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FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

FOR

MATTAMY HOMES
WATERIDGE VILLAGE – BLOCK 15

CITY OF OTTAWA

PROJECT NO.: 17-946

DECEMBER 2017 – REV 2

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
FOR
WATERIDGE VILLAGE – BLOCK 15

MATTAMY HOMES

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1.0 INTRODUCTION

David Schaeffer Engineering Limited (DSEL) has been retained to prepare a Functional Servicing and Stormwater Management report in support of the Site Plan Application for Block 15 of 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***, 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, it measures approximately ***1.96 ha*** and is zoned Residential Fourth Density Zone (R4Y[2311]).

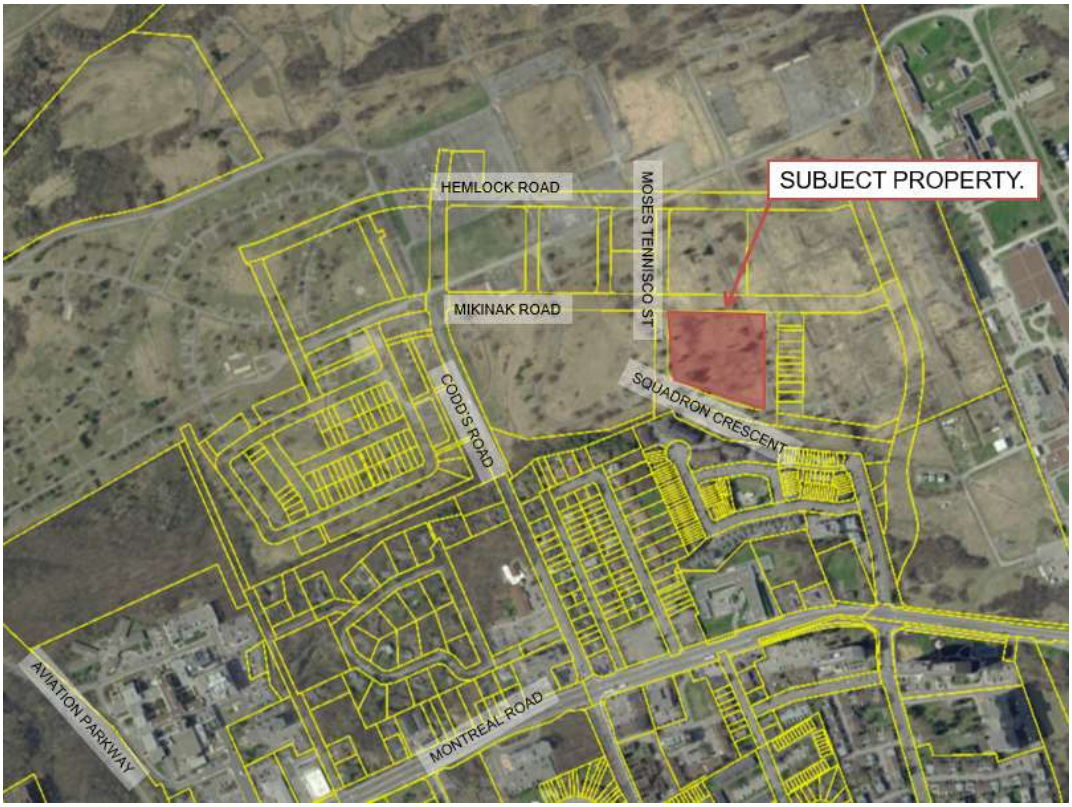

Figure 1: Site Location

The proposed development by Mattamy Homes involves the construction of 124 Rear Lane Townhomes. A copy of the site plan and site statistics are included in ***Drawings/Figures***.

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 existing lands are vacant, while the construction of the surrounding road network and underground services are currently underway at the time of this publication. 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 50 mm/day was estimated for Block 19, 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.

Squadron Crescent

- 200mm diameter PVC watermain
- 2400mm diameter storm sewer
- 300mm diameter sanitary sewer

Mikinak Road

- 900mm diameter watermain
- 375mm diameter storm sewer
- 250mm diameter sanitary sewer

The infrastructure described above is based on 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 dated September 15, 2017

The servicing received from IBI Group September 15, 2017 has been updated to provide stubs to the proposed property and 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.

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)

- **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*)

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

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

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

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

- **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)

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***. Based on the design drawings for the Wateridge Phase 1B subdivision, 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 are 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 to the 200mm watermain within Squadron Crescent. The site is serviced by surrounding fire hydrants on Squadron Crescent, Mikinak Road, and internal hydrants proposed on-site.

Due to the width of the right-of-way and the proximity of the Rear Lane Townhomes, it is proposed to provide a watermain 1.5m away from the proposed sanitary sewer. The water and sanitary sewers are designed in accordance with *Procedures to Govern Seperation of Sewers and Watermains (Procedure F-6-1)* prepared by the Ministry of the Environment.

Table 2 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	350 L/d/P
Residential Maximum Daily Demand	3.0 x avg. day *
Residential Maximum Hourly	4.5 x max. day *
Minimum Watermain Size	150mm diameter
Minimum Depth of Cover	2.4m from top of watermain to finished grade
During normal operating conditions desired operating pressure is within	350kPa and 480kPa
During normal operating conditions pressure must not drop below	275kPa
During normal operating conditions pressure must not exceed	552kPa
During fire flow operating pressure must not drop below	140kPa

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 summarizes the anticipated water supply demand and proposed boundary conditions. Boundary conditions for the subject site were 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	82.2	53.5	525.0	52.9	519.1
Peak Hour	369.7	52.1	511.1	51.5	505.0
Max Day + Fire Flow	11,000 + 246.5	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 within the 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.

Fire flow requirements are to be determined in accordance with City of Ottawa ***Water Supply Guidelines***. The Water Supply Guidelines specific that fire flows are to be estimated using the FUS in conjunction with the technical bulletin ISDTB-2014-02.

The following assumptions were provided by Mattamy Homes for both Stacked Townhomes and standard Townhomes and were used in estimating the fire supply requirements:

Type of construction – Non-Combustible Construction

Occupancy type – Non-Combustible

Sprinkler Protection – Non-Sprinklered

The estimated fire flow is ***13,000 L/min****;* actual building materials selected will affect the estimated flow; see ***Appendix B*** for detailed FUS calculations.

The ***Design Brief Phase 1B*** had contemplated a higher domestic demands and the same fire flow as predicted in this study. Therefore, the development complies with the design brief, a water distribution model was completed to ensure that the internal pipe network can adequately service the development.

3.3 Watermain Modeling

EPANet was utilized to determine pipe sizing and the availability of pressures throughout the system during Average Day demand, Peak Hour, and Max Day plus Fire Flow scenarios. The static model determines pressures based on the available head obtained from the boundary conditions from the ***Design Brief Phase 1B***, as indicated in ***Table 3.***

The model utilizes the Hazen-Williams equation to determine pressure drops, while the pipe properties, including friction factors, have been selected in accordance with Table 4.4 of the ***Water Supply Guidelines***.

A summary of the resulting pressures at all nodes are summarized in ***Table 4*** below.

Table 4
Resulting Pressures Proposed Conditions

Node ID	Average Day (kPa)	Peak Hour (kPa)	Max Day + Fire Flow* (kPa)
1	547.2	533.2	310.1
2	532.0	517.9	182.0
3	548.7	534.6	313.0
6	546.2	532.1	260.6
8	547.2	533.2	308.4
9	545.9	532.0	309.6
FH1*	540.8	526.7	186.4
*The fire flow yielding the lowest pressure was found at fire hydrant 1, which was used in this analysis.			

The minimum and maximum pressures shown in ***Table 4*** fall within the allowable pressures described in ***Table 2***. Pressures during Average Day and Peak Hour are at

the high end of the allowable pressure. A pressure test should be conducted at the time of construction to determine if pressure reducing valves are required.

The model predicted that water will flow in all areas of the system and no 'dead' zones were found.

3.4 Water Supply Conclusion

The boundary conditions at the site were determined from the ***Design Brief Phase 1B***. As demonstrated by ***Table 4***, the municipal system is capable of delivering water within the ***Water Supply Guidelines*** pressure range. Sufficient flow is available to provide fire protection for the site.

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 300mm sanitary sewer within Squadron Crescent. The total wastewater flow from the ***Design Brief Phase 1B*** is summarized in ***Table 5*** below.

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

Design Parameter	Total Flow (L/s)
Estimated Average Dry Weather Flow	2.15
Estimated Peak Dry Weather Flow	8.52
Estimated Peak Wet Weather Flow	9.07

The total flow summarized in ***Table 5*** 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***.

Table 6 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 - Residential	350 L/d/per
Peaking Factor	Harmon's Peaking Factor. 4.0
Infiltration and Inflow Allowance	0.28L/s/ha
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} AR^{2/3} S^{1/2}$
Minimum Sewer Size	200mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6m/s
Maximum Full Flowing Velocity	3.0m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012.	

Table 7 demonstrates the anticipated peak flow from the proposed development. See ***Appendix C*** for associated calculations.

Table 7
Summary of Estimated Peak Wastewater Flow

Design Parameter	Total Flow (L/s)
Estimated Average Dry Weather Flow	1.37
Estimated Peak Dry Weather Flow	5.48
Estimated Peak Wet Weather Flow	6.03

The estimated sanitary flow, based on the site plan provide in ***Drawings/Figures,*** anticipates a peak wet weather flow of ***6.03 L/s***.

The anticipated peak wastewater flow generated from the proposed development is less than contemplated in the ***Design Brief Phase 1B***, therefore, it can be concluded that there is capacity in the downstream system.

A sanitary calculation sheet was prepared for the on-site infrastructure, see ***Appendix C*** for the calculation sheet and ***SAN-1*** for sanitary drainage area drawing.

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 a wastewater flow that is less than contemplated in the ***Design Brief Phase 1B***, therefore, the existing sanitary sewers can convey the flow.

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***
- 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 2400mm 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*** for the drainage area figure. The overall Runoff Coefficient from the site is less than 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, the remaining overland flow was modeled within critical cross sections within the rear lane and at the exit of the site to the municipal ROW. It was determined that the depth of flow will be contained within the road cross section at both critical sections and not extend up to garages within the rear lane during the simulated 100-year storm event. 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 to direct all roof flow to side yard and bioswales, eventually draining to area drains. Grassed swales are proposed adjacent to the townhouse blocks to direct roof drainage to the area drains and to the oversized perforated pipe infiltration system. The granular base surrounding the perforated pipe has been sized in accordance with the ***LID Design Guide*** based on infiltration rates, ensuring a maximum drawdown time of 48 hours. Based on correspondence with Paterson Group, an infiltration rate of 50mm/day has been estimated for the soil in Block 19, a Block owned by the applicant north-west of Block 15. It is proposed to use material from this Block as fill on the adjacent sites, therefore, the LID infiltration practices will be placed within the fill from Block 19.

A bioswale is proposed within the Mews and consists of riverstone and larger vegetation which collects roof and rear yard drainage. The term “bioswale” as the proposed LID practice is a combination of “bioretention” and “enhanced grass swale” as defined by the ***LID Design Guide***. A layer of riverstone is proposed as ground cover along with native plants to slow down runoff to promote infiltration and evapotranspiration. The bioswale will continue to convey flow, similar to an enhanced grass swale, to a series of area drains connected to a rainwater harvesting unit located at the downstream end of the Mews.

The rainwater harvesting unit is proposed to store runoff from the Mews to be used for irrigation. The rainwater harvesting tank is equipped with a connection to the local watermain for use during dry periods. The rainwater harvesting is also equipped with an overflow to the local storm system in case of overflow and with an open grate to the surface in case of very large storm events that overwhelm the local storm sewer system. A schematic of the rainwater harvesting system prepared by LRL is included in Appendix D.

Details of the LID practices are shown on ***DS-1***.

All LID measures are designed to infiltrate or detain for future irrigation use an equivalent of the 4mm event over the site area and each LID measure must treat the minimum of the 15mm event. A total infiltration requirement of 4mm or ***78.3m^3*** and a total treatment volume of the 15mm event, or ***200.6m^3*** is required per the ***LID Demonstration Project***. The current rainwater harvesting and perforated pipe system provides ***209m^3*** of volume

to be infiltrated or detained for rainwater harvesting, exceeding the above noted requirements.

Refer to drawing ***SSP-1*** for the location of proposed LID practices.

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 bioswales, grassed swales, rainwater harvesting tanks and oversized perforated pipes are proposed to treat, storage and infiltrate roof and landscaped 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 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*** and a water distribution model completed for the site, sufficient pressure exists to support the development
- Based on estimated fire flow per the ***FUS***, there is sufficient pressure within the local system to provide the required fire flow
- The proposed development is anticipated to have a peak wet weather flow of ***6.03 L/s***; the adjacent sanitary sewer has capacity to convey the flow
- 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***
- LID practices in the form bioswales, grassed swales, rainwater harvesting tanks and oversized perforated pipes are proposed to treat, storage and infiltrate roof and landscaped runoff from the site, in accordance with the ***LID Demonstration Project***

Prepared by,
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Reviewed by,
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Per: Adam D. Fobert, P. Eng.

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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

Steve Merrick

From: David Gilbert <DGilbert@Patersongroup.ca>
Sent: Friday, September 22, 2017 2:30 PM
To: Steve Merrick
Subject: RE: Wateridge Village Phase 1B - Geotech Report

Hi Steve,

As discussed, the upper portion of the soils profile within Block 19 consists mainly of a silty clay. If this material were re-compacted across the other blocks, we estimate that the infiltration rate would be approximately 50 mm/day. To provide an accurate infiltration rate assessment, we could complete a series of pask permeameter tests once the material has been placed and re-compacted or in its presence state within Block 19.

Best regards,

David Gilbert, P.Eng.
Senior Geotechnical Engineer

patersongroup
Solution Oriented Engineering
60 years serving our clients

154 Colonnade Road South
Ottawa, Ontario
K2E 7J5
Tel: 613.226-7381 ext. 205

From: Steve Merrick [mailto:SMerrick@dsel.ca]
Sent: Thursday, September 21, 2017 9:21 AM
To: David Gilbert <DGilbert@Patersongroup.ca>
Subject: RE: Wateridge Village Phase 1B - Geotech Report

Hi Dave, same project but a different question. Can Paterson please provide an average infiltration rate for the Block 19? We are looking for this to size our LID systems understanding that the LID measures for Blocks 15, 22 and 24 will be within fill taken from Block 19.

I'll follow up with a phone call this morning to discuss.

Thanks!

Steve Merrick, P.Eng.
Project Manager / Intermediate Designer

DSEL
david schaeffer engineering ltd.

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

phone: (613) 836-0856 ext. 561
cell: (613) 222-7816
email: smerrick@DSEL.ca

From: Steve Merrick
Sent: Wednesday, September 20, 2017 4:03 PM
To: 'David Gilbert' <DGilbert@Patersongroup.ca>
Cc: 'Adam Fobert' <afobert@dsel.ca>
Subject: RE: Wateridge Village Phase 1B - Geotech Report

Thanks Dave, we are trying to get the feasibility of this option back to Mattamy quickly and your input would really help.

Thanks!

Steve Merrick, P.Eng.
Project Manager / Intermediate Designer

DSEL
david schaeffer engineering ltd.

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

phone: (613) 836-0856 ext. 561
cell: (613) 222-7816
email: smerrick@DSEL.ca

From: Steve Merrick
Sent: Wednesday, September 20, 2017 3:29 PM
To: David Gilbert <DGilbert@Patersongroup.ca>
Cc: 'Adam Fobert' <afobert@dsel.ca>
Subject: RE: Wateridge Village Phase 1B - Geotech Report

Hi Dave,

We are looking at some servicing options for Mattamy' blocks at Wateridge and wanted to input from Paterson on zone of influence and sewers in close proximity to the units. I have attached 3 sketches (very rough) showing some restrictive areas. Can you advise on the zone of influence from the footings and provide any other geotechnical recommendations or issues with the proposed sections?

Please refer to the servicing plans for locations of the 3 sections.

Thanks!

Steve Merrick, P.Eng.
Project Manager / Intermediate Designer

DSEL
david schaeffer engineering ltd.

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

phone: (613) 836-0856 ext. 561
cell: (613) 222-7816
email: smerrick@DSEL.ca

From: Jillian Normand [mailto:Jillian.Normand@mattamycorp.com]
Sent: Wednesday, August 9, 2017 5:21 PM
To: Adam Fobert <AFobert@dsel.ca>; Steve Merrick <SMerrick@dsel.ca>; Anne-Claude Schellenberg <ACSchellenberg@nak-design.com>; Sean Leogreen <sleogreen@nak-design.com>; Anita Bennell <abennell@nak-design.com>; Kevin Murphy <Kevin.Murphy@mattamycorp.com>; Jessica McLellan <Jessica.Mclellan@mattamycorp.com>; Marco VanderMaas <MVanderMaas@q4architects.com>; Daniel Potechin <Daniel.Potechin@mattamycorp.com>
Subject: Wateridge Village Phase 1B - Geotech Report

Hi team,

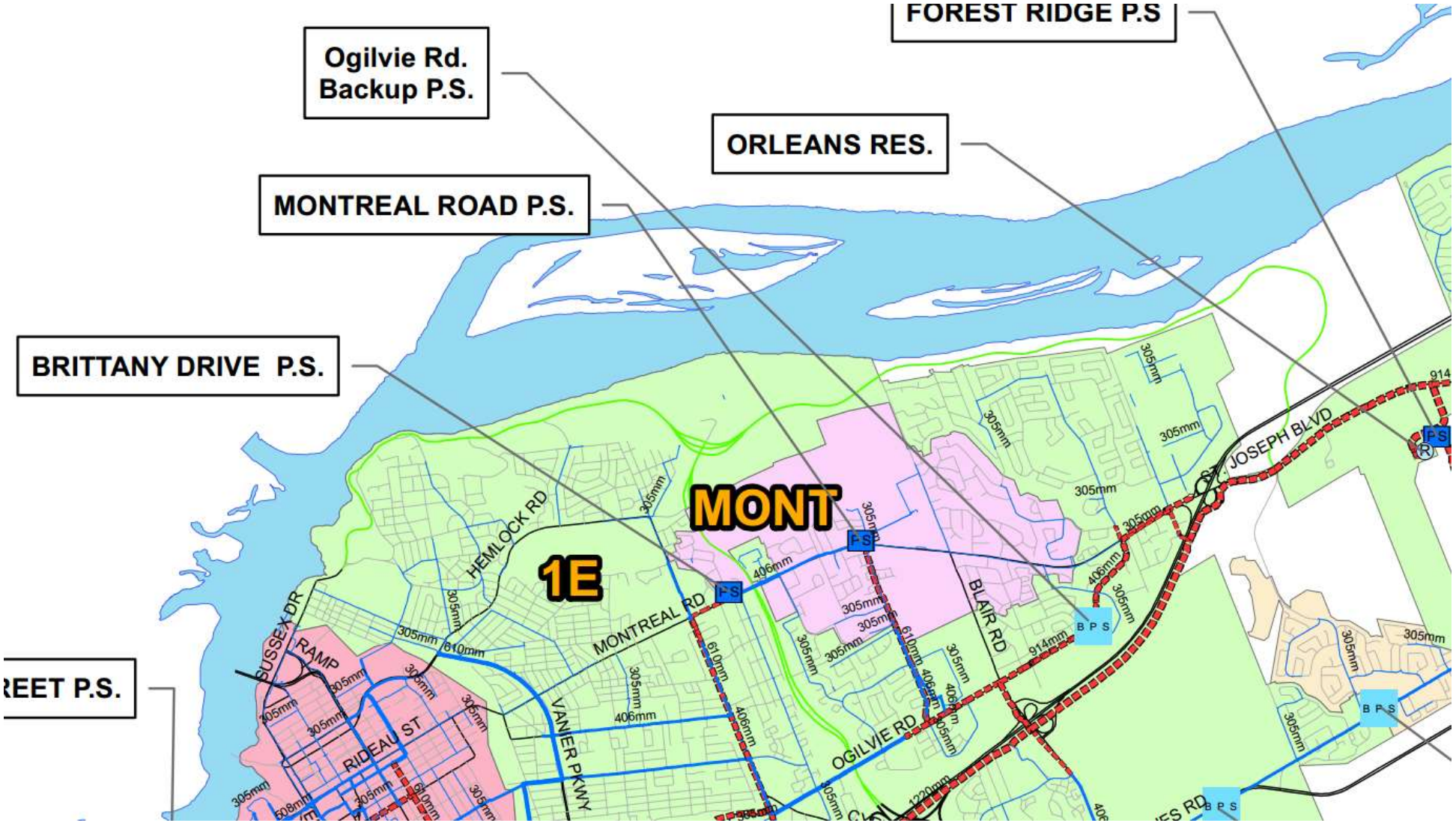
Please see attached for the updated Geotech Report, for your reference.

Jillian

Jillian Normand
Land Development Manager
T (613) 831-5144 (direct). **C** (613) 415-7786. **F** (613) 831-9060
Jillian.Normand@mattamycorp.com
Ottawa Office: 50 Hines Road, Suite 100, Ottawa, ON Canada K2K 2M5

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	125	338
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	338	118.3	82.2	354.9	246.5	532.4	369.7

Institutional / Commercial / Industrial Demand

Property Type	Unit Rate	Units	Avg. Daily		Max Day		Peak Hour	
			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
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	**118.3**	**82.2**	**354.9**	**246.5**	**532.4**	**369.7**

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: Ordinary Construction

C	1		*Type of Construction Coefficient per FUS Part II, Section 1*
A	1643.4	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	8918.6	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

N	10.1m-20m	15%	
S	0m-3m	25%	
E	3.1m-10m	20%	
W	10.1m-20m	15%	
	% Increase	**75%**	*value not to exceed 75% per FUS Part II, Section 4*
	Increase	**5737.5 L/min**	

Total Fire Flow

Fire Flow	13387.5	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 _____.
-Calculations based on Fire Underwriters Survey - Part II

Mattamy Homes
Wateridge Block 15
Proposed Site Conditions
Dwelling Block 12

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: Ordinary Construction

C	1		*Type of Construction Coefficient per FUS Part II, Section 1*
A	1643.1	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	8917.7	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

N	0m-3m	25%	
S	10.1m-20m	15%	
E	3.1m-10m	20%	
W	10.1m-20m	15%	
	% Increase	**75%**	*value not to exceed 75% per FUS Part II, Section 4*

Increase	**5737.5**	**L/min**

Total Fire Flow

Fire Flow	13387.5	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 _____.
-Calculations based on Fire Underwriters Survey - Part II

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**********************************************************************
*                          E P A N E T                               *
*                   Hydraulic and Water Quality                      *
*                   Analysis for Pipe Networks                       *
*                         Version 2.0                                *
**********************************************************************
```

AVERAGE DAY

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
3	9	8	57.2	200
5	3	6	53.6	200
6	6	12	43.0	200
7	12	FH1	4.1	150
8	6	8	83.8	150
9	8	11	13.8	200
13	11	FH2	4.0	150
1	3	1	55.4	200
11	1	11	47.5	200
4	WSquadron	3	23.3	200
10	12	2	10.6	200
12	2	9	97.4	150
14	9	SSquadron	27.8	200
2	2	4	13.2	150

Node Results:

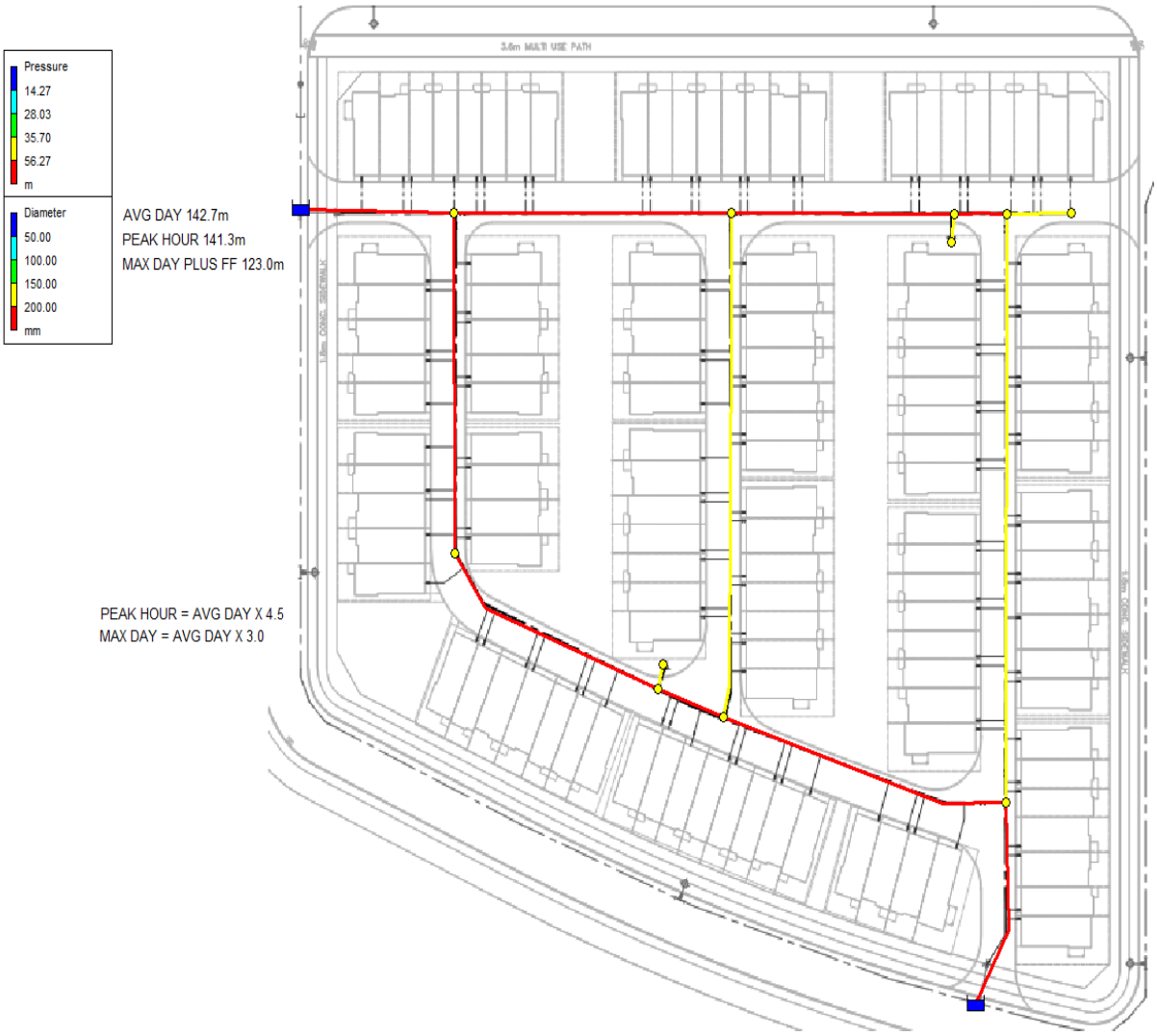
Node ID	Demand LPM	Head m	Pressure m	Quality
3	11.74	142.79	55.93	0.00
6	11.74	142.83	55.68	0.00
FH1	0.00	142.84	54.87	0.00
8	11.74	142.88	55.78	0.00
9	11.74	142.98	55.65	0.00
FH2	0.00	142.87	55.71	0.00
11	0.00	142.87	55.73	0.00
12	0.00	142.84	55.13	0.00
1	11.74	142.83	55.78	0.00
2	11.74	142.84	55.39	0.00
4	11.74	142.84	54.23	0.00

WSquadron	1031.18	142.70	0.00	0.00	Reservoir
SSquadron	-1113.36	143.10	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPM	Velocity m/s	Unit Headloss m/km	Status
3	752.64	0.40	1.69	Open
5	-522.85	0.28	0.75	Open
6	-325.49	0.17	0.31	Open
7	0.00	0.00	0.00	Open
8	-209.09	0.20	0.67	Open
9	531.81	0.28	1.00	Open
13	0.00	0.00	0.00	Open
1	-520.07	0.28	0.82	Open
11	-531.81	0.28	0.78	Open
4	-1031.18	0.55	3.73	Open
10	-325.50	0.17	0.40	Open
12	-348.98	0.33	1.39	Open
14	-1113.36	0.59	4.32	Open
2	11.74	0.01	0.00	Open

AVERAGE DAY SCENARIO – BLOCK 15



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*                          E P A N E T                               *
*                   Hydraulic and Water Quality                      *
*                   Analysis for Pipe Networks                       *
*                         Version 2.0                                *
**********************************************************************
```

MAX DAY PLUS FIREFLOW

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
3	9	8	57.2	200
5	3	6	53.6	200
6	6	12	43.0	200
7	12	FH1	4.1	150
8	6	8	83.8	150
9	8	11	13.8	200
13	11	FH2	4.0	150
1	3	1	55.4	200
11	1	11	47.5	200
4	WSquadron	3	23.3	200
10	12	2	10.6	200
12	2	9	97.4	150
14	9	SSquadron	27.8	200
2	2	4	13.2	150

Node Results:

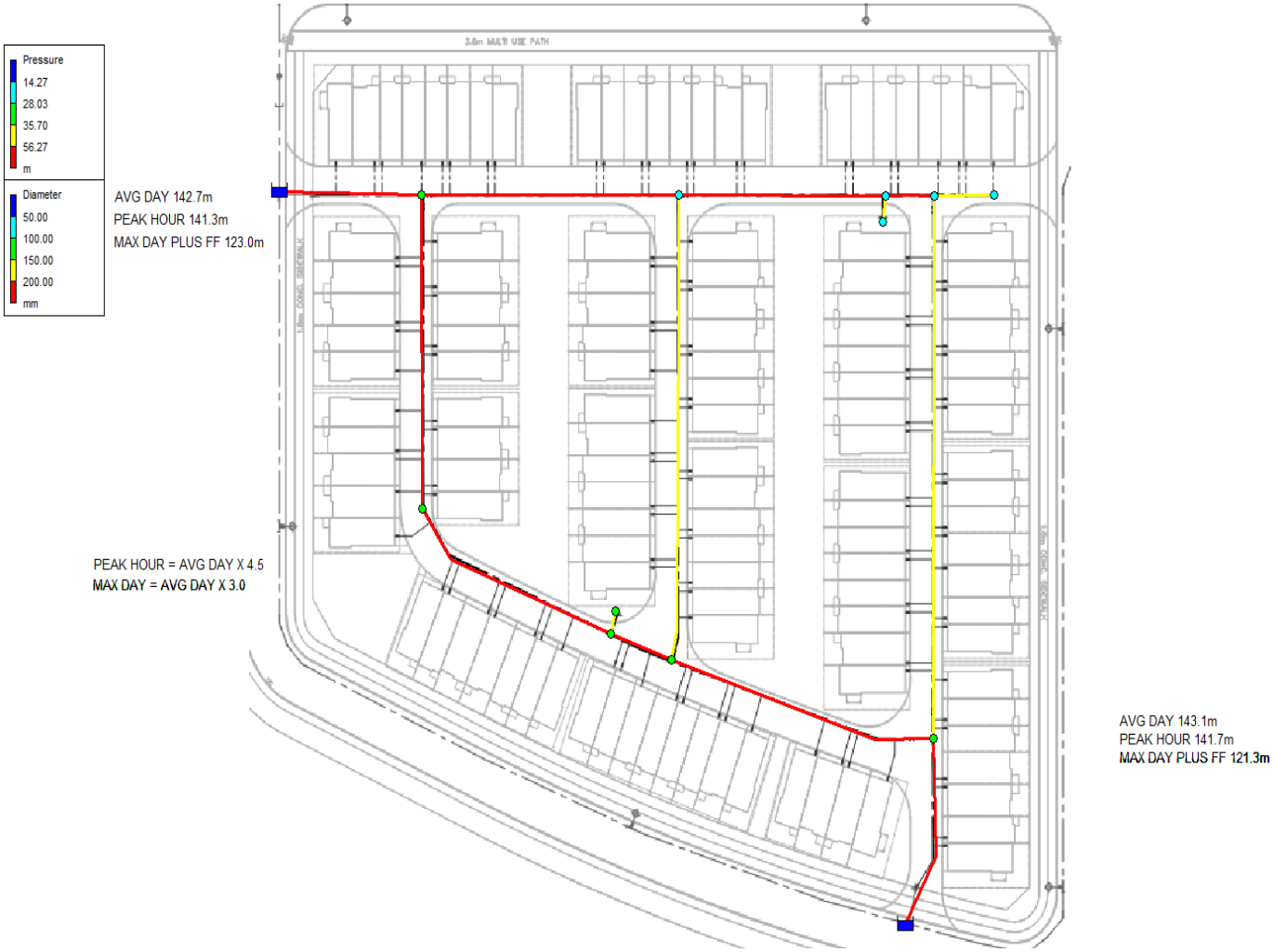
Node ID	Demand LPM	Head m	Pressure m	Quality
3	35.22	118.77	31.91	0.00
6	35.22	113.72	26.57	0.00
FH1	0.00	106.71	18.74	0.00
8	35.22	118.54	31.44	0.00
9	35.22	118.89	31.56	0.00
FH2	0.00	118.58	31.42	0.00
11	0.00	118.58	31.44	0.00
12	12999.99	106.71	19.00	0.00
1	35.22	118.66	31.61	0.00
2	35.22	107.16	19.71	0.00
4	35.22	107.16	18.55	0.00

WSquadron	-7888.98	123.00	0.00	0.00	Reservoir
SSquadron	-5357.55	121.30	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPM	Velocity m/s	Unit Headloss m/km	Status
3	1481.12	0.79	6.05	Open
5	6997.67	3.71	94.38	Open
6	9229.22	4.90	162.81	Open
7	0.00	0.00	0.00	Open
8	-2266.77	2.14	57.62	Open
9	-820.87	0.44	2.28	Open
13	0.00	0.00	0.00	Open
1	856.09	0.45	2.09	Open
11	820.87	0.44	1.75	Open
4	7888.98	4.19	181.35	Open
10	-3770.77	2.00	42.08	Open
12	-3841.21	3.62	120.42	Open
14	-5357.55	2.84	86.69	Open
2	35.22	0.03	0.03	Open

MAX DAY + FIRE FLOW SCENARIO – BLOCK 15



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*                          E P A N E T                       *
*                   Hydraulic and Water Quality              *
*                   Analysis for Pipe Networks               *
*                         Version 2.0                        *
**************************************************************
```

PEAK HOUR

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
3	9	8	57.2	200
5	3	6	53.6	200
6	6	12	43.0	200
7	12	FH1	4.1	150
8	6	8	83.8	150
9	8	11	13.8	200
13	11	FH2	4.0	150
1	3	1	55.4	200
11	1	11	47.5	200
4	WSquadron	3	23.3	200
10	12	2	10.6	200
12	2	9	97.4	150
14	9	SSquadron	27.8	200
2	2	4	13.2	150

Node Results:

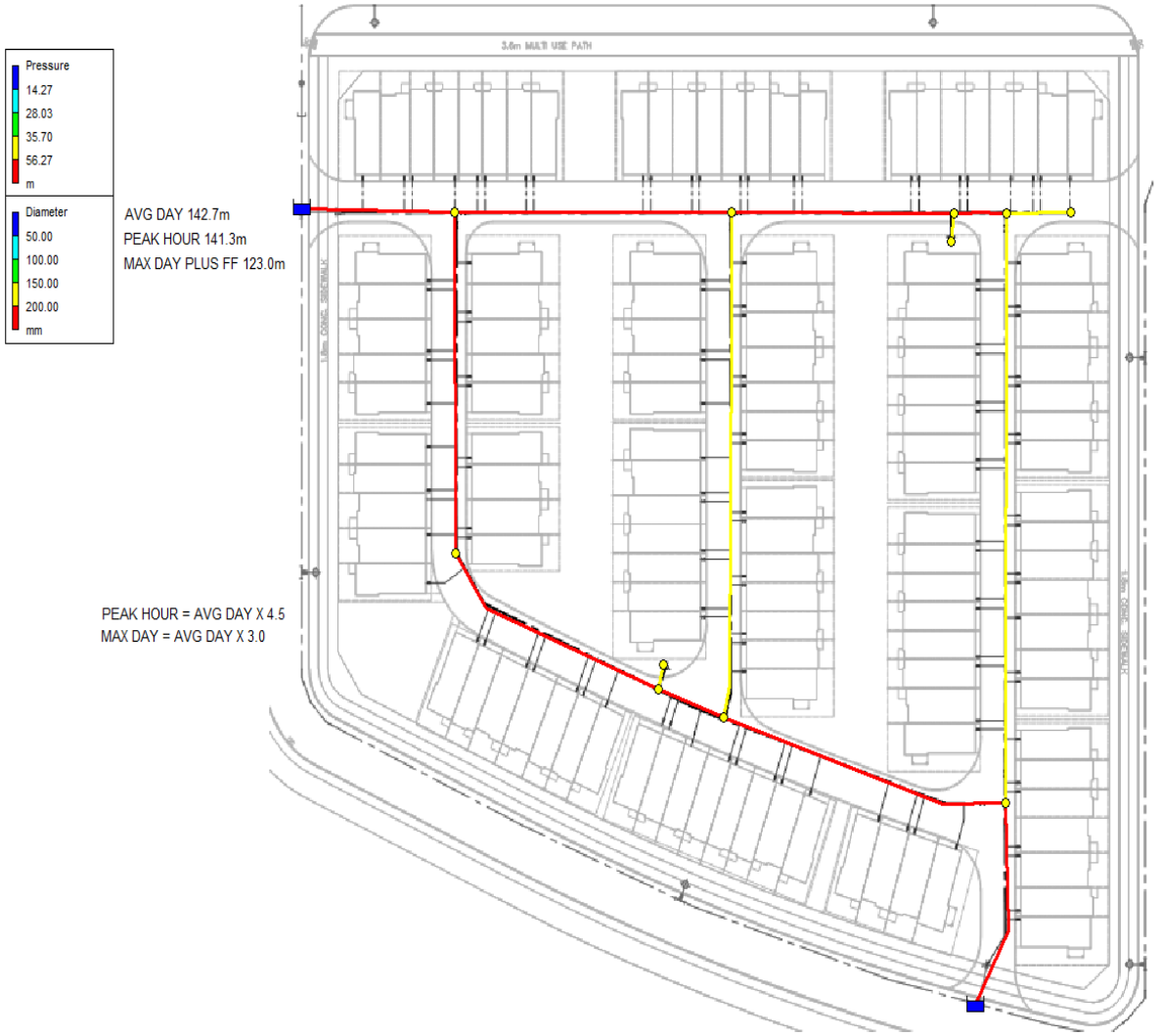
Node ID	Demand LPM	Head m	Pressure m	Quality	
3	52.83	141.36	54.50	0.00	
6	52.83	141.39	54.24	0.00	
FH1	0.00	141.40	53.43	0.00	
8	52.83	141.45	54.35	0.00	
9	52.83	141.56	54.23	0.00	
FH2	0.00	141.44	54.28	0.00	
11	0.00	141.44	54.30	0.00	
12	0.00	141.40	53.69	0.00	
1	52.83	141.40	54.35	0.00	
2	52.83	141.40	53.95	0.00	
4	52.83	141.40	52.79	0.00	
WSquadron	854.01	141.30	0.00	0.00	Reservoir

SSquadron	-1223.83	141.70	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPM	Velocity m/s	Unit Headloss m/km	Status
3	795.70	0.42	1.88	Open
5	-433.03	0.23	0.53	Open
6	-269.64	0.14	0.22	Open
7	0.00	0.00	0.00	Open
8	-216.22	0.20	0.71	Open
9	526.65	0.28	0.98	Open
13	0.00	0.00	0.00	Open
1	-473.82	0.25	0.69	Open
11	-526.65	0.28	0.76	Open
4	-854.01	0.45	2.60	Open
10	-269.64	0.14	0.28	Open
12	-375.30	0.35	1.59	Open
14	-1223.83	0.65	5.18	Open
2	52.83	0.05	0.07	Open

PEAK HOUR SCENARIO – BLOCK 15



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
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Ottawa, Ontario K1S 5N4 Canada
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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

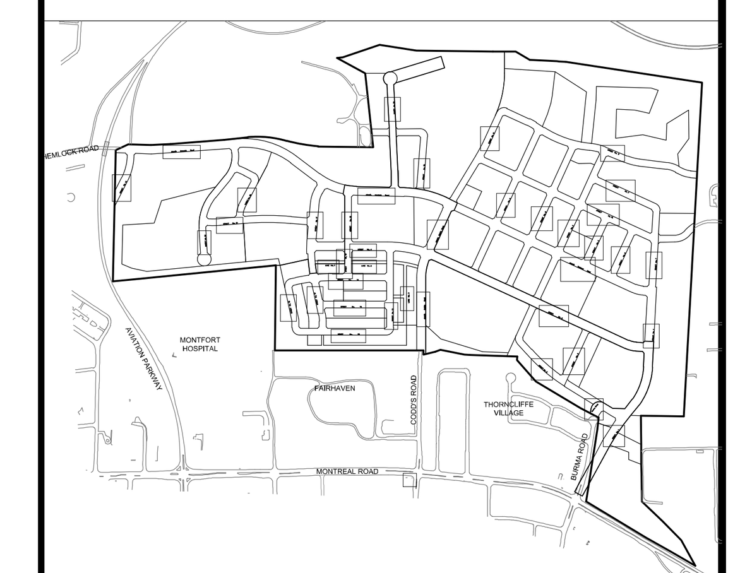
Signed ______________________

Date ______________________ 2017

Plan Number ______________________

LEGEND :

- AREA NUMBER
- 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

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SOCIÉTÉ IMMOBILIÈRE DU CANADA
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Ottawa, On K1P 5L4
613 998 7777

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
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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

Mattamy Homes
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	**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	125	338
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	**338**	
Average Domestic Flow	**1.37**	**L/s**
Peaking Factor	**4.00**	
Peak Domestic Flow	**5.48**	**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	**1.37**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**5.48**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**6.03**	**L/s**

SANITARY SEWER CALCULATION SHEET

PROJECT: **Mattamy - Wateridge**
LOCATION: **Block 15**
FILE REF: **17-946**
DATE: **07-Dec-17**

DESIGN PARAMETERS

Avg. Daily Flow Res.	350	L/p/d	Peak Fact Res. Per Harmons: Min = 2.0, Max =4.0		Infiltration / Inflow	0.28	L/s/ha
Avg. Daily Flow Comm.	50,000	L/ha/d	Peak Fact. Comm.	1.5	Min. Pipe Velocity	0.60	m/s full flowing
Avg. Daily Flow Instit.	50,000	L/ha/d	Peak Fact. Instit.	1.5	Max. Pipe Velocity	3.00	m/s full flowing
Avg. Daily Flow Indust.	35,000	L/ha/d	Peak Fact. Indust. per MOE graph		Mannings N	0.013	

Location			Residential Area and Population							Commercial		Institutional		Industrial			Infiltration				Pipe Data							
Area ID	Up	Down	Area	Proposed Townhouse	Pop.	Cumulative Area	Cumulative Pop.	Peak. Fact.	Q_{res}	Area	Accu. Area	Area	Accu. Area	Area	Accu. Area	Q_{C+I+I}	Total Area	Accu. Area	Infiltration Flow	Total Flow	DIA	Slope	Length	$A_{hydraulic}$	R	Velocity	Q_{cap}	Q / Q full
			(ha)	Units		(ha)		(-)	(L/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(mm)	(%)	(m)	(m^2)	(m)	(m/s)	(L/s)	(-)
On site																											
SAN-6	SAN6	SAN5	0.066	4	11.0	0.066	11.0	4.00	0.18		0.00		0.00		0.00	0.0	0.066	0.066	0.018	0.20	250	4.00	16.4	0.049	0.063	2.42	118.9	0.00
SAN-11a	SAN11	SAN5	0.428	33	90.0	0.428	90.0	4.00	1.46		0.00		0.00		0.00	0.0	0.428	0.428	0.120	1.58	250	0.50	100.5	0.049	0.063	0.86	42.0	0.04
SAN-5	SAN5	SAN4	0.154	8	22.0	0.648	123.0	4.00	1.99		0.00		0.00		0.00	0.0	0.154	0.648	0.181	2.17	250	0.50	53.6	0.049	0.063	0.86	42.0	0.05
SAN-13	SAN13	SAN4	0.368	26	71.0	0.368	71.0	4.00	1.15		0.00		0.00		0.00	0.0	0.368	0.368	0.103	1.25	250	0.60	81.0	0.049	0.063	0.94	46.1	0.03
SAN-4	SAN4	SAN3	0.162	9	25.0	1.178	219.0	4.00	3.55		0.00		0.00		0.00	0.0	0.162	1.178	0.330	3.88	250	0.50	53.6	0.049	0.063	0.86	42.0	0.09
SAN-12	SAN12	SAN11	0.008	4	11.0	0.008	11.0	4.00	0.18		0.00		0.00		0.00	0.0	0.008	0.008	0.002	0.18	250	0.50	22.4	0.049	0.063	0.86	42.0	0.00
SAN-11b	SAN11	SAN10	0.018	1	3.0	0.026	14.0	4.00	0.23		0.00		0.00		0.00	0.0	0.018	0.026	0.007	0.23	250	0.50	10.6	0.049	0.063	0.86	42.0	0.01
SAN-10	SAN10	SAN9	0.160	9	25.0	0.186	39.0	4.00	0.63		0.00		0.00		0.00	0.0	0.160	0.186	0.052	0.68	250	0.50	52.0	0.049	0.063	0.86	42.0	0.02
SAN-9	SAN9	SAN8	0.149	9	25.0	0.335	64.0	4.00	1.04		0.00		0.00		0.00	0.0	0.149	0.335	0.094	1.13	250	0.50	44.7	0.049	0.063	0.86	42.0	0.03
SAN-8	SAN8	SAN7	0.059	1	3.0	0.394	67.0	4.00	1.09		0.00		0.00		0.00	0.0	0.059	0.394	0.110	1.20	250	0.50	10.9	0.049	0.063	0.86	42.0	0.03
SAN-7	SAN7	SAN3	0.261	18	49.0	0.655	116.0	4.00	1.88		0.00		0.00		0.00	0.0	0.261	0.655	0.183	2.06	250	0.50	60.4	0.049	0.063	0.86	42.0	0.05
SAN-3	SAN3	SAN2	0.056	3	9.0	1.889	344.0	4.00	5.57		0.00		0.00		0.00	0.0	0.056	1.889	0.529	6.10	250	6.60	19.5	0.049	0.063	3.11	152.8	0.04
NONE	SAN2	SAN1/MH223A				1.889	344.0	4.00	5.57		0.00		0.00		0.00	0.0	0.000	1.889	0.529	6.10	250	6.60	12.2	0.049	0.063	3.11	152.8	0.04

APPENDIX D

Stormwater Management

IBI GROUP
400-333 Preston Street
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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

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

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

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

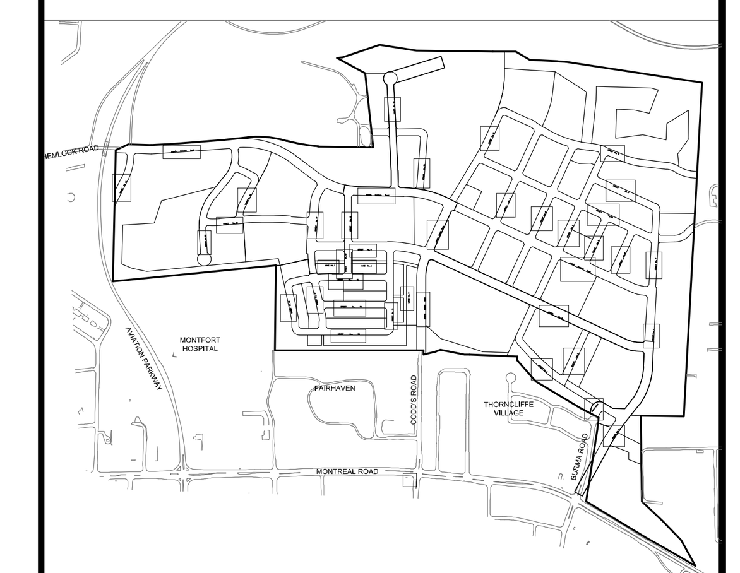
Signed ______________________

Date ______________________ 2017

Plan Number ______________________

LEGEND :

S168 2.01 0.80	AREA NUMBER
	RUNOFF COEFFICIENT
	AREA IN HECTARES
(arrow)	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: J.I.M.	Date: MAY 2016
Drawn: M.M.	Checked: J.I.M.
Project No.: 38298	Drawing No.: 500A

D07-16-15-0003

#17063

Storm Sewer Calculation Sheet
Block 15

										Sewer Data								
Up	Down	Area ID	Area	C	2.78 Indiv AxC	2.78 Acc AxC	T_C	I	Q	DIA	Slope	Length	$A_{hydraulic}$	R	Velocity	Qcap	Time Flow	Q / Q full
			(ha)	(-)			(min)	(mm/hr)	(L/s)	(mm)	(%)	(m)	(m^2)	(m)	(m/s)	(L/s)	(min)	(-)
On site																		
STM106	STM105	112, 106	0.153	0.82	0.35	0.35	10.0	104.2	36.3	300	0.50	103.7	0.071	0.075	0.97	68.4	1.8	0.53
STM105	STM104	105, 2	0.333	0.77	0.71	1.06	11.8	95.6	101.5	375	0.50	53.6	0.110	0.094	1.12	124.0	0.8	0.82
STM111	STM104	111	0.037	0.82	0.08	0.08	10.0	104.2	8.8	250	0.50	72.3	0.049	0.063	0.86	42.0	1.4	0.21
STM104	STM103	104, 1	0.414	0.75	0.86	2.01	12.6	92.3	185.4	525	0.50	53.6	0.216	0.131	1.40	304.1	0.6	0.61
STM110	STM109	110, 3	0.347	0.77	0.74	0.74	10.0	104.2	77.4	450	0.50	52.3	0.159	0.113	1.27	201.6	0.7	0.38
STM109	STM108	109	0.124	0.82	0.28	1.03	10.7	100.7	103.3	525	0.50	45.8	0.216	0.131	1.40	304.1	0.5	0.34
STM108	STM107	108, 101	0.106	0.82	0.24	1.27	11.2	98.1	124.3	525	0.50	9.1	0.216	0.131	1.40	304.1	0.1	0.41
STM107	STM103	107, 102	0.101	0.82	0.23	1.50	11.3	97.6	146.2	525	0.75	59.8	0.216	0.131	1.72	372.4	0.6	0.39
STM103	STM102	103	0.170	0.82	0.39	3.89	13.2	89.8	349.7	525	0.80	19.5	0.216	0.131	1.78	384.7	0.2	0.91
STM102	STM101	NONE	0.000	0.00	0.00	3.89	13.4	89.1	347.0	525	5.80	11.5	0.216	0.131	4.78	1035.7	0.0	0.34
						3.89	13.4											

```
00001> 2     Metric units
00002> *#*************************************************************************
00003> *#  Project Name: []    Project Number: [16-833]
00004> *#  Date        : 06-05-2016
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\005YC12H.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=[1.12](ha),
00021>                     XIMP=[0.80], TIMP=[0.80], 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=[0.230](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, 7.7] NSEG times
00044>                     ( DISTANCE (m), ELEVATION (m))=[0    , 100.03]
00045>                                                    [1.0  , 99.98]
00046>                                                    [1.2 , 99.90]
00047>                                                    [7.7  , 100.03]
00048>
00049> ***************************************************************************
00050> * Remaining Drainage Area to Squadron Cres.
00051> ***************************************************************************
00052> CALIB STANDHYD      ID=[1] NHYD=["A1"], DT=[1](min), AREA=[0.70](ha),
00053>                     XIMP=[0.80], TIMP=[0.80], DWF=[0](cms), LOSS=[1],
00054>                     Horton: Fo=[76.2](mm/hr), Fc=[13.2](mm/hr),
00055>                             DCAY=[4.14](/hr), F=[0](mm),
00056>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[2.0](%),
00057>                                          LGP=[10](m), MNP=[0.25], SCP=[0](min),
00058>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
00059>                                          LGI=[150](m), MNI=[0.013], SCI=[0](min)
00060>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00061> *%-----------------|-------------------------------------------------------|
00062> * Inlet Capacity per 5-Year Design Sheet Pipe Capacity
00063> COMPUTE DUALHYD     IDin=[1], CINLET=[0.150](cms), NINLET=[1],
00064>                     MAJID=[2], MajNHYD=["MAJOR"],
00065>                     MINID=[4], MinNHYD=["MINOR"],
00066>                     TMJSTO=[0](cu-m)
00067> *%-----------------|-------------------------------------------------------|
00068> ADD HYD             IDsum=[1], NHYD=["Total"], IDs to add=[2+3]
00069> *%-----------------|-------------------------------------------------------|
00070> * Cross Section at Site Entrance (Squadron Cres.)
00071> ROUTE CHANNEL       IDout=[3], NHYD=["ROAD"], IDin=[1],
00072>                     RDT=[1](min),
00073>                     CHLGTH=[10](m),  CHSLOPE=[3.5](%),
00074>                                      FPSLOPE=[3.5](%),
00075>                     SECNUM=[15.2],      NSEG=[1]
00076>                     ( SEGROUGH, SEGDIST (m))=[0.013, 8.5] NSEG times
00077>                     ( DISTANCE (m), ELEVATION (m))=[0    , 100]
00078>                                                    [1.8  , 99.96]
00079>                                                    [2.0 , 99.88]
00080>                                                    [8.5  , 100.04]
00081>
00082> ***************************************************************************
00083> ***************************************************************************
00084> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[2]
00085>                    ["C:\SWM_PRG\STMFILES\100YC24H.stm"]
00086> *%-----------------|-------------------------------------------------------|
00087> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[3]
00088>                    ["C:\SWM_PRG\STMFILES\CH4H100x.stm"]
00089> *%-----------------|-------------------------------------------------------|
00090> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[4]
00091>                    ["C:\SWM_PRG\STMFILES\CH6H100x.stm"]
00092> *%-----------------|-------------------------------------------------------|
00093> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[5]
00094>                    ["C:\SWM_PRG\STMFILES\100YC12H.stm"]
00095> *%-----------------|-------------------------------------------------------|
00096> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[6]
00097>                    ["C:\SWM_PRG\STMFILES\19790701.stm"]
00098> *%-----------------|-------------------------------------------------------|
00099> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[7]
00100>                    ["C:\SWM_PRG\STMFILES\19880804.stm"]
00101> *%-----------------|-------------------------------------------------------|
00102> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[8]
00103>                    ["C:\SWM_PRG\STMFILES\19960808.stm"]
00104> *%-----------------|-------------------------------------------------------|
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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: 2017-12-02     TIME: 12:05:28     RUN COUNTER: 000506          *
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: [16-833]
00053> *#  Date        : 06-05-2016
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\005YC12H.stm
00066> --------------------------------------------------------------------------------
00067> 001:0002--------------------------------------------------------------------------
00068> ---------------------
00069> | READ STORM       |    Filename: 5-Year 12-Hour Chicago Storm, 10 min Tim
00070> | Ptotal=  56.17 mm|    Comments: 5-Year 12-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    .940 |   3.17  3.680 |   6.17  2.770 |   9.17   1.300
00075>               .33    .980 |   3.33  4.580 |   6.33  2.600 |   9.33   1.270
00076>               .50   1.020 |   3.50  6.150 |   6.50  2.440 |   9.50   1.240
00077>               .67   1.060 |   3.67  9.610 |   6.67  2.310 |   9.67   1.200
00078>               .83   1.110 |   3.83 24.170 |   6.83  2.190 |   9.83   1.170
00079>              1.00   1.160 |   4.00 104.190 |  7.00  2.080 |  10.00   1.150
00080>              1.17   1.220 |   4.17  32.040 |  7.17  1.990 |  10.17   1.120
00081>              1.33   1.280 |   4.33  16.340 |  7.33  1.900 |  10.33   1.100
00082>              1.50   1.360 |   4.50  10.960 |  7.50  1.820 |  10.50   1.070
00083>              1.67   1.440 |   4.67   8.290 |  7.67  1.750 |  10.67   1.050
00084>              1.83   1.540 |   4.83   6.690 |  7.83  1.680 |  10.83   1.030
00085>              2.00   1.650 |   5.00   5.630 |  8.00  1.620 |  11.00   1.010
00086>              2.17   1.780 |   5.17   4.870 |  8.17  1.570 |  11.17    .990
00087>              2.33   1.940 |   5.33   4.300 |  8.33  1.510 |  11.33    .970
00088>              2.50   2.130 |   5.50   3.860 |  8.50  1.470 |  11.50    .950
00089>              2.67   2.370 |   5.67   3.510 |  8.67  1.420 |  11.67    .930
00090>              2.83   2.680 |   5.83   3.220 |  8.83  1.380 |  11.83    .920
00091>              3.00   3.100 |   6.00   2.980 |  9.00  1.340 |  12.00    .900
00092>
00093> --------------------------------------------------------------------------------
00094> 001:0003--------------------------------------------------------------------------
00095> ********************************************************************************
00096> * Post-Development Model - Wateridge Block 15
00097> ********************************************************************************
00098> ********************************************************************************
00099> * Drainage to Rear Lane
00100> ********************************************************************************
00101> ----------------------
00102> | CALIB STANDHYD     |   Area    (ha)=    1.12
00103> | 01:RL1     DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
00104> ----------------------
00105>                                IMPERVIOUS    PERVIOUS (i)
00106>      Surface Area     (ha)=         .90          .22
00107>      Dep. Storage     (mm)=        1.57         4.67
00108>      Average Slope     (%)=         .50         2.00
00109>      Length            (m)=      250.00        10.00
00110>      Mannings n            =        .013         .250
00111>
00112>      Max.eff.Inten.(mm/hr)=      104.19        65.05
00113>                over (min)        5.00         9.00
00114>      Storage Coeff.  (min)=        5.36 (ii)    9.01 (ii)
00115>      Unit Hyd. Tpeak (min)=        5.00         9.00
00116>      Unit Hyd. peak  (cms)=         .22          .13
00117>                                                          *TOTALS*
00118>      PEAK FLOW       (cms)=         .21          .02          .232 (iii)
00119>      TIME TO PEAK    (hrs)=        4.02         4.08         4.017
00120>      RUNOFF VOLUME    (mm)=       54.60        11.56        45.995
00121>      TOTAL RAINFALL   (mm)=       56.17        56.17        56.174
00122>      RUNOFF COEFFICIENT   =         .97          .21          .819
00123>
00124>        (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
00125>             Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
00126>             Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
00127>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00128>            THAN THE STORAGE COEFFICIENT.
00129>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00130>
00131> --------------------------------------------------------------------------------
00132> 001:0004--------------------------------------------------------------------------
00133> * Inlet Capacity per 5-Year Design Sheet
00134> ----------------------
00135> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .230  (cms)
00136> | TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =      1
00137> ----------------------   Total minor system capacity         =    .230  (cms)
00138>                          Total major system storage [TMJSTO] =      0.(cu.m.)
00139>
00140>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
00141>                                    (ha)     (cms)     (hrs)     (mm)     (cms)
00142>      TOTAL HYD.   01:RL1          1.12      .232     4.017   45.995      .000
00143>      ==========================================================================
00144>      MAJOR SYST   02:MAJOR         .00      .002     4.017   45.995      .000
00145>      MINOR SYST   04:MINOR        1.12      .230     4.017   45.995      .000
00146>
00147>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00148>
00149> --------------------------------------------------------------------------------
00150> 001:0005--------------------------------------------------------------------------
00151> * Rear Lane Cross Section
00152> ----------------------
00153> | ROUTE CHANNEL      |     Routing time step (min) =  1.00
00154> |  IN> 02:MAJOR      |     Number of SEGMENTS =  1
00155> | OUT< 03:LANE       |     Slopes (%), CHANNEL= .50   FLOODPLAIN= .50
00156> ----------------------                 LENGTH =   20.00    (m)
00157>
00158>                 <------ DATA FOR SECTION (  15.1) ------>
00159>                 Distance      Elevation       Manning
00160>                     .00         100.03         .0130
00161>                    1.00          99.98         .0130
00162>                    1.20          99.90         .0130
00163>                    7.70         100.03         .0130
00164>
00165>    <---------------------------- TRAVEL TIME TABLE ---------------------------->
00166>     DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME    D x V
00167>       (m)      (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)      (min)    (m2/s)
00168>      .007   99.907  .246E-01  .842E-03       .000      .123       2.70      .001
00169>      .014   99.914  .984E-01  .674E-02       .001      .196       1.70      .003
00170>      .021   99.921  .221E+00  .227E-01       .003      .256       1.30      .005
00171>      .027   99.927  .394E+00  .539E-01       .006      .311       1.07      .009
00172>      .034   99.934  .615E+00  .105E+00       .011      .360        .93      .012
00173>      .041   99.941  .886E+00  .182E+00       .018      .407        .82      .017
00174>      .048   99.948  .121E+01  .289E+00       .027      .451        .74      .022
00175>      .055   99.955  .157E+01  .431E+00       .039      .493        .68      .027
00176>      .062   99.962  .199E+01  .614E+00       .053      .533        .63      .033
00177>      .068   99.968  .246E+01  .842E+00       .070      .572        .58      .039
00178>      .075   99.975  .298E+01  .112E+01       .091      .610        .55      .046
00179>      .082   99.982  .354E+01  .146E+01       .114      .642        .52      .053
00180>      .089   99.989  .417E+01  .186E+01       .139      .668        .50      .059
00181>      .096   99.996  .487E+01  .233E+01       .169      .695        .48      .067
00182>      .103  100.003  .563E+01  .289E+01*      .203      .723        .46      .074
00183>      .110  100.010  .645E+01  .353E+01*      .242      .751        .44      .082
00184>      .116  100.016  .734E+01  .427E+01*      .286      .780        .43      .091
00185>      .123  100.023  .830E+01  .511E+01*      .335      .808        .41      .100
00186>      .130  100.030  .932E+01  .606E+01*      .390      .837        .40      .109
00187>
00188>  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
00189>  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
00190>  (*) Actual value may be less due to limited CHANNEL LENGTH for given SLOPE.
00191>
00192>                                <---- hydrograph ---->   <-pipe / channel->
00193>                           AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
00194>                           (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
00195>    INFLOW : ID= 2:MAJOR    .00     .002    4.02 45.995      .018       .232
00196>    OUTFLOW: ID= 3:LANE     .00     .001    4.03 45.995      .015       .202
00197>
00198>
00199> --------------------------------------------------------------------------------
00200> 001:0006--------------------------------------------------------------------------
00201> ********************************************************************************
00202> * Remaining Drainage Area to Squadron Cres.
00203> ********************************************************************************
00204> ----------------------
00205> | CALIB STANDHYD     |   Area    (ha)=     .70
00206> | 01:A1      DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
00207> ----------------------
00208>                                IMPERVIOUS    PERVIOUS (i)
00209>      Surface Area     (ha)=         .56          .14
00210>      Dep. Storage     (mm)=        1.57         4.67
00211>      Average Slope     (%)=         .50         2.00
00212>      Length            (m)=      150.00        10.00
00213>      Mannings n            =        .013         .250
00214>
00215>      Max.eff.Inten.(mm/hr)=      104.19        66.02
00216>                over (min)        4.00         8.00
00217>      Storage Coeff.  (min)=        3.95 (ii)    7.57 (ii)
00218>      Unit Hyd. Tpeak (min)=        4.00         8.00
00219>      Unit Hyd. peak  (cms)=         .28          .15
00220>                                                          *TOTALS*
00221>      PEAK FLOW       (cms)=         .15          .02          .159 (iii)
00222>      TIME TO PEAK    (hrs)=        4.00         4.07         4.017
00223>      RUNOFF VOLUME    (mm)=       54.60        11.56        45.995
00224>      TOTAL RAINFALL   (mm)=       56.17        56.17        56.174
00225>      RUNOFF COEFFICIENT   =         .97          .21          .819
00226>
00227>        (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
00228>             Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
00229>             Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
00230>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00231>            THAN THE STORAGE COEFFICIENT.
00232>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00233>
00234> --------------------------------------------------------------------------------
00235> 001:0007--------------------------------------------------------------------------
00236> * Inlet Capacity per 5-Year Design Sheet
00237> ----------------------
00238> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .150  (cms)
00239> | TotalHyd 01:A1     |   Number of inlets in system [NINLET] =      1
00240> ----------------------   Total minor system capacity         =    .150  (cms)
00241>                          Total major system storage [TMJSTO] =      0.(cu.m.)
00242>
00243>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
00244>                                    (ha)     (cms)     (hrs)     (mm)     (cms)
00245>      TOTAL HYD.   01:A1           .70      .159     4.017   45.995      .000
00246>      ==========================================================================
00247>      MAJOR SYST   02:MAJOR         .00      .009     4.017   45.995      .000
00248>      MINOR SYST   04:MINOR        .70      .150     3.983   45.995      .000
00249>
00250>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00251>
00252> --------------------------------------------------------------------------------
00253> 001:0008--------------------------------------------------------------------------
00254> ------------------------
00255> | ADD HYD (Total      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00256> ------------------------                   (ha)     (cms)   (hrs)   (mm)    (cms)
00257>                        ID1 02:MAJOR         .00      .009    4.02  45.99    .000
00258>                       +ID2 03:LANE          .00      .001    4.03  45.99    .000
```

```
                     ==========================================================
                     SUM 01:Total           .00      .009    4.02  45.99    .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=3.50   FLOODPLAIN=3.50
 --------------------                 LENGTH =   10.00    (m)

               <------ DATA FOR SECTION (  15.2) ------>
               Distance      Elevation       Manning
                    .00        100.00          .0130
                   1.80         99.96          .0130
                   2.00         99.88          .0130
                   8.50        100.04          .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)
      .006   99.886  .860E-02  .776E-04      .000      .309       .54     .002
      .013   99.893  .344E-01  .621E-03      .002      .490       .34     .006
      .019   99.899  .774E-01  .210E-02      .005      .642       .26     .012
      .025   99.905  .138E+00  .497E-02      .011      .778       .21     .020
      .032   99.912  .215E+00  .970E-02      .019      .903       .18     .029
      .038   99.918  .310E+00  .168E-01      .032     1.020       .16     .039
      .044   99.924  .421E+00  .266E-01      .048     1.130       .15     .050
      .051   99.931  .550E+00  .397E-01      .068     1.235       .13     .062
      .057   99.937  .697E+00  .566E-01      .093     1.336       .12     .076
      .063   99.943  .860E+00  .776E-01      .123     1.433       .12     .091
      .069   99.949  .104E+01  .103E+00      .159     1.527       .11     .106
      .076   99.956  .124E+01  .134E+00      .200     1.619       .10     .123
      .082   99.962  .145E+01  .171E+00      .244     1.680       .10     .138
      .088   99.968  .170E+01  .215E+00      .289     1.701       .10     .150
      .095   99.975  .198E+01  .268E+00      .344     1.736       .10     .164
      .101   99.981  .230E+01  .331E+00      .409     1.782       .09     .180
      .107   99.987  .265E+01  .406E+00      .485     1.835       .09     .197
      .114   99.994  .303E+01  .492E+00      .573     1.892       .09     .215
      .120  100.000  .345E+01  .591E+00      .673     1.953       .09     .234

  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            .00     .009    4.02 45.995      .024      .743
    OUTFLOW: ID= 3:ROAD             .00     .011    4.02 45.995      .025      .772


 ------------------------------------------------------------------------------
 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: [16-833]
 *#  Date         : 06-05-2016
 *#  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)=     1.12
 | 01:RL1     DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
 ---------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .90          .22
     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)=        .39          .07         .456 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.05        8.017
     RUNOFF VOLUME    (mm)=     105.16        37.31       91.599
     TOTAL RAINFALL   (mm)=     106.74       106.74      106.742
     RUNOFF COEFFICIENT   =        .99          .35         .858

       (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
 ----------------------
 | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .230  (cms)
 | TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =       1
 ----------------------   Total minor system capacity          =    .230  (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            1.12      .456     8.017    91.599     .000
     ==================================================================
     MAJOR SYST   02:MAJOR           .13      .226     8.017    91.599     .000
     MINOR SYST   04:MINOR           .99      .230     7.900    91.599     .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        100.03          .0130
                   1.00         99.98          .0130
                   1.20         99.90          .0130
                   7.70        100.03          .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)
      .007   99.907  .246E-01  .842E-03      .000      .123      2.70     .001
      .014   99.914  .984E-01  .674E-02      .001      .196      1.70     .003
      .021   99.921  .221E+00  .227E-01      .003      .256      1.30     .005
      .027   99.927  .394E+00  .539E-01      .006      .311      1.07     .009
      .034   99.934  .615E+00  .105E+00      .011      .360       .93     .012
      .041   99.941  .886E+00  .182E+00      .018      .407       .82     .017
      .048   99.948  .121E+01  .289E+00      .027      .451       .74     .022
      .055   99.955  .157E+01  .431E+00      .039      .493       .68     .027
      .062   99.962  .199E+01  .614E+00      .053      .533       .63     .033
      .068   99.968  .246E+01  .842E+00      .070      .572       .58     .039
      .075   99.975  .298E+01  .112E+01      .091      .610       .55     .046
      .082   99.982  .354E+01  .146E+01      .114      .642       .52     .053
      .089   99.989  .417E+01  .186E+01      .139      .668       .50     .059
      .096   99.996  .487E+01  .233E+01      .169      .695       .48     .067
      .103  100.003  .563E+01  .289E+01*     .203      .723       .46     .074
      .110  100.010  .645E+01  .353E+01*     .242      .751       .44     .082
      .116  100.016  .734E+01  .427E+01*     .286      .780       .43     .091
      .123  100.023  .830E+01  .511E+01*     .335      .808       .41     .100
      .130  100.030  .932E+01  .606E+01*     .390      .837       .40     .109

  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            .13     .226    8.02 91.599      .107      .739
    OUTFLOW: ID= 3:LANE             .13     .226    8.02 91.599      .107      .739


 ------------------------------------------------------------------------------
 002:0006---------------------------------------------------------------------
 *****************************************************************************
 * Remaining Drainage Area to Squadron Cres.
 *****************************************************************************
 ---------------------
 | CALIB STANDHYD      |   Area    (ha)=      .70
 | 01:A1      DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
 ---------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .56          .14
     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)=        .26          .05         .308 (iii)
     TIME TO PEAK    (hrs)=       8.00         8.03        8.000
```

```
     RUNOFF VOLUME    (mm)=     105.16        37.31         91.599
     TOTAL RAINFALL   (mm)=     106.74       106.74        106.742
     RUNOFF COEFFICIENT   =        .99          .35           .858

       (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
 ----------------------
 | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .150  (cms)
 | TotalHyd 01:A1     |   Number of inlets in system [NINLET] =       1
 ----------------------   Total minor system capacity         =    .150  (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               .70      .308     8.000    91.599     .000
     ========================================================================
     MAJOR SYST   02:MAJOR            .08      .158     8.000    91.599     .000
     MINOR SYST   04:MINOR            .62      .150     7.883    91.599     .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          .08      .158    8.00  91.60    .000
                    +ID2 03:LANE           .13      .226    8.02  91.60    .000
                     ==========================================================
                     SUM 01:Total          .21      .376    8.02  91.60    .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=3.50   FLOODPLAIN=3.50
 --------------------                LENGTH =   10.00     (m)

               <------ DATA FOR SECTION (  15.2) ------>
               Distance      Elevation       Manning
                    .00        100.00         .0130
                   1.80         99.96         .0130
                   2.00         99.88         .0130
                   8.50        100.04         .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)
     .006  99.886  .860E-02  .776E-04      .000       .309        .54     .002
     .013  99.893  .344E-01  .621E-03      .002       .490        .34     .006
     .019  99.899  .774E-01  .210E-02      .005       .642        .26     .012
     .025  99.905  .138E+00  .497E-02      .011       .778        .21     .020
     .032  99.912  .215E+00  .970E-02      .019       .903        .18     .029
     .038  99.918  .310E+00  .168E-01      .032      1.020        .16     .039
     .044  99.924  .421E+00  .266E-01      .048      1.130        .15     .050
     .051  99.931  .550E+00  .397E-01      .068      1.235        .13     .062
     .057  99.937  .697E+00  .566E-01      .093      1.336        .12     .076
     .063  99.943  .860E+00  .776E-01      .123      1.433        .12     .091
     .069  99.949  .104E+01  .103E+00      .159      1.527        .11     .106
     .076  99.956  .124E+01  .134E+00      .200      1.619        .10     .123
     .082  99.962  .145E+01  .171E+00      .244      1.680        .10     .138
     .088  99.968  .170E+01  .215E+00      .289      1.701        .10     .150
     .095  99.975  .198E+01  .268E+00      .344      1.736        .10     .164
     .101  99.981  .230E+01  .331E+00      .409      1.782        .09     .180
     .107  99.987  .265E+01  .406E+00      .485      1.835        .09     .197
     .114  99.994  .303E+01  .492E+00      .573      1.892        .09     .215
     .120 100.000  .345E+01  .591E+00      .673      1.953        .09     .234

  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         .21      .376    8.02 91.599      .098     1.759
   OUTFLOW: ID= 3:ROAD          .21      .378    8.02 91.599      .098     1.760

 ------------------------------------------------------------------------------
 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: [16-833]
 *#  Date          : 06-05-2016
 *#  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)=    1.12
 | 01:RL1    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
 ----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .90         .22
     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)=        .39         .06           .447 (iii)
     TIME TO PEAK    (hrs)=       1.33        1.38          1.350
     RUNOFF VOLUME    (mm)=      74.43       30.74         65.690
     TOTAL RAINFALL   (mm)=      76.00       76.00         75.998
     RUNOFF COEFFICIENT   =        .98         .40           .864

       (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
 ----------------------
 | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .230  (cms)
 | TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =       1
 ----------------------   Total minor system capacity         =    .230  (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             1.12      .447     1.350    65.690     .000
     ========================================================================
     MAJOR SYST   02:MAJOR            .17      .217     1.350    65.690     .000
     MINOR SYST   04:MINOR            .95      .230     1.233    65.690     .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        100.03         .0130
                   1.00         99.98         .0130
                   1.20         99.90         .0130
                   7.70        100.03         .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)
     .007  99.907  .246E-01  .842E-03      .000       .123       2.70     .001
     .014  99.914  .984E-01  .674E-02      .001       .196       1.70     .003
     .021  99.921  .221E+00  .227E-01      .003       .256       1.30     .005
     .027  99.927  .394E+00  .539E-01      .006       .311       1.07     .009
     .034  99.934  .615E+00  .105E+00      .011       .360        .93     .012
     .041  99.941  .886E+00  .182E+00      .018       .407        .82     .017
     .048  99.948  .121E+01  .289E+00      .027       .451        .74     .022
     .055  99.955  .157E+01  .431E+00      .039       .493        .68     .027
     .062  99.962  .199E+01  .614E+00      .053       .533        .63     .033
     .068  99.968  .246E+01  .842E+00      .070       .572        .58     .039
     .075  99.975  .298E+01  .112E+01      .091       .610        .55     .046
     .082  99.982  .354E+01  .146E+01      .114       .642        .52     .053
     .089  99.989  .417E+01  .186E+01      .139       .668        .50     .059
     .096  99.996  .487E+01  .233E+01      .169       .695        .48     .067
     .103 100.003  .563E+01  .289E+01*     .203       .723        .46     .074
     .110 100.010  .645E+01  .353E+01*     .242       .751        .44     .082
     .116 100.016  .734E+01  .427E+01*     .286       .780        .43     .091
     .123 100.023  .830E+01  .511E+01*     .335       .808        .41     .100
     .130 100.030  .932E+01  .606E+01*     .390       .837        .40     .109

  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         .17      .217    1.35 65.690      .105      .733
   OUTFLOW: ID= 3:LANE          .17      .217    1.35 65.690      .105      .733

 ------------------------------------------------------------------------------
 003:0006----------------------------------------------------------------------
 *****************************************************************************
 * Remaining Drainage Area to Squadron Cres.
 *****************************************************************************
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=     .70
 | 01:A1     DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
 ----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .56         .14
     Dep. Storage     (mm)=       1.57        4.67
     Average Slope     (%)=        .50        2.00
     Length            (m)=     150.00       10.00
     Mannings n           =       .013        .250
```

```
00775>      Max.eff.Inten.(mm/hr)=     178.56       146.64
00776>                 over (min)        3.00         6.00
00777>      Storage Coeff.  (min)=        3.18 (ii)    5.82 (ii)
00778>      Unit Hyd. Tpeak (min)=        3.00         6.00
00779>      Unit Hyd. peak  (cms)=         .36          .19
00780>                                                          *TOTALS*
00781>      PEAK FLOW       (cms)=         .26          .04          .303 (iii)
00782>      TIME TO PEAK    (hrs)=        1.33         1.37         1.333
00783>      RUNOFF VOLUME    (mm)=       74.43        30.74        65.690
00784>      TOTAL RAINFALL   (mm)=       76.00        76.00        75.998
00785>      RUNOFF COEFFICIENT   =         .98          .40          .864
00786>
00787>        (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
00788>             Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
00789>             Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
00790>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00791>            THAN THE STORAGE COEFFICIENT.
00792>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00793>
00794> ------------------------------------------------------------------------------
00795> 003:0007------------------------------------------------------------------------
00796> * Inlet Capacity per 5-Year Design Sheet
00797> ----------------------
00798> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .150  (cms)
00799> | TotalHyd 01:A1     |   Number of inlets in system [NINLET] =       1
00800> ----------------------   Total minor system capacity          =    .150  (cms)
00801>                          Total major system storage [TMJSTO] =      0.(cu.m.)
00802>
00803>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.       DWF
00804>                                    (ha)     (cms)     (hrs)     (mm)     (cms)
00805>      TOTAL HYD.   01:A1            .70      .303     1.333    65.690     .000
00806>      ==========================================================================
00807>      MAJOR SYST   02:MAJOR         .11      .153     1.333    65.690     .000
00808>      MINOR SYST   04:MINOR         .59      .150     1.217    65.690     .000
00809>
00810>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00811>
00812> ------------------------------------------------------------------------------
00813> 003:0008------------------------------------------------------------------------
00814> ----------------------
00815> | ADD HYD (Total     ) | ID: NHYD          AREA     QPEAK   TPEAK   R.V.    DWF
00816> ----------------------                     (ha)     (cms)   (hrs)   (mm)   (cms)
00817>                         ID1 02:MAJOR         .11     .153    1.33  65.69    .000
00818>                        +ID2 03:LANE          .17     .217    1.35  65.69    .000
00819>                         ==========================================================
00820>                         SUM 01:Total          .28     .362    1.35  65.69    .000
00821>
00822>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00823>
00824> ------------------------------------------------------------------------------
00825> 003:0009------------------------------------------------------------------------
00826> * Cross Section at Site Entrance (Squadron Cres.)
00827> ----------------------
00828> | ROUTE CHANNEL      |     Routing time step (min) =  1.00
00829> |  IN> 01:Total      |     Number of SEGMENTS =  1
00830> | OUT< 03:ROAD       |     Slopes (%), CHANNEL=3.50   FLOODPLAIN=3.50
00831> ----------------------                 LENGTH =   10.00     (m)
00832>
00833>                <------ DATA FOR SECTION (  15.2) ------>
00834>                Distance      Elevation       Manning
00835>                     .00         100.00         .0130
00836>                    1.80          99.96         .0130
00837>                    2.00          99.88         .0130
00838>                    8.50         100.04         .0130
00839>
00840>    <----------------------------- TRAVEL TIME TABLE ------------------------------>
00841>     DEPTH    ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME    D x V
00842>       (m)      (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)     (min)    (m2/s)
00843>      .006   99.886  .860E-02  .776E-04       .000      .309       .54      .002
00844>      .013   99.893  .344E-01  .621E-03       .002      .490       .34      .006
00845>      .019   99.899  .774E-01  .210E-02       .005      .642       .26      .012
00846>      .025   99.905  .138E+00  .497E-02       .011      .778       .21      .020
00847>      .032   99.912  .215E+00  .970E-02       .019      .903       .18      .029
00848>      .038   99.918  .310E+00  .168E-01       .032     1.020       .16      .039
00849>      .044   99.924  .421E+00  .266E-01       .048     1.130       .15      .050
00850>      .051   99.931  .550E+00  .397E-01       .068     1.235       .13      .062
00851>      .057   99.937  .697E+00  .566E-01       .093     1.336       .12      .076
00852>      .063   99.943  .860E+00  .776E-01       .123     1.433       .12      .091
00853>      .069   99.949  .104E+01  .103E+00       .159     1.527       .11      .106
00854>      .076   99.956  .124E+01  .134E+00       .200     1.619       .10      .123
00855>      .082   99.962  .145E+01  .171E+00       .244     1.680       .10      .138
00856>      .088   99.968  .170E+01  .215E+00       .289     1.701       .10      .150
00857>      .095   99.975  .198E+01  .268E+00       .344     1.736       .10      .164
00858>      .101   99.981  .230E+01  .331E+00       .409     1.782       .09      .180
00859>      .107   99.987  .265E+01  .406E+00       .485     1.835       .09      .197
00860>      .114   99.994  .303E+01  .492E+00       .573     1.892       .09      .215
00861>      .120  100.000  .345E+01  .591E+00       .673     1.953       .09      .234
00862>
00863>  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
00864>  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
00865>
00866>                                    <---- hydrograph ---->   <-pipe / channel->
00867>                                AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
00868>                                (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
00869>    INFLOW : ID= 1:Total         .28     .362    1.35 65.690       .096     1.749
00870>    OUTFLOW: ID= 3:ROAD          .28     .364    1.35 65.690       .097     1.750
00871>
00872>
00873> ------------------------------------------------------------------------------
00874> 003:0010------------------------------------------------------------------------
00875> ******************************************************************************
00876> ******************************************************************************
00877> ------------------------------------------------------------------------------
00878> 003:0002------------------------------------------------------------------------
00879> ------------------------------------------------------------------------------
00880> 003:0002------------------------------------------------------------------------
00881>   ** END OF RUN :   3
00882>
00883> ******************************************************************************
00884>
00885>
00886>
00887>
00888>
00889> ----------------------
00890> | START              |  Project  dir.: C:\SWM_PRG\17-918\Block15\
00891> ----------------------  Rainfall dir.: C:\SWM_PRG\17-918\Block15\
00892>     TZERO =   .00 hrs on        0
00893>     METOUT=   2 (output = METRIC)
00894>     NRUN  = 004
00895>     NSTORM=   1
00896>               #  1=C:\SWM_PRG\STMFILES\CH6H100x.stm
00897> ------------------------------------------------------------------------------
00898> 004:0002------------------------------------------------------------------------
00899> *#*****************************************************************************
00900> *#  Project Name: []    Project Number: [16-833]
00901> *#  Date        : 06-05-2016
00902> *#  Modeller    : [slm]
00903> *#  Company     : David Schaeffer Engineering Ltd.
00904> *#  License #   :  4488477
00905> *#*****************************************************************************
00906> ------------------------------------------------------------------------------
00907> 004:0002------------------------------------------------------------------------
00908> ----------------------
00909> | READ STORM        |    Filename: 100 years Chicago Storm 6 Hours step 10
00910> | Ptotal=  82.34 mm|    Comments: 100 years Chicago Storm 6 Hours step 10
00911> ----------------------
00912>                TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00913>                 hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00914>                 .17   2.910 |   1.67  15.980 |   3.17   8.020 |   4.67   3.770
00915>                 .33   3.170 |   1.83  40.670 |   3.33   7.080 |   4.83   3.570
00916>                 .50   3.480 |   2.00 178.650 |   3.50   6.340 |   5.00   3.400
00917>                 .67   3.880 |   2.17  54.040 |   3.67   5.760 |   5.17   3.240
00918>                 .83   4.390 |   2.33  27.310 |   3.83   5.280 |   5.33   3.100
00919>                1.00   5.080 |   2.50  18.230 |   4.00   4.880 |   5.50   2.970
00920>                1.17   6.050 |   2.67  13.730 |   4.17   4.540 |   5.67   2.850
00921>                1.33   7.550 |   2.83  11.050 |   4.33   4.250 |   5.83   2.740
00922>                1.50  10.170 |   3.00   9.280 |   4.50   3.990 |   6.00   2.640
00923>
00924> ------------------------------------------------------------------------------
00925> 004:0003------------------------------------------------------------------------
00926> ******************************************************************************
00927> * Post-Development Model - Wateridge Block 15
00928> ******************************************************************************
00929> ******************************************************************************
00930> * Drainage to Rear Lane
00931> ******************************************************************************
00932> ----------------------
00933> | CALIB STANDHYD     |   Area    (ha)=    1.12
00934> | 01:RL1    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
00935> ----------------------
00936>                                IMPERVIOUS    PERVIOUS (i)
00937>      Surface Area     (ha)=        .90          .22
00938>      Dep. Storage     (mm)=       1.57         4.67
00939>      Average Slope     (%)=        .50         2.00
00940>      Length            (m)=     250.00        10.00
00941>      Mannings n            =       .013         .250
00942>
00943>      Max.eff.Inten.(mm/hr)=     178.65       150.06
00944>                 over (min)        4.00         7.00
00945>      Storage Coeff.  (min)=        4.32 (ii)    6.93 (ii)
00946>      Unit Hyd. Tpeak (min)=        4.00         7.00
00947>      Unit Hyd. peak  (cms)=         .27          .16
00948>                                                          *TOTALS*
00949>      PEAK FLOW       (cms)=         .39          .06          .450 (iii)
00950>      TIME TO PEAK    (hrs)=        2.00         2.05         2.017
00951>      RUNOFF VOLUME    (mm)=       80.77        32.23        71.062
00952>      TOTAL RAINFALL   (mm)=       82.34        82.34        82.340
00953>      RUNOFF COEFFICIENT   =         .98          .39          .863
00954>
00955>        (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
00956>             Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
00957>             Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
00958>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00959>            THAN THE STORAGE COEFFICIENT.
00960>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00961>
00962> ------------------------------------------------------------------------------
00963> 004:0004------------------------------------------------------------------------
00964> * Inlet Capacity per 5-Year Design Sheet
00965> ----------------------
00966> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .230  (cms)
00967> | TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =       1
00968> ----------------------   Total minor system capacity          =    .230  (cms)
00969>                          Total major system storage [TMJSTO] =      0.(cu.m.)
00970>
00971>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.       DWF
00972>                                    (ha)     (cms)     (hrs)     (mm)     (cms)
00973>      TOTAL HYD.   01:RL1           1.12      .450     2.017    71.062     .000
00974>      ==========================================================================
00975>      MAJOR SYST   02:MAJOR          .16      .220     2.017    71.062     .000
00976>      MINOR SYST   04:MINOR          .96      .230     1.900    71.062     .000
00977>
00978>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00979>
00980> ------------------------------------------------------------------------------
00981> 004:0005------------------------------------------------------------------------
00982> * Rear Lane Cross Section
00983> ----------------------
00984> | ROUTE CHANNEL      |     Routing time step (min) =  1.00
00985> |  IN> 02:MAJOR      |     Number of SEGMENTS =  1
00986> | OUT< 03:LANE       |     Slopes (%), CHANNEL= .50   FLOODPLAIN= .50
00987> ----------------------                 LENGTH =   20.00     (m)
00988>
00989>                <------ DATA FOR SECTION (  15.1) ------>
00990>                Distance      Elevation       Manning
00991>                     .00         100.03         .0130
00992>                    1.00          99.98         .0130
00993>                    1.20          99.90         .0130
00994>                    7.70         100.03         .0130
00995>
00996>    <----------------------------- TRAVEL TIME TABLE ------------------------------>
00997>     DEPTH    ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME    D x V
00998>       (m)      (m)   (cu.m.)   (cu.m.)      (cms)     (m/s)     (min)    (m2/s)
00999>      .007   99.907  .246E-01  .842E-03       .000      .123      2.70      .001
01000>      .014   99.914  .984E-01  .674E-02       .001      .196      1.70      .003
01001>      .021   99.921  .221E+00  .227E-01       .003      .256      1.30      .005
01002>      .027   99.927  .394E+00  .539E-01       .006      .311      1.07      .009
01003>      .034   99.934  .615E+00  .105E+00       .011      .360       .93      .012
01004>      .041   99.941  .886E+00  .182E+00       .018      .407       .82      .017
01005>      .048   99.948  .121E+01  .289E+00       .027      .451       .74      .022
01006>      .055   99.955  .157E+01  .431E+00       .039      .493       .68      .027
01007>      .062   99.962  .199E+01  .614E+00       .053      .533       .63      .033
01008>      .068   99.968  .246E+01  .842E+00       .070      .572       .58      .039
01009>      .075   99.975  .298E+01  .112E+01       .091      .610       .55      .046
01010>      .082   99.982  .354E+01  .146E+01       .114      .642       .52      .053
01011>      .089   99.989  .417E+01  .186E+01       .139      .668       .50      .059
01012>      .096   99.996  .487E+01  .233E+01       .169      .695       .48      .067
01013>      .103  100.003  .563E+01  .289E+01*      .203      .723       .46      .074
01014>      .110  100.010  .645E+01  .353E+01*      .242      .751       .44      .082
01015>      .116  100.016  .734E+01  .427E+01*      .286      .780       .43      .091
01016>      .123  100.023  .830E+01  .511E+01*      .335      .808       .41      .100
01017>      .130  100.030  .932E+01  .606E+01*      .390      .837       .40      .109
01018>
01019>  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
01020>  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
01021>  (*) Actual value may be less due to limited CHANNEL LENGTH for given SLOPE.
01022>
01023>                                    <---- hydrograph ---->   <-pipe / channel->
01024>                                AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
01025>                                (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
01026>    INFLOW : ID= 2:MAJOR         .16     .220    2.02 71.062       .106      .735
01027>    OUTFLOW: ID= 3:LANE          .16     .220    2.02 71.062       .106      .735
01028>
01029>
01030> ------------------------------------------------------------------------------
01031> 004:0006------------------------------------------------------------------------
01032> ******************************************************************************
```

```
* Remaining Drainage Area to Squadron Cres.
********************************************************************************
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .70
| 01:A1      DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .56          .14
     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)=      178.65       150.62
                   over (min)        3.00         6.00
     Storage Coeff.  (min)=     3.18 (ii)    5.79 (ii)
     Unit Hyd. Tpeak (min)=        3.00         6.00
     Unit Hyd. peak  (cms)=         .36          .19
                                                      *TOTALS*
     PEAK FLOW       (cms)=         .26          .04          .304 (iii)
     TIME TO PEAK    (hrs)=        2.00         2.03         2.000
     RUNOFF VOLUME    (mm)=       80.77        32.23        71.062
     TOTAL RAINFALL   (mm)=       82.34        82.34        82.340
     RUNOFF COEFFICIENT   =         .98          .39          .863

       (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.

--------------------------------------------------------------------------------
004:0007--------------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet
----------------------
| COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .150  (cms)
| TotalHyd 01:A1     |   Number of inlets in system [NINLET] =      1
----------------------   Total minor system capacity         =    .150  (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            .70      .304     2.000    71.062     .000
     ==========================================================================
     MAJOR SYST   02:MAJOR         .10      .154     2.000    71.062     .000
     MINOR SYST   04:MINOR         .60      .150     1.883    71.062     .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
004:0008--------------------------------------------------------------------------
----------------------
| ADD HYD (Total     ) | ID: NHYD         AREA     QPEAK    TPEAK    R.V.     DWF
----------------------                     (ha)     (cms)    (hrs)    (mm)    (cms)
                        ID1 02:MAJOR         .10      .154     2.00   71.06     .000
                       +ID2 03:LANE          .16      .220     2.02   71.06     .000
                        ==========================================================
                        SUM 01:Total         .26      .366     2.02   71.06     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
004:0009--------------------------------------------------------------------------
* 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=3.50   FLOODPLAIN=3.50
----------------------                    LENGTH =   10.00    (m)

                <------ DATA FOR SECTION (  15.2) ------>
                Distance      Elevation       Manning
                    .00         100.00         .0130
                   1.80          99.96         .0130
                   2.00          99.88         .0130
                   8.50         100.04         .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)
     .006   99.886  .860E-02  .776E-04       .000      .309       .54     .002
     .013   99.893  .344E-01  .621E-03       .002      .490       .34     .006
     .019   99.899  .774E-01  .210E-02       .005      .642       .26     .012
     .025   99.905  .138E+00  .497E-02       .011      .778       .21     .020
     .032   99.912  .215E+00  .970E-02       .019      .903       .18     .029
     .038   99.918  .310E+00  .168E-01       .032     1.020       .16     .039
     .044   99.924  .421E+00  .266E-01       .048     1.130       .15     .050
     .051   99.931  .550E+00  .397E-01       .068     1.235       .13     .062
     .057   99.937  .697E+00  .566E-01       .093     1.336       .12     .076
     .063   99.943  .860E+00  .776E-01       .123     1.433       .12     .091
     .069   99.949  .104E+01  .103E+00       .159     1.527       .11     .106
     .076   99.956  .124E+01  .134E+00       .200     1.619       .10     .123
     .082   99.962  .145E+01  .171E+00       .244     1.680       .10     .138
     .088   99.968  .170E+01  .215E+00       .289     1.701       .10     .150
     .095   99.975  .198E+01  .268E+00       .344     1.736       .10     .164
     .101   99.981  .230E+01  .331E+00       .409     1.782       .09     .180
     .107   99.987  .265E+01  .406E+00       .485     1.835       .09     .197
     .114   99.994  .303E+01  .492E+00       .573     1.892       .09     .215
     .120  100.000  .345E+01  .591E+00       .673     1.953       .09     .234

  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         .26     .366    2.02 71.062      .097     1.751
    OUTFLOW: ID= 3:ROAD          .26     .368    2.02 71.062      .097     1.753

--------------------------------------------------------------------------------
004:0010--------------------------------------------------------------------------
********************************************************************************
********************************************************************************
--------------------------------------------------------------------------------
004:0002--------------------------------------------------------------------------
--------------------------------------------------------------------------------
004:0002--------------------------------------------------------------------------
--------------------------------------------------------------------------------
004:0002--------------------------------------------------------------------------
   ** END OF RUN :   4
********************************************************************************
********************************************************************************
--------------------
| 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  = 005
    NSTORM=   1
          #  1=C:\SWM_PRG\STMFILES\100YC12H.stm
--------------------------------------------------------------------------------
005:0002--------------------------------------------------------------------------
********************************************************************************
--------------------------------------------------------------------------------
--------------------
| READ STORM       |    Filename: 100-Year 12-Hour Chicago Storm, 10 min T
| Ptotal=  93.91 mm|    Comments: 100-Year 12-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   1.520  |   3.17   6.050 |   6.17   4.540 |   9.17   2.120
              .33   1.580  |   3.33   7.540 |   6.33   4.250 |   9.33   2.060
              .50   1.650  |   3.50  10.160 |   6.50   3.990 |   9.50   2.010
              .67   1.720  |   3.67  15.970 |   6.67   3.770 |   9.67   1.960
              .83   1.800  |   3.83  40.650 |   6.83   3.570 |   9.83   1.910
             1.00   1.880  |   4.00 178.560 |   7.00   3.400 |  10.00   1.860
             1.17   1.980  |   4.17  54.050 |   7.17   3.240 |  10.17   1.820
             1.33   2.090  |   4.33  27.320 |   7.33   3.100 |  10.33   1.780
             1.50   2.210  |   4.50  18.240 |   7.50   2.970 |  10.50   1.740
             1.67   2.340  |   4.67  13.740 |   7.67   2.850 |  10.67   1.700
             1.83   2.500  |   4.83  11.060 |   7.83   2.740 |  10.83   1.670
             2.00   2.690  |   5.00   9.290 |   8.00   2.640 |  11.00   1.630
             2.17   2.900  |   5.17   8.020 |   8.17   2.550 |  11.17   1.600
             2.33   3.160  |   5.33   7.080 |   8.33   2.460 |  11.33   1.570
             2.50   3.480  |   5.50   6.350 |   8.50   2.380 |  11.50   1.540
             2.67   3.880  |   5.67   5.760 |   8.67   2.310 |  11.67   1.510
             2.83   4.390  |   5.83   5.280 |   8.83   2.240 |  11.83   1.480
             3.00   5.070  |   6.00   4.880 |   9.00   2.180 |  12.00   1.460

--------------------------------------------------------------------------------
005:0003--------------------------------------------------------------------------
********************************************************************************
* Post-Development Model - Wateridge Block 15
********************************************************************************
********************************************************************************
* Drainage to Rear Lane
********************************************************************************
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.12
| 01:RL1     DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .90          .22
     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       153.85
                   over (min)        4.00         7.00
     Storage Coeff.  (min)=     4.32 (ii)    6.91 (ii)
     Unit Hyd. Tpeak (min)=        4.00         7.00
     Unit Hyd. peak  (cms)=         .27          .16
                                                      *TOTALS*
     PEAK FLOW       (cms)=         .39          .06          .452 (iii)
     TIME TO PEAK    (hrs)=        4.00         4.05         4.017
     RUNOFF VOLUME    (mm)=       92.33        34.06        80.681
     TOTAL RAINFALL   (mm)=       93.91        93.91        93.907
     RUNOFF COEFFICIENT   =         .98          .36          .859

       (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.

--------------------------------------------------------------------------------
005:0004--------------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet
----------------------
| COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .230  (cms)
| TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =      1
----------------------   Total minor system capacity         =    .230  (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           1.12      .452     4.017    80.681     .000
     ==========================================================================
     MAJOR SYST   02:MAJOR          .14      .222     4.017    80.681     .000
     MINOR SYST   04:MINOR          .98      .230     3.900    80.681     .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
005:0005--------------------------------------------------------------------------
* 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         100.03         .0130
                   1.00          99.98         .0130
                   1.20          99.90         .0130
                   7.70         100.03         .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)
     .007   99.907  .246E-01  .842E-03       .000      .123      2.70     .001
     .014   99.914  .984E-01  .674E-02       .001      .196      1.70     .003
     .021   99.921  .221E+00  .227E-01       .003      .256      1.30     .005
     .027   99.927  .394E+00  .539E-01       .006      .311      1.07     .009
     .034   99.934  .615E+00  .105E+00       .011      .360       .93     .012
     .041   99.941  .886E+00  .182E+00       .018      .407       .82     .017
     .048   99.948  .121E+01  .289E+00       .027      .451       .74     .022
     .055   99.955  .157E+01  .431E+00       .039      .493       .68     .027
     .062   99.962  .199E+01  .614E+00       .053      .533       .63     .033
     .068   99.968  .246E+01  .842E+00       .070      .572       .58     .039
```

```
          .075   99.975  .298E+01  .112E+01       .091       .610       .55      .046
          .082   99.982  .354E+01  .146E+01       .114       .642       .52      .053
          .089   99.989  .417E+01  .186E+01       .139       .668       .50      .059
          .096   99.996  .487E+01  .233E+01       .169       .695       .48      .067
          .103  100.003  .563E+01  .289E+01*      .203       .723       .46      .074
          .110  100.010  .645E+01  .353E+01*      .242       .751       .44      .082
          .116  100.016  .734E+01  .427E+01*      .286       .780       .43      .091
          .123  100.023  .830E+01  .511E+01*      .335       .808       .41      .100
          .130  100.030  .932E+01  .606E+01*      .390       .837       .40      .109

  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         .14     .222    4.02 80.681      .106       .736
     OUTFLOW: ID= 3:LANE          .14     .222    4.02 80.681      .106       .736


 --------------------------------------------------------------------------------
 005:0006------------------------------------------------------------------------
 ********************************************************************************
 * Remaining Drainage Area to Squadron Cres.
 ********************************************************************************
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=     .70
 | 01:A1     DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
 ----------------------
                               IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=        .56           .14
      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)=        .26           .04           .306 (iii)
      TIME TO PEAK    (hrs)=       4.00          4.03          4.000
      RUNOFF VOLUME    (mm)=      92.33         34.06         80.681
      TOTAL RAINFALL   (mm)=      93.91         93.91         93.907
      RUNOFF COEFFICIENT   =        .98           .36           .859

        (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
 ----------------------
 | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .150  (cms)
 | TotalHyd 01:A1     |   Number of inlets in system [NINLET] =       1
 ----------------------   Total minor system capacity         =    .150  (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            .70      .306     4.000   80.681     .000
      ======================================================================
      MAJOR SYST   02:MAJOR         .09      .156     4.000   80.681     .000
      MINOR SYST   04:MINOR         .61      .150     3.883   80.681     .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           .09      .156    4.00  80.68    .000
                    +ID2 03:LANE            .14      .222    4.02  80.68    .000
                     ===========================================================
                     SUM 01:Total           .24      .370    4.02  80.68    .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=3.50   FLOODPLAIN=3.50
 --------------------                 LENGTH =   10.00    (m)

                <------ DATA FOR SECTION (  15.2) ------>
                Distance      Elevation       Manning
                     .00        100.00          .0130
                    1.80         99.96          .0130
                    2.00         99.88          .0130
                    8.50        100.04          .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)
      .006   99.886  .860E-02  .776E-04     .000      .309       .54     .002
      .013   99.893  .344E-01  .621E-03     .002      .490       .34     .006
      .019   99.899  .774E-01  .210E-02     .005      .642       .26     .012
      .025   99.905  .138E+00  .497E-02     .011      .778       .21     .020
      .032   99.912  .215E+00  .970E-02     .019      .903       .18     .029
      .038   99.918  .310E+00  .168E-01     .032     1.020       .16     .039
      .044   99.924  .421E+00  .266E-01     .048     1.130       .15     .050
      .051   99.931  .550E+00  .397E-01     .068     1.235       .13     .062
      .057   99.937  .697E+00  .566E-01     .093     1.336       .12     .076
      .063   99.943  .860E+00  .776E-01     .123     1.433       .12     .091
      .069   99.949  .104E+01  .103E+00     .159     1.527       .11     .106
      .076   99.956  .124E+01  .134E+00     .200     1.619       .10     .123
      .082   99.962  .145E+01  .171E+00     .244     1.680       .10     .138
      .088   99.968  .170E+01  .215E+00     .289     1.701       .10     .150
      .095   99.975  .198E+01  .268E+00     .344     1.736       .10     .164
      .101   99.981  .230E+01  .331E+00     .409     1.782       .09     .180
      .107   99.987  .265E+01  .406E+00     .485     1.835       .09     .197
      .114   99.994  .303E+01  .492E+00     .573     1.892       .09     .215
      .120  100.000  .345E+01  .591E+00     .673     1.953       .09     .234

  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         .24     .370    4.02 80.681      .097      1.754
     OUTFLOW: ID= 3:ROAD          .24     .372    4.02 80.681      .097      1.755


 --------------------------------------------------------------------------------
 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: [16-833]
 *#  Date          : 06-05-2016
 *#  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)=    1.12
 | 01:RL1    DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
 ----------------------
                               IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=        .90           .22
      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)=        .24           .04           .285 (iii)
      TIME TO PEAK    (hrs)=       1.52          1.58          1.533
      RUNOFF VOLUME    (mm)=      82.42         42.29         74.393
      TOTAL RAINFALL   (mm)=      83.99         83.99         83.988
      RUNOFF COEFFICIENT   =        .98           .50           .886

        (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
 ----------------------
 | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .230  (cms)
 | TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =       1
 ----------------------   Total minor system capacity         =    .230  (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          1.12      .285     1.533   74.393     .000
      ======================================================================
      MAJOR SYST   02:MAJOR         .04      .055     1.533   74.393     .000
      MINOR SYST   04:MINOR        1.08      .230     1.417   74.393     .000

      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 --------------------------------------------------------------------------------
 006:0005------------------------------------------------------------------------
 * 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        100.03          .0130
```

```
                  1.00         99.98         .0130
                  1.20         99.90         .0130
                  7.70        100.03         .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)
     .007   99.907  .246E-01  .842E-03       .000      .123      2.70     .001
     .014   99.914  .984E-01  .674E-02       .001      .196      1.70     .003
     .021   99.921  .221E+00  .227E-01       .003      .256      1.30     .005
     .027   99.927  .394E+00  .539E-01       .006      .311      1.07     .009
     .034   99.934  .615E+00  .105E+00       .011      .360       .93     .012
     .041   99.941  .886E+00  .182E+00       .018      .407       .82     .017
     .048   99.948  .121E+01  .289E+00       .027      .451       .74     .022
     .055   99.955  .157E+01  .431E+00       .039      .493       .68     .027
     .062   99.962  .199E+01  .614E+00       .053      .533       .63     .033
     .068   99.968  .246E+01  .842E+00       .070      .572       .58     .039
     .075   99.975  .298E+01  .112E+01       .091      .610       .55     .046
     .082   99.982  .354E+01  .146E+01       .114      .642       .52     .053
     .089   99.989  .417E+01  .186E+01       .139      .668       .50     .059
     .096   99.996  .487E+01  .233E+01       .169      .695       .48     .067
     .103  100.003  .563E+01  .289E+01*      .203      .723       .46     .074
     .110  100.010  .645E+01  .353E+01*      .242      .751       .44     .082
     .116  100.016  .734E+01  .427E+01*      .286      .780       .43     .091
     .123  100.023  .830E+01  .511E+01*      .335      .808       .41     .100
     .130  100.030  .932E+01  .606E+01*      .390      .837       .40     .109

 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         .04     .055    1.53 74.393      .062      .537
   OUTFLOW: ID= 3:LANE          .04     .055    1.53 74.393      .062      .537


------------------------------------------------------------------------------
006:0006------------------------------------------------------------------------
******************************************************************************
* Remaining Drainage Area to Squadron Cres.
******************************************************************************
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .70
| 01:A1     DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .56          .14
     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)=      106.70        91.30
                  over (min)        4.00         7.00
     Storage Coeff.  (min)=        3.91 (ii)    7.09 (ii)
     Unit Hyd. Tpeak (min)=        4.00         7.00
     Unit Hyd. peak  (cms)=         .29          .16
                                                        *TOTALS*
     PEAK FLOW       (cms)=         .16          .03          .187 (iii)
     TIME TO PEAK    (hrs)=        1.50         1.55         1.517
     RUNOFF VOLUME    (mm)=       82.42        42.29        74.393
     TOTAL RAINFALL   (mm)=       83.99        83.99        83.988
     RUNOFF COEFFICIENT   =         .98          .50          .886

       (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.


------------------------------------------------------------------------------
006:0007------------------------------------------------------------------------
* Inlet Capacity per 5-Year Design Sheet
----------------------
| COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .150  (cms)
| TotalHyd 01:A1     |   Number of inlets in system [NINLET] =       1
----------------------   Total minor system capacity         =    .150  (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             .70      .187     1.517   74.393      .000
     ==========================================================================
     MAJOR SYST   02:MAJOR          .02      .037     1.517   74.393      .000
     MINOR SYST   04:MINOR          .68      .150     1.400   74.393      .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.


------------------------------------------------------------------------------
006:0008------------------------------------------------------------------------
----------------------
| ADD HYD (Total     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
----------------------                     (ha)     (cms)   (hrs)   (mm)    (cms)
                         ID1 02:MAJOR        .02      .037    1.52  74.39    .000
                        +ID2 03:LANE         .04      .055    1.53  74.39    .000
                         ==========================================================
                         SUM 01:Total        .06      .090    1.52  74.39    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.


------------------------------------------------------------------------------
006:0009------------------------------------------------------------------------
* 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=3.50   FLOODPLAIN=3.50
----------------------                  LENGTH =   10.00    (m)

               <------ DATA FOR SECTION (  15.2) ------>
               Distance      Elevation       Manning
                    .00         100.00         .0130
                   1.80          99.96         .0130
                   2.00          99.88         .0130
                   8.50         100.04         .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)
     .006   99.886  .860E-02  .776E-04       .000      .309       .54     .002
     .013   99.893  .344E-01  .621E-03       .002      .490       .34     .006
     .019   99.899  .774E-01  .210E-02       .005      .642       .26     .012
     .025   99.905  .138E+00  .497E-02       .011      .778       .21     .020
     .032   99.912  .215E+00  .970E-02       .019      .903       .18     .029
     .038   99.918  .310E+00  .168E-01       .032     1.020       .16     .039
     .044   99.924  .421E+00  .266E-01       .048     1.130       .15     .050
     .051   99.931  .550E+00  .397E-01       .068     1.235       .13     .062
     .057   99.937  .697E+00  .566E-01       .093     1.336       .12     .076
     .063   99.943  .860E+00  .776E-01       .123     1.433       .12     .091
     .069   99.949  .104E+01  .103E+00       .159     1.527       .11     .106
     .076   99.956  .124E+01  .134E+00       .200     1.619       .10     .123
     .082   99.962  .145E+01  .171E+00       .244     1.680       .10     .138
     .088   99.968  .170E+01  .215E+00       .289     1.701       .10     .150
     .095   99.975  .198E+01  .268E+00       .344     1.736       .10     .164
     .101   99.981  .230E+01  .331E+00       .409     1.782       .09     .180
     .107   99.987  .265E+01  .406E+00       .485     1.835       .09     .197
     .114   99.994  .303E+01  .492E+00       .573     1.892       .09     .215
     .120  100.000  .345E+01  .591E+00       .673     1.953       .09     .234

 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         .06     .090    1.52 74.393      .056      1.322
   OUTFLOW: ID= 3:ROAD          .06     .090    1.52 74.393      .056      1.321


------------------------------------------------------------------------------
006:0010------------------------------------------------------------------------
******************************************************************************
******************************************************************************
------------------------------------------------------------------------------
006:0002------------------------------------------------------------------------
------------------------------------------------------------------------------
006:0002------------------------------------------------------------------------
------------------------------------------------------------------------------
006:0002------------------------------------------------------------------------
------------------------------------------------------------------------------
006:0002------------------------------------------------------------------------
------------------------------------------------------------------------------
006:0002------------------------------------------------------------------------
------------------------------------------------------------------------------
006:0002------------------------------------------------------------------------
  ** END OF RUN :   6

******************************************************************************
```

```
01807> ----------------------
01808> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .230  (cms)
01809> | TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =       1
01810> ----------------------   Total minor system capacity         =    .230  (cms)
01811>                          Total major system storage [TMJSTO] =      0.(cu.m.)
01812>
01813>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
01814>                                     (ha)     (cms)     (hrs)     (mm)    (cms)
01815>      TOTAL HYD.   01:RL1           1.12      .323     2.033   70.738     .000
01816>      ==========================================================================
01817>      MAJOR SYST   02:MAJOR          .04      .093     2.033   70.738     .000
01818>      MINOR SYST   04:MINOR         1.08      .230     1.967   70.738     .000
01819>
01820>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01821>
01822> ------------------------------------------------------------------------------
01823> 007:0005------------------------------------------------------------------------
01824> * Rear Lane Cross Section
01825> ----------------------
01826> | ROUTE CHANNEL    |     Routing time step (min) =  1.00
01827> |  IN> 02:MAJOR    |     Number of SEGMENTS =  1
01828> | OUT< 03:LANE     |     Slopes (%), CHANNEL= .50   FLOODPLAIN= .50
01829> ----------------------          LENGTH =   20.00    (m)
01830>
01831>                  <------ DATA FOR SECTION (  15.1) ------>
01832>                  Distance      Elevation       Manning
01833>                       .00         100.03         .0130
01834>                     1.00          99.98         .0130
01835>                     1.20          99.90         .0130
01836>                     7.70         100.03         .0130
01837>
01838>    <---------------------------- TRAVEL TIME TABLE ---------------------------->
01839>     DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME    D x V
01840>       (m)      (m)   (cu.m.)   (cu.m.)       (cms)     (m/s)     (min)   (m2/s)
01841>      .007   99.907  .246E-01  .842E-03        .000      .123      2.70     .001
01842>      .014   99.914  .984E-01  .674E-02        .001      .196      1.70     .003
01843>      .021   99.921  .221E+00  .227E-01        .003      .256      1.30     .005
01844>      .027   99.927  .394E+00  .539E-01        .006      .311      1.07     .009
01845>      .034   99.934  .615E+00  .105E+00        .011      .360       .93     .012
01846>      .041   99.941  .886E+00  .182E+00        .018      .407       .82     .017
01847>      .048   99.948  .121E+01  .289E+00        .027      .451       .74     .022
01848>      .055   99.955  .157E+01  .431E+00        .039      .493       .68     .027
01849>      .062   99.962  .199E+01  .614E+00        .053      .533       .63     .033
01850>      .068   99.968  .246E+01  .842E+00        .070      .572       .58     .039
01851>      .075   99.975  .298E+01  .112E+01        .091      .610       .55     .046
01852>      .082   99.982  .354E+01  .146E+01        .114      .642       .52     .053
01853>      .089   99.989  .417E+01  .186E+01        .139      .668       .50     .059
01854>      .096   99.996  .487E+01  .233E+01        .169      .695       .48     .067
01855>      .103  100.003  .563E+01  .289E+01*       .203      .723       .46     .074
01856>      .110  100.010  .645E+01  .353E+01*       .242      .751       .44     .082
01857>      .116  100.016  .734E+01  .427E+01*       .286      .780       .43     .091
01858>      .123  100.023  .830E+01  .511E+01*       .335      .808       .41     .100
01859>      .130  100.030  .932E+01  .606E+01*       .390      .837       .40     .109
01860>
01861>  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
01862>  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
01863>  (*) Actual value may be less due to limited CHANNEL LENGTH for given SLOPE.
01864>
01865>                                    <---- hydrograph ---->   <-pipe / channel->
01866>                                AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
01867>                                (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
01868>    INFLOW : ID= 2:MAJOR         .04     .093    2.03 70.738      .076      .612
01869>    OUTFLOW: ID= 3:LANE          .04     .093    2.03 70.738      .076      .612
01870>
01871>
01872> ------------------------------------------------------------------------------
01873> 007:0006------------------------------------------------------------------------
01874> ******************************************************************************
01875> * Remaining Drainage Area to Squadron Cres.
01876> ******************************************************************************
01877> ----------------------
01878> | CALIB STANDHYD     |   Area    (ha)=     .70
01879> | 01:A1      DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
01880> ----------------------
01881>                              IMPERVIOUS    PERVIOUS (i)
01882>      Surface Area     (ha)=        .56          .14
01883>      Dep. Storage     (mm)=       1.57         4.67
01884>      Average Slope     (%)=        .50         2.00
01885>      Length            (m)=     150.00        10.00
01886>      Mannings n            =       .013         .250
01887>
01888>      Max.eff.Inten.(mm/hr)=     156.20       127.20
01889>                over (min)          3.00         6.00
01890>      Storage Coeff.  (min)=       3.36 (ii)    6.15 (ii)
01891>      Unit Hyd. Tpeak (min)=       3.00         6.00
01892>      Unit Hyd. peak  (cms)=        .35          .19
01893>                                                      *TOTALS*
01894>      PEAK FLOW       (cms)=        .20          .03          .228 (iii)
01895>      TIME TO PEAK    (hrs)=       2.00         2.03         2.000
01896>      RUNOFF VOLUME    (mm)=      79.02        37.60        70.738
01897>      TOTAL RAINFALL   (mm)=      80.59        80.59        80.591
01898>      RUNOFF COEFFICIENT   =        .98          .47          .878
01899>
01900>        (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
01901>            Fo   (mm/hr)= 76.20          K  (1/hr)=  4.14
01902>            Fc   (mm/hr)= 13.20     Cum.Inf.   (mm)=   .00
01903>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01904>            THAN THE STORAGE COEFFICIENT.
01905>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01906>
01907> ------------------------------------------------------------------------------
01908> 007:0007------------------------------------------------------------------------
01909> * Inlet Capacity per 5-Year Design Sheet
01910> ----------------------
01911> | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .150  (cms)
01912> | TotalHyd 01:A1     |   Number of inlets in system [NINLET] =       1
01913> ----------------------   Total minor system capacity         =    .150  (cms)
01914>                          Total major system storage [TMJSTO] =      0.(cu.m.)
01915>
01916>                    ID: NHYD        AREA     QPEAK     TPEAK     R.V.      DWF
01917>                                     (ha)     (cms)     (hrs)     (mm)    (cms)
01918>      TOTAL HYD.   01:A1            .70      .228     2.000   70.738     .000
01919>      ==========================================================================
01920>      MAJOR SYST   02:MAJOR          .03      .078     2.000   70.738     .000
01921>      MINOR SYST   04:MINOR         .67      .150     1.950   70.738     .000
01922>
01923>      NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01924>
01925> ------------------------------------------------------------------------------
01926> 007:0008------------------------------------------------------------------------
01927> ----------------------
01928> | ADD HYD (Total     ) | ID: NHYD          AREA     QPEAK   TPEAK   R.V.    DWF
01929> ----------------------                     (ha)     (cms)   (hrs)   (mm)   (cms)
01930>                          ID1 02:MAJOR        .03      .078    2.00  70.74    .000
01931>                        +ID2 03:LANE          .04      .093    2.03  70.74    .000
01932>                         ==========================================================
01933>                         SUM 01:Total          .06      .160    2.02  70.74    .000
01934>
01935>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01936>
01937> ------------------------------------------------------------------------------
01938> 007:0009------------------------------------------------------------------------
01939> * Cross Section at Site Entrance (Squadron Cres.)
01940> ----------------------
01941> | ROUTE CHANNEL    |     Routing time step (min) =  1.00
01942> |  IN> 01:Total    |     Number of SEGMENTS =  1
01943> | OUT< 03:ROAD     |     Slopes (%), CHANNEL=3.50   FLOODPLAIN=3.50
01944> ----------------------          LENGTH =   10.00    (m)
01945>
01946>                  <------ DATA FOR SECTION (  15.2) ------>
01947>                  Distance      Elevation       Manning
01948>                       .00         100.00         .0130
01949>                     1.80          99.96         .0130
01950>                     2.00          99.88         .0130
01951>                     8.50         100.04         .0130
01952>
01953>    <---------------------------- TRAVEL TIME TABLE ---------------------------->
01954>     DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME    D x V
01955>       (m)      (m)   (cu.m.)   (cu.m.)       (cms)     (m/s)     (min)   (m2/s)
01956>      .006   99.886  .860E-02  .776E-04        .000      .309       .54     .002
01957>      .013   99.893  .344E-01  .621E-03        .002      .490       .34     .006
01958>      .019   99.899  .774E-01  .210E-02        .005      .642       .26     .012
01959>      .025   99.905  .138E+00  .497E-02        .011      .778       .21     .020
01960>      .032   99.912  .215E+00  .970E-02        .019      .903       .18     .029
01961>      .038   99.918  .310E+00  .168E-01        .032     1.020       .16     .039
01962>      .044   99.924  .421E+00  .266E-01        .048     1.130       .15     .050
01963>      .051   99.931  .550E+00  .397E-01        .068     1.235       .13     .062
01964>      .057   99.937  .697E+00  .566E-01        .093     1.336       .12     .076
01965>      .063   99.943  .860E+00  .776E-01        .123     1.433       .12     .091
01966>      .069   99.949  .104E+01  .103E+00        .159     1.527       .11     .106
01967>      .076   99.956  .124E+01  .134E+00        .200     1.619       .10     .123
01968>      .082   99.962  .145E+01  .171E+00        .244     1.680       .10     .138
01969>      .088   99.968  .170E+01  .215E+00        .289     1.701       .10     .150
01970>      .095   99.975  .198E+01  .268E+00        .344     1.736       .10     .164
01971>      .101   99.981  .230E+01  .331E+00        .409     1.782       .09     .180
01972>      .107   99.987  .265E+01  .406E+00        .485     1.835       .09     .197
01973>      .114   99.994  .303E+01  .492E+00        .573     1.892       .09     .215
01974>      .120  100.000  .345E+01  .591E+00        .673     1.953       .09     .234
01975>
01976>  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
01977>  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
01978>
01979>                                    <---- hydrograph ---->   <-pipe / channel->
01980>                                AREA    QPEAK   TPEAK   R.V.   MAX DEPTH  MAX VEL
01981>                                (ha)    (cms)   (hrs)   (mm)       (m)      (m/s)
01982>    INFLOW : ID= 1:Total         .06     .160    2.02 70.738      .070      1.530
01983>    OUTFLOW: ID= 3:ROAD          .06     .162    2.02 70.738      .070      1.534
01984>
01985>
01986> ------------------------------------------------------------------------------
01987> 007:0010------------------------------------------------------------------------
01988> ******************************************************************************
01989> ******************************************************************************
01990> ------------------------------------------------------------------------------
01991> 007:0002------------------------------------------------------------------------
01992> ------------------------------------------------------------------------------
01993> 007:0002------------------------------------------------------------------------
01994> ------------------------------------------------------------------------------
01995> 007:0002------------------------------------------------------------------------
01996> ------------------------------------------------------------------------------
01997> 007:0002------------------------------------------------------------------------
01998> ------------------------------------------------------------------------------
01999> 007:0002------------------------------------------------------------------------
02000> ------------------------------------------------------------------------------
02001> 007:0002------------------------------------------------------------------------
02002>   ** END OF RUN :   7
02003>
02004> ******************************************************************************
02005>
02006>
02007>
02008>
02009>
02010> ----------------------
02011> | START            |  Project  dir.: C:\SWM_PRG\17-918\Block15\
02012> ----------------------  Rainfall dir.: C:\SWM_PRG\17-918\Block15\
02013>     TZERO =   .00 hrs on        0
02014>     METOUT=   2 (output = METRIC)
02015>     NRUN  = 008
02016>     NSTORM=   1
02017>            #  1=C:\SWM_PRG\STMFILES\19960808.stm
02018> ------------------------------------------------------------------------------
02019> 008:0002------------------------------------------------------------------------
02020> *#############################################################################
02021> *#  Project Name: []    Project Number: [16-833]
02022> *#  Date        : 06-05-2016
02023> *#  Modeller    : [slm]
02024> *#  Company     : David Schaeffer Engineering Ltd.
02025> *#  License #   :  4488477
02026> *#############################################################################
02027> ------------------------------------------------------------------------------
02028> 008:0002------------------------------------------------------------------------
02029> ----------------------
02030> | READ STORM        |    Filename: City of Ottawa August 8, 1996 Storm - 5m
02031> | Ptotal=  73.90 mm|    Comments: City of Ottawa August 8, 1996 Storm - 5m
02032> ----------------------
02033>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
02034>               hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
02035>               .08   4.000 |  1.58   9.300 |  3.08  63.700 |  4.58   1.300
02036>               .17  11.900 |  1.67   8.000 |  3.17  58.400 |  4.67   1.300
02037>               .25  26.500 |  1.75   4.000 |  3.25  47.800 |  4.75    .000
02038>               .33  13.300 |  1.83    .000 |  3.33  15.900 |  4.83    .000
02039>               .42    .000 |  1.92   2.700 |  3.42  13.300 |  4.92    .000
02040>               .50   2.700 |  2.00    .000 |  3.50   8.000 |  5.00    .000
02041>               .58    .000 |  2.08    .000 |  3.58   5.300 |  5.08   2.700
02042>               .67   8.000 |  2.17    .000 |  3.67   6.600 |  5.17    .000
02043>               .75  18.600 |  2.25   5.300 |  3.75   2.700 |  5.25    .000
02044>               .83  10.600 |  2.33    .000 |  3.83   4.000 |  5.33    .000
02045>               .92  21.200 |  2.42    .000 |  3.92   2.700 |  5.42    .000
02046>              1.00   2.700 |  2.50    .000 |  4.00   4.000 |  5.50    .000
02047>              1.08   2.700 |  2.58    .000 |  4.08   2.700 |  5.58    .000
02048>              1.17  15.900 |  2.67    .000 |  4.17   5.300 |  5.67    .000
02049>              1.25  66.300 |  2.75    .000 |  4.25   4.000 |  5.75   1.300
02050>              1.33  55.700 |  2.83   4.000 |  4.33   2.700 |
02051>              1.42 122.000 |  2.92  53.100 |  4.42   4.000 |
02052>              1.50  88.900 |  3.00  69.000 |  4.50   2.700 |
02053>
02054> ------------------------------------------------------------------------------
02055> 008:0003------------------------------------------------------------------------
02056> ******************************************************************************
02057> * Post-Development Model - Wateridge Block 15
02058> ******************************************************************************
02059> ******************************************************************************
02060> * Drainage to Rear Lane
02061> ******************************************************************************
02062> ----------------------
02063> | CALIB STANDHYD     |   Area    (ha)=    1.12
02064> | 01:RL1     DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
```

```
 ----------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=        .90           .22
      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)=        .23           .03          .262 (iii)
      TIME TO PEAK    (hrs)=       1.48          1.53         1.483
      RUNOFF VOLUME    (mm)=      72.33         33.77        64.617
      TOTAL RAINFALL   (mm)=      73.90         73.90        73.900
      RUNOFF COEFFICIENT   =        .98           .46          .874

        (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
 ----------------------
 | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .230  (cms)
 | TotalHyd 01:RL1    |   Number of inlets in system [NINLET] =       1
 ----------------------   Total minor system capacity         =    .230  (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         1.12      .262     1.483   64.617     .000
      ======================================================================
      MAJOR SYST   02:MAJOR        .01      .032     1.483   64.617     .000
      MINOR SYST   04:MINOR       1.11      .230     1.433   64.617     .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        100.03         .0130
                    1.00         99.98         .0130
                    1.20         99.90         .0130
                    7.70        100.03         .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)
      .007   99.907 .246E-01  .842E-03      .000      .123       2.70     .001
      .014   99.914 .984E-01  .674E-02      .001      .196       1.70     .003
      .021   99.921 .221E+00  .227E-01      .003      .256       1.30     .005
      .027   99.927 .394E+00  .539E-01      .006      .311       1.07     .009
      .034   99.934 .615E+00  .105E+00      .011      .360        .93     .012
      .041   99.941 .886E+00  .182E+00      .018      .407        .82     .017
      .048   99.948 .121E+01  .289E+00      .027      .451        .74     .022
      .055   99.955 .157E+01  .431E+00      .039      .493        .68     .027
      .062   99.962 .199E+01  .614E+00      .053      .533        .63     .033
      .068   99.968 .246E+01  .842E+00      .070      .572        .58     .039
      .075   99.975 .298E+01  .112E+01      .091      .610        .55     .046
      .082   99.982 .354E+01  .146E+01      .114      .642        .52     .053
      .089   99.989 .417E+01  .186E+01      .139      .668        .50     .059
      .096   99.996 .487E+01  .233E+01      .169      .695        .48     .067
      .103  100.003 .563E+01  .289E+01*     .203      .723        .46     .074
      .110  100.010 .645E+01  .353E+01*     .242      .751        .44     .082
      .116  100.016 .734E+01  .427E+01*     .286      .780        .43     .091
      .123  100.023 .830E+01  .511E+01*     .335      .808        .41     .100
      .130  100.030 .932E+01  .606E+01*     .390      .837        .40     .109

  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         .01     .032    1.48 64.617      .051      .467
    OUTFLOW: ID= 3:LANE          .01     .032    1.50 64.617      .051      .467


 ----------------------------------------------------------------------------
 008:0006--------------------------------------------------------------------
 ***************************************************************************
 * Remaining Drainage Area to Squadron Cres.
 ***************************************************************************
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=     .70
 | 01:A1     DT= 1.00 |   Total Imp(%)=   80.00   Dir. Conn.(%)=   80.00
 ----------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=        .56           .14
      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)=        .16           .02          .175 (iii)
      TIME TO PEAK    (hrs)=       1.45          1.52         1.467
      RUNOFF VOLUME    (mm)=      72.33         33.77        64.617
      TOTAL RAINFALL   (mm)=      73.90         73.90        73.900
      RUNOFF COEFFICIENT   =        .98           .46          .874

        (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
 ----------------------
 | COMPUTE DUALHYD    |   Average inlet capacities   [CINLET] =    .150  (cms)
 | TotalHyd 01:A1     |   Number of inlets in system [NINLET] =       1
 ----------------------   Total minor system capacity         =    .150  (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           .70      .175     1.467   64.617     .000
      ======================================================================
      MAJOR SYST   02:MAJOR        .01      .025     1.467   64.617     .000
      MINOR SYST   04:MINOR        .69      .150     1.417   64.617     .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          .01      .025    1.47  64.62    .000
                     +ID2 03:LANE           .01      .032    1.50  64.62    .000
                      =======================================================
                      SUM 01:Total          .03      .052    1.50  64.62    .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=3.50   FLOODPLAIN=3.50
 --------------------                 LENGTH =   10.00    (m)

                <------ DATA FOR SECTION (  15.2) ------>
                Distance      Elevation       Manning
                     .00        100.00         .0130
                    1.80         99.96         .0130
                    2.00         99.88         .0130
                    8.50        100.04         .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)
      .006   99.886 .860E-02  .776E-04      .000      .309        .54     .002
      .013   99.893 .344E-01  .621E-03      .002      .490        .34     .006
      .019   99.899 .774E-01  .210E-02      .005      .642        .26     .012
      .025   99.905 .138E+00  .497E-02      .011      .778        .21     .020
      .032   99.912 .215E+00  .970E-02      .019      .903        .18     .029
      .038   99.918 .310E+00  .168E-01      .032     1.020        .16     .039
      .044   99.924 .421E+00  .266E-01      .048     1.130        .15     .050
      .051   99.931 .550E+00  .397E-01      .068     1.235        .13     .062
      .057   99.937 .697E+00  .566E-01      .093     1.336        .12     .076
      .063   99.943 .860E+00  .776E-01      .123     1.433        .12     .091
      .069   99.949 .104E+01  .103E+00      .159     1.527        .11     .106
      .076   99.956 .124E+01  .134E+00      .200     1.619        .10     .123
      .082   99.962 .145E+01  .171E+00      .244     1.680        .10     .138
      .088   99.968 .170E+01  .215E+00      .289     1.701        .10     .150
      .095   99.975 .198E+01  .268E+00      .344     1.736        .10     .164
      .101   99.981 .230E+01  .331E+00      .409     1.782        .09     .180
      .107   99.987 .265E+01  .406E+00      .485     1.835        .09     .197
      .114   99.994 .303E+01  .492E+00      .573     1.892        .09     .215
      .120  100.000 .345E+01  .591E+00      .673     1.953        .09     .234

  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         .03     .052    1.50 64.617      .046     1.150
    OUTFLOW: ID= 3:ROAD          .03     .052    1.48 64.617      .046     1.151


 ----------------------------------------------------------------------------
 008:0010--------------------------------------------------------------------
 **************************************************************************
 ***************************************************************************
 ----------------------------------------------------------------------------
 008:0002--------------------------------------------------------------------
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 008:0002--------------------------------------------------------------------
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 008:0002--------------------------------------------------------------------
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 008:0002--------------------------------------------------------------------
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 008:0002--------------------------------------------------------------------
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 008:0002--------------------------------------------------------------------
 ----------------------------------------------------------------------------
 008:0002--------------------------------------------------------------------
       FINISH
 ----------------------------------------------------------------------------
 ****************************************************************************
      WARNINGS / ERRORS / NOTES
      -------------------------
    Simulation ended on 2017-12-02     at 12:05:29
 ============================================================================

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DRAWINGS / FIGURES