Proposed Residential & Commercial Draft Plan of Subdivision
CT Lands, Town of Cobourg
Vandyk – West Park Village Ltd.

STORMWATER MANAGEMENT REPORT

September 2020

MAEL Reference 20-021

MASONGSONG ASSOCIATES ENGINEERING LIMITED
ENGINEERING SUSTAINABLE FUTURES

STORMWATER MANAGEMENT REPORT

Proposed Residential & Commercial Draft Plan of Subdivision
CT Lands
Town of Cobourg

For

Vandyk – West Park Village Ltd.

September 2020

Prepared by:

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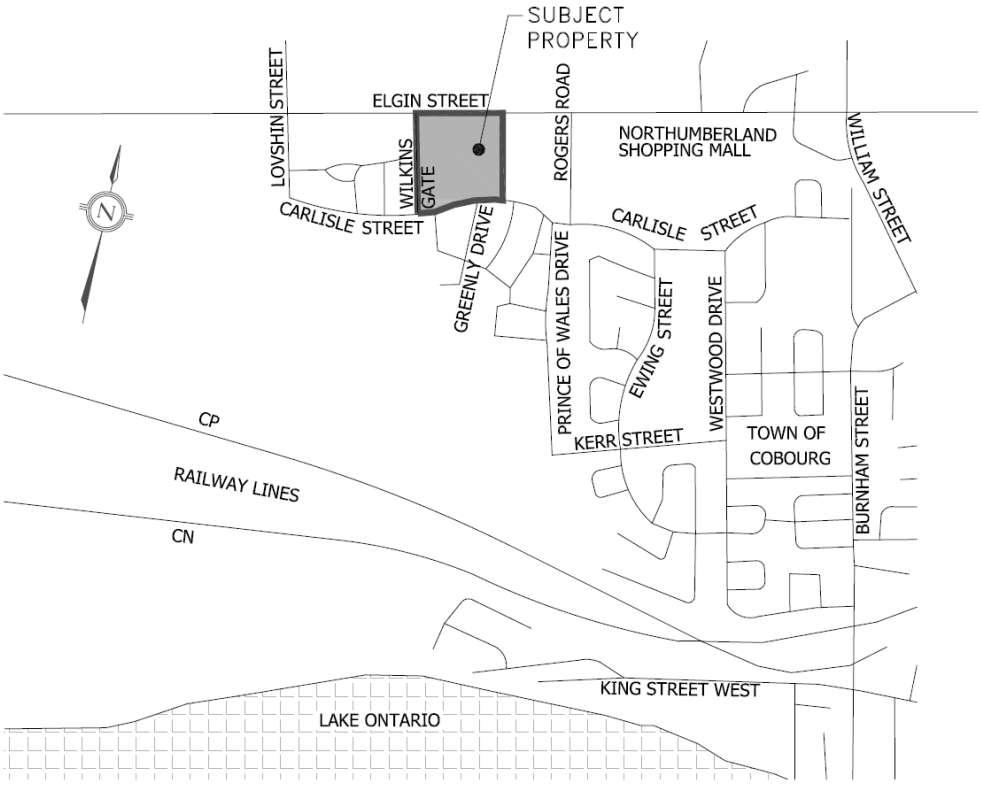
1.0 INTRODUCTION

1.1 Study Objectives and Location

Masongsong Associates Engineering Limited has been retained by Vandyk – West Park Village Ltd. to provide engineering services in support of Draft Plan Approval for a proposed residential and commercial development within an area known as the CT Lands, in the Town of Cobourg. The total site of approximately 3.70 ha (9.14 ac) is generally located west of Rogers Road and south of Elgin Street West. Immediately east of the subject property is an existing commercial plaza, occupied by Canadian Tire, and south of the subject property is an existing residential development, known as West Park Village subdivision. Figure 1 below illustrates the location of the proposed development.

Figure 1 *Site Location Key Plan*



The objective of this report is to identify the requirements for site servicing and stormwater management as it relates to current Town of Cobourg and Ganaraska Region Conservation Authority (GRCA) criteria, and to demonstrate how this proposed site will function within the framework of existing infrastructure.

1.2 Existing Site Description

The subject lands are comprised of a rectangularly shaped piece of land, with frontage on the south side of Elgin Street West. The lands are legally described as Part of Lot 23, Concession A, Town of Cobourg, County of Northumberland. The subject property is currently a cleared vacant open space, and is not occupied.

The subject lands were previously draft approved on July 14, 2014 and detailed engineering design of the municipal infrastructure was undertaken by Husson Engineering for the landowner starting in 2013 through to 2017. However, the conditions of draft plan approval were not satisfied within the time frame established under the draft plan conditions, and the draft plan lapsed in July 2019. Therefore, a new draft plan application is required to proceed with the subject development.

1.3 Proposed Development Plan

The development proposal consists of a 0.60 ha commercial plaza block fronting Elgin Street West and a 3.10 ha residential site immediately south of the commercial block. The commercial development has a preliminary site layout consisting of 3 proposed buildings on-site, surrounding by parking lot. The residential development is proposed to be comprised of 72 townhouse units with a central local park area, all accessible from a new 17.0m right-of-way internal municipal road (with vehicle access from existing Greenly Drive at the south limit of the site). The proposed draft plan of subdivision prepared by IBW Surveyors is attached in **Appendix A**.

The proposed draft plan is effectively the same as the original draft plan that was approved in July 2014. The current version supports the same number of residential units and the same commercial block area.

1.4 Background Studies

The subject site has been identified in the following studies/projects:

- **Functional Servicing and Stormwater Management Report, Cobourg CT Lands, September 2017, Husson Engineering + Management:** This SWM Report completed by Husson analyzed the subject site and provided detailed stormwater management and storm sewer designs to accommodate the proposed commercial and residential developments in support of the draft plan approved in 2014. The detailed design of the subdivision was approved in principle by the municipality, and the Environmental Compliance Approval (ECA) from the Ministry of Environment, Conservation and Parks (MECP) was obtained for the on-site sewers in August 2017 (refer to copies of MECP ECA in **Appendix F**). The design basis of this report has been closely followed with this updated report, to support the same development details proposed today.

- **Elgin Street West Storm Sewers:** Detailed design of storm sewers on Elgin Street West was also completed by Husson Engineering, on behalf of the landowner. It is understood that although these storm sewers were never constructed, their design was approved in principle by the Town of Cobourg based on the detailed design drawings prepared by Husson and further supported by the MECP ECA issued in June 2018 (refer to **Appendix F**). It is assumed that once all the necessary current approvals are in place, these sewers will be constructed by the developer, (with cost sharing agreement between County of Northumberland), to support the build out of the proposed subject commercial/residential plan of subdivision.

- **New Amherst Stormwater Management Report, December 2006, Sernas Associates:** The subject lands are identified as being tributary to the New Amherst stormwater

management pond, which was constructed in support of the New Amherst subdivision development west and downstream of the subject site. This pond was designed to provide quantity and quality control for an area including the subject CT Lands.

2.0 GRADING SCHEME

The subject site topography generally sheet drains in a northerly direction towards Elgin Street West from a high point of approximately 102.5 m to a low point of approximately 100.0 m, with an average grade of approximately 1.2%. The site frontage along Elgin Street West also follows a drainage pattern falling in a westerly direction.

Site specific grading for the both the commercial and residential developments are to match existing site limit grades and create self-contained drainage. Detailed site grading will be completed as part of a future detailed development application.

3.0 STORMWATER MANAGEMENT

3.1 Existing Storm Servicing and Drainage

The complete 3.70 ha of subject property (CT Lands) drains northerly to Elgin Street West. In addition, approximately 0.15 ha of external drainage naturally drains to the subject lands, which is then also directed to Elgin Street West. The pre-development area draining to Elgin Street West has an aggregate imperviousness of 2.1% (refer to Pre-Development Storm Drainage Plan in **Appendix A**, and Table 1 in **Appendix B**).

Drainage on Elgin Street West is then directed in a westerly direction, through an existing drainage swale on the road's boulevard. It is understood that this conveyance system is planned to be upgraded to a new storm sewer system, to supplement the existing ditch style drainage and to support the future urbanization of this County Road. Eventually, this Elgin Street West conveyance system will connect drainage to the downstream New Amherst SWM pond, via a drainage swale located to the west of the future construction phase of New Amherst development, which was designed to provide quantity and quality control for the subject CT Lands development.

Even though the subject site was included as tributary area to the downstream New Amherst SWM Facility, the subject site will be providing on-site storage and release rate control to maintain existing pre-development levels as previously agreed between the developer and reviewing agencies.

3.2 Proposed Storm Servicing and Drainage

A combined stormwater management scheme is proposed to provide control for the residential and commercial developments within the CT Lands, with a single outlet to Elgin Street West. While these developments will have separate ownerships, the stormwater controls for both developments are proposed to be located within the commercial development due to its suitability and space to provide for required volume detention.

The details of the proposed storm servicing and drainage, described below, are consistent with the master drainage parameters for the subject site, as set out in the New Amherst SWM Pond design report by Sernas.

3.2.1 Minor System Drainage

Storm drainage up to the 100-year event is proposed be captured and conveyed through a storm sewer pipe conveyance system on both the residential and commercial developments. Storm pipes are to be sized with capacity to covey the 100-year storm event. Drainage from residential lots is proposed to be picked up by rear-yard ditch inlet catchbasins, directed to a local sewer system on the proposed municipal road. This residential drainage is then to be conveyed north through a servicing easement and combined with the commercial development 100-year drainage captured before outletting at a controlled rate to Elgin Street West, to match pre-development discharge rates.

Due to anticipated site grading, some surface drainage will be directed southerly. Therefore, the southerly most double catchbasins within the residential development are designed with grate

openings sized to accommodate the 100-year storm capture for minor system conveyance to the site outlet. Figure STM-MJR in **Appendix A** highlights the 1.29 ha area draining southerly, which corresponds to a 100-year flow of 260 L/s (based on VO5 modelling).

DCBMH1 and DCBMH2 are proposed to be fitted with a Stepcon Model No. 5101 frame and grate. These grates provide for approximately 85% void space for increased flow through as compared to a standard catchbasin grate. Conservatively applying a 50% blockage potential to the proposed grate (as per MTO design requirements for inlet structures), the grate would provide an inlet capacity of 194 L/s each (assuming approximately 5 cm on ponding on the grate, before spill elevation based on grading). Refer to inlet-controlled flow calculation Table 4 in **Appendix B**. Therefore, a total flow through of 388 L/s is accommodated between DCBMH1 and DCBMH2, which is adequate to convey the 260 L/s 100-year flow into the minor system.

The commercial development minor system drainage will be captured after controlled roof drainage is released to the parking area, where catchbasins will collect 100-year storm drainage.

A proposed storm design sheet is included in **Appendix D**, which demonstrates that the minor system can adequately convey the 100-year storm drainage. At a further detailed design stage, a hydraulic grade line calculation will be included, to determine that the 100-year high water elevation does not exceed a depth of 0.3m below proposed basement floor elevations.

Under interim conditions, a 900mm diameter concrete storm pipe will be constructed. The proposed pipe will start at proposed SICBMH (immediately west of Rogers Street), and outlet to the Elgin Street West swale (south side boulevard), east of Loveshin Road/New Amherst Boulevard (approximately 425m west of Wilkins Gate). The site will outlet to a proposed MH22 connected to the above-mentioned storm pipe and will discharge to the Elgin Street West swale via the storm pipe, all in accordance with the accepted engineering drawings 600 & 603 for Elgin Street West works, included in **Appendix G** for reference.

Under ultimate conditions, a drainage swale will be constructed along west property boundary of the New Amherst development, from the Elgin Street West drainage swale, south to the New Amherst stormwater management (SWM) facility, located at the south property limit of the New Amherst development, all in accordance with the stormwater management plan (SWM 103), prepared by Sernas Associates, dated September 2006 and provided recently by the Town of Cobourg, (refer to **Appendix G**). Based on recent site visits, it appears that the drainage swale west of the future New Amherst development is not yet constructed. It is expected to be built as part of the New Amherst Stage 2 and Stage 3 development phases.

3.2.2 Major System Drainage

A significant portion of major storm drainage will follow an emergency overland flow route northerly towards Elgin Street West, and a small portion of overland drainage will be directed southerly to the existing West Park Village development. At detailed design stage, the overall development will be graded with a local low point to allow for a surface drainage spill point for flows above the 100-year event which are not captured by the minor system conveyance.

Town of Cobourg and GRCA design guidelines will be followed to ensure surface drainage ponding does not exceed 0.30m in the commercial development parking area, 0.15m in the residential municipal road area, and 0.30m on Elgin Street West.

3.2.3 Elgin Street West Storm Drainage

As described in Section 1.4 Background Studies above, storm sewers on Elgin Street West were previously proposed and designed in detail by Husson Engineering, refer to engineering drawings 600 & 603, in **Appendix G**. It is understood that the Town of Cobourg had approved these proposed sewers in principle, and MECP ECA approval was received in June 2018. Based on this, drainage plans and storm design sheets have been prepared with this submission which comply with the previous detailed design. Refer to Drainage Plan Figure DR-1 in **Appendix A**, and design sheets in **Appendix D**, which demonstrate that the proposed Elgin Street West sewers have capacity to convey adequate drainage, generated by the subject site.

The new storm sewers along Elgin Street West are proposed to drain in a westerly direction, ultimately conveying drainage downstream to a storm outfall discharging to the existing Elgin Street West drainage swale, at pre-development release rates, east of Loveshin Road/New Amherst Boulevard (approximately 425m west of Wilkins Gate). This new sewer system is designed to take drainage from the 3.85 ha subject CT Lands (including proposed residential and commercial developments, and existing external drainage area) as well as the 3.66 ha adjacent existing Canadian Tire commercial development. It is understood that the Canadian Tire development was designed with a maximum post-development site release rate of 0.080 m^3/s at all events up to the 100-year storm (as documented in the New Amherst SWM Report by Sernas).

3.3 Quantity Control

Current Town of Cobourg and GRCA design criteria coupled with MECP guidelines require that new developments control post-development flows to pre-development levels for all storm intensities from 2-year to 100-year inclusive. The residential and commercial developments must be quantity-controlled to a maximum level at each design storm.

3.3.1 Pre-Development Hydrologic Model

Due to the size of the subject development (larger than 2 ha), a Visual OTTHYMO (VO5) hydrologic model was used to model pre-development flow rates for the contributing CT Lands and adjacent Canadian Tire lands. VO5 model input parameters are summarized in Table 5 in **Appendix C**. The allowable release rate for the subject CT Lands have been determined by deducting the known controlled release rate of 0.080 m^3/s on the Canadian Tire lands from the modelled combined outflow rates. The allowable release rates for each design storm are summarized in Table 3.1.

Based on the New Amherst SWM Report by Sernas, the SCS Type II 6-hour rainfall distribution provides for the most stringent storm modeling scenario and is carried forward for the development's stormwater management design.

Table 3.1 *Subject Lands Allowable Release Rates*

Storm Event	Combined Pre-Development Flow (CT Lands + Canadian Tire Lands)	Post-Development Flow (Canadian Tire Lands)	Allowable Release Rate (CT Lands)
	(m^3/s)	(m^3/s)	(m^3/s)
2-year	0.186	0.080	0.106
5-year	0.292	0.080	0.212
10-year	0.415	0.080	0.335
25-year	0.480	0.080	0.400
50-year	0.533	0.080	0.453
100-year	0.690	0.080	0.610

3.3.2 Post-Development Volume Attenuation

To achieve the allowable release rates identified in Section 3.3.1, quantity control measures are proposed to detain storm drainage upstream of the ultimate controlled outlet to existing Elgin Street West sewers. Quantity control is proposed to be achieved by implementing two orifice tubes at the most downstream site manhole (MH20) to control the discharge flow rate. One (1) 125mm orifice tube is proposed, with an additional one (1) 450mm orifice tube at a higher elevation. On-site storage is to be provided through a combination of commercial building rooftop storage, and underground storage in minor system conveyance pipes and two storage chambers.

Roof Storage: Based on the preliminary commercial site layout, there are 3 proposed buildings which can store storm water by implementing controlled flow roof drains. Accutrol Weir Flow Control for Roof Drains (RD-100-A2), or approved equal, are proposed to be installed on the

roofs of Buildings A, B and C. Each flow control device will limit flow to 1.577 L/s (25 gpm, as per manufacturers specification included in **Appendix E**) at a ponding depth of 125mm (5 in). Relief scuppers should be installed to limit ponding to 125mm. The storage and release rates are summarized in the following Table 3.2.

Table 3.2 *Roof Storage Summary (Commercial Development)*

	Building A	**Building B**	**Building C**
Roof Area (Total)	270 m^2	756 m^2	279 m^2
Roof Area (Flat)	212 m^2	646 m^2	219 m^2
# of Roof Drains (RD-100-A2)	1	2	1
Release Rate (100-year)	1 * 1.577 = 1.577 L/s	2 * 1.577 = 3.154 L/s	1 * 1.577 = 1.577 L/s
Volume to be stored (100-year) *	17 m^3	46 m^3	17 m^3
Depth of Ponding (100-year)	17/212 = 80mm (< 125mm, OK)	46/646 = 71mm (< 125mm, OK)	17/219 = 78mm (< 125mm, OK)

* Based on VO5 model (described in Section 3.3.3 below).

Minor System Pipe Storage: As described in Section 3.2.1. above, the minor system for this development is designed to capture the 100-year storm runoff. The result is that the minor system (pipes and structures) provide significant on-site storage, upstream of the development's orifice control. A total of **375.2 m^3** of storage is available on the minor system, up to a 100-year high-water level of **99.55 m**. Tables 1A & 1B to 6A & 6B in **Appendix B** provide detail calculations to demonstrate this volume. It should be noted that the minor system components within the commercial development are excluded from available volume calculations, as they are designed at relatively higher elevations. It is recommended that the foundation drain collection system for the residential portion of the site be pumped to grade. Direct connection to the storm sewer is not recommended to prevent flooding of basements, as the conveyance pipes are also used for on-site storage.

Storage Chambers: Underground storage chambers, connected to the minor system upstream of the site's orifice control, are proposed to provide the remaining 100-year storage volume required. Two (2) Cultec Recharger 902HD storage chambers (or approved equal) are proposed, one within the east portion of the commercial site and one within the west portion. A combined storage of 565.6 m^3 is provided within the two chambers, at a maximum height of only 98.92m which is below the 100-year high-water elevation and the residential basement elevations.

These Cultec storage chambers detailed specifications were completed by a supplier with the original Husson Engineering design in 2017. These same specifications are included in **Appendix E** of this report, for reference. Prior to detailed design, these specifications will be verified for their conformance with current design details. Updated design and shop drawings will be provided for Town of Cobourg approval as needed, prior to detailed design.

The following Table 3.3 summarizes the 100-year storage volumes provided for the residential development.

Table 3.3 100-year *Available Storage (Residential Development)*

Elevation	Storage Component	100-year Storage Volume (m^3)
96.57 – 99.55	Pipes/Structures	375.2
97.40 – 98.92	Storage Chambers	565.6
Total		**940.8**

3.3.3 Post-Development Hydrologic Model

A post-development VO5 model was developed to measure the post-development release rate at each storm event, with the proposed storage attenuation measures described above in Section 3.3.2.

Similarly to the pre-development hydrologic model, the SCS Type II 6-hour rainfall distribution was used as it is known to be the most stringent storm modeling scenario for this development.

The VO5 input parameters are detailed in **Appendix C**, for the STANDHYD, NASHYD and RouteReservoir commands. Figures pertaining to the post-development's catchment areas and drainage characteristics are also included in **Appendix A**.

Based on results from the VO5 model, the proposed on-site storage has the capacity to accommodate the 100-year volume requirements. Furthermore, the release rates at each event up to the 100-year meet the maximum allowable release rates established. These results are summarized in Table 3.2 below, and detailed VO5 outputs are enclosed in **Appendix C**.

Table 3.4 *Subject Lands Proposed Release Rates*

Storm Event	Post-Development Release Rate	Within Allowable Release Rate? (per Table 3.1)	Required Storage Volume	Within Available 100-Year Storage Volume?
	(m^3/s)	(m^3/s)	(m^3)	(m^3)
2-year	0.051	Yes (< 0.106)	455	Yes (< 941)
5-year	0.122	Yes (< 0.212)	609	Yes (< 941)
10-year	0.245	Yes (< 0.335)	701	Yes (< 941)
25-year	0.316	Yes (< 0.400)	754	Yes (< 941)
50-year	0.371	Yes (< 0.453)	796	Yes (< 941)
100-year	0.570	Yes (< 0.610)	904	Yes (< 941)

3.4 Quality Control

The Town of Cobourg and GRCA require new developments to meet the MECP water quality target of enhanced level long-term average removal of 80% Total Suspended Solids (TSS) on an annual loading basis, based on the site discharge at post-development imperviousness.

The subject site is proposed to provide a consolidated standalone best-practice treatment of stormwater runoff for both the residential and commercial developments by implementing one oil-grit separator (OGS) device to treat the minor system drainage prior to discharging to proposed municipal sewers on Elgin Street West.

The overall baseline TSS removal efficiency for the development components requiring treatment are presented in the following Table 3.3. With a TSS removal rate of only 31.8%, further treatment is required before discharging stormwater to the municipal sewers.

Table 3.5 *Baseline TSS Removal Rates*

Surface Area Component	Area (m^2)	Site Percent Area (%)	Baseline TSS Removal Rate (%)	Weighted TSS Removal Rate (%)
Residential Development (Area 200)				
Grass/Landscape	13,463	35.3%	80%	28.3%
Paved/Building	17,535	46.0%	0%	0%
CT Lands External (Area 201)				
Grass/Landscape	527	1.4%	80%	1.1%
Paved/Building	726	1.9%	0%	0%
Commercial Development (Area 300, 301, 302 & 303)				
Grass/Landscape	1,149	3.0%	80%	2.4%
Paved/Building	4,751	12.4%	0%	0%
Total	**38,151**	**100%**		**31.8%**

** For surface area components, refer to Table 2, Post Development Area Summary in **Appendix B**.*
Note: Area 400 drains uncontrolled to Elgin Street West.

For sizing the required OGS device, the overall imperviousness for the development components requiring treatment is calculated in the following Table 3.4.

Table 3.6 *Post-Development Site Imperviousness*

Surface Area Component	Area (ha)	Runoff Coefficient	Imperviousness
Residential Development (Area 200)	3.100	0.62	57%
CT Lands External (Area 201)	0.125	0.63	58%
Commercial Development (Area 300, 301, 302 & 303)	0.590	0.77	81%
Total	**3.815**	**0.64**	**61%**

** For surface area components, refer to Table 2, Post Development Area Summary in **Appendix B**.*
Note: Area 400 drains uncontrolled to Elgin Street West.

A CDS Model PMSU30_35m is proposed to achieve a total TSS removal of **81.6%,** which exceeds the required 80% removal rate. The OGS will receive 100-year discharge from the minor conveyance system, before directing flow to the site discharge point to Elgin Street West. This treatment device was detailed in a specification completed by a supplier with the original Husson Engineering design in 2017. This specification is included in **Appendix E** of this report, for reference. Prior to detailed design, this specification will be verified for its conformance with

current design details. Updated design and shop drawings will be provided for Town of Cobourg approval as needed, prior to detailed design.

3.5 Maintenance and Monitoring

The proposed stormwater management system including pipes, maintenance holes, treatment device (oil-grit separator) and underground storage chambers will require some routine maintenance and monitoring through its operating cycle, as is typical for any infrastructure managing stormwater. Note, maintenance of all structures within the commercial portion of the development will be the responsibility of the commercial corporation.

3.5.1 Minor System Storage (Pipes, Maintenance Holes and OGS)

The conveyance system on storm pipes and maintenance holes has been designed to provide on-site storage, where all stormwater including the first flush up to the 100-year event will be captured on this minor system. This collected stormwater will be stored upstream of a controlled orifice outflow point during the events larger than the allowable site outflow rate. It is expected that this temporary storage of water will create opportunity for sediment to settle within the downstream most conveyance pipes or manholes. Furthermore, the proposed oil grit separator treatment device will also collect sediment through its treatment of stormwater.

Given this expected sediment load on the minor system, it is recommended to inspect the system every six months for the first two years, decreasing to once every year thereafter once the sediment loading rate is determined. If sediment is noted during inspection, the system should be cleaned out starting at the downstream most point (where sediments will more likely be collecting), moving upstream until sediment is not longer present. Maintenance and monitoring of the OGS device should be followed as per manufacturers recommendations.

3.5.2 Storage Chambers

The two proposed modular storage chambers are designed at locations “branched off” from the main conveyance/storage pipes. Stormwater is only expected to enter these chambers when retained stormwater (above the first flush) backs up in the system. There is also a manhole located downstream of each storage chamber, which should provide a concentrated location for most sediment to settle out of any stored water prior to reaching the storage chambers. This manhole is easily accessible for cleanout. It is recommended to inspect each storage chamber and downstream manhole structure every six months for the first two years, decreasing to once every year thereafter once the sediment loading rate is determined. If sediment is noted during inspection, the system should be cleaned out.

Installation of the modular storage chamber systems should be completed with consideration to avoid sediment from collecting in the chambers during construction. The site should be well stabilized prior to installation, and the downstream manholes should be temporarily disconnected in order to limit sediment from loading into the storage chambers.

3.5.3 Cost Estimate

The estimated costs associated with the maintenance and monitoring of the stormwater management system described above is outlined as follows:

Table 3.7 *10 Year Total Storm System Maintenance Cost*

Maintenance Item	**Frequency**	**Unit Cost**	**10-Year Cost**
Minor system flushing with vacuum truck	Every 2 years	$2,500	$12,500
OGS cleanout with vacuum truck	Every year	$1,200	$12,000
Storage Chamber clean with vacuum truck	Every 5 years	$1,200	$2,400
		Total =	**$26,900**

4.0 EROSION AND SEDIMENT CONTROL

Erosion and sediment control should be implemented for all construction activities within the subject site, and for each consecutive phase and stage of construction, including earthworks, servicing and building activities. The basic principles considered for minimizing erosion, sedimentation, and resultant negative environmental impacts include:

- Minimize local disturbance activities (e.g. grading);
- Expose the smallest possible land area to erosion for the shortest possible time;
- Implement erosion and sediment control measures before the outset of construction activities; and,
- Carry out regular inspections of erosion and sediment control measures and repair or maintain as necessary.
- Erection of silt fences around all site perimeters;
- Provide sediment traps (e.g. rock check dams, scour basins) along interceptor swales and points of swale discharge;
- Inlet controls at catchbasins, comprising filter cloth overlain with rip-rap;
- Implement a weekly street sweeping and cleaning program for any mudtracking onto the adjacent municipal roadways;
- Provide gravel “mud mats” at construction vehicle access points to minimize off-site tracking of sediments; and,
- Confine refueling/servicing equipment to areas well away from inlets to the minor system or major system elements.
- All waste and unused building materials (including garbage, cleaning wastes, wastewater, toxic materials, or hazardous materials) shall be properly disposed of and not allowed to be mixed with and carried off by runoff from the site into a receiving watercourse or storm sewer.

Removal of the erosion and sediment controls should be done once construction is completed and sediment run-off from the construction activities has stabilized. At the time of detail design, a detailed Erosion and Sediment Control Plan will be provided.

5.0 CONCLUSIONS AND SUMMARY RECOMMENDATIONS

This stormwater management report demonstrates that the proposed commercial and residential development can be accommodated by the existing local infrastructure. Specifically:

- **Storm Drainage and Quantity Control** will be captured from the post-development development, attenuated up to 100-year event with a controlled allowable release rate prior to outletting to proposed Elgin Street West sewers. On-site storage volume will be provided through a combination of commercial development rooftop storage, minor system pipes and structures, and two underground storage chambers.
- **Water Quality** treatment will be provided to meet the City's 80% TSS removal rate requirement by installing a CDS Model PMSU30_35m upstream of the site outlet to Elgin Street West, but downstream of the conveyance of storm pipes capturing site drainage. This treatment device will provide 81.6% TSS removal.
- **Erosion and Sediment Controls** will need to be implemented during development until the site has been stabilized with groundcover.

We trust you will find this submission is complete and in order. Should you have any questions or require additional information, please contact the undersigned.

Respectfully Submitted,

MASONGSONG ASSOCIATES ENGINEERING LIMITED

David Hoover, P.Eng
Senior Project Engineer

Lucila Ensuncho, M.A.Sc., P.Eng
Principal

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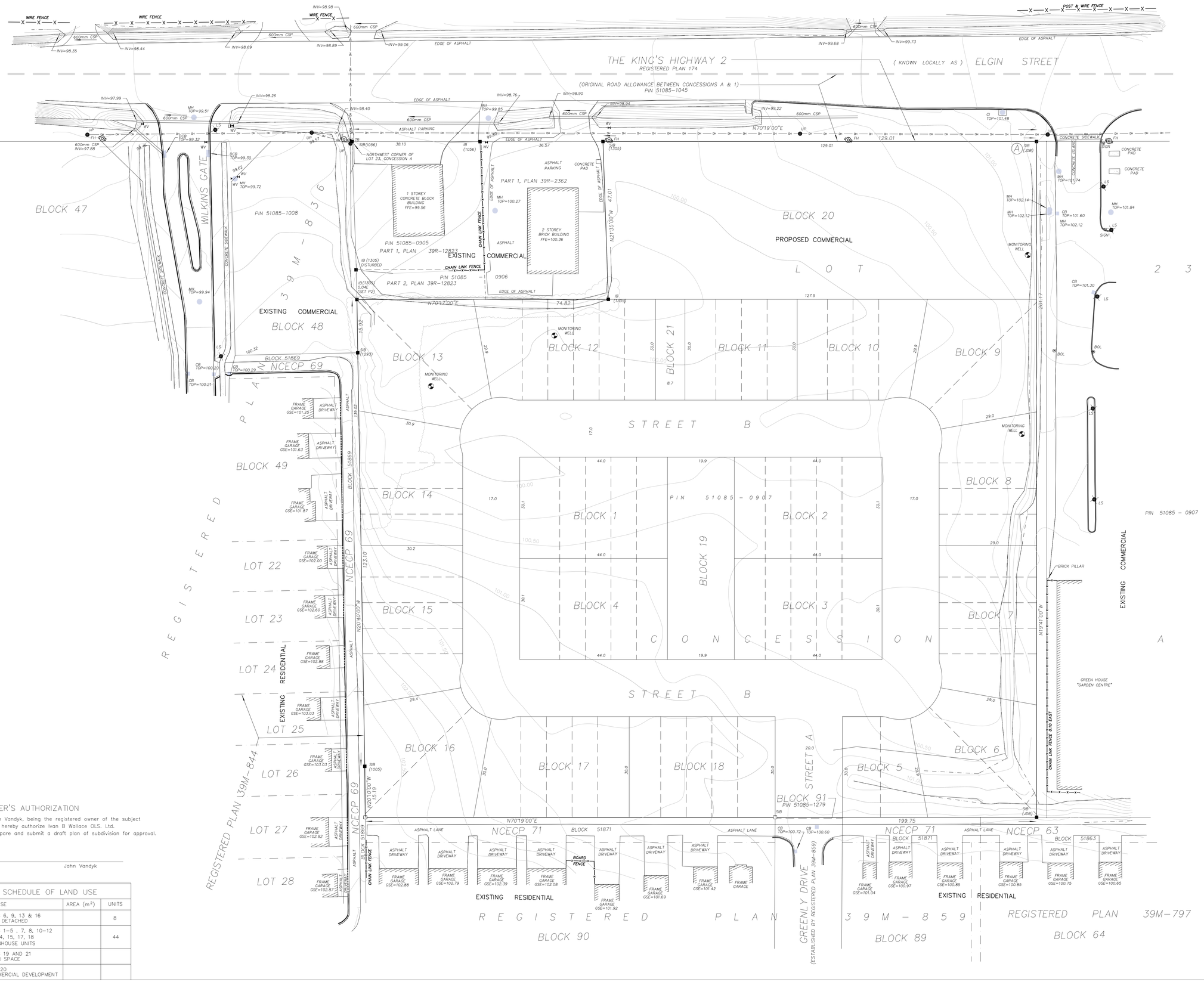
Appendix A

Figures:

Draft Plan

Figure STM-PRE
Figure STM-POST
Figure STM-MJR
Figure DR-1



PROPOSED DRAFT PLAN OF SUBDIVISION OF
PART OF LOT 23,
CONCESSION A
TOWN OF COBOURG
COUNTY OF NORTHUMBERLAND

SCALE 1 : 500 METRES
0 2 4 6 8 10 20 40

IVAN B. WALLACE O.L.S. LTD.

LEGEND

- ■ denotes Survey Monument Found
- □ denotes Survey Monument Set
- SSIB denotes Short Standard Iron Bar
- SIB denotes Standard Iron Bar
- IB denotes Iron Bar
- PIB denotes Plastic Bar
- CC denotes Cut Cross
- IP denotes Iron Pipe
- CSM denotes Cut Stone Monument
- CM denotes Concrete Monument
- CP denotes Concrete Pin
- ø denotes Round
- WIT denotes Witness
- M denotes Measured
- —OH— denotes Overhead Utility Wires
- WV denotes Water Valve / Key
- TB denotes Terminal Box
- BH denotes Borehole
- LS denotes Light Standard
- UP denotes Utility Pole
- CI denotes Curb Inlet
- MH denotes Maintenance Hole
- FH denotes Fire Hydrant
- CB denotes Catch Basin
- denotes Sign
- BOL denotes Bollard
- denotes Deciduous Tree w/Trunk Diameter

BEARING NOTES

Bearings are UTM Grid, derived from observed reference points A and B, by Real Time Network observations, UTM Zone 17, NAD83(CSRS)(2010).

For bearing comparisons, the following rotations were applied:
P1, RP, RP1 - 1°54'00" counter-clockwise

DISTANCE NOTES - METRIC

Distances and coordinates are in metres and can be converted to feet by dividing by 0.3048.

Distances are ground and can be converted to grid by multiplying by the combined scale factor of 1.000207.

ELEVATIONS

Elevations are geodetic and referred to the Town of Cobourg Benchmark No. 18 Elevation 104.662m.

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT:

(a) as shown on draft plan
(b) as shown on draft plan and key plan
(c) as shown on draft plan and key plan
(d) neighbourhood residential 2
(e) existing land uses : South - Neighbourhood residential
West - Neighbourhood residential 2
East - Commercial
North - Public road
(f) as shown on draft plan
(g) as shown on draft plan
(h) municipal water and sanitary sewer
(i) silty sand , till
(j) as shown on draft plan
(k) garbage collection, fire and police protection, school buses, hydro
(l) as shown on draft plan

SURVEYOR'S CERTIFICATE

I hereby certify that the boundaries and the land to be subdivided and their relationship to the adjacent lands are accurately and correctly shown on this plan.

DRAFT

Date David Comery

OWNER'S AUTHORIZATION

I, John Vandyk, being the registered owner of the subject lands, hereby authorize Ivan B Wallace OLS. Ltd. to prepare and submit a draft plan of subdivision for approval.

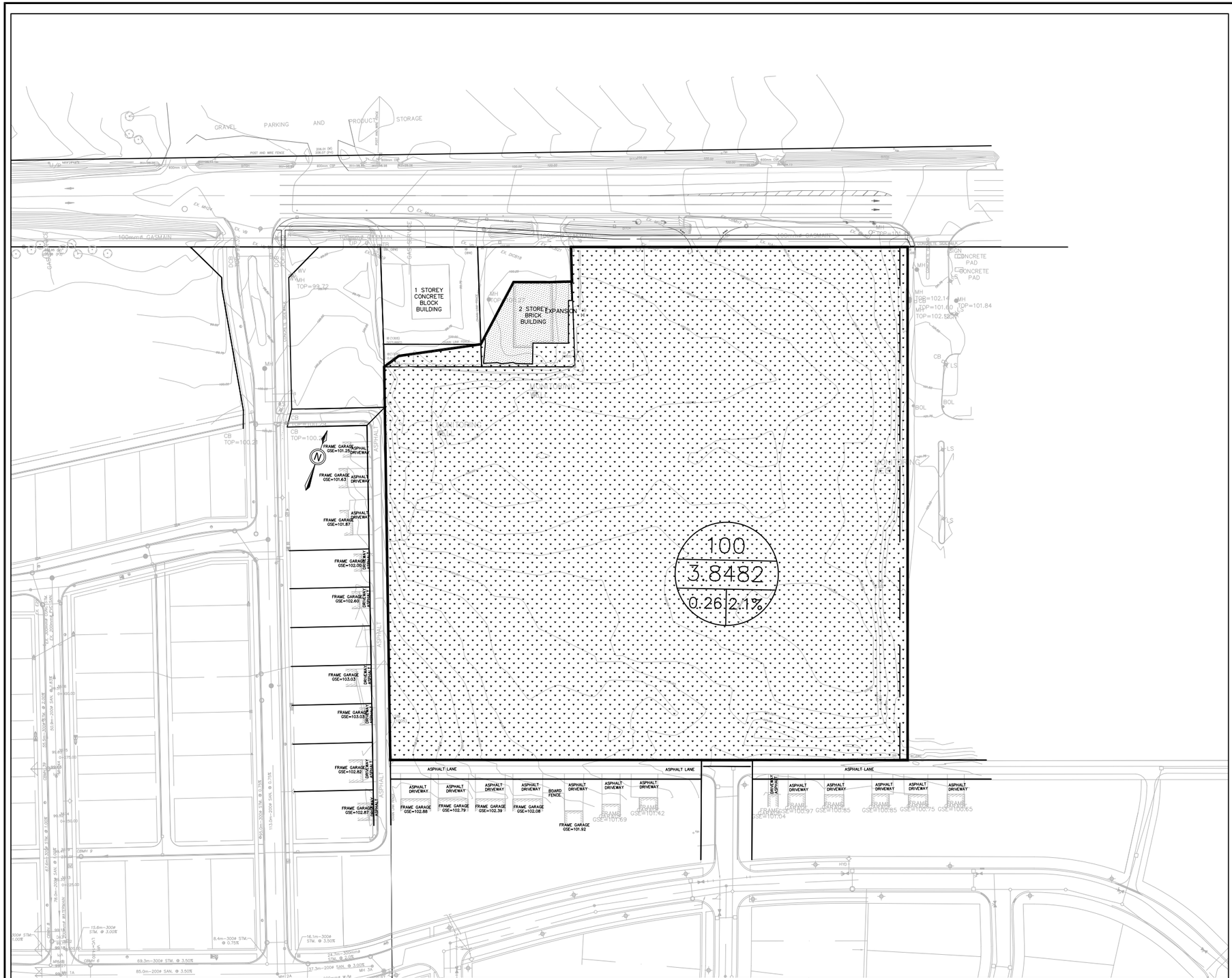
Date John Vandyk

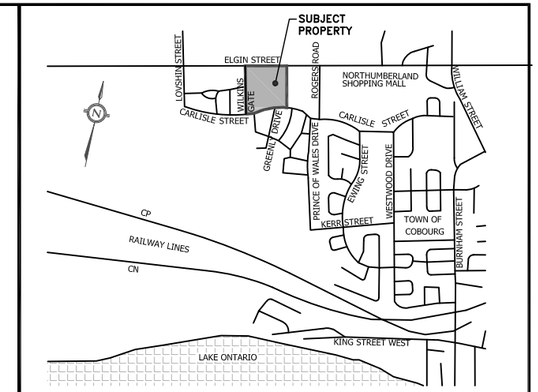
SCHEDULE OF LAND USE

LAND USE	AREA (m²)	UNITS
BLOCKS 6, 9, 13 & 16 SEMI DETACHED		8
BLOCKS 1-5 , 7, 8, 10-12 14, 15, 17, 18 TOWNHOUSE UNITS		44
BLOCKS 19 AND 21 OPEN SPACE		
BLOCK 20 COMMERCIAL DEVELOPMENT		

IBW SURVEYORS
IBWSURVEYORS.COM | 1.800.667.0696

PARTY CHIEF: DRAWN BY: MS CHECKED BY: PLOT DATE: APRIL 24,
FILE NAME: A-022113 COGO'S Available at LandSurveyRecords





KEYPLAN
N.T.S.

LEGEND :

- DRAINAGE BOUNDARY
- SUBCATCHMENT AREA
- 100 / 3.8907 / 0.26 | 2.1% — AREA I.D. / AREA (ha.) / RUNOFF COEFF. | IMPERVIOUSNESS
- PERVIOUS AREA
- IMPERVIOUS AREA
- EXISTING OVERLAND FLOW DIRECTION

*FOR DRAINAGE AREA CALCULATIONS, REFER TO Table 1 – Pre Development Area Summary

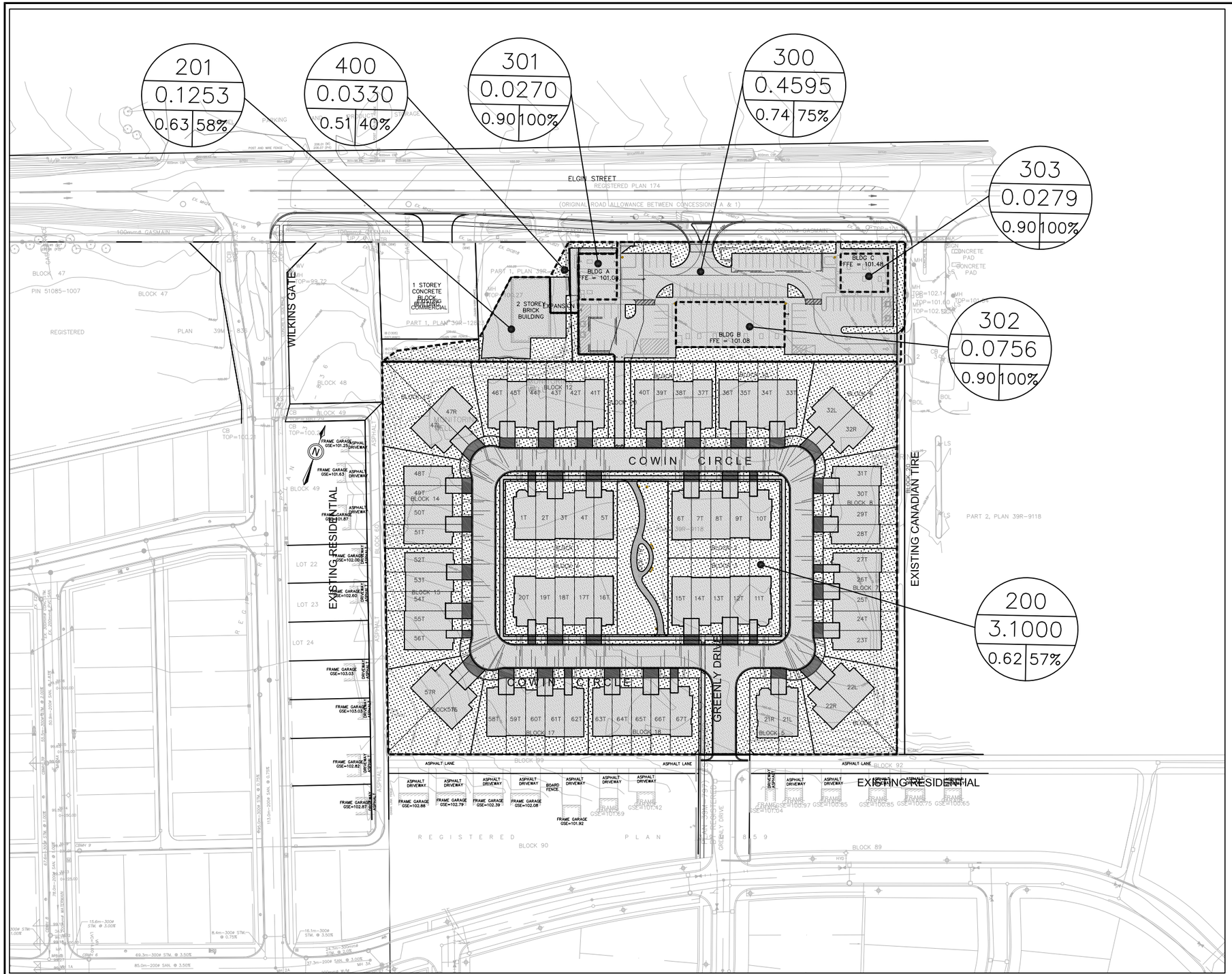
MASONGSONG ASSOCIATES
7800 KENNEDY ROAD
SUITE 201
MARKHAM, ONTARIO
L3R 2C7
T: (905) 944-0162
www.maeng.ca

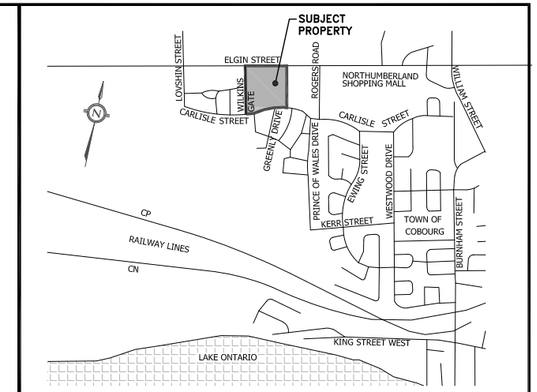
Client: VANDYK GROUP OF COMPANIES

Project: CT LANDS, COBOURG

Drawing Title: PRE-DEVELOPMENT STORM DRAINAGE PLAN

Scale:	Date:
NTS	MAY 2020
Project No: 11-553	Drawing No: STM-PRE





KEYPLAN
N.T.S.

LEGEND :

- DRAINAGE BOUNDARY
- SUBCATCHMENT AREA
- 100 / 3.8907 / 0.26 | 2.1% — AREA I.D. / AREA (ha.) / RUNOFF COEFF. | IMPERVIOUSNESS
- PERVIOUS AREA
- IMPERVIOUS AREA
- EXISTING OVERLAND FLOW DIRECTION

*FOR DRAINAGE AREA CALCULATIONS, REFER TO Table 2 – Post Development Area Summary

MASONGSONG ASSOCIATES
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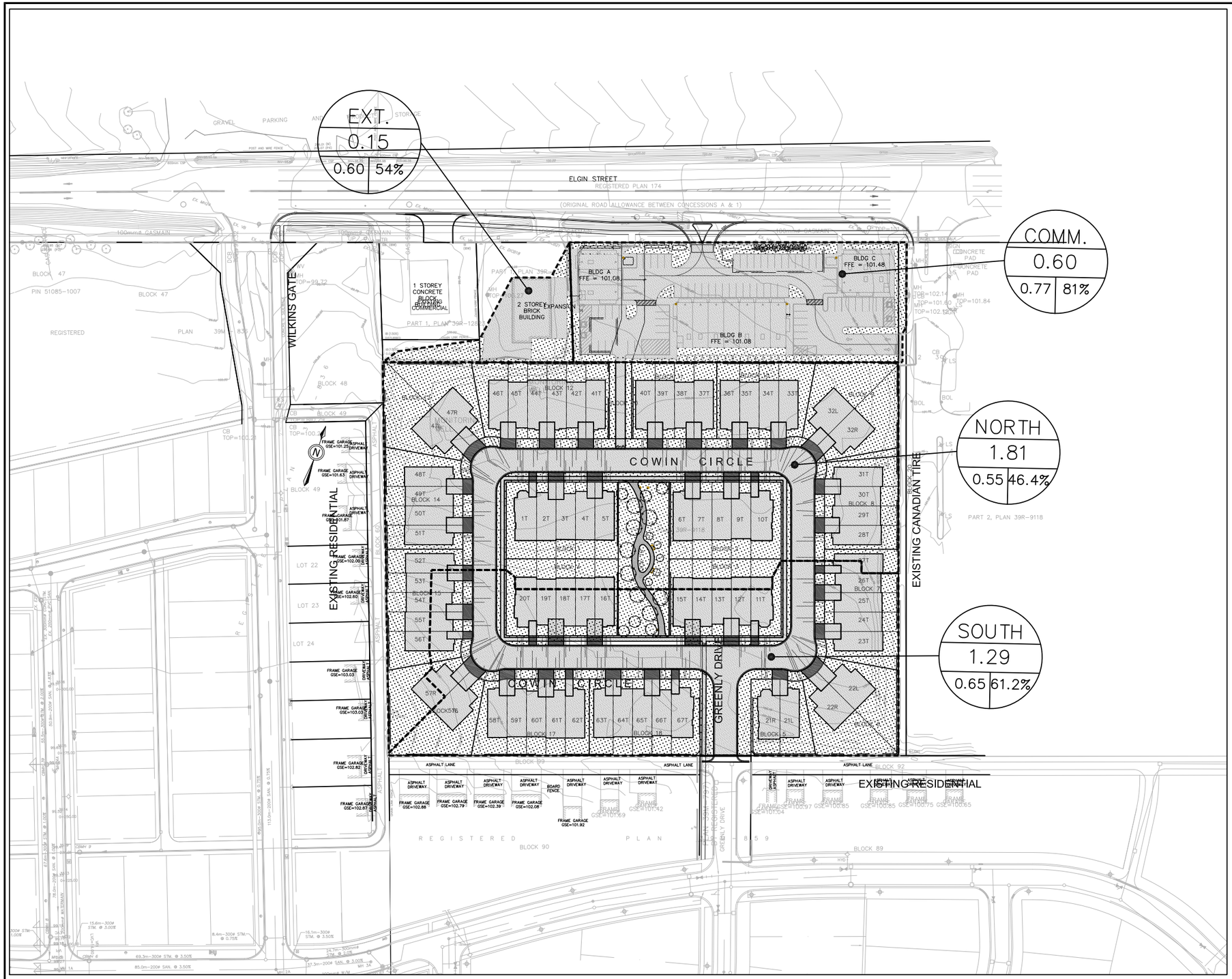
www.maeng.ca

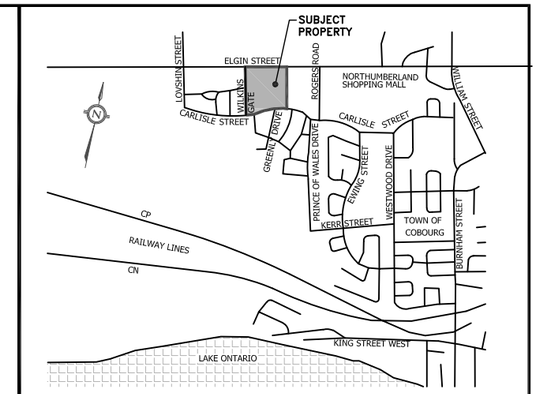
Client: VANDYK GROUP OF COMPANIES

Project: CT LANDS, COBOURG

Drawing Title: POST-DEVELOPMENT STORM DRAINAGE PLAN

Scale:	Date:
NTS	MAY 2020
Project No:	Drawing No:
11-553	STM-POST





KEYPLAN
N.T.S.

LEGEND :

- DRAINAGE BOUNDARY
- SUBCATCHMENT AREA
- 100 / 3.8907 / 0.26 | 2.1% — AREA I.D. / AREA (ha.) / RUNOFF COEFF. / IMPERVIOUSNESS
- PERVIOUS AREA
- IMPERVIOUS AREA
- EXISTING OVERLAND FLOW DIRECTION

*FOR DRAINAGE AREA CALCULATIONS, REFER TO Table 3 – Major Storm Drainage Area Summary

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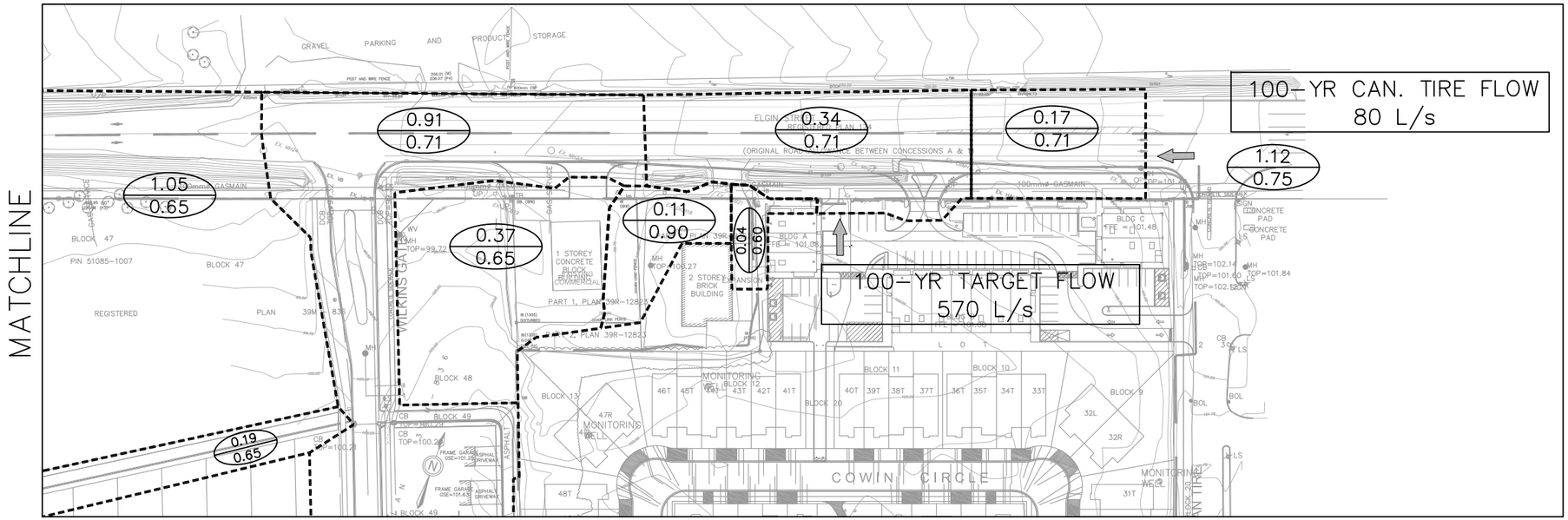
Client: VANDYK GROUP OF COMPANIES

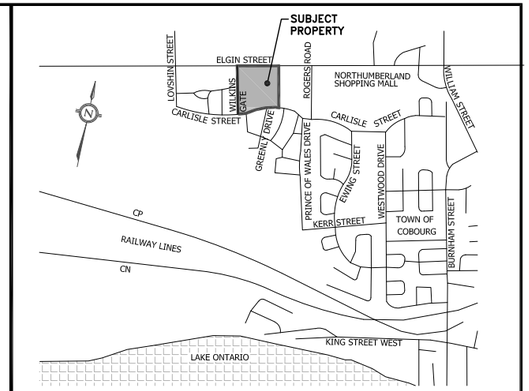
Project: CT LANDS, COBOURG

Drawing Title: MAJOR STORM DRAINAGE PLAN (RESIDENTIAL)

Scale: NTS | Date: MAY 2020

Project No: 11-553 | Drawing No: STM-MJR

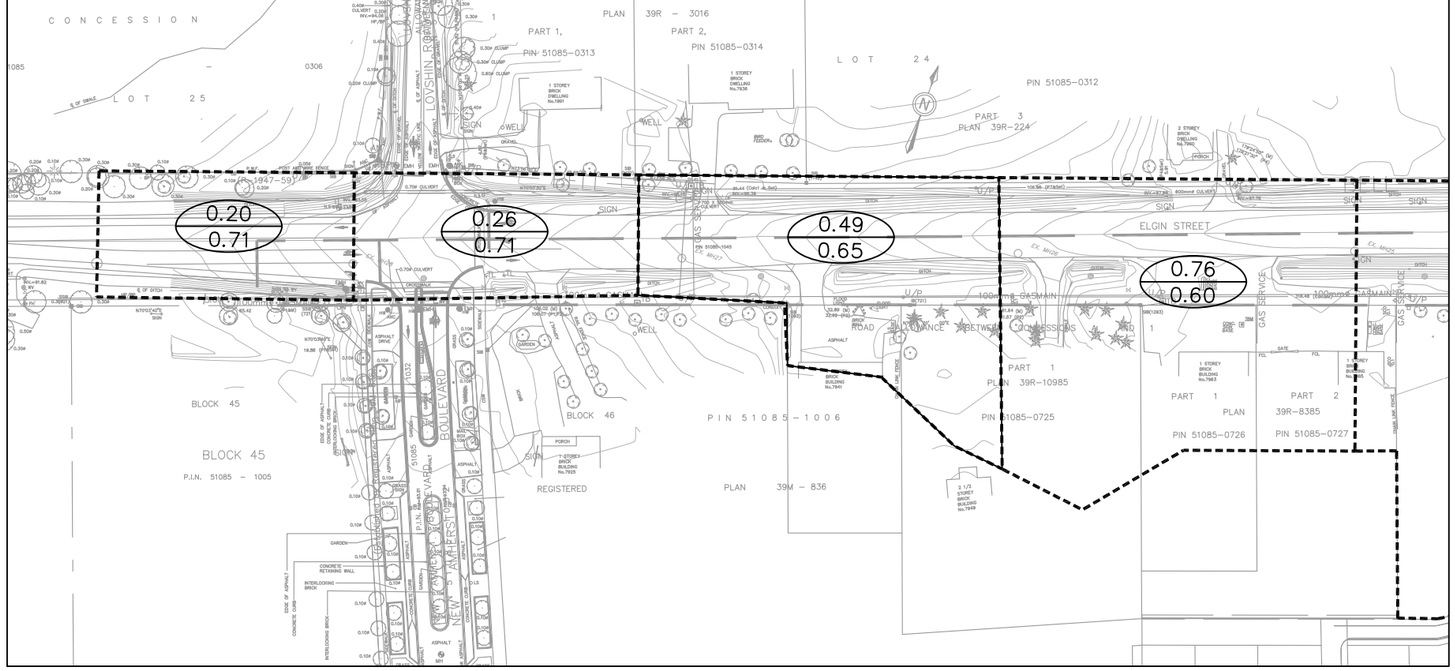




KEYPLAN
N.T.S.

LEGEND :

- SUBCATCHMENT AREA
- 0.17 / 0.71 — AREA (ha.) / RUNOFF COEFFICIENT
- EXISTING OVERLAND FLOW DIRECTION



MASONGSONG ASSOCIATES 7800 KENNEDY ROAD SUITE 201 MARKHAM, ONTARIO L3R 2C7 T: (905) 944-0162 www.maeng.ca	Client: **VANDYK GROUP OF COMPANIES**	Project: **CT LANDS, COBOURG**	Drawing Title: **ELGIN STREET/COUNTY RD 2 STORM DRAINAGE PLAN**	Scale: NTS Project No: 11-553	Date: MAY 2020 Drawing No: DR-1

Appendix B

Stormwater Management Calculations:

Table 1 – Pre-Development Area Summary
Table 2 – Post-Development Area Summary
Table 3 – Major Storm Drainage Area Summary

Table 4 – Inlet Control – Grate & Frame

Table 5 – VO5 Input Table (Pre-Development)
Table 6 – VO5 Input Table (Post-Development)
Table 7 – Storage-Discharge Curve, VO5 Route Reservoir 2001
Table 1A & 1B – 6A & 6B – Underground Storage Volumes

Table 1 Pre Development Area Summary

AREA I.D.	PRE-DEVELOPMENT TOTAL AREA SUMMARY (ha.)		TOTAL AREA (ha.)	COMPOSITE C'	IMPERVIOUSNESS (%)
	GRASS/LANDSCAPE ('R'=0.25)	PAVED/BUILDING ('R'=0.90)			
100 (CT Lands, including external)	*3.7660*	*0.0822*	*3.8482*	*0.26*	*2.1%*

Table 2 Post Development Area Summary

AREA I.D.	POST-DEVELOPMENT TOTAL AREA SUMMARY (ha.)		TOTAL AREA (ha.)	COMPOSITE C'	TOTAL IMPERVIOUSNESS (%)
	GRASS/LANDSCAPE ('R'=0.25)	PAVED/BUILDING ('R'=0.90)			
301 - Buidling A (Commercial)		0.0270	0.0270	0.90	100.0%
302 - Building B (Commercial)		0.0756	0.0756	0.90	100.0%
303 - Building C (Commercial)		0.0279	0.0279	0.90	100.0%
300 - Parking/Other (Commercial)	0.1149	0.3446	0.4595	0.74	75%
Commercial Totals=	0.1149	0.4751	0.5900 *	0.77	81%

* Total commercial A=0.60ha, but 0.01ha drains uncontrolled and is considered part of Area ID 400

400 - CT Lands Uncontrolled Commercial	0.0197	0.0133	0.0330	0.51	40%	* Note: Area ID 400 includes external commercial lands and a portion of the subject commercial block

201 - CT Lands External	0.0527	0.0726	0.1253	0.63	58%	

AREA I.D.	POST-DEVELOPMENT TOTAL AREA SUMMARY (ha.)		TOTAL AREA (ha.)	COMPOSITE C'	TIMP (%)	Directly Connected? (y/n)	XIMP (%)
	GRASS/LANDSCAPE ('R'=0.25)	PAVED/BUILDING ('R'=0.90)					
Townhouse (lot)	1.0260	0.1400	1.1660	0.33	12%	y	12%
Townhouse (building)		1.0130	1.0130	0.90	100%	n	0.0%
Park	0.1007	0.0192	0.1199	0.35	16%	y	16%
Right-of-way	0.1860	0.5580	0.7440	0.74	75%	y	75%
Access lane	0.0336	0.0234	0.0570	0.52	41%	y	41%
200 - CT Lands Totals	1.3463	1.7535	3.0999	0.62	**57%**		**24%**

*round to 60% conservatively *round to 30% conservatively

Table 3 Major Storm Drainage Area Summary

AREA I.D.	POST-DEVELOPMENT TOTAL AREA SUMMARY (ha.)		TOTAL AREA (ha.)	COMPOSITE C'	TIMP (%)
	GRASS/LANDSCAPE ('R'=0.25)	PAVED/BUILDING ('R'=0.90)			
SOUTH	*0.5005*	*0.7895*	1.2900	0.65	*61.2%*
NORTH	*0.9702*	*0.8398*	1.8100	0.55	*46.4%*

Table 4

Inlet Control - Grate & Frame
DCBMH 1 & DCBMH2

Project: CT Lands, Cobourg
Project No.: 20-021
By: M.F.
Date: 18-May-20

Steel Catchbasin Grate & Frame
Model No. 5101 (Stepcon)

CB Clear Opening, W =	0.61	m	
DCB, L = W x 2	1.22	m	
DCB, A =	0.744	m2	
Void Space, % =	85%		
Total Void Space =	0.633	m2	
Effective Void Space, Ae =	0.316	m2	(assuming 50% blockage, MTO requirement)
Head =	**0.05**	m	
Inlet Loss Coefficient, Cd =	0.62		(MTO)
Inlet Flow, Q = Cd x Ae x (2gh)^0.5 =	**194**	L/s	

Table 5

VO5 Input Table
Pre-Development Drainage

Project: CT Lands, Cobourg
Project No.: 20-021
By: M.F.
Date: 18-May-20

NASHYD Hydrograph

Parameter	Description	Subcatchment	
		100	101
		SITE	EXT-CANADIAN TIRE
DT (min)	Simulation time step increment	5	5
Area (ha)	Catchment area	3.89	3.66
DWF (m3/s)	A constant Dry Weather Flow (baseflow)	0	0
CN *	SCS Modified Curve Number	75	75
IA (mm) **	Initial abstraction	5 (open space)	2 (commercial)
N	Number of linear reservoir used	3	3
TP (hr) ***	Unit Hydrograph time to peak	0.40	0.40
Storm Index	Index of the rainfall in the rain group	1	1
Rain (mm/hr)	Optional rainfall intensity	0	0

Table 6

VO5 Input Table
Post-Development Drainage

Project: CT Lands, Cobourg
Project No.: 20-021
By: M.F.
Date: 18-May-20

NASHYD Hydrograph

Parameter	Description	Subcatchment
		400
		COMMERCIAL
DT (min)	Simulation time step increment	2
Area (ha)	Catchment area	0.03
DWF (m3/s)	A constant Dry Weather Flow (baseflow)	0
CN *	SCS Modified Curve Number	84.2
IA (mm) **	Initial abstraction	5
N	Number of linear reservoir used	3
TP (hr) ***	Unit Hydrograph time to peak	0.2
Storm Index	Index of the rainfall in the rain group	1
Rain (mm/hr)	Optional rainfall intensity	0

* Calculated using ????
** IA values from ????
*** TP = 0.67Tc , where Tc is calculated using Airport Equation (C<0.4) or Bransby Williams (C>0.4)

STANDHYD Hydrograph

Parameter	Description	Subcatchment					
		200	201	300	301	302	303
		CT Lands (Residential)	CT Lands (External1)	COMMERCIAL PARKING	COMMERICAL BLDG A	COMMERICAL BLDG B	COMMERICAL BLDG C
DT (min)	Simulation time step increment	5	5	2	2	2	2
Area (ha)	Catchment area	3.1	0.12	0.46	0.03	0.08	0.03
TIMP	Ratio of total impervious area	60	40	75	99	99	99
XIMP	Ratio of directly connected impervious area	30	0.10	75	99	99	99
DWF (m3/s)	A constant Dry Weather Flow (baseflow)	0	0	0	0	0	0
LOSS *	Type	Mod SCS	Mod SCS	Mod SCS	Mod SCS	Mod SCS	Mod SCS
	CN	75	75	75	75	75	75
	IA (mm) - Initial abstraction (pervious area)	8.47	8.47	8.47	8	8	8
SLPP (%)	Average slope of pervious area	2	2	2	2	2	2
LGP (m)	Overland flow length of pervious area	40	40	5	1	1	1
MNP	Manning's coefficient for pervious surface (sheet flow)	0.25	0.25	0.25	0.25	0.25	0.25
SCP (hr)	Storage coefficient for pervious area	0	0	0	0	0	0
DPSI (mm)	Available depression storage over impervious area	1	1	1	1	1	1
SLPI (%)	Average slope of impervious area	1	1	1	1	1	1
LGI Type	Calculation method	Auto	Auto	Auto	Auto	Auto	Auto
LGI (m)	Overland flow length of impervious area	75	75	55.3	13.5	22.4	13.6
MNI	Manning's coefficient for impervious surface (channel flow)	0.013	0.013	0.013	0.013	0.013	0.013
SCI (hr)	Storage coefficient for impervious area	0	0	0	0	0	0
Storm Index	Index of the rainfall in the rain group	1	1	1	1	1	1
Rain (mm/hr)	Optional rainfall intensity	0	0	0	0	0	0

* Calculated using ????

RouteReservoir - Rating Curves:

ID	Discharge (m3/s)	Storage (ha m)
3011 - Building A	0	0
	0.001577	0.0017
	1	0.05
3021 - Building B	0	0
	0.00315	0.0046
	1	0.01
3031 - Building C	0	0
	0.001577	0.0017
	1	0.01
2001 - CT Lands	0	0
	0.032	0.0001
	0.038	0.0116
	0.054	0.0558
	0.466	0.0870
	0.675	0.0941

Table 7

Storage-Discharge Curve (Underground Storage)
VO5 - Route Reservoir 2001

Project: CT Lands, Cobourg
Project No.: 20-021
By: M.F.
Date: 18-May-20

Control 1: Orifice Tube (@MH20)		**Control 2: Orifice Tube (@MH20)**	
Diam (m):	0.125	Diam (m):	0.450
Coeff: (tube)	0.800	Coeff: (tube)	0.800
Invert (m):	96.570	Invert (m):	98.190

Stage-Storage-Discharge Curve

Elevation	Cumulative Volume	**Storage**	Stage	**Orifice**		**Orifice**		**Total Outflow to sewers**	Description
				Head (to springline)	Outflow	Head (to springline)	Outflow		
m	m^3	**(ha.m)**	(m)	(m)	(m3/s)	(m)	(m3/s)	**(m3/s)**	
96.57	0	**0.0000**	0.000	0.00	0.000			0.000	
97.17	1	**0.0001**	0.600	0.54	0.032			0.032	
97.40	116	**0.0116**	0.830	0.77	0.038			0.038	
97.81	348	**0.0348**	1.240	1.18	0.047			0.047	
98.19	558	**0.0558**	1.620	1.56	0.054	0.00	0.000	0.054	
98.59	756	**0.0756**	2.020	1.96	0.061	0.18	0.236	0.297	
98.92	870	**0.0870**	2.350	2.29	0.066	0.51	0.400	0.466	
99.55	941	**0.0941**	2.980	2.92	0.074	1.14	0.600	0.675	

interpolate:

99.21 =100-yr HWL

0.0903 =100-year volume (from VO5)

Table 1A

Underground Storage Volumes - Sewers
Elevation 97.40 m

Project: CT Lands, Cobourg
Project No.: 20-021
By: M.F.
Date: 18-May-20

AVAILABLE STORAGE UNDERGROUND IN SEWERS
(BELOW ELEVATION of 97.40m WL) :

FROM	TO	LENGTH (m)	WL (m)	DOWNSTREAM INVERT (m)	DOWNSTREAM OBVERT (m)	Depth of pipe filled (m)	DIMENSIONS OR DIAMETER (mm)	VOLUME (cu.m.)
DICB1	DSCBMH1	9.4	97.40	99.11	99.41	0	300	0.00
DSCBMH1	DSCBMH2	8.5	97.40	98.80	99.33	0	525	0.00
DSCBMH2	MH1 (SOUTH)	28.8	97.40	98.43	98.96	0	525	0.00
DCB1	MH1 (NORTH)	9.4	97.40	99.71	100.09	0	375	0.00
MH1 (EAST)	MH8	25.7	97.40	98.16	98.84	0	675	0.00
DICB23	DICB9	30.2	97.40	98.97	99.27	0	300	0.00
DICB9	MH8	33.2	97.40	98.41	98.71	0	300	0.00
MH8	MH9	7.4	97.40	98.08	98.76	0	675	0.00
DICB11	MH9	32.5	97.40	99.14	99.44	0	300	0.00
MH9	MH10	40.5	97.40	97.84	98.52	0	675	0.00
DICB27	DICB16	30.0	97.40	100.06	100.36	0	300	0.00
DICB16	MH10	17.7	97.40	99.85	100.15	0	300	0.00
DICB24	CBMH6	24.1	97.40	99.25	99.55	0	300	0.00
DICB22	CBMH6	17.5	97.40	99.20	99.50	0	300	0.00
CBMH6	MH10	32.0	97.40	98.79	99.09	0	300	0.00
MH10	CBMH1	21.1	97.40	97.72	98.40	0	675	0.00
CB3	CBMH1	8.5	97.40	100.51	100.81	0	300	0.00
CBMH1	MH11	12.8	97.40	97.64	98.32	0	675	0.00
DICB12	MH11	32.5	97.40	99.17	99.47	0	300	0.00
MH11	MH12	8.2	97.40	97.55	98.23	0	675	0.00
DICB21	DICB13	30.3	97.40	99.24	99.54	0	300	0.00
DICB13	MH12	33.6	97.40	98.81	99.11	0	300	0.00
MH12	MH13	32.6	97.40	97.35	98.03	50	675	0.86
DICB25	DICB14	17.1	97.40	99.44	99.74	0	300	0.00
DICB14	MH13	32.9	97.40	99.02	99.32	0	300	0.00
MH13	DCBMH3	35.9	97.40	97.16	97.84	240	675	4.57
MH1 (WEST)	DCBMH1	41.0	97.40	98.51	99.19	0	675	0.00
DICB20	DCB2	5.2	97.40	99.70	100.00	0	300	0.00
DCB2	DCBMH1	8.5	97.40	99.54	99.92	0	375	0.00
DCBMH1	MH2	16.0	97.40	98.40	99.08	0	675	0.00
DICB2	MH2	33.0	97.40	99.11	99.41	0	300	0.00
MH2	MH3	40.3	97.40	98.18	98.86	0	675	0.00
DICB3	MH3	33.6	97.40	99.48	99.78	0	300	0.00
MH3	MH4	6.7	97.40	98.06	98.74	0	675	0.00
DICB4	MH4	33.4	97.40	100.00	100.30	0	300	0.00
MH4	MH5	41.1	97.40	97.82	98.50	0	675	0.00
DICB5	MH5	32.8	97.40	99.69	99.99	0	300	0.00
DICB26	DICB15	30.0	97.40	99.95	100.25	0	300	0.00
DICB15	MH5	17.7	97.40	99.74	100.04	0	300	0.00
MH5	CBMH3	20.8	97.40	97.68	98.36	0	675	0.00
CB1	CBMH3	8.5	97.40	100.51	100.81	0	300	0.00
CBMH3	MH6	13.1	97.40	97.59	98.27	0	675	0.00
DICB6	MH6	33.8	97.40	99.36	99.66	0	300	0.00
MH6	MH7	8.0	97.40	97.49	98.17	0	675	0.00
DICB10	MH7	32.9	97.40	97.99	98.37	0	375	0.00
MH7	DCBMH3	53.3	97.40	97.16	97.84	240	675	6.78
CB2	CBMH2	15.8	97.40	99.73	100.03	0	300	0.00
CBMH2	DCBMH2	5.3	97.40	99.37	99.67	0	300	0.00
DCBMH2	DCBMH3	8.5	97.40	97.15	97.83	250	675	1.13
DCBMH3	CBMH4	33.0	97.40	96.92	97.67	480	750	9.33
DICB7	MH21	15.3	97.40	98.01	98.31	0	300	0.00
DICB28	MH21	8.0	97.40	98.06	98.36	0	300	0.00
MH21	CBMH8	2.9	97.40	97.89	98.19	0	300	0.00
CBMH8	CBMH9	15.2	97.40	97.72	98.02	0	300	0.00
CBMH9	CBMH4	14.9	97.40	97.62	97.92	0	300	0.00
CBMH4	MH14	8.6	97.40	96.83	97.58	570	750	2.89
CBMH5	MH14	6.1	97.40	97.13	97.58	270	450	0.58
MH14	OGS1	3.7	97.40	96.80	97.55	600	750	1.31
OGS1	MH16	3.7	97.40	96.76	97.51	640	750	1.39
'EST CHAMBE	MH15	2.5	97.40	97.12	97.72	280	600	0.33
MH15	MH16	5.2	97.40	96.94	97.69	460	750	1.41
MH16	MH20	28.3	97.40	96.57	97.32	830	750	12.50
AST CHAMBE	MH17	2.7	97.40	97.14	97.74	260	600	0.33
MH17	MH18	7.2	97.40	96.93	97.68	470	750	1.99
MH18	MH19	12.5	97.40	96.81	97.56	590	750	4.34
MH19	MH20	12.5	97.40	96.66	97.41	740	750	5.45

55.20 cu.m.

Table 1B

Underground Storage Volumes - Structures
Elevation 97.40 m

Project: CT Lands, Cobourg
Project No.: 20-021
By: M.F.
Date: 18-May-20

AVAILABLE STORAGE UNDERGROUND IN CATCHBASINS AND MANHOLES
(BELOW ELEVATION of 97.40m WL) :

LOCATION	MH	HWL ELEV (m)	LOW INVERT ELEV (m)	DIMENSIONS OR DIAMETER (m)	VOLUME (cu.m.)	
RESIDENTIAL	MH19	97.40	96.72	1.50	1.20	
RESIDENTIAL	MH18	97.40	96.87	1.50	0.94	
RESIDENTIAL	MH17	97.40	96.97	1.50	0.76	
RESIDENTIAL	EAST CHAMBER	97.40	97.40	--	33.26	(see cultec spec sheet)
RESIDENTIAL	MH20	97.40	96.55	2.40	3.85	
RESIDENTIAL	MH15	97.40	96.96	1.50	0.78	
RESIDENTIAL	WEST CHAMBER	97.40	97.40	--	13.69	(see cultec spec sheet)
RESIDENTIAL	MH16	97.40	96.71	1.80	1.76	
RESIDENTIAL	OGS1	97.40	96.78	0.00	0.00	
RESIDENTIAL	CBMH5	97.40	97.20	1.20	0.23	
RESIDENTIAL	MH14	97.40	96.81	1.80	1.50	
RESIDENTIAL	CBMH9	97.40	97.69	1.20	0.00	
RESIDENTIAL	CBMH8	97.40	97.80	1.20	0.00	
RESIDENTIAL	MH21	97.40	97.92	1.20	0.00	
RESIDENTIAL	CBMH4	97.40	96.87	1.80	1.35	
RESIDENTIAL	DCBMH2	97.40	97.24	1.50	0.28	
RESIDENTIAL	CBMH2	97.40	99.39	1.20	0.00	
RESIDENTIAL	MH7	97.40	97.43	1.50	0.00	
RESIDENTIAL	MH6	97.40	97.53	1.50	0.00	
RESIDENTIAL	CBMH3	97.40	97.65	1.50	0.00	
RESIDENTIAL	MH5	97.40	97.78	1.50	0.00	
RESIDENTIAL	MH4	97.40	98.02	1.50	0.00	
RESIDENTIAL	MH3	97.40	98.13	1.50	0.00	
RESIDENTIAL	MH2	97.40	98.37	1.50	0.00	
RESIDENTIAL	DCBMH1	97.40	98.48	1.50	0.00	
RESIDENTIAL	DCBMH3	97.40	97.08	1.80	0.81	
RESIDENTIAL	MH13	97.40	97.33	1.50	0.12	
RESIDENTIAL	MH12	97.40	97.50	1.50	0.00	
RESIDENTIAL	MH11	97.40	97.59	1.50	0.00	
RESIDENTIAL	CBMH1	97.40	97.70	1.50	0.00	
RESIDENTIAL	CBMH6	97.40	99.11	1.20	0.00	
RESIDENTIAL	MH10	97.40	97.82	1.50	0.00	
RESIDENTIAL	MH9	97.40	98.03	1.50	0.00	
RESIDENTIAL	MH8	97.40	98.11	1.50	0.00	
RESIDENTIAL	MH1	97.40	98.28	1.80	0.00	
RESIDENTIAL	DSCBMH2	97.40	98.71	1.50	0.00	
RESIDENTIAL	DSCBMH1	97.40	98.88	1.50	0.00	
					60.52 cu.m.	

Table 2A

Underground Storage Volumes - Sewers
Elevation 97.81 m

Project: CT Lands, Cobourg
Project No.: 20-021
By: M.F.
Date: 18-May-20

AVAILABLE STORAGE UNDERGROUND IN SEWERS
(BELOW ELEVATION of 97.81m WL) :

FROM	TO	LENGTH (m)	WL (m)	DOWNSTREAM INVERT (m)	DOWNSTREAM OBVERT (m)	Depth of pipe filled (m)	DIMENSIONS OR DIAMETER (mm)	VOLUME (cu.m.)
DICB1	DSCBMH1	9.4	97.81	99.11	99.41	0	300	0.00
DSCBMH1	DSCBMH2	8.5	97.81	98.80	99.33	0	525	0.00
DSCBMH2	MH1 (SOUTH)	28.8	97.81	98.43	98.96	0	525	0.00
DCB1	MH1 (NORTH)	9.4	97.81	99.71	100.09	0	375	0.00
MH1 (EAST)	MH8	25.7	97.81	98.16	98.84	0	675	0.00
DICB23	DICB9	30.2	97.81	98.97	99.27	0	300	0.00
DICB9	MH8	33.2	97.81	98.41	98.71	0	300	0.00
MH8	MH9	7.4	97.81	98.08	98.76	0	675	0.00
DICB11	MH9	32.5	97.81	99.14	99.44	0	300	0.00
MH9	MH10	40.5	97.81	97.84	98.52	0	675	0.00
DICB27	DICB16	30.0	97.81	100.06	100.36	0	300	0.00
DICB16	MH10	17.7	97.81	99.85	100.15	0	300	0.00
DICB24	CBMH6	24.1	97.81	99.25	99.55	0	300	0.00
DICB22	CBMH6	17.5	97.81	99.20	99.50	0	300	0.00
CBMH6	MH10	32.0	97.81	98.79	99.09	0	300	0.00
MH10	CBMH1	21.1	97.81	97.72	98.40	90	675	1.01
CB3	CBMH1	8.5	97.81	100.51	100.81	0	300	0.00
CBMH1	MH11	12.8	97.81	97.64	98.32	170	675	1.15
DICB12	MH11	32.5	97.81	99.17	99.47	0	300	0.00
MH11	MH12	8.2	97.81	97.55	98.23	260	675	1.13
DICB21	DICB13	30.3	97.81	99.24	99.54	0	300	0.00
DICB13	MH12	33.6	97.81	98.81	99.11	0	300	0.00
MH12	MH13	32.6	97.81	97.35	98.03	460	675	7.95
DICB25	DICB14	17.1	97.81	99.44	99.74	0	300	0.00
DICB14	MH13	32.9	97.81	99.02	99.32	0	300	0.00
MH13	DCBMH3	35.9	97.81	97.16	97.84	650	675	12.37
MH1 (WEST)	DCBMH1	41.0	97.81	98.51	99.19	0	675	0.00
DICB20	DCB2	5.2	97.81	99.70	100.00	0	300	0.00
DCB2	DCBMH1	8.5	97.81	99.54	99.92	0	375	0.00
DCBMH1	MH2	16.0	97.81	98.40	99.08	0	675	0.00
DICB2	MH2	33.0	97.81	99.11	99.41	0	300	0.00
MH2	MH3	40.3	97.81	98.18	98.86	0	675	0.00
DICB3	MH3	33.6	97.81	99.48	99.78	0	300	0.00
MH3	MH4	6.7	97.81	98.06	98.74	0	675	0.00
DICB4	MH4	33.4	97.81	100.00	100.30	0	300	0.00
MH4	MH5	41.1	97.81	97.82	98.50	0	675	0.00
DICB5	MH5	32.8	97.81	99.69	99.99	0	300	0.00
DICB26	DICB15	30.0	97.81	99.95	100.25	0	300	0.00
DICB15	MH5	17.7	97.81	99.74	100.04	0	300	0.00
MH5	CBMH3	20.8	97.81	97.68	98.36	130	675	1.43
CB1	CBMH3	8.5	97.81	100.51	100.81	0	300	0.00
CBMH3	MH6	13.1	97.81	97.59	98.27	220	675	1.53
DICB6	MH6	33.8	97.81	99.36	99.66	0	300	0.00
MH6	MH7	8.0	97.81	97.49	98.17	320	675	1.36
DICB10	MH7	32.9	97.81	97.99	98.37	0	375	0.00
MH7	DCBMH3	53.3	97.81	97.16	97.84	650	675	18.37
CB2	CBMH2	15.8	97.81	99.73	100.03	0	300	0.00
CBMH2	DCBMH2	5.3	97.81	99.37	99.67	0	300	0.00
DCBMH2	DCBMH3	8.5	97.81	97.15	97.83	660	675	2.97
DCBMH3	CBMH4	33.0	97.81	96.92	97.67	890	750	14.58
DICB7	MH21	15.3	97.81	98.01	98.31	0	300	0.00
DICB28	MH21	8.0	97.81	98.06	98.36	0	300	0.00
MH21	CBMH8	2.9	97.81	97.89	98.19	0	300	0.00
CBMH8	CBMH9	15.2	97.81	97.72	98.02	90	300	0.32
CBMH9	CBMH4	14.9	97.81	97.62	97.92	190	300	0.67
CBMH4	MH14	8.6	97.81	96.83	97.58	980	750	3.80
CBMH5	MH14	6.1	97.81	97.13	97.58	680	450	0.97
MH14	OGS1	3.7	97.81	96.80	97.55	1010	750	1.63
OGS1	MH16	3.7	97.81	96.76	97.51	1050	750	1.63
'EST CHAMBE	MH15	2.5	97.81	97.12	97.72	690	600	0.71
MH15	MH16	5.2	97.81	96.94	97.69	870	750	2.30
MH16	MH20	28.3	97.81	96.57	97.32	1240	750	12.50
AST CHAMBE	MH17	2.7	97.81	97.14	97.74	670	600	0.76
MH17	MH18	7.2	97.81	96.93	97.68	880	750	3.18
MH18	MH19	12.5	97.81	96.81	97.56	1000	750	5.52
MH19	MH20	12.5	97.81	96.66	97.41	1150	750	5.52

103.37 cu.m.

Table 2B

Underground Storage Volumes - Structures
Elevation 97.81 m

Project: CT Lands, Cobourg
Project No.: 20-021
By: M.F.
Date: 18-May-20

AVAILABLE STORAGE UNDERGROUND IN CATCHBASINS AND MANHOLES
(BELOW ELEVATION of 97.81m WL) :

LOCATION	MH	HWL ELEV (m)	LOW INVERT ELEV (m)	DIMENSIONS OR DIAMETER (m)	VOLUME (cu.m.)	
RESIDENTIAL	MH19	97.81	96.72	1.50	1.93	
RESIDENTIAL	MH18	97.81	96.87	1.50	1.66	
RESIDENTIAL	MH17	97.81	96.97	1.50	1.48	
RESIDENTIAL	EAST CHAMBER	97.81	97.40	--	153.82	(see cultec spec sheet)
RESIDENTIAL	MH20	97.81	96.55	2.40	5.70	
RESIDENTIAL	MH15	97.81	96.96	1.50	1.50	
RESIDENTIAL	WEST CHAMBER	97.81	97.40	--	63.36	(see cultec spec sheet)
RESIDENTIAL	MH16	97.81	96.71	1.80	2.80	
RESIDENTIAL	OGS1	97.81	96.78	0.00	0.00	
RESIDENTIAL	CBMH5	97.81	97.20	1.20	0.69	
RESIDENTIAL	MH14	97.81	96.81	1.80	2.54	
RESIDENTIAL	CBMH9	97.81	97.69	1.20	0.14	
RESIDENTIAL	CBMH8	97.81	97.80	1.20	0.01	
RESIDENTIAL	MH21	97.81	97.92	1.20	0.00	
RESIDENTIAL	CBMH4	97.81	96.87	1.80	2.39	
RESIDENTIAL	DCBMH2	97.81	97.24	1.50	1.01	
RESIDENTIAL	CBMH2	97.81	99.39	1.20	0.00	
RESIDENTIAL	MH7	97.81	97.43	1.50	0.67	
RESIDENTIAL	MH6	97.81	97.53	1.50	0.49	
RESIDENTIAL	CBMH3	97.81	97.65	1.50	0.28	
RESIDENTIAL	MH5	97.81	97.78	1.50	0.05	
RESIDENTIAL	MH4	97.81	98.02	1.50	0.00	
RESIDENTIAL	MH3	97.81	98.13	1.50	0.00	
RESIDENTIAL	MH2	97.81	98.37	1.50	0.00	
RESIDENTIAL	DCBMH1	97.81	98.48	1.50	0.00	
RESIDENTIAL	DCBMH3	97.81	97.08	1.80	1.86	
RESIDENTIAL	MH13	97.81	97.33	1.50	0.85	
RESIDENTIAL	MH12	97.81	97.50	1.50	0.55	
RESIDENTIAL	MH11	97.81	97.59	1.50	0.39	
RESIDENTIAL	CBMH1	97.81	97.70	1.50	0.19	
RESIDENTIAL	CBMH6	97.81	99.11	1.20	0.00	
RESIDENTIAL	MH10	97.81	97.82	1.50	0.00	
RESIDENTIAL	MH9	97.81	98.03	1.50	0.00	
RESIDENTIAL	MH8	97.81	98.11	1.50	0.00	
RESIDENTIAL	MH1	97.81	98.28	1.80	0.00	
RESIDENTIAL	DSCBMH2	97.81	98.71	1.50	0.00	
RESIDENTIAL	DSCBMH1	97.81	98.88	1.50	0.00	
					244.37 cu.m.	

Table 3A

Underground Storage Volumes - Sewers
Elevation 98.19 m

Project: CT Lands, Cobourg
Project No.: 20-021
By: M.F.
Date: 18-May-20

AVAILABLE STORAGE UNDERGROUND IN SEWERS
(BELOW ELEVATION of 98.19m WL) :

FROM	TO	LENGTH (m)	WL (m)	DOWNSTREAM INVERT (m)	DOWNSTREAM OBVERT (m)	Depth of pipe filled (m)	DIMENSIONS OR DIAMETER (mm)	VOLUME (cu.m.)
DICB1	DSCBMH1	9.4	98.19	99.11	99.41	0	300	0.00
DSCBMH1	DSCBMH2	8.5	98.19	98.80	99.33	0	525	0.00
DSCBMH2	MH1 (SOUTH)	28.8	98.19	98.43	98.96	0	525	0.00
DCB1	MH1 (NORTH)	9.4	98.19	99.71	100.09	0	375	0.00
MH1 (EAST)	MH8	25.7	98.19	98.16	98.84	30	675	0.41
DICB23	DICB9	30.2	98.19	98.97	99.27	0	300	0.00
DICB9	MH8	33.2	98.19	98.41	98.71	0	300	0.00
MH8	MH9	7.4	98.19	98.08	98.76	110	675	0.43
DICB11	MH9	32.5	98.19	99.14	99.44	0	300	0.00
MH9	MH10	40.5	98.19	97.84	98.52	350	675	7.51
DICB27	DICB16	30.0	98.19	100.06	100.36	0	300	0.00
DICB16	MH10	17.7	98.19	99.85	100.15	0	300	0.00
DICB24	CBMH6	24.1	98.19	99.25	99.55	0	300	0.00
DICB22	CBMH6	17.5	98.19	99.20	99.50	0	300	0.00
CBMH6	MH10	32.0	98.19	98.79	99.09	0	300	0.00
MH10	CBMH1	21.1	98.19	97.72	98.40	470	675	5.26
CB3	CBMH1	8.5	98.19	100.51	100.81	0	300	0.00
CBMH1	MH11	12.8	98.19	97.64	98.32	550	675	3.73
DICB12	MH11	32.5	98.19	99.17	99.47	0	300	0.00
MH11	MH12	8.2	98.19	97.55	98.23	640	675	2.78
DICB21	DICB13	30.3	98.19	99.24	99.54	0	300	0.00
DICB13	MH12	33.6	98.19	98.81	99.11	0	300	0.00
MH12	MH13	32.6	98.19	97.35	98.03	840	675	11.67
DICB25	DICB14	17.1	98.19	99.44	99.74	0	300	0.00
DICB14	MH13	32.9	98.19	99.02	99.32	0	300	0.00
MH13	DCBMH3	35.9	98.19	97.16	97.84	1030	675	12.85
MH1 (WEST)	DCBMH1	41.0	98.19	98.51	99.19	0	675	0.00
DICB20	DCB2	5.2	98.19	99.70	100.00	0	300	0.00
DCB2	DCBMH1	8.5	98.19	99.54	99.92	0	375	0.00
DCBMH1	MH2	16.0	98.19	98.40	99.08	0	675	0.00
DICB2	MH2	33.0	98.19	99.11	99.41	0	300	0.00
MH2	MH3	40.3	98.19	98.18	98.86	10	675	0.21
DICB3	MH3	33.6	98.19	99.48	99.78	0	300	0.00
MH3	MH4	6.7	98.19	98.06	98.74	130	675	0.46
DICB4	MH4	33.4	98.19	100.00	100.30	0	300	0.00
MH4	MH5	41.1	98.19	97.82	98.50	370	675	8.06
DICB5	MH5	32.8	98.19	99.69	99.99	0	300	0.00
DICB26	DICB15	30.0	98.19	99.95	100.25	0	300	0.00
DICB15	MH5	17.7	98.19	99.74	100.04	0	300	0.00
MH5	CBMH3	20.8	98.19	97.68	98.36	510	675	5.62
CB1	CBMH3	8.5	98.19	100.51	100.81	0	300	0.00
CBMH3	MH6	13.1	98.19	97.59	98.27	600	675	4.17
DICB6	MH6	33.8	98.19	99.36	99.66	0	300	0.00
MH6	MH7	8.0	98.19	97.49	98.17	700	675	2.86
DICB10	MH7	32.9	98.19	97.99	98.37	200	375	1.94
MH7	DCBMH3	53.3	98.19	97.16	97.84	1030	675	19.07
CB2	CBMH2	15.8	98.19	99.73	100.03	0	300	0.00
CBMH2	DCBMH2	5.3	98.19	99.37	99.67	0	300	0.00
DCBMH2	DCBMH3	8.5	98.19	97.15	97.83	1040	675	3.04
DCBMH3	CBMH4	33.0	98.19	96.92	97.67	1270	750	14.58
DICB7	MH21	15.3	98.19	98.01	98.31	180	300	0.65
DICB28	MH21	8.0	98.19	98.06	98.36	130	300	0.25
MH21	CBMH8	2.9	98.19	97.89	98.19	300	300	0.20
CBMH8	CBMH9	15.2	98.19	97.72	98.02	470	300	1.07
CBMH9	CBMH4	14.9	98.19	97.62	97.92	570	300	1.05
CBMH4	MH14	8.6	98.19	96.83	97.58	1360	750	3.80
CBMH5	MH14	6.1	98.19	97.13	97.58	1060	450	0.97
MH14	OGS1	3.7	98.19	96.80	97.55	1390	750	1.63
OGS1	MH16	3.7	98.19	96.76	97.51	1430	750	1.63
'EST CHAMBE	MH15	2.5	98.19	97.12	97.72	1070	600	0.71
MH15	MH16	5.2	98.19	96.94	97.69	1250	750	2.30
MH16	MH20	28.3	98.19	96.57	97.32	1620	750	12.50
AST CHAMBE	MH17	2.7	98.19	97.14	97.74	1050	600	0.76
MH17	MH18	7.2	98.19	96.93	97.68	1260	750	3.18
MH18	MH19	12.5	98.19	96.81	97.56	1380	750	5.52
MH19	MH20	12.5	98.19	96.66	97.41	1530	750	5.52

146.42 cu.m.

Table 3B

Underground Storage Volumes - Structures
Elevation 98.19 m

Project: CT Lands, Cobourg
Project No.: 20-021
By: M.F.
Date: 18-May-20

AVAILABLE STORAGE UNDERGROUND IN CATCHBASINS AND MANHOLES
(BELOW ELEVATION of 98.19m WL) :

LOCATION	MH	HWL ELEV (m)	LOW INVERT ELEV (m)	DIMENSIONS OR DIAMETER (m)	VOLUME (cu.m.)	
RESIDENTIAL	MH19	98.19	96.72	1.50	2.60	
RESIDENTIAL	MH18	98.19	96.87	1.50	2.33	
RESIDENTIAL	MH17	98.19	96.97	1.50	2.16	
RESIDENTIAL	EAST CHAMBER	98.19	97.40	--	260.27	(see cultec spec sheet)
RESIDENTIAL	MH20	98.19	96.55	2.40	7.42	
RESIDENTIAL	MH15	98.19	96.96	1.50	2.17	
RESIDENTIAL	WEST CHAMBER	98.19	97.40	--	107.17	(see cultec spec sheet)
RESIDENTIAL	MH16	98.19	96.71	1.80	3.77	
RESIDENTIAL	OGS1	98.19	96.78	0.00	0.00	
RESIDENTIAL	CBMH5	98.19	97.20	1.20	1.12	
RESIDENTIAL	MH14	98.19	96.81	1.80	3.51	
RESIDENTIAL	CBMH9	98.19	97.69	1.20	0.57	
RESIDENTIAL	CBMH8	98.19	97.80	1.20	0.44	
RESIDENTIAL	MH21	98.19	97.92	1.20	0.31	
RESIDENTIAL	CBMH4	98.19	96.87	1.80	3.36	
RESIDENTIAL	DCBMH2	98.19	97.24	1.50	1.68	
RESIDENTIAL	CBMH2	98.19	99.39	1.20	0.00	
RESIDENTIAL	MH7	98.19	97.43	1.50	1.34	
RESIDENTIAL	MH6	98.19	97.53	1.50	1.17	
RESIDENTIAL	CBMH3	98.19	97.65	1.50	0.95	
RESIDENTIAL	MH5	98.19	97.78	1.50	0.72	
RESIDENTIAL	MH4	98.19	98.02	1.50	0.30	
RESIDENTIAL	MH3	98.19	98.13	1.50	0.11	
RESIDENTIAL	MH2	98.19	98.37	1.50	0.00	
RESIDENTIAL	DCBMH1	98.19	98.48	1.50	0.00	
RESIDENTIAL	DCBMH3	98.19	97.08	1.80	2.82	
RESIDENTIAL	MH13	98.19	97.33	1.50	1.52	
RESIDENTIAL	MH12	98.19	97.50	1.50	1.22	
RESIDENTIAL	MH11	98.19	97.59	1.50	1.06	
RESIDENTIAL	CBMH1	98.19	97.70	1.50	0.87	
RESIDENTIAL	CBMH6	98.19	99.11	1.20	0.00	
RESIDENTIAL	MH10	98.19	97.82	1.50	0.65	
RESIDENTIAL	MH9	98.19	98.03	1.50	0.28	
RESIDENTIAL	MH8	98.19	98.11	1.50	0.14	
RESIDENTIAL	MH1	98.19	98.28	1.80	0.00	
RESIDENTIAL	DSCBMH2	98.19	98.71	1.50	0.00	
RESIDENTIAL	DSCBMH1	98.19	98.88	1.50	0.00	
					412.03 cu.m.	

Table 4A

Underground Storage Volumes - Sewers
Elevation 98.59 m

Project: CT Lands, Cobourg
Project No.: 20-021
By: M.F.
Date: 18-May-20

AVAILABLE STORAGE UNDERGROUND IN SEWERS
(BELOW ELEVATION of 98.59m WL) :

FROM	TO	LENGTH (m)	WL (m)	DOWNSTREAM INVERT (m)	DOWNSTREAM OBVERT (m)	Depth of pipe filled (m)	DIMENSIONS OR DIAMETER (mm)	VOLUME (cu.m.)
DICB1	DSCBMH1	9.4	98.59	99.11	99.41	0	300	0.00
DSCBMH1	DSCBMH2	8.5	98.59	98.80	99.33	0	525	0.00
DSCBMH2	MH1 (SOUTH)	28.8	98.59	98.43	98.96	160	525	1.90
DCB1	MH1 (NORTH)	9.4	98.59	99.71	100.09	0	375	0.00
MH1 (EAST)	MH8	25.7	98.59	98.16	98.84	430	675	5.86
DICB23	DICB9	30.2	98.59	98.97	99.27	0	300	0.00
DICB9	MH8	33.2	98.59	98.41	98.71	180	300	1.41
MH8	MH9	7.4	98.59	98.08	98.76	510	675	2.00
DICB11	MH9	32.5	98.59	99.14	99.44	0	300	0.00
MH9	MH10	40.5	98.59	97.84	98.52	750	675	14.49
DICB27	DICB16	30.0	98.59	100.06	100.36	0	300	0.00
DICB16	MH10	17.7	98.59	99.85	100.15	0	300	0.00
DICB24	CBMH6	24.1	98.59	99.25	99.55	0	300	0.00
DICB22	CBMH6	17.5	98.59	99.20	99.50	0	300	0.00
CBMH6	MH10	32.0	98.59	98.79	99.09	0	300	0.00
MH10	CBMH1	21.1	98.59	97.72	98.40	870	675	7.55
CB3	CBMH1	8.5	98.59	100.51	100.81	0	300	0.00
CBMH1	MH11	12.8	98.59	97.64	98.32	950	675	4.58
DICB12	MH11	32.5	98.59	99.17	99.47	0	300	0.00
MH11	MH12	8.2	98.59	97.55	98.23	1040	675	2.93
DICB21	DICB13	30.3	98.59	99.24	99.54	0	300	0.00
DICB13	MH12	33.6	98.59	98.81	99.11	0	300	0.00
MH12	MH13	32.6	98.59	97.35	98.03	1240	675	11.67
DICB25	DICB14	17.1	98.59	99.44	99.74	0	300	0.00
DICB14	MH13	32.9	98.59	99.02	99.32	0	300	0.00
MH13	DCBMH3	35.9	98.59	97.16	97.84	1430	675	12.85
MH1 (WEST)	DCBMH1	41.0	98.59	98.51	99.19	80	675	1.74
DICB20	DCB2	5.2	98.59	99.70	100.00	0	300	0.00
DCB2	DCBMH1	8.5	98.59	99.54	99.92	0	375	0.00
DCBMH1	MH2	16.0	98.59	98.40	99.08	190	675	1.61
DICB2	MH2	33.0	98.59	99.11	99.41	0	300	0.00
MH2	MH3	40.3	98.59	98.18	98.86	410	675	8.76
DICB3	MH3	33.6	98.59	99.48	99.78	0	300	0.00
MH3	MH4	6.7	98.59	98.06	98.74	530	675	1.88
DICB4	MH4	33.4	98.59	100.00	100.30	0	300	0.00
MH4	MH5	41.1	98.59	97.82	98.50	770	675	14.71
DICB5	MH5	32.8	98.59	99.69	99.99	0	300	0.00
DICB26	DICB15	30.0	98.59	99.95	100.25	0	300	0.00
DICB15	MH5	17.7	98.59	99.74	100.04	0	300	0.00
MH5	CBMH3	20.8	98.59	97.68	98.36	910	675	7.44
CB1	CBMH3	8.5	98.59	100.51	100.81	0	300	0.00
CBMH3	MH6	13.1	98.59	97.59	98.27	1000	675	4.69
DICB6	MH6	33.8	98.59	99.36	99.66	0	300	0.00
MH6	MH7	8.0	98.59	97.49	98.17	1100	675	2.86
DICB10	MH7	32.9	98.59	97.99	98.37	600	375	3.63
MH7	DCBMH3	53.3	98.59	97.16	97.84	1430	675	19.07
CB2	CBMH2	15.8	98.59	99.73	100.03	0	300	0.00
CBMH2	DCBMH2	5.3	98.59	99.37	99.67	0	300	0.00
DCBMH2	DCBMH3	8.5	98.59	97.15	97.83	1440	675	3.04
DCBMH3	CBMH4	33.0	98.59	96.92	97.67	1670	750	14.58
DICB7	MH21	15.3	98.59	98.01	98.31	580	300	1.08
DICB28	MH21	8.0	98.59	98.06	98.36	530	300	0.57
MH21	CBMH8	2.9	98.59	97.89	98.19	700	300	0.20
CBMH8	CBMH9	15.2	98.59	97.72	98.02	870	300	1.07
CBMH9	CBMH4	14.9	98.59	97.62	97.92	970	300	1.05
CBMH4	MH14	8.6	98.59	96.83	97.58	1760	750	3.80
CBMH5	MH14	6.1	98.59	97.13	97.58	1460	450	0.97
MH14	OGS1	3.7	98.59	96.80	97.55	1790	750	1.63
OGS1	MH16	3.7	98.59	96.76	97.51	1830	750	1.63
'EST CHAMBE	MH15	2.5	98.59	97.12	97.72	1470	600	0.71
MH15	MH16	5.2	98.59	96.94	97.69	1650	750	2.30
MH16	MH20	28.3	98.59	96.57	97.32	2020	750	12.50
AST CHAMBE	MH17	2.7	98.59	97.14	97.74	1450	600	0.76
MH17	MH18	7.2	98.59	96.93	97.68	1660	750	3.18
MH18	MH19	12.5	98.59	96.81	97.56	1780	750	5.52
MH19	MH20	12.5	98.59	96.66	97.41	1930	750	5.52

191.77 cu.m.

Table 4B

Underground Storage Volumes - Structures
Elevation 98.59 m

Project: CT Lands, Cobourg
Project No.: 20-021
By: M.F.
Date: 18-May-20

AVAILABLE STORAGE UNDERGROUND IN CATCHBASINS AND MANHOLES
(BELOW ELEVATION of 98.59m WL) :

LOCATION	MH	HWL ELEV (m)	LOW INVERT ELEV (m)	DIMENSIONS OR DIAMETER (m)	VOLUME (cu.m.)	
RESIDENTIAL	MH19	98.59	96.72	1.50	3.30	
RESIDENTIAL	MH18	98.59	96.87	1.50	3.04	
RESIDENTIAL	MH17	98.59	96.97	1.50	2.86	
RESIDENTIAL	EAST CHAMBER	98.59	97.40	--	352.40	(see cultec spec sheet)
RESIDENTIAL	MH20	98.59	96.55	2.40	9.23	
RESIDENTIAL	MH15	98.59	96.96	1.50	2.88	
RESIDENTIAL	WEST CHAMBER	98.59	97.40	--	145.12	(see cultec spec sheet)
RESIDENTIAL	MH16	98.59	96.71	1.80	4.78	
RESIDENTIAL	OGS1	98.59	96.78	0.00	0.00	
RESIDENTIAL	CBMH5	98.59	97.20	1.20	1.57	
RESIDENTIAL	MH14	98.59	96.81	1.80	4.53	
RESIDENTIAL	CBMH9	98.59	97.69	1.20	1.02	
RESIDENTIAL	CBMH8	98.59	97.80	1.20	0.89	
RESIDENTIAL	MH21	98.59	97.92	1.20	0.76	
RESIDENTIAL	CBMH4	98.59	96.87	1.80	4.38	
RESIDENTIAL	DCBMH2	98.59	97.24	1.50	2.39	
RESIDENTIAL	CBMH2	98.59	99.39	1.20	0.00	
RESIDENTIAL	MH7	98.59	97.43	1.50	2.05	
RESIDENTIAL	MH6	98.59	97.53	1.50	1.87	
RESIDENTIAL	CBMH3	98.59	97.65	1.50	1.66	
RESIDENTIAL	MH5	98.59	97.78	1.50	1.43	
RESIDENTIAL	MH4	98.59	98.02	1.50	1.01	
RESIDENTIAL	MH3	98.59	98.13	1.50	0.81	
RESIDENTIAL	MH2	98.59	98.37	1.50	0.39	
RESIDENTIAL	DCBMH1	98.59	98.48	1.50	0.19	
RESIDENTIAL	DCBMH3	98.59	97.08	1.80	3.84	
RESIDENTIAL	MH13	98.59	97.33	1.50	2.23	
RESIDENTIAL	MH12	98.59	97.50	1.50	1.93	
RESIDENTIAL	MH11	98.59	97.59	1.50	1.77	
RESIDENTIAL	CBMH1	98.59	97.70	1.50	1.57	
RESIDENTIAL	CBMH6	98.59	99.11	1.20	0.00	
RESIDENTIAL	MH10	98.59	97.82	1.50	1.36	
RESIDENTIAL	MH9	98.59	98.03	1.50	0.99	
RESIDENTIAL	MH8	98.59	98.11	1.50	0.85	
RESIDENTIAL	MH1	98.59	98.28	1.80	0.79	
RESIDENTIAL	DSCBMH2	98.59	98.71	1.50	0.00	
RESIDENTIAL	DSCBMH1	98.59	98.88	1.50	0.00	
					563.89 cu.m.	

Table 5A

Underground Storage Volumes - Sewers
Elevation 98.92 m

Project: CT Lands, Cobourg
Project No.: 20-021
By: M.F.
Date: 18-May-20

AVAILABLE STORAGE UNDERGROUND IN SEWERS
(BELOW ELEVATION of 98.92m WL) :

FROM	TO	LENGTH (m)	WL (m)	DOWNSTREAM INVERT (m)	DOWNSTREAM OBVERT (m)	Depth of pipe filled (m)	DIMENSIONS OR DIAMETER (mm)	VOLUME (cu.m.)
DICB1	DSCBMH1	9.4	98.92	99.11	99.41	0	300	0.00
DSCBMH1	DSCBMH2	8.5	98.92	98.80	99.33	120	525	0.42
DSCBMH2	MH1 (SOUTH)	28.8	98.92	98.43	98.96	490	525	5.82
DCB1	MH1 (NORTH)	9.4	98.92	99.71	100.09	0	375	0.00
MH1 (EAST)	MH8	25.7	98.92	98.16	98.84	760	675	9.20
DICB23	DICB9	30.2	98.92	98.97	99.27	0	300	0.00
DICB9	MH8	33.2	98.92	98.41	98.71	510	300	2.35
MH8	MH9	7.4	98.92	98.08	98.76	840	675	2.65
DICB11	MH9	32.5	98.92	99.14	99.44	0	300	0.00
MH9	MH10	40.5	98.92	97.84	98.52	1080	675	14.49
DICB27	DICB16	30.0	98.92	100.06	100.36	0	300	0.00
DICB16	MH10	17.7	98.92	99.85	100.15	0	300	0.00
DICB24	CBMH6	24.1	98.92	99.25	99.55	0	300	0.00
DICB22	CBMH6	17.5	98.92	99.20	99.50	0	300	0.00
CBMH6	MH10	32.0	98.92	98.79	99.09	130	300	0.98
MH10	CBMH1	21.1	98.92	97.72	98.40	1200	675	7.55
CB3	CBMH1	8.5	98.92	100.51	100.81	0	300	0.00
CBMH1	MH11	12.8	98.92	97.64	98.32	1280	675	4.58
DICB12	MH11	32.5	98.92	99.17	99.47	0	300	0.00
MH11	MH12	8.2	98.92	97.55	98.23	1370	675	2.93
DICB21	DICB13	30.3	98.92	99.24	99.54	0	300	0.00
DICB13	MH12	33.6	98.92	98.81	99.11	110	300	0.87
MH12	MH13	32.6	98.92	97.35	98.03	1570	675	11.67
DICB25	DICB14	17.1	98.92	99.44	99.74	0	300	0.00
DICB14	MH13	32.9	98.92	99.02	99.32	0	300	0.00
MH13	DCBMH3	35.9	98.92	97.16	97.84	1760	675	12.85
MH1 (WEST)	DCBMH1	41.0	98.92	98.51	99.19	410	675	8.91
DICB20	DCB2	5.2	98.92	99.70	100.00	0	300	0.00
DCB2	DCBMH1	8.5	98.92	99.54	99.92	0	375	0.00
DCBMH1	MH2	16.0	98.92	98.40	99.08	520	675	4.41
DICB2	MH2	33.0	98.92	99.11	99.41	0	300	0.00
MH2	MH3	40.3	98.92	98.18	98.86	740	675	14.42
DICB3	MH3	33.6	98.92	99.48	99.78	0	300	0.00
MH3	MH4	6.7	98.92	98.06	98.74	860	675	2.40
DICB4	MH4	33.4	98.92	100.00	100.30	0	300	0.00
MH4	MH5	41.1	98.92	97.82	98.50	1100	675	14.71
DICB5	MH5	32.8	98.92	99.69	99.99	0	300	0.00
DICB26	DICB15	30.0	98.92	99.95	100.25	0	300	0.00
DICB15	MH5	17.7	98.92	99.74	100.04	0	300	0.00
MH5	CBMH3	20.8	98.92	97.68	98.36	1240	675	7.44
CB1	CBMH3	8.5	98.92	100.51	100.81	0	300	0.00
CBMH3	MH6	13.1	98.92	97.59	98.27	1330	675	4.69
DICB6	MH6	33.8	98.92	99.36	99.66	0	300	0.00
MH6	MH7	8.0	98.92	97.49	98.17	1430	675	2.86
DICB10	MH7	32.9	98.92	97.99	98.37	930	375	3.63
MH7	DCBMH3	53.3	98.92	97.16	97.84	1760	675	19.07
CB2	CBMH2	15.8	98.92	99.73	100.03	0	300	0.00
CBMH2	DCBMH2	5.3	98.92	99.37	99.67	0	300	0.00
DCBMH2	DCBMH3	8.5	98.92	97.15	97.83	1770	675	3.04
DCBMH3	CBMH4	33.0	98.92	96.92	97.67	2000	750	14.58
DICB7	MH21	15.3	98.92	98.01	98.31	910	300	1.08
DICB28	MH21	8.0	98.92	98.06	98.36	860	300	0.57
MH21	CBMH8	2.9	98.92	97.89	98.19	1030	300	0.20
CBMH8	CBMH9	15.2	98.92	97.72	98.02	1200	300	1.07
CBMH9	CBMH4	14.9	98.92	97.62	97.92	1300	300	1.05
CBMH4	MH14	8.6	98.92	96.83	97.58	2090	750	3.80
CBMH5	MH14	6.1	98.92	97.13	97.58	1790	450	0.97
MH14	OGS1	3.7	98.92	96.80	97.55	2120	750	1.63
OGS1	MH16	3.7	98.92	96.76	97.51	2160	750	1.63
'EST CHAMBE	MH15	2.5	98.92	97.12	97.72	1800	600	0.71
MH15	MH16	5.2	98.92	96.94	97.69	1980	750	2.30
MH16	MH20	28.3	98.92	96.57	97.32	2350	750	12.50
AST CHAMBE	MH17	2.7	98.92	97.14	97.74	1780	600	0.76
MH17	MH18	7.2	98.92	96.93	97.68	1990	750	3.18
MH18	MH19	12.5	98.92	96.81	97.56	2110	750	5.52
MH19	MH20	12.5	98.92	96.66	97.41	2260	750	5.52

219.04 cu.m.

Table 5B

Underground Storage Volumes - Structures
Elevation 98.92 m

Project: CT Lands, Cobourg
Project No.: 20-021
By: M.F.
Date: 18-May-20

AVAILABLE STORAGE UNDERGROUND IN CATCHBASINS AND MANHOLES
(BELOW ELEVATION of 98.92m WL) :

LOCATION	MH	HWL ELEV (m)	LOW INVERT ELEV (m)	DIMENSIONS OR DIAMETER (m)	VOLUME (cu.m.)	
RESIDENTIAL	MH19	98.92	96.72	1.50	3.89	
RESIDENTIAL	MH18	98.92	96.87	1.50	3.62	
RESIDENTIAL	MH17	98.92	96.97	1.50	3.45	
RESIDENTIAL	EAST CHAMBER	98.92	97.40	--	400.60	(see cultec spec sheet)
RESIDENTIAL	MH20	98.92	96.55	2.40	10.72	
RESIDENTIAL	MH15	98.92	96.96	1.50	3.46	
RESIDENTIAL	WEST CHAMBER	98.92	97.40	--	164.96	(see cultec spec sheet)
RESIDENTIAL	MH16	98.92	96.71	1.80	5.62	
RESIDENTIAL	OGS1	98.92	96.78	0.00	0.00	
RESIDENTIAL	CBMH5	98.92	97.20	1.20	1.95	
RESIDENTIAL	MH14	98.92	96.81	1.80	5.37	
RESIDENTIAL	CBMH9	98.92	97.69	1.20	1.39	
RESIDENTIAL	CBMH8	98.92	97.80	1.20	1.27	
RESIDENTIAL	MH21	98.92	97.92	1.20	1.13	
RESIDENTIAL	CBMH4	98.92	96.87	1.80	5.22	
RESIDENTIAL	DCBMH2	98.92	97.24	1.50	2.97	
RESIDENTIAL	CBMH2	98.92	99.39	1.20	0.00	
RESIDENTIAL	MH7	98.92	97.43	1.50	2.63	
RESIDENTIAL	MH6	98.92	97.53	1.50	2.46	
RESIDENTIAL	CBMH3	98.92	97.65	1.50	2.24	
RESIDENTIAL	MH5	98.92	97.78	1.50	2.01	
RESIDENTIAL	MH4	98.92	98.02	1.50	1.59	
RESIDENTIAL	MH3	98.92	98.13	1.50	1.40	
RESIDENTIAL	MH2	98.92	98.37	1.50	0.97	
RESIDENTIAL	DCBMH1	98.92	98.48	1.50	0.78	
RESIDENTIAL	DCBMH3	98.92	97.08	1.80	4.68	
RESIDENTIAL	MH13	98.92	97.33	1.50	2.81	
RESIDENTIAL	MH12	98.92	97.50	1.50	2.51	
RESIDENTIAL	MH11	98.92	97.59	1.50	2.35	
RESIDENTIAL	CBMH1	98.92	97.70	1.50	2.16	
RESIDENTIAL	CBMH6	98.92	99.11	1.20	0.00	
RESIDENTIAL	MH10	98.92	97.82	1.50	1.94	
RESIDENTIAL	MH9	98.92	98.03	1.50	1.57	
RESIDENTIAL	MH8	98.92	98.11	1.50	1.43	
RESIDENTIAL	MH1	98.92	98.28	1.80	1.63	
RESIDENTIAL	DSCBMH2	98.92	98.71	1.50	0.37	
RESIDENTIAL	DSCBMH1	98.92	98.88	1.50	0.07	
					651.22 cu.m.	

Table 6A

Underground Storage Volumes - Sewers
Elevation 99.55 m

Project: CT Lands, Cobourg
Project No.: 20-021
By: M.F.
Date: 18-May-20

AVAILABLE STORAGE UNDERGROUND IN SEWERS
(BELOW ELEVATION of 99.55m WL) :

FROM	TO	LENGTH (m)	WL (m)	DOWNSTREAM INVERT (m)	DOWNSTREAM OBVERT (m)	Depth of pipe filled (m)	DIMENSIONS OR DIAMETER (mm)	VOLUME (cu.m.)
DICB1	DSCBMH1	9.4	99.55	99.11	99.41	440	300	0.66
DSCBMH1	DSCBMH2	8.5	99.55	98.80	99.33	750	525	1.84
DSCBMH2	MH1 (SOUTH)	28.8	99.55	98.43	98.96	1120	525	6.23
DCB1	MH1 (NORTH)	9.4	99.55	99.71	100.09	0	375	0.00
MH1 (EAST)	MH8	25.7	99.55	98.16	98.84	1390	675	9.20
DICB23	DICB9	30.2	99.55	98.97	99.27	580	300	2.13
DICB9	MH8	33.2	99.55	98.41	98.71	1140	300	2.35
MH8	MH9	7.4	99.55	98.08	98.76	1470	675	2.65
DICB11	MH9	32.5	99.55	99.14	99.44	410	300	2.30
MH9	MH10	40.5	99.55	97.84	98.52	1710	675	14.49
DICB27	DICB16	30.0	99.55	100.06	100.36	0	300	0.00
DICB16	MH10	17.7	99.55	99.85	100.15	0	300	0.00
DICB24	CBMH6	24.1	99.55	99.25	99.55	300	300	1.70
DICB22	CBMH6	17.5	99.55	99.20	99.50	350	300	1.24
CBMH6	MH10	32.0	99.55	98.79	99.09	760	300	2.26
MH10	CBMH1	21.1	99.55	97.72	98.40	1830	675	7.55
CB3	CBMH1	8.5	99.55	100.51	100.81	0	300	0.00
CBMH1	MH11	12.8	99.55	97.64	98.32	1910	675	4.58
DICB12	MH11	32.5	99.55	99.17	99.47	380	300	2.30
MH11	MH12	8.2	99.55	97.55	98.23	2000	675	2.93
DICB21	DICB13	30.3	99.55	99.24	99.54	310	300	2.14
DICB13	MH12	33.6	99.55	98.81	99.11	740	300	2.38
MH12	MH13	32.6	99.55	97.35	98.03	2200	675	11.67
DICB25	DICB14	17.1	99.55	99.44	99.74	110	300	0.44
DICB14	MH13	32.9	99.55	99.02	99.32	530	300	2.33
MH13	DCBMH3	35.9	99.55	97.16	97.84	2390	675	12.85
MH1 (WEST)	DCBMH1	41.0	99.55	98.51	99.19	1040	675	14.67
DICB20	DCB2	5.2	99.55	99.70	100.00	0	300	0.00
DCB2	DCBMH1	8.5	99.55	99.54	99.92	10	375	0.03
DCBMH1	MH2	16.0	99.55	98.40	99.08	1150	675	5.73
DICB2	MH2	33.0	99.55	99.11	99.41	440	300	2.33
MH2	MH3	40.3	99.55	98.18	98.86	1370	675	14.42
DICB3	MH3	33.6	99.55	99.48	99.78	70	300	0.55
MH3	MH4	6.7	99.55	98.06	98.74	1490	675	2.40
DICB4	MH4	33.4	99.55	100.00	100.30	0	300	0.00
MH4	MH5	41.1	99.55	97.82	98.50	1730	675	14.71
DICB5	MH5	32.8	99.55	99.69	99.99	0	300	0.00
DICB26	DICB15	30.0	99.55	99.95	100.25	0	300	0.00
DICB15	MH5	17.7	99.55	99.74	100.04	0	300	0.00
MH5	CBMH3	20.8	99.55	97.68	98.36	1870	675	7.44
CB1	CBMH3	8.5	99.55	100.51	100.81	0	300	0.00
CBMH3	MH6	13.1	99.55	97.59	98.27	1960	675	4.69
DICB6	MH6	33.8	99.55	99.36	99.66	190	300	1.51
MH6	MH7	8.0	99.55	97.49	98.17	2060	675	2.86
DICB10	MH7	32.9	99.55	97.99	98.37	1560	375	3.63
MH7	DCBMH3	53.3	99.55	97.16	97.84	2390	675	19.07
CB2	CBMH2	15.8	99.55	99.73	100.03	0	300	0.00
CBMH2	DCBMH2	5.3	99.55	99.37	99.67	180	300	0.22
DCBMH2	DCBMH3	8.5	99.55	97.15	97.83	2400	675	3.04
DCBMH3	CBMH4	33.0	99.55	96.92	97.67	2630	750	14.58
DICB7	MH21	15.3	99.55	98.01	98.31	1540	300	1.08
DICB28	MH21	8.0	99.55	98.06	98.36	1490	300	0.57
MH21	CBMH8	2.9	99.55	97.89	98.19	1660	300	0.20
CBMH8	CBMH9	15.2	99.55	97.72	98.02	1830	300	1.07
CBMH9	CBMH4	14.9	99.55	97.62	97.92	1930	300	1.05
CBMH4	MH14	8.6	99.55	96.83	97.58	2720	750	3.80
CBMH5	MH14	6.1	99.55	97.13	97.58	2420	450	0.97
MH14	OGS1	3.7	99.55	96.80	97.55	2750	750	1.63
OGS1	MH16	3.7	99.55	96.76	97.51	2790	750	1.63
'EST CHAMBE	MH15	2.5	99.55	97.12	97.72	2430	600	0.71
MH15	MH16	5.2	99.55	96.94	97.69	2610	750	2.30
MH16	MH20	28.3	99.55	96.57	97.32	2980	750	12.50
AST CHAMBE	MH17	2.7	99.55	97.14	97.74	2410	600	0.76
MH17	MH18	7.2	99.55	96.93	97.68	2620	750	3.18
MH18	MH19	12.5	99.55	96.81	97.56	2740	750	5.52
MH19	MH20	12.5	99.55	96.66	97.41	2890	750	5.52
								250.63 cu.m.

Table 6B

Underground Storage Volumes - Structures
Elevation 99.55 m

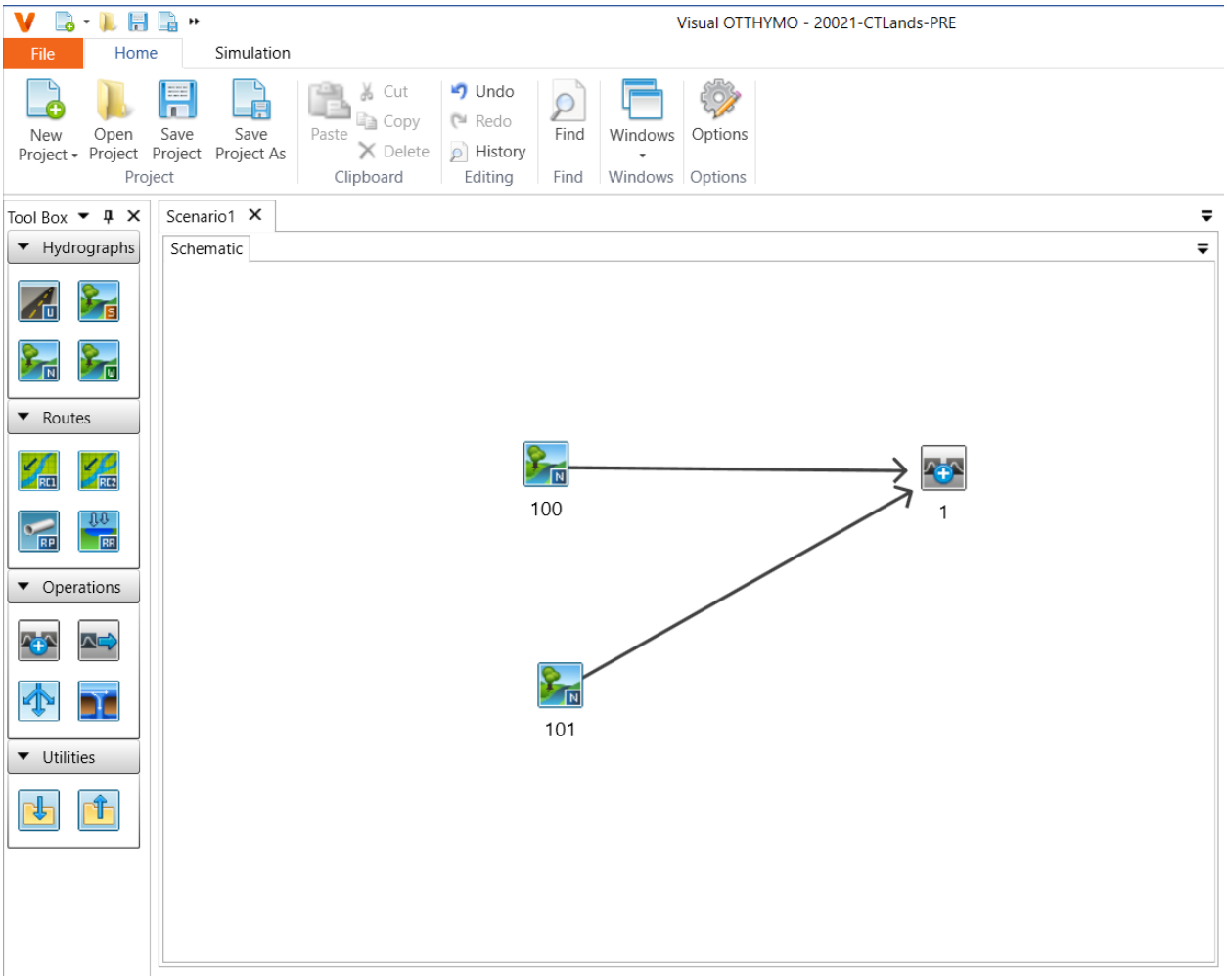
Project: CT Lands, Cobourg
Project No.: 20-021
By: M.F.
Date: 18-May-20

AVAILABLE STORAGE UNDERGROUND IN CATCHBASINS AND MANHOLES
(BELOW ELEVATION of 99.55m WL) :

LOCATION	MH	HWL ELEV (m)	LOW INVERT ELEV (m)	DIMENSIONS OR DIAMETER (m)	VOLUME (cu.m.)	
RESIDENTIAL	MH19	99.55	96.72	1.50	5.00	
RESIDENTIAL	MH18	99.55	96.87	1.50	4.74	
RESIDENTIAL	MH17	99.55	96.97	1.50	4.56	
RESIDENTIAL	EAST CHAMBER	99.55	97.40	--	400.60	(see cultec spec sheet)
RESIDENTIAL	MH20	99.55	96.55	2.40	13.57	
RESIDENTIAL	MH15	99.55	96.96	1.50	4.58	
RESIDENTIAL	WEST CHAMBER	99.55	97.40	--	164.96	(see cultec spec sheet)
RESIDENTIAL	MH16	99.55	96.71	1.80	7.23	
RESIDENTIAL	OGS1	99.55	96.78	0.00	0.00	
RESIDENTIAL	CBMH5	99.55	97.20	1.20	2.66	
RESIDENTIAL	MH14	99.55	96.81	1.80	6.97	
RESIDENTIAL	CBMH9	99.55	97.69	1.20	2.10	
RESIDENTIAL	CBMH8	99.55	97.80	1.20	1.98	
RESIDENTIAL	MH21	99.55	97.92	1.20	1.84	
RESIDENTIAL	CBMH4	99.55	96.87	1.80	6.82	
RESIDENTIAL	DCBMH2	99.55	97.24	1.50	4.08	
RESIDENTIAL	CBMH2	99.55	99.39	1.20	0.18	
RESIDENTIAL	MH7	99.55	97.43	1.50	3.75	
RESIDENTIAL	MH6	99.55	97.53	1.50	3.57	
RESIDENTIAL	CBMH3	99.55	97.65	1.50	3.36	
RESIDENTIAL	MH5	99.55	97.78	1.50	3.13	
RESIDENTIAL	MH4	99.55	98.02	1.50	2.70	
RESIDENTIAL	MH3	99.55	98.13	1.50	2.51	
RESIDENTIAL	MH2	99.55	98.37	1.50	2.09	
RESIDENTIAL	DCBMH1	99.55	98.48	1.50	1.89	
RESIDENTIAL	DCBMH3	99.55	97.08	1.80	6.29	
RESIDENTIAL	MH13	99.55	97.33	1.50	3.92	
RESIDENTIAL	MH12	99.55	97.50	1.50	3.62	
RESIDENTIAL	MH11	99.55	97.59	1.50	3.46	
RESIDENTIAL	CBMH1	99.55	97.70	1.50	3.27	
RESIDENTIAL	CBMH6	99.55	99.11	1.20	0.50	
RESIDENTIAL	MH10	99.55	97.82	1.50	3.06	
RESIDENTIAL	MH9	99.55	98.03	1.50	2.69	
RESIDENTIAL	MH8	99.55	98.11	1.50	2.54	
RESIDENTIAL	MH1	99.55	98.28	1.80	3.23	
RESIDENTIAL	DSCBMH2	99.55	98.71	1.50	1.48	
RESIDENTIAL	DSCBMH1	99.55	98.88	1.50	1.18	
					690.11 cu.m.	

Appendix C

VO5 Output Files
(Pre-Development & Post-Development)


Visual OTTHYMO - 20021-CTLands-PRE
File
Home
Simulation
New Project
Open Project
Save Project
Save Project As
Project
Paste
Cut
Copy
Delete
Clipboard
Undo
Redo
History
Editing
Find
Find
Windows
Windows
Options
Options
Tool Box
Hydrographs
Routes
Operations
Utilities
Scenario1
Schematic
100
1
101

```
================================================================================
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       V    V   I    SSSSS  U   U    A    L
       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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902e08\16743b32-27bc-4e2c-af97-81a404a
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C:\Users\MeganF.MAE-DOMAIN\AppData\Local\Civica\VH5\d504fbee-e1af-4614-bd06-c8471e
902e08\16743b32-27bc-4e2c-af97-81a404a


DATE: 05-18-2020                          TIME: 12:14:21

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
-------------------------
  **********************************************
  ** SIMULATION : 2year-SCS-6hr                **
  **********************************************

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|                  |              ata\Local\Temp\
|                  |              25bf3147-286c-45a7-9c9c-f2f29f6b2080\736469b8
```

| Ptotal= 42.92 mm | Comments: SCS 6 HR MASS CURVE

Duration of storm = 6.00 hrs
Mass curve time step = 30.00 min

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.50	1.72	2.00	4.29	3.50	9.44	5.00	2.58
1.00	2.58	2.50	5.15	4.00	4.29	5.50	1.72
1.50	2.58	3.00	46.35	4.50	3.43	6.00	1.72

CALIB	NASHYD (0100)	ID= 1 DT= 5.0 min

Area (ha)= 3.89 Curve Number (CN)= 75.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.40

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	1.72	1.583	4.29	3.083	9.44	4.58	2.58
0.167	1.72	1.667	4.29	3.167	9.44	4.67	2.58
0.250	1.72	1.750	4.29	3.250	9.44	4.75	2.58
0.333	1.72	1.833	4.29	3.333	9.44	4.83	2.58
0.417	1.72	1.917	4.29	3.417	9.44	4.92	2.58
0.500	1.72	2.000	4.29	3.500	9.44	5.00	2.58
0.583	2.58	2.083	5.15	3.583	4.29	5.08	1.72
0.667	2.58	2.167	5.15	3.667	4.29	5.17	1.72
0.750	2.58	2.250	5.15	3.750	4.29	5.25	1.72
0.833	2.58	2.333	5.15	3.833	4.29	5.33	1.72
0.917	2.58	2.417	5.15	3.917	4.29	5.42	1.72
1.000	2.58	2.500	5.15	4.000	4.29	5.50	1.72
1.083	2.58	2.583	46.35	4.083	3.43	5.58	1.72
1.167	2.58	2.667	46.35	4.167	3.43	5.67	1.72
1.250	2.58	2.750	46.35	4.250	3.43	5.75	1.72
1.333	2.58	2.833	46.35	4.333	3.43	5.83	1.72
1.417	2.58	2.917	46.35	4.417	3.43	5.92	1.72
1.500	2.58	3.000	46.35	4.500	3.43	6.00	1.72

Unit Hyd Qpeak (cms)= 0.371

PEAK FLOW (cms)= 0.089 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 11.728
TOTAL RAINFALL (mm)= 42.920
RUNOFF COEFFICIENT = 0.273

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   3.66   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   2.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.40

     Unit Hyd Qpeak  (cms)=   0.349

     PEAK FLOW       (cms)=   0.097 (i)
     TIME TO PEAK    (hrs)=   3.250
     RUNOFF VOLUME    (mm)=  13.331
     TOTAL RAINFALL   (mm)=  42.920
     RUNOFF COEFFICIENT   =   0.311

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

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

--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0100):     3.89   0.089     3.25    11.73
      + ID2= 2 (  0101):     3.66   0.097     3.25    13.33
        ================================================
        ID = 3 (  0001):     7.55   0.186     3.25    12.51

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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       V    V   I    SSSSS  U   U    A    L
       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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902e08\4eb088df-faef-4162-9f94-1bf04ff


DATE: 05-18-2020                          TIME: 12:14:21

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
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  **********************************************
  ** SIMULATION : 5year-SCS-6hr                **
  **********************************************

--------------------
| MASS STORM       |    Filename: C:\Users\MeganF.MAE-DOMAIN\AppD
|                  |              ata\Local\Temp\
|                  |              25bf3147-286c-45a7-9c9c-f2f29f6b2080\b77fb9dd
```

| Ptotal= 54.83 mm | Comments: SCS 6 HR MASS CURVE

Duration of storm = 6.00 hrs
Mass curve time step = 30.00 min

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.50	2.19	2.00	5.48	3.50	12.06	5.00	3.29
1.00	3.29	2.50	6.58	4.00	5.48	5.50	2.19
1.50	3.29	3.00	59.22	4.50	4.39	6.00	2.19

CALIB	NASHYD (0100)	ID= 1 DT= 5.0 min

Area (ha)= 3.89 Curve Number (CN)= 75.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.40

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	2.19	1.583	5.48	3.083	12.06	4.58	3.29
0.167	2.19	1.667	5.48	3.167	12.06	4.67	3.29
0.250	2.19	1.750	5.48	3.250	12.06	4.75	3.29
0.333	2.19	1.833	5.48	3.333	12.06	4.83	3.29
0.417	2.19	1.917	5.48	3.417	12.06	4.92	3.29
0.500	2.19	2.000	5.48	3.500	12.06	5.00	3.29
0.583	3.29	2.083	6.58	3.583	5.48	5.08	2.19
0.667	3.29	2.167	6.58	3.667	5.48	5.17	2.19
0.750	3.29	2.250	6.58	3.750	5.48	5.25	2.19
0.833	3.29	2.333	6.58	3.833	5.48	5.33	2.19
0.917	3.29	2.417	6.58	3.917	5.48	5.42	2.19
1.000	3.29	2.500	6.58	4.000	5.48	5.50	2.19
1.083	3.29	2.583	59.22	4.083	4.39	5.58	2.19
1.167	3.29	2.667	59.22	4.167	4.39	5.67	2.19
1.250	3.29	2.750	59.22	4.250	4.39	5.75	2.19
1.333	3.29	2.833	59.22	4.333	4.39	5.83	2.19
1.417	3.29	2.917	59.22	4.417	4.39	5.92	2.19
1.500	3.29	3.000	59.22	4.500	4.39	6.00	2.19

Unit Hyd Qpeak (cms)= 0.371

PEAK FLOW (cms)= 0.143 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 18.459
TOTAL RAINFALL (mm)= 54.830
RUNOFF COEFFICIENT = 0.337

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   3.66   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   2.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.40

     Unit Hyd Qpeak  (cms)=   0.349

     PEAK FLOW       (cms)=   0.149 (i)
     TIME TO PEAK    (hrs)=   3.250
     RUNOFF VOLUME    (mm)=  20.296
     TOTAL RAINFALL   (mm)=  54.830
     RUNOFF COEFFICIENT   =   0.370

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

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

--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0100):     3.89   0.143     3.25    18.46
      + ID2= 2 (  0101):     3.66   0.149     3.25    20.30
        ================================================
        ID = 3 (  0001):     7.55   0.292     3.25    19.35

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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       V    V   I    SSSSS  U   U    A    L
       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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902e08\c6e09b32-4b22-4354-b46d-7bdde5f
  Summary filename:
C:\Users\MeganF.MAE-DOMAIN\AppData\Local\Civica\VH5\d504fbee-e1af-4614-bd06-c8471e
902e08\c6e09b32-4b22-4354-b46d-7bdde5f


DATE: 05-18-2020                          TIME: 12:14:21

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
-------------------------
  ********************************************
  ** SIMULATION : 10year-SCS-6hr              **
  ********************************************

--------------------
| MASS STORM       |    Filename: C:\Users\MeganF.MAE-DOMAIN\AppD
|                  |              ata\Local\Temp\
|                  |              25bf3147-286c-45a7-9c9c-f2f29f6b2080\cb5946a4
```

| Ptotal= 67.08 mm | Comments: SCS 6 HR MASS CURVE

Duration of storm = 6.00 hrs
Mass curve time step = 30.00 min

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.50	2.68	2.00	6.71	3.50	14.76	5.00	4.02
1.00	4.02	2.50	8.05	4.00	6.71	5.50	2.68
1.50	4.02	3.00	72.45	4.50	5.37	6.00	2.68

CALIB	
NASHYD (0100)	Area (ha)= 3.89 Curve Number (CN)= 75.0
ID= 1 DT= 5.0 min	Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.40

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	2.68	1.583	6.71	3.083	14.76	4.58	4.02
0.167	2.68	1.667	6.71	3.167	14.76	4.67	4.02
0.250	2.68	1.750	6.71	3.250	14.76	4.75	4.02
0.333	2.68	1.833	6.71	3.333	14.76	4.83	4.02
0.417	2.68	1.917	6.71	3.417	14.76	4.92	4.02
0.500	2.68	2.000	6.71	3.500	14.76	5.00	4.02
0.583	4.02	2.083	8.05	3.583	6.71	5.08	2.68
0.667	4.02	2.167	8.05	3.667	6.71	5.17	2.68
0.750	4.02	2.250	8.05	3.750	6.71	5.25	2.68
0.833	4.02	2.333	8.05	3.833	6.71	5.33	2.68
0.917	4.02	2.417	8.05	3.917	6.71	5.42	2.68
1.000	4.02	2.500	8.05	4.000	6.71	5.50	2.68
1.083	4.02	2.583	72.45	4.083	5.37	5.58	2.68
1.167	4.02	2.667	72.45	4.167	5.37	5.67	2.68
1.250	4.02	2.750	72.45	4.250	5.37	5.75	2.68
1.333	4.02	2.833	72.45	4.333	5.37	5.83	2.68
1.417	4.02	2.917	72.45	4.417	5.37	5.92	2.68
1.500	4.02	3.000	72.45	4.500	5.37	6.00	2.68

Unit Hyd Qpeak (cms)= 0.371

PEAK FLOW (cms)= 0.206 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 26.259
TOTAL RAINFALL (mm)= 67.080
RUNOFF COEFFICIENT = 0.391

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   3.66   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   2.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.40

     Unit Hyd Qpeak  (cms)=   0.349

     PEAK FLOW       (cms)=   0.209 (i)
     TIME TO PEAK    (hrs)=   3.250
     RUNOFF VOLUME    (mm)=  28.280
     TOTAL RAINFALL   (mm)=  67.080
     RUNOFF COEFFICIENT   =   0.422

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

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

--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0100):     3.89   0.206     3.25    26.26
      + ID2= 2 (  0101):     3.66   0.209     3.25    28.28
        ================================================
        ID = 3 (  0001):     7.55   0.415     3.25    27.24

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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       V    V   I    SSSSS  U   U    A    L
       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 5.0\VO2\voin.dat

  Output  filename:
C:\Users\MeganF.MAE-DOMAIN\AppData\Local\Civica\VH5\d504fbee-e1af-4614-bd06-c8471e
902e08\a7a85975-fa3c-4cdd-97a9-a1615d1
  Summary filename:
C:\Users\MeganF.MAE-DOMAIN\AppData\Local\Civica\VH5\d504fbee-e1af-4614-bd06-c8471e
902e08\a7a85975-fa3c-4cdd-97a9-a1615d1


DATE: 05-18-2020                          TIME: 12:14:21

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
-------------------------
  ********************************************
  ** SIMULATION : 25year-SCS-6hr              **
  ********************************************

--------------------
| MASS STORM       |    Filename: C:\Users\MeganF.MAE-DOMAIN\AppD
|                  |              ata\Local\Temp\
|                  |              25bf3147-286c-45a7-9c9c-f2f29f6b2080\e0cca1b5
```

| Ptotal= 73.13 mm | Comments: SCS 6 HR MASS CURVE

Duration of storm = 6.00 hrs
Mass curve time step = 30.00 min

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.50	2.93	2.00	7.31	3.50	16.09	5.00	4.39
1.00	4.39	2.50	8.78	4.00	7.31	5.50	2.93
1.50	4.39	3.00	78.98	4.50	5.85	6.00	2.93

CALIB NASHYD (0100) ID= 1 DT= 5.0 min	Area (ha)= 3.89	Curve Number (CN)= 75.0	# of Linear Res.(N)= 3.00	U.H. Tp(hrs)= 0.40

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	2.93	1.583	7.31	3.083	16.09	4.58	4.39
0.167	2.93	1.667	7.31	3.167	16.09	4.67	4.39
0.250	2.93	1.750	7.31	3.250	16.09	4.75	4.39
0.333	2.93	1.833	7.31	3.333	16.09	4.83	4.39
0.417	2.93	1.917	7.31	3.417	16.09	4.92	4.39
0.500	2.93	2.000	7.31	3.500	16.09	5.00	4.39
0.583	4.39	2.083	8.78	3.583	7.31	5.08	2.93
0.667	4.39	2.167	8.78	3.667	7.31	5.17	2.93
0.750	4.39	2.250	8.78	3.750	7.31	5.25	2.93
0.833	4.39	2.333	8.78	3.833	7.31	5.33	2.93
0.917	4.39	2.417	8.78	3.917	7.31	5.42	2.93
1.000	4.39	2.500	8.78	4.000	7.31	5.50	2.93
1.083	4.39	2.583	78.98	4.083	5.85	5.58	2.93
1.167	4.39	2.667	78.98	4.167	5.85	5.67	2.93
1.250	4.39	2.750	78.98	4.250	5.85	5.75	2.93
1.333	4.39	2.833	78.98	4.333	5.85	5.83	2.93
1.417	4.39	2.917	78.98	4.417	5.85	5.92	2.93
1.500	4.39	3.000	78.98	4.500	5.85	6.00	2.93

Unit Hyd Qpeak (cms)= 0.371

PEAK FLOW (cms)= 0.240 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 30.374
TOTAL RAINFALL (mm)= 73.130
RUNOFF COEFFICIENT = 0.415

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   3.66   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   2.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.40

     Unit Hyd Qpeak  (cms)=   0.349

     PEAK FLOW       (cms)=   0.240 (i)
     TIME TO PEAK    (hrs)=   3.250
     RUNOFF VOLUME    (mm)=  32.471
     TOTAL RAINFALL   (mm)=  73.130
     RUNOFF COEFFICIENT   =   0.444

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

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

--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0100):     3.89   0.240     3.25    30.37
      + ID2= 2 (  0101):     3.66   0.240     3.25    32.47
        ================================================
        ID = 3 (  0001):     7.55   0.480     3.25    31.39

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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       V    V   I    SSSSS  U   U    A    L
       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 5.0\VO2\voin.dat

  Output  filename:
C:\Users\MeganF.MAE-DOMAIN\AppData\Local\Civica\VH5\d504fbee-e1af-4614-bd06-c8471e
902e08\4e31dfab-df9e-4274-b1ce-992c2cb
  Summary filename:
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902e08\4e31dfab-df9e-4274-b1ce-992c2cb


DATE: 05-18-2020                          TIME: 12:14:21

USER:



COMMENTS: _____________________________________________________________


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  **********************************************
  ** SIMULATION : 50year-SCS-6hr               **
  **********************************************

--------------------
| MASS STORM       |    Filename: C:\Users\MeganF.MAE-DOMAIN\AppD
|                  |              ata\Local\Temp\
|                  |              25bf3147-286c-45a7-9c9c-f2f29f6b2080\4754c2ab
```

| Ptotal= 77.91 mm | Comments: SCS 6 HR MASS CURVE

Duration of storm = 6.00 hrs
Mass curve time step = 30.00 min

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.50	3.12	2.00	7.79	3.50	17.14	5.00	4.67
1.00	4.67	2.50	9.35	4.00	7.79	5.50	3.12
1.50	4.67	3.00	84.14	4.50	6.23	6.00	3.12

CALIB	
NASHYD (0100)	Area (ha)= 3.89 Curve Number (CN)= 75.0
ID= 1 DT= 5.0 min	Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.40

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	3.12	1.583	7.79	3.083	17.14	4.58	4.67
0.167	3.12	1.667	7.79	3.167	17.14	4.67	4.67
0.250	3.12	1.750	7.79	3.250	17.14	4.75	4.67
0.333	3.12	1.833	7.79	3.333	17.14	4.83	4.67
0.417	3.12	1.917	7.79	3.417	17.14	4.92	4.67
0.500	3.12	2.000	7.79	3.500	17.14	5.00	4.67
0.583	4.67	2.083	9.35	3.583	7.79	5.08	3.12
0.667	4.67	2.167	9.35	3.667	7.79	5.17	3.12
0.750	4.67	2.250	9.35	3.750	7.79	5.25	3.12
0.833	4.67	2.333	9.35	3.833	7.79	5.33	3.12
0.917	4.67	2.417	9.35	3.917	7.79	5.42	3.12
1.000	4.67	2.500	9.35	4.000	7.79	5.50	3.12
1.083	4.67	2.583	84.14	4.083	6.23	5.58	3.12
1.167	4.67	2.667	84.14	4.167	6.23	5.67	3.12
1.250	4.67	2.750	84.14	4.250	6.23	5.75	3.12
1.333	4.67	2.833	84.14	4.333	6.23	5.83	3.12
1.417	4.67	2.917	84.14	4.417	6.23	5.92	3.12
1.500	4.67	3.000	84.14	4.500	6.23	6.00	3.12

Unit Hyd Qpeak (cms)= 0.371

PEAK FLOW (cms)= 0.267 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 33.731
TOTAL RAINFALL (mm)= 77.910
RUNOFF COEFFICIENT = 0.433

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   3.66   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   2.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.40

     Unit Hyd Qpeak  (cms)=   0.349

     PEAK FLOW       (cms)=   0.266 (i)
     TIME TO PEAK    (hrs)=   3.250
     RUNOFF VOLUME    (mm)=  35.881
     TOTAL RAINFALL   (mm)=  77.910
     RUNOFF COEFFICIENT   =   0.461

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

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

--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0100):     3.89   0.267     3.25    33.73
      + ID2= 2 (  0101):     3.66   0.266     3.25    35.88
        ================================================
        ID = 3 (  0001):     7.55   0.533     3.25    34.77

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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       V    V   I    SSSSS  U   U    A    L
       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 5.0\VO2\voin.dat

  Output  filename:
C:\Users\MeganF.MAE-DOMAIN\AppData\Local\Civica\VH5\d504fbee-e1af-4614-bd06-c8471e
902e08\05c15df7-e2b3-4402-b0f5-d00c717
  Summary filename:
C:\Users\MeganF.MAE-DOMAIN\AppData\Local\Civica\VH5\d504fbee-e1af-4614-bd06-c8471e
902e08\05c15df7-e2b3-4402-b0f5-d00c717


DATE: 05-18-2020                          TIME: 12:14:21

USER:



COMMENTS: _____________________________________________________________


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  **********************************************
  ** SIMULATION : 100year-SCS-6hr               **
  **********************************************

--------------------
| MASS STORM       |    Filename: C:\Users\MeganF.MAE-DOMAIN\AppD
|                  |              ata\Local\Temp\
|                  |              25bf3147-286c-45a7-9c9c-f2f29f6b2080\2a369ff6
```

| Ptotal= 91.42 mm | Comments: SCS 6 HR MASS CURVE

Duration of storm = 6.00 hrs
Mass curve time step = 30.00 min

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.50	3.66	2.00	9.14	3.50	20.11	5.00	5.49
1.00	5.49	2.50	10.97	4.00	9.14	5.50	3.66
1.50	5.49	3.00	98.73	4.50	7.31	6.00	3.66

CALIB NASHYD (0100) ID= 1 DT= 5.0 min	Area (ha)= 3.89	Curve Number (CN)= 75.0	# of Linear Res.(N)= 3.00	U.H. Tp(hrs)= 0.40

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	3.66	1.583	9.14	3.083	20.11	4.58	5.49
0.167	3.66	1.667	9.14	3.167	20.11	4.67	5.49
0.250	3.66	1.750	9.14	3.250	20.11	4.75	5.49
0.333	3.66	1.833	9.14	3.333	20.11	4.83	5.49
0.417	3.66	1.917	9.14	3.417	20.11	4.92	5.49
0.500	3.66	2.000	9.14	3.500	20.11	5.00	5.49
0.583	5.49	2.083	10.97	3.583	9.14	5.08	3.66
0.667	5.49	2.167	10.97	3.667	9.14	5.17	3.66
0.750	5.49	2.250	10.97	3.750	9.14	5.25	3.66
0.833	5.49	2.333	10.97	3.833	9.14	5.33	3.66
0.917	5.49	2.417	10.97	3.917	9.14	5.42	3.66
1.000	5.49	2.500	10.97	4.000	9.14	5.50	3.66
1.083	5.49	2.583	98.73	4.083	7.31	5.58	3.66
1.167	5.49	2.667	98.73	4.167	7.31	5.67	3.66
1.250	5.49	2.750	98.73	4.250	7.31	5.75	3.66
1.333	5.49	2.833	98.73	4.333	7.31	5.83	3.66
1.417	5.49	2.917	98.73	4.417	7.31	5.92	3.66
1.500	5.49	3.000	98.73	4.500	7.31	6.00	3.66

Unit Hyd Qpeak (cms)= 0.371

PEAK FLOW (cms)= 0.348 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 43.647
TOTAL RAINFALL (mm)= 91.420
RUNOFF COEFFICIENT = 0.477

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

-------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0101)|   Area    (ha)=   3.66   Curve Number   (CN)= 75.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   2.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.40

     Unit Hyd Qpeak  (cms)=   0.349

     PEAK FLOW       (cms)=   0.343 (i)
     TIME TO PEAK    (hrs)=   3.250
     RUNOFF VOLUME    (mm)=  45.925
     TOTAL RAINFALL   (mm)=  91.420
     RUNOFF COEFFICIENT   =   0.502

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

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

--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0100):     3.89   0.348     3.25    43.65
      + ID2= 2 (  0101):     3.66   0.343     3.25    45.92
        ================================================
        ID = 3 (  0001):     7.55   0.690     3.25    44.75

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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 FINISH
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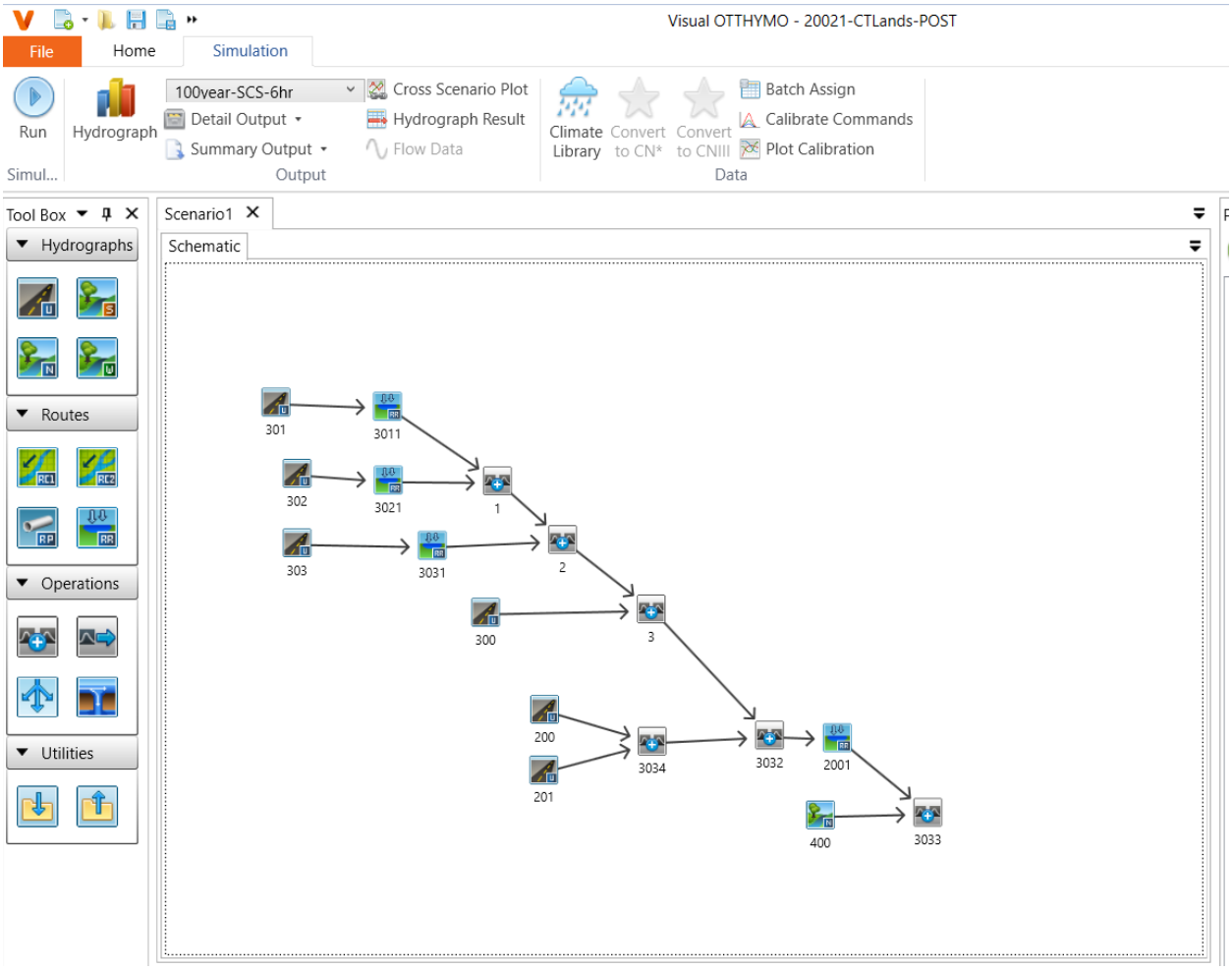
Visual OTTHYMO - 20021-CTLands-POST
File
Home
Simulation
Run
Hydrograph
100year-SCS-6hr
Detail Output
Summary Output
Cross Scenario Plot
Hydrograph Result
Flow Data
Output
Climate Library
Convert to CN*
Convert to CNIII
Batch Assign
Calibrate Commands
Plot Calibration
Data
Tool Box
Hydrographs
Routes
Operations
Utilities
Scenario1
Schematic
301
3011
302
3021
303
3031
1
2
3
300
200
201
3034
3032
2001
400
3033

```
================================================================================
=========================

       V    V   I    SSSSS  U   U    A    L
       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 5.0\VO2\voin.dat

  Output  filename:
C:\Users\MeganF.MAE-DOMAIN\AppData\Local\Civica\VH5\453e3070-1504-40b9-9dc9-0dcd12
ba2708\07fa3cd8-bc08-4289-b84c-8c007fa
  Summary filename:
C:\Users\MeganF.MAE-DOMAIN\AppData\Local\Civica\VH5\453e3070-1504-40b9-9dc9-0dcd12
ba2708\07fa3cd8-bc08-4289-b84c-8c007fa


DATE: 05-18-2020                          TIME: 12:47:55

USER:



COMMENTS: _____________________________________________________________


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  ********************************************
  ** SIMULATION : 2year-SCS-6hr               **
  ********************************************

--------------------
| MASS STORM       |    Filename: C:\Users\MeganF.MAE-DOMAIN\AppD
|                  |              ata\Local\Temp\
|                  |              faf41ccb-1f03-4a72-8417-79ca726736b4\f6937753
```

| Ptotal= 42.92 mm | Comments: SCS 6 HR MASS CURVE

Duration of storm = 6.00 hrs
Mass curve time step = 30.00 min

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.50	1.72	2.00	4.29	3.50	9.44	5.00	2.58
1.00	2.58	2.50	5.15	4.00	4.29	5.50	1.72
1.50	2.58	3.00	46.35	4.50	3.43	6.00	1.72

CALIB NASHYD (0400) ID= 1 DT= 2.0 min	Area (ha)= 0.03	Curve Number (CN)= 84.2	# of Linear Res.(N)= 3.00	U.H. Tp(hrs)= 0.20

NOTE: RAINFALL WAS TRANSFORMED TO 2.0 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
0.033	1.72	1.533	4.29	3.033	9.44	4.53	2.58
0.067	1.72	1.567	4.29	3.067	9.44	4.57	2.58
0.100	1.72	1.600	4.29	3.100	9.44	4.60	2.58
0.133	1.72	1.633	4.29	3.133	9.44	4.63	2.58
0.167	1.72	1.667	4.29	3.167	9.44	4.67	2.58
0.200	1.72	1.700	4.29	3.200	9.44	4.70	2.58
0.233	1.72	1.733	4.29	3.233	9.44	4.73	2.58
0.267	1.72	1.767	4.29	3.267	9.44	4.77	2.58
0.300	1.72	1.800	4.29	3.300	9.44	4.80	2.58
0.333	1.72	1.833	4.29	3.333	9.44	4.83	2.58
0.367	1.72	1.867	4.29	3.367	9.44	4.87	2.58
0.400	1.72	1.900	4.29	3.400	9.44	4.90	2.58
0.433	1.72	1.933	4.29	3.433	9.44	4.93	2.58
0.467	1.72	1.967	4.29	3.467	9.44	4.97	2.58
0.500	1.72	2.000	4.29	3.500	9.44	5.00	2.58
0.533	2.58	2.033	5.15	3.533	4.29	5.03	1.72
0.567	2.58	2.067	5.15	3.567	4.29	5.07	1.72
0.600	2.58	2.100	5.15	3.600	4.29	5.10	1.72
0.633	2.58	2.133	5.15	3.633	4.29	5.13	1.72
0.667	2.58	2.167	5.15	3.667	4.29	5.17	1.72
0.700	2.58	2.200	5.15	3.700	4.29	5.20	1.72
0.733	2.58	2.233	5.15	3.733	4.29	5.23	1.72
0.767	2.58	2.267	5.15	3.767	4.29	5.27	1.72
0.800	2.58	2.300	5.15	3.800	4.29	5.30	1.72
0.833	2.58	2.333	5.15	3.833	4.29	5.33	1.72
0.867	2.58	2.367	5.15	3.867	4.29	5.37	1.72

0.900	2.58	2.400	5.15	3.900	4.29	5.40	1.72
0.933	2.58	2.433	5.15	3.933	4.29	5.43	1.72
0.967	2.58	2.467	5.15	3.967	4.29	5.47	1.72
1.000	2.58	2.500	5.15	4.000	4.29	5.50	1.72
1.033	2.58	2.533	46.35	4.033	3.43	5.53	1.72
1.067	2.58	2.567	46.35	4.067	3.43	5.57	1.72
1.100	2.58	2.600	46.35	4.100	3.43	5.60	1.72
1.133	2.58	2.633	46.35	4.133	3.43	5.63	1.72
1.167	2.58	2.667	46.35	4.167	3.43	5.67	1.72
1.200	2.58	2.700	46.35	4.200	3.43	5.70	1.72
1.233	2.58	2.733	46.35	4.233	3.43	5.73	1.72
1.267	2.58	2.767	46.35	4.267	3.43	5.77	1.72
1.300	2.58	2.800	46.35	4.300	3.43	5.80	1.72
1.333	2.58	2.833	46.35	4.333	3.43	5.83	1.72
1.367	2.58	2.867	46.35	4.367	3.43	5.87	1.72
1.400	2.58	2.900	46.35	4.400	3.43	5.90	1.72
1.433	2.58	2.933	46.35	4.433	3.43	5.93	1.72
1.467	2.58	2.967	46.35	4.467	3.43	5.97	1.72
1.500	2.58	3.000	46.35	4.500	3.43	6.00	1.72

Unit Hyd Qpeak (cms)= 0.006

PEAK FLOW (cms)= 0.002 (i)
TIME TO PEAK (hrs)= 3.067
RUNOFF VOLUME (mm)= 16.445
TOTAL RAINFALL (mm)= 42.920
RUNOFF COEFFICIENT = 0.383

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

CALIB STANDHYD (0301) ID= 1 DT= 2.0 min	Area (ha)= 0.03 Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.03	0.00
Dep. Storage	(mm)=	1.00	8.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	13.50	1.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		46.35	15.67
over (min)		5.00	2.00
Storage Coeff.	(min)=	1.04 (ii)	1.21 (ii)
Unit Hyd. Tpeak	(min)=	4.00	2.00
Unit Hyd. peak	(cms)=	0.51	0.69

				TOTALS
PEAK FLOW	(cms)=	0.00	0.00	0.004 (iii)

```
     TIME TO PEAK    (hrs)=       2.73         3.00          3.00
     RUNOFF VOLUME    (mm)=      41.92        10.20         41.56
     TOTAL RAINFALL   (mm)=      42.92        42.92         42.92
     RUNOFF COEFFICIENT   =       0.98         0.24          0.97

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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(  3011)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.0000      0.0500
                          0.0016     0.0017   |   0.0000      0.0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0301)      0.030      0.004      3.00      41.56
   OUTFLOW: ID= 1 (  3011)      0.030      0.001      3.50      32.45

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.95
                  TIME SHIFT OF PEAK FLOW         (min)= 30.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0008

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0302)|   Area    (ha)=   0.08
|ID= 1 DT= 2.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.08         0.00
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      22.40         1.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      46.35        15.67
               over (min)         5.00         2.00
     Storage Coeff.  (min)=       1.42 (ii)    1.58 (ii)
     Unit Hyd. Tpeak (min)=       4.00         2.00
     Unit Hyd. peak  (cms)=       0.47         0.61
                                                          *TOTALS*
```

```
     PEAK FLOW       (cms)=       0.01         0.00          0.010 (iii)
     TIME TO PEAK    (hrs)=       2.80         3.00           3.00
     RUNOFF VOLUME    (mm)=      41.92        10.20          41.59
     TOTAL RAINFALL   (mm)=      42.92        42.92          42.92
     RUNOFF COEFFICIENT   =       0.98         0.24           0.97

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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(  3021)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.0000      0.0100
                          0.0032     0.0046   |   0.0000      0.0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0302)      0.080      0.010      3.00       41.59
   OUTFLOW: ID= 1 (  3021)      0.080      0.002      3.53       36.97

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 15.01
                  TIME SHIFT OF PEAK FLOW         (min)= 32.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0022

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

--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  3011):     0.03   0.001     3.50    32.45
      + ID2= 2 (  3021):     0.08   0.002     3.53    36.97
        ================================================
        ID = 3 (  0001):     0.11   0.002     3.53    35.74

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0303)|   Area    (ha)=   0.03
|ID= 1 DT= 2.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
```

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--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.03         0.00
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      13.60         1.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      46.35        15.67
               over (min)         5.00         2.00
     Storage Coeff.  (min)=       1.05 (ii)    1.22 (ii)
     Unit Hyd. Tpeak (min)=       4.00         2.00
     Unit Hyd. peak  (cms)=       0.51         0.69
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.004 (iii)
     TIME TO PEAK    (hrs)=       2.73         3.00           3.00
     RUNOFF VOLUME    (mm)=      41.92        10.20          41.56
     TOTAL RAINFALL   (mm)=      42.92        42.92          42.92
     RUNOFF COEFFICIENT   =       0.98         0.24           0.97

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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(  3031)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.0000      0.0100
                          0.0016     0.0017   |   0.0000      0.0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0303)      0.030      0.004      3.00       41.56
   OUTFLOW: ID= 1 (  3031)      0.030      0.001      3.50       32.45

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.95
                  TIME SHIFT OF PEAK FLOW         (min)= 30.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0008

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

--------------------
| ADD HYD  (  0002)|
```

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):     0.11   0.002     3.53    35.74
      + ID2= 2 (  3031):     0.03   0.001     3.50    32.45
        ================================================
        ID = 3 (  0002):     0.14   0.003     3.53    35.03

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0300)|   Area    (ha)=   0.46
|ID= 1 DT= 2.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  75.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.34         0.12
     Dep. Storage     (mm)=       1.00         8.47
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      55.30         5.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      46.35        15.39
               over (min)         5.00         6.00
     Storage Coeff.  (min)=       2.44 (ii)    4.21 (ii)
     Unit Hyd. Tpeak (min)=       4.00         6.00
     Unit Hyd. peak  (cms)=       0.37         0.23
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.00          0.049 (iii)
     TIME TO PEAK    (hrs)=       3.00         3.00           3.00
     RUNOFF VOLUME    (mm)=      41.92         9.96          33.93
     TOTAL RAINFALL   (mm)=      42.92        42.92          42.92
     RUNOFF COEFFICIENT   =       0.98         0.23           0.79


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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  (  0003)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0002):     0.14   0.003     3.53    35.03
      + ID2= 2 (  0300):     0.46   0.049     3.00    33.93
        ================================================
```

ID = 3 (0003): 0.60 0.052 3.00 34.18

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	
STANDHYD (0200)	Area (ha)= 3.10
ID= 1 DT= 5.0 min	Total Imp(%)= 60.00 Dir. Conn.(%)= 30.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.86	1.24
Dep. Storage	(mm)=	1.00	8.47
Average Slope	(%)=	1.00	2.00
Length	(m)=	75.00	40.00
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	1.72	1.583	4.29	3.083	9.44	4.58	2.58
0.167	1.72	1.667	4.29	3.167	9.44	4.67	2.58
0.250	1.72	1.750	4.29	3.250	9.44	4.75	2.58
0.333	1.72	1.833	4.29	3.333	9.44	4.83	2.58
0.417	1.72	1.917	4.29	3.417	9.44	4.92	2.58
0.500	1.72	2.000	4.29	3.500	9.44	5.00	2.58
0.583	2.58	2.083	5.15	3.583	4.29	5.08	1.72
0.667	2.58	2.167	5.15	3.667	4.29	5.17	1.72
0.750	2.58	2.250	5.15	3.750	4.29	5.25	1.72
0.833	2.58	2.333	5.15	3.833	4.29	5.33	1.72
0.917	2.58	2.417	5.15	3.917	4.29	5.42	1.72
1.000	2.58	2.500	5.15	4.000	4.29	5.50	1.72
1.083	2.58	2.583	46.35	4.083	3.43	5.58	1.72
1.167	2.58	2.667	46.35	4.167	3.43	5.67	1.72
1.250	2.58	2.750	46.35	4.250	3.43	5.75	1.72
1.333	2.58	2.833	46.35	4.333	3.43	5.83	1.72
1.417	2.58	2.917	46.35	4.417	3.43	5.92	1.72
1.500	2.58	3.000	46.35	4.500	3.43	6.00	1.72

Max.Eff.Inten.(mm/hr)=		46.35	43.35	
over (min)		5.00	15.00	
Storage Coeff. (min)=		2.92 (ii)	12.78 (ii)	
Unit Hyd. Tpeak (min)=		5.00	15.00	
Unit Hyd. peak (cms)=		0.28	0.08	
				TOTALS
PEAK FLOW	(cms)=	0.12	0.10	0.217 (iii)
TIME TO PEAK	(hrs)=	3.00	3.08	3.00

```
     RUNOFF VOLUME    (mm)=      41.92        16.77          24.31
     TOTAL RAINFALL   (mm)=      42.92        42.92          42.92
     RUNOFF COEFFICIENT   =       0.98         0.39           0.57

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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 (  0201)|   Area    (ha)=   0.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.30   Dir. Conn.(%)=   0.10
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.07
     Dep. Storage     (mm)=       1.00         8.47
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      75.00        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      46.35        37.99
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.92 (ii)   13.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.28         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.01          0.006 (iii)
     TIME TO PEAK    (hrs)=       2.75         3.08           3.08
     RUNOFF VOLUME    (mm)=      41.92        16.20          16.15
     TOTAL RAINFALL   (mm)=      42.92        42.92          42.92
     RUNOFF COEFFICIENT   =       0.98         0.38           0.38

***** 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*  =  75.0    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  (  3034)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0200):     3.10   0.217     3.00    24.31
      + ID2= 2 (  0201):     0.12   0.006     3.08    16.15
        ================================================
        ID = 3 (  3034):     3.22   0.222     3.00    24.01

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

```
--------------------
| ADD HYD  (  3032)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0003):     0.60   0.052     3.00    34.18
      + ID2= 2 (  3034):     3.22   0.222     3.00    24.01
        ================================================
        ID = 3 (  3032):     3.82   0.274     3.00    25.61

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

```
--------------------
| RESERVOIR(  2001)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0540      0.0558
                          0.0320     0.0001   |   0.4660      0.0870
                          0.0380     0.0116   |   0.6750      0.0941

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3032)      3.820      0.274      3.00      25.61
   OUTFLOW: ID= 1 (  2001)      3.820      0.050      3.77      25.62

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.34
                  TIME SHIFT OF PEAK FLOW         (min)= 46.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0455
```

```
--------------------
| ADD HYD  (  3033)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  2001):     3.82   0.050     3.77    25.62
      + ID2= 2 (  0400):     0.03   0.002     3.07    16.45
```

```
        ==================================================
        ID = 3 (  3033):     3.85   0.051     3.67    25.55

     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    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 5.0\VO2\voin.dat

  Output  filename:
C:\Users\MeganF.MAE-DOMAIN\AppData\Local\Civica\VH5\453e3070-1504-40b9-9dc9-0dcd12
ba2708\40b22a80-82f9-4eb4-b5ab-9d4731b
  Summary filename:
C:\Users\MeganF.MAE-DOMAIN\AppData\Local\Civica\VH5\453e3070-1504-40b9-9dc9-0dcd12
ba2708\40b22a80-82f9-4eb4-b5ab-9d4731b


DATE: 05-18-2020                          TIME: 12:47:55

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
-------------------------
  **********************************************
  ** SIMULATION : 5year-SCS-6hr                **
  **********************************************

--------------------
| MASS STORM       |    Filename: C:\Users\MeganF.MAE-DOMAIN\AppD
|                  |              ata\Local\Temp\
|                  |              faf41ccb-1f03-4a72-8417-79ca726736b4\1a3aebca
```

| Ptotal= 54.83 mm | Comments: SCS 6 HR MASS CURVE

Duration of storm = 6.00 hrs
Mass curve time step = 30.00 min

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.50	2.19	2.00	5.48	3.50	12.06	5.00	3.29
1.00	3.29	2.50	6.58	4.00	5.48	5.50	2.19
1.50	3.29	3.00	59.22	4.50	4.39	6.00	2.19

CALIB NASHYD (0400) ID= 1 DT= 2.0 min	Area (ha)= 0.03	Curve Number (CN)= 84.2	# of Linear Res.(N)= 3.00	U.H. Tp(hrs)= 0.20

NOTE: RAINFALL WAS TRANSFORMED TO 2.0 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
0.033	2.19	1.533	5.48	3.033	12.06	4.53	3.29
0.067	2.19	1.567	5.48	3.067	12.06	4.57	3.29
0.100	2.19	1.600	5.48	3.100	12.06	4.60	3.29
0.133	2.19	1.633	5.48	3.133	12.06	4.63	3.29
0.167	2.19	1.667	5.48	3.167	12.06	4.67	3.29
0.200	2.19	1.700	5.48	3.200	12.06	4.70	3.29
0.233	2.19	1.733	5.48	3.233	12.06	4.73	3.29
0.267	2.19	1.767	5.48	3.267	12.06	4.77	3.29
0.300	2.19	1.800	5.48	3.300	12.06	4.80	3.29
0.333	2.19	1.833	5.48	3.333	12.06	4.83	3.29
0.367	2.19	1.867	5.48	3.367	12.06	4.87	3.29
0.400	2.19	1.900	5.48	3.400	12.06	4.90	3.29
0.433	2.19	1.933	5.48	3.433	12.06	4.93	3.29
0.467	2.19	1.967	5.48	3.467	12.06	4.97	3.29
0.500	2.19	2.000	5.48	3.500	12.06	5.00	3.29
0.533	3.29	2.033	6.58	3.533	5.48	5.03	2.19
0.567	3.29	2.067	6.58	3.567	5.48	5.07	2.19
0.600	3.29	2.100	6.58	3.600	5.48	5.10	2.19
0.633	3.29	2.133	6.58	3.633	5.48	5.13	2.19
0.667	3.29	2.167	6.58	3.667	5.48	5.17	2.19
0.700	3.29	2.200	6.58	3.700	5.48	5.20	2.19
0.733	3.29	2.233	6.58	3.733	5.48	5.23	2.19
0.767	3.29	2.267	6.58	3.767	5.48	5.27	2.19
0.800	3.29	2.300	6.58	3.800	5.48	5.30	2.19
0.833	3.29	2.333	6.58	3.833	5.48	5.33	2.19
0.867	3.29	2.367	6.58	3.867	5.48	5.37	2.19

0.900	3.29	2.400	6.58	3.900	5.48	5.40	2.19
0.933	3.29	2.433	6.58	3.933	5.48	5.43	2.19
0.967	3.29	2.467	6.58	3.967	5.48	5.47	2.19
1.000	3.29	2.500	6.58	4.000	5.48	5.50	2.19
1.033	3.29	2.533	59.21	4.033	4.39	5.53	2.19
1.067	3.29	2.567	59.22	4.067	4.39	5.57	2.19
1.100	3.29	2.600	59.22	4.100	4.39	5.60	2.19
1.133	3.29	2.633	59.22	4.133	4.39	5.63	2.19
1.167	3.29	2.667	59.22	4.167	4.39	5.67	2.19
1.200	3.29	2.700	59.22	4.200	4.39	5.70	2.19
1.233	3.29	2.733	59.22	4.233	4.39	5.73	2.19
1.267	3.29	2.767	59.22	4.267	4.39	5.77	2.19
1.300	3.29	2.800	59.22	4.300	4.39	5.80	2.19
1.333	3.29	2.833	59.22	4.333	4.39	5.83	2.19
1.367	3.29	2.867	59.22	4.367	4.39	5.87	2.19
1.400	3.29	2.900	59.22	4.400	4.39	5.90	2.19
1.433	3.29	2.933	59.22	4.433	4.39	5.93	2.19
1.467	3.29	2.967	59.22	4.467	4.39	5.97	2.19
1.500	3.29	3.000	59.22	4.500	4.39	6.00	2.19

Unit Hyd Qpeak (cms)= 0.006

PEAK FLOW (cms)= 0.002 (i)
TIME TO PEAK (hrs)= 3.067
RUNOFF VOLUME (mm)= 25.079
TOTAL RAINFALL (mm)= 54.830
RUNOFF COEFFICIENT = 0.457

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

CALIB	
STANDHYD (0301)	Area (ha)= 0.03
ID= 1 DT= 2.0 min	Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.03	0.00	
Dep. Storage	(mm)=	1.00	8.00	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	13.50	1.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		59.22	25.16	
over (min)		5.00	2.00	
Storage Coeff.	(min)=	0.95 (ii)	1.10 (ii)	
Unit Hyd. Tpeak	(min)=	4.00	2.00	
Unit Hyd. peak	(cms)=	0.52	0.71	
				TOTALS
PEAK FLOW	(cms)=	0.00	0.00	0.005 (iii)

```
     TIME TO PEAK    (hrs)=       2.73         3.00          3.00
     RUNOFF VOLUME    (mm)=      53.83        16.68         53.45
     TOTAL RAINFALL   (mm)=      54.83        54.83         54.83
     RUNOFF COEFFICIENT   =       0.98         0.30          0.97

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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(  3011)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.0000      0.0500
                          0.0016     0.0017   |   0.0000      0.0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0301)      0.030      0.005      3.00      53.45
   OUTFLOW: ID= 1 (  3011)      0.030      0.001      3.50      44.40

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.01
                  TIME SHIFT OF PEAK FLOW         (min)= 30.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0010

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--------------------
| CALIB            |
| STANDHYD (  0302)|   Area    (ha)=   0.08
|ID= 1 DT= 2.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.08         0.00
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      22.40         1.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      59.22        25.16
               over (min)        5.00         2.00
     Storage Coeff.  (min)=       1.28 (ii)    1.44 (ii)
     Unit Hyd. Tpeak (min)=       4.00         2.00
     Unit Hyd. peak  (cms)=       0.48         0.64
                                                          *TOTALS*
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     PEAK FLOW       (cms)=       0.01         0.00          0.013 (iii)
     TIME TO PEAK    (hrs)=       2.80         3.00           3.00
     RUNOFF VOLUME    (mm)=      53.83        16.68          53.44
     TOTAL RAINFALL   (mm)=      54.83        54.83          54.83
     RUNOFF COEFFICIENT   =       0.98         0.30           0.97

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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(  3021)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.0000      0.0100
                          0.0032     0.0046   |   0.0000      0.0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0302)      0.080      0.013      3.00      53.44
   OUTFLOW: ID= 1 (  3021)      0.080      0.002      3.53      48.82

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 15.07
                  TIME SHIFT OF PEAK FLOW         (min)= 32.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0029

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--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  3011):     0.03   0.001     3.50    44.40
      + ID2= 2 (  3021):     0.08   0.002     3.53    48.82
        ================================================
        ID = 3 (  0001):     0.11   0.003     3.53    47.61

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0303)|   Area    (ha)=   0.03
|ID= 1 DT= 2.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
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--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.03         0.00
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      13.60         1.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      59.22        25.16
               over (min)        5.00         2.00
     Storage Coeff.  (min)=       0.95 (ii)    1.10 (ii)
     Unit Hyd. Tpeak (min)=       4.00         2.00
     Unit Hyd. peak  (cms)=       0.52         0.71
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.005 (iii)
     TIME TO PEAK    (hrs)=       2.73         3.00           3.00
     RUNOFF VOLUME    (mm)=      53.83        16.68          53.45
     TOTAL RAINFALL   (mm)=      54.83        54.83          54.83
     RUNOFF COEFFICIENT   =       0.98         0.30           0.97

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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(  3031)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.0000      0.0100
                          0.0016     0.0017   |   0.0000      0.0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0303)      0.030      0.005      3.00      53.45
   OUTFLOW: ID= 1 (  3031)      0.030      0.001      3.50      44.40

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.01
                  TIME SHIFT OF PEAK FLOW         (min)= 30.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0010

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--------------------
| ADD HYD  (  0002)|
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|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):     0.11   0.003     3.53    47.61
      + ID2= 2 (  3031):     0.03   0.001     3.50    44.40
        ================================================
        ID = 3 (  0002):     0.14   0.004     3.53    46.92

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0300)|   Area    (ha)=   0.46
|ID= 1 DT= 2.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  75.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.34         0.12
     Dep. Storage     (mm)=       1.00         8.47
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      55.30         5.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      59.22        24.87
               over (min)         5.00         4.00
     Storage Coeff.  (min)=       2.21 (ii)    3.82 (ii)
     Unit Hyd. Tpeak (min)=       4.00         4.00
     Unit Hyd. peak  (cms)=       0.39         0.29
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.01          0.065 (iii)
     TIME TO PEAK    (hrs)=       3.00         3.00           3.00
     RUNOFF VOLUME    (mm)=      53.83        16.40          44.47
     TOTAL RAINFALL   (mm)=      54.83        54.83          54.83
     RUNOFF COEFFICIENT   =       0.98         0.30           0.81


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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  (  0003)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0002):     0.14   0.004     3.53    46.92
      + ID2= 2 (  0300):     0.46   0.065     3.00    44.47
        ================================================
```

ID = 3 (0003): 0.60 0.068 3.00 45.04

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	
STANDHYD (0200)	Area (ha)= 3.10
ID= 1 DT= 5.0 min	Total Imp(%)= 60.00 Dir. Conn.(%)= 30.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.86	1.24
Dep. Storage	(mm)=	1.00	8.47
Average Slope	(%)=	1.00	2.00
Length	(m)=	75.00	40.00
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	2.19	1.583	5.48	3.083	12.06	4.58	3.29
0.167	2.19	1.667	5.48	3.167	12.06	4.67	3.29
0.250	2.19	1.750	5.48	3.250	12.06	4.75	3.29
0.333	2.19	1.833	5.48	3.333	12.06	4.83	3.29
0.417	2.19	1.917	5.48	3.417	12.06	4.92	3.29
0.500	2.19	2.000	5.48	3.500	12.06	5.00	3.29
0.583	3.29	2.083	6.58	3.583	5.48	5.08	2.19
0.667	3.29	2.167	6.58	3.667	5.48	5.17	2.19
0.750	3.29	2.250	6.58	3.750	5.48	5.25	2.19
0.833	3.29	2.333	6.58	3.833	5.48	5.33	2.19
0.917	3.29	2.417	6.58	3.917	5.48	5.42	2.19
1.000	3.29	2.500	6.58	4.000	5.48	5.50	2.19
1.083	3.29	2.583	59.22	4.083	4.39	5.58	2.19
1.167	3.29	2.667	59.22	4.167	4.39	5.67	2.19
1.250	3.29	2.750	59.22	4.250	4.39	5.75	2.19
1.333	3.29	2.833	59.22	4.333	4.39	5.83	2.19
1.417	3.29	2.917	59.22	4.417	4.39	5.92	2.19
1.500	3.29	3.000	59.22	4.500	4.39	6.00	2.19

Max.Eff.Inten.(mm/hr)=		59.22	64.24	
	over (min)	5.00	15.00	
Storage Coeff.	(min)=	2.65 (ii)	11.08 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	15.00	
Unit Hyd. peak	(cms)=	0.29	0.09	
				TOTALS
PEAK FLOW	(cms)=	0.15	0.17	0.312 (iii)
TIME TO PEAK	(hrs)=	3.00	3.08	3.00

```
     RUNOFF VOLUME    (mm)=      53.83        25.40          33.93
     TOTAL RAINFALL   (mm)=      54.83        54.83          54.83
     RUNOFF COEFFICIENT   =       0.98         0.46           0.62

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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 (  0201)|   Area    (ha)=   0.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.30   Dir. Conn.(%)=   0.10
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.07
     Dep. Storage     (mm)=       1.00         8.47
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      75.00        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      59.22        59.92
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.65 (ii)   11.31 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.29         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.01          0.009 (iii)
     TIME TO PEAK    (hrs)=       2.75         3.08           3.08
     RUNOFF VOLUME    (mm)=      53.83        24.68          24.66
     TOTAL RAINFALL   (mm)=      54.83        54.83          54.83
     RUNOFF COEFFICIENT   =       0.98         0.45           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*  =  75.0    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  (  3034)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0200):     3.10   0.312     3.00    33.93
      + ID2= 2 (  0201):     0.12   0.009     3.08    24.66
        ================================================
        ID = 3 (  3034):     3.22   0.321     3.00    33.58

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  3032)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0003):     0.60   0.068     3.00    45.04
      + ID2= 2 (  3034):     3.22   0.321     3.00    33.58
        ================================================
        ID = 3 (  3032):     3.82   0.389     3.00    35.39

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| RESERVOIR(  2001)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0540      0.0558
                          0.0320     0.0001   |   0.4660      0.0870
                          0.0380     0.0116   |   0.6750      0.0941

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3032)      3.820      0.389      3.00      35.39
   OUTFLOW: ID= 1 (  2001)      3.820      0.121      3.47      35.40

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 31.21
                  TIME SHIFT OF PEAK FLOW         (min)= 28.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0609
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--------------------
| ADD HYD  (  3033)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  2001):     3.82   0.121     3.47    35.40
      + ID2= 2 (  0400):     0.03   0.002     3.07    25.08
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        ==================================================
        ID = 3 (  3033):     3.85   0.122     3.47    35.32

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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       V    V   I    SSSSS  U   U    A    L
       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 5.0\VO2\voin.dat

  Output  filename:
C:\Users\MeganF.MAE-DOMAIN\AppData\Local\Civica\VH5\453e3070-1504-40b9-9dc9-0dcd12
ba2708\e6a023c0-e54d-481b-9e2e-7c708c5
  Summary filename:
C:\Users\MeganF.MAE-DOMAIN\AppData\Local\Civica\VH5\453e3070-1504-40b9-9dc9-0dcd12
ba2708\e6a023c0-e54d-481b-9e2e-7c708c5


DATE: 05-18-2020                          TIME: 12:47:55

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
-------------------------
  **********************************************
  ** SIMULATION : 10year-SCS-6hr               **
  **********************************************

--------------------
| MASS STORM       |    Filename: C:\Users\MeganF.MAE-DOMAIN\AppD
|                  |              ata\Local\Temp\
|                  |              faf41ccb-1f03-4a72-8417-79ca726736b4\6322830b
```

| Ptotal= 67.08 mm | Comments: SCS 6 HR MASS CURVE

Duration of storm = 6.00 hrs
Mass curve time step = 30.00 min

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.50	2.68	2.00	6.71	3.50	14.76	5.00	4.02
1.00	4.02	2.50	8.05	4.00	6.71	5.50	2.68
1.50	4.02	3.00	72.45	4.50	5.37	6.00	2.68

CALIB NASHYD (0400) ID= 1 DT= 2.0 min	Area (ha)= 0.03	Curve Number (CN)= 84.2	# of Linear Res.(N)= 3.00	U.H. Tp(hrs)= 0.20

NOTE: RAINFALL WAS TRANSFORMED TO 2.0 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
0.033	2.68	1.533	6.71	3.033	14.76	4.53	4.02
0.067	2.68	1.567	6.71	3.067	14.76	4.57	4.02
0.100	2.68	1.600	6.71	3.100	14.76	4.60	4.02
0.133	2.68	1.633	6.71	3.133	14.76	4.63	4.02
0.167	2.68	1.667	6.71	3.167	14.76	4.67	4.02
0.200	2.68	1.700	6.71	3.200	14.76	4.70	4.02
0.233	2.68	1.733	6.71	3.233	14.76	4.73	4.02
0.267	2.68	1.767	6.71	3.267	14.76	4.77	4.02
0.300	2.68	1.800	6.71	3.300	14.76	4.80	4.02
0.333	2.68	1.833	6.71	3.333	14.76	4.83	4.02
0.367	2.68	1.867	6.71	3.367	14.76	4.87	4.02
0.400	2.68	1.900	6.71	3.400	14.76	4.90	4.02
0.433	2.68	1.933	6.71	3.433	14.76	4.93	4.02
0.467	2.68	1.967	6.71	3.467	14.76	4.97	4.02
0.500	2.68	2.000	6.71	3.500	14.76	5.00	4.02
0.533	4.02	2.033	8.05	3.533	6.71	5.03	2.68
0.567	4.02	2.067	8.05	3.567	6.71	5.07	2.68
0.600	4.02	2.100	8.05	3.600	6.71	5.10	2.68
0.633	4.02	2.133	8.05	3.633	6.71	5.13	2.68
0.667	4.02	2.167	8.05	3.667	6.71	5.17	2.68
0.700	4.02	2.200	8.05	3.700	6.71	5.20	2.68
0.733	4.02	2.233	8.05	3.733	6.71	5.23	2.68
0.767	4.02	2.267	8.05	3.767	6.71	5.27	2.68
0.800	4.02	2.300	8.05	3.800	6.71	5.30	2.68
0.833	4.02	2.333	8.05	3.833	6.71	5.33	2.68
0.867	4.02	2.367	8.05	3.867	6.71	5.37	2.68

0.900	4.02	2.400	8.05	3.900	6.71	5.40	2.68
0.933	4.02	2.433	8.05	3.933	6.71	5.43	2.68
0.967	4.02	2.467	8.05	3.967	6.71	5.47	2.68
1.000	4.02	2.500	8.05	4.000	6.71	5.50	2.68
1.033	4.02	2.533	72.44	4.033	5.37	5.53	2.68
1.067	4.02	2.567	72.45	4.067	5.37	5.57	2.68
1.100	4.02	2.600	72.45	4.100	5.37	5.60	2.68
1.133	4.02	2.633	72.45	4.133	5.37	5.63	2.68
1.167	4.02	2.667	72.45	4.167	5.37	5.67	2.68
1.200	4.02	2.700	72.45	4.200	5.37	5.70	2.68
1.233	4.02	2.733	72.45	4.233	5.37	5.73	2.68
1.267	4.02	2.767	72.45	4.267	5.37	5.77	2.68
1.300	4.02	2.800	72.45	4.300	5.37	5.80	2.68
1.333	4.02	2.833	72.45	4.333	5.37	5.83	2.68
1.367	4.02	2.867	72.45	4.367	5.37	5.87	2.68
1.400	4.02	2.900	72.45	4.400	5.37	5.90	2.68
1.433	4.02	2.933	72.45	4.433	5.37	5.93	2.68
1.467	4.02	2.967	72.45	4.467	5.37	5.97	2.68
1.500	4.02	3.000	72.45	4.500	5.37	6.00	2.68

Unit Hyd Qpeak (cms)= 0.006

PEAK FLOW (cms)= 0.003 (i)
TIME TO PEAK (hrs)= 3.067
RUNOFF VOLUME (mm)= 34.702
TOTAL RAINFALL (mm)= 67.080
RUNOFF COEFFICIENT = 0.517

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

CALIB	
STANDHYD (0301)	Area (ha)= 0.03
ID= 1 DT= 2.0 min	Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.03	0.00	
Dep. Storage	(mm)=	1.00	8.00	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	13.50	1.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		72.45	36.05	
over (min)		5.00	2.00	
Storage Coeff.	(min)=	0.87 (ii)	1.01 (ii)	
Unit Hyd. Tpeak	(min)=	4.00	2.00	
Unit Hyd. peak	(cms)=	0.53	0.73	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.00	0.006 (iii)

```
     TIME TO PEAK    (hrs)=       2.70         3.00          3.00
     RUNOFF VOLUME    (mm)=      66.08        24.28         65.66
     TOTAL RAINFALL   (mm)=      67.08        67.08         67.08
     RUNOFF COEFFICIENT   =       0.99         0.36          0.98

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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(  3011)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.0000      0.0500
                          0.0016     0.0017   |   0.0000      0.0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0301)      0.030      0.006      3.00      65.66
   OUTFLOW: ID= 1 (  3011)      0.030      0.001      3.50      56.58

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.04
                  TIME SHIFT OF PEAK FLOW         (min)= 30.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0012

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0302)|   Area    (ha)=   0.08
|ID= 1 DT= 2.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.08         0.00
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      22.40         1.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      72.45        36.05
               over (min)        5.00         2.00
     Storage Coeff.  (min)=       1.18 (ii)    1.32 (ii)
     Unit Hyd. Tpeak (min)=       4.00         2.00
     Unit Hyd. peak  (cms)=       0.49         0.66
                                                          *TOTALS*
```

```
     PEAK FLOW       (cms)=       0.02         0.00          0.016 (iii)
     TIME TO PEAK    (hrs)=       2.77         3.00           3.00
     RUNOFF VOLUME    (mm)=      66.08        24.28          65.65
     TOTAL RAINFALL   (mm)=      67.08        67.08          67.08
     RUNOFF COEFFICIENT   =       0.99         0.36           0.98

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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(  3021)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.0000      0.0100
                          0.0032     0.0046   |   0.0000      0.0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0302)      0.080      0.016      3.00       65.65
   OUTFLOW: ID= 1 (  3021)      0.080      0.002      3.53       61.03

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 15.10
                  TIME SHIFT OF PEAK FLOW         (min)= 32.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0035

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--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  3011):     0.03   0.001     3.50    56.58
      + ID2= 2 (  3021):     0.08   0.002     3.53    61.03
        ================================================
        ID = 3 (  0001):     0.11   0.004     3.53    59.81

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0303)|   Area    (ha)=   0.03
|ID= 1 DT= 2.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
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--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.03         0.00
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      13.60         1.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      72.45        36.05
               over (min)        5.00         2.00
     Storage Coeff.  (min)=       0.88 (ii)    1.02 (ii)
     Unit Hyd. Tpeak (min)=       4.00         2.00
     Unit Hyd. peak  (cms)=       0.53         0.73
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.006 (iii)
     TIME TO PEAK    (hrs)=       2.70         3.00           3.00
     RUNOFF VOLUME    (mm)=      66.08        24.28          65.66
     TOTAL RAINFALL   (mm)=      67.08        67.08          67.08
     RUNOFF COEFFICIENT   =       0.99         0.36           0.98

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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(  3031)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.0000      0.0100
                          0.0016     0.0017   |   0.0000      0.0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0303)      0.030      0.006      3.00       65.66
   OUTFLOW: ID= 1 (  3031)      0.030      0.001      3.50       56.57

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.04
                  TIME SHIFT OF PEAK FLOW         (min)= 30.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0012

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--------------------
| ADD HYD  (  0002)|
```

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):     0.11   0.004     3.53    59.81
      + ID2= 2 (  3031):     0.03   0.001     3.50    56.57
        ================================================
        ID = 3 (  0002):     0.14   0.005     3.53    59.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0300)|   Area    (ha)=   0.46
|ID= 1 DT= 2.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  75.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.34         0.12
     Dep. Storage     (mm)=       1.00         8.47
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      55.30         5.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      72.45        35.76
               over (min)        5.00         4.00
     Storage Coeff.  (min)=       2.04 (ii)    3.52 (ii)
     Unit Hyd. Tpeak (min)=       4.00         4.00
     Unit Hyd. peak  (cms)=       0.40         0.30
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.01          0.081 (iii)
     TIME TO PEAK    (hrs)=       2.97         3.00           3.00
     RUNOFF VOLUME    (mm)=      66.08        23.98          55.55
     TOTAL RAINFALL   (mm)=      67.08        67.08          67.08
     RUNOFF COEFFICIENT   =       0.99         0.36           0.83


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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  (  0003)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0002):     0.14   0.005     3.53    59.12
      + ID2= 2 (  0300):     0.46   0.081     3.00    55.55
        ================================================
```

ID = 3 (0003):   0.60   0.085   3.00   56.38

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	
STANDHYD (0200)	Area (ha)= 3.10
ID= 1 DT= 5.0 min	Total Imp(%)= 60.00 Dir. Conn.(%)= 30.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.86	1.24
Dep. Storage	(mm)=	1.00	8.47
Average Slope	(%)=	1.00	2.00
Length	(m)=	75.00	40.00
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	2.68	1.583	6.71	3.083	14.76	4.58	4.02
0.167	2.68	1.667	6.71	3.167	14.76	4.67	4.02
0.250	2.68	1.750	6.71	3.250	14.76	4.75	4.02
0.333	2.68	1.833	6.71	3.333	14.76	4.83	4.02
0.417	2.68	1.917	6.71	3.417	14.76	4.92	4.02
0.500	2.68	2.000	6.71	3.500	14.76	5.00	4.02
0.583	4.02	2.083	8.05	3.583	6.71	5.08	2.68
0.667	4.02	2.167	8.05	3.667	6.71	5.17	2.68
0.750	4.02	2.250	8.05	3.750	6.71	5.25	2.68
0.833	4.02	2.333	8.05	3.833	6.71	5.33	2.68
0.917	4.02	2.417	8.05	3.917	6.71	5.42	2.68
1.000	4.02	2.500	8.05	4.000	6.71	5.50	2.68
1.083	4.02	2.583	72.45	4.083	5.37	5.58	2.68
1.167	4.02	2.667	72.45	4.167	5.37	5.67	2.68
1.250	4.02	2.750	72.45	4.250	5.37	5.75	2.68
1.333	4.02	2.833	72.45	4.333	5.37	5.83	2.68
1.417	4.02	2.917	72.45	4.417	5.37	5.92	2.68
1.500	4.02	3.000	72.45	4.500	5.37	6.00	2.68

Max.Eff.Inten.(mm/hr)=		72.45	86.90	
over (min)		5.00	10.00	
Storage Coeff. (min)=		2.45 (ii)	9.91 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.30	0.11	
				TOTALS
PEAK FLOW	(cms)=	0.19	0.25	0.437 (iii)
TIME TO PEAK	(hrs)=	3.00	3.00	3.00

```
     RUNOFF VOLUME    (mm)=      66.08        35.02          44.34
     TOTAL RAINFALL   (mm)=      67.08        67.08          67.08
     RUNOFF COEFFICIENT   =       0.99         0.52           0.66

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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 (  0201)|   Area    (ha)=   0.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.30   Dir. Conn.(%)=   0.10
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.07
     Dep. Storage     (mm)=       1.00         8.47
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      75.00        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      72.45        81.39
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.45 (ii)   10.11 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.30         0.10
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.01          0.013 (iii)
     TIME TO PEAK    (hrs)=       2.83         3.08           3.08
     RUNOFF VOLUME    (mm)=      66.08        34.15          34.14
     TOTAL RAINFALL   (mm)=      67.08        67.08          67.08
     RUNOFF COEFFICIENT   =       0.99         0.51           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*  =  75.0    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  (  3034)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0200):     3.10   0.437     3.00    44.34
      + ID2= 2 (  0201):     0.12   0.013     3.08    34.14
        ================================================
        ID = 3 (  3034):     3.22   0.449     3.00    43.96

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

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--------------------
| ADD HYD  (  3032)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0003):     0.60   0.085     3.00    56.38
      + ID2= 2 (  3034):     3.22   0.449     3.00    43.96
        ================================================
        ID = 3 (  3032):     3.82   0.534     3.00    45.91

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| RESERVOIR(  2001)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0540      0.0558
                          0.0320     0.0001   |   0.4660      0.0870
                          0.0380     0.0116   |   0.6750      0.0941

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3032)      3.820      0.534      3.00      45.91
   OUTFLOW: ID= 1 (  2001)      3.820      0.242      3.17      45.92

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 45.31
                  TIME SHIFT OF PEAK FLOW         (min)= 10.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0701
```

```
--------------------
| ADD HYD  (  3033)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  2001):     3.82   0.242     3.17    45.92
      + ID2= 2 (  0400):     0.03   0.003     3.07    34.70
```

```
        ==================================================
        ID = 3 (  3033):     3.85   0.245     3.17    45.83

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
```

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

       V    V   I    SSSSS  U   U    A    L
       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 5.0\VO2\voin.dat

  Output  filename:
C:\Users\MeganF.MAE-DOMAIN\AppData\Local\Civica\VH5\453e3070-1504-40b9-9dc9-0dcd12
ba2708\c8b2f34f-ac42-49df-be3e-e07602d
  Summary filename:
C:\Users\MeganF.MAE-DOMAIN\AppData\Local\Civica\VH5\453e3070-1504-40b9-9dc9-0dcd12
ba2708\c8b2f34f-ac42-49df-be3e-e07602d


DATE: 05-18-2020                          TIME: 12:47:56

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
-------------------------
  **********************************************
  ** SIMULATION : 25year-SCS-6hr               **
  **********************************************

--------------------
| MASS STORM       |    Filename: C:\Users\MeganF.MAE-DOMAIN\AppD
|                  |              ata\Local\Temp\
|                  |              faf41ccb-1f03-4a72-8417-79ca726736b4\c7e742bc
```

| Ptotal= 73.13 mm | Comments: SCS 6 HR MASS CURVE

Duration of storm = 6.00 hrs
Mass curve time step = 30.00 min

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.50	2.93	2.00	7.31	3.50	16.09	5.00	4.39
1.00	4.39	2.50	8.78	4.00	7.31	5.50	2.93
1.50	4.39	3.00	78.98	4.50	5.85	6.00	2.93

CALIB NASHYD (0400) ID= 1 DT= 2.0 min	Area (ha)= 0.03	Curve Number (CN)= 84.2	# of Linear Res.(N)= 3.00	U.H. Tp(hrs)= 0.20

NOTE: RAINFALL WAS TRANSFORMED TO 2.0 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
0.033	2.93	1.533	7.31	3.033	16.09	4.53	4.39
0.067	2.93	1.567	7.31	3.067	16.09	4.57	4.39
0.100	2.93	1.600	7.31	3.100	16.09	4.60	4.39
0.133	2.93	1.633	7.31	3.133	16.09	4.63	4.39
0.167	2.93	1.667	7.31	3.167	16.09	4.67	4.39
0.200	2.93	1.700	7.31	3.200	16.09	4.70	4.39
0.233	2.93	1.733	7.31	3.233	16.09	4.73	4.39
0.267	2.93	1.767	7.31	3.267	16.09	4.77	4.39
0.300	2.93	1.800	7.31	3.300	16.09	4.80	4.39
0.333	2.93	1.833	7.31	3.333	16.09	4.83	4.39
0.367	2.93	1.867	7.31	3.367	16.09	4.87	4.39
0.400	2.93	1.900	7.31	3.400	16.09	4.90	4.39
0.433	2.93	1.933	7.31	3.433	16.09	4.93	4.39
0.467	2.93	1.967	7.31	3.467	16.09	4.97	4.39
0.500	2.93	2.000	7.31	3.500	16.09	5.00	4.39
0.533	4.39	2.033	8.78	3.533	7.31	5.03	2.93
0.567	4.39	2.067	8.78	3.567	7.31	5.07	2.93
0.600	4.39	2.100	8.78	3.600	7.31	5.10	2.93
0.633	4.39	2.133	8.78	3.633	7.31	5.13	2.93
0.667	4.39	2.167	8.78	3.667	7.31	5.17	2.93
0.700	4.39	2.200	8.78	3.700	7.31	5.20	2.93
0.733	4.39	2.233	8.78	3.733	7.31	5.23	2.93
0.767	4.39	2.267	8.78	3.767	7.31	5.27	2.93
0.800	4.39	2.300	8.78	3.800	7.31	5.30	2.93
0.833	4.39	2.333	8.78	3.833	7.31	5.33	2.93
0.867	4.39	2.367	8.78	3.867	7.31	5.37	2.93

0.900	4.39	2.400	8.78	3.900	7.31	5.40	2.93
0.933	4.39	2.433	8.78	3.933	7.31	5.43	2.93
0.967	4.39	2.467	8.78	3.967	7.31	5.47	2.93
1.000	4.39	2.500	8.78	4.000	7.31	5.50	2.93
1.033	4.39	2.533	78.98	4.033	5.85	5.53	2.93
1.067	4.39	2.567	78.98	4.067	5.85	5.57	2.93
1.100	4.39	2.600	78.98	4.100	5.85	5.60	2.93
1.133	4.39	2.633	78.98	4.133	5.85	5.63	2.93
1.167	4.39	2.667	78.98	4.167	5.85	5.67	2.93
1.200	4.39	2.700	78.98	4.200	5.85	5.70	2.93
1.233	4.39	2.733	78.98	4.233	5.85	5.73	2.93
1.267	4.39	2.767	78.98	4.267	5.85	5.77	2.93
1.300	4.39	2.800	78.98	4.300	5.85	5.80	2.93
1.333	4.39	2.833	78.98	4.333	5.85	5.83	2.93
1.367	4.39	2.867	78.98	4.367	5.85	5.87	2.93
1.400	4.39	2.900	78.98	4.400	5.85	5.90	2.93
1.433	4.39	2.933	78.98	4.433	5.85	5.93	2.93
1.467	4.39	2.967	78.98	4.467	5.85	5.97	2.93
1.500	4.39	3.000	78.98	4.500	5.85	6.00	2.93

Unit Hyd Qpeak (cms)= 0.006

PEAK FLOW (cms)= 0.004 (i)
TIME TO PEAK (hrs)= 3.067
RUNOFF VOLUME (mm)= 39.662
TOTAL RAINFALL (mm)= 73.130
RUNOFF COEFFICIENT = 0.542

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

CALIB	
STANDHYD (0301)	Area (ha)= 0.03
ID= 1 DT= 2.0 min	Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.03	0.00
Dep. Storage	(mm)=	1.00	8.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	13.50	1.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		78.98	41.74
over (min)		5.00	2.00
Storage Coeff.	(min)=	0.84 (ii)	0.98 (ii)
Unit Hyd. Tpeak	(min)=	4.00	2.00
Unit Hyd. peak	(cms)=	0.53	0.74

				TOTALS
PEAK FLOW	(cms)=	0.01	0.00	0.007 (iii)

```
     TIME TO PEAK    (hrs)=       2.70         3.00          3.00
     RUNOFF VOLUME    (mm)=      72.13        28.32         71.69
     TOTAL RAINFALL   (mm)=      73.13        73.13         73.13
     RUNOFF COEFFICIENT   =       0.99         0.39          0.98

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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(  3011)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.0000      0.0500
                          0.0016     0.0017   |   0.0000      0.0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0301)      0.030      0.007      3.00      71.69
   OUTFLOW: ID= 1 (  3011)      0.030      0.001      3.50      62.62

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.06
                  TIME SHIFT OF PEAK FLOW         (min)= 30.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0013

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0302)|   Area    (ha)=   0.08
|ID= 1 DT= 2.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.08         0.00
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      22.40         1.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      78.98        41.74
               over (min)        5.00         2.00
     Storage Coeff.  (min)=       1.14 (ii)    1.28 (ii)
     Unit Hyd. Tpeak (min)=       4.00         2.00
     Unit Hyd. peak  (cms)=       0.50         0.67
                                                          *TOTALS*
```

```
     PEAK FLOW       (cms)=       0.02         0.00          0.017 (iii)
     TIME TO PEAK    (hrs)=       2.77         3.00           3.00
     RUNOFF VOLUME    (mm)=      72.13        28.32          71.68
     TOTAL RAINFALL   (mm)=      73.13        73.13          73.13
     RUNOFF COEFFICIENT   =       0.99         0.39           0.98

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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(  3021)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.0000      0.0100
                          0.0032     0.0046   |   0.0000      0.0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0302)      0.080      0.017      3.00       71.68
   OUTFLOW: ID= 1 (  3021)      0.080      0.003      3.53       67.07

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 15.11
                  TIME SHIFT OF PEAK FLOW         (min)= 32.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0039

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

--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  3011):     0.03   0.001     3.50    62.62
      + ID2= 2 (  3021):     0.08   0.003     3.53    67.07
        ================================================
        ID = 3 (  0001):     0.11   0.004     3.53    65.86

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0303)|   Area    (ha)=   0.03
|ID= 1 DT= 2.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
```

```
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.03         0.00
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      13.60         1.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      78.98        41.74
               over (min)        5.00         2.00
     Storage Coeff.  (min)=       0.85 (ii)    0.98 (ii)
     Unit Hyd. Tpeak (min)=       4.00         2.00
     Unit Hyd. peak  (cms)=       0.53         0.74
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.007 (iii)
     TIME TO PEAK    (hrs)=       2.70         3.00           3.00
     RUNOFF VOLUME    (mm)=      72.13        28.32          71.69
     TOTAL RAINFALL   (mm)=      73.13        73.13          73.13
     RUNOFF COEFFICIENT   =       0.99         0.39           0.98

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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(  3031)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.0000      0.0100
                          0.0016     0.0017   |   0.0000      0.0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0303)      0.030      0.007      3.00      71.69
   OUTFLOW: ID= 1 (  3031)      0.030      0.001      3.50      62.62

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.06
                  TIME SHIFT OF PEAK FLOW         (min)= 30.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0013

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

--------------------
| ADD HYD  (  0002)|
```

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):     0.11   0.004     3.53    65.86
      + ID2= 2 (  3031):     0.03   0.001     3.50    62.62
        ================================================
        ID = 3 (  0002):     0.14   0.005     3.53    65.17

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0300)|   Area    (ha)=   0.46
|ID= 1 DT= 2.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  75.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.34         0.12
     Dep. Storage     (mm)=       1.00         8.47
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      55.30         5.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      78.98        41.45
               over (min)        5.00         4.00
     Storage Coeff.  (min)=       1.97 (ii)    3.40 (ii)
     Unit Hyd. Tpeak (min)=       4.00         4.00
     Unit Hyd. peak  (cms)=       0.41         0.31
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.01          0.089 (iii)
     TIME TO PEAK    (hrs)=       2.97         3.00           3.00
     RUNOFF VOLUME    (mm)=      72.13        28.00          61.09
     TOTAL RAINFALL   (mm)=      73.13        73.13          73.13
     RUNOFF COEFFICIENT   =       0.99         0.38           0.84

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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  (  0003)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0002):     0.14   0.005     3.53    65.17
      + ID2= 2 (  0300):     0.46   0.089     3.00    61.09
```

```
    ================================================
    ID = 3 (  0003):     0.60   0.094     3.00    62.04

  NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0200)|   Area    (ha)=   3.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  30.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
  Surface Area     (ha)=       1.86         1.24
  Dep. Storage     (mm)=       1.00         8.47
  Average Slope     (%)=       1.00         2.00
  Length            (m)=      75.00        40.00
  Mannings n             =     0.013        0.250

      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    2.93 | 1.583    7.31 | 3.083   16.09 |  4.58    4.39
            0.167    2.93 | 1.667    7.31 | 3.167   16.09 |  4.67    4.39
            0.250    2.93 | 1.750    7.31 | 3.250   16.09 |  4.75    4.39
            0.333    2.93 | 1.833    7.31 | 3.333   16.09 |  4.83    4.39
            0.417    2.93 | 1.917    7.31 | 3.417   16.09 |  4.92    4.39
            0.500    2.93 | 2.000    7.31 | 3.500   16.09 |  5.00    4.39
            0.583    4.39 | 2.083    8.78 | 3.583    7.31 |  5.08    2.93
            0.667    4.39 | 2.167    8.78 | 3.667    7.31 |  5.17    2.93
            0.750    4.39 | 2.250    8.78 | 3.750    7.31 |  5.25    2.93
            0.833    4.39 | 2.333    8.78 | 3.833    7.31 |  5.33    2.93
            0.917    4.39 | 2.417    8.78 | 3.917    7.31 |  5.42    2.93
            1.000    4.39 | 2.500    8.78 | 4.000    7.31 |  5.50    2.93
            1.083    4.39 | 2.583   78.98 | 4.083    5.85 |  5.58    2.93
            1.167    4.39 | 2.667   78.98 | 4.167    5.85 |  5.67    2.93
            1.250    4.39 | 2.750   78.98 | 4.250    5.85 |  5.75    2.93
            1.333    4.39 | 2.833   78.98 | 4.333    5.85 |  5.83    2.93
            1.417    4.39 | 2.917   78.98 | 4.417    5.85 |  5.92    2.93
            1.500    4.39 | 3.000   78.98 | 4.500    5.85 |  6.00    2.93

  Max.Eff.Inten.(mm/hr)=      78.98        98.37
            over (min)        5.00        10.00
  Storage Coeff.  (min)=      2.36 (ii)    9.47 (ii)
  Unit Hyd. Tpeak (min)=      5.00        10.00
  Unit Hyd. peak  (cms)=      0.30         0.12
                                                    *TOTALS*
  PEAK FLOW       (cms)=      0.20         0.29          0.492 (iii)
```

```
     TIME TO PEAK    (hrs)=       3.00         3.00          3.00
     RUNOFF VOLUME    (mm)=      72.13        39.97         49.62
     TOTAL RAINFALL   (mm)=      73.13        73.13         73.13
     RUNOFF COEFFICIENT   =       0.99         0.55          0.68

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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 (  0201)|   Area    (ha)=   0.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.30   Dir. Conn.(%)=   0.10
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.07
     Dep. Storage     (mm)=       1.00         8.47
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      75.00        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      78.98        92.28
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.36 (ii)    9.65 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.11
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.02          0.016 (iii)
     TIME TO PEAK    (hrs)=       2.83         3.00           3.00
     RUNOFF VOLUME    (mm)=      72.13        39.05          39.03
     TOTAL RAINFALL   (mm)=      73.13        73.13          73.13
     RUNOFF COEFFICIENT   =       0.99         0.53           0.53

***** 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*  =  75.0    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  (  3034)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0200):     3.10   0.492     3.00    49.62
      + ID2= 2 (  0201):     0.12   0.016     3.00    39.03
        ====================================================
        ID = 3 (  3034):     3.22   0.508     3.00    49.22

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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


--------------------
| ADD HYD  (  3032)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0003):     0.60   0.094     3.00    62.04
      + ID2= 2 (  3034):     3.22   0.508     3.00    49.22
        ====================================================
        ID = 3 (  3032):     3.82   0.602     3.00    51.23

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--------------------
| RESERVOIR(  2001)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)    |   (cms)     (ha.m.)
                          0.0000     0.0000    |   0.0540      0.0558
                          0.0320     0.0001    |   0.4660      0.0870
                          0.0380     0.0116    |   0.6750      0.0941

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3032)      3.820      0.602      3.00      51.23
   OUTFLOW: ID= 1 (  2001)      3.820      0.312      3.13      51.25

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 51.92
                  TIME SHIFT OF PEAK FLOW         (min)=  8.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0754

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


--------------------
| ADD HYD  (  3033)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  2001):     3.82   0.312     3.13    51.25
```

```
 + ID2= 2 (  0400):     0.03   0.004     3.07    39.66
   ================================================
   ID = 3 (  3033):     3.85   0.316     3.13    51.16

 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    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 5.0\VO2\voin.dat

  Output  filename:
C:\Users\MeganF.MAE-DOMAIN\AppData\Local\Civica\VH5\453e3070-1504-40b9-9dc9-0dcd12
ba2708\1722637b-852b-4e1c-863d-1bfce95
  Summary filename:
C:\Users\MeganF.MAE-DOMAIN\AppData\Local\Civica\VH5\453e3070-1504-40b9-9dc9-0dcd12
ba2708\1722637b-852b-4e1c-863d-1bfce95


DATE: 05-18-2020                          TIME: 12:47:56

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
-------------------------
  ********************************************
  ** SIMULATION : 50year-SCS-6hr              **
  ********************************************

--------------------
| MASS STORM       |    Filename: C:\Users\MeganF.MAE-DOMAIN\AppD
|                  |              ata\Local\Temp\
|                  |              faf41ccb-1f03-4a72-8417-79ca726736b4\df401f20
```

| Ptotal= 77.91 mm | Comments: SCS 6 HR MASS CURVE

Duration of storm = 6.00 hrs
Mass curve time step = 30.00 min

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.50	3.12	2.00	7.79	3.50	17.14	5.00	4.67
1.00	4.67	2.50	9.35	4.00	7.79	5.50	3.12
1.50	4.67	3.00	84.14	4.50	6.23	6.00	3.12

CALIB NASHYD (0400)	Area (ha)= 0.03	Curve Number (CN)= 84.2
ID= 1 DT= 2.0 min	Ia (mm)= 5.47	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.20	

NOTE: RAINFALL WAS TRANSFORMED TO 2.0 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
0.033	3.12	1.533	7.79	3.033	17.14	4.53	4.67
0.067	3.12	1.567	7.79	3.067	17.14	4.57	4.67
0.100	3.12	1.600	7.79	3.100	17.14	4.60	4.67
0.133	3.12	1.633	7.79	3.133	17.14	4.63	4.67
0.167	3.12	1.667	7.79	3.167	17.14	4.67	4.67
0.200	3.12	1.700	7.79	3.200	17.14	4.70	4.67
0.233	3.12	1.733	7.79	3.233	17.14	4.73	4.67
0.267	3.12	1.767	7.79	3.267	17.14	4.77	4.67
0.300	3.12	1.800	7.79	3.300	17.14	4.80	4.67
0.333	3.12	1.833	7.79	3.333	17.14	4.83	4.67
0.367	3.12	1.867	7.79	3.367	17.14	4.87	4.67
0.400	3.12	1.900	7.79	3.400	17.14	4.90	4.67
0.433	3.12	1.933	7.79	3.433	17.14	4.93	4.67
0.467	3.12	1.967	7.79	3.467	17.14	4.97	4.67
0.500	3.12	2.000	7.79	3.500	17.14	5.00	4.67
0.533	4.67	2.033	9.35	3.533	7.79	5.03	3.12
0.567	4.67	2.067	9.35	3.567	7.79	5.07	3.12
0.600	4.67	2.100	9.35	3.600	7.79	5.10	3.12
0.633	4.67	2.133	9.35	3.633	7.79	5.13	3.12
0.667	4.67	2.167	9.35	3.667	7.79	5.17	3.12
0.700	4.67	2.200	9.35	3.700	7.79	5.20	3.12
0.733	4.67	2.233	9.35	3.733	7.79	5.23	3.12
0.767	4.67	2.267	9.35	3.767	7.79	5.27	3.12
0.800	4.67	2.300	9.35	3.800	7.79	5.30	3.12
0.833	4.67	2.333	9.35	3.833	7.79	5.33	3.12
0.867	4.67	2.367	9.35	3.867	7.79	5.37	3.12

0.900	4.67	2.400	9.35	3.900	7.79	5.40	3.12
0.933	4.67	2.433	9.35	3.933	7.79	5.43	3.12
0.967	4.67	2.467	9.35	3.967	7.79	5.47	3.12
1.000	4.67	2.500	9.35	4.000	7.79	5.50	3.12
1.033	4.67	2.533	84.14	4.033	6.23	5.53	3.12
1.067	4.67	2.567	84.14	4.067	6.23	5.57	3.12
1.100	4.67	2.600	84.14	4.100	6.23	5.60	3.12
1.133	4.67	2.633	84.14	4.133	6.23	5.63	3.12
1.167	4.67	2.667	84.14	4.167	6.23	5.67	3.12
1.200	4.67	2.700	84.14	4.200	6.23	5.70	3.12
1.233	4.67	2.733	84.14	4.233	6.23	5.73	3.12
1.267	4.67	2.767	84.14	4.267	6.23	5.77	3.12
1.300	4.67	2.800	84.14	4.300	6.23	5.80	3.12
1.333	4.67	2.833	84.14	4.333	6.23	5.83	3.12
1.367	4.67	2.867	84.14	4.367	6.23	5.87	3.12
1.400	4.67	2.900	84.14	4.400	6.23	5.90	3.12
1.433	4.67	2.933	84.14	4.433	6.23	5.93	3.12
1.467	4.67	2.967	84.14	4.467	6.23	5.97	3.12
1.500	4.67	3.000	84.14	4.500	6.23	6.00	3.12

Unit Hyd Qpeak (cms)= 0.006

PEAK FLOW (cms)= 0.004 (i)
TIME TO PEAK (hrs)= 3.067
RUNOFF VOLUME (mm)= 43.659
TOTAL RAINFALL (mm)= 77.910
RUNOFF COEFFICIENT = 0.560

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

CALIB STANDHYD (0301) | ID= 1 DT= 2.0 min	Area (ha)= 0.03 Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.03	0.00
Dep. Storage	(mm)=	1.00	8.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	13.50	1.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		84.14	46.35
over (min)		5.00	2.00
Storage Coeff. (min)=		0.82 (ii)	0.95 (ii)
Unit Hyd. Tpeak (min)=		4.00	2.00
Unit Hyd. peak (cms)=		0.53	0.75
			TOTALS
PEAK FLOW (cms)=		0.01	0.00 0.007 (iii)

```
     TIME TO PEAK    (hrs)=       2.70         3.00          3.00
     RUNOFF VOLUME    (mm)=      76.91        31.62         76.45
     TOTAL RAINFALL   (mm)=      77.91        77.91         77.91
     RUNOFF COEFFICIENT   =       0.99         0.41          0.98

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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(  3011)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.0000      0.0500
                          0.0016     0.0017   |   0.0000      0.0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0301)      0.030      0.007      3.00      76.45
   OUTFLOW: ID= 1 (  3011)      0.030      0.001      3.50      67.42

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.07
                  TIME SHIFT OF PEAK FLOW         (min)= 30.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0014

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0302)|   Area    (ha)=   0.08
|ID= 1 DT= 2.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.08         0.00
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      22.40         1.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      84.14        46.35
               over (min)        5.00         2.00
     Storage Coeff.  (min)=       1.12 (ii)    1.25 (ii)
     Unit Hyd. Tpeak (min)=       4.00         2.00
     Unit Hyd. peak  (cms)=       0.50         0.68
                                                          *TOTALS*
```

```
     PEAK FLOW       (cms)=       0.02         0.00          0.019 (iii)
     TIME TO PEAK    (hrs)=       2.77         3.00           3.00
     RUNOFF VOLUME    (mm)=      76.91        31.62          76.44
     TOTAL RAINFALL   (mm)=      77.91        77.91          77.91
     RUNOFF COEFFICIENT   =       0.99         0.41           0.98

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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(  3021)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.0000      0.0100
                          0.0032     0.0046   |   0.0000      0.0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0302)      0.080      0.019      3.00       76.44
   OUTFLOW: ID= 1 (  3021)      0.080      0.003      3.53       71.85

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 15.12
                  TIME SHIFT OF PEAK FLOW         (min)= 32.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0041

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

--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  3011):     0.03   0.001     3.50    67.42
      + ID2= 2 (  3021):     0.08   0.003     3.53    71.85
        ================================================
        ID = 3 (  0001):     0.11   0.004     3.53    70.64

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0303)|   Area    (ha)=   0.03
|ID= 1 DT= 2.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
```

```
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.03         0.00
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      13.60         1.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      84.14        46.35
               over (min)         5.00         2.00
     Storage Coeff.  (min)=       0.83 (ii)    0.96 (ii)
     Unit Hyd. Tpeak (min)=       4.00         2.00
     Unit Hyd. peak  (cms)=       0.53         0.74
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.007 (iii)
     TIME TO PEAK    (hrs)=       2.70         3.00           3.00
     RUNOFF VOLUME    (mm)=      76.91        31.62          76.45
     TOTAL RAINFALL   (mm)=      77.91        77.91          77.91
     RUNOFF COEFFICIENT   =       0.99         0.41           0.98

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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(  3031)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.0000      0.0100
                          0.0016     0.0017   |   0.0000      0.0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0303)      0.030      0.007      3.00       76.45
   OUTFLOW: ID= 1 (  3031)      0.030      0.001      3.50       67.42

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.07
                  TIME SHIFT OF PEAK FLOW         (min)= 30.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0014

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

--------------------
| ADD HYD  (  0002)|
```

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):     0.11   0.004     3.53    70.64
      + ID2= 2 (  3031):     0.03   0.001     3.50    67.42
        ================================================
        ID = 3 (  0002):     0.14   0.005     3.53    69.95

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0300)|   Area    (ha)=   0.46
|ID= 1 DT= 2.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  75.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.34         0.12
     Dep. Storage     (mm)=       1.00         8.47
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      55.30         5.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      84.14        46.07
               over (min)         5.00         4.00
     Storage Coeff.  (min)=       1.92 (ii)    3.32 (ii)
     Unit Hyd. Tpeak (min)=       4.00         4.00
     Unit Hyd. peak  (cms)=       0.42         0.31
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.01          0.095 (iii)
     TIME TO PEAK    (hrs)=       2.97         3.00           3.00
     RUNOFF VOLUME    (mm)=      76.91        31.29          65.50
     TOTAL RAINFALL   (mm)=      77.91        77.91          77.91
     RUNOFF COEFFICIENT   =       0.99         0.40           0.84

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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  (  0003)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0002):     0.14   0.005     3.53    69.95
      + ID2= 2 (  0300):     0.46   0.095     3.00    65.50
```

```
      ================================================
      ID = 3 (  0003):     0.60   0.100     3.00    66.54

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0200)|   Area    (ha)=   3.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  30.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       1.86         1.24
    Dep. Storage     (mm)=       1.00         8.47
    Average Slope     (%)=       1.00         2.00
    Length            (m)=      75.00        40.00
    Mannings n           =      0.013        0.250

        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    3.12 | 1.583    7.79 | 3.083   17.14 |  4.58    4.67
             0.167    3.12 | 1.667    7.79 | 3.167   17.14 |  4.67    4.67
             0.250    3.12 | 1.750    7.79 | 3.250   17.14 |  4.75    4.67
             0.333    3.12 | 1.833    7.79 | 3.333   17.14 |  4.83    4.67
             0.417    3.12 | 1.917    7.79 | 3.417   17.14 |  4.92    4.67
             0.500    3.12 | 2.000    7.79 | 3.500   17.14 |  5.00    4.67
             0.583    4.67 | 2.083    9.35 | 3.583    7.79 |  5.08    3.12
             0.667    4.67 | 2.167    9.35 | 3.667    7.79 |  5.17    3.12
             0.750    4.67 | 2.250    9.35 | 3.750    7.79 |  5.25    3.12
             0.833    4.67 | 2.333    9.35 | 3.833    7.79 |  5.33    3.12
             0.917    4.67 | 2.417    9.35 | 3.917    7.79 |  5.42    3.12
             1.000    4.67 | 2.500    9.35 | 4.000    7.79 |  5.50    3.12
             1.083    4.67 | 2.583   84.14 | 4.083    6.23 |  5.58    3.12
             1.167    4.67 | 2.667   84.14 | 4.167    6.23 |  5.67    3.12
             1.250    4.67 | 2.750   84.14 | 4.250    6.23 |  5.75    3.12
             1.333    4.67 | 2.833   84.14 | 4.333    6.23 |  5.83    3.12
             1.417    4.67 | 2.917   84.14 | 4.417    6.23 |  5.92    3.12
             1.500    4.67 | 3.000   84.14 | 4.500    6.23 |  6.00    3.12

    Max.Eff.Inten.(mm/hr)=      84.14       107.52
              over (min)        5.00        10.00
    Storage Coeff.  (min)=      2.30 (ii)    9.16 (ii)
    Unit Hyd. Tpeak (min)=      5.00        10.00
    Unit Hyd. peak  (cms)=      0.30         0.12
                                                      *TOTALS*
    PEAK FLOW       (cms)=      0.22         0.32          0.537 (iii)
```

```
     TIME TO PEAK    (hrs)=       3.00         3.00          3.00
     RUNOFF VOLUME    (mm)=      76.91        43.96         53.84
     TOTAL RAINFALL   (mm)=      77.91        77.91         77.91
     RUNOFF COEFFICIENT   =       0.99         0.56          0.69

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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 (  0201)|   Area    (ha)=   0.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.30   Dir. Conn.(%)=   0.10
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.07
     Dep. Storage     (mm)=       1.00         8.47
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      75.00        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      84.14       100.98
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.30 (ii)    9.33 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.02         0.017 (iii)
     TIME TO PEAK    (hrs)=       2.75         3.00          3.00
     RUNOFF VOLUME    (mm)=      76.91        42.99         42.97
     TOTAL RAINFALL   (mm)=      77.91        77.91         77.91
     RUNOFF COEFFICIENT   =       0.99         0.55          0.55

***** 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*  =  75.0    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  (  3034)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0200):     3.10   0.537     3.00    53.84
      + ID2= 2 (  0201):     0.12   0.017     3.00    42.97
        ====================================================
        ID = 3 (  3034):     3.22   0.554     3.00    53.44

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  3032)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0003):     0.60   0.100     3.00    66.54
      + ID2= 2 (  3034):     3.22   0.554     3.00    53.44
        ====================================================
        ID = 3 (  3032):     3.82   0.654     3.00    55.49

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| RESERVOIR(  2001)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)    |   (cms)     (ha.m.)
                          0.0000     0.0000    |   0.0540      0.0558
                          0.0320     0.0001    |   0.4660      0.0870
                          0.0380     0.0116    |   0.6750      0.0941

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3032)      3.820      0.654      3.00      55.49
   OUTFLOW: ID= 1 (  2001)      3.820      0.367      3.10      55.49

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 56.08
                  TIME SHIFT OF PEAK FLOW         (min)=  6.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0796

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


--------------------
| ADD HYD  (  3033)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  2001):     3.82   0.367     3.10    55.49
```

```
      + ID2= 2 (  0400):     0.03   0.004     3.07    43.66
        ================================================
        ID = 3 (  3033):     3.85   0.371     3.10    55.40

     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    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 5.0\VO2\voin.dat

  Output  filename:
C:\Users\MeganF.MAE-DOMAIN\AppData\Local\Civica\VH5\453e3070-1504-40b9-9dc9-0dcd12
ba2708\fc5fa931-94bd-40b6-b513-bf07bd4
  Summary filename:
C:\Users\MeganF.MAE-DOMAIN\AppData\Local\Civica\VH5\453e3070-1504-40b9-9dc9-0dcd12
ba2708\fc5fa931-94bd-40b6-b513-bf07bd4


DATE: 05-18-2020                          TIME: 12:47:56

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
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  **********************************************
  ** SIMULATION : 100year-SCS-6hr               **
  **********************************************

--------------------
| MASS STORM       |    Filename: C:\Users\MeganF.MAE-DOMAIN\AppD
|                  |              ata\Local\Temp\
|                  |              faf41ccb-1f03-4a72-8417-79ca726736b4\a8aefadd
```

| Ptotal= 91.42 mm | Comments: SCS 6 HR MASS CURVE

Duration of storm = 6.00 hrs
Mass curve time step = 30.00 min

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.50	3.66	2.00	9.14	3.50	20.11	5.00	5.49
1.00	5.49	2.50	10.97	4.00	9.14	5.50	3.66
1.50	5.49	3.00	98.73	4.50	7.31	6.00	3.66

| CALIB |
| NASHYD (0400)| Area (ha)= 0.03 Curve Number (CN)= 84.2
|ID= 1 DT= 2.0 min | Ia (mm)= 5.47 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.20

NOTE: RAINFALL WAS TRANSFORMED TO 2.0 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
0.033	3.66	1.533	9.14	3.033	20.12	4.53	5.49
0.067	3.66	1.567	9.14	3.067	20.11	4.57	5.49
0.100	3.66	1.600	9.14	3.100	20.11	4.60	5.49
0.133	3.66	1.633	9.14	3.133	20.11	4.63	5.49
0.167	3.66	1.667	9.14	3.167	20.11	4.67	5.49
0.200	3.66	1.700	9.14	3.200	20.11	4.70	5.49
0.233	3.66	1.733	9.14	3.233	20.11	4.73	5.49
0.267	3.66	1.767	9.14	3.267	20.11	4.77	5.49
0.300	3.66	1.800	9.14	3.300	20.11	4.80	5.49
0.333	3.66	1.833	9.14	3.333	20.11	4.83	5.49
0.367	3.66	1.867	9.14	3.367	20.11	4.87	5.49
0.400	3.66	1.900	9.14	3.400	20.11	4.90	5.49
0.433	3.66	1.933	9.14	3.433	20.11	4.93	5.49
0.467	3.66	1.967	9.14	3.467	20.11	4.97	5.49
0.500	3.66	2.000	9.14	3.500	20.11	5.00	5.49
0.533	5.49	2.033	10.97	3.533	9.14	5.03	3.66
0.567	5.49	2.067	10.97	3.567	9.14	5.07	3.66
0.600	5.49	2.100	10.97	3.600	9.14	5.10	3.66
0.633	5.49	2.133	10.97	3.633	9.14	5.13	3.66
0.667	5.49	2.167	10.97	3.667	9.14	5.17	3.66
0.700	5.49	2.200	10.97	3.700	9.14	5.20	3.66
0.733	5.49	2.233	10.97	3.733	9.14	5.23	3.66
0.767	5.49	2.267	10.97	3.767	9.14	5.27	3.66
0.800	5.49	2.300	10.97	3.800	9.14	5.30	3.66
0.833	5.49	2.333	10.97	3.833	9.14	5.33	3.66
0.867	5.49	2.367	10.97	3.867	9.14	5.37	3.66

0.900	5.49	2.400	10.97	3.900	9.14	5.40	3.66
0.933	5.49	2.433	10.97	3.933	9.14	5.43	3.66
0.967	5.49	2.467	10.97	3.967	9.14	5.47	3.66
1.000	5.49	2.500	10.97	4.000	9.14	5.50	3.66
1.033	5.49	2.533	98.73	4.033	7.31	5.53	3.66
1.067	5.49	2.567	98.73	4.067	7.31	5.57	3.66
1.100	5.49	2.600	98.73	4.100	7.31	5.60	3.66
1.133	5.49	2.633	98.73	4.133	7.31	5.63	3.66
1.167	5.49	2.667	98.73	4.167	7.31	5.67	3.66
1.200	5.49	2.700	98.73	4.200	7.31	5.70	3.66
1.233	5.49	2.733	98.73	4.233	7.31	5.73	3.66
1.267	5.49	2.767	98.73	4.267	7.31	5.77	3.66
1.300	5.49	2.800	98.73	4.300	7.31	5.80	3.66
1.333	5.49	2.833	98.73	4.333	7.31	5.83	3.66
1.367	5.49	2.867	98.73	4.367	7.31	5.87	3.66
1.400	5.49	2.900	98.73	4.400	7.31	5.90	3.66
1.433	5.49	2.933	98.73	4.433	7.31	5.93	3.66
1.467	5.49	2.967	98.73	4.467	7.31	5.97	3.66
1.500	5.49	3.000	98.73	4.500	7.31	6.00	3.66

Unit Hyd Qpeak (cms)= 0.006

PEAK FLOW (cms)= 0.005 (i)
TIME TO PEAK (hrs)= 3.067
RUNOFF VOLUME (mm)= 55.253
TOTAL RAINFALL (mm)= 91.420
RUNOFF COEFFICIENT = 0.604

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

CALIB STANDHYD (0301) ID= 1 DT= 2.0 min	Area (ha)= 0.03 Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.03	0.00
Dep. Storage	(mm)=	1.00	8.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	13.50	1.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		98.73	59.86
over (min)		5.00	2.00
Storage Coeff.	(min)=	0.77 (ii)	0.90 (ii)
Unit Hyd. Tpeak	(min)=	4.00	2.00
Unit Hyd. peak	(cms)=	0.54	0.76
			TOTALS
PEAK FLOW	(cms)=	0.01	0.00 0.008 (iii)

```
     TIME TO PEAK    (hrs)=       2.70         3.00          3.00
     RUNOFF VOLUME    (mm)=      90.42        41.40         89.92
     TOTAL RAINFALL   (mm)=      91.42        91.42         91.42
     RUNOFF COEFFICIENT   =       0.99         0.45          0.98

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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(  3011)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.0000      0.0500
                          0.0016     0.0017   |   0.0000      0.0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0301)      0.030      0.008      3.00      89.92
   OUTFLOW: ID= 1 (  3011)      0.030      0.002      3.50      80.84

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.08
                  TIME SHIFT OF PEAK FLOW         (min)= 30.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0017

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0302)|   Area    (ha)=   0.08
|ID= 1 DT= 2.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.08         0.00
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      22.40         1.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      98.73        59.86
               over (min)         5.00         2.00
     Storage Coeff.  (min)=       1.05 (ii)    1.17 (ii)
     Unit Hyd. Tpeak (min)=       4.00         2.00
     Unit Hyd. peak  (cms)=       0.51         0.70
                                                        *TOTALS*
```

```
     PEAK FLOW       (cms)=       0.02         0.00          0.022 (iii)
     TIME TO PEAK    (hrs)=       2.77         3.00           3.00
     RUNOFF VOLUME    (mm)=      90.42        41.40          89.92
     TOTAL RAINFALL   (mm)=      91.42        91.42          91.42
     RUNOFF COEFFICIENT   =       0.99         0.45           0.98

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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(  3021)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.0000      0.0100
                          0.0032     0.0046   |   0.0000      0.0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0302)      0.080      0.022      3.00       89.92
   OUTFLOW: ID= 1 (  3021)      0.080      0.006      3.10       85.32

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 25.22
                  TIME SHIFT OF PEAK FLOW         (min)=  6.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0046

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--------------------
| ADD HYD  (  0001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  3011):     0.03   0.002     3.50    80.84
      + ID2= 2 (  3021):     0.08   0.006     3.10    85.32
        ================================================
        ID = 3 (  0001):     0.11   0.007     3.10    84.10

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0303)|   Area    (ha)=   0.03
|ID= 1 DT= 2.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
```

```
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.03         0.00
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      13.60         1.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      98.73        59.86
               over (min)         5.00         2.00
     Storage Coeff.  (min)=       0.78 (ii)    0.90 (ii)
     Unit Hyd. Tpeak (min)=       4.00         2.00
     Unit Hyd. peak  (cms)=       0.54         0.76
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.008 (iii)
     TIME TO PEAK    (hrs)=       2.70         3.00           3.00
     RUNOFF VOLUME    (mm)=      90.42        41.40          89.92
     TOTAL RAINFALL   (mm)=      91.42        91.42          91.42
     RUNOFF COEFFICIENT   =       0.99         0.45           0.98

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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(  3031)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.0000      0.0100
                          0.0016     0.0017   |   0.0000      0.0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0303)      0.030      0.008      3.00      89.92
   OUTFLOW: ID= 1 (  3031)      0.030      0.002      3.50      80.84

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.08
                  TIME SHIFT OF PEAK FLOW         (min)= 30.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0017

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--------------------
| ADD HYD  (  0002)|
```

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):     0.11   0.007     3.10    84.10
      + ID2= 2 (  3031):     0.03   0.002     3.50    80.84
        ================================================
        ID = 3 (  0002):     0.14   0.009     3.10    83.40

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0300)|   Area    (ha)=   0.46
|ID= 1 DT= 2.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  75.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.34         0.12
     Dep. Storage     (mm)=       1.00         8.47
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      55.30         5.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      98.73        59.58
               over (min)         5.00         4.00
     Storage Coeff.  (min)=       1.80 (ii)    3.11 (ii)
     Unit Hyd. Tpeak (min)=       4.00         4.00
     Unit Hyd. peak  (cms)=       0.43         0.33
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.09         0.02          0.114 (iii)
     TIME TO PEAK    (hrs)=       2.93         3.00           3.00
     RUNOFF VOLUME    (mm)=      90.42        41.05          78.07
     TOTAL RAINFALL   (mm)=      91.42        91.42          91.42
     RUNOFF COEFFICIENT   =       0.99         0.45           0.85

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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  (  0003)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0002):     0.14   0.009     3.10    83.40
      + ID2= 2 (  0300):     0.46   0.114     3.00    78.07
```

```
      ================================================
      ID = 3 (  0003):     0.60   0.120     3.00    79.32

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0200)|   Area    (ha)=   3.10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  60.00   Dir. Conn.(%)=  30.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       1.86         1.24
    Dep. Storage     (mm)=       1.00         8.47
    Average Slope     (%)=       1.00         2.00
    Length            (m)=      75.00        40.00
    Mannings n           =      0.013        0.250

        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    3.66 | 1.583    9.14 | 3.083   20.11 |  4.58    5.49
             0.167    3.66 | 1.667    9.14 | 3.167   20.11 |  4.67    5.49
             0.250    3.66 | 1.750    9.14 | 3.250   20.11 |  4.75    5.49
             0.333    3.66 | 1.833    9.14 | 3.333   20.11 |  4.83    5.49
             0.417    3.66 | 1.917    9.14 | 3.417   20.11 |  4.92    5.49
             0.500    3.66 | 2.000    9.14 | 3.500   20.11 |  5.00    5.49
             0.583    5.49 | 2.083   10.97 | 3.583    9.14 |  5.08    3.66
             0.667    5.49 | 2.167   10.97 | 3.667    9.14 |  5.17    3.66
             0.750    5.49 | 2.250   10.97 | 3.750    9.14 |  5.25    3.66
             0.833    5.49 | 2.333   10.97 | 3.833    9.14 |  5.33    3.66
             0.917    5.49 | 2.417   10.97 | 3.917    9.14 |  5.42    3.66
             1.000    5.49 | 2.500   10.97 | 4.000    9.14 |  5.50    3.66
             1.083    5.49 | 2.583   98.73 | 4.083    7.31 |  5.58    3.66
             1.167    5.49 | 2.667   98.73 | 4.167    7.31 |  5.67    3.66
             1.250    5.49 | 2.750   98.73 | 4.250    7.31 |  5.75    3.66
             1.333    5.49 | 2.833   98.73 | 4.333    7.31 |  5.83    3.66
             1.417    5.49 | 2.917   98.73 | 4.417    7.31 |  5.92    3.66
             1.500    5.49 | 3.000   98.73 | 4.500    7.31 |  6.00    3.66

    Max.Eff.Inten.(mm/hr)=      98.73       133.69
              over (min)         5.00        10.00
    Storage Coeff.  (min)=       2.16 (ii)    8.44 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.31         0.12
                                                      *TOTALS*
    PEAK FLOW       (cms)=       0.26         0.41          0.664 (iii)
```

```
     TIME TO PEAK    (hrs)=       3.00         3.00          3.00
     RUNOFF VOLUME    (mm)=      90.42        55.54         66.00
     TOTAL RAINFALL   (mm)=      91.42        91.42         91.42
     RUNOFF COEFFICIENT   =       0.99         0.61          0.72

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

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    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 (  0201)|   Area    (ha)=   0.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  40.30   Dir. Conn.(%)=   0.10
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.05         0.07
     Dep. Storage     (mm)=       1.00         8.47
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      75.00        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      98.73       125.90
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.16 (ii)    8.60 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.02          0.022 (iii)
     TIME TO PEAK    (hrs)=       2.83         3.00           3.00
     RUNOFF VOLUME    (mm)=      90.42        54.45          54.44
     TOTAL RAINFALL   (mm)=      91.42        91.42          91.42
     RUNOFF COEFFICIENT   =       0.99         0.60           0.60

***** 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*  =  75.0    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  (  3034)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0200):     3.10   0.664     3.00    66.00
      + ID2= 2 (  0201):     0.12   0.022     3.00    54.44
        ====================================================
        ID = 3 (  3034):     3.22   0.686     3.00    65.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD  (  3032)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0003):     0.60   0.120     3.00    79.32
      + ID2= 2 (  3034):     3.22   0.686     3.00    65.57
        ====================================================
        ID = 3 (  3032):     3.82   0.806     3.00    67.73

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
--------------------
| RESERVOIR(  2001)|
| IN= 2---> OUT= 1 |
| DT=  2.0 min     |     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)    |   (cms)     (ha.m.)
                          0.0000     0.0000    |   0.0540      0.0558
                          0.0320     0.0001    |   0.4660      0.0870
                          0.0380     0.0116    |   0.6750      0.0941

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3032)      3.820      0.806      3.00      67.73
   OUTFLOW: ID= 1 (  2001)      3.820      0.565      3.07      67.75

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 70.07
                  TIME SHIFT OF PEAK FLOW         (min)=  4.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0904

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

--------------------
| ADD HYD  (  3033)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  2001):     3.82   0.565     3.07    67.75
```

```
 + ID2= 2 (  0400):     0.03   0.005     3.07    55.25
   ================================================
   ID = 3 (  3033):     3.85   0.570     3.07    67.65

 NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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Appendix D

Storm Sewer Design Sheets
(On-site Sewers &
Elgin Street Sewers)

TOWN OF COBOURG

ENGINEERING DEPARTMENT

Masongsong Associates Engineering Limited

DESIGN STORM:	5 YEAR RETURN
I (100-YEAR):	667/(Tc+0.5)^0.7, Tc in minutes
I (5-YEAR):	3455(Tc+20), Tc in minutes
Tc (start): commercial	10 min
ICD Discharge	L/s (Sceptre Type 'A')
CB / RLCB Discharge	L/s

CT LANDS

Vandyk Group of Companies

STORM SEWER DESIGN SHEET

PREPARED BY:	M.F.
CHECKED BY:	L.E.
FILE No.:	2020-021
DATE	MAY 2020

MANHOLES					A	C	LEG	ACC.	Tc	I	Q_{5yr}	STORM SEWER DESIGN INFORMATION					TIME		Q_{5yr}/Q_{full}
LOCATION	FROM	INVERT	TO	INVERT	area (ha)	runoff coeff.	A x C	A x C	(min)	(5-YR) (mm/hr)	(l/s)	size (mm)	slope (%)	length (m)	Q full (l/s)	V full (m/s)	SECT. (min)	Oversize for Storage	Capacity (%)
Commercial Development					5-YEAR														
	CB105	99.48	MH117	99.34	0.010	0.25	0.003	0.003	10.00	115.17	0.80	300	2.00	7.30	137	1.93	0.06		1%
	MH117	99.25	MH114	99.09	0.000	0.00	0.000	0.003	10.06	114.93	0.80	300	1.50	10.10	118	1.68	0.10		1%
	PLUG C	99.03	MH114	98.99	0.000	0.00	0.000	0.000	10.00	115.17	1.13	300	1.00	4.00	97	1.37	0.05		1%
	MH114	98.76	CBMH115	98.46	0.000	0.00	0.000	0.003	10.16	114.54	1.93	300	2.00	15.30	137	1.93	0.13		1%
	CB103	99.17	CBMH104	98.95	0.060	0.95	0.057	0.057	10.00	115.17	18.23	300	1.00	21.50	97	1.37	0.26		19%
	CBMH104	98.36	CBMH115	98.25	0.080	0.95	0.076	0.133	10.26	114.17	42.18	300	0.50	20.00	68	0.97	0.34		62%
	CBMH115	98.16	CBMH116	98.05	0.080	0.95	0.076	0.212	10.61	112.88	67.45	375	0.50	22.90	124	1.12	0.34		54%
	PLUG B	98.39	CBMH116	98.29	0.000	0.00	0.000	0.000	10.00	115.17	3.18	300	1.20	8.20	106	1.50	0.09		3%
	CBMH116	98.02	CBMH108	97.86	0.070	0.95	0.067	0.278	10.95	111.64	90.52	375	0.50	31.20	124	1.12	0.46		73%
	CB115	98.91	CBMH108	98.81	0.020	0.25	0.005	0.005	10.00	115.17	1.60	300	1.00	10.10	97	1.37	0.12		2%
	PLUG A	98	CBMH108	97.89	0.000	0.00	0.000	0.000	10.00	115.17	1.17	300	1.00	11.20	97	1.37	0.14		1%
	CBMH108	97.77	CBMH102	97.66	0.050	0.95	0.048	0.331	11.41	110.00	106.46	375	0.50	21.70	124	1.12	0.32		86%
	CBMH102	97.59	CBMH5	97.55	0.090	0.95	0.086	0.416	11.73	108.88	131.30	450	0.50	7.30	202	1.27	0.10		65%
	CB101	98.97	CBMH5	98.84	0.030	0.25	0.01	0.008	10.00	115.17	2.40	300	1.00	13.10	97	1.37	0.16		2%

TOWN OF COBOURG

ENGINEERING DEPARTMENT

Masongsong Associates Engineering Limited

DESIGN STORM:	5 YEAR RETURN
I (100-YEAR):	825/(Tc+1.7)^0.739, Tc in minutes
I (5-YEAR): residential	2464/(Tc+16), Tc in minutes
Tc (start): residential	15 min
ICD Discharge	L/s (Sceptre Type 'A')
CB / RLCB Discharge	L/s

CT LANDS

Vandyk Group of Companies

STORM SEWER DESIGN SHEET

PREPARED BY:	**M.F.**
CHECKED BY:	**L.E.**
FILE No.:	**2020-021**
DATE	**MAY 2020**

MANHOLES					A	C	LEG	ACC.	Tc	I	Q_{100yr}	STORM SEWER DESIGN INFORMATION					TIME	Q_{100yr}/Q_{full}
LOCATION	FROM	INVERT	TO	INVERT	area (ha)	runoff coeff.	A x C	A x C	(min)	(100-YR) (mm/hr)	(l/s)	size (mm)	slope (%)	length (m)	Q full (l/s)	V full (m/s)	SECT. (min)	Capacity (%)
Residential Development					100-YEAR													
Greenly Drive	DICB1	99.2	DSCBMH1	99.11	0.040	0.938	0.038	0.038	15.00	103.01	11	300	1.00	9.40	97	1.37	0.11	11%
	DSCBMH1	98.88	DSCBMH2	98.80	0.100	0.938	0.094	0.131	15.11	102.49	37	525	1.00	8.50	430	1.99	0.07	9%
	DSCBMH2	98.71	MH1 (SOUTH)	98.43	0.160	0.938	0.150	0.281	15.19	102.17	80	525	1.00	28.80	430	1.99	0.24	19%
Cowin Circle (south)	DCB1	99.80	MH1 (NORTH)	99.71	0.150	0.938	0.141	0.141	15.00	103.01	40	375	1.00	9.40	175	1.59	0.10	23%
	MH1 (EAST)	98.28	MH8	98.16			0.000	0.422	15.43	101.10	118	675	0.50	25.70	594	1.66	0.26	20%
	DICB23	99.27	DICB9	98.97	0.070	0.938	0.066	0.066	15.00	103.01	19	300	1.00	30.20	97	1.37	0.37	19%
	DICB9	98.88	MH8	98.41	0.060	0.938	0.056	0.122	15.37	101.36	34	300	1.40	33.20	114	1.62	0.34	30%
	MH8	98.11	MH9	98.08			0.000	0.544	15.71	99.89	151	675	0.50	7.40	594	1.66	0.07	25%
Cowin Circle (east)	DICB11	99.46	MH9	99.14	0.040	0.938	0.038	0.038	15.00	103.01	11	300	1.00	32.50	97	1.37	0.40	11%
	MH9	98.03	MH10	97.84			0.000	0.581	15.78	99.57	161	675	0.50	40.50	594	1.66	0.41	27%
	DICB27	100.36	DICB16	100.06	0.050	0.938	0.047	0.047	15.00	103.01	13	300	1.00	30.00	97	1.37	0.37	
	DICB16	100.03	MH10	99.85	0.040	0.938	0.038	0.084	15.37	101.37	24	300	1.00	17.70	97	1.37	0.22	25%
	DICB24	99.49	CBMH6	99.25	0.050	0.938	0.047	0.047	15.00	103.01	13	300	1.00	24.10	97	1.37	0.29	14%
	DICB22	99.37	CBMH6	99.20	0.030	0.938	0.028	0.028	15.00	103.01	8	300	1.00	17.50	97	1.37	0.21	8%
	CBMH6	99.11	MH10	98.79	0.040	0.938	0.038	0.113	15.29	101.69	32	300	1.00	32.00	97	1.37	0.39	33%
	MH10	97.82	CBMH1	97.72			0.000	0.778	16.19	97.90	212	675	0.50	21.10	594	1.66	0.21	36%
	CB3	100.60	CBMH1	100.51	0.030	0.938	0.028	0.028	15.00	103.01	8	300	1.00	8.50	97	1.37	0.10	8%
	CBMH1	97.70	MH11	97.64	0.060	0.938	0.056	0.863	16.40	97.05	233	675	0.50	12.80	594	1.66	0.13	39%
	DICB12	99.49	MH11	99.17	0.050	0.938	0.047	0.047	15.00	103.01	13	300	1.00	32.50	97	1.37	0.40	14%
Cowin Circle (north)	MH11	97.59	MH12	97.55			0.000	0.909	16.53	96.54	244	675	0.50	8.20	594	1.66	0.08	41%
	DICB21	99.54	DICB13	99.24	0.080	0.938	0.075	0.075	15.00	103.01	21	300	1.00	30.30	97	1.37	0.37	22%
	DICB13	99.15	MH12	98.81	0.050	0.938	0.047	0.122	15.37	101.36	34	300	1.00	33.60	97	1.37	0.41	35%
	MH12	97.50	MH13	97.35			0.000	1.031	16.61	96.22	276	675	0.50	32.60	594	1.66	0.33	46%
	DICB25	99.61	DICB14	99.44	0.030	0.938	0.028	0.028	15.00	103.01	8	300	1.00	17.10	97	1.37	0.21	8%
	DICB14	99.35	MH13	99.02	0.040	0.938	0.038	0.066	15.21	102.07	19	300	1.00	32.90	97	1.37	0.40	19%
	MH13	97.33	DCBMH3	97.16			0.000	1.097	16.94	94.97	289	675	0.50	35.90	594	1.66	0.36	49%
Cowin Circle (south)	MH1 (WEST)	98.71	DCBMH1	98.51			0.000	0.000	15.00	103.01	0	675	0.50	41.00	594	1.66	0.41	0%
	DICB20	99.75	DCB2	99.70	0.040	0.563	0.023	0.023	15.00	103.01	6	300	1.00	5.20	97	1.37	0.06	7%
	DCB2	99.63	DCBMH1	99.54	0.140	0.938	0.131	0.154	15.06	102.72	44	375	1.00	8.50	175	1.59	0.09	25%
	DCBMH1	98.48	MH2	98.40	0.200	0.938	0.188	0.341	15.41	101.17	96	675	0.50	16.00	594	1.66	0.16	16%
	DICB2	99.44	MH2	99.11	0.090	0.938	0.084	0.084	15.00	103.01	24	300	1.00	33.00	97	1.37	0.40	25%
	MH2	98.37	MH3	98.18			0.000	0.426	15.57	100.48	119	675	0.50	40.30	594	1.66	0.40	20%
	DICB3	99.81	MH3	99.48	0.080	0.938	0.075	0.075	15.00	103.01	21	300	1.00	33.60	97	1.37	0.41	22%
	MH3	98.13	MH4	98.06			0.000	0.501	15.98	98.77	137	675	1.00	6.70	841	2.35	0.05	16%
	DICB4	100.33	MH4	100.00	0.080	0.938	0.075	0.075	15.00	103.01	21	300	1.00	33.40	97	1.37	0.41	22%
Cowin Circle (west)	MH4	98.02	MH5	97.82			0.000	0.576	16.02	98.58	158	675	0.50	41.10	594	1.66	0.41	27%
	DICB5	100.01	MH5	99.69	0.080	0.938	0.075	0.075	15.00	103.01	21	300	1.00	32.80	97	1.37	0.40	22%
	DICB26	100.25	DICB15	99.95	0.050	0.938	0.047	0.047	15.00	103.01	13	300	1.00	30.00	97	1.37	0.37	14%
	DICB15	99.92	MH5	99.74	0.030	0.938	0.028	0.075	15.37	101.37	21	300	1.00	17.70	97	1.37	0.22	22%
	MH5	97.78	CBMH3	97.68			0.000	0.726	16.44	96.91	195	675	0.50	20.80	594	1.66	0.21	33%
	CB1	100.59	CBMH3	100.51	0.030	0.938	0.028	0.028	15.00	103.01	8	300	1.00	8.50	97	1.37	0.10	8%
	CBMH3	97.65	MH6	97.59	0.070	0.938	0.066	0.819	16.65	96.10	219	675	0.50	13.10	594	1.66	0.13	37%
	DICB6	99.70	MH6	99.36	0.100	0.938	0.094	0.094	15.00	103.01	27	300	1.00	33.80	97	1.37	0.41	28%

TOWN OF COBOURG

ENGINEERING DEPARTMENT

Masongsong Associates
Engineering Limited

DESIGN STORM:	5 YEAR RETURN
I (100-YEAR):	825/(Tc+1.7)^0.739, Tc in minutes
I (5-YEAR): residential	2464/(Tc+16), Tc in minutes
Tc (start): residential	15 min
ICD Discharge	L/s (Sceptre Type 'A')
CB / RLCB Discharge	L/s

CT LANDS

Vandyk Group of Companies

STORM SEWER DESIGN SHEET

PREPARED BY:	**M.F.**
CHECKED BY:	**L.E.**
FILE No.:	**2020-021**
DATE	**MAY 2020**

MANHOLES					A	C	LEG	ACC.	Tc	I	Q_{100yr}	STORM SEWER DESIGN INFORMATION					TIME	Q_{100yr}/Q_{full}
LOCATION	FROM	INVERT	TO	INVERT	area (ha)	runoff coeff.	A x C	A x C	(min)	(100-YR) (mm/hr)	(l/s)	size (mm)	slope (%)	length (m)	Q full (l/s)	V full (m/s)	SECT. (min)	Capacity (%)
Residential Development					100-YEAR													
Cowin Circle (north)	MH6	97.53	MH7	97.49			0.000	0.913	16.78	95.59	242	675	0.50	8.00	594	1.66	0.08	41%
	DICB10	98.32	MH7	97.99	0.110	0.938	0.103	0.103	15.00	103.01	30	375	1.00	32.90	175	1.59	0.35	17%
	MH7	97.43	DCBMH3	97.16			0.000	1.016	16.86	95.29	269	675	0.50	53.30	594	1.66	0.53	45%
Park	CB2	99.89	CBMH2	99.73	0.040	0.563	0.023	0.023	15.00	103.01	6	300	1.00	15.80	97	1.37	0.19	7%
	CBMH2	99.39	DCBMH2	99.37	0.040	0.563	0.023	0.045	15.19	102.14	13	300	0.50	5.30	68	0.97	0.09	19%
	DCBMH2	97.24	DCBMH3	97.15	0.160	0.938	0.150	0.195	15.28	101.73	55	675	1.00	8.50	841	2.35	0.06	7%
Access Road	DCBMH3	97.08	CBMH4	96.92	0.050	0.938	0.047	2.355	17.39	93.31	610	750	0.50	33.00	787	1.78	0.31	78%
Ex. Commercial	DICB7	98.16	MH21	98.01	0.100	0.990	0.099	0.099	15.00	103.01	28	300	1.00	15.30	97	1.37	0.19	29%
	DICB28	98.14	MH21	98.06	0.020	0.938	0.019	0.019	15.00	103.01	5	300	1.00	8.00	97	1.37	0.10	6%
	MH21	97.92	CBMH8	97.89			0.000	0.118	15.19	102.17	33	300	1.00	2.90	97	1.37	0.04	35%
Access Road	CBMH8	97.80	CBMH9	97.72	0.050	0.938	0.047	0.165	15.22	102.01	47	300	0.50	15.20	68	0.97	0.26	68%
	CBMH9	97.69	CBMH4	97.62	0.030	0.938	0.028	0.193	15.48	100.86	54	300	0.50	14.90	68	0.97	0.26	79%
	CBMH4	96.87	MH14	96.83	0.050	0.938	0.047	2.595	17.70	92.21	665	750	0.50	8.60	787	1.78	0.08	84%
Commercial	CBMH5	97.20	MH14	97.13	0.590	0.990	0.584	0.584	15.00	103.01	173	450	1.10	6.10	299	1.88	0.05	58%
	MH14	96.81	OGS1	96.80			0.000	3.179	17.78	91.93	817	750	0.50	3.70	787	1.78	0.03	104%
	OGS1	96.78	MH16	96.76			0.000	3.179	17.82	91.80	816	750	0.50	3.70	787	1.78	0.03	104%
	WEST CHAMBER		MH15	97.12					15.00	103.01		600	2.00	2.50	868	3.07	0.01	0%
	MH15	96.96	MH16	96.94					15.01	102.95		750	0.50	5.20	787	1.78	0.05	0%
	MH16	96.71	MH20	96.57			0.000	3.179	17.85	91.68	815	750	0.50	28.30	787	1.78	0.26	104%
	EAST CHAMBER		MH17	97.14					15.00	103.01		600	1.00	2.70	614	2.17	0.02	0%
	MH17	96.97	MH18	96.93					15.02	102.91		750	0.50	7.20	787	1.78	0.07	0%
	MH18	96.87	MH19	96.81					15.09	102.61		750	0.50	12.50	787	1.78	0.12	0%
	MH19	96.72	MH20	96.66					15.20	102.08		750	0.50	12.50	787	1.78	0.12	0%

TOWN OF COBOURG

ENGINEERING DEPARTMENT

Masongsong Associates
Engineering Limited

DESIGN STORM:	10 YEAR RETURN
I (10-YEAR):	3455/(Tc+20), Tc in minutes
Tc (start): commercial	10 min
ICD Discharge	L/s (Sceptre Type 'A')
CB / RLCB Discharge	L/s

CT LANDS

Vandyk Group of Companies

STORM SEWER DESIGN SHEET

PREPARED BY:	M.F.
CHECKED BY:	L.E.
FILE No.:	2020-021
DATE	MAY 2020

MANHOLES					A	C	LEG	ACC.	Tc	I	Q_{10yr}	STORM SEWER DESIGN INFORMATION					TIME	Oversize for Storage	Q_{5yr}/Q_{full}
LOCATION	FROM	INVERT	TO	INVERT	area (ha)	runoff coeff.	A x C	A x C	(min)	(10-YR) (mm/hr)	(l/s)	size (mm)	slope (%)	length (m)	Q full (l/s)	V full (m/s)	SECT. (min)		Capacity (%)
Elgin Street- Municipal Sewers					10-YEAR														
County Road 2	Ex. Elgin St				1.120	0.75	0.840	0.840	10.00	115.17	268.72								
County Road 2	Can. Tire Lands										80.00								
County Road 2	Ex. Elgin St + Can. Tire		MH30								348.72	600	0.50	525.00	434	1.54	5.70		80%
County Road 2	MH30		CBMH7				0.000	0.840	15.70	96.78	305.83	600	3.00	48.80	1063	3.76	0.22		29%
County Road 2	CBMH7		MH22		0.170	0.71	0.121	0.961	15.91	96.20	336.72	600	3.00	42.40	1063	3.76	0.19		32%
County Road 2	MH21		MH22				0.000				570.00	750	0.50	9.90	787	1.78	0.09		72%
County Road 2	DICB21		MH23		0.040	0.60	0.024	0.024	10.00	115.17	7.68	300	1.00	12.00	97	1.37	0.15		8%
County Road 2	DICB18		MH23		0.110	0.90	0.099	0.099	10.00	115.17	31.67	300	1.80	10.30	130	1.84	0.09		24%
County Road 2	MH22		MH23		0.340	0.71	0.241	1.202	16.10	95.70	969.56	900	0.50	89.40	1280	2.01	0.74		76%
County Road 2	DICB19		MH23		0.370	0.65	0.241	0.241	10.00	115.17	76.94	375	1.00	12.80	175	1.59	0.13		44%
County Road 2	MH23		MH24		0.910	0.65	0.592	2.157	16.84	93.78	1211.90	900	0.50	88.60	1280	2.01	0.73		95%
County Road 2	MH24		MH25		1.050	0.65	0.683	2.840	17.58	91.94	1375.24	975	0.50	90.00	1585	2.12	0.71		87%
County Road 2	MH25		MH26		0.760	0.60	0.456	3.296	18.28	90.25	1476.16	1050	0.50	90.00	1931	2.23	0.67		76%
County Road 2	MH26		MH27		0.490	0.65	0.32	3.614	18.96	88.69	1540.36	1050	0.50	90.00	1931	2.23	0.67		80%
County Road 2	MH27		MH28		0.260	0.65	0.17	3.783	19.63	87.18	1566.17	1050	1.70	88.00	3560	4.11	0.36		44%
County Road 2	MH28		MH29		0.200	0.71	0.14	3.925	19.99	86.41	1592.08	1050	1.00	68.50	2731	3.15	0.36		58%
County Road 2	MH29		DITCH				0.00	3.925	20.35	85.63	1583.63	1050	0.50	4.80	1931	2.23	0.04		82%

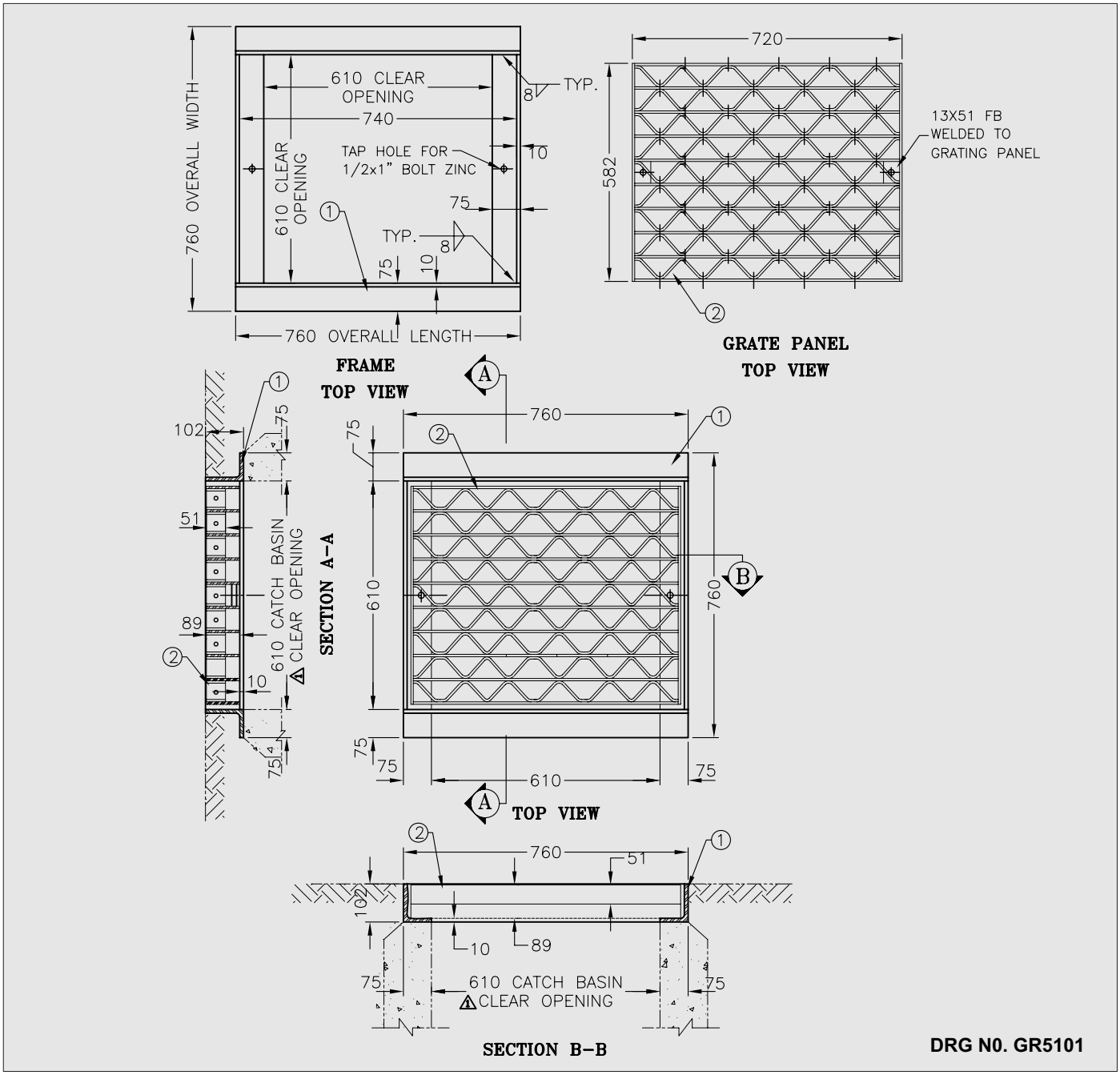
Appendix E

Supplier Details:

Stepcon Steel Catchbasin Frane & Grate Model No. 5101
Accutrol Weir Flow Control for Roof Drains Model RD-100-A2
CDS Model PMSU30_35m Stormwater Treatment Unit
Cultec Recharger 902HD Stormwater System

STEPCON INDUSTRIES INC.
2364 Haines Rd., Unit 20-21 Mississauga, Ontario Canada

Steel Catchbasin Grate & Frame *MODEL NO. **5101***



Note:

1) All steel members shell be hot dipped galvanized after fabrication.
2) Welding shall conform to CSA W47.1 & CSA W59-03 latest edition
3) Welded surface remains as welded.

Materials

#	QTY	MATERIALS	DESCRIPTION
1	1	CSA STEEL G40.21 M-300W	100 x 75 x 10 unequal angle frame
2	1	STEEL	STEPCON grate reticuling rivets type V mesh as following 6 x 69mm bearing bars 6 x 51mm reticulate bars

Accutrol Weirs

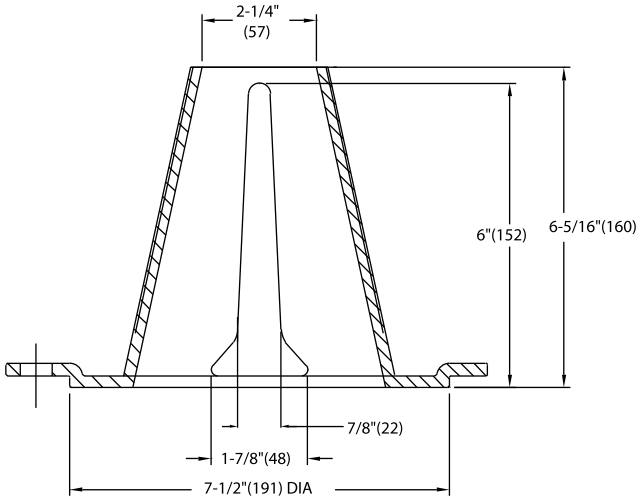
Tag: _____

Flow Control for Roof Drains

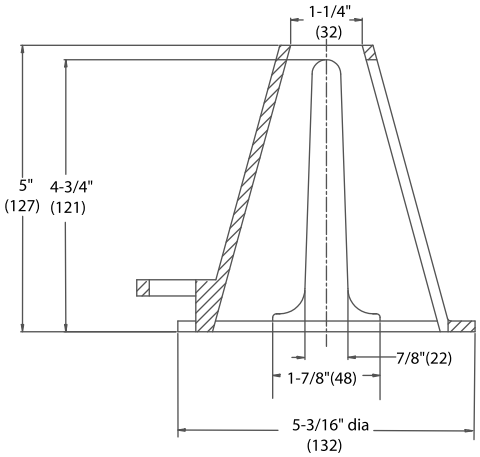
ACCUTROL WEIR FLOW CONTROL

SPECIFICATION: Watts Drainage Products epoxy coated cast iron Accutrol Weir is designed with parabolic openings which limit the flow of rain water off a roof. Each weir slot controls flow to 5 gpm per inch of head to a maximum of 30 gpm at 6" head(for large sump), 25 gpm at 5" head(for small sump) . The Accutrol Weir is secured to the flashing clamp of the roof drain. The Accutrol Weir is available with 1 to 4 slots for the large sump drain and up to 3 slots for the small sump drain.

For Large Sump Roof Drains Specify the "-A" option and number of slots required. (ie. "RD-100-A2" for two slot weir)
For Small Sump Roof Drains Specify the "-A" option and number of slots required. (ie. "RD-200-A1" for one slot weir)



LARGE SUMP ACCUTROL WEIR



SMALL SUMP ACCUTROL WEIR

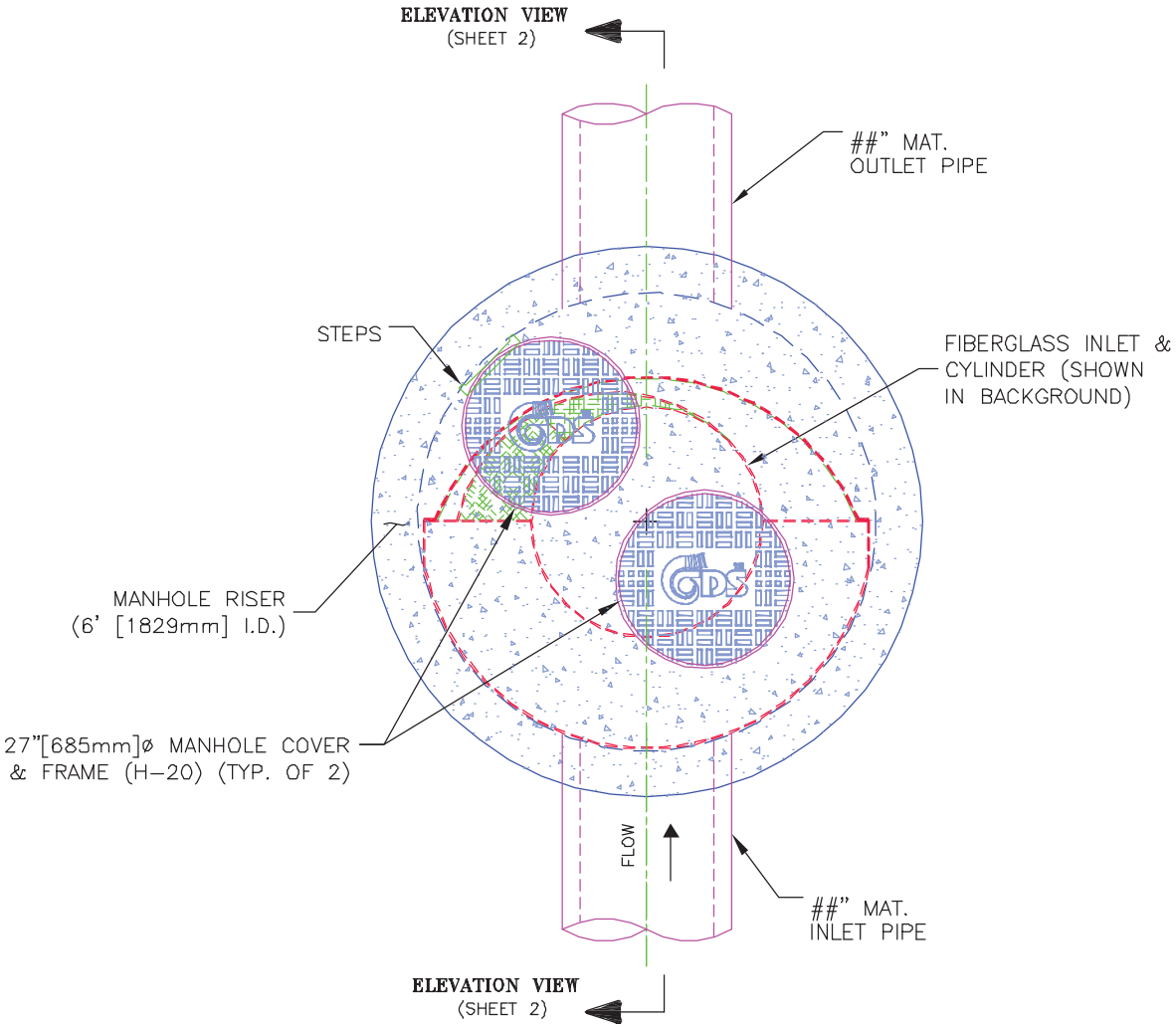
Job Name _____ Contractor _____

Job Location _____ Contractor's P.O. No. _____

Engineer _____ Representative _____

CANADA: 5435 North Service Road, Burlington, ON, L7L 5H7 TEL: 905-332-6718 TOLL-FREE: 1-888-208-8927 Website: www.wattsdrainage.ca

PLAN VIEW



CDS MODEL PMSU30_35m
STORM WATER TREATMENT UNIT
FLOW RATE 106 L/S

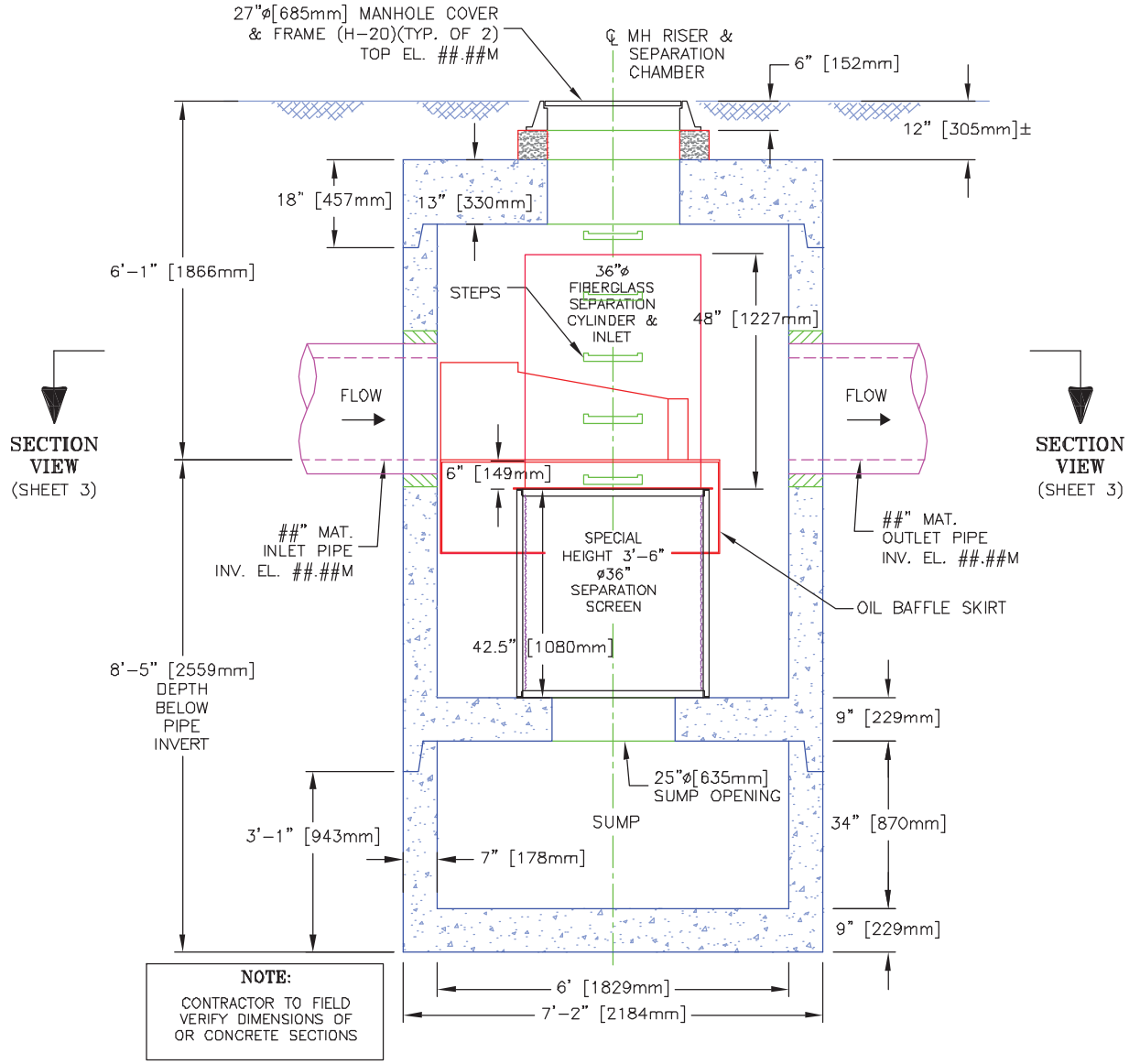
CONTECH STORMWATER SOLUTIONS

PROJECT NAME
CITY, STATE

JOB#	CAN-##-###	SCALE 1" = 2.5'
DATE	##/##/##	SHEET 1
DRAWN	INITIALS	
APPROV.		

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577

ELEVATION VIEW



CDS MODEL PMSU30_35m
STORM WATER TREATMENT UNIT
FLOW RATE 106 L/S

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# CAN-##-###	SCALE 1" = 3'
		DATE ##/##/##	SHEET 2
		DRAWN INITIALS	
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577

Annual TSS Removal Efficiency Using Historical Weather Data

Area (ha) =	3.81		**Engineer:**	**Husson Engineering + Management**
C =	0.64		**Contact:**	Michael Plewes B.A.Sc.
Rational Conv.	2.775	converts from m3/s to l/s	**Report Date:**	09-Jun-17
CDS Model:	PMSU3035_6			
Flowrate =	106	l/s	**Site:**	CT Lands
Weather Station:	6158350		**Location:**	Cobourg, ON
PSD:	FINE		**OGS ID:**	CDS

Rainfall Intensity Range (mm/hr)	*Total Rainfall* (mm)*	*Rainfall intensity mm/hr (I)*	*Runoff Rate Per The Rational Method (l/s) Q = C x I x A x 2.77*	*Rainfall Volume %*	*CDS Flow Rate (l/s)*	*Operating Rate*	*Efficiency** (%)*	*Relative Efficiency (%)*
0.0 - 0.5	620.70	0.5	3.4	7.3%	3.4	0.03	97.9	7.1
0.5 - 1.0	791.80	1.0	6.7	9.4%	6.7	0.06	97.0	9.1
1.0 - 1.5	809.20	1.5	10.1	9.6%	10.1	0.10	96.1	9.2
1.5 - 2.0	765.50	2.0	13.5	9.1%	13.5	0.13	95.2	8.7
2.0 - 2.5	546.70	2.5	16.9	6.5%	16.9	0.16	94.3	6.1
2.5 -3.0	512.90	3.0	20.2	6.1%	20.2	0.19	93.4	5.7
3.0 - 4.0	840.50	4.0	27.0	10.0%	27.0	0.25	91.6	9.2
4.0 - 5.0	644.80	5.0	33.7	7.6%	33.7	0.32	89.7	6.8
5.0 - 6.0	505.30	6.0	40.5	6.0%	40.5	0.38	87.9	5.3
6.0 - 7.0	430.30	7.0	47.2	5.1%	47.2	0.45	86.1	4.4
7.0 - 8.0	302.10	8.0	54.0	3.6%	54.0	0.51	84.3	3.0
8.0 - 9.0	167.40	9.0	60.7	2.0%	60.7	0.57	82.4	1.6
9.0 - 10.0	275.00	10.0	67.5	3.3%	67.5	0.64	80.6	2.7
10.0 - 11.0	198.10	11.0	74.2	2.3%	74.2	0.70	78.8	1.8
11.0 - 12.0	160.70	12.0	80.9	1.9%	80.9	0.76	77.0	1.5
12.0 - 13.0	136.50	13.0	87.7	1.6%	87.7	0.83	75.1	1.2
13.0 - 15.0	150.10	15.0	101.2	1.8%	101.2	0.95	71.5	1.3
15.0 - 20.0	366.60	20.0	134.9	4.3%	106.0	1.00	55.2	2.4
20.0 - 25.0	70.80	25.0	168.6	0.8%	106.0	1.00	44.1	0.4
25.0 - 30.0	111.90	30.0	202.4	1.3%	106.0	1.00	36.8	0.5
30.0 -35.0	0.00	35.0	236.1	0.0%	106.0	1.00	31.5	0.0
35.0 - 40.0	38.70	40.0	269.8	0.5%	106.0	1.00	27.6	0.1
	8445.60							

TSS Removal:	**88.1%**
Efficiency Adjustment:	**6.5%**
Net Annual TSS Removal:	**81.6%**
Net Annual Volume Treated:	**96.5%**

1) Historical Data including years 1982 to 1998 from Ontario Climate Centre
2) CDS Efficiency based on testing conducted at the University of Central Florida
3) Adjustment for use of 60 minute time step data on site with a time of concentration less than 30 minutes
4) CDS design flowrate and scaling based on standard manufacturer model & product specifications

INLINE
HYDRAULIC CALCULATIONS

CT LANDS
COBOURG, ON
558694-10

DESIGN PARAMETERS

CDS Model No. =	CDS3035	
Design Treatment Flow =	**3.8**	cfs (106.2 l/s)
Peak Design Flow =	30.16	cfs (854 l/s)
Peak Design Return Interval =	100	year
Rim Elevation @ US Structure	330.51	ft (100.74 m)

DETAILED CALCULATIONS

TREATMENT FLOW

Tailwater Condition at Outfall, EL_0

EL_0 = 317.56 ft (96.79 m) (invert plus depth of flow at D/S outlet)

Exit Loss from DownStream Pipe, h_1

$h_1 = k * [V^2 / (2*g)]$

where,

k = 1.00

$V = Q / A_F$

= 4.08 fps

h_1 = 0.26 ft

$EGL_1 = EL_0 + h_1$

= 317.82 ft (96.87 m)

Head Loss Through Downstream Pipe, h_2

Friction Losses, h_2

$h_2 = S_{EGL} * L$

where,

L = 106.627 ft

$S_{EGL} = [(Q * n) / (1.49 * A_F * R^{2/3})]^2$

where,

Pipe Characteristics

Dia. =	30	in
S_{PIPE} =	0.0050	ft/ft
n =	0.013	

Flow Characteristics

d_F =	0.61	ft
A_F =	0.92	sf
P_W =	2.57	ft
R =	0.36	ft

Head Loss Through Downstream Pipe, h_2 (cont.'d)

S_{EGL} = 0.00501 ft / ft

h_2 = 0.5347 ft

EGL_2' = $EGL_1 + h_2$
= 318.35 ft

Check Entrance Condition for Critical Depth Control

$EL_{CDS\ Inv.}$ = 317.49 ft

d_c = 0.65 ft

$EGL_C = EL_{CDS\ Inv.} + d_c + V_{dc}^2 / (2*g)$
= 318.35 ft

Identify Controling EGL

Flow enters pipe at critical depth, EGLc controls.
EGL_2 = 318.35 ft (97.03 m)

Re-entry Loss into DownStream Pipe, h_3

$h_3 = k * [V^2 / (2*g)]$

where,
k = 0.20
V = Q / A
= 3.73 fps (area based on critical depth)

h_3 = 0.04 ft

$EGL_3' = EGL_2 + h_3$
= 318.39 ft (97.05 m)

Oil Baffle Loss, h_4

$h_4 = k * [V^2 / (2*g)]$

where,
k = 1.00
A_{Baffle} = **6.50** sf
V = Q / Abaffle
= 0.58 fps

h_4 = 0.0052 ft

$EGL_4 = EGL_3 + h_4$
= 318.40 ft (97.05 m)

Check Standard Weir Elevation

HL_{CDS} = 0.75 ft

$EL_W' = EGL_4 + HL_{CDS}$
= 319.15 ft

$H_W' = EL_W' - EL_{CDS\ INV.}$
= 1.66 ft, or 19.93 in

Std. Weir Height = 24.0 in
Status **OK**

Use H_W = **24** in, or 2.00 ft

$EL_W = EL_{CDS\ INV.} + H_W$
= 319.49 ft (97.38 m)

PEAK CONVEYANCE FLOW

Tailwater Condition at Outfall, EL_0

EL_0 = **326.61** ft (99.55 m) (tailwater condition per engineer, max WL)

Exit Loss from DownStream Pipe, h_1

$h_1 = k * [V^2 / (2*g)]$

where,

k = 1.00

$V = Q / A_F$

= 6.15 fps

h_1 = 0.59 ft

$EGL_1 = EL_0 + h_1$

= 327.19 ft (99.73 m)

Head Loss Through Downstream Pipe, h_2

Friction Losses, h_2

$h_2 = S_{EGL} * L$

where,

L = 106.627 ft

$S_{EGL} = [(Q * n) / (1.49 * A_F * R^{2/3})]^2$

where,

Pipe Characteristics

Dia. = 30 in

S_{PIPE} = 0.0050 ft/ft

n = 0.013

Flow Characteristics

d_n = 2.50 ft

A_F = 4.91 sf

P_W = 7.85 ft

R = 0.62 ft

S_{EGL} = 0.0054 ft / ft

h_2 = 0.57 ft

$EGL_2' = EGL_1 + h_2$

= 327.77 ft

Check Entrance Condition for Critical Depth Control

$EL_{CDS\ Inv.}$ = 317.49 ft

d_c = 1.83 ft

$EGL_C = EL_{CDS\ Inv.} + d_c + V_{dc}^2 / (2*g)$

= 320.27 ft

Identify Controling EGL

Friction based EGL controls.

EGL_2 = 327.77 ft (99.9 m)

Re-entry Loss into DownStream Pipe, h_3

$h_3 = k * [V^2 / (2*g)]$

where,

$k =$ 0.20

$V = Q / A_F$

$=$ 6.15 fps (area based on flow depth)

$h_3 =$ 0.12 ft

$EGL_3 = EGL_2 + h_3$

$=$ 327.89 ft (99.94 m)

Oil Baffle Loss, h_4

$h_4 = k * [V^2 / (2*g)]$

where,

$k =$ 0.00 (Skirted-baffle model)

$A_{Baffle} =$ 6.50 sf

$V = Q / A_{Baffle}$

$=$ 4.64 fps

$h_4 =$ 0.00 ft

$EGL_4 = EGL_3 + h_4$

$=$ 327.89 ft

$HGL_4 = EGL_4 - [V_P^2 / (2*g)]$

$=$ 327.30 ft (99.76 m)

Head over Diversion Weir, h_5

Elevation of Weir

$EL_{Weir} =$ 319.49 ft (established above)

Headloss for Free Discharge Condition

$h_{5a} = [Q / (C * L)]^{2/3}$

where,

$C =$ 3.1

$L =$ 3.00 ft

$h_{5a} =$ 2.19 ft

$EGL_{5a} = EL_{Weir} + h_{5a}$

$=$ 321.68 ft

Headloss for Submerged Condition

$d_{Sub} =$ 7.81 ft (depth of submergence)

$h_{5b} =$ 0.04 ft (separate submerged weir calc.)

$EGL_{5b} = EGL_4 + h_{5b}$

$=$ 327.92 ft

Identify EGL U/S of Weir

The discharge condition is Submerged , therefore

$EGL_5 =$ 327.92 ft (99.95 m)

Expansion Loss from U/S Pipe, h_6

$h_6 = k * [V^2 / (2*g)]$

where,

$k =$ 0.30

$V = Q / A_F$

$=$ 6.15 fps

$h_6 =$ 0.18 ft

$EGL_6 = EGL_5 + h_6$

$=$ 328.10 ft (100 m)

Head Loss Through Upstream Pipe, h_7

Friction Losses, h_7

$h_7 = S_{EGL} * L$

where,

$L =$ 10.3018 ft

$S_{EGL} = [(Q * n) / (1.49 * A_F * R^{2/3})]^2$

where,

Pipe Characteristics

Dia. = 30 in

$S_{PIPE} =$ 0.0050 ft/ft

$n =$ 0.013

Flow Characteristics

$d_n =$ 2.50 ft

$A_F =$ 4.91 sf

$P_W =$ 7.85 ft

$R =$ 0.62 ft

$S_{EGL} =$ 0.0054 ft / ft

$h_7 =$ 0.06 ft

$EGL_7' = EGL_6 + h_7$

$=$ 328.15 ft

Check Entrance Condition for Critical Depth Control

$EL_{U/S\ Inv.} =$ 317.54 ft

$d_c =$ 1.83 ft

$EGL_C = EL_{CDS\ Inv.} + d_c + V_{dc}^2 / (2*g)$

$=$ 320.32 ft

Identify Controling EGL

Friction based EGL controls.

$EGL_7 =$ 328.15 ft (100.02 m)

$HGL_7 = EGL_7 - [V^2 / (2*g)]$

$=$ 327.57 ft (99.84 m)

Freeboard = 2.94 ft (0.98 m) (at first upstream structure)

CT LANDS
ELGIN STREET
COBOURG, ON

DRAWING INDEX

TITLE	SHEET NO.
RECHARGER 902HD SYSTEM LAYOUT SHEET	1 OF 2
RECHARGER 902HD SYSTEM DETAIL SHEET	2 OF 2

PROJECT INFORMATION	
PROJECT NO:	15-7692
GEOSTORM SALES REP:	KENT FRAME PHONE: (416)-570-4676 FAX: (905)-939-9753 KENT@GEOSTORM.CA
CULTEC CAD TECH:	DAN GERA (203)-775-4416 EXT. 129 DGERA@CULTEC.COM
COMMENTS:	REV. 01 - 11/11/15 - EAST SYSTEM UPDATED PER ENGINEER COMMENTS
	REV. 02 - 3/9/17 - SYSTEMS UPDATED PER CURRENT SERVICING PLAN

CULTEC, Inc.
Subsurface Stormwater Management Systems
P.O. Box 280
878 Federal Road
Brookfield, CT 06804
www.cultec.com
PH: (203) 775-4416
PH: (800) 4-CULTEC
FX: (203) 775-1462
tech@cultec.com

GeoStorm Inc.
122 Creditstone Road
Vaughan, Ontario
L4K 1P2

BEFORE YOU BEGIN - REQUIRED MATERIALS AND EQUIPMENT

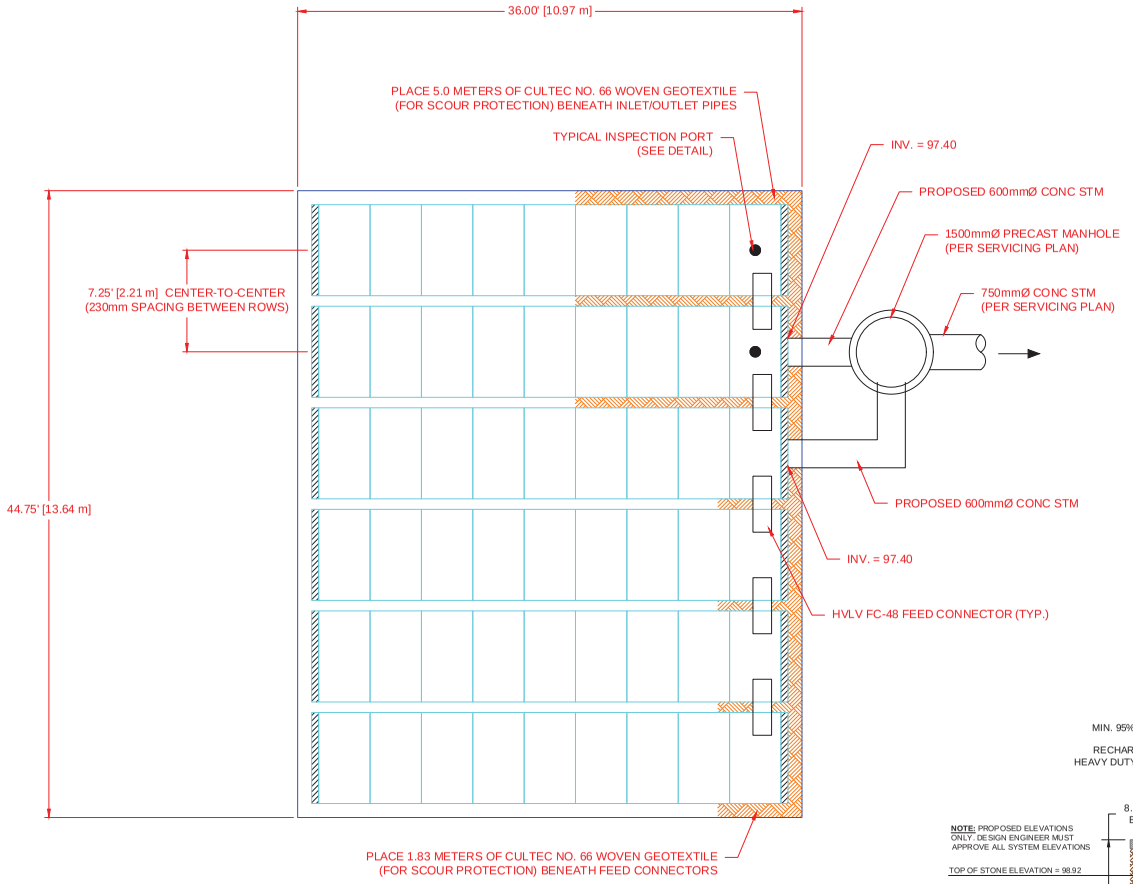
1. PROPER GEOTECHNICAL SOIL EVALUATION BY A QUALIFIED ENGINEER OR SOIL SCIENTIST TO DETERMINE SUITABILITY OF STRUCTURAL INSTALLATION
2. OSHA COMPLIANCE
3. CULTEC WARNING TAPE, OR EQUIVALENT
4. ASSURANCES FROM LOCAL UTILITIES THAT NO UNDERGROUND GAS, ELECTRICAL OR OTHER POTENTIALLY DANGEROUS PIPELINES OR CONDUITS ARE ALREADY BURIED AT THE SITE
5. ACCEPTABLE 1- 2 INCH (25 - 51 mm) WASHED, CRUSHED STONE AS DETAILED IN CULTEC'S INSTALLATION INSTRUCTIONS. CLEANLINESS OF STONE TO BE VERIFIED BY ENGINEER.
6. ACCEPTABLE FILL MATERIAL AS SHOWN IN CULTEC'S INSTALLATION INSTRUCTIONS.
7. ALL CULTEC CHAMBERS AND ACCESSORIES AS SPECIFIED IN THE ENGINEER'S PLANS INCLUDING CULTEC NO. 410 NON-WOVEN GEOTEXTILE, CULTEC STORMFILTER AND CULTEC NO. 66 WOVEN GEOTEXTILE, WHERE APPLICABLE.
8. RECIPROCATING SAW OR ROUTER
9. STONE BUCKET
10. STONE CONVEYOR AND/OR TRACKED EXCAVATOR
11. TRANSIT OR LASER LEVEL MEASURING DEVICE
12. COMPACTION EQUIPMENT WITH MAXIMUM GROSS VEHICLE WEIGHT OF 12,000 LBS (5,440 KGS). VIBRATORY ROLLERS MAY ONLY BE USED ON THE STONE BASE PRIOR TO THE INSTALLATION OF CHAMBERS.
13. CHECK CULTEC CHAMBERS FOR DAMAGE PRIOR TO INSTALLATION. DO NOT USE DAMAGED CULTEC CHAMBERS, CONTACT YOUR SUPPLIER IMMEDIATELY TO REPORT DAMAGE OR PACKING-LIST DISCREPANCIES.

REQUIREMENTS FOR CULTEC CHAMBER SYSTEM INSTALLATIONS

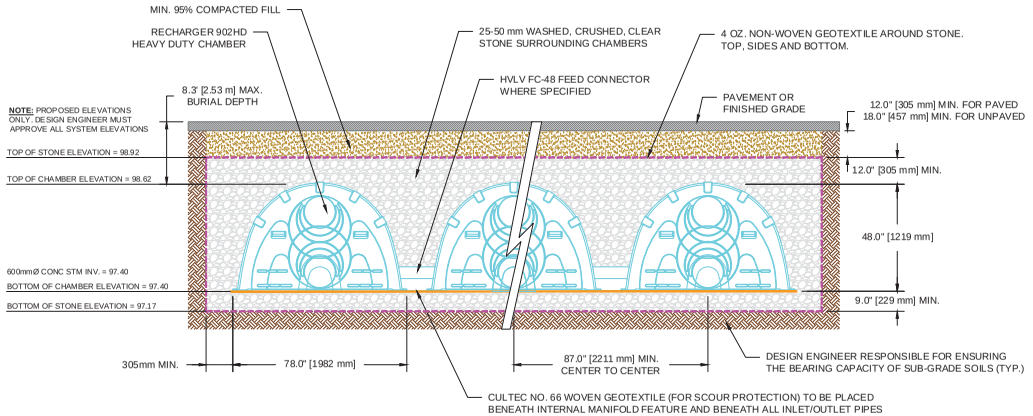
8. INSTALLING CONTRACTORS ARE EXPECTED TO COMPREHEND AND USE THE MOST CURRENT INSTALLATION INSTRUCTIONS PRIOR TO BEGINNING A SYSTEM INSTALLATION. IF THERE IS ANY QUESTION AS TO WHETHER YOU POSSESS THE MOST CURRENT INSTRUCTIONS, CONTACT CULTEC AT (203) 775-4416 OR VISIT WWW.CULTEC.COM.
9. CONTACT CULTEC AT LEAST THIRTY DAYS PRIOR TO SYSTEM INSTALLATION TO ARRANGE FOR A PRE-CONSTRUCTION MEETING.
10. ALL CULTEC SYSTEM DESIGNS MUST BE CERTIFIED BY A REGISTERED PROFESSIONAL ENGINEER.
11. USE CULTEC INSTALLATION INSTRUCTIONS AS A GUIDELINE ONLY FOR MINIMUM/MAXIMUM REQUIREMENTS. ACTUAL DESIGN MAY VARY. REFER TO APPROVED CONSTRUCTION DRAWINGS FOR JOB-SPECIFIC DETAILS. BE SURE TO FOLLOW THE ENGINEER'S DRAWINGS AS YOUR PRIMARY GUIDE.
12. THE FOUNDATION STONE SHALL BE LEVEL AND COMPACTED PRIOR TO CHAMBER INSTALLATION.
13. OVERLAPPING RIB CONNECTIONS OF CHAMBERS SHALL BE FULLY SHOULDERED PRIOR TO STONE PLACEMENT.
14. CENTER-TO-CENTER SPACING SHALL BE CHECKED AND MAINTAINED THROUGHOUT INSTALLATION PROCESS.
15. ANY DISCREPANCIES WITH THE SYSTEM SUB-GRADE SOIL'S BEARING CAPACITY MUST BE REPORTED TO THE DESIGN ENGINEER.
16. NON-WOVEN GEOTEXTILE MUST BE USED AS SPECIFIED IN THE ENGINEER'S DRAWINGS.
17. CULTEC REQUIRES THE CONTRACTOR TO REFER TO CULTEC'S INSTALLATION INSTRUCTIONS CONCERNING VEHICULAR TRAFFIC. RESPONSIBILITY FOR PREVENTING VEHICLES THAT EXCEED CULTEC'S REQUIREMENTS FROM TRAVELING ACROSS OR PARKING OVER THE CHAMBER SYSTEM LIES SOLELY WITH THE CONTRACTOR THROUGHOUT THE ENTIRE SITE CONSTRUCTION PROCESS. THE PLACEMENT OF WARNING TAPE, TEMPORARY FENCING, AND/OR APPROPRIATELY LOCATED SIGNS IS HIGHLY RECOMMENDED. IMPRINTED WARNING TAPE IS AVAILABLE FROM CULTEC. FOR ACCEPTABLE VEHICLE LOAD INFORMATION, REFER TO CULTEC INSTALLATION INSTRUCTIONS.
18. TRAFFIC OF INSTALLATION EQUIPMENT OR OTHER VEHICULAR TRAFFIC OVER TOP OF THE CULTEC STORMWATER SYSTEM IS STRICTLY RESTRICTED AND PROHIBITED UNTIL SATISFACTORY COVER AND COMPACTION IS ACHIEVED ACCORDING TO CULTEC'S MANUFACTURER INSTALLATION INSTRUCTIONS.
19. EROSION AND SEDIMENT-CONTROL MEASURES MUST MEET LOCAL CODES AND THE DESIGN ENGINEER'S SPECIFICATIONS THROUGHOUT THE ENTIRE SITE CONSTRUCTION PROCESS.
20. CULTEC SYSTEMS MUST BE DESIGNED AND INSTALLED IN ACCORDANCE WITH CULTEC'S MINIMUM REQUIREMENTS. FAILURE TO DO SO WILL VOID THE LIMITED WARRANTY.
21. CONTACT CULTEC, INC. AT 203-775-4416 WITH ANY QUESTIONS OR FURTHER CLARIFICATION OF REQUIREMENTS.
22. PLACEMENT OF EMBEDMENT STONE MUST BE IN ACCORDANCE WITH CULTEC'S INSTALLATION INSTRUCTIONS. STONE COLUMN HEIGHT DEFERENTIAL MUST NEVER EXCEED 12" (305 mm) BETWEEN CHAMBER ROWS, ADJACENT CHAMBERS OR STONE PERIMETER. STONE MUST BE PLACED OVER THE CROWN OF THE CHAMBERS TO ANCHOR THE CHAMBERS IN PLACE AND MAINTAIN ROW SPACING.
23. EMBEDMENT STONE MUST ONLY BE PLACED BY EXCAVATOR OR TELESCOPING CONVEYOR BOOM. PLACEMENT OF EMBEDMENT STONE WITH BULLDOZER IS NOT AN ACCEPTABLE METHOD OF INSTALLATION AND MAY CAUSE DAMAGE TO THE CHAMBERS. ANY CHAMBERS DAMAGED USING AN UNACCEPTABLE METHOD OF BACKFILL ARE NOT COVERED UNDER THE CULTEC LIMITED WARRANTY.

THIS DRAWING WAS PREPARED TO SUPPORT THE DESIGN ENGINEER FOR THE PROPOSED SYSTEM. IT IS THE ULTIMATE RESPONSIBILITY OF THE DESIGN ENGINEER TO ASSURE THAT THE STORMWATER SYSTEM'S DESIGN IS IN FULL COMPLIANCE WITH ALL APPLICABLE LAWS AND REGULATIONS. IT IS THE DESIGN ENGINEER'S RESPONSIBILITY TO ENSURE THAT THE CULTEC PRODUCTS ARE DESIGNED IN ACCORDANCE WITH CULTEC'S MINIMUM REQUIREMENTS. CULTEC INC. DOES NOT APPROVE PLANS, SIZING, OR SYSTEM DESIGNS. THE DESIGNING ENGINEER IS RESPONSIBLE FOR ALL DESIGN DECISIONS.

CULTEC RECHARGER® 902HD STORMWATER SYSTEM



RECHARGER 902HD WEST SYSTEM PLAN VIEW DETAIL



RECHARGER 902HD WEST SYSTEM CROSS-SECTION DETAIL

CULTEC RECHARGER 902HD LEGEND

- RECHARGER 902HD CHAMBER: (54) UNITS
- RECHARGER 902HD END CAP: (12) UNITS
- HVLV FC-48 FEED CONNECTORS: (5) UNITS
- STONE BORDER
- CULTEC NO. 66 WOVEN GEOTEXTILE

TOTAL STORAGE PROVIDED: 164.99 m³

NOTE: ALL EXTERNAL STRUCTURES, INLET/OUTLET PIPES, AND PROPOSED SYSTEM ELEVATIONS MUST BE DESIGNED AND APPROVED BY DESIGN ENGINEER. ALL SYSTEM ELEVATIONS PROVIDED ON THESE DRAWINGS MUST BE VERIFIED BY THE DESIGN ENGINEER AND THE DESIGN ENGINEER MUST ENSURE ALL CHAMBER BURIAL REQUIREMENTS ARE MET.

CULTEC, Inc.
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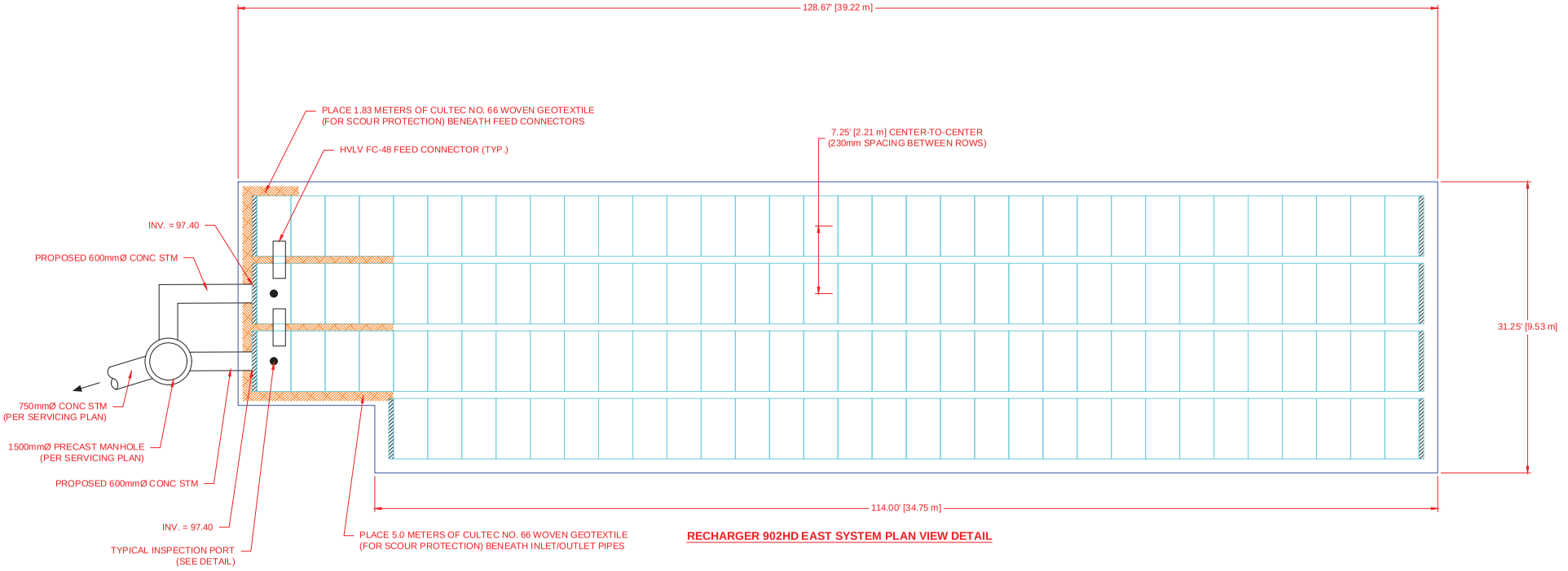
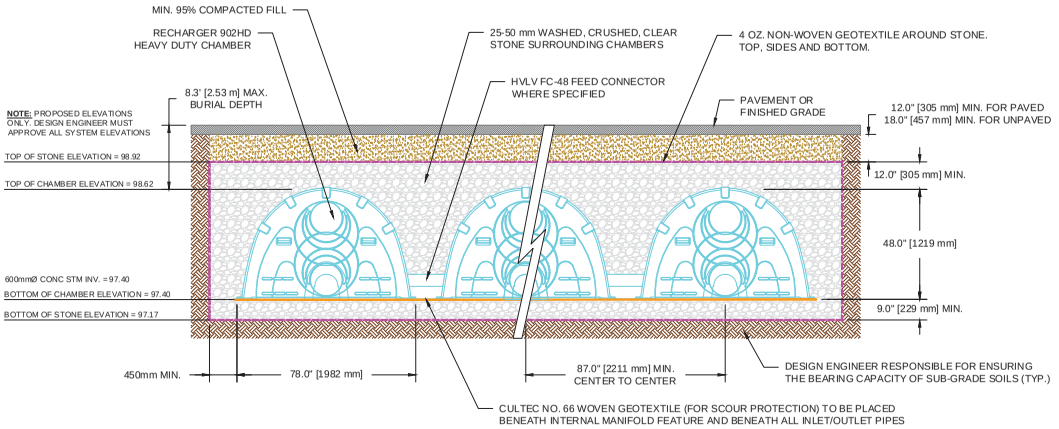
Vaughan, Ontario
L4K 1P2

CT LANDS
ELGIN STREET
COBOURG, ON
WEST SYSTEM LAYOUT SHEET

RECHARGER 902HD			
PROJECT NO:	15-7692.02	DATE:	3/9/17
DESIGNED BY:	DPG	DRAWN BY:	DPG
SCALE:	N.T.S.	SHEET NO:	1 OF 3



RECHARGER 902HD EAST SYSTEM PLAN VIEW DETAIL



RECHARGER 902HD EAST SYSTEM CROSS-SECTION DETAIL

CULTEC RECHARGER 902HD LEGEND

- RECHARGER 902HD CHAMBER: (132) UNITS
- RECHARGER 902HD END CAP: (8) UNITS
- HVLV FC-48 FEED CONNECTORS: (2) UNITS
- STONE BORDER
- CULTEC NO. 66 WOVEN GEOTEXTILE

TOTAL STORAGE PROVIDED: 400.64 m³

NOTE: ALL EXTERNAL STRUCTURES, INLET/OUTLET PIPES, AND PROPOSED SYSTEM ELEVATIONS MUST BE DESIGNED AND APPROVED BY DESIGN ENGINEER. ALL SYSTEM ELEVATIONS PROVIDED ON THESE DRAWINGS MUST BE VERIFIED BY THE DESIGN ENGINEER AND THE DESIGN ENGINEER MUST ENSURE ALL CHAMBER BURIAL REQUIREMENTS ARE MET.

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CT LANDS
ELGIN STREET
COBOURG, ON
EAST SYSTEM LAYOUT SHEET

RECHARGER 902HD			
PROJECT NO:	15-7692.02	DATE:	3/9/17
DESIGNED BY:	DPG	DRAWN BY:	DPG
SCALE:	N.T.S.	SHEET NO:	2 OF 3

CULTEC RECHARGER® 902HD PRODUCT SPECIFICATIONS

GENERAL

CULTEC RECHARGER® 902HD CHAMBERS ARE DESIGNED FOR UNDERGROUND STORMWATER MANAGEMENT. THE CHAMBERS MAY BE USED FOR RETENTION, RECHARGING, DETENTION OR CONTROLLING THE FLOW OF ON-SITE STORMWATER RUNOFF.

CHAMBER PARAMETERS

1. THE CHAMBERS SHALL BE MANUFACTURED BY CULTEC, INC. OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE CHAMBER SHALL BE STRUCTURAL FOAM INJECTION-MOLDED OF BLUE VIRGIN HIGH-MOLECULAR WEIGHT IMPACT-MODIFIED POLYPROPYLENE.
3. THE CHAMBER SHALL BE ARCHED IN SHAPE.
4. THE CHAMBER SHALL BE OPEN-BOTTOMED.
5. THE CHAMBER SHALL BE JOINED USING AN INTERLOCKING OVERLAPPING RIB METHOD. CONNECTIONS MUST BE FULLY SHOULDERED OVERLAPPING RIBS, HAVING NO SEPARATE COUPLINGS.
6. THE NOMINAL CHAMBER DIMENSIONS OF THE CULTEC RECHARGER® 902HD SHALL BE 48 INCHES (1219 mm) TALL, 78 INCHES (1981 mm) WIDE AND 4.10 FEET (1.25 mm) LONG. THE INSTALLED LENGTH OF A JOINED RECHARGER® 902HD SHALL BE 3.67 FEET (1.12 m).
7. MULTIPLE CHAMBERS MAY BE CONNECTED TO FORM DIFFERENT LENGTH ROWS. EACH ROW SHALL BEGIN AND END WITH A SEPARATELY FORMED CULTEC RECHARGER® 902HD END CAP. MAXIMUM INLET OPENING ON THE END CAP IS 24 INCHES (600 mm).
8. THE CHAMBER SHALL HAVE TWO SIDE PORT ALSTO ACCEPT CULTEC HVLV™ FC-48 FEED CONNECTORS TO CREATE AN INTERNAL MANIFOLD. MAXIMUM ALLOWABLE PIPE SIZE IN THE SIDE PORT A, IS 11.5 INCHES (292 mm).
9. THE NOMINAL CHAMBER DIMENSIONS OF THE CULTEC HVLV™ FC-48 FEED CONNECTOR SHALL BE 12 INCHES (305 mm) TALL, 16 INCHES (406 mm) WIDE AND 49 INCHES (1244 mm) LONG.
10. THE NOMINAL STORAGE VOLUME OF THE RECHARGER® 902HD CHAMBER SHALL BE 17.66 FT3 / FT (1.641 m3 / m) - WITHOUT STONE. THE NOMINAL STORAGE VOLUME OF A JOINED RECHARGER® 902HD SHALL BE 64.75 FT3 / UNIT (1.834 m3 / UNIT) - WITHOUT STONE.
11. THE NOMINAL STORAGE VOLUME OF THE HVLV™ FC-48 FEED CONNECTOR SHALL BE 0.913 FT3 / FT (0.085 m3 / m) - WITHOUT STONE.
12. THE RECHARGER® 902HD CHAMBER SHALL HAVE TWENTY-FOUR DISCHARGE HOLES BORED INTO THE SIDEWALLS OF THE UNIT'S CORE TO PROMOTE LATERAL CONVEYANCE OF WATER.
13. THE RECHARGER® 902HD CHAMBER SHALL HAVE 7 CORRUGATIONS.
14. THE CHAMBER SHALL BE DESIGNED TO WITHSTAND AASHTO HS-25 DEFINED LOADS WHEN INSTALLED ACCORDING TO CULTEC'S RECOMMENDED INSTALLATION INSTRUCTIONS.
15. THE CHAMBER SHALL HAVE A RAISED INTEGRAL CAP AT THE TOP OF THE ARCH NEAR THE CENTER OF EACH UNIT TO BE USED AS AN OPTIONAL INSPECTION PORT OR CLEAN-OUT.
16. THE UNITS MAY BE TRIMMED TO CUSTOM LENGTHS BY CUTTING BACK TO ANY CORRUGATION.
17. THE CHAMBER SHALL BE MANUFACTURED IN A FACILITY EMPLOYING CULTEC'S QUALITY CONTROL AND ASSURANCE PROCEDURES.
18. MAXIMUM ALLOWABLE COVER OVER THE TOP OF THE CHAMBER SHALL BE 8.5 FEET (2.59 m).

END CAP PARAMETERS

1. THE CULTEC RECHARGER® 902HD END CAP (REFERRED TO AS 'END CAP') SHALL BE MANUFACTURED BY CULTEC, INC. OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE END CAP SHALL BE TWIN-SHEET THERMOFORMED OF BLACK VIRGIN HIGH MOLECULAR WEIGHT POLYETHYLENE.
3. THE END CAP SHALL BE JOINED AT THE BEGINNING AND END OF EACH ROW OF CHAMBERS USING AN INTERLOCKING OVERLAPPING RIB METHOD. CONNECTIONS MUST BE FULLY SHOULDERED OVERLAPPING RIBS, HAVING NO SEPARATE COUPLINGS.
4. THE NOMINAL DIMENSIONS OF THE END CAP SHALL BE 48.5 INCHES (1231 mm) TALL, 78 INCHES (1982 mm) WIDE AND 9.7 INCHES (246 mm) LONG. WHEN JOINED WITH A RECHARGER 902HD CHAMBER, THE INSTALLED LENGTH OF THE END CAP SHALL BE 6.2 INCHES (157 mm).
5. MAXIMUM INLET OPENING ON THE END CAP IS 24 INCHES (600 mm).
6. THE END CAP SHALL BE DESIGNED TO WITHSTAND AASHTO HS-25 DEFINED LOADS WHEN INSTALLED ACCORDING TO CULTEC'S RECOMMENDED INSTALLATION INSTRUCTIONS.

CULTEC HVLV FC-48 FEED CONNECTOR PRODUCT SPECIFICATIONS

GENERAL

CULTEC HVLV FC-48 FEED CONNECTORS ARE DESIGNED TO CREATE AN INTERNAL MANIFOLD FOR CULTEC RECHARGER® MODEL 902HD STORMWATER CHAMBERS.

FEED CONNECTOR PARAMETERS

1. THE FEED CONNECTOR SHALL BE MANUFACTURED BY CULTEC, INC. OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE FEED CONNECTOR SHALL BE VACUUM THERMOFORMED OF BLACK HIGH-MOLECULAR WEIGHT HIGH-DENSITY POLYETHYLENE (HMWHDPE).
3. THE FEED CONNECTOR SHALL BE ARCHED IN SHAPE.
4. THE FEED CONNECTOR SHALL BE OPEN-BOTTOMED.
5. THE NOMINAL DIMENSIONS OF THE CULTEC HVLV FC-48 FEED CONNECTOR SHALL BE 12 INCHES (305 mm) TALL, 16 INCHES (406 mm) WIDE AND 49 INCHES (1244 mm) LONG.
6. THE NOMINAL STORAGE VOLUME OF THE HVLV FC-48 FEED CONNECTOR SHALL BE 0.913 FT3 / FT (0.085 m3 / m) - WITHOUT STONE.
7. THE HVLV FC-48 FEED CONNECTOR SHALL HAVE 4 CORRUGATIONS.
8. THE HVLV FC-48 FEED CONNECTOR MUST BE FORMED AS A WHOLE UNIT HAVING TWO OPEN END WALLS AND HAVING NO SEPARATE END PLATES OR SEPARATE END WALLS. THE UNIT SHALL FIT INTO THE SIDE PORTALS OF THE CULTEC RECHARGER® STORMWATER CHAMBER AND ACT AS CROSS FEED CONNECTIONS CREATING AN INTERNAL MANIFOLD.
9. THE FEED CONNECTOR SHALL BE DESIGNED TO WITHSTAND AASHTO HS-25 DEFINED LOADS WHEN INSTALLED ACCORDING TO CULTEC'S RECOMMENDED INSTALLATION INSTRUCTIONS.
10. THE FEED CONNECTOR SHALL BE MANUFACTURED IN AN ISO 9001:2008 CERTIFIED FACILITY.

CULTEC NO. 66™ WOVEN GEOTEXTILE

GENERAL

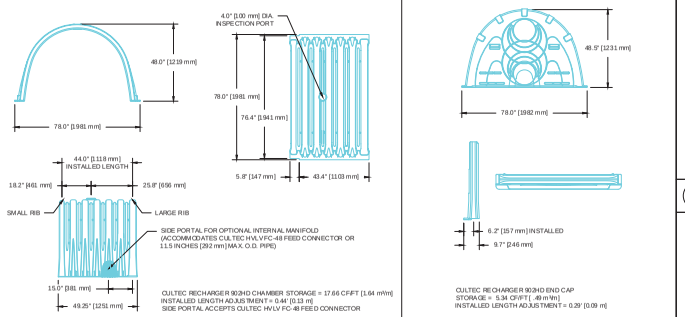
CULTEC NO. 66™ WOVEN GEOTEXTILE IS UTILIZED AS AN UNDERLAYMENT TO PREVENT SCOURING CAUSED BY WATER MOVEMENT WITHIN THE CULTEC CHAMBERS AND FEED CONNECTORS UTILIZING THE CULTEC MANIFOLD FEATURE.

GEOTEXTILE PARAMETERS

1. THE GEOTEXTILE SHALL BE PROVIDED BY CULTEC, INC. OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE GEOTEXTILE SHALL BE BLACK IN APPEARANCE.
3. THE GEOTEXTILE SHALL HAVE A TENSILE STRENGTH OF 315 LBS (1.40KN) PER ASTM D4632 TESTING METHOD.
4. THE GEOTEXTILE SHALL HAVE A TENSILE ELONGATION RESISTANCE OF 15% PER ASTM D4632 TESTING METHOD.
5. THE GEOTEXTILE SHALL HAVE A MULLEN BURST RESISTANCE OF 600PSI (4138 KPA) PER ASTM D3786 TESTING METHOD.
6. THE GEOTEXTILE SHALL HAVE A TEAR RESISTANCE OF 115 LBS (0.51 KN) PER ASTM D4533 TESTING METHOD.
7. THE GEOTEXTILE SHALL HAVE A PUNCTURE RESISTANCE OF 150 LBS (0.66 KN) PER ASTM D4833 TESTING METHOD.
8. THE GEOTEXTILE SHALL HAVE A CBR PUNCTURE RESISTANCE OF 900 LBS (4.00 KN) PER ASTM D6241 TESTING METHOD.
9. THE GEOTEXTILE SHALL HAVE A UV RESISTANCE OF 70% @ 500 HRS. PER ASTM D4355 TESTING METHOD.
10. THE GEOTEXTILE SHALL HAVE A PERMITTIVITY RATING OF 0.05 SEC-1 PER ASTM D4491 TESTING METHOD.
11. THE GEOTEXTILE SHALL HAVE A WATER FLOW RATING OF 4 GPM/FT2 (160 LPM/M2) PER ASTM D4491 TESTING METHOD.
12. THE GEOTEXTILE SHALL HAVE A PERCENT OPEN AREA OF <1% PER CW-02215 TESTING METHOD.
13. THE GEOTEXTILE SHALL HAVE AN APPARENT OPENING SIZE OF 40 US STD. SIEVE (0.425 MM) PER ASTM D4751 TESTING METHOD.
14. THE GEOTEXTILE SHALL CONSIST OF A 100% HIGH-TENACITY, SLIT-FILM POLYPROPYLENE YARNS.

902HD 1.0

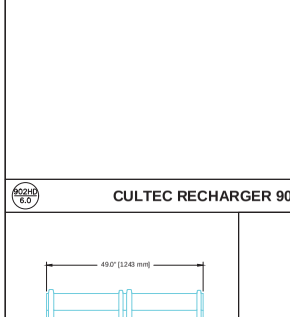
GENERAL NOTES



CULTEC RECHARGER 902HD CHAMBER STORAGE = 17.66 CF/FT [1.64 m³/m]
INSTALLED LENGTH ADJUSTMENT = 0.44" [0.13 m]
SIDE PORTAL ACCEPTS CULTEC HVLV FC-48 FEED CONNECTOR

902HD 4.0

CULTEC RECHARGER 902HD HEAVY DUTY THREE VIEW



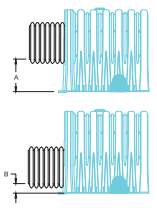
CULTEC RECHARGER 902HD END CAP
STORAGE = 5.34 CF/FT [.49 m³/m]
INSTALLED LENGTH ADJUSTMENT = 0.29" [0.09 m]

902HD 5.0

CULTEC RECHARGER 902HD HEAVY DUTY END CAP THREE VIEW

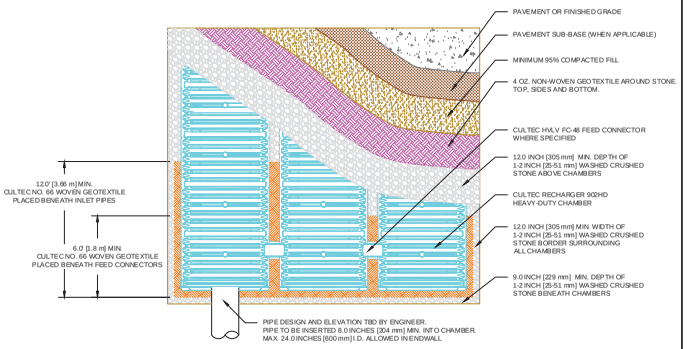
PIPE	A	B
6" [150 mm]	N/A	N/A
8" [200 mm]	N/A	N/A
10" [250 mm]	N/A	N/A
12" [300 mm]	29.50" [749 mm]	2.25" [57 mm]
15" [375 mm]	26.50" [673 mm]	2.25" [57 mm]
18" [450 mm]	23.50" [597 mm]	2.50" [64 mm]
24" [600 mm]	16.50" [420 mm]	3.00" [76 mm]

*THE TYPICAL INVERT TABLE ABOVE IS BASED ON THE INSIDE DIAMETER OF STANDARD CORRUGATED PLASTIC PIPE. THE HEAVY DUTY END CAP HAS PRE-MARKED TRIM LINES FOR PIPE DIAMETERS 12" (300 mm), 15" (375 mm), 18" (450 mm) AND 24" (600 mm). PIPES OF ANY SIZE AND MATERIAL, UP TO 24" MAY BE PLACED AT CUSTOM LOCATIONS AND CUSTOM INVERTS. THE CROWN OF THE PIPE MUST REMAIN A MINIMUM OF 4" (100 mm) FROM THE EDGE OF THE HEAVY DUTY END CAP.



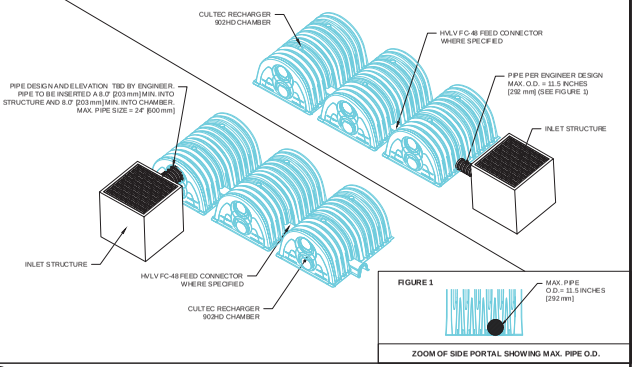
902HD 8.0

CULTEC RECHARGER 902HD TYPICAL PIPE INVERTS



902HD 2.0

CULTEC RECHARGER 902HD HEAVY DUTY PLAN VIEW



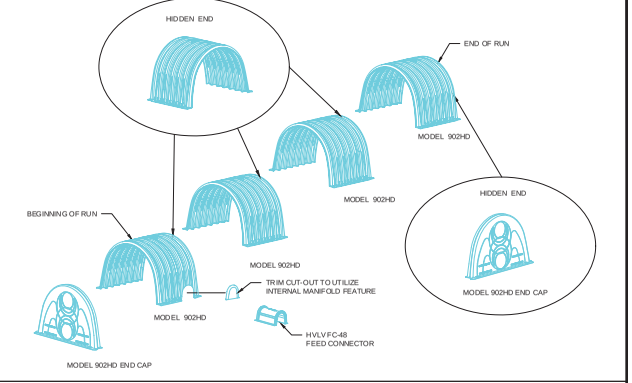
902HD 3.0

CULTEC TYPICAL INLET CONNECTION

SEE SYSTEM LAYOUT SHEETS FOR SYSTEM-SPECIFIC CROSS-SECTION DETAILS

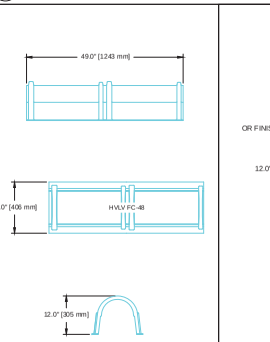
902HD 6.0

CULTEC RECHARGER 902HD HEAVY DUTY TYPICAL CROSS SECTION



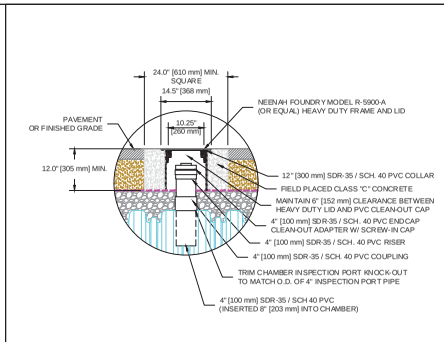
902HD 7.0

CULTEC RECHARGER 902HD HEAVY DUTY TYPICAL INTERLOCK



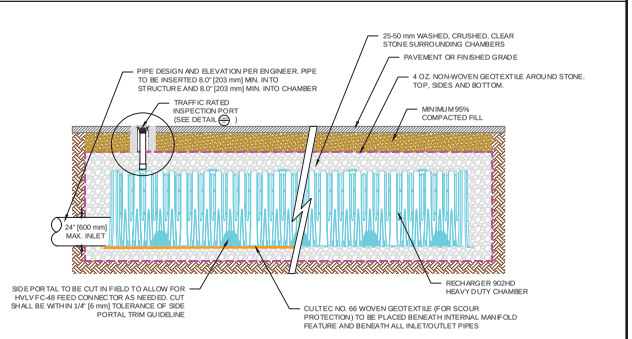
902HD 9.0

CULTEC HVLV FC-48 FEED CONNECTOR THREE VIEW



902HD 10.0

INSPECTION PORT - ZOOM DETAIL



902HD 11.0

CULTEC INTERNAL MANIFOLD - INSPECTION PORT DETAIL

CULTEC, Inc.
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CT LANDS
ELGIN STREET
COBOURG, ON
DETAIL SHEET

RECHARGER 902HD

PROJECT NO:	15-7692.02	DATE:	3/9/17
DESIGNED BY:	DPG	DRAWN BY:	DPG
SCALE:	N.T.S.	SHEET NO:	3 OF 3

STORAGE CHAMBER SUMMARY

Depth	Elevation	East Chambers	West Chambers	Total
1753	98.92	400.60	164.96	565.56
1727	98.90	396.91	163.44	560.35
1702	98.87	393.21	161.92	555.13
1676	98.85	389.52	160.40	549.92
1651	98.82	385.82	158.88	544.70
1626	98.80	382.13	157.35	539.48
1600	98.77	378.43	155.83	534.26
1575	98.75	374.74	154.31	529.05
1549	98.72	371.04	152.79	523.83
1524	98.69	367.35	151.27	518.62
1499	98.67	363.65	149.75	513.40
1473	98.64	359.95	148.23	508.18
1448	98.62	356.26	146.71	502.97
1422	98.59	352.40	145.12	497.52
1397	98.57	348.37	143.46	491.83
1372	98.54	344.01	141.66	485.67
1346	98.52	339.24	139.69	478.93
1321	98.49	334.14	137.59	471.73
1295	98.47	328.71	135.36	464.07
1270	98.44	323.12	133.05	456.17
1245	98.42	317.36	130.68	448.04
1219	98.39	311.44	128.24	439.68
1194	98.36	305.44	125.77	431.21
1168	98.34	299.27	123.23	422.50
1143	98.31	293.01	120.65	413.66
1118	98.29	286.60	118.01	404.61
1092	98.26	280.18	115.37	395.55
1067	98.24	273.60	112.66	386.26
1041	98.21	266.94	109.92	376.86
1016	98.19	260.27	107.17	367.44
991	98.16	253.45	104.36	357.81
965	98.14	246.62	101.55	348.17
940	98.11	239.71	98.71	338.42
914	98.08	232.80	95.86	328.66
889	98.06	225.72	92.95	318.67
864	98.03	218.73	90.07	308.80
838	98.01	211.66	87.16	298.82
813	97.98	204.50	84.22	288.72
787	97.96	197.34	81.27	278.61
762	97.93	190.18	78.32	268.50
737	97.91	182.94	75.35	258.29
711	97.88	175.70	72.37	248.07
686	97.86	168.46	69.39	237.85
660	97.83	161.14	66.37	227.51
635	97.81	153.82	63.36	217.18
610	97.78	146.50	60.35	206.85
584	97.75	139.09	57.30	196.39
559	97.73	131.69	54.25	185.94
533	97.70	124.20	51.17	175.37
508	97.68	116.80	48.12	164.92
483	97.65	109.31	45.04	154.35
457	97.63	101.82	41.95	143.77
432	97.60	94.25	38.83	133.08
406	97.58	86.68	35.71	122.39
381	97.55	79.10	32.59	111.69
356	97.53	71.53	29.47	101.00
330	97.50	63.88	26.32	90.20
305	97.48	56.31	23.19	79.50
279	97.45	48.57	20.00	68.57
254	97.42	40.91	16.85	57.76
229	97.40	33.26	13.69	46.95
203	97.37	29.56	12.17	41.73
178	97.35	25.87	10.65	36.52
152	97.32	22.17	9.13	31.30
127	97.30	18.48	7.60	26.08
102	97.27	14.78	6.08	20.86
76	97.25	11.09	4.56	15.65
51	97.22	7.39	3.04	10.43
25	97.20	3.70	1.52	5.22
0	97.17	0.00	0.00	0.00

CULTEC Recharger 902HD Stormwater System Calculations

PREPARED FOR:

PROJECT INFORMATION:

15-7692.02
Elgin Street
Cobourg, ON
East System

CALCULATED BY:

Dan Gera
CULTEC, Inc.
878 Federal Rd.
Brookfield, CT 06804
PH: 203.775.4416
Fx: 203.775.1462

DATE: 3/10/17

System Information

Proposed bed layout of

4 No. of Rows
3914.56 ft² - Area *(from CAD file)*
132 Total No. of Chambers in System
320 ft. - Perimeter *(from CAD file)*

Given:

Stone base	9	inches	229	mm
Stone above	12	inches	305	mm
Chamber Spacing	9	inches	229	mm
No. of HVLV FC-48 Feed Connectors	2	units		
Stone Porosity	40	%		
Stone Border Width	1.25	feet	0.381	m

Assumptions

Model Name		Chamber Height (inches / mm)	Design Unit Height (feet / m)	Chamber Width (inches / mm)	Chamber Spacing (inches / mm)	Design Unit Width (feet / m)	Chamber Volume per Linear Foot (cu. ft/ft / cu. m/m)	Design Unit Volume (cu. ft/ft / cu. m/m)	Installed Chamber Length (feet / m)
Recharger® 902HD Chamber	English	48	5.750	78	9	7.25	17.66	27.271	3.667
	Metric	1219	1.753	1981	229	2.21	1.641	2.533	1.118
Recharger® 902HD End Cap	English	48.5	5.750	78	9	7.25	5.509	19.980	0.501
	Metric	1232	1.753	1981	229	2.21	0.512	1.856	0.153
HVLV™ FC -48 Feed Connectors	English	12	n/a	16	n/a	n/a	0.913	n/a	0.750
	Metric	305	n/a	406	n/a	n/a	0.085	n/a	0.229

Storage Provided within CULTEC Recharger 902HD Stormwater Chamber, End Caps and HVLV FC-48 Feed Connector Internal Manifold System *- not including stone*

Number of Recharger 902HD chambers by design			=	132	pcs	
132	pcs x	3.667	=	484.00	feet	147.52 m
Number of Recharger 902HD end caps			=	8	pcs	
8	pcs x	0.501	=	4.01	feet	1.22 m
Number of HVLV FC-48 Feed Connectors			=	2	pcs	
2	pcs x	0.750	=	1.50	feet	0.46 m
Total footage of Recharger 902HD chambers			=	484.00	feet	147.52 m
Total footage of Recharger 902HD end caps			=	4.01	feet	
Total footage of HVLV FC-48 Feed Connectors			=	1.50	feet	0.46 m
Storage provided within Recharger 902HD chambers			=	8547.44	CF	242.06 m^3
Storage provided within Recharger 902HD end caps				22.08	CF	0.63 m^3
Storage provided within HVLV FC-48 Feed Connectors			=	1.37	CF	0.04 m^3
Total Storage within Recharger 902HD chambers and feed connectors			=	**8570.89**	**CF**	**242.73 m^3**

Storage Provided within Entire CULTEC Stormwater System - *including stone*

Effective Bed depth *(not including additional cover)*		5.75	feet	1.75 m
Total Area		3914.56	sq. ft.	363.66 m^2
Volume of Effective Excavation *(not including additional cover)*		22508.72	CF	637.45 m^3
Perimeter of Bed		320.00	feet	97.54 m
Total Storage within CULTEC Recharger 902HD chambers, end caps and feed connectors		8570.89	CF	242.73 m^3
Total Stone Required		13937.83	CF	394.72 m^3
		516	CY	
		723	tons	
Storage provided within stone		5575.13	CF	157.89 m^3
Total Storage within CULTEC Stormwater System	=	**14147**	**CF**	**400.64 m^3**

Req. storage attained.

CULTEC MATERIALS LIST

Model	Quantity	Unit of Measure	Quantity	Unit of Measure
Recharger 902HD Heavy Duty Chamber	132	pcs		
Recharger 902HD End Cap	8	pcs		
HVLV FC-48 Feed Connectors	2	pcs		
CULTEC No. 410 Non-Woven Geotextile 12.5' W x 360' L (3.81 m W x 109.73 m L)	3	rolls		
CULTEC No. 66 Woven Geotextile 6' x 100' (1.83 m W x 30.48 m L)	75	feet	22.86	m
Total Stone	723	tons	395	cubic meters

Last updated: 10/23/14

Project Information:

15-7692.02
Elgin Street
Cobourg, ON
East System

System Information:

40	stone void (%)		
4	number of rows		
3914.56	sq. ft. area	363.66	m^2 area
484	ft. of chambers	147.52	m of chambers
4.008	ft. of end caps	1.22	m of end caps
1.5	ft. of feed connectors (exposed)	0.46	m of feed connectors (exposed)

132	pcs of	Recharger 902HD Chambers
8	pcs of	Recharger 902HD End Caps
2	pcs of	HVLV FC-48 Feed Connectors

INCREMENTAL STORAGE FOR CULTEC RECHARGER 902HD SYSTEM

TOP OF SYSTEM	Elevation				Chamber Volume		End Cap Volume		HVLV FC-48 Feed Connector Volume		Stone Volume		Cumulative Storage Volume		Total Cumulative Storage Volume	
	Cumulative Elevation				per inch	per 25.4 mm	per inch	per 25.4 mm	per inch	per 25.4 mm	per inch	per 25.4 mm	per inch	per 25.4 mm	per inch	per 25.4 mm
	inches	mm	inches	mm	ft^3	m^3	ft^3	m^3	ft^3	m^3	ft^3	m^3	ft^3	m^3	ft^3	m^3
STONE ABOVE	69	1753	12	305							130.49	3.70	130.49	3.70	14145.61	400.60
	68	1727	11	279							130.49	3.70	130.49	3.70	14015.13	396.91
	67	1702	10	254							130.49	3.70	130.49	3.70	13884.64	393.21
	66	1676	9	229							130.49	3.70	130.49	3.70	13754.16	389.52
	65	1651	8	203							130.49	3.70	130.49	3.70	13623.67	385.82
	64	1626	7	178							130.49	3.70	130.49	3.70	13493.19	382.13
	63	1600	6	152							130.49	3.70	130.49	3.70	13362.70	378.43
	62	1575	5	127							130.49	3.70	130.49	3.70	13232.21	374.74
	61	1549	4	102							130.49	3.70	130.49	3.70	13101.73	371.04
	60	1524	3	76							130.49	3.70	130.49	3.70	12971.24	367.35
	59	1499	2	51							130.49	3.70	130.49	3.70	12840.76	363.65
	58	1473	1	25							130.49	3.70	130.49	3.70	12710.27	359.95
CHAMBER HEIGHT	57	1448	48	1219	9.68	0.27	0.16	0.00			126.55	3.58	136.39	3.86	12579.79	356.26
	56	1422	47	1194	19.36	0.55	0.23	0.01			122.65	3.47	142.24	4.03	12443.40	352.40
	55	1397	46	1168	38.72	1.10	0.23	0.01			114.90	3.25	153.86	4.36	12301.16	348.37
	54	1372	45	1143	62.92	1.78	0.31	0.01			105.19	2.98	168.42	4.77	12147.30	344.01
	53	1346	44	1118	82.28	2.33	0.39	0.01			97.42	2.76	180.09	5.10	11978.88	339.24
	52	1321	43	1092	101.64	2.88	0.31	0.01			89.71	2.54	191.66	5.43	11798.79	334.14
	51	1295	42	1067	111.32	3.15	0.39	0.01			85.80	2.43	197.51	5.59	11607.14	328.71
	50	1270	41	1041	121.00	3.43	0.39	0.01			81.93	2.32	203.32	5.76	11409.63	323.12
	49	1245	40	1016	130.68	3.70	0.39	0.01			78.06	2.21	209.13	5.92	11206.31	317.36
	48	1219	39	991	135.52	3.84	0.39	0.01			76.12	2.16	212.03	6.00	10997.19	311.44
	47	1194	38	965	145.20	4.11	0.39	0.01			72.25	2.05	217.84	6.17	10785.16	305.44
	46	1168	37	940	150.04	4.25	0.47	0.01			70.28	1.99	220.79	6.25	10567.32	299.27
	45	1143	36	914	159.72	4.52	0.39	0.01			66.44	1.88	226.55	6.42	10346.53	293.01
	44	1118	35	889	159.72	4.52	0.39	0.01			66.44	1.88	226.55	6.42	10119.98	286.60
	43	1092	34	864	169.40	4.80	0.47	0.01			62.54	1.77	232.40	6.58	9893.43	280.18
	42	1067	33	838	174.24	4.93	0.39	0.01			60.63	1.72	235.26	6.66	9661.02	273.60
	41	1041	32	813	174.24	4.93	0.39	0.01			60.63	1.72	235.26	6.66	9425.76	266.94
	40	1016	31	787	183.92	5.21	0.47	0.01			56.73	1.61	241.12	6.83	9190.50	260.27
	39	991	30	762	183.92	5.21	0.39	0.01			56.76	1.61	241.07	6.83	8949.38	253.45
	38	965	29	737	188.76	5.35	0.54	0.02			54.76	1.55	244.07	6.91	8708.31	246.62
	37	940	28	711	188.76	5.35	0.39	0.01			54.83	1.55	243.97	6.91	8464.25	239.71
	36	914	27	686	198.44	5.62	0.47	0.01			50.92	1.44	249.83	7.08	8220.27	232.80
	35	889	26	660	193.60	5.48	0.47	0.01			52.86	1.50	246.92	6.99	7970.45	225.72
	34	864	25	635	198.44	5.62	0.39	0.01			50.95	1.44	249.78	7.07	7723.52	218.73
	33	838	24	610	203.28	5.76	0.47	0.01			48.99	1.39	252.73	7.16	7473.74	211.66
	32	813	23	584	203.28	5.76	0.47	0.01			48.99	1.39	252.73	7.16	7221.01	204.50
	31	787	22	559	203.28	5.76	0.54	0.02			48.96	1.39	252.78	7.16	6968.27	197.34
	30	762	21	533	208.12	5.89	0.47	0.01			47.05	1.33	255.64	7.24	6715.50	190.18
	29	737	20	508	208.12	5.89	0.47	0.01			47.05	1.33	255.64	7.24	6459.86	182.94
	28	711	19	483	208.12	5.89	0.47	0.01			47.05	1.33	255.64	7.24	6204.22	175.70
	27	686	18	457	212.96	6.03	0.47	0.01			45.12	1.28	258.54	7.32	5948.59	168.46
	26	660	17	432	212.96	6.03	0.47	0.01			45.12	1.28	258.54	7.32	5690.05	161.14
	25	635	16	406	212.96	6.03	0.54	0.02			45.08	1.28	258.59	7.32	5431.51	153.82
	24	610	15	381	217.80	6.17	0.47	0.01			43.18	1.22	261.44	7.40	5172.92	146.50
	23	584	14	356	217.80	6.17	0.47	0.01			43.18	1.22	261.44	7.40	4911.47	139.09
	22	559	13	330	222.64	6.31	0.47	0.01			41.24	1.17	264.35	7.49	4650.03	131.69
	21	533	12	305	217.80	6.17	0.54	0.02	0.01	0.00	43.15	1.22	261.49	7.41	4385.68	124.20
	20	508	11	279	222.64	6.31	0.47	0.01	0.05	0.00	41.22	1.17	264.38	7.49	4124.19	116.80
	19	483	10	254	222.64	6.31	0.54	0.02	0.09	0.00	41.18	1.17	264.45	7.49	3859.81	109.31
	18	457	9	229	227.48	6.44	0.54	0.02	0.11	0.00	39.23	1.11	267.36	7.57	3595.36	101.82
	17	432	8	203	227.48	6.44	0.54	0.02	0.12	0.00	39.23	1.11	267.37	7.57	3328.00	94.25
	16	406	7	178	227.48	6.44	0.54	0.02	0.13	0.00	39.23	1.11	267.38	7.57	3060.62	86.68
	15	381	6	152	227.48	6.44	0.47	0.01	0.13	0.00	39.25	1.11	267.33	7.57	2793.25	79.10
	14	356	5	127	232.32	6.58	0.54	0.02	0.14	0.00	37.28	1.06	270.29	7.65	2525.92	71.53
	13	330	4	102	227.48	6.44	0.54	0.02	0.14	0.00	39.22	1.11	267.38	7.57	2255.63	63.88
	12	305	3	76	237.16	6.72	0.62	0.02	0.15	0.00	35.32	1.00	273.24	7.74	1988.25	56.31
	11	279	2	51	232.32	6.58	0.54	0.02	0.15	0.00	37.28	1.06	270.29	7.65	1715.00	48.57
	10	254	1	25	232.32	6.58	0.62	0.02	0.16	0.00	37.25	1.05	270.34	7.66	1444.71	40.91
STONE BASE	9	229	9	229							130.49	3.70	130.49	3.70	1174.37	33.26
	8	203	8	203							130.49	3.70	130.49	3.70	1043.88	29.56
	7	178	7	178							130.49	3.70	130.49	3.70	913.40	25.87
	6	152	6	152							130.49	3.70	130.49	3.70	782.91	22.17
	5	127	5	127							130.49	3.70	130.49	3.70	652.43	18.48
	4	102	4	102							130.49	3.70	130.49	3.70	521.94	14.78
	3	76	3	76							130.49	3.70	130.49	3.70	391.46	11.09
	2	51	2	51							130.49	3.70	130.49	3.70	260.97	7.39
	1	25	1	25							130.49	3.70	130.49	3.70	130.49	3.70
	0	0	0	0							0.00	0.00	0.00	0.00	0.00	0.00
BOTTOM OF SYSTEM					Chamber Volume		End Cap Volume		HVLV FC-48 Feed Connector Volume		Stone Volume		Cumulative Storage Volume		Total Cumulative Storage Volume	
					8547.44 cu. ft.	242.06 m^3	21.40 cu. ft.	0.61 m^3	1.37 cu. ft.	0.04 m^3	5575.41 cu. ft.	157.90 m^3	14145.61 cu. ft.	400.60 m^3	14145.61 cu. ft.	400.60 m^3

CULTEC Recharger 902HD Stormwater System Calculations

PREPARED FOR:

PROJECT INFORMATION:

15-7692.02
Elgin Street
Cobourg, ON
West System

CALCULATED BY:

Dan Gera
CULTEC, Inc.
878 Federal Rd.
Brookfield, CT 06804
PH: 203.775.4416
Fx: 203.775.1462

DATE: 3/10/17

System Information

Proposed bed layout of 6 Rows 9 No. of Units per Row

Given:

Stone base	9	inches	229	mm
Stone above	12	inches	305	mm
Chamber Spacing	9	inches	229	mm
No. of HVLV FC-48 Feed Connectors	5	units		
Stone Porosity	40	%		
Stone Border Width	1	feet	0.3048	m

Assumptions

Model Name		Chamber Height (inches / mm)	Design Unit Height (feet / m)	Chamber Width (inches / mm)	Chamber Spacing (inches / mm)	Design Unit Width (feet / m)	Chamber Volume per Linear Foot (cu. ft/ft / cu. m/m)	Design Unit Volume (cu. ft/ft / cu. m/m)	Installed Chamber Length (feet / m)
Recharger® 902HD Chamber	English	48	5.750	78	9	7.25	17.66	27.271	3.667
	Metric	1219	1.753	1981	229	2.21	1.641	2.533	1.118
Recharger® 902HD End Cap	English	48.5	5.750	78	9	7.25	5.509	19.980	0.501
	Metric	1232	1.753	1981	229	2.21	0.512	1.856	0.153
HVLV™ FC -48 Feed Connectors	English	12	n/a	16	n/a	n/a	0.913	n/a	0.750
	Metric	305	n/a	406	n/a	n/a	0.085	n/a	0.229

Storage Provided within CULTEC Recharger 902HD Stormwater Chamber, End Caps and HVLV FC-48 Feed Connector Internal Manifold System

- not including stone

Number of Recharger 902HD chambers by design			=	54	pcs	
54	pcs x	3.667	=	198.00	feet	60.35 m
Number of Recharger 902HD end caps			=	12	pcs	
12	pcs x	0.501	=	6.01	feet	1.83 m
Number of HVLV FC-48 Feed Connectors			=	5	pcs	
5	pcs x	0.750	=	3.75	feet	1.14 m
Total footage of Recharger 902HD chambers			=	198.00	feet	60.35 m
Total footage of Recharger 902HD end caps			=	6.01	feet	
Total footage of HVLV FC-48 Feed Connectors			=	3.75	feet	1.14 m
Storage provided within Recharger 902HD chambers			=	3496.68	CF	99.03 m^3
Storage provided within Recharger 902HD end caps				33.12	CF	0.94 m^3
Storage provided within HVLV FC-48 Feed Connectors			=	3.42	CF	0.10 m^3
Total Storage within Recharger 902HD chambers and feed connectors			=	**3533.22**	**CF**	**100.06 m^3**

Storage Provided within Entire CULTEC Stormwater System - *including stone*

Bed width	44.75	feet	13.64 m
Bed length	36.00	feet	10.97 m
Effective Bed depth *(not including additional cover)*	5.75	feet	1.75 m
Total Area	1611.09	sq. ft.	149.67 m^2
Volume of Effective Excavation *(not including additional cover)*	9263.76	CF	262.35 m^3
Perimeter of Bed	161.50	feet	49.23 m
Total Storage within CULTEC Recharger 902HD chambers, end caps and feed connectors	3533.22	CF	100.06 m^3
Total Stone Required	5730.54	CF	162.29 m^3
	212	CY	
	297	tons	
Storage provided within stone	2292.22	CF	64.92 m^3
Total Storage within CULTEC Stormwater System =	**5826**	**CF**	**164.99 m^3**

Req. storage attained.

CULTEC MATERIALS LIST

Model	Quantity	Unit of Measure	Quantity	Unit of Measure
Recharger 902HD Heavy Duty Chamber	54	pcs		
Recharger 902HD End Cap	12	pcs		
HVLV FC-48 Feed Connectors	5	pcs		
CULTEC No. 410 Non-Woven Geotextile 12.5' W x 360' L (3.81 m W x 109.73 m L)	2	rolls		
CULTEC No. 66 Woven Geotextile 6' x 100' (1.83 m W x 30.48 m L)	100	feet	30.48	m
Total Stone	297	tons	162	cubic meters

Last updated: 10/23/14

Project Information:

15-7692.02
Elgin Street
Cobourg, ON
West System

System Information:

40	stone void (%)		
6	number of rows		
1611.0895	sq. ft. area	149.67	m^2 area
198	ft. of chambers	60.35	m of chambers
6.012	ft. of end caps	1.83	m of end caps
3.75	ft. of feed connectors (exposed)	1.14	m of feed connectors (exposed)

54	pcs of	Recharger 902HD Chambers
12	pcs of	Recharger 902HD End Caps
5	pcs of	HVLV FC-48 Feed Connectors

INCREMENTAL STORAGE FOR CULTEC RECHARGER 902HD SYSTEM

TOP OF SYSTEM	Elevation				Chamber Volume		End Cap Volume		HVLV FC-48 Feed Connector Volume		Stone Volume		Cumulative Storage Volume		Total Cumulative Storage Volume	
	Cumulative Elevation				per inch	per 25.4 mm	per inch	per 25.4 mm	per inch	per 25.4 mm	per inch	per 25.4 mm	per inch	per 25.4 mm	per inch	per 25.4 mm
	inches	mm	inches	mm	ft^3	m^3	ft^3	m^3	ft^3	m^3	ft^3	m^3	ft^3	m^3	ft^3	m^3
STONE ABOVE	69	1753	12	305							53.70	1.52	53.70	1.52	5824.83	164.96
	68	1727	11	279							53.70	1.52	53.70	1.52	5771.12	163.44
	67	1702	10	254							53.70	1.52	53.70	1.52	5717.42	161.92
	66	1676	9	229							53.70	1.52	53.70	1.52	5663.72	160.40
	65	1651	8	203							53.70	1.52	53.70	1.52	5610.01	158.88
	64	1626	7	178							53.70	1.52	53.70	1.52	5556.31	157.35
	63	1600	6	152							53.70	1.52	53.70	1.52	5502.61	155.83
	62	1575	5	127							53.70	1.52	53.70	1.52	5448.90	154.31
	61	1549	4	102							53.70	1.52	53.70	1.52	5395.20	152.79
	60	1524	3	76							53.70	1.52	53.70	1.52	5341.50	151.27
	59	1499	2	51							53.70	1.52	53.70	1.52	5287.80	149.75
	58	1473	1	25							53.70	1.52	53.70	1.52	5234.09	148.23
CHAMBER HEIGHT	57	1448	48	1219	3.96	0.11	0.23	0.01			52.03	1.47	56.22	1.59	5180.39	146.71
	56	1422	47	1194	7.92	0.22	0.35	0.01			50.40	1.43	58.66	1.66	5124.17	145.12
	55	1397	46	1168	15.84	0.45	0.35	0.01			47.23	1.34	63.42	1.80	5065.51	143.46
	54	1372	45	1143	25.74	0.73	0.47	0.01			43.22	1.22	69.43	1.97	5002.09	141.66
	53	1346	44	1118	33.66	0.95	0.58	0.02			40.01	1.13	74.25	2.10	4932.66	139.69
	52	1321	43	1092	41.58	1.18	0.47	0.01			36.88	1.04	78.93	2.24	4858.42	137.59
	51	1295	42	1067	45.54	1.29	0.58	0.02			35.25	1.00	81.38	2.30	4779.49	135.36
	50	1270	41	1041	49.50	1.40	0.58	0.02			33.67	0.95	83.75	2.37	4698.11	133.05
	49	1245	40	1016	53.46	1.51	0.58	0.02			32.09	0.91	86.13	2.44	4614.36	130.68
	48	1219	39	991	55.44	1.57	0.58	0.02			31.29	0.89	87.32	2.47	4528.23	128.24
	47	1194	38	965	59.40	1.68	0.58	0.02			29.71	0.84	89.69	2.54	4440.91	125.77
	46	1168	37	940	61.38	1.74	0.70	0.02			28.87	0.82	90.95	2.58	4351.22	123.23
	45	1143	36	914	65.34	1.85	0.58	0.02			27.33	0.77	93.26	2.64	4260.27	120.65
	44	1118	35	889	65.34	1.85	0.58	0.02			27.33	0.77	93.26	2.64	4167.02	118.01
	43	1092	34	864	69.30	1.96	0.70	0.02			25.70	0.73	95.70	2.71	4073.76	115.37
	42	1067	33	838	71.28	2.02	0.58	0.02			24.96	0.71	96.82	2.74	3978.06	112.66
	41	1041	32	813	71.28	2.02	0.58	0.02			24.96	0.71	96.82	2.74	3881.24	109.92
	40	1016	31	787	75.24	2.13	0.70	0.02			23.33	0.66	99.27	2.81	3784.42	107.17
	39	991	30	762	75.24	2.13	0.58	0.02			23.37	0.66	99.20	2.81	3685.15	104.36
	38	965	29	737	77.22	2.19	0.81	0.02			22.49	0.64	100.52	2.85	3585.96	101.55
	37	940	28	711	77.22	2.19	0.58	0.02			22.58	0.64	100.38	2.84	3485.44	98.71
	36	914	27	686	81.18	2.30	0.70	0.02			20.95	0.59	102.83	2.91	3385.05	95.86
	35	889	26	660	79.20	2.24	0.70	0.02			21.74	0.62	101.64	2.88	3282.22	92.95
	34	864	25	635	81.18	2.30	0.58	0.02			21.00	0.59	102.76	2.91	3180.58	90.07
	33	838	24	610	83.16	2.36	0.70	0.02			20.16	0.57	104.02	2.95	3077.82	87.16
	32	813	23	584	83.16	2.36	0.70	0.02			20.16	0.57	104.02	2.95	2973.80	84.22
	31	787	22	559	83.16	2.36	0.81	0.02			20.11	0.57	104.09	2.95	2869.79	81.27
	30	762	21	533	85.14	2.41	0.70	0.02			19.37	0.55	105.21	2.98	2765.70	78.32
	29	737	20	508	85.14	2.41	0.70	0.02			19.37	0.55	105.21	2.98	2660.49	75.35
	28	711	19	483	85.14	2.41	0.70	0.02			19.37	0.55	105.21	2.98	2555.29	72.37
	27	686	18	457	87.12	2.47	0.70	0.02			18.58	0.53	106.39	3.01	2450.08	69.39
	26	660	17	432	87.12	2.47	0.70	0.02			18.58	0.53	106.39	3.01	2343.69	66.37
	25	635	16	406	87.12	2.47	0.81	0.02			18.53	0.52	106.46	3.02	2237.29	63.36
	24	610	15	381	89.10	2.52	0.70	0.02			17.78	0.50	107.58	3.05	2130.83	60.35
	23	584	14	356	89.10	2.52	0.70	0.02			17.78	0.50	107.58	3.05	2023.25	57.30
	22	559	13	330	91.08	2.58	0.70	0.02			16.99	0.48	108.77	3.08	1915.67	54.25
	21	533	12	305	89.10	2.52	0.81	0.02	0.02	0.00	17.73	0.50	107.66	3.05	1806.90	51.17
	20	508	11	279	91.08	2.58	0.70	0.02	0.12	0.00	16.95	0.48	108.84	3.08	1699.24	48.12
	19	483	10	254	91.08	2.58	0.81	0.02	0.23	0.01	16.86	0.48	108.97	3.09	1590.40	45.04
	18	457	9	229	93.06	2.64	0.81	0.02	0.27	0.01	16.04	0.45	110.19	3.12	1481.42	41.95
	17	432	8	203	93.06	2.64	0.81	0.02	0.30	0.01	16.03	0.45	110.21	3.12	1371.23	38.83
	16	406	7	178	93.06	2.64	0.81	0.02	0.32	0.01	16.03	0.45	110.22	3.12	1261.02	35.71
	15	381	6	152	93.06	2.64	0.70	0.02	0.33	0.01	16.07	0.46	110.16	3.12	1150.80	32.59
	14	356	5	127	95.04	2.69	0.81	0.02	0.35	0.01	15.22	0.43	111.42	3.16	1040.65	29.47
	13	330	4	102	93.06	2.64	0.81	0.02	0.36	0.01	16.01	0.45	110.24	3.12	929.22	26.32
	12	305	3	76	97.02	2.75	0.93	0.03	0.36	0.01	14.38	0.41	112.69	3.19	818.98	23.19
	11	279	2	51	95.04	2.69	0.81	0.02	0.37	0.01	15.21	0.43	111.44	3.16	706.29	20.00
	10	254	1	25	95.04	2.69	0.93	0.03	0.40	0.01	15.16	0.43	111.52	3.16	594.85	16.85
STONE BASE	9	229	9	229							53.70	1.52	53.70	1.52	483.33	13.69
	8	203	8	203							53.70	1.52	53.70	1.52	429.62	12.17
	7	178	7	178							53.70	1.52	53.70	1.52	375.92	10.65
	6	152	6	152							53.70	1.52	53.70	1.52	322.22	9.13
	5	127	5	127							53.70	1.52	53.70	1.52	268.51	7.60
	4	102	4	102							53.70	1.52	53.70	1.52	214.81	6.08
	3	76	3	76							53.70	1.52	53.70	1.52	161.11	4.56
	2	51	2	51							53.70	1.52	53.70	1.52	107.41	3.04
	1	25	1	25							53.70	1.52	53.70	1.52	53.70	1.52
	0	0	0	0							0.00	0.00	0.00	0.00	0.00	0.00
BOTTOM OF SYSTEM					Chamber Volume		End Cap Volume		HVLV FC-48 Feed Connector Volume		Stone Volume		Cumulative Storage Volume		Total Cumulative Storage Volume	
					3496.68	99.03	32.10	0.91	3.42	0.10	2292.63	64.93	5824.83	164.96	5824.83	164.96
					cu. ft.	m^3	cu. ft.	m^3	cu. ft.	m^3	cu. ft.	m^3	cu. ft.	m^3	cu. ft.	m^3

CULTEC, Inc.
P.O. Box 280 Brookfield, CT 06804

PH: 203-775-4416
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Appendix F

MECP Environmental Compliance Approvals

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 5516-AZ3T9A
Issue Date: June 19, 2018

2286974 Ontario Inc.
1944 Fowler Dr
Mississauga, Ontario
L5K 0A1

Site Location: Cobourg CT Lands
Lot Part of Lot 23, Concession A
Town of Cobourg, County of Northumberland
K9A 4J7

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

the establishment of wastewater infrastructure Works to service a proposed subdivision, named the CT lands Development, located between Rogers Road and Loveshin Street, on the south side of Elgin Street, within the Gage Creek Watershed, in the Town of Cobourg, in the County of Northumberland, consisting of the following:

- **storm sewers** located on Elgin Street, from approximately 240 metres east of the intersection of Wilkins Gate and Elgin Street to approximately 85 metres west of the intersection of Loveshin Street and Elgin Street, discharging to the storm outfall, identified below;
- **storm outfall** located on Elgin Street, from approximately 85 metres west of the intersection of Loveshin Street and Elgin Street to approximately 90 metres west of the intersection of Loveshin Street and Elgin Street, discharging to the existing drainage ditch on Elgin Street, complete with rip-rap and filter fabric at the outlet;
- **sanitary sewers** located on Elgin Street, from approximately 145 metres east of the intersection of Wilkins Gate and Elgin Street to approximately 70 metres east of the intersection of Loveshin Street and Elgin Street, discharging to the existing sanitary sewers on Elgin Street;

including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned Works;

all in accordance with the submitted application and supporting documents listed in

Schedule A forming part of this Approval.

For the purpose of this environmental compliance approval, the following definitions apply:

1. "Approval" means this entire document and any schedules attached to it, and the application;
2. "Director" means a person appointed by the Minister pursuant to section 5 of the EPA for the purposes of Part II.1 of the EPA;
3. "District Manager" means the District Manager of the appropriate local District Office of the Ministry, where the Works are geographically located;
4. "EPA" means the *Environmental Protection Act,* R.S.O. 1990, c.E.19, as amended;
5. "Ministry" means the ministry of the government of Ontario responsible for the EPA and OWRA and includes all officials, employees or other persons acting on its behalf;
6. "MNRF" means the Ministry of Natural Resources and Forestry of the government of Ontario and includes all officials, employees or other persons acting on its behalf;
7. "Owner" means 2286974 Ontario Inc., and includes its successors and assignees;
8. "OWRA" means the *Ontario Water Resources Act,* R.S.O. 1990, c. O.40, as amended;
9. "Works" means the sewage Works described in the Owner's application, and this Approval.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. **GENERAL CONDITIONS**
    1. The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works is notified of this Approval and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

2. Except as otherwise provided by these Conditions, the Owner shall design, build, install, operate and maintain the Works in accordance with the description given in this Approval, and the application for approval of the Works.
3. Where there is a conflict between a provision of any document in the schedule referred to in this Approval and the conditions of this Approval, the conditions in this Approval shall take precedence, and where there is a conflict between the documents in the schedule, the document bearing the most recent date shall prevail.
4. Where there is a conflict between the documents listed in Schedule A and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.
5. The conditions of this Approval are severable. If any condition of this Approval, or the application of any requirement of this Approval to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this Approval shall not be affected thereby.
6. The issuance of, and compliance with the conditions of, this Approval does not:
    a. relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement, including, but not limited to, the obligation to obtain approval from the local conservation authority/MNRF necessary to construct or operate the sewage works; or
    b. limit in any way the authority of the Ministry to require certain steps be taken to require the Owner to furnish any further information related to compliance with this Approval.

2. **EXPIRY OF APPROVAL**
    1. This Approval will cease to apply to those parts of the Works which have not been constructed within five (5) years of the date of this Approval.
    2. In the event that completion and commissioning of any portion of the Works is anticipated to be delayed beyond the specified expiry period, the Owner shall submit an application of extension to the expiry period, at least twelve (12) months prior to the end of the period. The application for extension shall include the reason(s) for the delay, whether there is any design change(s) and a review of whether the standards applicable at the time of Approval of the Works are still applicable at the time of request for extension, to ensure the ongoing protection of the environment.

3. **CHANGE OF OWNER**
    1. The Owner shall notify the District Manager and the Director, in writing, of any of the following changes within thirty (30) days of the change occurring:
        a. change of Owner;
        b. change of address of the Owner;
        c. change of partners where the Owner is or at any time becomes a partnership, and a copy of the most recent declaration filed under the *Business Names Act,* R.S.O. 1990, c.B17 shall be included in the notification to the District Manager; or
        d. change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current information filed under the *Corporations Information Act,* R.S.O. 1990, c. C39 shall be included in the notification to the District Manager.
    2. In the event of any change in ownership of the Works, other than a change to a successor municipality, the Owner shall notify in writing the succeeding owner of the existence of this Approval, and a copy of such notice shall be forwarded to the District Manager and the Director.
    3. The Owner shall ensure that all communications made pursuant to this condition refer to the number at the top of this Approval.

4. **OPERATION AND MAINTENANCE**
    1. If applicable, any proposed storm sewers or other stormwater conveyance in this Approval can be constructed but not operated until the proposed stormwater management facilities in this Approval or any other Approval that are designed to service the storm sewers or other stormwater conveyance are in operation.

Schedule A

1. Application for Environmental Compliance Approval, dated February 23, 2018, received on March 9, 2018, submitted by Husson Engineering + Management on behalf of 2286974 Ontario Inc.;
2. Stormwater Management Report (along with all its appendices), dated September 2017, prepared by Husson Engineering + Management;
3. Pipe Data Form, prepared by Husson Engineering + Management;
4. Sanitary Design Sheet, dated May 10, 2018, prepared by Husson Engineering + Management;
5. Storm Design Sheet, dated May 18, 2018, prepared by Husson Engineering +

Management;

6. Engineering Drawings a set of twenty-six (26) engineering drawings, stamped and dated on March 1, 2018, prepared by Husson Engineering + Management;
7. Engineering Drawing, Elgin Street Plan and Profile Station 0+870 To 1+020, stamped and dated on May 10, 2018, prepared by Husson Engineering + Management;
8. Engineering Drawings, General Plan, Grading Plan and Storm Drainage Plan, stamped and dated on May 18, 2018, prepared by Husson Engineering + Management;
9. Engineering Drawings, Elgin Street Plan and Profile Station 1+330 To 1+606 and Elgin Street Plan and Profile Station 1+020 To 1+330, stamped and dated on May 28, 2018, prepared by Husson Engineering + Management; and
10. Emails from Edward McGriskin of Husson Engineering + Management, dated May 11, May 16, May 17, May 18 and May 28, 2018;

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the Works are constructed and operated in the manner in which they were described and upon which approval was granted. This condition is also included to emphasize the precedence of conditions in the Approval and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review. Condition 1.6 is included to emphasize that the issuance of this Approval does not diminish any other statutory and regulatory obligations to which the Owner is subject in the construction, maintenance and operation of the Works. The Condition specifically highlights the need to obtain any necessary conservation authority approvals. The Condition also emphasizes the fact that this Approval doesn't limit the authority of the Ministry to require further information.
2. Condition 2 is included to ensure that, when the Works are constructed, the Works will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment.
3. Condition 3 is included to ensure that the Ministry records are kept accurate and current with respect to the approved Works and to ensure that subsequent owners of the Works are made aware of the Approval and continue to operate the Works in compliance with it.
4. Condition 4 is included to prevent the operation of stormwater pipes and other conveyance until such time that their required associated stormwater management

Works are also constructed.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

a. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
b. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or** www.ert.gov.on.ca

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 19th day of June, 2018

Christina Labarge, P.Eng.

Director
appointed for the purposes of Part II.1 of the *Environmental Protection Act*

GW/
c: DWMD Supervisor, MOECC Peterborough
Edward McGriskin, Husson Engineering + Management

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 6817-APGK8V
Issue Date: August 17, 2017

2286974 Ontario Inc.
1944 Fowler Drive
Mississauga, Ontario
L5K 0A1

Site Location: Cobourg CT Lands
Lot Part of Lot 23, Concession A
Town of Cobourg, County of Northumberland
K9A 4J7

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

for the establishment of stormwater infrastructure for the collection, treatment and storage of stormwater run-off to related to the development of the Cobourg CT Lands, located west of Rogers Road and south of Elgin Street, in the Town of Cobourg, County of Northumberland, to provide Enhanced level quality control and attenuate post-development peak flows to pre-development flows for all storm events including the 100 year storm, consisting of the following:

Storm sewers on Greenly Drive, from approximately 30 meters south of Cowin Circle, discharging to proposed sewers on Cowin Circle described below;

Storm sewers (with catchbasin leads) on Cowin Circle, from Greenly Drive, travelling East and West to Access Lane, discharging to the proposed storm sewers on Access Lane;

Storm sewers on Access Lane from Cowin Circle to approximately 50 meters North of Cowin Circle, discharging through the oil grit separator described below;

rooftop storage (catchment area - 0.027 ha) : located on top of Building A, having a depth of 0.08 meters and storage volume of 17 meters cubed, allowing a total maximum discharge of 2 litres per second, discharging through storm pipes to the oil and grit separator, identified below;

rooftop storage (catchment area - 0.0756 ha): located on top of Building B, having a depth of 0.071 meters and storage volume of 46 meters cubed, allowing a total maximum discharge of 3 litre per second, discharging through storm pipes to the oil and grit separator, identified below;

rooftop storage (catchment area - 0.0279 ha): located on top of Building C, having a depth of 0.078 meters and storage volume of 17 meters cubed, allowing a total maximum discharge of 2 litre per second, discharging to the oil and grit separator, identified below;

underground storage: two (2) underground Cultec Recharger 902HD chambers, located on the far northeast side of the property, with a total detention storage volume of approximately 565.56 meters cubed, with an additional 335.3 cubic meters of storage found in the pipe network, receiving flows from the storm sewers described above, complete with orifice tubes between MH20 and MH21 for a

maximum release rate of 5.37 litres per second, discharging through to the oil and grit separator described below;

oil/grit separator (catchment area – 3.81 hectares): - one (1) oil and grit separator (CDS Model PMSU3035-6 or Equivalent Equipment) located on the northern side of the property, approximately 5 meters north of the northern side of Cowin Circle, having a sediment capacity of 2402 litres, oil capacity of 994 litres, with a total holding capacity of 5718 litres and a peak conveyed flow rate of 106 litres per second, discharging through a 750 millimetre pipe into the proposed sewers on Elgin Street;

Sanitary Sewers on Cowin Circle from Greenly Drive, travelling East and West to Access Lane, discharging to the proposed sanitary sewers on Access lane;

Sanitary Sewers on Access Lane from Cowin Circle to Elgin Street, discharging to existing sanitary sewers on Elgin Street;

including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned Works;

all in accordance with the submitted application and supporting documents listed in Schedule "A" forming part of this Approval.

For the purpose of this environmental compliance approval, the following definitions apply:

1. "*Approval*" means this entire document and any schedules attached to it, and the application;
2. *"Director*" means a person appointed by the Minister pursuant to section 5 of the *EPA* for the purposes of Part II.1 of the *EPA;*
3. "*District Manager*" means the *District Manager* of the appropriate local District Office of the *Ministry*, where the *Works* are geographically located;
4. "*EPA*" means the Environmental Protection Act, R.S.O. 1990, c.E.19, as amended;
5. "*Equivalent Equipment*" means a substituted equipment or like-for-like equipment that meets the required quality and performance standards of a named equipment;
6. "*Ministry*" means the ministry of the government of Ontario responsible for the *EPA* and *OWRA* and includes all officials, employees or other persons acting on its behalf;
7. "*Owner*" means 2286974 Ontario Inc., and includes its successors and assignees;
8. "*OWRA*" means the Ontario Water Resources Act, R.S.O. 1990, c. O.40, as amended;
9. "*Water Supervisor*" means the *Water Supervisor* of the appropriate local office of the Safe Drinking Water Branch of the *Ministry,* where the *Works* are geographically located;
10. "*Works*" means the sewage works described in the *Owner's* application, and this *Approval.*

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. **GENERAL CONDITIONS**
    1. The *Owner* shall ensure that any person authorized to carry out work on or operate any aspect of the *Works* is notified of this *Approval* and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

2. Except as otherwise provided by these Conditions, the *Owner* shall design, build, install, operate and maintain the *Works* in accordance with the description given in this *Approval,* and the application for approval of the *Works.*
3. Where there is a conflict between a provision of any document in the schedule referred to in this *Approval* and the conditions of this *Approval,* the conditions in this *Approval* shall take precedence, and where there is a conflict between the documents in the schedule, the document bearing the most recent date shall prevail.
4. Where there is a conflict between the documents listed in Schedule 'A' and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.
5. The conditions of this *Approval* are severable. If any condition of this *Approval,* or the application of any requirement of this *Approval* to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this *Approval* shall not be affected thereby.

2. **EXPIRY OF APPROVAL**
   1. This *Approval* will cease to apply to those parts of the *Work* which have not been constructed within five (5) years of the date of this *Approval.*
   2. In the event that completion and commissioning of any portion of the *Works* is anticipated to be delayed beyond the specified expiry period, the *Owner* shall submit an application of extension to the expiry period, at least twelve (12) months prior to the end of the period. The application for extension shall include the reason(s) for the delay, whether there is any design change(s) and a review of whether the standards applicable at the time of *Approval* of the *Works* are still applicable at the time of request for extension, to ensure the ongoing protection of the environment.
3. **CHANGE OF OWNER**
   1. The *Owner* shall notify the *District Manager* and the *Director,* in writing, of any of the following changes within thirty (30) days of the change occurring:
      a. change of *Owner;*
      b. change of address of the *Owner;*
      c. change of partners where the *Owner* is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c.B17 shall be included in the notification to the *District Manager;* or
      d. change of name of the corporation where the *Owner* is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C39 shall be included in the notification to the *District Manager.*
   2. In the event of any change in ownership of the *Works*, other than a change to a successor municipality, the *Owner* shall notify in writing the succeeding owner of the existence of this *Approval*, and a copy of such notice shall be forwarded to the *District Manager* and the *Director.*
   3. The *Owner* shall ensure that all communications made pursuant to this condition refer to the number at the top of this *Approval.*
   4. Notwithstanding any other requirements in this *Approval*, upon transfer of the ownership or assumption of the *Works* to a municipality if applicable, any reference to the *District Manager* shall be replaced with the *Water Supervisor.*
4. **OPERATION AND MAINTENANCE**
   1. If applicable, any proposed storm sewers or other stormwater conveyance in this *Approval* can be constructed but not operated until the proposed stormwater management facilities in this

Approval or any other *Approval* that are designed to service the storm sewers or other stormwater conveyance are in operation.

2. The *Owner* shall make all necessary investigations, take all necessary steps and obtain all necessary approvals so as to ensure that the physical structure, siting and operations of the *Works* do not constitute a safety or health hazard to the general public.
3. The *Owner* shall inspect and ensure that the design minimum liquid retention volume is maintained in the *Works* at all times, except when maintenance is required.
4. The *Owner* shall undertake an inspection of the condition of the *Works,* at least once a year, and undertake any necessary cleaning and maintenance to ensure that sediment, debris and excessive decaying vegetation are removed from the *Works* to prevent the excessive build-up of sediment, oil/grit, debris and/or decaying vegetation, to avoid reduction of the capacity and/or permeability of the *Works,* as applicable. The *Owner* shall also regularly inspect and clean out the inlet to and outlet from the *Works* to ensure that these are not obstructed.
5. The *Owner* shall design, construct and operate the *Works* with the objective that the effluent from the *Works* is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film, sheen, foam or discoloration on the receiving waters.
6. The *Owner* shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook at the *Owner's* administration office for inspection by the *Ministry.* The logbook shall include the following:
   a. the name of the *Works;* and
   b. the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed and method of clean-out of the *Works.*
7. The *Owner* shall prepare an operations manual prior to the commencement of operation of the *Works* that includes, but is not necessarily limited to, the following information:
   a. operating and maintenance procedures for routine operation of the *Works;*
   b. inspection programs, including frequency of inspection, for the *Works* and the methods or tests employed to detect when maintenance is necessary;
   c. repair and maintenance programs, including the frequency of repair and maintenance for the *Works;*
   d. contingency plans and procedures for dealing with potential spills and any other abnormal situations and for notifying the *District Manager;* and
   e. procedures for receiving, responding and recording public complaints, including recording any follow-up actions taken.
8. The *Owner* shall maintain the operations manual current and retain a copy at the location of the *Works* for the operational life of the *Works.* Upon request, the *Owner* shall make the manual available to *Ministry* staff.

5. **TEMPORARY EROSION AND SEDIMENT CONTROL**
   1. The *Owner* shall install and maintain temporary sediment and erosion control measures during construction and conduct inspections once every two (2) weeks and after each significant storm event (a significant storm event is defined as a minimum of 25 mm of rain in any 24 hours period). The inspections and maintenance of the temporary sediment and erosion control measures shall continue until they are no longer required and at which time they shall be removed and all disturbed areas reinstated properly.
   2. The *Owner* shall maintain records of inspections and maintenance which shall be made available for inspection by the *Ministry,* upon request. The record shall include the name of the inspector, date of inspection, and the remedial measures, if any, undertaken to maintain the

temporary sediment and erosion control measures.

6. **REPORTING**
    1. One (1) week prior to the start-up of the operation of the *Works,* the *Owner* shall notify the *District Manager* (in writing) of the pending start-up date.
    2. The *Owner* shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to *Ministry* staff.
    3. The *Owner* shall prepare and submit a performance report to the *District Manager* on an annual basis, within ninety (90) days following the end of the period being reported upon. The first such report shall cover the first annual period following the commencement of operation of the *Works* and subsequent reports shall be submitted to cover successive annual periods following thereafter. The reports shall contain, but shall not be limited to, the following information:
        a. a description of any operating problems encountered and corrective actions taken;
        b. a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the *Works,* including an estimate of the quantity of any materials removed from the *Works;*
        c. a summary of any complaints received during the reporting period and any steps taken to address the complaints;
        d. a summary of all spill or abnormal discharge events; and
        e. any other information the *District Manager* requires from time to time.

Schedule A

Application for Environmental Compliance Approval for Municipal and Private Sewage Works, dated April 10, 2017 and received on June 15, 2017, submitted by 2286974 Ontario Inc.;

Stormwater Management Report – Cobourg CT Lands – Town of Cobourg, dated June 2017 prepared by Husson Engineering and Management;

Pipe Data Form; prepared by Husson;

Storm Sewer Design Sheet, dated June 9, 2017, prepared by Husson Engineering and Management;

Engineering Drawings: Corporation of the Town of Cobourg – Cobourg CT Lands – Sixth Submission, dated June 9, 2017, prepared by Husson Engineering and Management; and

E-mails from Jennifer Hazelton of Husson Engineering and Management. to the MOECC, dated July 14, 17, and 20 2017.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the *Works* are constructed and operated in the manner in which they were described and upon which approval was granted. This condition is also included to emphasize the precedence of conditions in the *Approval* and the practice that the *Approval* is based on the most current document, if several conflicting documents are submitted for review.
2. Condition 2 is included to ensure that, when the *Works* are constructed, the *Works* will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment.
3. Condition 3 is included to ensure that the *Ministry* records are kept accurate and current with

respect to approved *Works* and to ensure that subsequent owners of the *Works* are made aware of the *Approval* and continue to operate the *Works* in compliance with it.

4. Condition 4 is included as regular inspection and necessary removal of sediment and excessive decaying vegetation from the *Works* are required to mitigate the impact of sediment, debris and/or decaying vegetation on the treatment capacity of the *Works*. The Condition also ensures that adequate storage is maintained in the *Works* at all times as required by the design. Furthermore, this Condition is included to ensure that the *Works* are operated and maintained to function as designed.
5. Condition 5 is included as installation, regular inspection and maintenance of the temporary sediment and erosion control measures is required to mitigate the impact on the downstream receiving watercourse during construction until they are no longer required.
6. Condition 6 is included to provide a performance record for future references, to ensure that the *Ministry* is made aware of problems as they arise, and to provide a compliance record for all the terms and conditions outlined in this *Approval*, so that the *Ministry* can work with the *Owner* in resolving any problems in a timely manner.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

a. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
b. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or** www.ert.gov.on.ca

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 17th day of August, 2017

Christina Labarge, P.Eng.
Director
appointed for the purposes of Part II.1 of
the *Environmental Protection Act*

EC/
c: DWMD Supervisor, MOECC Peterborough
Jennifer Hazelton, Husson Limited

Appendix G

Supplementary Engineering Drawings:

Stormwater Management Plan (SWM 103) prepared by Sernas Associates
Engineering Drawings (600 & 603) prepared by Husson Engineering

HIGHWAY 2 (ELGIN STREET)

EXISTING CANADIAN TIRE

ROGER ROAD

NEW AMHERST BOULEVARD

101
11.2 ha

102
21.5 ha

103
25.5 ha

201
6.43 ha

200
16.7 ha

1
1.14 ha

2
1.81 ha

3
0.71 ha

301
1.3 ha

EXISTING SWALE

INTERIM DRAINAGE FROM HIGHWAY 2 TO BE CONVEYED VIA EXISTING SWALE TO SWM FACILITY.

ULTIMATE DRAINAGE FROM HIGHWAY 2 TO BE CONVEYED VIA PROPOSED MAJOR (OVERLAND) AND MINOR (STORM SEWER) SYSTEM.

PROPOSED DITCH INLET CATCHBASIN TO CAPTURE MAJOR SYSTEM FROM PARK THAT IS IN EXCESS OF OVERLAND FLOW ROUTE CAPACITY (RIGHT OF WAY)

FUTURE PHASE

FUTURE PHASE

FUTURE PHASE

PARK

PARK

MAJOR SYSTEM ONLY

ALL MAJOR SYSTEM FLOW FROM AREAS 101, 102 AND 200 TO BE CONVEYED OVERLAND THROUGH PARK TOWARDS WEST PROPERTY LIMITS.

PROPOSED SWM FACILITY

SEE INSET

REGIONAL STORM FLOOD LINE 81.26m

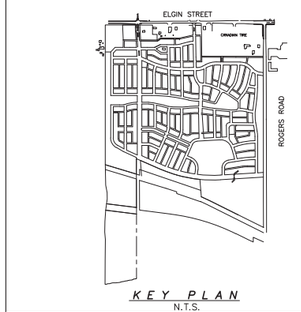
CPR

WEST PARK VILLAGE SWM FACILITY

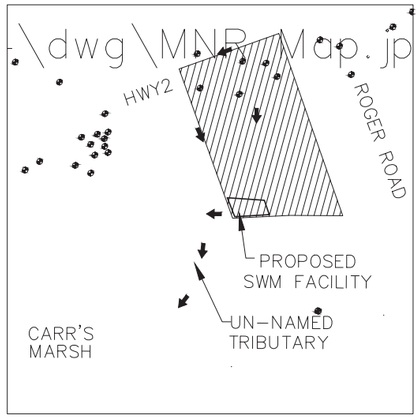
LEGEND

- AREA I.D. / DRAINAGE AREA (HECTARES)
- MAJOR SYSTEM
- MINOR SYSTEM
- POST-DEVELOPMENT DRAINAGE AREA BOUNDARY
- SITE AREA
- DIRECTION OF OVERLAND FLOW
- REGIONAL STORM FLOODLINE
- EXISTING WELL

CONTRACTOR TO BE RESPONSIBLE FOR LOCATION OF ALL EXIST'G U/G & OVERHEAD UTILITIES. VARIOUS UTILITIES CONCERNED TO BE GIVEN REQUIRED ADVANCE NOTICE PRIOR TO ANY DIGGING FOR STAKE OUT. THE CONSULTANT ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.



KEY PLAN
N.T.S.



REVIEWED

_____ P. Eng.
Town Of Cobourg

Date: _____

REVISIONS

No.	DESCRIPTION	DATE	BY	APPROVED

THE CORPORATION OF THE TOWN OF COBOURG
Public Works Department

NEW AMHERST
14T-96001

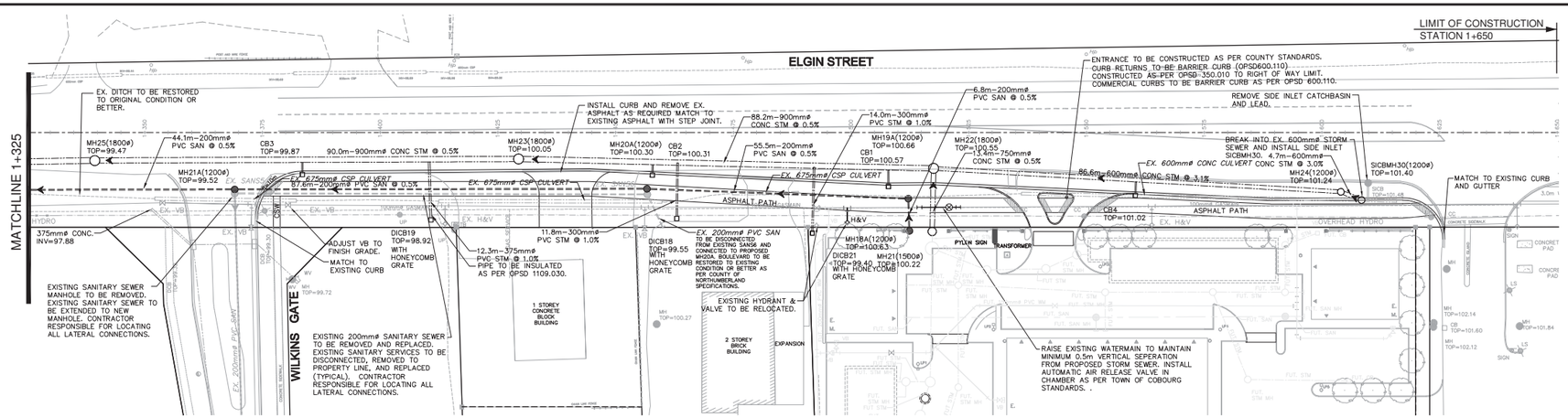
STORMWATER MANAGEMENT PLAN

LICENCED PROFESSIONAL ENGINEER
A.R. KEEPING
100041334
PROVINCE OF ONTARIO

SERNAS ASSOCIATES
110 Scotia Court
Unit 41
Whitby, ON
L1N 8Y7
T 905.686.6402
F 905.432.7877
sernas.com

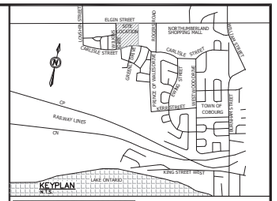
DATE : SEPTEMBER, 2006	DRAWN BY : I.M.	PROJECT No. 06044
SCALE 1:2000	DESIGNED BY : A.K.	DRAWING No. SWM-103
	CHECKED BY :	

R:\P Data - NOV. 30, 2006 File: 06044-SWM103.DWG



NOTES

1. ALL DRIVEWAYS TO REMAIN ACCESSIBLE DURING CONSTRUCTION.
2. ALL DISTURBED AREAS TO BE REINSTATED TO EQUAL OR BETTER QUALITY AFTER SANITARY AND STORM SEWER INSTALLATION.
3. ANY UTILITY STRUCTURES WITHIN ROW WHICH ARE DISTURBED BY CONSTRUCTION NEEDS TO BE COORDINATED WITH APPROPRIATE UTILITY.
4. CONTRACTOR TO PREPARE A TRAFFIC CONTROL PLAN IN ACCORDANCE WITH MTO BOOK 7 AND SUBMIT TO THE COUNTY OF NORTHUMBERLAND FOR APPROVAL PRIOR TO COMMENCING CONSTRUCTION. A MINIMUM OF ONE LANE OF TRAFFIC IN BOTH DIRECTIONS IS TO BE MAINTAINED AT ALL TIMES. .
5. CONTRACTOR TO MAINTAIN EXISTING FLOWS ALONG DITCH DURING CONSTRUCTION.
6. CONTRACTOR TO PROVIDE ALL BY-PASS PUMPING AND BULK HEADING AS REQUIRED TO MAINTAIN FLOWS DURING CONSTRUCTION.
7. PAVEMENT STRUCTURE TO BE AS PER THE COUNTY OF NORTHUMBERLAND, OPSS 350, OPSS 314 AND SOIL ENGINEERS REPORT DATED MAY 2013.
8. INSPECTION OF WORKS WITHIN THE COUNTY ROW TO BE INSPECTED AND SIGNED OFF BY THE COUNTY ENGINEER IN ADDITION TO THE TOWN ENGINEER.
9. CURB SPECIFICATION AS PER OPSD 600.030 CONCRETE CURB AND GUTTER.
10. ALL REMOVAL OF EXISTING ASPHALT REQUIRED FOR CONSTRUCTION TO BE SAW CUT AND LAP JOINT AS PER DETAIL ON DRAWING 100 TO BE USED BETWEEN NEW ASPHALT AND EXISTING ASPHALT. .
11. RESTORE ALL LANDSCAPE AREAS WITH MINIMUM 300mm OF TOPSOIL AND SOD.



BENCH MARK ELEV. 104.662m
COBOURG BENCHMARK 18 — LOCATED AT TERRY FOX SCH.OL ON THE NORTH SIDE,0.3m EAST OF MAIN ENTRANCE, 0.3m ABOVE GRADE.

SITE BENCH MARK ELEV. 100.656m
SPIKE ON TOP OF FENCE POST LOCATED AT SOUTH EAST CORNER OF EXISTING CARPET SUPERSTORE PROPERTY

SITE BENCH MARK ELEV. 102.059m
SPIKE LOCATED IN MORTAR CRACK ON PILLAR LOCATED AT NORTHWEST CORNER OF CANADIAN TIRE GARDEN CENTRE

LEGEND

- PROPOSED STORM
- PROPOSED CATCHBASIN MANHOLE
- PROPSED CATCHBASIN AND LEAD
- EXISTING STORM
- EXISTING SANITARY
- PROPOSED WATERMAIN
- EXISTING WATERMAIN
- PROPOSED HYDRANT AND VALVE
- EXISTING HYDRANT & VALVE
- PROPOSED VALVE AND BOX
- EXISTING VALVE AND BOX

CLIENT:

VANDYK group of companies

No.	DATE	REVISIONS	BY
14.	2019-01-11	REVISED PER COUNTY COMMENTS	EJM
13.	2018-05-28	RE-ISSUED FOR ECA APPROVAL	EJM
12.	2018-05-18	RE-ISSUED FOR ECA APPROVAL	EJM
11.	2018-05-10	RE-ISSUED FOR ECA APPROVAL	EJM
10.	2018-03-01	UPDATED AS PER LATEST COMMENTS	EJM
9.	2017-12-19	UPDATED AS PER LATEST COMMENTS	JSH
8.	2017-09-08	FINAL SUBMISSION	JSH
7.	2017-08-30	ISSUED FOR TENDER	JSH
6.	2017-06-09	SIXTH SUBMISSION	JSH
5.	2017-03-10	FIFTH SUBMISSION	JSH

REGIONAL APPROVAL:

MUNICIPAL APPROVAL:

STAMP: LICENSED PROFESSIONAL ENGINEER — E. J. McGRISKIN — 100151249 — Jan. 11, 2019 — PROVINCE OF ONTARIO

CONSULTANT:

HUSSON ENGINEERING + MANAGEMENT
P 905.709.6825
1725 16TH AVENUE, SUITE 103
RICHMOND HILL, ON L4B 4G8
HUSSON.CA

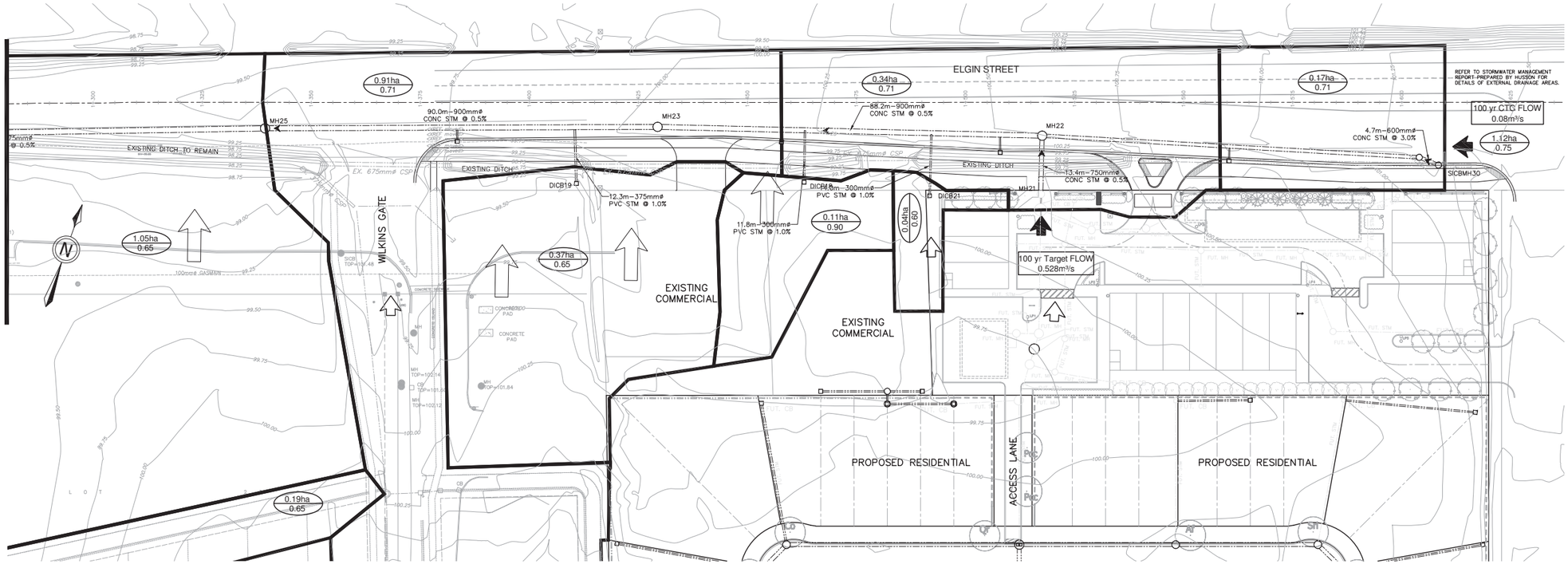
PROJECT TITLE:

TOWN OF COBOURG
COBOURG CT LANDS
CONTRACT No.

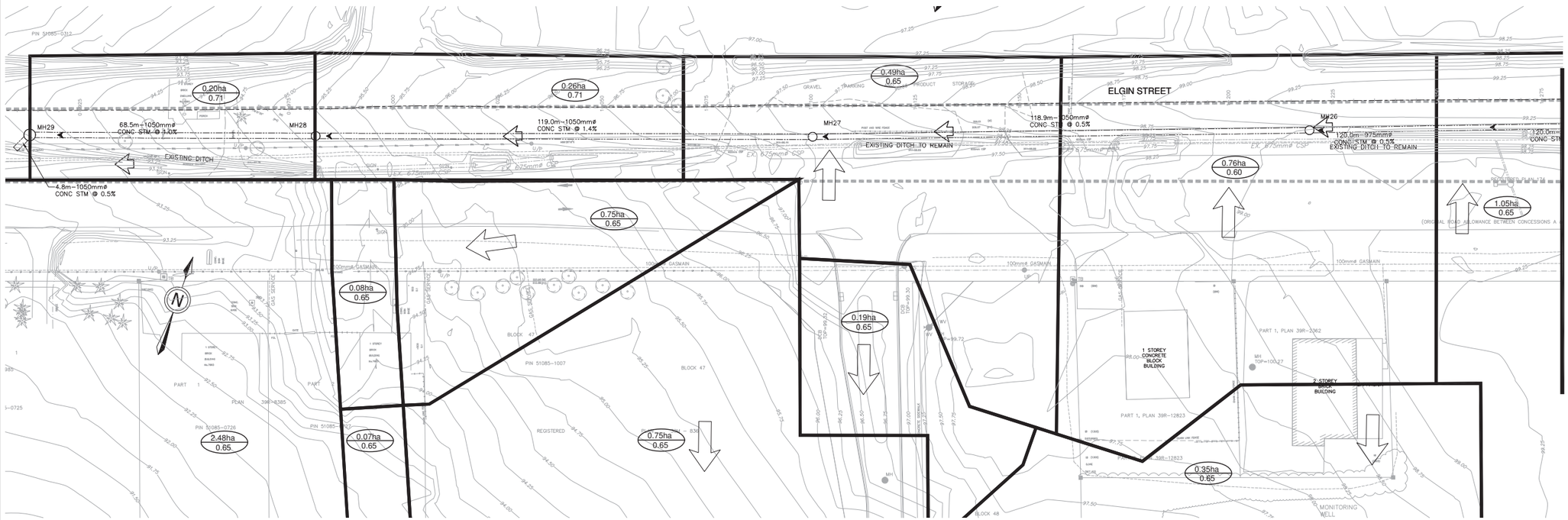
DRAWING TITLE:

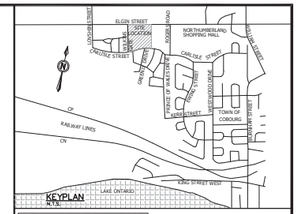
ELGIN STREET GENERAL PLAN

SCALE: 1:500	DESIGN BY: E.J.M.	CHECKED BY: J.S.H.
	DRAWN BY: E.J.M.	CHECKED BY: D.P.H.
CONSULTANT FILE No. 12617	DRAWING No. 600	
DATE DRAWN JULY 2013	SHEET No. SHEET 15 OF 26	



NOTE: AREAS AND RUNOFF COEFFICIENTS FOR AREAS WEST OF CT LANDS DEVELOPMENT HAVE BEEN DEFINED AS PER THE SERNAS STORMWATER MANAGEMENT REPORT - FINAL, DECEMBER 2006, TOPOGRAPHICAL SURVEYS PROVIDED BY IVAN B WALLACE, JANUARY 2014, AND CURRENT STANDARDS PROVIDED BY THE GRCA.





BENCH MARK ELEV. 104.662m
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SPIKE LOCATED IN MORTAR CRACK ON PILLAR LOCATED AT NORTHWEST CORNER OF CANADIAN TIRE GARDEN CENTRE

LEGEND

- 0.08ha / 0.75 — AREA (ha) / RUNOFF COEFFICIENT
- PROPOSED STORM
- PROPOSED CATCHBASIN MANHOLE
- PROPSED CATCHBASIN AND LEAD
- EXISTING STORM
- FUTURE STORM
- STORM DRAINAGE AREA BOUNDARY
- EMERGENCY OVERLAND FLOW
- 100 YR FLOW FROM EXTERNAL SITES
- EXISTING FLOW

CLIENT:

VANDYK group of companies

No.	DATE	REVISIONS	BY
14.	2019–01–11	REVISED PER COUNTY COMMENTS	EJM
13.	2018–05–28	RE–ISSUED FOR ECA APPROVAL	EJM
12.	2018–05–18	RE–ISSUED FOR ECA APPROVAL	EJM
11.	2018–05–10	RE–ISSUED FOR ECA APPROVAL	EJM
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5.	2017–03–10	FIFTH SUBMISSION	JSH

REGIONAL APPROVAL:

MUNICIPAL APPROVAL:

STAMP: LICENSED PROFESSIONAL ENGINEER — E.J. MCGRISKIN — 100151243 — Jan. 11, 2019 — PROVINCE OF ONTARIO

CONSULTANT:

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RICHMOND HILL, ON L4B 4C8
HUSSON.CA

PROJECT TITLE:

TOWN OF COBOURG
COBOURG CT LANDS
CONTRACT No.

DRAWING TITLE:

ELGIN STREET
STORM DRAINAGE PLAN

SCALE: 1:500	DESIGN BY: E.J.M.	CHECKED BY: J.S.H.
	DRAWN BY: E.J.M.	CHECKED BY: D.P.H.
CONSULTANT FILE No. 12617	DRAWING No. 603	
DATE DRAWN JULY 2013	SHEET No. SHEET 18 OF 26	

Municipal and Development Engineering

Water Resources Engineering

Planning

Project Management

MASONGSONG ASSOCIATES ENGINEERING LIMITED
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