481 YONGE STREET
APARTMENT DEVELOPMENT
STORMWATER MANAGEMENT REPORT & CONSTRUCTION MITIGATION PLAN
CITY OF BARRIE

Prepared by:

Pinestone Engineering Ltd.
Barrie Office
20 Bell Farm Road
Barrie, Ontario L4M 6E4

Phone: 705-503-1777
Fax: 705-645-7262
Email: pinestone@pel.ca
Web: www.pel.ca

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1.0 INTRODUCTION

1.1 General

The proposed development is located at 481 Yonge Street, east of the intersection of Yonge Street and Macmillan Crescent. The property is legally described as Block 113 of Registered Plan 51M-453 in the City of Barrie, County of Simcoe.

The subject site is approximately 0.57 hectares (1.4 acres) in area. The property is currently vacant and consists of unimproved lands which generally consist of native grasses. The site is bounded by Macmillan Crescent to the north, an existing residential subdivision to the east, commercial development to the south, and Yonge Street to the west. The location of the subject site is illustrated on Figure 1.

The proposed development will include a 4-storey building with 67 apartment units. Access to the development will be provided by a single driveway connection to Macmillan Crescent. Parking for the development will be provided via a surface parking facility and 1 level of underground parking located at the basement level. A copy of the site plan prepared by Naylor Architect Inc. is included in Appendix A for further details.

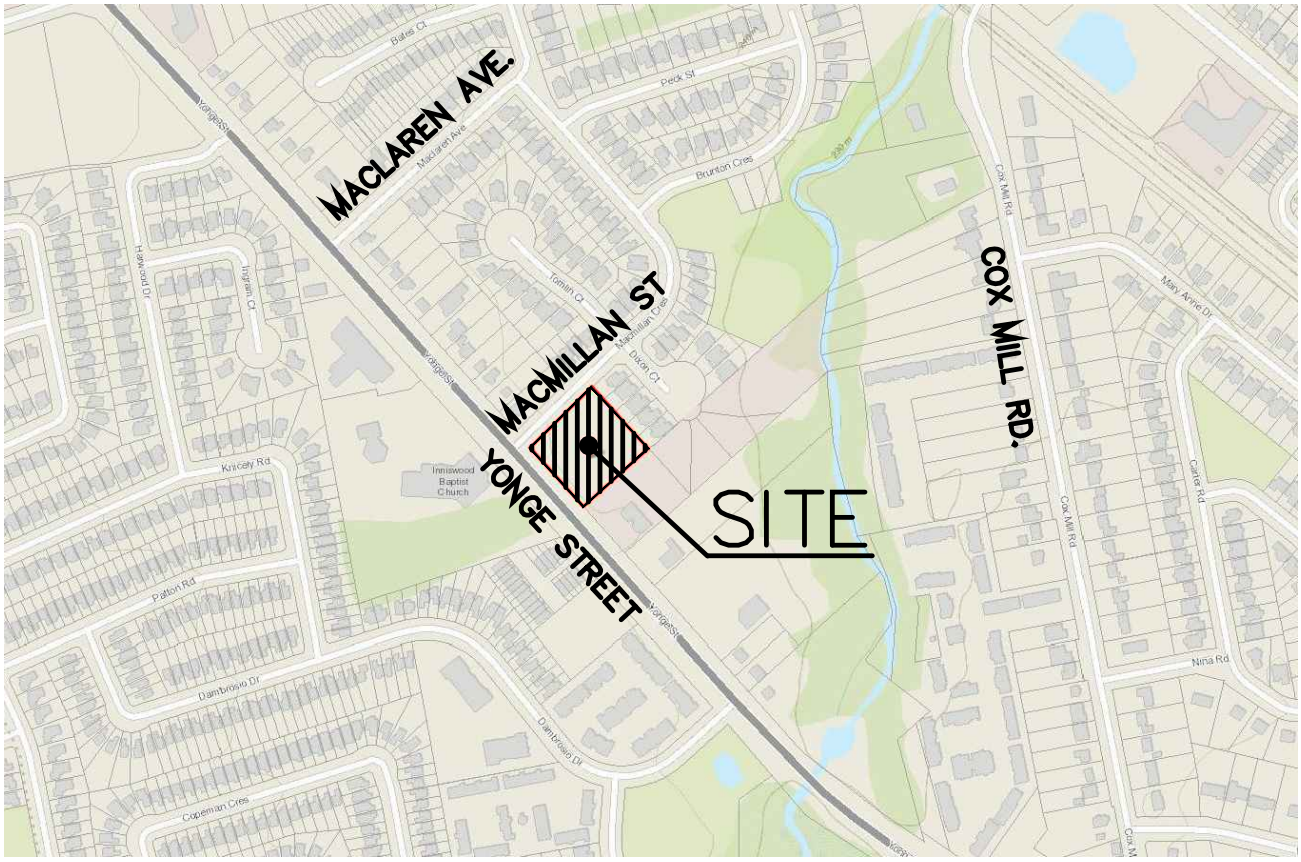
1.2 Purpose and Scope

Pinestone Engineering Ltd (PEL) has been retained by the property owner to prepare a Storm Water Management Report in support of a Site Plan Approval. The report describes the stormwater quality and quantity control strategy for the site.

2.0 REFERENCE REPORTS

The following reports and studies have been used for reference in the preparation of this Storm Water Management Report:

i) *City of Barrie Storm Drainage and Storm Water Management Policies and Design Guidelines, prepared by the City of Barrie Engineering Department, February 2022*
ii) *LSCRA Technical Guidelines for Storm Water Management Submissions, Effective Date: April 2022*
iii) *Lake Simcoe Protection Plan, June 2009*
iv) *City of Barrie Development Manual, prepared by the City of Barrie Engineering Department, December 2017*
v) *Ministry of the Environment Storm Water Management Planning and Design Manual, March 2003.*
vi) *Low Impact Development Manual prepared by Credit Valley Conservation and Toronto and Region Conservation, 2010*
vii) *City of Barrie Infiltration Low Impact Development Screening Process, 2017*
viii) *LSRCA Phosphorus Offsetting Policy, Effective Date: July 2021*



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#481 YONGE STREET APARTMENT DEVELOPMENT

LOCATION PLAN

DATE:	SCALE:	PROJECT No.	FIGURE No.
MAY 2022	N.T.S.	19-11433-B	FIGURE 1

3.0 EXISTING CONDITIONS

3.1 General

The subject site is approximately 0.57 hectares (1.4 acres) in area. The property is currently vacant and consists of unimproved lands which generally consist of native grasses. The site is located within the City's urban servicing area and municipal services are available for connection beneath Yonge Street and Macmillan Crescent. Existing services to the property not being utilized for the proposed development will be removed.

3.2 Topography

Based on a review of the topographic survey provided by Rudy Mak Surveying Ltd., the property slopes moderately from west to east at an average slope of 5.0%. Elevations across the site range between 251.75m ASL at the western corner of the site to 245.28m ASL at the eastern corner of the site.

3.3 Site Geology

A geotechnical investigation for the subject property was completed by Haddad Geotechnical Inc. in January 2014. The field investigation consisted of drilling seven boreholes extending to depths of approximately 8m below grade. Based on our review of their report, the shallow subsurface soils include fill materials consisting of sandy silt/silty sand ranging from 1.5m to 1.7m below existing grades. Boreholes 1 to 5 caved in at depths ranging from 2.1m to 5.7m and water rose to depths ranging from 2.1m to 3.9m. The groundwater table at the subject site was observed to be inconsistent and varied in elevation from 245.5m ASL to 246.8m ASL across the area of the site.

A second investigation was conducted in March 2022. The field investigation consisted of the drilling of eight boreholes, and installation of five monitoring wells. The boreholes were advanced 2.8-5.0m below existing grade. Groundwater level monitoring revealed measurements ranging from 0.89m – 2.03m below the ground surface across the site on March 18th, 2022.

Based on our review of the soil information provided by Haddad Geotechnical Inc. we have classified the site material as a Type BC under the Soil Conservation Service, hydrologic soil group as outlined in the *MTO Drainage Manual Volume 3, Design Chart 1.08*. Reference to this design chart, and a copy of the geotechnical investigation, is included in Appendix B.

3.4 Drainage Conditions

A 450mm diameter storm sewer exists beneath Yonge Street, and a 300mm diameter storm sewer exists beneath Macmillan Crescent. An existing catch basin exists in the east corner of the property. Site drainage is directed to the existing catch basin via overland sheet flow and outlets to an existing 250mm diameter storm sewer discharging to the Macmillan Crescent storm sewer system. The Macmillan Crescent storm sewer conveys drainage to

an existing stormwater management detention pond prior to discharging to Lovers Creek.

The subject property is part of the existing Little Avenue & Highway #11 Subdivision Storm Drainage Plan. According to Drawing No. 1995-057-007 of the City of Barrie engineering records, the downstream stormwater management pond (Lovers Creek SWMF LV13) is sized to accommodate drainage generated from the subject property with a design runoff coefficient of 0.4. A copy of the referenced storm drainage plan is included in Appendix C.

The site is not located within a Lake Simcoe Regional Conservation Authority (LSRCA) regulated area based on available mapping on their website, however, the site is considered a "major development" as defined in the Lake Simcoe Protection Plan, therefore stormwater phosphorus control measures are required in accordance with the Lake Simcoe Phosphorus Offsetting Policy (LSPOP).

4.0 PROPOSED DEVELOPMENT

The proposed development will include a 4-storey building with 67 apartment units. Access to the development will be provided by a single driveway connection to Macmillan Crescent. Parking for the development will be provided via a surface parking facility and 1 level of underground parking located at the basement level.

Catchment 201, consisting of drainage generated from the building rooftop and upper parking lot, will be directed to a catch basin installed within the driveway. Stormwater will be attenuated within subsurface storage tanks installed below the parking lot, with additional attenuation storage provided in a surface cell created within the asphalt parking lot. Flows will be attenuated by an online orifice plate installed within the outlet pipe from STMMH#2. Attenuated flows will outlet through an Imbrium Jellyfish Filter for treatment, prior to discharging offsite via a storm sewer connection to the existing storm sewer network beneath Macmillan Crescent. Drainage generated from catchment 202, consisting of the lower driveway entrance and landscape area, will sheet flow to the proposed bioretention facility located at the northern corner of the property. Runoff will overflow the top of grate of CBMH#1 during storm events greater than the 2-year event and flow through an Imbrium Jellyfish Filter for treatment, prior to discharging offsite via a storm sewer connection to the existing storm sewer network beneath Macmillan Crescent. Drainage generated from catchment 203, consisting of perimeter landscape, balconies, and the basement parking ramp, will be conveyed via enhanced grass swales to the existing catchbasin located in the eastern corner of the property. Drainage generated from catchment 204, consisting of perimeter landscape, balconies, and a small portion of the driveway entrance, will continue to flow offsite to the existing storm sewer system beneath Macmillan Crescent like pre-development conditions.

5.0 HYDROLOGY

5.1 Design Criteria

Based on a review of the City of Barrie's Storm Water Management (SWM) Guidelines and LSRCA Technical Guidelines, the following design criteria, in accordance with the current

MECP SWM Planning and Design Manual (MECP, 2003) were established for the proposed development:

Quantity Control:

- Peak flow attenuation for the 2-year through 100-year storm events to allowable release rates using the City of Barrie's WPCC IDF parameters.

- Both the 4-hour Chicago and 24-hour SCS Type II storms must be modelled for the specified storm events.

- Safe conveyance of the regulatory flows through the site to a sufficient outlet is required. The regulatory storm for developments within the Lover's Creek watershed is the Hurricane Hazel Flood Event Standard in accordance with Ontario Regulation 179/06.

Volume Control:

- As per City policy 4.1.3 of the Storm Water Policy and Design Guidelines, sites less than 5 ha shall minimize any anticipated changes in the water balance between pre-development and post development conditions and shall provide a minimum infiltration equivalent to the first 5mm of rainfall.

Quality Control:

- The City of Barrie and the LSRCA in accordance with Ontario Regulation 219/09 regarding water quality and phosphorus loading to Lake Simcoe, requires that all new storm water management facilities provide as a minimum the "enhanced" level of protection in accordance with the MECP Storm Water Management Planning and Design Manual (MECP, 2003).

- Preparation of phosphorus and water balance calculations to meet City of Barrie and LSRCA requirements and the Lake Simcoe Protection Plan.

- Preparation of detailed erosion, sediment control and construction mitigation plan to be implemented as part of the construction program.

According to the Drainage Master Plan for the City of Barrie, prepared by Tatham Engineering in March 2019, the subject site is not located within a Wellhead Protection Area nor a significant groundwater recharge area (SGRA) nor an Intake Protection Zone. Therefore, infiltration of runoff generated from paved surfaces is permitted in accordance with Table 1.2 of the Infiltration Low Impact Development Screening Process prepared by the City of Barrie. Excerpts from the Drainage Master Plan and a copy of Table 1.2 of the LID Screening Process is included in Appendix C.

5.2 Design Storms

We have selected the following design storms as part of our evaluation:

- 2-year design storm
- 5-year design storm
- 10-year design storm
- 25-year design storm
- 50-year design storm
- 100-year design storm
- Hurricane Hazel Flood Event

Rainfall intensity - duration frequency (IDF) values for the Barrie Area were entered into an equation that expresses the time relationship intensity for specific frequency, in the form of:

$$i = \frac{a}{(t+b)^c}$$

where: i = intensity, mm/hr.
t = time of concentration, minutes
a,b,c = constants developed to fit IDF curve

The rainfall runoff event simulation model OTTHYMO was used to simulate watershed response to design rainfall events. Derivation of the design storm hyetographs were based on the "Chicago" 4-hour distribution using the intensity, duration, frequency (IDF) data. In addition to the “Chicago” storms, the 24-hour SCS Type II storms, and the Hurricane Hazel regional storm were also modelled as required by the City of Barrie.

The IDF curve parameters for the City of Barrie are outlined in Table 1, below. A copy of the IDF values taken from the City’s SWM Guidelines are included in Appendix C.

Table 1
Barrie WPCC IDF Curve Parameters

Rainfall Event	Parameter		
	A	B	C
2 Yr	675.586	4.681	0.780
5 Yr	843.019	4.582	0.763
10 Yr	976.898	4.745	0.760
25 Yr	1133.123	4.734	0.756
50 Yr	1251.473	4.847	0.753
100 Yr	1383.628	4.905	0.754

5.3 Drainage Catchments

One (1) pre-development and four (4) post-development catchments have been delineated for the site in order to estimate the corresponding peak runoff rates for the site. The pre-development catchment area represents the existing condition of the development area, which consists of native grasses. A design runoff coefficient of 0.4 for the property will be utilized in the hydrological modelling. The post-development catchments represent the new grading concept for the proposed development area with the addition of an apartment building, paved surfaces, and landscape area. The pre-development and post-development catchment parameters are included in Appendix C. Pre-development and post-development

catchment areas are illustrated on drawings PRE-1 and POST-1 included in Appendix D.

5.4 Modelling Results

The results of the hydrologic modelling are displayed in Tables 2 and 3 below for the Hurricane Hazel Regional Storm, and the 2-year to 100-year return frequency storm events for the 4hr Chicago distribution, and the 24hr SCS Type II distribution.

Table 2
Model Results - 4hr Chicago Distributions

	2Yr	**5Yr**	**10Yr**	**25Yr**	**50Yr**	**100Yr**
PRE-DEVELOPMENT (m^3/sec)						
Catchment 101	0.018	0.033	0.045	0.062	0.075	0.089
Total Pre-Development Runoff Rate	**0.018**	**0.033**	**0.045**	**0.062**	**0.075**	**0.089**
POST-DEVELOPMENT (m^3/sec)						
Catchment 201	0.103	0.135	0.156	0.183	0.202	0.222
Catchment 202	0.015	0.020	0.023	0.028	0.031	0.035
Catchment 203	0.003	0.006	0.009	0.012	0.015	0.017
Catchment 204	0.004	0.007	0.008	0.011	0.018	0.015
Total Post-Development Runoff Rate	**0.125**	**0.168**	**0.196**	**0.233**	**0.265**	**0.287**

Table 3
Model Results - 24hr SCS Type II and Hurricane Hazel Regional Storm Distributions

	2Yr	5Yr	10Yr	25Yr	50Yr	100Yr	Hazel
PRE-DEVELOPMENT (m^3/sec)							
Catchment 101	0.036	0.066	0.087	0.114	0.137	0.157	0.071
Total Pre-Development Runoff Rate	**0.036**	**0.066**	**0.087**	**0.114**	**0.137**	**0.157**	**0.071**
POST-DEVELOPMENT (m^3/sec)							
Catchment 201	0.062	0.087	0.103	0.124	0.140	0.154	0.049
Catchment 202	0.010	0.014	0.017	0.021	0.024	0.027	0.009
Catchment 203	0.006	0.010	0.013	0.017	0.020	0.023	0.009
Catchment 204	0.006	0.011	0.015	0.020	0.024	0.027	0.010
Total Post-Development Runoff Rate	**0.083**	**0.122**	**0.149**	**0.182**	**0.208**	**0.231**	**0.077**

Based on the calculated results of the hydrological modelling, it is expected that post-development flows directed to the existing Macmillan Crescent storm sewer will increase due to the proposed construction of the building and paved surfaces. Visual OTTHYMO input/output calculations are included in Appendix C.

6.0 STORM WATER MANAGEMENT PLAN

6.1 Quantity Control

As noted in the comparison of the pre-development and post-development flows, an increase in runoff will occur due to the proposed construction of the building and paved surfaces. To satisfy the selected design criteria, peak flow attenuation of post- development flows to pre-development levels for all storm events up to and including the 100-year storm event will be provided by directing roof drainage and a large portion of pavement drainage to a stormwater management facility consisting of a combination of subsurface stormwater detention tanks and parking lot surface storage.

Catchment 201, consisting of drainage generated from the building rooftop and upper parking lot, will be directed to a private onsite storm sewer installed within the asphalt driveway. Stormwater will be attenuated within precast concrete storage tanks installed below the parking lot, with additional attenuation storage provided in a surface cell created within the asphalt parking lot. The 85.17m^3 subsurface storage tank system will consist of two (2) 42,585 L water holding tanks (Newmarket Precast Model 36,000 or equivalent) connected in series and set at an invert elevation of +/- 245.60m ASL. The SWM tanks will

also be equipped with access grates for maintenance. Flows will be attenuated by a 75mm dia. online orifice plate installed within the outlet pipe from STMMH#2 at an elevation of 245.45m ASL. Additional storage volume is provided in a surface cell created within the parking lot once ponding elevations exceed the top of grate of CB#1 at an elevation of 248.55m ASL. The maximum ponding elevation for the 5-year and 100-year events will be 247.59m ASL and 248.83m ASL, respectively. This limits ponding above the asphalt surface to below 0.3m. Attenuated flows will outlet through an Imbrium Jellyfish Filter for treatment, prior to discharging offsite via a storm sewer connection to the existing storm sewer network beneath Macmillan Crescent. Major overland flow from catchment 201 will overflow the driveway once water levels exceed 248.80m ASL and discharge to the existing storm sewer beneath Macmillan Crescent prior to ultimately discharging to Lovers Creek.

Drainage generated from catchment 202, consisting of the lower driveway entrance and landscape area, will sheet flow to the proposed bioretention facility located at the northern corner of the property. Dead storage provided in the 0.25m depth surface depression of the bioretention facility will be utilized to attenuate runoff generated from the 2-year storm event. Runoff will overflow the top of grate of CBMH#1 during storm events greater than the 2-year event and flow through an Imbrium Jellyfish Filter for treatment, prior to discharging offsite via a storm sewer connection to the existing storm sewer network beneath Macmillan Crescent.

Drainage generated from catchment 203, consisting of perimeter landscape, balconies, and the basement parking ramp, will be conveyed via enhanced grass swales to the existing catchbasin located in the eastern corner of the property. These enhanced grass swales, equipped with rock check dams, will reduce swale flow velocities, and provide attenuation of peak stormwater rates. As per the LID Manual (2010), enhanced swales can provide a runoff reduction between 10-20%, depending on the conditions of the native soil, longitudinal slope, vegetative cover, and flow velocity. In Visual OTTHYMO, low-impact development measures, including enhanced swales, bio-retention facilities, soakaways, and chambers, can be modelled downstream of a designated catchment area to develop a better understanding of the site-specific stormwater quantity and quality control benefits of that particular LID measure. For 0.3m wide enhanced grass swales constructed in BC-type soils, and fitted with rock check dams, runoff reduction for catchment 203 can be achieved. For the purpose of hydrological modelling, only surface storage created by the installation of rock check dams is utilized for flow attenuation. The enhanced grass swales are sized to convey storm events up to and including the 100-year event. An enhanced swale design sheet is included in Appendix C. The location and details of the enhanced grass swale are identified on drawing GP-1 included in Appendix D.

Drainage generated from catchment 204, consisting of perimeter landscape, balconies, and a small portion of the driveway entrance, will continue to flow offsite to the existing storm sewer system beneath Macmillan Crescent like pre-development conditions.

The stage-storage-discharge relationship of the proposed storage facilities are summarized in Table 4.

Table 4
Stage-Storage-Discharge Relationship of Storage Cells

	Description	Control Stage (m)	Elevation (m)	Volume (m^3)	Discharge (m^3/s)
Catchment 201: Stormwater Detention Tanks and Parking Lot Surface Ponding (75mm Dia. Orifice in STMMH#2)	Orifice Invert	0.00	245.45	0.00	0.0000
	Invert of Tanks	0.11	245.60	0.74	0.0041
	Contour	0.46	245.95	15.91	0.0084
	Contour	0.71	246.20	26.08	0.0104
	Contour	0.96	246.45	36.26	0.0121
	Contour	1.21	246.70	46.43	0.0136
	Contour	1.46	246.95	56.60	0.0149
	Contour	1.71	247.20	66.78	0.0161
	Contour	1.96	247.45	76.95	0.0173
	Contour	2.21	247.70	87.12	0.0183
	Underside of Tank Lids	2.36	247.85	92.73	0.0189
	Contour	2.46	247.95	93.00	0.0193
	Contour	2.71	248.20	93.65	0.0203
	Top of Grate	3.06	248.55	94.57	0.0216
	Contour	3.11	248.60	96.36	0.0217
	Contour	3.16	248.65	101.48	0.0219
	Contour	3.21	248.70	109.93	0.0221
	Contour	3.26	248.75	123.42	0.0223
	Driveway Overflow	3.31	248.80	143.55	0.0224
	Contour	3.36	248.85	170.42	0.1878
Catchment 202: Bioretention Cell Surface Depression Storage	Bottom of Surface Cell	0.00	247.45	0.00	
	Contour	0.02	247.47	1.22	
	Contour	0.04	247.49	2.47	
	Contour	0.06	247.51	3.75	
	Contour	0.08	247.53	5.07	
	Contour	0.10	247.55	6.42	
	Contour	0.12	247.57	7.80	
	Contour	0.14	247.59	9.22	
	Contour	0.16	247.61	10.67	
	Contour	0.18	247.63	12.15	
	Contour	0.20	247.65	13.67	
	Contour	0.22	247.67	15.22	
	Contour	0.23	247.68	16.00	
	Contour	0.24	247.69	16.80	
	Top of Overflow Grate	0.25	247.70	17.60	
	Contour	0.26	247.71	18.42	
	Contour	0.28	247.73	20.07	
	Top of Berm	0.30	247.75	21.75	

Detailed calculations, including the control sizing for all orifices and weirs, are included in Appendix C. The location of the stormwater management facilities and further design details are illustrated on the engineering drawings included in Appendix D (envelope at the rear of this report).

6.1.1. Effectiveness of SWM Facility

Table 5 and Table 6 summarize the effectiveness of the proposed stormwater attenuation features based on the hydrologic model results.

Table 5
Model Results - 4hr Chicago Distributions

	2Yr	5Yr	10Yr	25Yr	50Yr	100Yr
PRE-DEVELOPMENT (m^3/sec)						
Catchment 101	0.018	0.033	0.045	0.062	0.075	0.089
Total Pre-Development Runoff Rate	**0.018**	**0.033**	**0.045**	**0.062**	**0.075**	**0.089**
POST-DEVELOPMENT (m^3/sec)						
Catchment 201	0.103	0.135	0.156	0.183	0.202	0.222
Catchment 202	0.015	0.020	0.023	0.028	0.031	0.035
Catchment 203	0.003	0.006	0.009	0.012	0.015	0.017
Catchment 204	0.004	0.007	0.008	0.011	0.018	0.015
Total Post-Development Runoff Rate	**0.125**	**0.168**	**0.196**	**0.233**	**0.265**	**0.287**
POST-DEVELOPMENT SWM (m^3/sec)						
Catchment 201	0.014	0.017	0.019	0.022	0.022	0.022
Catchment 202	0.000	0.002	0.004	0.007	0.014	0.016
Catchment 203	0.001	0.003	0.006	0.008	0.010	0.012
Catchment 204	0.004	0.007	0.008	0.011	0.018	0.015
Total Post-Development SWM Runoff Rate	**0.017**	**0.024**	**0.031**	**0.044**	**0.059**	**0.064**
Catchment 201 SWM Facility Storage Volume / Ponding Elevation (m^3 / m ASL)	53 / 246.86	75 / 247.40	91 / 247.81	110 / 248.70	126 / 248.76	143 / 248.80

Table 6
Model Results - 24hr SCS Type II and Hurricane Hazel Regional Storm Distributions

	2Yr	5Yr	10Yr	25Yr	50Yr	100Yr	Hazel
PRE-DEVELOPMENT (m^3/sec)							
Catchment 101	0.036	0.066	0.087	0.114	0.137	0.157	0.071
Total Pre-Development Runoff Rate	**0.036**	**0.066**	**0.087**	**0.114**	**0.137**	**0.157**	**0.071**
POST-DEVELOPMENT (m^3/sec)							
Catchment 201	0.062	0.087	0.103	0.124	0.140	0.154	0.049
Catchment 202	0.010	0.014	0.017	0.021	0.024	0.027	0.009
Catchment 203	0.006	0.010	0.013	0.017	0.020	0.023	0.009
Catchment 204	0.006	0.011	0.015	0.020	0.024	0.027	0.010
Total Post-Development Runoff Rate	**0.083**	**0.122**	**0.149**	**0.182**	**0.208**	**0.231**	**0.077**
POST-DEVELOPMENT SWM (m^3/sec)							
Catchment 201	0.015	0.018	0.022	0.022	0.022	0.071	0.040
Catchment 202	0.001	0.014	0.017	0.021	0.024	0.027	0.009
Catchment 203	0.006	0.010	0.013	0.017	0.020	0.023	0.009
Catchment 204	0.006	0.011	0.015	0.020	0.024	0.027	0.010
Total Post-Development SWM Runoff Rate	**0.025**	**0.052**	**0.064**	**0.080**	**0.090**	**0.099**	**0.063**
Catchment 201 SWM Facility Storage Volume / Ponding Elevation (m^3 / m ASL)	55 / 246.91	83 / 247.60	101 / 248.65	124 / 248.75	143 / 248.80	159 / 248.83	147 / 248.81

With the implementation of this SWM strategy, peak flow attenuation of post-development flows to pre-development levels, will be achieved. There will be no increase in runoff directed to adjacent private properties and there is no downstream flood impact concern associated with this development on the municipal sewer system beneath Macmillan Crescent, and Sophia Creek.

6.2 Quality Control

The primary objective of the stormwater management plan for this development is to maintain acceptable water quality within the receiving storm sewer network and ultimate outfall, Lovers Creek, by maintaining existing site drainage patterns and flowrates. In order

to provide water quality enhancement to an "enhanced" level of protection (80% TSS removal) for this development, we have incorporated a "treatment train" approach consisting of the following elements:

- Provision of "soft" landscaping where feasible.

- Yard grading using minimal surface slopes where possible to promote infiltration.

- Provision of an Imbrium Jellyfish Filter for oil and sediment removal from runoff generated from catchments 201 & 202. For a 0.396-hectare drainage area that is 92.8% impervious, a Jellyfish JF4-2-1-L1 treatment unit (or an approved equivalent) is required. A JF4-2-1-L1 unit will provide 89% removal of total suspended solids. Design calculations utilizing the manufacturer's software, the ETV verification statement, and maintenance guide are included in Appendix C.

- Construction of a bioretention facility for catchment 202 to promote infiltration of runoff into the underlying filter media and gravel storage layer. The bioretention facility has been designed to meet a permissible drawdown time of 24-48 hours in accordance with Section 4.6.2 of the MECP SWM Planning and Design Manual (2003). According to the TRCA LID Manual, bioretention facilities are credited with 75% TSS removal. Detailed design calculations are included in Appendix C. Operation and maintenance of the facility should be conducted as outlined in the LID factsheet included in Appendix C. The location and details of the proposed bioretention facility are shown on the engineering drawings included in Appendix D.

- Construction of enhanced grass swales with rock check dams to reduce ditch flow velocities and promote filtration of stormwater generated from catchment 203. According to the TRCA LID Manual, enhanced swales are credited with 76% TSS removal. Operation and maintenance of the facility should be conducted as outlined in the LID factsheet included in Appendix C.

- Provision of perimeter landscape area in catchment 204. Landscape area will provide some TSS removal benefit as it performs as vegetative filter strips, cleansing runoff as it sheet flows to the existing storm sewer beneath Macmillan Crescent. TSS removal benefit of vegetative filter strips range from 20-80% per the TRCA LID Manual. A conservative estimate of 50% was utilized for the hydrological modelling.

- Suitable construction mitigation measures to be utilized during the site development.

Visual OTTHYMO was utilized to determine the pre and post development TSS loadings for the proposed development area. A continuous model was simulated, based on City of Barrie precipitation, temperature, and evaporation data provided by Environment Canada. This climate data was obtained from the Barrie Landfill Station for the year 2020. The event mean concentration (EMC) values for each land use are chosen from the LID TTT Tool, accepted by the TRCA and the LSRCA. In the pre-development condition, open space land use was chosen to determine the TSS loading. For the post-development condition, the proposed development was broken down into pavement, rooftop, and landscape land uses.

The calculated TSS loadings are illustrated in Table 7.

Table 7
Pre & Post TSS Loading

	TSS Load (kg/year)
Pre-Development	32.272
Post Development with no BMP's	208.900
Post Development with BMP's	27.344

The potential treatment alternatives have been evaluated with respect to their applicability for this development and implemented in a manner to achieve the best total suspended solids (TSS) removal possible. As summarized above, the proposed treatment measures in conglomeration will provide an overall TSS removal of 86.91% (1-(27.344kg / 208.9kg)*100) which exceeds the criteria outlined. Visual OTTHYMO input/output calculations are included in Appendix C.

6.3 Water Budget

As per City policy 4.1.3 of the Storm Water Policy and Design Guidelines, sites less than 5 ha shall minimize any anticipated changes in the water balance between pre-development and post-development conditions and shall provide a minimum infiltration equivalent to the first 5mm of rainfall. Based on a total development area of 5700m^2, the first 5mm of rainfall to be retained on the site for infiltration equates to 28.5m^3. Initial abstraction values provided in the City's SWM guidelines are shown in Table 8.

Table 8
Initial Abstraction Values

Cover	Initial Abstraction / Depression Storage (mm)
Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious areas	2

Adapted from UNESCO, Manual on Drainage in Urbanized Areas, 1987

Using the values provided in Table 8 above, the subject property yields an overall initial abstraction value of 2.86mm, therefore, approximately 16.3m^3 of rainfall will be retained on the site through initial abstraction in the post-development condition. A water balance deficit of 12.2m^3 exists in the post-development condition.

Additional storage will be provided through the implementation of LID controls such as a bioretention facility and enhanced grass swales. As designed, the proposed bioretention facility will provide 17.6m^3 of storage in the shallow surface depression, and 22.61m^3 of storage in the engineered soil media. The proposed enhanced grass swales will detain

3.48m^3 of runoff behind the rock check dams to promote infiltration. The proposed controls in conglomeration will provide 43.69m^3 of additional storage of site runoff which meets the minimum water balance requirement of the City of Barrie.

A water budget analysis was conducted in accordance with the LSRCA Technical Guidelines and the Lake Simcoe Protection Plan (LSPP) Water Budget Policy. Visual OTTHYMO was utilized to simulate a continuous model based on City of Barrie precipitation, temperature, and evaporation data provided by Environment Canada. This climate data was obtained from the Barrie Landfill Station for the year 2020. Results of the annual pre-development and post-development water balance is included Table 9, below. Visual OTTHYMO input/output calculations are included in Appendix C.

Table 9
Water Balance Summary

Characteristic	Site		
	Pre-Development	**Post Development**	**Post Development with SWM Implemented**
Output (Volumes)			
Precipitation (mm/yr)	933.8	933.8	933.8
Evapotranspiration (mm/yr)	459.098	200.868	202.332
Groundwater Infiltration (mm/yr)	128.201	46.932	46.932
Total Runoff (mm/yr)	209.696	631.897	529.325
Total Storage (mm/yr)	136.806	54.104	155.212
Total Storage (m^3/yr)	**780**	**308**	**885**

Based on the results of the water balance analysis, the site yields an overall stormwater storage volume of 780m^3/year and 308m^3/year in the pre-development and post-development condition, respectively, therefore the property would experience a water balance deficit of 472m^3/year. With the implementation of multiple LID measures including a bioretention facility and enhanced grass swales, the post-development storage volume will increase to 885m^3/year. Since the proposed development improves the water storage and infiltration potential for the subject property, an offsetting fee is not required by the LSRCA, in accordance with the LSPP Water Budget Policy.

6.4 Phosphorus Budget

According to section 2.3.2 of the LSRCA Technical Guidelines, any “major development” requires the removal of 80% of the annual Total Phosphorus (TP) load. Visual OTTHYMO was utilized to determine annual pre and post development phosphorus loadings for the proposed development area. The calculated phosphorus loadings are illustrated in Table 10.

Table 10
Pre & Post Phosphorus Loading

	P Load (kg/year)
Pre-Development	0.239
Post Development with no BMP's	0.673
Post Development with BMP's	0.106

The proposed Imbrium Jellyfish Filter will provide 77% TP removal for intercepted flows from Catchments 201 and 202, prior to discharging to the existing municipal storm sewer beneath Macmillan Crescent. Extended-detention storage provided by the SWM tanks will also provide some level of phosphorus removal as sediment settles to the bottom of the tanks and manhole/catchbasin sump. The MECP Phosphorus Budget Tool Report (March, 2012) provides a 25% TP removal credit for underground storage. The perimeter landscape area in catchment 204 will also provide some TP removal benefit as it performs as vegetative filter strips, cleansing runoff as it sheet flows to the existing storm sewer beneath Macmillan Crescent. Vegetative filter strips are credited with a TP removal rate of 65% per the MECP Phosphorus Budget Tool Report. The enhanced swales and bioretention facility will also provide some level of phosphorus removal by infiltration of site runoff into the underlying native soils. Factoring in filtration/evapotranspiration potential of the soft landscaping, the site will achieve an overall TP removal rate of 84.25% (1-(0.106kg / 0.673kg)*100). A copy of the phosphorus calculations showing the proposed best management practices and their corresponding phosphorus load reductions is included in Appendix C.

As previously mentioned, the subject property is part of the existing Little Avenue & Highway #11 Subdivision Storm Drainage Plan. According to Drawing No. 1995-057-007 of the City of Barrie engineering records, the downstream stormwater management pond (Lovers Creek SWMF LV13) is sized to accommodate drainage generated from the subject property (runoff coefficient of 0.4) for treatment and attenuation, prior to discharging to Lovers Creek. According to the MECP Phosphorus Budget Tool Report, detention ponds are credited with a TP removal rate of 63%, therefore, the annual TP loading from runoff generated on the subject property will be reduced from 0.106 kg/year to 0.039 kg/year.

In addition to providing 80% TP removal, the site must also conform to the Lake Simcoe Phosphorus Offsetting Program (LSPOP). The LSPOP requires that all new development must control 100% of the phosphorus from leaving the property, in order to maintain or improve the water quality of Lake Simcoe. Since this site does not achieve the zero-export target, a phosphorus budget is required in accordance with the LSPOP and the Lake Simcoe Protection Plan (LSPP).

Given that the phosphorus reduction needed to achieve net zero is 0.039 kg/year, the total amount of phosphorus needing to be offset is as follows:

0.039 kg/year X 2.5 (offset ratio) **= 0.098 kg/year**

A compensation fee is required by the LSRCA in accordance with the LSPOP for the phosphorus deficit of 0.098 kg/year.

7.0 EROSION AND SEDIMENT CONTROL

7.1 Mitigation Measures

Sedimentation and erosion control measures are required during construction and until such a time that site development has been completed and the driveway area has been paved.

The use of various siltation control measures will be implemented to protect the adjacent properties and receiving waterbodies from migrating sediments. These works include but may not be limited to:

- Installation of siltation fencing along the perimeter of the development area.
- Filter cloth / silt sack placement over drains.
- Installation of vehicle tracking mud mat at the entrance to the site.

Prior to carrying out site grading the siltation barriers and mud mats shall be in place. Any onsite storm sewer works will not be permitted to outlet to the municipal sewers until the site has been stabilized. The filter cartridges in the proposed Imbrium Jellyfish Filter should not be installed until the site has been stabilized.

Other temporary installations of silt fence or other appropriate measures may be required during grading to minimize silt migration from the site. The measures will need to be removed, replaced, and relocated as required during the construction period until the site works have been completed and vegetation established. During construction, all stockpiled material will be placed up-gradient of the siltation controls with additional siltation fencing installation around the stockpiles.

7.2 Monitoring and Maintenance During Construction

It is the responsibility of the contractor and owner to maintain the siltation control devices until suitable grass cover has been established upon completion of construction.

A regular review of the facilities by the contractor should be carried out during the construction period to ensure that the facilities are being properly maintained, and if necessary, replaced. Inspection reports are to be completed monthly and distributed to the owner, contractor, and City.

If site works are to continue through the winter and spring the engineer should be contacted by the owner to review the measures in place with the contractor on a regular basis to ensure that the facilities are adequate and in good working order.

All reasonable methods to control erosion and sedimentation are to be taken during construction. The contractor should inspect the siltation devices immediately after each rainfall. Damaged devices should be repaired immediately, and additional devices installed if necessary. Silt should be removed from the fencing and related siltation devices when

deposits are noticeable.

Should the erosion control measures fail, and sediment migrate beyond the limits of the control works, additional sedimentation facilities may need to be installed in the area of the migration and down gradient to contain the sediment.

8.0 SUMMARY AND CONCLUSIONS

The findings of this report are summarized as follows:

- Attenuation of peak post-development flowrates to below pre-development levels will be provided by utilizing precast concrete stormwater detention tanks located beneath the parking level and a surface storage cell created in the asphalt parking lot. A 75mm dia. orifice plate installed on the outlet pipe from STMMH#2 will control flows to or below pre-development levels. The proposed bioretention facility will also provide some stormwater attenuation benefit as dead storage provided in the surface depression.

- Quality control for the development will be provided by a treatment train approach consisting of underground storage (25% TP removal), a bioretention facility (75% TSS removal), an Imbrium Jellyfish Filter (89% TSS removal and 77% TP removal), enhanced swales (76% TSS removal), and perimeter landscape as filter strips (50% TSS removal and 65% TP removal). These measures in conglomeration will provide 86.91% removal of annual TSS, and 84.25% removal of annual total phosphorus.

- An offsetting fee is required by the LSRCA to compensate for the zero-target phosphorus deficit.

- The proposed LID measures provide enough storage for infiltration to meet the water balance requirements of the City of Barrie and the LSRCA. An offsetting fee is not required by the LSRCA to compensate for a water balance deficit.

- Suitable measures can be implemented during construction to protect the adjacent properties and receiving storm sewers from migrating sediments.

It is therefore recommended that:

1) This report and drawings be submitted to the City of Barrie and the LSRCA for review and approval.

2) The construction mitigation measures outlined in this report are utilized as a guideline for construction mitigation measures for this site.

All of which is respectfully submitted.
PINESTONE ENGINEERING LTD.

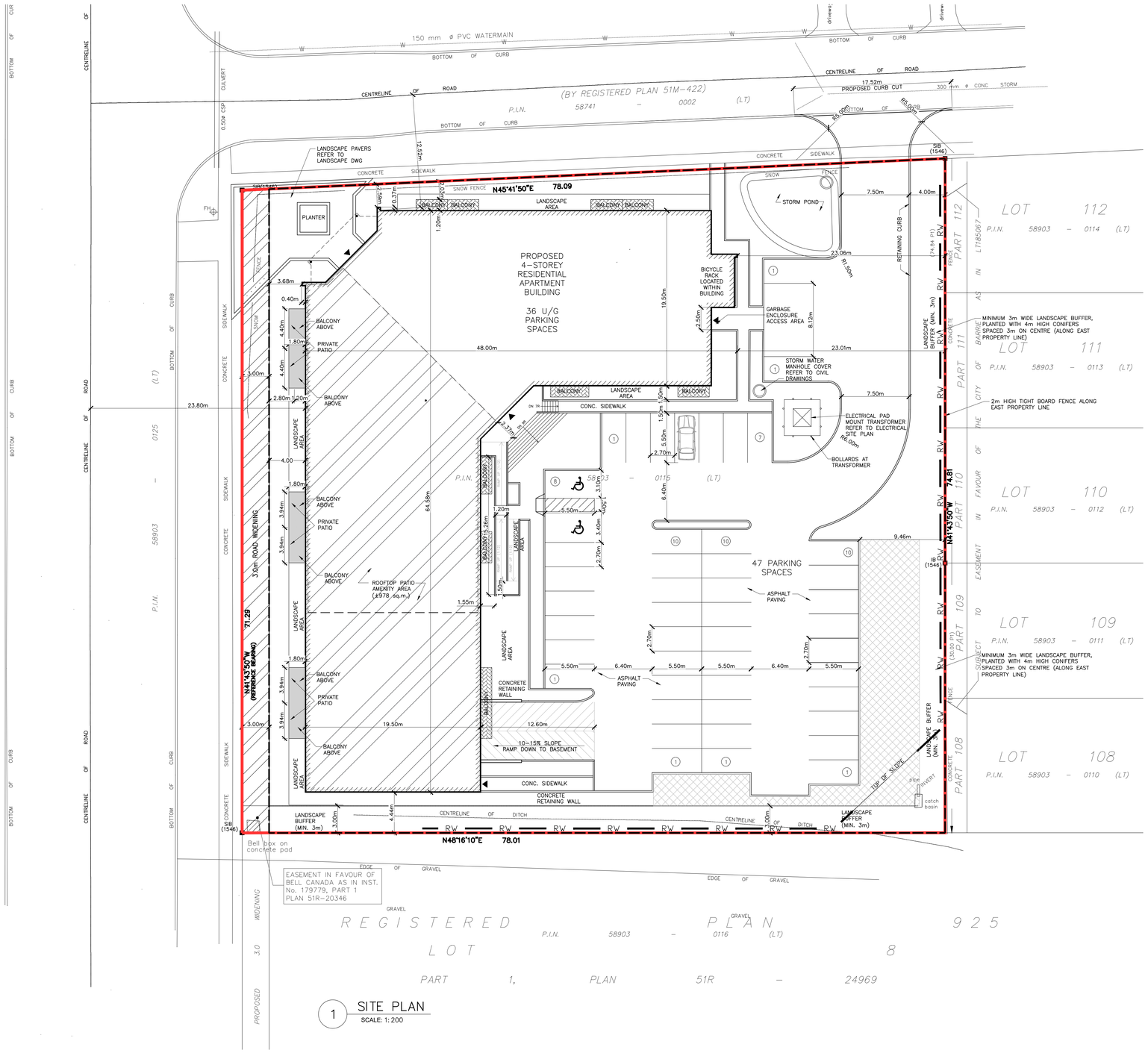
Dwight Hordyk, EIT
Project Designer

Joe Voisin, P.Eng
Senior Engineer

APPENDIX A

SITE PLAN

PINESTONE ENGINEERING LTD.



1 SITE PLAN
SCALE: 1:200

TOPOGRAPHIC SURVEY OF ALL OF BLOCK 113 PLAN 51M-453 IN THE CITY OF BARRIE IN THE COUNTY OF SIMCOE

SURVEY BY :
RUDY MAK SURVEYING LTD. (OLS)
DATED : OCTOBER 8, 2013

89 BIG BAY POINT ROAD,
BARRIE, ONTARIO L4N 8M5
TEL: (705) 722-3845
email: mail@maksurveying.com

ELEVATION NOTE

ELEVATIONS ARE GEODETIC AND ARE REFERRED TO THE CITY OF BARRIE VERTICAL CONTROL. ON SITE BENCHMARK IS THE SIB(1546) IN THE N.W. CORNER OF THE PARCEL HAVING AN ELEVATION OF 251.222 TBM.

BEARING NOTE

BEARINGS ARE ASTRONOMIC AND ARE REFERRED TO THE EASTERLY LIMIT OF YONGE STREET AS SHOWN ON REGISTERED PLAN 51M-453 AND BEING N41°43'50"W.

NOTES:

THIS TOPOGRAPHIC SURVEY PLAN DELINEATES THE FEATURES AS SHOWN AND VISIBLE, GIVEN THE SITE CONDITIONS. CONSTRUCTION ACTIVITY, FROZEN GROUND, SNOW COVER, ETC. MAY HAVE HIDDEN FEATURES OTHERWISE VISIBLE. THE LOCATION OF UNDERGROUND SERVICES, IF SHOWN, WAS DERIVED FROM PLANS OBTAINED FROM OTHER AGENCIES. RUDY MAK SURVEYING CANNOT BE HELD RESPONSIBLE FOR THE LOCATION AND ACCURACY OF UNDERGROUND SERVICES. THE LOCATION OF ALL SERVICES MUST BE VERIFIED ON SITE. ONLY A SIGNED AND SEALED PAPER COPY OF THIS SURVEY IS AN ORIGINAL COPY. NO DIGITAL VERSION OF THIS PLAN IS TO BE CONSIDERED "ORIGINAL" AND MAY HAVE BEEN ALTERED BY OTHERS.

METRIC

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

LEGEND

■	DENOTES FOUND SURVEY MONUMENT
-□-	DENOTES PLANTED SURVEY MONUMENT
SIB	DENOTES STANDARD IRON BAR
IB	DENOTES IRON BAR
-x-x-	DENOTES FENCING
(1546)	DENOTES RUDY MAK SURVEYING LTD.
	DENOTES MANHOLE (SANITARY)
	DENOTES MANHOLE (STORM)
	DENOTES MANHOLE (BELL TELEPHONE)
	DENOTES WATER VALVE
	DENOTES BELL BOX
	DENOTES LIGHT STANDARD
	DENOTES HYDRO POLE
	DENOTES CATCH BASIN
	DENOTES FIRE HYDRANT
	DENOTES ELEVATION SHOWN ON TOPOGRAPHIC SURVEY BY RUDY MAK SURVEYING LTD. DATED JULY 27, 1995
	DENOTES ELEVATION DATED OCTOBER 8, 2013
250.76	DENOTES PROPOSED FINISHED ELEVATION
	DENOTES PROPOSED SNOW STORAGE AREA (±350 sq.m.)
	DENOTES PROPOSED AMENITY AREA (±806 sq.m.)
-●-	DENOTES PROPOSED SNOW STORAGE SIGN

SITE SUMMARY

ZONING MU2

SITE AREA	= 5,699 sq.m./61,343 sq.ft./0.5699 ha (1.41 acres)
LOT AREA (after 3.0m road widening)	= 5,485 sq.m./0.5485 ha (1.36 acres)
LOT FRONTAGE	= 71.29 m
PROPOSED TOTAL APARTMENT UNITS	= 67 units
MAXIMUM BUILDING HEIGHT ALLOWED	= 16.5m (By-law 2015-097 - Bill 098)
PROPOSED BUILDING HEIGHT	= 16.136m
PROPOSED BUILDING AREA (COVERAGE)	= 1,744.6 sq.m. (18,778.7 sq.ft.) = 31.8% (lot area)
PROPOSED TOTAL G.F.A.	= 6,899.8 sq.m. (74,268.8 sq.ft.)
PROPOSED FLOOR SPACE INDEX	= 1.25
TOTAL PAVED AREA	= 2,302.14 sq.m (24,780.02 sq.ft) = 42%
TOTAL LANDSCAPED AREA	= 1,438.26 sq.m (15,481.3 sq.ft) = 26.2%

SET-BACK REQUIREMENT

REQUIRED FRONT YARD	= 4.0m MINIMUM (C.O.A. DECISION A33/12)
PROPOSED FRONT YARD (after road widening)	= 4.0m
REQUIRED SIDE YARD	= 3.0m MINIMUM (By-law 2015-097 - Bill 098)
PROPOSED EXTERIOR SIDE YARD	= 3.0m
PROPOSED INTERIOR SIDE YARD	= 4.5m
REQUIRED REAR YARD	= 7.0m MINIMUM (By-law 2015-097 - Bill 098)
PROPOSED REAR YARD	= 25.71m

PARKING REQUIREMENT

PARKING REQUIRED (1.2spaces/unit (By-law 2015-097 - Bill 098))	= 67 CARS
TYPE 'A' HANDICAP PARKING REQUIRED (By-law 2009-141)	= 1 CARS
TYPE 'B' HANDICAP PARKING REQUIRED (By-law 2009-141)	= 2 CARS
PARKING PROVIDED (including 4 handicap parking spaces) (includes 12 visitor parking)	= 81 CARS
MINIMUM AISLE	= 6.4m
TYPICAL 90° PARKING SPACE	= 2.70 x 5.50
HANDICAP PARKING SPACE TYPE 'A'	= 3.40 x 5.50
HANDICAP PARKING SPACE TYPE 'B'	= 3.10 x 5.50

1. THIS DRAWING IS THE PROPERTY OF THE ARCHITECT AND MAY NOT BE USED IN WHOLE OR IN PART FOR ANY PROJECT OTHER THAN THAT DESIGNATED HEREIN.
2. DO NOT SCALE DRAWINGS.
3. CONTRACTOR TO VERIFY JOB SITE AND DRAWING DIMENSIONS AND CONDITIONS. REPORT ANY AND ALL DISCREPANCIES TO THE ARCHITECT PRIOR TO CONTSTRUCTION.
4. ALL WORK MUST CONFORM TO THE LATEST LOCAL BUILDING CODE, LOCAL BY-LAWS AND NFPA 96.
5. THESE DRAWINGS ARE PROTECTED BY COPYRIGHT © NAYLOR ARCHITECT INC. 2015

REVISION: NO.	DATE	DESCRIPTION
1	SEP 09/19	CITY COMMENTS
2	JUN 01/20	REV. PER MARK-UP REC JUN 01/20
3	APR 06/22	INDICATE PAD MOUNT TRANSFORMER AND SW MAN HOLE

ISSUED: TO	DATE	DESCRIPTION
CLIENT	AUG 27/19	FOR REVIEW
CLIENT	SEP 03/19	FOR REVIEW
CLIENT	DEC 05/19	FOR REVIEW
CLIENT	MAY 25/20	FOR REVIEW
CLIENT	JUN 01/20	FOR REVIEW
CONSULTANTS	JAN 19/22	FOR PRELIM REVIEW
CONSULTANTS	MAR17/22	FOR COORDINATION
CONSULTANTS	APR06/22	FOR COORDINATION

SEAL: ONTARIO ASSOCIATION OF ARCHITECTS — CHRISTOPHER J. NAYLOR LICENCE 4938

NAYLOR ARCHITECT INC.
2800 John Street Unit 22
Markham, Ontario
L3R 0E2
Tel: 905.470.2463
Fax: 905.470.7713
E-mail: info@naylorarchitect.com

PROJECT:

PROPOSED APARTMENT BUILDING

481 YONGE STREET BARRIE, ONTARIO

DRAWN:	DATE:
V.G.	DEC,2019
CHECKED BY: C.N.	
SCALE: AS NOTED	PROJECT NO.: 19100
SHEET TITLE: SITE PLAN	

REVISION NO.:

SHEET NO.: SP1

APPENDIX B

GEOTECHNICAL REPORT

PINESTONE ENGINEERING LTD.

HADDAD GEOTECHNICAL INC.

Geotechnical & Environmental Engineers

Geotechnical Investigation
Proposed Apartment Building
481 Yonge Street
Barrie, Ontario

Prepared for:

481 Yonge Developments
145 Welham Road, Unit 10
Barrie, Ontario
L4N 8Y3

Project: 21-15954

April 12th, 2022

151 Amber Street, Unit 17
Markham, Ontario, Canada L3R 3B3

(905) 475-0951
1-888-214-4285

Fax: (905) 475-8338
info@haddadgeo.com

HADDAD GEOTECHNICAL INC.
Geotechnical & Environmental Engineers

April 12th, 2022

Project: 21-15954

481 Yonge Developments Inc.
145 Welham Road, Unit 10
Barrie, Ontario
L4N 8Y8

Re: Geotechnical Investigation
Proposed Apartment Building
481 Yonge Street
Barrie, Ontario

Dear Edward Lea,

Further to your authorization and our previous report #13-9408 dated, January 6, 2014, Haddad Geotechnical Inc. has conducted a supplementary investigation of subsurface conditions in the area of proposed apartment building to be constructed on the subject property. The results of this investigation, together with our recommendations and comments with regards to design and construction of foundations for the proposed new building, excavation and temporary shoring, permanent drainage, etc., are presented in the enclosed report.

We trust that the information presented in this report satisfies your present requirements. Should you require further information, please contact our office.

Yours very truly,
HADDAD GEOTECHNICAL INC.

Nelson Weese, Geotechnical Engineering Technologist.

Encs:
Dist:
481 Yonge Developments Inc. - 1 pdf
Colliers International, *Attn: Julia Erridge* - 1 pdf
File: 21-15954.481.Yonge.Street.GI.2022

151 Amber Street, Unit 17
Markham, Ontario, Canada L3R 3B3
(905) 475-0951
1-888-214-4285
Fax: (905) 475-8338
info@haddadgeo.com

HADDAD GEOTECHNICAL INC.
Geotechnical & Environmental Engineers

Geotechnical Investigation
Proposed Apartment Building
481 Yonge Street
Barrie, Ontario

1. INTRODUCTION

1.1 Project

1. The architectural plans for the project, prepared by Naylor Architect Inc, indicate that the proposed development of the subject site will comprise the construction of a new four-story, multi-unit apartment building, with one level of underground parking at the property under consideration.

2. The plans for the proposed project indicate that the finished main floor for proposed apartment building is to be set at elevation 251.50±m, with the finished floor elevation for the proposed underground parking garage is to be set at elevation 248.45±m.

3. The property under consideration is currently vacant.

1.2 Purpose

The objectives of the subsurface investigation were to:

- provide subsurface information with regards to the types, thicknesses and variability of the subsoils underlying the area of the proposed building.
- establish groundwater conditions (if any).
- provide information for the design and construction of foundations, excavation, temporary shoring, earthworks, permanent drainage provisions, floor construction, etc. for the proposed apartment building.

1.3 Site Description

1. The site under consideration is located on the southeast corner of Yonge Street and Macmillian Crescent in the City of Barrie.

2. At the time of our investigation the site under consideration is vacant land with no structure present on site. A few old growth trees were observed on the property.

3. The topography of the subject site was observed to slope down considerably from Yonge Street, and then continues to slope northeast along Macmillian Crescent for the entire site.

2. FIELD AND LABORATORY WORK

2.1 Fieldwork

1. The fieldwork, carried out on March 14th and 15th, 2022, consisted of the drilling of eight (8) boreholes, and installation of five (5) monitoring wells at the approximate locations as shown on Drawing No. 1.

2. Borehole Nos. 101 to 105 were advanced to 5.0±m below existing grades, and Borehole Nos. 106 to 108 were advanced to 2.8±m below existing grades using track mounted power drilling equipment with 100mm diameter, continuous flight augers. Samples were obtained with a split spoon sampler, driven by a 140-lb hammer, falling 30" (760mm).

3. Detailed descriptions of the subsoils encountered in the sampled Boreholes are presented on the borehole logs, Drawing Nos. 2 to 9.

4. The surface elevations at the Borehole locations are referenced to the northwest corner of the property, having an elevation of 251.55±m, as per the site survey provided by Naylor Architect Inc.

2.2 Subsurface Conditions

2.2.1 Surficial Materials and Fill

1. The surficial materials at Borehole Nos. 101 to 108 were observed to consist of 50±mm to 200±mm of grass and topsoils.

2. Fill materials consisting of loose sandy silt with trace clay and occasional organics and roots in moist condition, and brown to dark brown in colour, were observed below the surficial materials at borehole locations 101 to 104, and 108, and extended to 1.53±m below grades at borehole locations 101 to 104, and 0.7±m below grade at Borehole No. 108.

3. Fill materials consisting of loose, clayey silt with occasional gravels, organics, and roots in moist condition, and brown in colour, were observed below the surficial materials at borehole locations 105 to 107 and extended to 1.53±m below grade at Borehole No. 105, and 0.7±m below grades at Borehole Nos. 105 and 106.

2.2.2 Natural Subsoils

1. Natural, loose to very dense, silty sand subsoils with trace to some clay and trace gravels in moist condition were observed to underlie the fill materials at borehole locations 101 to 105 and extended to the fully explored depths of 5.0±m below grades. The results of Standard Penetration Tests (SPT) in the silty sand subsoils indicated penetration resistance of 8 blows per 300mm, to over 50 blows per 100mm.

2. Natural, loose to very dense, silt and sand subsoils with trace clay and gravels in moist condition were observed to underlie the fill materials at borehole locations 106 to 108 and extended to the fully explored depths of 2.8±m below grades. The results of Standard Penetration Tests (SPT) in the silt and sand subsoils indicated penetration resistance of 5 to 27 blows per 300mm.

2. FIELD AND LABORATORY WORK (cont'd)

2.3 Groundwater (cont'd)

1. Monitoring Well Nos. 1 to 5, MW - 1 to MW - 5, were installed in Borehole Nos. 101 to 105, as shown on the provided Site Plan, Drawing No. 1.

2. Table No. 1 below, presents the elevations of groundwater levels at the monitoring wells, upon borehole completion of drilling operations and four and seventeen days after drilling completion.

Table No. 1
Elevations of Groundwater at Monitoring Well Location
Reading on March 18th & March 31st, 2022

Monitoring Well (BH) No.	Existing Grade Elevation, ±m	Reading on March 18, 2022		Reading on March 31, 2022		Soils
		Depth, ±m	Groundwater Elevation at or below, ±m	Depth, ±m	Groundwater Elevation at or below, ±m	
MW1	248.7	1.28	247.42	1.85	246.85	Silty Sand
MW2	249.03	0.89	248.14	0.88	248.15	Fill
MW3	249.39	1.35	248.04	2.00	247.39	Silty Sand
MW4	248.47	2.07	246.40	2.56	245.91	Silty Sand
MW5	247.95	2.03	245.92	2.43	245.52	Silty Sand

3. It is to be noted that additional information of water tables will be presented in Hydrogeological Assessment Report of the property, currently in progress by Haddad Geotechnical Inc.

2.4 Laboratory Work

1. The laboratory analysis of borehole samples included the determination of moisture contents and gradation analyses.

2. The results of moisture content are presented on the Borehole Logs and the results of gradation analyses carried out on four representative samples of the native subsoils encountered in Borehole Nos. 101, 104, 106 and 108, are presented on Drawing No. 10.

3. The results of the gradation analyses carried out on the upper natural subsoils sample obtained from Borehole No. 101 indicated 7% gravel, 46% sand, 31% silt, and 16% clay.

4. The results of the gradation analyses carried out on the upper natural subsoils sample obtained from Borehole No. 104 indicated 1% gravel, 46% sand, 34% silt, and 9% clay.

5. The results of the gradation analyses carried out on the upper natural subsoils sample obtained from Borehole No. 106 indicated 3% gravel, 51% sand, 39% silt, and 7% clay.

6. The results of the gradation analyses carried out on the upper natural subsoils sample obtained from Borehole No. 108 indicated 2% gravel, 45% sand, 53% silt and finer.

3. DISCUSSION AND RECOMMENDATIONS

3.1 Geotechnical Design Considerations

1. The architectural drawings, prepared by Naylor Architects Inc, indicate the main floor for the proposed apartment building to be set at elevation 251.50±m, and the finished floor of the underground parking is to be set at elevation 248.45±m.

2. With the assumption of founding level for conventional spread, at a minimum depth of 0.5±m below the floor level, this will situate the underside of proposed footings of the underground parking at elevation of 247.95±m, or lower in order to accommodate for thickness of slab-on-grade and underlying granular basecourses.

3. It should be noted that the proposed founding level of 247.95±m is located above the existing grade for a portion of the site, borehole locations 105 to 108. Excavations for the proposed foundations in these areas must be extended a minimum of 1.2±m below existing grade for purposes of frost protection.

4. The organic stained fill materials encountered at each borehole location, ranging from depths of 0.7±m to 1.5±m below the existing grades on site are not suitable for the support of any permanent structures.

5. The above-noted founding levels of basement i.e. 247.95±m, will place the conventional spread foundations of the proposed apartment building within the observed loose, sandy silt fill materials encountered in Borehole Nos. 101 to 104, which will not provide satisfactory conditions for the support of conventional spread foundations.

6. Excavations for the foundations of the proposed apartment building at the subject site must be extended to the natural, silty sand and/or silt and sand subsoils encountered at depth ranging form 1.8±m to 2.3±m below grades, (elevations ranging from 243.6±m to 247.6±m) withing the explored depths at Borehole Nos. 101 to 106.

7. The water table was observed within Borehole Nos. 101 to 105, at 0.8±m to 2.6±m below the existing grade, at an elevation of 248.15±m to 245.952±m. The observed water table is above the underside of the proposed spread foundations. It should be noted that the boreholes were conducted in March 2022, at normally a wet time of year.

8. Due to the height of the proposed apartment building with one of underground parking, the existing grade changes on site, and the observed high-water tables, it is our opinion that a deep foundation such has helical piers supported by grade beams may be considered for support for the proposed apartment building to transfer the required load down to competent subsoils.

3.2 Foundations

3.2.1 Helical Pile Foundations

1. The helical pile system supported with grade beams may be considered by project structural engineer for the support of the proposed building. Design of the helical pile foundation system with concrete grade beams is to be conducted by a project structural engineer with the consideration of following comments.

3. DISCUSSION AND RECOMMENDATIONS (cont'd)

3.2 Foundations (cont'd)

3.2.1 Helical Pile Foundations (cont'd)

2. It has been our experience that helical piers established in earth conditions similar to the medium dense to very dense silty sand / silt and sand subsoils encountered in Borehole Nos. 101 to 106, at elevations ranging from 243.1±m to 246.0±m on the subject site, and installed by relatively light, portable equipment, may provide resistance (SLS) of up to 80kN (20kips) in compression (i.e., with end-bearing component). In order to achieve the above load capacity, it will be necessary to advance the lead section, with the helices at least 1.5±m into the lower, natural, very dense, strata encountered at Borehole Nos. 101 to 108.

3. It is recommended that the helical piers be installed with grouted concrete shafts, in order to provide increased stiffness and ability to resist lateral movements.

4. Design of the helical piers is to be conducted by a structural engineer and/or specialist firm. It is essential that the specialist contractors performing the installation operations for helical piers is fully aware of the subsurface conditions and must make every effort to use appropriate technique and equipment in order to accomplish this task.

5. It is recommended that the final plans of the proposed foundation system should be reviewed with the consideration of this report by a qualified professional engineer before installation, to ensure that the helical piers are advanced to competent subsoils.

6. It is strongly recommended that an engineer from our office should be on site to witness the installation of the helical piers to safely support the design loadings and to confirm adequate founding.

3.2.2 Protection against Frost Action

1. Footings and/or grade beams for portions of the structure in exterior and unheated interior areas must be protected against frost action by at least 1.2±m earth cover.

2. During cold weather, the freshly placed concrete must be covered with insulating blankets to protect against freezing, as per OPSS 904. Ice and snow are to be removed from the base of the excavation in the area where concrete is to be placed and the concrete must not be placed on frozen soil.

3.2.4 Earthquake Design Factors

1. For purpose of design of the proposed structure for earthquake loads and effects as per Table 4.1.8.4A, in the Ontario Building Code (2012), Site Class "D" conditions may be assumed for the foundations established on the natural, medium dense to very dense, silty sand and/or silt and sand silt subsoils at the anticipated elevations as described in Section 3.2.1, above.

2. The remaining parameters should be selected as per the Ontario Building Code.

3. DISCUSSION AND RECOMMENDATIONS (cont'd)

3.3 Excavation and Earthworks

3.3.1 General Excavation

1. In general, due to the observed water table elevation above the lowest level in MW 1 - 5, the excavation may require positive de-watering measures for at least the construction phase. Dewatering recommendations are to be provided in full Hydrogeological Investigation of the property currently in progress by Haddad Geotechnical Inc.

2. Excavations must be conducted in conformance with regulation 213/91 (construction projects) under the Ontario Construction Health and Safety Act.

3. The upper fill materials may be classified as Type 3 soils. The natural, medium dense, silty sand and/or silt and sand subsoils observed in Borehole Nos. 101 to 108 may be classified as Type 2 soils, as per the Ontario Occupational Health and Safety Act.

4. Within the confines of the project area, the sides of excavations in the upper fill materials and natural subsoils may be safely cut to 1V : 1H while above the observed water table. Below the water table, the side of the excavation may be safely cut to 1V : 2H.

5. Where the above-noted safe cut side of excavation cannot be accomplished within the limits of the subject property, the installation of temporary shoring will be required.

6. Prior to commencement of construction, a sedimentation control fence must be installed on the perimeter of the construction area, to minimize the effects of surface erosion on the surrounding area. A typical detail of a sedimentation control fence is shown on Drawing No. 11.

7. Where the general excavation will produce soil which are not re-used as fill or backfill within the limits of the subject property, these soils are determined to be "excess soil". Ontario Regulation 406/19 requires that an Excess Soils Characterization (ESC) report be prepared by a qualified person (QP_{ESA}), as defined by Regulation. The ESC report is to be prepared to determine options for off-site disposal of soils to be excavated and removed from the site. The report will require an environmental assessment to identify potential environmental issues which may impact soils to be excavated. Additional sampling and chemical analysis of soils on the site will be required for the above report, in conformance with Regulation 406/19. An additional report calls an Excess Soils Destination Assessment (ESDA) report, also prepared by qualified person, will also be required by Regulation 406/19, once receiving site for excess soil has been selected and prior to commencement of general excavation and removal of the soils from the subject site. The ESDA report s to be based on the finding of the ESC report.

3.3.2 Earthworks

1. Prior to filling and/or backfilling, the exposed subgrade should be thoroughly cleaned to remove all loose, disturbed, or organic materials.

2. Any regrading carried out up to the underside of basecourses below slab-on-grade or exterior pavement should be carried out using only approved, free draining materials, placed in shallow lifts not exceeding 150mm and compacted to at least 98% Standard Proctor maximum dry density.

3. DISCUSSION AND RECOMMENDATIONS (cont'd)

3.3.2 Earthworks (cont'd)

3. The upper fill materials are not suitable for backfill below slab-on-grade or exterior pavement due to the presence of roots and organic content but may be reused below soft-landscaped areas. The natural silty sand / silt and sand subsoils excavated from the area of the proposed new building may be re-used as backfill, up to the underside of basecourses below slab-on-grade and/or exterior pavement, provided that the materials are below optimum moisture content. Alternatively, imported materials conforming to OPSS Select Subgrade designation may also be used.

4. Prior to materials being imported to the site for backfilling purposes, originating from a source site other than a rock quarry or licensed sand and gravel pit, an Excess Soil Characterization report, prepared in conformance Ontario Regulation 153/04 must be provided by the source site for our review and approval, to certify that the incoming materials conform with the criteria of Ontario Regulation 153/04 Table 3 Generic Site Condition Standards for site in residential use, as is applicable to the subject property

5. Backfilling and compaction operations should be inspected by an engineer or technologist from our office, with in-situ density tests carried out to verify that a satisfactory degree of compaction is achieved.

3.4 Design of Underground Perimeter Walls and Retaining Walls

1. Underground walls must be adequately water-proofed and designed to resist an earth pressure, p, in kPa, at any depth, h, in metres, below grade, as given by the following expression:

$$p = k(\gamma h + q)$$

where: k = 0.3, the coefficient of lateral earth pressure
γ = 21kN/m^3, the unit weight of the drained granular backfill materials to be retained by perimeter walls at other locations
q = in kPa, the equivalent uniform vertical pressure of any surcharge acting near the wall.

2. The above parameters assume that the retained soil (i.e. wall backfill materials) can be drained effectively to eliminate hydrostatic pressure on the wall as described in Section 3.5, below.

3.5 Subsurface Drainage Provisions

1 Underground walls and the lowest slab must be positively water-proofed to avoid the ingress of water into the underground levels due to hydrostatic pressure on the walls. In addition, underfloor drains may be installed to prevent the build-up of hydrostatic pressure on the slab-on-grade.

2 Where the perimeter walls are adjacent to open cut areas and are to support backfill, the waterproofing, drainage and backfill requirements are presented on Drawing No. 12. It is recommended that cleanouts are placed at strategic locations to allow for periodic cleaning and washing of the weeping tile of the perimeter drainage to inhibit the clogging of the interior of the pipes.

3. DISCUSSION AND RECOMMENDATIONS (cont'd)

3.5 Subsurface Drainage Provisions (cont'd)

3 As the free groundwater level in boreholes conducted at the site is approximately at or above the proposed lowest floor level, it is anticipated that the foundation drains will intercept groundwater. Foundation drainage consisting of perimeter weeping tile, led to a positive outlet in a sump pit, will be required to intercept the anticipated groundwater.

4 Alternatively, discharge from foundation drains and sump pit to a subsurface infiltration facility may be considered. The subsurface infiltration facility, located at minimum 5m from the foundation wall of the building, as per Ontario Building Code (2016) section 9.14.5.3, and with base of facility at least 1.0m above the seasonal high groundwater level, as per requirement of Ministry of the Environment, Conservation and Parks (MECP).

5 The exterior grades should also be sloped away from the proposed building in order to minimize ponding of surface stormwater adjacent to the proposed building.

3.6 Floor Construction

1. Slab-on-grade type of floor construction may be considered for the lowest level of the proposed structure.

2. The exposed subgrade should be thoroughly cleaned to remove all loose, organic, and disturbed materials prior to filling. It is recommended that the placement of a non-woven geotextile be placed over the exposed subgrade to inhibit the migration of the lower, finer materials into the granular basecourses and subsurface drainage.

3. Any regrading carried out up to the underside of basecourses below slab-on-grade should be carried out using only approved, free draining materials, placed in shallow lifts not exceeding 150mm and compacted to at least 98% Standard Proctor maximum dry density.

4. Regrading operations should be inspected by an engineer or technologist from our office, with in-situ density tests carried out to verify that a satisfactory degree of compaction is achieved.

5. Following the successful completion of regrading operations as described in Section 3.3.3, above, the slab-on-grade may be constructed over a minimum thickness varying from 200mm (8") well-compacted Granular "A" or 300mm (12") of 19mm ($^3/_4$") crushed stone or compacted (vibrated) clear stone.

6. The slab-on-grade should be constructed independently of any structural members (i.e. walls, columns, etc.) by means of fibre board or an equivalent isolation compound. Saw cuts should be provided along column lines, with "diamond" cuts around columns, to minimize uncontrolled cracking of floor slab.

4. REPORT LIMITATIONS

1. The information provided, and recommendations made in this report, in terms of the thickness, depth and type of subsoils encountered, groundwater levels, etc., are only applicable to the actual locations explored. Subsurface and groundwater conditions between and beyond the borehole locations may differ from those encountered at the borehole locations, and such conditions may become apparent during construction, which could not be detected or anticipated at the time of writing of this report. Should additional information become apparent upon excavation or construction, or further investigation, our office should be contacted so that the situation may be reassessed, and alternate recommendations made, if deemed necessary. It is recommended practice that the Geotechnical Engineer be retained during the construction to confirm that the subsurface conditions across the site do not deviate materially from those encountered in the boreholes.

2. The design recommendations given in this report are applicable only to the project described in the text, and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known, it is our recommendation that Haddad Geotechnical Inc. be retained during the final design stage to verify that the design is consistent with our recommendations, and that the assumptions made in our analysis are valid.

3. The comments made in this report relating to potential construction problems and possible methods of construction are intended only for the guidance of the designer. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. The report has been prepared in accordance with normally accepted geotechnical engineering practices. No other warranty is expressed or implied.

4. The information provided, and recommendations presented in this report reflect the best judgment of Haddad Geotechnical Inc. in light of the information available to it at the time of preparation. Any use which a third party makes of this report or any reliance on or decisions to be based on it are the responsibility of that third party. Haddad Geotechnical Inc. accepts no responsibility for damages, if any suffered by any third party as a result of decisions made or actions based on this report.

We trust that the information presented in this report satisfies your present requirements. Should you require further information, please contact our office.

Yours very truly,
HADDAD GEOTECHNICAL INC.

Nelson Weese, Geotechnical Engineering Technologist.

Damoon Kasemi, M.Sc., P.Eng.

Encs.
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Colliers International, *Attn: Julia Erridge* - 1 pdf
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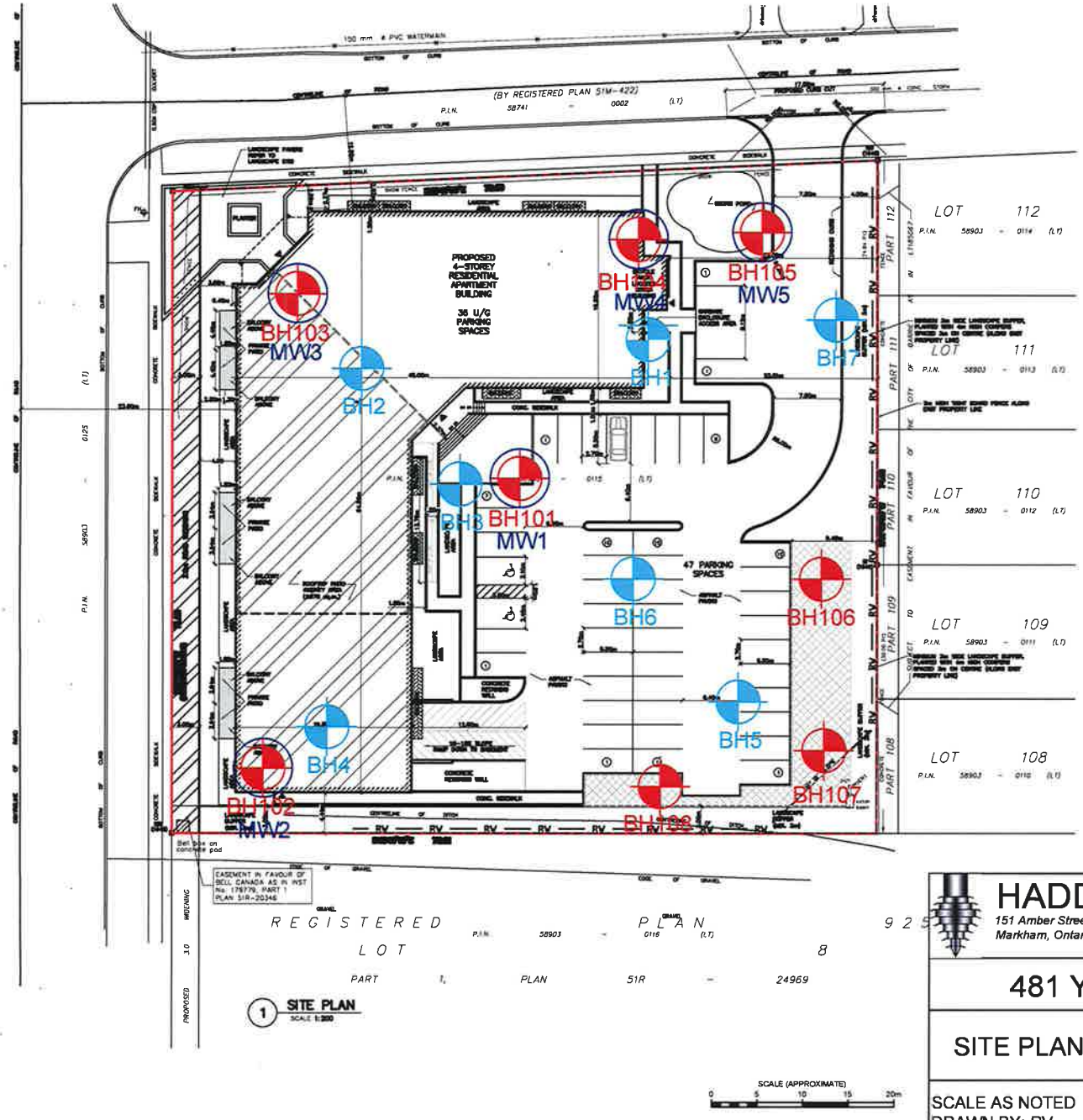


BOREHOLE LOCATIONS, 2014

BOREHOLE LOCATIONS, 2022

MONITORING WELL LOCATIONS, 2022

HADDAD GEOTECHNICAL INC.
151 Amber Street, Unit 17
Markham, Ontario, Canada, L3R 3B3
905-475-0951, fax: 905-475-8338
info@haddadgeo.com

481 YONGE STREET, BARRIE

SITE PLAN SHOWING BOREHOLE LOCATION

SCALE AS NOTED
DRAWN BY: RV

PROJECT:21-15954
DRAWING No. 1
DATE: APRIL 5, 2022

HADDAD GEOTECHNICAL INC.

Engineering Data Sheet For Borehole No. 101 and Monitoring Well No. 1

Project No. 22-15954
Drawing No. 2

Project: Proposed Development
Location: 481 Yonge Street, Barrie
Hole Location: see Drawing No. 1
Hole Elevation & Datum: , see Note 1
Start Date: Mar 14, 2022 | End Date: Mar 14, 2022
Field Supervision: RV/BZ

LEGEND
51 mm dia Split Spoon Sample
Auger Sample
N - Standard Penetration Value
Gradation Analysis Completed M
Water Level
Pocket Penetrometer

Description	Elev. ±m	Depth ±m	Sample No.	N	Moisture Content %
GROUND SURFACE	248.70	0.0			
TOPSOIL - 200±mm FILL - loose, sandy silt with trace clay, organics, brown moist			SS0	11	17.3
		1.0	SS1	6	14.7
	247.2				
SILTY SAND - with trace to some clay and trace gravels, oxidization seams, brown moist	246.85 (03/31/22)	2.0	SS2	9	12.0
turns grey, becomes very moist at 2.3m			SS3	20	11.2
occ. rocks		3.0	SS4	16	8.8
		4.0			
becomes wet at 4.6			SS5	43	11.2
END OF BOREHOLE	243.7	5.0			
		6.0			
		7.0			
		8.0			
		9.0			
		10.0			
		11.0			
		12.0			
		13.0			
		14.0			
		15.0			

Strength and Penetration Resistance (KPa)
0 50 100 150 200 250

N Blows/300mm
0 20 40 60 80 100

NOTES:
1. Elevation datum, Northwest corner of the property El. 251.222m, as per site survey provided by client
2. Borehole open to 5.0±m depth and wet upon completion.
3. Monitoring well MW1 installed March 14, 2022. Flush mount at grade.
   - 0.0 - 1.6m riser
   - 1.6 - 4.6m screen
   - 0.0 - 1.1m bentonite backfill
   - 1.1 - 4.6m sand backfill
4. Water level (depth, (elevations)), m
   - March 18, 2022 1.28 (247.42)
   - March 31, 2022 1.85 (246.85)

HADDAD GEOTECHNICAL INC.

Engineering Data Sheet For Borehole No. 102 and Monitoring Well No. 2

Project No. 22-15954
Drawing No. 3

Project: Proposed Development
Location: 481 Yonge Street, Barrie
Hole Location: see Drawing No. 1
Hole Elevation & Datum: , see Note 1
Start Date: Mar 14, 2022 | End Date: Mar 14, 2022
Field Supervision: RV/BZ

LEGEND
51 mm dia Split Spoon Sample
Auger Sample
N - Standard Penetration Value
Gradation Analysis Completed M
Water Level
Pocket Penetrometer

Description	Elev. ±m	Depth ±m	Sample No.	N	Moisture Content %
GROUND SURFACE	249.03	0.0			
TOPSOIL - 150±mm FILL - loose, sandy silt with trace clay, organics, brown moist			SS0	8	11.2
▼ 248.15 (03/31/22)		1.0	SS1	6	12.2
SILTY SAND - with trace to some clay and trace gravels, oxidization seams, grey	247.5	2.0	SS2	17	8.3
becomes very moist at 2.3m		3.0	SS3	18	11.1
becomes wet below 4.6±m		4.0	SS4	45	13.3
END OF BOREHOLE	244.0	5.0	SS5	73	9.2
		6.0			
		7.0			
		8.0			
		9.0			
		10.0			
		11.0			
		12.0			
		13.0			
		14.0			
		15.0			

Strength and Penetration Resistance (KPa)
0 50 100 150 200 250
N Blows/300mm
0 20 40 60 80 100

NOTES:
1. Elevation datum, Northwest corner of the property El. 251.222m, as per site survey provided by client
2. Borehole open to 5.0±m depth and wet upon completion.
3. Monitoring well MW2 installed March 14, 2022. Flush mount at grade.
   - 0.0 - 1.6m riser
   - 1.6 - 4.6m screen
   - 0.0 - 1.1m bentonite backfill
   - 1.1 - 4.6m sand backfill
4. Water level (depth, (elevations)), m
   - March 18, 2022 0.89 (248.14)
   - March 31, 2022 0.88 (248.15)

HADDAD GEOTECHNICAL INC.

Engineering Data Sheet For Borehole No. 103 and Monitoring Well No. 3

Project No. 22-15954
Drawing No. 4

Project: Proposed Development
Location: 481 Yonge Street, Barrie
Hole Location: see Drawing No. 1
Hole Elevation & Datum: , see Note 1
Start Date: Mar 15, 2022 | End Date: Mar 15, 2022
Field Supervision: RV/BZ

LEGEND
51 mm dia Split Spoon Sample
Auger Sample
N - Standard Penetration Value
Gradation Analysis Completed M
Water Level
Pocket Penetrometer

Description	Elev. ±m	Depth ±m
GROUND SURFACE	249.39	0.0
TOPSOIL - 50±mm FILL - loose, sandy silt with trace clay, occ. gravel, organics, brown, moist		
	247.9	
SILTY SAND - with some clay and trace gravels, oxidization seams, grey moist	247.39 (03/31/22)	2.0
END OF BOREHOLE	244.3	5.0

Strength and Penetration Resistance (KPa): 0, 50, 100, 150, 200, 250
N Blows/300mm: 0, 20, 40, 60, 80, 100

Sample No.	N	Moisture Content %
SS0	6	11.6
SS1	5	21.7
SS2	17	33.4
SS3	23	13.0
SS4	27	8.9
SS5	27	8.7

NOTES:
1. Elevation datum, Northwest corner of the property El. 251.222m, as per site survey provided by client
2. Borehole open to 5.0±m depth and wet upon completion.
3. Monitoring well MW3 installed March 15, 2022. Flush mount at grade.
   - 0.0 - 1.6m riser
   - 1.6 - 4.6m screen
   - 0.0 - 1.1m bentonite backfill
   - 1.1 - 4.6m sand backfill
4. Water level (depth, (elevations)), m
   - March 18, 2022 1.35 (248.04)
   - March 31, 2022 2.00 (247.39)

HADDAD GEOTECHNICAL INC.

Engineering Data Sheet For Borehole No. 104 and Monitoring Well No. 4

Project No. 22-15954
Drawing No. 5

Project: Proposed Development
Location: 481 Yonge Street, Barrie
Hole Location: see Drawing No. 1
Hole Elevation & Datum: , see Note 1
Start Date: Mar 15, 2022 | End Date: Mar 15, 2022
Field Supervision: RV/BZ

LEGEND
51 mm dia Split Spoon Sample
Auger Sample
N - Standard Penetration Value
Gradation Analysis Completed M
Water Level
Pocket Penetrometer

Description	Elev. ±m	Depth ±m	Sample No.	N	Moisture Content %
GROUND SURFACE	248.47	0.0			
TOPSOIL - 50±mm FILL - loose, sandy silt with trace clay, occ. gravel, organics, brown, moist			SS0	8	17.8
		1.0	SS1	8	19.6
	246.9				
SILTY SAND - with trace to some clay ans trace gravels, oxidization seams, grey moist		2.0	SS2	9	19.1
	245.91 (03/31/22)		M SS3	15	23.6
very moist at 3±m		3.0	SS4	50/4"	10.0
		4.0			
wet at 4.6m			SS5	51	12.8
END OF BOREHOLE	243.4	5.0			
		6.0			
		7.0			
		8.0			
		9.0			
		10.0			
		11.0			
		12.0			
		13.0			
		14.0			
		15.0			

Strength and Penetration Resistance (KPa)
0 50 100 150 200 250
N Blows/300mm
0 20 40 60 80 100

NOTES:
1. Elevation datum, Northwest corner of the property El. 251.222m, as per site survey provided by client
2. Borehole open to 5.0±m depth and wet upon completion.
3. Monitoring well MW4 installed March 15, 2022. Flush mount at grade.
   - 0.0 - 1.6m riser
   - 1.6 - 4.6m screen
   - 0.0 - 1.1m bentonite backfill
   - 1.1 - 4.6m sand backfill
4. Water level (depth, (elevations)), m
   - March 18, 2022 2.07 (246.40)
   - March 31, 2022 2.56 (245.91)

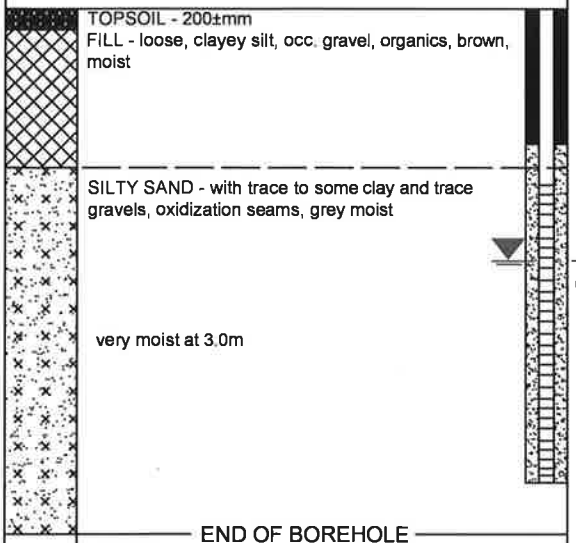
HADDAD GEOTECHNICAL INC.

Engineering Data Sheet For Borehole No. 105 and Monitoring Well No. 5

Project No. 22-15954
Drawing No. 6

Project: Proposed Development
Location: 481 Yonge Street, Barrie
Hole Location: see Drawing No. 1
Hole Elevation & Datum: , see Note 1
Start Date: Mar 15, 2022 | End Date: Mar 15, 2022
Field Supervision: RV/BZ

LEGEND
51 mm dia Split Spoon Sample | Water Level
Auger Sample
N - Standard Penetration Value | Pocket Penetrometer
Gradation Analysis Completed M



Description	Elev. ±m	Depth ±m
GROUND SURFACE	247.95	0.0
TOPSOIL - 200±mm FILL - loose, clayey silt, occ. gravel, organics, brown, moist		
	246.4	1.0
SILTY SAND - with trace to some clay and trace gravels, oxidization seams, grey moist		2.0
	-245.52 (03/31/22)	
very moist at 3.0m		3.0
		4.0
END OF BOREHOLE	242.9	5.0
		6.0
		7.0
		8.0
		9.0
		10.0
		11.0
		12.0
		13.0
		14.0
		15.0

Strength and Penetration Resistance (KPa): 0, 50, 100, 150, 200, 250
N Blows/300mm: 0, 20, 40, 60, 80, 100

Sample No.	N	Moisture Content %
SS0	6	17.0
SS1	9	25.5
SS2	8	14.7
M SS3	19	10.0
SS4	27	9.7
SS5	-	-

NOTES:
1. Elevation datum, Northwest corner of the property El. 251.222m, as per site survey provided by client
2. Borehole open to 5.0±m depth and wet upon completion.
3. Monitoring well MW5 installed March 15, 2022. Flush mount at grade.
   - 0.0 - 1.6m riser
   - 1.6 - 4.6m screen
   - 0.0 - 1.1m bentonite backfill
   - 1.1 - 4.6m sand backfill
4. Water level (depth, (elevations)), m
   - March 18, 2022 2.03 (245.92)
   - March 31, 2022 2.43 (245.52)

HADDAD GEOTECHNICAL INC.

Engineering Data Sheet For Borehole No. 106

Project No. 22-15954
Drawing No. 7

Project: Proposed Development
Location: 481 Yonge Street, Barrie
Hole Location: see Drawing No. 1
Hole Elevation & Datum: , see Note 1
Start Date: Mar 15, 2022 | End Date: Mar 15, 2022
Field Supervision: RV/BZ

LEGEND
51 mm dia Split Spoon Sample
Auger Sample
N - Standard Penetration Value
Gradation Analysis Completed M
Water Level
Pocket Penetrometer

Description	Elev. ±m	Depth ±m	Sample No.	N	Moisture Content %
GROUND SURFACE	245.92	0.0			
TOPSOIL - 200±mm FILL - loose, clayey silt, occ. gravel, organics, brown, moist			SS0	4	20.5
SILT and SAND - with trace clay and trace gravels, oxidization seams, grey moist	245.2	1.0	SS1	6	13.8
		2.0	SS2	11	10.4
END OF BOREHOLE	243.1	3.0	M SS3	27	8.1
		4.0			
		5.0			
		6.0			
		7.0			
		8.0			
		9.0			
		10.0			
		11.0			
		12.0			
		13.0			
		14.0			
		15.0			

Strength and Penetration Resistance (KPa)
0 50 100 150 200 250
N Blows/300mm
0 20 40 60 80 100

NOTES:
1. Elevation datum, Northwest corner of the property El. 251.222m, as per site survey provided by client
2. Borehole open to 2.8±m depth and wet upon completion.

HADDAD GEOTECHNICAL INC.

Engineering Data Sheet For Borehole No. 107

Project No. 22-15954
Drawing No. 8

Project: Proposed Development
Location: 481 Yonge Street, Barrie
Hole Location: see Drawing No. 1
Hole Elevation & Datum: , see Note 1
Start Date: Mar 15, 2022 | End Date: Mar 15, 2022
Field Supervision: RV/BZ

LEGEND
51 mm dia Split Spoon Sample
Auger Sample
N - Standard Penetration Value
Gradation Analysis Completed M
Water Level
Pocket Penetrometer

Description	Elev. ±m	Depth ±m	Sample No.	N	Moisture Content %
GROUND SURFACE	245.89	0.0			
TOPSOIL - 200±mm FILL - loose, clayey silt, occ. gravel, organics, brown, moist			SS0	-	-
	245.1	1.0	SS1	-	-
SILT and SAND - trace clay and trace gravels, oxidization seams, grey, moist		2.0	SS2	-	-
			SS3	-	-
END OF BOREHOLE	243.1	3.0			
		4.0			
		5.0			
		8.0			
		7.0			
		8.0			
		9.0			
		10.0			
		11.0			
		12.0			
		13.0			
		14.0			
		15.0			

Strength and Penetration Resistance (KPa)
0 50 100 150 200 250
N Blows/300mm
0 20 40 60 80 100

NOTES:
1. Elevation datum, Northwest corner of the property El. 251.222m, as per site survey provided by client
2. Borehole open to 2.8±m depth and wet upon completion.

HADDAD GEOTECHNICAL INC.

Engineering Data Sheet For Borehole No. 108

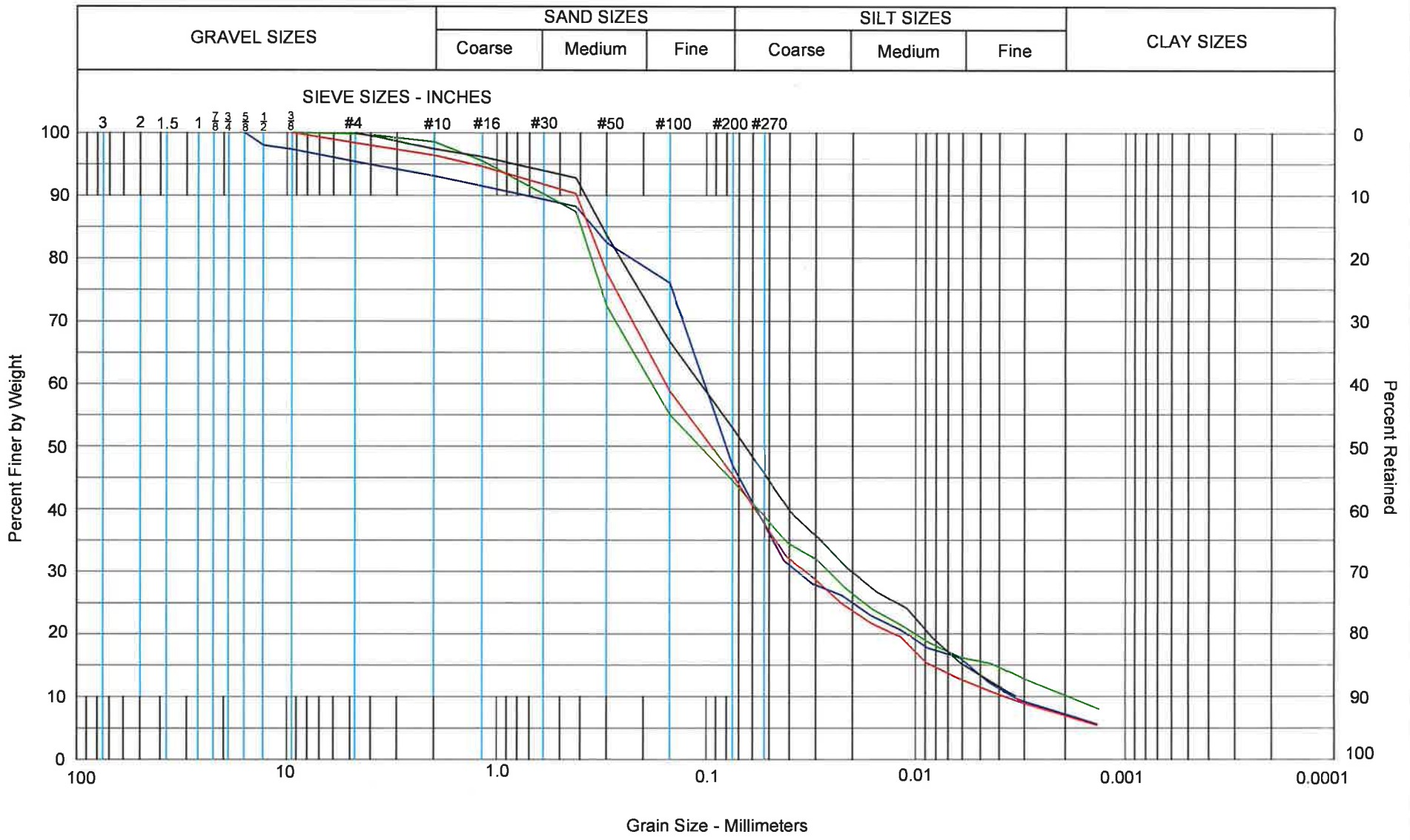
Project No. 22-15954
Drawing No. 9

Project: Proposed Development
Location: 481 Yonge Street, Barrie
Hole Location: see Drawing No. 1
Hole Elevation & Datum: , see Note 1
Start Date: Mar 15, 2022 | End Date: Mar 15, 2022
Field Supervision: RV/BZ

LEGEND
51 mm dia Split Spoon Sample
Auger Sample
N - Standard Penetration Value
Gradation Analysis Completed M
Water Level
Pocket Penetrometer

Description	Elev. ±m	Depth ±m	Sample No.	N	Moisture Content %
GROUND SURFACE	247.85	0.0			
TOPSOIL - 200±mm FILL - loose, silty sand with trace clay, occ. gravel, organics, brown, moist			SS0	11	16.1
SILT and SAND - with trace clay and trace gravels, roots, brown, moist	247.1	1.0	SS1	9	12.4
		2.0	M SS2	10	21.0
			SS3	5	15.9
END OF BOREHOLE	245.1	3.0			
NOTES: 1. Elevation datum, Northwest corner of the property El. 251.222m, as per site survey provided by client 2. Borehole open to 2.8±m depth and wet upon completion.		4.0			
		5.0			
		6.0			
		7.0			
		8.0			
		9.0			
		10.0			
		11.0			
		12.0			
		13.0			
		14.0			
		15.0			

Strength and Penetration Resistance (KPa)
0 50 100 150 200 250
N Blows/300mm
0 20 40 60 80 100



BH101 SS2 - (1.5±m to 1.9±m) (7% Gravel, 46% Sand, 31% Silt, 16% Clay)
BH104 SS3 - (2.2±m to 2.7±m) (1% Gravel, 46% Sand, 34% Silt, 9% Clay)
BH106 SS3 - (2.2±m to 2.7±m) (3% Gravel, 51% Sand, 39% Silt, 7% Clay)
BH108 SS2 - (1.5±m to 1.9±m) (2% Gravel, 45% Sand, 53% Silt)

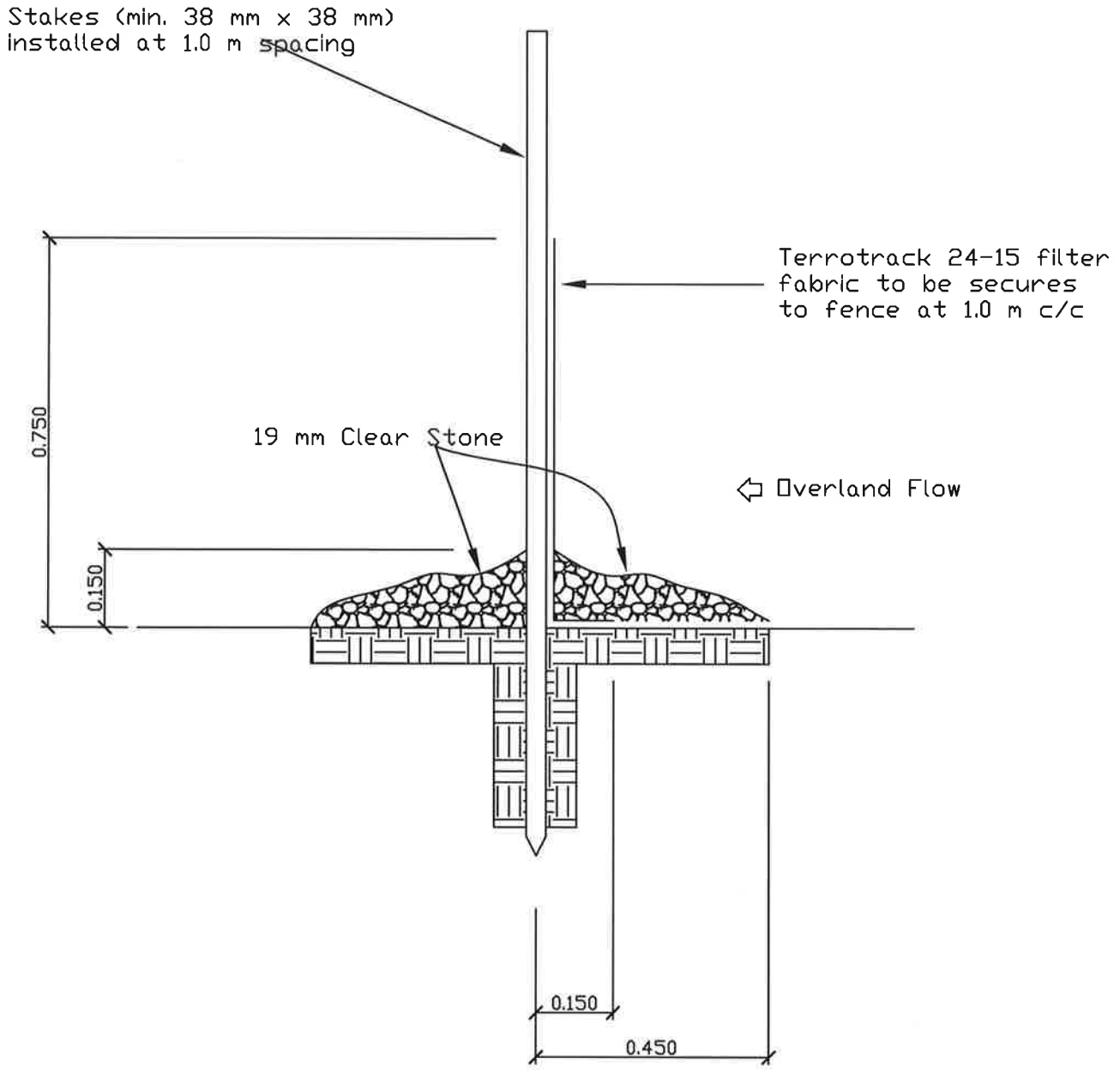
HADDAD GEOTECHNICAL INC.
151 Amber Street, Unit 17, 18
Markham, Ontario L3R 3B3
phone: 905-475-0951, fax: 905-475-8338
info@haddadgeo.com

481 YONGE STREET, BARRIE

GRADATION ANALYSES A.S.T.M. D422
NATIVE SUBSOILS

SCALE: AS INDICATED
DRAWN BY: RV

PROJECT: 22-15954
DRAWING No.10
DATE: APRIL 5, 2022



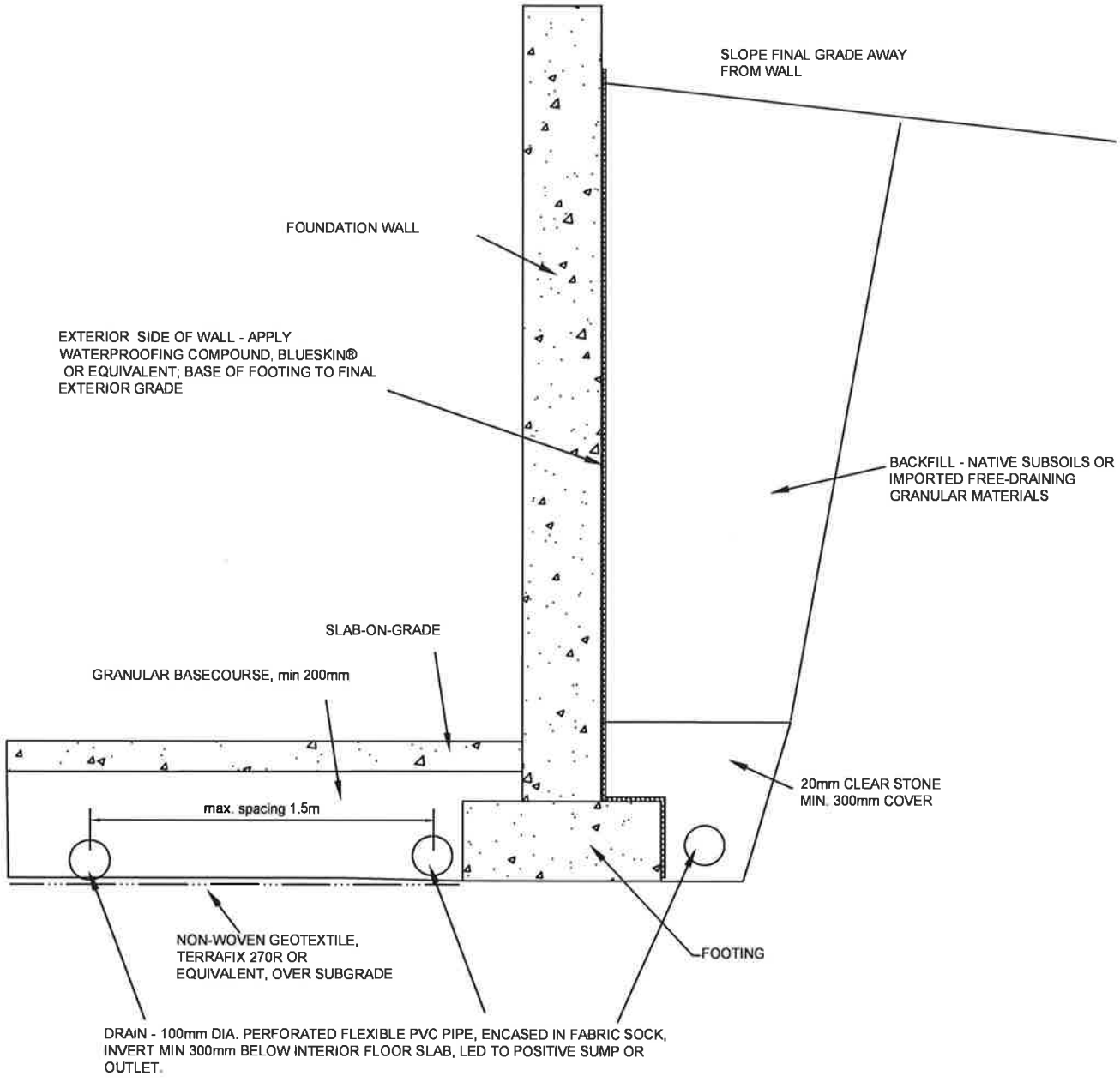
HADDAD GEOTECHNICAL INC.
151 Amber Street, Unit 17
Markham, Ontario, Canada, L3R 3B3
905-475-0951, fax: 905-475-8338
info@haddadgeo.com

481 YONGE STREET, BARRIE

SCHEMATIC SECTION SHOWING
SEDIMENTATION CONTROL FENCE

SCALE: AS NOTED
DRAWN BY: NW

PROJECT: 21-15954
DRAWING No. 11
DATE: APRIL 7, 2022



HADDAD GEOTECHNICAL INC.
151 Amber Street, Unit 17
Markham, Ontario, Canada L3R 3B3
905-475-0951, 1-866-214-214-4285
fax 905-475-8338 info@haddadgeo.com

481 YONGE STREET, BARRIE

TYPICAL SECTION SHOWING PERIMETER & SUB-FLOOR DRAINAGE PROVISIONS

SCALE AS NOTED
DRAWN BY: NW

PROJECT: 21-15954
DRAWING No. 12
DATE: APRIL 8, 2022

HADDAD GEOTECHNICAL INC.

Geotechnical & Environmental Engineers

Geotechnical Investigation
Proposed Apartment Building
481 Yonge Street
Barrie, Ontario

Prepared for:

Manny Enterprises
c/o B.A.R.A Consulting
2652 Bayview Avenue
Toronto, Ontario
M2L 1B9

Project: 13-9048

January 6, 2014

7321 Victoria Park Avenue, Unit 21 *(905) 475-0951* *Fax: (905) 475-8338*
Markham, Ontario, Canada L3R 2Z8 *1-888-214-4285* *info@haddadgeo.com*

HADDAD GEOTECHNICAL INC.
Geotechnical & Environmental Engineers

January 6, 2014

Project: 13-9084

Manny Enterprises
c/o B.A.R.A Consulting
2652 Bayview Avenue
Toronto, Ontario
M2L 1B9

Attention: Mr. Brian Atkins

Re: Geotechnical Investigation
Proposed Apartment Building
481 Yonge Street
Barrie, Ontario

Dear Sirs:

Haddad Geotechnical Inc. was authorized by Manny Enterprises, the owners of the subject property, to conduct an investigation of subsurface conditions on the subject property. The results of this investigation, together with our recommendations and comments with regards to design and construction of foundations for the proposed building, to be constructed on the site noted-above, excavation, permanent drainage provisions, etc., and information for the design and construction of proposed storm pond, driveways and parking lot are presented in the enclosed report.

We trust that the information presented in this report satisfies your present requirements. Should you require further information, please contact our office.

Yours very truly,
HADDAD GEOTECHNICAL INC.

D. Graham Fisher, M.E.Sc., P.Eng.

Encs.
Dist:
Manny Enterprises
c/o B.A.R.A Consulting -1 (hard copy & 1 pdf)
Atkins + VanGroll Inc. -1 (pdf)
City of Barrie, Building Dept. -1 ***
*** to be forwarded with application for building permit
File:139048.gi

7321 Victoria Park Avenue, Unit 21 *(905) 475-0951* *Fax: (905) 475-8338*
Markham, Ontario, Canada L3R 2Z8 *1-888-214-4285* *info@haddadgeo.com*

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HADDAD GEOTECHNICAL INC.
Geotechnical & Environmental Engineers

Geotechnical Investigation
Proposed Apartment Building
481 Yonge Street
Barrie, Ontario

1. INTRODUCTION

1.1 Project

1. It is proposed to construct a new, three-storey, residential apartment building on the property under consideration, as shown on Site Plan, Drawing No.1. The north-easterly (nominal) portion of the building will be two-storey.

2. The plans for the project, prepared by B.A.R.A Consulting, indicate that the main floor of the proposed building to be set at elevation 249.75m. The proposed building have one underground parking level with finished to be set at 3.0m below the main floor level, i.e. elevation: 246.75m. An access ramp to the underground garage will be located at the northwest side of the building.

3. The north, south and west sides of the proposed building will have setbacks ranging from 9.83±m to 11.29±m, 7.50±m and 4.0±m from north, south and west property lines of the subject site, respectively.

4. In addition to above, an exterior asphalt-paved passenger vehicle parking lot, storm pond and an amenity area is to be constructed in the south easterly potion of the site, shown on Site Plan, Drawing No.1. An asphalt paved driveway, with configuration as shown on Drawing No.1, is to be constructed from the south side of Macmillan Crescent, which will extend south to the ramp to underground garage and exterior parking lot.

5. A landscape area, consisting of soft and hard landscape features, will be constructed beyond the extent of the open parking lot and proposed building. A storm water management pond will be situated in the southeast corner of the site.

1.2 Purpose

The objectives of the subsurface investigation were to:

- provide subsurface information with regards to the types, thicknesses and variability of the subsoils underlying the area of the proposed building.
- establish groundwater conditions.
- provide information for the design and construction of foundations, excavation, earthworks, temporary shoring, permanent drainage provisions, floor construction, driveway, parking areas, etc., for the proposed building.
- provide information for the design and construction of proposed infiltration facilities for disposal of storm runoff water.

1. INTRODUCTION (cont'd)

1.3 Site Description – Present

1. The subject site is located in the northeast corner of intersection of Yonge Street and Macmillan Crescent, south of Little Avenue, in the City of Barrie.

2. At the time of our investigation, the site was a vacant, undeveloped lot, covered with grass and trees.

3. The topography of the site slopes moderately from north to south and west to east.

2. FIELD AND LABORATORY WORK

2.1 Fieldwork

1. The fieldwork, carried out on December 16, 2013, consisted of the drilling of seven sampled Boreholes, at the locations as shown on the Schematic Site Plan, Drawing No. 1. Borehole Nos.1 to 4 were located in the area of proposed building, Borehole No. 5 in the area of proposed storm water retention pond. Borehole Nos. 6 and 7 were located in the area of proposed driveway and parking lot, respectively.

2. Detailed descriptions of the subsoils encountered are presented on the Borehole logs, Drawing Nos. 2 to 7.

3. The surface elevations at the boreholes are referenced to the top of the manhole cover located approximately at the intersection of Macmillan Crescent and Yonge Street, elevation: 251.95m, as indicated on Site Plan Drawing No.1, provided by the client.

4. Boreholes 1 to 5 were punched to depths ranging from 4.95±m (16.5±ft) to 7.95±m (26.50±ft) and Borehole Nos. 6 and 7 were punched to depths 2.10±m (7.0±ft) and 1.95±m (6.5±ft) below existing grades using rubber-tracked drilling equipment, with 100mm diameter, continuous flight augers. Samples were obtained with a split spoon sampler, driven by a 140-lb hammer, falling 30" (760mm).

5. In addition to the above, a falling head permeability test were conducted at Borehole No. 5, to determine coefficient of permeability in the in-situ natural subsoils, as described in detail in Section 2.4, below.

2.2 Subsurface Conditions

2.2.1 Surficial Materials and Fill

1. The surficial materials at Borehole Nos. 5 to 7 were observed to consist of topsoil with thickness ranging from 75±mm to 150±mm. The surficial materials at Borehole No. 3 were observed to consist of gravels with a thickness of 50±mm

2. Fill materials were encountered at the surface of Borehole Nos. 1, 2 and 4 and below the topsoil and gravels at Borehole Nos. 5 to 7 and 3, respectively.

2. FIELD AND LABORATORY WORK (cont'd)

2.2 Subsurface Conditions (cont'd)

2.2.1 Surficial Materials and Fill (cont'd)

3. The fill materials, consisting of sandy silt/silty sand, were encountered in a moist to very moist and very loose to compact condition and extended to depths ranging from 1.5±m to 1.7±m (i.e. elevation 245.3±m to 248.1±m) below existing grades with the exception of Borehole Nos. 3, 4 and 6, where fill materials extended to depths of 4.5±m (elevation 244.7±m), 3.0±m (elevation 246.5±m), 2.3±m (elevation 246.4±m) below existing grades.

2.2.2 Natural Subsoils

1. Natural, loose to very dense, silty sand/sandy silt subsoils were observed to underlay fill materials encountered at Borehole locations 1 to 7and extended to the explored depths ranging from 1.95±m to 7.95±m (i.e. elevation 240.6±m to 246.5±m) with the exception of Borehole No.4. The results of Standard Penetration Tests (SPT) in the silty sand subsoils indicated penetration resistance of 8 to over 88 blows per 300mm

2. A layer of natural, firm, clayey silt subsoils were observed to underlay the natural, medium dense, silty sand subsoils encountered in Borehole No. 4 within the depth range 4.0±m to 6.3±m below existing grade (i.e. within the elevation ranging from 245.5±m to 243.2±m). The results of Standard Penetration Tests (SPT) in the clayey silt subsoils indicated penetration resistance of 7 blows per 300mm. The clayey silt subsoils, at elevation 243.2±m, were observed to be overlying natural, medium dense to very dense silty sand subsoils, which extended down to the explored depth of 7.8±m (elevation 241.7±m) below existing grade. The results of Standard Penetration Tests (SPT) in the silty sand subsoils indicated penetration resistance of 26 to 100 blows per 300mm.

2.3 Groundwater

1. Borehole Nos. 1 to 5 caved at depths ranging from 2.1±m to 5.7±m and water rose to depths ranging from 2.1±m to 3.9±m (i.e. elevations ranging from 244.0±m to 246.8±m) below existing grades following completion.

2. The observed ground water levels, encountered in boreholes noted-above, may be attributed to the presence of perched water condition in the upper fill materials and natural sandy silt/silty sand subsoils.

3. The ground water table at the subject site was observed to be inconsistent and varied in elevation from 245.5±m to 246.8±m across the area of the site, with a general trend indicating groundwater flow from west to east and north to south.

2. FIELD AND LABORATORY WORK (cont'd)

2.4 Falling Head Permeability Test

1. Permeability test were conducted in Borehole No. 5, generally following the procedures for falling-head permeability test as presented in ASTM standard No. D2434-65T.

2. Borehole No. 5 was caved at 3.3±m and water rose to 3.0±m below existing grade upon completion of the drilling of the borehole.

3. The water table in the borehole was measured after two days, i.e. on December 18, 2013, of the first water table measurement carried out on December 16, 2013, noted-above. The water table in the Borehole was high, i.e. extended to a depth of 0.95±m below existing grade. The surface of the water in the borehole was lowered to a depth of 1.5±m below existing grade. The fall/rise in water level was monitored after a time interval of 12 minutes.

4. A summary of readings at the borehole location, with analysis are presented in Appendix "A". Our measurement indicated rising of groundwater level in the Borehole, indicating negative values of permeability in Appendix "A".

5. Measurement of rising hydraulic head in Borehole No. 5, located in the area of storm pond at time intervals noted above, indicated a coefficient of permeability (k) for the silty sand/sandy silt subsoils as $8x10^{-4}$ cm /sec.

6. On the basis of the results of the above testing, the subject site is not suitable for the design of storm pond due to the presence of high ground water table on the subject site.

2.5 Laboratory Work

1. The laboratory analysis of borehole samples carried out included the determination of moisture contents, with results as presented on the Borehole Logs.

2. The results of gradation analyses carried out on three representative samples of the upper and lower native subsoils, encountered in Borehole Nos. 2, 4 and 5, are presented on Drawing No. 8.

3. The results of the gradation analyses carried out on the upper native subsoils sample obtained from Borehole No. 2 indicated 7% gravels, 57% sand, 31% silt and traces of clay (i.e. 2%).

4. The results of the gradation analyses carried out on the lower native subsoils obtained from Borehole No. 5 indicated 20% sand, 66% silt and 14% clay.

5. The results of the gradation analyses carried out on the upper native subsoils obtained from Borehole No. 5 indicated 10% gravels, 49% sand, 36% silt and traces of clay (i.e. 5%).

3. DISCUSSION AND RECOMMENDATIONS

3.1 Geotechnical Overview

1. The plans for the project, provided by B.A.R.A Consulting, indicate that the main floor of the proposed building is to be set at elevation 249.75m. The proposed building will have one underground parking garage with finished to be set at 3.0m below the main floor level, i.e. elevation 246.75m.

2. The above-noted finished floor level of the underground parking garage will place underside of the conventional spread foundations of the proposed building to be set at or below elevation 246.45±m in order to accommodate thickness for slab-on-grade and underlying granular basecourses.

3. In light of the above, the finished floor level of the parking garage (i.e. 246.75±m) and underside of the conventional spread foundations (i.e. 246.45±m) of the proposed building will be within the natural, medium dense, sandy silt/silty sand subsoils at Borehole locations 1, 2 and 4 and within the upper fill materials and below highest ground water table (elevation 246.8±m) encountered at Borehole No.3.

4. The upper fill materials encountered in a very loose to loose condition, at Borehole locations 1 to 7, are not suitable for the support of foundations of permanent structures.

5. Excavation down to approximate elevation 246.9±m should be relatively straightforward with no significant groundwater problems anticipated. Minor seepage emanating from the upper fill materials and wet seams within the natural silty sand/sandy silt subsoils can be controlled by local pumping. Prior to excavation below 246.8±m, in the area of proposed building, positive dewatering measures will be required.

6. The natural silty sand subsoils encountered in Borehole No. 3, are under groundwater table and excavation to reach the natural soils will be 4.5±m deep and will require faces of excavation to be temporarily braced in addition to extensive dewatering measures in order to pour conventional spread foundations on natural, undisturbed soils. The extent of the deep depth of fill materials in the area of Borehole No.3 is not known.

7. A loose clayey sandy silt layer encountered about 1±m below the founding level (i.e. elevation 246.45±m) at Borehole No.4 (in the elevation range 245.5±m–243.2±m) is competent to support a maximum Serviceability Limit States bearing capacity of 70 kPa in order to limit the total and differential settlement of less than 25mm.

8. In order to avoid the uncertainty about the extent of deep fill in the area of Borehole No.3 and natural soils below groundwater table, consideration may be given to constructing the entire building on grade beams supported on deep foundation system, advanced to natural, very dense, silty sand subsoils encountered at borehole locations 1, 3 and 4 in the elevation range 241.7±m to 240.6±m.

9. A deep foundation system, such as driven piles or helical piers, may be considered, in order to transfer the structural loadings down to the lower, competent natural subsoils. Drilled caisson foundations are not recommended due to the anticipated difficulty in provided undisturbed condition in wet sand subsoils at the base, without extensive dewatering of the site.

3. DISCUSSION AND RECOMMENDATIONS (cont'd)

3.1 Geotechnical Overview (cont'd)

10. The lowest finished floor level (i.e. 246.75±m) and footing level (i.e. 246.45±m) of the proposed building, will make it necessary to install a permanent dewatering system, with underfloor drains, as shown on Drawing No. 10, leading to sump pits, and with an emergency generator system in place to ensure continuous operation of pumps in order to avoid ground water causing hydrostatic pressure on the basement slab-on-grade.

11. Following the installation of driven pile foundations, general excavation down to the anticipated level (i.e. 246.75-1.2=245.55±m) for grade beams, and buried services below the lowest floor level, should be relatively straightforward down to elevation 246.9±m with no significant groundwater problems being encountered. Prior to excavation below elevation 246.8±m, positive dewatering measures will be required.

12. In order to avoid continuous pumping of groundwater from the underground parking garage sumps, consideration may be to raising the finished floor level of the parking garage to at least 0.3m (i.e. 246.80±m +0.3m=247.10±m) above the highest groundwater level (i.e. 246.80±m) encountered in Borehole No. 3.

3.2 Foundations

3.2.1 Driven Pile Foundations

1. Closed-end, concrete filled steel pipe piles, driven to practical refusal in the very dense, silty sand subsoils, underlying the site, may be considered for the support of the proposed foundations. It has been our experience that relatively small diameter, concrete-filled pipe piles, with 7" to 10" outer diameter and heavy wall thickness may be successfully driven to practical refusal, in materials similar to the very dense silty sand/sandy silt with occasional gravels subsoils encountered at this site. In order to achieve the above design loads, specialist piling contractors, utilizing conventional pile-driving equipment, were employed.

2. The estimated load capacities (i.e., serviceability limit states (S.L.S.)) for piles ranging in diameter from 7" to 10", are presented in Table No. 1, below. The load capacity, **R**, of driven piles in granular soils is estimated using the following relationship (Canadian Foundation Engineering Manual (1992):

$$\mathbf{R = m\ N\ A_t + n\ N\ D\ A_s}$$

where: **m** = empirical coefficient, = 400 for driven
N = SPT value at pile toe (blows per 300mm)
$\mathbf{A_t}$ = pile toe area, m^2
n = empirical coefficient, = 2 for driven piles
N = average SPT value along pile length (blows per 300mm)
D = pile embedment length, m
$\mathbf{A_s}$ = pile shaft area, m^2, per unit length above bearing pressure has.

3. DISCUSSION AND RECOMMENDATIONS (cont'd)

3.2 Foundations (cont'd)

3.2.1 Driven Pile Foundations (cont'd)

3. For the subject site, an average pile length of 5m is assumed (i.e, base of cap at 1.2m below finished floor of underground parking garage, depth of 5±m to very dense silty sand), along with an SPT value of 52 blows per 300mm at the pile toe, and average SPT of 3 blows per 300mm along the pile shaft. As it is anticipated that the piles will encountered refusal relatively quickly below the upper limit of the natural soils, and it is assumed that the piles will be essentially end-bearing, and that the contribution of frictional capacity of the portion of the piles while the upper, loose fill materials will be negligible. A factor of safety of 4 has been assumed as recommended in the Canadian Foundation Engineering Manual (1992). The load capacities in terms of ultimate limit states (U.L.S.) are also shown on Table No. 1.

4. Pipe piles should consist of steel conforming to CSA Standard CAN3-G40.21 M81. Structural Quality Steels, and having a minimum yield strength of at least 350MPa (50 k.s.i.). Concrete with 28-day compressive strength of at least 25MPa, or as directed by the project structural engineer, should be used to fill the piles. The lower end of the pile must be sufficiently sealed to prevent the seepage of water into the pile prior to concreting.

Table No. 1
Estimated Pile Capacities

Pile Diameter inches	Skin Friction Capacity, kN SLS (ULS)	End Bearing Capacity, kN SLS (ULS)	Total Bearing Capacity, kN SLS (ULS)
7	4 (16)	129 (516)	133 (532)
8	5(20)	168 (672)	173 (692)
9	5(20)	213 (852)	218 (872)
10	6(24)	263 (1052)	269 (1076)

5. It is essential that the pile driving-contractor submit details of the piles to be used, hammer weight and energy, etc., to our office for review and approval prior to construction, so that appropriate refusal criteria can be developed prior to construction. It is imperative that pile driving operations be carried under full-time inspection by an engineer from our office in order to verify the achievement of practical refusal and capacity of the driven piles.

6. Due to the proximity of an existing building on the property to the east of the subject site, monitoring of vibrations should be carried out by the piling subcontractor during pile installation. It also recommended that pre-construction condition survey of the buildings on the adjacent properties be conducted in order to document the locations of existing cracks and/or structural distortions, prior to commencement of construction.

3. DISCUSSION AND RECOMMENDATIONS (cont'd)

3.2 Foundations (cont'd)

3.2.2 Helical Pier Foundations

1. As an alternative to the driven piles, the support of the proposed building on grade beams supported by a deep foundation system consisting of helical piers may be considered.

2. The helical piers consisting of stainless steel solid shafts and two to three partial helices on their lead sections are screwed down into the soils until the torque exerted by the hydraulic turning system reaches a prescribed design value. This torque has been empirically related to the bearing pressure of the founding stratum.

3. It has been our experience that helical piers established in subsurface conditions similar to the dense strata encountered on the subject site, and installed by relatively light, portable equipment, may provide resistance (S.L.S.) of up to 220kN (50kips) in compression (i.e., with end-bearing component). In order to achieve the above load capacity, it will be necessary to advance the lead section, with the helices at least 2.0±m into the lower natural, very dense, silty sand subsoils encountered at borehole locations 1, 3 and 4 in the elevation range 241.7±m to 240.6±m.

4. It is recommended that the helical piers be installed with grouted concrete shafts, in order to provide increased stiffness and ability to resist lateral movements.

5. It is recommended that an engineer from our office be on site to witness the installation of the helical piers to safely support the design loadings and to confirm adequate founding.

3.2.3 Protection against Frost Action

1. Footings and/or grade beams for portions of the structure in exterior and unheated interior areas must be protected against frost action by at least 1.2m earth cover.

3.2.4 Earthquake Design Factors

1. For purpose of design of the proposed structure for earthquake loads and effects as per Table 4.1.8.4A, in the Ontario Building Code (2006), Site Class "D" conditions may be assumed for deep foundations established on the natural, dense to very dense , sandy silt subsoils.

2. The remaining parameters should be selected as per the Ontario Building Code.

3.2.5 Foundation Notes

1. The above recommendations for driven pile or helical pier foundations apply only to the actual borehole locations explored. Variations may be present beyond these locations. Should significant variations become evident during construction, it may be necessary to re-evaluate the recommendations of this report.

3. DISCUSSION AND RECOMMENDATIONS (cont'd)

3.3 Excavation, Temporary Shoring and Earthworks

3.3.1 General Excavation

1. In general, the excavation of the upper fill materials and natural subsoils down to approximate elevation 246.9±m should be relatively straightforward with no major groundwater problems anticipated. Minor seepage emanating from the wet seams in the upper fill materials and natural underlying soils can be controlled by local pumping.

2. Prior to excavation below elevation 246.8±m it will be necessary to install positive dewatering measures. It is anticipated that a vacuum point well system will be required to the high silt content of the natural, wet sandy silt soils.

3. The upper fill materials and natural, very loose to very dense, sandy silt/silty sand subsoils, below groundwater table, may be classed as Type 3 soils, as per the Ontario Ministry of Labour Occupational Health and Safety Act.

4. Within the confines of the project area, the sides of excavations in the upper fill materials and underlying natural sandy silt/sandy silt subsoils, above groundwater table, may be safely cut back to 1 vertical to 1 horizontal.

5. Prior to commencement of construction, a sedimentation control fence must be installed on the perimeter of the construction area, to minimize the effects of surface erosion on the surrounding area. A typical detail of a sedimentation control fence is shown on Drawing No. 10.

3.3.2 Temporary Shoring

1. Where the above-noted safe cut side of excavation cannot be accomplished within the limits of the subject property, the installation of temporary shoring will be required. It is anticipated that temporary shoring may be required along the west sides of the property (Yonge Street frontage).

2. The temporary shoring system may consist of conventional soldier piles and wood lagging, either cantilevered or supported by rakers. The use of driven sheet piles is not recommended, due to the potential for transmittal of vibrations associated with driving, to neighbouring structures. The spaces behind the timber lagging should be backfilled with the native sand or equivalent free-draining material, in order to minimize the effects of hydrostatic pressure on the shoring.

3. The design of temporary shoring system must take into account the presence of any underground utilities and services that may be present on the neighbouring property and the proximity of the existing houses which must be protected against lateral or downward movements. If the services or existing house are present within the active zone behind the shoring system appropriate parameters must be considered to avoid any harmful movements. The criteria for the adoption of active (i.e. k_a) condition and at rest condition (i.e. k_o) are given in the Canadian Foundation Engineering Manual (1992), Section 27.1.3.1 (1), as follows:

3. DISCUSSION AND RECOMMENDATIONS (cont'd)

3.3 Excavation, Temporary Shoring and Earthworks (cont'd)

3.3.2 Temporary Shoring (cont'd)

i. If moderate wall movements can be permitted, active pressure may be computed using the coefficient of active earth pressure k_a.
ii. If foundations of buildings or services exist at shallow depth at a distance less than H (height of wall) behind the top of the wall and not closer than 0.5H, the pressure should be computed using coefficient of earth pressure, $k = 0.5(k_a+k_o)$.
iii. If services exist at a shallow depth at a distance less than 0.5H behind the top of the wall, pressure should be computed using the coefficient of earth pressure at rest, k_o.
iv. Above the level of foundations or services the earth pressure coefficient k_a may be used.

4. A triangular pressure distribution envelope is assumed for the design of all supporting elements. It is assumed that the lagging does not extend below the base of excavation. The lateral pressure, p, in kPa, acting on a unit element at any depth h, in metres, below the surface of the retained soil, may be estimated from the following expression:

$$p = k\gamma H + kq$$

where: γ = the unit weight of the soil being retained = 21.0 kN/m^3
q = the equivalent uniform vertical pressure, in kPa, of any surcharge acting adjacent to the wall
K = the earth pressure coefficient
K_a = 0.3, the active pressure coefficient, applicable where small movements may be tolerated in the retained soil.
K_0 = 0.5, the 'at-rest' earth pressure coefficient, where no movement in the retained soil can be permitted, such as the presence of buried services or foundations close to the wall
Kp = 3.0, passive coefficient for natural, loose to medium dense, sandy silt and firm clayey sandy silt subsoils in a very moist to wet condition.

The above parameters assume that the retained soil is drained to at least the base of excavation.

3.3.3 Earthworks

1. Prior to filling and/or backfilling, the exposed subgrade should be thoroughly cleaned to remove all loose, wet, disturbed or organic materials.

2. Any regrading carried out up to the underside of basecourses below slab-on-grade or exterior pavement should be carried out using only approved, free draining materials, placed in shallow lifts not exceeding 150mm and compacted to at least 98% Standard Proctor maximum dry density.

3. DISCUSSION AND RECOMMENDATIONS (cont'd)

3.3 Excavation, Temporary Shoring and Earthworks (cont'd)

3.3.3 Earthworks (cont'd)

3. The fill materials on the site, with organic content should not be reused for backfill below interior slab-on-grade or exterior paved areas, however, they may be used in proposed soft landscaped areas. The natural sandy silt/silty sand subsoils excavated from the area of the proposed building may be re-used as backfill, up to the underside of basecourses below slab-on-grade and/or exterior pavement, provided that the materials are below optimum moisture content. Alternatively, imported materials conforming to OPSS Select Subgrade designation may also be used.

4. Backfilling and compaction operations should be inspected by an engineer or technologist from our office, with in-situ density tests carried out to verify that a satisfactory degree of compaction is achieved.

3.4 **Design of Underground Perimeter Walls and Retaining Walls**

1. Underground walls must be adequately damp-proofed and designed to resist an earth pressure, p, in kPa, at any depth, h, in metres, below grade, as given by the following expression:

$$p = k(\gamma h + q)$$

where: k = 0.3, the coefficient of lateral earth pressure
γ = 21kN/m^3, the unit weight of the drained granular backfill materials to be retained by perimeter walls at other locations
q = in kPa, the equivalent uniform vertical pressure of any surcharge acting near the wall.

3.5 Subsurface Drainage Provisions

1. Underground walls must be positively damp-proofed with perimeter drainage provided to avoid the build-up of hydrostatic pressure on the walls. Due to the presence of high groundwater table at the subject site, underfloor drains should be installed in a grid formation at a maximum spacing of 1.5m to prevent the build-up of hydrostatic pressure on the slab-on-grade in the basement, as shown on Drawing No. 9.

2. The above perimeter and underfloor drainage should be led to a positive frost-free sump from which the water can be pumped to an exterior dry well or the municipal sewers.

3. Exterior grades should be sloped away from the building.

3. DISCUSSION AND RECOMMENDATIONS (cont'd)

3.6 Floor Construction

1. Slab-on-grade type of floor construction may be considered for the lowest level of the proposed structure.

2. Following the successful completion of regrading operations as described in Section 3.3.3, above, The slab-on-grade may be constructed over a minimum thickness of 150mm (6"), well-compacted Granular "A" or 19mm ($^3/_4$") crushed stone.

3. The slab-on-grade should be constructed independently of any structural members (i.e. walls, columns, etc.) by means of fibre board or an equivalent isolation compound. Saw cuts should be provided along column lines, with "diamond" cuts around columns, to minimize uncontrolled cracking of floor slab.

3.7 Pavement Design and Construction

1. The upper fill materials and the natural silty sand subsoils encountered at the boreholes will provide satisfactory subgrade for the pavement structure of the proposed expansion of the parking lot and adjacent driveways. However, proofrolling and or re-compaction of the subgrade will be required prior to placement of subbase and basecourse below asphalt pavement on stable and competent subgrade.

2. Prior to filling and/or backfilling, the exposed subgrade should be thoroughly cleaned to remove all loose, disturbed and organic materials prior to filling.

3. Any regrading carried out up to the underside of basecourses below exterior pavement should be carried out using only approved, free draining materials, placed in shallow lifts not exceeding 150mm and compacted to at least 98% Standard Proctor maximum dry density.

4. The upper fill materials, and native silty sand subsoils may be considered as acceptable for use as backfill up to underside of basecourse below slab-on-grade as long as they are below the optimum moisture contents and free of organics. Alternatively, imported materials conforming to OPSS Select Subgrade designation should be used.

5. The above filling/backfilling and compaction operations should be inspected by an engineer or technologist from our office, with in-situ density tests carried out to verify that a satisfactory degree of compaction is achieved.

6. The placement of the fill materials and sub-base and basecourses should be carried out in thin lifts, max. 150±mm (6") lifts, and compacted to 98% of the Standard Proctor maximum dry density in the thicknesses noted above.

7. Following satisfactory completion of preparation of basecourses as noted above, the asphalt pavement may be replaced, in two lifts each consisting of H.L. 8 binder course, and H.L. 3 surface course. The asphalt materials should conform to the requirements of OPSS Form 1150. The asphalt pavement should be compacted to at least 97% compaction of mix design density, as verified by in-situ nuclear density testing.

3. DISCUSSION AND RECOMMENDATIONS (cont'd)

3.7 Pavement Design and Construction (cont'd)

8. The following pavement compositions are recommended for the subject site.

Heavy-Duty Pavement (Driveway Areas)	
Asphalt: Surface Course HL3	35mm
Binder Course HL8	65mm
Basecourses: Granular "A" or equivalent	150mm
Sub-Base: 50mm crushed stone or equivalent	300mm
on stable and competent subgrade	

on stable and competent subgrade

Light-Duty Pavement (Passenger Car Parking)	
Asphalt: Surface Course HL3	35mm
Binder Course HL8	40mm
Basecourses: Granular "A" or equivalent	300mm
on stable and competent subgrade	

9. The asphalt binder and surface course pavements should be placed during dry conditions, with air temperature in excess of 4°C.

10. The asphalt pavement should be compacted to at least 97% compaction of mix design density, as verified by in-situ nuclear density testing.

11. The preparation of subgrade, placement and compaction of the granular basecourses and asphalt pavement should be inspected by an engineer or technologist from our office, to verify the adequate pavement thickness is applied, and that satisfactory degree of compaction is achieved.

4. REPORT LIMITATIONS

1. The information provided and recommendations made in this report, in terms of the thickness, depth and type of subsoils encountered, groundwater levels, etc., are only applicable to the actual locations explored. Subsurface and groundwater conditions between and beyond the borehole locations may differ from those encountered at the borehole locations, and such conditions may become apparent during construction, which could not be detected or anticipated at the time of writing of this report. Should additional information become apparent upon excavation or construction, or further investigation, our office should be contacted so that the situation may be reassessed, and alternate recommendations made, if deemed necessary. It is recommended practice that the Geotechnical Engineer be retained during the construction to confirm that the subsurface conditions across the site do not deviate materially from those encountered in the boreholes.

4. REPORT LIMITATIONS (cont'd)

2. The design recommendations given in this report are applicable only to the project described in the text, and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known, it is our recommendation that Haddad Geotechnical Inc. be retained during the final design stage to verify that the design is consistent with our recommendations, and that the assumptions made in our analysis are valid.

3. The comments made in this report relating to potential construction problems and possible methods of construction are intended only for the guidance of the designer. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. The report has been prepared in accordance with normally accepted geotechnical engineering practices. No other warranty is expressed or implied.

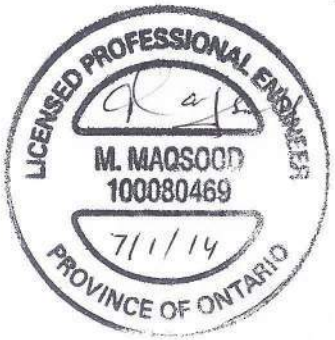
4. The information provided and recommendations presented in this report reflect the best judgment of Haddad Geotechnical Inc. in light of the information available to it at the time of preparation. Any use which a third party makes of this report or any reliance on or decisions to be based on it are the responsibility of that third party. Haddad Geotechnical Inc. accepts no responsibility for damages, if any suffered by any third party as a result of decisions made or actions based on this report.

We trust that the information presented in this report satisfies your present requirements. Should you require further information, please contact our office.

Yours very truly,
HADDAD GEOTECHNICAL INC.

Muhammad Maqsood, P.Eng.

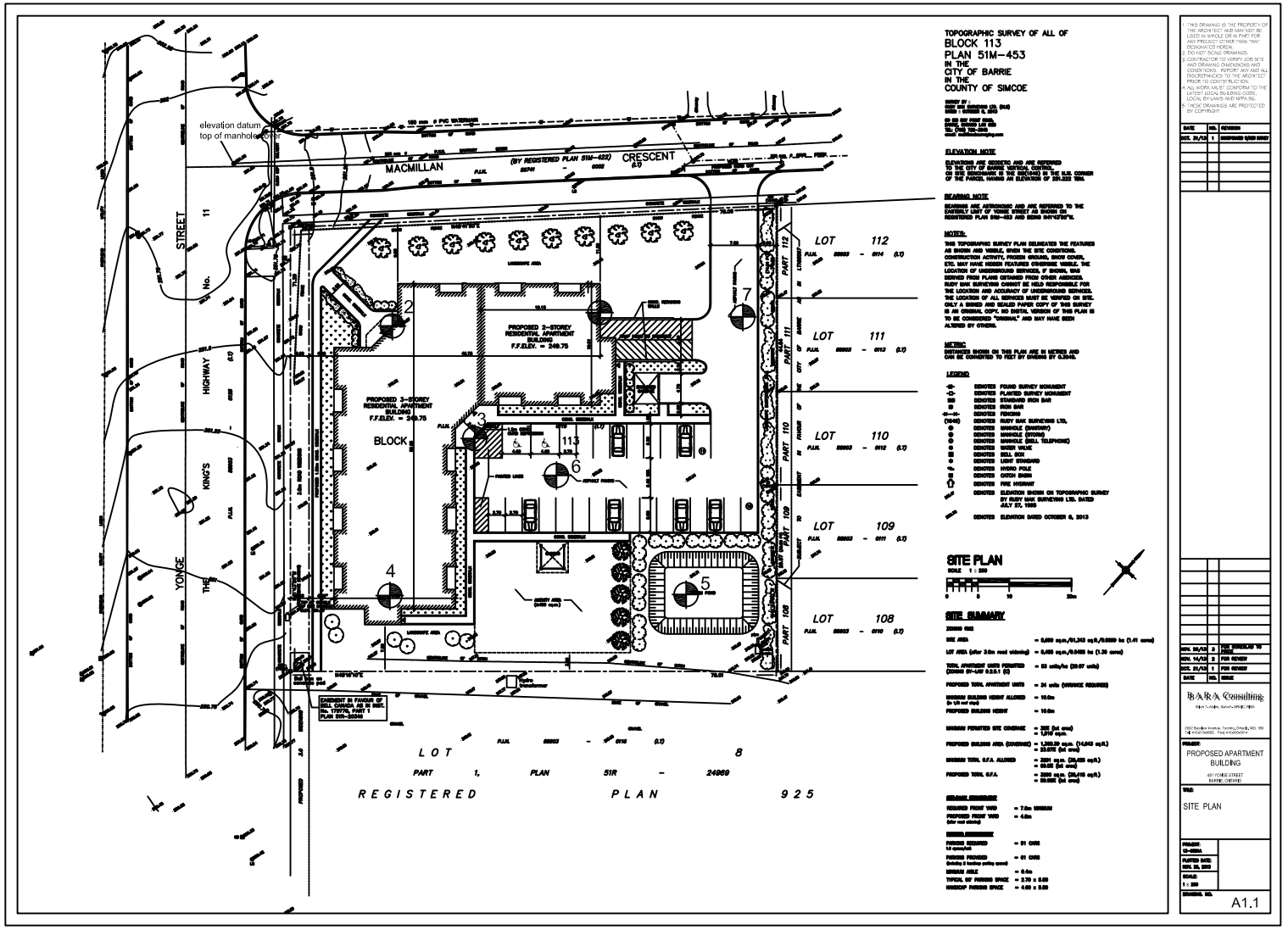
D. Graham Fisher, M.E.Sc., P. Eng.



Encs.
Dist:

Manny Enterprises	
c/o B.A.R.A Consulting	-1 (hard copy & 1 pdf)
Atkins + VanGroll Inc.	-1 (pdf)
City of Barrie, Building Dept.	-1 ***

*** to be forwarded with application for building permit
File:139048.gi



HADDAD GEOTECHNICAL INC.

7321 Victoria Park Avenue, Unit 21
Markham, Ontario, Canada, L3R 2Z8
905-475-0951, fax: 905-475-8338
info@haddadgeo.com

481 YONGE STREET, BARRIE, ONTARIO

SITE PLAN SHOWING APPROXIMATE LOCATIONS OF BOREHOLES

SCALE AS NOTED
DRAWN BY: MM

PROJECT: 13-9048
DRAWING No. 1
DATE: JANUARY 3, 2014

HADDAD GEOTECHNICAL INC.

Project No. 13-9048
Drawing No. 2

Engineering Data Sheet For Borehole No. 1

Project: Proposed Low Rise Apartment Building

Location: 481 Yonge Street, Barrie, Ontario

Hole Location: see Drawing No. 1

Hole Elevation & Datum: 248.55±m, see Note 1

Start Date: 16/12/2013 | End Date: 16/12/2013 | Field Supervision: VL

Split Spoon
Auger Sample
Shelby Tube
Core Sample
51mm dia Cone

Pocket Penetrometer
Unconfined Compression
Water Level
Vane Test, Sensitivity
51mm dia Split Spoon
Gradation Analysis Completed M

Description	Elev. ±m	Depth ±m	Strength and Penetration Resistance C kPa / N (Standard Penetration Value) Blows/300mm	Sample No.	"N"	Moisture Content %
GROUND SURFACE	248.55	0.0				
FILL -loose, sandy silt/silty sand, occ. thin roots, organic-stained, black to brown, moist to very moist				AS0		15.7
		1.0		SS1	6	21.7
	247.0					
SILTY SAND, medium dense to very dense, occ. gravels, brown to grey, moist to wet	246.4	2.0		SS2	15	11.2
				SS3	21	11.1
		3.0		SS4	22	12.2
		4.0				
		5.0		SS5	50	11.0
		6.0		SS6	43	10.2
		7.0				
				SS7	52	9.4
END OF BOREHOLE	240.6	8.0				
		9.0				
		10.0				
		11.0				
		12.0				
		13.0				
		14.0				
		15.0				

NOTES:
1. Elevation datum, referenced to the top of manhole cover located approximately in the center of intersection of Macmillan Crescent and Yonge Street, elevation: 251.95m, as indicated on Site Plan provided by the client.
2. Borehole caved at 2.1±m depth; base of hole wet upon completion.

HADDAD GEOTECHNICAL INC.

Project No. 13-9048
Drawing No. 3

Engineering Data Sheet For Borehole No. 2

Project: Proposed Low Rise Apartment Building

Location: 481 Yonge Street, Barrie, Ontario

Hole Location: see Drawing No. 1

Hole Elevation & Datum: 249.71±m, see Note 1

Start Date: 16/12/2013 | End Date: 16/12/2013 | Field Supervision: VL

Split Spoon
Auger Sample
Shelby Tube
Core Sample
51mm dia Cone
Pocket Penetrometer
Unconfined Compression
Water Level
Vane Test, Sensitivity
51mm dia Split Spoon
Gradation Analysis Completed M

Description	Elev. ±m	Depth ±m	Strength and Penetration Resistance C kPa / N (Standard Penetration Value) Blows/300mm	Sample No.	"N"	Moisture Content %
GROUND SURFACE	249.71	0.0				
FILL- very loose, sandy silt/silty sand, occ. thin roots, organic-stained, black to brown, very moist				AS0		NA
		1.0		SS1	7	16.9
SILTY SAND/SANDY SILT, medium dense to dense, layered, occ. gravels, brown to grey, moist to wet	248.1	2.0		SS2	11	18.7
		3.0		SS3	17	8.6
▼	245.8	4.0		SS4	29	10.9
		5.0		SS5	31	8.2
		6.0		SS6	30	8.3
		7.0		SS7	26	7.2
END OF BOREHOLE	240.6	8.0				
		9.0				
		10.0				
		11.0				
		12.0				
		13.0				
		14.0				
		15.0				

NOTES:
1. Elevation datum, referenced to the top of manhole cover located approximately in the center of intersection of Macmillan Crescent and Yonge Street, elevation: 251.95m, as indicated on Site Plan provided by the client.
2. Borehole caved at 5.1±m and water rose to 3.9±m depth upon completion.

HADDAD GEOTECHNICAL INC.

Project No. 13-9048
Drawing No. 4

Engineering Data Sheet For Borehole No. 3

Project: Proposed Low Rise Apartment Building

Location: 481 Yonge Street, Barrie, Ontario

Hole Location: see Drawing No. 1

Hole Elevation & Datum: 249.24±m, see Note 1

Start Date: 16/12/2013 | End Date: 16/12/2013 | Field Supervision: VL

Split Spoon
Auger Sample
Shelby Tube
Core Sample
51mm dia Cone

Pocket Penetrometer
Unconfined Compression
Water Level
Vane Test, Sensitivity
51mm dia Split Spoon
Gradation Analysis Completed M

Description	Elev. ±m	Depth ±m	Strength and Penetration Resistance: C kPa; N (Standard Penetration Value) 20 40 60 80 Blows/300mm	Sample No.	"N"	Moisture Content %
GROUND SURFACE	249.24	0.0				
GRAVELS- 50±mm FILL- very loose, sandy silt, occ. gravels, organic-stained, black to brown, very moist				SS0	4	8.2
		1.0		SS1	2	15.8
		2.0		SS2	1	18.6
▼	246.8			SS3	3	15.9
		3.0		SS4	4	22.4
		4.0				
SILTY SAND, dense to very dense, layered, occ. gravels, brown to grey, wet	244.7			SS5	43	11.9
		5.0				
		6.0		SS6	50	10.1
		7.0				
END OF BOREHOLE	241.3	8.0		SS7	88/10"	6.4
		9.0				
		10.0				
		11.0				
		12.0				
		13.0				
		14.0				
		15.0				

NOTES:
1. Elevation datum, referenced to the top of manhole cover located approximately in the center of intersection of Macmillan Crescent and Yonge Street, elevation: 251.95m, as indicated on Site Plan provided by the client.
2. Borehole caved at 2.4±m and water rose to 3.9±m depth upon completion.

HADDAD GEOTECHNICAL INC.

Project No. 13-9048
Drawing No. 5

Engineering Data Sheet For Borehole No. 4

Project: Proposed Low Rise Apartment Building

Location: 481 Yonge Street, Barrie, Ontario

Hole Location: see Drawing No. 1

Hole Elevation & Datum: 249.47±m, see Note 1

Start Date: 16/12/2013 | End Date: 16/12/2013 | Field Supervision: VL

Split Spoon
Auger Sample
Shelby Tube
Core Sample
51mm dia Cone

Pocket Penetrometer
Unconfined Compression
Water Level
Vane Test, Sensitivity
51mm dia Split Spoon
Gradation Analysis Completed M

Description	Elev. ±m	Depth ±m	Sample No.	"N"	Moisture Content %
GROUND SURFACE	249.47	0.0			
FILL- loose, sandy silt/silty sand, peat, organic-stained, black to brown, very moist			SS0	5	21.1
		1.0	SS1	9	17.7
		2.0	SS2	6	15.6
			SS3	7	22.2
SILTY SAND, medium dense, oxidized, brown, very moist to wet	246.5	3.0	SS4	20	15.5
CLAYEY SANDY SILT, firm, grey, very moist	245.5	4.0			
		5.0	SS5	7	24.2
		6.0	SS6	26	12.2
SILTY SAND, medium dense to very dense, grey, wet	243.2	7.0			
			SS7	50/6"	10.9
END OF BOREHOLE	241.7	8.0			
		9.0			
		10.0			
		11.0			
		12.0			
		13.0			
		14.0			
		15.0			

Strength and Penetration Resistance
C kPa
N (Standard Penetration Value) Blows/300mm
20 40 60 80

NOTES:
1. Elevation datum, referenced to the top of manhole cover located approximately in the center of intersection of Macmillan Crescent and Yonge Street, elevation: 251.95m, as indicated on Site Plan provided by the client.
2. Borehole caved at 5.7±m and water rose to 3.9±m depth upon completion.

HADDAD GEOTECHNICAL INC.

Project No. 13-9048
Drawing No. 6

Engineering Data Sheet For Borehole No. 5

Project: Proposed Low Rise Apartment Building

Location: 481 Yonge Street, Barrie, Ontario

Hole Location: see Drawing No. 1

Hole Elevation & Datum: 247.00±m, see Note 1

Start Date: 16/12/2013 | End Date: 16/12/2013 | Field Supervision: VL

Split Spoon
Auger Sample
Shelby Tube
Core Sample
51mm dia Cone

Pocket Penetrometer
Unconfined Compression
Water Level
Vane Test, Sensitivity
51mm dia Split Spoon
Gradation Analysis Completed M

Description	Elev. ±m	Depth ±m	Strength and Penetration Resistance C kPa / N (Standard Penetration Value) Blows/300mm	Sample No.	"N"	Moisture Content %
GROUND SURFACE	247.00	0.0				
TOPSOIL-75±mm FILL- loose, sandy silt, brown, very moist				SS0	8	20.3
		1.0		SS1	9	20.1
▼	245.5					
SILTY SAND/SANDY SILT, loose to very dense, occ. gravels, oxidized, brown, very moist to wet		2.0		SS2	5	17.5
				SS3	15	11.9
		3.0		SS4	26	8.5
		4.0				
				SS5	64	6.5
END OF BOREHOLE	242.1	5.0				
		6.0				
		7.0				
		8.0				
		9.0				
		10.0				
		11.0				
		12.0				
		13.0				
		14.0				
		15.0				

NOTES:
1. Elevation datum, referenced to the top of manhole cover located approximately in the center of intersection of Macmillan Crescent and Yonge Street, elevation: 251.95m, as indicated on Site Plan provided by the client.
2. Borehole caved at 3.3±m and water rose to 3.0±m depth upon completion.
3. Water rose to 1.5±m below existing grade after two days

HADDAD GEOTECHNICAL INC.

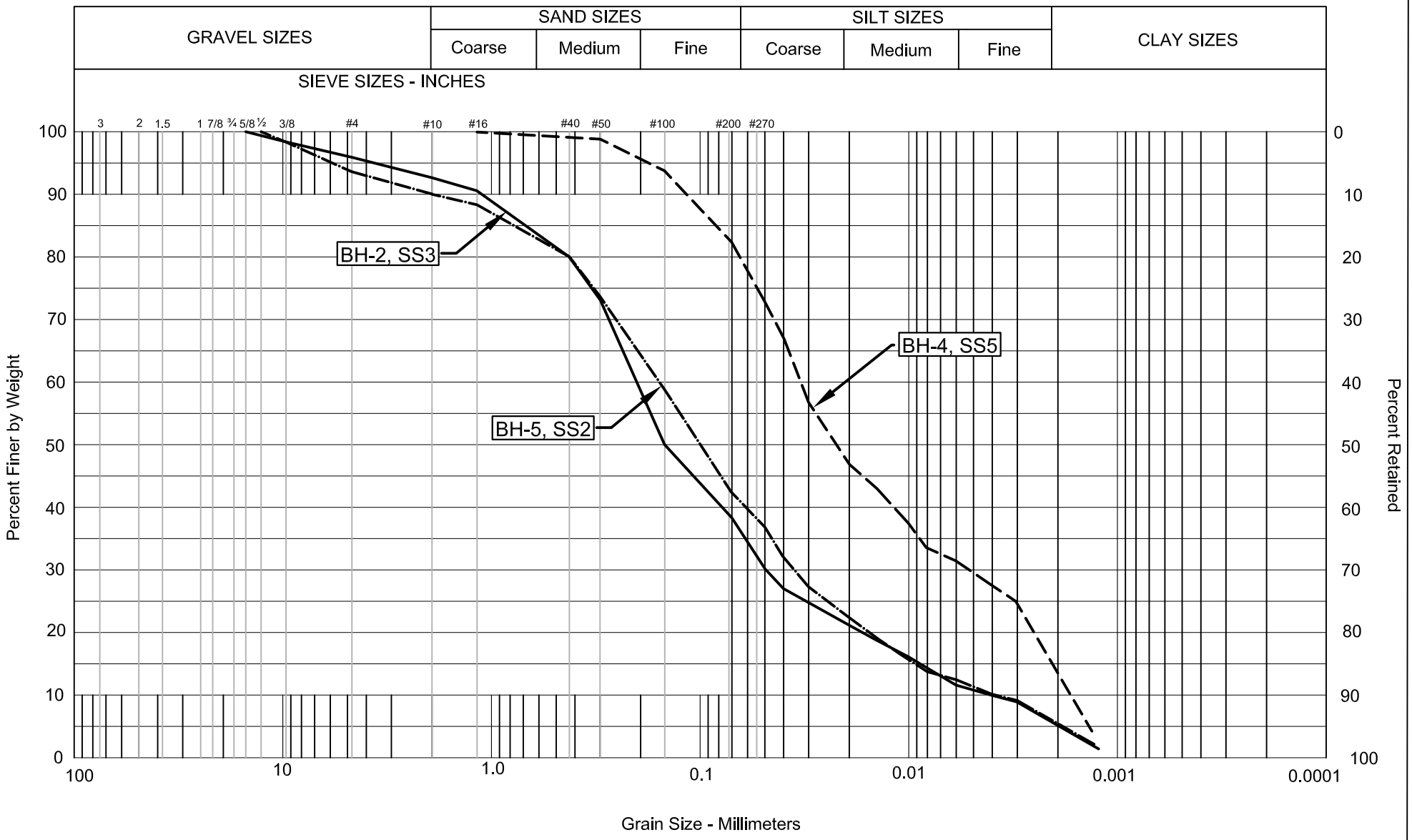
Project No. 13-9048
Drawing No. 7

Engineering Data Sheet For Borehole Nos. 6 and 7

Project: Proposed Low Rise Apartment Building
Location: 481 Yonge Street, Barrie, Ontario
Hole Location: see Drawing No. 1
Hole Elevation & Datum: 248.65±m, see Note 1
Start Date: 16/12/2013 | End Date: 16/12/2013 | Field Supervision: VL

Split Spoon | Pocket Penetrometer
Auger Sample | Unconfined Compression
Shelby Tube | Water Level
Core Sample | Vane Test, Sensitivity
51mm dia Cone | 51mm dia Split Spoon
Gradation Analysis Completed M

Description	Elev. ±m	Depth ±m	Strength and Penetration Resistance C kPa; N (Standard Penetration Value) Blows/300mm (20, 40, 60, 80)	Sample No.	"N"	Moisture Content %	Headspace Reading ppm
GROUND SURFACE OF BOREHOLE NO. 6	248.65	0.0					
TOPSOIL-75±mm FILL - loose to compact, sandy silt, organic-stained, dark brown, moist to very moist				SS0	9	17.2	
		1.0		SS1	10	23.0	
		2.0		SS2	10	13.4	
	246.4						
SANDY SILT/SILTY SAND, medium dense, occ. roots, brown, very moist	246.5						
END OF BOREHOLE							
NOTES: 1. Elevation datum, referenced to the top of manhole located approximately in the center of intersection of Macmillan Crescent and Yonge Street, elevation: 251.95m, as indicated on Site Plan provided by the client. 2. Borehole open and dry to 1.5±m depth upon completion.		3.0 4.0 5.0					
GROUND SURFACE OF BOREHOLE NO. 7	247.08	0.0					
TOPSOIL - 150±mm FILL - loose, sandy silt, organic-stained, brown, moist				SS0	7	16.9	
		1.0		SS1	6	16.7	
	245.6						
SANDY SILT, loose, brown, wet				SS2	8	17.0	
END OF BOREHOLE	245.1	2.0					
NOTES: 1. Elevation datum, referenced to the top of manhole located approximately in the center of intersection of Macmillan Crescent and Yonge Street, elevation: 251.95m, as indicated on Site Plan provided by the client. 2. Borehole open at 1.5±m depth; base of hole wet upon completion.		3.0 4.0 5.0 6.0 7.0 8.0 9.0					



BH-2,SS3 (2.25±m to 2.70±m)

BH-4, SS5 (4.50±m to 4.95±m)

BH-5, SS2 (1.50±m to 1.95±m)

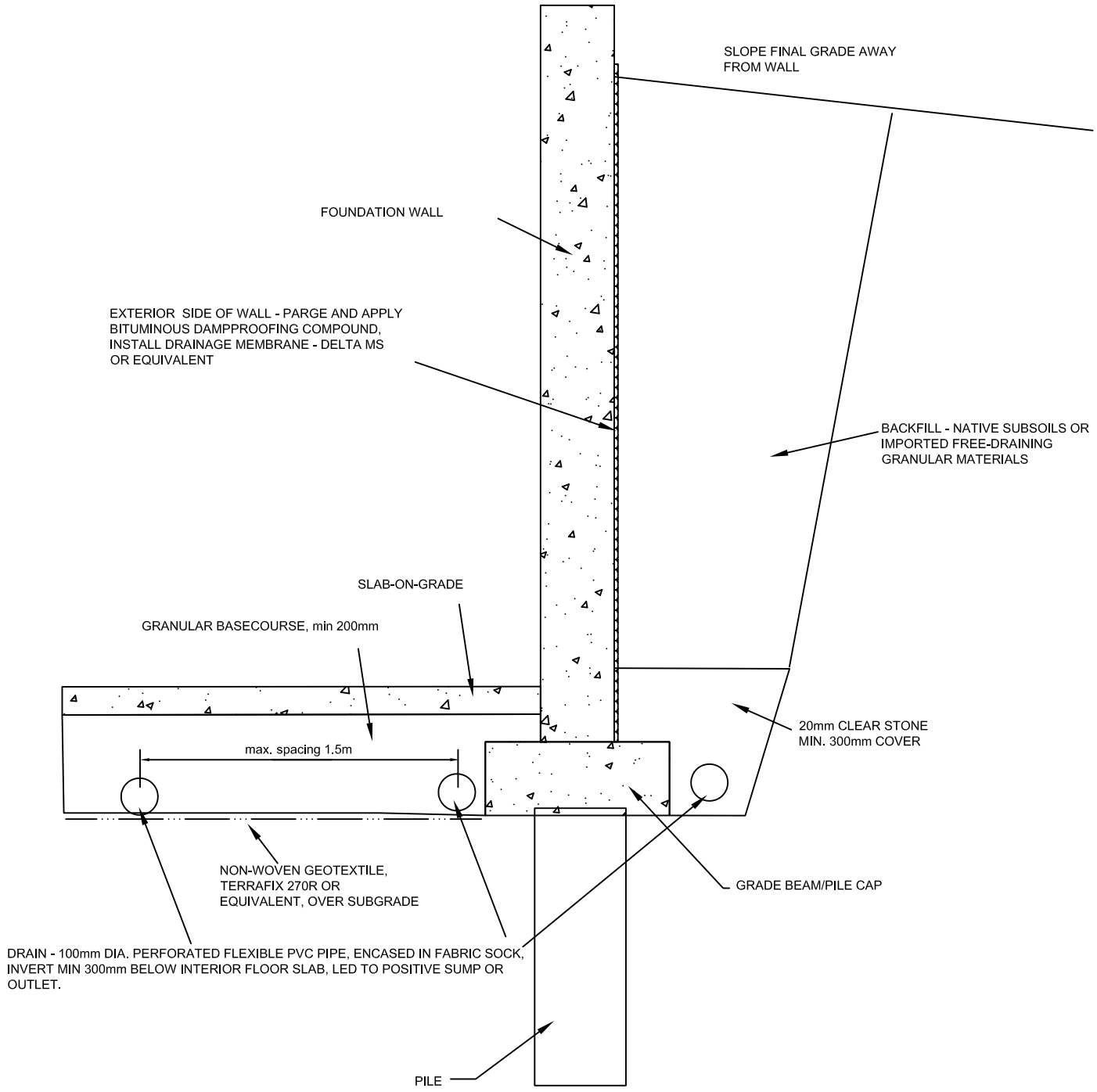
HADDAD GEOTECHNICAL INC.
7321 Victoria Park Avenue, Unit 21
Markham, Ontario, Canada, L3R 2Z8
905-475-0951, fax: 905-475-8338
haddad.geotechnical@gmail.com

481 YONGE STREET, BARRIE, ONTARIO

GRADATION ANALYSES A.S.T.M. D422
NATIVE SUBSOILS

SCALE: AS INDICATED
DRAWN BY: MM

PROJECT: 13-9048
DRAWING No. 8
DATE: JANUARY 3, 2014



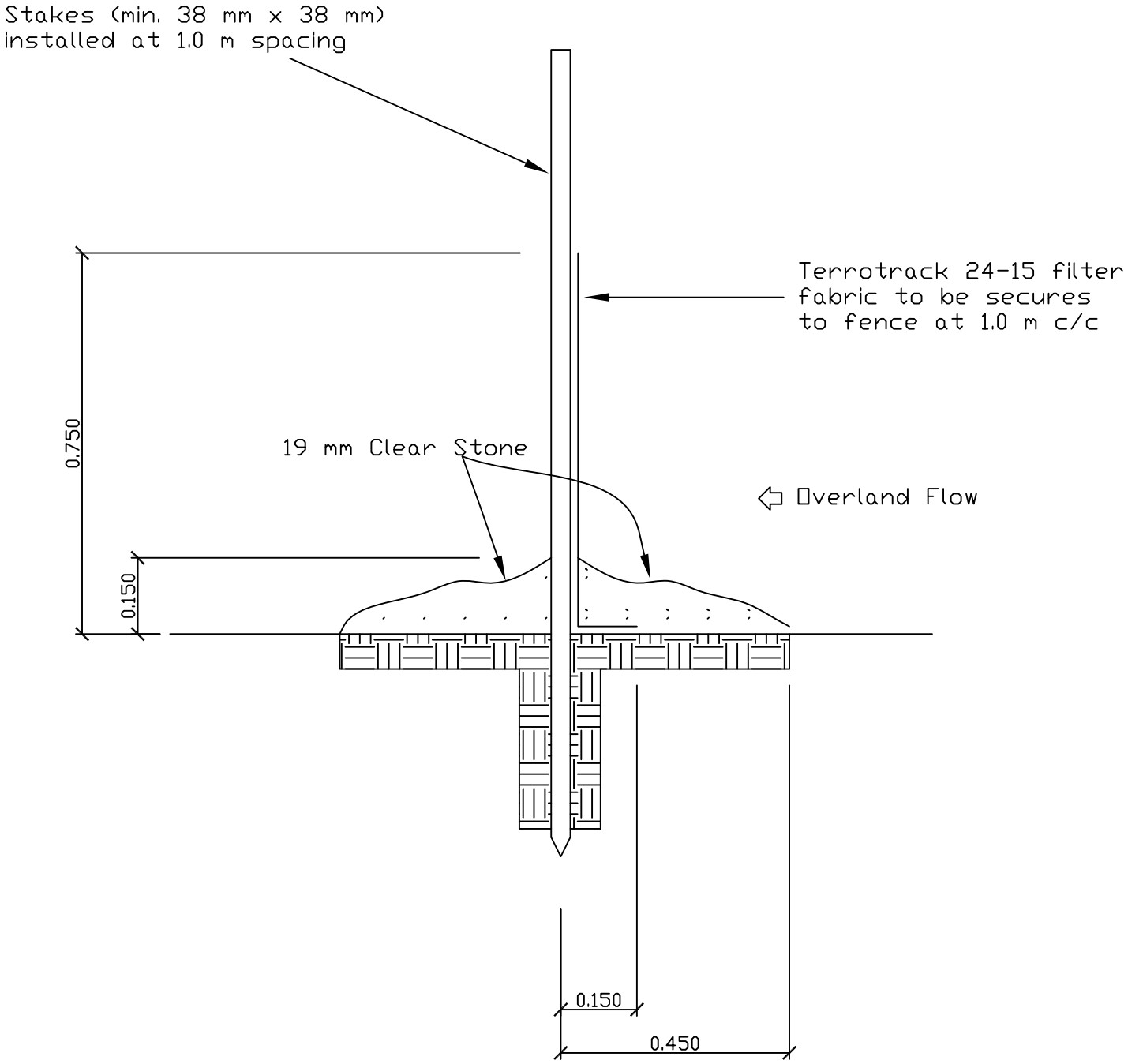
HADDAD GEOTECHNICAL INC.
7321 Victoria Park Avenue, Unit 21
Markham, Ontario, Canada L3R 2Z8
905-475-0951, 1-888-214-214-4285
fax 905-475-8338 info@haddadgeo.com

481 YONGE STREET, BARRIE, ONTARIO

TYPICAL SECTION SHOWING PERIMETER & SUB-FLOOR DRAINAGE PROVISIONS

SCALE AS NOTED
DRAWN BY: MM

PROJECT: 13-9048
DRAWING No. 9
DATE: JANUARY 6, 2014



HADDAD GEOTECHNICAL INC.
7321 Victoria Park Avenue, Unit 21
Markham, Ontario, Canada, L3R 2Z8
905-475-0951, fax: 905-475-8338
haddad.geotechnical@gmail.com

481 YONGE STREET, BARRIE, ONTARIO

SCHEMATIC SECTION SHOWING
SEDIMENTATION CONTROL FENCE

SCALE: AS NOTED
DRAWN BY: GF

PROJECT: 13-9048
DRAWING No. 10
DATE: JANUARY 6, 2014

Appendix "A"

Data and Analysis - In-situ Falling Head Permeability Test

Borehole No.5:	**13-9048**
Diameter of Hole (Inches):	6
Depth of Hole From Existing Grade (ft):	11
Circumference of Borehole (ft):	1.570796327
Circular Area of Hole (ft^2):	0.196349541

Time	Time in Minutes	Time Interval Seconds	Measured depth in Hole (ft)	Perculated Depth (ft)	Segmental volume of water (cu.ft) perculated	Segmental volume flow rate (cu.ft / sec)	Perculation surface area (sq.ft)	Permability Coefficient (cm/sec)	Average Permeability Coefficient (cm/sec)
15:30			5						
15:42	12	720	4.08	-0.92	-0.180641578	-0.000250891	9.621127502	-0.00079483	
									-0.00079483

Design Chart 1.08: Hydrologic Soil Groups (Continued)

- Based on Soil Texture

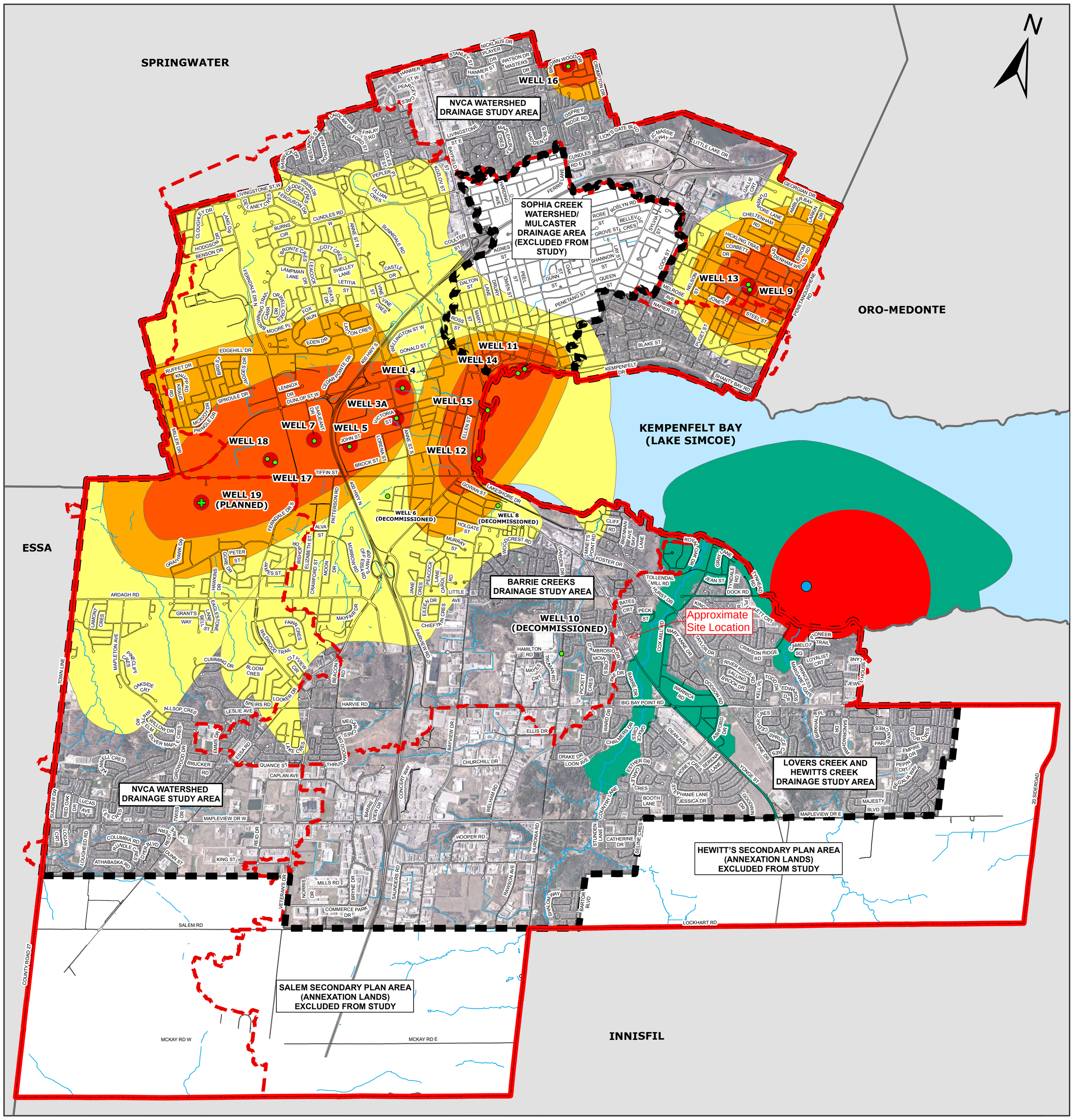
Sands, Sandy Loams and Gravels	
- overlying sand, gravel or limestone bedrock, very well drained	A
- ditto, imperfectly drained	AB
- shallow, overlying Precambrian bedrock or clay subsoil	B
Medium to Coarse Loams	
- overlying sand, gravel or limestone, well drained	AB
- shallow, overlying Precambrian bedrock or clay subsoil	B
Medium Textured Loams	
- shallow, overlying limestone bedrock	B
- overlying medium textured subsoil	BC
Silt Loams, Some Loams	
- with good internal drainage	BC
- with slow internal drainage and good external drainage	C
Clays, Clay Loams, Silty Clay Loams	
- with good internal drainage	C
- with imperfect or poor external drainage	C
- with slow internal drainage and good external drainage	D

Source: U.S. Department of Agriculture (1972)

APPENDIX C

STORMWATER MANAGEMENT CALCULATIONS AND REFERENCE DOCUMENTS

PINESTONE ENGINEERING LTD.



Source: Approved Assessment Report: Lake Simcoe and Couchiching-Black River Source Protection Area Part 1. South Georgian Bay – Lake Simcoe Source Protection Committee (2011)

Disclaimer

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Legend

- ROADS
- WATERCOURSES
- DRAINAGE STUDY AREA BOUNDARY
- OVERALL STUDY AREA
- ANNEXATION LANDS (EXCLUDED FROM STUDY)
- SOPHIA CREEK AND MULCASTER DRAINAGE AREAS (EXCLUDED FROM STUDY)
- MUNICIPAL BOARDER
- INTAKE PROTECTION ZONE 1 (VULNERABILITY SCORE 8)
- INTAKE PROTECTION ZONE 2 (VULNERABILITY SCORE 6.4)

WHPA

- WHPA-A (100m RADIUS)
- WHPA-B (2yr TIME OF TRAVEL)
- WHPA-C (10yr TIME OF TRAVEL)
- WHPA-D (25yr TIME OF TRAVEL)
- SURFACE WATER INTAKE (TYPE D)

TATHAM ENGINEERING

Barrie

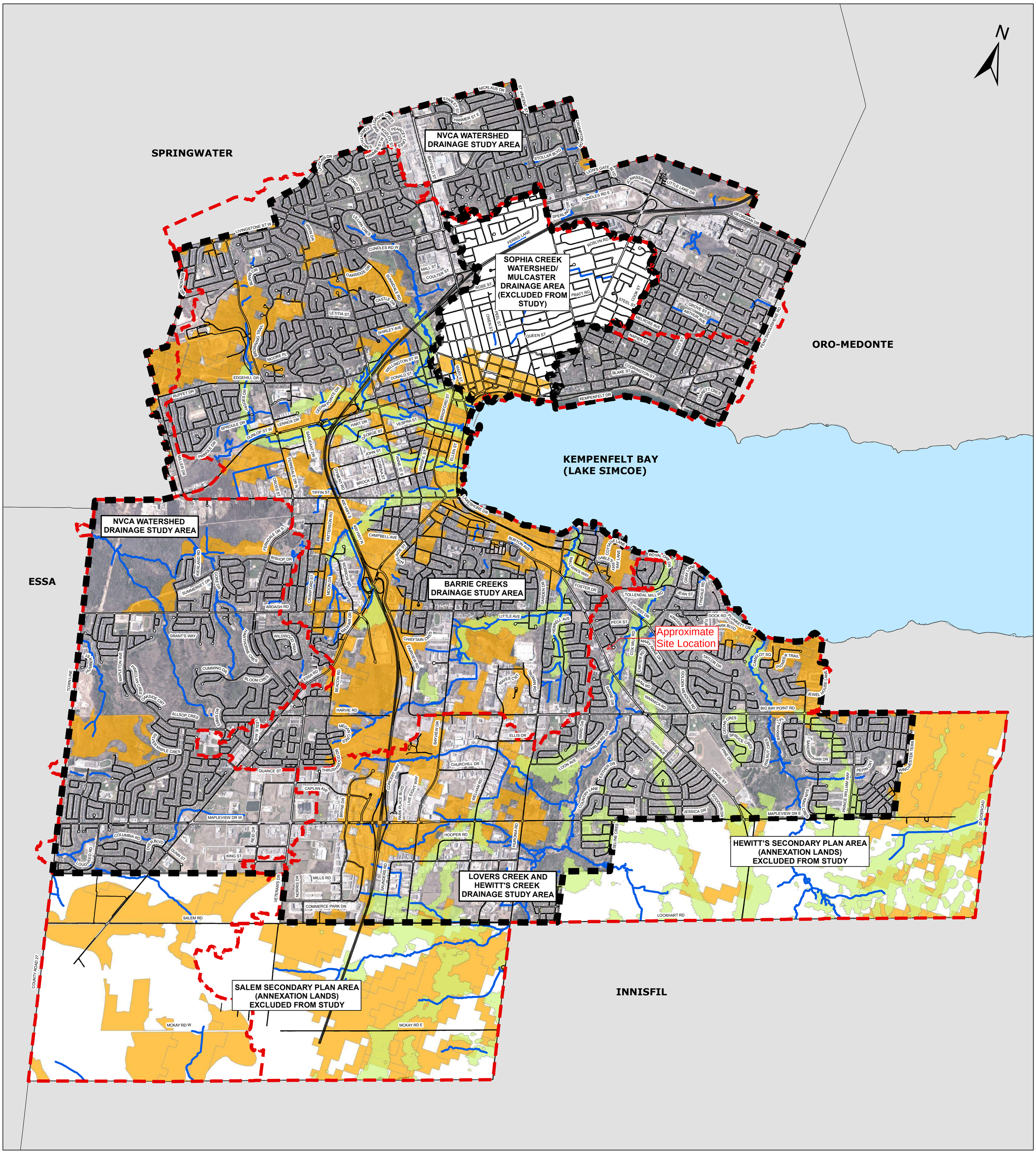
SCALE = 1:24,000

0 325 650 1,300 1,950 2,600 Meters

DRAINAGE MASTER PLAN

FIGURE 10 - KNOWN WELLHEAD PROTECTION AREA/INTAKE PROTECTION AREA PLAN

DATE: MARCH 2019



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LEGEND

- ROADS
- WATERCOURSES
- DRAINAGE STUDY AREA BOUNDARY
- OVERALL STUDY AREA
- SGRA *(SIGNIFICANT GROUNDWATER RECHARGE AREAS)*
- ESGRA *(ECOLOGICALLY SIGNIFICANT GROUNDWATER RECHARGE AREAS)*
- ANNEXATION LANDS (EXCLUDED FROM STUDY)
- SOPHIA CREEK AND MULCASTER DRAINAGE AREAS (EXCLUDED FROM STUDY)
- MUNICIPAL BORDER

TATHAM ENGINEERING

Barrie

SCALE = 1:24,000

0 310 620 1,240 1,860 2,480 Meters

DRAINAGE MASTER PLAN

FIGURE 11 - GROUNDWATER RECHARGE AREA PLAN

DATE: MARCH 2019

Table 1.2 Infiltration LID requirements for **paved area** runoff for major and non-major development

Note: This table outlines requirements for paved area runoff only. Runoff from vegetated areas and rooftop are always permitted to be infiltrated, while runoff from pollution hot spot is never permitted.

Land Use	Vulnerable Area	Requirement
Low Density Residential	***Wellhead Protection Area A and B***	Infiltration based practices are not permitted
	Issues Contributing Area	Infiltration based practices are permitted
	Wellhead Protection Area C and D	
	Intake Protection Zone-1 and Zone-2	
	Lake Simcoe Protection Plan Significant Groundwater Recharge Areas	
	Highly Vulnerable Aquifers	
	Not Vulnerable	
Commercial & Institutional	***Wellhead Protection Area A and B***	Infiltration based practices are not permitted
	Issues Contributing Area	
	Wellhead Protection Area C and D	Infiltration based practices are permitted with conditions
	Intake Protection Zone-1 and Zone-2	Infiltration based practices are permitted
	Lake Simcoe Protection Plan Significant Groundwater Recharge Areas	Infiltration based practices are not permitted
	Highly Vulnerable Aquifers	
	Not Vulnerable	Infiltration based practices are permitted
Industrial	***Wellhead Protection Area A and B***	Infiltration based practices are not permitted
	Issues Contributing Area	
	Wellhead Protection Area C and D	
	Intake Protection Zone-1 and Zone-2	
	Lake Simcoe Protection Plan Significant Groundwater Recharge Areas	
	Highly Vulnerable Aquifers	
	Not Vulnerable	
Mixed Use and High Density Residential	***Wellhead Protection Area A and B***	Infiltration based practices are not permitted
	Issues Contributing Area	Infiltration based practices are permitted with conditions
	Wellhead Protection Area C and D	
	Intake Protection Zone-1 and Zone-2	Infiltration based practices are permitted
	Lake Simcoe Protection Plan Significant Groundwater Recharge Areas	Infiltration based practices are permitted with conditions
	Highly Vulnerable Aquifers	
	Not Vulnerable	Infiltration based practices are permitted
Open Spaces and Environmental Protection Areas	***Wellhead Protection Area A and B***	Infiltration based practices are permitted with conditions
	Issues Contributing Area	
	Wellhead Protection Area C and D	
	Intake Protection Zone-1 and Zone-2	
	Lake Simcoe Protection Plan Significant Groundwater Recharge Areas	
	Highly Vulnerable Aquifers	
	Not Vulnerable	Infiltration based practices are permitted

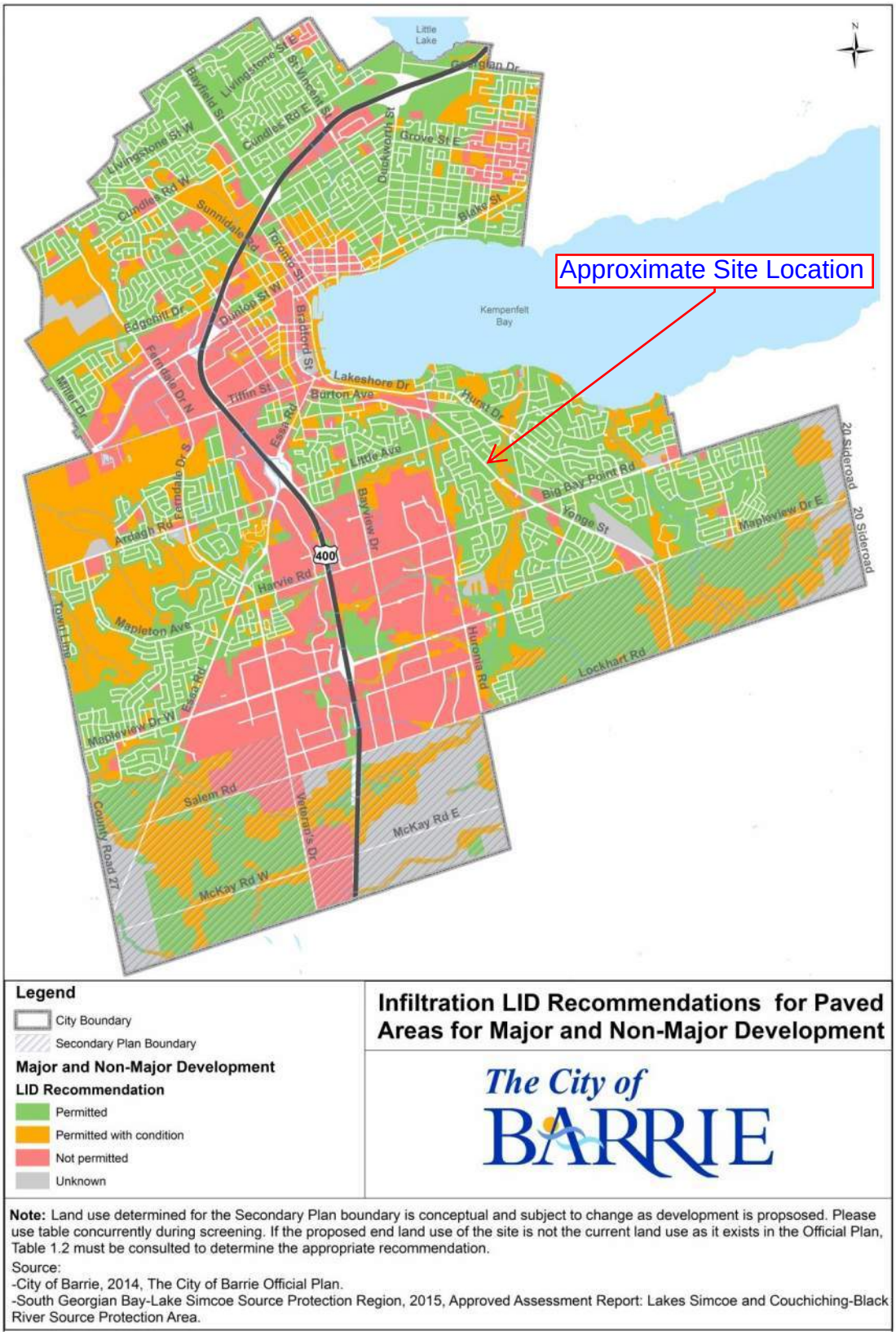
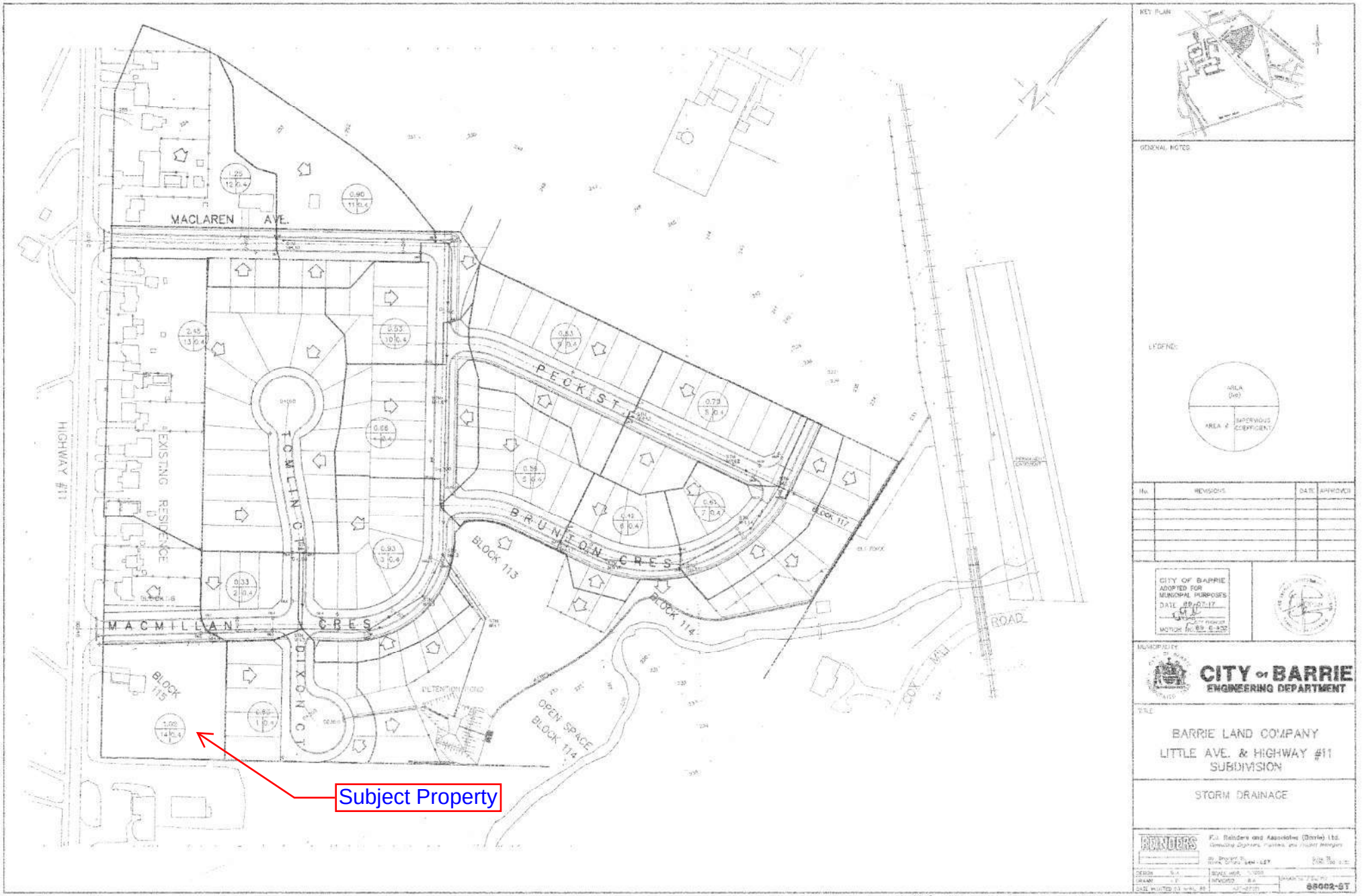


Figure 3. Screening map showing infiltration LID recommendations for paved area runoff for major and non-major development



1995-067-007 95-57 STM2 SUB 171

The runoff coefficient shall be calculated in accordance with the following table:

Table 3.2: Runoff Coefficients (Rational C) (5-yr to 10-yr) Based on Hydrologic Soil Group

Land Use	Runoff Coefficient "C"		
	A-AB	B-BC	C-D
Cultivated Land, 0 - 5% grade	0.22	0.35	0.55
Cultivated Land, 5 - 10% grade	0.30	0.45	0.60
Cultivated Land, 10 - 30% grade	0.40	0.65	0.70
Pasture Land, 0 - 5% grade	0.10	0.28	0.40
Pasture Land, 5 - 10% grade	0.15	0.35	0.45
Pasture Land, 10 - 30% grade	0.22	0.40	0.55
Woodlot or Cutover, 0 – 5% grade	0.08	0.25	0.35
Woodlot or Cutover, 5 - 10% grade	0.12	0.30	0.42
Woodlot or Cutover, 10 - 30% grade	0.18	0.35	0.52
Lakes and Wetlands	0.05	0.05	0.05
Impervious Area (i.e., buildings, roads, parking lots, etc.)	0.95	0.95	0.95
Gravel (not to be used for proposed parking or storage areas)	0.40	0.50	0.60
Residential – Single Family	0.30	0.40	0.50
Residential – Multiple (i.e., semi, townhouse, apartment)	0.50	0.60	0.70
Industrial – light	0.55	0.65	0.75
Industrial – heavy	0.65	0.75	0.85
Commercial	0.60	0.70	0.80
Unimproved Areas	0.10	0.20	0.30
Lawn, < 2% grade	0.05	0.11	0.17
Lawn, 2 - 7% grade	0.10	0.16	0.22
Lawn, > 7% grade	0.15	0.25	0.35

Adapted from Design Chart 1.07, Ontario Ministry of Transportation, "MTO Drainage Management Manual," MTO. (1997)

An approximation of the runoff coefficient can be calculated based on the following relationship with: $c=(0.7)(TIMP)+0.2$

where,

c = the runoff coefficient

TIMP = total impervious fraction (dimensionless)

The runoff coefficient shall be adjusted for return period events greater than the 10-yr storm per the following table:

Table 3.3: Runoff Coefficient Adjustment for 25-yr to 100-yr Storms

Return Period	Runoff Coefficient "C"
25 years	$C_{25} = 1.1*C_5$
50 years	$C_{50} = 1.2*C_5$
100 years	$C_{100} = 1.25*C_5$

Adapted from Design Chart 1.07, Ontario Ministry of Transportation,"MTO Drainage Management Manual," MTO. (1997).

7.2.5 Calculation of Model Parameters

Model parameters shall be site specific, area weighted if required, and provided with the design documents. Soils information shall be obtained from on-site soil testing (*e.g.* borehole data) or soil survey mapping (*e.g. Soil Survey of Simcoe County*).

Table 7.4: Curve Numbers for Selected Land Uses

Land Use Description	Hydrologic Soil Group (AMC II)						
	A	AB	B	BC	C	CD	D
Cultivated Land (Fallow)	77	82	86	89	91	93	94
[2]**Cultivated Land** (Row Crops)							
---- without agricultural BMPs	72	77	81	85	88	90	91
---- [3]with agricultural BMPs	62	67	71	75	78	80	81
[4]**Cultivated Land (Small Grain)**							
---- without agricultural BMPs	65	71	76	80	84	86	88
---- with agricultural BMPs	59	65	70	74	78	80	81
[5]**Cultivated Land** (Close-seeded Legumes or Rotation Meadow)							
---- without agricultural BMPs	66	72	77	81	85	87	89
---- with agricultural BMPs	51	59	67	72	76	78	80
Pasture or Range Land							
---- [6]poor condition	68	74	79	83	86	88	89
---- [7]good condition	39	50	61	68	74	77	80
Meadow							
---- good condition	30	44	58	65	71	75	78
Wooded or Forest Land							
---- [8]poor cover	45	56	66	72	77	80	83
---- [9]good cover	25	40	55	63	70	74	77
Open Spaces, Lawns, Parks, Golf Courses, Cemeteries							
---- good condition (≥75% grass coverage)	39	50	61	68	74	77	80

---- fair condition (50% - 75% grass coverage)	49	59	69	74	79	82	84
Commercial and Business Areas (~85% impervious)	89	91	92	93	94	95	95
Industrial Areas (~72% impervious)	81	85	88	90	91	92	93
[10]**Residential Areas**							
---- ≤ 1/8 acre lot size (~65% impervious)	77	81	85	88	90	91	92
---- 1/4 acre lot size (~38% impervious)	61	68	75	79	83	85	87
---- 1/3 acre lot size (~30% impervious)	57	65	72	77	81	84	86
---- ½ acre lot size (~25% impervious)	54	62	70	75	80	83	85
---- 1 acre lot size (~20% impervious)	51	60	68	74	79	82	84
Paved Parking Lots, Roofs, Driveways	98	98	98	98	98	98	98
Streets and Roads							
---- paved with curb and storm sewer connection	98	98	98	98	98	98	98
---- gravel	76	81	85	87	89	90	91
---- dirt	72	77	82	85	87	88	89
[11]**Open Water Bodies** (Lakes, Wetlands, Ponds)	100	100	100	100	100	100	100

1 -- Adapted from U.S. Soil Conservation Service National Engineering Handbook (1972), MTC Drainage Manual Chapter B (1984), MTO Drainage Management Manual (1997).
2 -- Includes row crops such as soybeans, corn, sorghum hay, peanut, potato, etc.
3 -- Includes agricultural best management practices (BMPs) such as contouring and terracing.
4 -- Includes small grain crops such as winter wheat, spring wheat, durham wheat, barley, oats, rye, etc.
5 -- Includes close-seeded legumes such as alfalfa, timothy grass, grass hay, etc.
6 -- Poor condition is defined as heavily grazed, no mulch, or has plant cover on less than 50% of the area.
7 -- Good condition is defined as lightly grazed, more than 75% of the area has plant cover.
8 -- Poor cover is defined as heavily grazed or regularly burned so that litter, small trees and brush are regularly destroyed.
9 -- Good cover is defined as protected from grazing so that litter and shrubs cover the soil.
10 -- Curve numbers are calculated assuming that roof leaders are connected to the driveway and/or road with a minimum of additional infiltration.
11 – When a number of water bodies within a large multi-land use catchment is modeled, a CN value of 50 may be applied to the water bodies in calculating the area-weighted CN value. When isolating a water body and modeling as a separate catchment, then a CN value of 100 should be used and the catchment is typically routed through a reservoir.

481 YONGE STREET APARTMENT DEVELOPMENT

PRE DEVELOPMENT SWM INPUT PARAMETERS - CITY OF BARRIE

Barrie, Ontario

Project Number: 19-11433B
Date: April 4, 2022
Design By: DH
File: Z:\Project Documents\11433 481 Yonge Street\11433.1B Detailed Design\SWM\HYMO SWM Calculations - DH.xls

Time of Concentration Calculations:

Catchment Parameters			
Catchment ID	=	101	
Catchment Area	=	0.5700	ha
Flow Length	=	70	m
Slope	=	0.05	m/m
Weighted Runoff Coefficient*	=	0.40	
Time of Concentration Results			
Bransby Williams Formula (use for C>0.4)	=	3.1	min.
Airport Formula (use for C<=0.4)	=	11.2	min.
Time to Peak			
2/3 of Time of Concentration	=	0.12	hr

* Runoff Coefficient Taken From Little Avenue & Highway #11 Subdivision Storm Drainage Plan; City of Barrie Engineering Record File No. 1995-057-007

Pre Development Curve Number (CN):

Catchment	Hydrologic Soil Group	Soil Texture	Total Area (m^2)	Lakes / Wetlands / SWMF's (m^2)	Forest / Woodlot Area (m^2)	Meadow / Field Area (m^2)	Open Space Area (m^2)	Crop Area (m^2)	Weighted CN
101	BC	Silty Sand	5,700				5,700		74.0

Pre Development Initial Abstraction (IA):

Catchment	Total Area (m^2)	Open Space Area (m^2)	Forest/Woodlot Area (m^2)	Lakes / Wetlands SWMF (m^2)	Meadow/Field Area (m^2)	Pasture/Range Area (m^2)	Weighted IA
101	5,700	5,700		0			5.0

SCS Curve Numbers							
	Hydrologic Soil Group						
Cover	A	AB	B	BC	C	CD	D
Wetlands / Lakes/ SWMF's	100	100	100	100	100	100	100
Forest/Woodlot	25	40	55	63	70	74	77
Meadow/Field	30	44	58	65	71	75	78
Open Space	49	59	69	74	79	82	84
Pasture/Range	39	50	61	68	74	77	80
Impervious Areas	98	98	98	98	98	98	98

* Taken from City of Barrie Stormwater Management Policies and Design Guidelines (2022)

Initial Abstraction / Depression Storage	
Cover	Depth (mm)
Wetlands / Lakes/ SWMF	0
Forest/Woodlot	10
Meadow/Field	8
Open Space	5
Pasture/Range	7
Impervious Areas	2

* Taken from City of Barrie Stormwater Management Policies and Design Guidelines (2022)

481 YONGE STREET APARTMENT DEVELOPMENT

POST DEVELOPMENT SWM INPUT PARAMETERS - CITY OF BARRIE / LSRCA JURISDICTION

Barrie, Ontario

Project Number: 19-11433B
Date: April 4, 2022
Design By: DH
File: Z:\Project Documents\11433 481 Yonge Street\11433.1B Detailed Design\SWM\HYMO SWM Calculations - DH.xls

Runoff Coefficients	
Land Use	**"C"**
Lawn (<2%)	0.11
Lawn (2-7%)	0.16
Residential Rooftop Area	0.95
Semi-detached Rooftop Area	0.95
Townhouse Rooftop Area	0.95
Medium/High Density Impervious Area	0.60
Industrial	0.65
Commercial	0.70
Paved areas	0.95

* Taken from City of Barrie Stormwater Management Policies and Design Guidelines (2022)

Post Development Runoff Coefficients:

Catchment	Total Area (m^2)	Lawn (<2%) (m^2)	Lawn (2-7%) (m^2)	Residential Rooftop Area (m^2)	Semi-detached Rooftop Area (m^2)	Townhouse Rooftop Area (m^2)	Medium/High Density Impervious Area (m^2)	Industrial Area (m^2)	Commercial Area (m^2)	Paved Area (m^2)	Weighted C
201	3,310		80	1,745						1,485	0.93
202	650		205							445	0.70
203	910		740							170	0.31
204	830		615							215	0.36

Time of Concentration Calculations:

Catchment Parameters			
Catchment ID	=	201	
Catchment Area	=	0.3310	ha
Pervious Flow Length	=	30	m
Pervious Slope	=	0.04	m/m
Impervious Slope	=	0.03	m/m
Weighted Runoff Coefficient	=	0.93	

Catchment Parameters			
Catchment ID	=	202	
Catchment Area	=	0.0650	ha
Pervious Flow Length	=	20	m
Pervious Slope	=	0.05	m/m
Impervious Slope	=	0.04	m/m
Weighted Runoff Coefficient	=	0.70	

Catchment Parameters			
Catchment ID	=	203	
Catchment Area	=	0.0910	ha
Flow Length	=	20	m
Slope	=	0.2	m/m
Weighted Runoff Coefficient*	=	0.31	

Time of Concentration Results			
Bransby Williams Formula (use for C>0.4)	=	0.8	min.
Airport Formula (use for C<=0.4)	=	4.3	min.
Time to Peak			
2/3 of Time of Concentration	=	0.05	hr

Catchment Parameters			
Catchment ID	=	204	
Catchment Area	=	0.0830	ha
Pervious Flow Length	=	20	m
Pervious Slope	=	0.05	m/m
Impervious Slope	=	0.04	m/m
Weighted Runoff Coeff	=	0.36	

Post Development Curve Number (CN):

Catchment	Hydrologic Soil Group	Soil Texture	Total Area (m^2)	Lakes / Wetlands / SWMF's (m^2)	Forest / Woodlot Area (m^2)	Meadow / Field Area (m^2)	Lawn / Grass Area (m^2)	Impervious Area (m^2)	Weighted CN
201	BC	Silty Sand	80				80		68.0
202	BC	Silty Sand	205				205		68.0
203	BC	Silty Sand	910				740	170	73.6
204	BC	Silty Sand	615				615		68.0

SCS Curve Numbers							
	Hydrologic Soil Group						
Cover	**A**	**AB**	**B**	**BC**	**C**	**CD**	**D**
Wetlands / Lakes/ SWMF's	100	100	100	100	100	100	100
Forest/Woodlot	25	40	55	63	70	74	77
Meadow/Field	30	44	58	65	71	75	78
Lawn/Grass	39	50	61	68	74	77	80
Pasture/Range	39	50	61	68	74	77	80
Impervious Areas	98	98	98	98	98	98	98

* Taken from City of Barrie Stormwater Management Policies and Design Guidelines (2022)

Post Development Initial Abstraction (IA):

Catchment	Total Area (m^2)	Lawn/Grass Area (m^2)	Forest/Woodlot Area (m^2)	Lakes / Wetlands SWMF (m^2)	Meadow/Field Area (m^2)	Impervious Area (m^2)	Weighted IA
201	80	80					5.0
202	205	205					5.0
203	910	740				170	4.4
204	615	615					5.0

Initial Abstraction / Depression Storage	
Cover	**Depth (mm)**
Wetlands / Lakes/ SWMF	0
Forest/Woodlot	10
Meadow/Field	8
Lawn/Grass	5
Cultivated	7
Impervious Areas	2

* Taken from City of Barrie Stormwater Management Policies and Design Guidelines (2022)

For STANDHYD Command in Otthymo:

Pervious Area Calculations:	Catchment	Total Pervious Area (m2)
	201	80

Impervious Area Calulations:	Catchment	Total Directly Connected Area (m2)	Total Indirectly Connected Area (m2)	Total Impervious Area (m2)	% Ximp	% Timp
	201	3,230	0	3,230	97.6	97.6

Pervious Area Calculations:	Catchment	Total Pervious Area (m2)
	202	205

Impervious Area Calulations:	Catchment	Total Directly Connected Area (m2)	Total Indirectly Connected Area (m2)	Total Impervious Area (m2)	% Ximp	% Timp
	202	445	0	445	68.5	68.5

Pervious Area Calculations:	Catchment	Total Pervious Area (m2)
	204	615

Impervious Area Calulations:	Catchment	Total Directly Connected Area (m2)	Total Indirectly Connected Area (m2)	Total Impervious Area (m2)	% Ximp	% Timp
	204	108	108	215	13.0	25.9

Total Post Development Initial Abstraction (IA):

Catchment	Total Area (m^2)	Lawn/Grass Area (m^2)	Forest/Woodlot Area (m^2)	Lakes / Wetlands SWMF (m^2)	Meadow/Field Area (m^2)	Impervious Area (m^2)	Weighted IA
	5,700	1,640				4,060	2.86

481 YONGE STREET APARTMENT DEVELOPMENT
Stormwater Management Facility Storage Volumes
Barrie, Ontario

PINESTONE ENGINEERING LTD.

Project Number: 19-11433B
Date: April 25, 2022
File: Z:\Project Documents\11433 481 Yonge Street\11433.1B Detailed Design\SWM\Pond Sizing Calculations.xls

STAGE-STORAGE RELATIONSHIP - PONDING VOLUMES

Elevation	Depth	Precast Concrete SWM Tanks	Manhole and Pipe Storage	Surface Ponding Facility				Comments
				Area	Avg. Area	Live	Accum. Live	
m	*m*	m^3	m^3	m^2	m^2	m^3	m^3	*m*
245.45	0.00		0.00				0.00	Orifice Invert
245.60	0.15	0.00	0.74				0.74	Invert of Tanks
245.95	0.50	13.33	1.85				15.91	Contour
246.20	0.75	9.52	0.66				26.08	Contour
246.45	1.00	9.52	0.66				36.26	Contour
246.70	1.25	9.52	0.66				46.43	Contour
246.95	1.50	9.52	0.66				56.60	Contour
247.20	1.75	9.52	0.66				66.78	Contour
247.45	2.00	9.52	0.66				76.95	Contour
247.70	2.25	9.52	0.66				87.12	Contour
247.85	2.40	5.22	0.39				92.73	Underside of Tank Lids
247.95	2.50		0.26				93.00	Contour
248.20	2.75		0.66				93.65	Contour
248.55	3.10		0.92	0.36	0.00	0.00	94.57	Top of Grate
248.60	3.15		0.11	66.91	33.63	1.68	96.36	Contour
248.65	3.20		0.11	133.45	100.18	5.01	101.48	Contour
248.70	3.25		0.11	200.00	166.73	8.34	109.93	Contour
248.75	3.30		0.11	335.00	267.50	13.38	123.42	Contour
248.80	3.35			470.00	402.50	20.12	143.55	Driveway Overflow
248.85	3.40			605.00	537.50	26.87	170.42	Contour

Storage Tank Size: Newmarket Pre-Cast Concrete Water Holding Tank Model 36,000 (or equivalent)
Total Capacity: 42.585 m^3
Volume per 0.05m: 0.952 m^3
Tank Height: 2.237 m

481 YONGE STREET APARTMENT DEVELOPMENT
STORMWATER MANAGEMENT FACILITY STAGE STORAGE DISCHARGE RELATIONSHIP
Barrie, Ontario

Project Number: 19-11433B
Date: April 25, 2022
File: Z:\Project Documents\11433 481 Yonge Street\11433.1B Detailed Design\SWM\Pond Sizing Calculations.xls

Orifice Calculations			
$Q_o=C_d*A_o*(2*g*H_o)^{0.5}$			
	Orifice 1	Orifice 2	
C_d	0.63		
Invert (m)	245.45		
Width (m)	0.000		
Diameter/Height (m)	0.075		
Type (H/V)	V		

Cd/Cw	Description
0.63	Orifice Plate
0.8	Orifice Tube
1.7	Broad Crested Weir

Overflow Weir Calculations	
$Q_w=C_w*(H_w)^{1.5}*((L-0.2*H_w)+(0.8*TAN(THETA)*H_w))$	
Cw	1.70
Invert (m)	248.8
Length (m)	8.7
Side Slope (H:V)	0
Side Slope (rad)	0.000

Stage Discharge Relationship for Stormwater Management Facility:

Stage	Active Volume	Control Orifice						Overflow Weir Flow	Total Flow	Comments
		Area	H_o	Flow	Area	H_o	Flow			
m	m^3	m^2	m	m^3/s	m^2	m	m^3/s	m^3/s	m^3/s	
245.45	0.00	0.0044	0.00	0.0000				0.0000	0.0000	Orifice Invert
245.60	0.74	0.0044	0.11	0.0041				0.0000	0.0041	Invert of Tanks
245.95	15.91	0.0044	0.46	0.0084				0.0000	0.0084	Contour
246.20	26.08	0.0044	0.71	0.0104				0.0000	0.0104	Contour
246.45	36.26	0.0044	0.96	0.0121				0.0000	0.0121	Contour
246.70	46.43	0.0044	1.21	0.0136				0.0000	0.0136	Contour
246.95	56.60	0.0044	1.46	0.0149				0.0000	0.0149	Contour
247.20	66.78	0.0044	1.71	0.0161				0.0000	0.0161	Contour
247.45	76.95	0.0044	1.96	0.0173				0.0000	0.0173	Contour
247.70	87.12	0.0044	2.21	0.0183				0.0000	0.0183	Contour
247.85	92.73	0.0044	2.36	0.0189				0.0000	0.0189	Underside of Tank Lids
247.95	93.00	0.0044	2.46	0.0193				0.0000	0.0193	Contour
248.20	93.65	0.0044	2.71	0.0203				0.0000	0.0203	Contour
248.55	94.57	0.0044	3.06	0.0216				0.0000	0.0216	Top of Grate
248.60	96.36	0.0044	3.11	0.0217				0.0000	0.0217	Contour
248.65	101.48	0.0044	3.16	0.0219				0.0000	0.0219	Contour
248.70	109.93	0.0044	3.21	0.0221				0.0000	0.0221	Contour
248.75	123.42	0.0044	3.26	0.0223				0.0000	0.0223	Contour
248.80	143.55	0.0044	3.31	0.0224				0.0000	0.0224	Driveway Overflow
248.85	170.42	0.0044	3.36	0.0226				0.1652	0.1878	Contour

481 YONGE STREET APARTMENT DEVELOPMENT
Bioretention Cell Surface Storage Volumes
City of Barrie

Project Number: 19-11433B
Date: April 25, 2022
File: Z:\Project Documents\11433 481 Yonge Street\11433.1B Detailed Design\SWM\Pond Sizing Calculations.xls

STAGE-STORAGE RELATIONSHIP - BIORETENTION CELL VOLUMES

Elevation	Depth	Basin Areas				Comments
		Area	Avg. Area	Basin Volume	Accum. Volume	
m	*m*	m^2	*m2*	m^3	m^3	*m*
247.45	0.00					
247.45	0.00	60		0.00	0.00	Bottom of Surface Cell
247.47	0.02	61.67	60.83	1.22	1.22	Contour
247.49	0.04	63.33	62.50	1.25	2.47	Contour
247.51	0.06	65.00	64.17	1.28	3.75	Contour
247.53	0.08	66.67	65.83	1.32	5.07	Contour
247.55	0.10	68.33	67.50	1.35	6.42	Contour
247.57	0.12	70.00	69.17	1.38	7.80	Contour
247.59	0.14	71.67	70.83	1.42	9.22	Contour
247.61	0.16	73.33	72.50	1.45	10.67	Contour
247.63	0.18	75.00	74.17	1.48	12.15	Contour
247.65	0.20	76.67	75.83	1.52	13.67	Contour
247.67	0.22	78.33	77.50	1.55	15.22	Contour
247.68	0.23	79.17	78.75	0.79	16.00	Contour
247.69	0.24	80.00	79.58	0.80	16.80	Contour
247.70	0.25	80.84	80.42	0.80	17.60	Top of Overflow Grate
247.71	0.26	81.67	81.25	0.81	18.42	Contour
247.73	0.28	83.33	82.50	1.65	20.07	Contour
247.75	0.30	85.00	84.17	1.68	21.75	Top of Berm

APPENDIX C – SITE EVALUATION AND SOIL TESTING PROTOCOL FOR STORMWATER INFILTRATION

Site Evaluation and Soil Testing Protocol for Stormwater Infiltration

C1.0 INTRODUCTION

C1.1 Purpose of the Protocol

The purpose of this protocol is to describe evaluation and field testing procedures to:

- Determine if stormwater infiltration best management practices (BMPs) are well suited to a site, and at what locations; and
- Obtain the required data for stormwater infiltration BMP design.

C1.2 When to Conduct Testing

Designers are encouraged to conduct site evaluation and soil testing early in the development planning and design process so that information gained can be incorporated into the design. Chapters 2 and 3 of this guide describe planning and design principles, processes and practices to better integrate stormwater management into the development planning process. It is recommended that site evaluation and soil testing be conducted following the development of a preliminary plan for the proposed development. The designer should possess an understanding of potential BMP types and locations prior to soil testing. On-site tests may be carried out in advance to identify potential BMP types and locations.

C1.3 Who Should Conduct Testing

Qualified professionals, who can substantiate by qualifications or experience their ability to carry out the evaluation, should conduct the soil testing. A professional, experienced in observing and evaluating soil conditions is necessary to ascertain conditions that might affect BMP performance that cannot be thoroughly assessed with testing procedures.

C2.0 SOIL INFILTRATION TESTING: A MULTI-STEP PROCESS

Soil infiltration testing is a four-step process to obtain the necessary information for stormwater management planning and design. The four steps include:

1. Background Evaluation
    - Based on available published and site specific data;
    - Includes consideration of proposed development plan;
    - Used to identify potential BMP types, locations and soil test locations;
    - Done prior to field work; and
    - On-site soil tests may be done to identify/screen potential BMP locations.

2. Test Pit or Soil Boring Observations
    - Includes multiple testing locations;
    - Provides an understanding of sub-surface conditions; and

- Identifies limiting conditions (e.g., aquitard, bedrock or water table elevations).

3. Infiltration Testing
   - Must be conducted on-site;
   - Various testing methods are available; and
   - Different testing methods for screening versus verification purposes.

4. Design Considerations
   - Determination of a suitable infiltration rate for design calculations; and
   - Consideration of desired BMP drawdown period.

C2.1 Step 1. Background Evaluation

Prior to performing testing and developing a detailed site plan, existing site conditions should be inventoried and mapped including, but not limited to:

- Surficial geology and underlying stratigraphy;
- Watercourses (perennial and intermittent), water bodies, wetlands and floodplains;
- Small headwater drainage features;
- Topography, slope, and drainage patterns;
- Existing land cover and land use;
- Natural heritage conservation areas; and
- Other man-made features or conditions that may impact design such as existing nearby structures (buildings, infrastructure, etc.).

A sketch plan or preliminary layout plan for the proposed development should be evaluated, including:

- The preliminary grading plan and areas of cut and fill;
- The location and water surface elevation of all existing, and location of proposed water supply sources and wells;
- The location of all existing and proposed on-site wastewater (septic) systems;
- The location of other features of note such as utility rights-of-way, water and sewer lines, etc.;
- Existing data from borehole, well and geophysical testing; and
- Proposed location of development features (buildings, roads, utilities, etc.).

In Step 1, the designer should determine the potential location of infiltration BMPs. The approximate location of these BMPs should be noted on the proposed development plan and should serve as the basis for the location and number of soil tests to be performed on-site.

Important: If the proposed development is located on areas that may otherwise be suitable for stormwater infiltration BMPs, or if the proposed grading plan is such that potential BMP locations are eliminated, the designer is strongly encouraged to revisit the proposed layout and grading plan and adjust the development plan as necessary.

Development of areas suitable for infiltration BMPs does not preclude the use of subsurface infiltration BMPs for runoff volume reduction and groundwater recharge benefits (e.g., soakaways, infiltration trenches and chambers, perforated pipe systems).

C2.2 Step 2. Test Pit or Soil Boring Observations

Test pits or soil borings provide information regarding the soil horizons and overall soil conditions both horizontally and vertically in that portion of the site. Multiple observations can be made across a site at a relatively low cost and in a short time period. The use of test pits is preferable to soil borings as visual observation is narrowly limited in a soil boring and the soil horizons cannot be observed *in-situ*, but must be observed from the extracted borings.

Test pit excavations or soil borings should extend to a depth of between 2.5 to 5 metres below ground surface or until bedrock or fully saturated conditions are encountered. It is important that the tests provide information related to conditions at least 1.5 metres below the proposed bottom elevation of the infiltration BMP. Test pit trenches should be benched at 1 metre depth intervals for access and infiltration testing. A test pit should never be accessed if soil conditions are unsuitable for safe entry, or if site constraints preclude entry or exit. Where excavation of a test pit to the required depth would create an undesirable or unsafe condition, two soil borings may be conducted instead.

At each test location, the following conditions should be noted and described:

- Soil horizons (upper and lower boundary);
- Soil texture and colour for each horizon;
- Color patterns (mottling) and observed depth;
- Depth to water table (if encountered);
- Depth to bedrock (if encountered);
- Observations of pores or roots (size, depth);
- Estimated type and percent coarse fragments;
- Hardpan or other limiting layers; and
- Strike and dip of soil horizons.

At the designer's discretion, soil samples may be collected at various horizons for additional analyses (e.g., grain size analysis).

The number of test pits or soil borings varies depending on site conditions and the proposed development plan. General guidelines are as follows:

- For infiltration BMPs with footprint surface areas from 50 to 900 square metres, a minimum of two test pits or one test pit and two soil borings are required at, or within 10 metres of the proposed location to determine the suitability and distribution of soil types present;
- For infiltration BMPs with footprint surface areas greater than 900 square metres, a minimum of one test should be conducted for each 450 square metres of

footprint surface area. Tests should be conducted equidistant from each other to provide adequate characterization of the area;

- For linear infiltration BMPs a minimum of one test should be conducted within each soil mapping unit present along the proposed BMP location. Soil borings should be conducted every 50 metres and a test pit should be conducted every 450 metres; and
- For sites with multiple infiltration BMPs, each with footprint surface areas less than 50 square metres, a minimum of one test pit is required and one soil boring per infiltration BMP location is recommended.

The recommendations above are guidelines. Additional tests should be conducted if local conditions indicate significant variability in soil type, geology, water table levels, bedrock or topography. Similarly, uniform site conditions may indicate that fewer tests are required.

C2.3 Step 3. Infiltration Testing

A variety of field tests exist for estimating the infiltration rate of the native soil that include the use of permeameter or infiltrometer devices, percolation tests and empirical relationships between grain size distribution and hydraulic conductivity. At least one test should be conducted at the proposed bottom elevation of the infiltration BMP, plus additional tests at every other soil horizon encountered within 1.5 metres below the proposed bottom elevation. A minimum of two tests per test pit are recommended. More tests are warranted if results from the first two tests are substantially different. The geometric mean value should be used to determine the average infiltration rate for each soil horizon following multiple tests.

Based on field observations, infiltration testing results and the desired drawdown period (typically 48 hours), the designer may elect to modify the proposed bottom elevation of a BMP (see Step 4). Therefore, personnel conducting infiltration tests should be prepared to adjust test locations and depths depending upon observed conditions.

Infiltration testing methods discussed in this protocol include:

- Guelph permeameter test;
- Double-ring infiltrometer test;
- Borehole permeameter test; and
- Percolation test.

There are differences between these methods. Guelph permeameter and double-ring infiltrometer tests estimate the vertical movement of water through the bottom of the test area. The outer ring helps to reduce the lateral movement of water in the soil. Borehole permeameter and percolation tests allow water movement through both the bottom and sides of the test area. For this reason, the measured rate of water level drop in these types of tests must be adjusted to represent the discharge that is occurring on both the bottom and sides of the test hole.

For initial screening of a site for potential BMP types and locations, percolation tests and grain size analyses of samples from soil borings are suitable methods for estimating the infiltration rate of the native soil. Tests should not be conducted in the rain or within 24 hours of significant rainfall events (>15 millimetres depth), or when the temperature is below freezing. The preferred testing period is during April and May. This is the period when infiltration is likely to be diminished by saturated conditions. Percolation tests conducted between June 1 and December 31 should be done following a 24 hour pre-soaking period to simulate field saturated conditions. Pre-soaking is not required for permeameter or infiltrometer test methods.

To verify native soil infiltration rates for design purposes, it is strongly recommended that infiltration tests be carried out with a permeameter or infiltrometer to determine the field saturated hydraulic conductivity (K_{fs}), rather than percolation tests or grain-size analyses. Alternatively, other permeability test procedures that yield a saturated hydraulic conductivity rate can be used, such as formulas developed by Elrick and Reynolds[1], or others for computation of hydraulic conductivity and saturated hydraulic conductivity.

Many *in-situ* methods have been developed for determining field saturated hydraulic conductivity within the unsaturated (vadose) zone of the soil. Detailed testing methods and standards that are available but not discussed in detail in this protocol include (but are not limited to):

- Constant head well permeameter method (i.e., Guelph Permeameter method)[2, 3];
- Constant head double-ring infiltrometer method[3, 4];
- Constant head pressure (single-ring) infiltrometer method[5];

A complete guide for comparing standard methods is presented in ASTM International Designation D5126-90 (2004)[6]. Further detailed discussion on standard methods can also be found in Amoozegar and Warrick (1986)[5].

[1] Elrick, D.E. and Reynolds, W.D. 1992. Infiltration from constant head well permeameters and infiltrometers. In, G.C. Topp, W.D. Reynolds and R.E. Green (Eds.). Advances in measurement of soil physical properties: Bringing theory into practice. Special Publication 30. Soil Society of America. Madison, WI.

[2] Reynolds, W.D., Elrick, D.E. 1986. A method for simultaneous *in-situ* measurement in the vadose zone of field-saturated hydraulic conductivity, sorptivity and the conductivity-pressure head relationship. *Ground Water Monitoring Review*. No. 9. pp. 184-193.

[3] Reynolds, W.D. 1993. Saturated Hydraulic Conductivity: Field Measurement. In, M.R. Carter (ed.). Soil Sampling and Methods of Analysis. Chapter 56. Canadian Society of Soil Science. Lewis Publishers. Ann Arbor, MA.

[4] ASTM International. 2003. Designation D 3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using a Double-Ring Infiltrometer. West Conshohocken, PA.

[5] Amoozegar, A. and Warrick, A.W. 1986. Hydraulic conductivity of saturated soils: field methods. In, A. Klute (ed.) Methods of Soil Analysis. 2nd edition. No. 9 Agronomy. American Society of Agronomy, Madison, WI.

[6] ASTM International. 2004. Designation D5126-90 (2004), Standard Guide for Comparison of Field Methods for Determining Hydraulic Conductivity in the Vadose Zone. West Conshohocken, PA.

For the purpose of designing the infiltration BMP, hydraulic conductivity values (typically in centimetres per second) generated from permeameter or infiltrometer tests must be converted into infiltration rates (typically in millimetres per hour). **It is critical to note that hydraulic conductivity and infiltration rate are two different concepts and that conversion from one parameter to another cannot be done through unit conversion**. Particularly for fine grained soils, there is no consistent relationship due to the many factors involved. Table C1 and Figure C1 describes approximate relationships between hydraulic conductivity, percolation time and infiltration rate. Measured hydraulic conductivity values can be converted to infiltration rates using the approximate relationship described in Figure C1.

Table C1: Approximate relationships between hydraulic conductivity, percolation time and infiltration rate

Hydraulic Conductivity, K_{fs} (centimetres/second)	Percolation Time, T (minutes/centimetre)	Infiltration Rate, 1/T (millimetres/hour)
0.1	2	300
0.01	4	150
0.001	8	75
0.0001	12	50
0.00001	20	30
0.000001	50	12

Source: Ontario Ministry of Municipal Affairs and Housing (OMMAH). 1997. Supplementary Guidelines to the Ontario Building Code 1997. SG-6 Percolation Time and Soil Descriptions. Toronto, Ontario.

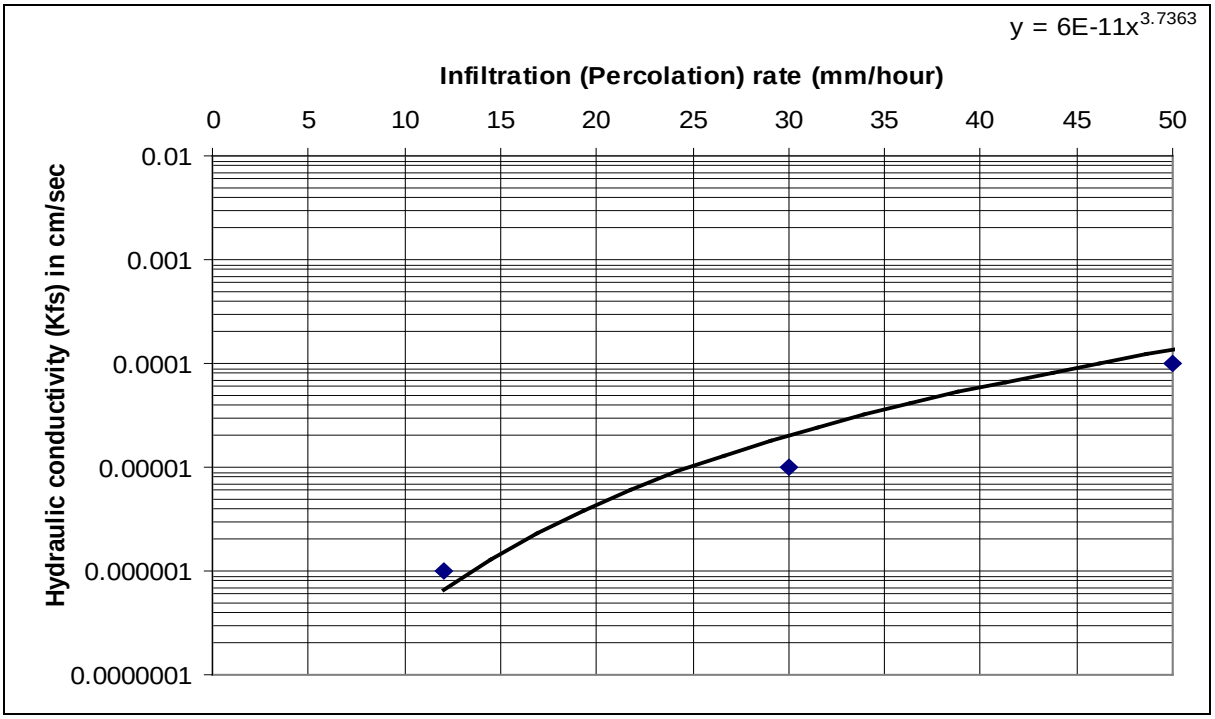
Following testing, the test pits should be refilled with the original soil and the surface replaced with the original topsoil.

The results and locations of all test pits, soil borings and infiltration tests should be included in documents submitted to commenting and approval agencies in support of the development proposal.

C2.4 Step 4. Design Considerations

The infiltration rate used to design an infiltration BMP must incorporate a safety correction factor that compensates for potential reductions in soil permeability due to compaction or smearing during construction, gradual accumulation of fine sediments over the lifespan of the BMP and uncertainty in measured values when less permeable soil horizons exist within 1.5 metres below the proposed bottom elevation of the BMP.

Figure C1: Approximate relationship between infiltration rate and hydraulic conductivity



Source: Ontario Ministry of Municipal Affairs and Housing (OMMAH). 1997. Supplementary Guidelines to the Ontario Building Code 1997. SG-6 Percolation Time and Soil Descriptions. Toronto, Ontario.

The measured infiltration rate (in millimetres per hour) at the proposed bottom elevation of the BMP must be divided by a safety correction factor selected from Table C2 to calculate the design infiltration rate. To select a safety correction factor from Table C2, calculate the ratio of the mean (geometric) measured infiltration rate at the proposed bottom elevation of the BMP to the rate in the least permeable soil horizon within 1.5 metres below the bottom of the BMP. Based on this ratio, a safety correction factor is selected from Table C2. For example, where the mean infiltration rate measured at the proposed bottom elevation of the BMP is 30 mm/h, and the mean infiltration rate measured in an underlying soil horizon within 1.5 metres of the bottom is 12 mm/h, the ratio would be 2.5, the safety correction factor would be 3.5, and the design infiltration rate would be 8.6 mm/h. Where the soil horizon is continuous within 1.5 metres below the proposed bottom of the BMP, the mean infiltration rate measured at the bottom elevation of the BMP should be divided by a safety correction factor of 2.5 to calculate the design infiltration rate.

Table C2: Safety correction factors for calculating design infiltration rates

Ratio of Mean Measured Infiltration Rates[1]	Safety Correction Factor[2]
≤ 1	2.5
1.1 to 4.0	3.5
4.1 to 8.0	4.5
8.1 to 16.0	6.5
16.1 or greater	8.5

Source: Wisconsin Department of Natural Resources. 2004. Conservation Practice Standards. Site Evaluation for Stormwater Infiltration (1002). Madison, WI.

Notes:

1. Ratio is determined by dividing the geometric mean measured infiltration rate at the proposed bottom elevation of the BMP by the geometric mean measured infiltration rate of the least permeable soil horizon within 1.5 metres below the proposed bottom elevation of the BMP.
2. The design infiltration rate is calculated by dividing the geometric mean measured infiltration rate at the proposed bottom elevation of the BMP by the safety correction factor.

The design infiltration rate should be used to determine the maximum depth of the water storage component of the BMP, based on the desired drawdown period (typically 48 hours to fully drain the BMP; see Chapter 4 for guidance regarding the design of specific infiltration BMP types). Based on the calculated design infiltration rate, assumptions regarding the bottom elevation of the BMP may need to be reconsidered and further infiltration testing may be warranted.

Bioretention Cell Design Calculations

The following is a list of parameters and design criteria for a bioretention cell to capture and treat runoff generated from catchment 202

- The capacity to treat runoff from a 650m^2 catchment area consisting of pavement and landscape area.
- A rainfall depth of 20mm - According to the MECP Stormwater Management Planning and Design Manual (2003), the target storage volume should be 20mm over the surface area since 90% of all daily rainfall depths are less than this amount.
- An overall runoff coefficient of 0.70 for catchment 202.
- A maximum infiltration rate of 70mm/hr for native silty sand (Table C1, TRCA LID Manual) and minimum 25mm/hr for engineered filter media (Section 5.4.2, TRCA LID Manual).
- A recommended drawdown time of 24-48 hours per the LID Manual.
- A soil porosity of 0.4 for the recommended use of 50mm diameter clear stone as the storage media.
- An estimated filter media depth of 0.65m, stone reservoir depth of 0.3m and surface storage depth of 0.25m.
- A safety correction factor of 2.5 (as per Table C2, TRCA LID Manual) from a ratio of mean measured infiltration rates of 1.0.
- A design infiltration rate of 28mm/hr (70mm/hr / 2.5)

$$Runoff\ Volume = C * i * A$$

where: C = *surface runoff coefficient*
i = *intensity, mm/hr.*
A = *runoff catchment area, m^2*

$$Runoff\ Volume = (0.7)(0.02m)(650m^2) = 9.1m^3$$

Underdrain Requirement – Per section 4.5.2 of the LID Manual, an underdrain is required where native soil infiltration rates are less than 15mm/hr (hydraulic conductivity of less than 1x10^{-6}cm/s). From our review of the Geotechnical Investigation, prepared by HADDAD GEOTECHNICAL INC. in January of 2014, the site is generally underlain by a stratum of silty sand with an estimated infiltration rate of 70mm/hr (hydraulic conductivity of 8x10^{-4} cm/s), therefore an underdrain is not required.

Storage Depth – A deep reservoir on a highly permeable soil can cause soil compaction and loss of permeability from the mass of overlying stone and stored water. Therefore, an additional calculation should be conducted to determine the maximum allowable bioretention cell depth while maintaining a target water drawdown time of 24-48 hours. As per the Low Impact Development Stormwater Management Planning and Design Guide (2010):

$$d_{c\,max} = \frac{i * (t_s - \frac{d_p}{i}}{V_r}$$

where:
- $d_{c\,max}$ = *maximum bioretention cell depth, mm*
- i = *design infiltration rate of native soil, mm/hr.*
- t_s = *drawdown time, hr*
- V_r = *void space ratio for filter bed & storage layer*
- d_p = *maximum surface ponding depth (mm)*

$$d_{c\,max} = \frac{28 * \left(48 - \frac{250}{28}\right)}{0.4} = 2735mm = 2.73m\ (48\ hours)$$
$$d_{c\,min} = \frac{28 * \left(24 - \frac{250}{28}\right)}{0.4} = 1055mm = 1.05m\ (24\ hours)$$

The proposed bioretention cell will have a filter media depth of 0.65m, a pea gravel layer depth of 0.1m, and a gravel storage layer depth of 0.3m. The total depth of the bioretention cell is 1.05m, which meets the minimum depth requirement of 1.05m to achieve a drawdown time of 24 hours.

To calculate the bottom area of the bioretention cell, the following equation from the LID Manual is utilized:

$$A = \frac{WQV}{d_c V_r}$$

where:
- A = *bioretention cell footprint, m^2*
- WQV = *water quality volume, m^3*
- d_c = *bioretention cell depth, m*
- V_r = *void space ratio for filter bed & storage layer*

$$A = \frac{(9.1m^3)}{(1.05)(0.4)} = 21.67m^2$$

The proposed bioretention cell will have a filter media depth of 0.65m, a pea gravel layer depth of 0.1m, a gravel storage layer depth of 0.3m, and a minimum bottom area of 21.67m^2.

The bottom area of the cell will be 60m^2 (8.5m x 7m) to capture and treat runoff. The additional surface storage area in the 0.25m depth surface depression will be utilized to attenuate smaller storm events.

PRE-DEVELOPMENT

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       V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


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  Output  filename:
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DATE: 04-11-2022                          TIME: 10:12:24

USER:



COMMENTS: _____________________________________________________________


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  ************************************************
  ** SIMULATION : 100yr 24hr 5min SCS Type II   **
  ************************************************


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|                  |              ata\Local\Temp\
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|                  |              f539c440-bbe2-4a81-9f2b-81615b25c7da\1ebb117f
| Ptotal=137.63 mm |    Comments: 100yr 24hr 5min SCS Type II
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TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	6.08	2.48	12.17	19.82	18.25	2.48
0.08	1.51	6.17	2.48	12.25	19.82	18.33	2.48
0.17	1.51	6.25	2.48	12.33	19.82	18.42	2.48
0.25	1.51	6.33	2.48	12.42	19.82	18.50	2.48
0.33	1.51	6.42	2.48	12.50	19.82	18.58	2.48
0.42	1.51	6.50	2.48	12.58	10.18	18.67	2.48
0.50	1.51	6.58	2.48	12.67	10.18	18.75	2.48
0.58	1.51	6.67	2.48	12.75	10.18	18.83	2.48
0.67	1.51	6.75	2.48	12.83	10.18	18.92	2.48
0.75	1.51	6.83	2.48	12.92	10.18	19.00	2.48
0.83	1.51	6.92	2.48	13.00	10.18	19.08	2.48
0.92	1.51	7.00	2.48	13.08	7.43	19.17	2.48
1.00	1.51	7.08	3.03	13.17	7.43	19.25	2.48
1.08	1.51	7.17	3.03	13.25	7.43	19.33	2.48
1.17	1.51	7.25	3.03	13.33	7.43	19.42	2.48
1.25	1.51	7.33	3.03	13.42	7.43	19.50	2.48
1.33	1.51	7.42	3.03	13.50	7.43	19.58	2.48
1.42	1.51	7.50	3.03	13.58	5.78	19.67	2.48
1.50	1.51	7.58	3.03	13.67	5.78	19.75	2.48
1.58	1.51	7.67	3.03	13.75	5.78	19.83	2.48
1.67	1.51	7.75	3.03	13.83	5.78	19.92	2.48
1.75	1.51	7.83	3.03	13.92	5.78	20.00	2.48
1.83	1.51	7.92	3.03	14.00	5.78	20.08	1.65
1.92	1.51	8.00	3.03	14.08	4.13	20.17	1.65
2.00	1.51	8.08	3.58	14.17	4.13	20.25	1.65
2.08	1.79	8.17	3.58	14.25	4.13	20.33	1.65
2.17	1.79	8.25	3.58	14.33	4.13	20.42	1.65
2.25	1.79	8.33	3.58	14.42	4.13	20.50	1.65
2.33	1.79	8.42	3.58	14.50	4.13	20.58	1.65
2.42	1.79	8.50	3.58	14.58	4.13	20.67	1.65
2.50	1.79	8.58	3.85	14.67	4.13	20.75	1.65
2.58	1.79	8.67	3.85	14.75	4.13	20.83	1.65
2.67	1.79	8.75	3.85	14.83	4.13	20.92	1.65
2.75	1.79	8.83	3.85	14.92	4.13	21.00	1.65
2.83	1.79	8.92	3.85	15.00	4.13	21.08	1.65
2.92	1.79	9.00	3.85	15.08	4.13	21.17	1.65
3.00	1.79	9.08	4.40	15.17	4.13	21.25	1.65
3.08	1.79	9.17	4.40	15.25	4.13	21.33	1.65
3.17	1.79	9.25	4.40	15.33	4.13	21.42	1.65
3.25	1.79	9.33	4.40	15.42	4.13	21.50	1.65
3.33	1.79	9.42	4.40	15.50	4.13	21.58	1.65
3.42	1.79	9.50	4.40	15.58	4.13	21.67	1.65
3.50	1.79	9.58	4.95	15.67	4.13	21.75	1.65
3.58	1.79	9.67	4.95	15.75	4.13	21.83	1.65
3.67	1.79	9.75	4.95	15.83	4.13	21.92	1.65

3.75	1.79	9.83	4.95	15.92	4.13	22.00	1.65
3.83	1.79	9.92	4.95	16.00	4.13	22.08	1.65
3.92	1.79	10.00	4.95	16.08	2.48	22.17	1.65
4.00	1.79	10.08	6.33	16.17	2.48	22.25	1.65
4.08	2.20	10.17	6.33	16.25	2.48	22.33	1.65
4.17	2.20	10.25	6.33	16.33	2.48	22.42	1.65
4.25	2.20	10.33	6.33	16.42	2.48	22.50	1.65
4.33	2.20	10.42	6.33	16.50	2.48	22.58	1.65
4.42	2.20	10.50	6.33	16.58	2.48	22.67	1.65
4.50	2.20	10.58	8.53	16.67	2.48	22.75	1.65
4.58	2.20	10.67	8.53	16.75	2.48	22.83	1.65
4.67	2.20	10.75	8.53	16.83	2.48	22.92	1.65
4.75	2.20	10.83	8.53	16.92	2.48	23.00	1.65
4.83	2.20	10.92	8.53	17.00	2.48	23.08	1.65
4.92	2.20	11.00	8.53	17.08	2.48	23.17	1.65
5.00	2.20	11.08	13.21	17.17	2.48	23.25	1.65
5.08	2.20	11.17	13.21	17.25	2.48	23.33	1.65
5.17	2.20	11.25	13.21	17.33	2.48	23.42	1.65
5.25	2.20	11.33	13.21	17.42	2.48	23.50	1.65
5.33	2.20	11.42	13.21	17.50	2.48	23.58	1.65
5.42	2.20	11.50	13.21	17.58	2.48	23.67	1.65
5.50	2.20	11.58	40.74	17.67	2.48	23.75	1.65
5.58	2.20	11.67	40.74	17.75	2.48	23.83	1.65
5.67	2.20	11.75	40.74	17.83	2.48	23.92	1.65
5.75	2.20	11.83	168.46	17.92	2.48	24.00	1.65
5.83	2.20	11.92	168.46	18.00	2.48		
5.92	2.20	12.00	168.46	18.08	2.48		
6.00	2.20	12.08	19.82	18.17	2.48		

CALIB					
NASHYD (0101)	Area (ha)=	0.57	Curve Number (CN)=	74.0	
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.12			

Unit Hyd Qpeak (cms)= 0.181

PEAK FLOW (cms)= 0.157 (i)
TIME TO PEAK (hrs)= 12.083
RUNOFF VOLUME (mm)= 78.224
TOTAL RAINFALL (mm)= 137.630
RUNOFF COEFFICIENT = 0.568

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
      V    V   I    SSSSS  U   U    A    L              (v 6.2.2011)
      V    V   I    SS     U   U   A A   L
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

Output filename:
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Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\67a10df8-51b0-46fa-91bb-39353adb9b3a\scen

DATE: 04-11-2022 TIME: 10:12:24

USER:

COMMENTS: _____

****
** SIMULATION : 100yr 4hr 5min Chicago **
****

CHICAGO STORM	IDF curve parameters:	A=	1383.628
Ptotal= 87.45 mm		B=	4.905
		C=	0.754

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	6.06	1.00	24.64	2.00	16.04	3.00	7.96
0.08	6.41	1.08	36.97	2.08	14.68	3.08	7.67
0.17	6.81	1.17	81.48	2.17	13.55	3.17	7.40
0.25	7.27	1.25	245.55	2.25	12.60	3.25	7.15
0.33	7.81	1.33	103.86	2.33	11.79	3.33	6.92
0.42	8.45	1.42	59.20	2.42	11.08	3.42	6.71
0.50	9.23	1.50	41.66	2.50	10.47	3.50	6.51
0.58	10.19	1.58	32.37	2.58	9.93	3.58	6.32
0.67	11.42	1.67	26.62	2.67	9.45	3.67	6.15
0.75	13.06	1.75	22.72	2.75	9.02	3.75	5.99
0.83	15.34	1.83	19.89	2.83	8.63	3.83	5.83
0.92	18.79	1.92	17.73	2.92	8.28	3.92	5.69

CALIB			
NASHYD (0101)	Area (ha)=	0.57	Curve Number (CN)= 74.0
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.12	

Unit Hyd Qpeak (cms)= 0.181

PEAK FLOW (cms)= 0.089 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 39.062
TOTAL RAINFALL (mm)= 87.445
RUNOFF COEFFICIENT = 0.447

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
V    V   I    SS     U   U   A A   L
 V  V    I     SS    U   U  AAAAA  L
 V  V    I      SS   U   U  A   A  L
  VV     I    SSSSS  UUUUU  A   A  LLLLL

 OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
O   O    T      T    H   H   Y Y   MM MM  O   O
O   O    T      T    H   H    Y    M   M  O   O
```

```
       OOO     T      T    H   H    Y    M   M   OOO
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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

Output filename:
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Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\45f16c01-4460-4396-8dd5-c18a14fa612f\scen

DATE: 04-11-2022 TIME: 10:12:24

USER:

COMMENTS: _____

****
** SIMULATION : 10yr 24hr 5min SCS Type II **
****

READ STORM	Filename: C:\Users\dhordyk\AppData\Local\Temp\f539c440-bbe2-4a81-9f2b-81615b25c7da\bdb34a83
Ptotal= 93.03 mm	Comments: 10yr 24hr 5min SCS Type II

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	6.08	1.67	12.17	13.40	18.25	1.67
0.08	1.02	6.17	1.67	12.25	13.40	18.33	1.67
0.17	1.02	6.25	1.67	12.33	13.40	18.42	1.67
0.25	1.02	6.33	1.67	12.42	13.40	18.50	1.67
0.33	1.02	6.42	1.67	12.50	13.40	18.58	1.67
0.42	1.02	6.50	1.67	12.58	6.88	18.67	1.67
0.50	1.02	6.58	1.67	12.67	6.88	18.75	1.67

0.58	1.02	6.67	1.67	12.75	6.88	18.83	1.67
0.67	1.02	6.75	1.67	12.83	6.88	18.92	1.67
0.75	1.02	6.83	1.67	12.92	6.88	19.00	1.67
0.83	1.02	6.92	1.67	13.00	6.88	19.08	1.67
0.92	1.02	7.00	1.67	13.08	5.02	19.17	1.67
1.00	1.02	7.08	2.05	13.17	5.02	19.25	1.67
1.08	1.02	7.17	2.05	13.25	5.02	19.33	1.67
1.17	1.02	7.25	2.05	13.33	5.02	19.42	1.67
1.25	1.02	7.33	2.05	13.42	5.02	19.50	1.67
1.33	1.02	7.42	2.05	13.50	5.02	19.58	1.67
1.42	1.02	7.50	2.05	13.58	3.91	19.67	1.67
1.50	1.02	7.58	2.05	13.67	3.91	19.75	1.67
1.58	1.02	7.67	2.05	13.75	3.91	19.83	1.67
1.67	1.02	7.75	2.05	13.83	3.91	19.92	1.67
1.75	1.02	7.83	2.05	13.92	3.91	20.00	1.67
1.83	1.02	7.92	2.05	14.00	3.91	20.08	1.12
1.92	1.02	8.00	2.05	14.08	2.79	20.17	1.12
2.00	1.02	8.08	2.42	14.17	2.79	20.25	1.12
2.08	1.21	8.17	2.42	14.25	2.79	20.33	1.12
2.17	1.21	8.25	2.42	14.33	2.79	20.42	1.12
2.25	1.21	8.33	2.42	14.42	2.79	20.50	1.12
2.33	1.21	8.42	2.42	14.50	2.79	20.58	1.12
2.42	1.21	8.50	2.42	14.58	2.79	20.67	1.12
2.50	1.21	8.58	2.60	14.67	2.79	20.75	1.12
2.58	1.21	8.67	2.60	14.75	2.79	20.83	1.12
2.67	1.21	8.75	2.60	14.83	2.79	20.92	1.12
2.75	1.21	8.83	2.60	14.92	2.79	21.00	1.12
2.83	1.21	8.92	2.60	15.00	2.79	21.08	1.12
2.92	1.21	9.00	2.60	15.08	2.79	21.17	1.12
3.00	1.21	9.08	2.98	15.17	2.79	21.25	1.12
3.08	1.21	9.17	2.98	15.25	2.79	21.33	1.12
3.17	1.21	9.25	2.98	15.33	2.79	21.42	1.12
3.25	1.21	9.33	2.98	15.42	2.79	21.50	1.12
3.33	1.21	9.42	2.98	15.50	2.79	21.58	1.12
3.42	1.21	9.50	2.98	15.58	2.79	21.67	1.12
3.50	1.21	9.58	3.35	15.67	2.79	21.75	1.12
3.58	1.21	9.67	3.35	15.75	2.79	21.83	1.12
3.67	1.21	9.75	3.35	15.83	2.79	21.92	1.12
3.75	1.21	9.83	3.35	15.92	2.79	22.00	1.12
3.83	1.21	9.92	3.35	16.00	2.79	22.08	1.12
3.92	1.21	10.00	3.35	16.08	1.67	22.17	1.12
4.00	1.21	10.08	4.28	16.17	1.67	22.25	1.12
4.08	1.49	10.17	4.28	16.25	1.67	22.33	1.12
4.17	1.49	10.25	4.28	16.33	1.67	22.42	1.12
4.25	1.49	10.33	4.28	16.42	1.67	22.50	1.12
4.33	1.49	10.42	4.28	16.50	1.67	22.58	1.12
4.42	1.49	10.50	4.28	16.58	1.67	22.67	1.12
4.50	1.49	10.58	5.77	16.67	1.67	22.75	1.12
4.58	1.49	10.67	5.77	16.75	1.67	22.83	1.12
4.67	1.49	10.75	5.77	16.83	1.67	22.92	1.12
4.75	1.49	10.83	5.77	16.92	1.67	23.00	1.12
4.83	1.49	10.92	5.77	17.00	1.67	23.08	1.12
4.92	1.49	11.00	5.77	17.08	1.67	23.17	1.12
5.00	1.49	11.08	8.93	17.17	1.67	23.25	1.12
5.08	1.49	11.17	8.93	17.25	1.67	23.33	1.12
5.17	1.49	11.25	8.93	17.33	1.67	23.42	1.12
5.25	1.49	11.33	8.93	17.42	1.67	23.50	1.12
5.33	1.49	11.42	8.93	17.50	1.67	23.58	1.12
5.42	1.49	11.50	8.93	17.58	1.67	23.67	1.12
5.50	1.49	11.58	27.54	17.67	1.67	23.75	1.12
5.58	1.49	11.67	27.54	17.75	1.67	23.83	1.12
5.67	1.49	11.75	27.54	17.83	1.67	23.92	1.12
5.75	1.49	11.83	113.87	17.92	1.67	24.00	1.12
5.83	1.49	11.92	113.87	18.00	1.67		
5.92	1.49	12.00	113.87	18.08	1.67		
6.00	1.49	12.08	13.40	18.17	1.67		

CALIB					
NASHYD (0101)	Area (ha)=	0.57	Curve Number (CN)=	74.0	
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.12			

Unit Hyd Qpeak (cms)= 0.181

PEAK FLOW (cms)= 0.087 (i)
TIME TO PEAK (hrs)= 12.083
RUNOFF VOLUME (mm)= 43.129
TOTAL RAINFALL (mm)= 93.030
RUNOFF COEFFICIENT = 0.464

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
       V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

Output filename:
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DATE: 04-11-2022 TIME: 10:12:23

USER:

COMMENTS: _____

** SIMULATION : 10yr 4hr 5min Chicago **

| CHICAGO STORM | Ptotal= 59.77 mm |

IDF curve parameters: A= 976.898
B= 4.745
C= 0.760
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	4.04	1.00	16.64	2.00	10.79	3.00	5.32
0.08	4.28	1.08	25.08	2.08	9.86	3.08	5.13
0.17	4.55	1.17	55.96	2.17	9.10	3.17	4.94
0.25	4.86	1.25	173.13	2.25	8.45	3.25	4.78
0.33	5.22	1.33	71.59	2.33	7.91	3.33	4.62
0.42	5.65	1.42	40.40	2.42	7.43	3.42	4.48
0.50	6.18	1.50	28.30	2.50	7.02	3.50	4.34
0.58	6.83	1.58	21.92	2.58	6.65	3.58	4.22
0.67	7.66	1.67	17.99	2.67	6.33	3.67	4.10
0.75	8.77	1.75	15.33	2.75	6.04	3.75	3.99
0.83	10.31	1.83	13.40	2.83	5.78	3.83	3.89
0.92	12.65	1.92	11.94	2.92	5.54	3.92	3.79

| CALIB | NASHYD (0101) | ID= 1 DT= 5.0 min |

Area (ha)= 0.57 Curve Number (CN)= 74.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.12

Unit Hyd Qpeak (cms)= 0.181

PEAK FLOW (cms)= 0.045 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 20.548
TOTAL RAINFALL (mm)= 59.765
RUNOFF COEFFICIENT = 0.344

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

V V I SSSSS U U A L (v 6.2.2011)
V V I SS U U A A L
V V I SS U U AAAAA L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

OOO TTTTT TTTTT H H Y Y M M OOO TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

Output filename:

C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\ede9
8872-c2cf-4f10-8226-179eca179275\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\ede9
8872-c2cf-4f10-8226-179eca179275\scen

DATE: 04-11-2022 TIME: 10:12:24

USER:

COMMENTS: _____

  ****
  ** SIMULATION : 25yr 24hr 5min SCS Type II **
  ****

| READ STORM | Filename: C:\Users\dhordyk\AppD
| | ata\Local\Temp\
| | f539c440-bbe2-4a81-9f2b-81615b25c7da\8a53c9fe
| Ptotal=111.09 mm | Comments: 25yr 24hr 5min SCS Type II

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	6.08	2.00	12.17	16.00	18.25	2.00
0.08	1.22	6.17	2.00	12.25	16.00	18.33	2.00
0.17	1.22	6.25	2.00	12.33	16.00	18.42	2.00
0.25	1.22	6.33	2.00	12.42	16.00	18.50	2.00
0.33	1.22	6.42	2.00	12.50	16.00	18.58	2.00
0.42	1.22	6.50	2.00	12.58	8.22	18.67	2.00
0.50	1.22	6.58	2.00	12.67	8.22	18.75	2.00
0.58	1.22	6.67	2.00	12.75	8.22	18.83	2.00
0.67	1.22	6.75	2.00	12.83	8.22	18.92	2.00
0.75	1.22	6.83	2.00	12.92	8.22	19.00	2.00
0.83	1.22	6.92	2.00	13.00	8.22	19.08	2.00
0.92	1.22	7.00	2.00	13.08	6.00	19.17	2.00
1.00	1.22	7.08	2.44	13.17	6.00	19.25	2.00
1.08	1.22	7.17	2.44	13.25	6.00	19.33	2.00
1.17	1.22	7.25	2.44	13.33	6.00	19.42	2.00
1.25	1.22	7.33	2.44	13.42	6.00	19.50	2.00
1.33	1.22	7.42	2.44	13.50	6.00	19.58	2.00
1.42	1.22	7.50	2.44	13.58	4.67	19.67	2.00
1.50	1.22	7.58	2.44	13.67	4.67	19.75	2.00
1.58	1.22	7.67	2.44	13.75	4.67	19.83	2.00
1.67	1.22	7.75	2.44	13.83	4.67	19.92	2.00
1.75	1.22	7.83	2.44	13.92	4.67	20.00	2.00
1.83	1.22	7.92	2.44	14.00	4.67	20.08	1.33
1.92	1.22	8.00	2.44	14.08	3.33	20.17	1.33
2.00	1.22	8.08	2.89	14.17	3.33	20.25	1.33
2.08	1.44	8.17	2.89	14.25	3.33	20.33	1.33
2.17	1.44	8.25	2.89	14.33	3.33	20.42	1.33
2.25	1.44	8.33	2.89	14.42	3.33	20.50	1.33
2.33	1.44	8.42	2.89	14.50	3.33	20.58	1.33
2.42	1.44	8.50	2.89	14.58	3.33	20.67	1.33
2.50	1.44	8.58	3.11	14.67	3.33	20.75	1.33
2.58	1.44	8.67	3.11	14.75	3.33	20.83	1.33
2.67	1.44	8.75	3.11	14.83	3.33	20.92	1.33
2.75	1.44	8.83	3.11	14.92	3.33	21.00	1.33
2.83	1.44	8.92	3.11	15.00	3.33	21.08	1.33
2.92	1.44	9.00	3.11	15.08	3.33	21.17	1.33
3.00	1.44	9.08	3.55	15.17	3.33	21.25	1.33
3.08	1.44	9.17	3.55	15.25	3.33	21.33	1.33
3.17	1.44	9.25	3.55	15.33	3.33	21.42	1.33
3.25	1.44	9.33	3.55	15.42	3.33	21.50	1.33
3.33	1.44	9.42	3.55	15.50	3.33	21.58	1.33
3.42	1.44	9.50	3.55	15.58	3.33	21.67	1.33
3.50	1.44	9.58	4.00	15.67	3.33	21.75	1.33
3.58	1.44	9.67	4.00	15.75	3.33	21.83	1.33
3.67	1.44	9.75	4.00	15.83	3.33	21.92	1.33
3.75	1.44	9.83	4.00	15.92	3.33	22.00	1.33
3.83	1.44	9.92	4.00	16.00	3.33	22.08	1.33
3.92	1.44	10.00	4.00	16.08	2.00	22.17	1.33
4.00	1.44	10.08	5.11	16.17	2.00	22.25	1.33
4.08	1.78	10.17	5.11	16.25	2.00	22.33	1.33
4.17	1.78	10.25	5.11	16.33	2.00	22.42	1.33
4.25	1.78	10.33	5.11	16.42	2.00	22.50	1.33
4.33	1.78	10.42	5.11	16.50	2.00	22.58	1.33
4.42	1.78	10.50	5.11	16.58	2.00	22.67	1.33
4.50	1.78	10.58	6.89	16.67	2.00	22.75	1.33
4.58	1.78	10.67	6.89	16.75	2.00	22.83	1.33
4.67	1.78	10.75	6.89	16.83	2.00	22.92	1.33
4.75	1.78	10.83	6.89	16.92	2.00	23.00	1.33
4.83	1.78	10.92	6.89	17.00	2.00	23.08	1.33
4.92	1.78	11.00	6.89	17.08	2.00	23.17	1.33
5.00	1.78	11.08	10.66	17.17	2.00	23.25	1.33
5.08	1.78	11.17	10.66	17.25	2.00	23.33	1.33
5.17	1.78	11.25	10.66	17.33	2.00	23.42	1.33
5.25	1.78	11.33	10.66	17.42	2.00	23.50	1.33
5.33	1.78	11.42	10.66	17.50	2.00	23.58	1.33
5.42	1.78	11.50	10.66	17.58	2.00	23.67	1.33
5.50	1.78	11.58	32.88	17.67	2.00	23.75	1.33
5.58	1.78	11.67	32.88	17.75	2.00	23.83	1.33
5.67	1.78	11.75	32.88	17.83	2.00	23.92	1.33

```
                5.75    1.78 | 11.83  135.97 | 17.92    2.00 | 24.00    1.33
                5.83    1.78 | 11.92  135.97 | 18.00    2.00 |
                5.92    1.78 | 12.00  135.97 | 18.08    2.00 |
                6.00    1.78 | 12.08   16.00 | 18.17    2.00 |

--------------------------------------------------------------------------------

--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   0.57   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.12

     Unit Hyd Qpeak  (cms)=   0.181

     PEAK FLOW       (cms)=   0.114 (i)
     TIME TO PEAK    (hrs)=  12.083
     RUNOFF VOLUME    (mm)=  56.850
     TOTAL RAINFALL   (mm)= 111.090
     RUNOFF COEFFICIENT   =   0.512

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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========================

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\3e8a
cc51-7076-42d8-93c1-d27985fd1e1f\scen

  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\3e8a
cc51-7076-42d8-93c1-d27985fd1e1f\scen


DATE: 04-11-2022                          TIME: 10:12:23

USER:


COMMENTS: _____________________________________________________________


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  ***********************************************
  ** SIMULATION : 25yr 4hr 5min Chicago         **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1133.123
| Ptotal= 70.87 mm |                          B=   4.734
--------------------                          C=   0.756
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    =  5.00 min
                        Time to peak ratio =  0.33

     TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
      hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
     0.00    4.87 |  1.00   19.82 |  2.00   12.89 |  3.00    6.39
     0.08    5.15 |  1.08   29.77 |  2.08   11.79 |  3.08    6.16
     0.17    5.47 |  1.17   65.99 |  2.17   10.89 |  3.17    5.94
     0.25    5.84 |  1.25  202.83 |  2.25   10.12 |  3.25    5.74
     0.33    6.27 |  1.33   84.29 |  2.33    9.47 |  3.33    5.56
     0.42    6.79 |  1.42   47.77 |  2.42    8.91 |  3.42    5.39
     0.50    7.41 |  1.50   33.55 |  2.50    8.41 |  3.50    5.23
     0.58    8.19 |  1.58   26.05 |  2.58    7.98 |  3.58    5.08
     0.67    9.18 |  1.67   21.41 |  2.67    7.59 |  3.67    4.94
     0.75   10.49 |  1.75   18.27 |  2.75    7.25 |  3.75    4.81
     0.83   12.33 |  1.83   15.99 |  2.83    6.93 |  3.83    4.68
     0.92   15.10 |  1.92   14.26 |  2.92    6.65 |  3.92    4.57


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   0.57   Curve Number   (CN)= 74.0
```

```
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.12

     Unit Hyd Qpeak  (cms)=   0.181

     PEAK FLOW       (cms)=   0.062 (i)
     TIME TO PEAK    (hrs)=   1.417
     RUNOFF VOLUME    (mm)=  27.596
     TOTAL RAINFALL   (mm)=  70.867
     RUNOFF COEFFICIENT   =   0.389

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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       V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\2e5c
53a0-472a-4652-973e-f0494fcbdc17\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\2e5c
53a0-472a-4652-973e-f0494fcbdc17\scen


DATE: 04-11-2022                          TIME: 10:12:23

USER:
```

COMMENTS: _____

```
  ************************************************
  ** SIMULATION : 2yr 24hr 5min SCS Type II     **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\dhordyk\AppD
|                  |              ata\Local\Temp\
|                  |              f539c440-bbe2-4a81-9f2b-81615b25c7da\35a9b8d2
| Ptotal= 55.62 mm |    Comments: 2yr 24hr 5min SCS Type II
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	6.08	1.00	12.17	8.01	18.25	1.00
0.08	0.61	6.17	1.00	12.25	8.01	18.33	1.00
0.17	0.61	6.25	1.00	12.33	8.01	18.42	1.00
0.25	0.61	6.33	1.00	12.42	8.01	18.50	1.00
0.33	0.61	6.42	1.00	12.50	8.01	18.58	1.00
0.42	0.61	6.50	1.00	12.58	4.12	18.67	1.00
0.50	0.61	6.58	1.00	12.67	4.12	18.75	1.00
0.58	0.61	6.67	1.00	12.75	4.12	18.83	1.00
0.67	0.61	6.75	1.00	12.83	4.12	18.92	1.00
0.75	0.61	6.83	1.00	12.92	4.12	19.00	1.00
0.83	0.61	6.92	1.00	13.00	4.12	19.08	1.00
0.92	0.61	7.00	1.00	13.08	3.00	19.17	1.00
1.00	0.61	7.08	1.22	13.17	3.00	19.25	1.00
1.08	0.61	7.17	1.22	13.25	3.00	19.33	1.00
1.17	0.61	7.25	1.22	13.33	3.00	19.42	1.00
1.25	0.61	7.33	1.22	13.42	3.00	19.50	1.00
1.33	0.61	7.42	1.22	13.50	3.00	19.58	1.00
1.42	0.61	7.50	1.22	13.58	2.34	19.67	1.00
1.50	0.61	7.58	1.22	13.67	2.34	19.75	1.00
1.58	0.61	7.67	1.22	13.75	2.34	19.83	1.00
1.67	0.61	7.75	1.22	13.83	2.34	19.92	1.00
1.75	0.61	7.83	1.22	13.92	2.34	20.00	1.00
1.83	0.61	7.92	1.22	14.00	2.34	20.08	0.67
1.92	0.61	8.00	1.22	14.08	1.67	20.17	0.67
2.00	0.61	8.08	1.45	14.17	1.67	20.25	0.67
2.08	0.72	8.17	1.45	14.25	1.67	20.33	0.67
2.17	0.72	8.25	1.45	14.33	1.67	20.42	0.67
2.25	0.72	8.33	1.45	14.42	1.67	20.50	0.67
2.33	0.72	8.42	1.45	14.50	1.67	20.58	0.67
2.42	0.72	8.50	1.45	14.58	1.67	20.67	0.67
2.50	0.72	8.58	1.56	14.67	1.67	20.75	0.67

```
 2.58    0.72 |  8.67    1.56 | 14.75    1.67 | 20.83    0.67
 2.67    0.72 |  8.75    1.56 | 14.83    1.67 | 20.92    0.67
 2.75    0.72 |  8.83    1.56 | 14.92    1.67 | 21.00    0.67
 2.83    0.72 |  8.92    1.56 | 15.00    1.67 | 21.08    0.67
 2.92    0.72 |  9.00    1.56 | 15.08    1.67 | 21.17    0.67
 3.00    0.72 |  9.08    1.78 | 15.17    1.67 | 21.25    0.67
 3.08    0.72 |  9.17    1.78 | 15.25    1.67 | 21.33    0.67
 3.17    0.72 |  9.25    1.78 | 15.33    1.67 | 21.42    0.67
 3.25    0.72 |  9.33    1.78 | 15.42    1.67 | 21.50    0.67
 3.33    0.72 |  9.42    1.78 | 15.50    1.67 | 21.58    0.67
 3.42    0.72 |  9.50    1.78 | 15.58    1.67 | 21.67    0.67
 3.50    0.72 |  9.58    2.00 | 15.67    1.67 | 21.75    0.67
 3.58    0.72 |  9.67    2.00 | 15.75    1.67 | 21.83    0.67
 3.67    0.72 |  9.75    2.00 | 15.83    1.67 | 21.92    0.67
 3.75    0.72 |  9.83    2.00 | 15.92    1.67 | 22.00    0.67
 3.83    0.72 |  9.92    2.00 | 16.00    1.67 | 22.08    0.67
 3.92    0.72 | 10.00    2.00 | 16.08    1.00 | 22.17    0.67
 4.00    0.72 | 10.08    2.56 | 16.17    1.00 | 22.25    0.67
 4.08    0.89 | 10.17    2.56 | 16.25    1.00 | 22.33    0.67
 4.17    0.89 | 10.25    2.56 | 16.33    1.00 | 22.42    0.67
 4.25    0.89 | 10.33    2.56 | 16.42    1.00 | 22.50    0.67
 4.33    0.89 | 10.42    2.56 | 16.50    1.00 | 22.58    0.67
 4.42    0.89 | 10.50    2.56 | 16.58    1.00 | 22.67    0.67
 4.50    0.89 | 10.58    3.45 | 16.67    1.00 | 22.75    0.67
 4.58    0.89 | 10.67    3.45 | 16.75    1.00 | 22.83    0.67
 4.67    0.89 | 10.75    3.45 | 16.83    1.00 | 22.92    0.67
 4.75    0.89 | 10.83    3.45 | 16.92    1.00 | 23.00    0.67
 4.83    0.89 | 10.92    3.45 | 17.00    1.00 | 23.08    0.67
 4.92    0.89 | 11.00    3.45 | 17.08    1.00 | 23.17    0.67
 5.00    0.89 | 11.08    5.34 | 17.17    1.00 | 23.25    0.67
 5.08    0.89 | 11.17    5.34 | 17.25    1.00 | 23.33    0.67
 5.17    0.89 | 11.25    5.34 | 17.33    1.00 | 23.42    0.67
 5.25    0.89 | 11.33    5.34 | 17.42    1.00 | 23.50    0.67
 5.33    0.89 | 11.42    5.34 | 17.50    1.00 | 23.58    0.67
 5.42    0.89 | 11.50    5.34 | 17.58    1.00 | 23.67    0.67
 5.50    0.89 | 11.58   16.46 | 17.67    1.00 | 23.75    0.67
 5.58    0.89 | 11.67   16.46 | 17.75    1.00 | 23.83    0.67
 5.67    0.89 | 11.75   16.46 | 17.83    1.00 | 23.92    0.67
 5.75    0.89 | 11.83   68.08 | 17.92    1.00 | 24.00    0.67
 5.83    0.89 | 11.92   68.08 | 18.00    1.00 |
 5.92    0.89 | 12.00   68.08 | 18.08    1.00 |
 6.00    0.89 | 12.08    8.01 | 18.17    1.00 |

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--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   0.57   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.12

     Unit Hyd Qpeak  (cms)=   0.181

     PEAK FLOW       (cms)=   0.036 (i)
     TIME TO PEAK    (hrs)=  12.083
     RUNOFF VOLUME    (mm)=  18.076
     TOTAL RAINFALL   (mm)=  55.620
     RUNOFF COEFFICIENT   =   0.325

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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================================================================================
========================

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\bc4c
fa29-328e-40b0-a30a-c43c7db175f3\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\bc4c
fa29-328e-40b0-a30a-c43c7db175f3\scen

DATE: 04-11-2022                          TIME: 10:12:24

USER:


COMMENTS: _____________________________________________________________
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  **********************************************
  ** SIMULATION : 2yr 4hr 5min Chicago         **
  **********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 675.586
| Ptotal= 37.03 mm |                          B=   4.681
--------------------                          C=   0.780
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =  0.33

                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00    2.31 |  1.00   10.03 |  2.00    6.39 |  3.00    3.08
                0.08    2.45 |  1.08   15.38 |  2.08    5.82 |  3.08    2.96
                0.17    2.61 |  1.17   35.54 |  2.17    5.36 |  3.17    2.85
                0.25    2.80 |  1.25  114.99 |  2.25    4.96 |  3.25    2.75
                0.33    3.01 |  1.33   45.86 |  2.33    4.63 |  3.33    2.66
                0.42    3.27 |  1.42   25.27 |  2.42    4.34 |  3.42    2.57
                0.50    3.59 |  1.50   17.44 |  2.50    4.09 |  3.50    2.49
                0.58    3.98 |  1.58   13.36 |  2.58    3.87 |  3.58    2.42
                0.67    4.48 |  1.67   10.88 |  2.67    3.68 |  3.67    2.35
                0.75    5.15 |  1.75    9.21 |  2.75    3.50 |  3.75    2.29
                0.83    6.10 |  1.83    8.01 |  2.83    3.35 |  3.83    2.22
                0.92    7.55 |  1.92    7.10 |  2.92    3.20 |  3.92    2.17


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--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   0.57   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.12

     Unit Hyd Qpeak  (cms)=   0.181

     PEAK FLOW       (cms)=   0.018 (i)
     TIME TO PEAK    (hrs)=   1.417
     RUNOFF VOLUME    (mm)=   8.348
     TOTAL RAINFALL   (mm)=  37.034
     RUNOFF COEFFICIENT   =   0.225

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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       V    V   I    SSSSS  U   U    A    L              (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\c5d7
125b-06c7-4894-b6e0-32307c556cd0\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\c5d7
125b-06c7-4894-b6e0-32307c556cd0\scen


DATE: 04-11-2022                          TIME: 10:12:24

USER:



COMMENTS: _____________________________________________________________


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  **********************************************
  ** SIMULATION : 50yr 24hr 5min SCS Type II    **
  **********************************************


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READ STORM	Filename: C:\Users\dhordyk\AppD ata\Local\Temp\ f539c440-bbe2-4a81-9f2b-81615b25c7da\7f35fdfa
Ptotal=125.40 mm	Comments: 50yr 24hr 5min SCS Type II

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	6.08	2.26	12.17	18.06	18.25	2.26
0.08	1.38	6.17	2.26	12.25	18.06	18.33	2.26
0.17	1.38	6.25	2.26	12.33	18.06	18.42	2.26
0.25	1.38	6.33	2.26	12.42	18.06	18.50	2.26
0.33	1.38	6.42	2.26	12.50	18.06	18.58	2.26
0.42	1.38	6.50	2.26	12.58	9.28	18.67	2.26
0.50	1.38	6.58	2.26	12.67	9.28	18.75	2.26
0.58	1.38	6.67	2.26	12.75	9.28	18.83	2.26
0.67	1.38	6.75	2.26	12.83	9.28	18.92	2.26
0.75	1.38	6.83	2.26	12.92	9.28	19.00	2.26
0.83	1.38	6.92	2.26	13.00	9.28	19.08	2.26
0.92	1.38	7.00	2.26	13.08	6.77	19.17	2.26
1.00	1.38	7.08	2.76	13.17	6.77	19.25	2.26
1.08	1.38	7.17	2.76	13.25	6.77	19.33	2.26
1.17	1.38	7.25	2.76	13.33	6.77	19.42	2.26
1.25	1.38	7.33	2.76	13.42	6.77	19.50	2.26
1.33	1.38	7.42	2.76	13.50	6.77	19.58	2.26
1.42	1.38	7.50	2.76	13.58	5.27	19.67	2.26
1.50	1.38	7.58	2.76	13.67	5.27	19.75	2.26
1.58	1.38	7.67	2.76	13.75	5.27	19.83	2.26
1.67	1.38	7.75	2.76	13.83	5.27	19.92	2.26
1.75	1.38	7.83	2.76	13.92	5.27	20.00	2.26
1.83	1.38	7.92	2.76	14.00	5.27	20.08	1.50
1.92	1.38	8.00	2.76	14.08	3.76	20.17	1.50
2.00	1.38	8.08	3.26	14.17	3.76	20.25	1.50
2.08	1.63	8.17	3.26	14.25	3.76	20.33	1.50
2.17	1.63	8.25	3.26	14.33	3.76	20.42	1.50
2.25	1.63	8.33	3.26	14.42	3.76	20.50	1.50
2.33	1.63	8.42	3.26	14.50	3.76	20.58	1.50
2.42	1.63	8.50	3.26	14.58	3.76	20.67	1.50
2.50	1.63	8.58	3.51	14.67	3.76	20.75	1.50
2.58	1.63	8.67	3.51	14.75	3.76	20.83	1.50
2.67	1.63	8.75	3.51	14.83	3.76	20.92	1.50
2.75	1.63	8.83	3.51	14.92	3.76	21.00	1.50
2.83	1.63	8.92	3.51	15.00	3.76	21.08	1.50
2.92	1.63	9.00	3.51	15.08	3.76	21.17	1.50
3.00	1.63	9.08	4.01	15.17	3.76	21.25	1.50
3.08	1.63	9.17	4.01	15.25	3.76	21.33	1.50
3.17	1.63	9.25	4.01	15.33	3.76	21.42	1.50
3.25	1.63	9.33	4.01	15.42	3.76	21.50	1.50
3.33	1.63	9.42	4.01	15.50	3.76	21.58	1.50
3.42	1.63	9.50	4.01	15.58	3.76	21.67	1.50
3.50	1.63	9.58	4.51	15.67	3.76	21.75	1.50
3.58	1.63	9.67	4.51	15.75	3.76	21.83	1.50
3.67	1.63	9.75	4.51	15.83	3.76	21.92	1.50
3.75	1.63	9.83	4.51	15.92	3.76	22.00	1.50
3.83	1.63	9.92	4.51	16.00	3.76	22.08	1.50
3.92	1.63	10.00	4.51	16.08	2.26	22.17	1.50
4.00	1.63	10.08	5.77	16.17	2.26	22.25	1.50
4.08	2.01	10.17	5.77	16.25	2.26	22.33	1.50
4.17	2.01	10.25	5.77	16.33	2.26	22.42	1.50
4.25	2.01	10.33	5.77	16.42	2.26	22.50	1.50
4.33	2.01	10.42	5.77	16.50	2.26	22.58	1.50
4.42	2.01	10.50	5.77	16.58	2.26	22.67	1.50
4.50	2.01	10.58	7.77	16.67	2.26	22.75	1.50
4.58	2.01	10.67	7.77	16.75	2.26	22.83	1.50
4.67	2.01	10.75	7.77	16.83	2.26	22.92	1.50
4.75	2.01	10.83	7.77	16.92	2.26	23.00	1.50
4.83	2.01	10.92	7.77	17.00	2.26	23.08	1.50
4.92	2.01	11.00	7.77	17.08	2.26	23.17	1.50
5.00	2.01	11.08	12.04	17.17	2.26	23.25	1.50
5.08	2.01	11.17	12.04	17.25	2.26	23.33	1.50
5.17	2.01	11.25	12.04	17.33	2.26	23.42	1.50
5.25	2.01	11.33	12.04	17.42	2.26	23.50	1.50
5.33	2.01	11.42	12.04	17.50	2.26	23.58	1.50
5.42	2.01	11.50	12.04	17.58	2.26	23.67	1.50
5.50	2.01	11.58	37.12	17.67	2.26	23.75	1.50
5.58	2.01	11.67	37.12	17.75	2.26	23.83	1.50
5.67	2.01	11.75	37.12	17.83	2.26	23.92	1.50
5.75	2.01	11.83	153.49	17.92	2.26	24.00	1.50
5.83	2.01	11.92	153.49	18.00	2.26		
5.92	2.01	12.00	153.49	18.08	2.26		
6.00	2.01	12.08	18.06	18.17	2.26		

CALIB			
NASHYD (0101)	Area (ha)= 0.57	Curve Number (CN)= 74.0	
ID= 1 DT= 5.0 min	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.12		

Unit Hyd Qpeak (cms)= 0.181

PEAK FLOW (cms)= 0.137 (i)
TIME TO PEAK (hrs)= 12.083
RUNOFF VOLUME (mm)= 68.223
TOTAL RAINFALL (mm)= 125.400
RUNOFF COEFFICIENT = 0.544

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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       V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\1b1b
2c1b-e0df-4dd3-98ed-199eb54175f0\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\1b1b
2c1b-e0df-4dd3-98ed-199eb54175f0\scen


DATE: 04-11-2022                          TIME: 10:12:23

USER:



COMMENTS: _____________________________________________________________


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  ***********************************************
  ** SIMULATION : 50yr 4hr 5min Chicago         **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1251.473
| Ptotal= 79.54 mm |                          B=   4.847
--------------------                          C=   0.753
                          used in:   INTENSITY =  A / (t + B)^C

                          Duration of storm  =  4.00 hrs
                          Storm time step    =  5.00 min
                          Time to peak ratio =  0.33

 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.00    5.53 |  1.00   22.40 |  2.00   14.60 |  3.00    7.26
 0.08    5.85 |  1.08   33.57 |  2.08   13.36 |  3.08    6.99
 0.17    6.21 |  1.17   73.94 |  2.17   12.33 |  3.17    6.75
 0.25    6.63 |  1.25  223.60 |  2.25   11.47 |  3.25    6.52
 0.33    7.12 |  1.33   94.25 |  2.33   10.74 |  3.33    6.31
 0.42    7.70 |  1.42   53.72 |  2.42   10.10 |  3.42    6.12
 0.50    8.41 |  1.50   37.82 |  2.50    9.54 |  3.50    5.94
 0.58    9.29 |  1.58   29.40 |  2.58    9.05 |  3.58    5.77
 0.67   10.40 |  1.67   24.19 |  2.67    8.61 |  3.67    5.61
 0.75   11.89 |  1.75   20.65 |  2.75    8.22 |  3.75    5.46
 0.83   13.96 |  1.83   18.09 |  2.83    7.87 |  3.83    5.32
 0.92   17.09 |  1.92   16.14 |  2.92    7.55 |  3.92    5.19


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--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   0.57   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.12

     Unit Hyd Qpeak  (cms)=   0.181

     PEAK FLOW       (cms)=   0.075 (i)
     TIME TO PEAK    (hrs)=   1.417
     RUNOFF VOLUME    (mm)=  33.473
     TOTAL RAINFALL   (mm)=  79.544
     RUNOFF COEFFICIENT   =   0.421

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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       V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
```

```
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\5313
6be9-53b6-49b8-a115-dbed19a25076\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\5313
6be9-53b6-49b8-a115-dbed19a25076\scen


DATE: 04-11-2022                          TIME: 10:12:24

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
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  ********************************************
  ** SIMULATION : 5yr 24hr 5min SCS Type II     **
  ********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\dhordyk\AppD
|                  |              ata\Local\Temp\
|                  |              f539c440-bbe2-4a81-9f2b-81615b25c7da\07b93d6a
| Ptotal= 78.55 mm |    Comments: 5yr 24hr 5min SCS Type II
--------------------
                TIME     RAIN |  TIME     RAIN |'  TIME     RAIN |  TIME     RAIN
                 hrs    mm/hr |   hrs    mm/hr |'   hrs    mm/hr |   hrs    mm/hr
                0.00     0.00 |  6.08     1.41 | 12.17    11.31 | 18.25     1.41
                0.08     0.86 |  6.17     1.41 | 12.25    11.31 | 18.33     1.41
                0.17     0.86 |  6.25     1.41 | 12.33    11.31 | 18.42     1.41
                0.25     0.86 |  6.33     1.41 | 12.42    11.31 | 18.50     1.41
                0.33     0.86 |  6.42     1.41 | 12.50    11.31 | 18.58     1.41
                0.42     0.86 |  6.50     1.41 | 12.58     5.81 | 18.67     1.41
                0.50     0.86 |  6.58     1.41 | 12.67     5.81 | 18.75     1.41
                0.58     0.86 |  6.67     1.41 | 12.75     5.81 | 18.83     1.41
                0.67     0.86 |  6.75     1.41 | 12.83     5.81 | 18.92     1.41
                0.75     0.86 |  6.83     1.41 | 12.92     5.81 | 19.00     1.41
                0.83     0.86 |  6.92     1.41 | 13.00     5.81 | 19.08     1.41
                0.92     0.86 |  7.00     1.41 | 13.08     4.24 | 19.17     1.41
                1.00     0.86 |  7.08     1.73 | 13.17     4.24 | 19.25     1.41
                1.08     0.86 |  7.17     1.73 | 13.25     4.24 | 19.33     1.41
                1.17     0.86 |  7.25     1.73 | 13.33     4.24 | 19.42     1.41
                1.25     0.86 |  7.33     1.73 | 13.42     4.24 | 19.50     1.41
                1.33     0.86 |  7.42     1.73 | 13.50     4.24 | 19.58     1.41
                1.42     0.86 |  7.50     1.73 | 13.58     3.30 | 19.67     1.41
                1.50     0.86 |  7.58     1.73 | 13.67     3.30 | 19.75     1.41
                1.58     0.86 |  7.67     1.73 | 13.75     3.30 | 19.83     1.41
                1.67     0.86 |  7.75     1.73 | 13.83     3.30 | 19.92     1.41
                1.75     0.86 |  7.83     1.73 | 13.92     3.30 | 20.00     1.41
                1.83     0.86 |  7.92     1.73 | 14.00     3.30 | 20.08     0.94
                1.92     0.86 |  8.00     1.73 | 14.08     2.36 | 20.17     0.94
                2.00     0.86 |  8.08     2.04 | 14.17     2.36 | 20.25     0.94
                2.08     1.02 |  8.17     2.04 | 14.25     2.36 | 20.33     0.94
                2.17     1.02 |  8.25     2.04 | 14.33     2.36 | 20.42     0.94
                2.25     1.02 |  8.33     2.04 | 14.42     2.36 | 20.50     0.94
                2.33     1.02 |  8.42     2.04 | 14.50     2.36 | 20.58     0.94
                2.42     1.02 |  8.50     2.04 | 14.58     2.36 | 20.67     0.94
                2.50     1.02 |  8.58     2.20 | 14.67     2.36 | 20.75     0.94
                2.58     1.02 |  8.67     2.20 | 14.75     2.36 | 20.83     0.94
                2.67     1.02 |  8.75     2.20 | 14.83     2.36 | 20.92     0.94
                2.75     1.02 |  8.83     2.20 | 14.92     2.36 | 21.00     0.94
                2.83     1.02 |  8.92     2.20 | 15.00     2.36 | 21.08     0.94
                2.92     1.02 |  9.00     2.20 | 15.08     2.36 | 21.17     0.94
                3.00     1.02 |  9.08     2.51 | 15.17     2.36 | 21.25     0.94
                3.08     1.02 |  9.17     2.51 | 15.25     2.36 | 21.33     0.94
                3.17     1.02 |  9.25     2.51 | 15.33     2.36 | 21.42     0.94
                3.25     1.02 |  9.33     2.51 | 15.42     2.36 | 21.50     0.94
                3.33     1.02 |  9.42     2.51 | 15.50     2.36 | 21.58     0.94
                3.42     1.02 |  9.50     2.51 | 15.58     2.36 | 21.67     0.94
                3.50     1.02 |  9.58     2.83 | 15.67     2.36 | 21.75     0.94
                3.58     1.02 |  9.67     2.83 | 15.75     2.36 | 21.83     0.94
                3.67     1.02 |  9.75     2.83 | 15.83     2.36 | 21.92     0.94
                3.75     1.02 |  9.83     2.83 | 15.92     2.36 | 22.00     0.94
                3.83     1.02 |  9.92     2.83 | 16.00     2.36 | 22.08     0.94
                3.92     1.02 | 10.00     2.83 | 16.08     1.41 | 22.17     0.94
                4.00     1.02 | 10.08     3.61 | 16.17     1.41 | 22.25     0.94
                4.08     1.26 | 10.17     3.61 | 16.25     1.41 | 22.33     0.94
                4.17     1.26 | 10.25     3.61 | 16.33     1.41 | 22.42     0.94
                4.25     1.26 | 10.33     3.61 | 16.42     1.41 | 22.50     0.94
                4.33     1.26 | 10.42     3.61 | 16.50     1.41 | 22.58     0.94
                4.42     1.26 | 10.50     3.61 | 16.58     1.41 | 22.67     0.94
                4.50     1.26 | 10.58     4.87 | 16.67     1.41 | 22.75     0.94
```

4.58	1.26	10.67	4.87	16.75	1.41	22.83	0.94
4.67	1.26	10.75	4.87	16.83	1.41	22.92	0.94
4.75	1.26	10.83	4.87	16.92	1.41	23.00	0.94
4.83	1.26	10.92	4.87	17.00	1.41	23.08	0.94
4.92	1.26	11.00	4.87	17.08	1.41	23.17	0.94
5.00	1.26	11.08	7.54	17.17	1.41	23.25	0.94
5.08	1.26	11.17	7.54	17.25	1.41	23.33	0.94
5.17	1.26	11.25	7.54	17.33	1.41	23.42	0.94
5.25	1.26	11.33	7.54	17.42	1.41	23.50	0.94
5.33	1.26	11.42	7.54	17.50	1.41	23.58	0.94
5.42	1.26	11.50	7.54	17.58	1.41	23.67	0.94
5.50	1.26	11.58	23.25	17.67	1.41	23.75	0.94
5.58	1.26	11.67	23.25	17.75	1.41	23.83	0.94
5.67	1.26	11.75	23.25	17.83	1.41	23.92	0.94
5.75	1.26	11.83	96.15	17.92	1.41	24.00	0.94
5.83	1.26	11.92	96.15	18.00	1.41		
5.92	1.26	12.00	96.15	18.08	1.41		
6.00	1.26	12.08	11.31	18.17	1.41		

```
--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   0.57   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.12

     Unit Hyd Qpeak  (cms)=   0.181

     PEAK FLOW       (cms)=   0.066 (i)
     TIME TO PEAK    (hrs)=  12.083
     RUNOFF VOLUME    (mm)=  32.786
     TOTAL RAINFALL   (mm)=  78.550
     RUNOFF COEFFICIENT   =   0.417

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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       V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
```

```
       OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\3fd6
82a0-fe90-4100-8d7c-bc3eaedf1cdd\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\3fd6
82a0-fe90-4100-8d7c-bc3eaedf1cdd\scen


DATE: 04-11-2022                          TIME: 10:12:24

USER:


COMMENTS: _____________________________________________________________
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  ***********************************************
  ** SIMULATION : 5yr 4hr 5min Chicago          **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 843.019
| Ptotal= 50.76 mm |                          B=   4.582
--------------------                          C=   0.763
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =  0.33
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	3.39	1.00	14.01	2.00	9.07	3.00	4.46
0.08	3.58	1.08	21.15	2.08	8.29	3.08	4.30
0.17	3.81	1.17	47.54	2.17	7.64	3.17	4.15
0.25	4.07	1.25	150.31	2.25	7.10	3.25	4.01

0.33	4.38	1.33	60.96	2.33	6.64	3.33	3.88
0.42	4.74	1.42	34.18	2.42	6.24	3.42	3.75
0.50	5.18	1.50	23.88	2.50	5.89	3.50	3.64
0.58	5.73	1.58	18.47	2.58	5.58	3.58	3.54
0.67	6.43	1.67	15.15	2.67	5.31	3.67	3.44
0.75	7.36	1.75	12.90	2.75	5.07	3.75	3.35
0.83	8.67	1.83	11.27	2.83	4.85	3.83	3.26
0.92	10.64	1.92	10.04	2.92	4.65	3.92	3.18

CALIB					
NASHYD (0101)	Area (ha)=	0.57	Curve Number (CN)=	74.0	
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.12			

Unit Hyd Qpeak (cms)= 0.181

PEAK FLOW (cms)= 0.033 (i)
TIME TO PEAK (hrs)= 1.417
RUNOFF VOLUME (mm)= 15.301
TOTAL RAINFALL (mm)= 50.757
RUNOFF COEFFICIENT = 0.301

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
V    V   I    SS     U   U   A A   L
 V  V    I     SS    U   U  AAAAA  L
 V  V    I      SS   U   U  A   A  L
  VV     I    SSSSS  UUUUU  A   A  LLLLL

 OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
O   O    T      T    H   H   Y Y   MM MM  O   O
O   O    T      T    H   H    Y    M   M  O   O
 OOO     T      T    H   H    Y    M   M   OOO
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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\ff3b851b-b0fb-475f-9df6-48065b24de29\scen
Summary filename: C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\ff3b851b-b0fb-475f-9df6-48065b24de29\scen

DATE: 04-11-2022 TIME: 10:12:24

USER:

COMMENTS: _____

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**********************************************
** SIMULATION : HAZEL                        **
**********************************************
```

READ STORM	Filename: C:\Users\dhordyk\AppData\Local\Temp\f539c440-bbe2-4a81-9f2b-81615b25c7da\bd658d54
Ptotal=212.00 mm	Comments: HAZEL

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	6.00	3.00	13.00	6.00	23.00	9.00	53.00
0.20	6.00	3.20	13.00	6.20	23.00	9.20	53.00
0.40	6.00	3.40	13.00	6.40	23.00	9.40	53.00
0.60	6.00	3.60	13.00	6.60	23.00	9.60	53.00
0.80	6.00	3.80	13.00	6.80	23.00	9.80	53.00
1.00	4.00	4.00	17.00	7.00	13.00	10.00	38.00
1.20	4.00	4.20	17.00	7.20	13.00	10.20	38.00
1.40	4.00	4.40	17.00	7.40	13.00	10.40	38.00
1.60	4.00	4.60	17.00	7.60	13.00	10.60	38.00
1.80	4.00	4.80	17.00	7.80	13.00	10.80	38.00
2.00	6.00	5.00	13.00	8.00	13.00	11.00	13.00
2.20	6.00	5.20	13.00	8.20	13.00	11.20	13.00
2.40	6.00	5.40	13.00	8.40	13.00	11.40	13.00
2.60	6.00	5.60	13.00	8.60	13.00	11.60	13.00
2.80	6.00	5.80	13.00	8.80	13.00	11.80	13.00

```
--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   0.57   Curve Number   (CN)= 74.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.12
```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

```
    Unit Hyd Qpeak  (cms)=   0.181

    PEAK FLOW       (cms)=   0.071 (i)
    TIME TO PEAK    (hrs)=  10.000
    RUNOFF VOLUME    (mm)= 142.710
    TOTAL RAINFALL   (mm)= 212.000
    RUNOFF COEFFICIENT   =   0.673

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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 FINISH
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POST-DEVELOPMENT

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       V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\b01c
222a-87d6-4e7a-b0db-27feccfef743\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\b01c
222a-87d6-4e7a-b0db-27feccfef743\scen


DATE: 04-11-2022                          TIME: 10:12:37

USER:



COMMENTS: _____________________________________________________________


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  ***********************************************
  ** SIMULATION : 100yr 24hr 5min SCS Type II   **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\dhordyk\AppD
|                  |              ata\Local\Temp\
|                  |              cd86384e-8c20-40ff-ac17-d1529f466c73\1ebb117f
| Ptotal=137.63 mm |    Comments: 100yr 24hr 5min SCS Type II
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	6.08	2.48	12.17	19.82	18.25	2.48
0.08	1.51	6.17	2.48	12.25	19.82	18.33	2.48
0.17	1.51	6.25	2.48	12.33	19.82	18.42	2.48
0.25	1.51	6.33	2.48	12.42	19.82	18.50	2.48
0.33	1.51	6.42	2.48	12.50	19.82	18.58	2.48
0.42	1.51	6.50	2.48	12.58	10.18	18.67	2.48
0.50	1.51	6.58	2.48	12.67	10.18	18.75	2.48
0.58	1.51	6.67	2.48	12.75	10.18	18.83	2.48
0.67	1.51	6.75	2.48	12.83	10.18	18.92	2.48
0.75	1.51	6.83	2.48	12.92	10.18	19.00	2.48
0.83	1.51	6.92	2.48	13.00	10.18	19.08	2.48
0.92	1.51	7.00	2.48	13.08	7.43	19.17	2.48
1.00	1.51	7.08	3.03	13.17	7.43	19.25	2.48
1.08	1.51	7.17	3.03	13.25	7.43	19.33	2.48
1.17	1.51	7.25	3.03	13.33	7.43	19.42	2.48
1.25	1.51	7.33	3.03	13.42	7.43	19.50	2.48
1.33	1.51	7.42	3.03	13.50	7.43	19.58	2.48
1.42	1.51	7.50	3.03	13.58	5.78	19.67	2.48
1.50	1.51	7.58	3.03	13.67	5.78	19.75	2.48
1.58	1.51	7.67	3.03	13.75	5.78	19.83	2.48
1.67	1.51	7.75	3.03	13.83	5.78	19.92	2.48
1.75	1.51	7.83	3.03	13.92	5.78	20.00	2.48
1.83	1.51	7.92	3.03	14.00	5.78	20.08	1.65
1.92	1.51	8.00	3.03	14.08	4.13	20.17	1.65
2.00	1.51	8.08	3.58	14.17	4.13	20.25	1.65
2.08	1.79	8.17	3.58	14.25	4.13	20.33	1.65
2.17	1.79	8.25	3.58	14.33	4.13	20.42	1.65
2.25	1.79	8.33	3.58	14.42	4.13	20.50	1.65
2.33	1.79	8.42	3.58	14.50	4.13	20.58	1.65
2.42	1.79	8.50	3.58	14.58	4.13	20.67	1.65
2.50	1.79	8.58	3.85	14.67	4.13	20.75	1.65
2.58	1.79	8.67	3.85	14.75	4.13	20.83	1.65
2.67	1.79	8.75	3.85	14.83	4.13	20.92	1.65
2.75	1.79	8.83	3.85	14.92	4.13	21.00	1.65
2.83	1.79	8.92	3.85	15.00	4.13	21.08	1.65
2.92	1.79	9.00	3.85	15.08	4.13	21.17	1.65
3.00	1.79	9.08	4.40	15.17	4.13	21.25	1.65
3.08	1.79	9.17	4.40	15.25	4.13	21.33	1.65
3.17	1.79	9.25	4.40	15.33	4.13	21.42	1.65
3.25	1.79	9.33	4.40	15.42	4.13	21.50	1.65
3.33	1.79	9.42	4.40	15.50	4.13	21.58	1.65
3.42	1.79	9.50	4.40	15.58	4.13	21.67	1.65
3.50	1.79	9.58	4.95	15.67	4.13	21.75	1.65
3.58	1.79	9.67	4.95	15.75	4.13	21.83	1.65
3.67	1.79	9.75	4.95	15.83	4.13	21.92	1.65

3.75	1.79	9.83	4.95	15.92	4.13	22.00	1.65
3.83	1.79	9.92	4.95	16.00	4.13	22.08	1.65
3.92	1.79	10.00	4.95	16.08	2.48	22.17	1.65
4.00	1.79	10.08	6.33	16.17	2.48	22.25	1.65
4.08	2.20	10.17	6.33	16.25	2.48	22.33	1.65
4.17	2.20	10.25	6.33	16.33	2.48	22.42	1.65
4.25	2.20	10.33	6.33	16.42	2.48	22.50	1.65
4.33	2.20	10.42	6.33	16.50	2.48	22.58	1.65
4.42	2.20	10.50	6.33	16.58	2.48	22.67	1.65
4.50	2.20	10.58	8.53	16.67	2.48	22.75	1.65
4.58	2.20	10.67	8.53	16.75	2.48	22.83	1.65
4.67	2.20	10.75	8.53	16.83	2.48	22.92	1.65
4.75	2.20	10.83	8.53	16.92	2.48	23.00	1.65
4.83	2.20	10.92	8.53	17.00	2.48	23.08	1.65
4.92	2.20	11.00	8.53	17.08	2.48	23.17	1.65
5.00	2.20	11.08	13.21	17.17	2.48	23.25	1.65
5.08	2.20	11.17	13.21	17.25	2.48	23.33	1.65
5.17	2.20	11.25	13.21	17.33	2.48	23.42	1.65
5.25	2.20	11.33	13.21	17.42	2.48	23.50	1.65
5.33	2.20	11.42	13.21	17.50	2.48	23.58	1.65
5.42	2.20	11.50	13.21	17.58	2.48	23.67	1.65
5.50	2.20	11.58	40.74	17.67	2.48	23.75	1.65
5.58	2.20	11.67	40.74	17.75	2.48	23.83	1.65
5.67	2.20	11.75	40.74	17.83	2.48	23.92	1.65
5.75	2.20	11.83	168.46	17.92	2.48	24.00	1.65
5.83	2.20	11.92	168.46	18.00	2.48		
5.92	2.20	12.00	168.46	18.08	2.48		
6.00	2.20	12.08	19.82	18.17	2.48		

CALIB	
NASHYD (0203)	Area (ha)= 0.09 Curve Number (CN)= 73.6
ID= 1 DT= 5.0 min	Ia (mm)= 4.40 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.05

Unit Hyd Qpeak (cms)= 0.070

PEAK FLOW (cms)= 0.023 (i)
TIME TO PEAK (hrs)= 12.083
RUNOFF VOLUME (mm)= 60.367
TOTAL RAINFALL (mm)= 137.630
RUNOFF COEFFICIENT = 0.439

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB

STANDHYD (0201)	Area (ha)= 0.33
ID= 1 DT= 5.0 min	Total Imp(%)= 97.60 Dir. Conn.(%)= 97.60

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.32	0.01	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	3.00	4.00	
Length	(m)=	46.98	30.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		168.46	102.64	
over (min)		5.00	5.00	
Storage Coeff. (min)=		0.95 (ii)	1.84 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.34	0.32	
				TOTALS
PEAK FLOW	(cms)=	0.15	0.00	0.154 (iii)
TIME TO PEAK	(hrs)=	12.08	12.08	12.08
RUNOFF VOLUME	(mm)=	135.63	69.76	134.05
TOTAL RAINFALL	(mm)=	137.63	137.63	137.63
RUNOFF COEFFICIENT	=	0.99	0.51	0.97

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 68.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0204)	Area (ha)= 0.08
ID= 1 DT= 5.0 min	Total Imp(%)= 25.90 Dir. Conn.(%)= 13.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.02	0.06	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	5.00	
Length	(m)=	23.52	20.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		168.46	130.23	
over (min)		5.00	5.00	
Storage Coeff. (min)=		0.71 (ii)	3.89 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.34	0.25	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.02	0.027 (iii)

```
     TIME TO PEAK    (hrs)=      12.08        12.08          12.08
     RUNOFF VOLUME    (mm)=     135.63        75.64          83.40
     TOTAL RAINFALL   (mm)=     137.63       137.63         137.63
     RUNOFF COEFFICIENT   =       0.99         0.55           0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     168.46       102.64
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.53 (ii)    2.64 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.29
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.027 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.08          12.08
     RUNOFF VOLUME    (mm)=     135.63        69.76         114.88
     TOTAL RAINFALL   (mm)=     137.63       137.63         137.63
     RUNOFF COEFFICIENT   =       0.99         0.51           0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0201):     0.33   0.154    12.08   134.05
     + ID2= 2 (  0202):     0.06   0.027    12.08   114.88
       ================================================
       ID = 3 (  0205):     0.40   0.180    12.08   130.90

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0205):     0.40   0.180    12.08   130.90
     + ID2= 2 (  0203):     0.09   0.023    12.08    60.37
       ================================================
       ID = 1 (  0205):     0.49   0.203    12.08   117.72

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0205):     0.49   0.203    12.08   117.72
     + ID2= 2 (  0204):     0.08   0.027    12.08    83.40
       ================================================
       ID = 3 (  0205):     0.57   0.231    12.08   112.72

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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================================================================================
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      V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
      V    V   I    SS     U   U   A A   L
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

Output filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\1064ab2a-4045-4be0-86d1-bc385dee6caf\scen
Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\1064ab2a-4045-4be0-86d1-bc385dee6caf\scen

DATE: 04-11-2022 TIME: 10:12:36

USER:

COMMENTS: _____

****
** SIMULATION : 100yr 4hr 5min Chicago **
****

CHICAGO STORM
Ptotal= 87.45 mm

IDF curve parameters: A=1383.628
B= 4.905
C= 0.754
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	6.06	1.00	24.64	2.00	16.04	3.00	7.96
0.08	6.41	1.08	36.97	2.08	14.68	3.08	7.67
0.17	6.81	1.17	81.48	2.17	13.55	3.17	7.40
0.25	7.27	1.25	245.55	2.25	12.60	3.25	7.15
0.33	7.81	1.33	103.86	2.33	11.79	3.33	6.92
0.42	8.45	1.42	59.20	2.42	11.08	3.42	6.71
0.50	9.23	1.50	41.66	2.50	10.47	3.50	6.51
0.58	10.19	1.58	32.37	2.58	9.93	3.58	6.32
0.67	11.42	1.67	26.62	2.67	9.45	3.67	6.15
0.75	13.06	1.75	22.72	2.75	9.02	3.75	5.99
0.83	15.34	1.83	19.89	2.83	8.63	3.83	5.83
0.92	18.79	1.92	17.73	2.92	8.28	3.92	5.69

CALIB NASHYD (0203) ID= 1 DT= 5.0 min	Area (ha)= 0.09 Curve Number (CN)= 73.6 Ia (mm)= 4.40 # of Linear Res.(N)= 3.00 U.H. Tp(hrs)= 0.05

Unit Hyd Qpeak (cms)= 0.070

PEAK FLOW (cms)= 0.017 (i)
TIME TO PEAK (hrs)= 1.333
RUNOFF VOLUME (mm)= 30.211
TOTAL RAINFALL (mm)= 87.445
RUNOFF COEFFICIENT = 0.345

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (0201) ID= 1 DT= 5.0 min	Area (ha)= 0.33 Total Imp(%)= 97.60 Dir. Conn.(%)= 97.60

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.32	0.01	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	3.00	4.00	
Length	(m)=	46.98	30.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		245.55	64.33	
over (min)		5.00	5.00	
Storage Coeff. (min)=		0.82 (ii)	1.58 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.34	0.33	
				TOTALS
PEAK FLOW	(cms)=	0.22	0.00	0.222 (iii)
TIME TO PEAK	(hrs)=	1.33	1.33	1.33
RUNOFF VOLUME	(mm)=	85.45	33.65	84.20
TOTAL RAINFALL	(mm)=	87.45	87.45	87.45
RUNOFF COEFFICIENT	=	0.98	0.38	0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     245.55        85.49
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       0.61 (ii)    5.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.34         0.16
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01         0.015 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.42
     RUNOFF VOLUME    (mm)=      85.45        37.41         43.63
     TOTAL RAINFALL   (mm)=      87.45        87.45         87.45
     RUNOFF COEFFICIENT   =       0.98         0.43          0.50

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     245.55        64.33
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.46 (ii)    2.27 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.30
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.00         0.035 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      85.45        33.65         69.12
     TOTAL RAINFALL   (mm)=      87.45        87.45         87.45
     RUNOFF COEFFICIENT   =       0.98         0.38          0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0201):     0.33   0.222     1.33    84.20
     + ID2= 2 (  0202):     0.06   0.035     1.33    69.12
       ================================================
       ID = 3 (  0205):     0.40   0.256     1.33    81.73

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0205):     0.40   0.256     1.33    81.73
     + ID2= 2 (  0203):     0.09   0.017     1.33    30.21
       ================================================
       ID = 1 (  0205):     0.49   0.274     1.33    72.10

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
```

```
--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
       ID1= 1 (  0205):      0.49    0.274     1.33     72.10
     + ID2= 2 (  0204):      0.08    0.015     1.42     43.63
       ================================================
       ID = 3 (  0205):      0.57    0.287     1.33     67.95

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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================================================================================
========================

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\a514
249c-106f-4ff4-8730-34759a6012e9\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\a514
249c-106f-4ff4-8730-34759a6012e9\scen


DATE: 04-11-2022                          TIME: 10:12:37

USER:



COMMENTS: _____________________________________________________________
```

```
--------------------------------------------------------------------------------
-----------------------
  ********************************************
  ** SIMULATION : 10yr 24hr 5min SCS Type II    **
  ********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\dhordyk\AppD
|                  |              ata\Local\Temp\
|                  |              cd86384e-8c20-40ff-ac17-d1529f466c73\bdb34a83
| Ptotal= 93.03 mm |    Comments: 10yr 24hr 5min SCS Type II
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	6.08	1.67	12.17	13.40	18.25	1.67
0.08	1.02	6.17	1.67	12.25	13.40	18.33	1.67
0.17	1.02	6.25	1.67	12.33	13.40	18.42	1.67
0.25	1.02	6.33	1.67	12.42	13.40	18.50	1.67
0.33	1.02	6.42	1.67	12.50	13.40	18.58	1.67
0.42	1.02	6.50	1.67	12.58	6.88	18.67	1.67
0.50	1.02	6.58	1.67	12.67	6.88	18.75	1.67
0.58	1.02	6.67	1.67	12.75	6.88	18.83	1.67
0.67	1.02	6.75	1.67	12.83	6.88	18.92	1.67
0.75	1.02	6.83	1.67	12.92	6.88	19.00	1.67
0.83	1.02	6.92	1.67	13.00	6.88	19.08	1.67
0.92	1.02	7.00	1.67	13.08	5.02	19.17	1.67
1.00	1.02	7.08	2.05	13.17	5.02	19.25	1.67
1.08	1.02	7.17	2.05	13.25	5.02	19.33	1.67
1.17	1.02	7.25	2.05	13.33	5.02	19.42	1.67
1.25	1.02	7.33	2.05	13.42	5.02	19.50	1.67
1.33	1.02	7.42	2.05	13.50	5.02	19.58	1.67
1.42	1.02	7.50	2.05	13.58	3.91	19.67	1.67
1.50	1.02	7.58	2.05	13.67	3.91	19.75	1.67
1.58	1.02	7.67	2.05	13.75	3.91	19.83	1.67
1.67	1.02	7.75	2.05	13.83	3.91	19.92	1.67
1.75	1.02	7.83	2.05	13.92	3.91	20.00	1.67
1.83	1.02	7.92	2.05	14.00	3.91	20.08	1.12
1.92	1.02	8.00	2.05	14.08	2.79	20.17	1.12
2.00	1.02	8.08	2.42	14.17	2.79	20.25	1.12
2.08	1.21	8.17	2.42	14.25	2.79	20.33	1.12
2.17	1.21	8.25	2.42	14.33	2.79	20.42	1.12
2.25	1.21	8.33	2.42	14.42	2.79	20.50	1.12
2.33	1.21	8.42	2.42	14.50	2.79	20.58	1.12
2.42	1.21	8.50	2.42	14.58	2.79	20.67	1.12
2.50	1.21	8.58	2.60	14.67	2.79	20.75	1.12
2.58	1.21	8.67	2.60	14.75	2.79	20.83	1.12
2.67	1.21	8.75	2.60	14.83	2.79	20.92	1.12

2.75	1.21	8.83	2.60	14.92	2.79	21.00	1.12
2.83	1.21	8.92	2.60	15.00	2.79	21.08	1.12
2.92	1.21	9.00	2.60	15.08	2.79	21.17	1.12
3.00	1.21	9.08	2.98	15.17	2.79	21.25	1.12
3.08	1.21	9.17	2.98	15.25	2.79	21.33	1.12
3.17	1.21	9.25	2.98	15.33	2.79	21.42	1.12
3.25	1.21	9.33	2.98	15.42	2.79	21.50	1.12
3.33	1.21	9.42	2.98	15.50	2.79	21.58	1.12
3.42	1.21	9.50	2.98	15.58	2.79	21.67	1.12
3.50	1.21	9.58	3.35	15.67	2.79	21.75	1.12
3.58	1.21	9.67	3.35	15.75	2.79	21.83	1.12
3.67	1.21	9.75	3.35	15.83	2.79	21.92	1.12
3.75	1.21	9.83	3.35	15.92	2.79	22.00	1.12
3.83	1.21	9.92	3.35	16.00	2.79	22.08	1.12
3.92	1.21	10.00	3.35	16.08	1.67	22.17	1.12
4.00	1.21	10.08	4.28	16.17	1.67	22.25	1.12
4.08	1.49	10.17	4.28	16.25	1.67	22.33	1.12
4.17	1.49	10.25	4.28	16.33	1.67	22.42	1.12
4.25	1.49	10.33	4.28	16.42	1.67	22.50	1.12
4.33	1.49	10.42	4.28	16.50	1.67	22.58	1.12
4.42	1.49	10.50	4.28	16.58	1.67	22.67	1.12
4.50	1.49	10.58	5.77	16.67	1.67	22.75	1.12
4.58	1.49	10.67	5.77	16.75	1.67	22.83	1.12
4.67	1.49	10.75	5.77	16.83	1.67	22.92	1.12
4.75	1.49	10.83	5.77	16.92	1.67	23.00	1.12
4.83	1.49	10.92	5.77	17.00	1.67	23.08	1.12
4.92	1.49	11.00	5.77	17.08	1.67	23.17	1.12
5.00	1.49	11.08	8.93	17.17	1.67	23.25	1.12
5.08	1.49	11.17	8.93	17.25	1.67	23.33	1.12
5.17	1.49	11.25	8.93	17.33	1.67	23.42	1.12
5.25	1.49	11.33	8.93	17.42	1.67	23.50	1.12
5.33	1.49	11.42	8.93	17.50	1.67	23.58	1.12
5.42	1.49	11.50	8.93	17.58	1.67	23.67	1.12
5.50	1.49	11.58	27.54	17.67	1.67	23.75	1.12
5.58	1.49	11.67	27.54	17.75	1.67	23.83	1.12
5.67	1.49	11.75	27.54	17.83	1.67	23.92	1.12
5.75	1.49	11.83	113.87	17.92	1.67	24.00	1.12
5.83	1.49	11.92	113.87	18.00	1.67		
5.92	1.49	12.00	113.87	18.08	1.67		
6.00	1.49	12.08	13.40	18.17	1.67		

CALIB					
NASHYD (0203)	Area (ha)= 0.09	Curve Number (CN)= 73.6			
ID= 1 DT= 5.0 min	Ia (mm)= 4.40	# of Linear Res.(N)= 3.00			
	U.H. Tp(hrs)= 0.05				

Unit Hyd Qpeak (cms)= 0.070

PEAK FLOW (cms)= 0.013 (i)
TIME TO PEAK (hrs)= 12.083
RUNOFF VOLUME (mm)= 33.344
TOTAL RAINFALL (mm)= 93.030
RUNOFF COEFFICIENT = 0.358

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0201)	Area (ha)= 0.33				
ID= 1 DT= 5.0 min	Total Imp(%)= 97.60	Dir. Conn.(%)= 97.60			
		IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)=	0.32	0.01		
Dep. Storage	(mm)=	2.00	5.00		
Average Slope	(%)=	3.00	4.00		
Length	(m)=	46.98	30.00		
Mannings n	=	0.013	0.250		
Max.Eff.Inten.(mm/hr)=		113.87	55.15		
over (min)		5.00	5.00		
Storage Coeff. (min)=		1.11 (ii)	2.15 (ii)		
Unit Hyd. Tpeak (min)=		5.00	5.00		
Unit Hyd. peak (cms)=		0.34	0.31		
				TOTALS	
PEAK FLOW	(cms)=	0.10	0.00	0.103 (iii)	
TIME TO PEAK	(hrs)=	12.08	12.08	12.08	
RUNOFF VOLUME	(mm)=	91.03	37.34	89.74	
TOTAL RAINFALL	(mm)=	93.03	93.03	93.03	
RUNOFF COEFFICIENT	=	0.98	0.40	0.96	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 68.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0204)	Area (ha)= 0.08				
ID= 1 DT= 5.0 min	Total Imp(%)= 25.90	Dir. Conn.(%)= 13.00			
		IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)=	0.02	0.06		

```
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     113.87        71.64
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.83 (ii)    4.87 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.22
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.01         0.015 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08         12.08
     RUNOFF VOLUME    (mm)=      91.03        41.35         47.78
     TOTAL RAINFALL   (mm)=      93.03        93.03         93.03
     RUNOFF COEFFICIENT   =       0.98         0.44          0.51

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     113.87        55.15
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.62 (ii)    3.09 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.27
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00         0.017 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08         12.08
     RUNOFF VOLUME    (mm)=      91.03        37.34         74.11
     TOTAL RAINFALL   (mm)=      93.03        93.03         93.03
     RUNOFF COEFFICIENT   =       0.98         0.40          0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0201):     0.33   0.103    12.08    89.74
     + ID2= 2 (  0202):     0.06   0.017    12.08    74.11
       ================================================
       ID = 3 (  0205):     0.40   0.121    12.08    87.17

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0205):     0.40   0.121    12.08    87.17
     + ID2= 2 (  0203):     0.09   0.013    12.08    33.34
       ================================================
       ID = 1 (  0205):     0.49   0.134    12.08    77.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0205):     0.49   0.134    12.08    77.12
     + ID2= 2 (  0204):     0.08   0.015    12.08    47.78
       ================================================
       ID = 3 (  0205):     0.57   0.149    12.08    72.84

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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```
       V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

Output filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\969eb80a-8c10-4f86-acc1-4c9bb8647b93\scen
Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\969eb80a-8c10-4f86-acc1-4c9bb8647b93\scen

DATE: 04-11-2022 TIME: 10:12:36

USER:

COMMENTS: _____

****
** SIMULATION : 10yr 4hr 5min Chicago **
****

| CHICAGO STORM | Ptotal= 59.77 mm |

IDF curve parameters: A= 976.898
B= 4.745
C= 0.760
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	4.04	1.00	16.64	2.00	10.79	3.00	5.32
0.08	4.28	1.08	25.08	2.08	9.86	3.08	5.13
0.17	4.55	1.17	55.96	2.17	9.10	3.17	4.94
0.25	4.86	1.25	173.13	2.25	8.45	3.25	4.78
0.33	5.22	1.33	71.59	2.33	7.91	3.33	4.62
0.42	5.65	1.42	40.40	2.42	7.43	3.42	4.48
0.50	6.18	1.50	28.30	2.50	7.02	3.50	4.34
0.58	6.83	1.58	21.92	2.58	6.65	3.58	4.22
0.67	7.66	1.67	17.99	2.67	6.33	3.67	4.10
0.75	8.77	1.75	15.33	2.75	6.04	3.75	3.99
0.83	10.31	1.83	13.40	2.83	5.78	3.83	3.89
0.92	12.65	1.92	11.94	2.92	5.54	3.92	3.79

CALIB NASHYD (0203) ID= 1 DT= 5.0 min	Area (ha)= 0.09 Curve Number (CN)= 73.6 Ia (mm)= 4.40 # of Linear Res.(N)= 3.00 U.H. Tp(hrs)= 0.05

Unit Hyd Qpeak (cms)= 0.070

PEAK FLOW (cms)= 0.009 (i)
TIME TO PEAK (hrs)= 1.333
RUNOFF VOLUME (mm)= 15.965
TOTAL RAINFALL (mm)= 59.765
RUNOFF COEFFICIENT = 0.267

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (0201) ID= 1 DT= 5.0 min	Area (ha)= 0.33 Total Imp(%)= 97.60 Dir. Conn.(%)= 97.60

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.32	0.01
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	3.00	4.00
Length	(m)=	46.98	30.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		173.13	32.19

```
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.94 (ii)    1.82 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.32
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.15         0.00          0.156 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      57.77        17.21          56.79
     TOTAL RAINFALL   (mm)=      59.77        59.77          59.77
     RUNOFF COEFFICIENT   =       0.97         0.29           0.95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.13        43.96
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       0.70 (ii)    5.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.34         0.15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01          0.008 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      57.77        19.59          24.51
     TOTAL RAINFALL   (mm)=      59.77        59.77          59.77
     RUNOFF COEFFICIENT   =       0.97         0.33           0.41

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.13        32.19
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.53 (ii)    2.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.29
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.023 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      57.77        17.21          44.98
     TOTAL RAINFALL   (mm)=      59.77        59.77          59.77
     RUNOFF COEFFICIENT   =       0.97         0.29           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0201):     0.33   0.156     1.33    56.79
     + ID2= 2 (  0202):     0.06   0.023     1.33    44.98
       ================================================
       ID = 3 (  0205):     0.40   0.179     1.33    54.85

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
```

```
--------------------
| ADD HYD  (  0205)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0205):     0.40   0.179     1.33    54.85
      + ID2= 2 (  0203):     0.09   0.009     1.33    15.97
        ================================================
        ID = 1 (  0205):     0.49   0.188     1.33    47.59

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0205):     0.49   0.188     1.33    47.59
      + ID2= 2 (  0204):     0.08   0.008     1.33    24.51
        ================================================
        ID = 3 (  0205):     0.57   0.196     1.33    44.23

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
========================

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\1ac3
d834-bf7b-4e5b-b0ed-844fa972173b\scen

  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\1ac3
d834-bf7b-4e5b-b0ed-844fa972173b\scen


DATE: 04-11-2022                          TIME: 10:12:36

USER:


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ***********************************************
  ** SIMULATION : 25yr 24hr 5min SCS Type II    **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\dhordyk\AppD
|                  |              ata\Local\Temp\
|                  |              cd86384e-8c20-40ff-ac17-d1529f466c73\8a53c9fe
| Ptotal=111.09 mm |    Comments: 25yr 24hr 5min SCS Type II
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00    0.00 |  6.08    2.00 | 12.17   16.00 | 18.25    2.00
                0.08    1.22 |  6.17    2.00 | 12.25   16.00 | 18.33    2.00
                0.17    1.22 |  6.25    2.00 | 12.33   16.00 | 18.42    2.00
                0.25    1.22 |  6.33    2.00 | 12.42   16.00 | 18.50    2.00
                0.33    1.22 |  6.42    2.00 | 12.50   16.00 | 18.58    2.00
                0.42    1.22 |  6.50    2.00 | 12.58    8.22 | 18.67    2.00
                0.50    1.22 |  6.58    2.00 | 12.67    8.22 | 18.75    2.00
                0.58    1.22 |  6.67    2.00 | 12.75    8.22 | 18.83    2.00
                0.67    1.22 |  6.75    2.00 | 12.83    8.22 | 18.92    2.00
                0.75    1.22 |  6.83    2.00 | 12.92    8.22 | 19.00    2.00
                0.83    1.22 |  6.92    2.00 | 13.00    8.22 | 19.08    2.00
                0.92    1.22 |  7.00    2.00 | 13.08    6.00 | 19.17    2.00
                1.00    1.22 |  7.08    2.44 | 13.17    6.00 | 19.25    2.00
                1.08    1.22 |  7.17    2.44 | 13.25    6.00 | 19.33    2.00
                1.17    1.22 |  7.25    2.44 | 13.33    6.00 | 19.42    2.00
                1.25    1.22 |  7.33    2.44 | 13.42    6.00 | 19.50    2.00
                1.33    1.22 |  7.42    2.44 | 13.50    6.00 | 19.58    2.00
                1.42    1.22 |  7.50    2.44 | 13.58    4.67 | 19.67    2.00
                1.50    1.22 |  7.58    2.44 | 13.67    4.67 | 19.75    2.00
                1.58    1.22 |  7.67    2.44 | 13.75    4.67 | 19.83    2.00
                1.67    1.22 |  7.75    2.44 | 13.83    4.67 | 19.92    2.00
```

1.75	1.22	7.83	2.44	13.92	4.67	20.00	2.00
1.83	1.22	7.92	2.44	14.00	4.67	20.08	1.33
1.92	1.22	8.00	2.44	14.08	3.33	20.17	1.33
2.00	1.22	8.08	2.89	14.17	3.33	20.25	1.33
2.08	1.44	8.17	2.89	14.25	3.33	20.33	1.33
2.17	1.44	8.25	2.89	14.33	3.33	20.42	1.33
2.25	1.44	8.33	2.89	14.42	3.33	20.50	1.33
2.33	1.44	8.42	2.89	14.50	3.33	20.58	1.33
2.42	1.44	8.50	2.89	14.58	3.33	20.67	1.33
2.50	1.44	8.58	3.11	14.67	3.33	20.75	1.33
2.58	1.44	8.67	3.11	14.75	3.33	20.83	1.33
2.67	1.44	8.75	3.11	14.83	3.33	20.92	1.33
2.75	1.44	8.83	3.11	14.92	3.33	21.00	1.33
2.83	1.44	8.92	3.11	15.00	3.33	21.08	1.33
2.92	1.44	9.00	3.11	15.08	3.33	21.17	1.33
3.00	1.44	9.08	3.55	15.17	3.33	21.25	1.33
3.08	1.44	9.17	3.55	15.25	3.33	21.33	1.33
3.17	1.44	9.25	3.55	15.33	3.33	21.42	1.33
3.25	1.44	9.33	3.55	15.42	3.33	21.50	1.33
3.33	1.44	9.42	3.55	15.50	3.33	21.58	1.33
3.42	1.44	9.50	3.55	15.58	3.33	21.67	1.33
3.50	1.44	9.58	4.00	15.67	3.33	21.75	1.33
3.58	1.44	9.67	4.00	15.75	3.33	21.83	1.33
3.67	1.44	9.75	4.00	15.83	3.33	21.92	1.33
3.75	1.44	9.83	4.00	15.92	3.33	22.00	1.33
3.83	1.44	9.92	4.00	16.00	3.33	22.08	1.33
3.92	1.44	10.00	4.00	16.08	2.00	22.17	1.33
4.00	1.44	10.08	5.11	16.17	2.00	22.25	1.33
4.08	1.78	10.17	5.11	16.25	2.00	22.33	1.33
4.17	1.78	10.25	5.11	16.33	2.00	22.42	1.33
4.25	1.78	10.33	5.11	16.42	2.00	22.50	1.33
4.33	1.78	10.42	5.11	16.50	2.00	22.58	1.33
4.42	1.78	10.50	5.11	16.58	2.00	22.67	1.33
4.50	1.78	10.58	6.89	16.67	2.00	22.75	1.33
4.58	1.78	10.67	6.89	16.75	2.00	22.83	1.33
4.67	1.78	10.75	6.89	16.83	2.00	22.92	1.33
4.75	1.78	10.83	6.89	16.92	2.00	23.00	1.33
4.83	1.78	10.92	6.89	17.00	2.00	23.08	1.33
4.92	1.78	11.00	6.89	17.08	2.00	23.17	1.33
5.00	1.78	11.08	10.66	17.17	2.00	23.25	1.33
5.08	1.78	11.17	10.66	17.25	2.00	23.33	1.33
5.17	1.78	11.25	10.66	17.33	2.00	23.42	1.33
5.25	1.78	11.33	10.66	17.42	2.00	23.50	1.33
5.33	1.78	11.42	10.66	17.50	2.00	23.58	1.33
5.42	1.78	11.50	10.66	17.58	2.00	23.67	1.33
5.50	1.78	11.58	32.88	17.67	2.00	23.75	1.33
5.58	1.78	11.67	32.88	17.75	2.00	23.83	1.33
5.67	1.78	11.75	32.88	17.83	2.00	23.92	1.33
5.75	1.78	11.83	135.97	17.92	2.00	24.00	1.33
5.83	1.78	11.92	135.97	18.00	2.00		
5.92	1.78	12.00	135.97	18.08	2.00		
6.00	1.78	12.08	16.00	18.17	2.00		

CALIB					
NASHYD (0203)	Area (ha)= 0.09	Curve Number (CN)= 73.6			
ID= 1 DT= 5.0 min	Ia (mm)= 4.40	# of Linear Res.(N)= 3.00			
	U.H. Tp(hrs)= 0.05				

Unit Hyd Qpeak (cms)= 0.070

PEAK FLOW (cms)= 0.017 (i)
TIME TO PEAK (hrs)= 12.083
RUNOFF VOLUME (mm)= 43.906
TOTAL RAINFALL (mm)= 111.090
RUNOFF COEFFICIENT = 0.395

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (0201)	Area (ha)= 0.33	
ID= 1 DT= 5.0 min	Total Imp(%)= 97.60	Dir. Conn.(%)= 97.60

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.32	0.01	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	3.00	4.00	
Length	(m)=	46.98	30.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	135.97	73.60	
over (min)		5.00	5.00	
Storage Coeff.	(min)=	1.03 (ii)	2.00 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	5.00	
Unit Hyd. peak	(cms)=	0.34	0.31	
				TOTALS
PEAK FLOW	(cms)=	0.12	0.00	0.124 (iii)
TIME TO PEAK	(hrs)=	12.08	12.08	12.08
RUNOFF VOLUME	(mm)=	109.09	49.89	107.67
TOTAL RAINFALL	(mm)=	111.09	111.09	111.09
RUNOFF COEFFICIENT	=	0.98	0.45	0.97

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 68.0 Ia = Dep. Storage (Above)

```
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     135.97        94.58
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.77 (ii)    4.39 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.23
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.02          0.020 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08          12.08
     RUNOFF VOLUME    (mm)=     109.09        54.70          61.74
     TOTAL RAINFALL   (mm)=     111.09       111.09         111.09
     RUNOFF COEFFICIENT   =       0.98         0.49           0.56

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     135.97        73.60
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.58 (ii)    2.87 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.28
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.021 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.08          12.08
     RUNOFF VOLUME    (mm)=     109.09        49.88          90.44
     TOTAL RAINFALL   (mm)=     111.09       111.09         111.09
     RUNOFF COEFFICIENT   =       0.98         0.45           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0201):     0.33   0.124    12.08   107.67
     + ID2= 2 (  0202):     0.06   0.021    12.08    90.44
       ================================================
       ID = 3 (  0205):     0.40   0.145    12.08   104.84

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0205):     0.40   0.145    12.08   104.84
     + ID2= 2 (  0203):     0.09   0.017    12.08    43.91
       ================================================
       ID = 1 (  0205):     0.49   0.162    12.08    93.45

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
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```
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0205):     0.49   0.162    12.08    93.45
      + ID2= 2 (  0204):     0.08   0.020    12.08    61.74
        ====================================================
        ID = 3 (  0205):     0.57   0.182    12.08    88.84

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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       V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\bd60
d0cd-082d-4aed-bfd0-0afab54bef4e\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\bd60
d0cd-082d-4aed-bfd0-0afab54bef4e\scen


DATE: 04-11-2022                          TIME: 10:12:36

USER:



COMMENTS: _____________________________________________________________


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  ***********************************************
  ** SIMULATION : 25yr 4hr 5min Chicago         **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1133.123
| Ptotal= 70.87 mm |                          B=   4.734
--------------------                          C=   0.756
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =  0.33

              TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
               hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
              0.00    4.87 |  1.00   19.82 |  2.00   12.89 |  3.00    6.39
              0.08    5.15 |  1.08   29.77 |  2.08   11.79 |  3.08    6.16
              0.17    5.47 |  1.17   65.99 |  2.17   10.89 |  3.17    5.94
              0.25    5.84 |  1.25  202.83 |  2.25   10.12 |  3.25    5.74
              0.33    6.27 |  1.33   84.29 |  2.33    9.47 |  3.33    5.56
              0.42    6.79 |  1.42   47.77 |  2.42    8.91 |  3.42    5.39
              0.50    7.41 |  1.50   33.55 |  2.50    8.41 |  3.50    5.23
              0.58    8.19 |  1.58   26.05 |  2.58    7.98 |  3.58    5.08
              0.67    9.18 |  1.67   21.41 |  2.67    7.59 |  3.67    4.94
              0.75   10.49 |  1.75   18.27 |  2.75    7.25 |  3.75    4.81
              0.83   12.33 |  1.83   15.99 |  2.83    6.93 |  3.83    4.68
              0.92   15.10 |  1.92   14.26 |  2.92    6.65 |  3.92    4.57


------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0203)|   Area    (ha)=   0.09   Curve Number   (CN)= 73.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.05

     Unit Hyd Qpeak  (cms)=   0.070

     PEAK FLOW       (cms)=   0.012 (i)
     TIME TO PEAK    (hrs)=   1.333
     RUNOFF VOLUME    (mm)=  21.389
     TOTAL RAINFALL   (mm)=  70.867
     RUNOFF COEFFICIENT   =   0.302

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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```
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  97.60   Dir. Conn.(%)=  97.60
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.01
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       3.00         4.00
     Length            (m)=      46.98        30.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     202.83        44.25
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.88 (ii)    1.71 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.32
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.18         0.00          0.183 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      68.87        23.40          67.77
     TOTAL RAINFALL   (mm)=      70.87        70.87          70.87
     RUNOFF COEFFICIENT   =       0.97         0.33           0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     202.83        59.67
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       0.66 (ii)    5.00 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.34         0.16
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01          0.011 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.42
     RUNOFF VOLUME    (mm)=      68.87        26.34          31.84
     TOTAL RAINFALL   (mm)=      70.87        70.87          70.87
     RUNOFF COEFFICIENT   =       0.97         0.37           0.45

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     202.83        44.25
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.50 (ii)    2.45 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.30
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.00          0.028 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      68.87        23.40          54.54
     TOTAL RAINFALL   (mm)=      70.87        70.87          70.87
     RUNOFF COEFFICIENT   =       0.97         0.33           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0201):     0.33   0.183     1.33    67.77
     + ID2= 2 (  0202):     0.06   0.028     1.33    54.54
       ================================================
       ID = 3 (  0205):     0.40   0.211     1.33    65.60

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0205):     0.40   0.211     1.33    65.60
     + ID2= 2 (  0203):     0.09   0.012     1.33    21.39
       ================================================
       ID = 1 (  0205):     0.49   0.223     1.33    57.34

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0205):     0.49   0.223     1.33    57.34
     + ID2= 2 (  0204):     0.08   0.011     1.42    31.84
       ================================================
       ID = 3 (  0205):     0.57   0.233     1.33    53.63

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
========================

       V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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```
                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\3d70
ab07-5ad6-4137-b607-a20aa16b2394\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\3d70
ab07-5ad6-4137-b607-a20aa16b2394\scen


DATE: 04-11-2022                          TIME: 10:12:37

USER:


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ***********************************************
  ** SIMULATION : 2yr 24hr 5min SCS Type II     **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\dhordyk\AppD
|                  |              ata\Local\Temp\
|                  |              cd86384e-8c20-40ff-ac17-d1529f466c73\35a9b8d2
| Ptotal= 55.62 mm |    Comments: 2yr 24hr 5min SCS Type II
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00    0.00 |  6.08    1.00 | 12.17    8.01 | 18.25    1.00
                0.08    0.61 |  6.17    1.00 | 12.25    8.01 | 18.33    1.00
                0.17    0.61 |  6.25    1.00 | 12.33    8.01 | 18.42    1.00
                0.25    0.61 |  6.33    1.00 | 12.42    8.01 | 18.50    1.00
                0.33    0.61 |  6.42    1.00 | 12.50    8.01 | 18.58    1.00
                0.42    0.61 |  6.50    1.00 | 12.58    4.12 | 18.67    1.00
                0.50    0.61 |  6.58    1.00 | 12.67    4.12 | 18.75    1.00
                0.58    0.61 |  6.67    1.00 | 12.75    4.12 | 18.83    1.00
                0.67    0.61 |  6.75    1.00 | 12.83    4.12 | 18.92    1.00
```

0.75	0.61	6.83	1.00	12.92	4.12	19.00	1.00
0.83	0.61	6.92	1.00	13.00	4.12	19.08	1.00
0.92	0.61	7.00	1.00	13.08	3.00	19.17	1.00
1.00	0.61	7.08	1.22	13.17	3.00	19.25	1.00
1.08	0.61	7.17	1.22	13.25	3.00	19.33	1.00
1.17	0.61	7.25	1.22	13.33	3.00	19.42	1.00
1.25	0.61	7.33	1.22	13.42	3.00	19.50	1.00
1.33	0.61	7.42	1.22	13.50	3.00	19.58	1.00
1.42	0.61	7.50	1.22	13.58	2.34	19.67	1.00
1.50	0.61	7.58	1.22	13.67	2.34	19.75	1.00
1.58	0.61	7.67	1.22	13.75	2.34	19.83	1.00
1.67	0.61	7.75	1.22	13.83	2.34	19.92	1.00
1.75	0.61	7.83	1.22	13.92	2.34	20.00	1.00
1.83	0.61	7.92	1.22	14.00	2.34	20.08	0.67
1.92	0.61	8.00	1.22	14.08	1.67	20.17	0.67
2.00	0.61	8.08	1.45	14.17	1.67	20.25	0.67
2.08	0.72	8.17	1.45	14.25	1.67	20.33	0.67
2.17	0.72	8.25	1.45	14.33	1.67	20.42	0.67
2.25	0.72	8.33	1.45	14.42	1.67	20.50	0.67
2.33	0.72	8.42	1.45	14.50	1.67	20.58	0.67
2.42	0.72	8.50	1.45	14.58	1.67	20.67	0.67
2.50	0.72	8.58	1.56	14.67	1.67	20.75	0.67
2.58	0.72	8.67	1.56	14.75	1.67	20.83	0.67
2.67	0.72	8.75	1.56	14.83	1.67	20.92	0.67
2.75	0.72	8.83	1.56	14.92	1.67	21.00	0.67
2.83	0.72	8.92	1.56	15.00	1.67	21.08	0.67
2.92	0.72	9.00	1.56	15.08	1.67	21.17	0.67
3.00	0.72	9.08	1.78	15.17	1.67	21.25	0.67
3.08	0.72	9.17	1.78	15.25	1.67	21.33	0.67
3.17	0.72	9.25	1.78	15.33	1.67	21.42	0.67
3.25	0.72	9.33	1.78	15.42	1.67	21.50	0.67
3.33	0.72	9.42	1.78	15.50	1.67	21.58	0.67
3.42	0.72	9.50	1.78	15.58	1.67	21.67	0.67
3.50	0.72	9.58	2.00	15.67	1.67	21.75	0.67
3.58	0.72	9.67	2.00	15.75	1.67	21.83	0.67
3.67	0.72	9.75	2.00	15.83	1.67	21.92	0.67
3.75	0.72	9.83	2.00	15.92	1.67	22.00	0.67
3.83	0.72	9.92	2.00	16.00	1.67	22.08	0.67
3.92	0.72	10.00	2.00	16.08	1.00	22.17	0.67
4.00	0.72	10.08	2.56	16.17	1.00	22.25	0.67
4.08	0.89	10.17	2.56	16.25	1.00	22.33	0.67
4.17	0.89	10.25	2.56	16.33	1.00	22.42	0.67
4.25	0.89	10.33	2.56	16.42	1.00	22.50	0.67
4.33	0.89	10.42	2.56	16.50	1.00	22.58	0.67
4.42	0.89	10.50	2.56	16.58	1.00	22.67	0.67
4.50	0.89	10.58	3.45	16.67	1.00	22.75	0.67
4.58	0.89	10.67	3.45	16.75	1.00	22.83	0.67
4.67	0.89	10.75	3.45	16.83	1.00	22.92	0.67
4.75	0.89	10.83	3.45	16.92	1.00	23.00	0.67
4.83	0.89	10.92	3.45	17.00	1.00	23.08	0.67
4.92	0.89	11.00	3.45	17.08	1.00	23.17	0.67
5.00	0.89	11.08	5.34	17.17	1.00	23.25	0.67
5.08	0.89	11.17	5.34	17.25	1.00	23.33	0.67
5.17	0.89	11.25	5.34	17.33	1.00	23.42	0.67
5.25	0.89	11.33	5.34	17.42	1.00	23.50	0.67
5.33	0.89	11.42	5.34	17.50	1.00	23.58	0.67
5.42	0.89	11.50	5.34	17.58	1.00	23.67	0.67
5.50	0.89	11.58	16.46	17.67	1.00	23.75	0.67
5.58	0.89	11.67	16.46	17.75	1.00	23.83	0.67
5.67	0.89	11.75	16.46	17.83	1.00	23.92	0.67
5.75	0.89	11.83	68.08	17.92	1.00	24.00	0.67
5.83	0.89	11.92	68.08	18.00	1.00		
5.92	0.89	12.00	68.08	18.08	1.00		
6.00	0.89	12.08	8.01	18.17	1.00		

CALIB					
NASHYD (0203)	Area (ha)=	0.09	Curve Number (CN)=	73.6	
ID= 1 DT= 5.0 min	Ia (mm)=	4.40	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.05			

Unit Hyd Qpeak (cms)= 0.070

PEAK FLOW (cms)= 0.006 (i)
TIME TO PEAK (hrs)= 12.083
RUNOFF VOLUME (mm)= 14.063
TOTAL RAINFALL (mm)= 55.620
RUNOFF COEFFICIENT = 0.253

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0201)	Area (ha)=	0.33			
ID= 1 DT= 5.0 min	Total Imp(%)=	97.60	Dir. Conn.(%)=	97.60	

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.32	0.01
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	3.00	4.00
Length	(m)=	46.98	30.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		68.08	22.21
over (min)		5.00	5.00
Storage Coeff. (min)=		1.36 (ii)	2.64 (ii)
Unit Hyd. Tpeak (min)=		5.00	5.00

```
     Unit Hyd. peak  (cms)=       0.33         0.29
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.00          0.062 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08          12.08
     RUNOFF VOLUME    (mm)=      53.62        15.06          52.69
     TOTAL RAINFALL   (mm)=      55.62        55.62          55.62
     RUNOFF COEFFICIENT   =       0.96         0.27           0.95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      68.08        29.86
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.02 (ii)    6.75 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.34         0.14
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.006 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08          12.08
     RUNOFF VOLUME    (mm)=      53.62        17.22          20.35
     TOTAL RAINFALL   (mm)=      55.62        55.62          55.62
     RUNOFF COEFFICIENT   =       0.96         0.31           0.37

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      68.08        22.21
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.77 (ii)    3.79 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.25
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.010 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08          12.08
     RUNOFF VOLUME    (mm)=      53.62        15.06          41.47
     TOTAL RAINFALL   (mm)=      55.62        55.62          55.62
     RUNOFF COEFFICIENT   =       0.96         0.27           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0201):     0.33   0.062    12.08    52.69
      + ID2= 2 (  0202):     0.06   0.010    12.08    41.47
        ================================================
        ID = 3 (  0205):     0.40   0.071    12.08    50.85

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
```

```
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0205):     0.40   0.071    12.08    50.85
      + ID2= 2 (  0203):     0.09   0.006    12.08    14.06
        ====================================================
        ID = 1 (  0205):     0.49   0.077    12.08    43.98

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0205):     0.49   0.077    12.08    43.98
      + ID2= 2 (  0204):     0.08   0.006    12.08    20.35
        ====================================================
        ID = 3 (  0205):     0.57   0.083    12.08    40.54

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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=======================

       V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
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ebce-f09e-4e60-8ccd-4b7bfce22d30\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\0236
ebce-f09e-4e60-8ccd-4b7bfce22d30\scen

DATE: 04-11-2022                          TIME: 10:12:36

USER:


COMMENTS: _____________________________________________________________

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  ***********************************************
  ** SIMULATION : 2yr 4hr 5min Chicago          **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 675.586
| Ptotal= 37.03 mm |                          B=   4.681
--------------------                          C=   0.780
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =  0.33

    TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
     hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
    0.00    2.31 |  1.00   10.03 |  2.00    6.39 |  3.00    3.08
    0.08    2.45 |  1.08   15.38 |  2.08    5.82 |  3.08    2.96
    0.17    2.61 |  1.17   35.54 |  2.17    5.36 |  3.17    2.85
    0.25    2.80 |  1.25  114.99 |  2.25    4.96 |  3.25    2.75
    0.33    3.01 |  1.33   45.86 |  2.33    4.63 |  3.33    2.66
    0.42    3.27 |  1.42   25.27 |  2.42    4.34 |  3.42    2.57
    0.50    3.59 |  1.50   17.44 |  2.50    4.09 |  3.50    2.49
    0.58    3.98 |  1.58   13.36 |  2.58    3.87 |  3.58    2.42
    0.67    4.48 |  1.67   10.88 |  2.67    3.68 |  3.67    2.35
    0.75    5.15 |  1.75    9.21 |  2.75    3.50 |  3.75    2.29
    0.83    6.10 |  1.83    8.01 |  2.83    3.35 |  3.83    2.22
    0.92    7.55 |  1.92    7.10 |  2.92    3.20 |  3.92    2.17


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0203)|   Area    (ha)=   0.09   Curve Number   (CN)= 73.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.05
```

```
     Unit Hyd Qpeak  (cms)=   0.070

     PEAK FLOW       (cms)=   0.003 (i)
     TIME TO PEAK    (hrs)=   1.333
     RUNOFF VOLUME    (mm)=   6.566
     TOTAL RAINFALL   (mm)=  37.034
     RUNOFF COEFFICIENT   =   0.177

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  97.60   Dir. Conn.(%)=  97.60
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.01
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       3.00         4.00
     Length            (m)=      46.98        30.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     114.99        12.52
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.10 (ii)    2.14 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.31
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.10         0.00          0.103 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      35.03         6.77          34.35
     TOTAL RAINFALL   (mm)=      37.03        37.03          37.03
     RUNOFF COEFFICIENT   =       0.95         0.18           0.93

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     114.99        17.88
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       0.82 (ii)    7.87 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.34         0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.004 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50           1.33
     RUNOFF VOLUME    (mm)=      35.03         7.98          11.44
     TOTAL RAINFALL   (mm)=      37.03        37.03          37.03
     RUNOFF COEFFICIENT   =       0.95         0.22           0.31

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     114.99        12.52
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.62 (ii)    3.07 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.27
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.015 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      35.03         6.77          26.13
```

```
     TOTAL RAINFALL   (mm)=      37.03        37.03          37.03
     RUNOFF COEFFICIENT   =       0.95         0.18           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0201):     0.33   0.103     1.33    34.35
      + ID2= 2 (  0202):     0.06   0.015     1.33    26.13
        ====================================================
        ID = 3 (  0205):     0.40   0.118     1.33    33.00

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0205):     0.40   0.118     1.33    33.00
      + ID2= 2 (  0203):     0.09   0.003     1.33     6.57
        ====================================================
        ID = 1 (  0205):     0.49   0.121     1.33    28.06

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0205):     0.49   0.121     1.33    28.06
      + ID2= 2 (  0204):     0.08   0.004     1.33    11.44
        ====================================================
        ID = 3 (  0205):     0.57   0.125     1.33    25.64

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
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5cac-bc49-4450-9be3-bc1e35514c28\scen
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DATE: 04-11-2022                          TIME: 10:12:37

USER:


COMMENTS: _____________________________________________________

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  ***********************************************
  ** SIMULATION : 50yr 24hr 5min SCS Type II    **
  ***********************************************


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|    READ STORM    |    Filename: C:\Users\dhordyk\AppD
|                  |              ata\Local\Temp\
|                  |              cd86384e-8c20-40ff-ac17-d1529f466c73\7f35fdfa
| Ptotal=125.40 mm |    Comments: 50yr 24hr 5min SCS Type II
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	6.08	2.26	12.17	18.06	18.25	2.26
0.08	1.38	6.17	2.26	12.25	18.06	18.33	2.26
0.17	1.38	6.25	2.26	12.33	18.06	18.42	2.26
0.25	1.38	6.33	2.26	12.42	18.06	18.50	2.26
0.33	1.38	6.42	2.26	12.50	18.06	18.58	2.26
0.42	1.38	6.50	2.26	12.58	9.28	18.67	2.26
0.50	1.38	6.58	2.26	12.67	9.28	18.75	2.26
0.58	1.38	6.67	2.26	12.75	9.28	18.83	2.26
0.67	1.38	6.75	2.26	12.83	9.28	18.92	2.26
0.75	1.38	6.83	2.26	12.92	9.28	19.00	2.26
0.83	1.38	6.92	2.26	13.00	9.28	19.08	2.26
0.92	1.38	7.00	2.26	13.08	6.77	19.17	2.26
1.00	1.38	7.08	2.76	13.17	6.77	19.25	2.26
1.08	1.38	7.17	2.76	13.25	6.77	19.33	2.26
1.17	1.38	7.25	2.76	13.33	6.77	19.42	2.26
1.25	1.38	7.33	2.76	13.42	6.77	19.50	2.26
1.33	1.38	7.42	2.76	13.50	6.77	19.58	2.26
1.42	1.38	7.50	2.76	13.58	5.27	19.67	2.26
1.50	1.38	7.58	2.76	13.67	5.27	19.75	2.26
1.58	1.38	7.67	2.76	13.75	5.27	19.83	2.26
1.67	1.38	7.75	2.76	13.83	5.27	19.92	2.26
1.75	1.38	7.83	2.76	13.92	5.27	20.00	2.26
1.83	1.38	7.92	2.76	14.00	5.27	20.08	1.50
1.92	1.38	8.00	2.76	14.08	3.76	20.17	1.50
2.00	1.38	8.08	3.26	14.17	3.76	20.25	1.50
2.08	1.63	8.17	3.26	14.25	3.76	20.33	1.50
2.17	1.63	8.25	3.26	14.33	3.76	20.42	1.50
2.25	1.63	8.33	3.26	14.42	3.76	20.50	1.50
2.33	1.63	8.42	3.26	14.50	3.76	20.58	1.50
2.42	1.63	8.50	3.26	14.58	3.76	20.67	1.50
2.50	1.63	8.58	3.51	14.67	3.76	20.75	1.50
2.58	1.63	8.67	3.51	14.75	3.76	20.83	1.50
2.67	1.63	8.75	3.51	14.83	3.76	20.92	1.50
2.75	1.63	8.83	3.51	14.92	3.76	21.00	1.50
2.83	1.63	8.92	3.51	15.00	3.76	21.08	1.50
2.92	1.63	9.00	3.51	15.08	3.76	21.17	1.50
3.00	1.63	9.08	4.01	15.17	3.76	21.25	1.50
3.08	1.63	9.17	4.01	15.25	3.76	21.33	1.50
3.17	1.63	9.25	4.01	15.33	3.76	21.42	1.50
3.25	1.63	9.33	4.01	15.42	3.76	21.50	1.50
3.33	1.63	9.42	4.01	15.50	3.76	21.58	1.50
3.42	1.63	9.50	4.01	15.58	3.76	21.67	1.50
3.50	1.63	9.58	4.51	15.67	3.76	21.75	1.50
3.58	1.63	9.67	4.51	15.75	3.76	21.83	1.50
3.67	1.63	9.75	4.51	15.83	3.76	21.92	1.50
3.75	1.63	9.83	4.51	15.92	3.76	22.00	1.50
3.83	1.63	9.92	4.51	16.00	3.76	22.08	1.50
3.92	1.63	10.00	4.51	16.08	2.26	22.17	1.50
4.00	1.63	10.08	5.77	16.17	2.26	22.25	1.50
4.08	2.01	10.17	5.77	16.25	2.26	22.33	1.50
4.17	2.01	10.25	5.77	16.33	2.26	22.42	1.50
4.25	2.01	10.33	5.77	16.42	2.26	22.50	1.50
4.33	2.01	10.42	5.77	16.50	2.26	22.58	1.50
4.42	2.01	10.50	5.77	16.58	2.26	22.67	1.50
4.50	2.01	10.58	7.77	16.67	2.26	22.75	1.50
4.58	2.01	10.67	7.77	16.75	2.26	22.83	1.50
4.67	2.01	10.75	7.77	16.83	2.26	22.92	1.50
4.75	2.01	10.83	7.77	16.92	2.26	23.00	1.50
4.83	2.01	10.92	7.77	17.00	2.26	23.08	1.50
4.92	2.01	11.00	7.77	17.08	2.26	23.17	1.50
5.00	2.01	11.08	12.04	17.17	2.26	23.25	1.50
5.08	2.01	11.17	12.04	17.25	2.26	23.33	1.50
5.17	2.01	11.25	12.04	17.33	2.26	23.42	1.50
5.25	2.01	11.33	12.04	17.42	2.26	23.50	1.50
5.33	2.01	11.42	12.04	17.50	2.26	23.58	1.50
5.42	2.01	11.50	12.04	17.58	2.26	23.67	1.50
5.50	2.01	11.58	37.12	17.67	2.26	23.75	1.50
5.58	2.01	11.67	37.12	17.75	2.26	23.83	1.50
5.67	2.01	11.75	37.12	17.83	2.26	23.92	1.50
5.75	2.01	11.83	153.49	17.92	2.26	24.00	1.50
5.83	2.01	11.92	153.49	18.00	2.26		
5.92	2.01	12.00	153.49	18.08	2.26		
6.00	2.01	12.08	18.06	18.17	2.26		

CALIB			
NASHYD (0203)	Area (ha)= 0.09	Curve Number (CN)= 73.6	
ID= 1 DT= 5.0 min	Ia (mm)= 4.40	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.05		

Unit Hyd Qpeak (cms)= 0.070

PEAK FLOW (cms)= 0.020 (i)
TIME TO PEAK (hrs)= 12.083
RUNOFF VOLUME (mm)= 52.664
TOTAL RAINFALL (mm)= 125.400
RUNOFF COEFFICIENT = 0.420

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (0201)	Area (ha)= 0.33	
ID= 1 DT= 5.0 min	Total Imp(%)= 97.60	Dir. Conn.(%)= 97.60

```
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.01
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       3.00         4.00
     Length            (m)=      46.98        30.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     153.49        89.02
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.98 (ii)    1.91 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.32
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.14         0.00          0.140 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08          12.08
     RUNOFF VOLUME    (mm)=     123.40        60.42         121.89
     TOTAL RAINFALL   (mm)=     125.40       125.40         125.40
     RUNOFF COEFFICIENT   =       0.98         0.48           0.97

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     153.49       113.57
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.73 (ii)    4.10 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.24
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.02          0.024 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08          12.08
     RUNOFF VOLUME    (mm)=     123.40        65.82          73.27
     TOTAL RAINFALL   (mm)=     125.40       125.40         125.40
     RUNOFF COEFFICIENT   =       0.98         0.52           0.58

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     153.49        89.02
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.55 (ii)    2.74 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.29
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.024 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.08          12.08
     RUNOFF VOLUME    (mm)=     123.40        60.42         103.56
     TOTAL RAINFALL   (mm)=     125.40       125.40         125.40
     RUNOFF COEFFICIENT   =       0.98         0.48           0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0205)|
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```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0201):     0.33   0.140    12.08   121.89
     + ID2= 2 (  0202):     0.06   0.024    12.08   103.56
       ================================================
       ID = 3 (  0205):     0.40   0.164    12.08   118.88

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
-------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0205):     0.40   0.164    12.08   118.88
     + ID2= 2 (  0203):     0.09   0.020    12.08    52.66
       ================================================
       ID = 1 (  0205):     0.49   0.184    12.08   106.51

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0205):     0.49   0.184    12.08   106.51
     + ID2= 2 (  0204):     0.08   0.024    12.08    73.27
       ================================================
       ID = 3 (  0205):     0.57   0.208    12.08   101.67

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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================================================================================
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      V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
      V    V   I    SS     U   U   A A   L
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
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```
                    *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\e03f
120a-b128-488e-ab1a-c0dbbfb80983\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\e03f
120a-b128-488e-ab1a-c0dbbfb80983\scen


DATE: 04-11-2022                          TIME: 10:12:36

USER:


COMMENTS: _____________________________________________________________

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  **********************************************
  ** SIMULATION : 50yr 4hr 5min Chicago         **
  **********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1251.473
| Ptotal= 79.54 mm |                          B=   4.847
--------------------                          C=   0.753
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =  0.33

      TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
       hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
      0.00    5.53 |  1.00   22.40 |  2.00   14.60 |  3.00    7.26
      0.08    5.85 |  1.08   33.57 |  2.08   13.36 |  3.08    6.99
      0.17    6.21 |  1.17   73.94 |  2.17   12.33 |  3.17    6.75
      0.25    6.63 |  1.25  223.60 |  2.25   11.47 |  3.25    6.52
      0.33    7.12 |  1.33   94.25 |  2.33   10.74 |  3.33    6.31
      0.42    7.70 |  1.42   53.72 |  2.42   10.10 |  3.42    6.12
      0.50    8.41 |  1.50   37.82 |  2.50    9.54 |  3.50    5.94
      0.58    9.29 |  1.58   29.40 |  2.58    9.05 |  3.58    5.77
      0.67   10.40 |  1.67   24.19 |  2.67    8.61 |  3.67    5.61
```

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                0.75   11.89 |  1.75   20.65 |  2.75    8.22 |  3.75    5.46
                0.83   13.96 |  1.83   18.09 |  2.83    7.87 |  3.83    5.32
                0.92   17.09 |  1.92   16.14 |  2.92    7.55 |  3.92    5.19


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0203)|   Area    (ha)=   0.09   Curve Number   (CN)= 73.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.05

     Unit Hyd Qpeak  (cms)=   0.070

     PEAK FLOW       (cms)=   0.015 (i)
     TIME TO PEAK    (hrs)=   1.333
     RUNOFF VOLUME    (mm)=  25.911
     TOTAL RAINFALL   (mm)=  79.544
     RUNOFF COEFFICIENT   =   0.326

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  97.60   Dir. Conn.(%)=  97.60
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.01
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       3.00         4.00
     Length            (m)=      46.98        30.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     223.60        54.10
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.85 (ii)    1.64 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.32
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.20         0.00          0.202 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      77.54        28.63          76.37
     TOTAL RAINFALL   (mm)=      79.54        79.54          79.54
     RUNOFF COEFFICIENT   =       0.97         0.36           0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     223.60        72.36
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.63 (ii)    4.66 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.22
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01          0.018 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      77.54        32.01          37.88
     TOTAL RAINFALL   (mm)=      79.54        79.54          79.54
     RUNOFF COEFFICIENT   =       0.97         0.40           0.48

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
```

```
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     223.60        54.10
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.48 (ii)    2.36 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.30
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.00          0.031 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      77.54        28.63          62.13
     TOTAL RAINFALL   (mm)=      79.54        79.54          79.54
     RUNOFF COEFFICIENT   =       0.97         0.36           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0201):     0.33   0.202     1.33    76.37
     + ID2= 2 (  0202):     0.06   0.031     1.33    62.13
       ================================================
       ID = 3 (  0205):     0.40   0.233     1.33    74.03

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0205):     0.40   0.233     1.33    74.03
     + ID2= 2 (  0203):     0.09   0.015     1.33    25.91
       ================================================
       ID = 1 (  0205):     0.49   0.247     1.33    65.04

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0205):     0.49   0.247     1.33    65.04
     + ID2= 2 (  0204):     0.08   0.018     1.33    37.88
       ================================================
       ID = 3 (  0205):     0.57   0.265     1.33    61.08

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
========================

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\5f48
6416-4e25-41e6-8240-66e38d39df15\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\5f48
6416-4e25-41e6-8240-66e38d39df15\scen


DATE: 04-11-2022                          TIME: 10:12:37

USER:



COMMENTS: _____________________________________________________________
```

```
--------------------------------------------------------------------------------
------------------------
  ***********************************************
  ** SIMULATION : 5yr 24hr 5min SCS Type II     **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\dhordyk\AppD
|                  |              ata\Local\Temp\
|                  |              cd86384e-8c20-40ff-ac17-d1529f466c73\07b93d6a
| Ptotal= 78.55 mm |    Comments: 5yr 24hr 5min SCS Type II
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	6.08	1.41	12.17	11.31	18.25	1.41
0.08	0.86	6.17	1.41	12.25	11.31	18.33	1.41
0.17	0.86	6.25	1.41	12.33	11.31	18.42	1.41
0.25	0.86	6.33	1.41	12.42	11.31	18.50	1.41
0.33	0.86	6.42	1.41	12.50	11.31	18.58	1.41
0.42	0.86	6.50	1.41	12.58	5.81	18.67	1.41
0.50	0.86	6.58	1.41	12.67	5.81	18.75	1.41
0.58	0.86	6.67	1.41	12.75	5.81	18.83	1.41
0.67	0.86	6.75	1.41	12.83	5.81	18.92	1.41
0.75	0.86	6.83	1.41	12.92	5.81	19.00	1.41
0.83	0.86	6.92	1.41	13.00	5.81	19.08	1.41
0.92	0.86	7.00	1.41	13.08	4.24	19.17	1.41
1.00	0.86	7.08	1.73	13.17	4.24	19.25	1.41
1.08	0.86	7.17	1.73	13.25	4.24	19.33	1.41
1.17	0.86	7.25	1.73	13.33	4.24	19.42	1.41
1.25	0.86	7.33	1.73	13.42	4.24	19.50	1.41
1.33	0.86	7.42	1.73	13.50	4.24	19.58	1.41
1.42	0.86	7.50	1.73	13.58	3.30	19.67	1.41
1.50	0.86	7.58	1.73	13.67	3.30	19.75	1.41
1.58	0.86	7.67	1.73	13.75	3.30	19.83	1.41
1.67	0.86	7.75	1.73	13.83	3.30	19.92	1.41
1.75	0.86	7.83	1.73	13.92	3.30	20.00	1.41
1.83	0.86	7.92	1.73	14.00	3.30	20.08	0.94
1.92	0.86	8.00	1.73	14.08	2.36	20.17	0.94
2.00	0.86	8.08	2.04	14.17	2.36	20.25	0.94
2.08	1.02	8.17	2.04	14.25	2.36	20.33	0.94
2.17	1.02	8.25	2.04	14.33	2.36	20.42	0.94
2.25	1.02	8.33	2.04	14.42	2.36	20.50	0.94
2.33	1.02	8.42	2.04	14.50	2.36	20.58	0.94
2.42	1.02	8.50	2.04	14.58	2.36	20.67	0.94
2.50	1.02	8.58	2.20	14.67	2.36	20.75	0.94
2.58	1.02	8.67	2.20	14.75	2.36	20.83	0.94
2.67	1.02	8.75	2.20	14.83	2.36	20.92	0.94
2.75	1.02	8.83	2.20	14.92	2.36	21.00	0.94
2.83	1.02	8.92	2.20	15.00	2.36	21.08	0.94
2.92	1.02	9.00	2.20	15.08	2.36	21.17	0.94
3.00	1.02	9.08	2.51	15.17	2.36	21.25	0.94
3.08	1.02	9.17	2.51	15.25	2.36	21.33	0.94
3.17	1.02	9.25	2.51	15.33	2.36	21.42	0.94
3.25	1.02	9.33	2.51	15.42	2.36	21.50	0.94
3.33	1.02	9.42	2.51	15.50	2.36	21.58	0.94
3.42	1.02	9.50	2.51	15.58	2.36	21.67	0.94
3.50	1.02	9.58	2.83	15.67	2.36	21.75	0.94
3.58	1.02	9.67	2.83	15.75	2.36	21.83	0.94
3.67	1.02	9.75	2.83	15.83	2.36	21.92	0.94
3.75	1.02	9.83	2.83	15.92	2.36	22.00	0.94
3.83	1.02	9.92	2.83	16.00	2.36	22.08	0.94
3.92	1.02	10.00	2.83	16.08	1.41	22.17	0.94
4.00	1.02	10.08	3.61	16.17	1.41	22.25	0.94
4.08	1.26	10.17	3.61	16.25	1.41	22.33	0.94
4.17	1.26	10.25	3.61	16.33	1.41	22.42	0.94
4.25	1.26	10.33	3.61	16.42	1.41	22.50	0.94
4.33	1.26	10.42	3.61	16.50	1.41	22.58	0.94
4.42	1.26	10.50	3.61	16.58	1.41	22.67	0.94
4.50	1.26	10.58	4.87	16.67	1.41	22.75	0.94
4.58	1.26	10.67	4.87	16.75	1.41	22.83	0.94
4.67	1.26	10.75	4.87	16.83	1.41	22.92	0.94
4.75	1.26	10.83	4.87	16.92	1.41	23.00	0.94
4.83	1.26	10.92	4.87	17.00	1.41	23.08	0.94
4.92	1.26	11.00	4.87	17.08	1.41	23.17	0.94
5.00	1.26	11.08	7.54	17.17	1.41	23.25	0.94
5.08	1.26	11.17	7.54	17.25	1.41	23.33	0.94
5.17	1.26	11.25	7.54	17.33	1.41	23.42	0.94
5.25	1.26	11.33	7.54	17.42	1.41	23.50	0.94
5.33	1.26	11.42	7.54	17.50	1.41	23.58	0.94
5.42	1.26	11.50	7.54	17.58	1.41	23.67	0.94
5.50	1.26	11.58	23.25	17.67	1.41	23.75	0.94
5.58	1.26	11.67	23.25	17.75	1.41	23.83	0.94
5.67	1.26	11.75	23.25	17.83	1.41	23.92	0.94
5.75	1.26	11.83	96.15	17.92	1.41	24.00	0.94
5.83	1.26	11.92	96.15	18.00	1.41		
5.92	1.26	12.00	96.15	18.08	1.41		
6.00	1.26	12.08	11.31	18.17	1.41		

```
--------------------------------------------------------------------------------

--------------------
| CALIB            |
| NASHYD   (  0203)|   Area    (ha)=   0.09   Curve Number   (CN)= 73.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.05

     Unit Hyd Qpeak  (cms)=   0.070

     PEAK FLOW       (cms)=   0.010 (i)
```

```
     TIME TO PEAK    (hrs)=  12.083
     RUNOFF VOLUME    (mm)=  25.384
     TOTAL RAINFALL   (mm)=  78.550
     RUNOFF COEFFICIENT   =   0.323

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  97.60   Dir. Conn.(%)=  97.60
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.01
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       3.00         4.00
     Length            (m)=      46.98        30.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      96.15        41.39
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.19 (ii)    2.30 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.33         0.30
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.09         0.00          0.087 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08          12.08
     RUNOFF VOLUME    (mm)=      76.55        28.02          75.38
     TOTAL RAINFALL   (mm)=      78.55        78.55          78.55
     RUNOFF COEFFICIENT   =       0.97         0.36           0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      96.15        54.36
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       0.88 (ii)    5.40 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.34         0.16
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.01          0.011 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08          12.08
     RUNOFF VOLUME    (mm)=      76.55        31.34          37.16
     TOTAL RAINFALL   (mm)=      78.55        78.55          78.55
     RUNOFF COEFFICIENT   =       0.97         0.40           0.47

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      96.15        41.39
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.67 (ii)    3.30 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.27
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.014 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08          12.08
     RUNOFF VOLUME    (mm)=      76.55        28.02          61.26
     TOTAL RAINFALL   (mm)=      78.55        78.55          78.55
     RUNOFF COEFFICIENT   =       0.97         0.36           0.78
```

```
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0201):     0.33   0.087    12.08    75.38
     + ID2= 2 (  0202):     0.06   0.014    12.08    61.26
       ================================================
       ID = 3 (  0205):     0.40   0.102    12.08    73.07

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0205):     0.40   0.102    12.08    73.07
     + ID2= 2 (  0203):     0.09   0.010    12.08    25.38
       ================================================
       ID = 1 (  0205):     0.49   0.111    12.08    64.16

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0205):     0.49   0.111    12.08    64.16
     + ID2= 2 (  0204):     0.08   0.011    12.08    37.16
       ================================================
       ID = 3 (  0205):     0.57   0.122    12.08    60.22

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
=======================

      V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
      V    V   I    SS     U   U   A A   L
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\d5c3
2d97-15cc-4719-8c86-e1086f96cb4f\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\d5c3
2d97-15cc-4719-8c86-e1086f96cb4f\scen


DATE: 04-11-2022                          TIME: 10:12:36

USER:


COMMENTS: ____________________________________________________________

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  ***********************************************
  ** SIMULATION : 5yr 4hr 5min Chicago          **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 843.019
| Ptotal= 50.76 mm |                          B=   4.582
--------------------                          C=   0.763
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =  0.33
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	3.39	1.00	14.01	2.00	9.07	3.00	4.46
0.08	3.58	1.08	21.15	2.08	8.29	3.08	4.30
0.17	3.81	1.17	47.54	2.17	7.64	3.17	4.15
0.25	4.07	1.25	150.31	2.25	7.10	3.25	4.01
0.33	4.38	1.33	60.96	2.33	6.64	3.33	3.88
0.42	4.74	1.42	34.18	2.42	6.24	3.42	3.75
0.50	5.18	1.50	23.88	2.50	5.89	3.50	3.64
0.58	5.73	1.58	18.47	2.58	5.58	3.58	3.54
0.67	6.43	1.67	15.15	2.67	5.31	3.67	3.44
0.75	7.36	1.75	12.90	2.75	5.07	3.75	3.35
0.83	8.67	1.83	11.27	2.83	4.85	3.83	3.26
0.92	10.64	1.92	10.04	2.92	4.65	3.92	3.18

CALIB	NASHYD (0203)	ID= 1 DT= 5.0 min

Area (ha)= 0.09 Curve Number (CN)= 73.6
Ia (mm)= 4.40 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.05

Unit Hyd Qpeak (cms)= 0.070

PEAK FLOW (cms)= 0.006 (i)
TIME TO PEAK (hrs)= 1.333
RUNOFF VOLUME (mm)= 11.926
TOTAL RAINFALL (mm)= 50.757
RUNOFF COEFFICIENT = 0.235

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	STANDHYD (0201)	ID= 1 DT= 5.0 min

Area (ha)= 0.33
Total Imp(%)= 97.60 Dir. Conn.(%)= 97.60

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.32	0.01
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	3.00	4.00
Length	(m)=	46.98	30.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		150.31	23.56
over (min)		5.00	5.00
Storage Coeff. (min)=		0.99 (ii)	1.92 (ii)
Unit Hyd. Tpeak (min)=		5.00	5.00
Unit Hyd. peak (cms)=		0.34	0.31
			TOTALS
PEAK FLOW	(cms)=	0.13	0.00 0.135 (iii)
TIME TO PEAK	(hrs)=	1.33	1.33 1.33
RUNOFF VOLUME	(mm)=	48.76	12.67 47.89
TOTAL RAINFALL	(mm)=	50.76	50.76 50.76
RUNOFF COEFFICIENT	=	0.96	0.25 0.94

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 68.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	STANDHYD (0204)	ID= 1 DT= 5.0 min

Area (ha)= 0.08
Total Imp(%)= 25.90 Dir. Conn.(%)= 13.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.02	0.06
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	2.00	5.00
Length	(m)=	23.52	20.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		150.31	32.61
over (min)		5.00	10.00
Storage Coeff. (min)=		0.74 (ii)	6.28 (ii)
Unit Hyd. Tpeak (min)=		5.00	10.00
Unit Hyd. peak (cms)=		0.34	0.15
			TOTALS
PEAK FLOW	(cms)=	0.00	0.00 0.007 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42 1.33
RUNOFF VOLUME	(mm)=	48.76	14.58 18.99
TOTAL RAINFALL	(mm)=	50.76	50.76 50.76
RUNOFF COEFFICIENT	=	0.96	0.29 0.37

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 68.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.

```
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     150.31        23.56
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.56 (ii)    2.76 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.28
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.020 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      48.76        12.67          37.38
     TOTAL RAINFALL   (mm)=      50.76        50.76          50.76
     RUNOFF COEFFICIENT   =       0.96         0.25           0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0201):     0.33   0.135     1.33    47.89
      + ID2= 2 (  0202):     0.06   0.020     1.33    37.38
        ====================================================
        ID = 3 (  0205):     0.40   0.155     1.33    46.16

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0205):     0.40   0.155     1.33    46.16
      + ID2= 2 (  0203):     0.09   0.006     1.33    11.93
        ====================================================
        ID = 1 (  0205):     0.49   0.161     1.33    39.77

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0205):     0.49   0.161     1.33    39.77
      + ID2= 2 (  0204):     0.08   0.007     1.33    18.99
        ====================================================
        ID = 3 (  0205):     0.57   0.168     1.33    36.74

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
========================

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\f918
6ffa-fac4-4536-b31f-2f04bf9a2ef0\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\f918
```

6ffa-fac4-4536-b31f-2f04bf9a2ef0\scen

DATE: 04-11-2022 TIME: 10:12:37

USER:

COMMENTS: _____

```
  **********************************************
  ** SIMULATION : HAZEL                       **
  **********************************************
```

READ STORM	Filename: C:\Users\dhordyk\AppData\Local\Temp\cd86384e-8c20-40ff-ac17-d1529f466c73\bd658d54
Ptotal=212.00 mm	Comments: HAZEL

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	6.00	3.00	13.00	6.00	23.00	9.00	53.00
0.20	6.00	3.20	13.00	6.20	23.00	9.20	53.00
0.40	6.00	3.40	13.00	6.40	23.00	9.40	53.00
0.60	6.00	3.60	13.00	6.60	23.00	9.60	53.00
0.80	6.00	3.80	13.00	6.80	23.00	9.80	53.00
1.00	4.00	4.00	17.00	7.00	13.00	10.00	38.00
1.20	4.00	4.20	17.00	7.20	13.00	10.20	38.00
1.40	4.00	4.40	17.00	7.40	13.00	10.40	38.00
1.60	4.00	4.60	17.00	7.60	13.00	10.60	38.00
1.80	4.00	4.80	17.00	7.80	13.00	10.80	38.00
2.00	6.00	5.00	13.00	8.00	13.00	11.00	13.00
2.20	6.00	5.20	13.00	8.20	13.00	11.20	13.00
2.40	6.00	5.40	13.00	8.40	13.00	11.40	13.00
2.60	6.00	5.60	13.00	8.60	13.00	11.60	13.00
2.80	6.00	5.80	13.00	8.80	13.00	11.80	13.00

CALIB		
NASHYD (0203)	Area (ha)= 0.09	Curve Number (CN)= 73.6
ID= 1 DT= 5.0 min	Ia (mm)= 4.40	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.05	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Unit Hyd Qpeak (cms)= 0.070

PEAK FLOW (cms)= 0.009 (i)
TIME TO PEAK (hrs)= 10.000
RUNOFF VOLUME (mm)= 110.082
TOTAL RAINFALL (mm)= 212.000

RUNOFF COEFFICIENT = 0.519

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0201)	Area (ha)= 0.33		
ID= 1 DT= 5.0 min	Total Imp(%)= 97.60	Dir. Conn.(%)= 97.60	

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.32	0.01
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	3.00	4.00
Length	(m)=	46.98	30.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Max.Eff.Inten.(mm/hr)=	53.00	42.70		
over (min)	5.00	5.00		
Storage Coeff. (min)=	1.51 (ii)	2.92 (ii)		
Unit Hyd. Tpeak (min)=	5.00	5.00		
Unit Hyd. peak (cms)=	0.33	0.28		
			TOTALS	
PEAK FLOW (cms)=	0.05	0.00	0.049 (iii)	
TIME TO PEAK (hrs)=	9.58	10.00	10.00	
RUNOFF VOLUME (mm)=	210.00	131.23	208.11	
TOTAL RAINFALL (mm)=	212.00	212.00	212.00	
RUNOFF COEFFICIENT =	0.99	0.62	0.98	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 68.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0204)	Area (ha)= 0.08		
ID= 1 DT= 5.0 min	Total Imp(%)= 25.90	Dir. Conn.(%)= 13.00	

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.02	0.06
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	2.00	5.00
Length	(m)=	23.52	20.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00

0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Max.Eff.Inten.(mm/hr)=	53.00	52.24	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.12 (ii)	5.71 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.34	0.15	
			TOTALS
PEAK FLOW (cms)=	0.00	0.01	0.010 (iii)
TIME TO PEAK (hrs)=	9.58	10.00	10.00
RUNOFF VOLUME (mm)=	210.00	139.42	148.56
TOTAL RAINFALL (mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT =	0.99	0.66	0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 68.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0202) | Area (ha)= 0.06
ID= 1 DT= 5.0 min | Total Imp(%)= 68.50 Dir. Conn.(%)= 68.50

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.04	0.02
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	4.00	5.00
Length	(m)=	20.82	20.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00

```
               2.000    4.00 | 5.000   17.00 | 8.000   13.00 | 11.00   38.00
               2.083    6.00 | 5.083   13.00 | 8.083   13.00 | 11.08   13.00
               2.167    6.00 | 5.167   13.00 | 8.167   13.00 | 11.17   13.00
               2.250    6.00 | 5.250   13.00 | 8.250   13.00 | 11.25   13.00
               2.333    6.00 | 5.333   13.00 | 8.333   13.00 | 11.33   13.00
               2.417    6.00 | 5.417   13.00 | 8.417   13.00 | 11.42   13.00
               2.500    6.00 | 5.500   13.00 | 8.500   13.00 | 11.50   13.00
               2.583    6.00 | 5.583   13.00 | 8.583   13.00 | 11.58   13.00
               2.667    6.00 | 5.667   13.00 | 8.667   13.00 | 11.67   13.00
               2.750    6.00 | 5.750   13.00 | 8.750   13.00 | 11.75   13.00
               2.833    6.00 | 5.833   13.00 | 8.833   13.00 | 11.83   13.00
               2.917    6.00 | 5.917   13.00 | 8.917   13.00 | 11.92   13.00
               3.000    6.00 | 6.000   13.00 | 9.000   13.00 | 12.00   13.00

     Max.Eff.Inten.(mm/hr)=      53.00        42.70
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       0.85 (ii)    4.19 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.24
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.009 (iii)
     TIME TO PEAK    (hrs)=       9.33        10.00         10.00
     RUNOFF VOLUME    (mm)=     210.00       131.23        185.15
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       0.99         0.62          0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0201):     0.33   0.049    10.00   208.11
      + ID2= 2 (  0202):     0.06   0.009    10.00   185.15
        ================================================
        ID = 3 (  0205):     0.40   0.057    10.00   204.34

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0205):     0.40   0.057    10.00   204.34
      + ID2= 2 (  0203):     0.09   0.009    10.00   110.08
        ================================================
        ID = 1 (  0205):     0.49   0.066    10.00   186.73

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0205)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0205):     0.49   0.066    10.00   186.73
      + ID2= 2 (  0204):     0.08   0.010    10.00   148.56
        ================================================
        ID = 3 (  0205):     0.57   0.077    10.00   181.17

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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 FINISH
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POST-DEVELOPMENT SWM

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       V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\0aab
4236-1efc-4c9f-a1a3-a5c739a9cf6a\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\0aab
4236-1efc-4c9f-a1a3-a5c739a9cf6a\scen


DATE: 04-25-2022                          TIME: 11:03:14

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ***********************************************
  ** SIMULATION : 100yr 24hr 5min SCS Type II   **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\dhordyk\AppD
|                  |              ata\Local\Temp\
```

```
|                  |              b3cec1e8-54db-4fb7-970a-9d201c8a3957\1ebb117f
| Ptotal=137.63 mm |    Comments: 100yr 24hr 5min SCS Type II
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	6.08	2.48	12.17	19.82	18.25	2.48
0.08	1.51	6.17	2.48	12.25	19.82	18.33	2.48
0.17	1.51	6.25	2.48	12.33	19.82	18.42	2.48
0.25	1.51	6.33	2.48	12.42	19.82	18.50	2.48
0.33	1.51	6.42	2.48	12.50	19.82	18.58	2.48
0.42	1.51	6.50	2.48	12.58	10.18	18.67	2.48
0.50	1.51	6.58	2.48	12.67	10.18	18.75	2.48
0.58	1.51	6.67	2.48	12.75	10.18	18.83	2.48
0.67	1.51	6.75	2.48	12.83	10.18	18.92	2.48
0.75	1.51	6.83	2.48	12.92	10.18	19.00	2.48
0.83	1.51	6.92	2.48	13.00	10.18	19.08	2.48
0.92	1.51	7.00	2.48	13.08	7.43	19.17	2.48
1.00	1.51	7.08	3.03	13.17	7.43	19.25	2.48
1.08	1.51	7.17	3.03	13.25	7.43	19.33	2.48
1.17	1.51	7.25	3.03	13.33	7.43	19.42	2.48
1.25	1.51	7.33	3.03	13.42	7.43	19.50	2.48
1.33	1.51	7.42	3.03	13.50	7.43	19.58	2.48
1.42	1.51	7.50	3.03	13.58	5.78	19.67	2.48
1.50	1.51	7.58	3.03	13.67	5.78	19.75	2.48
1.58	1.51	7.67	3.03	13.75	5.78	19.83	2.48
1.67	1.51	7.75	3.03	13.83	5.78	19.92	2.48
1.75	1.51	7.83	3.03	13.92	5.78	20.00	2.48
1.83	1.51	7.92	3.03	14.00	5.78	20.08	1.65
1.92	1.51	8.00	3.03	14.08	4.13	20.17	1.65
2.00	1.51	8.08	3.58	14.17	4.13	20.25	1.65
2.08	1.79	8.17	3.58	14.25	4.13	20.33	1.65
2.17	1.79	8.25	3.58	14.33	4.13	20.42	1.65
2.25	1.79	8.33	3.58	14.42	4.13	20.50	1.65
2.33	1.79	8.42	3.58	14.50	4.13	20.58	1.65
2.42	1.79	8.50	3.58	14.58	4.13	20.67	1.65
2.50	1.79	8.58	3.85	14.67	4.13	20.75	1.65
2.58	1.79	8.67	3.85	14.75	4.13	20.83	1.65
2.67	1.79	8.75	3.85	14.83	4.13	20.92	1.65
2.75	1.79	8.83	3.85	14.92	4.13	21.00	1.65
2.83	1.79	8.92	3.85	15.00	4.13	21.08	1.65
2.92	1.79	9.00	3.85	15.08	4.13	21.17	1.65
3.00	1.79	9.08	4.40	15.17	4.13	21.25	1.65
3.08	1.79	9.17	4.40	15.25	4.13	21.33	1.65
3.17	1.79	9.25	4.40	15.33	4.13	21.42	1.65
3.25	1.79	9.33	4.40	15.42	4.13	21.50	1.65
3.33	1.79	9.42	4.40	15.50	4.13	21.58	1.65
3.42	1.79	9.50	4.40	15.58	4.13	21.67	1.65
3.50	1.79	9.58	4.95	15.67	4.13	21.75	1.65
3.58	1.79	9.67	4.95	15.75	4.13	21.83	1.65
3.67	1.79	9.75	4.95	15.83	4.13	21.92	1.65

3.75	1.79	9.83	4.95	15.92	4.13	22.00	1.65
3.83	1.79	9.92	4.95	16.00	4.13	22.08	1.65
3.92	1.79	10.00	4.95	16.08	2.48	22.17	1.65
4.00	1.79	10.08	6.33	16.17	2.48	22.25	1.65
4.08	2.20	10.17	6.33	16.25	2.48	22.33	1.65
4.17	2.20	10.25	6.33	16.33	2.48	22.42	1.65
4.25	2.20	10.33	6.33	16.42	2.48	22.50	1.65
4.33	2.20	10.42	6.33	16.50	2.48	22.58	1.65
4.42	2.20	10.50	6.33	16.58	2.48	22.67	1.65
4.50	2.20	10.58	8.53	16.67	2.48	22.75	1.65
4.58	2.20	10.67	8.53	16.75	2.48	22.83	1.65
4.67	2.20	10.75	8.53	16.83	2.48	22.92	1.65
4.75	2.20	10.83	8.53	16.92	2.48	23.00	1.65
4.83	2.20	10.92	8.53	17.00	2.48	23.08	1.65
4.92	2.20	11.00	8.53	17.08	2.48	23.17	1.65
5.00	2.20	11.08	13.21	17.17	2.48	23.25	1.65
5.08	2.20	11.17	13.21	17.25	2.48	23.33	1.65
5.17	2.20	11.25	13.21	17.33	2.48	23.42	1.65
5.25	2.20	11.33	13.21	17.42	2.48	23.50	1.65
5.33	2.20	11.42	13.21	17.50	2.48	23.58	1.65
5.42	2.20	11.50	13.21	17.58	2.48	23.67	1.65
5.50	2.20	11.58	40.74	17.67	2.48	23.75	1.65
5.58	2.20	11.67	40.74	17.75	2.48	23.83	1.65
5.67	2.20	11.75	40.74	17.83	2.48	23.92	1.65
5.75	2.20	11.83	168.46	17.92	2.48	24.00	1.65
5.83	2.20	11.92	168.46	18.00	2.48		
5.92	2.20	12.00	168.46	18.08	2.48		
6.00	2.20	12.08	19.82	18.17	2.48		

CALIB NASHYD (0203) ID= 1 DT= 5.0 min	Area (ha)= 0.09 Curve Number (CN)= 73.6 Ia (mm)= 4.40 # of Linear Res.(N)= 3.00 U.H. Tp(hrs)= 0.05

Unit Hyd Qpeak (cms)= 0.070

PEAK FLOW (cms)= 0.023 (i)
TIME TO PEAK (hrs)= 12.083
RUNOFF VOLUME (mm)= 60.367
TOTAL RAINFALL (mm)= 137.630
RUNOFF COEFFICIENT = 0.439

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SWALE(0208)	SURFACE PONDING LAYER: IN= 2--> OUT= 3 | Length (m)= 16.00 Height (m)= 0.25 DT= 5.0 MIN | Left Slope = 3.00 Right Slope = 3.00 Bottom Width (m)= 0.30 Surface slope(%) = 1.80

NATIVE SOIL LAYER:
Infiltration (m/hr) = 0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW:ID= 2	0.09	0.023	12.08	60.37
OUTFLOW:ID= 1	0.00	0.000	0.00	0.00
OVERFLOW:ID= 3	0.09	0.023	12.08	58.36

Volume Reduction Rate[(RVin-RVout)/RVin](%)= 3.32
Maximum ponding/storage volume (cu.m.)= 1.82
Time to reach Max storage (Hr)= 9.33
Volume of water for drawdown in LID (cu.m.)= 1.82
Calculated Drawdown Time (Hr)= 1642.33

Junction Command(0209)

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 3(0208)	0.09	0.02	12.08	58.36
OUTFLOW: ID= 2(0209)	0.09	0.02	12.08	58.36

SWALE(0210)	SURFACE PONDING LAYER: IN= 2--> OUT= 3 | Length (m)= 10.00 Height (m)= 0.25 DT= 5.0 MIN | Left Slope = 3.00 Right Slope = 3.00 Bottom Width (m)= 0.30 Surface slope(%) = 3.00

NATIVE SOIL LAYER:
Infiltration (m/hr) = 0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW:ID= 2	0.09	0.023	12.08	58.36
OUTFLOW:ID= 1	0.00	0.000	0.00	0.00
OVERFLOW:ID= 3	0.09	0.023	12.08	57.16

Volume Reduction Rate[(RVin-RVout)/RVin](%)= 2.06
Maximum ponding/storage volume (cu.m.)= 1.09
Time to reach Max storage (Hr)= 10.33
Volume of water for drawdown in LID (cu.m.)= 1.09
Calculated Drawdown Time (Hr)= 1642.33

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  --------------------------
  | Junction Command(0211) |
  --------------------------

                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0210)    0.09     0.02   12.08    57.16
  OUTFLOW: ID= 2(  0211)    0.09     0.02   12.08    57.16

  ------------------------------------------------------------------------------
------------------
| SWALE(  0212)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   10.00  Height          (m)=    0.25
|DT=  5.0 MIN    |  Left Slope        =    3.00  Right Slope        =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    5.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.09         0.023            12.08        57.16
     OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
    OVERFLOW:ID= 3     0.09         0.023            12.08        56.54

               Volume Reduction Rate[(RVin-RVout)/RVin](%)=        1.09
               Maximum ponding/storage volume      (cu.m.)=        0.57
               Time to reach Max storage              (Hr)=       10.67
               Volume of water for drawdown in LID (cu.m.)=        0.57
               Calculated Drawdown Time               (Hr)=     1642.33

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  | Junction Command(0213) |
  --------------------------

                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0212)    0.09     0.02   12.08    56.54
  OUTFLOW: ID= 2(  0213)    0.09     0.02   12.08    56.54

  ------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     168.46       130.23
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.71 (ii)    3.89 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.25
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.02         0.027 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08         12.08
     RUNOFF VOLUME    (mm)=     135.63        75.64         83.40
     TOTAL RAINFALL   (mm)=     137.63       137.63        137.63
     RUNOFF COEFFICIENT   =       0.99         0.55          0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     168.46       102.64
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.53 (ii)    2.64 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.29
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01         0.027 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.08         12.08
     RUNOFF VOLUME    (mm)=     135.63        69.76        114.88
     TOTAL RAINFALL   (mm)=     137.63       137.63        137.63
     RUNOFF COEFFICIENT   =       0.99         0.51          0.83
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***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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|Bioretention(  0206)|  OUTFLOW: OFF,  UNDERDRAIN: OFF
|IN= 2--> OUT= 3     |
| DT=  5.0 min       |
---------------------  SURFACE PONDING LAYER:

                         Max. Ponding Storage(cu.m.)=       17.60

                       STAGE        AREA          |   STAGE      AREA
                        (m)        (m2)           |    (m)       (m2)
                       0.000        60.000        |   0.160       73.330
                       0.020        61.670        |   0.180       75.000
                       0.040        63.330        |   0.200       76.670
                       0.060        65.000        |   0.220       78.330
                       0.080        66.670        |   0.230       79.170
                       0.100        68.330        |   0.240       80.000
                       0.120        70.000        |   0.250       80.840
                       0.140        71.670        |   0.000        0.000

                    MULCH LAYER:
                    Depth      (m)=    0.08  Porosity           =  0.00
                    Maximum Mulch layer Volume (cu.m.)=     0.00

                    ENGINEERED SOIL LAYER:
                    Soil moisture =    0.30  Depth            (m)=  0.65
                    Width      (m)=    8.50  Length           (m)=  7.00
                    Porosity      =    0.00  Infiltration (m/hr) = 0.0000
                    Maximum Engineered Soil layer Volume(cu.m.)=    0.04

                    STORAGE LAYER:
                    Depth       (m)=    0.30  Porosity          =  0.00
                    Seepage (m/hr) = 0.0000
                    Maximum Storage layer Volume(cu.m.)=     0.02

                    TOTAL AVAILABLE STORAGE:

                    TOTAL STORAGE=Surface Ponding + Mulch Layer + Engineered soil
+Storage Layer(cu.m.)=       17.66

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                                AREA         QPEAK            TPEAK         R.V.
                                (ha)         (cms)            (hrs)         (mm)
                  INFLOW:ID= 2     0.06         0.027            12.08       114.88
                OVERFLOW:ID= 3     0.06         0.027            12.08        87.79

                         Volume Reduction Rate[(RVin-RVout)/RVin] (%)=       23.57
                         Time to reach Max Ponding storage       (Hr)=        0.00
                         Volume of water for drawdown in LID  (cu.m.)=       17.61
                         Volume of Max. Water Storage         (cu.m.)=        0.00
                         Maximum Surface Ponding And Mulch Vol(cu.m.)=       17.60
                         Maximum Engineered Soil Volume       (cu.m.)=        0.01
                         Surface Ponding And Mulch Drawdown Time(Hr)=     1642.33
                         Engineered Soil Drawdown time          (Hr)=        0.00
                         Calculated Drawdown Time               (Hr)=        0.00

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  | Junction Command(0207) |
  --------------------------

                                    AREA     QPEAK   TPEAK     R.V.
                                    (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0206)    0.07     0.03   12.08    87.79
  OUTFLOW: ID= 2(  0207)    0.07     0.03   12.08    87.79

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| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  97.60   Dir. Conn.(%)=  97.60
--------------------

                                  IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.01
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       3.00         4.00
     Length            (m)=      46.98        30.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     168.46       102.64
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.95 (ii)    1.84 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.32
                                                              *TOTALS*
     PEAK FLOW       (cms)=       0.15         0.00          0.154 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08          12.08
     RUNOFF VOLUME    (mm)=     135.63        69.76         134.05
     TOTAL RAINFALL   (mm)=     137.63       137.63         137.63
     RUNOFF COEFFICIENT   =       0.99         0.51           0.97
```

```
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0205)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0189      0.0093
                          0.0041     0.0001   |   0.0193      0.0093
                          0.0084     0.0016   |   0.0203      0.0094
                          0.0104     0.0026   |   0.0216      0.0095
                          0.0121     0.0036   |   0.0217      0.0096
                          0.0136     0.0046   |   0.0219      0.0101
                          0.0149     0.0057   |   0.0221      0.0110
                          0.0161     0.0067   |   0.0223      0.0123
                          0.0173     0.0077   |   0.0224      0.0144
                          0.0183     0.0087   |   0.1878      0.0170

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0201)     0.331      0.154     12.08     134.05
   OUTFLOW: ID= 1 (  0205)     0.331      0.071     12.17     134.05

                 PEAK   FLOW   REDUCTION [Qout/Qin](%)= 46.34
                 TIME SHIFT OF PEAK FLOW         (min)=  5.00
                 MAXIMUM  STORAGE   USED       (ha.m.)=  0.0159

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0204):     0.08   0.027    12.08    83.40
     + ID2= 2 (  0205):     0.33   0.071    12.17   134.05
       ================================================
       ID = 3 (  0214):     0.41   0.080    12.17   123.89

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0214):     0.41   0.080    12.17   123.89
     + ID2= 2 (  0207):     0.06   0.027    12.08    87.79
       ================================================
       ID = 1 (  0214):     0.48   0.084    12.17   118.99

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0214):     0.48   0.084    12.17   118.99
     + ID2= 2 (  0213):     0.09   0.023    12.08    56.54
       ================================================
       ID = 3 (  0214):     0.57   0.099    12.08   109.02

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
========================

      V    V   I    SSSSS  U   U    A    L              (v 6.2.2011)
      V    V   I    SS     U   U   A A   L
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\5765
512f-e294-4fce-935f-a325d9803126\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\5765
512f-e294-4fce-935f-a325d9803126\scen
```

DATE: 04-25-2022 TIME: 11:03:17

USER:

COMMENTS: _____

**** SIMULATION : 100yr 4hr 5min Chicago **

| CHICAGO STORM | IDF curve parameters: A=1383.628
| Ptotal= 87.45 mm | B= 4.905
| | C= 0.754

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	6.06	1.00	24.64	2.00	16.04	3.00	7.96
0.08	6.41	1.08	36.97	2.08	14.68	3.08	7.67
0.17	6.81	1.17	81.48	2.17	13.55	3.17	7.40
0.25	7.27	1.25	245.55	2.25	12.60	3.25	7.15
0.33	7.81	1.33	103.86	2.33	11.79	3.33	6.92
0.42	8.45	1.42	59.20	2.42	11.08	3.42	6.71
0.50	9.23	1.50	41.66	2.50	10.47	3.50	6.51
0.58	10.19	1.58	32.37	2.58	9.93	3.58	6.32
0.67	11.42	1.67	26.62	2.67	9.45	3.67	6.15
0.75	13.06	1.75	22.72	2.75	9.02	3.75	5.99
0.83	15.34	1.83	19.89	2.83	8.63	3.83	5.83
0.92	18.79	1.92	17.73	2.92	8.28	3.92	5.69

| CALIB | NASHYD (0203) | ID= 1 DT= 5.0 min |

Area (ha)= 0.09 Curve Number (CN)= 73.6
Ia (mm)= 4.40 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.05

Unit Hyd Qpeak (cms)= 0.070

PEAK FLOW (cms)= 0.017 (i)
TIME TO PEAK (hrs)= 1.333
RUNOFF VOLUME (mm)= 30.211
TOTAL RAINFALL (mm)= 87.445
RUNOFF COEFFICIENT = 0.345

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| SWALE(0208) | IN= 2--> OUT= 3 | DT= 5.0 MIN |

SURFACE PONDING LAYER:
Length (m)= 16.00 Height (m)= 0.25
Left Slope = 3.00 Right Slope = 3.00
Bottom Width (m)= 0.30 Surface slope(%) = 1.80

NATIVE SOIL LAYER:
Infiltration (m/hr) = 0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW:ID= 2	0.09	0.017	1.33	30.21
OUTFLOW:ID= 1	0.00	0.000	0.00	0.00
OVERFLOW:ID= 3	0.09	0.017	1.33	28.21

Volume Reduction Rate[(RVin-RVout)/RVin](%)= 6.63
Maximum ponding/storage volume (cu.m.)= 1.82
Time to reach Max storage (Hr)= 1.33
Volume of water for drawdown in LID (cu.m.)= 1.82
Calculated Drawdown Time (Hr)= 1662.42

| Junction Command(0209) |

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 3(0208)	0.09	0.02	1.33	28.21
OUTFLOW: ID= 2(0209)	0.09	0.02	1.33	28.21

| SWALE(0210) | IN= 2--> OUT= 3 | DT= 5.0 MIN |

SURFACE PONDING LAYER:
Length (m)= 10.00 Height (m)= 0.25
Left Slope = 3.00 Right Slope = 3.00
Bottom Width (m)= 0.30 Surface slope(%) = 3.00

NATIVE SOIL LAYER:
Infiltration (m/hr) = 0.0000

```
                      AREA         QPEAK            TPEAK         R.V.
                      (ha)         (cms)            (hrs)         (mm)
     INFLOW:ID= 2     0.09         0.017             1.33        28.21
    OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
   OVERFLOW:ID= 3     0.09         0.014             1.33        27.01

             Volume Reduction Rate[(RVin-RVout)/RVin](%)=        4.26
             Maximum ponding/storage volume      (cu.m.)=        1.09
             Time to reach Max storage             (Hr)=        1.33
             Volume of water for drawdown in LID (cu.m.)=        1.09
             Calculated Drawdown Time              (Hr)=     1662.42

  --------------------------
  | Junction Command(0211) |
  --------------------------

                        AREA     QPEAK   TPEAK     R.V.
                        (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0210)    0.09     0.01    1.33    27.01
  OUTFLOW: ID= 2(  0211)    0.09     0.01    1.33    27.01

  ------------------------------------------------------------------------------
------------------
| SWALE(  0212)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   10.00  Height          (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    5.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                      AREA         QPEAK            TPEAK         R.V.
                      (ha)         (cms)            (hrs)         (mm)
     INFLOW:ID= 2     0.09         0.014             1.33        27.01
    OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
   OVERFLOW:ID= 3     0.09         0.012             1.33        26.38

             Volume Reduction Rate[(RVin-RVout)/RVin](%)=        2.30
             Maximum ponding/storage volume      (cu.m.)=        0.57
             Time to reach Max storage             (Hr)=        1.33
             Volume of water for drawdown in LID (cu.m.)=        0.57
             Calculated Drawdown Time              (Hr)=     1662.42

  --------------------------
  | Junction Command(0213) |
  --------------------------

                        AREA     QPEAK   TPEAK     R.V.
                        (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0212)    0.09     0.01    1.33    26.38
  OUTFLOW: ID= 2(  0213)    0.09     0.01    1.33    26.38

  ------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     245.55        85.49
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       0.61 (ii)    5.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.34         0.16
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01         0.015 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.42
     RUNOFF VOLUME    (mm)=      85.45        37.41         43.63
     TOTAL RAINFALL   (mm)=      87.45        87.45         87.45
     RUNOFF COEFFICIENT   =       0.98         0.43          0.50

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250
```

```
     Max.Eff.Inten.(mm/hr)=     245.55        64.33
                over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.46 (ii)    2.27 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.30
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.00          0.035 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      85.45        33.65          69.12
     TOTAL RAINFALL   (mm)=      87.45        87.45          87.45
     RUNOFF COEFFICIENT   =       0.98         0.38           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
----------------------
|Bioretention(  0206)|  OUTFLOW: OFF,  UNDERDRAIN: OFF
|IN= 2--> OUT= 3     |
| DT=  5.0 min       |
----------------------  SURFACE PONDING LAYER:

                        Max. Ponding Storage(cu.m.)=       17.60

                       STAGE        AREA          |   STAGE      AREA
                        (m)        (m2)          |    (m)       (m2)
                       0.000        60.000        |   0.160       73.330
                       0.020        61.670        |   0.180       75.000
                       0.040        63.330        |   0.200       76.670
                       0.060        65.000        |   0.220       78.330
                       0.080        66.670        |   0.230       79.170
                       0.100        68.330        |   0.240       80.000
                       0.120        70.000        |   0.250       80.840
                       0.140        71.670        |   0.000        0.000

                     MULCH LAYER:
                     Depth      (m)=    0.08  Porosity           =  0.00
                     Maximum Mulch layer Volume (cu.m.)=     0.00

                     ENGINEERED SOIL LAYER:
                     Soil moisture =    0.30  Depth            (m)=  0.65
                     Width      (m)=    8.50  Length           (m)=  7.00
                     Porosity      =    0.00  Infiltration (m/hr) = 0.0000
                     Maximum Engineered Soil layer Volume(cu.m.)=    0.04

                     STORAGE LAYER:
                     Depth       (m)=    0.30  Porosity          =  0.00
                     Seepage (m/hr) = 0.0000
                     Maximum Storage layer Volume(cu.m.)=     0.02

                     TOTAL AVAILABLE STORAGE:

                     TOTAL STORAGE=Surface Ponding + Mulch Layer + Engineered soil
+Storage Layer(cu.m.)=       17.66

                     NATIVE SOIL LAYER:
                     Infiltration (m/hr) = 0.0000

                        AREA         QPEAK            TPEAK         R.V.
                        (ha)         (cms)            (hrs)         (mm)
       INFLOW:ID= 2     0.06         0.035             1.33         69.12
     OVERFLOW:ID= 3     0.06         0.016             1.42         42.04

               Volume Reduction Rate[(RVin-RVout)/RVin] (%)=       39.18
               Time to reach Max Ponding storage       (Hr)=        0.00
               Volume of water for drawdown in LID  (cu.m.)=       17.61
               Volume of Max. Water Storage         (cu.m.)=        0.00
               Maximum Surface Ponding And Mulch Vol(cu.m.)=       17.60
               Maximum Engineered Soil Volume       (cu.m.)=        0.01
               Surface Ponding And Mulch Drawdown Time(Hr)=     1662.42
               Engineered Soil Drawdown time          (Hr)=        0.00
               Calculated Drawdown Time               (Hr)=        0.00

  --------------------------
  | Junction Command(0207) |
  --------------------------

                             AREA     QPEAK   TPEAK     R.V.
                             (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0206)    0.07     0.02    1.42    42.04
  OUTFLOW: ID= 2(  0207)    0.07     0.02    1.42    42.04

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  97.60   Dir. Conn.(%)=  97.60
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.01
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       3.00         4.00
     Length            (m)=      46.98        30.00
     Mannings n           =      0.013        0.250
```

```
     Max.Eff.Inten.(mm/hr)=     245.55        64.33
                over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.82 (ii)    1.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.33
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.22         0.00          0.222 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      85.45        33.65          84.20
     TOTAL RAINFALL   (mm)=      87.45        87.45          87.45
     RUNOFF COEFFICIENT   =       0.98         0.38           0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0205)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0189      0.0093
                          0.0041     0.0001   |   0.0193      0.0093
                          0.0084     0.0016   |   0.0203      0.0094
                          0.0104     0.0026   |   0.0216      0.0095
                          0.0121     0.0036   |   0.0217      0.0096
                          0.0136     0.0046   |   0.0219      0.0101
                          0.0149     0.0057   |   0.0221      0.0110
                          0.0161     0.0067   |   0.0223      0.0123
                          0.0173     0.0077   |   0.0224      0.0144
                          0.0183     0.0087   |   0.1878      0.0170

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0201)     0.331      0.222      1.33      84.20
   OUTFLOW: ID= 1 (  0205)     0.331      0.022      1.83      84.20

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 10.11
                  TIME SHIFT OF PEAK FLOW         (min)= 30.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0143

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0204):     0.08   0.015     1.42    43.63
     + ID2= 2 (  0205):     0.33   0.022     1.83    84.20
       ================================================
       ID = 3 (  0214):     0.41   0.037     1.42    76.07

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0214):     0.41   0.037     1.42    76.07
     + ID2= 2 (  0207):     0.06   0.016     1.42    42.04
       ================================================
       ID = 1 (  0214):     0.48   0.053     1.42    71.45

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0214):     0.48   0.053     1.42    71.45
     + ID2= 2 (  0213):     0.09   0.012     1.33    26.38
       ================================================
       ID = 3 (  0214):     0.57   0.064     1.42    64.25

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
========================

      V    V   I    SSSSS  U   U    A    L              (v 6.2.2011)
      V    V   I    SS     U   U   A A   L
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
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```

***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

Output filename:
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9409-ee7d-474e-98cc-75a4ef141697\scen
Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\7f42
9409-ee7d-474e-98cc-75a4ef141697\scen

DATE: 04-25-2022 TIME: 11:03:17

USER:

COMMENTS: _____

** SIMULATION : 10yr 24hr 5min SCS Type II **

| READ STORM | Filename: C:\Users\dhordyk\AppD
| | ata\Local\Temp\
| | b3cec1e8-54db-4fb7-970a-9d201c8a3957\bdb34a83
| Ptotal= 93.03 mm | Comments: 10yr 24hr 5min SCS Type II

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	6.08	1.67	12.17	13.40	18.25	1.67
0.08	1.02	6.17	1.67	12.25	13.40	18.33	1.67
0.17	1.02	6.25	1.67	12.33	13.40	18.42	1.67
0.25	1.02	6.33	1.67	12.42	13.40	18.50	1.67
0.33	1.02	6.42	1.67	12.50	13.40	18.58	1.67
0.42	1.02	6.50	1.67	12.58	6.88	18.67	1.67
0.50	1.02	6.58	1.67	12.67	6.88	18.75	1.67
0.58	1.02	6.67	1.67	12.75	6.88	18.83	1.67
0.67	1.02	6.75	1.67	12.83	6.88	18.92	1.67
0.75	1.02	6.83	1.67	12.92	6.88	19.00	1.67
0.83	1.02	6.92	1.67	13.00	6.88	19.08	1.67
0.92	1.02	7.00	1.67	13.08	5.02	19.17	1.67
1.00	1.02	7.08	2.05	13.17	5.02	19.25	1.67
1.08	1.02	7.17	2.05	13.25	5.02	19.33	1.67
1.17	1.02	7.25	2.05	13.33	5.02	19.42	1.67
1.25	1.02	7.33	2.05	13.42	5.02	19.50	1.67
1.33	1.02	7.42	2.05	13.50	5.02	19.58	1.67
1.42	1.02	7.50	2.05	13.58	3.91	19.67	1.67
1.50	1.02	7.58	2.05	13.67	3.91	19.75	1.67
1.58	1.02	7.67	2.05	13.75	3.91	19.83	1.67
1.67	1.02	7.75	2.05	13.83	3.91	19.92	1.67
1.75	1.02	7.83	2.05	13.92	3.91	20.00	1.67
1.83	1.02	7.92	2.05	14.00	3.91	20.08	1.12
1.92	1.02	8.00	2.05	14.08	2.79	20.17	1.12
2.00	1.02	8.08	2.42	14.17	2.79	20.25	1.12
2.08	1.21	8.17	2.42	14.25	2.79	20.33	1.12
2.17	1.21	8.25	2.42	14.33	2.79	20.42	1.12
2.25	1.21	8.33	2.42	14.42	2.79	20.50	1.12
2.33	1.21	8.42	2.42	14.50	2.79	20.58	1.12
2.42	1.21	8.50	2.42	14.58	2.79	20.67	1.12
2.50	1.21	8.58	2.60	14.67	2.79	20.75	1.12
2.58	1.21	8.67	2.60	14.75	2.79	20.83	1.12
2.67	1.21	8.75	2.60	14.83	2.79	20.92	1.12
2.75	1.21	8.83	2.60	14.92	2.79	21.00	1.12
2.83	1.21	8.92	2.60	15.00	2.79	21.08	1.12
2.92	1.21	9.00	2.60	15.08	2.79	21.17	1.12
3.00	1.21	9.08	2.98	15.17	2.79	21.25	1.12
3.08	1.21	9.17	2.98	15.25	2.79	21.33	1.12
3.17	1.21	9.25	2.98	15.33	2.79	21.42	1.12
3.25	1.21	9.33	2.98	15.42	2.79	21.50	1.12
3.33	1.21	9.42	2.98	15.50	2.79	21.58	1.12
3.42	1.21	9.50	2.98	15.58	2.79	21.67	1.12
3.50	1.21	9.58	3.35	15.67	2.79	21.75	1.12
3.58	1.21	9.67	3.35	15.75	2.79	21.83	1.12
3.67	1.21	9.75	3.35	15.83	2.79	21.92	1.12
3.75	1.21	9.83	3.35	15.92	2.79	22.00	1.12
3.83	1.21	9.92	3.35	16.00	2.79	22.08	1.12
3.92	1.21	10.00	3.35	16.08	1.67	22.17	1.12
4.00	1.21	10.08	4.28	16.17	1.67	22.25	1.12
4.08	1.49	10.17	4.28	16.25	1.67	22.33	1.12
4.17	1.49	10.25	4.28	16.33	1.67	22.42	1.12
4.25	1.49	10.33	4.28	16.42	1.67	22.50	1.12
4.33	1.49	10.42	4.28	16.50	1.67	22.58	1.12
4.42	1.49	10.50	4.28	16.58	1.67	22.67	1.12
4.50	1.49	10.58	5.77	16.67	1.67	22.75	1.12
4.58	1.49	10.67	5.77	16.75	1.67	22.83	1.12
4.67	1.49	10.75	5.77	16.83	1.67	22.92	1.12
4.75	1.49	10.83	5.77	16.92	1.67	23.00	1.12
4.83	1.49	10.92	5.77	17.00	1.67	23.08	1.12
4.92	1.49	11.00	5.77	17.08	1.67	23.17	1.12
5.00	1.49	11.08	8.93	17.17	1.67	23.25	1.12

5.08	1.49	11.17	8.93	17.25	1.67	23.33	1.12
5.17	1.49	11.25	8.93	17.33	1.67	23.42	1.12
5.25	1.49	11.33	8.93	17.42	1.67	23.50	1.12
5.33	1.49	11.42	8.93	17.50	1.67	23.58	1.12
5.42	1.49	11.50	8.93	17.58	1.67	23.67	1.12
5.50	1.49	11.58	27.54	17.67	1.67	23.75	1.12
5.58	1.49	11.67	27.54	17.75	1.67	23.83	1.12
5.67	1.49	11.75	27.54	17.83	1.67	23.92	1.12
5.75	1.49	11.83	113.87	17.92	1.67	24.00	1.12
5.83	1.49	11.92	113.87	18.00	1.67		
5.92	1.49	12.00	113.87	18.08	1.67		
6.00	1.49	12.08	13.40	18.17	1.67		

CALIB			
NASHYD (0203)	Area (ha)= 0.09	Curve Number (CN)= 73.6	
ID= 1 DT= 5.0 min	Ia (mm)= 4.40	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.05		

Unit Hyd Qpeak (cms)= 0.070

PEAK FLOW (cms)= 0.013 (i)
TIME TO PEAK (hrs)= 12.083
RUNOFF VOLUME (mm)= 33.344
TOTAL RAINFALL (mm)= 93.030
RUNOFF COEFFICIENT = 0.358

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SWALE(0208)	SURFACE PONDING LAYER:				
IN= 2--> OUT= 3	Length (m)= 16.00	Height (m)=	0.25		
DT= 5.0 MIN	Left Slope = 3.00	Right Slope =	3.00		
	Bottom Width (m)= 0.30	Surface slope(%) =	1.80		

NATIVE SOIL LAYER:
Infiltration (m/hr) = 0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW:ID= 2	0.09	0.013	12.08	33.34
OUTFLOW:ID= 1	0.00	0.000	0.00	0.00
OVERFLOW:ID= 3	0.09	0.013	12.08	31.34

Volume Reduction Rate[(RVin-RVout)/RVin](%)= 6.01
Maximum ponding/storage volume (cu.m.)= 1.82
Time to reach Max storage (Hr)= 11.00
Volume of water for drawdown in LID (cu.m.)= 1.82
Calculated Drawdown Time (Hr)= 1642.33

Junction Command(0209)

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 3(0208)	0.09	0.01	12.08	31.34
OUTFLOW: ID= 2(0209)	0.09	0.01	12.08	31.34

SWALE(0210)	SURFACE PONDING LAYER:				
IN= 2--> OUT= 3	Length (m)= 10.00	Height (m)=	0.25		
DT= 5.0 MIN	Left Slope = 3.00	Right Slope =	3.00		
	Bottom Width (m)= 0.30	Surface slope(%) =	3.00		

NATIVE SOIL LAYER:
Infiltration (m/hr) = 0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW:ID= 2	0.09	0.013	12.08	31.34
OUTFLOW:ID= 1	0.00	0.000	0.00	0.00
OVERFLOW:ID= 3	0.09	0.013	12.08	30.14

Volume Reduction Rate[(RVin-RVout)/RVin](%)= 3.83
Maximum ponding/storage volume (cu.m.)= 1.09
Time to reach Max storage (Hr)= 11.58
Volume of water for drawdown in LID (cu.m.)= 1.09
Calculated Drawdown Time (Hr)= 1642.33

Junction Command(0211)

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 3(0210)	0.09	0.01	12.08	30.14
OUTFLOW: ID= 2(0211)	0.09	0.01	12.08	30.14

SWALE(0212)	SURFACE PONDING LAYER:				
IN= 2--> OUT= 3	Length (m)= 10.00	Height (m)=	0.25		
DT= 5.0 MIN	Left Slope = 3.00	Right Slope =	3.00		
	Bottom Width (m)= 0.30	Surface slope(%) =	5.80		

NATIVE SOIL LAYER:
Infiltration (m/hr) = 0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW:ID= 2	0.09	0.013	12.08	30.14
OUTFLOW:ID= 1	0.00	0.000	0.00	0.00
OVERFLOW:ID= 3	0.09	0.013	12.08	29.52

Volume Reduction Rate[(RVin-RVout)/RVin](%)= 2.06
Maximum ponding/storage volume (cu.m.)= 0.57
Time to reach Max storage (Hr)= 11.75
Volume of water for drawdown in LID (cu.m.)= 0.57
Calculated Drawdown Time (Hr)= 1642.33

Junction Command(0213)

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 3(0212)	0.09	0.01	12.08	29.52
OUTFLOW: ID= 2(0213)	0.09	0.01	12.08	29.52

CALIB (0204) | ID= 1 DT= 5.0 min	Area (ha)= 0.08 Total Imp(%)= 25.90 Dir. Conn.(%)= 13.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.02	0.06	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	5.00	
Length	(m)=	23.52	20.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		113.87	71.64	
over (min)		5.00	5.00	
Storage Coeff. (min)=		0.83 (ii)	4.87 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.34	0.22	
				TOTALS
PEAK FLOW	(cms)=	0.00	0.01	0.015 (iii)
TIME TO PEAK	(hrs)=	12.08	12.08	12.08
RUNOFF VOLUME	(mm)=	91.03	41.35	47.78
TOTAL RAINFALL	(mm)=	93.03	93.03	93.03
RUNOFF COEFFICIENT	=	0.98	0.44	0.51

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 68.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB (0202) | ID= 1 DT= 5.0 min	Area (ha)= 0.06 Total Imp(%)= 68.50 Dir. Conn.(%)= 68.50

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.04	0.02	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	4.00	5.00	
Length	(m)=	20.82	20.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		113.87	55.15	
over (min)		5.00	5.00	
Storage Coeff. (min)=		0.62 (ii)	3.09 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.34	0.27	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.00	0.017 (iii)
TIME TO PEAK	(hrs)=	12.08	12.08	12.08
RUNOFF VOLUME	(mm)=	91.03	37.34	74.11
TOTAL RAINFALL	(mm)=	93.03	93.03	93.03
RUNOFF COEFFICIENT	=	0.98	0.40	0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 68.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

Bioretention(0206) | IN= 2--> OUT= 3 | DT= 5.0 min	OUTFLOW: OFF, UNDERDRAIN: OFF

SURFACE PONDING LAYER:

Max. Ponding Storage(cu.m.)= 17.60

```
  STAGE        AREA          |   STAGE      AREA
   (m)        (m2)           |    (m)       (m2)
  0.000        60.000        |   0.160       73.330
  0.020        61.670        |   0.180       75.000
  0.040        63.330        |   0.200       76.670
  0.060        65.000        |   0.220       78.330
  0.080        66.670        |   0.230       79.170
  0.100        68.330        |   0.240       80.000
  0.120        70.000        |   0.250       80.840
  0.140        71.670        |   0.000        0.000

MULCH LAYER:
Depth      (m)=    0.08  Porosity           =  0.00
Maximum Mulch layer Volume (cu.m.)=     0.00

ENGINEERED SOIL LAYER:
Soil moisture =    0.30  Depth            (m)=  0.65
Width      (m)=    8.50  Length           (m)=  7.00
Porosity      =    0.00  Infiltration (m/hr) = 0.0000
Maximum Engineered Soil layer Volume(cu.m.)=    0.04

STORAGE LAYER:
Depth       (m)=    0.30  Porosity          =  0.00
Seepage (m/hr) = 0.0000
Maximum Storage layer Volume(cu.m.)=     0.02

TOTAL AVAILABLE STORAGE:

TOTAL STORAGE=Surface Ponding + Mulch Layer + Engineered soil
+Storage Layer(cu.m.)=       17.66

NATIVE SOIL LAYER:
Infiltration (m/hr) = 0.0000

                AREA         QPEAK            TPEAK         R.V.
                (ha)         (cms)            (hrs)         (mm)
     INFLOW:ID= 2     0.06         0.017            12.08        74.11
   OVERFLOW:ID= 3     0.07         0.017            12.08        47.03

            Volume Reduction Rate[(RVin-RVout)/RVin] (%)=       36.54
            Time to reach Max Ponding storage       (Hr)=        0.00
            Volume of water for drawdown in LID  (cu.m.)=       17.61
            Volume of Max. Water Storage         (cu.m.)=        0.00
            Maximum Surface Ponding And Mulch Vol(cu.m.)=       17.60
            Maximum Engineered Soil Volume       (cu.m.)=        0.01
            Surface Ponding And Mulch Drawdown Time(Hr)=     1642.33
            Engineered Soil Drawdown time          (Hr)=        0.00
            Calculated Drawdown Time               (Hr)=        0.00
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 | Junction Command(0207) |
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                        AREA     QPEAK   TPEAK     R.V.
                        (ha)     (cms)    (hrs)    (mm)
 INFLOW : ID= 3(  0206)    0.07     0.02   12.08    47.03
 OUTFLOW: ID= 2(  0207)    0.07     0.02   12.08    47.03

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--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  97.60   Dir. Conn.(%)=  97.60
--------------------
                           IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.32         0.01
    Dep. Storage     (mm)=       2.00         5.00
    Average Slope     (%)=       3.00         4.00
    Length            (m)=      46.98        30.00
    Mannings n           =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=     113.87        55.15
              over (min)        5.00         5.00
    Storage Coeff.  (min)=       1.11 (ii)    2.15 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.34         0.31
                                                        *TOTALS*
    PEAK FLOW       (cms)=       0.10         0.00          0.103 (iii)
    TIME TO PEAK    (hrs)=      12.08        12.08          12.08
    RUNOFF VOLUME    (mm)=      91.03        37.34          89.74
    TOTAL RAINFALL   (mm)=      93.03        93.03          93.03
    RUNOFF COEFFICIENT   =       0.98         0.40           0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  =  68.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0205)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0189      0.0093
                          0.0041     0.0001   |   0.0193      0.0093
```

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                        0.0084     0.0016   |   0.0203      0.0094
                        0.0104     0.0026   |   0.0216      0.0095
                        0.0121     0.0036   |   0.0217      0.0096
                        0.0136     0.0046   |   0.0219      0.0101
                        0.0149     0.0057   |   0.0221      0.0110
                        0.0161     0.0067   |   0.0223      0.0123
                        0.0173     0.0077   |   0.0224      0.0144
                        0.0183     0.0087   |   0.1878      0.0170

                              AREA     QPEAK     TPEAK       R.V.
                              (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0201)     0.331      0.103     12.08      89.74
   OUTFLOW: ID= 1 (  0205)     0.331      0.022     12.17      89.74

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.14
                  TIME SHIFT OF PEAK FLOW         (min)=  5.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0101

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--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0204):     0.08   0.015    12.08    47.78
     + ID2= 2 (  0205):     0.33   0.022    12.17    89.74
       ================================================
       ID = 3 (  0214):     0.41   0.034    12.08    81.33

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0214):     0.41   0.034    12.08    81.33
     + ID2= 2 (  0207):     0.07   0.017    12.08    47.03
       ================================================
       ID = 1 (  0214):     0.48   0.051    12.08    76.67

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0214):     0.48   0.051    12.08    76.67
     + ID2= 2 (  0213):     0.09   0.013    12.08    29.52
       ================================================
       ID = 3 (  0214):     0.57   0.064    12.08    69.14

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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      V    V   I    SSSSS  U   U    A    L              (v 6.2.2011)
      V    V   I    SS     U   U   A A   L
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
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                 *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\2a12
1e83-9bef-43dc-a941-bd0afc565e89\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\2a12
1e83-9bef-43dc-a941-bd0afc565e89\scen


DATE: 04-25-2022                          TIME: 11:03:16

USER:


COMMENTS: _____

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  ******************************************
  ** SIMULATION : 10yr 4hr 5min Chicago         **
  ******************************************
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--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 976.898
| Ptotal= 59.77 mm |                          B=   4.745
--------------------                          C=   0.760
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =  0.33

                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00    4.04 |  1.00   16.64 |  2.00   10.79 |  3.00    5.32
                0.08    4.28 |  1.08   25.08 |  2.08    9.86 |  3.08    5.13
                0.17    4.55 |  1.17   55.96 |  2.17    9.10 |  3.17    4.94
                0.25    4.86 |  1.25  173.13 |  2.25    8.45 |  3.25    4.78
                0.33    5.22 |  1.33   71.59 |  2.33    7.91 |  3.33    4.62
                0.42    5.65 |  1.42   40.40 |  2.42    7.43 |  3.42    4.48
                0.50    6.18 |  1.50   28.30 |  2.50    7.02 |  3.50    4.34
                0.58    6.83 |  1.58   21.92 |  2.58    6.65 |  3.58    4.22
                0.67    7.66 |  1.67   17.99 |  2.67    6.33 |  3.67    4.10
                0.75    8.77 |  1.75   15.33 |  2.75    6.04 |  3.75    3.99
                0.83   10.31 |  1.83   13.40 |  2.83    5.78 |  3.83    3.89
                0.92   12.65 |  1.92   11.94 |  2.92    5.54 |  3.92    3.79


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--------------------
| CALIB            |
| NASHYD   (  0203)|   Area    (ha)=   0.09   Curve Number   (CN)= 73.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.05

     Unit Hyd Qpeak  (cms)=   0.070

     PEAK FLOW       (cms)=   0.009 (i)
     TIME TO PEAK    (hrs)=   1.333
     RUNOFF VOLUME    (mm)=  15.965
     TOTAL RAINFALL   (mm)=  59.765
     RUNOFF COEFFICIENT   =   0.267

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
------------------
| SWALE(  0208)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   16.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    1.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
     INFLOW:ID= 2     0.09         0.009             1.33        15.97
    OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
  OVERFLOW:ID= 3      0.09         0.006             1.42        13.96

              Volume Reduction Rate[(RVin-RVout)/RVin](%)=       12.55
              Maximum ponding/storage volume      (cu.m.)=        1.82
              Time to reach Max storage              (Hr)=        1.33
              Volume of water for drawdown in LID (cu.m.)=        1.82
              Calculated Drawdown Time               (Hr)=     1662.42

  --------------------------
  | Junction Command(0209) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0208)    0.09     0.01    1.42    13.96
  OUTFLOW: ID= 2(  0209)    0.09     0.01    1.42    13.96

  --------------------------------------------------------------------------------
------------------
| SWALE(  0210)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   10.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    3.00

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
     INFLOW:ID= 2     0.09         0.006             1.42        13.96
    OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
  OVERFLOW:ID= 3      0.09         0.006             1.42        12.76

              Volume Reduction Rate[(RVin-RVout)/RVin](%)=        8.61
              Maximum ponding/storage volume      (cu.m.)=        1.09
              Time to reach Max storage              (Hr)=        1.33
              Volume of water for drawdown in LID (cu.m.)=        1.09
              Calculated Drawdown Time               (Hr)=     1662.42

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  | Junction Command(0211) |
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                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0210)    0.09     0.01    1.42    12.76
  OUTFLOW: ID= 2(  0211)    0.09     0.01    1.42    12.76

  --------------------------------------------------------------------------------
------------------
| SWALE(  0212)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   10.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    5.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
     INFLOW:ID= 2      0.09         0.006             1.42        12.76
    OUTFLOW:ID= 1      0.00         0.000             0.00         0.00
   OVERFLOW:ID= 3      0.09         0.006             1.42        12.14

               Volume Reduction Rate[(RVin-RVout)/RVin](%)=        4.87
               Maximum ponding/storage volume      (cu.m.)=        0.57
               Time to reach Max storage              (Hr)=        1.42
               Volume of water for drawdown in LID (cu.m.)=        0.57
               Calculated Drawdown Time               (Hr)=     1662.42

  --------------------------
  | Junction Command(0213) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0212)    0.09     0.01    1.42    12.14
  OUTFLOW: ID= 2(  0213)    0.09     0.01    1.42    12.14

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.13        43.96
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       0.70 (ii)    5.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.34         0.15
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01          0.008 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      57.77        19.59         24.51
     TOTAL RAINFALL   (mm)=      59.77        59.77         59.77
     RUNOFF COEFFICIENT   =       0.97         0.33          0.41

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.13        32.19
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.53 (ii)    2.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.29
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.023 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      57.77        17.21         44.98
     TOTAL RAINFALL   (mm)=      59.77        59.77         59.77
     RUNOFF COEFFICIENT   =       0.97         0.29          0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
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          CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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----------------------
|Bioretention(  0206)|  OUTFLOW: OFF,  UNDERDRAIN: OFF
|IN= 2--> OUT= 3     |
| DT=  5.0 min       |
----------------------  SURFACE PONDING LAYER:

                        Max. Ponding Storage(cu.m.)=       17.60

                      STAGE        AREA          |   STAGE      AREA
                       (m)        (m2)           |    (m)       (m2)
                      0.000        60.000        |   0.160       73.330
                      0.020        61.670        |   0.180       75.000
                      0.040        63.330        |   0.200       76.670
                      0.060        65.000        |   0.220       78.330
                      0.080        66.670        |   0.230       79.170
                      0.100        68.330        |   0.240       80.000
                      0.120        70.000        |   0.250       80.840
                      0.140        71.670        |   0.000        0.000

                    MULCH LAYER:
                    Depth      (m)=    0.08  Porosity           =  0.00
                    Maximum Mulch layer Volume (cu.m.)=     0.00

                    ENGINEERED SOIL LAYER:
                    Soil moisture =    0.30  Depth            (m)=  0.65
                    Width      (m)=    8.50  Length           (m)=  7.00
                    Porosity      =    0.00  Infiltration (m/hr) = 0.0000
                    Maximum Engineered Soil layer Volume(cu.m.)=    0.04

                    STORAGE LAYER:
                    Depth       (m)=    0.30  Porosity          =  0.00
                    Seepage (m/hr) = 0.0000
                    Maximum Storage layer Volume(cu.m.)=     0.02

                    TOTAL AVAILABLE STORAGE:

                    TOTAL STORAGE=Surface Ponding + Mulch Layer + Engineered soil
+Storage Layer(cu.m.)=       17.66

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.06         0.023             1.33        44.98
    OVERFLOW:ID= 3     0.06         0.004             1.58        17.90

                Volume Reduction Rate[(RVin-RVout)/RVin] (%)=       60.21
                Time to reach Max Ponding storage       (Hr)=        0.00
                Volume of water for drawdown in LID  (cu.m.)=       17.61
                Volume of Max. Water Storage         (cu.m.)=        0.00
                Maximum Surface Ponding And Mulch Vol(cu.m.)=       17.60
                Maximum Engineered Soil Volume       (cu.m.)=        0.01
                Surface Ponding And Mulch Drawdown Time(Hr)=     1662.42
                Engineered Soil Drawdown time           (Hr)=        0.00
                Calculated Drawdown Time                (Hr)=        0.00

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  | Junction Command(0207) |
  --------------------------

                              AREA     QPEAK   TPEAK     R.V.
                              (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0206)    0.07     0.00    1.58    17.90
  OUTFLOW: ID= 2(  0207)    0.07     0.00    1.58    17.90

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  97.60   Dir. Conn.(%)=  97.60
--------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.01
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       3.00         4.00
     Length            (m)=      46.98        30.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     173.13        32.19
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.94 (ii)    1.82 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.32
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.15         0.00          0.156 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      57.77        17.21          56.79
     TOTAL RAINFALL   (mm)=      59.77        59.77          59.77
     RUNOFF COEFFICIENT   =       0.97         0.29           0.95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
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```
          CN*  =  68.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0205)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0189      0.0093
                          0.0041     0.0001   |   0.0193      0.0093
                          0.0084     0.0016   |   0.0203      0.0094
                          0.0104     0.0026   |   0.0216      0.0095
                          0.0121     0.0036   |   0.0217      0.0096
                          0.0136     0.0046   |   0.0219      0.0101
                          0.0149     0.0057   |   0.0221      0.0110
                          0.0161     0.0067   |   0.0223      0.0123
                          0.0173     0.0077   |   0.0224      0.0144
                          0.0183     0.0087   |   0.1878      0.0170

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0201)     0.331      0.156      1.33      56.79
   OUTFLOW: ID= 1 (  0205)     0.331      0.019      1.67      56.79

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.04
                  TIME SHIFT OF PEAK FLOW         (min)= 20.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0091

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--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0204):     0.08   0.008     1.33    24.51
     + ID2= 2 (  0205):     0.33   0.019     1.67    56.79
       ================================================
       ID = 3 (  0214):     0.41   0.025     1.42    50.32

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0214):     0.41   0.025     1.42    50.32
     + ID2= 2 (  0207):     0.06   0.004     1.58    17.90
       ================================================
       ID = 1 (  0214):     0.48   0.028     1.58    45.92

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0214):     0.48   0.028     1.58    45.92
     + ID2= 2 (  0213):     0.09   0.006     1.42    12.14
       ================================================
       ID = 3 (  0214):     0.57   0.031     1.42    40.53

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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================================================================================
========================

      V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
      V    V   I    SS     U   U   A A   L
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\39ce
d2c2-505e-471f-83fa-2692ab8aa74f\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\39ce
d2c2-505e-471f-83fa-2692ab8aa74f\scen


DATE: 04-25-2022                          TIME: 11:03:16
```

USER:

COMMENTS: _____

****
** SIMULATION : 25yr 24hr 5min SCS Type II **
****

READ STORM	Filename: C:\Users\dhordyk\AppD ata\Local\Temp\ b3cec1e8-54db-4fb7-970a-9d201c8a3957\8a53c9fe
Ptotal=111.09 mm	Comments: 25yr 24hr 5min SCS Type II

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	6.08	2.00	12.17	16.00	18.25	2.00
0.08	1.22	6.17	2.00	12.25	16.00	18.33	2.00
0.17	1.22	6.25	2.00	12.33	16.00	18.42	2.00
0.25	1.22	6.33	2.00	12.42	16.00	18.50	2.00
0.33	1.22	6.42	2.00	12.50	16.00	18.58	2.00
0.42	1.22	6.50	2.00	12.58	8.22	18.67	2.00
0.50	1.22	6.58	2.00	12.67	8.22	18.75	2.00
0.58	1.22	6.67	2.00	12.75	8.22	18.83	2.00
0.67	1.22	6.75	2.00	12.83	8.22	18.92	2.00
0.75	1.22	6.83	2.00	12.92	8.22	19.00	2.00
0.83	1.22	6.92	2.00	13.00	8.22	19.08	2.00
0.92	1.22	7.00	2.00	13.08	6.00	19.17	2.00
1.00	1.22	7.08	2.44	13.17	6.00	19.25	2.00
1.08	1.22	7.17	2.44	13.25	6.00	19.33	2.00
1.17	1.22	7.25	2.44	13.33	6.00	19.42	2.00
1.25	1.22	7.33	2.44	13.42	6.00	19.50	2.00
1.33	1.22	7.42	2.44	13.50	6.00	19.58	2.00
1.42	1.22	7.50	2.44	13.58	4.67	19.67	2.00
1.50	1.22	7.58	2.44	13.67	4.67	19.75	2.00
1.58	1.22	7.67	2.44	13.75	4.67	19.83	2.00
1.67	1.22	7.75	2.44	13.83	4.67	19.92	2.00
1.75	1.22	7.83	2.44	13.92	4.67	20.00	2.00
1.83	1.22	7.92	2.44	14.00	4.67	20.08	1.33
1.92	1.22	8.00	2.44	14.08	3.33	20.17	1.33
2.00	1.22	8.08	2.89	14.17	3.33	20.25	1.33
2.08	1.44	8.17	2.89	14.25	3.33	20.33	1.33
2.17	1.44	8.25	2.89	14.33	3.33	20.42	1.33
2.25	1.44	8.33	2.89	14.42	3.33	20.50	1.33
2.33	1.44	8.42	2.89	14.50	3.33	20.58	1.33
2.42	1.44	8.50	2.89	14.58	3.33	20.67	1.33
2.50	1.44	8.58	3.11	14.67	3.33	20.75	1.33
2.58	1.44	8.67	3.11	14.75	3.33	20.83	1.33
2.67	1.44	8.75	3.11	14.83	3.33	20.92	1.33
2.75	1.44	8.83	3.11	14.92	3.33	21.00	1.33
2.83	1.44	8.92	3.11	15.00	3.33	21.08	1.33
2.92	1.44	9.00	3.11	15.08	3.33	21.17	1.33
3.00	1.44	9.08	3.55	15.17	3.33	21.25	1.33
3.08	1.44	9.17	3.55	15.25	3.33	21.33	1.33
3.17	1.44	9.25	3.55	15.33	3.33	21.42	1.33
3.25	1.44	9.33	3.55	15.42	3.33	21.50	1.33
3.33	1.44	9.42	3.55	15.50	3.33	21.58	1.33
3.42	1.44	9.50	3.55	15.58	3.33	21.67	1.33
3.50	1.44	9.58	4.00	15.67	3.33	21.75	1.33
3.58	1.44	9.67	4.00	15.75	3.33	21.83	1.33
3.67	1.44	9.75	4.00	15.83	3.33	21.92	1.33
3.75	1.44	9.83	4.00	15.92	3.33	22.00	1.33
3.83	1.44	9.92	4.00	16.00	3.33	22.08	1.33
3.92	1.44	10.00	4.00	16.08	2.00	22.17	1.33
4.00	1.44	10.08	5.11	16.17	2.00	22.25	1.33
4.08	1.78	10.17	5.11	16.25	2.00	22.33	1.33
4.17	1.78	10.25	5.11	16.33	2.00	22.42	1.33
4.25	1.78	10.33	5.11	16.42	2.00	22.50	1.33
4.33	1.78	10.42	5.11	16.50	2.00	22.58	1.33
4.42	1.78	10.50	5.11	16.58	2.00	22.67	1.33
4.50	1.78	10.58	6.89	16.67	2.00	22.75	1.33
4.58	1.78	10.67	6.89	16.75	2.00	22.83	1.33
4.67	1.78	10.75	6.89	16.83	2.00	22.92	1.33
4.75	1.78	10.83	6.89	16.92	2.00	23.00	1.33
4.83	1.78	10.92	6.89	17.00	2.00	23.08	1.33
4.92	1.78	11.00	6.89	17.08	2.00	23.17	1.33
5.00	1.78	11.08	10.66	17.17	2.00	23.25	1.33
5.08	1.78	11.17	10.66	17.25	2.00	23.33	1.33
5.17	1.78	11.25	10.66	17.33	2.00	23.42	1.33
5.25	1.78	11.33	10.66	17.42	2.00	23.50	1.33
5.33	1.78	11.42	10.66	17.50	2.00	23.58	1.33
5.42	1.78	11.50	10.66	17.58	2.00	23.67	1.33
5.50	1.78	11.58	32.88	17.67	2.00	23.75	1.33
5.58	1.78	11.67	32.88	17.75	2.00	23.83	1.33
5.67	1.78	11.75	32.88	17.83	2.00	23.92	1.33
5.75	1.78	11.83	135.97	17.92	2.00	24.00	1.33
5.83	1.78	11.92	135.97	18.00	2.00		
5.92	1.78	12.00	135.97	18.08	2.00		
6.00	1.78	12.08	16.00	18.17	2.00		

```
| CALIB            |
| NASHYD   (  0203)|   Area    (ha)=   0.09   Curve Number   (CN)= 73.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.05

     Unit Hyd Qpeak  (cms)=   0.070

     PEAK FLOW       (cms)=   0.017 (i)
     TIME TO PEAK    (hrs)=  12.083
     RUNOFF VOLUME    (mm)=  43.906
     TOTAL RAINFALL   (mm)= 111.090
     RUNOFF COEFFICIENT   =   0.395

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
------------------
| SWALE(  0208)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   16.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    1.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.09         0.017            12.08        43.91
     OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
    OVERFLOW:ID= 3     0.09         0.017            12.08        41.90

              Volume Reduction Rate[(RVin-RVout)/RVin](%)=        4.56
              Maximum ponding/storage volume      (cu.m.)=        1.82
              Time to reach Max storage             (Hr)=       10.33
              Volume of water for drawdown in LID (cu.m.)=        1.82
              Calculated Drawdown Time              (Hr)=     1642.33

  --------------------------
  | Junction Command(0209) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0208)    0.09     0.02   12.08    41.90
  OUTFLOW: ID= 2(  0209)    0.09     0.02   12.08    41.90

  --------------------------------------------------------------------------------
------------------
| SWALE(  0210)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   10.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    3.00

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.09         0.017            12.08        41.90
     OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
    OVERFLOW:ID= 3     0.09         0.017            12.08        40.70

              Volume Reduction Rate[(RVin-RVout)/RVin](%)=        2.87
              Maximum ponding/storage volume      (cu.m.)=        1.09
              Time to reach Max storage             (Hr)=       11.17
              Volume of water for drawdown in LID (cu.m.)=        1.09
              Calculated Drawdown Time              (Hr)=     1642.33

  --------------------------
  | Junction Command(0211) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0210)    0.09     0.02   12.08    40.70
  OUTFLOW: ID= 2(  0211)    0.09     0.02   12.08    40.70

  --------------------------------------------------------------------------------
------------------
| SWALE(  0212)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   10.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    5.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.09         0.017            12.08        40.70
     OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
    OVERFLOW:ID= 3     0.09         0.017            12.08        40.08

              Volume Reduction Rate[(RVin-RVout)/RVin](%)=        1.53
              Maximum ponding/storage volume      (cu.m.)=        0.57
              Time to reach Max storage             (Hr)=       11.33
              Volume of water for drawdown in LID (cu.m.)=        0.57
              Calculated Drawdown Time              (Hr)=     1642.33

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  | Junction Command(0213) |
  --------------------------

                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0212)    0.09     0.02   12.08    40.08
  OUTFLOW: ID= 2(  0213)    0.09     0.02   12.08    40.08

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     135.97        94.58
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.77 (ii)    4.39 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.23
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.02          0.020 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08          12.08
     RUNOFF VOLUME    (mm)=     109.09        54.70          61.74
     TOTAL RAINFALL   (mm)=     111.09       111.09         111.09
     RUNOFF COEFFICIENT   =       0.98         0.49           0.56

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     135.97        73.60
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.58 (ii)    2.87 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.28
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.021 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.08          12.08
     RUNOFF VOLUME    (mm)=     109.09        49.88          90.44
     TOTAL RAINFALL   (mm)=     111.09       111.09         111.09
     RUNOFF COEFFICIENT   =       0.98         0.45           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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----------------------
|Bioretention(  0206)|  OUTFLOW: OFF,  UNDERDRAIN: OFF
|IN= 2--> OUT= 3     |
| DT=  5.0 min       |
----------------------  SURFACE PONDING LAYER:

                          Max. Ponding Storage(cu.m.)=       17.60

                        STAGE        AREA          |   STAGE      AREA
                         (m)        (m2)          |    (m)       (m2)
                        0.000        60.000        |   0.160       73.330
                        0.020        61.670        |   0.180       75.000
                        0.040        63.330        |   0.200       76.670
                        0.060        65.000        |   0.220       78.330
                        0.080        66.670        |   0.230       79.170
                        0.100        68.330        |   0.240       80.000
                        0.120        70.000        |   0.250       80.840
                        0.140        71.670        |   0.000        0.000

                      MULCH LAYER:
                      Depth      (m)=    0.08  Porosity           =  0.00
                      Maximum Mulch layer Volume (cu.m.)=     0.00
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                    ENGINEERED SOIL LAYER:
                    Soil moisture =    0.30  Depth            (m)=  0.65
                    Width      (m)=    8.50  Length           (m)=  7.00
                    Porosity      =    0.00  Infiltration (m/hr) = 0.0000
                    Maximum Engineered Soil layer Volume(cu.m.)=    0.04

                    STORAGE LAYER:
                    Depth       (m)=    0.30  Porosity          =  0.00
                    Seepage (m/hr) = 0.0000
                    Maximum Storage layer Volume(cu.m.)=     0.02

                    TOTAL AVAILABLE STORAGE:

                    TOTAL STORAGE=Surface Ponding + Mulch Layer + Engineered soil
+Storage Layer(cu.m.)=       17.66

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.06         0.021            12.08        90.43
    OVERFLOW:ID= 3     0.06         0.021            12.08        63.35

               Volume Reduction Rate[(RVin-RVout)/RVin] (%)=       29.95
               Time to reach Max Ponding storage       (Hr)=        0.00
               Volume of water for drawdown in LID  (cu.m.)=       17.61
               Volume of Max. Water Storage         (cu.m.)=        0.00
               Maximum Surface Ponding And Mulch Vol(cu.m.)=       17.60
               Maximum Engineered Soil Volume       (cu.m.)=        0.01
               Surface Ponding And Mulch Drawdown Time(Hr)=     1642.33
               Engineered Soil Drawdown time          (Hr)=        0.00
               Calculated Drawdown Time               (Hr)=        0.00

  --------------------------
  | Junction Command(0207) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0206)    0.07     0.02   12.08    63.35
  OUTFLOW: ID= 2(  0207)    0.07     0.02   12.08    63.35

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  97.60   Dir. Conn.(%)=  97.60
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.01
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       3.00         4.00
     Length            (m)=      46.98        30.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     135.97        73.60
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.03 (ii)    2.00 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.31
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.12         0.00          0.124 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08         12.08
     RUNOFF VOLUME    (mm)=     109.09        49.89        107.67
     TOTAL RAINFALL   (mm)=     111.09       111.09        111.09
     RUNOFF COEFFICIENT   =       0.98         0.45          0.97

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0205)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0189      0.0093
                          0.0041     0.0001   |   0.0193      0.0093
                          0.0084     0.0016   |   0.0203      0.0094
                          0.0104     0.0026   |   0.0216      0.0095
                          0.0121     0.0036   |   0.0217      0.0096
                          0.0136     0.0046   |   0.0219      0.0101
                          0.0149     0.0057   |   0.0221      0.0110
                          0.0161     0.0067   |   0.0223      0.0123
                          0.0173     0.0077   |   0.0224      0.0144
                          0.0183     0.0087   |   0.1878      0.0170

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0201)      0.331      0.124     12.08     107.67
   OUTFLOW: ID= 1 (  0205)      0.331      0.022     12.17     107.67

               PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.00
               TIME SHIFT OF PEAK FLOW         (min)=  5.00
```

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                MAXIMUM  STORAGE   USED       (ha.m.)=  0.0124

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--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0204):     0.08   0.020    12.08    61.74
     + ID2= 2 (  0205):     0.33   0.022    12.17   107.67
       ================================================
       ID = 3 (  0214):     0.41   0.042    12.08    98.46

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0214):     0.41   0.042    12.08    98.46
     + ID2= 2 (  0207):     0.06   0.021    12.08    63.35
       ================================================
       ID = 1 (  0214):     0.48   0.063    12.08    93.70

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0214):     0.48   0.063    12.08    93.70
     + ID2= 2 (  0213):     0.09   0.017    12.08    40.08
       ================================================
       ID = 3 (  0214):     0.57   0.080    12.08    85.14

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
=======================

      V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
      V    V   I    SS     U   U   A A   L
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
```

```
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\138c
e8e6-b3b4-4dc8-af03-ee9e0cf26eab\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\138c
e8e6-b3b4-4dc8-af03-ee9e0cf26eab\scen


DATE: 04-25-2022                          TIME: 11:03:15

USER:


COMMENTS: _____________________________________________________________


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  ***********************************************
  ** SIMULATION : 25yr 4hr 5min Chicago         **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1133.123
| Ptotal= 70.87 mm |                          B=   4.734
--------------------                          C=   0.756
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =  0.33

     TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
      hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
     0.00    4.87 |  1.00   19.82 |'  2.00   12.89 |  3.00    6.39
     0.08    5.15 |  1.08   29.77 |'  2.08   11.79 |  3.08    6.16
     0.17    5.47 |  1.17   65.99 |'  2.17   10.89 |  3.17    5.94
```

0.25	5.84	1.25	202.83	2.25	10.12	3.25	5.74
0.33	6.27	1.33	84.29	2.33	9.47	3.33	5.56
0.42	6.79	1.42	47.77	2.42	8.91	3.42	5.39
0.50	7.41	1.50	33.55	2.50	8.41	3.50	5.23
0.58	8.19	1.58	26.05	2.58	7.98	3.58	5.08
0.67	9.18	1.67	21.41	2.67	7.59	3.67	4.94
0.75	10.49	1.75	18.27	2.75	7.25	3.75	4.81
0.83	12.33	1.83	15.99	2.83	6.93	3.83	4.68
0.92	15.10	1.92	14.26	2.92	6.65	3.92	4.57

CALIB NASHYD (0203) ID= 1 DT= 5.0 min				
	Area (ha)=	0.09	Curve Number (CN)=	73.6
	Ia (mm)=	4.40	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	0.05		

Unit Hyd Qpeak (cms)= 0.070

PEAK FLOW	(cms)=	0.012 (i)
TIME TO PEAK	(hrs)=	1.333
RUNOFF VOLUME	(mm)=	21.389
TOTAL RAINFALL	(mm)=	70.867
RUNOFF COEFFICIENT	=	0.302

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SWALE(0208) IN= 2--> OUT= 3 DT= 5.0 MIN					
	SURFACE PONDING LAYER:				
	Length	(m)=	16.00	Height (m)=	0.25
	Left Slope	=	3.00	Right Slope =	3.00
	Bottom Width	(m)=	0.30	Surface slope(%) =	1.80

NATIVE SOIL LAYER:
Infiltration (m/hr) = 0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW:ID= 2	0.09	0.012	1.33	21.39
OUTFLOW:ID= 1	0.00	0.000	0.00	0.00
OVERFLOW:ID= 3	0.09	0.010	1.33	19.39

Volume Reduction Rate[(RVin-RVout)/RVin](%)=		9.37
Maximum ponding/storage volume (cu.m.)=		1.82
Time to reach Max storage (Hr)=		1.33
Volume of water for drawdown in LID (cu.m.)=		1.82
Calculated Drawdown Time (Hr)=		1662.42

Junction Command(0209)				
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 3(0208)	0.09	0.01	1.33	19.39
OUTFLOW: ID= 2(0209)	0.09	0.01	1.33	19.39

SWALE(0210) IN= 2--> OUT= 3 DT= 5.0 MIN					
	SURFACE PONDING LAYER:				
	Length	(m)=	10.00	Height (m)=	0.25
	Left Slope	=	3.00	Right Slope =	3.00
	Bottom Width	(m)=	0.30	Surface slope(%) =	3.00

NATIVE SOIL LAYER:
Infiltration (m/hr) = 0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW:ID= 2	0.09	0.010	1.33	19.39
OUTFLOW:ID= 1	0.00	0.000	0.00	0.00
OVERFLOW:ID= 3	0.09	0.008	1.42	18.18

Volume Reduction Rate[(RVin-RVout)/RVin](%)=		6.20
Maximum ponding/storage volume (cu.m.)=		1.09
Time to reach Max storage (Hr)=		1.33
Volume of water for drawdown in LID (cu.m.)=		1.09
Calculated Drawdown Time (Hr)=		1662.42

Junction Command(0211)				
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 3(0210)	0.09	0.01	1.42	18.18
OUTFLOW: ID= 2(0211)	0.09	0.01	1.42	18.18

SWALE(0212) IN= 2--> OUT= 3 DT= 5.0 MIN					
	SURFACE PONDING LAYER:				
	Length	(m)=	10.00	Height (m)=	0.25
	Left Slope	=	3.00	Right Slope =	3.00
	Bottom Width	(m)=	0.30	Surface slope(%) =	5.80

NATIVE SOIL LAYER:
Infiltration (m/hr) = 0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW:ID= 2	0.09	0.008	1.42	18.18
OUTFLOW:ID= 1	0.00	0.000	0.00	0.00
OVERFLOW:ID= 3	0.09	0.008	1.42	17.56

Volume Reduction Rate[(RVin-RVout)/RVin](%)= 3.42
Maximum ponding/storage volume (cu.m.)= 0.57
Time to reach Max storage (Hr)= 1.33
Volume of water for drawdown in LID (cu.m.)= 0.57
Calculated Drawdown Time (Hr)= 1662.42

Junction Command(0213)

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 3(0212)	0.09	0.01	1.42	17.56
OUTFLOW: ID= 2(0213)	0.09	0.01	1.42	17.56

CALIB / STANDHYD (0204) / ID= 1 DT= 5.0 min	Area (ha)= 0.08 Total Imp(%)= 25.90 Dir. Conn.(%)= 13.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.02	0.06	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	5.00	
Length	(m)=	23.52	20.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		202.83	59.67	
over (min)		5.00	10.00	
Storage Coeff. (min)=		0.66 (ii)	5.00 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.34	0.16	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.01	0.011 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.42
RUNOFF VOLUME	(mm)=	68.87	26.34	31.84
TOTAL RAINFALL	(mm)=	70.87	70.87	70.87
RUNOFF COEFFICIENT	=	0.97	0.37	0.45

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 68.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB / STANDHYD (0202) / ID= 1 DT= 5.0 min	Area (ha)= 0.06 Total Imp(%)= 68.50 Dir. Conn.(%)= 68.50

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.04	0.02	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	4.00	5.00	
Length	(m)=	20.82	20.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		202.83	44.25	
over (min)		5.00	5.00	
Storage Coeff. (min)=		0.50 (ii)	2.45 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.34	0.30	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.00	0.028 (iii)
TIME TO PEAK	(hrs)=	1.33	1.33	1.33
RUNOFF VOLUME	(mm)=	68.87	23.40	54.54
TOTAL RAINFALL	(mm)=	70.87	70.87	70.87
RUNOFF COEFFICIENT	=	0.97	0.33	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 68.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

Bioretention(0206) / IN= 2--> OUT= 3 / DT= 5.0 min	OUTFLOW: OFF, UNDERDRAIN: OFF

SURFACE PONDING LAYER:

Max. Ponding Storage(cu.m.)= 17.60

STAGE (m)	AREA (m2)	STAGE (m)	AREA (m2)

```
                  0.000        60.000        |   0.160       73.330
                  0.020        61.670        |   0.180       75.000
                  0.040        63.330        |   0.200       76.670
                  0.060        65.000        |   0.220       78.330
                  0.080        66.670        |   0.230       79.170
                  0.100        68.330        |   0.240       80.000
                  0.120        70.000        |   0.250       80.840
                  0.140        71.670        |   0.000        0.000

                MULCH LAYER:
                Depth      (m)=    0.08  Porosity           =  0.00
                Maximum Mulch layer Volume (cu.m.)=     0.00

                ENGINEERED SOIL LAYER:
                Soil moisture =    0.30  Depth            (m)=  0.65
                Width      (m)=    8.50  Length           (m)=  7.00
                Porosity      =    0.00  Infiltration (m/hr) = 0.0000
                Maximum Engineered Soil layer Volume(cu.m.)=    0.04

                STORAGE LAYER:
                Depth       (m)=    0.30  Porosity           =  0.00
                Seepage (m/hr) = 0.0000
                Maximum Storage layer Volume(cu.m.)=     0.02

                TOTAL AVAILABLE STORAGE:

                TOTAL STORAGE=Surface Ponding + Mulch Layer + Engineered soil
+Storage Layer(cu.m.)=       17.66

                NATIVE SOIL LAYER:
                Infiltration (m/hr) = 0.0000

                   AREA         QPEAK            TPEAK         R.V.
                   (ha)         (cms)            (hrs)         (mm)
     INFLOW:ID= 2     0.06         0.028             1.33       54.54
   OVERFLOW:ID= 3     0.06         0.007             1.50       27.45

             Volume Reduction Rate[(RVin-RVout)/RVin] (%)=       49.66
             Time to reach Max Ponding storage       (Hr)=        0.00
             Volume of water for drawdown in LID  (cu.m.)=       17.61
             Volume of Max. Water Storage         (cu.m.)=        0.00
             Maximum Surface Ponding And Mulch Vol(cu.m.)=       17.60
             Maximum Engineered Soil Volume       (cu.m.)=        0.01
             Surface Ponding And Mulch Drawdown Time(Hr)=     1662.42
             Engineered Soil Drawdown time          (Hr)=        0.00
             Calculated Drawdown Time               (Hr)=        0.00

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  | Junction Command(0207) |
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                           AREA     QPEAK   TPEAK     R.V.
                           (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0206)    0.07     0.01    1.50    27.45
  OUTFLOW: ID= 2(  0207)    0.07     0.01    1.50    27.45

  ------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  97.60   Dir. Conn.(%)=  97.60
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.01
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       3.00         4.00
     Length            (m)=      46.98        30.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     202.83        44.25
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.88 (ii)    1.71 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.32
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.18         0.00          0.183 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      68.87        23.40          67.77
     TOTAL RAINFALL   (mm)=      70.87        70.87          70.87
     RUNOFF COEFFICIENT   =       0.97         0.33           0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0205)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0189      0.0093
                          0.0041     0.0001   |   0.0193      0.0093
                          0.0084     0.0016   |   0.0203      0.0094
                          0.0104     0.0026   |   0.0216      0.0095
                          0.0121     0.0036   |   0.0217      0.0096
```

```
                        0.0136     0.0046   |   0.0219      0.0101
                        0.0149     0.0057   |   0.0221      0.0110
                        0.0161     0.0067   |   0.0223      0.0123
                        0.0173     0.0077   |   0.0224      0.0144
                        0.0183     0.0087   |   0.1878      0.0170

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0201)      0.331      0.183      1.33      67.77
   OUTFLOW: ID= 1 (  0205)      0.331      0.022      1.67      67.77

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.08
                   TIME SHIFT OF PEAK FLOW         (min)= 20.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0110

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--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0204):     0.08   0.011     1.42    31.84
      + ID2= 2 (  0205):     0.33   0.022     1.67    67.77
        ================================================
        ID = 3 (  0214):     0.41   0.031     1.50    60.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0214):     0.41   0.031     1.50    60.57
      + ID2= 2 (  0207):     0.06   0.007     1.50    27.45
        ================================================
        ID = 1 (  0214):     0.48   0.038     1.50    56.08

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0214):     0.48   0.038     1.50    56.08
      + ID2= 2 (  0213):     0.09   0.008     1.42    17.56
        ================================================
        ID = 3 (  0214):     0.57   0.044     1.42    49.93
```

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     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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================================================================================
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       V    V   I    SSSSS  U   U    A    L              (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\158f
ecb3-5b28-4bc4-9581-d16016bde5d7\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\158f
ecb3-5b28-4bc4-9581-d16016bde5d7\scen


DATE: 04-25-2022                          TIME: 11:03:15

USER:


COMMENTS: _____

--------------------------------------------------------------------------------
------------------------
  ***********************************************
  ** SIMULATION : 2yr 24hr 5min SCS Type II     **
  ***********************************************


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```

READ STORM	Filename: C:\Users\dhordyk\AppD ata\Local\Temp\ b3cec1e8-54db-4fb7-970a-9d201c8a3957\35a9b8d2
Ptotal= 55.62 mm	Comments: 2yr 24hr 5min SCS Type II

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	0.00	6.08	1.00	12.17	8.01	18.25	1.00
0.08	0.61	6.17	1.00	12.25	8.01	18.33	1.00
0.17	0.61	6.25	1.00	12.33	8.01	18.42	1.00
0.25	0.61	6.33	1.00	12.42	8.01	18.50	1.00
0.33	0.61	6.42	1.00	12.50	8.01	18.58	1.00
0.42	0.61	6.50	1.00	12.58	4.12	18.67	1.00
0.50	0.61	6.58	1.00	12.67	4.12	18.75	1.00
0.58	0.61	6.67	1.00	12.75	4.12	18.83	1.00
0.67	0.61	6.75	1.00	12.83	4.12	18.92	1.00
0.75	0.61	6.83	1.00	12.92	4.12	19.00	1.00
0.83	0.61	6.92	1.00	13.00	4.12	19.08	1.00
0.92	0.61	7.00	1.00	13.08	3.00	19.17	1.00
1.00	0.61	7.08	1.22	13.17	3.00	19.25	1.00
1.08	0.61	7.17	1.22	13.25	3.00	19.33	1.00
1.17	0.61	7.25	1.22	13.33	3.00	19.42	1.00
1.25	0.61	7.33	1.22	13.42	3.00	19.50	1.00
1.33	0.61	7.42	1.22	13.50	3.00	19.58	1.00
1.42	0.61	7.50	1.22	13.58	2.34	19.67	1.00
1.50	0.61	7.58	1.22	13.67	2.34	19.75	1.00
1.58	0.61	7.67	1.22	13.75	2.34	19.83	1.00
1.67	0.61	7.75	1.22	13.83	2.34	19.92	1.00
1.75	0.61	7.83	1.22	13.92	2.34	20.00	1.00
1.83	0.61	7.92	1.22	14.00	2.34	20.08	0.67
1.92	0.61	8.00	1.22	14.08	1.67	20.17	0.67
2.00	0.61	8.08	1.45	14.17	1.67	20.25	0.67
2.08	0.72	8.17	1.45	14.25	1.67	20.33	0.67
2.17	0.72	8.25	1.45	14.33	1.67	20.42	0.67
2.25	0.72	8.33	1.45	14.42	1.67	20.50	0.67
2.33	0.72	8.42	1.45	14.50	1.67	20.58	0.67
2.42	0.72	8.50	1.45	14.58	1.67	20.67	0.67
2.50	0.72	8.58	1.56	14.67	1.67	20.75	0.67
2.58	0.72	8.67	1.56	14.75	1.67	20.83	0.67
2.67	0.72	8.75	1.56	14.83	1.67	20.92	0.67
2.75	0.72	8.83	1.56	14.92	1.67	21.00	0.67
2.83	0.72	8.92	1.56	15.00	1.67	21.08	0.67
2.92	0.72	9.00	1.56	15.08	1.67	21.17	0.67
3.00	0.72	9.08	1.78	15.17	1.67	21.25	0.67
3.08	0.72	9.17	1.78	15.25	1.67	21.33	0.67
3.17	0.72	9.25	1.78	15.33	1.67	21.42	0.67
3.25	0.72	9.33	1.78	15.42	1.67	21.50	0.67
3.33	0.72	9.42	1.78	15.50	1.67	21.58	0.67
3.42	0.72	9.50	1.78	15.58	1.67	21.67	0.67
3.50	0.72	9.58	2.00	15.67	1.67	21.75	0.67
3.58	0.72	9.67	2.00	15.75	1.67	21.83	0.67
3.67	0.72	9.75	2.00	15.83	1.67	21.92	0.67
3.75	0.72	9.83	2.00	15.92	1.67	22.00	0.67
3.83	0.72	9.92	2.00	16.00	1.67	22.08	0.67
3.92	0.72	10.00	2.00	16.08	1.00	22.17	0.67
4.00	0.72	10.08	2.56	16.17	1.00	22.25	0.67
4.08	0.89	10.17	2.56	16.25	1.00	22.33	0.67
4.17	0.89	10.25	2.56	16.33	1.00	22.42	0.67
4.25	0.89	10.33	2.56	16.42	1.00	22.50	0.67
4.33	0.89	10.42	2.56	16.50	1.00	22.58	0.67
4.42	0.89	10.50	2.56	16.58	1.00	22.67	0.67
4.50	0.89	10.58	3.45	16.67	1.00	22.75	0.67
4.58	0.89	10.67	3.45	16.75	1.00	22.83	0.67
4.67	0.89	10.75	3.45	16.83	1.00	22.92	0.67
4.75	0.89	10.83	3.45	16.92	1.00	23.00	0.67
4.83	0.89	10.92	3.45	17.00	1.00	23.08	0.67
4.92	0.89	11.00	3.45	17.08	1.00	23.17	0.67
5.00	0.89	11.08	5.34	17.17	1.00	23.25	0.67
5.08	0.89	11.17	5.34	17.25	1.00	23.33	0.67
5.17	0.89	11.25	5.34	17.33	1.00	23.42	0.67
5.25	0.89	11.33	5.34	17.42	1.00	23.50	0.67
5.33	0.89	11.42	5.34	17.50	1.00	23.58	0.67
5.42	0.89	11.50	5.34	17.58	1.00	23.67	0.67
5.50	0.89	11.58	16.46	17.67	1.00	23.75	0.67
5.58	0.89	11.67	16.46	17.75	1.00	23.83	0.67
5.67	0.89	11.75	16.46	17.83	1.00	23.92	0.67
5.75	0.89	11.83	68.08	17.92	1.00	24.00	0.67
5.83	0.89	11.92	68.08	18.00	1.00		
5.92	0.89	12.00	68.08	18.08	1.00		
6.00	0.89	12.08	8.01	18.17	1.00		

CALIB NASHYD (0203) ID= 1 DT= 5.0 min	Area (ha)= 0.09 Curve Number (CN)= 73.6 Ia (mm)= 4.40 # of Linear Res.(N)= 3.00 U.H. Tp(hrs)= 0.05

Unit Hyd Qpeak (cms)= 0.070

PEAK FLOW (cms)= 0.006 (i)
TIME TO PEAK (hrs)= 12.083
RUNOFF VOLUME (mm)= 14.063
TOTAL RAINFALL (mm)= 55.620
RUNOFF COEFFICIENT = 0.253

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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------------------
| SWALE(  0208)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   16.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    1.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.09         0.006            12.08        14.06
     OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
    OVERFLOW:ID= 3     0.09         0.006            12.08        12.06

              Volume Reduction Rate[(RVin-RVout)/RVin](%)=       14.24
              Maximum ponding/storage volume      (cu.m.)=        1.82
              Time to reach Max storage             (Hr)=       11.92
              Volume of water for drawdown in LID (cu.m.)=        1.82
              Calculated Drawdown Time              (Hr)=     1642.33

  --------------------------
  | Junction Command(0209) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0208)    0.09     0.01   12.08    12.06
  OUTFLOW: ID= 2(  0209)    0.09     0.01   12.08    12.06

  ------------------------------------------------------------------------------
------------------
| SWALE(  0210)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   10.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    3.00

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.09         0.006            12.08        12.06
     OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
    OVERFLOW:ID= 3     0.09         0.006            12.08        10.86

              Volume Reduction Rate[(RVin-RVout)/RVin](%)=        9.97
              Maximum ponding/storage volume      (cu.m.)=        1.09
              Time to reach Max storage             (Hr)=       12.00
              Volume of water for drawdown in LID (cu.m.)=        1.09
              Calculated Drawdown Time              (Hr)=     1642.33

  --------------------------
  | Junction Command(0211) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0210)    0.09     0.01   12.08    10.86
  OUTFLOW: ID= 2(  0211)    0.09     0.01   12.08    10.86

  ------------------------------------------------------------------------------
------------------
| SWALE(  0212)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   10.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    5.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.09         0.006            12.08        10.86
     OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
    OVERFLOW:ID= 3     0.09         0.006            12.08        10.24

              Volume Reduction Rate[(RVin-RVout)/RVin](%)=        5.73
              Maximum ponding/storage volume      (cu.m.)=        0.57
              Time to reach Max storage             (Hr)=       12.00
              Volume of water for drawdown in LID (cu.m.)=        0.57
              Calculated Drawdown Time              (Hr)=     1642.33

  --------------------------
  | Junction Command(0213) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0212)    0.09     0.01   12.08    10.24
  OUTFLOW: ID= 2(  0213)    0.09     0.01   12.08    10.24

  ------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
```

```
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      68.08        29.86
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.02 (ii)    6.75 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.34         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00         0.006 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08         12.08
     RUNOFF VOLUME    (mm)=      53.62        17.22         20.35
     TOTAL RAINFALL   (mm)=      55.62        55.62         55.62
     RUNOFF COEFFICIENT   =       0.96         0.31          0.37

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      68.08        22.21
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.77 (ii)    3.79 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.25
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00         0.010 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08         12.08
     RUNOFF VOLUME    (mm)=      53.62        15.06         41.47
     TOTAL RAINFALL   (mm)=      55.62        55.62         55.62
     RUNOFF COEFFICIENT   =       0.96         0.27          0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
----------------------
|Bioretention(  0206)|  OUTFLOW: OFF,  UNDERDRAIN: OFF
|IN= 2--> OUT= 3     |
| DT=  5.0 min       |
----------------------  SURFACE PONDING LAYER:

                          Max. Ponding Storage(cu.m.)=       17.60

                        STAGE        AREA          |   STAGE      AREA
                         (m)        (m2)          |    (m)       (m2)
                        0.000        60.000        |   0.160       73.330
                        0.020        61.670        |   0.180       75.000
                        0.040        63.330        |   0.200       76.670
                        0.060        65.000        |   0.220       78.330
                        0.080        66.670        |   0.230       79.170
                        0.100        68.330        |   0.240       80.000
                        0.120        70.000        |   0.250       80.840
                        0.140        71.670        |   0.000        0.000

                      MULCH LAYER:
                      Depth      (m)=    0.08  Porosity           =  0.00
                      Maximum Mulch layer Volume (cu.m.)=     0.00

                      ENGINEERED SOIL LAYER:
                      Soil moisture =    0.30  Depth            (m)=  0.65
                      Width      (m)=    8.50  Length           (m)=  7.00
                      Porosity      =    0.00  Infiltration (m/hr) = 0.0000
                      Maximum Engineered Soil layer Volume(cu.m.)=    0.04

                      STORAGE LAYER:
                      Depth       (m)=    0.30  Porosity          =  0.00
                      Seepage (m/hr) = 0.0000
                      Maximum Storage layer Volume(cu.m.)=     0.02

                      TOTAL AVAILABLE STORAGE:

                      TOTAL STORAGE=Surface Ponding + Mulch Layer + Engineered soil
+Storage Layer(cu.m.)=       17.66
```

```
                NATIVE SOIL LAYER:
                Infiltration (m/hr) = 0.0000

                    AREA         QPEAK            TPEAK         R.V.
                    (ha)         (cms)            (hrs)         (mm)
   INFLOW:ID= 2     0.06         0.010            12.08        41.47
  OVERFLOW:ID= 3    0.06         0.001            12.42        14.39

          Volume Reduction Rate[(RVin-RVout)/RVin] (%)=       65.30
          Time to reach Max Ponding storage       (Hr)=        0.00
          Volume of water for drawdown in LID  (cu.m.)=       17.61
          Volume of Max. Water Storage         (cu.m.)=        0.00
          Maximum Surface Ponding And Mulch Vol(cu.m.)=       17.60
          Maximum Engineered Soil Volume       (cu.m.)=        0.01
          Surface Ponding And Mulch Drawdown Time(Hr)=     1642.33
          Engineered Soil Drawdown time          (Hr)=        0.00
          Calculated Drawdown Time               (Hr)=        0.00

 --------------------------
 | Junction Command(0207) |
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                       AREA     QPEAK   TPEAK     R.V.
                       (ha)     (cms)    (hrs)    (mm)
 INFLOW : ID= 3(  0206)    0.07     0.00   12.42    14.39
 OUTFLOW: ID= 2(  0207)    0.07     0.00   12.42    14.39

 ------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  97.60   Dir. Conn.(%)=  97.60
--------------------
                           IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.32         0.01
    Dep. Storage     (mm)=       2.00         5.00
    Average Slope     (%)=       3.00         4.00
    Length            (m)=      46.98        30.00
    Mannings n           =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=      68.08        22.21
              over (min)        5.00         5.00
    Storage Coeff.  (min)=       1.36 (ii)    2.64 (ii)
    Unit Hyd. Tpeak (min)=       5.00         5.00
    Unit Hyd. peak  (cms)=       0.33         0.29
                                                          *TOTALS*
    PEAK FLOW       (cms)=       0.06         0.00          0.062 (iii)
    TIME TO PEAK    (hrs)=      12.08        12.08          12.08
    RUNOFF VOLUME    (mm)=      53.62        15.06          52.69
    TOTAL RAINFALL   (mm)=      55.62        55.62          55.62

    RUNOFF COEFFICIENT   =       0.96         0.27           0.95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0205)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0189      0.0093
                          0.0041     0.0001   |   0.0193      0.0093
                          0.0084     0.0016   |   0.0203      0.0094
                          0.0104     0.0026   |   0.0216      0.0095
                          0.0121     0.0036   |   0.0217      0.0096
                          0.0136     0.0046   |   0.0219      0.0101
                          0.0149     0.0057   |   0.0221      0.0110
                          0.0161     0.0067   |   0.0223      0.0123
                          0.0173     0.0077   |   0.0224      0.0144
                          0.0183     0.0087   |   0.1878      0.0170

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0201)      0.331      0.062     12.08      52.69
   OUTFLOW: ID= 1 (  0205)      0.331      0.015     12.17      52.69

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 23.61
                  TIME SHIFT OF PEAK FLOW         (min)=  5.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0055

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--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0204):     0.08   0.006    12.08    20.35
      + ID2= 2 (  0205):     0.33   0.015    12.17    52.69
        ================================================
        ID = 3 (  0214):     0.41   0.020    12.08    46.21

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
```

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--------------------
| ADD HYD  (  0214)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0214):     0.41   0.020    12.08    46.21
      + ID2= 2 (  0207):     0.06   0.001    12.42    14.39
        ==================================================
        ID = 1 (  0214):     0.48   0.020    12.08    41.89

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0214):     0.48   0.020    12.08    41.89
      + ID2= 2 (  0213):     0.09   0.006    12.08    10.24
        ==================================================
        ID = 3 (  0214):     0.57   0.025    12.08    36.84

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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================================================================================
========================

       V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\f6f1
c606-c760-48f8-8ac2-4928a3ecf49f\scen
  Summary filename:
```

```
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\f6f1
c606-c760-48f8-8ac2-4928a3ecf49f\scen


DATE: 04-25-2022                          TIME: 11:03:18

USER:


COMMENTS: _____________________________________________________________


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  ***********************************************
  ** SIMULATION : 2yr 4hr 5min Chicago          **
  ***********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 675.586
| Ptotal= 37.03 mm |                          B=   4.681
--------------------                          C=   0.780
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =  0.33

     TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
      hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
     0.00    2.31 |  1.00   10.03 |  2.00    6.39 |  3.00    3.08
     0.08    2.45 |  1.08   15.38 |  2.08    5.82 |  3.08    2.96
     0.17    2.61 |  1.17   35.54 |  2.17    5.36 |  3.17    2.85
     0.25    2.80 |  1.25  114.99 |  2.25    4.96 |  3.25    2.75
     0.33    3.01 |  1.33   45.86 |  2.33    4.63 |  3.33    2.66
     0.42    3.27 |  1.42   25.27 |  2.42    4.34 |  3.42    2.57
     0.50    3.59 |  1.50   17.44 |  2.50    4.09 |  3.50    2.49
     0.58    3.98 |  1.58   13.36 |  2.58    3.87 |  3.58    2.42
     0.67    4.48 |  1.67   10.88 |  2.67    3.68 |  3.67    2.35
     0.75    5.15 |  1.75    9.21 |  2.75    3.50 |  3.75    2.29
     0.83    6.10 |  1.83    8.01 |  2.83    3.35 |  3.83    2.22
     0.92    7.55 |  1.92    7.10 |  2.92    3.20 |  3.92    2.17

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0203)|   Area    (ha)=   0.09   Curve Number   (CN)= 73.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.40   # of Linear Res.(N)= 3.00
```

```
--------------------   U.H. Tp(hrs)=   0.05

     Unit Hyd Qpeak  (cms)=   0.070

     PEAK FLOW       (cms)=   0.003 (i)
     TIME TO PEAK    (hrs)=   1.333
     RUNOFF VOLUME    (mm)=   6.566
     TOTAL RAINFALL   (mm)=  37.034
     RUNOFF COEFFICIENT   =   0.177

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
------------------
| SWALE(  0208)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   16.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    1.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.09         0.003             1.33         6.57
     OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
    OVERFLOW:ID= 3     0.09         0.002             1.50         4.56

              Volume Reduction Rate[(RVin-RVout)/RVin](%)=       30.51
              Maximum ponding/storage volume      (cu.m.)=        1.82
              Time to reach Max storage              (Hr)=        1.42
              Volume of water for drawdown in LID (cu.m.)=        1.82
              Calculated Drawdown Time               (Hr)=     1662.42

  --------------------------
  | Junction Command(0209) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0208)    0.09     0.00    1.50     4.56
  OUTFLOW: ID= 2(  0209)    0.09     0.00    1.50     4.56

  --------------------------------------------------------------------------------
------------------
| SWALE(  0210)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   10.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    3.00

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.09         0.002             1.50         4.56
     OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
    OVERFLOW:ID= 3     0.09         0.001             1.75         3.36

              Volume Reduction Rate[(RVin-RVout)/RVin](%)=       26.34
              Maximum ponding/storage volume      (cu.m.)=        1.09
              Time to reach Max storage              (Hr)=        1.67
              Volume of water for drawdown in LID (cu.m.)=        1.09
              Calculated Drawdown Time               (Hr)=     1662.42

  --------------------------
  | Junction Command(0211) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0210)    0.09     0.00    1.75     3.36
  OUTFLOW: ID= 2(  0211)    0.09     0.00    1.75     3.36

  --------------------------------------------------------------------------------
------------------
| SWALE(  0212)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   10.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    5.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.09         0.001             1.75         3.36
     OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
    OVERFLOW:ID= 3     0.09         0.001             1.92         2.74

              Volume Reduction Rate[(RVin-RVout)/RVin](%)=       18.50
              Maximum ponding/storage volume      (cu.m.)=        0.57
              Time to reach Max storage              (Hr)=        1.83
              Volume of water for drawdown in LID (cu.m.)=        0.57
              Calculated Drawdown Time               (Hr)=     1662.42

  --------------------------
  | Junction Command(0213) |
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                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0212)    0.09     0.00    1.92     2.74
  OUTFLOW: ID= 2(  0213)    0.09     0.00    1.92     2.74

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     114.99        17.88
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       0.82 (ii)    7.87 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.34         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.004 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50          1.33
     RUNOFF VOLUME    (mm)=      35.03         7.98         11.44
     TOTAL RAINFALL   (mm)=      37.03        37.03         37.03
     RUNOFF COEFFICIENT   =       0.95         0.22          0.31

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     114.99        12.52
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.62 (ii)    3.07 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.27
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.015 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      35.03         6.77         26.13
     TOTAL RAINFALL   (mm)=      37.03        37.03         37.03
     RUNOFF COEFFICIENT   =       0.95         0.18          0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
----------------------
|Bioretention(  0206)|  OUTFLOW: OFF,  UNDERDRAIN: OFF
|IN= 2--> OUT= 3     |
| DT=  5.0 min       |
----------------------  SURFACE PONDING LAYER:

                          Max. Ponding Storage(cu.m.)=       17.60

                        STAGE        AREA          |   STAGE      AREA
                         (m)        (m2)          |    (m)       (m2)
                        0.000        60.000        |   0.160       73.330
                        0.020        61.670        |   0.180       75.000
                        0.040        63.330        |   0.200       76.670
                        0.060        65.000        |   0.220       78.330
                        0.080        66.670        |   0.230       79.170
                        0.100        68.330        |   0.240       80.000
                        0.120        70.000        |   0.250       80.840
                        0.140        71.670        |   0.000        0.000

                      MULCH LAYER:
                      Depth      (m)=    0.08  Porosity           =  0.00
                      Maximum Mulch layer Volume (cu.m.)=     0.00

                      ENGINEERED SOIL LAYER:
                      Soil moisture =    0.30  Depth           (m)=  0.65
                      Width      (m)=    8.50  Length          (m)=  7.00
```

```
                    Porosity      =    0.00  Infiltration (m/hr) = 0.0000
                    Maximum Engineered Soil layer Volume(cu.m.)=    0.04

                    STORAGE LAYER:
                    Depth       (m)=    0.30  Porosity          =  0.00
                    Seepage (m/hr) = 0.0000
                    Maximum Storage layer Volume(cu.m.)=     0.02

                    TOTAL AVAILABLE STORAGE:

                    TOTAL STORAGE=Surface Ponding + Mulch Layer + Engineered soil
+Storage Layer(cu.m.)=       17.66

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.06         0.015             1.33        26.13
    OVERFLOW:ID= 3     0.00         0.000             0.00         0.00

              Volume Reduction Rate[(RVin-RVout)/RVin] (%)=      100.00
              Time to reach Max Ponding storage       (Hr)=        0.00
              Volume of water for drawdown in LID  (cu.m.)=       16.99
              Volume of Max. Water Storage         (cu.m.)=        0.00
              Maximum Surface Ponding And Mulch Vol(cu.m.)=       16.98
              Maximum Engineered Soil Volume       (cu.m.)=        0.01
              Surface Ponding And Mulch Drawdown Time(Hr)=     1662.42
              Engineered Soil Drawdown time          (Hr)=        0.00
              Calculated Drawdown Time               (Hr)=        0.00

  --------------------------
  | Junction Command(0207) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0206)    0.00     0.00    0.00     0.00
  OUTFLOW: ID= 2(  0207)    0.00     0.00    0.00     0.00

  ------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  97.60   Dir. Conn.(%)=  97.60
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.01
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       3.00         4.00
     Length            (m)=      46.98        30.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     114.99        12.52
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.10 (ii)    2.14 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.31
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.10         0.00          0.103 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      35.03         6.77          34.35
     TOTAL RAINFALL   (mm)=      37.03        37.03          37.03
     RUNOFF COEFFICIENT   =       0.95         0.18           0.93

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0205)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0189      0.0093
                         0.0041     0.0001    |   0.0193      0.0093
                         0.0084     0.0016    |   0.0203      0.0094
                         0.0104     0.0026    |   0.0216      0.0095
                         0.0121     0.0036    |   0.0217      0.0096
                         0.0136     0.0046    |   0.0219      0.0101
                         0.0149     0.0057    |   0.0221      0.0110
                         0.0161     0.0067    |   0.0223      0.0123
                         0.0173     0.0077    |   0.0224      0.0144
                         0.0183     0.0087    |   0.1878      0.0170

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0201)      0.331      0.103      1.33       34.35
   OUTFLOW: ID= 1 (  0205)      0.331      0.014      1.58       34.35

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.98
                  TIME SHIFT OF PEAK FLOW         (min)= 15.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0053

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--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
       ID1= 1 (  0204):      0.08    0.004     1.33     11.44
     + ID2= 2 (  0205):      0.33    0.014     1.58     34.35
       ================================================
       ID = 3 (  0214):      0.41    0.017     1.50     29.76

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   3 +  2 =  1    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
*** W A R N I N G :  HYDROGRAPH   0207 <ID= 2> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0001 = HYDROGRAPH 0003
       ID1= 3 (  0214):      0.41    0.017     1.50     29.76
     + ID2= 2 (  0207):      0.00    0.000     0.00      0.00
       ================================================
       ID = 1 (  0214):      0.41    0.017     1.50     29.76

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
       ID1= 1 (  0214):      0.41    0.017     1.50     29.76
     + ID2= 2 (  0213):      0.09    0.001     1.92      2.74
       ================================================
       ID = 3 (  0214):      0.51    0.017     1.50     24.89

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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 FINISH
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       V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H  Y Y   MM MM  O   O
       O   O    T      T    H   H   Y    M M M  O   O
        OOO     T      T    H   H   Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\1d5d
25e8-5010-484b-8a89-2ae6c587690c\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\1d5d
25e8-5010-484b-8a89-2ae6c587690c\scen


DATE: 04-25-2022                          TIME: 11:03:15

USER:


COMMENTS: _____________________________________________________


--------------------------------------------------------------------------------
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  ***********************************************
  ** SIMULATION : 50yr 24hr 5min SCS Type II    **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\dhordyk\AppD
|                  |              ata\Local\Temp\
|                  |              b3cec1e8-54db-4fb7-970a-9d201c8a3957\7f35fdfa
| Ptotal=125.40 mm |    Comments: 50yr 24hr 5min SCS Type II
--------------------
                TIME     RAIN |  TIME     RAIN |'  TIME     RAIN |  TIME     RAIN
                 hrs   mm/hr |   hrs    mm/hr |'   hrs    mm/hr |   hrs    mm/hr
                0.00     0.00 |  6.08     2.26 | 12.17    18.06 | 18.25     2.26
                0.08     1.38 |  6.17     2.26 | 12.25    18.06 | 18.33     2.26
```

0.17	1.38	6.25	2.26	12.33	18.06	18.42	2.26
0.25	1.38	6.33	2.26	12.42	18.06	18.50	2.26
0.33	1.38	6.42	2.26	12.50	18.06	18.58	2.26
0.42	1.38	6.50	2.26	12.58	9.28	18.67	2.26
0.50	1.38	6.58	2.26	12.67	9.28	18.75	2.26
0.58	1.38	6.67	2.26	12.75	9.28	18.83	2.26
0.67	1.38	6.75	2.26	12.83	9.28	18.92	2.26
0.75	1.38	6.83	2.26	12.92	9.28	19.00	2.26
0.83	1.38	6.92	2.26	13.00	9.28	19.08	2.26
0.92	1.38	7.00	2.26	13.08	6.77	19.17	2.26
1.00	1.38	7.08	2.76	13.17	6.77	19.25	2.26
1.08	1.38	7.17	2.76	13.25	6.77	19.33	2.26
1.17	1.38	7.25	2.76	13.33	6.77	19.42	2.26
1.25	1.38	7.33	2.76	13.42	6.77	19.50	2.26
1.33	1.38	7.42	2.76	13.50	6.77	19.58	2.26
1.42	1.38	7.50	2.76	13.58	5.27	19.67	2.26
1.50	1.38	7.58	2.76	13.67	5.27	19.75	2.26
1.58	1.38	7.67	2.76	13.75	5.27	19.83	2.26
1.67	1.38	7.75	2.76	13.83	5.27	19.92	2.26
1.75	1.38	7.83	2.76	13.92	5.27	20.00	2.26
1.83	1.38	7.92	2.76	14.00	5.27	20.08	1.50
1.92	1.38	8.00	2.76	14.08	3.76	20.17	1.50
2.00	1.38	8.08	3.26	14.17	3.76	20.25	1.50
2.08	1.63	8.17	3.26	14.25	3.76	20.33	1.50
2.17	1.63	8.25	3.26	14.33	3.76	20.42	1.50
2.25	1.63	8.33	3.26	14.42	3.76	20.50	1.50
2.33	1.63	8.42	3.26	14.50	3.76	20.58	1.50
2.42	1.63	8.50	3.26	14.58	3.76	20.67	1.50
2.50	1.63	8.58	3.51	14.67	3.76	20.75	1.50
2.58	1.63	8.67	3.51	14.75	3.76	20.83	1.50
2.67	1.63	8.75	3.51	14.83	3.76	20.92	1.50
2.75	1.63	8.83	3.51	14.92	3.76	21.00	1.50
2.83	1.63	8.92	3.51	15.00	3.76	21.08	1.50
2.92	1.63	9.00	3.51	15.08	3.76	21.17	1.50
3.00	1.63	9.08	4.01	15.17	3.76	21.25	1.50
3.08	1.63	9.17	4.01	15.25	3.76	21.33	1.50
3.17	1.63	9.25	4.01	15.33	3.76	21.42	1.50
3.25	1.63	9.33	4.01	15.42	3.76	21.50	1.50
3.33	1.63	9.42	4.01	15.50	3.76	21.58	1.50
3.42	1.63	9.50	4.01	15.58	3.76	21.67	1.50
3.50	1.63	9.58	4.51	15.67	3.76	21.75	1.50
3.58	1.63	9.67	4.51	15.75	3.76	21.83	1.50
3.67	1.63	9.75	4.51	15.83	3.76	21.92	1.50
3.75	1.63	9.83	4.51	15.92	3.76	22.00	1.50
3.83	1.63	9.92	4.51	16.00	3.76	22.08	1.50
3.92	1.63	10.00	4.51	16.08	2.26	22.17	1.50
4.00	1.63	10.08	5.77	16.17	2.26	22.25	1.50
4.08	2.01	10.17	5.77	16.25	2.26	22.33	1.50
4.17	2.01	10.25	5.77	16.33	2.26	22.42	1.50
4.25	2.01	10.33	5.77	16.42	2.26	22.50	1.50
4.33	2.01	10.42	5.77	16.50	2.26	22.58	1.50
4.42	2.01	10.50	5.77	16.58	2.26	22.67	1.50
4.50	2.01	10.58	7.77	16.67	2.26	22.75	1.50
4.58	2.01	10.67	7.77	16.75	2.26	22.83	1.50
4.67	2.01	10.75	7.77	16.83	2.26	22.92	1.50
4.75	2.01	10.83	7.77	16.92	2.26	23.00	1.50
4.83	2.01	10.92	7.77	17.00	2.26	23.08	1.50
4.92	2.01	11.00	7.77	17.08	2.26	23.17	1.50
5.00	2.01	11.08	12.04	17.17	2.26	23.25	1.50
5.08	2.01	11.17	12.04	17.25	2.26	23.33	1.50
5.17	2.01	11.25	12.04	17.33	2.26	23.42	1.50
5.25	2.01	11.33	12.04	17.42	2.26	23.50	1.50
5.33	2.01	11.42	12.04	17.50	2.26	23.58	1.50
5.42	2.01	11.50	12.04	17.58	2.26	23.67	1.50
5.50	2.01	11.58	37.12	17.67	2.26	23.75	1.50
5.58	2.01	11.67	37.12	17.75	2.26	23.83	1.50
5.67	2.01	11.75	37.12	17.83	2.26	23.92	1.50
5.75	2.01	11.83	153.49	17.92	2.26	24.00	1.50
5.83	2.01	11.92	153.49	18.00	2.26		
5.92	2.01	12.00	153.49	18.08	2.26		
6.00	2.01	12.08	18.06	18.17	2.26		

CALIB					
NASHYD (0203)	Area (ha)=	0.09	Curve Number (CN)=	73.6	
ID= 1 DT= 5.0 min	Ia (mm)=	4.40	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.05			

Unit Hyd Qpeak (cms)= 0.070

PEAK FLOW (cms)= 0.020 (i)
TIME TO PEAK (hrs)= 12.083
RUNOFF VOLUME (mm)= 52.664
TOTAL RAINFALL (mm)= 125.400
RUNOFF COEFFICIENT = 0.420

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SWALE(0208)	SURFACE PONDING LAYER:					
IN= 2--> OUT= 3	Length (m)=	16.00	Height (m)=	0.25		
DT= 5.0 MIN	Left Slope =	3.00	Right Slope =	3.00		
	Bottom Width (m)=	0.30	Surface slope(%) =	1.80		

NATIVE SOIL LAYER:
Infiltration (m/hr) = 0.0000

```
                      AREA         QPEAK            TPEAK         R.V.
                      (ha)         (cms)            (hrs)         (mm)
     INFLOW:ID= 2     0.09         0.020            12.08        52.66
    OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
   OVERFLOW:ID= 3     0.09         0.020            12.08        50.66

            Volume Reduction Rate[(RVin-RVout)/RVin](%)=        3.80
            Maximum ponding/storage volume      (cu.m.)=        1.82
            Time to reach Max storage             (Hr)=        9.83
            Volume of water for drawdown in LID (cu.m.)=        1.82
            Calculated Drawdown Time              (Hr)=     1642.33

  --------------------------
  | Junction Command(0209) |
  --------------------------

                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0208)    0.09     0.02   12.08    50.66
  OUTFLOW: ID= 2(  0209)    0.09     0.02   12.08    50.66

  ------------------------------------------------------------------------------
------------------
| SWALE(  0210)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   10.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    3.00

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                      AREA         QPEAK            TPEAK         R.V.
                      (ha)         (cms)            (hrs)         (mm)
     INFLOW:ID= 2     0.09         0.020            12.08        50.66
    OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
   OVERFLOW:ID= 3     0.09         0.020            12.08        49.46

            Volume Reduction Rate[(RVin-RVout)/RVin](%)=        2.37
            Maximum ponding/storage volume      (cu.m.)=        1.09
            Time to reach Max storage             (Hr)=       10.75
            Volume of water for drawdown in LID (cu.m.)=        1.09
            Calculated Drawdown Time              (Hr)=     1642.33

  --------------------------
  | Junction Command(0211) |
  --------------------------

                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0210)    0.09     0.02   12.08    49.46
  OUTFLOW: ID= 2(  0211)    0.09     0.02   12.08    49.46

  ------------------------------------------------------------------------------
------------------
| SWALE(  0212)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   10.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    5.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                      AREA         QPEAK            TPEAK         R.V.
                      (ha)         (cms)            (hrs)         (mm)
     INFLOW:ID= 2     0.09         0.020            12.08        49.46
    OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
   OVERFLOW:ID= 3     0.09         0.020            12.08        48.84

            Volume Reduction Rate[(RVin-RVout)/RVin](%)=        1.26
            Maximum ponding/storage volume      (cu.m.)=        0.57
            Time to reach Max storage             (Hr)=       11.00
            Volume of water for drawdown in LID (cu.m.)=        0.57
            Calculated Drawdown Time              (Hr)=     1642.33

  --------------------------
  | Junction Command(0213) |
  --------------------------

                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0212)    0.09     0.02   12.08    48.84
  OUTFLOW: ID= 2(  0213)    0.09     0.02   12.08    48.84

  ------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------

                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     153.49       113.57
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       0.73 (ii)    4.10 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
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     Unit Hyd. peak  (cms)=       0.34         0.24
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.02          0.024 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08          12.08
     RUNOFF VOLUME    (mm)=     123.40        65.82          73.27
     TOTAL RAINFALL   (mm)=     125.40       125.40         125.40
     RUNOFF COEFFICIENT   =       0.98         0.52           0.58

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     153.49        89.02
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.55 (ii)    2.74 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.29
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.024 (iii)
     TIME TO PEAK    (hrs)=      12.00        12.08          12.08
     RUNOFF VOLUME    (mm)=     123.40        60.42         103.56
     TOTAL RAINFALL   (mm)=     125.40       125.40         125.40
     RUNOFF COEFFICIENT   =       0.98         0.48           0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
----------------------
|Bioretention(  0206)|  OUTFLOW: OFF,  UNDERDRAIN: OFF
|IN= 2--> OUT= 3     |
| DT=  5.0 min       |
----------------------  SURFACE PONDING LAYER:

                          Max. Ponding Storage(cu.m.)=       17.60

                        STAGE        AREA          |   STAGE      AREA
                         (m)        (m2)          |    (m)       (m2)
                        0.000        60.000        |   0.160       73.330
                        0.020        61.670        |   0.180       75.000
                        0.040        63.330        |   0.200       76.670
                        0.060        65.000        |   0.220       78.330
                        0.080        66.670        |   0.230       79.170
                        0.100        68.330        |   0.240       80.000
                        0.120        70.000        |   0.250       80.840
                        0.140        71.670        |   0.000        0.000

                      MULCH LAYER:
                      Depth      (m)=    0.08  Porosity           =  0.00
                      Maximum Mulch layer Volume (cu.m.)=     0.00

                      ENGINEERED SOIL LAYER:
                      Soil moisture =    0.30  Depth            (m)=  0.65
                      Width      (m)=    8.50  Length           (m)=  7.00
                      Porosity      =    0.00  Infiltration (m/hr) = 0.0000
                      Maximum Engineered Soil layer Volume(cu.m.)=    0.04

                      STORAGE LAYER:
                      Depth       (m)=    0.30  Porosity          =  0.00
                      Seepage (m/hr) = 0.0000
                      Maximum Storage layer Volume(cu.m.)=     0.02

                      TOTAL AVAILABLE STORAGE:

                      TOTAL STORAGE=Surface Ponding + Mulch Layer + Engineered soil
+Storage Layer(cu.m.)=       17.66

                      NATIVE SOIL LAYER:
                      Infiltration (m/hr) = 0.0000

                         AREA         QPEAK            TPEAK         R.V.
                         (ha)         (cms)            (hrs)         (mm)
       INFLOW:ID= 2     0.06         0.024            12.08       103.56
    OVERFLOW:ID= 3     0.06         0.024            12.08        76.47

              Volume Reduction Rate[(RVin-RVout)/RVin] (%)=       26.15
```

```
              Time to reach Max Ponding storage       (Hr)=        0.00
              Volume of water for drawdown in LID  (cu.m.)=       17.61
              Volume of Max. Water Storage         (cu.m.)=        0.00
              Maximum Surface Ponding And Mulch Vol(cu.m.)=       17.60
              Maximum Engineered Soil Volume       (cu.m.)=        0.01
              Surface Ponding And Mulch Drawdown Time(Hr)=     1642.33
              Engineered Soil Drawdown time          (Hr)=        0.00
              Calculated Drawdown Time               (Hr)=        0.00

  --------------------------
  | Junction Command(0207) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0206)    0.07     0.02   12.08    76.47
  OUTFLOW: ID= 2(  0207)    0.07     0.02   12.08    76.47

  ------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  97.60   Dir. Conn.(%)=  97.60
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.01
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       3.00         4.00
     Length            (m)=      46.98        30.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     153.49        89.02
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.98 (ii)    1.91 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.32
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.14         0.00          0.140 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08         12.08
     RUNOFF VOLUME    (mm)=     123.40        60.42        121.89
     TOTAL RAINFALL   (mm)=     125.40       125.40        125.40
     RUNOFF COEFFICIENT   =       0.98         0.48          0.97

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0205)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0189      0.0093
                         0.0041     0.0001   |   0.0193      0.0093
                         0.0084     0.0016   |   0.0203      0.0094
                         0.0104     0.0026   |   0.0216      0.0095
                         0.0121     0.0036   |   0.0217      0.0096
                         0.0136     0.0046   |   0.0219      0.0101
                         0.0149     0.0057   |   0.0221      0.0110
                         0.0161     0.0067   |   0.0223      0.0123
                         0.0173     0.0077   |   0.0224      0.0144
                         0.0183     0.0087   |   0.1878      0.0170

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (  0201)      0.331      0.140     12.08     121.89
     OUTFLOW: ID= 1 (  0205)      0.331      0.022     12.17     121.89

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 16.05
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0143

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0204):     0.08   0.024    12.08    73.27
      + ID2= 2 (  0205):     0.33   0.022    12.17   121.89
        ================================================
        ID = 3 (  0214):     0.41   0.046    12.08   112.14

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0214):     0.41   0.046    12.08   112.14
      + ID2= 2 (  0207):     0.06   0.024    12.08    76.47
        ================================================
        ID = 1 (  0214):     0.48   0.070    12.08   107.30
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0214)					
1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0214):		0.48	0.070	12.08	107.30
+ ID2= 2 (0213):		0.09	0.020	12.08	48.84
ID = 3 (0214):		0.57	0.090	12.08	97.97

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
       V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

Output filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\639a8bd5-9ff4-4375-9fe5-ca33fc493d2a\scen
Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\639a8bd5-9ff4-4375-9fe5-ca33fc493d2a\scen

DATE: 04-25-2022 TIME: 11:03:17

USER:

COMMENTS: _____

****
** SIMULATION : 50yr 4hr 5min Chicago **
****

CHICAGO STORM	
Ptotal= 79.54 mm	

IDF curve parameters: A=1251.473
B= 4.847
C= 0.753
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	5.53	1.00	22.40	2.00	14.60	3.00	7.26
0.08	5.85	1.08	33.57	2.08	13.36	3.08	6.99
0.17	6.21	1.17	73.94	2.17	12.33	3.17	6.75
0.25	6.63	1.25	223.60	2.25	11.47	3.25	6.52
0.33	7.12	1.33	94.25	2.33	10.74	3.33	6.31
0.42	7.70	1.42	53.72	2.42	10.10	3.42	6.12
0.50	8.41	1.50	37.82	2.50	9.54	3.50	5.94
0.58	9.29	1.58	29.40	2.58	9.05	3.58	5.77
0.67	10.40	1.67	24.19	2.67	8.61	3.67	5.61
0.75	11.89	1.75	20.65	2.75	8.22	3.75	5.46
0.83	13.96	1.83	18.09	2.83	7.87	3.83	5.32
0.92	17.09	1.92	16.14	2.92	7.55	3.92	5.19

CALIB					
NASHYD (0203)	Area (ha)=	0.09	Curve Number (CN)=	73.6	
ID= 1 DT= 5.0 min	Ia (mm)=	4.40	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.05			

Unit Hyd Qpeak (cms)= 0.070

PEAK FLOW (cms)= 0.015 (i)
TIME TO PEAK (hrs)= 1.333
RUNOFF VOLUME (mm)= 25.911
TOTAL RAINFALL (mm)= 79.544
RUNOFF COEFFICIENT = 0.326

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SWALE(0208)	SURFACE PONDING LAYER:					
IN= 2--> OUT= 3	Length	(m)=	16.00	Height	(m)=	0.25
DT= 5.0 MIN	Left Slope	=	3.00	Right Slope	=	3.00
	Bottom Width	(m)=	0.30	Surface slope(%)	=	1.80

NATIVE SOIL LAYER:
Infiltration (m/hr) = 0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW:ID= 2	0.09	0.015	1.33	25.91
OUTFLOW:ID= 1	0.00	0.000	0.00	0.00
OVERFLOW:ID= 3	0.09	0.013	1.33	23.91

Volume Reduction Rate[(RVin-RVout)/RVin](%)= 7.73
Maximum ponding/storage volume (cu.m.)= 1.82
Time to reach Max storage (Hr)= 1.33
Volume of water for drawdown in LID (cu.m.)= 1.82
Calculated Drawdown Time (Hr)= 1662.42

Junction Command(0209)

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 3(0208)	0.09	0.01	1.33	23.91
OUTFLOW: ID= 2(0209)	0.09	0.01	1.33	23.91

SWALE(0210)	SURFACE PONDING LAYER:					
IN= 2--> OUT= 3	Length	(m)=	10.00	Height	(m)=	0.25
DT= 5.0 MIN	Left Slope	=	3.00	Right Slope	=	3.00
	Bottom Width	(m)=	0.30	Surface slope(%)	=	3.00

NATIVE SOIL LAYER:
Infiltration (m/hr) = 0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW:ID= 2	0.09	0.013	1.33	23.91
OUTFLOW:ID= 1	0.00	0.000	0.00	0.00
OVERFLOW:ID= 3	0.09	0.010	1.42	22.71

Volume Reduction Rate[(RVin-RVout)/RVin](%)= 5.03
Maximum ponding/storage volume (cu.m.)= 1.09
Time to reach Max storage (Hr)= 1.33
Volume of water for drawdown in LID (cu.m.)= 1.09
Calculated Drawdown Time (Hr)= 1662.42

Junction Command(0211)

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 3(0210)	0.09	0.01	1.42	22.71
OUTFLOW: ID= 2(0211)	0.09	0.01	1.42	22.71

SWALE(0212)	SURFACE PONDING LAYER:					
IN= 2--> OUT= 3	Length	(m)=	10.00	Height	(m)=	0.25
DT= 5.0 MIN	Left Slope	=	3.00	Right Slope	=	3.00
	Bottom Width	(m)=	0.30	Surface slope(%)	=	5.80

NATIVE SOIL LAYER:
Infiltration (m/hr) = 0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW:ID= 2	0.09	0.010	1.42	22.71
OUTFLOW:ID= 1	0.00	0.000	0.00	0.00
OVERFLOW:ID= 3	0.09	0.010	1.42	22.08

Volume Reduction Rate[(RVin-RVout)/RVin](%)= 2.74
Maximum ponding/storage volume (cu.m.)= 0.57
Time to reach Max storage (Hr)= 1.33
Volume of water for drawdown in LID (cu.m.)= 0.57
Calculated Drawdown Time (Hr)= 1662.42

Junction Command(0213)

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 3(0212)	0.09	0.01	1.42	22.08
OUTFLOW: ID= 2(0213)	0.09	0.01	1.42	22.08

CALIB				
STANDHYD (0204)	Area	(ha)=	0.08	

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     223.60        72.36
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.63 (ii)    4.66 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.22
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01          0.018 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      77.54        32.01          37.88
     TOTAL RAINFALL   (mm)=      79.54        79.54          79.54
     RUNOFF COEFFICIENT   =       0.97         0.40           0.48

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     223.60        54.10
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.48 (ii)    2.36 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.30
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.00          0.031 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      77.54        28.63          62.13
     TOTAL RAINFALL   (mm)=      79.54        79.54          79.54
     RUNOFF COEFFICIENT   =       0.97         0.36           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
----------------------
|Bioretention(  0206)|  OUTFLOW: OFF,  UNDERDRAIN: OFF
|IN= 2--> OUT= 3     |
| DT=  5.0 min       |
----------------------  SURFACE PONDING LAYER:

                          Max. Ponding Storage(cu.m.)=       17.60

                        STAGE        AREA          |   STAGE      AREA
                         (m)        (m2)          |    (m)       (m2)
                        0.000        60.000        |   0.160       73.330
                        0.020        61.670        |   0.180       75.000
                        0.040        63.330        |   0.200       76.670
                        0.060        65.000        |   0.220       78.330
                        0.080        66.670        |   0.230       79.170
                        0.100        68.330        |   0.240       80.000
                        0.120        70.000        |   0.250       80.840
                        0.140        71.670        |   0.000        0.000

                      MULCH LAYER:
                      Depth      (m)=    0.08  Porosity           =  0.00
                      Maximum Mulch layer Volume (cu.m.)=     0.00

                      ENGINEERED SOIL LAYER:
                      Soil moisture =    0.30  Depth            (m)=  0.65
                      Width      (m)=    8.50  Length           (m)=  7.00
                      Porosity      =    0.00  Infiltration (m/hr) = 0.0000
                      Maximum Engineered Soil layer Volume(cu.m.)=    0.04

                      STORAGE LAYER:
                      Depth       (m)=    0.30  Porosity          =  0.00
                      Seepage (m/hr) = 0.0000
                      Maximum Storage layer Volume(cu.m.)=     0.02

                      TOTAL AVAILABLE STORAGE:
```

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                    TOTAL STORAGE=Surface Ponding + Mulch Layer + Engineered soil
+Storage Layer(cu.m.)=       17.66

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
     INFLOW:ID= 2     0.06         0.031             1.33        62.13
    OVERFLOW:ID= 3    0.06         0.014             1.42        35.04

              Volume Reduction Rate[(RVin-RVout)/RVin] (%)=       43.59
              Time to reach Max Ponding storage       (Hr)=        0.00
              Volume of water for drawdown in LID  (cu.m.)=       17.61
              Volume of Max. Water Storage         (cu.m.)=        0.00
              Maximum Surface Ponding And Mulch Vol(cu.m.)=       17.60
              Maximum Engineered Soil Volume       (cu.m.)=        0.01
              Surface Ponding And Mulch Drawdown Time(Hr)=     1662.42
              Engineered Soil Drawdown time          (Hr)=        0.00
              Calculated Drawdown Time               (Hr)=        0.00

  --------------------------
  | Junction Command(0207) |
  --------------------------

                         AREA     QPEAK   TPEAK     R.V.
                         (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0206)    0.07     0.01    1.42    35.04
  OUTFLOW: ID= 2(  0207)    0.07     0.01    1.42    35.04

  ------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  97.60   Dir. Conn.(%)=  97.60
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32          0.01
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       3.00          4.00
     Length            (m)=      46.98         30.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     223.60         54.10
               over (min)        5.00          5.00
     Storage Coeff.  (min)=       0.85 (ii)     1.64 (ii)
     Unit Hyd. Tpeak (min)=       5.00          5.00
     Unit Hyd. peak  (cms)=       0.34          0.32
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.20          0.00          0.202 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.33           1.33
     RUNOFF VOLUME    (mm)=      77.54         28.63          76.37
     TOTAL RAINFALL   (mm)=      79.54         79.54          79.54
     RUNOFF COEFFICIENT   =       0.97          0.36           0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0205)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0189      0.0093
                         0.0041     0.0001   |   0.0193      0.0093
                         0.0084     0.0016   |   0.0203      0.0094
                         0.0104     0.0026   |   0.0216      0.0095
                         0.0121     0.0036   |   0.0217      0.0096
                         0.0136     0.0046   |   0.0219      0.0101
                         0.0149     0.0057   |   0.0221      0.0110
                         0.0161     0.0067   |   0.0223      0.0123
                         0.0173     0.0077   |   0.0224      0.0144
                         0.0183     0.0087   |   0.1878      0.0170

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0201)      0.331      0.202      1.33       76.37
   OUTFLOW: ID= 1 (  0205)      0.331      0.022      1.75       76.37

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 11.05
                  TIME SHIFT OF PEAK FLOW         (min)= 25.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0126

------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0204):     0.08   0.018     1.33    37.88
     + ID2= 2 (  0205):     0.33   0.022     1.75    76.37
       ================================================
       ID = 3 (  0214):     0.41   0.034     1.42    68.65
```

```
     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0214):     0.41   0.034     1.42    68.65
      + ID2= 2 (  0207):     0.06   0.014     1.42    35.04
        ================================================
        ID = 1 (  0214):     0.48   0.049     1.42    64.09

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0214):     0.48   0.049     1.42    64.09
      + ID2= 2 (  0213):     0.09   0.010     1.42    22.08
        ================================================
        ID = 3 (  0214):     0.57   0.059     1.42    57.38

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
========================

       V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\e14f
4457-0225-4f93-8673-97d2b0e40212\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\e14f
4457-0225-4f93-8673-97d2b0e40212\scen


DATE: 04-25-2022                          TIME: 11:03:18

USER:


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ***********************************************
  ** SIMULATION : 5yr 24hr 5min SCS Type II     **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\dhordyk\AppD
|                  |              ata\Local\Temp\
|                  |              b3cec1e8-54db-4fb7-970a-9d201c8a3957\07b93d6a
| Ptotal= 78.55 mm |    Comments: 5yr 24hr 5min SCS Type II
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00    0.00 |  6.08    1.41 | 12.17   11.31 | 18.25    1.41
                0.08    0.86 |  6.17    1.41 | 12.25   11.31 | 18.33    1.41
                0.17    0.86 |  6.25    1.41 | 12.33   11.31 | 18.42    1.41
                0.25    0.86 |  6.33    1.41 | 12.42   11.31 | 18.50    1.41
                0.33    0.86 |  6.42    1.41 | 12.50   11.31 | 18.58    1.41
                0.42    0.86 |  6.50    1.41 | 12.58    5.81 | 18.67    1.41
                0.50    0.86 |  6.58    1.41 | 12.67    5.81 | 18.75    1.41
                0.58    0.86 |  6.67    1.41 | 12.75    5.81 | 18.83    1.41
                0.67    0.86 |  6.75    1.41 | 12.83    5.81 | 18.92    1.41
                0.75    0.86 |  6.83    1.41 | 12.92    5.81 | 19.00    1.41
                0.83    0.86 |  6.92    1.41 | 13.00    5.81 | 19.08    1.41
                0.92    0.86 |  7.00    1.41 | 13.08    4.24 | 19.17    1.41
                1.00    0.86 |  7.08    1.73 | 13.17    4.24 | 19.25    1.41
                1.08    0.86 |  7.17    1.73 | 13.25    4.24 | 19.33    1.41
                1.17    0.86 |  7.25    1.73 | 13.33    4.24 | 19.42    1.41
                1.25    0.86 |  7.33    1.73 | 13.42    4.24 | 19.50    1.41
                1.33    0.86 |  7.42    1.73 | 13.50    4.24 | 19.58    1.41
                1.42    0.86 |  7.50    1.73 | 13.58    3.30 | 19.67    1.41
```

1.50	0.86	7.58	1.73	13.67	3.30	19.75	1.41
1.58	0.86	7.67	1.73	13.75	3.30	19.83	1.41
1.67	0.86	7.75	1.73	13.83	3.30	19.92	1.41
1.75	0.86	7.83	1.73	13.92	3.30	20.00	1.41
1.83	0.86	7.92	1.73	14.00	3.30	20.08	0.94
1.92	0.86	8.00	1.73	14.08	2.36	20.17	0.94
2.00	0.86	8.08	2.04	14.17	2.36	20.25	0.94
2.08	1.02	8.17	2.04	14.25	2.36	20.33	0.94
2.17	1.02	8.25	2.04	14.33	2.36	20.42	0.94
2.25	1.02	8.33	2.04	14.42	2.36	20.50	0.94
2.33	1.02	8.42	2.04	14.50	2.36	20.58	0.94
2.42	1.02	8.50	2.04	14.58	2.36	20.67	0.94
2.50	1.02	8.58	2.20	14.67	2.36	20.75	0.94
2.58	1.02	8.67	2.20	14.75	2.36	20.83	0.94
2.67	1.02	8.75	2.20	14.83	2.36	20.92	0.94
2.75	1.02	8.83	2.20	14.92	2.36	21.00	0.94
2.83	1.02	8.92	2.20	15.00	2.36	21.08	0.94
2.92	1.02	9.00	2.20	15.08	2.36	21.17	0.94
3.00	1.02	9.08	2.51	15.17	2.36	21.25	0.94
3.08	1.02	9.17	2.51	15.25	2.36	21.33	0.94
3.17	1.02	9.25	2.51	15.33	2.36	21.42	0.94
3.25	1.02	9.33	2.51	15.42	2.36	21.50	0.94
3.33	1.02	9.42	2.51	15.50	2.36	21.58	0.94
3.42	1.02	9.50	2.51	15.58	2.36	21.67	0.94
3.50	1.02	9.58	2.83	15.67	2.36	21.75	0.94
3.58	1.02	9.67	2.83	15.75	2.36	21.83	0.94
3.67	1.02	9.75	2.83	15.83	2.36	21.92	0.94
3.75	1.02	9.83	2.83	15.92	2.36	22.00	0.94
3.83	1.02	9.92	2.83	16.00	2.36	22.08	0.94
3.92	1.02	10.00	2.83	16.08	1.41	22.17	0.94
4.00	1.02	10.08	3.61	16.17	1.41	22.25	0.94
4.08	1.26	10.17	3.61	16.25	1.41	22.33	0.94
4.17	1.26	10.25	3.61	16.33	1.41	22.42	0.94
4.25	1.26	10.33	3.61	16.42	1.41	22.50	0.94
4.33	1.26	10.42	3.61	16.50	1.41	22.58	0.94
4.42	1.26	10.50	3.61	16.58	1.41	22.67	0.94
4.50	1.26	10.58	4.87	16.67	1.41	22.75	0.94
4.58	1.26	10.67	4.87	16.75	1.41	22.83	0.94
4.67	1.26	10.75	4.87	16.83	1.41	22.92	0.94
4.75	1.26	10.83	4.87	16.92	1.41	23.00	0.94
4.83	1.26	10.92	4.87	17.00	1.41	23.08	0.94
4.92	1.26	11.00	4.87	17.08	1.41	23.17	0.94
5.00	1.26	11.08	7.54	17.17	1.41	23.25	0.94
5.08	1.26	11.17	7.54	17.25	1.41	23.33	0.94
5.17	1.26	11.25	7.54	17.33	1.41	23.42	0.94
5.25	1.26	11.33	7.54	17.42	1.41	23.50	0.94
5.33	1.26	11.42	7.54	17.50	1.41	23.58	0.94
5.42	1.26	11.50	7.54	17.58	1.41	23.67	0.94
5.50	1.26	11.58	23.25	17.67	1.41	23.75	0.94
5.58	1.26	11.67	23.25	17.75	1.41	23.83	0.94
5.67	1.26	11.75	23.25	17.83	1.41	23.92	0.94
5.75	1.26	11.83	96.15	17.92	1.41	24.00	0.94
5.83	1.26	11.92	96.15	18.00	1.41		
5.92	1.26	12.00	96.15	18.08	1.41		
6.00	1.26	12.08	11.31	18.17	1.41		

```
--------------------
| CALIB            |
| NASHYD   (  0203)|   Area    (ha)=   0.09   Curve Number   (CN)= 73.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.05

     Unit Hyd Qpeak  (cms)=   0.070

     PEAK FLOW       (cms)=   0.010 (i)
     TIME TO PEAK    (hrs)=  12.083
     RUNOFF VOLUME    (mm)=  25.384
     TOTAL RAINFALL   (mm)=  78.550
     RUNOFF COEFFICIENT   =   0.323

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

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------------------
| SWALE(  0208)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   16.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    1.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
     INFLOW:ID= 2     0.09         0.010            12.08        25.38
    OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
   OVERFLOW:ID= 3     0.09         0.010            12.08        23.38

             Volume Reduction Rate[(RVin-RVout)/RVin](%)=        7.89
             Maximum ponding/storage volume      (cu.m.)=        1.82
             Time to reach Max storage              (Hr)=       11.50
             Volume of water for drawdown in LID (cu.m.)=        1.82
             Calculated Drawdown Time               (Hr)=     1642.33

  -------------------------
  | Junction Command(0209) |
  -------------------------
```

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                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0208)    0.09     0.01   12.08    23.38
  OUTFLOW: ID= 2(  0209)    0.09     0.01   12.08    23.38

  --------------------------------------------------------------------------------
------------------
| SWALE(  0210)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   10.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope        =    3.00  Right Slope        =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    3.00

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
     INFLOW:ID= 2      0.09         0.010            12.08        23.38
    OUTFLOW:ID= 1      0.00         0.000             0.00         0.00
   OVERFLOW:ID= 3      0.09         0.010            12.08        22.18

               Volume Reduction Rate[(RVin-RVout)/RVin](%)=        5.14
               Maximum ponding/storage volume      (cu.m.)=        1.09
               Time to reach Max storage              (Hr)=       11.83
               Volume of water for drawdown in LID (cu.m.)=        1.09
               Calculated Drawdown Time               (Hr)=     1642.33

  --------------------------
  | Junction Command(0211) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0210)    0.09     0.01   12.08    22.18
  OUTFLOW: ID= 2(  0211)    0.09     0.01   12.08    22.18

  --------------------------------------------------------------------------------
------------------
| SWALE(  0212)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   10.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope        =    3.00  Right Slope        =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    5.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
     INFLOW:ID= 2      0.09         0.010            12.08        22.18
    OUTFLOW:ID= 1      0.00         0.000             0.00         0.00
   OVERFLOW:ID= 3      0.09         0.010            12.08        21.56

               Volume Reduction Rate[(RVin-RVout)/RVin](%)=        2.80
               Maximum ponding/storage volume      (cu.m.)=        0.57
               Time to reach Max storage              (Hr)=       11.92
               Volume of water for drawdown in LID (cu.m.)=        0.57
               Calculated Drawdown Time               (Hr)=     1642.33

  --------------------------
  | Junction Command(0213) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0212)    0.09     0.01   12.08    21.56
  OUTFLOW: ID= 2(  0213)    0.09     0.01   12.08    21.56

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------

                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      96.15        54.36
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       0.88 (ii)    5.40 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.34         0.16
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.01          0.011 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08          12.08
     RUNOFF VOLUME    (mm)=      76.55        31.34          37.16
     TOTAL RAINFALL   (mm)=      78.55        78.55          78.55
     RUNOFF COEFFICIENT   =       0.97         0.40           0.47

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
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     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      96.15        41.39
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.67 (ii)    3.30 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.27
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.014 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08          12.08
     RUNOFF VOLUME    (mm)=      76.55        28.02          61.26
     TOTAL RAINFALL   (mm)=      78.55        78.55          78.55
     RUNOFF COEFFICIENT   =       0.97         0.36           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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----------------------
|Bioretention(  0206)|  OUTFLOW: OFF,  UNDERDRAIN: OFF
|IN= 2--> OUT= 3     |
| DT=  5.0 min       |
----------------------  SURFACE PONDING LAYER:

                        Max. Ponding Storage(cu.m.)=       17.60

                      STAGE        AREA          |   STAGE      AREA
                       (m)        (m2)          |    (m)       (m2)
                      0.000        60.000        |   0.160       73.330
                      0.020        61.670        |   0.180       75.000
                      0.040        63.330        |   0.200       76.670
                      0.060        65.000        |   0.220       78.330
                      0.080        66.670        |   0.230       79.170
                      0.100        68.330        |   0.240       80.000
                      0.120        70.000        |   0.250       80.840
                      0.140        71.670        |   0.000        0.000

                     MULCH LAYER:
                     Depth      (m)=    0.08  Porosity           =  0.00
                     Maximum Mulch layer Volume (cu.m.)=     0.00

                     ENGINEERED SOIL LAYER:
                     Soil moisture =    0.30  Depth            (m)=  0.65
                     Width      (m)=    8.50  Length           (m)=  7.00
                     Porosity      =    0.00  Infiltration (m/hr) = 0.0000
                     Maximum Engineered Soil layer Volume(cu.m.)=    0.04

                     STORAGE LAYER:
                     Depth       (m)=    0.30  Porosity           =  0.00
                     Seepage (m/hr) = 0.0000
                     Maximum Storage layer Volume(cu.m.)=     0.02

                     TOTAL AVAILABLE STORAGE:

                     TOTAL STORAGE=Surface Ponding + Mulch Layer + Engineered soil
+Storage Layer(cu.m.)=       17.66

                     NATIVE SOIL LAYER:
                     Infiltration (m/hr) = 0.0000

                        AREA         QPEAK            TPEAK         R.V.
                        (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.06         0.014            12.08        61.26
    OVERFLOW:ID= 3     0.06         0.014            12.08        34.18

              Volume Reduction Rate[(RVin-RVout)/RVin] (%)=       44.21
              Time to reach Max Ponding storage       (Hr)=        0.00
              Volume of water for drawdown in LID  (cu.m.)=       17.61
              Volume of Max. Water Storage         (cu.m.)=        0.00
              Maximum Surface Ponding And Mulch Vol(cu.m.)=       17.60
              Maximum Engineered Soil Volume       (cu.m.)=        0.01
              Surface Ponding And Mulch Drawdown Time(Hr)=     1642.33
              Engineered Soil Drawdown time          (Hr)=        0.00
              Calculated Drawdown Time               (Hr)=        0.00

  --------------------------
  | Junction Command(0207) |
  --------------------------

                             AREA     QPEAK   TPEAK     R.V.
                             (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0206)    0.07      0.01   12.08    34.18
```

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  OUTFLOW: ID= 2(  0207)    0.07     0.01   12.08    34.18

  --------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  97.60   Dir. Conn.(%)=  97.60
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.01
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       3.00         4.00
     Length            (m)=      46.98        30.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      96.15        41.39
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.19 (ii)    2.30 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.33         0.30
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.09         0.00          0.087 (iii)
     TIME TO PEAK    (hrs)=      12.08        12.08          12.08
     RUNOFF VOLUME    (mm)=      76.55        28.02          75.38
     TOTAL RAINFALL   (mm)=      78.55        78.55          78.55
     RUNOFF COEFFICIENT   =       0.97         0.36           0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0205)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0189      0.0093
                          0.0041     0.0001   |   0.0193      0.0093
                          0.0084     0.0016   |   0.0203      0.0094
                          0.0104     0.0026   |   0.0216      0.0095
                          0.0121     0.0036   |   0.0217      0.0096
                          0.0136     0.0046   |   0.0219      0.0101
                          0.0149     0.0057   |   0.0221      0.0110
                          0.0161     0.0067   |   0.0223      0.0123
                          0.0173     0.0077   |   0.0224      0.0144
                          0.0183     0.0087   |   0.1878      0.0170

                                    AREA     QPEAK     TPEAK       R.V.
                                    (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0201)      0.331      0.087     12.08      75.38
   OUTFLOW: ID= 1 (  0205)      0.331      0.018     12.17      75.38

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.38
                  TIME SHIFT OF PEAK FLOW         (min)=  5.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0083

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0204):     0.08   0.011    12.08    37.16
     + ID2= 2 (  0205):     0.33   0.018    12.17    75.38
       ================================================
       ID = 3 (  0214):     0.41   0.027    12.08    67.72

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0214):     0.41   0.027    12.08    67.72
     + ID2= 2 (  0207):     0.06   0.014    12.08    34.18
       ================================================
       ID = 1 (  0214):     0.48   0.042    12.08    63.17

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0214):     0.48   0.042    12.08    63.17
     + ID2= 2 (  0213):     0.09   0.010    12.08    21.56
       ================================================
       ID = 3 (  0214):     0.57   0.052    12.08    56.53

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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================================================================================
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```

```
       V    V   I    SSSSS  U   U    A    L             (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\548e
97bc-2cb6-4905-818b-b45812b32731\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\548e
97bc-2cb6-4905-818b-b45812b32731\scen


DATE: 04-25-2022                          TIME: 11:03:17

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ************************************************
  ** SIMULATION : 5yr 4hr 5min Chicago          **
  ************************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 843.019
| Ptotal= 50.76 mm |                          B=   4.582
--------------------                          C=   0.763
                       used in:   INTENSITY =  A / (t + B)^C
                                  Duration of storm  =  4.00 hrs
                                  Storm time step    =  5.00 min
                                  Time to peak ratio =  0.33

 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.00    3.39 |  1.00   14.01 |  2.00    9.07 |  3.00    4.46
 0.08    3.58 |  1.08   21.15 |  2.08    8.29 |  3.08    4.30
 0.17    3.81 |  1.17   47.54 |  2.17    7.64 |  3.17    4.15
 0.25    4.07 |  1.25  150.31 |  2.25    7.10 |  3.25    4.01
 0.33    4.38 |  1.33   60.96 |  2.33    6.64 |  3.33    3.88
 0.42    4.74 |  1.42   34.18 |  2.42    6.24 |  3.42    3.75
 0.50    5.18 |  1.50   23.88 |  2.50    5.89 |  3.50    3.64
 0.58    5.73 |  1.58   18.47 |  2.58    5.58 |  3.58    3.54
 0.67    6.43 |  1.67   15.15 |  2.67    5.31 |  3.67    3.44
 0.75    7.36 |  1.75   12.90 |  2.75    5.07 |  3.75    3.35
 0.83    8.67 |  1.83   11.27 |  2.83    4.85 |  3.83    3.26
 0.92   10.64 |  1.92   10.04 |  2.92    4.65 |  3.92    3.18

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0203)|   Area    (ha)=   0.09   Curve Number   (CN)= 73.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.05

     Unit Hyd Qpeak  (cms)=   0.070

     PEAK FLOW       (cms)=   0.006 (i)
     TIME TO PEAK    (hrs)=   1.333
     RUNOFF VOLUME    (mm)=  11.926
     TOTAL RAINFALL   (mm)=  50.757
     RUNOFF COEFFICIENT   =   0.235

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
------------------
| SWALE(  0208)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   16.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    1.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
      INFLOW:ID= 2     0.09         0.006             1.33        11.93
```

```
   OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
  OVERFLOW:ID= 3     0.09         0.005             1.42         9.92

            Volume Reduction Rate[(RVin-RVout)/RVin](%)=       16.80
            Maximum ponding/storage volume      (cu.m.)=        1.82
            Time to reach Max storage              (Hr)=        1.33
            Volume of water for drawdown in LID (cu.m.)=        1.82
            Calculated Drawdown Time               (Hr)=     1662.42

 --------------------------
 | Junction Command(0209) |
 --------------------------

                        AREA     QPEAK   TPEAK     R.V.
                        (ha)     (cms)    (hrs)    (mm)
 INFLOW : ID= 3(  0208)    0.09     0.00    1.42     9.92
 OUTFLOW: ID= 2(  0209)    0.09     0.00    1.42     9.92

 ------------------------------------------------------------------------------
------------------
| SWALE(  0210)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   10.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    3.00

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
     INFLOW:ID= 2     0.09         0.005             1.42         9.92
    OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
   OVERFLOW:ID= 3     0.09         0.003             1.50         8.72

            Volume Reduction Rate[(RVin-RVout)/RVin](%)=       12.11
            Maximum ponding/storage volume      (cu.m.)=        1.09
            Time to reach Max storage              (Hr)=        1.42
            Volume of water for drawdown in LID (cu.m.)=        1.09
            Calculated Drawdown Time               (Hr)=     1662.42

 --------------------------
 | Junction Command(0211) |
 --------------------------

                        AREA     QPEAK   TPEAK     R.V.
                        (ha)     (cms)    (hrs)    (mm)
 INFLOW : ID= 3(  0210)    0.09     0.00    1.50     8.72
 OUTFLOW: ID= 2(  0211)    0.09     0.00    1.50     8.72

 ------------------------------------------------------------------------------
------------------
| SWALE(  0212)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   10.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    5.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
     INFLOW:ID= 2     0.09         0.003             1.50         8.72
    OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
   OVERFLOW:ID= 3     0.09         0.003             1.50         8.10

            Volume Reduction Rate[(RVin-RVout)/RVin](%)=        7.13
            Maximum ponding/storage volume      (cu.m.)=        0.57
            Time to reach Max storage              (Hr)=        1.42
            Volume of water for drawdown in LID (cu.m.)=        0.57
            Calculated Drawdown Time               (Hr)=     1662.42

 --------------------------
 | Junction Command(0213) |
 --------------------------

                        AREA     QPEAK   TPEAK     R.V.
                        (ha)     (cms)    (hrs)    (mm)
 INFLOW : ID= 3(  0212)    0.09     0.00    1.50     8.10
 OUTFLOW: ID= 2(  0213)    0.09     0.00    1.50     8.10

 ------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------

                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     150.31        32.61
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       0.74 (ii)    6.28 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.34         0.15
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.007 (iii)
```

```
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      48.76        14.58         18.99
     TOTAL RAINFALL   (mm)=      50.76        50.76         50.76
     RUNOFF COEFFICIENT   =       0.96         0.29          0.37

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  68.50   Dir. Conn.(%)=  68.50
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.04         0.02
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       4.00         5.00
     Length            (m)=      20.82        20.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     150.31        23.56
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.56 (ii)    2.76 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.28
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.020 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      48.76        12.67         37.38
     TOTAL RAINFALL   (mm)=      50.76        50.76         50.76
     RUNOFF COEFFICIENT   =       0.96         0.25          0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
----------------------
|Bioretention(  0206)|  OUTFLOW: OFF,  UNDERDRAIN: OFF
|IN= 2--> OUT= 3     |
| DT=  5.0 min       |
----------------------  SURFACE PONDING LAYER:

                          Max. Ponding Storage(cu.m.)=       17.60

                        STAGE        AREA          |   STAGE      AREA
                         (m)        (m2)          |    (m)       (m2)
                        0.000        60.000        |   0.160       73.330
                        0.020        61.670        |   0.180       75.000
                        0.040        63.330        |   0.200       76.670
                        0.060        65.000        |   0.220       78.330
                        0.080        66.670        |   0.230       79.170
                        0.100        68.330        |   0.240       80.000
                        0.120        70.000        |   0.250       80.840
                        0.140        71.670        |   0.000        0.000

                    MULCH LAYER:
                    Depth      (m)=    0.08  Porosity           =  0.00
                    Maximum Mulch layer Volume (cu.m.)=     0.00

                    ENGINEERED SOIL LAYER:
                    Soil moisture =    0.30  Depth            (m)=  0.65
                    Width      (m)=    8.50  Length           (m)=  7.00
                    Porosity     =    0.00  Infiltration (m/hr) = 0.0000
                    Maximum Engineered Soil layer Volume(cu.m.)=    0.04

                    STORAGE LAYER:
                    Depth       (m)=    0.30  Porosity          =  0.00
                    Seepage (m/hr) = 0.0000
                    Maximum Storage layer Volume(cu.m.)=     0.02

                    TOTAL AVAILABLE STORAGE:

                    TOTAL STORAGE=Surface Ponding + Mulch Layer + Engineered soil
+Storage Layer(cu.m.)=       17.66

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
          INFLOW:ID= 2     0.06         0.020             1.33        37.38
       OVERFLOW:ID= 3     0.07         0.002             1.92        10.30

               Volume Reduction Rate[(RVin-RVout)/RVin] (%)=       72.45
               Time to reach Max Ponding storage       (Hr)=        0.00
               Volume of water for drawdown in LID  (cu.m.)=       17.61
               Volume of Max. Water Storage         (cu.m.)=        0.00
```

```
              Maximum Surface Ponding And Mulch Vol(cu.m.)=       17.60
              Maximum Engineered Soil Volume       (cu.m.)=        0.01
              Surface Ponding And Mulch Drawdown Time(Hr)=     1662.42
              Engineered Soil Drawdown time          (Hr)=        0.00
              Calculated Drawdown Time               (Hr)=        0.00

  --------------------------
  | Junction Command(0207) |
  --------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0206)    0.07     0.00    1.92    10.30
  OUTFLOW: ID= 2(  0207)    0.07     0.00    1.92    10.30

  ------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   0.33
|ID= 1 DT= 5.0 min |   Total Imp(%)=  97.60   Dir. Conn.(%)=  97.60
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.01
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       3.00         4.00
     Length            (m)=      46.98        30.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     150.31        23.56
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.99 (ii)    1.92 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.31
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.13         0.00          0.135 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      48.76        12.67          47.89
     TOTAL RAINFALL   (mm)=      50.76        50.76          50.76
     RUNOFF COEFFICIENT   =       0.96         0.25           0.94

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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```

```
| RESERVOIR(  0205)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0189      0.0093
                          0.0041     0.0001   |   0.0193      0.0093
                          0.0084     0.0016   |   0.0203      0.0094
                          0.0104     0.0026   |   0.0216      0.0095
                          0.0121     0.0036   |   0.0217      0.0096
                          0.0136     0.0046   |   0.0219      0.0101
                          0.0149     0.0057   |   0.0221      0.0110
                          0.0161     0.0067   |   0.0223      0.0123
                          0.0173     0.0077   |   0.0224      0.0144
                          0.0183     0.0087   |   0.1878      0.0170

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0201)      0.331     0.135      1.33      47.89
   OUTFLOW: ID= 1 (  0205)      0.331     0.017      1.67      47.89

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.65
                  TIME SHIFT OF PEAK FLOW         (min)= 20.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0075

------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0204):     0.08   0.007     1.33    18.99
     + ID2= 2 (  0205):     0.33   0.017     1.67    47.89
       ================================================
       ID = 3 (  0214):     0.41   0.022     1.42    42.09

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0214):     0.41   0.022     1.42    42.09
     + ID2= 2 (  0207):     0.07   0.002     1.92    10.30
       ================================================
       ID = 1 (  0214):     0.48   0.022     1.42    37.78

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------
```

```
--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0214):     0.48   0.022     1.42    37.78
      + ID2= 2 (  0213):     0.09   0.003     1.50     8.10
        ================================================
        ID = 3 (  0214):     0.57   0.024     1.50    33.04

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
========================

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2011)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
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0545-e714-46ce-9555-9c8f474d5b01\scen
  Summary filename:
C:\Users\dhordyk\AppData\Local\Civica\VH5\8b6dfc70-7c8b-437a-b1ad-e48760573048\2993
0545-e714-46ce-9555-9c8f474d5b01\scen


DATE: 04-25-2022                          TIME: 11:03:16

USER:



COMMENTS: _____________________________________________________________
```

```
--------------------------------------------------------------------------------
------------------------
  ***********************************************
  ** SIMULATION : HAZEL                        **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\dhordyk\AppD
|                  |              ata\Local\Temp\
|                  |              b3cec1e8-54db-4fb7-970a-9d201c8a3957\bd658d54
| Ptotal=212.00 mm |    Comments: HAZEL
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00    6.00 |  3.00   13.00 |  6.00   23.00 |  9.00   53.00
                0.20    6.00 |  3.20   13.00 |  6.20   23.00 |  9.20   53.00
                0.40    6.00 |  3.40   13.00 |  6.40   23.00 |  9.40   53.00
                0.60    6.00 |  3.60   13.00 |  6.60   23.00 |  9.60   53.00
                0.80    6.00 |  3.80   13.00 |  6.80   23.00 |  9.80   53.00
                1.00    4.00 |  4.00   17.00 |  7.00   13.00 | 10.00   38.00
                1.20    4.00 |  4.20   17.00 |  7.20   13.00 | 10.20   38.00
                1.40    4.00 |  4.40   17.00 |  7.40   13.00 | 10.40   38.00
                1.60    4.00 |  4.60   17.00 |  7.60   13.00 | 10.60   38.00
                1.80    4.00 |  4.80   17.00 |  7.80   13.00 | 10.80   38.00
                2.00    6.00 |  5.00   13.00 |  8.00   13.00 | 11.00   13.00
                2.20    6.00 |  5.20   13.00 |  8.20   13.00 | 11.20   13.00
                2.40    6.00 |  5.40   13.00 |  8.40   13.00 | 11.40   13.00
                2.60    6.00 |  5.60   13.00 |  8.60   13.00 | 11.60   13.00
                2.80    6.00 |  5.80   13.00 |  8.80   13.00 | 11.80   13.00

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| CALIB            |
| NASHYD   (  0203)|   Area    (ha)=   0.09   Curve Number   (CN)= 73.6
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.40   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.05

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08   53.00
               0.167    6.00 | 3.167   13.00 | 6.167   23.00 |  9.17   53.00
               0.250    6.00 | 3.250   13.00 | 6.250   23.00 |  9.25   53.00
               0.333    6.00 | 3.333   13.00 | 6.333   23.00 |  9.33   53.00
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0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Unit Hyd Qpeak (cms)= 0.070

PEAK FLOW (cms)= 0.009 (i)
TIME TO PEAK (hrs)= 10.000
RUNOFF VOLUME (mm)= 110.082
TOTAL RAINFALL (mm)= 212.000
RUNOFF COEFFICIENT = 0.519

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

SWALE(0208)	SURFACE PONDING LAYER:					
IN= 2--> OUT= 3	Length	(m)=	16.00	Height	(m)=	0.25
DT= 5.0 MIN	Left Slope	=	3.00	Right Slope	=	3.00
	Bottom Width	(m)=	0.30	Surface slope(%)	=	1.80

NATIVE SOIL LAYER:
Infiltration (m/hr) = 0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW:ID= 2	0.09	0.009	10.00	110.08
OUTFLOW:ID= 1	0.00	0.000	0.00	0.00
OVERFLOW:ID= 3	0.09	0.009	10.00	108.08

Volume Reduction Rate[(RVin-RVout)/RVin](%)= 1.82
Maximum ponding/storage volume (cu.m.)= 1.82
Time to reach Max storage (Hr)= 3.42
Volume of water for drawdown in LID (cu.m.)= 1.82
Calculated Drawdown Time (Hr)= 1654.33

Junction Command(0209)

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 3(0208)	0.09	0.01	10.00	108.08
OUTFLOW: ID= 2(0209)	0.09	0.01	10.00	108.08

SWALE(0210)	SURFACE PONDING LAYER:					
IN= 2--> OUT= 3	Length	(m)=	10.00	Height	(m)=	0.25
DT= 5.0 MIN	Left Slope	=	3.00	Right Slope	=	3.00
	Bottom Width	(m)=	0.30	Surface slope(%)	=	3.00

NATIVE SOIL LAYER:
Infiltration (m/hr) = 0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW:ID= 2	0.09	0.009	10.00	108.08
OUTFLOW:ID= 1	0.00	0.000	0.00	0.00
OVERFLOW:ID= 3	0.09	0.009	10.00	106.88

Volume Reduction Rate[(RVin-RVout)/RVin](%)= 1.11
Maximum ponding/storage volume (cu.m.)= 1.09
Time to reach Max storage (Hr)= 3.83
Volume of water for drawdown in LID (cu.m.)= 1.09
Calculated Drawdown Time (Hr)= 1654.33

Junction Command(0211)

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                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0210)    0.09     0.01   10.00   106.88
  OUTFLOW: ID= 2(  0211)    0.09     0.01   10.00   106.88

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| SWALE(  0212)  |  SURFACE PONDING LAYER:
|IN= 2--> OUT= 3 |  Length          (m)=   10.00  Height           (m)=    0.25
|DT=  5.0 MIN    |  Left Slope         =    3.00  Right Slope         =    3.00
------------------  Bottom Width    (m)=    0.30  Surface slope(%)    =    5.80

                    NATIVE SOIL LAYER:
                    Infiltration (m/hr) = 0.0000

                       AREA         QPEAK            TPEAK         R.V.
                       (ha)         (cms)            (hrs)         (mm)
     INFLOW:ID= 2     0.09         0.009            10.00       106.88
    OUTFLOW:ID= 1     0.00         0.000             0.00         0.00
   OVERFLOW:ID= 3     0.09         0.009            10.00       106.25

               Volume Reduction Rate[(RVin-RVout)/RVin](%)=        0.58
               Maximum ponding/storage volume      (cu.m.)=        0.57
               Time to reach Max storage              (Hr)=        4.00
               Volume of water for drawdown in LID (cu.m.)=        0.57
               Calculated Drawdown Time               (Hr)=     1654.33

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  | Junction Command(0213) |
  ---------------------------

                          AREA     QPEAK   TPEAK     R.V.
                          (ha)     (cms)    (hrs)    (mm)
  INFLOW : ID= 3(  0212)    0.09     0.01   10.00   106.25
  OUTFLOW: ID= 2(  0213)    0.09     0.01   10.00   106.25

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| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=   0.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  25.90   Dir. Conn.(%)=  13.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.02         0.06
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      23.52        20.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
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---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

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Max.Eff.Inten.(mm/hr)=      53.00        52.24
          over (min)         5.00        10.00
Storage Coeff.  (min)=       1.12 (ii)    5.71 (ii)
Unit Hyd. Tpeak (min)=       5.00        10.00
Unit Hyd. peak  (cms)=       0.34         0.15
                                                    *TOTALS*
PEAK FLOW       (cms)=       0.00         0.01         0.010 (iii)
TIME TO PEAK    (hrs)=       9.58        10.00        10.00
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RUNOFF VOLUME (mm)=	210.00	139.42	148.56
TOTAL RAINFALL (mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT =	0.99	0.66	0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 68.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0202)	Area (ha)= 0.06
ID= 1 DT= 5.0 min	Total Imp(%)= 68.50 Dir. Conn.(%)= 68.50

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.04	0.02
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	4.00	5.00
Length	(m)=	20.82	20.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Max.Eff.Inten.(mm/hr)=	53.00	42.70	
over (min)	5.00	5.00	
Storage Coeff. (min)=	0.85 (ii)	4.19 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.34	0.24	
			TOTALS
PEAK FLOW (cms)=	0.01	0.00	0.009 (iii)
TIME TO PEAK (hrs)=	9.33	10.00	10.00
RUNOFF VOLUME (mm)=	210.00	131.23	185.15
TOTAL RAINFALL (mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT =	0.99	0.62	0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 68.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

Bioretention(0206)	OUTFLOW: OFF, UNDERDRAIN: OFF
IN= 2--> OUT= 3	
DT= 5.0 min	

SURFACE PONDING LAYER:

Max. Ponding Storage(cu.m.)= 17.60

STAGE	AREA	STAGE	AREA

(m)	(m2)	(m)	(m2)
0.000	60.000	0.160	73.330
0.020	61.670	0.180	75.000
0.040	63.330	0.200	76.670
0.060	65.000	0.220	78.330
0.080	66.670	0.230	79.170
0.100	68.330	0.240	80.000
0.120	70.000	0.250	80.840
0.140	71.670	0.000	0.000

MULCH LAYER:
Depth (m)= 0.08 Porosity = 0.00
Maximum Mulch layer Volume (cu.m.)= 0.00

ENGINEERED SOIL LAYER:
Soil moisture = 0.30 Depth (m)= 0.65
Width (m)= 8.50 Length (m)= 7.00
Porosity = 0.00 Infiltration (m/hr) = 0.0000
Maximum Engineered Soil layer Volume(cu.m.)= 0.04

STORAGE LAYER:
Depth (m)= 0.30 Porosity = 0.00
Seepage (m/hr) = 0.0000
Maximum Storage layer Volume(cu.m.)= 0.02

TOTAL AVAILABLE STORAGE:

TOTAL STORAGE=Surface Ponding + Mulch Layer + Engineered soil +Storage Layer(cu.m.)= 17.66

NATIVE SOIL LAYER:
Infiltration (m/hr) = 0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW:ID= 2	0.06	0.009	10.00	185.15
OVERFLOW:ID= 3	0.06	0.009	10.00	158.07

Volume Reduction Rate[(RVin-RVout)/RVin] (%)= 14.63
Time to reach Max Ponding storage (Hr)= 0.00
Volume of water for drawdown in LID (cu.m.)= 17.61
Volume of Max. Water Storage (cu.m.)= 0.00
Maximum Surface Ponding And Mulch Vol(cu.m.)= 17.60
Maximum Engineered Soil Volume (cu.m.)= 0.01
Surface Ponding And Mulch Drawdown Time(Hr)= 1654.33
Engineered Soil Drawdown time (Hr)= 0.00
Calculated Drawdown Time (Hr)= 0.00

| Junction Command(0207) |

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 3(0206)	0.07	0.01	10.00	158.07
OUTFLOW: ID= 2(0207)	0.07	0.01	10.00	158.07

CALIB STANDHYD (0201) ID= 1 DT= 5.0 min	Area (ha)= 0.33 Total Imp(%)= 97.60 Dir. Conn.(%)= 97.60

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.32	0.01
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	3.00	4.00
Length (m)=	46.98	30.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00

```
              2.083    6.00 | 5.083   13.00 | 8.083   13.00 | 11.08   13.00
              2.167    6.00 | 5.167   13.00 | 8.167   13.00 | 11.17   13.00
              2.250    6.00 | 5.250   13.00 | 8.250   13.00 | 11.25   13.00
              2.333    6.00 | 5.333   13.00 | 8.333   13.00 | 11.33   13.00
              2.417    6.00 | 5.417   13.00 | 8.417   13.00 | 11.42   13.00
              2.500    6.00 | 5.500   13.00 | 8.500   13.00 | 11.50   13.00
              2.583    6.00 | 5.583   13.00 | 8.583   13.00 | 11.58   13.00
              2.667    6.00 | 5.667   13.00 | 8.667   13.00 | 11.67   13.00
              2.750    6.00 | 5.750   13.00 | 8.750   13.00 | 11.75   13.00
              2.833    6.00 | 5.833   13.00 | 8.833   13.00 | 11.83   13.00
              2.917    6.00 | 5.917   13.00 | 8.917   13.00 | 11.92   13.00
              3.000    6.00 | 6.000   13.00 | 9.000   13.00 | 12.00   13.00

     Max.Eff.Inten.(mm/hr)=      53.00        42.70
               over (min)        5.00         5.00
     Storage Coeff.  (min)=      1.51 (ii)    2.92 (ii)
     Unit Hyd. Tpeak (min)=      5.00         5.00
     Unit Hyd. peak  (cms)=      0.33         0.28
                                                        *TOTALS*
     PEAK FLOW       (cms)=      0.05         0.00          0.049 (iii)
     TIME TO PEAK    (hrs)=      9.58        10.00         10.00
     RUNOFF VOLUME    (mm)=    210.00       131.23        208.11
     TOTAL RAINFALL   (mm)=    212.00       212.00        212.00
     RUNOFF COEFFICIENT   =      0.99         0.62          0.98

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  68.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0205)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0189      0.0093
                         0.0041     0.0001   |   0.0193      0.0093
                         0.0084     0.0016   |   0.0203      0.0094
                         0.0104     0.0026   |   0.0216      0.0095
                         0.0121     0.0036   |   0.0217      0.0096
                         0.0136     0.0046   |   0.0219      0.0101
                         0.0149     0.0057   |   0.0221      0.0110
                         0.0161     0.0067   |   0.0223      0.0123
                         0.0173     0.0077   |   0.0224      0.0144
                         0.0183     0.0087   |   0.1878      0.0170
```

```
                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0201)      0.331      0.049     10.00     208.11
   OUTFLOW: ID= 1 (  0205)      0.331      0.040     10.08     208.11

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 82.66
                    TIME SHIFT OF PEAK FLOW         (min)=  5.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0147

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0204):     0.08   0.010    10.00   148.56
      + ID2= 2 (  0205):     0.33   0.040    10.08   208.11
        ================================================
        ID = 3 (  0214):     0.41   0.050    10.08   196.17

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0214)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0214):     0.41   0.050    10.08   196.17
      + ID2= 2 (  0207):     0.06   0.009    10.00   158.07
        ================================================
        ID = 1 (  0214):     0.48   0.056    10.08   191.00

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

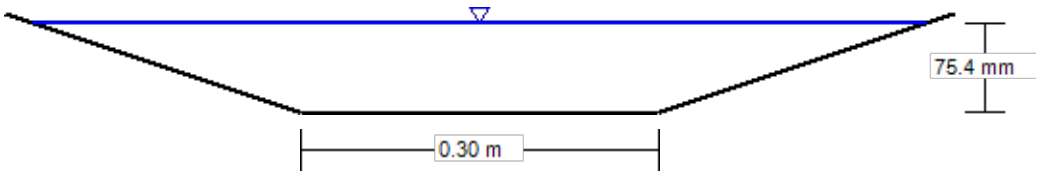
--------------------
| ADD HYD  (  0214)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0214):     0.48   0.056    10.08   191.00
      + ID2= 2 (  0213):     0.09   0.009    10.00   106.25
        ================================================
        ID = 3 (  0214):     0.57   0.063    10.08   177.47

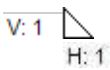
     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
```

Cross Section for Enhanced Swale

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.030
Channel Slope	0.016 m/m
Normal Depth	75.4 mm
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Bottom Width	0.30 m
Discharge	23.00 L/s





481 YONGE STREET APARTMENT DEVELOPMENT

City of Barrie

STORM SEWER DESIGN SHEET

ENGINEERING AND PUBLIC WORKS

Project Number: 19-11433B
Date: April 12, 2022
Design By: DPH
Checked By: JHV
File: Z:\Project Documents\11433 481 Yonge Street\11433.1B Detailed Design\SWM\Storm Sewer Design Sheet (Barrie IDF).xls

Drainage Area Plan No: N/A

Design Parameters

100 YEAR STORM

Q=kAIR, k=0.00278
Intensity (I) = a/(tc+b)^c
a = 1383.628
b = 4.905
c = 0.754

Manning's "n" 0.013
Min. Velocity 0.800 m/s
Max. Velocity 6.000 m/s

PINESTONE ENGINEERING LTD.

LOCATION				STORMWATER FLOW								DESIGN					
STREET	AREA NUMBER	MANHOLE LOCATION FROM MH	MANHOLE LOCATION TO MH	AREA (A)	RUNOFF COEFF. (C)	A x C	CUMUL. A x C	CONCENTRATION TIME TOTAL	CONCENTRATION TIME IN PIPE	RAIN INTENSITY (I)	FLOW (Q)	PIPE SIZE	LENGTH	SLOPE	CAPACITY	FULL FLOW VELOCITY	ACTUAL VELOCITY
				ha		*ha*	*ha*	*min*	*min*	*mm/hr*	*L/s*	*mm*	*m*	*%*	*L/s*	*m/s*	*m/s*
		JF4-2-1-L1	Ex. Storm Sewer	**100 YEAR CONTROLLED DESIGN FLOW FROM VO MODELLING**							75.00000	300	8.5	0.80	86.49179	1.2236	1.3776

ON-LINE
Jellyfish Filter Sizing Report

Project Information

Date	Monday, April 25, 2022
Project Name	481 Yonge St
Project Number	
Location	Barrie

Jellyfish Filter Design Overview

This report provides information for the sizing and specification of the Jellyfish Filter. When designed properly in accordance to the guidelines detailed in the Jellyfish Filter Technical Manual, the Jellyfish Filter will exceed the performance and longevity of conventional horizontal bed and granular media filters.
Please see ***www.ImbriumSystems.com*** *for more information.*

Jellyfish Filter System Recommendation

The Jellyfish Filter model JF4-2-1-L1 is recommended to meet the water quality objective by treating a flow of 12.6 L/s, which meets or exceeds 90% of the average annual rainfall runoff volume based on 36 years of BARRIE WPCC rainfall data for this site. This Jellyfish Model has a Peak Flow Capacity of 83.4 L/s. This model has a sediment capacity of 142 kg, which meets or exceeds the estimated average annual sediment load.

Jellyfish Model	Number of High-Flo Cartridges	Number of Draindown Cartridges	Manhole Diameter (m)	Treatment Flow Rate (L/s)	Peak Capacity (L/s)	Bypass MAW	Sediment Capacity (kg)
JF4-2-1-L1	2	1	1.2	12.6	83.4	Yes	142

The Jellyfish Filter System

The patented Jellyfish Filter is an engineered stormwater quality treatment technology featuring unique membrane filtration in a compact stand-alone treatment system that removes a high level and wide variety of stormwater pollutants. Exceptional pollutant removal is achieved at high treatment flow rates with minimal head loss and low maintenance costs. Each lightweight Jellyfish Filter cartridge contains an extraordinarily large amount of membrane surface area, resulting in superior flow capacity and pollutant removal capacity.

Maintenance

Regular scheduled maintenance is necessary to assure proper functioning of the Jellyfish Filter. The maintenance inverval is designed to be a minimum of 12 months, but this will vary significantly with on-line desings based on storm event conditions, site loading conditions and upstream pretreatment measures. Quarterly inspections and inspections after all storms beyond the 5-year event are recommended until enough historical performance data has been logged to comfortably initiate an alternative inspection interval.
Please see ***www.ImbriumSystems.com*** *for more information.*

Thank you for the opportunity to present this information to you and your client.

Performance

Jellyfish efficiently captures a high level of Stormwater pollutants, including:

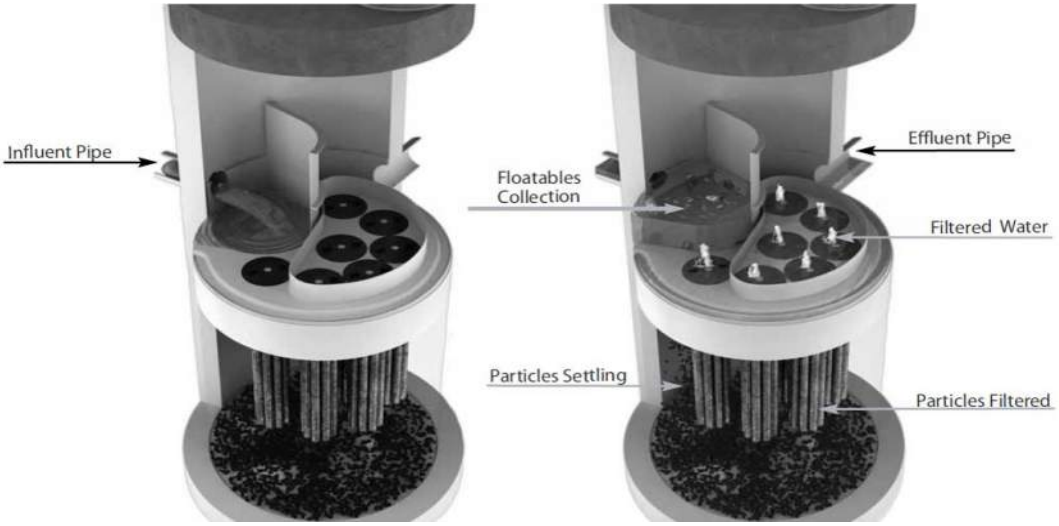
- ☑ 89% of the total suspended solids (TSS) load, including particles less than 5 microns
- ☑ 59% TP removal & 51% TN removal
- ☑ 90% Total Copper, 81% Total Lead, 70% Total Zinc
- ☑ Particulate-bound pollutants such as nutrients, toxic metals, hydrocarbons and bacteria
- ☑ Free oil, Floatable trash and debris

Field Proven Peformance

The Jellyfish filter has been field tested on an urban site with 25 TARP qualifying rain events and field monitored according to the TARP field test protocol, demonstrating:

- A median TSS removal efficiency of 89%, and a median SSC removal of 99%;
- The ability to capture fine particles as indicated by an effluent d50 median of 3 microns for all monitotred storm events, and a median effluent turbidity of 5 NTUs;
- A median Total Phosphorus removal of 59%, and a median Total Nitrogen removal of 51%.

Jellyfish Filter Treatment Functions



Pre-treatment and Membrane Filtration

Jellyfish® Filter

Project Information

Date:	Monday, April 25, 2022
Project Name:	481 Yonge St
Project Number:	
Location:	Barrie

Designer Information

Company:	Dwight Hordyk
Contact:	Pinestone Engineering Ltd
Phone #:	

Notes

Rainfall

Name:	BARRIE WPCC
State:	ON
ID:	557
Record:	1968 to 2003
Co-ords:	44°23'N, 79°41'W

Drainage Area

Total Area:	0.396 ha
Imperviousness:	92.8%

Upstream Detention

Peak Release Rate:	n/a
Pretreatment Credit:	n/a

Design System Requirements

Flow Loading	90% of the Average Annual Runoff based on 36 years of BARRIE WPCC rainfall data:	**10.1 L/s**
Sediment Loading	Treating 90% of the average annual runoff volume, 1079 m³, with a suspended sediment concentration of 100 mg/L.	**108 kg**
Peak Flow	The flow which must pass through the unit, includes	**75 L/s**

Recommendation

The Jellyfish Filter model JF4-2-1-L1 is recommended to meet the water quality objective by treating a flow of 12.6 L/s, which meets or exceeds 90% of the average annual rainfall runoff volume based on 36 years of BARRIE WPCC rainfall data for this site. This Jellyfish Model has a Peak Flow Capacity of 83.4 L/s. This model has a sediment capacity of 142 kg, which meets or exceeds the estimated average annual sediment load.

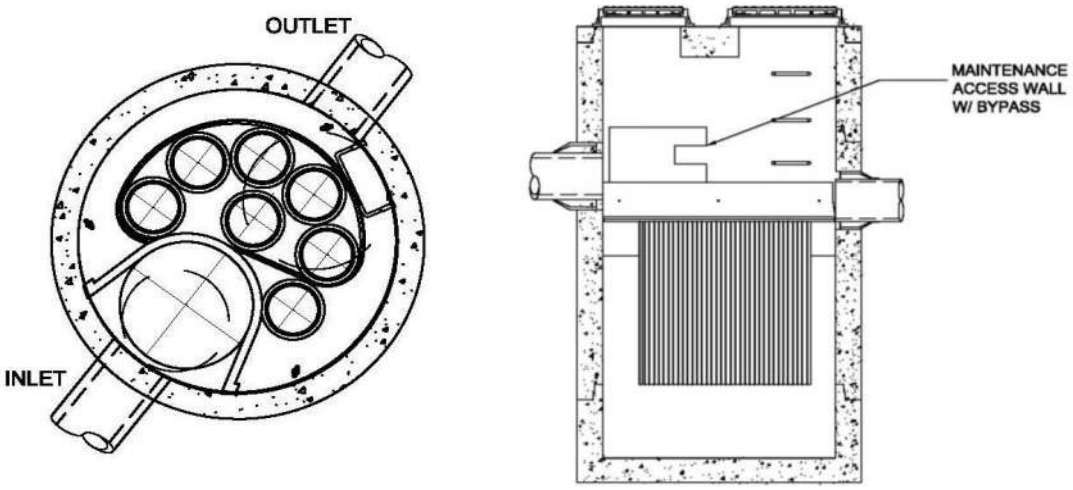
Jellyfish Model	Number of High-Flo Cartridges	Number of Draindown Cartridges	Bypass MAW	Addt'l Sump (ft)	Manhole Diameter (m)	Wet Vol Below Deck (L)	Sump Storage (m³)	Oil Capacity (L)	Treatment Flow Rate (L/s)	Sediment Capacity (kg)
JF4-1-1-L0	1	1	No	0	1.2	2313	0.34	379	7.6	85
JF4-1-1-L1	1	1	Yes	1	1.2	2661	0.34	379	7.6	85
JF4-2-1-L0	2	1	No	0	1.2	2313	0.34	379	12.6	142
JF4-2-1-L1	**2**	**1**	**Yes**	**1**	**1.2**	**2661**	**0.34**	**379**	**12.6**	**142**
JF6-3-1-L0	3	1	No	0	1.8	5205	0.79	848	17.7	199
JF6-3-1-L1	3	1	Yes	1	1.8	6003	0.79	848	17.7	199
JF6-4-1-L0	4	1	No	0	1.8	5205	0.79	848	22.7	256
JF6-4-1-L1	4	1	Yes	1	1.8	6003	0.79	848	22.7	256
JF6-5-1-L0	5	1	No	0	1.8	5205	0.79	848	27.8	313
JF6-5-1-L1	5	1	Yes	1	1.8	6003	0.79	848	27.8	313
JF6-6-1-L0	6	1	No	0	1.8	5205	0.79	848	28.6	370
JF6-6-1-L1	6	1	Yes	1	1.8	6003	0.79	848	28.6	370
JF8-6-2-L0	6	2	No	0	2.4	9252	1.42	1469	35.3	398
JF8-6-2-L1	6	2	Yes	1	2.4	10675	1.42	1469	35.3	398
JF8-7-2-L0	7	2	No	0	2.4	9252	1.42	1469	40.4	455
JF8-7-2-L1	7	2	Yes	1	2.4	10675	1.42	1469	40.4	455
JF8-8-2-L0	8	2	No	0	2.4	9252	1.42	1469	45.4	512
JF8-8-2-L1	8	2	Yes	1	2.4	10675	1.42	1469	45.4	512
JF8-9-2-L0	9	2	No	0	2.4	9252	1.42	1469	50.5	569
JF8-9-2-L1	9	2	Yes	1	2.4	10675	1.42	1469	50.5	569
JF8-10-2-L0	10	2	No	0	2.4	9252	1.42	1469	50.5	626
JF8-10-2-L1	10	2	Yes	1	2.4	10675	1.42	1469	50.5	626
JF10-11-3-L0	11	3	No	0	3.0	14456	2.21	2302	63.1	711
JF10-11-3-L1	11	3	Yes	1	3.0	16678	2.21	2302	63.1	711
JF10-12-3-L0	12	3	No	0	3.0	14456	2.21	2302	68.2	768
JF10-12-3-L1	12	3	Yes	1	3.0	16678	2.21	2302	68.2	768
JF10-12-4-L0	12	4	No	0	3.0	14456	2.21	2302	70.7	796
JF10-12-4-L1	12	4	Yes	1	3.0	16678	2.21	2302	70.7	796
JF10-13-4-L0	13	4	No	0	3.0	14456	2.21	2302	75.7	853
JF10-13-4-L1	13	4	Yes	1	3.0	16678	2.21	2302	75.7	853
JF10-14-4-L0	14	4	No	0	3.0	14456	2.21	2302	78.9	910

JF10-14-4-L1	14	4	Yes	1	3.0	16678	2.21	2302	78.9	910
JF10-15-4-L0	15	4	No	0	3.0	14456	2.21	2302	78.9	967
JF10-15-4-L1	15	4	Yes	1	3.0	16678	2.21	2302	78.9	967
JF10-16-4-L0	16	4	No	0	3.0	14456	2.21	2302	78.9	1024
JF10-16-4-L1	16	4	Yes	1	3.0	16678	2.21	2302	78.9	1024
JF10-17-4-L0	17	4	No	0	3.0	14456	2.21	2302	78.9	1081
JF10-17-4-L1	17	4	Yes	1	3.0	16678	2.21	2302	78.9	1081
JF10-18-4-L0	18	4	No	0	3.0	14456	2.21	2302	78.9	1138
JF10-18-4-L1	18	4	Yes	1	3.0	16678	2.21	2302	78.9	1138
JF10-19-4-L0	19	4	No	0	3.0	14456	2.21	2302	78.9	1195
JF10-19-4-L1	19	4	Yes	1	3.0	16678	2.21	2302	78.9	1195
JF12-20-5-L0	20	5	No	0	3.6	20820	3.2	2771	113.6	1280
JF12-20-5-L1	20	5	Yes	1	3.6	24012	3.2	2771	113.6	1280
JF12-21-5-L0	21	5	No	0	3.6	20820	3.2	2771	113.7	1337
JF12-21-5-L1	21	5	Yes	1	3.6	24012	3.2	2771	113.7	1337
JF12-22-5-L0	22	5	No	0	3.6	20820	3.2	2771	113.7	1394
JF12-22-5-L1	22	5	Yes	1	3.6	24012	3.2	2771	113.7	1394
JF12-23-5-L0	23	5	No	0	3.6	20820	3.2	2771	113.7	1451
JF12-23-5-L1	23	5	Yes	1	3.6	24012	3.2	2771	113.7	1451
JF12-24-5-L0	24	5	No	0	3.6	20820	3.2	2771	113.7	1508
JF12-24-5-L1	24	5	Yes	1	3.6	24012	3.2	2771	113.7	1508
JF12-25-5-L0	25	5	No	0	3.6	20820	3.2	2771	113.7	1565
JF12-25-5-L1	25	5	Yes	1	3.6	24012	3.2	2771	113.7	1565
JF12-26-5-L0	26	5	No	0	3.6	20820	3.2	2771	113.7	1622
JF12-26-5-L1	26	5	Yes	1	3.6	24012	3.2	2771	113.7	1622
JF12-27-5-L0	27	5	No	0	3.6	20820	3.2	2771	113.7	1679
JF12-27-5-L1	27	5	Yes	1	3.6	24012	3.2	2771	113.7	1679

Jellyfish® Filter

Jellyfish Filter Design Notes

- Typically the Jellyfish Filter is designed in an offline configuration, as all stormwater filter systems will perform for a longer duration between required maintenance services when designed and applied in off-line configurations. Depending on the design parameters, an optional internal bypass may be incorporated into the Jellyfish Filter. However, note that inspection and maintenance frequency should be expected to increase above that of an off-line system. Speak to your local representative for more information.



Jellyfish Filter Typical Online Layout

- Typically, 18 inches (457 mm) of driving head is designed into the system, calculated as the difference in elevation between the top of the diversion structure weir and the invert of the Jellyfish Filter outlet pipe. Alternative driving head values can be designed as 12 to 24 inches (305 to 610mm) depending on specific site requirements, requiring additional sizing and design assistance. Alternative driving head values are only possible with off-line configuration.
- Typically, the Jellyfish Filter is designed with the inlet pipe configured 6 inches (150 mm) above the outlet invert elevation.
- The Jellyfish Filter can not accommodate multiple inlet pipes in an on-line configuration.
- Typical systems conform to the following pipe orientations:

Model Diameter (m)	Minimum Angle Inlet / Outlet Pipes	Minimum Inlet Pipe Diameter (mm)	Maximum Inlet Pipe Diameter (mm)
1.2	**62º**	**150**	**300**
1.8	59º	200	300
2.4	52º	250	375
3.0	48º	300	450
3.6	40º	300	450

- Outlet pipes to be one size larger than inlet pipes on new projects.
- The Jellyfish Filter can be built at all depths of cover generally associated with conventional stormwater conveyance systems. For sites that require minimal depth of cover for the stormwater infrastructure, the Jellyfish Filter can be applied in a shallow application using a hatch cover. The general minimum depth of cover is 36 inches (915 mm) from top of the underslab to outlet invert.
- If driving head caclulations account for water elevation during submerged conditions the Jellyfish Filter will function effectively under submerged condtions.
- Jellyfish Filter systems may incorporate grated inlets depending on system configuration.
- For sites with water quality treatment flow rates or mass loadings that exceed the design flow rate of the largest standard Jellyfish Filter manhole models, systems can be designed that hydraulically connect multiple Jellyfish Filters in series or alternatively Jellyfish vault units can be designed.

STANDARD SPECIFICATION
STORMWATER QUALITY – MEMBRANE FILTRATION TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

Specifies requirements for construction and performance of an underground stormwater quality membrane filtration treatment device that removes pollutants from stormwater runoff through the unit operations of sedimentation, floatation, and membrane filtration.

1.2 REFERENCE STANDARDS

ASTM C 891: Specification for Installation of Underground Precast Concrete Utility Structures
ASTM C 478: Specification for Precast Reinforced Concrete Manhole Sections
ASTM C 443: Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM D 4101: Specification for Copolymer steps construction

CAN/CSA-A257.4-M92
Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections and Fittings Using Rubber Gaskets

CAN/CSA-A257.4-M92
Precast Reinforced Circular Concrete Manhole Sections, Catch Basins and Fittings

Canadian Highway Bridge Design Code

1.3 SHOP DRAWINGS

Shop drawings for the structure and performance are to be submitted with each order to the contractor. Contractor shall forward shop drawing submittal to the consulting engineer for approval. Shop drawings are to detail the structure's precast concrete and call out or note the fiberglass (FRP) internals/components.

1.4 PRODUCT SUBSTITUTIONS

No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the engineer of record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

1.5 HANDLING AND STORAGE

Prevent damage to materials during storage and handling.

PART 2 – PRODUCTS

2.1 GENERAL

2.1.1 The device shall be a cylindrical or rectangular, all concrete structure (including risers), constructed from precast concrete riser and slab components or monolithic precast structure(s), installed to conform to ASTM C 891 and to any required state highway, municipal or local specifications; whichever is more stringent. The device shall be watertight.

2.1.2 Cartridge Deck The cylindrical concrete device shall include a fiberglass deck. The rectangular concrete device shall include a coated aluminum deck. In either instance, the insert shall be bolted and sealed watertight inside the precast concrete chamber. The deck shall serve as: (a) a horizontal divider between the lower treatment zone and the upper treated effluent zone; (b) a deck for attachment of filter cartridges such that the membrane filter elements of each cartridge extend into the lower treatment zone; (c) a platform for maintenance workers to service the filter cartridges (maximum manned weight = 450 pounds (204 kg)); (d) a conduit for conveyance of treated water to the effluent pipe.

2.1.3 Membrane Filter Cartridges Filter cartridges shall be comprised of reusable cylindrical membrane filter elements connected to a perforated head plate. The number of membrane filter elements per cartridge shall be a minimum of eleven 2.75-inch (70-mm) diameter elements. The length of each filter element shall be a minimum 15 inches (381 mm). Each cartridge shall be fitted into the cartridge deck by insertion into a cartridge receptacle that is permanently mounted into the cartridge deck. Each cartridge shall be secured by a cartridge lid that is threaded onto the receptacle, or similar mechanism to secure the cartridge into the deck. The maximum treatment flow rate of a filter cartridge shall be controlled by an orifice in the cartridge lid, or on the individual cartridge itself, and based on a design flux rate (surface loading rate) determined by the maximum treatment flow rate per unit of filtration membrane surface area. The maximum design flux rate shall be 0.21 gpm/ft² (0.142 lps/m²).

Each membrane filter cartridge shall allow for manual installation and removal. Each filter cartridge shall have filtration membrane surface area and dry installation weight as follows (if length of filter cartridge is between those listed below, the surface area and weight shall be proportionate to the next length shorter and next length longer as shown below):

Filter Cartridge Length (in / mm)	Minimum Filtration Membrane Surface Area (ft2 / m2)	Maximum Filter Cartridge Dry Weight (lbs / kg)
15	106 / 9.8	10.5 / 4.8
27	190 / 17.7	15.0 / 6.8
40	282 / 26.2	20.5 / 9.3
54	381 / 35.4	25.5 / 11.6

2.1.4 Backwashing Cartridges The filter device shall have a weir extending above the cartridge deck, or other mechanism, that encloses the high flow rate filter cartridges when placed in their respective cartridge receptacles within the cartridge deck. The weir, or other mechanism, shall collect a pool of filtered water during inflow events that backwashes the high flow rate cartridges when the inflow

event subsides. All filter cartridges and membranes shall be reusable and allow for the use of filtration membrane rinsing procedures to restore flow capacity and sediment capacity; extending cartridge service life.

2.1.5 Maintenance Access to Captured Pollutants The filter device shall contain an opening(s) that provides maintenance access for removal of accumulated floatable pollutants and sediment, removal of and replacement of filter cartridges, cleaning of the sump, and rinsing of the deck. Access shall have a minimum clear vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.

2.1.6 Bend Structure The device shall be able to be used as a bend structure with minimum angles between inlet and outlet pipes of 90-degrees or less in the stormwater conveyance system.

2.1.7 Double-Wall Containment of Hydrocarbons The cylindrical precast concrete device shall provide double-wall containment for hydrocarbon spill capture by a combined means of an inner wall of fiberglass, to a minimum depth of 12 inches (305 mm) below the cartridge deck, and the precast vessel wall.

2.1.8 Baffle The filter device shall provide a baffle that extends from the underside of the cartridge deck to a minimum length equal to the length of the membrane filter elements. The baffle shall serve to protect the membrane filter elements from contamination by floatables and coarse sediment. The baffle shall be flexible and continuous in cylindrical configurations, and shall be a straight concrete or aluminum wall in rectangular configurations.

2.1.9 Sump The device shall include a minimum 24 inches (610 mm) of sump below the bottom of the cartridges for sediment accumulation, unless otherwise specified by the design engineer. Depths less than 24 inches may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.

2.2 PRECAST CONCRETE SECTIONS

All precast concrete components shall be manufactured to a minimum live load of HS-20 truck loading or greater based on local regulatory specifications, unless otherwise modified or specified by the design engineer, and shall be watertight.

2.3 JOINTS All precast concrete manhole configuration joints shall use nitrile rubber gaskets and shall meet the requirements of ASTM C443, Specification C1619, Class D or engineer approved equal to ensure oil resistance. Mastic sealants or butyl tape are not an acceptable alternative.

2.4 GASKETS Only profile neoprene or nitrile rubber gaskets in accordance to CSA A257.3-M92 will be accepted. Mastic sealants, butyl tape or Conseal CS-101 are not acceptable gasket materials.

2.5 FRAME AND COVER Frame and covers must be manufactured from cast-iron or other composite material tested to withstand H-20 or greater design loads, and as approved by the

local regulatory body. Frames and covers must be embossed with the name of the device manufacturer or the device brand name.

2.6 DOORS AND HATCHES If provided shall meet designated loading requirements or at a minimum for incidental vehicular traffic.

2.7 CONCRETE All concrete components shall be manufactured according to local specifications and shall meet the requirements of ASTM C 478.

2.8 FIBERGLASS The fiberglass portion of the filter device shall be constructed in accordance with the following standard: ASTM D-4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks.

2.9 STEPS Steps shall be constructed according to ASTM D4101 of copolymer polypropylene, and be driven into preformed or pre-drilled holes after the concrete has cured, installed to conform to applicable sections of state, provincial and municipal building codes, highway, municipal or local specifications for the construction of such devices.

2.10 INSPECTION All precast concrete sections shall be inspected to ensure that dimensions, appearance and quality of the product meet local municipal specifications and ASTM C 478.

PART 3 – PERFORMANCE

3.1 GENERAL

3.1.1 Verification – The stormwater quality filter must be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV).

3.1.2 Function - The stormwater quality filter treatment device shall function to remove pollutants by the following unit treatment processes; sedimentation, floatation, and membrane filtration.

3.1.3 Pollutants - The stormwater quality filter treatment device shall remove oil, debris, trash, coarse and fine particulates, particulate-bound pollutants, metals and nutrients from stormwater during runoff events.

3.1.4 Bypass - The stormwater quality filter treatment device shall typically utilize an external bypass to divert excessive flows. Internal bypass systems shall be equipped with a floatables baffle, and must avoid passage through the sump and/or cartridge filtration zone.

3.1.5 Treatment Flux Rate (Surface Loading Rate) – The stormwater quality filter treatment device shall treat 100% of the required water quality treatment flow based on a maximum design treatment flux rate (surface loading rate) across the membrane filter cartridges of 0.21 gpm/ft² (0.142 lps/m²).

3.2 FIELD TEST PERFORMANCE

At a minimum, the stormwater quality filter device shall have been field tested and verified with a minimum 25 TARP qualifying storm events and field monitoring shall have been conducted according to the TARP 2009 NJDEP TARP field test protocol, and have received NJCAT verification.

3.2.1 Suspended Solids Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median TSS removal efficiency of 85% and a minimum median SSC removal efficiency of 95%.

3.2.2 Runoff Volume – The stormwater quality filter treatment device shall be engineered, designed, and sized to treat a minimum of 90 percent of the annual runoff volume determined from use of a minimum 15-year rainfall data set.

3.2.3 Fine Particle Removal - The stormwater quality filter treatment device shall have demonstrated the ability to capture fine particles as indicated by a minimum median removal efficiency of 75% for the particle fraction less than 25 microns, an effluent d_{50} of 15 microns or lower for all monitored storm events.

3.2.4 Turbidity Reduction - The stormwater quality filter treatment device shall have demonstrated the ability to reduce the turbidity from influent from a range of 5 to 171 NTU to an effluent turbidity of 15 NTU or lower.

3.2.5 Nutrient (Total Phosphorus & Total Nitrogen) Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median Total Phosphorus removal of 55%, and a minimum median Total Nitrogen removal of 50%.

3.2.6 Metals (Total Zinc & Total Copper) Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median Total Zinc removal of 55%, and a minimum median Total Copper removal of 85%.

3.3 INSPECTION and MAINTENANCE

The stormwater quality filter device shall have the following features:

3.3.1 Durability of membranes are subject to good handling practices during inspection and maintenance (removal, rinsing, and reinsertion) events, and site specific conditions that may have heavier or lighter loading onto the cartridges, and pollutant variability that may impact the membrane structural integrity. Membrane maintenance and replacement shall be in accordance with manufacturer's recommendations.

3.3.2 Inspection which includes trash and floatables collection, sediment depth determination, and visible determination of backwash pool depth shall be easily conducted from grade (outside the structure).

3.3.3 Manual rinsing of the reusable filter cartridges shall promote restoration of the flow capacity and sediment capacity of the filter cartridges, extending cartridge service life.

3.3.4 The filter device shall have a minimum 12 inches (305 mm) of sediment storage depth, and a minimum of 12 inches between the top of the sediment storage and bottom of the filter cartridge tentacles, unless otherwise specified by the design engineer. Variances may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.

3.3.5 Sediment removal from the filter treatment device shall be able to be conducted using a standard maintenance truck and vacuum apparatus, and a minimum one point of entry to the sump that is unobstructed by filter cartridges.

3.3.6 Maintenance access shall have a minimum clear height that provides suitable vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.

3.3.7 Filter cartridges shall be able to be maintained without the requirement of additional lifting equipment.

PART 4 – EXECUTION

4.1 INSTALLATION

4.1.1 PRECAST DEVICE CONSTRUCTION SEQUENCE

The installation of a watertight precast concrete device should conform to ASTM C 891 and to any state highway, municipal or local specifications for the construction of manholes, whichever is more stringent. Selected sections of a general specification that are applicable are summarized below.

4.1.1.1 The watertight precast concrete device is installed in sections in the following sequence:

- aggregate base
- base slab
- treatment chamber and cartridge deck riser section(s)
- bypass section
- connect inlet and outlet pipes
- concrete riser section(s) and/or transition slab (if required)
- maintenance riser section(s) (if required)
- frame and access cover

4.1.2 The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

4.1.3 Adjustment of the stormwater quality treatment device can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary to restore original condition and watertight seals. Once the stormwater quality treatment device has been constructed, any/all lift holes must be plugged watertight with mortar or non-shrink grout.

4.1.4 Inlet and Outlet Pipes Inlet and outlet pipes should be securely set into the device using approved pipe seals (flexible boot connections, where applicable) so that the structure is watertight, and such that any pipe intrusion into the device does not impact the device functionality.

4.1.5 Frame and Cover Installation Adjustment units (e.g. grade rings) should be installed to set the frame and cover at the required elevation. The adjustment units should be laid in a full bed of mortar with successive units being joined using sealant recommended by the manufacturer. Frames for the cover should be set in a full bed of mortar at the elevation specified.

4.2 MAINTENANCE ACCESS WALL
In some instances the Maintenance Access Wall, if provided, shall require an extension attachment and sealing to the precast wall and cartridge deck at the job site, rather than at the precast facility. In this instance, installation of these components shall be performed according to instructions provided by the manufacturer.

4.3 FILTER CARTRIDGE INSTALLATION Filter cartridges shall be installed in the cartridge deck only after the construction site is fully stabilized and in accordance with the manufacturer's guidelines and recommendations. Contractor to contact the manufacturer to schedule cartridge delivery and review procedures/requirements to be completed to the device prior to installation of the cartridges and activation of the system.

PART 5 – QUALITY ASSURANCE

5.1 FILTER CARTRIDGE INSTALLATION Manufacturer shall coordinate delivery of filter cartridges and other internal components with contractor. Filter cartridges shall be delivered and installed complete after site is stabilized and unit is ready to accept cartridges. Unit is ready to accept cartridges after is has been cleaned out and any standing water, debris, and other materials have been removed. Contractor shall take appropriate action to protect the filter cartridge receptacles and filter cartridges from damage during construction, and in accordance with the manufacturer's recommendations and guidance. For systems with cartridges installed prior to full site stabilization and prior to system activation, the contractor can plug inlet and outlet pipes to prevent stormwater and other influent from entering the device. Plugs must be removed during the activation process.

5.2 INSPECTION AND MAINTENANCE

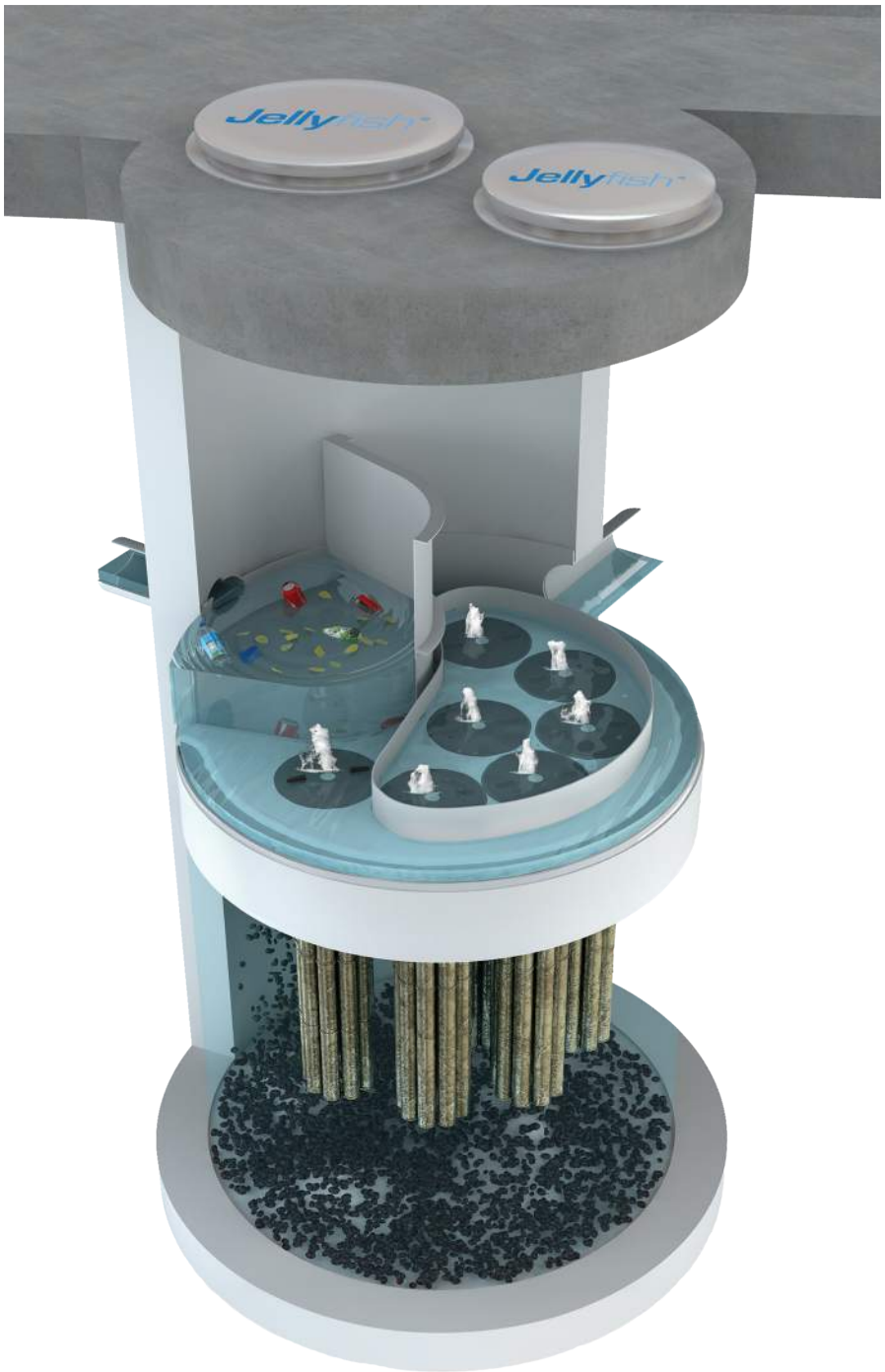
5.2.1 The manufacturer shall provide an Owner's Manual upon request.

5.2.2 After construction and installation, and during operation, the device shall be inspected and cleaned as necessary based on the manufacturer's recommended inspection and maintenance guidelines and the local regulatory agency/body.

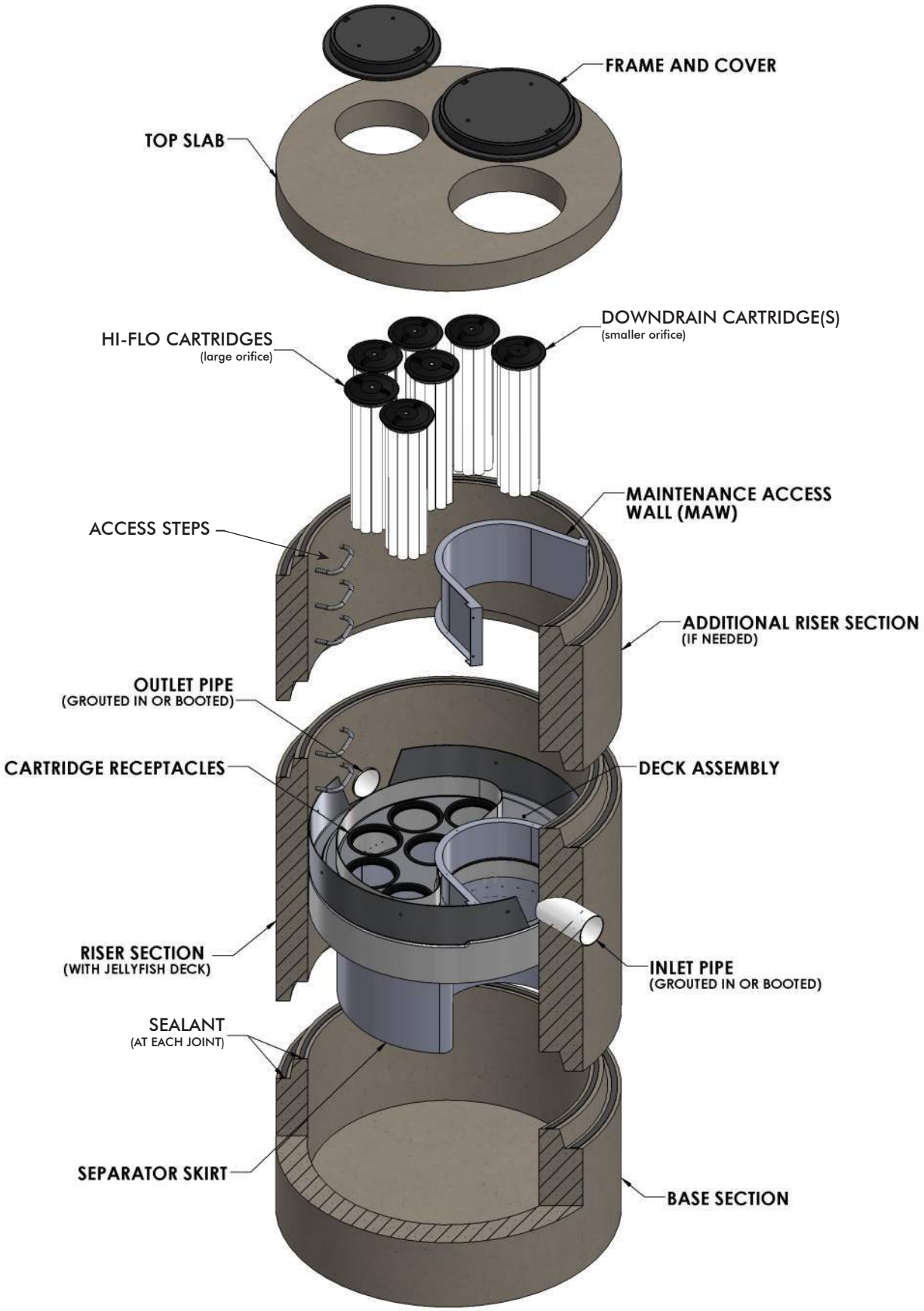
5.3 REPLACEMENT FILTER CARTRIDGES When replacement membrane filter elements and/or other parts are required, only membrane filter elements and parts approved by the manufacturer for use with the stormwater quality filter device shall be installed.

END OF SECTION

Jellyfish® Filter
Owner's Manual



imbrium®


FRAME AND COVER
TOP SLAB
DOWNDRAIN CARTRIDGE(S)
(smaller orifice)
HI-FLO CARTRIDGES
(large orifice)
MAINTENANCE ACCESS
WALL (MAW)
ACCESS STEPS
ADDITIONAL RISER SECTION
(IF NEEDED)
OUTLET PIPE
(GROUTED IN OR BOOTED)
CARTRIDGE RECEPTACLES
DECK ASSEMBLY
RISER SECTION
(WITH JELLYFISH DECK)
INLET PIPE
(GROUTED IN OR BOOTED)
SEALANT
(AT EACH JOINT)
SEPARATOR SKIRT
BASE SECTION

WARNINGS / CAUTION

1. FALL PROTECTION may be required.
2. WATCH YOUR STEP if standing on the Jellyfish Filter Deck at any time; Great care and safety must be taken while walking or maneuvering on the Jellyfish Filter Deck. Attentive care must be taken while standing on the Jellyfish Filter Deck at all times to prevent stepping onto a lid, into or through a cartridge hole or slipping on the deck.
3. The Jellyfish Filter Deck can be SLIPPERY WHEN WET.
4. If the Top Slab, Covers or Hatches have not yet been installed, or are removed for any reason, great care must be taken to NOT DROP ANYTHING ONTO THE JELLYFISH FILTER DECK. The Jellyfish Filter Deck and Cartridge Receptacle Rings can be damaged under high impact loads. *This type of activity voids all warranties. All damaged items to be replaced at owner's expense*.
5. Maximum deck load 2 persons, total weight 250 lbs. per person.

Safety Notice

Jobsite safety is a topic and practice addressed comprehensively by others. The inclusions here are intended to be reminders to whole areas of Safety Practice that are the responsibility of the Owner(s), Manager(s) and Contractor(s). OSHA and Canadian OSH, and Federal, State/Provincial, and Local Jurisdiction Safety Standards apply on any given site or project. The knowledge and applicability of those responsibilities is the Contractor's responsibility and outside the scope of Imbrium® Systems.

Confined Space Entry

Secure all equipment and perform all training to meet applicable local and OSHA regulations regarding confined space entry. It is the Contractor's or entry personnel's responsibility to proceed safely at all times.

Personal Safety Equipment

Contractor is responsible to provide and wear appropriate personal protection equipment as needed including, but not limited to safety boots, hard hat, reflective vest, protective eyewear, gloves and fall protection equipment as necessary. Make sure all equipment is **staffed with trained and/or certified personnel**, and all equipment is checked for proper operation and safety features prior to use.

- Fall protection equipment
- Eye protection
- Safety boots
- Ear protection
- Gloves
- Ventilation and respiratory protection
- Hard hat
- Maintenance and protection of traffic plan

Thank You for purchasing the Jellyfish® Filter!

Imbrium® Systems would like to thank you for selecting the Jellyfish Filter to meet your project's stormwater treatment needs. With proper inspection and maintenance, the Jellyfish Filter is designed to deliver ongoing, high levels of stormwater pollutant removal.

If you have any questions, please feel free to call us or e-mail us at info@imbriumsystems.com.

Imbrium Systems
USA: 301.279.8827 | 888.279.8826
CAD: 416.960.9900 | 800.565.4801
INT'L: +1.416.960.9900

Jellyfish Filter Patents

The Jellyfish Filter is protected by one or more of the following patents:

U.S. Patent No. 8,123,935; U.S. Patent No. 8,287,726; U.S. Patent No. 8,221,618
Australia Patent No. 2008,286,748
Canadian Patent No. 2,696,482
Korean Patent No. 10-1287539
New Zealand Patent No. 583,461; New Zealand Patent No. 604,227
South African Patent No. 2010,01068
**other patents pending*

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Chapter 1

1.0 – Owner Specific Jellyfish Filter Product Information

Below you will find your specific Jellyfish Filter unit information to help you easily inspect, maintain and order parts for your system.

Owner Name:	
Phone Number:	
Site Address:	
Site GPS Coordinates/unit location:	
Unit Location Description:	
Jellyfish Filter Model No.:	
Cartridge Installation Date:	
No. of Hi-Flo Cartridges	
Length of Hi-Flo Cartridges:	
Lid Orifice Diameter on Hi-Flo Cartridge:	
No. of Draindown Cartridges:	
Length of Draindown Cartridges:	
Lid Orifice Diameter on Draindown Cartridge:	
No. of Blank Cartridge Lids:	
Online System (Yes/No):	
Offline System (Yes/No):	

Notes:

Chapter 2

2.0 – Jellyfish Filter System Operations and Functions

The Jellyfish Filter is an engineered stormwater quality treatment technology that removes a high level and wide variety of stormwater pollutants. Each Jellyfish Filter cartridge consists of multiple membrane - encased filter elements ("filtration tentacles") attached to a cartridge head plate. The filtration tentacles provide a large filtration surface area, resulting in high flow and high pollutant removal capacity.

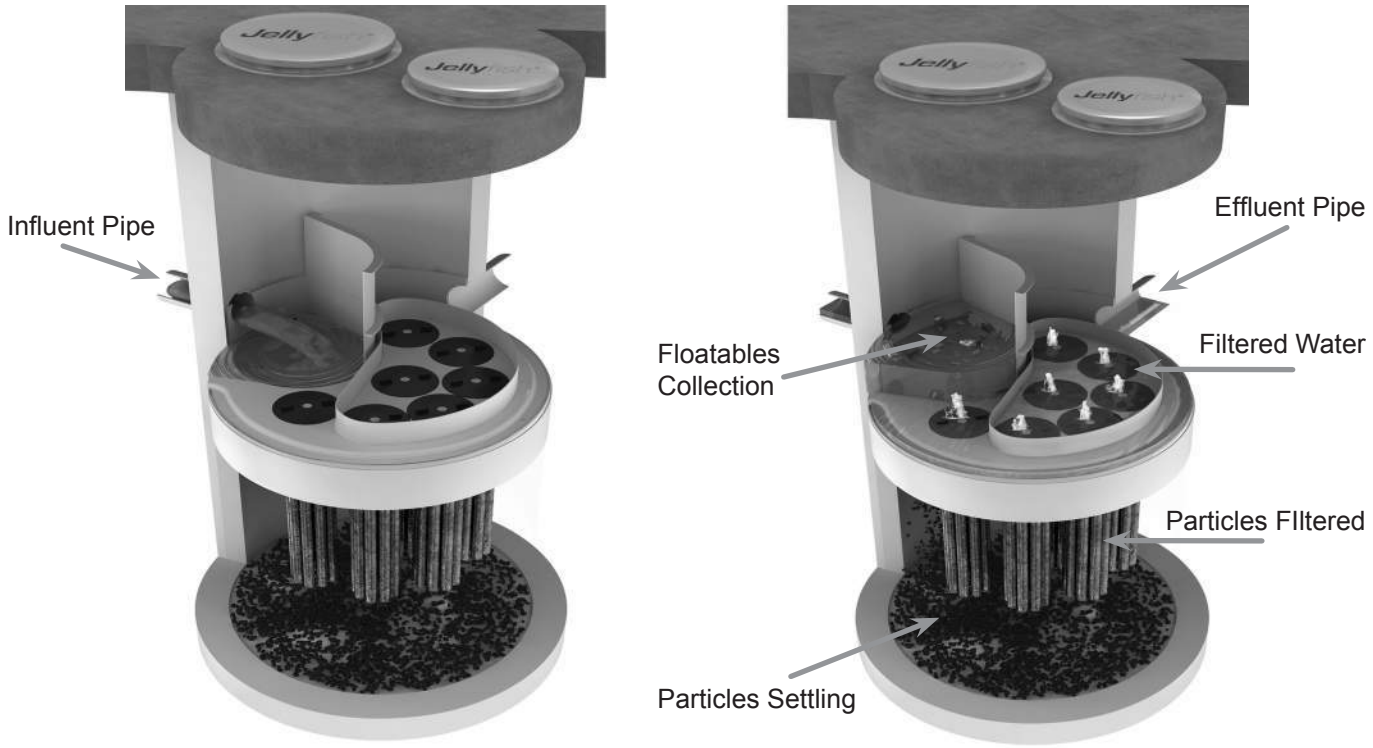
The Jellyfish Filter functions are depicted in **Figure 1** below.

FIGURE 1

Jellyfish Filter Treatment Functions

Membrane Filtration

Section View with Maintenance Access Wall (MAW) Cutaway



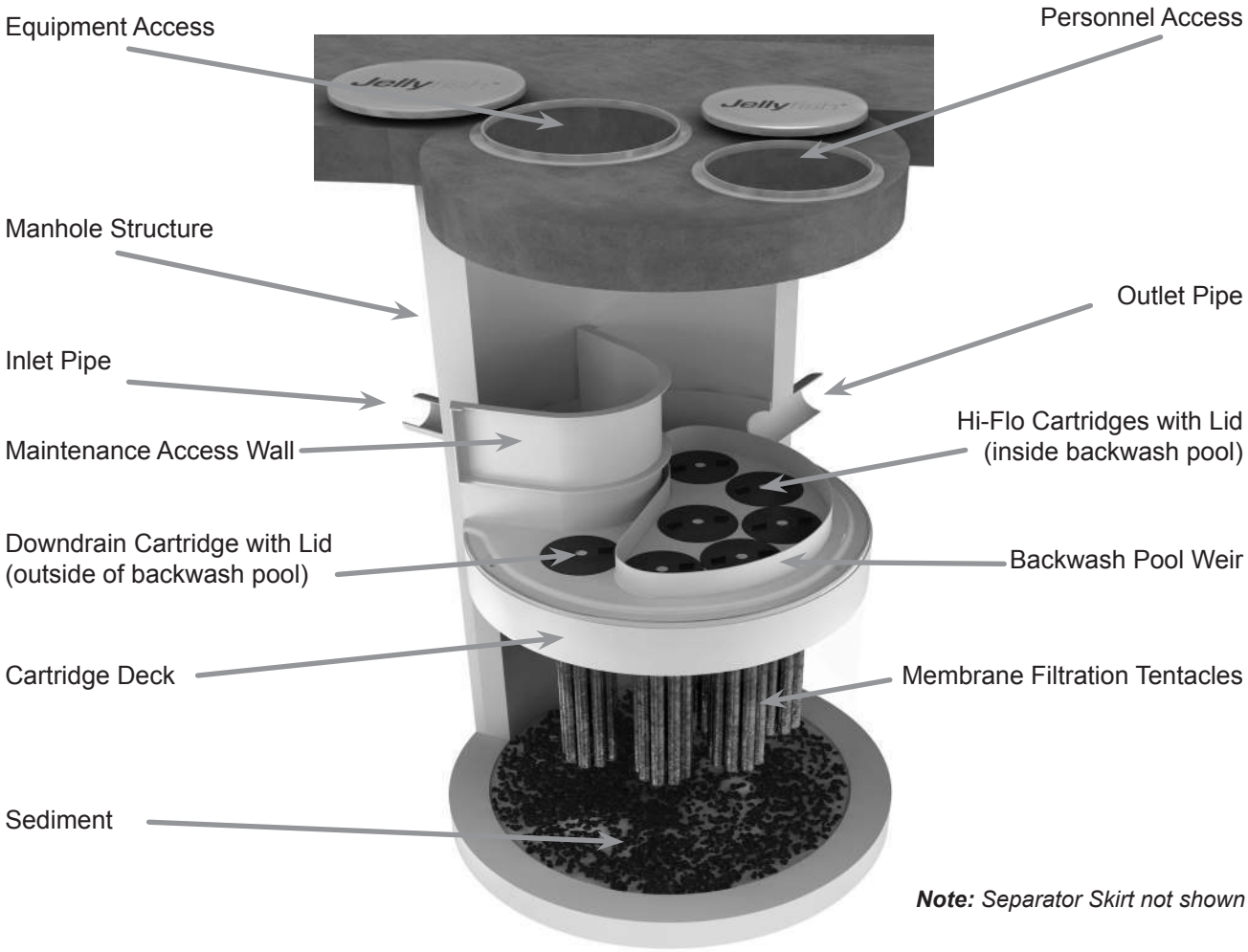
Jellyfish Filter cartridges are backwashed after each peak storm event, which removes accumulated sediment from the membranes. This backwash process extends the service life of the cartridges and increases the time between maintenance events.

For additional details on the operation and pollutant capabilities of the Jellyfish Filter please refer to additional details on our website at www.imbriumsystems.com.

2.1 – Components and Cartridges

The Jellyfish Filter and components are depicted in Figure 2 below.

FIGURE 2 **Jellyfish Filter Components**



Tentacles are available in various lengths as depicted in Table 1 below.

Table 1 – Cartridge Lengths / Weights and Cartridge Lid Orifice Diameters

Cartridge Lengths	Dry Weight	Hi-Flo Orifice Diameter	Draindown Orifice Diameter
15 inches (381 mm)	10 lbs (4.5 kg)	35 mm	20 mm
27 inches (686 mm)	14.5 lbs (6.6 kg)	45 mm	25 mm
40 inches (1,016 mm)	19.5 lbs (8.9 kg)	55 mm	30 mm
54 inches (1,372 mm)	25 lbs (11.4 kg)	70 mm	35 mm

A Jellyfish membrane filtration cartridge is depicted in Figure 3 below.

FIGURE 3

Jellyfish Membrane Filtration Cartridge

2.2 – Jellyfish Membrane Filtration Cartridge Assembly

The Jellyfish Filter utilizes multiple membrane filtration cartridges. Each cartridge consists of removable cylindrical filtration "tentacles" attached to a cartridge head plate. Each filtration tentacle has a threaded pipe nipple and o-ring. To attach, insert the top pipe nipples with the o-ring through the head plate holes and secure with locking nuts. Locking nuts to be hand tighten and checked with a wrench as shown below.

2.3 – Jellyfish Membrane Filtration Cartridge Installation

- After the upstream catchment and site have stabilized, remove any accumulated sediment and debris from the Jellyfish Filter structure and upstream diversion structure (if applicable). Failure to address this step completely will reduce the time between required maintenance.
- Descend to the cartridge deck (see Safety Notice and page 3).
- Lower the Jellyfish membrane filtration cartridges into the cartridge receptacles within the cartridge deck. A filter cartridge should be placed into each of the draindown cartridge receptacles outside the backwash pool weir. It is possible dependent on the Jellyfish Filter model purchased that not all cartridge receptacles will be filled with a filter cartridge. In that case, a blank headplate and blank cartridge lid (has no orfice) would be installed.

Cartridge Assembly

Avoid snagging the cartridge membranes on the recpticle lip when inserting the Jellyfish membrane filtration cartridges into the cartridge receptacles. Use a gentle twisting or sideways motion to clear any potential snag. Do not force the tentacles down into the cartridge receptacle, as this may damage the membranes. Apply downward pressure on the cartridge head plate to seat the rim gasket (thick circular gasket surrounding the circumference of the head plate) into the cartridge receptacle.

- Examine the cartridge lids to differentiate lids with a small orifice, a large orifice, and no orifice.
  - Lids with a small orifice are to be inserted into the draindown cartridge receptacles, outside of the backwash pool weir.
  - Lids with a large orifice are to be inserted into the hi-flo cartridge receptacles within the backwash pool weir.
  - Lids with no orifice (blank cartridge lids) and a blank headplate are to be inserted into unoccupied cartridge receptacles.
- **To install a cartridge lid, align the cartridge lid male threads with the cartridge receptacle female threads. Firmly twist the cartridge lid clockwise a minimum 110º to seat the filter cartridge snugly in place, with a proper watertight seal.**

Chapter 3

3.0 – Inspection and Maintenance Overview

The primary purpose of the Jellyfish Filter is to capture and remove pollutants from stormwater runoff. As with any filtration system, captured pollutants must be removed to maintain the filter's maximum treatment performance. Regular inspection and maintenance are required to insure proper functioning of the system.

Maintenance frequencies and requirements are site specific and vary depending on pollutant loading. Maintenance activities may be required in the event of an upstream chemical spill or due to excessive sediment loading from site erosion or extreme runoff events. It is a good practice to inspect the system after major storm events.

Inspection activities are typically conducted from surface observations and include:

- Observe if standing water is present
- Observe if there is any physical damage to the deck or cartridge lids
- Observe the amount of debris in the Maintenance Access Wall (MAW)

Maintenance activities typically include:

- Removal of oil, floatable trash and debris
- Removal of collected sediments from manhole sump
- Rinsing and re-installing the filter cartridges
- Replace filter cartridge tentacles, as needed.

It is recommended that Jellyfish Filter inspection and maintenance be performed by professionally trained individuals, with experience in stormwater maintenance and disposal services. Maintenance procedures may require manned entry into the Jellyfish structure. Only professional maintenance service providers trained in confined space entry procedures should enter the vessel. Procedures, safety and damage prevention precautions, and other information, included in these guidelines, should be reviewed and observed prior to all inspection and maintenance activities.

3.1 – Inspection

3.1.1 – Timing

Inspection of the Jellyfish Filter is key in determining the maintenance requirements for, and to develop a history of the site's pollutant loading characteristics. In general, inspections should be performed at the times indicated below; *or per the approved project stormwater quality documents (if applicable), whichever is more frequent.*

- Post-construction inspection is required prior to putting the Jellyfish Filter into service. All construction debris or construction-related sediment within the device must be removed, and any damage to system components repaired.
- A minimum of two inspections during the first year of operation to assess the sediment and floatable pollutant accumulation, and to ensure proper functioning of the system.

- Inspection frequency in subsequent years is based on the inspection and maintenance plan developed in the first year of operation. Minimum frequency should be once per year.
- Inspection is recommended after each major storm event.
- Immediately after an upstream oil, fuel or other chemical spill.

3.1.2 – Inspection Tools and Equipment

The following equipment and tools are typically required when performing a Jellyfish Filter inspection:

- Access cover lifting tool
- Sediment probe (clear hollow tube with check valve)
- Tape measure
- Flashlight
- Camera
- Inspection and maintenance log documentation
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

3.1.3 – Inspection Procedure

The following procedure is recommended when performing inspections:

- Provide traffic control measures as necessary.
- Inspect the MAW for floatable pollutants such as trash, debris, and oil sheen.
- Measure oil and sediment depth by lowering a sediment probe through the MAW opening until contact is made with the floor of the structure. Retrieve the probe, record sediment depth, and presences of any oil layers and repeat in multiple locations within the MAW opening. **Sediment depth of 12 inches or greater indicates maintenance is required**.
- Inspect cartridge lids. Missing or damaged cartridge lids to be replaced.
- Inspect the MAW, cartridge deck, and backwash pool weir for cracks or broken components. If damaged, repair is required.
- **Dry weather inspections:** inspect the cartridge deck for standing water.
  - No standing water under normal operating condition.
  - Standing water **inside** the backwash pool, but not outside the backwash pool, this condition indicates that the filter cartridges need to be rinsed.
  - Standing water **outside** the backwash pool may indicate a backwater condition caused by high water elevation in the receiving water body, or possibly a blockage in downstream infrastructure.
- **Wet weather inspections:** observe the rate and movement of water in the unit. Note the depth of water above deck elevation within the MAW.
  - **Less than 6 inches**, flow should be exiting the cartridge lids of each of the draindown cartridges (i.e. cartridges located outside the backwash pool).
  - **Greater than 6 inches**, flow should be exiting the cartridge lids of each of the draindown cartridges and each of the hi-flo cartridges (i.e. cartridges located inside the backwash pool), and water should be overflowing the backwash pool weir.
  - **18 inches or greater** and relatively little flow is exiting the cartridge lids and outlet pipe, this condition indicates that the filter cartridges are occluded with sediment and need to be rinsed.

The depth of sediment and oil can be measured from the surface by using a sediment probe or dipstick tube equipped with a ball check valve and inserted through the Jellyfish Filter's maintenance access wall opening. The large opening provides convenient access for inspection and vacuum removal of water and pollutants.

3.2 – Maintenance

3.2.1 – Maintenance Requirements

Required maintenance for Jellyfish Filter units is based upon results of the most recent inspection, historical maintenance records, or the site specific water quality management plan; whichever is more frequent. In general, maintenance requires some combination of the following:

- **Sediment removal for depths reaching 12 inches or greater, or within 3 years of the most recent sediment cleaning, whichever occurs sooner.**
- Floatable trash, debris, and oil must be removed.
- Filter cartridges rinsed and re-installed as required by the most recent inspection results, or within 12 months of the most recent filter rinsing, whichever occurs first.
- Replace filter cartridge if rinsing does not remove accumulated sediment from the tentacles, or if tentacles are damaged or missing. It is recommended that tentacles should remain in service no longer than 5 years before replacement.
- Damaged or missing cartridge deck components must be repaired or replaced as indicated by results of the most recent inspection.
- The unit must be cleaned out and filter cartridges inspected immediately after an upstream oil, fuel, or chemical spill. Filter cartridge tentacles should be replaced if damaged by the spill.

3.2.2 – Maintenance Tools and Equipment

The following equipment and tools are typically required when performing Jellyfish Filter maintenance:

- Vacuum truck
- Ladder
- Garden hose and low pressure sprayer
- Rope or cord to lift filter cartridges from the cartridge deck to the surface
- Adjustable pliers for removing filter cartridge tentacles from cartridge head plate
- Plastic tub or garbage can for collecting effluent from rinsed filter cartridge tentacles
- Access cover lifting tool
- Sediment probe (clear hollow tube with check valve)
- Tape measure
- Flashlight
- Camera
- Inspection and maintenance log documentation
- Safety cones and caution tape
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Proper safety equipment for confined space entry
- Replacement filter cartridge tentacles if required

3.2.3 – Maintenance Procedure

The following procedures are recommended when maintaining the Jellyfish Filter:

- Provide traffic control measures as necessary.
- Open all covers and hatches. Use ventilation equipment as required, according to confined space entry procedures.
- **Caution:** Dropping objects onto the cartridge deck may cause damage.
- Perform **Inspection Procedure** prior to maintenance activity.
- To access the cartridge deck for filter cartridge service, descend the ladder and step directly onto the deck. **Caution:** Do not step onto the maintenance access wall (MAW) or backwash pool weir, as damage may result. Note that the cartridge deck may be slippery.

3.2.4 – Filter Cartridge Rinsing Procedure

- Remove a cartridge lid.
- Remove the cartridge from the receptacle using the lifting loops in the cartridge head plate. **Caution:** Should

a snag occur, do not force the cartridge upward as damage to the tentacles may result. Rotate the cartridge with a slight sideways motion to clear the snag and continue removing the cartridge.

- Thread a rope or cord through the lifting loops and lift the filter cartridge from the cartridge deck to the top surface outside the structure.
- **Caution:** Immediately replace and secure the lid on the exposed empty receptacle as a safety precaution. Never expose more than one empty cartridge receptacle.
- Repeat the filter cartridge removal procedure until all of the cartridges are located at the top surface outside the structure.
- Disassemble the tentacles from each filter cartridge by rotating counter-clockwise. Remove the tentacles from the cartridge head plate.
- Position a receptacle in a plastic tub or garbage can such that the rinse water is captured. Using a low-pressure garden hose sprayer, direct a wide-angle water spray at a downward 45° angle onto the tentacle membrane, sweeping from top to bottom along the length of the tentacle. Rinse until all sediment is removed from the membrane. **Caution:** Do not use a high pressure sprayer or focused stream of water on the membrane. Excessive water pressure may damage the membrane. Turn membran upside down and pour out any residual rinsewater to ensure center of tentacle is clear of any sediment.

Rinsing of dirty filter cartridge tentacles with a low-pressure garden hose sprayer, and using a plastic garbage container to capture rinse water.

- Remove rinse water from rinse tub or garbage can using a vacuum hose as needed.
- Slip the o-ring over the tentacle nipple and reassemble onto the cartridge head plate; hand-tighten.
- If rinsing is ineffective in removing sediment from the tentacles, or if tentacles are damaged, provisions must be made to replace the spent or damaged tentacles with new tentacles. Contact Imbrium Systems to order replacement tentacles.
- Lower a rinsed filter cartridge to the cartridge deck. Remove the cartridge lid on a receptacle and carefully lower the filter cartridge into the receptacle until the head plate gasket is seated squarely on the lip of the receptacle. **Caution:** Should a snag occur when lowering the cartridge into the receptacle, do not force the cartridge downward; damage may occur. Rotate the cartridge with a slight sideways motion to clear the snag and complete the installation.
- Replace the cartridge lid on the exposed receptacle. Rinse away any accumulated grit from the receptacle threads if needed to get a proper fit. **Align the cartridge lid male threads with the cartridge receptacle female threads. Firmly twist the cartridge lid clockwise a minimum 110º to seat the filter cartridge snugly in place, with a proper watertight seal**.
- Repeat cartridge installation until all cartridges are installed.

3.2.5 – Vacuum Cleaning Procedure

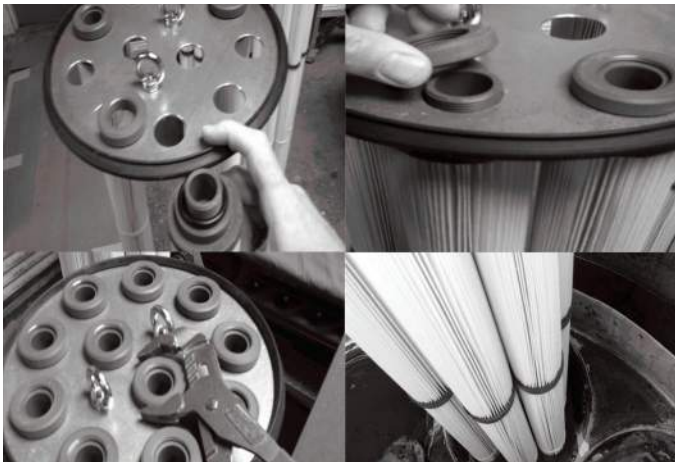
- **Caution:** Perform vacuum cleaning of the Jellyfish Filter only after filter cartridges have been removed from the system. Access the lower chamber for vacuum cleaning **only through the maintenance access wall (MAW) opening**, being careful not to damage the flexible plastic separator skirt that is attached to the underside of the deck. The separator skirt surrounds the filter cartridge zone, and could be torn if contacted by the wand. **Do not lower the vacuum wand through a cartridge receptacle**, as damage to the receptacle will result.
  - To remove floatable trash, debris, and oil, lower the vacuum hose into the MAW opening and vacuum floatable pollutants off the surface of the water. Alternatively, floatable solids may be removed by a net or skimmer.
  - Using a vacuum hose, remove the water from the lower chamber to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank.
  - Remove the sediment from the bottom of the unit through the MAW opening.
  - For larger diameter Jellyfish Filter manholes (8-ft, 10-ft, 12-ft diameter), complete sediment removal may be facilitated by removing a cartridge lid from an empty receptacle and inserting a jetting wand (not a vacuum wand) through the receptacle. Use the sprayer to rinse loosened sediment toward the vacuum hose in the MAW opening, being careful not to damage the receptacle..
  - After the unit is clean, re-fill the lower chamber with water if required by the local jurisdiction, and re-install filter cartridges.
  - Dispose of sediment, floatable trash and debris, oil, spent tentacles, and water according to local regulatory requirements.

3.2.6 – Chemical Spills

- **Caution**: If a chemical spill has been captured by the Jellyfish Filter, do not attempt maintenance. Immediately contact the local hazard response agency.

A maintenance worker stationed on the surface uses a vacuum hose to evacuate water, sediment, and floatables from the Jellyfish Filter by inserting the vacuum wand through the maintenance access wall opening.

A view of a Jellyfish Filter cartridge deck from the surface showing all the cartridge lids intact and no standing water on the deck (left image), and inspection of the flexible separator skirt from inside the maintenance access wall opening (right image).



Assembly of a Jellyfish Filter cartridge (left) and installation of a filter cartridge into a cartridge receptacle in the deck (right).

3.3 – Disposal Procedures

Disposal requirements for recovered pollutants and spent filtration tentacles may vary depending on local guidelines. In most areas the sediment and spent filtration tentacles, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.

Petroleum-based pollutants captured by the Jellyfish Filter, such as oil and fuels, should be removed and disposed of by a licensed waste management company.

Although the Jellyfish Filter captures virtually all free oil, a sheen may still be present at the MAW. A rainbow or sheen can be visible at oil concentrations of less than 10 mg/L (ppm).

Chapter 4

4.0 – Recommended Safety Procedures

Jobsite safety is a topic and a practice addressed comprehensively by others. The inclusions here are merely reminders to whole areas of Safety Practice that are the responsibility of the Owner(s), Manager(s) and Contractor(s). OSHA and Canadian OSH, and Federal, State/Provincial, and Local Jurisdiction Safety Standards apply.

4.1 – Confined Space/Personal Safety Equipment/Warning and Cautions

Please see reference on Page 3.

Chapter 5

5.0 – Jellyfish Filter Replacement Parts

Jellyfish membrane filtration cartridges, cartridge components, cartridge lids, other replacement parts can be ordered by contacting Imbrium Systems at:

United States: 888-279-8826 or 301-279-8827

Canada/International: 800-565-4801 or +1-416-960-9900

info@imbriumsystems.com

5.1 – Jellyfish Filter Replacement Parts List

Note: Jellyfish Cartridges and/or Filtration tentacles are available in the following lengths:

• 15 Inch (381 mm) • 27 Inch (686 mm) • 40 Inch (1,016 mm) • 54 Inch (1,372 mm)

- Jellyfish Cartridge (specify length). Includes head plate with lifting loops, rim gasket, eleven (11) filtration tentacles, eleven (11) o-rings, and eleven (11) locking nuts
- Standard Head plate
- Blank head plate
- Rim gasket (for head plate)
- Locking nuts (for tentacles)
- O-rings (for tentacles)
- Cartridge lids are available with the following orifice sizes: 70mm, 55mm, 45mm, 35mm, 30mm, 25mm, 30mm, blank lid (no orifice)
- Maintenance Access Wall (MAW) extension (18-inch segment)

** Nothing in this catalog should be construed as an expressed warranty or implied warranties, including the warranties of merchantability and of fitness for any particular purpose.*

Jellyfish Filter Inspection and Maintenance Log

Owner: _____ Jellyfish Model No.:_____

Location: _____ GPS Coordinates: _____

Land Use: Commercial:_____ Industrial: _____ Service Station:_____

Road/Highway:____ Airport: _____ Residential: _____ Parking Lot:_____

Date/Time:						
Inspector:						
Maintenance Contractor:						
Visible Oil Present: (Y/N)						
Oil Quantity Removed						
Floatable Debris Present: (Y/N)						
Floatable Debris removed: (Y/N)						
Water Depth in Backwash Pool						
Draindown Cartridges externally rinsed and re-commissioned: (Y/N)						
New tentacles put on Cartridges: (Y/N)						
Hi-Flo cartridges externally rinsed and recommissioned (Y/N):						
New tentacles put on Hi-Flo Cartridges: (Y/N)						
Sediment Depth Measured: (Y/N)						
Sediment Depth (inches or mm):						
Sediment Removed: (Y/N)						
Cartridge Lids intact: (Y/N)						
Observed Damage:						
Comments:						

that class of BMP. In two cases, (sorbtive media interceptors and soakways/infiltration trenches), although there are no Ontario phosphorus removal efficiencies reported in the review materials, the techniques are not limited by geography. The reported ranges in efficiency for these BMP classes are narrow so the median efficiency is chosen as a representative phosphorus removal efficiency. In all other cases, there are unacceptable regional differences and wide ranges in efficiencies that would not support the derivation of single representative phosphorus removal efficiencies. In the case of dry swales, the non-Ontario removal efficiencies may be usable, but the range of reported values is large such that it will be necessary to identify design criteria that will limit the range in efficiencies for this class of BMPs before a value can be chosen.

Table 3. Phosphorus Removal Efficiencies for Major Classes of BMPs Using the Decision Tree (Figure 5)

BMP Class	Reference IDs[1]	Reported Phosphorus Removal Efficiency (%)		Relevant to Ontario?	Range <40%?	Are Non-Ontario values acceptable?	Possible design criteria?	Median % Removal Efficiency
		Min	Max					
Post-development BMPs								
Bioretention Systems	8-10, 12,13, 34-38, 40	-1552	80	no	no	no	No	none
Constructed Wetlands	104, 106, 109	72	87	yes	yes			77
Dry Detention Ponds	104, 109	0	20	no	yes	yes		10
Dry Swales	24, 26-32	-216	94	no	no	no	possible	none
Enhanced Grass/Water Quality Swales	21, 104	34	55	no	yes	no	No	none
Flow Balancing Systems	106	77		no	?	yes	Min data	77
Green Roofs	2	-248		no	no	no	No	none
Hydrodynamic Devices	109	-8		no	?	yes		none
Perforated Pipe Infiltration/Exfiltration Systems	7, 4	81	93	yes	yes			87
Sand or Media Filters	104, 109	30	59	no	yes	yes		45
Soakaways - Infiltration Trenches	6, 104	50	70	no	yes	yes		60
Sorbtive Media Interceptors	111	78	80	no	yes	yes		79
Underground Storage	106	25		no	?	yes	Min data	25
Vegetated Filter Strips/Stream Buffers	6, 42, 104	60	70	no	yes	yes	Yes	65
Wet Detention Ponds	104-106, 109	42	85	yes	yes			63

Notes: [1]References associated with IDs are provided in Appendix 7.

BIORETENTION

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

GENERAL DESCRIPTION

As a stormwater filter and infiltration practice, bioretention temporarily stores, treats and infiltrates runoff. Depending on native soil infiltration rate and physical constraints, the system may be designed without an underdrain for full infiltration, with an underdrain for partial infiltration, or with an impermeable liner and underdrain for filtration only (i.e., a biofilter). The primary component of the practice is the filter bed which is a mixture of sand, fines and organic material. Other elements include a mulch ground cover and plants adapted to the conditions of a stormwater practice. Bioretention is designed to capture small storm events or the water quality storage requirement. An overflow or bypass is necessary to pass large storm event flows. Bioretention can be adapted to fit into many different development contexts and provide a convenient area for snow storage and treatment.

Source: Minnesota Businesses for Clean Water

Source: City of Portland

DESIGN GUIDANCE

SOIL CHARACTERISTICS

Bioretention can be constructed over any soil type, but hydrologic soil group A and B are best for achieving water balance goals. If possible, bioretention should be sited in the areas of the development with the highest native soil infiltration rates. Bioretention in soils with infiltration rates less than 15 mm/hr will require an underdrain. Designers should verify the native soil infiltration rate at the proposed location and depth through measurement of hydraulic conductivity under field saturated conditions.

GEOMETRY & SITE LAYOUT

Key geometry and site layout factors include:

- The minimum footprint of the filter bed area is based on the drainage area. Typical drainage areas to bioretention are between 100 m2 to 0.5 hectares. The maximum recommended drainage area is 0.8 hectares. Typical ratios of impervious drainage area to treatment facility area range from 5:1 to 15:1.
- Bioretention can be configured to fit into many locations and shapes. However, cells that are narrow may concentrate flow as it spreads throughout the cell and result in erosion.
- The filter bed surface should be level to encourage stormwater to spread out evenly over the surface.

PRE-TREATMENT

Pretreatment prevents premature clogging by capturing coarse sediment particles before they reach the filter bed. Where the runoff source area produces little sediment, such as roofs, bioretention can function effectively without pretreatment. To treat parking area or road runoff, a two-cell design that incorporates a forebay is recommended. Pretreatment practices that may be feasible, depending on the method of conveyance and the availability of space include:

- *Two-cell design (channel flow):* Forebay ponding volume should account for 25% of the water quality storage requirement and be designed with a 2:1 length to width ratio.
- *Vegetated filter strip (sheet flow):* Should be a minimum of three (3) metres in width. If smaller strips are used, more frequent maintenance of the filter bed can be anticipated.
- *Gravel diaphragm (sheet flow):* A small trench filled with pea gravel, which is perpendicular to the flow path between the edge of the pavement and the bioretention practice will promote settling out of sediment and maintain sheet flow into the facility. A drop of 50-150 mm into the gravel diaphragm can be used to dissipate energy and promote settling.
- *Rip rap and/or dense vegetation (channel flow):* Suitable for small bioretention cells with drainage areas less than 100 square metres.

GRAVEL STORAGE LAYER

- DEPTH: Should be a minimum of 300 mm deep and sized to provide the required storage volume. Granular material should be 50 mm diameter clear stone.
- PEA GRAVEL CHOKING LAYER: A 100 mm deep layer of pea gravel (3 to 10 mm diameter clear stone) should be placed on top of the coarse gravel storage layer as a choking layer separating it from the overlying filter media bed.

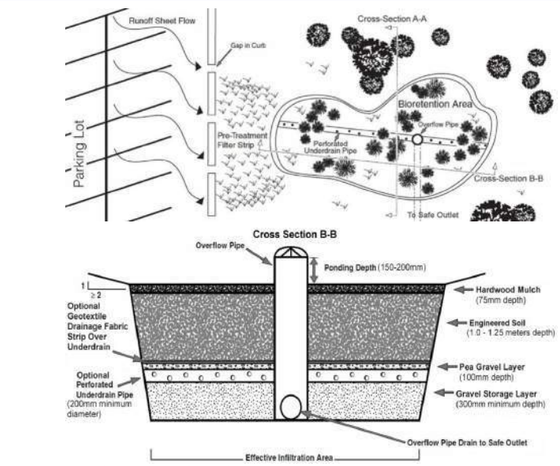
FILTER MEDIA

- COMPOSITION: To ensure a consistent and homogeneous bed, filter media should come pre-mixed from an approved vendor.
- DEPTH: Recommended depth is between 1.0 and 1.25 m. However in constrained applications, pollutant removal benefits may be achieved in beds as shallow as 500 mm. If trees are to be included in the design, bed depth must be at least 1.0 m.
- MULCH: A 75 mm layer of mulch on the surface of the filter bed enhances plant survival, suppresses weed growth and pretreats runoff before it reaches the filter bed.

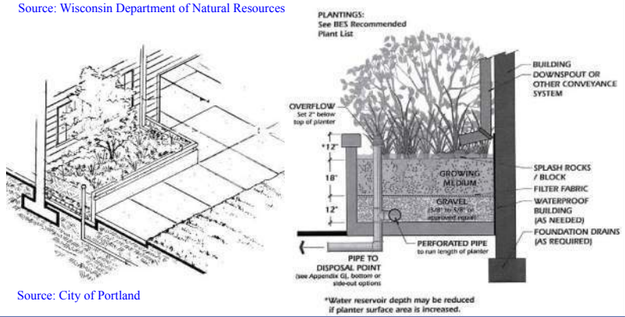
CONVEYANCE AND OVERFLOW

Bioretention can be designed to be inline or offline from the drainage system. Inline bioretention accepts all flow from a drainage area and conveys larger event flows through an overflow outlet. Overflow structures must be sized to safely convey larger storm events out of the facility. The invert of the overflow should be placed at the maximum water surface elevation of the bioretention area, which is typically 150-250 mm above the filter bed surface.

Offline bioretention practices use flow splitters or bypass channels that only allow the required water quality storage volume to enter the facility. This may be achieved with a pipe, weir, or curb opening sized for the target flow, but in conjunction, create a bypass channel so that higher flows do not pass over the surface of the filter bed. Using a weir or curb opening minimizes clogging and reduces maintenance frequency.



Source: Wisconsin Department of Natural Resources



Source: City of Portland

ABILITY TO MEET SWM OBJECTIVES

BMP	Water Balance Benefit	Water Quality Improvement	Stream Channel Erosion Control Benefits
Bioretention with no underdrain	Yes	Yes - size for water quality storage requirement	Partial - based on available storage volume and infiltration rates
Bioretention with underdrain	Partial - based on available storage volume beneath the underdrain and soil infiltration rate	Yes - size for water quality storage requirement	Partial - based on available storage volume beneath the underdrain and soil infiltration rate
Bioretention with underdrain and impermeable liner	Partial - some volume reduction through evapotranspiration	Yes - size for water quality storage requirement	Partial - some volume reduction through evapotranspiration

UNDERDRAIN

- Only needed where native soil infiltration rate is less than 15 mm/hr (hydraulic conductivity of less than 1x10-6 cm/s).
- Should consist of a perforated pipe embedded in the coarse gravel storage layer at least 100 mm above the bottom.
- A strip of geotextile filter fabric placed between the filter media and pea gravel choking layer over the perforated pipe is optional to help prevent fine soil particles from entering the underdrain.
- A vertical standpipe connected to the underdrain can be used as a cleanout and monitoring well.

MONITORING WELLS

A capped vertical stand pipe consisting of an anchored 100 to 150 mm diameter perforated pipe with a lockable cap installed to the bottom of the facility is recommended for monitoring drainage time between storms.

GENERAL SPECIFICATIONS

Material	Specification	Quantity
Filter Media Composition	Filter Media Soil Mixture to contain: • 85 to 88% sand • 8 to 12% soil fines • 3 to 5% organic matter (leaf compost) Other Criteria: • Phosphorus soil test index (P-Index) value between 10 to 30 ppm • Cationic exchange capacity (CEC) greater than 10 meq/100 g • Free of stones, stumps, roots and other large debris • pH between 5.5 to 7.5 • Infiltration rate greater than 25 mm/hr	Recommended depth is between 1.0 and 1.25 metres.
Mulch Layer	Shredded hardwood bark mulch	A 75 mm layer on the surface of the filter bed
Geotextile	Material specifications should conform to Ontario Provincial Standard Specification (OPSS) 1860 for Class II geotextile fabrics. Should be woven monofilament or non-woven needle punched fabrics. Woven slit film and non-woven heat bonded fabrics should not be used as they are prone to clogging. For further guidance see CVC/TRCA LID SWM Planning and Design Guide, Table 4.5.5.	Strip over the perforated pipe underdrain (if present) between the filter media bed and gravel storage layer (stone reservoir)
Gravel	Washed 50 mm diameter clear stone should be used to surround the underdrain and for the gravel storage layer Washed 3 to 10 mm diameter clear stone should be used for pea gravel choking layer.	Volume based on dimensions, assuming a void space ratio of 0.4.
Underdrain	Perforated HDPE or equivalent, minimum 100 mm diameter, 200 mm recommended.	• Perforated pipe for length of cell. • Non-perforated pipe as needed to connect with storm drain system. • One or more caps. • T's for underdrain configuration

CONSTRUCTION CONSIDERATIONS

Ideally, bioretention sites should remain outside the limit of disturbance until construction of the bioretention begins to prevent soil compaction by heavy equipment. Locations should not be used as sediment basins during construction, as the concentration of fines will prevent post-construction infiltration. To prevent sediment from clogging the surface of a bioretention cell, stormwater should be diverted away from the bioretention until the drainage area is fully stabilized.

For further guidance regarding key steps during construction, see the CVC/TRCA LID SWM Planning and Design Guide, Section 4.5.2 - Construction Considerations)

OPERATION AND MAINTENANCE

Bioretention requires routine inspection and maintenance of the landscaping as well as periodic inspection for less frequent maintenance needs or remedial maintenance. Generally, routine maintenance will be the same as for any other landscaped area; weeding, pruning, and litter removal. Regular watering may be required during the first two years until vegetation is established.

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

Trash and debris should be removed from pretreatment devices, the bioretention area surface and inlet and outlets at least twice annually. Other maintenance activities include reapplying mulch, pruning, weeding replacing dead vegetation and repairing eroded areas as needed. Remove accumulated sediment on the bioretention area surface when dry and exceeding 25 mm depth.

SITE CONSIDERATIONS

Wellhead Protection

Facilities receiving road or parking lot runoff should not be located within two (2) year time-of-travel wellhead protection areas.

Available Space

Reserve open areas of about 10 to 20% of the size of the contributing drainage area.

Site Topography

Contributing slopes should be between 1 to 5%. The surface of the filter bed should be flat to allow flow to spread out. A stepped multi-cell design can also be used.

Available Head

If an underdrain is used, then 1 to 1.5 metres elevation difference is needed between the inflow point and the downstream storm drain invert.

Water Table

A minimum of one (1) metre separating the seasonally high water table or top of bedrock elevation and the bottom of the practice is necessary.

Soils

Bioretention can be located over any soil type, but hydrologic soil group A and B soils are best for achieving water balance benefits. Facilities should be located in portions of the site with the highest native soil infiltration rates. Where infiltration rates are less than 15 mm/hr (hydraulic conductivity less than 1x10-6 cm/s) an underdrain is required. Native soil infiltration rate at the proposed facility location and depth should be confirmed through measurement of hydraulic conductivity under field saturated conditions.

Drainage Area & Runoff Volume

Typical contributing drainage areas are between 100 m2 to 0.5 hectares. The maximum recommended contributing drainage area is 0.8 hectares. Typical ratios of impervious drainage area to treatment facility area range from 5:1 to 15:1.

Pollution Hot Spot Runoff

To protect groundwater from possible contamination, runoff from pollution hot spots should not be treated by bioretention facilities designed for full or partial infiltration. Facilities designed with an impermeable liner (filtration only facilities) can be used to treat runoff from pollution hot spots.

Proximity to Underground Utilities

Designers should consult local utility design guidance for the horizontal and vertical clearances required between storm drains, ditches, and surface water bodies.

Overhead Wires

Check whether the future tree canopy height in the bioretention area will interfere with existing overhead phone and power lines.

Setback from Buildings

If an impermeable liner is used, no setback is needed. If not, a four (4) metre setback from building foundations should be applied.

Toronto and Region Conservation for The Living City

CVC Credit Valley Conservation

FOR FURTHER DETAILS SEE SECTION 4.5 OF THE CVC/TRCA LID SWM GUIDE

ENHANCED GRASS SWALES

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

GENERAL DESCRIPTION

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

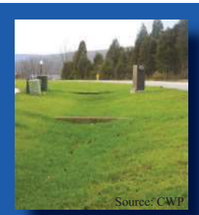
Where development density, topography and depth to water table permit, enhanced grass swales are a preferred alternative to both curb and gutter and storm drains as a stormwater conveyance system. When incorporated into a site design, they can reduce impervious cover, accent the natural landscape, and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

Source: Delaware Department of Transportation

Source: Seattle Public Utilities

Source: Thomas Engineering

Source: Sue Donaldson


Source: CWP

DESIGN GUIDANCE

GEOMETRY AND SITE LAYOUT

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

PRE-TREATMENT

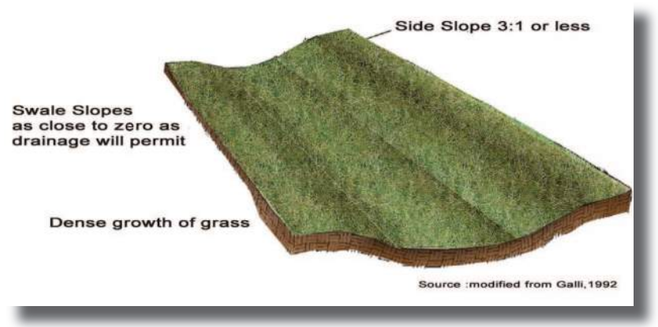
A pea gravel diaphragm located along the top of each bank can be used to provide pretreatment of any runoff entering the swale laterally along its length. Vegetated filter strips or mild side slopes (3:1) also provide pretreatment for any lateral sheet flow entering the swale. Sedimentation forebays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

CONVEYANCE AND OVERFLOW

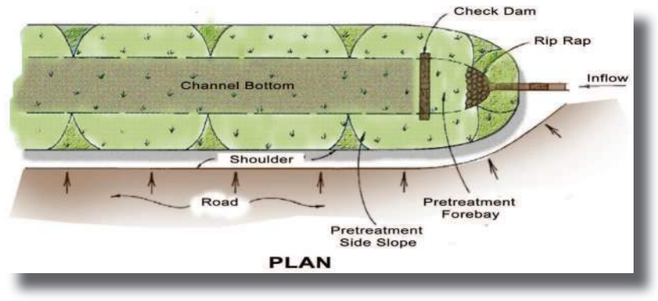
Grass swales must be designed for a maximum velocity of 0.5 m/s or less for the 4 hour 25 mm Chicago storm event. The swale should also convey the locally required design storm (usually the 10 year storm) at non-erosive velocities.

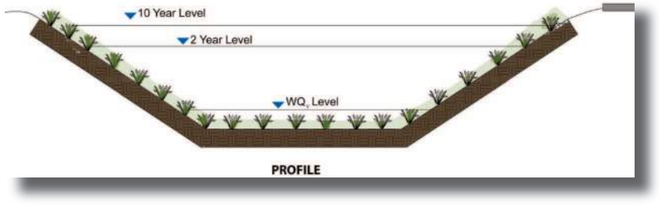
SOIL AMENDMENTS

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



PLAN VIEW OF A GRASS SWALE





PLAN AND PROFILE VIEWS

ABILITY TO MEET SWM OBJECTIVES

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

GENERAL SPECIFICATIONS

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

CONSTRUCTION CONSIDERATIONS

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

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

OPERATION AND MAINTENANCE

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

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

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

SITE CONSIDERATIONS

Available Space

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

Site Topography

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

Drainage Area & Runoff Volume

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

Soil

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

Pollution Hot Spot Runoff

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

Proximity to Underground Utilities

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

Water Table

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

Setback from Buildings

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

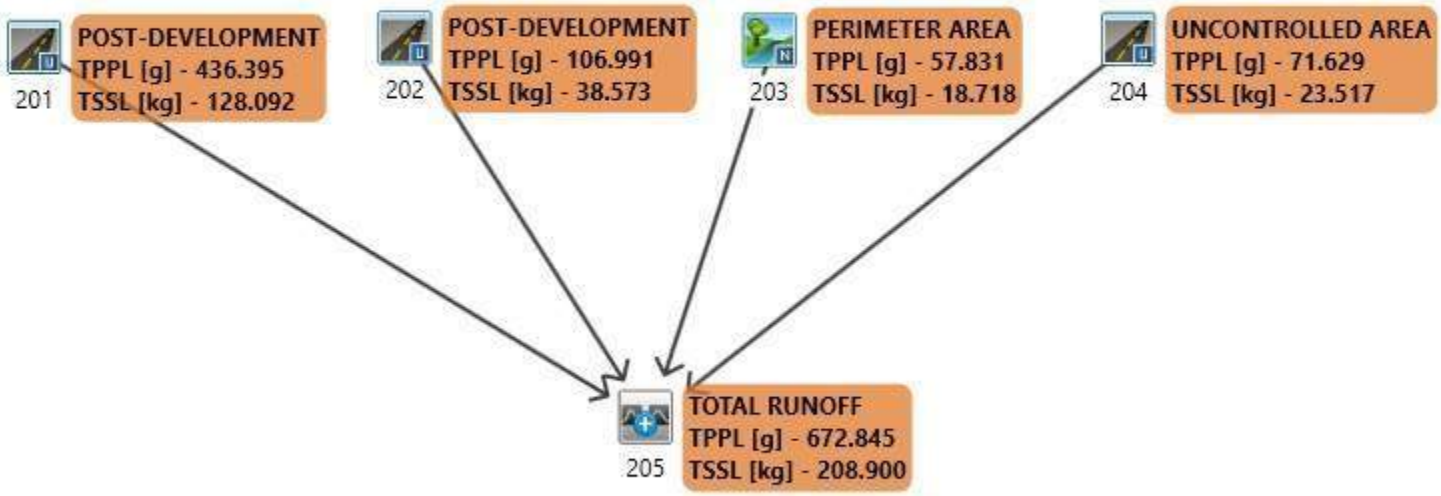
TORONTO AND REGION Conservation for The Living City

CVC CREDIT VALLEY CONSERVATION

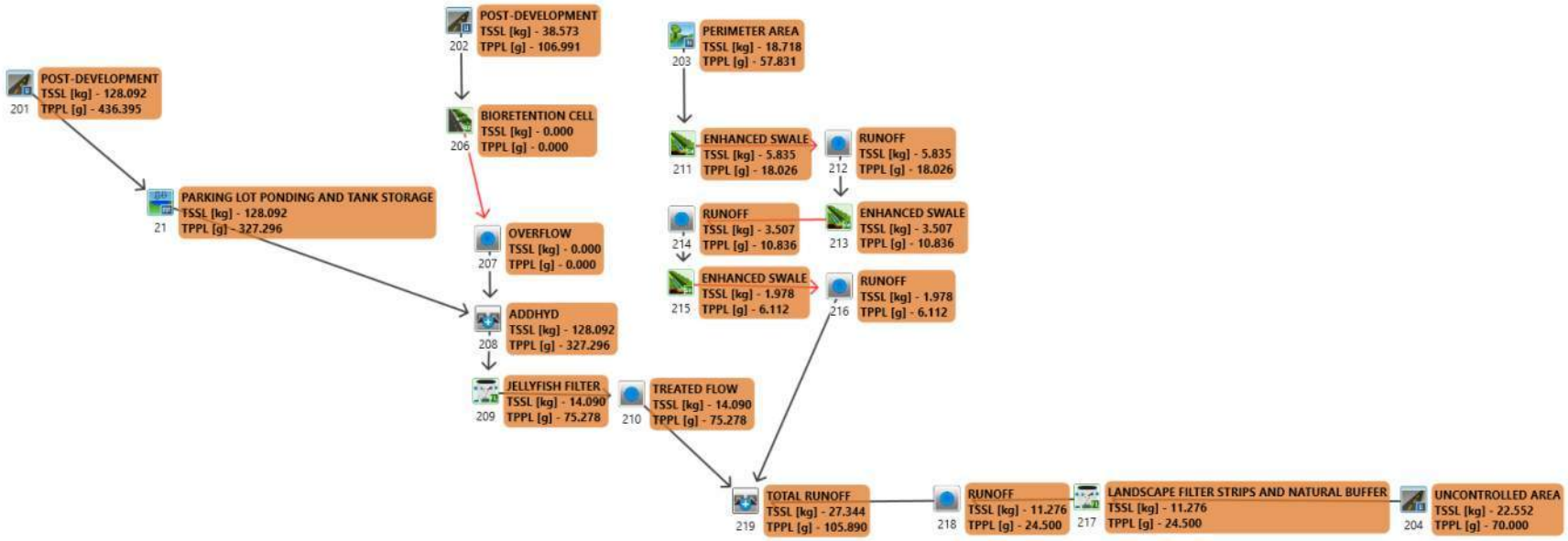
FOR FURTHER DETAILS SEE SECTION 4.8 OF THE CVC/TRCA LID SWM GUIDE

PRE-DEVELOPMENT

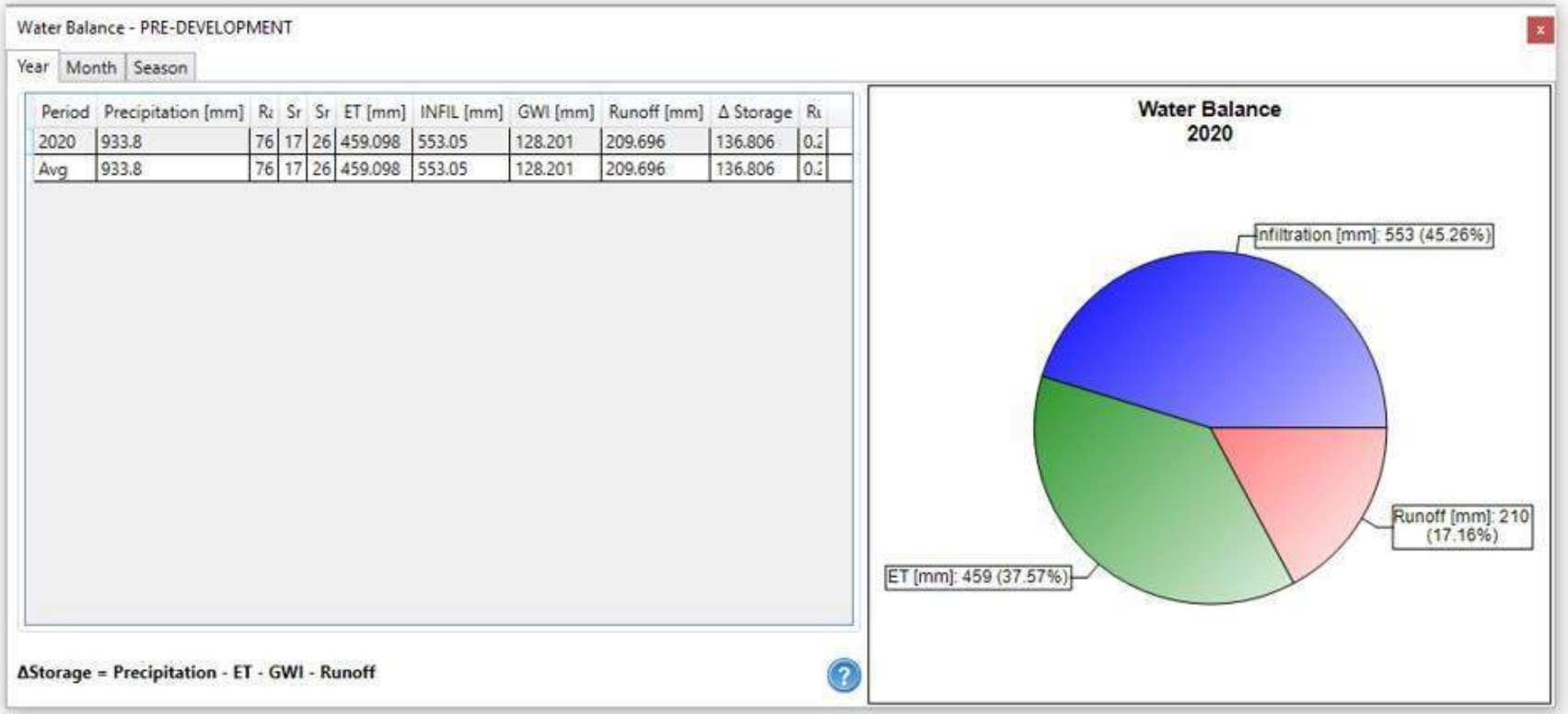
POST-DEVELOPMENT



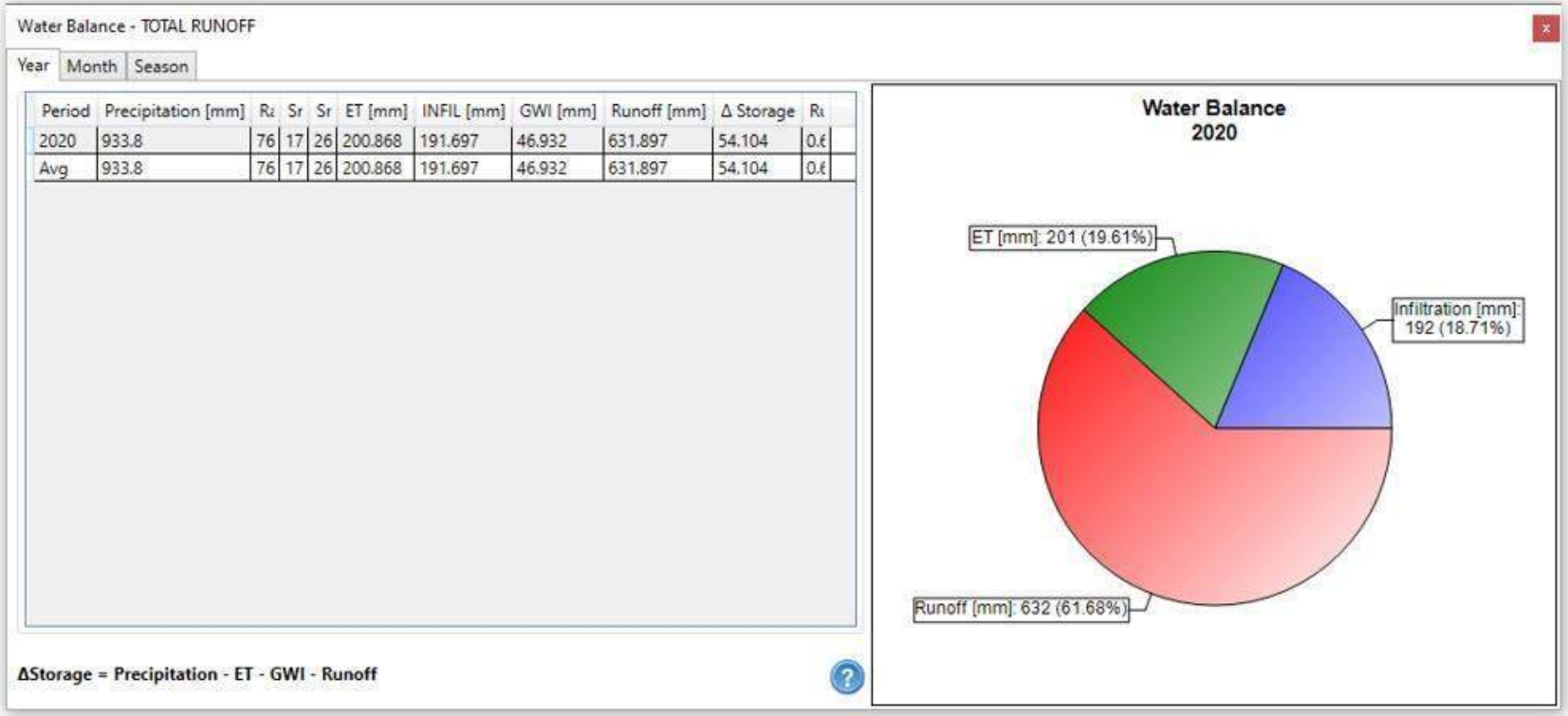
POST-DEVELOPMENT SWM



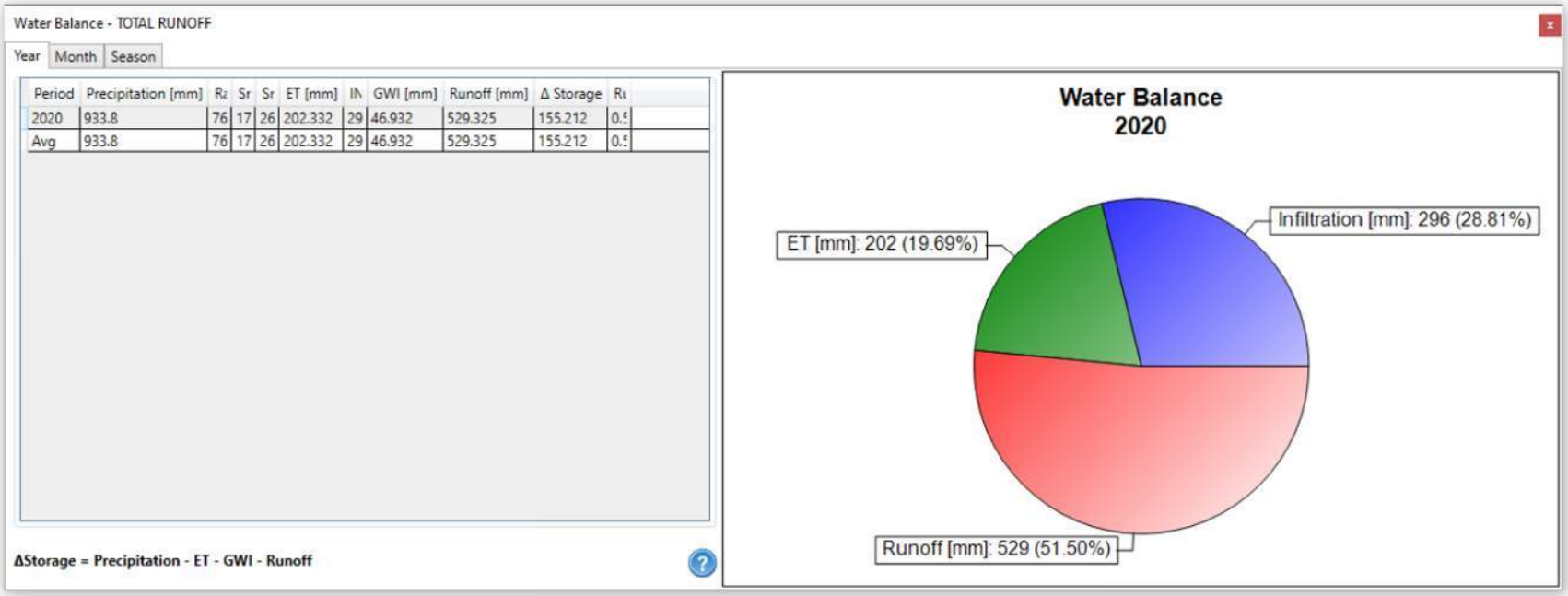
PRE-DEVELOPMENT



POST-DEVELOPMENT



POST-DEVELOPMENT SWM



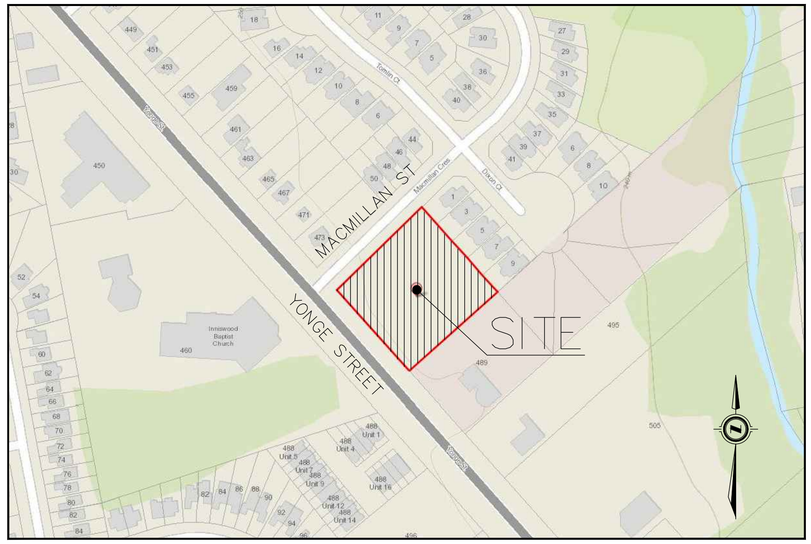
APPENDIX D

ENGINEERING DRAWINGS (ENVELOPE AT REAR OF REPORT)

PEL
PINESTONE ENGINEERING LTD.

#481 YONGE STREET
64 UNIT APARTMENT DEVELOPMENT
BARRIE, ONTARIO

Dwg.No.	Description
	TITLE PAGE
EX–1	EXISTING CONDITIONS PLAN
ESC–1	EROSION AND SEDIMENT CONTROL PLAN
SERV–1	SITE SERVICING PLAN
GP–1	SITE GRADING PLAN
PM–1	PAVEMENT PAINT MARKINGS AND SIGNAGE PLAN
PRE–1	PRE–DEVELOPMENT CATCHMENT PLAN
POST–1	POST DEVELOPMENT CATCHMENT PLAN
DET–1	STANDARD AND CONSTRUCTION DETAILS
GN–1	GENERAL NOTES AND DETAILS



SITE LOCATION

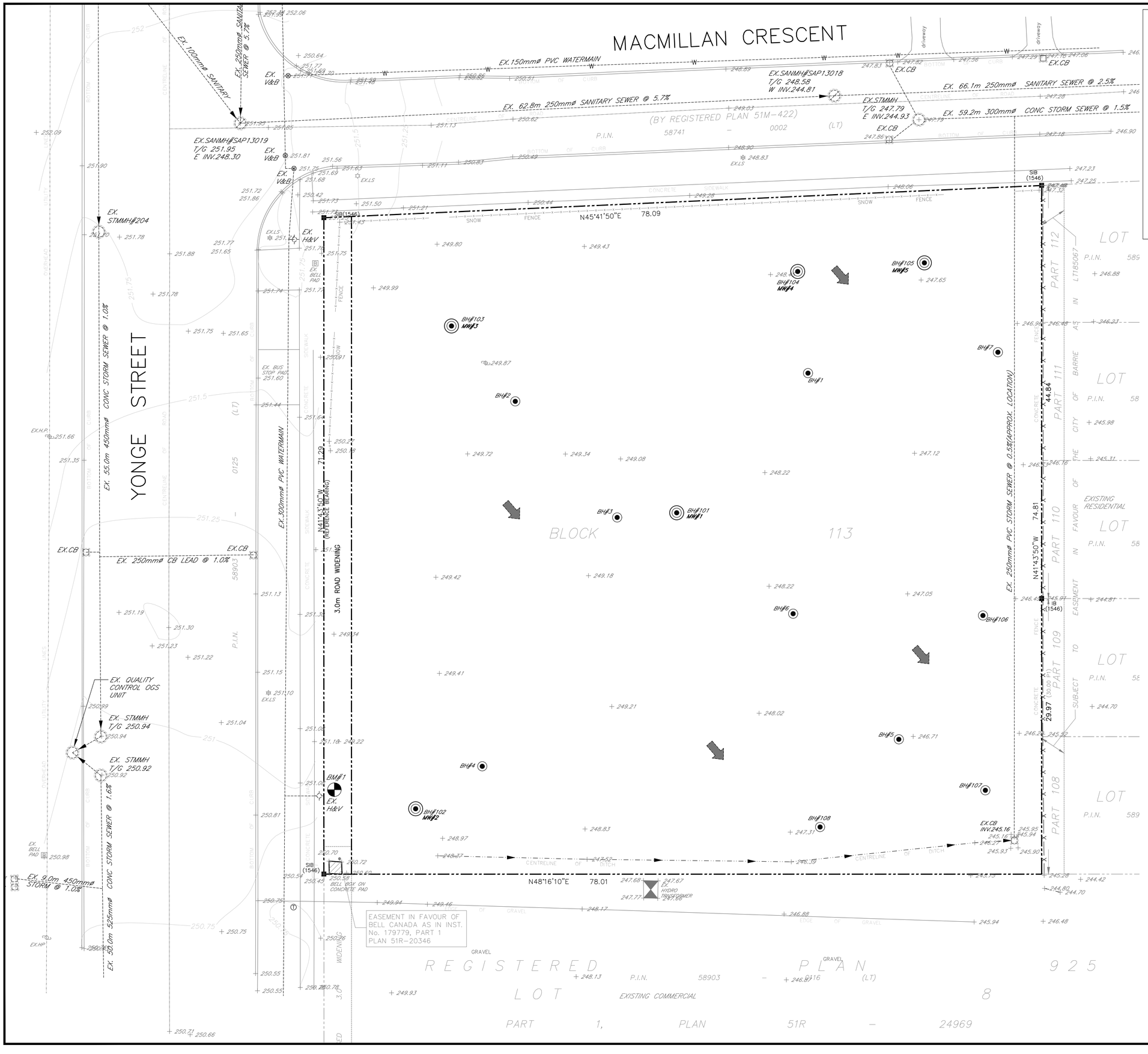
PUBLIC WORKS DEPARTMENT
CITY OF BARRIE DEVELOPMENT SERVICES
70 COLLIER STREET
BARRIE, ONTARIO
L4M 4T5

DEVELOPER
481 YONGE DEVELOPMENTS INC.
145 WELHAM ROAD, UNIT 10
BARRIE, ONTARIO
L4N 8Y3

DEVELOPER'S ENGINEER
PINESTONE ENGINEERING LTD.
20 BELL FARM ROAD, UNIT 1
BARRIE, ONTARIO
L4M 6E4

PEL
PINESTONE ENGINEERING LIMITED | www.pel.ca

FOR APPROVAL
City File: D28-035-220
April 2022
PEL Project No. 19-11433.1-B



LEGEND

- CONTOUR
- EXISTING HYDRO POLE
- EXISTING TREELINE
- EXISTING SANITARY MANHOLE
- EXISTING STORM MANHOLE
- EXISTING STORM CATCHBASIN
- DITCH CENTERLINE
- DIRECTION OF OVERLAND FLOW
- BOREHOLE 2014
- BOREHOLE 2022 MONITORING WELL 2022
- EXISTING CHAINLINK FENCE
- EXISTING BELL CANADA PEDESTAL
- EXISTING WATER VALVE
- EXISTING HYDRANT AND VALVE
- EXISTING OVERHEAD HYDRO WIRE
- EXISTING TRANSFORMER
- EXISTING LAMP STANDARD

PINESTONE ENGINEERING LIMITED | www.pel.ca

The position of existing above ground and underground utilities and facilities are not necessarily shown on the drawings, and where shown, the accuracy of the position of such utilities and facilities is not guaranteed. Before starting work, the contractor shall confirm the exact location of all existing utilities and facilities, and shall assume all liability for damage to them

Drawings shall not be used for construction unless sealed and signed. All work to be performed in accordance with the Occupational Health & Safety Act 1990.

Any errors and/or omissions shall be reported to Pinestone Engineering Ltd. without delay.

KEY MAP

NOTES

1. TOPOGRAPHIC SURVEY COMPLETED BY RUDY MAK SURVEYING LTD. O.L.S., JULY 1995 AND OCTOBER 2013.
2. SITE PLAN PROVIDED BY NAYLOR ARCHITECT INC. APRIL 6, 2022
3. REFER TO GEOTECHNICAL REPORT PREPARED BY HADDARD GEOTECHNICAL LTD. FOR BOREHOLE INFORMATION.

BENCHMARK

BM#1
TOP OF SPINDLE OF FIRE HYDRANT ELEV. 251.85

NO.	YY.MM.DD	REVISION	BY

SEAL

LICENSED PROFESSIONAL ENGINEER
J.H. VOISIN
100172758
May 4th, 2022
PROVINCE OF ONTARIO

NORTH ARROW

DESIGN BY:	J.V.
DRAWN BY:	J.L.
CHECKED	J.V.
DATE:	APRIL 2022
SCALE:	1:200

CLIENT/PROJECT

#481 YONGE STREET APARTMENT DEVELOPMENT BARRIE, ONTARIO

DRAWING TITLE

EXISTING CONDITIONS PLAN

PROJECT NO.	DRAWING NO.	REVISION
19-11433-B	EX-1	0

GP-1

MACMILLAN CRESCENT

YONGE STREET

EX.150mmø PVC WATERMAIN

EX. 62.8m 250mmø SANITARY SEWER @ 5.7%

EX. 66.1m 250mmø SANITARY SEWER

EX. 59.2m 300mmø CONC STORM SEWER @ 0.5%(APPROX. LOCATION)

EX. 100mmø SANITARY

EX. 250mmø SANITARY SEWER @ 5.7%

EX. 55.0m 450mmø CONC STORM SEWER @ 1.0%

EX. 50.0m 525mmø CONC STORM SEWER @ 1.6%

9.0m 450mmø CONC STORM @ 1.0%

EX. 300mmø PVC WATERMAIN

EX. 250mmø CB LEAD @ 1.0%

EX.SANMH#SAP13019
T/G 251.95
E INV.248.30

EX.SANMH#SAP13018
T/G 248.58
W INV.244.81

EX.STMMH
T/G 247.79
E INV.244.93

EX. STMMH#204

EX. STMMH
T/G 250.94

EX. STMMH
T/G 250.92

EX. QUALITY CONTROL OGS UNIT

EX. V&B

EX. H&V

EX. BELL PAD

EX. BUS STOP PAD

EX.CB

EX.LS

SIB (1546)

N45°41'50"E 78.09

N48°16'10"E 78.01

N44°14'50"W 74.84

N44°14'50"W 29.97

3.0m ROAD WIDENING

(BY REGISTERED PLAN 51M-422)

P.I.N. 58741 – 0002 (LT)

P.I.N. 58903 – 0125 (LT)

P.I.N. 58903 – 0116 (LT)

BLOCK 113

PART 112

PART 111

PART 110

PART 109

PART 108

REGISTERED PLAN 92

LOT 8

PART 1, PLAN 51R – 24969

EXISTING COMMERCIAL

SEDIMENT CONTROL FENCE PER BSD-1233

TEMPORARY CONSTRUCTION ACCESS PER BSD-23D

INSTALL SILT SACK IN EX. CB. CONTRACTOR TO MAINTAIN AFTER EVERY RAINFALL EVENT

BH#101 MW#1
BH#102 MW#2
BH#103 MW#3
BH#104 MW#4
BH#105 MW#5
BH#1
BH#2
BH#3
BH#4
BH#5
BH#6
BH#7
BH#106
BH#107
BH#108

BM#1
TOP OF SPINDLE OF FIRE HYDRANT ELEV. 251.85

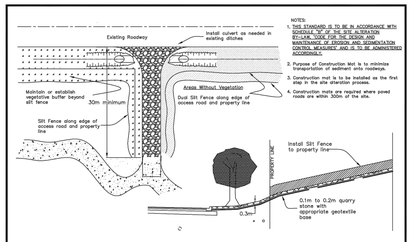
EASEMENT IN FAVOUR OF BELL CANADA AS IN INST. No. 179779, PART 1 PLAN 51R-20346

BELL BOX ON CONCRETE PAD

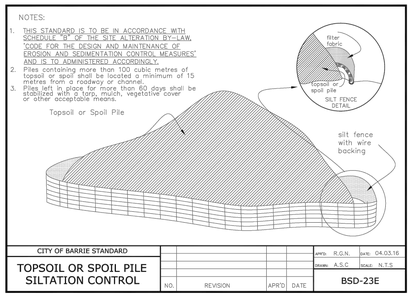
EX. HYDRO TRNSFORMER

EROSION CONTROL NOTES:

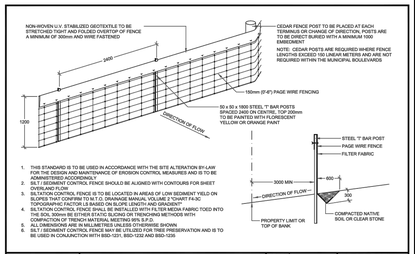
1. ALL SILT FENCING TO BE INSTALLED PRIOR TO ANY GRADING OR EXCAVATION.
2. EROSION CONTROL FENCING TO BE INSTALLED AROUND THE BASE OF ALL STOCKPILES. ADDITIONAL EROSION CONTROL MEASURES MAY BE REQUIRED AS SITE DEVELOPMENT PROGRESSES. CONTRACTOR TO PROVIDE ALL ADDITIONAL EROSION CONTROL STRUCTURES.
3. PINESTONE ENGINEERING LTD. TO MONITOR EROSION CONTROL STRUCTURES TO ENSURE FENCING IS INSTALLED AND MAINTENANCE IS PERFORMED TO CITY REQUIREMENTS.
4. EROSION CONTROL STRUCTURES TO BE MONITORED AT LEAST ONCE A WEEK AND AFTER EVERY RAINFALL AND DAMAGE REPAIRED IMMEDIATELY.
5. SEDIMENTS TO BE REMOVED WHEN ACCUMULATIONS REACH A MAXIMUM OF 1/2 THE HEIGHT OF THE FENCE.
6. ALL EROSION CONTROL STRUCTURES TO REMAIN IN PLACE UNTIL ALL DISTURBED GROUND HAVE BEEN RESTABILIZED EITHER BY PAVING OR RESTORATION OF VEGETATIVE GROUND COVER.
7. NO ALTERNATE METHODS OF EROSION PROTECTION SHALL BE PERMITTED UNLESS APPROVED BY PINESTONE ENGINEERING LTD. AND THE CITY OF BARRIE DEPARTMENT OF PUBLIC WORKS.
8. CONTRACTOR IS RESPONSIBLE FOR MUNICIPAL ROADWAY AND SIDEWALK TO BE CLEARED OF ALL SEDIMENTS FROM VEHICULAR TRACKING ETC. AT THE END OF EACH DAY.



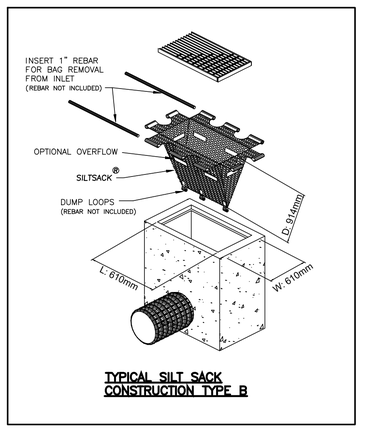
CITY OF BARRIE STANDARD					
CONSTRUCTION ENTRANCE MAT	1. Standardized Dimension Text	J.S.	05.10.28	APP'D: R.G.N.	DATE: 04.03.16
				DRAWN: A.S.C	SCALE: N.T.S
	NO. REVISION	APP'D	DATE	BSD-23D	



CITY OF BARRIE STANDARD					
TOPSOIL OR SPOIL PILE SILTATION CONTROL				APP'D: R.G.N.	DATE: 04.03.16
				DRAWN: A.S.C	SCALE: N.T.S
	NO. REVISION	APP'D	DATE	BSD-23E	



Barrie STANDARD DETAIL	SILTATION CONTROL FENCING	REV No. 2	DATE: OCT 2017	APPROVED Oct 10/17 date
		SCALE: N.T.S.	BSD-1233 FORMERLY BSD-23A	Original Signed By DIRECTOR OF ENGINEERING



TYPICAL SILT SACK CONSTRUCTION TYPE B

NOTE: ANY MATERIAL STOCK PILES REQUIRE PERIMETER SILT FENCE PER CITY DETAIL BSD-23E

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3. REFER TO GEOTECHNICAL REPORT PREPARED BY HADDARD GEOTECHNICAL LTD. FOR BOREHOLE INFORMATION.

LEGEND

- S——S SILT FENCE
- CONSTRUCTION ENTRANCE MAT
- 221.0 CONTOUR
- EXISTING HYDRO POLE
- EXISTING TREELINE
- DITCH CENTERLINE
- DIRECTION OF OVERLAND FLOW
- EXISTING CHAINLINK FENCE
- EXISTING BELL CANADA PEDESTAL
- EXISTING WATER VALVE
- EXISTING HYDRANT AND VALVE
- EXISTING OVERHEAD HYDRO WIRE
- BH#3 BOREHOLE 2014
- BH#101 MW#1 BOREHOLE 2022 MONITORING WELL 2022

BENCHMARK

BM#1
TOP OF SPINDLE OF FIRE HYDRANT ELEV. 251.85

NO.	YY.MM.DD	REVISION	BY

SEAL

NORTH ARROW

DESIGN BY:	J.V.
DRAWN BY:	J.L.
CHECKED	J.V.
DATE:	APRIL 2022
SCALE:	1:200

CLIENT/PROJECT

#481 YONGE STREET APARTMENT DEVELOPMENT BARRIE, ONTARIO

DRAWING TITLE

EROSION AND SEDIMENT CONTROL PLAN

PROJECT NO.	DRAWING NO.	REVISION
19-11433-B	ESC-1	0

GP-1

MACMILLAN CRESCENT

YONGE STREET

EX.150mmø PVC WATERMAIN

EX. 62.8m 250mmø SANITARY SEWER @ 5.7%

EX. 66.1m 250mmø SANITARY SEWER @ 2.5%

EX. 59.2m 300mmø CONC STORM SEWER @ 1.5%

EX. 55.0m 450mmø CONC STORM SEWER @ 1.0%

EX. 50.0m 525mmø CONC STORM SEWER @ 1.6%

EX.300mmø PVC WATERMAIN

EX. 250mmø CB LEAD @ 1.0%

EX. 9.0m 450mmø STORM @ 1.0%

EX. 100mmø SANITARY

EX. 250mmø SANITARY SEWER @ 5.7%

EX.SANMH#SAP13018
T/G 248.58
W INV.244.81
S INV. 244.90

EX.STMMH
T/G 247.79
E INV.244.93

EX.SANMH#SAP13019
T/G 251.95
E INV.248.30

EX. STMMH#204

EX. STMMH
T/G 250.94

EX. STMMH
T/G 250.92

EX. QUALITY CONTROL OGS UNIT

CORE-IN AND CONNECT TO EXISTING SANITARY MANHOLE WITH KOR-N-SEAL. REBENCH PER OPSD 701.021
INV.244.90

13.0m-200mmø
SAN. @ 6.00%

2.0m-200mmø
SAN. @ 6.00%

SANMH#1A(1200ø)
T/G 247.65
S INV. 245.83
NE INV. 245.68

8.5m-300mmø
STM. @ 0.80%

CORE-IN AND
CONNECT TO EX.STMMH
INV.245.10

SIB (1546)

IMBRIUM JELLYFISH
JF4-2-1-L1
(1200mmø)
T/G 247.82
NW 245.17
S INV.245.32

N45°41'50"E 78.09

PROPOSED 4-STOREY RESIDENTIAL
APARTMENT BUILDING
36 U/G PARKING SPACES
FFE. 251.50
BFFE. 248.45

BOTTOM ELEV. 247.45

5.5m-300mmø
STM. @ 0.50%

CBMH#1(1200mmø)
C/W BIRD CAGE GRATE
PER OPSD 400.120
T/G 247.70
SE INV.245.35
N INV.245.35

20.5m-300mmø STM @ 0.50%

1.5m-300mmø
STM. @ 3.3%
(C/W BACK FLOW
PREVENTER)

STM INV.
246.40

STMMH#2(1200mmø)
T/G 248.90
SE INV. 245.48
SW INV. 246.35
NW INV. 245.45
C/W 75mmø
ORIFICE PLATE
ON NW INV.

PROPOSED
TRANSFORMER

20.5m-300mmø STM @ 0.50%

STMMH#1(1200mmø)
T/G 248.90
SE INV. 245.60
NW INV. 245.58

300mmø OUTLET
FROM TANK

TANK INV.
245.61

42,585L SWM TANKS
(NEWMARKET PRE-CAST CONCRETE
PRODUCTS LTD. OR EQUIVALENT)
C/W LOCKABLE MAINTENANCE HATCHES

TANK INV.
245.65

300mmø TANK
OUTLET CONNECTION

CB#1 (600x600mm)
T/G 248.55
SW INV. 245.69

INV.
245.67

4.0m-300mmø
STM. @ 0.5%

MAINTENANCE FRAME
AND GRATES TO MATCH
FINISHED ASPHALT

'A'
(SEE SHEET GN-1
FOR DETAIL)

INV.
245.10

NDS CB(300mmx300mm)OR EQIVALENT
C/W GALVANIZED STEEL
GRATE AND 200mmø OUTLET
T/G 245.40
INV.245.13

2.5m-200mmø
SUBDRAIN @ 1.0%

EX.CB
T/G 245.90
NW INV.245.16

CONTRACTOR TO LOCATE
EX. STORM LINE AND
PROVIDE CCTV INSPECTION
REPORT TO ENGINEER PRIOR
TO CONSTRUCTION

EXISTING
RESIDENTIAL

N41°43'50"W 74.81

N41°43'50"W 29.97

3.0m ROAD WIDENING

N41°43'50"W 71.29
(REFERENCE BEARING)

BM#1

PLANTER

BALCONY

LANDSCAPE AREA

CONC. SIDEWALK

CONCRETE RETAINING WALL

5-7% SLOPE
RAMP DOWN
TO BASEMENT.

METER INSTALLATION PER
CITY STANDARD BSD-533
C/W BACKFLOW DEVICE
PER BY-LAW 2010-102 AS
AMENDED

4.9m 305mmø WIDE ZURN Z882
TRENCH DRAIN(No. 8201) @ 1.04%
T/G 248.40
NW INV. 248.24
SW INV. 248.19

INSULATE OUTLET PIPE
PER BSD-514 AND
PROVIDE HEAT TRACING

100mmø DOMESTICE WATER
SERVICE INV. 248.30

CONNECT TO EXISTING
WATERMAIN WITH TAPPING SLEEVE
AND VALVE

200mmø FIRE SERVICE
INV. 248.30

ENTER BUILDING PER CITY
STANDARD BSD-505
AND BSD-510

SIB (1546)

BELL BOX ON
CONCRETE PAD

N48°16'10"E 78.01

INV. 247.75

EX.
HYDRO
TRNSFORMER

6.8m 200mmø
STM @ 6.4%

200mmø OUTLET C/W
RODENT GRATE AND
OUTLET PROTECTION PER
OPSD 810.010

GRAVEL

EXISTING COMMERCIAL

EX. BUS STOP PAD

EX. BELL PAD

EX. H&V

EX. V&B

EX.LS

EX.CB

EX.HP

BH#1 MW#1
BH#2 MW#2
BH#3
BH#4 MW#4
BH#101 MW#1
BH#102 MW#2
BH#103 MW#3
BH#104 MW#4
BH#105
BH#106
BH#107
BH#108

LEGEND

- PROPOSED CATCHBASIN
- PROPOSED STORM MANHOLE
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED SANITARY MANHOLE
- PROPOSED VALVE AND BOX
- PROPOSED TEE
- EX. HP
- EX. CATCHBASIN
- EX. HYDRANT
- EX. VALVE AND BOX
- EX. SANITARY MANHOLE
- EX. STORM MANHOLE
- OVERHEAD HYDRO WIRE
- TRANSFORMER LOCATION
- FCRD FLOW CONTROL ROOF DRAIN
- BH#1 BOREHOLE 2014
- BH#101 MW#1 BOREHOLE 2022 MONITORING WELL 2022
- PROPOSED LIGHTING
- PROPOSED BIO RETENTION FACILITY

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KEY MAP

NOTES

1. TOPOGRAPHIC SURVEY COMPLETED BY RUDY MAK SURVEYING LTD. O.L.S., JULY 1995 AND OCTOBER 2013.
2. SITE PLAN PROVIDED BY NAYLOR ARCHITECT INC. APRIL 6, 2022
3. REFER TO GEOTECHNICAL REPORT PREPARED BY HADDARD GEOTECHNICAL LTD. FOR BOREHOLE INFORMATION.

BENCHMARK

BM#1
TOP OF SPINDLE OF FIRE HYDRANT ELEV. 251.85

NO.	YY.MM.DD	REVISION	BY

SEAL

LICENSED PROFESSIONAL ENGINEER
J.H. VOISIN
100172759
May 4th, 2022
PROVINCE OF ONTARIO

NORTH ARROW

DESIGN BY:	D.H.
DRAWN BY:	C.A.
CHECKED	J.V.
DATE:	APRIL 2022
SCALE:	1: 200

CLIENT/PROJECT

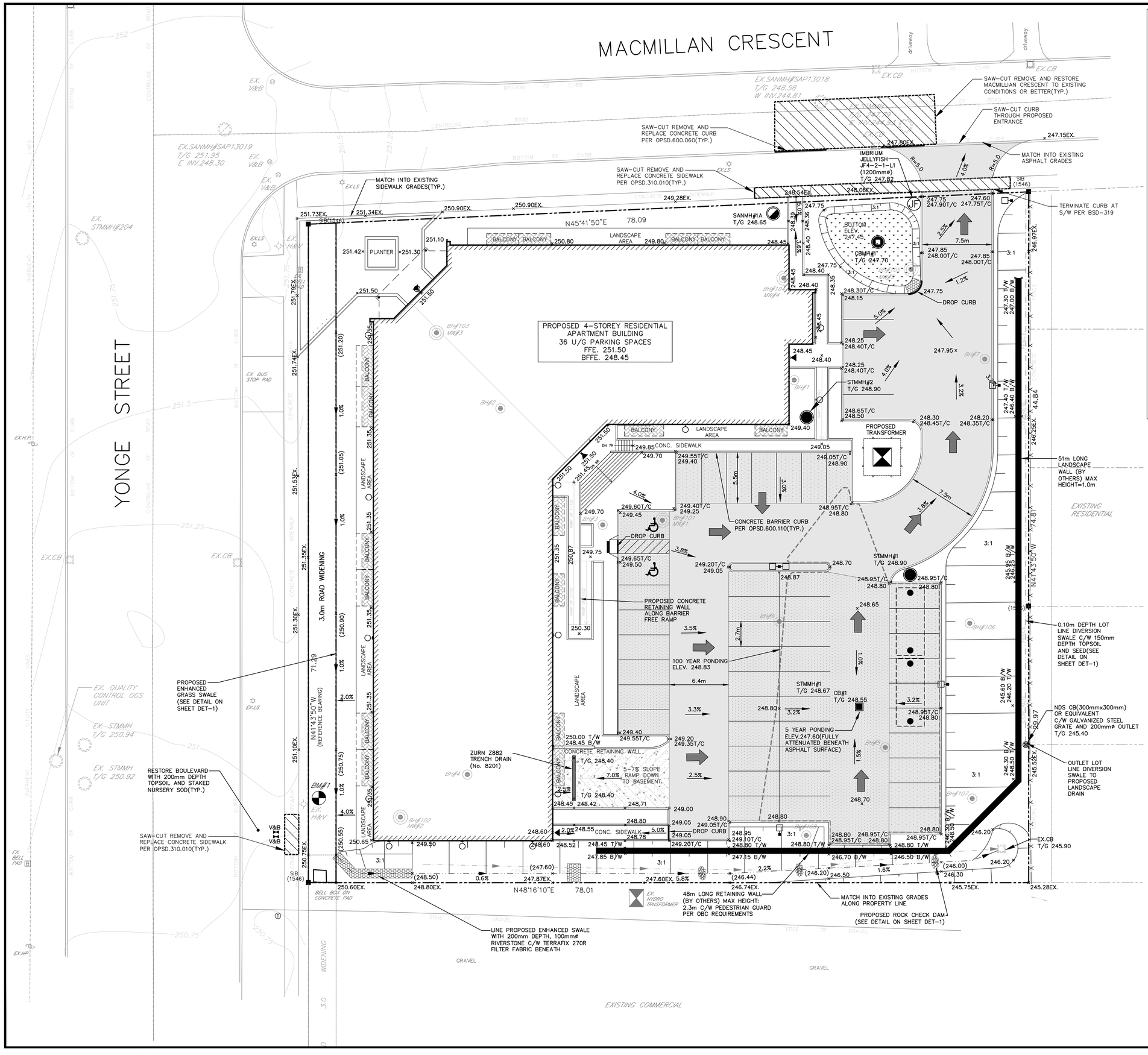
#481 YONGE STREET
APARTMENT DEVELOPMENT
BARRIE, ONTARIO

DRAWING TITLE

SITE SERVICING PLAN

PROJECT NO.	DRAWING NO.	REVISION
19-11433.1-B	SERV-1	0

G



LEGEND

- 220.00 PROPOSED ELEVATION
- (220.00) PROPOSED SWALE ELEVATION
- 220.00T/C PROPOSED TOP OF CURB
- 220.00EX. EXISTING ELEVATION
- DIRECTION OF OVERLAND FLOW
- 3.0% PROPOSED GRADE
- S — S SILT FENCE
- DITCH CENTERLINE
- PROPOSED RIVERSTONE/RIPRAP
- PROPOSED CONCRETE
- PROPOSED HEAVY DUTY ASPHALT AREA
- PROPOSED LIGHT DUTY ASPHALT AREA
- PROPOSED ROCK CHECK DAM
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED STORM MANHOLE
- PROPOSED SANITARY MANHOLE
- PROPOSED HYDRANT AND VALVE
- EX. HP/LS
- EX. CATCHBASIN
- EX. VALVE AND BOX
- EX. SANITARY MANHOLE
- EX. STORM MANHOLE
- 246.00 CONTOUR
- OVERHEAD HYDRO WIRE
- PROPOSED TRANSFORMER
- FCRD FLOW CONTROL ROOF DRAIN
- BH#3 BOREHOLE 2014
- BH#101 MW#1 BOREHOLE 2022 MONITORING WELL 2022
- PROPOSED LIGHTING
- PROPOSED BIO RETENTION FACILITY

PINESTONE ENGINEERING LIMITED | www.pel.ca

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3. REFER TO GEOTECHNICAL REPORT PREPARED BY HADDARD GEOTECHNICAL LTD. FOR BOREHOLE INFORMATION.

BENCHMARK

BM#1
TOP OF SPINDLE OF FIRE HYDRANT ELEV. 251.85

NO.	YY.MM.DD	REVISION	BY

SEAL

NORTH ARROW

DESIGN BY:	D.H.
DRAWN BY:	C.A.
CHECKED	J.V.
DATE:	APRIL 2022
SCALE:	1:200

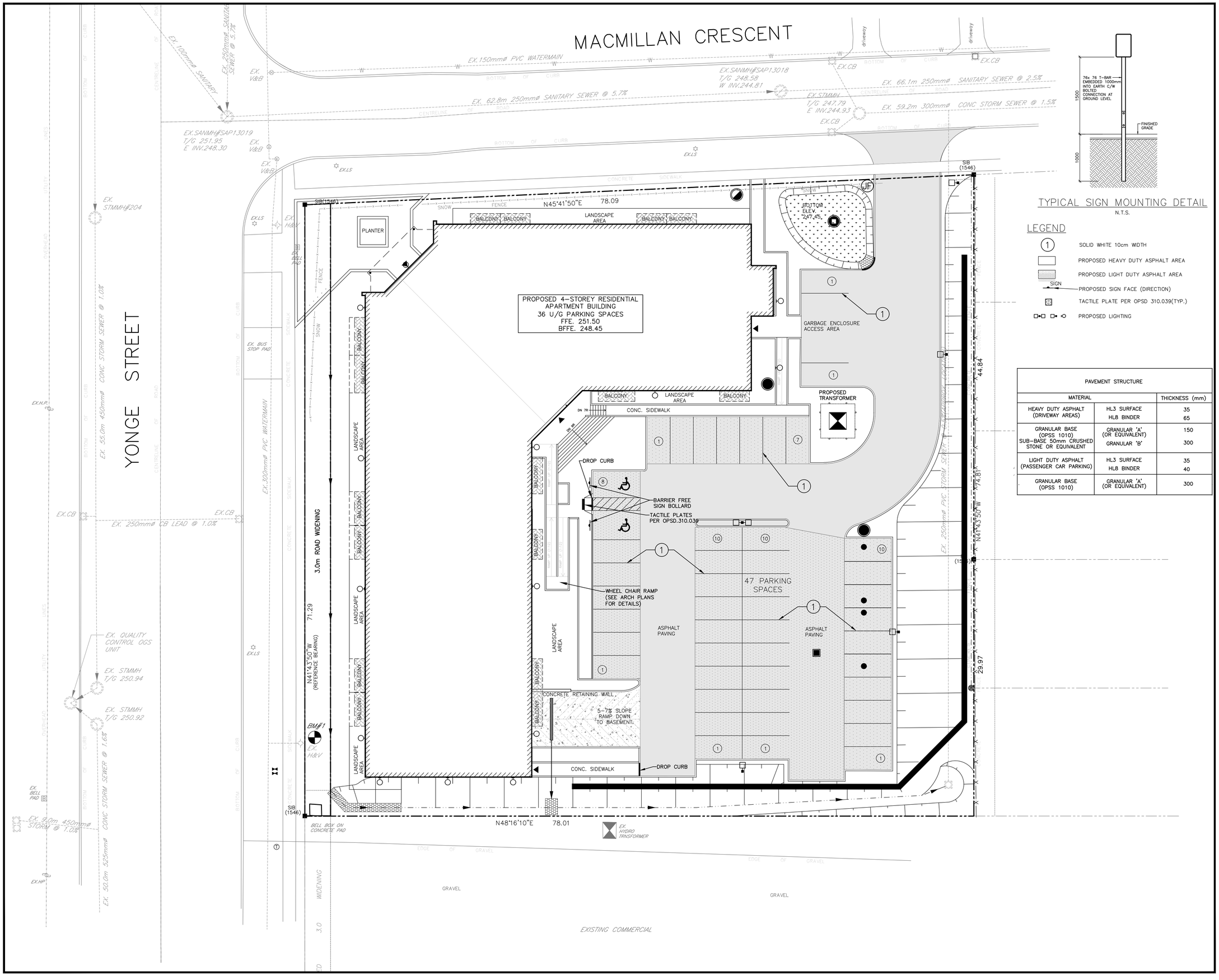
CLIENT/PROJECT

#481 YONGE STREET APARTMENT DEVELOPMENT BARRIE, ONTARIO

DRAWING TITLE

SITE GRADING PLAN

PROJECT NO.	DRAWING NO.	REVISION
19-11433.1-B	GP-1	0



TYPICAL SIGN MOUNTING DETAIL

N.T.S.

LEGEND

- (1) SOLID WHITE 10cm WIDTH
- PROPOSED HEAVY DUTY ASPHALT AREA
- PROPOSED LIGHT DUTY ASPHALT AREA
- SIGN — PROPOSED SIGN FACE (DIRECTION)
- TACTILE PLATE PER OPSD 310.039(TYP.)
- PROPOSED LIGHTING

PAVEMENT STRUCTURE		
MATERIAL		THICKNESS (mm)
HEAVY DUTY ASPHALT (DRIVEWAY AREAS)	HL3 SURFACE HL8 BINDER	35 65
GRANULAR BASE (OPSS 1010) SUB-BASE 50mm CRUSHED STONE OR EQUIVALENT	GRANULAR 'A' (OR EQUIVALENT) GRANULAR 'B'	150 300
LIGHT DUTY ASPHALT (PASSENGER CAR PARKING)	HL3 SURFACE HL8 BINDER	35 40
GRANULAR BASE (OPSS 1010)	GRANULAR 'A' (OR EQUIVALENT)	300

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BENCHMARK

BM#1
TOP OF SPINDLE OF FIRE HYDRANT ELEV. 251.85

NO.	YY.MM.DD	REVISION	BY

SEAL

LICENSED PROFESSIONAL ENGINEER
D.H. VOISIN
100172758
May 4th, 2022
PROVINCE OF ONTARIO

NORTH ARROW

DESIGN BY:	D.H.
DRAWN BY:	C.A.
CHECKED	J.V.
DATE:	APRIL 2022
SCALE:	1:200

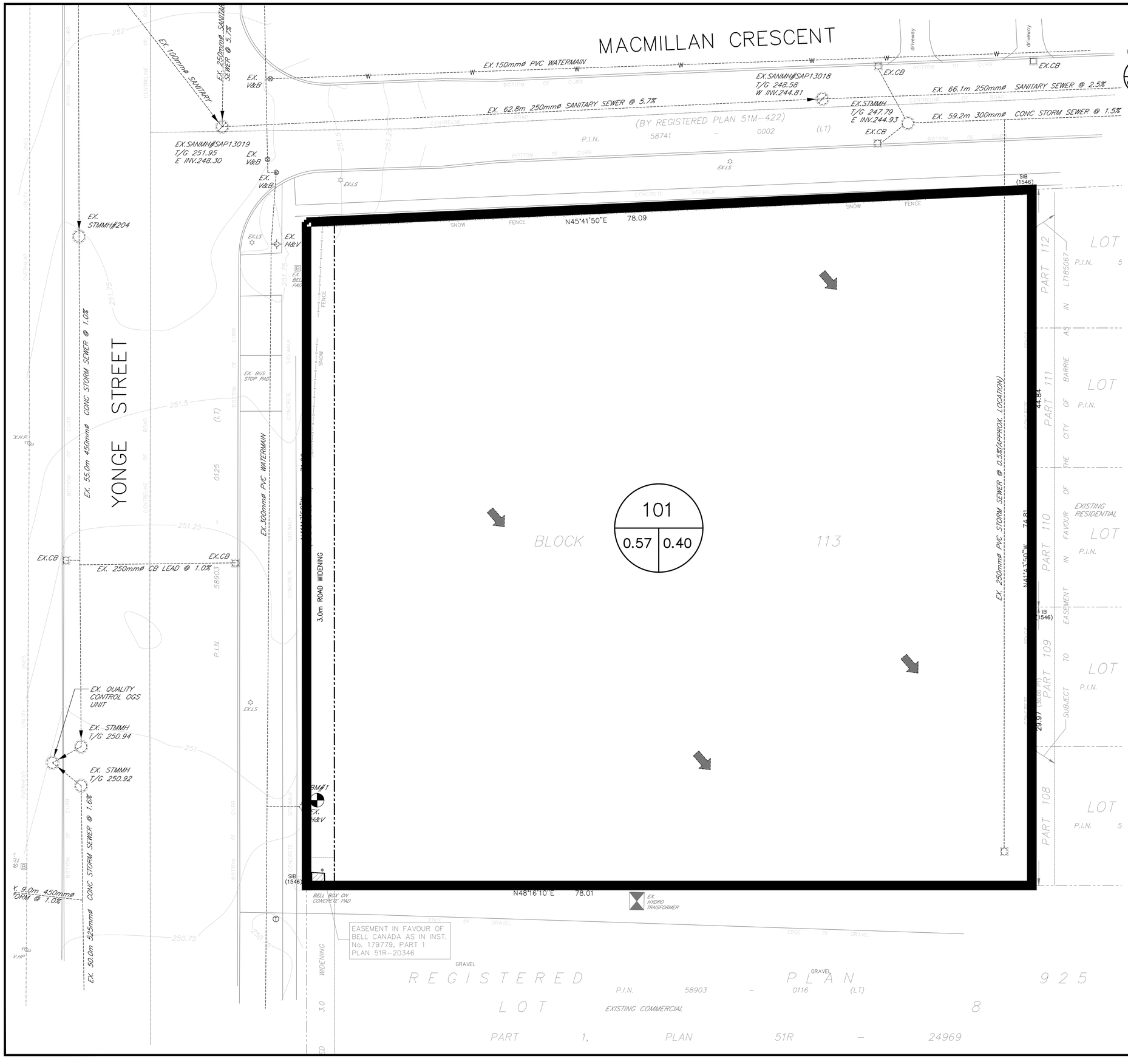
CLIENT/PROJECT

#481 YONGE STREET APARTMENT DEVELOPMENT BARRIE, ONTARIO

DRAWING TITLE

PAVEMENT PAINT MARKINGS AND SIGNAGE PLAN

PROJECT NO.	DRAWING NO.	REVISION
19-11433.1-B	PM-1	0



LEGEND

- DIRECTION OF OVERLAND FLOW
- PRE-DEVELOPMENT CATCHMENT BOUNDARY
- 101 — PRE-DEVELOPMENT CATCHMENT NUMBER
- 0.57 | 0.40 — RUN-OFF COEFFICIENT
- PRE-DEVELOPMENT CATCHMENT AREA(ha.)

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BENCHMARK

BM#1
TOP OF SPINDLE OF FIRE HYDRANT ELEV. 251.85

NO.	YY.MM.DD	REVISION	BY

SEAL

LICENSED PROFESSIONAL ENGINEER
J.A. VOISIN
100172758
May 4th, 2022
PROVINCE OF ONTARIO

NORTH ARROW

DESIGN BY:	J.V.
DRAWN BY:	J.L.
CHECKED	J.V.
DATE:	APRIL 2022
SCALE:	1:200

CLIENT/PROJECT

#481 YONGE STREET
APARTMENT DEVELOPMENT
BARRIE, ONTARIO

DRAWING TITLE

PRE DEVELOPMENT CATCHMENT PLAN

PROJECT NO.	DRAWING NO.	REVISION
19-11433-B	PRE-1	0

MACMILLAN CRESCENT

YONGE STREET

EX. 100mmø SANITARY

EX. 2500mmø SANITARY SEWER @ 5.7%

EX. V&B

EX. 150mmø PVC WATERMAIN

EX. 62.8m 250mmø SANITARY SEWER @ 5.7%

EX.SANMH#SAP13018
T/G 248.58
W INV.244.81
S INV. 244.90

EX. 66.1m 250mmø SANITARY SEWER @ 2.5%

EX.STMMH
T/G 247.79
E INV.244.93

EX. 59.2m 300mmø CONC STORM SEWER @ 1.5%

CORE-IN AND CONNECT TO EXISTING SANITARY MANHOLE WITH KOR-N-SEAL. REBENCH PER OPSD 701.021
INV.244.90

EX.CB

driveway

(BY REGISTERED PLAN 51M-422)

P.I.N. 58741 0002 (LT)

13.0m-200mmø SAN. @ 6.00%

EX.SANMH#SAP13019
T/G 251.95
E INV.248.30

EX. STMMH#204

EX. H&V

EX.LS

2.0m-200mmø SAN. @ 6.00%

SANMH#1A(1200ø)
T/G 247.65
S INV. 245.83
NE INV. 245.68

8.5m-300mmø STM. @ 0.80%

CORE-IN AND CONNECT TO EX.STMMH
INV.245.10

SIB (1546)

204
0.083 0.36

PROPOSED 4-STOREY RESIDENTIAL APARTMENT BUILDING
36 U/G PARKING SPACES
FFE. 251.50
BFFE. 248.45

N45°41'50"E 78.09

FENCE

LANDSCAPE

BALCONY

SAN INV. 246.25

PLANTER

BOTTOM ELEV. 247.45

5.5m-300mmø STM. @ 0.50%

IMBRIUM JELLYFISH
JF4-2-1-L1
(1200mmø)
T/G 247.82
NW 245.17
S INV.245.32

CBMH#1(1200mmø)
C/W BIRD CAGE GRATE
PER OPSD.400.120
T/G 247.70
SE INV.245.35
N INV.245.35

20.5m-200mmø STM @ 0.50%

STMMH#2(1200mmø)
T/G 248.90
SE INV. 245.48
SW INV. 246.35
NW INV. 245.45
C/W 75mmø
ORIFICE PLATE
ON NW INV.

202
0.065 0.70

1.5m-300mmø STM. @ 3.3%
(C/W BACK FLOW PREVENTER)

STM INV. 246.40

PROPOSED TRANSFORMER

CONC. SIDEWALK

DN 7%

20.3m-300mmø STM @ 0.50%

44.84

STMMH#1(1200mmø)
T/G 248.90
SE INV. 245.60
NW INV. 245.58

'A'

201
0.33 0.93

300mmø OUTLET FROM TANK

TANK INV. 245.61

42,585L SWM TANKS
(NEWMARKET PRE-CAST CONCRETE PRODUCTS LTD. OR EQUIVALENT)
C/W LOCKABLE MAINTENANCE HATCHES

300mmø TANK OUTLET CONNECTION

TANK INV. 245.65

CB#1 (600x600mm)
T/G 248.55
SW INV. 245.69

INV. 245.67

4.0m-300mmø STM. @ 0.5%

INV. 245.10

MAINTENANCE FRAME AND GRATES TO MATCH FINISHED ASPHALT

'A'
(SEE SHEET GN-1 FOR DETAIL)

NDS CB(300mmx300mm)OR EQ
C/W GALVANIZED STEEL GRATE AND 200mmø OUTLET
T/G 245.40
INV.245.13

2.5m-200mmø SUBDRAIN @ 1.0%

EX.CB
T/G 245.90
NW INV.245.16

CONTRACTOR TO LOCATE EX. STORM LINE AND PROVIDE CCTV INSPECTION REPORT TO ENGINEER PRIO TO CONSTRUCTION

EX. 250mmø PVC STORM SEWER @ 0.50%

29.97

3.0m ROAD WIDENING

LANDSCAPE AREA

CONCRETE RETAINING WALL

5-7% SLOPE RAMP DOWN TO BASEMENT

4.9m 305mmø WIDE ZURN Z882 TRENCH DRAIN(No. 8201) @ 1.04%
T/G 248.40
NW INV. 248.24
SW INV. 248.19

METER INSTALLATION PER CITY STANDARD BSD-533
C/W BACKFLOW DEVICE
PER BY-LAW 2010-102 AS AMENDED

INSULATE OUTLET PIPE PER BSD-514 AND PROVIDE HEAT TRACING

CONC. SIDEWALK

BM#1

EX. H&V

100mmø DOMESTIC WATER SERVICE INV. 248.30

CONNECT TO EXISTING WATERMAIN WITH TAPPING SLEEVE AND VALVE

200mmø FIRE SERVICE INV. 248.30

ENTER BUILDING PER CITY STANDARD BSD-505 AND BSD-510

BELL BOX ON CONCRETE PAD

EASEMENT IN FAVOUR OF BELL CANADA AS IN INST. No. 179779, PART 1 PLAN 51R-20346

N48°16'10"E 78.01

INV. 247.75

EX. HYDRO TRANSFORMER

203
0.091 0.31

6.8m 200mmø STM @ 6.4%

200mmø OUTLET C/W RODENT GRATE AND OUTLET PROTECTION PER OPSD 810.010

EX. QUALITY CONTROL OGS UNIT

EX. STMMH
T/G 250.94

EX. STMMH
T/G 250.92

EX. 50.0m 525mmø CONC STORM SEWER @ 1.6%

EX. 55.0m 450mmø CONC STORM SEWER @ 1.0%

EX. 100mmø PVC WATERMAIN

EX. BUS STOP PAD

EX.CB

EX. 250mmø CB LEAD @ 1.0%

450mmø @ 1.0%

EXISTING RESIDENTIAL

EXISTING COMMERCIAL

REGISTERED PLAN 925

LOT 8 PART 1, PLAN 51R - 24969

P.I.N. 58903 - 0116 (LT)

P.I.N. 58903 (LT) LT185067 PART 112

P.I.N. 58903 PART 111

P.I.N. 58903 PART 110

P.I.N. 58903 PART 109

P.I.N. 58903 PART 108

LEGEND

- DIRECTION OF MAJOR OVERLAND FLOW
- POST-DEVELOPMENT CATCHMENT BOUNDARY
- 201 / 0.33 | 0.55 — POST-DEVELOPMENT CATCHMENT NUMBER / RUN-OFF COEFFICIENT / POST-DEVELOPMENT CATCHMENT AREA(ha.)

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BENCHMARK

BM#1
TOP OF SPINDLE OF FIRE HYDRANT ELEV. 251.85

NO.	YY.MM.DD	REVISION	BY

SEAL

LICENSED PROFESSIONAL ENGINEER
A.H. VOISIN
100172758
May 4th, 2022
PROVINCE OF ONTARIO

NORTH ARROW

DESIGN BY:	J.V.
DRAWN BY:	J.L.
CHECKED	J.V.
DATE:	APRIL 2022
SCALE:	1:200

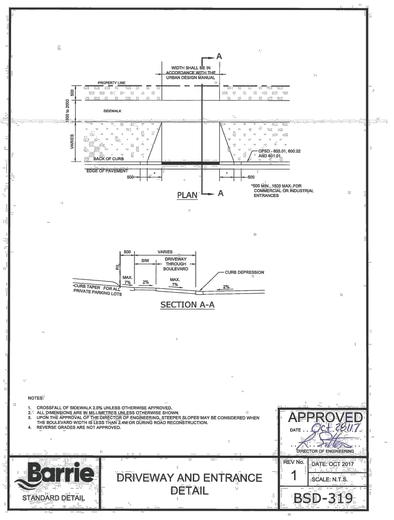
CLIENT/PROJECT

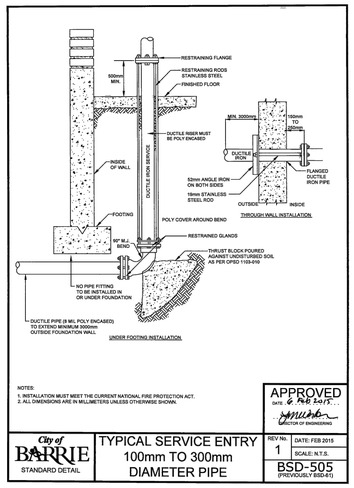
#481 YONGE STREET APARTMENT DEVELOPMENT BARRIE, ONTARIO

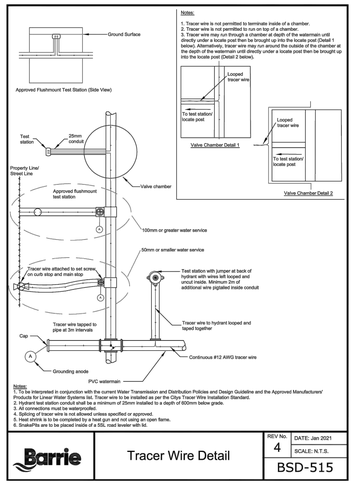
DRAWING TITLE

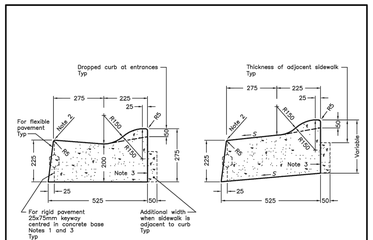
POST DEVELOPMENT CATCHMENT PLAN

PROJECT NO.	DRAWING NO.	REVISION
19-11433-B	POST	0





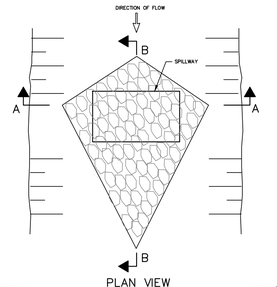




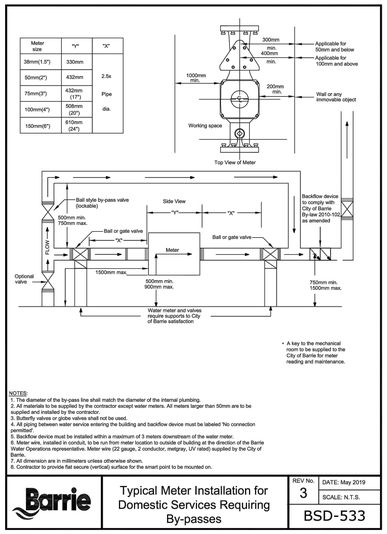
LEGEND:
S = Rate of pavement superelevation in percent, %.

NOTES:
1 When curb and gutter is adjacent to concrete pavement or base, this drawing shall be used in conjunction with OPSD 552.010 and 552.020.
2 Flexible and composite pavement shall be placed 5mm above the adjacent edge of gutter.
3 For slipforming procedure a 5% batter is acceptable.
A Treatment at entrances shall be according to OPSD 351.010.
B Outlet treatment shall be according to the OPSD 610 Series.
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev 2
CONCRETE SEMI-MOUNTABLE CURB WITH STANDARD GUTTER		
	OPSD 600.060	



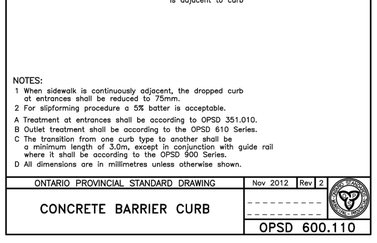
ROCK CHECK DAM DETAIL
NTS



* A key to the mechanical room to be supplied to the City of Barrie for meter reading and maintenance.

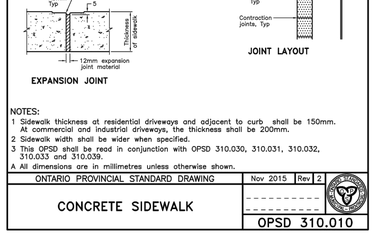
NOTES:
1. The diameter of the by-pass line shall match the diameter of the internal plumbing.
2. All materials to be supplied by the contractor except water meters. All meters larger than 50mm are to be supplied and installed by the contractor.
3. Butterfly valves or globe valves shall not be used.
4. All piping between water service entering the building and backflow device must be labeled 'No connection permitted'.
5. Backflow device must be installed within a maximum of 3 meters downstream of the water meter.
6. Meter wire, installed in conduit, to be run from meter location to outside of building at the direction of the Barrie Water Operations representative. Meter wire (22 gauge, 2 conductor, metgray, UV rated) supplied by the City of Barrie.
7. All dimensions are in millimeters unless otherwise shown.
8. Contractor to provide flat secure (vertical) surface for the smart point to be mounted on.

Barrie
Typical Meter Installation for Domestic Services Requiring By-passes
REV No. 3
DATE: May 2019
SCALE: N.T.S.
BSD-533



NOTES:
1 When sidewalk is continuously adjacent, the dropped curb at entrances shall be reduced to 75mm.
2 For slipforming procedure a 5% batter is acceptable.
A Treatment at entrances shall be according to OPSD 351.010.
B Outlet treatment shall be according to the OPSD 610 Series.
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.
D All dimensions are in millimetres unless otherwise shown.

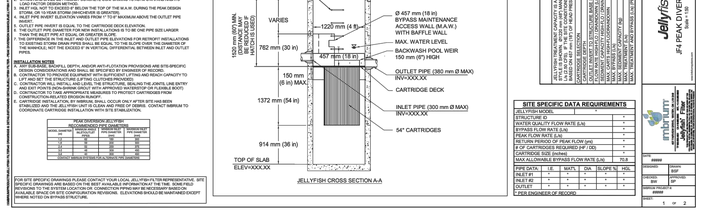
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev 2
CONCRETE BARRIER CURB		
	OPSD 600.110	

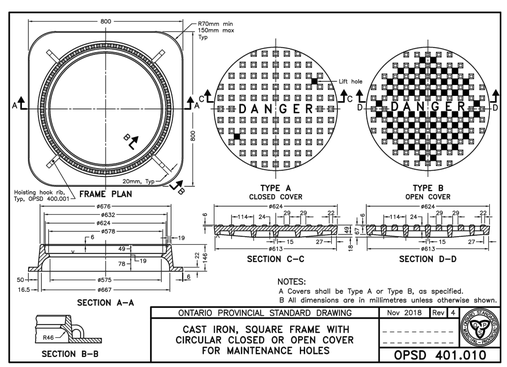


NOTES:
1 Sidewalk thickness at residential driveways and adjacent to curb shall be 150mm. At commercial and industrial driveways, the thickness shall be 200mm.
2 Sidewalk width shall be wider when specified.
3 This OPSD shall be read in conjunction with OPSD 310.030, 310.031, 310.032, 310.033 and 310.039.
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
CONCRETE SIDEWALK		
	OPSD 310.010	

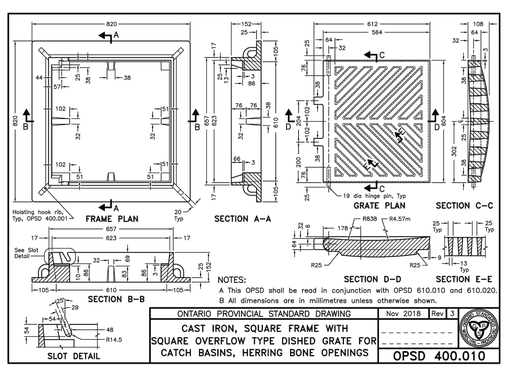
DRAWING NOT TO BE USED FOR CONSTRUCTION





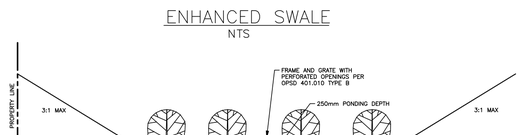
NOTES:
A Covers shall be Type A or Type B, as specified.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 4
CAST IRON, SQUARE FRAME WITH CIRCULAR CLOSED OR OPEN COVER FOR MAINTENANCE HOLES		
	OPSD 401.010	

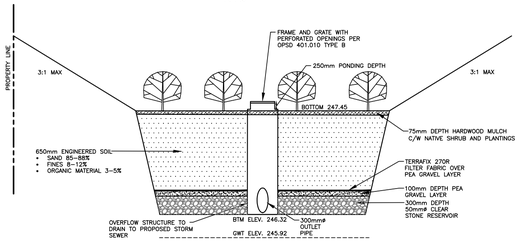


NOTES:
A This OPSD shall be read in conjunction with OPSD 610.010 and 610.020.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 3
CAST IRON, SQUARE FRAME WITH SQUARE OVERFLOW TYPE DISHED GRATE FOR CATCH BASINS, HERRING BONE OPENINGS		
	OPSD 400.010	



ENHANCED SWALE
NTS



BIORETENTION FACILITY
N.T.S.

The position of existing above ground and underground utilities and facilities are not necessarily shown on the drawings, and where shown, the accuracy of the position of such utilities and facilities is not guaranteed. Before starting work, the contractor shall confirm the exact location of all existing utilities and facilities, and shall assume all liability for damage to them

Drawings shall not be used for construction unless sealed and signed. All work to be performed in accordance with the Occupational Health & Safety Act 1990.

Any errors and/or omissions shall be reported to Pinestone Engineering Ltd. without delay.

KEY MAP

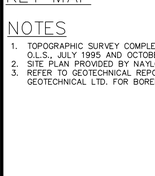
NOTES
1. TOPOGRAPHIC SURVEY COMPLETED BY RUDY MAK SURVEYING LTD. O.L.S., JULY 1995 AND OCTOBER 2013.
2. SITE PLAN PROVIDED BY NAYLOR ARCHITECT INC. APRIL 6, 2022
3. REFER TO GEOTECHNICAL REPORT PREPARED BY HADDARD GEOTECHNICAL LTD. FOR BOREHOLE INFORMATION.

BENCHMARK

BM#1
TOP OF SPINDLE OF FIRE HYDRANT ELEV. 251.85

NO.	YY.MM.DD	REVISION	BY

SEAL



NORTH ARROW

DESIGN BY:	J.V.
DRAWN BY:	J.L.
CHECKED	J.V.
DATE:	APRIL 2022
SCALE:	1: 200

CLIENT/PROJECT

#481 YONGE STREET
APARTMENT DEVELOPMENT
BARRIE, ONTARIO

DRAWING TITLE

STANDARD AND CONSTRUCTION DETAILS

PROJECT NO.	DRAWING NO.	REVISION
19-11433-B	DET-1	0

GENERAL NOTES

1. DRAWINGS

A. ALL DRAWINGS SHALL BE PRODUCED IN ACCORDANCE WITH CURRENT CITY OF BARRIE STANDARDS & SYMBOLS FOR PLAN & PROFILE DRAWINGS, GENERAL SERVICE PLANS AND LOT GRADING PLANS.

2. MEASUREMENTS

A. ALL DIMENSIONS ARE IN METRES, EXCEPT PIPE DIAMETERS, WHICH ARE IN MILLIMETRES, UNLESS SPECIFIED OTHERWISE.

3. GENERAL

A. ALL WORK SHALL BE IN ACCORDANCE WITH CURRENT CITY OF BARRIE STANDARD DRAWINGS (BSD) AND ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD).

B. ORDER OF PRECEDENCE OF STANDARD DRAWINGS IS FIRSTLY CITY OF BARRIE STANDARD DRAWINGS (BSD) AND SECONDLY ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD).

C. LOCATION OF EXISTING SERVICES ARE NOT GUARANTEED. THE CONTRACTOR IS REQUIRED TO NOTIFY THE VARIOUS UTILITY COMPANIES 48 HOURS PRIOR TO THE COMMENCEMENT OF ANY WORK.

D. A ROAD OCCUPANCY PERMIT IS REQUIRED FROM THE ROADS AND PARKS OPERATIONS BRANCH PRIOR TO THE COMMENCEMENT OF WORK WITHIN ANY CITY RIGHT-OF-WAY.

E. A SITE ALTERATION PERMIT IS REQUIRED FROM THE ENGINEERING DEPARTMENT PRIOR TO THE COMMENCEMENT OF ANY EARTH WORKS ON THE SITE.

F. NATIVE MATERIAL, SUITABLE FOR BACKFILL, SHALL BE COMPACTED TO 95% STANDARD PROCTOR MAXIMUM DRY DENSITY.

G. GRANULAR MATERIAL , USED FOR BACKFILL , SHALL BE PLACED IN LAYERS 150mm IN DEPTH MAXIMUM AND COMPACTED TO 100% STANDARD PROCTOR MAXIMUM DRY DENSITY.

H. ALL DISTURBED AREAS ARE TO BE REINSTATED TO THEIR ORIGINAL CONDITION OR BETTER, AS DETERMINED BY THE CITY ENGINEERING DEPARTMENT.

I. ALL SILT CONTROL AND EROSION PROTECTION DEVICES ARE TO BE IN PLACE PRIOR TO THE COMMENCEMENT OF CONSTRUCTION AND SHALL REMAIN IN PLACE AND BE MAINTAINED BY THE CONTRACTOR UNTIL CONSTRUCTION IS COMPLETE AND THE GRASS HAS ESTABLISHED GROWTH, SUBJECT TO APPROVAL BY THE CITY ENGINEERING DEPARTMENT.

CITY OF BARRIE STANDARD	NO.	REVISION	APR'D	DATE	APR'D: R.G.N.	DATE: 92.05.15
GENERAL NOTES	3.	3. NOTE: 3.E. REVISED & 3.I. ADDED	J.S.	05.01.10	DRAWN: L.A.J.	SCALE: N.T.S.
	2.	3.D. – "ENGINEERING DEPARTMENT"	B.R.	02.10.28		
	1.	3.E. TOPSOIL PERMIT		01.12.06		BSD-N6

GENERAL NOTES – STORM SEWER

STORM SEWER

A. STORM SEWER TO BE PROVIDED ON ALL ROADS WITH CURB AND GUTTER.

B. PLACE ALL CATCH BASIN LATERALS AT 2% GRADE UNLESS OTHERWISE NOTED. PIPE SIZE MINIMUM 250mm DIA. SINGLE , 300mm DIA. DOUBLE.

C. STORM SEWERS SHALL BE CONSTRUCTED WITH BEDDING AS PER OPSD-802.010 (GRAN. 'A' EMBEDMENT MATERIAL) FOR FLEXIBLE PIPES AND OPSD-802.030 OR 802.031 CLASS B (GRAN. 'A' BEDDING MATERIAL) OR RIGID PIPE UNLESS OTHERWISE APPROVED BY THE DIRECTOR OF ENGINEERING.

D. MAINTENANCE HOLE TOPS (FRAMES) AND CATCH BASIN (FRAMES) ARE TO BE SET TO BASE COURSE ASPHALT GRADE AND THEN ADJUSTED TO FINAL GRADE WHEN THE TOP LIFT OF ASPHALT IS PLACED. ALL ADJUSTMENT WILL BE ACCORDANCE WITH BSD-N2.

E. STORM SEWER TO BE LOCATED OFFSET 3.0m SOUTH OR EAST OF CENTRELINE UNLESS OTHERWISE SPECIFIED.

F. ALL CONNECTIONS TO THE STORM MAIN SHALL BE MADE WITH A STORM MANHOLE OR APPROVED FACTORY TEE CONNECTION AS PER OPSD-708.01 OR 708.03.

G. PIPE MATERIAL TO BE REINFORCED CONCRETE WITH A MINIMUM STRENGTH OF 50 N/m/mm CERTIFIED TO C.S.A. STANDARD A247.2–1982, CLASS 50–D (PREVIOUSLY C.S.A. STANDARD A257.2–1974, CLASS II) OR PVC CERTIFIED TO C.S.A. STANDARDS 182.2 AND 182.4.

H. STORM SEWER TO BE MINIMUM 300mm DIAMETER WITH JOINTS CONFORMING TO C.S.A. STANDARD A257.3.

I. ALL PIPE BEDDING MUST CONFORM TO OPSD, MAXIMUM COVER TABLE. NO FLEXIBLE PIPE SEWERS WILL BE INSTALLED WITH A DEPTH OF COVER GREATER THAN 6 METRES UNLESS SPECIFICALLY APPROVED BY THE DIRECTOR OF ENGINEERING.

J. ALL PIPE HANDLING INSTALLATIONS MUST BE IN STRICT COMPLIANCE WITH MANUFACTURES INSTALLATION GUIDES AND THE C.C.P.A. OR UNIBELL GUIDELINES.

K. SUMP PUMP DISCHARGE PIPING IN BOULEVARD:
IN THE EVENT OF OVERACTIVE SUMP PUMP ACTIVITY, A 150mm DIAMETER PVC DR–28 SEWER MAY BE INSTALLED, WHEN SO DIRECTED BY THE DIRECTOR OF ENGINEERING, ALONG THE FRONTAGES OF DESIGNATED LOTS, WITH AN OFFSET OF 0.6m FROM BACK OF CURB. THIS SEWER IS TO BE CAPPED AT THE UPSTREAM END AND IS TO OUTLET INTO THE NEAREST CATCHBASIN DOWNSTREAM. DEPTH OF SEWER IS TO BE EQUAL TO SUBDRAIN DEPTH. NOT TO BE DIRECTLY CONNECTED TO FOUNDATION DRAINS.

CITY OF BARRIE STANDARD	NO.	REVISION	APR'D	DATE	APR'D: R.G.N.	DATE: 92.05.15
GENERAL NOTES STORM SEWERS	4.	NOTE 'K' – SUMP PUMP DISCHARGE PIPING	B.R.	2003.01.07	DRAWN: L.A.J.	SCALE: N.T.S.
	3.	NOTE 'I' & 'C' – "DIRECTOR OF ENGINEERING"	B.R.	2002.10.28		
	2.	NOTE "C" OPSD NUMBER REVISION	K.C.	2000.03.16		
	1.	NOTE "D" CHANGED	K.C.	98.03.30		BSD-N5

GENERAL NOTES - WATERMAIN

1. CONTRACTORS SHALL INFORM THE CITY OF BARRIE WATER OPERATIONS DEPARTMENT A MINIMUM OF 48 HOURS IN ADVANCE OF THEIR INTENTIONS TO PERFORM WORK ON WATER INFRASTRUCTURE.

2. OPERATION OF HYDRANTS AND VALVES ON THE POTABLE WATER SYSTEM BY OTHER THAN QUALIFIED WATER OPERATIONS STAFF IS PROHIBITED BY CURRENT BY-LAW. CITY SERVICE FEES ARE PER THE CURRENT FEES BY-LAW. THE CITY'S WATER OPERATIONS STAFF WILL SWAB, PRESSURE TEST, CHLORINATE AND FLUSH ALL NEW WATERMAINS.

3. MINIMUM COVER OVER WATERMAIN SHALL BE 1.7m. THE MINIMUM HORIZONTAL SEPARATION BETWEEN WATERMAIN AND SEWERS SHALL BE 2.5m; WHERE WATERMAIN CONFLICTS WITH SEWER PIPES, DEFLECT WATERMAIN HORIZONTALLY OR VERTICALLY WHILE PROVIDING A MINIMUM OF 0.5m CLEARANCE BETWEEN WATERMAIN AND SEWERS. MAINTAIN MINIMUM DEPTH OF COVER AT ALL TIMES.

4. WATERMAIN SHALL BE INSTALLED IN BEDDING AS PER OPSD 802.010 (GRANULAR 'A' EMBEDMENT MATERIAL) FOR FLEXIBLE PIPES AND OPSD 802.030 OR 802.031 CLASS 'B' (GRANULAR 'A' BEDDING MATERIAL, GRANULAR 'A' OR SELECT NATIVE COVER MATERIAL) FOR RIGID PIPE UNLESS OTHERWISE APPROVED BY THE DIRECTOR OF WATER OPERATIONS. ALTERNATIVE EMBEDMENT MATERIAL - SAND MEETING GRADATION REQUIREMENTS OF OPSS.MUNI 1004.05.07 COMPACTED TO 95% STANDARD PROCTOR MAXIMUM DRY DENSITY IS PERMISSIBLE WHERE NOTED IN STANDARD DETAILS. GEOTECHNICAL CERTIFICATION OF MATERIAL AND COMPACTION TESTING MUST BE PROVIDED EVERY 150 METRES. THE COMPACTION TESTING MUST INCLUDE THE ENTIRE EMBEDMENT ENVELOPE (HAUNCHES, BEDDING, TOP OF PIPE AND COVER).

5. COPPER WATER MAINS AND SERVICES 25mm TO 50mm IN DIAMETER SHALL BE EMBEDDED IN SAND 100mm ABOVE AND BELOW TO CONFORM TO OPSS.MUNI 1004.05.07.

6. RESTRAINING WILL BE REQUIRED ON ALL HYDRANTS, THRUST BLOCKS, AS PER OPSD 1103.010 AND 1103.020. RESTRAINING DEVICES MAY BE REQUIRED IN ADDITION TO STANDARD CONCRETE THRUST BLOCKING WHERE SOIL CONDITIONS WARRANT AT THE CITY'S DISCRETION.

7. NEW WATERMAINS TO BE PVC DR18 CL150 MINIMUM; DUCTILE IRON CL52 AS PER THE APPROVED MANUFACTURERS PRODUCTS FOR LINEAR WATER SYSTEMS LIST.

8. TRACING WIRE SHALL BE #12 AWG HIGH STRENGTH COPPER CLAD (HS-CSS) AND SHALL BE INSTALLED ON THE TOTAL LENGTH OF ALL WATERMAIN AND BROUGHT UP AT EACH HYDRANT AND CONNECTED TO FLANGE BOLT. ALL SPLICES TO UTILIZE CONNECTORS AS PER THE APPROVED MANUFACTURERS PRODUCTS FOR LINEAR WATER SYSTEMS LIST.

9. ALL WATER SERVICES SHALL BE MINIMUM 25mm TYPE 'K' COPPER OR 25mm CROSS-LINKED POLYETHYLENE UNLESS OTHERWISE APPROVED BY THE DIRECTOR OF WATER OPERATIONS. WATER SERVICE SADDLES SHALL BE USED WHEN TAPPING INTO PVC WATERMAIN.

10. SERVICE TAPPINGS SHALL BE PLACED AT A MINIMUM SEPARATION OF 1.0m AND A MINIMUM OF 0.6m FROM JOINTS. (ENDS OF PIPE)

11. RISER PIPES ARE TO BE INSTALLED AS PER BSD-510, AND REMOVED AS DIRECTED. SWABBING SCHEDULE TO BE SUPPLIED BY A WATER OPERATIONS FIELD REPRESENTATIVE. ALL RISERS ARE TO BE RESTRAINED OR THRUST BLOCKED.

12. ALL NEW CURB STOPS AND BOXES TO BE LOCATED AT PROPERTY LINE AND OUT OF DRIVEWAYS AND SIDEWALKS.

City of BARRIE STANDARD DETAIL	GENERAL NOTES - WATERMAIN	REV No. 2	DATE: MAY 2015	APPROVED DATE May 29/15 DIRECTOR OF ENGINEERING
			SCALE: N.T.S.	
		BSD-500		

PARKING LOT/DRIVEWAY NOTES

1) EXISTING SOILS AND GRANULAR MATERIALS TO BE REMOVED TO THE LIMITS SHOWN ON THE DRAWINGS AND ANY SURPLUS IS TO BE DISPOSED OFF–SITE AT A LOCATION CHOSEN BY, AND PAID FOR, BY THE CONTRACTOR.

2) PROPOSED SUB–GRADE TO BE INSPECTED AND PROOF–ROLLED IN THE PRESENCE OF THE GEOTECHNICAL ENGINEER AND APPROVED PRIOR TO PLACEMENT OF GRANULAR "B". DEFICIENT AREAS ARE TO BE SUB–EXCAVATED AND REPLACED WITH GRANULAR "B" AS DIRECTED BY THE GEOTECHNICAL ENGINEER.

3) THE GRANULAR SUB–BASE IS TO BE INSPECTED AND PROOF–ROLLED IN THE PRESENCE OF THE GEOTECHNICAL ENGINEER AND APPROVED PRIOR TO PLACEMENT OF THE GRANULAR "A".

4) THE GRANULAR BASE IS TO BE INSPECTED AND PROOF–ROLLED IN THE PRESENCE OF THE GEOTECHNICAL ENGINEER AND APPROVED PRIOR TO PLACEMENT OF THE ASPHALT.

5) CONTRACTOR TO PROVIDE SAMPLES OF GRANULAR MATERIALS AND THE ASPHALT MIX DESIGNS TO THE GEOTECHNICAL ENGINEER PRIOR TO CONSTRUCTION.

6) GRANULAR MATERIALS TO BE UNIFORMLY COMPACTED TO MINIMUM 100% STANDARD PROCTOR MAXIMUM DRY DENSITY. HOT LAID ASPHALT TO BE ROLLED UNIFORMLY TO A MINIMUM OF 97% MARSHALL BULK DENSITY.

7) GRASSED AREAS DISTURBED DURING CONSTRUCTION TO BE RESTORED WITH MINIMUM 200mm TOPSOIL AND SOD.

8) TOPSOIL SHALL CONFORM TO OPSS 570, EXCEPT THAT TOPSOIL SHALL CONTAIN NOT LESS THAN 4% ORGANIC MATTER FOR CLAY LOAMS AND NOT LESS THAN 2% FOR SANDY LOAMS, WITH AN ACIDITY VALUE RANGING FROM P.H. 6.0 TO P.H. 7.5 AND CAPABLE OF SUSTAINING VIGOROUS PLANT GROWTH. IT SHALL BE FREE FROM ANY ADMIXTURE OF SUBSOIL, CLAY LUMPS, STONES GREATER THAN 25MM IN DIAMETER AND ANY OTHER EXTRANEOUS MATTER.

9) SOD SHALL CONFORM TO OPSS 571.

RESTORATION NOTES

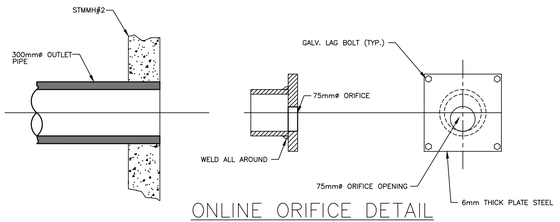
A. REINSTATE ROADS TO PREVIOUS CONDITION OR BETTER. MINIMUM 40mm HL3, 100mm HL4, 150mm GRANULAR 'A AND 500mm GRANULAR 'B'

B. CONTRACTOR TO RESTORE DRIVEWAYS AND BOULEVARD IN AREAS DISTURBED BY CONSTRUCTION TO EQUAL OR BETTER CONDITIONS.

C. MINIMUM GRAVEL DRIVEWAY RESTORATION TO BE 150mm, GRANULAR 'A'. ASPHALT DRIVEWAY RESTORATION TO BE 50mm OF HL3. AND 200mm GRANULAR 'A'

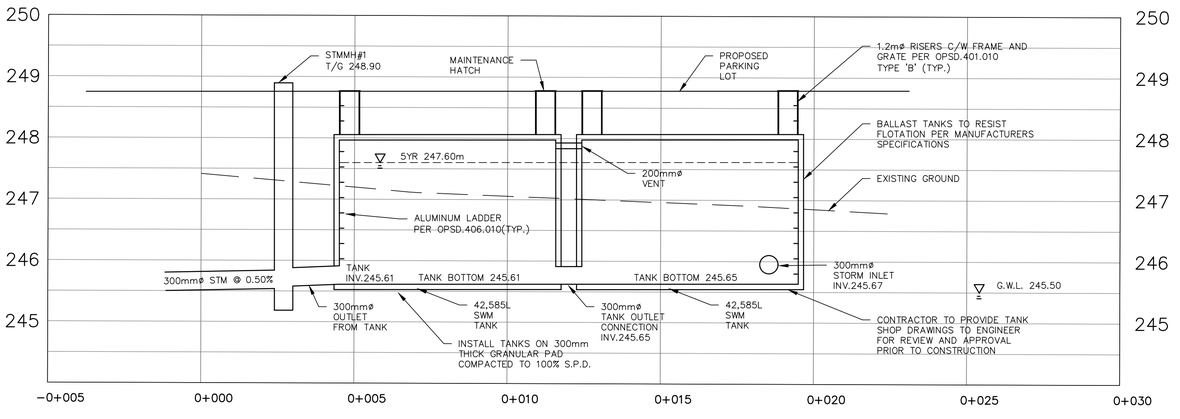
D. ALL GRASSED AREAS DISTURBED DURING CONSTRUCTION SHALL BE RESTORED WITH 200mm DEPTH TOPSOIL AND SOD. MAINTAIN UNTIL ESTABLISHED.

E. ALL RESTORATION WORK TO BE COMPLETED TO THE SATISFACTION OF THE ENGINEER. F. DRIVEWAYS TO BE 50mm HL3 WITH 200mm GRANULAR 'A' MINIMUM.



ONLINE ORIFICE DETAIL

N.T.S.



SECTION A–A

SCALE H=1:100
V=1:50

GENERAL NOTES – SANITARY SEWER

SANITARY SEWERS

A. SANITARY SEWER TO BE LOCATED AT THE CENTRELINE OF THE ROAD.

B. SEWERS SHALL BE CONSTRUCTED WITH BEDDINGS AS PER OPSD–802.010, (GRAN. 'A' EMBEDMENT MATERIAL) FOR FLEXIBLE PIPES AND OPSD–802.030 OR 802.031 CLASS B (GRAN. 'A' BEDDING MATERIAL) FOR RIGID PIPE UNLESS OTHERWISE APPROVED BY THE DIRECTOR OF ENGINEERING.

C. MAXIMUM DEFLECTION FROM COMBINED LIVE AND DEAD LOADING SHALL NOT EXCEED ANY C.S.A., O.P.S. OR MANUFACTURERS RECOMMENDED SPECIFICATIONS.

D. PVC, CONCRETE AND PROFILE WALL PVC SEWERS SHALL HAVE RUBBER GASKET TYPE JOINTS AND SHALL BE CERTIFIED TO CONFORM TO ALL APPLICABLE CURRENT C.S.A. SPECIFICATIONS.

E. CONCRETE SANITARY SEWERS SHALL HAVE A MINIMUM STRENGTH OF 50 N/m/mm CONFORMING TO CSA STANDARD A257.2–1982, CLASS 50–D (PREVIOUSLY C.S.A. STANDARD A257.2–1974, CLASS II).

F. MAINTENANCE HOLE TOPS (FRAMES) ARE TO BE SET TO BASE COURSE ASPHALT GRADE AND THEN ADJUSTED TO FINAL GRADE WHEN THE TOP LIFT OF ASPHALT IS PLACE. ALL ADJUSTMENT WILL BE ACCORDANCE WITH BSD–N2.

G. ALL CONNECTIONS TO NEW SANITARY MAINS SHALL BE PRE–MANUFACTURED, FABRICATED TEES. CONNECTIONS TO EXISTING SANITARY SEWER SHALL BE MADE WITH APPROVED FACTORY MADE TEES OR INSERTA–TEES IN STRICT ACCORDANCE TO MANUFACTURES GUIDELINES.

CITY OF BARRIE STANDARD	NO.	REVISION	APR'D	DATE	APR'D: R.G.N.	DATE: 92.05.15
GENERAL NOTES SANITARY SEWERS	4.	NOTE "B" – "ENGINEERING"	B.R.	2002.10.28	DRAWN: L.A.J.	SCALE: N.T.S.
	3.	NOTE "B" OPSD NUMBER REVISION	K.C.	2000.03.16		
	2.	NOTE "F" CHANGED	K.C.	98.03.30		
	1.	CHANGES TO B. TO G.	K.C.	95.04.24		BSD-N3

GENERAL NOTES – SANITARY SEWER

SANITARY SERVICE LATERALS

A. SANITARY LATERAL CONNECTION TO BE LOCATED AT THE CENTRELINE OF THE LOT AND CAPPED.

B. LOCATION OF LATERAL TO BE MARKED 2.0m PAST PROPERTY LINE WITH A 50 x 100mm WOOD MARKER, PAINTED GREEN, EXTENDING FROM SERVICE INVERT TO 300mm ABOVE GROUND LEVEL.

C. PIPE TO BE MINIMUM 100 mm DIA. PVC SDR28, RUBBER GASKET TYPE JOINTS AND SHALL CONFORM TO C.S.A. (B–182.2.3.4) (COLOURED) FOR A RESIDENTIAL HOUSE AND 150mm MINIMUM DIA. PVC SDR28 FOR INDUSTRIAL/COMMERCIAL DEVELOPMENT.

D. MINIMUM DEPTH OF LATERAL AT PROPERTY LINE SHALL BE 2.4m MEASURED FROM THE SEWER OBVERT TO FINISHED GROUND SURFACE ELEVATION UNLESS NOTED OTHERWISE.

E. ALL CONNECTIONS TO NEW SANITARY MAINS SHALL BE PRE–MANUFACTURED, FABRICATED TEES. CONNECTIONS TO EXISTING SANITARY SEWER SHALL BE MADE WITH APPROVED FACTORY MADE TEES OR INSERTA–TEES IN STRICT ACCORDANCE TO MANUFACTURES GUIDELINES.

F. MINIMUM PIPE SLOPE TO BE 2.0%, MAXIMUM 8.0% (SEE OPSD–1006.010, 1006.020).

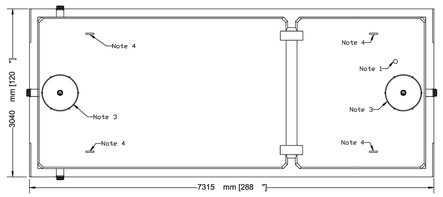
CITY OF BARRIE STANDARD	NO.	REVISION	APR'D	DATE	APR'D: R.G.N.	DATE: 92.05.15
GENERAL NOTES SANITARY SEWERS	2.	OPSD NUMBERS REVISED	K.C.	2000.08.17	DRAWN: L.A.J.	SCALE: N.T.S.
	1.	CHANGES TO B. TO G.	K.C.	95.04.24		BSD-N4

NEWMARKET PRE-CAST CONCRETE PRODUCTS LTD.

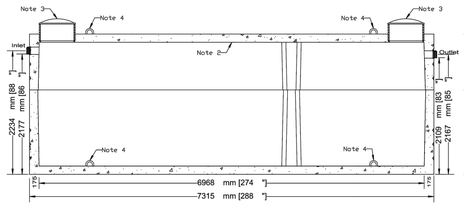
Telephone: 905-852-6111 ; Toll Free 1-800-263-1297

Model 36,000 (8000 GAL) Holding Tank - 2 Piece Unit

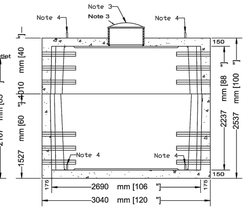
Working Capacity 37,518 Litres (8253 Gal)



Top Section



Side Elevation Section



End Elevation Section

- This tank design is installed in multiple units
- Each unit is tongue and groove design and is sealed with fibrous mastic sealant
- tanks are cast with 35 MPA strength concrete at 7 days with 5-7% air
- Steel reinforced with 20m rebar, spaced at 300mm in each direction at 50mm cover. CAN/CSA-G30.18.
- Tanks conform to National Standards of Canada CAN/CSA B66-16
- Non-sulphate resistant concrete
- Standard (three) 100mm Inlets and one 100mm outlet fitted with flexible rubber connections

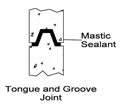
Top Half Weight.....14,515Kg (32,000Lbs)
Bottom Half Weight.....19,960Kg (44,003Lbs)
Total Tank Weight.....34,475Kg (76,003Lbs)

Notes
1. 75mm dia. PVC pipe cast-in to facilitate pump installation or venting
2. Water Storage Capacity to underside of lop.....42,**585 Litres (9367 Gal)**
3. Cast in place 610mm ID plastic riser with plastic lid secured with stainless steel fasteners extending 178mm above top
4. Lifting Hooks - 4 Points each Section

Designed for up to two metre burial over top of tank - vehicle traffic tanks are available upon request. Specialty conformations may be possible

Tank Markings Observed:
Inlet & Outlet is Marked.
Tank is marked on tank lid - Inlet End

NPCP
2017 HOLDING 36000
B.D. 2 METRE
WC 37518
NON-SULPHATE
AGINP



Tongue and Groove Joint

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Any errors and/or omissions shall be reported to Pinestone Engineering Ltd. without delay.

PINESTONE ENGINEERING LIMITED | www.pel.co

KEY MAP

NOTES

1. TOPOGRAPHIC SURVEY COMPLETED BY RUDY MAK SURVEYING LTD. O.L.S., JULY 1995 AND OCTOBER 2013.
2. SITE PLAN PROVIDED BY NAYLOR ARCHITECT INC. APRIL 6, 2022
3. REFER TO GEOTECHNICAL REPORT PREPARED BY HADDARD GEOTECHNICAL LTD. FOR BOREHOLE INFORMATION.

BENCHMARK

BM#1
TOP OF SPINDLE OF FIRE HYDRANT ELEV. 251.85

NO.	YY.MM.DD	REVISION	BY

SEAL

LICENSED PROFESSIONAL ENGINEER
J.H. VOISIN
100172758
May 4th, 2022
PROVINCE OF ONTARIO

NORTH ARROW

DESIGN BY:	J.V.
DRAWN BY:	J.L.
CHECKED	J.V.
DATE:	APRIL 2022
SCALE:	1: 200

CLIENT/PROJECT

#481 YONGE STREET APARTMENT DEVELOPMENT BARRIE, ONTARIO

DRAWING TITLE

GENERAL NOTES AND DETAILS

PROJECT NO.	DRAWING NO.	REVISION
19-11433-B	GN-1	0

G