Fastfrate

Site Servicing and Stormwater Management Report

Fastfrate Ottawa Warehouse and Distribution Facility

Client Project Number : GA18-0631-01

CIMA+ file number: A001083
October 3, 2022 – Revision 3 – For Site Plan Control

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Executive Summary

This Site Servicing and Stormwater Management Report presents the proposed potable water, sanitary and storm servicing for the Fastfrate Ottawa Warehouse and Distribution Facility. This report will be used in support of the Site Plan Approval process.

Sanitary servicing of the site will be achieved with an on-site wastewater treatment system. This system consists of a sewer, septic tank, pumping chamber, Level IV treatment unit, shallow-buried trench system and mantle. It is anticipated that and Environmental Compliance Approval (ECA) from the MECP will be required, as the system will treat over 10,000 L/d of sanitary sewage.

Potable water will be supplied to the site by a new drinking water well, with sufficient capacity to service the intended development. Since the site is not serviced by municipal watermains, and since the proposed drinking water well will not have the capacity required to provide fire protection, the fire protection volumes will be provided from the permanent pool of the proposed stormwater management wet pond. The fire protection system consists of two (2) dry hydrants, a Siamese connection, and a building sprinkler system.

The stormwater management (SWM) for the Fastfrate site is subject to the overall SWM of the Hawthorne Industrial Park, as presented in the Hawthorne Industrial Park Stormwater Management Report (HIP SWM report), prepared by J.L. Richards & Associates, and dated May 2009. This report also demonstrates how the proposed SWM strategy conforms to the requirements of the HIP SWM report and of the regulatory authorities. Overall, the SWM strategy will be achieved with a system of ditches, culverts, and a wet pond which will provide stormwater quality and quantity control for the site.

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Fastfrate - Ottawa

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1. Introduction

CIMA+ was retained by CIVITAS & Fastfrate to prepare a Site Servicing and Stormwater Management Report for the proposed construction of a warehouse containing cross-docks and office building, at 301 Somme Street in Ottawa, Ontario.

The purpose of this assessment is to confirm that the proposed development will be serviced adequately by the proposed water supply well, septic system and stormwater management. This assessment shall be used in support of the application for Site Plan Approval.

The detailed design of sediment and erosion control measures, site servicing (storm, sanitary, water) and grading, as well as measures for the control of stormwater runoff, are considered in this report, in general accordance with the Ottawa Sewer Design Guidelines (2012), the Ottawa Design Guidelines – Water Distribution (2010) and associated Technical Bulletins.

1.1 Site Description and Proposed Development

The Site is located near the intersection of Rideau Road and Somme Street. The subject site is currently vacant and measures approximately 4.05 ha. The site is bounded by Somme Street to the south and west, by Rideau Road and Christie Creek to the north and by vacant land to the east. The proposed development is a 76,505 sq. ft. warehouse building with associated loading dock areas and employee parking stalls. Refer to the project drawings for the site plan of the proposed development (prepared by CIVITAS).

Figure 1-1 : Site Location & Key Plan

The objective of this study is to assess current site servicing conditions through the review of available background documents and to present detailed concepts, calculations, and results to provide adequate site servicing for the new building and associated parking lot.

1.2 Existing Infrastructure

The proposed site is part of the Hawthorne Industrial Park (HIP) which is currently serviced by roads and an existing open ditch system and SWM facility that convey stormwater and provide SWM quantity control for the entire HIP. The site is not serviced by municipal sewers or municipal watermains.

1.3 Summary of Applicable Background Documents

- MOE SWM Manual (2003)
- 2012 Ottawa Sewer Design Guidelines, as amended by technical bulletins
- 2010 Ottawa Design Guidelines for Water Supply, as amended by technical bulletins
- Existing Master SWM Report (prepared by J.L. Richards Associates Ltd., May 2009)
- Hydrogeological Assessment Report (prepared by GHD, 2021)
- Septic Assessment Report (prepared by GHD, 2021)
- Environmental Impact Study (prepared by GHD, 2021)

1.3.1 Stormwater Management Report, Hawthorne Industrial Park By J.L. Richards & Associates Limited – May 2009.

This report addresses stormwater management within the Hawthorne Industrial Park (**Appendix A – JL Richards SWM Plan**). The contents of this report are discussed in more detail in **Section 4**.

1.3.2 Hydrogeological Assessment Report by GHD, 2021.

This report addresses the hydrogeological characteristics of the site and assessing the capacity of the on-site well (GHD, 2021a).

1.3.3 Septic Assessment Report by GHD, 2021.

This report addresses the percolation rate of the site and assessing the capacity of the on-site septic system (GHD, 2021b).

1.3.4 Environmental Impact Study by GHD, 2021.

A scoped environmental impact study was prepared for this project. This report summarised the investigations of potential environmental impacts and required mitigation measures, & setbacks to be respected during construction of this project.

1.4 Consultation and Permits

In response to the pre-consultation requirements defined in the City’s Development Servicing Study Checklist, the following agencies were consulted in support of the preparation of this report. The Development Servicing Study Checklist as well as all relevant correspondence with the consulted agencies can be found in **Appendix F**.

City of Ottawa

A Pre-Application Consultation meeting was done with the City of Ottawa. The meeting discussions revolved around planning, engineering, and transportation requirements. Details of this consultation are included in **Appendix F**.

CIMA+ had a second meeting with Harry Alvey from the City of Ottawa on May 18, 2021. The discussion was mostly about SWM strategies and fire protection. Details of this consultation are included in **Appendix F.**

South Nation Conservation Authority (SNCA)

The subject site falls under the jurisdiction of the South Nation Conservation Authority (SNCA). CIMA+ contacted James Holland from the SNCA to identify the any Natural Heritage/Hazards features that may impact the development as well as any Storm Water Management Criteria for the site and required approvals/permits. Correspondence with James Holland has been included in **Appendix F**.

Ministry of the Environment, Conservation and Parks (MECP)

CIMA+ expects that the proposed development will require an Environmental Compliance Approval (ECA) as the development requires an on-site wastewater treatment system treating over 10,000 L/d.

It is expected that the application can be submitted directly to the MECP, and not through the City of Ottawa’s Transfer of Review (ToR) Program. The correspondence with the City project manager has been provided in **Appendix F**.

2. Sanitary Servicing

2.1 Existing Conditions

The HIP and the subject site are not serviced by municipal sanitary sewers.

2.2 Sanitary Sewer

Design Criteria

The design criteria for determining the sanitary peak flow rates for the proposed development follow the parameters outlined in Figure 4.3 – Peak Flow Design Parameters Summary of the City of Ottawa Sewer Design Guidelines, 2012 as amended by all applicable Technical Bulletins. These criteria was used to size the sanitary sewers on this project. Namely, the following parameters have been used in determining the peak sanitary flow rates:

Table 2-1: Sanitary Peak Flow Determination Design Criteria

Design Criterion	Commercial Areas
Commercial Average Flow	2.80 L/m^2/day
Commercial Peaking Factor	1.5
Total Infiltration Allowance	0.33 L/s/effective gross hectare (for all areas)

Proposed Sanitary Peak Flows for Sanitary Sewer Sizing

The estimated peak flows from the proposed development based on the design criteria listed in **Table 2-1** are outlined in the following Table.

Table 2-2: Peak Sanitary Flows – Sanitary Sewer Sizing

Flow Type	Total Flow Rate (L/s)
Average Dry Weather Flow Rate	0.23
Peak Dry Weather Flow Rate	0.35
Peak Wet Weather Flow Rate	0.35

Detailed calculations for peak sanitary flows for sanitary sewer sizing are presented in **Appendix D**.

Sanitary Sewer Sizing

The flows indicated above will be directed from the building to the onsite wastewater disposal system through a new 200mm diameter PVC sanitary sewer. This sewer sizing is acceptable per the calculations and sewer design sheets (refer to **Appendix D**).

2.3 Onsite Wastewater Disposal System

2.3.1 Daily Design Sewage Flow

Onsite wastewater treatment systems are regulated under the Ontario Regulation 332/12, the Building Code Act (1992) (OBC), Part 8 of Division B provides the information required the design, construction, installation, operation, and maintenance of these system. The Fastfrate warehouse facility requires a Class 4 system to accept both greywater and human waste.

The proposed Fastfrate facility will be developed with a maximum of 41 loading bays and will be provided with a total of 7 water closets. The daily design sewage flow for the Fastfrate facility was calculated to be 12,800 L/d in accordance with Table 8.2.1.3.3.B of the OBC. For non-residential occupancies, the septic tank working capacity shall be three times the daily design sanitary sewage flow. Therefore, the septic tank must have a minimum working volume of 38,400 L. A summary of the daily sewage design flow calculations are provided in **Table 2-3** below.

Table 2-3: Daily Design Sewage Flow Rate and Septic Tank Volume

Parameter as per OBC – Table 8.2.1.3.B.	Volume (L) as per OBC	Design Basis for Fastfrate	Flow (L/d) (1)
Warehouse			
a) Per water closet, **and**	950	7	6,650
b) Per loading bay	150	41	6,150
Total Daily Design Flow			**12,800**
Minimum Septic Tank Volume (3x the Daily Design Flow) (L)			**38,400**

Notes:
1. Column 2 x Column 3 = Column 4 (e.g., 950 L x 7 = 6,650 L/d)

2.3.2 System Design

A Class 4 septic system typically consists of a septic tank and leaching bed. Depending on the system, a pumping chamber to dose the leaching bed and/or a level IV treatment unit may be required. The design of the septic system is based on the following two factors:

- Daily sewage design flowrate
- Percolation Time of the native soil (T-Time)

The percolation time (T-Time) of the native soil is defined as the amount of time it takes for water to travel 1 cm. Typical T-times of soils ranges from 1 to 50 minutes, with some soils up to 125 minutes. GHD limited (GHD) was retained to excavate test pits to help determine soil stratigraphy and the T-time. Five test pits were advanced to depths ranging from 2.4 to 3.4 m within the proposed septic system area and SWM pond. The soil stratigraphy consisted of fill at each location and described as gravelly sand with silt trace clay to a silty sand with gravel and clay. Fill was observed to the bottom of each test pit. Refer to GHD's septic assessment (GHD, 2021b) for more information. Groundwater seepage was encountered at each test pit and was observed between 1.8 and 2.4 m below ground surface. GHD estimated the T-time to have an average value of 12 to 20 min/cm, based upon gradation test results only. As a conservative approach, a Design T-time of 20 min/cm was selected for sizing the leaching bed for this site.

There are 5 types of leaching beds regulated in Ontario under the OBC:

1. Conventional Leaching Bed
2. Sand Filter Bed
3. Shallow Buried Trench (SBT)
4. Type A Dispersal Bed
5. Type B Dispersal Bed

For the Fastfrate site, a raised SBT leaching bed was selected as it would meet all space and site constraints. The footprint of the SBT system is smaller than a conventional absorption trench system such as a conventional leaching or sand filter bed because the soil is not relied upon for any significant portion of the treatment.

A SBT is an alternative to a conventional leaching bed and are always used in conjunction with a treatment unit capable of consistently providing effluent with 10 mg/L five-day carbonaceous biochemical oxygen demand ($cBOD_5$) and 10 mg/L suspended solids (SS). A SBT leaching bed is a pressurized distribution system which delivers regular timed doses of effluent to small diameter laterals (typically 25 mm PVC pipe) supported inside of a plastic chamber. The laterals are perforated at regular intervals on the top of the pipe with an adequate number of orifices on the bottom to provide self-drainage to prevent freezing during cold weather. When the dosing pump starts, effluent is forced along the entire length of the lateral and sprayed upwards where it hits the chamber and trickles down into the soil. The pump is sized to account for friction losses, static losses, and a residual pressure head of at least 600 mm at the furthest point from the pump. This ensures the entire footprint of the leaching bed is utilized and provides a more efficient distribution and use of the soil absorption system. For soils with T-times of up to 50 min/cm, hourly dosing is generally sufficient to allow the ponded water in the trench to infiltrate into the soil.

Septic Tank, Pumping Chamber & Level IV Treatment Unit Clearances

As per Section 8.2.1.6.(1), the septic tank, level IV treatment unit and the pumping chamber will meet the minimum clearances for treatment unit listed in the OBC Table 8.2.1.6.A. In addition, as per 8.7.4.0.(11), the distances set out in column 2 of Table 8.2.1.6.B. shall be increased by twice the height that the leaching bed is raised above the original grade. The current grade at the site where the septic system will be installed is 90.950 meters above sea level (m ASL). The SBT will be raised with a sand mantle below the SBT. The top of grade of the SBT at the highest elevation is 91.6 m. Therefore, the minimum clearances must be increased by 1.3m. A summary of the clearances required for the treatment units (septic system, pumping chamber, and level IV treatment unit) and the SBT leaching bed at the Fastfrate facility septic system is given in **Table 2-4** and **Table 2-5** below, respectively.

It is noted that there will be a SWM facility located east of the septic system, which will be considered as a pond for establishing minimum separation requirements.

Table 2-4: Minimum Clearances for Treatment Units

Object (1)	Treatment Units Minimum Clearance, m (1)	Additional Clearance required for the Treatment Units at Fastfrate, m (2)	Total Clearance required for the Treatment Units at Fastfrate, m (3)
Structure	1.5	1.3	2.8
Well	15	1.3	16.3
Lake	15	1.3	16.3
Pond	15	1.3	16.3
Reservoir	15	1.3	16.3
River	15	1.3	16.3
Spring	15	1.3	16.3
Stream	15	1.3	16.3
Property Line	3	1.3	4.3

Notes:

1. Columns 1 and 2 are taken from OBC Table 8.2.4.6.A
2. [SBT Top of Grade (91.6 m) - Original ground elevation (90.95 m)] x 2 = 1.3 m
3. Total Clearances required for the Treatment Units for the Fastfrate facility

Table 2-5: Minimum Clearances for Distribution Piping and Leaching Chambers

Object [(1)]	**Distribution Piping and Leaching Chambers Minimum Clearance, m** [(1)]	**Additional Clearance required for the SBT leaching bed at Fastfrate, m** [(2)]	**Total Clearance required for the SBT leaching bed at Fastfrate** [(3)]
Structure	5	1.3	6.3
Well with a watertight casing to a depth of at least 6 m	15	1.3	16.3
Any other well	30	1.3	31.3
Lake	15	1.3	16.3
Pond	15	1.3	16.3
Reservoir	15	1.3	16.3
River	15	1.3	16.3
Spring not used as a source of potable water	15	1.3	16.3
Stream	15	1.3	16.3
Property Line	3	1.3	4.3

Notes:

1. Columns 1 and 2 is taken from OBC Table 8.2.4.6.B
2. [SBT Top of Grade (91.6 m) - Original ground elevation (90.95 m)] x 2 = 1.3 m
3. Total Clearances required for the Treatment Units for the Fastfrate facility

Pumping Chamber

In accordance with sentence 8.7.6.1(3) of the OBC, the pump chamber should have a volume between 50% and 75% of the daily design capacity is recommended. Therefore, it is recommended the pump chamber have a minimum working capacity of 19,200 L.

Submersible Pumps

Wastewater will flow by gravity to the septic tank, and then by gravity to the pumping chamber. The discharge from the pumping chamber and the rest of the system will be pressurized and require submersible pumps. Submersible, readily available and replaceable pumps are wired and rated for an effluent with 3 mm to 20 mm solids handling capacity. An alternating duplex pump configuration is recommended to allow time for service in the event of a pump failure. The specified pump must have a capacity equal to or greater than the calculated maximum pressure requirement as per the SBT design at the design flow. Five submersible pumps will be required:

- Two pumps for the pumping chamber discharge which will operate in a duty / standby configuration with rotation on stop, time, and failure
- Two pumps for the level IV treatment discharge which will operate in a duty / standby configuration with rotation on stop, time, and failure
- One pump for the level IV treatment discharge that will recycle effluent upstream of the septic tank.

The submersible pumps will be provided by the level IV treatment unit supplier, Waterloo Biofilter. Waterloo Biofilter typically specifies Little Giant WS Effluent Series submersible pumps. As per item 8.6.1.3.(4), when a pump or siphon is required the pump or siphon shall be designed to discharge a dose of at least 75% of the internal volume of the distribution pipe within a time period not exceeding fifteen minutes. Therefore, the volume required to dose 75% of 175 m of 50 mm diameter schedule 40 PVC pipe is approximately 64.5 L within 15 minutes, or a required pump flow rate of 4.30 L/min (0.07 L/s). Sentence 8.7.6.1.(2) requires residual pressure (minimum 600 mm as per sentence 8.7.6.1.(2) at the furthest lateral) to ensure the entire bed is dosed.

The Little Giant WS Effluent Series includes submersible pumps capable of dosing 1.70 L/s to 9.5 L/s, depending on the model. With a minimum flow rate of 0.07 L/s, the Little Giant submersible pumps will provide more than the minimum required dosing flowrate. There are several Little Giant WS Effluent Series submersible pump models. The Hazen William formula was used to calculate the theoretical total dynamic head (TDH) in meters of each of the three pumping scenarios and plotted against the different Little Giant submersible pump curves to find the theoretical operating flowrate. A summary of the results in listed in Table 2-6 below. Refer to **Appendix E** for the pump system curves and calculations.

Table 2-6: Theoretical Pumping Flow Rates

System	Recommended Pump Model	Theoretical Operating Point
Pumping Chamber Discharge	WS50HM-12-20	3.2 L/s at 12.8 m TDH
Level IV Treatment Discharge to SBT	WS100HM-12-20	2.2 L/s at 23.8 m TDH
Level IV Treatment Discharge Recycle Line	WS50M-20	5.7 L/s at 3.1 m TDH

Level IV Treatment Unit

A Level IV Treatment is required for SBT type leaching beds. The Waterloo Biofilter level IV treatment unit will be designed to meet the level IV treatment effluent requirements of 10 mg/L for both SS and cBOD$_5$, as listed in Table 2-7 (adapted from OBC Table 8.6.2.2.).

Table 2-7: OBC Treatment Unit Levels and Required Effluent Concentrations

Item	Column 1 Classification of Treatment Unit (1)	Column 2 Suspended Solids (2)	Column 3 CBOD$_5$(2)
1.	Level II	30	25
2.	Level III	15	15
3.	Level IV	10	10

Notes:
1. The classifications of *treatment units* specified in Column 1 correspond to the levels of treatment described in CAN/BNQ 3680-600, “Onsite Residential Wastewater Treatment Technologies”.
2. Maximum concentration in mg/L based on a 30-day average.

The level IV treatment unit must be certified to CAN/BNQ 3680-600 “Onsite Residential Water Treatment Technologies”. The treatment units installed in Ontario typically either use aeration or a filter media to provide treatment. Aeration treatment units have higher operation and maintenance costs and effort as blowers are required in addition to pumps. Filter media type treatment units do not require blowers and require the filter media to be replaced approximately every 10+ years or to the manufacturer’s recommendation. A filter media type level IV treatment unit such as a Waterloo Biofilter is recommended for this application. The sanitary waste from the warehouse will flow by gravity to the septic tank, where settling will occur, and the effluent will flow by gravity to a pumping chamber. The pumping chamber will consist of 2 pumps (duty/ standby configuration with frequent rotation via an alternating timer), which will pump the effluent to the level IV treatment unit to evenly dose the filter media. The filtered water will then be either pumped to the shallow buried trench by one of two pumps (duty / standby configuration with frequenting rotation on an alternating timer) or recycled to the inlet of the septic tank by a third dedicated pump. This recycle line from the level IV treatment unit post nitrification will allow for partial denitrification of the effluent – the reduction in effluent nitrates. All pumps will be controlled and monitored by a common control panel for remote monitoring, control, and data logging over a stable cellular network to Waterloo Biofilter who will contact personnel from the Fastfrate facility. Alarms include high water, float failure and pump failure from the Waterloo Smart Panel. A flow schematic of the system is given in **Figure 2-1** below.

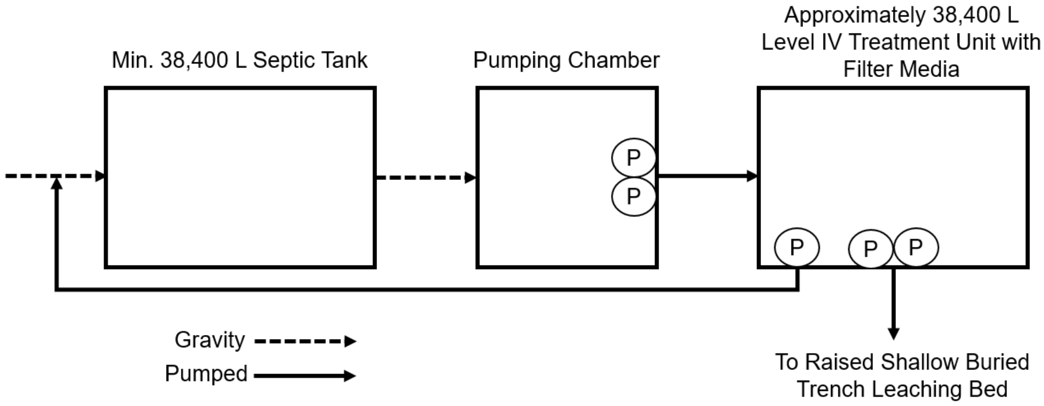

Figure 2-1: Septic System Process Flow Schematic

Shallow Buried Trench Leaching Bed

Due to the shallow groundwater seepage observed at 1.8 to 2.4 m below the surface and the requirement that the bottom of the leaching bed must be a minimum of 900 mm above the top of the high ground water table, the leaching bed must be raised. Due to the limited available space on the site, a SBT system with a sand mantle is recommended to minimize the system footprint. The sand mantle will be approximately 15 m in total length with the last 3 meters of the mantle changing direction slightly more north-west than the first 12 m of the mantle. Even with the irregular shape of the mantle, effluent will flow through the mantle as the T-time of the sand mantle will be imported sand fill with a percolation rate of 6 to 10 minutes/cm and have a maximum 5% if fines passing through a No. 200 sieve.

The length of the SBT distribution pipe laterals is calculated based on the T-time and the Table 8.7.3.1 in the OBC. The percolation tests of the native soil in the area of the proposed septic bed yield 12 to 20 minutes/cm according the GHD report. As per Table 8.7.3.1 in the OBC, a percolation between 1 to 20 minutes/cm corresponds to the following formula to calculate the length of distribution pipe required:

$$L = \frac{Q}{75}$$

Where:

L = The length of distribution pipe in m

Q = Total Daily Design Flow Rate (12,800 L/d for the Fastfrate Facility)

Therefore, the SBT must have a minimum distribution pipe length of 171 m (rounded up to the nearest meter). The OBC stipulates the maximum length of a SBT distribution run is 30 m as specified in clause 8.7.3.2(2)(a). To accommodate the clearances for the SWM pond and property line, 7 distribution pipe runs of 25 m (175 m total) is recommended.

Each lateral shall include a test port at the end of each line. Each test port will have a long radius sweep bend at the end, equipped with a normally closed ball valve and a removal plug with a drilled orifice the same diameter as the lateral spray orifices. The test ports are intended to allow individual line squirt testing and testing of all lines at once. The plugs will be removable to allow line flushing and cleaning as necessary.

The spray orifice size is important in the flow/pressure calculation, and it is recommended that 3 mm sizing be used as a default. OOWA best practices recommends orifices are spaced between 0.6 to 1.2 m along the lateral for even distribution of effluent. The orifices for the Fastfrate facility are specified to be spaced 0.6 m apart.

In addition to the spray orifices, drain orifices are recommended to be evenly spaced, facing downward, on each lateral to allow for drain-out and prevent freezing between pump cycles. It is recommended to have a drain orifice every 2 to 4 spray orifices, offset from the spray orifices and having orifice shields installed to prevent erosion of the trench base. The drain orifices will be spaced every 3 m apart and will be offset from the spray orifices.

OOWA Best Practices recommends the manifold should be at least one trade size larger than the laterals, typically between 32 mm (1.25” nominal) and 50 mm (2” nominal). The distribution laterals will be 25 mm diameter Schedule 40 PVC, and the manifold will be 50 mm diameter Schedule 40 PVC. Each lateral will include a ball valve for isolation and a 50 mm to 25 mm reducer. The components of the SBT leaching bed are given in the section below.

Fill will be required for the raised SBT system. The contact area at the base of the fill system was carefully considered. The contact area between the fill and the native receiving soils is important in order to safely transition treated effluent from the fill to the native soils without causing environmental risks. Due to inconsistent native soil type at the site and as a precaution, a sand mantle is recommended.

The mantle for the Fastfrate septic system was designed according to Option 2 of the Ontario Onsite Wastewater Association (OOWA) Best Practices: Shallow Buried Trench Guidance Document:

The contact area between the native soils and the fill material is which the SBT bed and mantle area should be at least equal to the following formula:

$$A = \frac{Q \times T}{850}$$

Where:

A = Contact Area (m^2)

T = The T-time of the receiving soils (a conservative T-time of 20 minutes/cm was used)

Q = Total Daily Design Flow Rate (12,800 L/d for the Fastfrate facility)

Therefore, the minimum recommended mantle area is 302 m^2. The total mantle surface area provided (extended and beneath the SBT) has an approximate contact surface area of 660 m^2 and is over double the minimum surface area as calculated by the OOWA Best Practices.

Each lateral shall include a test port at the end of each line this may be an individual access port at the end of each lateral. Each test port will have a long radium sweep bend at each test port equipped with a normal closed ball valve and a removal plug with a drilled orifice the same diameter as the lateral spray orifices. The test ports are intended to allow individual line squirt testing and testing of all lines at once. The plugs will be removable to allow line flushing and cleaning as necessary.

The orifice size is important in the flow/pressure calculation, and it is recommended that 3 mm sizing be used as a default. OOWA Best Practices recommends orifices are spaced between 0.6 to 1.2 me along the later for even distribution of effluent. The orifices for the Fastfrate facility septic system are specified to be spaced 0.6 m apart.

The drain orifices are evenly spaced, facing downward, on each lateral to allow for drain-out and prevent freezing during pump cycles. It is recommended to have a drain orifice every 2 to 4 spray orifices, offset from the spray orifices and having orifice shields installed to prevent erosion of the trench base. The drain orifices will be spaced every 3 m apart and will be offset from the spray orifices.

OOWA Best Practices recommends the manifold should be at least one trade size larger than the laterals, typically between 32 mm (1.25" nominal) and 50 mm (2" nominal). The distribution laterals will be 25 mm diameter Schedule 40 PVC pipe, and the manifold will be 50 mm diameter Schedule 40 PVC pipe. Each lateral will include a ball valve for isolation and a 50 mm to 25 mm reducer. To summarize, the components of the SBT system for the Fastfrate facility include:

- Treatment Unit certified to Level IV CAN/BNQ 3680-600 "Onsite Residential Wastewater Treatment Technologies"
- Dosing pump chamber and pumps equipped with timer controls.
- Forcemain from dosing chamber to distribution manifold which typically is PVC schedule 40
- Manifold (header) assembly, consisting of 50 mm (2") pressure pipe (PVC Schedule 40)
- Laterals in the leaching bed consisting of 25 mm (1") pressure pipe (PVC Schedule 40) with 3 mm orifice holes spaced evenly along the top of the pipe and 3 mm drain holes on the bottom
- Pipe support to keep the lateral off the bottom of the trench
- Leaching chamber covering the laterals. Large diameter pipe cut in half is not acceptable, as the footprint of the sidewalls is not sufficient to prevent settling of the chambers over time. Chambers with a wide resting foot are preferred.
- Filter cloth over the chambers
- "Sweep 90' fitting extending within 10 cm of the finished grade at the end of each lateral. The vertical piece may be equipped with a ball valve if desired, and terminate with a threaded cap.

Ground Water Elevation and Native Fill

The septic, pump chamber, and level IV treatment unit tanks will require to be wrapped in a waterproof material to prevent groundwater infiltration. Due to the inconsistency of the fill material observed and the shallow groundwater seepage encountered by GHD, the leaching bed will be required to be raised. The 100-year flood elevation is 90.1 m ASL, therefore the SBT leaching bed and sand mantle have been designed to be above this elevation as not to flood out the septic system during a 100-year storm event. It is recommended prior to placement of the imported fill that any surficial organics are to be removed from the tile bed and mantle area. Additionally, the existing fill material is recommended to be compacted to ensure uneven settlement does not occur.

2.4 Sanitary Servicing Summary and Conclusions

The sanitary servicing design for the proposed development conforms to the requirements of the City of Ottawa Sewer Design Guidelines, 2012, as amended by all applicable Technical Bulletins.

The on-site wastewater disposal system (Septic Tank, Level IV treatment unit and shallow-buried trench system) conform to the requirements of the Ontario Building Code part 8. However, due to the Total Daily Design Sewage Flow being >10,000L, and ECA from the MECP will be required for this system.

3. Potable Water Servicing

3.1 Existing Conditions

The site is currently undeveloped and is not serviced by municipal watermains. As such potable water for this site will be provided by a groundwater supply well. Refer to the GHD's Hydrogeological Assessment (GHD, 2021a) for more information.

3.2 Building Water Demands (Domestic and Fire Protection)

3.2.1 Potable Water Quantity Requirements

Based on design flows from the OBC, the average daily water use for the facility is **8.9 L/min** (**Table 3-1**). Considering a peak demand of 35.6 L/min (average demand * 4), the well discharge of 60 L/min in the Hydrogeological Report will sufficiently meet the water demand requirements of the facility.

Table 3-1 Potable Water Design Flows

Parameter as per OBC – Table 8.2.1.3.B.	Volume (L) as per OBC	Design Basis for Fastfrate	Flow (L/d) (1)
Warehouse			
a) Per water closet, and	950	7	6,650
b) Per loading bay	150	41	6,150
		Total Daily Design Flow (L/d)	**12,800**

Notes:
1. Column 2 x Column 3 = Column 4 (e.g., 950 L x 7 = 6,650 L/d)

The above water demands were also compared with ones obtained following the City of Ottawa Design Guidelines – Water Distribution, 2010 as amended by all applicable Technical Bulletins. The peak water demand obtained using this method is **0.75 L/s (45.0 L/min).** This value is also within well discharge capacity. (**Table 3-2**).

Table 3-2 Potable Water Design Flows – City of Ottawa Design Guidelines – Water Distribution

Demand Type	Average Daily Demand (L/s)	Maximum Daily Demand (L/s)	Maximum (Peak) Hour Demand (L/s)
Commercial	0.28	0.42	0.75
Total	**0.28**	**0.42**	**0.75**

3.2.2 Fire Protection Quantity Requirements

The facility is not connected to a municipal water supply and will therefore require other means of fire protection. The fire protection flow and volumes have been determined by Civilec in a report. Refer to (**Appendix C**).

3.2.2.1 Fire Protection Flow

The Fire Protection flow identified in Civilec report is 7500L/min (125L/s). Refer to (**Appendix C**). The fire flow will be divided between one intake pipe to supply the sprinkler system and two dry fire hydrants. The intake pipe to supply the sprinkler system has been designed for the entire fire flow.

3.2.2.2 Fire Protection Volume

The Fire Protection Volume required for this site as per Civilec report is 675m^3. Refer to (**Appendix C**). The current pond configuration has a storage capacity of 683m^3 of volume between the max ice thickness (88.610) and the top of the intake pipe (87.550).

3.2.2.3 Fire Protection System

The proposed SWM wet pond shall be used for storing water for fire protection. Refer to **Section 4.5** for more information on the design of the proposed SWM pond.

A fire pump located in a 2-hour fire rated mechanical room in the building shall serve the Fire Protection system. The fire pump inlet shall be connected to an 8.0 m deep sump, to be hydraulically connected to the pond via an intake pipe at the base of Pond.

To ensure that the fire protection volumes are adequate during winter conditions, the maximum ice thickness on the permanent pool of the SWM wet pond was determined based on the Annual Freezing Degree Days method. Based on an Ice cover condition coefficient of 2.4 and the Annual Freezing Degree Days value 785 °C-day for 2019, the ice thickness of 67.24 cm was obtained. Based on this calculation, the design ice thickness used is of 69 cm. Detailed calculations are presented in **Appendix C**.

The permanent pool of the proposed SWM pond provides fire protection volumes of 683 m^3 with Ice cover, and 1305 m^3 without ice cover. This volume will provide sufficient volume of water to supply the building, fire protection intake, and two (2) dry hydrants.

A free-standing Siamese connection will be located outside the front entrance and would be used to supply the sprinkler system if the pump within the shaft were unable to draw water from the fire protection pond.

To prevent exfiltration and maintain the water level of the permanent pool, the SWM pond will be constructed with a liner. Specifications for the liner are provided in **Appendix G**. In the event the water level in the sump & pond drops below the minimum level, makeup water will be provided to the sump and pond from the well to mitigate losses due to infiltration and evaporation. Alarm indicators will monitor the levels in the sump & pond, and will control the supply of makeup water to the pond and sump from the well.

The building fire protection system requires 6624 US gal. per minute (110 L/s) per NFPA 13. As such, the building fire protection intake was sized as a 450mm pipe, slopes at 0.2% with a capacity of 127 L/s under gravity free flow conditions (Factor of safety = 1.15). An intake screen capacity of 220 L/s is also specified for the building fire protection intake (Factor of safety = 2.0).

3.3 Proposed Water Supply Well

3.3.1 Well Quality

Samples tested from an existing water supply well confirmed that there were no health-related parameters in exceedance of the Ontario Drinking Water Standards (ODWS). There were several parameters that exceeded their respective ODWS for aesthetic objectives including hardness, total dissolved solids, turbidity, manganese, and iron. These parameters will require commercially available treatment equipment (for example a water softener for treatment of hardness). The treatment systems will be determined later in the design process. A detailed breakdown of test results is presented in GHD's Hydrogeological Assessment (GHD, 2021a).

As a proactive measure, it is recommended that bacteriological treatment (i.e., ultraviolet treatment) be used at a minimum. It is anticipated that the well system will be regulated and will require treatment to meet appropriate standards to ensure potable water is available to employees and visitors. A water treatment specialist should be retained for treatment and a qualified engineer should review the final treatment system before use.

3.3.2 Well Quantity

The water supply well referred to as TW-2 in the Hydrogeological Assessment is capable of providing long-term quantities of groundwater at a pumping rate of 60 L/min based upon the pumping test completed (GHD, 2021a). After 6 hours of pumping, the well drawdown was 1.15 m with 23.9 m of available drawdown remaining. A total of 21,600 L was pumped from the well during the testing.

Based upon the septic total daily design values of 12,800 L/day, the well exceeds the daily design quantities estimated. The actual water volume required for the development on a daily basis is expected to be much less than 10,000 L/day. The water supply well and the aquifer that it is drilled into can safely provide the long-term quantities required for this development based upon the testing completed without significant interference to future and existing neighbouring wells.

3.4 Conclusion – Potable Water Servicing

The proposed well will provide sufficient potable water supply for the development, while the proposed SWM pond permanent pool will provide sufficient fire protection volume for the development.

4. Storm Water Management

4.1 Background

As previously mentioned, the subject site is currently vacant and is part of the Hawthorne Industrial Park (HIP). The site is generally flat and slopes towards the North-East corner before it reaches the 6m tall embankment and reaches Christie Creek on Rideau Road. There is a fill layer of approx. 6m thick across most of the site.

The HIP sector and the Fastfrate site are subject to the HIP Stormwater Management Report and associated drawings (**Appendix A**), developed by J.L. Richards and dated May 2009. This report established the Stormwater Management design for the HIP, which was then used as the design basis for the roads, open ditch system, and HIP SWM facility (refer to Drawings issued for MOE Approval; **Appendix A**).

The HIP SWM facility, located east of the industrial site, only provides stormwater quantity control for the HIP sector. The HIP SWM facility controls storm events up to the 2 - year post-development peak flow to 50% of the 2-year pre-development peak flow; and controls post-development peak flows to pre-development levels for storm events ranging from the 2-year to the 100-year recurrence. The HIP SWM report specifies that individual parcels of the HIP must provide stormwater quality control.

4.2 Stormwater Management Strategy

4.2.1 Deviations from the HIP SWM Report & Drainage Plan

The proposed SWM strategy for this site deviates from that of the HIP SWM report.

The drainage plan for the HIP divides the drainage of the Fastfrate site between two outlets. Part of the site drains to Christie Creek while the remainder drains to the HIP SWM facility via the open ditch system along Somme Street. (**Figure 4-1**).

To simplify the SWM strategy the drainage distribution between both outlets has been altered from what was presented in the HIP SWM report, redirecting more runoff towards the HIP SWM facility (**Figure 4-1**). This simplifies the site grading and allows all quality control measures to be in a single location. Therefore, the proposed conditions require quantity control (through on-site retention) to respect the allowable release flowrates up to the 100-year storm stipulated in the HIP SWM report.

Figure 4-1 SWM Drainage Area from HIP SWM (left), and from Proposed SWM (right)

The original drainage plans and sewer design sheets for the HIP sector, as well as the proposed SWM plan for the Fastfrate site are provided in **Appendix B**.

4.2.2 Allowable Post Development Flow Rates and Quantity Control Requirements

The allowable release rate for the proposed site was determined based on parameters of the HIP SWM report, sewer design sheets and SWM plans. Since the Fastfrate site is smaller than its corresponding catchments of the HIP SWM report, the allowable release rate for the catchments to the HIP SWM facility was re-calculated to account for this. For this calculation, the runoff coefficient, time of concentration and rainfall intensity were kept identical to the HIP SWM report.

Based on this calculation, the allowable release rate for the site to the HIP SWM facility is of **906.9 L/s**, up to and including the 100-year storm event to comply with the HIP SWM report (**Table 4-1).** Supporting calculations and location of sourced information can be found in **Appendix B.**

Table 4-1: Post-development Allowable 100-year Release Flows – HIP SWM Facility

Catchment ID	Catchment area (ha)	Runoff Coefficient (factored)	Time of Concentration (minutes)	Rainfall Intensity (mm/hr)	Allowable Release Flow (L/s)
Fastfrate Site – HIP SWM Report	3.06	0.88	19.43	122.15	**906.87**

The uncontrolled release flow for the proposed site was calculated and compared with the values determined in **Table 4-1.** This comparison is summarised in **Table 4-2.**

Quantity control is therefore required for this site due to the catchment redistribution discussed in Section 4.2.1. Supporting calculations and location of sourced information can be found in **Appendix B.**

Table 4-2: *Post-development Allowable 100-year Release Rates – HIP SWM Facility*

Catchment ID	Catchment area (ha)	Runoff Coefficient (factored)	Uncontrolled Release Flow – 100year (L/s)	Allowable Release Flow – 100-year (L/s)	Allowable Release Rate – 100-year (L/s/ha)
Fastfrate Site – HIP SWM Report	3.06	0.88	906.9	906.9	296.89
Fastfrate Site – Proposed SWM	3.66	0.92	1093.2	906.9	247.78

Similar calculations for the redistribution of catchments that outlet to Christie Creek were undertaken and are included in **Appendix B.**

4.3 Design Criteria and Assumptions

- Quality control requirements: 80% TSS Removal must be provided for our site as required by the South Nation Conservation Authority (SNCA).
- Per the HIP SWM report, the existing open ditch system is designed to the 100-year event, and the existing culverts are designed to the 10-year event.
- The current site plan deviates from the HIP SWM report. To conform with the original SWM, the 100-year allowable release rate to the SWM facility must remain at 906.9 L/s (refer to **Section 4.2.2**).

4.4 Proposed Storm Servicing

All detailed SWM calculations and plans are presented in **Appendix B.**

4.4.1 Stormwater Quality Control

As specified in the HIP SWM report, the HIP SWM facility was not designed to provide quality control. It was anticipated that each individual parcel was to provide its own quality control and achieve the normal level of protection (70% TSS Removal).

Through consultation with the South Nation Conservation Authority (SNCA, refer to **Appendix F**) the quality control requirements for the HIP parcels have been revised to the enhanced level of protection (80% TSS removal).

The portion of the site that naturally drains into Christie Creek will not require quality treatment since this area will remain undeveloped and vegetated. Therefore, only the developed portion of the site draining towards the Somme Street ditches and to the existing HIP SWM facility will be treated for quality.

The quality control requirements will be achieved using a combination of grassed swales and a wet pond, operating as a “treatment train”. The grassed swales, which are sloped to promote infiltration and low channel velocities (<0.5 m/s) will provide the required pre-treatment for the wet pond.

The wet pond was designed based on the volumetric water quality criteria, interpolated Table 3.2 of the MECP SWM guidelines (2003). Since the proposed site has an imperviousness ratio of 74%, the total storage requirement for quality control is of 231.67 m^3/ha. The wet pond requires a total water Quality Storage of 847m^3. In the pond dimensioning, at least 701.5 m^3 will be provided in the permanent pool and at least 147m^3 will be provided as extended detention (**Table 4-3**).

For this facility, the extended detention volume will be retained for a period of at least 12 hours, as per the MECP SWM Guidelines on wet ponds with < 8 ha of drainage area.

Table 4-3: Wet Pond Volume Calculations – 74% Impervious; 80% TSS Removal

Quality Control Volumes	MECP Storage Requirement (m³/ha)	Catchment Area (ha)	Required Storage Volume (m³)
Permanent Pool	191.67	3.66	701.5
Extended Detention	40		146.4
Total	**231.67**	**3.66**	**847.9**

4.4.2 Stormwater Quantity Control

The anticipated post-development flow rates and required storage when controlled to the allowable post-development release rate are summarized below.

The site's SWM outlet will likely to be submerged during the 100-year storm due to the water level in the Somme street ditch. Considering this, the storage volumes for this site were determined assuming constant discharge at **half of the allowable release rate**. This method is used to provide the additional retention required because of the hydraulic grade line at the outlet. The storage requirements at the full and half release rates are compared in **Table 4-4,** and Supporting calculations can be found in **Appendix B.**

At a release rate of **435.4 L/s**, a storage volume of **716 m³** is proposed in the SWM pond and a storage volume of **115 m^3** is proposed on roofs for a total of **831 m^3**. This volume can be accumulated on the site available storage volume**.** The available storage volumes do not account for surface storage in storm sewers, culverts or other ponding areas.

For the roof sub-areas of the warehouse and office building, the proposed release rate is **236.7 L/s**. This release rate generates **115 m^3** of roof storage, which is conservative with respect to the maximum available storage on the building roof (**Table 4-4)**. This release rate cannot be reduced further without exceeding available roof storage.

Table 4-4: Post-development Flowrate and Storage Summary

Retention Areas	100-year – Full Release Rate (L/s)	100-year – Half Release Rate (L/s)	100-year Storage Volume – Full Release Rate (m³)	100-year Storage Volume – Half Release Rate (m³)	Available Storage Volume (m³)
Roof Sub-Area	236.7		**115.0**		143.9

SWM Pond & Swales	670.2	216.76	329.9	**716.0**	996.1
Total Site	**906.9**	453.4	444.9	**831.0**	1140.0

To protect the site from a backwater in the Somme street Ditch, the outlet pipe will be equipped with an inline backflow preventer (**Appendix G**). This coupled with the ample available storage capacity on site will be sufficient to ensure the site SWM functions properly in the event of prolonged surcharging of the receiving open ditch system during the 100-year event.

4.4.3 Site Culverts, Stormwater Outlet and Backwater Elevations

The site culverts were sized based the 100-year peak flow and resulting backwater elevations. The backwater elevations were determined based on elevations culvert headwater, calculated assuming steady-state flow conditions and a constant tailwater elevation.

To simplify the headwater calculation, upstream culverts used the downstream culvert's headwater elevation as the upstream tailwater elevation.

The 100-year water level in the municipal ditch (90.07 m ASL) was used as the tailwater elevation for the site's stormwater outlet. This depth was determined from grades in the Somme Street Ditch and its 100-year flow depth determined in the HIP SWM report.

Because of the flat nature of the site, the site's culverts are designed for the 100-year design storm due to the limited freeboard between the site and Somme street catchments.

A summary of the site culvert design under freeflow and submerged condition of the site outlet are presented in **Table 4-5** and **Table 4-6**, respectively. Detailed calculations supporting the culvert sizing are available under **Appendix B**.

Table 4-5: Culvert Sizing Summary – Freeflow

Culvert	Size	Catchment	Q_{100y} (L/s)	HW	HW/D	HW elevation	TW elevation
East Ditch	1x CSPA 1030x740	A2	446	0.56	0.76	90.09	89.82
West Ditch	1x CSPA 910x660	A1	231	0.575	0.87	90.09	89.82
STM Pond Transfer Culvert	2x CSPA 1030x740	A1-A7	907	0.595	0.80	89.82	89.50

Table 4-6: Culvert Sizing Summary – Submerged Outlet

Culvert	Size	Catchment	Q_{100y} (L/s)	HW	HW/D	HW elevation	TW elevation
East Ditch	1x CSPA 1030x740	A2	446	0.92	1.24	90.45	90.300

West Ditch	1x CSPA 910x660	A1	231	0.92	1.39	90.51	90.300
STM Pond Transfer Culvert	2x CSPA 1030x740	A1 to A7	907	1.00	1.35	90.300	90.150

Further to the tables above, the backwater elevations resulting from the 100-year design storm are summarized below, for both the Freeflow and Submerged Outlet conditions. Based on these elevations, the water surface elevation on the site remains at 0.300 from the building underside of footing in both conditions.

Table 4-7: Summary of Backwater Elevations – 100-year

Location	Headwater Elevation – Freeflow Outlet Condition (m)	Headwater Elevation – Surcharged Outlet Condition (m)	Reference to Supporting Calculations
Outlet Pipe	90.09	90.150	
Culvert #1	90.09	90.51	HW for "West Site – 100y"
Culvert #2	90.16	90.45	HW for "East Site – 100y"
Culvert #3	90.55	90.55	HW for "West Entrance"
Culvert #4	90.22	90.22	HW for "East Entrance"
Culvert #5	89.82	90.30	HW for "Transfer Culvert – 100y"

Spill points have been included in the site to mitigate the risk of localised flooding should site culverts be blocked during the 100-year design storm (**Table 4-8**).

Table 4-8: Summary of Site Spill Points

Site Spill Points	Spill Elevation (m)
SWM Pond Overflow to Somme Street Ditch	90.200
West Site Spill to Christie Creek	90.280
East Site Spill to Christie Creek	90.280
SWM Pond Overflow u/s of Transfer Culvert	90.375

Site ditches have been designed to convey the 100-year flow with a manning`s ‘n’-value of 0.03 for long grassed swale. Detailed calculations with input values shown in **Table 4-9** have been provided in **Appendix B,** . A summary of inputs to the calculations is provided

Table 4-9: Ditch Sizing Summary

Ditch	Catchment	Q_{100y} (L/s)
East Ditch	A2	446
West Ditch	A1	231

4.4.4 Municipal Ditch and Road Culverts

The east and west entrances to the site cross the existing open ditch system and require installation of culverts. The sizing of the culverts was determined with consideration of the upstream municipal culverts since the SWM system outlet for stormwater is situated downstream of these culverts. The culverts were sized for the 10-year storm, as per the HIP SWM report. Culvert sizing suitability calculations can be found in **Appendix B**.

4.4.5 Building Service Connection

A 600 mm storm sewer service connection will be provided on the south side of the proposed building and will be directed towards the SWM pond. The storm sewer will convey controlled runoff from the roof and uncontrolled runoff from catchments A4 and A5 (refer to **Appendix B**).

4.4.6 Deviations from the Ottawa Sewer Design Guidelines – Swale Minimum Slope

The slope of the swales conveying stormwater for this site are inferior to the minimum slope specified in section 6.4.1 of the Sewer Design guidelines.

The grassed swales are intended to contribute to runoff quality control, operating with the proposed wet pond as a “treatment train”. The reduced slope of grassed swales promotes infiltration and low channel velocities (<0.5 m/s). This improves the effectiveness of grassed swales for runoff quality control (LID SWM Planning and Design Manual).

Based on the interpretation from percolation tests for this site, the soil infiltration rate can be estimated to range between 30 to 50mm/hr. With dry swales, an underdrain is typically recommended if the soil infiltration rate is <15 mm/hr.

As such, the risk of prolonged ponding of water in the ditches is mitigated by the soil infiltration rate and presence of on-site existing fill and well draining soil.

4.4.7 Culvert Ends

Given the addition of localized clear zone with recoverable slopes at the culvert location is not feasible, an assessment of roadway safety implications for the culvert ends were completed by CIMA+ in accordance with the MTO Roadside Design Manual and MTO

Roadside Evaluation Manual. The assessment focused on the installation of guiderails to shield the culvert ends.

Although the culvert ends are located within the clear zone, the installation of new guide rail is also considered a hazard within the clear zone, and thus the collision risk and severity with the new guiderail may outweigh the benefits of shielding the culvert ends. The installation of guide rail is generally recommended where the Cost/Benefit (CB) ratio is ≥ 1. The findings of the analysis produced a CB Ratio of –4.27 for the west entrance and –2.23 for the east entrance meaning that the collision risk and severity with a new guiderail is greater than that of the culvert ends. Refer to **Appendix B.16** for the MTO Roadside Evaluation spreadsheet and calculations.

4.5 Proposed SWM Pond Sizing

This section presents the proposed sizing of the SWM Pond for this project. A summary of the required volumes to be provided in the Wet Pond is presented in **Table 4-10**, and a breakdown of the pond levels and provided volumes is presented in **Table 4-11**.

Table 4-10: Summary of Required SWM Pond Volumes

Parameter	Required Volume (m^3)	Source
Retention Volume	**Full Release Rate:** 329.9 **Half Release Rate:** 716.04	Table 4-4
Extended Detention	146.4	Table 4-3
Fire Protection Volume	675	Section 3.2.2.2
Permanent Pool for Quality Control	701.5	Table 4-3
Sediment Accumulation Volume (25 years)	226.8	Section 4.6.1

Table 4-11: Summary of Provided SWM Pond Volumes

Control Volumes			**Bottom Elevation**	**Top Elevation**	**Depth**	**Provided Volume**	**Required Volume**	
			(m ASL)	**(m ASL)**	**(m)**	**(m^3)**	**(m^3)**	
Freeboard	to 90.375		90.150	90.375	0.225	232.9	-	
	to 90.200		90.150	90.200	0.050	50.8	-	
Retention Volume			89.500	90.150	0.650	**Pond:** 610.3 **Swales:** 436.0 **Total:** 1046.3	**Full Release Rate** 329.9	**Half Release Rate** 716.04
Extended Detention			89.300	89.500	0.200	169.1	146.4	
Permanent Pool (PP)	Fire Protection Volume	With Ice Cover	87.550	88.610	1.06	683	675	
		Normal	87.550	89.300	1.60	1305	-	
	Depth of Fire Protection Intake		87.100	87.550	0.450	209	-	
	Sediment Accumulation Volume		86.100	87.100	1.0	327	226.8	
	Total PP Volume		86.100	89.300	3.2	1946	701.5	

4.6 Calculations

4.6.1 Sediment Accumulation Volume

Based on the MECP SWM planning and design guidelines, a conservative estimate of the sediment accumulation volume required for a duration of 25 years is 226.8 m^3 assuming an annual TSS loading of 3.10 m^3/ha/year and a removal efficiency of 80%.

4.6.2 Pond Controls

As defined in the City of Ottawa Sewer Design Guidelines (2012), the Rational Method is a valid approach to determination of peak flows and pipe capacity for drainage areas of less than 40 ha in size. Thus, the Rational Method has been used in the determination of required storage volumes to store the 100-year storm events to the pre-determined allowable release rates.

4.6.2.1 Extended Detention Control (Quality)

The wet pond will use a 200mm reverse pipe with **one 80 mm dia. orifice plate** to control the detention time to the minimum detention time of 12h, per MOE Guidelines for drainage areas less than 8 ha.

Using equation 4.10 from the MECP SWM guidelines resulted in a drawdown time of 15.53 hours.

$$t = \frac{2\,A_p}{C\,A_o(2g)^{0.5}}\left(h_1^{0.5} - h_2^{0.5}\right)$$

Equation 4.10: Drawdown Time

Where:

t = drawdown time in seconds

A_p = surface area of pond (m^2)

C = discharge coefficient

A_0 = cross-sectional area of the orifice (m^2)

g = gravitational acceleration constant

h_1 = starting water elevation above the orifice (m)

h_2 = ending water elevation above the orifice (m)

$$t = \frac{2A_p}{CA_0(2g)^{0.5}}\left(h_1^{0.5} - h_2^{0.5}\right)$$

$$t = \frac{2(876.75)}{(0.63)(0.005)(2 * 9.81)^{0.5}}\left(0.2^{0.5} - 0^{0.5}\right)$$

$$t = 55906\ s = 15.53\ hours$$

4.6.2.2 Release Rate Control (Quantity)

The release rate control, under free flow conditions, will be achieved by **one 450x830 mm rectangular orifice** set at an invert elevation of **89.500 m ASL** and **one 200x775 mm rectangular orifice** set at an invert elevation of **89.925 m ASL**. The outlet structure will control the 100-year release rate to 906.6 L/s under freeflow outlet conditions, and to 470.8 L/s under submerged outlet conditions (Table 4-12).

Table 4-12 Resulting Release Flow with Proposed Controls

Release Rate Control Flow condition	Controlled Release Flow (L/s)	Max. Water Surface Elevation at pond outlet (m ASL)
Free Flow Outlet Condition	906.6	90.090
Submerged Outlet Condition	470.8	90.170

4.6.3 Watercourse Protection Measures

Erosion protection of the soils is required at the inlet and outlet ends of the culverts across the site to provide channel stabilization and scour resistance of the flowing water based on the outlet velocity generated by the check flow for scour, which is the 100-year event.

Design Chart 2.17 of the MTO Drainage Management Manual specifies the maximum permissive flow velocities for a channel based on the channel's native lining material (i.e. soil type). The maximum permissible velocity of a silty sand channel shall be 1.5m/s for water carrying fine silts. In accordance with HDDS WC-3, section 3.2, where the velocity is exceeded the stone size for scour and erosion protection shall be as follows.

Table 4-13: Scour Protection Sizing

Stone Sizes for Scour and Erosion Protection-Low Volume Roads							
Velocity (m/s)	<2.0	<2.6	<3.0	<3.5	<4.0	<4.7	<5.0
Nominal Stone Size* (mm)	100	200	300	400	500	800	1000

* Maximum size of stone to be 1.5 times the nominal stone size. 80% of stones (by mass) must have a diameter of at least 60% of nominal stone size.

The proposed culverts for the Fastfrate site all have velocities below 1.5m/s during the 100-year event and therefore would not require any scour protection. However, to be conservative, CIMA+ recommends scour protection at each culvert entrance and outlet. A nominal stone size of 100mm for erosion protection at the disturbed areas of the watercourse, upstream and downstream within the vicinity of the structure required. The protective apron shall consist of a minimum thickness of 1.5 times the nominal stone size and shall extend for a distance of two times the total culvert rise. Protection along the inlet and outlet embankments to an elevation of 0.3m above the high-water mark is also recommended.

4.7 SWM Conclusions

The storm servicing design for the proposed development generally conforms to the requirements of the City of Ottawa Sewer Design Guidelines, 2012, as amended by all applicable Technical Bulletins. The storm servicing design also conforms to the HIP SWM report (J.L. Richards ,2009). Justifications have been provided where deviations were proposed by the SWM strategy.

The allowable release rate for the site post-development was calculated to be **906.9 L/s**. It is expected that this can be achieved via roof storage and the proposed SWM wet pond.

A Roof Flow Control Declaration will be provided upon completion of the Mechanical and Structural design.

5. Conclusion

The current study demonstrates how the proposed servicing of the site will be achieved, in that the proposed SWM strategy conforms to the existing SWM plan and that the proposed Potable Water, Fire Protection and Sanitary Servicing works will be sufficient to service the proposed development.

Within the site, all services have been designed in keeping with the City of Ottawa design requirements and the requirements of the HIP SWM Report.

We trust this site servicing and stormwater management report is to your satisfaction. If you have any questions regarding this report, please do not hesitate to contact the undersigned.

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Engineering for People

A

Appendix A-1 -
JL Richards Storm Water Management Report

STORMWATER MANAGEMENT REPORT

HAWTHORNE INDUSTRIAL PARK

February 2009
(Revised April 2009)
(Revised May 2009)

Prepared for:

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STORMWATER MANAGEMENT REPORT

HAWTHORNE INDUSTRIAL PARK

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STORMWATER MANAGEMENT REPORT

HAWTHORNE INDUSTRIAL PARK

1.0 INTRODUCTION

1.1 Background

In 1999, J.L. Richards & Associates Limited (JLR) completed a Stormwater Management Study, on behalf of Beaver Road Builders Ltd., for the development of a proposed area previously referred to as the Hawthorne Road Industrial Subdivision. The main objective of the1999 Study was to develop a conceptual storm servicing alternative (including stormwater management) that would support the proposed development without adversely affecting the hydrological regimes of receiving streams. The 1999 Study provided a conceptual design of the conveyance system and on-site storage requirements for the proposed development in order to satisfy the regulatory agencies of the time, namely the Region of Ottawa-Carleton, the City of Gloucester and the South Nation Conservation Authority (SNC).

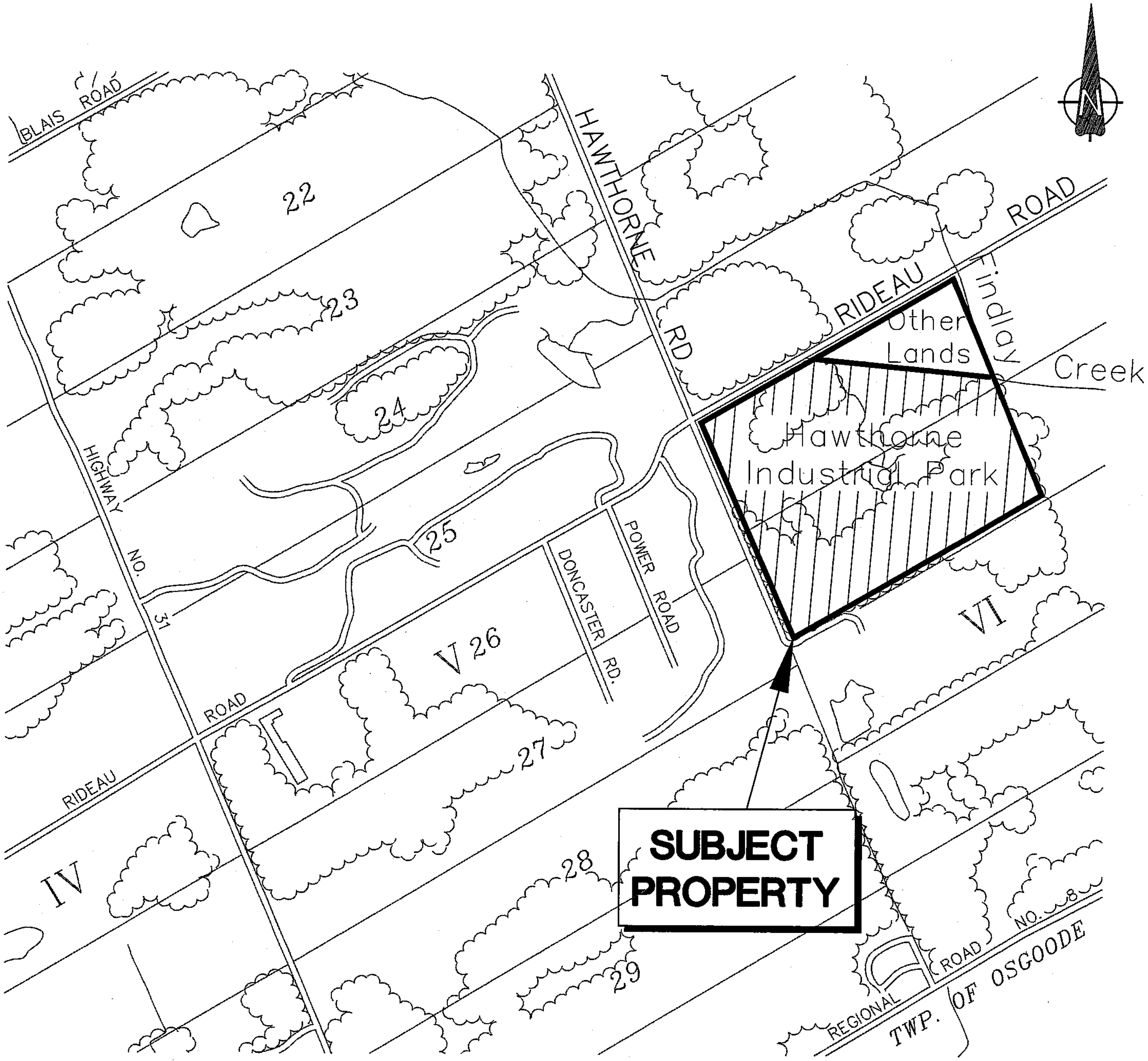
The current landowner, R.W. Tomlinson Limited (Tomlinson), now wishes to complete the development of the subject land, herein referred to as the Hawthorne Industrial Park (HIP).

1.2 General

The proposed 70 hectare (ha) site is located immediately southeast of the Hawthorne Road/ Rideau Road intersection (refer to Figure 1) in the City of Ottawa (formerly in the City of Gloucester) and is expected to service future industrial operations varying in size. Over the past decade, the site has been used to dispose of fill materials resulting from Tomlinson's construction activities. The fill material has been placed in areas where fill was required for the construction of the proposed HIP.

Currently, Orgaworld Canada Ltd. (Orgaworld), has leased approximately 10 ha within HIP, which will house the source separated organics program being implemented by the City of Ottawa in 2009. The Orgaworld site includes a Stormwater Management Facility with a capacity of 15,994 m^3 providing on-site water quantity and quality control.

In addition, a permanent facility within the above subject lands is a total suspended solids (TSS) treatment facility. Consisting of three (3) ponds, this facility was designed



NOT TO SCALE

PROJECT:

HAWTHORNE INDUSTRIAL PARK

DRAWING:

KEY PLAN

J.L.Richards
ENGINEERS·ARCHITECTS·PLANNERS

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DESIGN: M.B.
DRAWN: ARM
CHECKED: G.F.
PLOTTED: Apr 30, 2009

DRAWING NO.: FIGURE 1

JLR NO: 20983

to provide aggregate wash water management to Tomlinson's existing quarry operations on the west side of Hawthorne Road (refer to Appendix 'I' for a copy of the Ministry of the Environment (MOE) Certificate of Approval (C of A) related to these works). In addition to the existing aggregate wash treatment facility, it is proposed to construct separate stormwater management facilities to service water quantity and quality requirements for the HIP.

1.3 Objectives

This Stormwater Managment Report (SWMR) was prepared to demonstrate that the subject lands can be developed as an Industrial Park Subdivision in compliance with the current surface water objectives of the watershed. Since the subject lands drain to Findlay Creek, which is tributary to the North Castor River, storm runoff criteria for this development must be in accordance with the recommendations of the document entitled "Shield's Creek Subwatershed Study, Totten Sims Hubicki Associates, June, 2004", referred throughout this Report as SCSS. More specifically, the above Report provided the following design criteria with regard to stormwater:

Water Quantity

Peak Flow	Post-development peak flows must be controlled to pre-development levels for storm events ranging from a 1:2 year to a 1:100 year recurrence.
Infiltration	Section 5.5 of the SCSS recommends that the quantity and quality of groundwater infiltration be maintained to pre-development rates.
Erosion	The stormwater management strategy for the proposed HIP must be developed to maintain the erosion potential to current levels.

Water Quality

The proposed stormwater management strategy for HIP must be developed to meet a Normal Level of Protection (as per the MOE's publication entitled "Stormwater Management Planning and Design Manual, March, 2003", referred throughout this Report as SWMPDM, which corresponds to a standard approach used in urban development to obtain a targeted total suspended solids (TSS) removal rate of 70%.

2.0 STORM DRAINAGE

2.1 General

Storm servicing for the HIP was designed using the dual drainage concept, also known as the minor/major drainage system. The minor drainage system is mainly comprised of an on-site open ditch and culvert system. The minor system was designed to capture and convey runoff during frequent storm events up to a 1:10 year recurrence. The major system formed by swales/ditches, streets, etc. was sized to accommodate runoff during storm events exceeding 1:10 year up to the 1:100 year recurrence.

The open ditches, culverts and swales were sized using the Rational Method. An inlet time of 15 minutes and runoff coefficients (C-factors) ranging from 0.20 to 0.90 were used in the sizing of the conveyance systems. It should be noted, however, that C-factors used were increased by 10% for the 1:25 year peak flow calculations and by 25% for the 1:100 year recurrence, as per Section 5.4.5.2.1 of the City of Ottawa's Sewer Design Guidelines (November 2004). Rainfall intensities (i.e., Intensity-Duration-Frequency curves (IDF)) required by the Rational Method were also extracted from the City of Ottawa's Sewer Design Guidelines. Peak flow rates for the HIP and Hawthorne Road and Rideau Road are summarized in Table 1 (refer to Appendix 'A' for copies of the Rational Method Design Sheets for the 1:10 year and 1:100 year storm events).

Table 1 - Summary of Peak Flow Rates

Description	Peak Flows (L/s)	
	10 Year	100 Year
Hawthorne Industrial Park (HIP)	5,422	12,814
Hawthorne Road / Rideau Road	3,192	5,417

2.2 Design Criteria

The municipal infrastructure associated with the HIP was designed using the following criteria:

- The HIP open ditch system was sized with sufficient capacity to convey, under free-flowing conditions, the 1:100 year peak flow rate, as calculated by the Rational Method (refer to Appendix 'A' for a copy of the 1:100 year Design Sheet).

- The Hawthorne Road open ditch system was sized with sufficient capacity to convey, under free-flowing conditions, the 1:100 year peak flow rate, as calculated by the Rational Method (refer to Appendix 'A' for a copy of the 1:100 year Design Sheet).

- The existing downstream ditch system along Rideau Road was evaluated to ensure sufficient capacity to convey, under free-flowing conditions, the 1:100 year peak flow rate, as calculated by the Rational Method (refer to Appendix 'A' for a copy of the 1:100 year Design Sheet).

- The culverts included in the HIP and along Hawthorne Road/Rideau Road were sized with sufficient capacity to convey the 1:10 year peak flow rate without overtopping the roadway embankment (refer to Appendix 'A' for a copy of the 1:10 year Design Sheet).

- Given that the receiving watercourse was found to shelter fisheries, the SCSS recommended that a "normal" level of protection be achieved for quality control. To fulfill this requirement, industrial sites must direct runoff to an appropriately sized oil/grit separator unit before stormwater can be conveyed off site to the open roadside ditch/culvert system. To achieve quality control for the internal roads, it is proposed to provide infiltration storage volume in the roadside open ditch system, as per the requirements presented in Table 3.2 of the SWMPDM.

- The SCSS recommended that the erosion potential be maintained to current levels for the receiving water course. To fulfill the above requirement, the two year post-development peak flow will be controlled to 50% of the pre-development peak flow rate.

- Storage volume is to be implemented for the control of the post-development peak flows to pre-development levels for storm events ranging from a 1:2 year to a 1:100 year recurrence to comply with the recommendations of the SCSS.

This Stormwater Management Report (SWMR) has been written to demonstrate that the subject land could be developed in compliance with the above surface water criteria and also prepared in accordance with the SWMPDM. The proposed stormwater management strategy for the HIP was developed to meet a "normal" level of protection, which corresponds to a standard approach used in land development to obtain a targeted TSS removal rate of 70%.

3.0 STORM SERVICING

3.1 General

Peak flow estimation is an important task that is carried out for any proposed development. There are several reasons that explain why flood flow rates are computed as part of site development. The main purpose of these calculations, however, is to allow for the proper configuration and sizing of the proposed conveyance systems to minimize the risk of flooding.

Drainage works are designed for a real or hypothetical storm event that may or may not happen during the lifetime of the facilities. At the onset of the design process, design criteria are adopted that may vary with the type of project, in recognition of the impacts of failure. For this particular project, the level of protection adopted (storm events up to a 1:100 year recurrence) was based on design storm characteristics of an infrequent storm event having a low probability to occur.

3.2 Description of Conveyance Systems and Design Basis

Flowing water can be conveyed to an outlet by either open-channel flow or pipe flow. Storm runoff generated by the subject lands is to be collected and conveyed by a roadside ditch/culvert system before discharging to Findlay Creek via an end-of-pipe stormwater management facility (SWMF).

Sizing of the conveyance systems was carried out using various levels of service. The open ditch system was sized with sufficient capacity to convey, under free-flowing conditions, storm runoff up to the 1:100 year recurrence, while roadway culverts were sized to provide conveyance of the 1:10 year peak flow rates without overtopping the roadway embankments.

As part of this sizing exercise, Storm Drainage Area Plans were prepared and included in this Report (refer to Drawing D-ST1 for the HIP and Drawing D-ST2 for Hawthorne and Rideau Road) that show the delineated area for each of the conveyance segments (i.e., from node location to node location), along with its assigned runoff coefficient (C-factor) based on the type of surface. Since the final development of Hawthorne Industrial Park is unknown at this time, a conservative on-site runoff coefficient (C-factor) of 0.70 was used. Table 2 illustrates the breakdown of a typical site that would generate a weighted runoff coefficient of 0.70.

Table 2 - Typical Potential Land Use Breakdown

Type of Surface	Area (%)	C-Factor
Building	10	1.0
Asphalt Parking	35	0.90
Gravel	35	0.70
Grass	20	0.20
Overall	100	**0.70**

It should be noted that the C-factors shown on the Storm Drainage Area Plans denote those associated with 1:10 year peak flow calculations. As recommended in Section 5.4.5.2.1 of the City of Ottawa's Sewer Design Guidelines, C-factors shown on drawings were increased by 10% and 25% for the 1:25 year and 1:100 year peak flow calculations, respectively (refer to Appendix 'A' for copies of the Rational Method Design Sheets).

3.2.1 Open Ditch System

An open ditch channel is a conduit used to convey flowing water from one location to another, with a free surface. A channel can be classified as either artificial (i.e., manmade) or natural. Artificial channels are those constructed or developed as a result of human activity. This type of conveyance system is usually implemented as a long and mild-sloped channel built in the ground, which provides conveyance of water between two points, with sections of regular geometry and shape. An open ditch system is generally designed to follow site topography and the vertical profile of the adjacent roadway. The most commonly used shapes for open channel ditches are trapezoidal and triangular, with the latter shape utilized mainly for ditches servicing small drainage areas.

The open ditches associated with the HIP and Hawthorne Road were sized with sufficient capacity to convey 1:100 year peak flow rates. As previously noted, the Rational Method Design Sheets (refer to Appendix 'A' for copy of the 1:100 year design sheet) were used to quantify the 1:100 year peak flow rates. The open ditch configuration was carried out utilizing Manning's relationship, along with the proposed geometry and slope of the channel. Two Storm Drainage Area Plans were prepared (refer to Drawings D-ST1 and D-ST2) showing proposed ditch inverts that match those shown on the Rational Method Design Sheets. Based on the ditch sizing exercise, it was determined that triangular shape ditches with 3:1 side slopes and variable depths provided the necessary conveyance of the 1:100 year peak flow rate. The Site Servicing and Grading Plan (refer to Drawing SG) was developed to provide the configuration of open ditch segments.

The existing open ditches along Rideau Road were also evaluated to ensure sufficient capacity was able to convey the 1:100 year peak flow rates resulting from upstream construction works (i.e., construction of Hawthorne Road). The Rational Method Design Sheets (refer to Appendix 'A' for copy of the 1:100 year design sheet) were used to quantify the 1:100 year peak flow rates. An existing 900 mm diameter culvert crossing under Hawthorne Road conveys flow along the north side of Rideau Road (refer to Drawing D-ST2). The capacity of this existing culvert was estimated at 1,400 L/s under a 1.5 m headwater (refer to Appendix 'B' for Culvert Design Summary Table). Upon the review of existing topography, any headwater depths greater than 1.5 m resulted in runoff being directed northerly along Hawthorne Road towards Findlay Creek. In light of the above, the existing open ditches along Rideau Road were evaluated using a conservative plug flow of 1,400 L/s in addition to surface runoff generated by the contributing areas.

3.2.2 Culvert System

The principal function of a culvert is to convey water through an embankment while, at the same time, supporting the weight of the overlying fill and vehicular movement. Culverts can be made of many different materials; steel, polyvinylchloride (PVC), high density polyethylene (HDPE) and concrete. Culverts selected for the HIP and Hawthorne Road are made of corrugated steel, in either round or arch shape. Field observations have shown that there are two major types of culvert flow conditions: inlet control and outlet control.

1. Flow Under Inlet Control

Flow with inlet control means that the discharge capacity of a culvert is controlled at the culvert entrance by the depth of headwater and by the entrance geometry, including the barrel shape, cross sectional area and the type of inlet edge. The roughness and length of the culvert barrel, and the outlet conditions are not factors in determining the culvert capacity. The longitudinal slope reduces headwater only to a small degree and can normally be neglected for conventional culverts flowing in inlet control.

2. Flow Under Outlet Control

Flow with outlet control means that the discharge capacity of a culvert is controlled by the depth of tailwater, including the velocity head within the barrel, the entrance and friction losses. The roughness, length of the culvert barrel, and slope are factors in determining the culvert capacity; the inlet geometry is of lesser importance.

To avoid having to conduct detailed hydraulic computations that would determine the type of flow under which a culvert will probably operate, the procedure recommended by the MTO (refer to MTO's Drainage Management Manual) was utilized. This methodology, referred to as the Conventional Culvert Design procedure, requires that MTO's Design Charts and Design Nomographs be used for both inlet and outlet control conditions. The higher headwater depth that is calculated from those two operating conditions would indicate the type of control and would provide the governing headwater depth. This methodology was utilized to size each culvert crossing, along with the 1:10 year peak flow rates calculated by the Rational Method Design Sheets (refer to Appendix 'A') for each of the conveyance segments. Furthermore, this calculation sheet also provides proposed culvert sizes, along with the type of control and governing depth found when using the conventional culvert design procedure. A summary of the various parameters estimated using MTO's nomographs at each of the culverts has been tabulated using MTO's Form D4-I (refer to Appendix 'B' for Conventional Culvert Design Sheet). This analysis shows that the proposed culvert crossings within the HIP and along Hawthorne Road are capable of conveying the 1:10 year peak flow rates as a minimum, without overtopping any of the roadway embankments. The hydraulic calculations were carried out assuming a roughness coefficient of 0.024 for any of the CSP and CSPA culverts. The Site Servicing and Grading Plan (Drawing SG) shows proposed culvert sizes, lengths and invert elevations at each of the crossings.

The proposed 1030 x 740 mm CSPA culvert crossing under the entrance of the pond access road was of concern due to the high flow rate during the 1:100 year storm event.

There was a possibility that the excess flow overtopping this culvert could short circuit into SWMF via the pond access road. Therefore, an analysis of the flow overtopping the proposed entrance culvert was conducted and the results confirmed that the residual flow would indeed be contained within the right-of-way corridor (refer to Appendix 'J' for desktop calculation).

4.0 WATER BALANCE

Water balance analyses are typically carried out to assess any changes in infiltration to subsurface water-bearing zones as a result of the urbanization (i.e., increase of hard surfaces) of land. The SCSS has identified the need to maintain a necessary level of quantity and quality groundwater recharge via infiltration. Groundwater recharge is required to maintain subsurface base flow to streams and wetlands in addition to maintaining groundwater levels for private and municipal wells. The Hydrogeological Study completed by Golder Associates Limited in 2008 for the HIP identified the site as being underlain by a shallow and deep aquifer separated by an impermeable rock layer. The upper aquifer provided subsurface groundwater flow to streams, while the lower aquifer was the main source for well water supply. Therefore, groundwater recharge for this site was intended to provide subsurface base flow into the receiving Findlay Creek.

Construction fill operations have been active for the HIP since 1994. The results of the geotechnical field investigation conducted by Inspec-Sol Incorporated in 2008 indicates that as much as 5.5 m of fill material (MW7-08) has been placed on parts of the site. The non-native heterogenous fill material is comprised mainly of silty clay and contains trace amounts of road and construction materials. Although the soil component of the fill material exhibits the characteristics of silty clay, the varying composition and density of the remaining portion of the fill affects its permeability in localized areas. Given the above existing conditions, it is difficult to determine how groundwater recharge will behave as subsurface flow in the existing fill matrix, particularly from individual sites within the HIP. The MOE expressed concerns about the use of infiltration strategies on the individual sites given the past history as a construction fill site. Furthermore, the MOE SWMPDM does not endorse the use of infiltration basins on lands zoned for industrial use as there is an increased risk of groundwater contamination should a spill occur on site.

An option was considered to provide infiltration for the entire site at the base of the end-of-pipe Dry Pond facility. Upon further investigation, the geotechnical report indicated that there was a high groundwater table at the proposed pond location. In addition, in-situ soils in the area exhibited poor drainage properties which would have resulted in long retention times at the base of the pond, making it difficult to meet the water balance deficit requirements for the entire site while attempting to mimic the pre-development hydrological cycle.

Representatives from the City and SNC were consulted, and it was concluded that the SCSS groundwater balance targets for this site would be difficult to meet. It was also recognized that on-site infiltration strategies for this industrial subdivision could have a detrimental effect on groundwater quality and jeopardize the natural ecological integrity of receiving waters. In light of the above, it was decided by the approval authorities that the requirement for the water balance would be waived for the HIP development.

5.0 WATER QUALITY

5.1 General

Urbanization has been found to modify the hydrological regime of a receiving stream if inadequate stormwater management measures are implemented. The potential impacts associated with runoff arise primarily from the amount of urban area that is impervious to rain and snowmelt water. These impervious surfaces increase the amount of direct surface runoff that is generated and is conveyed more efficiently to the receiving stream. As part of the SCSS, fisheries resources have been inventoried along this watercourse, along with its associated tributaries. Given that the receiving watercourses were found to shelter fisheries, the approved document recommended that a "normal" level of protection be achieved. To fulfil this requirement, it is proposed that each individual site provide an oil/grit separator and infiltration storage be provided within the roadside open ditch system, as per the requirements presented in the SWMPDM.

5.2 Water Quality Requirement

Stormwater servicing for the HIP has been developed in accordance with the water quality recommendations of the SCSS (70% TSS removal). To fulfil this requirement, individual sites will be required to provide an oil/grit separator be installed to provide quality treatment (i.e., 70% TSS removal) of surface runoff before entering the roadside open ditch/culvert system. In addition, the oil/grit separator will be able to capture and contain hydrocarbons in the event of an on-site accidental spill.

To fulfill the water quality objectives for the paved portion of the HIP internal roads, it is proposed to provide infiltration within the open roadside ditch system to meet the storage volume requirements presented in Table 3.2 of the SWMPDM. Based on the normal level of service required and an imperviousness of 100% for the internal roads, Table 3.2 yields an extrapolated storage volume requirement of 35 m^3/ha. To achieve this storage volume, a clear stone envelope complete with a 200 mm diameter perforated pipe will be installed at the base of the roadside ditches to meet the required storage volume (Refer to Appendix C for calculations).

The following table presents the calculated infiltration volume required for water quality control and those provided by the roadside open ditch system to meet the recommended MOE Design Guidelines.

Table 3 - Water Quality Infiltration Requirements

Phase	Area (ha)	Infiltration Volume Requirement (m^3)	Infiltration Method	Length of 200 mm diameter Perf. Pipe (m)	Infiltration Volume Provided (m^3)
1	1.58	55.1	Open Ditch	1760	55.3
2	0.21	7.4	Open Ditch	240	7.5
Total	1.79	62.5	Open Ditch	2000	62.8

As shown in the above Table, the infiltration volume provided by the proposed open roadside ditch network (62.8 m^3) exceeds that obtained from Table 3.2 (62.5 m^3) of the SWMPDM. It should be noted that additional storage within the void space of the clear stone envelope was not accounted for and would increase the actual infiltration storage volume shown in Table 3.

6.0 HYDROLOGICAL ANALYSIS

6.1 General

To satisfy the surface water objectives presented in Subsections 1.3 and 2.2, a hydrological analysis was carried out to quantify peak flow rate variations resulting from the development of the proposed HIP. To quantify this variation, the SWMHYMO Stormwater Management Hydrological Model (Version 4.02, July, 1999) was utilized to calculate peak flows during severe storm events.

To carry out the hydrological analysis, three storm drainage plans were developed; one representing the pre-development drainage conditions, one representing the post-development conditions for the current study area, Phase 1, and the other for the post-development drainage conditions, including future development, Phase 2. For each of these plans, subwatershed boundaries were delineated based on existing topography of the site and the proposed overland flow direction following development of the site (refer to Figures 2, 3 and 4 for details).

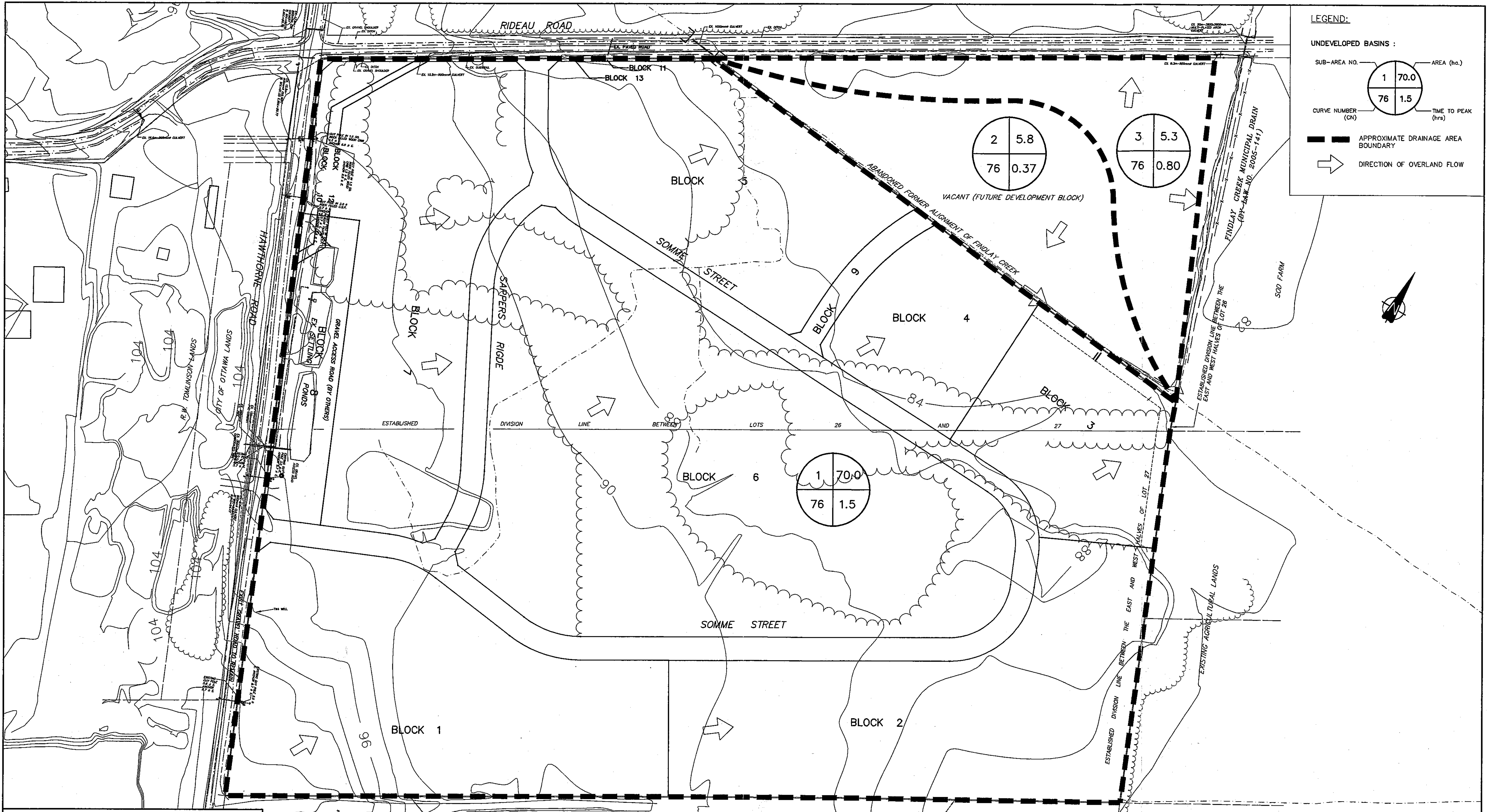
6.2 Synthetic Design Storm Simulation and Hydrological Parameters

Peak runoff rates were calculated for both pre- and post-development conditions using synthetic design storm event modelling. Peak flow rates were estimated using the 3-hour Chicago Design Storm Event, as this synthetic storm event has been recognized as the most critical event for urban runoff applications (refer to Section 5.4.3.1 of the City of Ottawa's Sewer Design Guidelines). The design storm analysis was completed using volumes derived from the Intensity-Duration-Frequency (IDF) curve equation shown in Section 5.4.2 of the City of Ottawa Sewer Design Guidelines compiled using data from 1967 to 1997.

A SWMHYMO data file was developed to represent both pre- and post-development conditions of the subject area. Simulation of surficial runoff generated from undeveloped subwatersheds was carried out using the "DESIGN NASHYD" command along with the SCS procedure to compute rainfall losses. The SCS procedure uses the Curve Number (CN) method to compute rainfall losses and the Nash unit hydrograph to simulate the hydrological response from undeveloped watersheds. To simulate surface runoff from urban subwatersheds, the "CALIB STANDHYD" command was utilized. Hydrological parameter selection and methodology is described below:

Curve Number (CN)

In order to estimate a Curve Number that represents pre-development conditions, the geotechnical investigation completed by Inspec-Sol, entitled "Geotechnical Study Subdivision Plan, Hawthorne Industrial Park, Lots 26 and 27 Concession 6, Southeast of Hawthorne and Rideau Roads, Ottawa, Ontario" dated December 19, 2008 was used. At the time of this investigation, large amounts of fill material were encountered over the majority of the site, which does not reflect the pre-development conditions. As such, only native soils encountered below fill material were used to establish pre-development condition Curve Numbers. The review of the geotechnical investigation shows native



PROJECT:

HAWTHORNE
INDUSTRIAL PARK

DRAWING:

PRE-DEVELOPMENT
STORM DRAINAGE AREA
PLAN

J.L.Richards
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DESIGN:	M.B.
DRAWN:	ARM
CHECKED:	G.F.
PLOTTED:	Apr 30, 2009

DRAWING NO.:
FIGURE 2

JLR NO:
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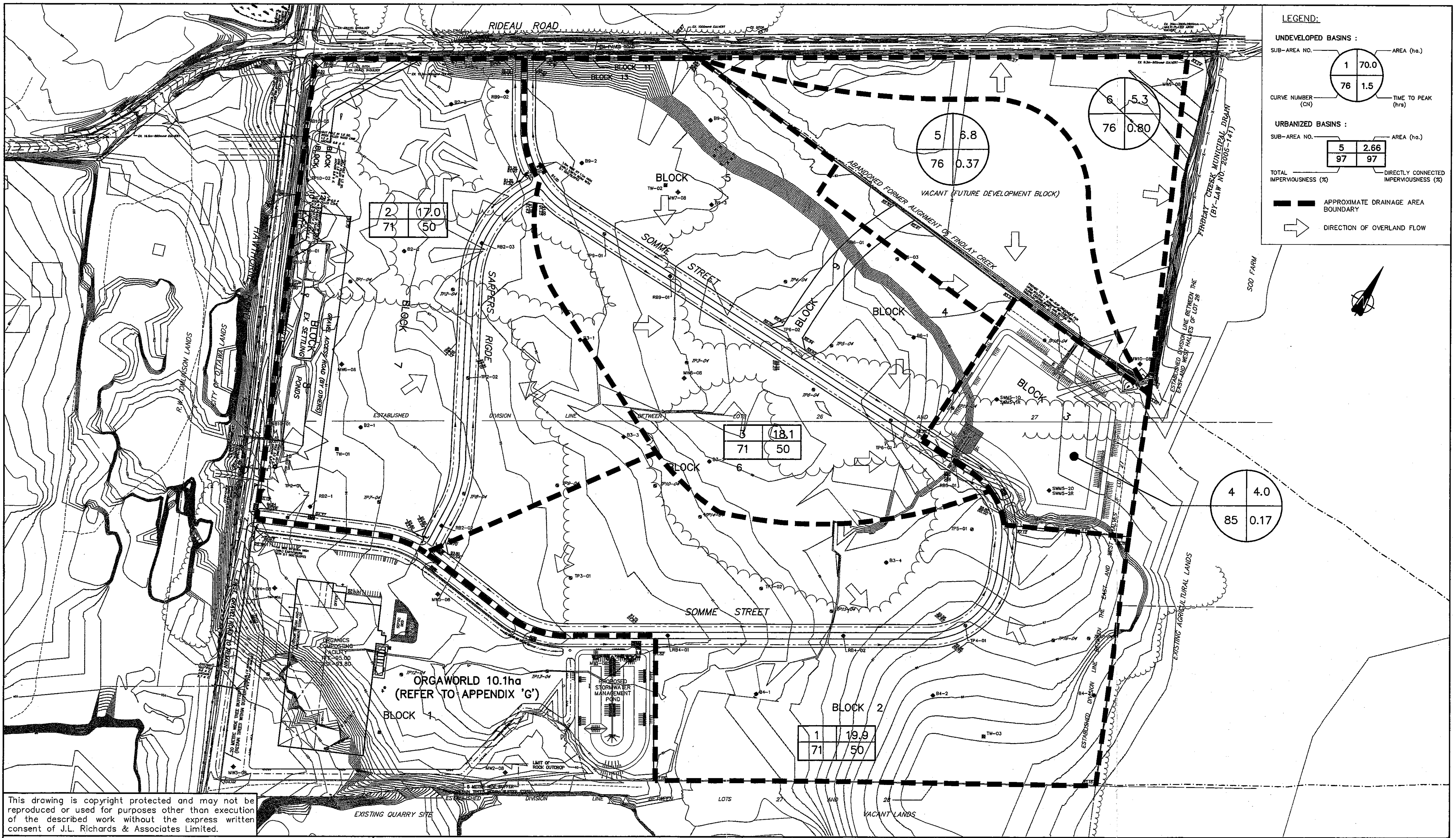

PROJECT:

HAWTHORNE
INDUSTRIAL PARK

DRAWING:

POST DEVELOPMENT – PHASE 1
STORM DRAINAGE AREA
PLAN

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DESIGN:	M.B.
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CHECKED:	G.F.
PLOTTED:	Apr 30, 2009

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FIGURE 3

JLR NO:
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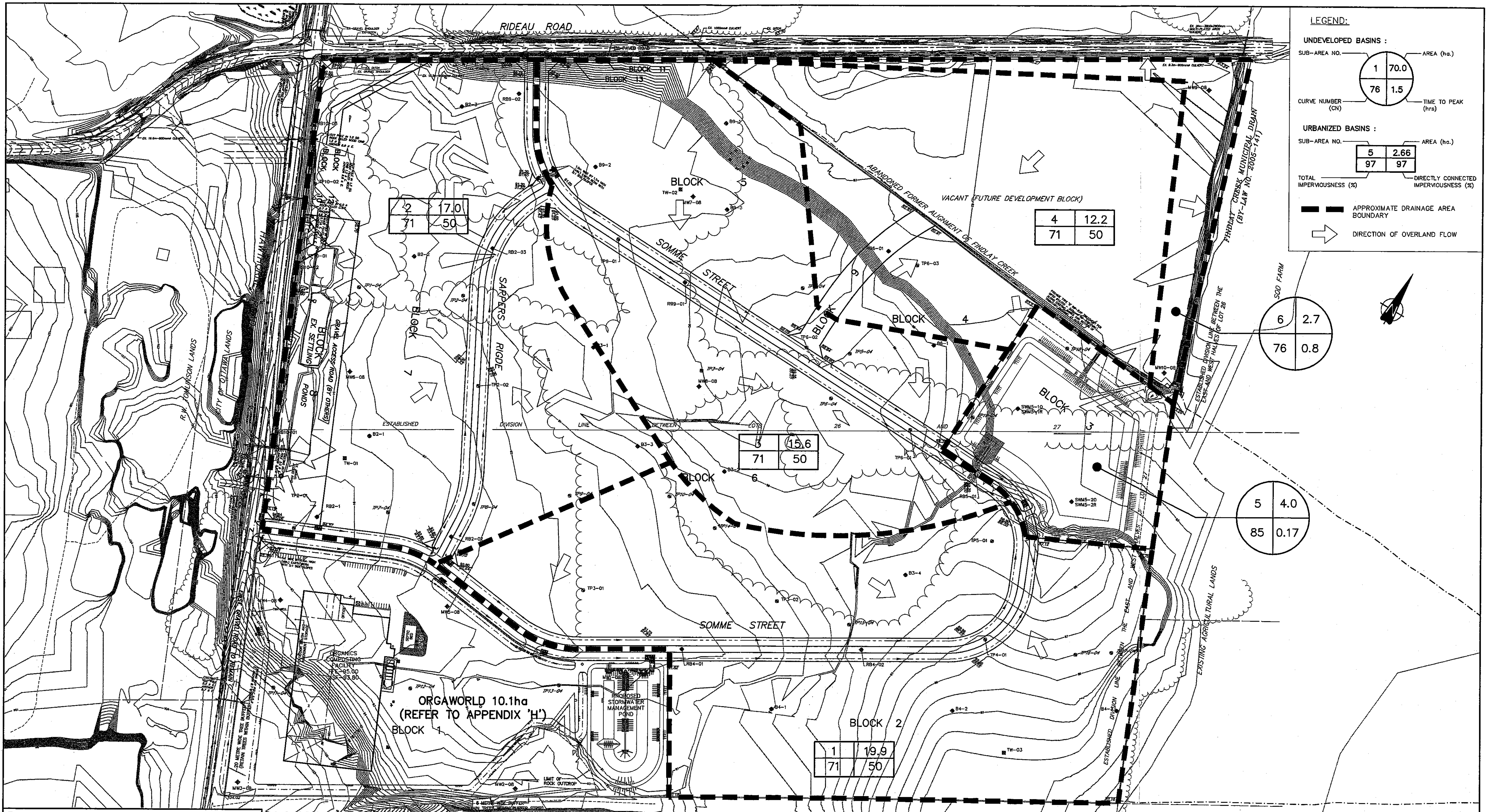

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PROJECT:

HAWTHORNE
INDUSTRIAL PARK

DRAWING:

POST DEVELOPMENT – PHASE 2
STORM DRAINAGE AREA
PLAN

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CHECKED: G.F.
PLOTTED: Apr 30, 2009

DRAWING NO.:
FIGURE 4

JLR NO:
20983

soils ranging from silty sand in Blocks 4 and 5, to silty clay in Blocks 3, 5, 7 and 8, to sandstone and limestone in parts of Blocks 2 and 3. These soils have been classified by Inspec-Sol as being associated with hydrologic soil groups (HSG), ranging from “B” to “D” for silty sand to silty clay, respectively. Areas where rock was encountered (i.e., Sandstone and Limestone) were classified as “Rockland.” Based on this information and current land usage, as interpreted from aerial photography, a pre-development Curve Number (CN) of 76 has been calculated using the Ministry of Transportation of Ontario (MTO) Chart H2-8. Detailed calculations for the HIP have been included in Appendix ‘D’.

Under post-development conditions, it is proposed to provide sufficient grade differential to allow for positive drainage to meet City of Ottawa Design Standards. As the subject lands are to be developed as an Industrial Park with a significant increase in hard surfaces (i.e., buildings, asphalt and gravel), the post-development conditions were, therefore, analysed taking into consideration the low potential of these surfaces to infiltrate storm runoff.

Imperviousness

Surface runoff under post-development conditions is greatly impacted by the imperviousness of its tributary area. Since the final development of the HIP is unknown, a conservative assumption for typical surfaces encountered in similar industrial parks was developed, as illustrated in Table 2. To determine the imperviousness based on the assumed breakdown presented in Table 2, an imperviousness calculation was carried out and is presented in Appendix ‘D’. The imperviousness calculation was based on the following assumptions:

- an imperviousness of 100% was assigned for building footprints;
- an imperviousness of 100% was assigned for all asphalt parking surfaces.
- an imperviousness of 70% was assigned for all gravel surfaces; and
- it was assumed that 50% of the total imperviousness (TIMP) 50 % was modelled as directly connected imperviousness (XIMP).

Based on the above, a total imperviousness of 70% was calculated, which is equivalent to a runoff coefficient of 0.7. The hydrological analysis was, therefore, carried out using a total imperviousness of 70%, consistent with the runoff coefficient used for sizing the open ditch/culvert system.

Time to Peak (T_p)

Time to peak calculations were carried out under pre-development conditions. Time of concentration was first estimated using the Uplands Method Chart based on the various flow paths. Once calculated, the times to peak were set to 67% (i.e., 2/3) of the time of concentration (T_c). Under pre-development conditions, a 90 minute time to peak was calculated (refer to Appendix 'D' for calculations). When modelling post-development conditions, the "CALIB STANDHYD" command was used to calculate the time to peak associated with the proposed site surfaces and grades (refer to Appendix 'E' for SWMHYMO outputs).

6.3 Simulation of Pre- and Post-Development (Uncontrolled) Conditions

The hydrological analysis was carried over the entire HIP under both the pre- and post-development conditions. As stated in Section 6.1, two post-development conditions were investigated, namely, Phase 1 and Phase 2. Phase 1 evaluates servicing for the current Study area, while Phase 2 includes the current Study area along with servicing of an additional 11.2 ha of land to the north east, shown on drawings as "Future Development Block."

Peak flow rates were computed with SWMHYMO using the procedure and parameters described in Subsection 6.2. Table 4 presents the simulated peak runoff rates under a 3 hour Chicago design storm event for both the pre- and post- (uncontrolled) development conditions for the HIP (refer to Appendix 'E' for SWMHYMO data input and output files), along with those under a 4 hour - 25 mm storm.

Table 4 - SWMHYMO Simulation Results

Return Period or Storm Depth	Peak Flow Rates (L/s)		
	Pre-Development	Phase 1 Post-Development (Uncontrolled)	Phase 2 Post-Development (Uncontrolled)
25 mm	252	1,941	2,231
2	467	3,077	3,548
5	826	4,812	5,554
10	1,097	6,135	7,029
25	1,468	7,772	9,013
50	1,767	9,240	10,588
100	2,093	10,662	12,132

Simulation results presented in the above table show that uncontrolled post-development peak flows substantially exceed those obtained under pre-development conditions. Based on the design criterion for water quantity (refer to Subsections 1.3 and 2.2 for details), post-development peak flows should be maintained to their pre-development levels for storm events ranging from a 1:5 year to a 1:100 year recurrence. In addition, the 2-year post-development peak flow should be controlled to 50% of the 2-year pre-development peak flow to satisfy the erosion criterion. Water quantity control measures were, therefore, found to be necessary for the development of this site. Details and stormwater servicing approaches proposed to fulfil the design criteria listed in Subsections 1.3 and 2.2 are presented in the following Subsections.

6.4 Simulation of Phase 1 Post-Development (Controlled) Conditions

Development of the subject lands (i.e., 70 ha, as illustrated on Figure 3) will increase the imperviousness of the subject area. To achieve the surface water objectives listed in Subsections 1.3 and 2.2, it is proposed that an end-of-pipe facility be constructed that would provide storage volume for retention of runoff.

The stormwater management criteria for the development of the HIP consist of maintaining erosion potential and peak flow rates at the pre-development levels. Storm servicing of the Subdivision was, therefore, developed such that all of these requirements were fulfilled, along with the achievement of a "normal" protection level. It is proposed to implement the following stormwater management servicing approach for the development of the HIP:

End-of-Pipe SWMF (Block 3)

Based on the proposed grading, the end-of-pipe facility was found to generate a volume of 37,240 m³ (3.25 m depth). A low flow ditch sized for 2 year storm events was also included in the bottom of the end-of-pipe facility to convey flows to the outlet structure. The configuration of the outlet structure would be as follows:

- 1 x 150 mm diameter orifice within a 200 mm diameter Polyvinyl Chloride (PVC) pipe at elevation 82.90 m, which serves as outlet to the facility;
- 2 x 600 mm diameter Corrugated Steel Pipe culvert at elevation 84.80 m, which also serves as outlet to the facility;
- One (1) emergency overflow spillway (6.0 m wide) at elevation 86.15 m, which serves as outlet to the facility during a storm event greater than 1:100 year.

The above configuration was used to develop a Stage-Storage-Discharge relationship that relates the storativity and outlet capabilities of the proposed facility at various geodetic elevations (refer to Appendix 'F' for copy of this Table). This data (storage-discharge table) was then used as input to the SWMHYMO's ROUTE RESERVOIR command.

A SWMHYMO file, representing the post-development controlled conditions of the HIP, was developed incorporating the storage volume and the outflow capability of the proposed end-of-pipe facility. The following table presents the simulated peak runoff rates for the three (3) hour Chicago design storm under the post-development controlled conditions (refer to Appendix 'G' for SWMHYMO data input and output files), along with those under the four (4) hour - 25 mm storm.

Table 5 - SWMHYMO Simulation Results (Post-Development - Phase 1 Controlled Conditions)

Return Period or Storm Depth	Peak Flow Rates (L/s)	
	Pre-Development	Phase 1 Post-Development (Controlled)(1)
25 mm	252	127
2 year	467	194(2)
5 year	826	359
10 year	1,097	589
25 year	1,468	939
50 year	1,767	1,191
100 year	2,093	1,531

Note: (1) Post-development flow is the sum of flows from the end-of-pipe facility and two uncontrolled Sub-Areas totalling 12.1 ha.

(2) 2 year post-development peak flow less than half the 2-year pre-development peak flow (233 L/s).

Simulation results presented in Table 5 show that the Phase 1 post-development controlled peak flows will be maintained below pre-development levels for the HIP. Consequently, the water quantity objective defined in Subsections 1.3 and 2.2 will be met under Phase 1.

6.5 Simulation of Phase 2 Post-Development (Controlled) Conditions

Development of Phase 2, as depicted on Figure 4, includes the Future Development Block located in the northeast corner of the HIP. This additional land could be serviced by the previously proposed end-of-pipe facility, without any modifications to facility size or outlet structure. However, a second inlet would be required in the northeast corner of the facility, which could be designed during the detailed design stage of the Future Development Block.

A SWMHYMO file, representing the Phase 2 post-development controlled conditions of the HIP, was developed incorporating the storage volume and the outflow capability of the proposed end-of-pipe facility. The following table presents the simulated peak runoff rates for the three (3) hour Chicago design storm under the Phase 2 post-development controlled conditions (refer to Appendix 'H' for SWMHYMO data input and output files), along with those under the four (4) hour - 25 mm storm.

Table 6 - SWMHYMO Simulation Results
(Post-Development - Phase 2 Controlled Conditions)

Return Period or Storm Depth	Peak Flow Rates (L/s)	
	Pre-Development	Phase 2 Post-Development (Controlled)(1)
25 mm	252	73
2 year	467	156(2)
5 year	826	457
10 year	1,097	729
25 year	1,468	1,051
50 year	1,767	1,348
100 year	2,093	1,515

Note: (1) Post-development flow is the sum of flows from the end-of-pipe facility and one uncontrolled Sub-Area totalling 2.7 ha.

(2) 2-year post-development peak flow less than half the 2 year pre-development peak flow (233 L/s).

Simulation results presented in Table 6 show that the Phase 2 post-development controlled peak flows will be maintained below pre-development levels for the HIP. Consequently, the water quantity objective defined in Subsections 1.3 and 2.2 will also be met under Phase 2.

6.6 Simulation of the July 1, 1979 Historical Storm Event and Flood Potential

6.6.1 Simulation of the July 1, 1979 Historical Storm Event

In addition to designing the major drainage system to convey the 1:100 year storm event, the performance of both the open ditch system and SWMF was also assessed under the July 1, 1979 historical storm event. This historical storm event is defined as a high volume / low intensity storm event (when compared to the 1:100 year event) which occurred mostly over a three hour period (refer to Table 5.6 in the Ottawa Sewer Design Guidelines). As shown in Table 5.6, the maximum intensity of 106.7 mm/hr only occurred for a 10 minute period (i.e, between the 85 to 95 minute time interval). The 1:100 year storm event intensities used to size the open ditch system were found to exceed the highest intensity of 106.7 mm/hr (refer to Appendix 'A' for 1:100 year Rational Method Sheet) with the exception of the most downstream ditch section (i.e., from Node 19 to Pond) where an intensity of 101.69 mm/hr was rather utilized. If an intensity of 106.7 mm/hr was used, the overall peak flow would increase from 12,814 L/s to 13,430 L/s substantially less than the free-flowing capacity of 52,735 L/s for the proposed ditch configuration. Consequently, the proposed open ditch system has the ability to convey flows generated by the July 1, 1979 storm event.

To supplement the above open ditch analysis, a hydrological analysis was also conducted to assess the performance of the SWMF under the July 1, 1979 storm event. A SWMHYMO file was, therefore, developed for the controlled Phase 2 post-development conditions of the HIP. Simulation results show that the Phase 2 post-development runoff during the July 1, 1979 storm event will be contained within the SWMF with all three of the outlet culverts flowing full in addition to approximately 210 mm of flow depth over the emergency overflow channel (refer to Appendix 'K' for SWMHYMO data input and output files). Therefore, the outlet of the SWMF has sufficient capacity to convey the July 1, 1979 historical storm event via the designated overland flow route without overtopping the banks.

6.6.2 Flood Potential

Draft approval Condition 12 of the draft subdivision conditions by the former Region of Ottawa-Carleton requires that "The owner shall complete a study indicating the extent of potential flooding on the property from Findlay Creek. The study including all models and assumptions shall be to the satisfaction of the South Nation River Conservation Authority." This condition was included as part of the original February 10, 1998 draft conditions (Gloucester File: S-RU-94-03).

Many changes have occurred on-site and adjacent to the site since Condition 12 was included in the draft approval for this site. Improvements to the roadside ditch were made along Rideau Road, immediately adjacent to the site. Surface runoff generated by the lands north of Rideau Road and conveyed to the small tributary located within the HIP site has now been re-directed toward the northeast corner of the site where the existing 3.8 m wide x 2.8 m high multi plate arch culvert crosses Rideau Road. A municipal drainage report was prepared by Stantec Consulting in 2004 for this section of Findlay Creek which assessed the overall geomorphological conditions and provided recommendations for future maintenance. In addition, the SCSS conducted a flood hazard analysis. The 100 year flows from the Stantec model were plotted along the creeks modelled. Floodlines were shown in Figure 6.2.3 of the report. No floodlines were indicated for the section of Findlay Creek adjacent to the HIP site.

As indicated previously in the Section 4 of this Report, as much as 5.5 m of construction fill has been added to the site since 1994. The placed fill material on the site has eliminated the natural low lying areas and raised the site grade approximately 4.5 m above the top of creek bank. The current site grades will be maintained as a minimum for the development of the HIP subdivision. Therefore, we have no concerns about flooding on the property from Findlay Creek given the above changes to the site and improvements to the adjacent drainage network. Consequently, Condition 12 of the draft approval should be considered as being satisfied on the basis that this condition is out of date based on the current site conditions.

7.0 EROSION AND SEDIMENT CONTROL MEASURES DURING CONSTRUCTION

During construction of the roadway, the collection systems (i.e., ditches, culverts, sewers, etc.) and end-of-pipe facility, appropriate erosion and sediment control measures, as outlined in MNR's "Guidelines on Erosion and Sediment Control for Urban Construction Sites," will be implemented to trap sediment on site. To ensure proper implementation, the proposed measures have been incorporated onto Drawing ESC (Drawing entitled "Erosion and Sedimentation Control Plan"). The measures shown on this Drawing were developed based on topography and site constraints. As a minimum, the following measures will be implemented during construction:

- Supply and installation of straw bale flow check dams (as per OPSD 219.180) at the upstream end of each culvert. Proposed locations of straw bale barriers are indicated on Drawing ESC.

- Supply and installation of topsoil and hydroseed along the entire open ditch system once grading has been completed for a section. Mulching will be carried out immediately after hydroseeding. This will allow for immediate bank stabilization of the system and will prevent sediment ladden from occurring from exposed ditch surfaces.

- Supply and installation of light duty silt fences (as per OPSD 219.110) at the toe of slope surrounding the proposed stormwater management pond (refer to Drawing ESC for details). It is recommended that silt fences also be used to enclose borrow and stockpile areas resulting from topsoil stripping activities or any excavating activities; locations to be determined in the field during grading operations.

- If dewatering and pumping operations become necessary, filtration is proposed using sediment dewatering bags prior to discharge off-site.

All control measures will be carried out in accordance with the following documents:

i) "Guidelines on Erosion and Sediment Control for Urban Construction Sites" published by Ontario Ministries of Natural Resources, Environment, Municipal Affairs and Housing, and Transportation and Communication, Association of Construction Authorities of Ontario, and Urban Development Institute, Ontario, May 1987.

ii) "Erosion and Sediment Control" Training Manual by Ministry of Environment, Spring 1998.

iii) Applicable Regulations and Guidelines of the Ministry of Natural Resources. As a minimum, during the construction of the conveyance systems, the following Stormwater Management Practices will be used:

Any stockpiled material will be kept on flat areas during construction, well away from any natural flow paths. In the event that the stockpile is placed in other areas where potential washoff to the conveyance system is expected, silt fences will be installed to enclose the materials and prevent any washoff to the conveyance system.

8.0 SUMMARY AND CONCLUSION

1. This Stormwater Management Report has been prepared to present a complete approach in achieving the stormwater criteria developed as part of the approved document entitled “Shields Creek Subwatershed Study.”

2. Stormwater servicing for the proposed HIP has been designed using the dual drainage concept. Storm servicing will be carried out with the use of an open ditch/culvert system. The open ditch system has been designed to convey the 1:00 year peak flow rates. Similarly, the culverts have been sized to convey the 1:10 year flow without any overtopping.

3. To fulfil the design criteria associated with water quality (as per the SCSS), it is proposed to provide both on-site oil/grit separators and infiltration storage volume within the roadside open ditch system. As per the requirements set out in Table 3.2 of the MOE SWMPDM, a total infiltration volume of 62.5 m^3 is required under Phase 2 to achieve a “normal” level of protection (i.e., TSS removal of 70%).

4. Water balance and infiltration requirements were not implemented due to existing site conditions and proposed industrial use development.

5. The 2-year post-development peak flow will be controlled to 50% of the 2-year pre-development peak flow. Therefore, meeting the SCSS recommendations associated with erosion potential.

6. Simulation results presented in Tables 5 and 6 show that proposed infrastructure will maintain peak flows below pre-development levels for both Phase 1 and Phase 2 of the HIP. Consequently, this design criterion (peak flow control) will be fulfilled.

7. A detailed Erosion and Sedimentation Control Plan has been prepared to reduce the impact of construction activities on Findlay Creek.

Prepared by: Mark Buchan
Mark Buchanan, E.I.T.

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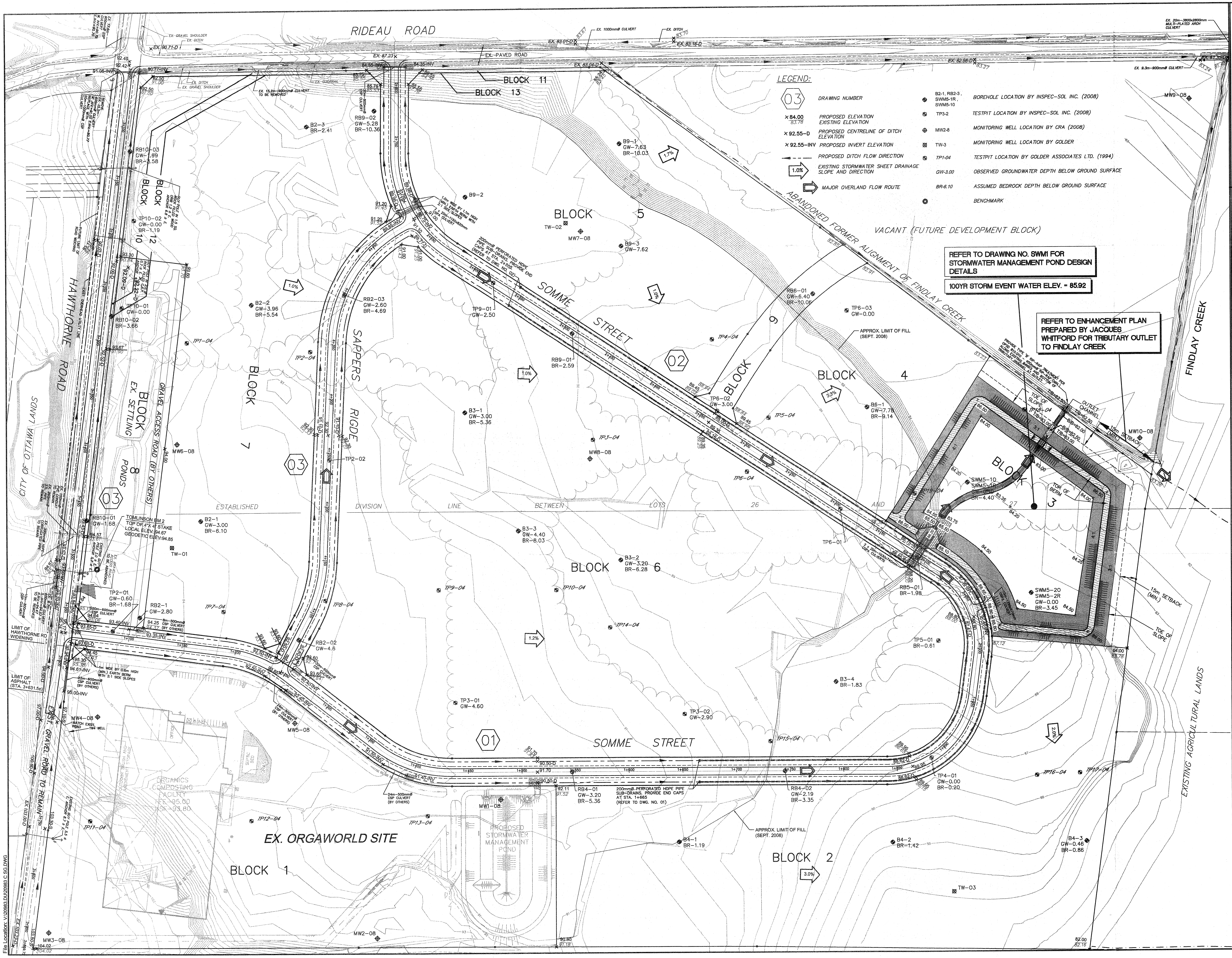
Reviewed by:
Derrick Upton, P.Eng.



REFER TO DRAWING NO. SWM1 FOR STORMWATER MANAGEMENT POND DESIGN DETAILS

100YR STORM EVENT WATER ELEV. = 85.92

REFER TO ENHANCEMENT PLAN PREPARED BY JACQUES WHITFORD FOR TRIBUTARY OUTLET TO FINDLAY CREEK

LEGEND:

03	DRAWING NUMBER
× 84.00 / 83.78	PROPOSED ELEVATION EXISTING ELEVATION
× 92.55–D	PROPOSED CENTRELINE OF DITCH ELEVATION
× 92.55–INV	PROPOSED INVERT ELEVATION
◄ – – –	PROPOSED DITCH FLOW DIRECTION
1.0%	EXISTING STORMWATER SHEET DRAINAGE SLOPE AND DIRECTION
⇨	MAJOR OVERLAND FLOW ROUTE
B2-1, RB2-3, SWM5-1R, SWM5-10	BOREHOLE LOCATION BY INSPEC–SOL INC. (2008)
TP3-2	TESTPIT LOCATION BY INSPEC–SOL INC. (2008)
MW2-8	MONITORING WELL LOCATION BY CRA (2008)
TW-3	MONITORING WELL LOCATION BY GOLDER
TP1-04	TESTPIT LOCATION BY GOLDER ASSOCIATES LTD. (1994)
GW-3.00	OBSERVED GROUNDWATER DEPTH BELOW GROUND SURFACE
BR-6.10	ASSUMED BEDROCK DEPTH BELOW GROUND SURFACE
●	BENCHMARK

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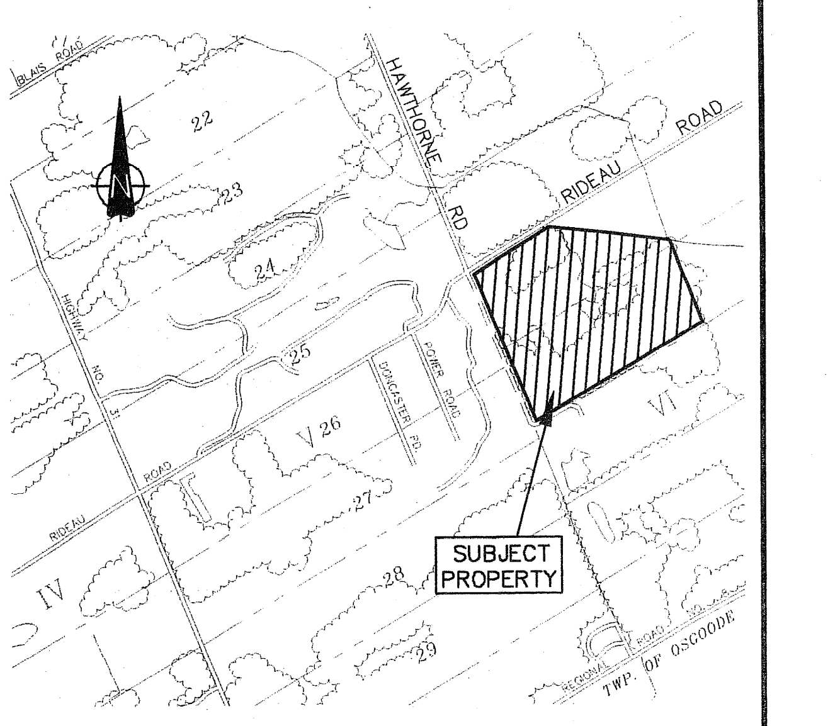
Key Map



NOT TO SCALE

GENERAL NOTES:

1. HAWTHORNE INDUSTRIAL PARK DRAWINGS TO BE READ IN CONJUNCTION WITH THE GEOTECHNICAL INVESTIGATION REPORT No. T020556–A1 PREPARED BY INSPEC–SOL DATED JANUARY 30, 2009.
2. A GEOTECHNICAL ENGINEERED LICENSED IN THE PROVINCE OF ONTARIO IS TO INSPECT ALL SUBGRADE SURFACES FOR FOOTINGS AND PAVEMENT STRUCTURES PRIOR TO CONSTRUCTION.
3. ALL MATERIAL AND CONSTRUCTION METHODS TO BE IN ACCORDANCE WITH ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS (OPSS) AND CITY OF OTTAWA GUIDELINES.

NO.	ISSUE	DATE
3	ISSUED FOR M.O.E. APPROVAL	28/05/09
2	REVISED PER CITY COMMENTS	30/04/09
1	ISSUED FOR CITY APPROVAL	12/02/09

SCALE: 1:1500

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LICENSED PROFESSIONAL ENGINEER
D. P. UPTON
May 29/09
PROVINCE OF ONTARIO

PROJECT NORTH

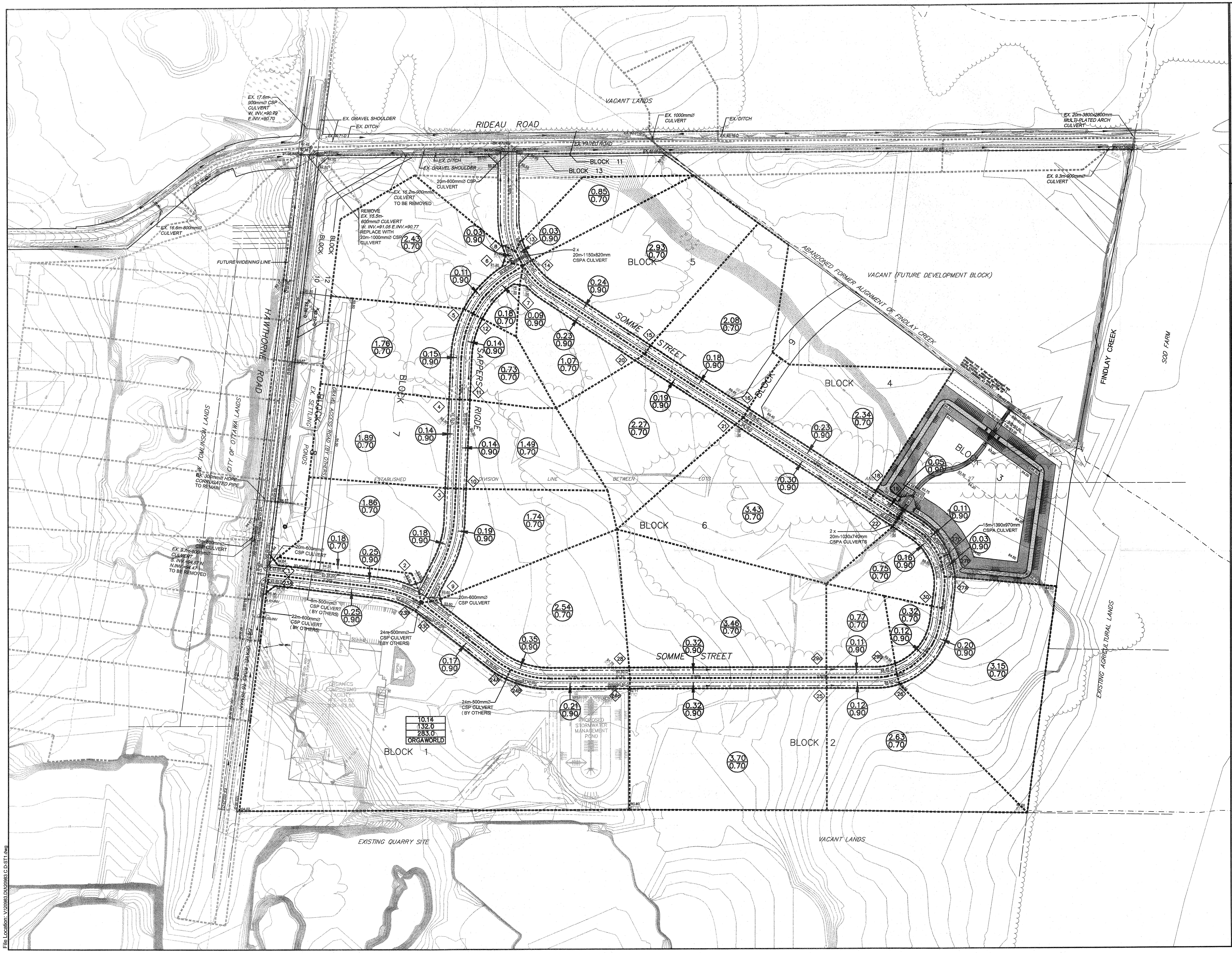
PROJECT:

HAWTHORNE
INDUSTRIAL
PARK

DRAWING:

SITE SERVICING
AND
GRADING

DESIGN: M.B.
DRAWN: T.S.
CHECKED: D.U.
PLOTTED: May 28, 2009
DRAWING NO.: SG
JLR NO: 20983



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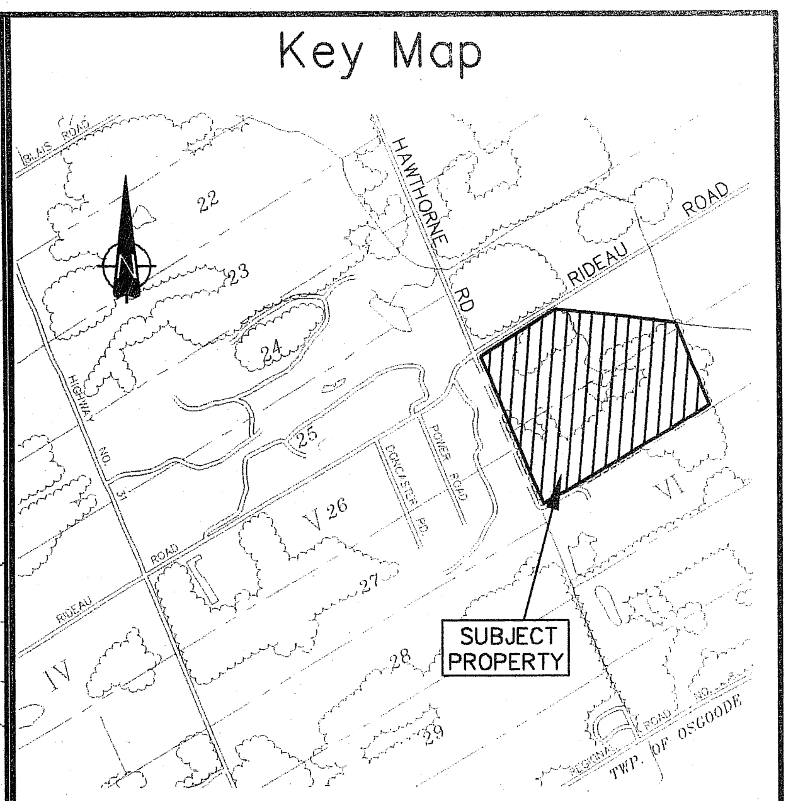
Key Map



NOT TO SCALE

LEGEND

■■■■■■■■■	DRAINAGE BOUNDARY
2.91 0.70	AREA IN HECTARES * RUNOFF COEFFICIENT (C)
10.14 132.0 283.0 ORGAWORLD	DRAINAGE AREA (ha) 10 YEAR PEAK FLOW (l/s) 100 YEAR PEAK FLOW (l/s) ORGAWORLD SITE
◇28	NODE LOCATION NUMBER
◄— — —	PROPOSED DITCH AND FLOW DIRECTION

* NOTE: RUNOFF COEFFICIENT (C) FOR DEVELOPMENT AREA IS BASED ON A WEIGHTED AVERAGE OF 0.70, WHILE ROADWAYS ARE 0.90.

03	ISSUED FOR M.O.E. APPROVAL	28/05/09
02	REVISED PER CITY COMMENTS	30/04/09
01	ISSUED FOR CITY APPROVAL	12/02/09
NO.	ISSUE	DATE

SCALE: 1:2000

0 25 50 100 150

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K7L 5N4
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Fax: 613 544 5679

PROFESSIONAL STAMP

D. P. UPTON

PROJECT NORTH

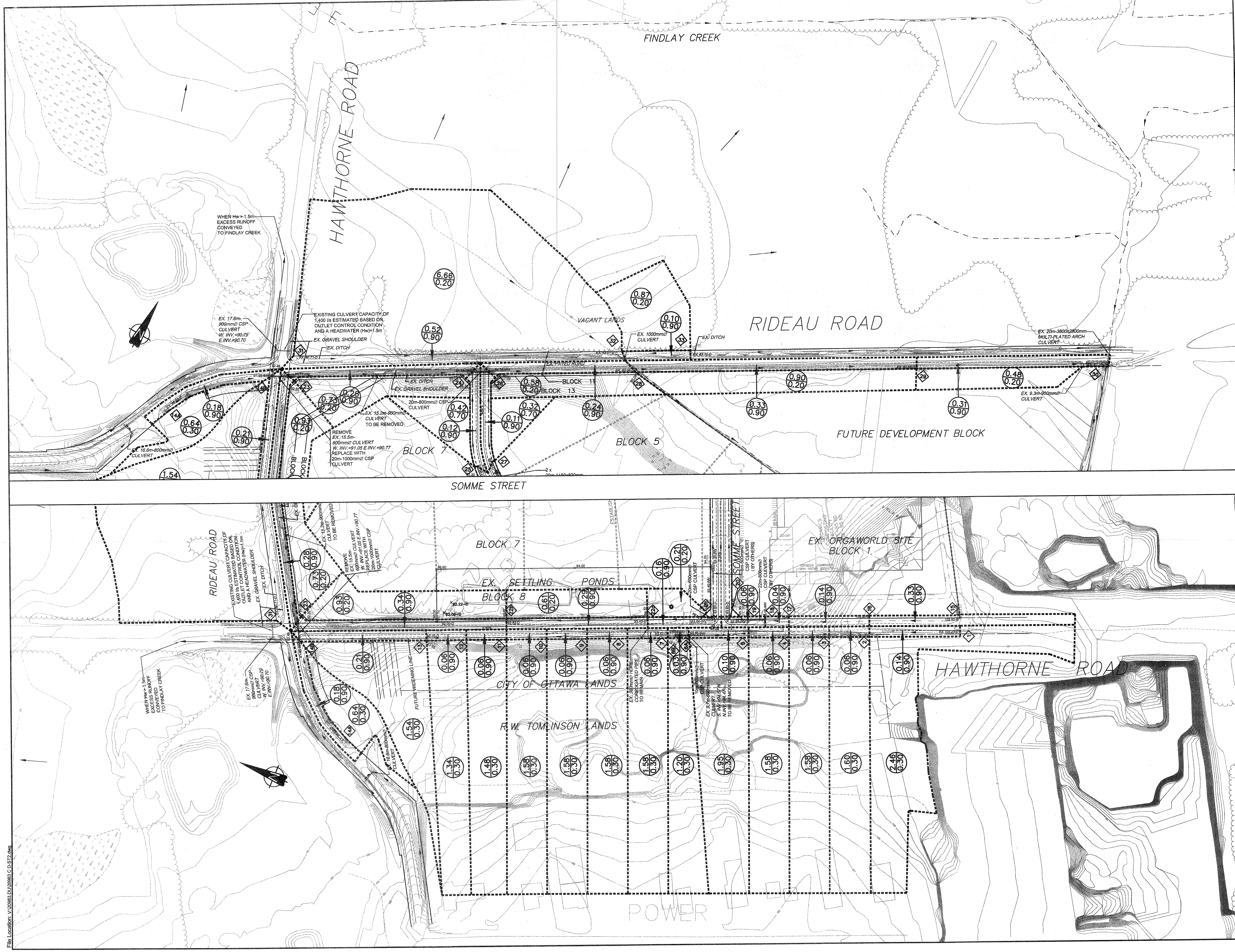
PROJECT:

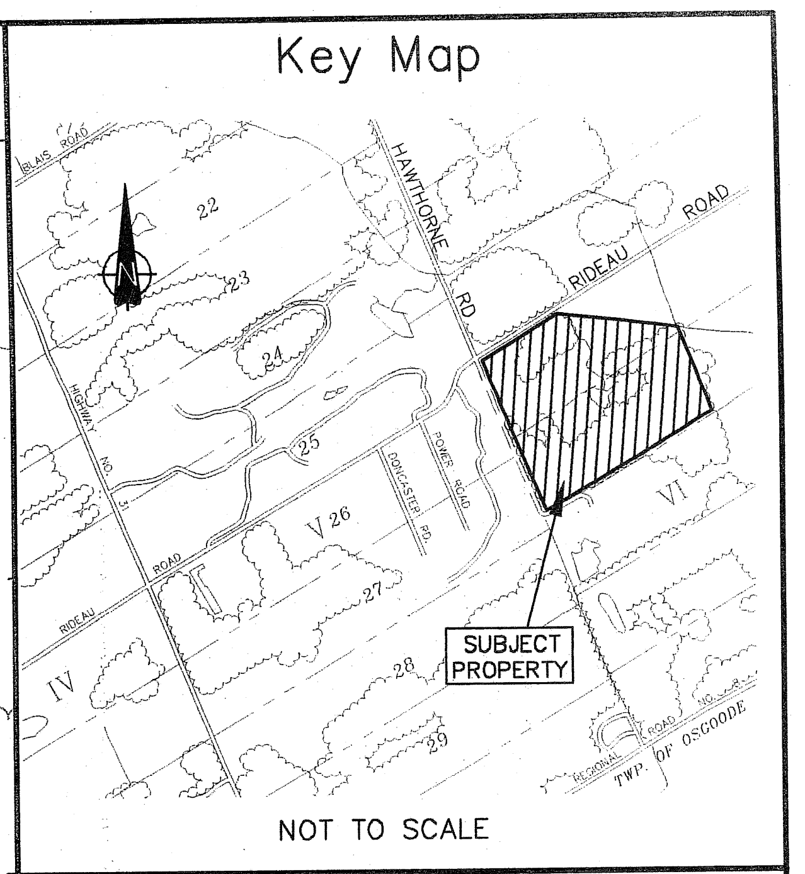
HAWTHORNE
INDUSTRIAL
PARK

DRAWING:

STORM DRAINAGE
AREA PLAN

DESIGN:	M.B.	DRAWING NO.:	D-ST1
DRAWN:	T.S.		
CHECKED:	D.U.	JLR NO:	
PLOTTED:	May 28, 2009		20983





LEGEND

- ▪▪▪▪▪▪▪▪ DRAINAGE BOUNDARY
- (2.91 / 0.70) AREA IN HECTARES / * RUNOFF COEFFICIENT (C)
- ◇28 NODE LOCATION NUMBER
- ◄– – – PROPOSED DITCH AND FLOW DIRECTION
- ◄—— EXISTING SURFACE FLOW DIRECTION

* NOTE: RUNOFF COEFFICIENT (C) FOR DEVELOPMENT AREA IS BASED ON A WEIGHTED AVERAGE OF 0.70, WHILE ROADWAYS ARE 0.90.

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SCALE: 1:2000

0 25 50 100 150

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PROFESSIONAL STAMP

LICENSED PROFESSIONAL ENGINEER
D. P. UPTON
May 29/09
PROVINCE OF ONTARIO

PROJECT NORTH

PROJECT:

HAWTHORNE
INDUSTRIAL
PARK

DRAWING:

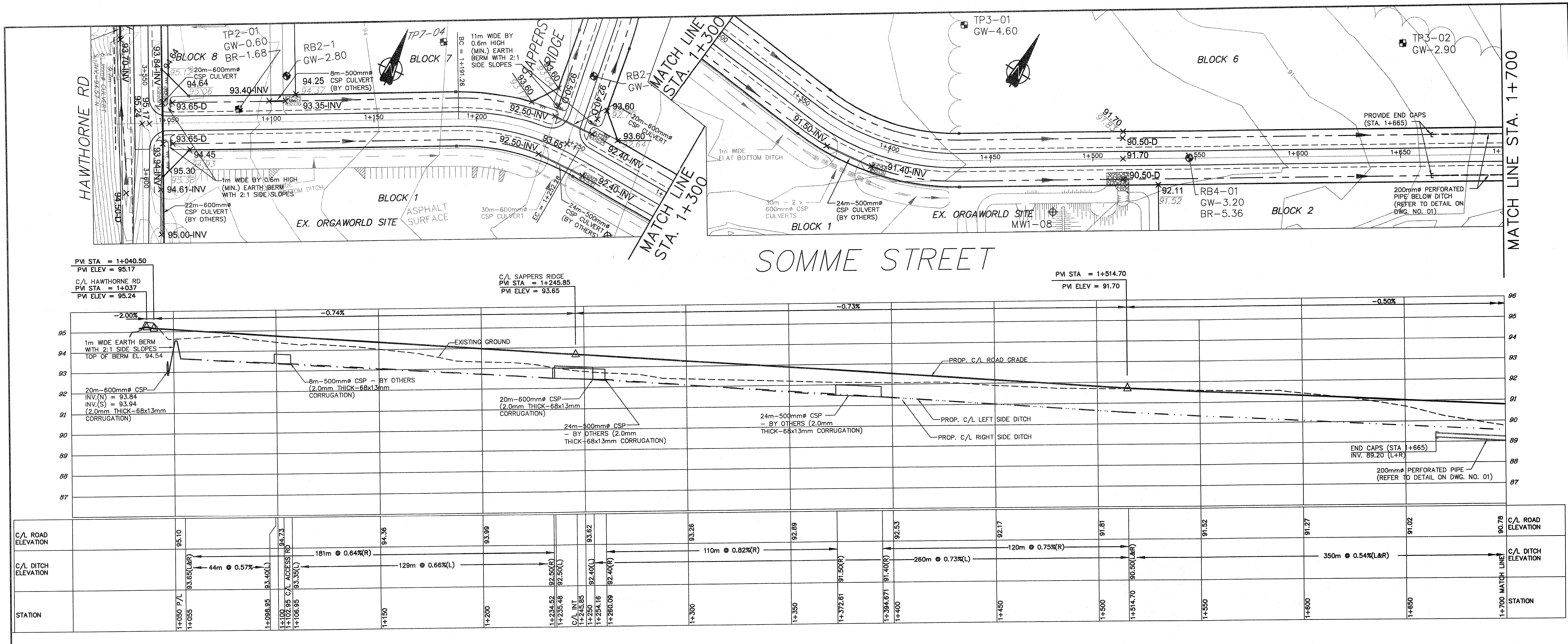
STORM DRAINAGE
AREA PLAN

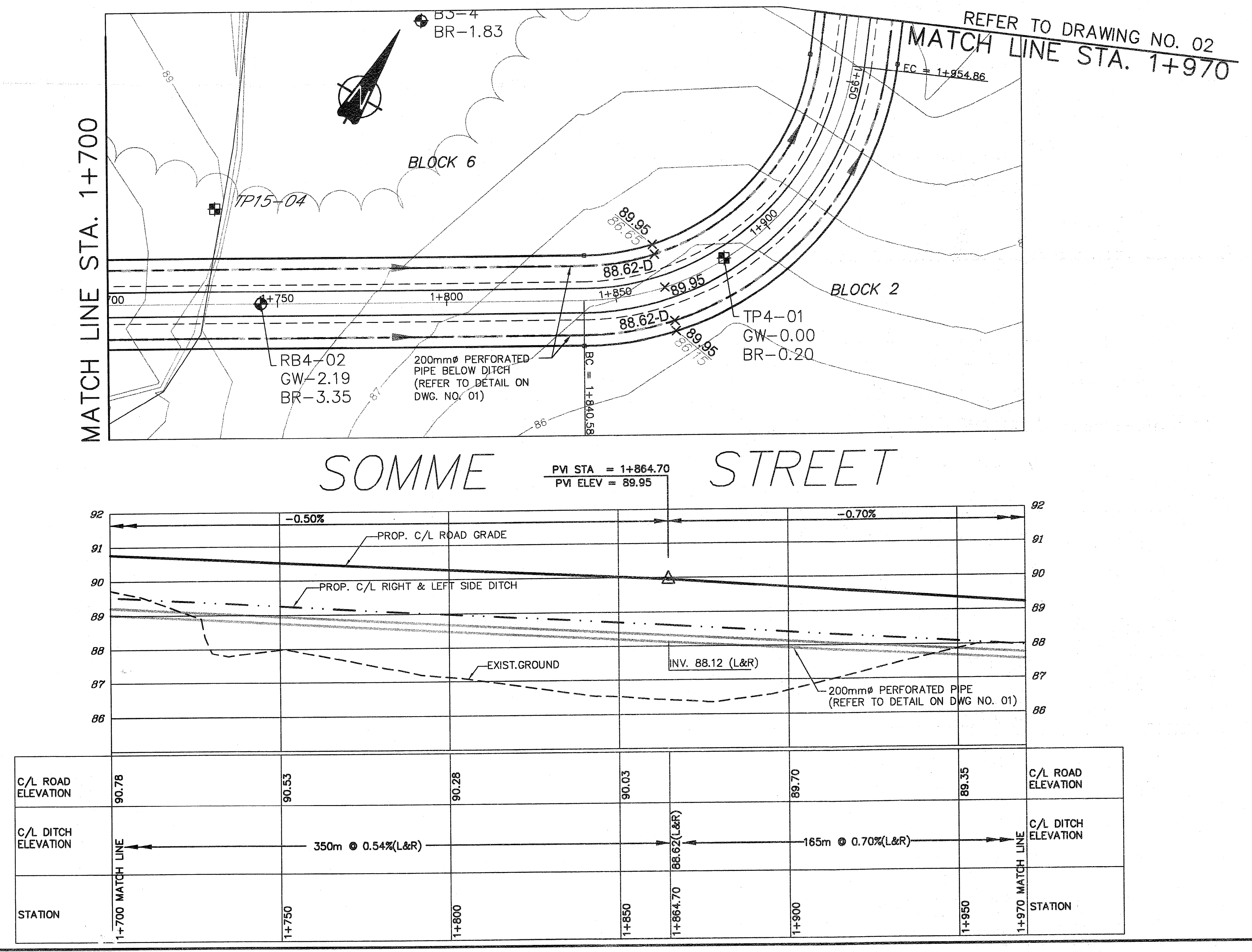
DESIGN: M.B.
DRAWN: T.S.
CHECKED: D.U.
PLOTTED: May 28, 2009

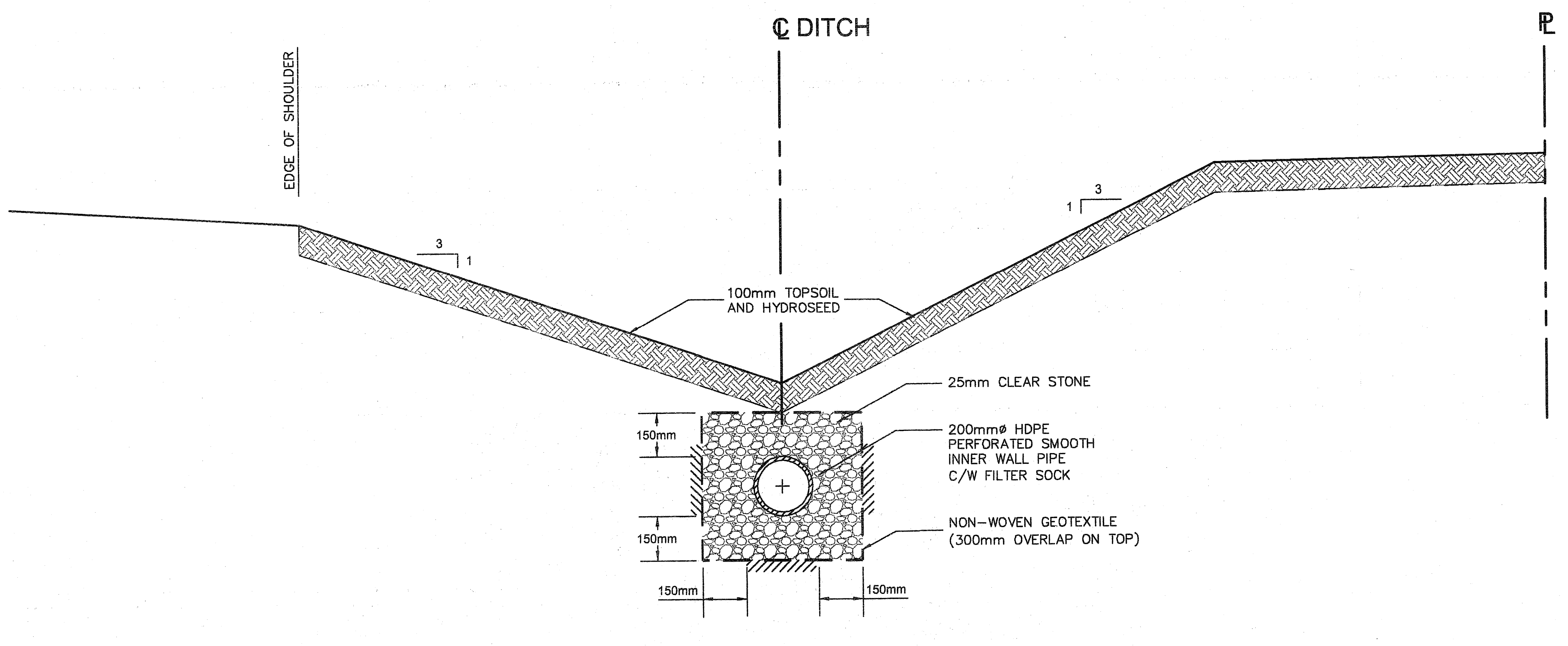
DRAWING NO.: **D-ST2**

JLR NO: 20983

File Location: V:\20983\DU\20983 C D-ST2.dwg







ROADSIDE DITCH PERFORATED PIPE INSTALLATION (TYPICAL)

N.T.S.

NOTE:

1. SUB-DRAIN TO BE NON-PERFORATED PIPE UNDER CULVERTS.

2. WORKS TO BE CONSTRUCTED AS PER CITY OF OTTAWA DETAIL DRAWING NO.s S9 AND S26.

LEGEND:

◄ - - —	*PROPOSED DITCH AND FLOW DIRECTION*
═	*PROPOSED CULVERT*
▨	*PROPOSED RIP-RAP*
×93.50	*PROPOSED C/L ELEVATION*
×92.55-D	*PROPOSED DITCH ELEVATION*
×92.55-INV	*PROPOSED INVERT*
+ 89.45 *88.90*	*PROPOSED ELEVATION* *EXISTING ELEVATION*
⊕ B2-1, RB2-3, SWM5-1R, SWM5-10	*BOREHOLE LOCATION BY INSPEC-SOL INC. (2008)*
▣ TP3-2	*TESTPIT LOCATION BY INSPEC-SOL INC. (2008)*
⊕ MW2-8	*MONITORING WELL LOCATION BY CRA (2008)*
⊠ TW-3	*MONITORING WELL LOCATION BY GOLDER ASSOCIATES LTD.*
▣ *TP1-04*	*TESTPIT LOCATION BY GOLDER ASSOCIATES LTD. (1994)*
GW-3.00	*OBSERVED GROUNDWATER DEPTH BELOW GROUND SURFACE*
BR-6.10	*ASSUMED BEDROCK DEPTH BELOW GROUND SURFACE*

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SCALE:
1:1000 (HORIZ.) 0 10 20 50
1:100 (VERT.) 0 1 2 5

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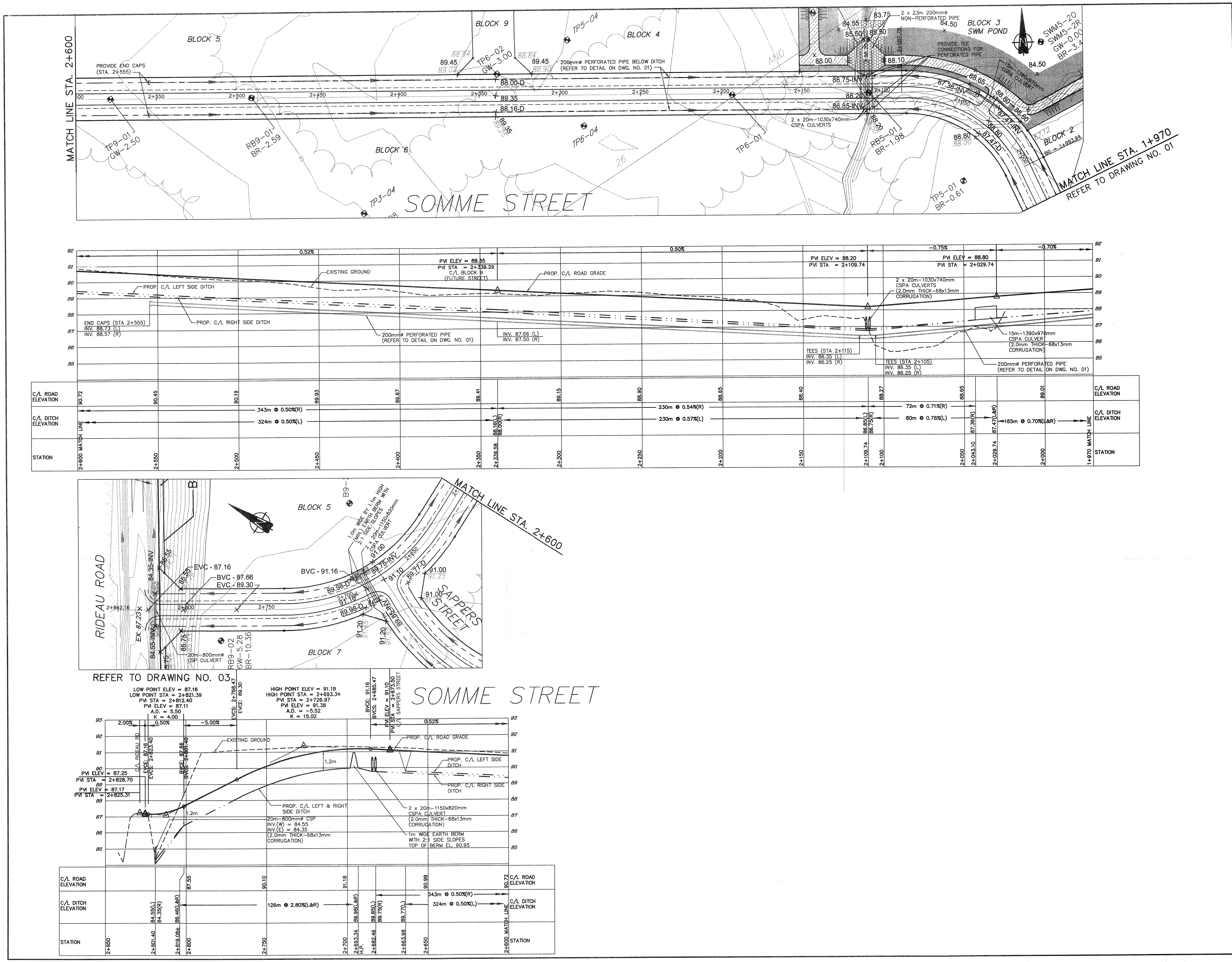
PROFESSIONAL STAMP
D. P. UPTON

PROJECT NORTH

PROJECT:
HAWTHORNE
INDUSTRIAL
PARK

DRAWING:
PLAN & PROFILE
SOMME STREET
HAWTHORNE RD TO STA. 1+970

DESIGN: M.B.
DRAWN: T.S.
CHECKED: D.U.
PLOTTED: May 28, 2009
DRAWING NO.: 01
JLR NO: 20983



LEGEND:

◄ — — —	PROPOSED DITCH AND FLOW DIRECTION
═	PROPOSED CULVERT
▨	PROPOSED RIP-RAP
×93.50	PROPOSED C/L ELEVATION
×92.55-D	PROPOSED DITCH ELEVATION
×92.55-INV	PROPOSED INVERT
+ 89.45 / 88.90	PROPOSED ELEVATION EXISTING ELEVATION
B2-1, RB2-3 , SWM5-1R , SWM5-10	BOREHOLE LOCATION BY INSPEC-SOL INC. (2008)
TP3-2	TESTPIT LOCATION BY INSPEC-SOL INC. (2008)
MW2-8	MONITORING WELL LOCATION BY CRA (2008)
TW-3	MONITORING WELL LOCATION BY GOLDER ASSOCIATES LTD.
TP1-04	TESTPIT LOCATION BY GOLDER ASSOCIATES LTD. (1994)
GW-3.00	OBSERVED GROUNDWATER DEPTH BELOW GROUND SURFACE
BR-6.10	ASSUMED BEDROCK DEPTH BELOW GROUND SURFACE

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1:100 (VERT.) 0 1 2 5

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PROFESSIONAL STAMP
D. P. UPTON
May 29/09

PROJECT NORTH

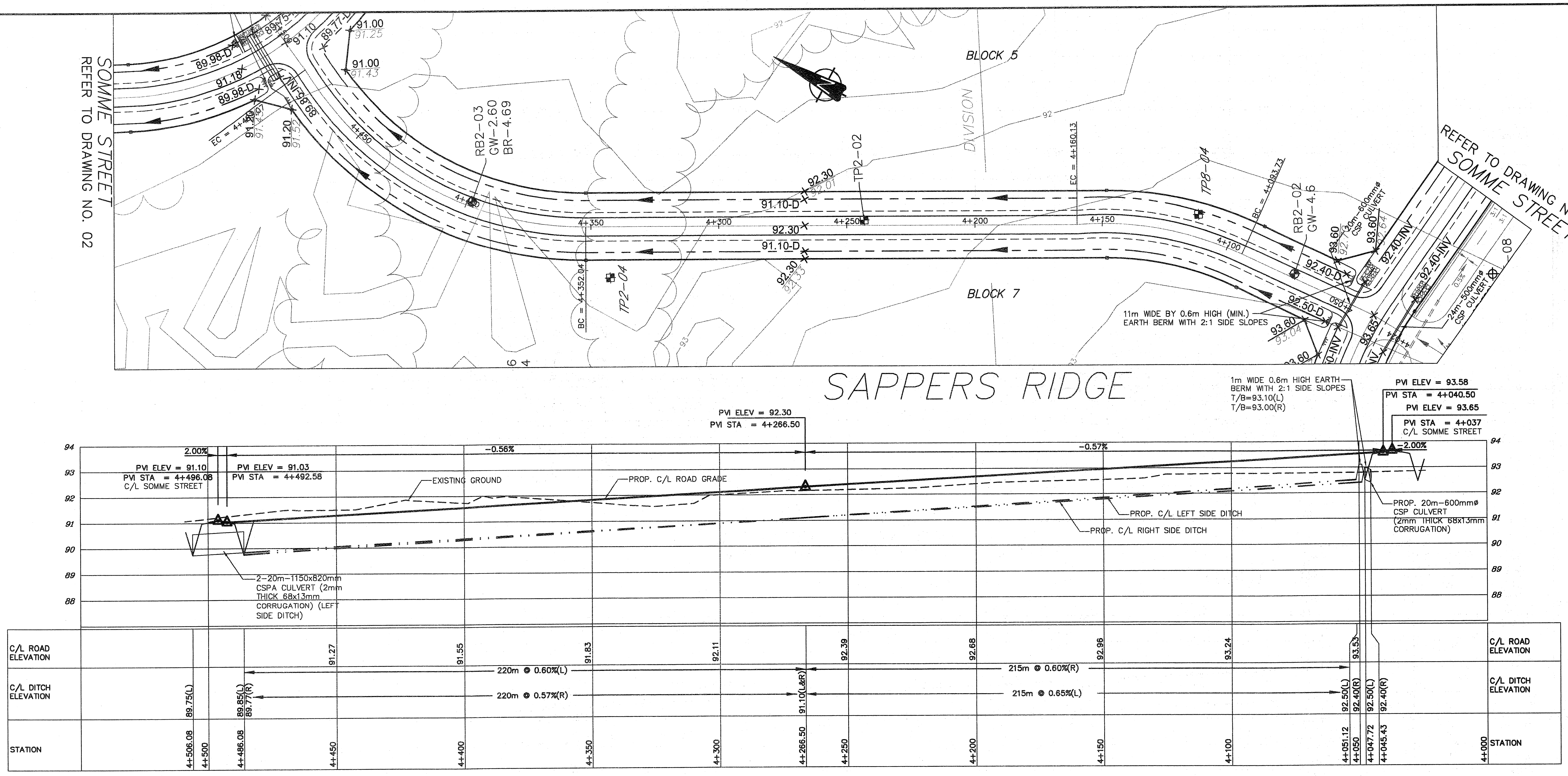
PROJECT:

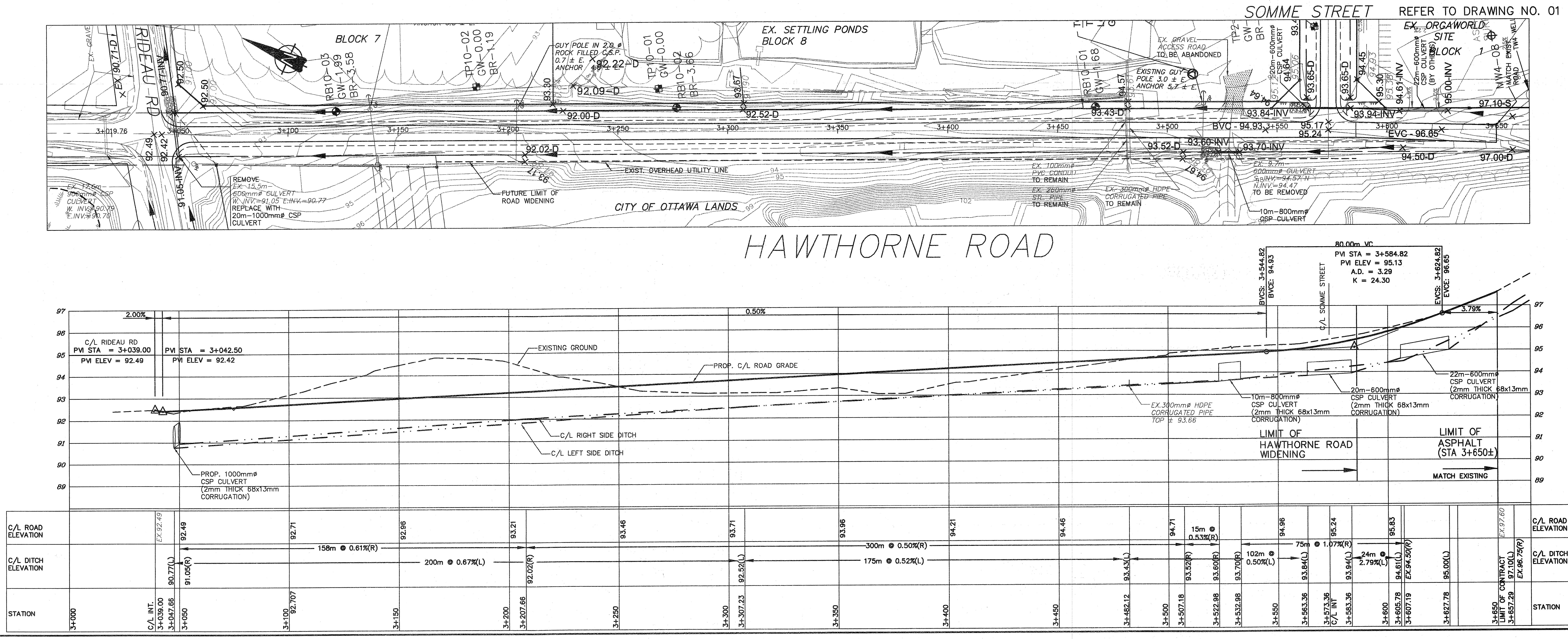
HAWTHORNE
INDUSTRIAL
PARK

DRAWING:

PLAN & PROFILE
SOMME STREET
STA. 1+970 TO RIDEAU ROAD

DESIGN: M.B.
DRAWN: T.S.
CHECKED: D.U.
PLOTTED: May 28, 2009
DRAWING NO.: 02
JLR NO: 20983





LEGEND:

◄— — ——	PROPOSED DITCH AND FLOW DIRECTION
═══	PROPOSED CULVERT
▨	PROPOSED RIP-RAP
×93.50	PROPOSED C/L ELEVATION
×92.55-D	PROPOSED DITCH ELEVATION
×92.55-INV	PROPOSED INVERT
+ 89.45 88.90	PROPOSED ELEVATION EXISTING ELEVATION
● B2-1, RB2-3, SWM5-1R, SWM5-10	BOREHOLE LOCATION BY INSPEC-SOL INC. (2008)
▣ TP3-2	TESTPIT LOCATION BY INSPEC-SOL INC. (2008)
⊕ MW2-8	MONITORING WELL LOCATION BY CRA (2008)
⊠ TW-3	MONITORING WELL LOCATION BY GOLDER ASSOCIATES LTD.
▣ TP1-04	TESTPIT LOCATION BY GOLDER ASSOCIATES LTD. (1994)
GW-3.00	OBSERVED GROUNDWATER DEPTH BELOW GROUND SURFACE
BR-6.10	ASSUMED BEDROCK DEPTH BELOW GROUND SURFACE

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1:1000 (HORIZ.) 0 10 20 50
1:100 (VERT.) 0 1 2 5

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PROFESSIONAL STAMP
D. P. UPTON
May 29/09

PROJECT NORTH

PROJECT:

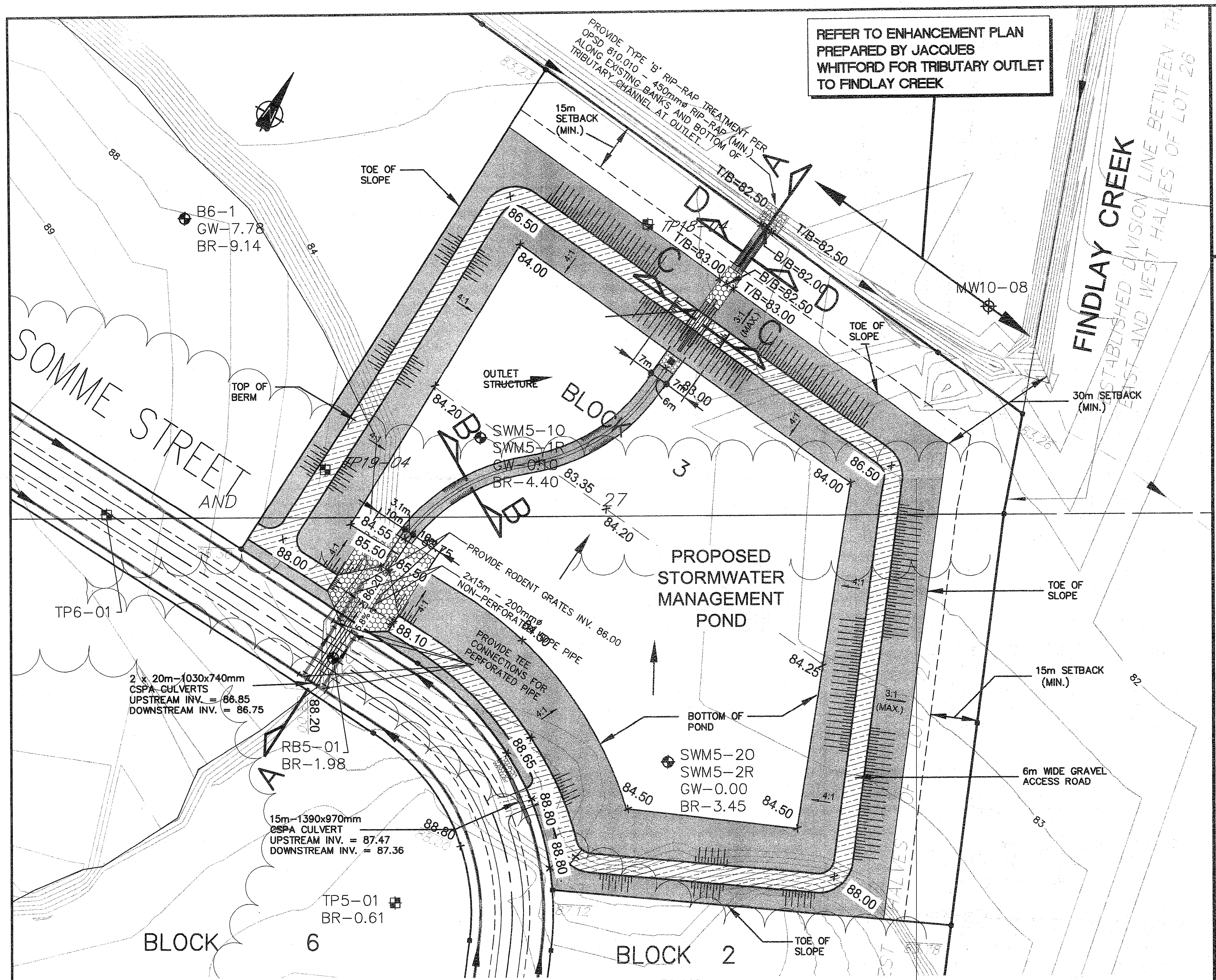
HAWTHORNE
INDUSTRIAL
PARK

DRAWING:

PLAN & PROFILE
SAPPERS RIDGE
AND
HAWTHORNE ROAD EXTENSION

DESIGN: M.B.
DRAWN: T.S.
CHECKED: D.U.
PLOTTED: May 28, 2009
DRAWING NO.: 03
JLR NO: 20983

File Location: V:\20983.DU\20983 C 03.dwg



POND PLAN

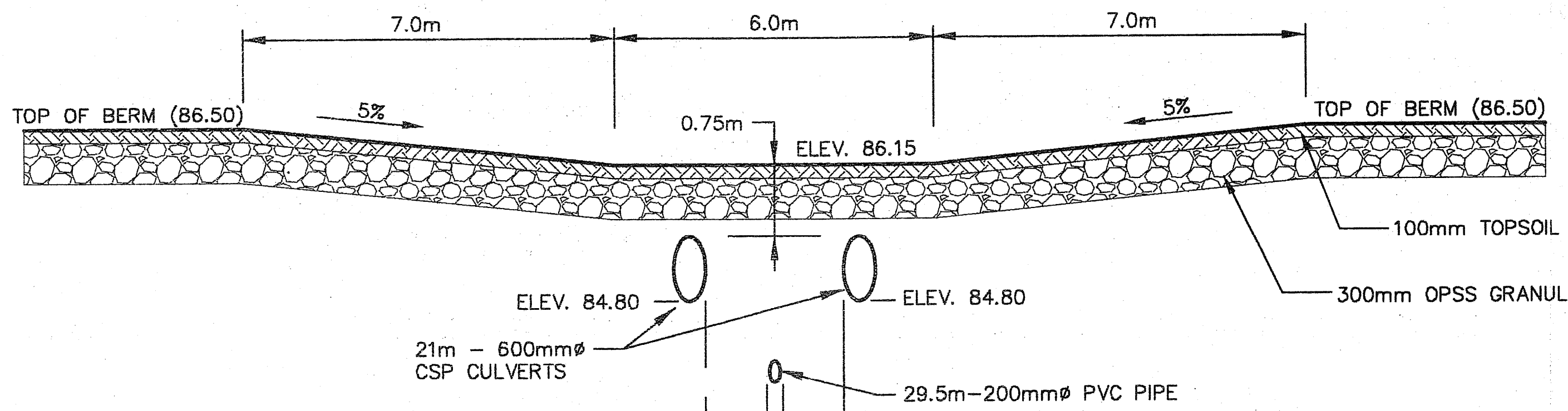
0 10 20 50

1:1000

LEGEND

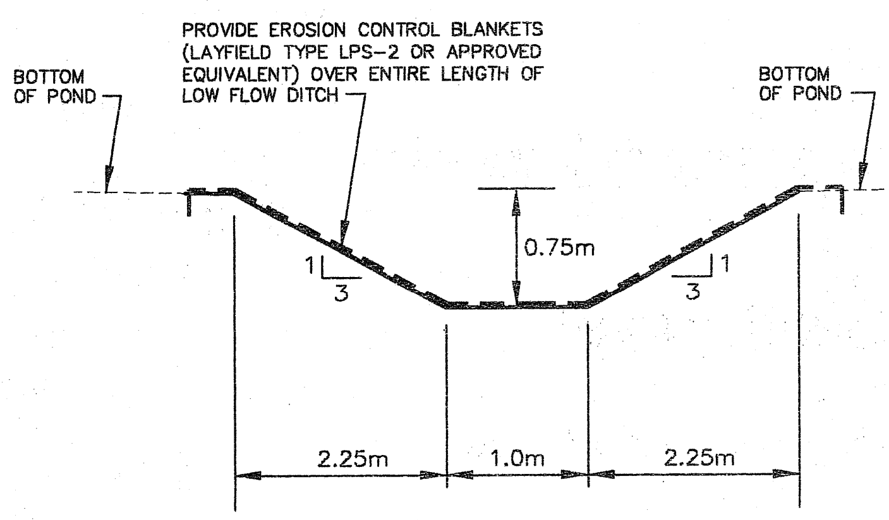
× 91.70	PROPOSED ELEVATION
═	PROPOSED CULVERT
←- - -	PROPOSED DITCH AND FLOW DIRECTION
.|.|.|.|.	PROPOSED TERRACING
▨	PROPOSED POND ACCESS ROAD - 100mm TOPSOIL AND SEED - 300mm OPSS GRANULAR 'B'
▒	EROSION CONTROL BLANKET
⬡	PROPOSED CABLE CONCRETE MATS

⊕	B2-1, RB2-3, SWM5-1R SWM5-10	*BOREHOLE LOCATION BY INSPEC-SOL INC. (2008)*
⊞	TP3-2	*TESTPIT LOCATION BY INSPEC-SOL INC. (2008)*
⊕	MW2-8	*MONITORING WELL LOCATION BY CRA (2008)*
⊠	TW-3	*MONITORING WELL LOCATION BY GOLDER*
⊞	*TP1-04*	*TESTPIT LOCATION BY GOLDER ASSOCIATES LTD. (1994)*
	GW-3.00	*OBSERVED GROUNDWATER DEPTH BELOW GROUND SURFACE*
	BR-6.10	*ASSUMED BEDROCK DEPTH BELOW GROUND SURFACE*



SECTION 'C-C'

N.T.S.



SECTION 'B-B'

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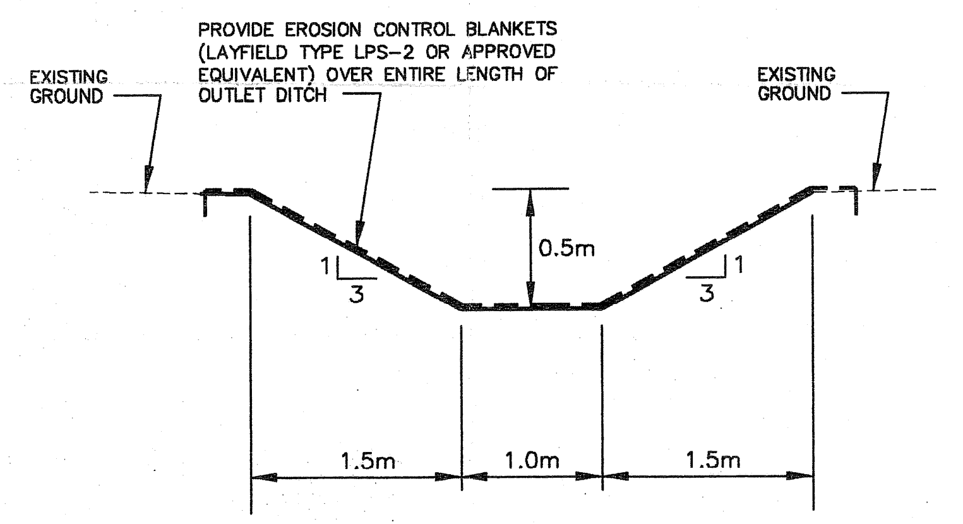

SECTION 'D-D'

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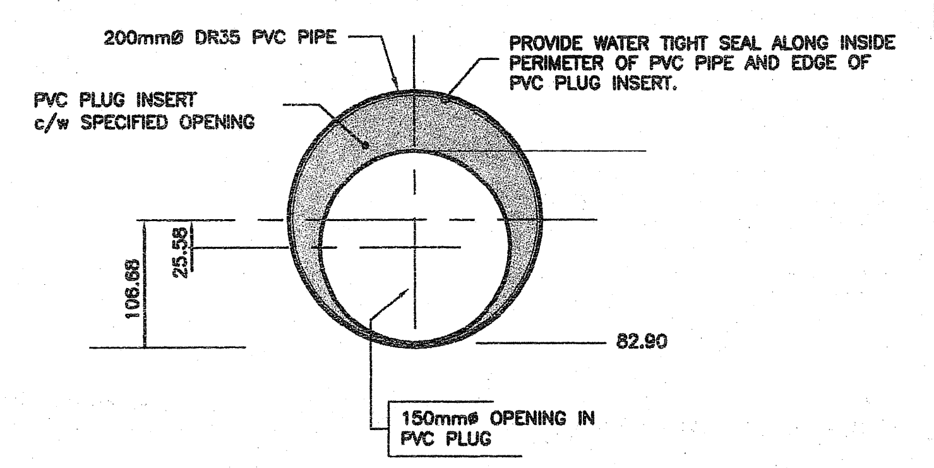
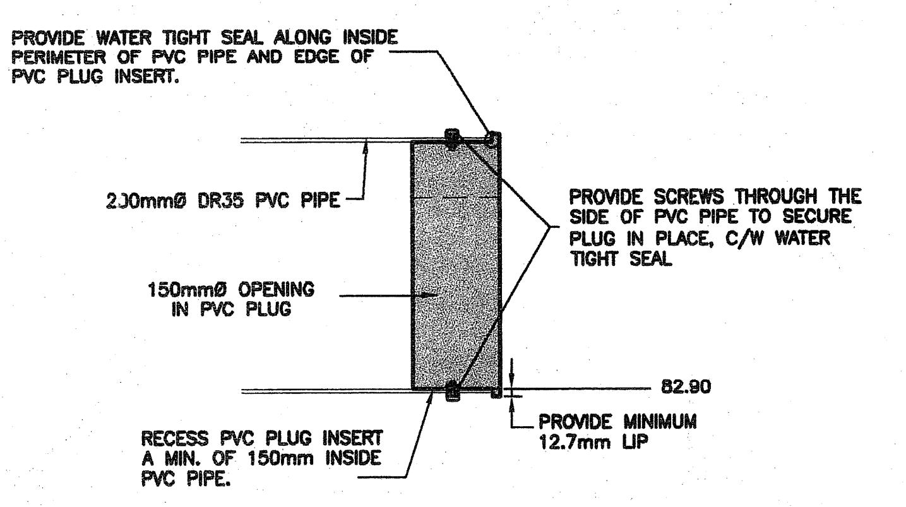


150mm CIRCULAR FLOW RESTRICTOR

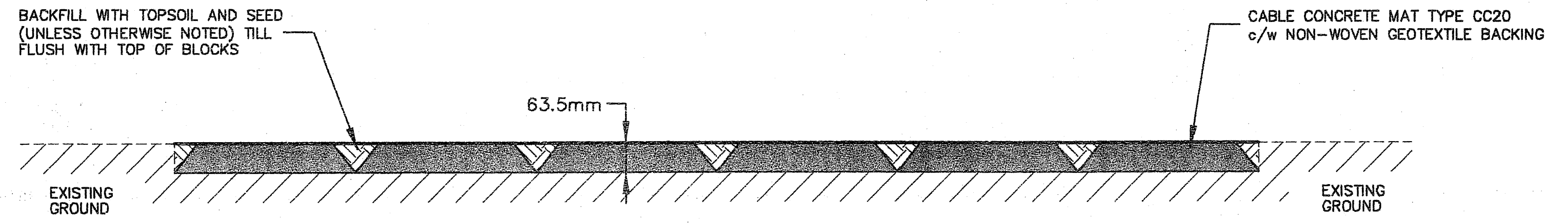
NOT TO SCALE

NOTE : PVC PLUG TO BE INSTALLED ON INLET FRONT FACE OF 200mmØ PVC PIPE



TYPICAL MOUNTING DETAIL OF PVC PLUG TO FRONT FACE OF PVC PIPE

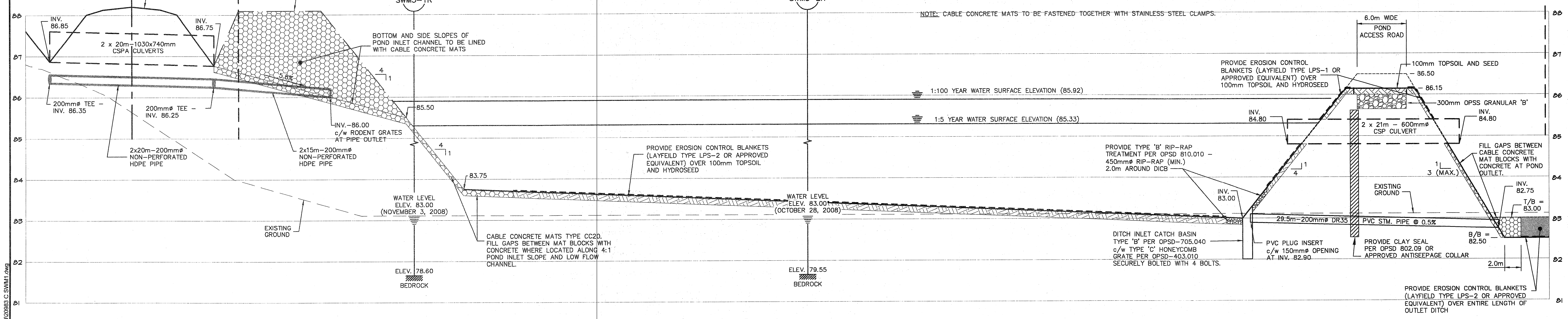
NOT TO SCALE



TYPICAL SECTION CABLE CONCRETE MAT INSTALLATION

N.T.S.

NOTE: CABLE CONCRETE MATS TO BE FASTENED TOGETHER WITH STAINLESS STEEL CLAMPS.



SECTION 'A-A' THROUGH POND

1:250 (HORIZ.) 0 5 10

1:50 (VERT.) 0 1 2

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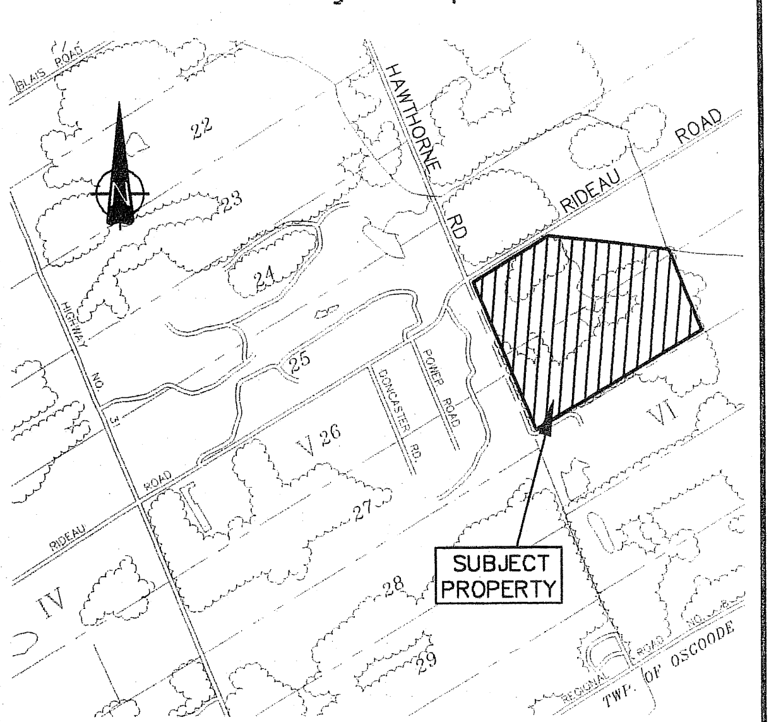
Key Map



NOT TO SCALE

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SCALE: AS SHOWN

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PROFESSIONAL STAMP

D. P. UPTON

PROJECT NORTH

PROJECT:

HAWTHORNE
INDUSTRIAL
PARK

DRAWING:

STORMWATER MANAGEMENT POND
PLAN
AND
SECTIONS

DESIGN: M.B.
DRAWN: T.S.
CHECKED: D.U.
PLOTTED: May 28, 2009
DRAWING NO.: **SWM1**
JLR NO: 20983

GENERAL NOTES FOR EROSION AND SEDIMENTATION CONTROL MEASURES DURING CONSTRUCTION :

During construction activities appropriate erosion and sediment control measures, as outlined in MNR's "Guidelines on Erosion and Sediment Control for Urban Construction Sites", shall be implemented to trap sediment on-site.

As a minimum, the following erosion and sedimentation control measures will be provided during construction:

- supply and install straw bale flow check dams (per OPSD 219.180) upstream of all culvert installations at locations shown on Drawing NO. ESC. Do not remove straw bale barriers until the upstream vegetation has been established;
- supply and install silt fence barrier (per OPSD 219.110) at locations shown on Drawing NO. ESC; and
- supply and install silt fence barrier (per OPSD 219.110) to enclose all borrow and stockpile areas resulting from topsoil stripping activities or any excavating activities (i.e. exact location to be determined during construction).

Furthermore, if dewatering and pumping operations become necessary, sediment dewatering bags shall be used to filter sediment prior to releasing groundwater into the receiving stream.

All control measures will be carried out in accordance with the following documents:

1) "Guidelines on Erosion and Sediment Control for Urban Construction Sites" published by Ontario Ministries of Natural Resources, Environment, Municipal Affairs, and Transportation & Communication, Association of Construction Authorities of Ontario and Urban Development Institute, Ontario, May 1987.

2) "Erosion and Sediment Control" Training Manual by Ministry of Environment, Spring 1998.

3) Applicable Regulations and guidelines of the Ministry of Natural Resources. As a minimum, during the construction of municipal services,the following Stormwater Management Practices will be used:

- Any stockpiled material will be kept on flat areas during construction, well away from any natural flow paths. In the event that the stockpile is placed in other areas where potential washoff to the conveyance system is expected, silt fences (per OPSD 219.110) will be installed to enclose the materials and prevent any washoff to the conveyance system.
- All pumped stormwater/groundwater will be filtered through sediment dewatring bags prior to its release to the receiving stream.

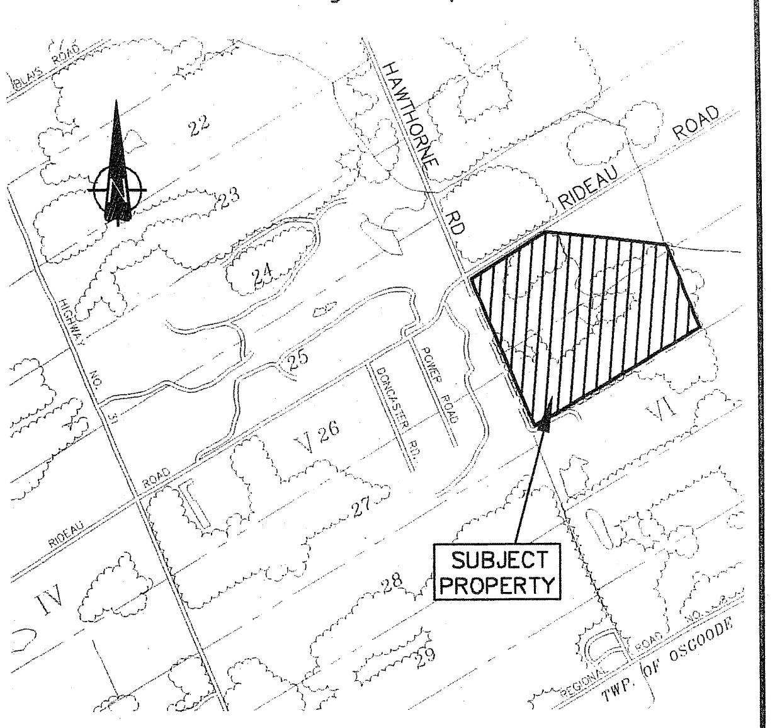
Sediment and Erosion control measures shall be implemented prior to work and maintained during the work phase by the general contractor to prevent entry of sediment into the receiving stream. All sediment and erosion control measures shall be inspected daily by the general contractor to ensure that they are functioning properly and are being maintained and/or upgraded as required. If the sediment and erosion control measures are not functioning properly, no further work shall occur until the problem has been addressed and rectified.

All materials and equipment used for the purpose of site preparation and project completion shall be operated and stored in a manner that prevents any deleterious substances (i.e. petroleum products, silt, etc.) from entering the receiving stream. Vehicle and equipment re-fuelling and maintenance shall be conducted away from drainage channels. Any part of equipment entering drainage channels shall be free of fluid leaks and externally cleaned/degreased to prevent any deleterious substances from entering the receiving stream.

GENERAL NOTES :

1. ALL STOCKPILED EXCAVATED MATERIAL IS TO BE LOCATED A MINIMUM OF 10m FROM ALL WATERCOURSES AND IS TO BE ENCLOSED WITH A SILT SCREEN (PER OPSD 219.110) OR LIGHT-DUTY STRAW BALE BARRIER (PER OPSD 219.100).
2. ALL SILT CONTROL MEASURES ARE TO BE INSPECTED ONCE PER MONTH AND AFTER EACH SIGNIFICANT RAINFALL EVENT TOTALLING 10mm OR GREATER. GENERAL CONTRACTOR TO REPAIR AS REQUIRED.
3. HYDROSEEDING OF ALL DITCHES IS TO BE PROVIDED IMMEDIATELY FOLLOWING FINAL SHAPING/GRADING.
4. THE GENERAL CONTRACTOR IS RESPONSIBLE FOR IMPLEMENTING BEST MANAGEMENT PRACTICES TO PROVIDE PROTECTION OF THE RECEIVING WATERCOURSE DURING ALL PHASES OF CONSTRUCTION.
5. SEDIMENT AND EROSION CONTROL MEASURES MAY BE MODIFIED IN THE FIELD AT THE DISCRETION OF THE CITY OF OTTAWA SITE INSPECTOR AND/OR THE LOCAL CONSERVATION AUTHORITY.

Key Map



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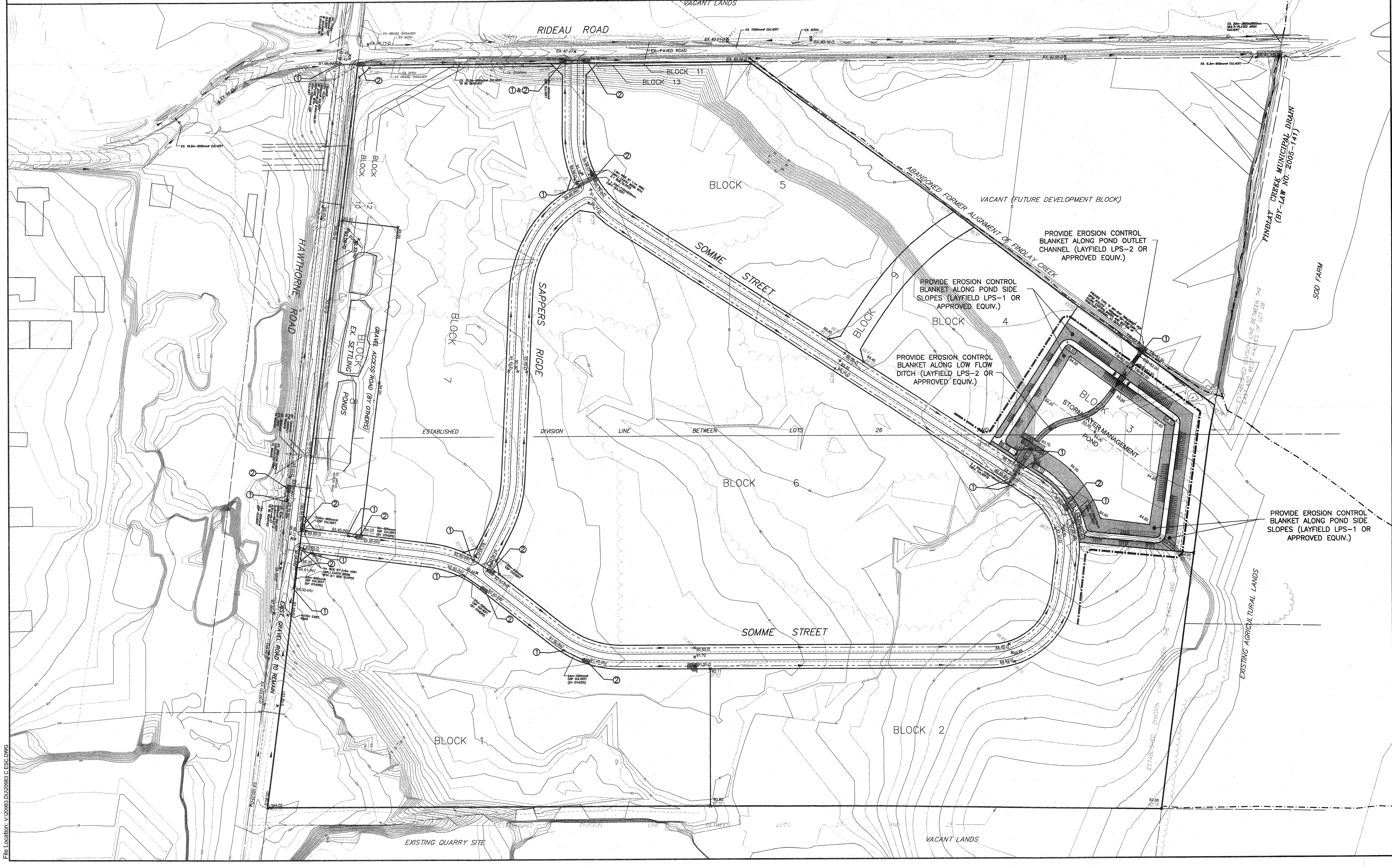

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LEGEND

× 91.70	PROPOSED ELEVATION
═	PROPOSED CULVERT
←- - - —	PROPOSED DITCH AND FLOW DIRECTION
.l.l.l.l.l.	PROPOSED TERRACING
▬ ▮ ▬ ▮ ▬	LIGHT-DUTY SILT FENCE BARRIER TO OPSD-219.110
▨	PROPOSED EROSION CONTROL BLANKET
⬡	PROPOSED CABLE CONCRETE MATS
①	PROPOSED LOCATION OF STRAW BALE FLOW CHECK DAM TO OPSD-219.180
② ▨	PROPOSED RIP-RAP TREATMENT TYPE 'B' TO OPSD-810.010

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PROFESSIONAL STAMP

LICENSED PROFESSIONAL ENGINEER
D. P. UPTON
May 29/09
PROVINCE OF ONTARIO

PROJECT NORTH

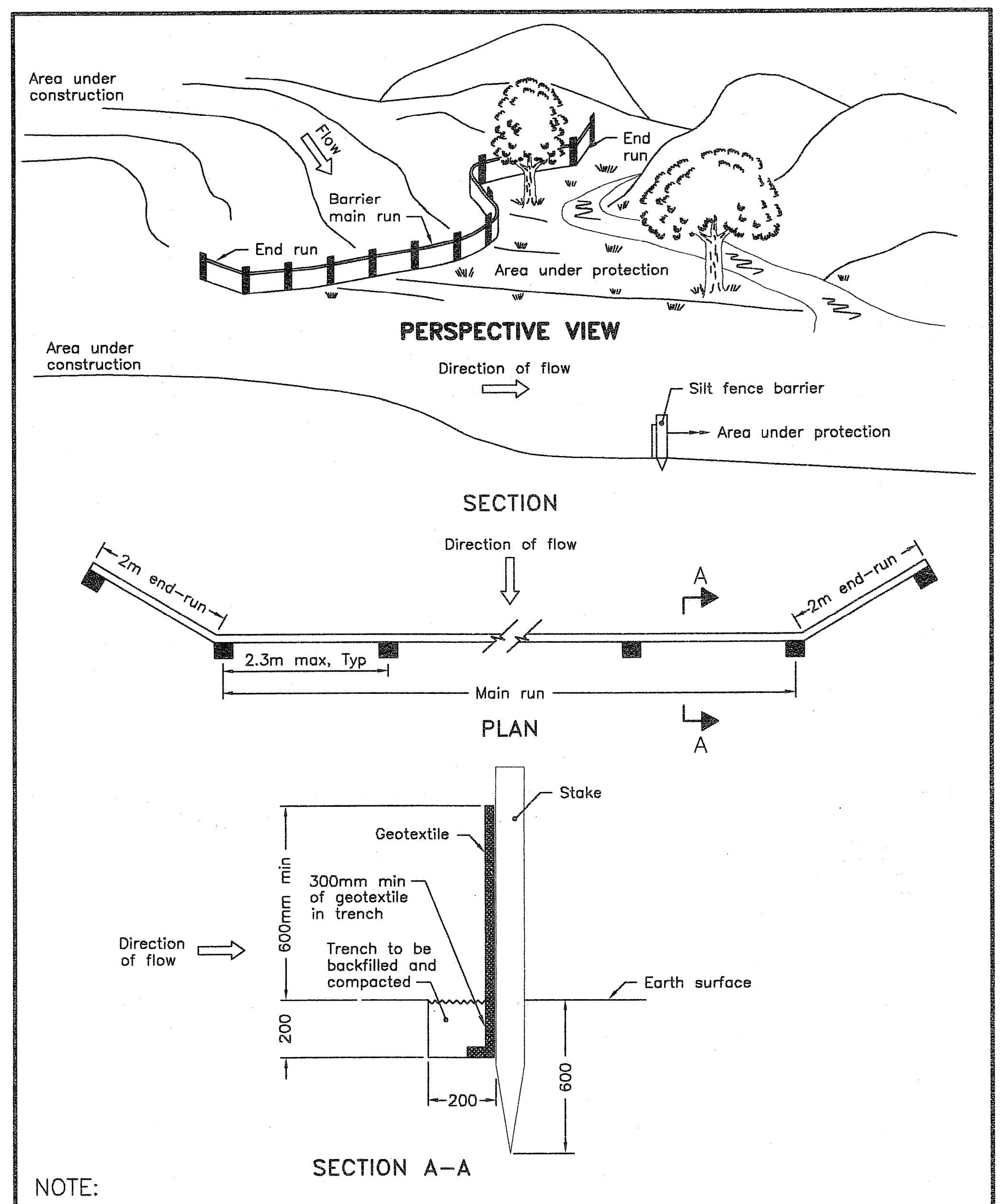
PROJECT:

HAWTHORNE
INDUSTRIAL
PARK

DRAWING:

EROSION AND SEDIMENT
CONTROL PLAN

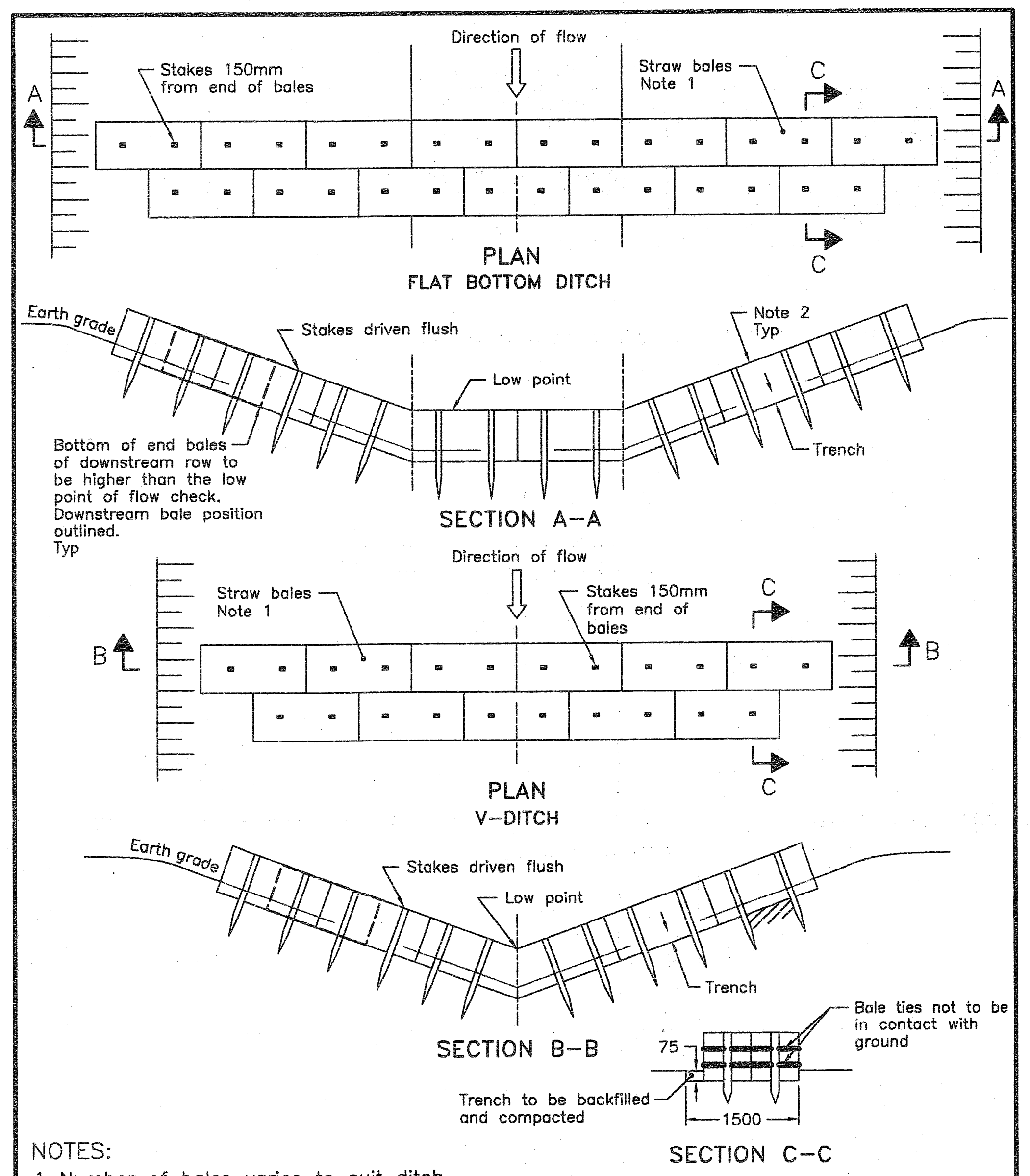
DESIGN: M.B.
DRAWN: T.S.
CHECKED: D.U.
PLOTTED: May 28, 2009
DRAWING NO.: ESC
JLR NO: 20983



NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2006	Rev 1
LIGHT-DUTY SILT FENCE BARRIER	OPSD 219.110	



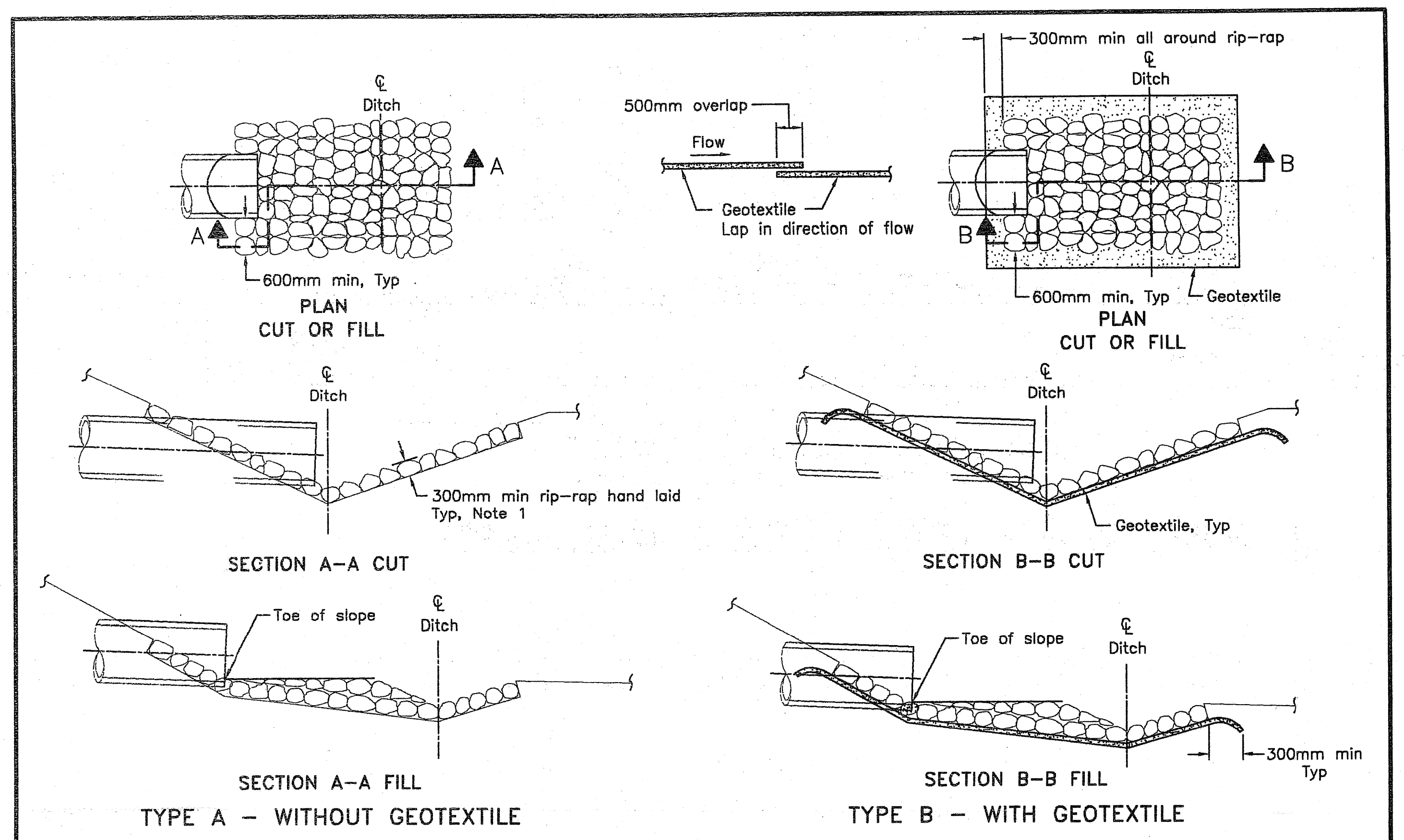
NOTES:

1 Number of bales varies to suit ditch.

2 Straw bales to be butted tightly against adjoining bales and shaped to conform to the sides of the ditch to prevent water flow through barrier.

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2006	Rev 1
STRAW BALE FLOW CHECK DAM	OPSD 219.180	

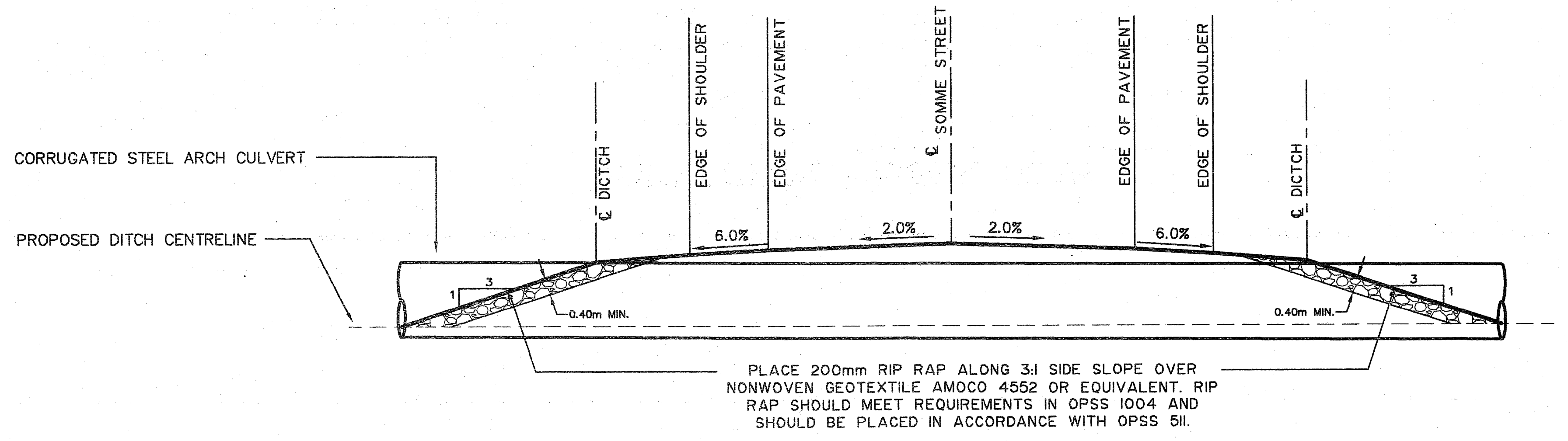


NOTES:

1 The thickness of the rip-rap layer shall be at least 1.5 times the rip-rap mean diameter.

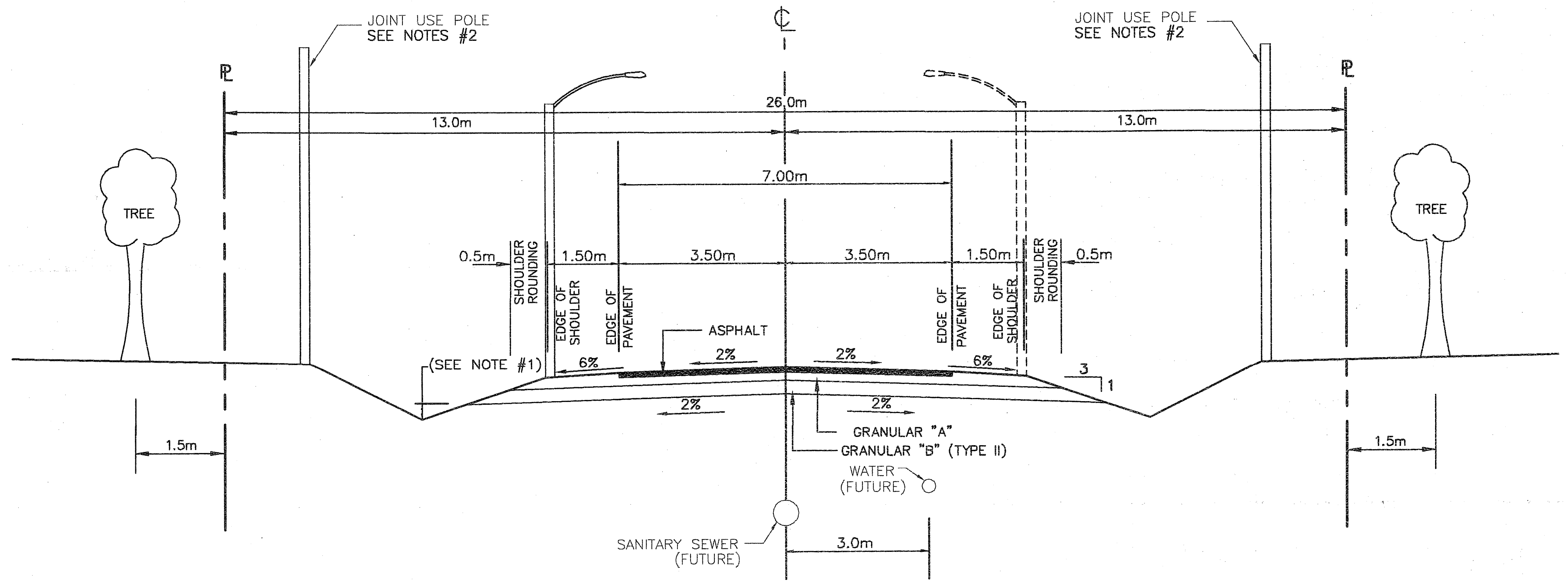
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2007	Rev 1
RIP-RAP TREATMENT FOR SEWER AND CULVERT OUTLETS	OPSD 810.010	



TYPICAL SECTION THRU CULVERT ROAD CROSSING

N.T.S



26.0 METER ROAD ALLOWANCE
RURAL SECTION

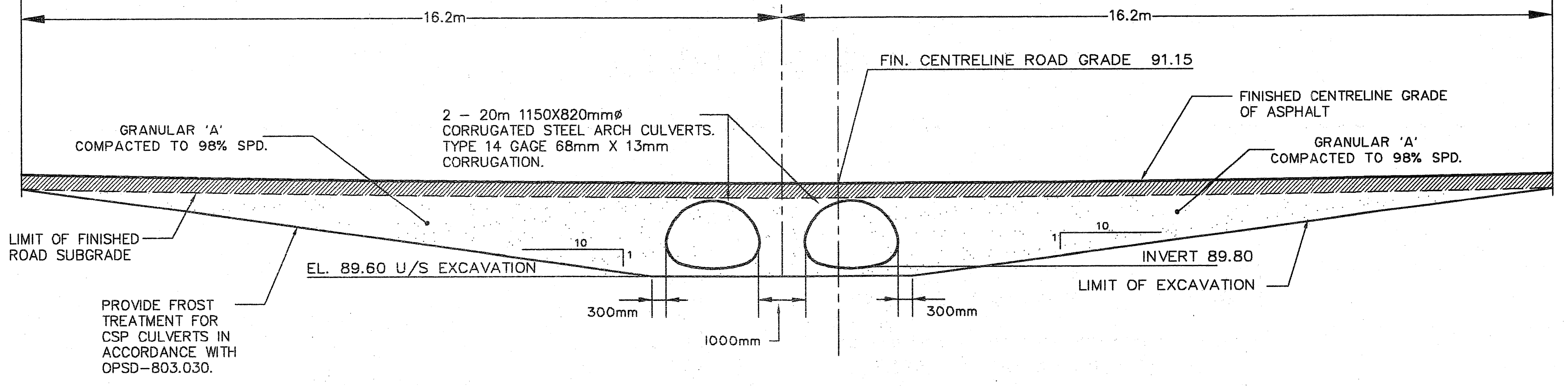
PAVEMENT STRUCTURE SCHEDULE

HAWTHORNE ROAD:
- 50mm HL3 SURFACE COURSE (SUPERPAVE 12.5mm – PG58-34 LEVEL 3)
- 100mm HL8 BINDER COURSE (SUPERPAVE 19.0mm – PG58-34 LEVEL 3)
- 150mm OPSS GRANULAR "A" BASE
- 300mm OPSS GRANULAR "B" TYPE II SUB-BASE

INTERNAL ACCESS ROADS:
- 50mm HL3 SURFACE COURSE (SUPERPAVE 12.5mm – PG58-34 LEVEL 2)
- 75mm HL8 BINDER COURSE (SUPERPAVE 19.0mm – PG58-34 LEVEL 2)
- 150mm OPSS GRANULAR "A" BASE
- 300mm OPSS GRANULAR "B" TYPE II SUB-BASE

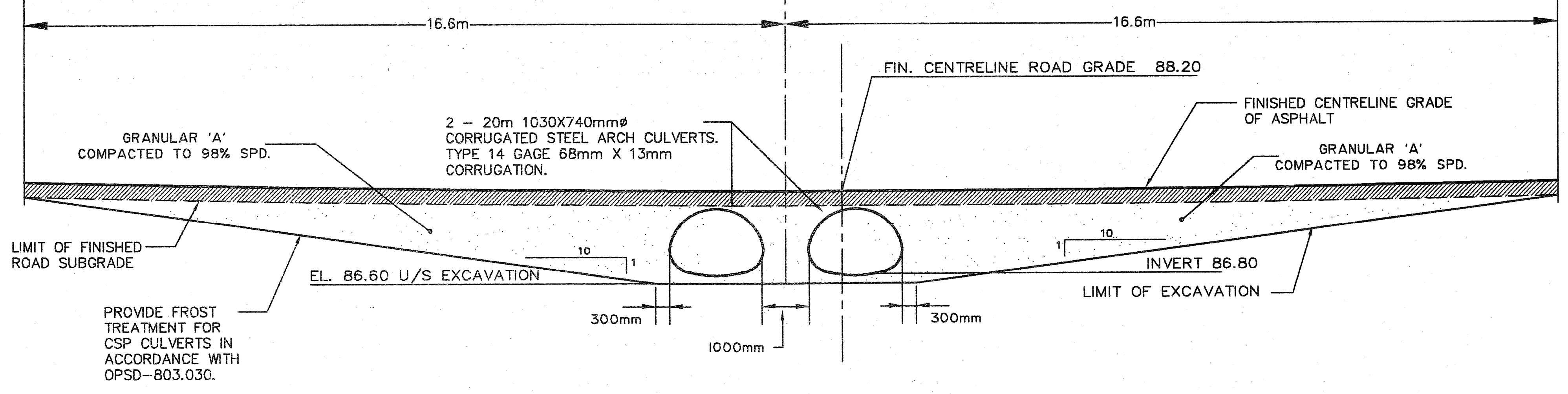
NOTES:

1. DITCHES SHALL BE CONSTRUCTED TO A MINIMUM OF 500mm BELOW SUBGRADE ELEVATION.
2. JOINT USE POLES WILL BE USED FOR OVERHEAD UTILITIES. THE POLES SHALL BE LOCATED 1.0m FROM PROPERTY LINE..
3. SHOULDER ON COLLECTOR STREET TO BE SURFACE TREATED, WHERE REQUIRED BY CITY ENGINEER.
4. SUB-EXCAVATE SOFT AREAS IN SUBBASE AND FILL WITH GRANULAR 'B' COMPACTED IN 0.15m LAYERS.
5. ALL MATERIALS TO BE SUPPLIED AND PLACED AS PER O.P.S.S. STANDARDS AND SPECIFICATIONS.
6. DEPTH OF GRANULAR 'B' TO BE INCREASED AS REQUIRED BY SOIL CONDITIONS.
7. AREA FROM THE EDGE OF SHOULDER TO THE PROPERTY LINE IS TO BE SODDED OR SEEDED.
8. ALL SERVICES INDICATED MAY NOT NECESSARILY APPLY AT THIS TIME.
9. LIGHT STANDARDS TO BE LOCATED 1.5m FROM EDGE OF ASPHALT.
10. TYPE II GRANULAR 'B' IS CRUSHED ROCK.
11. ALL DRIVEWAY CULVERTS TO BE 500mm DIA CSP UNLESS OTHERWISE NOTED.
12. ALL INTERSECTION RADII TO BE PAVED PER OPSD 304.01
13. ROADWAY CONSTRUCTION IS TO BE AS PER THE GEOTECHNICAL RECOMMENDATIONS PROVIDED BY INSPEC-SOL INC. (REPORT NO. T020556-A1 DATED JAN. 30, 2009)



CULVERT ROAD CROSSING DETAIL 1

N.T.S



CULVERT ROAD CROSSING DETAIL 2

N.T.S

NO.	ISSUE	DATE
03	ISSUED FOR M.O.E. APPROVAL	28/05/09
02	REVISED PER CITY COMMENTS	30/04/09
01	ISSUED FOR CITY APPROVAL	12/02/09

SCALE: N.T.S.

J.L.Richards
ENGINEERS·ARCHITECTS·PLANNERS

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& Associates Limited
203-863 Princess Street
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Tel: 613 544 1424
Fax: 613 544 5679

PROFESSIONAL STAMP

LICENSED PROFESSIONAL ENGINEER
D. P. UPTON
May 29/09
PROVINCE OF ONTARIO

PROJECT NORTH

PROJECT:

HAWTHORNE
INDUSTRIAL
PARK

DRAWING:

DETAILS

DESIGN: M.B.
DRAWN: T.S.
CHECKED: D.U.
PLOTTED: May 29, 2009
DRAWING NO.: DT
JLR NO: 20983

File Location: V:\20983.DU\20983 C DT.dwg

APPENDIX 'A'

RATIONAL METHOD DESIGN SHEETS
(1:10 year and 1:100 year Design Sheets)

J.L. RICHARDS AND ASSOCIATES LIMITED, Consulting Engineers, Architects and Planners

DATE : 5/27/2009

Hawthorne Industrial Park

OPEN DITCH/CULVERT DESIGN SHEET

City of Ottawa

Prepared by: M. Buchanan, E.I.T.

JLR 20983

February 2009 (Revised April 2009)

1:10 year Ottawa International Airport IDF Curve

Checked by: G. Forget, P.Eng.

Increase Runoff Coefficient by 0.0%

DETAILS	NODES		DRAINAGE AREA					PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA									CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT						FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)
	FROM	TO	Area at C of 0.70 (ha)	Area at C of 0.90 (ha)	SUM(A)	SUM(A*C)	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D_{10yr} m	D_{max} m	SS X:1	SLOPE %	Q_{10yr} l/s	Q_{100yr} l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL	HW 1:10 (m)			
NORTHERN CATCHMENT AREA																														
WEST SIDE SAPPERS RIDGE	2	3	1.86	0.18	2.04	1.46	1.46	4.07	4.07	15.00	97.85	398.2	0.00	0.42	1.20	3.00	0.50	424.2	6973.0	0.80	136.80							2.84	92.50	91.82
WEST SIDE SAPPERS RIDGE	3	4	1.89	0.14	2.03	1.45	2.92	4.04	8.11	17.84	88.22	715.4	0.00	0.51	1.20	3.00	0.80	904.2	8856.1	1.16	111.00							1.60	91.82	90.93
WEST SIDE SAPPERS RIDGE	4	5	1.76	0.15	1.91	1.36	4.28	3.79	11.90	19.44	83.68	995.9	0.00	0.58	1.20	3.00	0.51	1011.3	7029.1	1.00	112.85							1.88	90.93	90.36
WEST SIDE SAPPERS RIDGE	5	6	2.43	0.11	2.54	1.80	6.08	5.00	16.90	21.32	78.96	1334.4	0.00	0.65	1.20	3.00	0.62	1513.4	7762.6	1.19	82.79							1.16	90.36	89.85
										22.47																				
NORTH ENTRANCE TO SOMME STREET	8	6		0.03	0.03	0.03	0.03	0.08	0.08	15.00	97.85	7.3	0.00	0.20	1.20	3.00	1.30	94.9	11276.7	0.79	10.00							0.21	89.98	89.85
										15.21																				
CULVERT CROSSING	6	14		0.00	0.00	0.00	6.11	0.00	16.97	22.47	76.34	1295.8					0.50				20.00	2	-----	1.15 x 0.82	NO	YES	**0.75**	0.38	89.85	89.75
										22.85																				
NORTH PORTION SOMME STREET	13	14	0.85	0.03	0.88	0.62	0.62	1.73	1.73	15.00	97.85	169.2	0.00	0.30	1.20	3.00	2.30	372.0	14999.4	1.38	10.00							0.12	89.98	89.75
										15.12																				
NORTH PORTION SOMME STREET	14	15	2.93	0.24	3.17	2.27	8.99	6.30	25.00	22.85	75.52	1888.2	0.00	0.74	1.20	3.00	0.50	1926.6	6992.8	1.17	184.04							2.62	89.75	88.83
NORTH PORTION SOMME STREET	15	16	2.08	0.18	2.26	1.62	10.61	4.50	29.50	25.47	70.36	2075.4	0.00	0.77	1.20	3.00	0.57	2291.4	7480.8	1.29	145.08							1.88	88.83	88.00
NORTH PORTION SOMME STREET	16	18	2.34	0.23	2.57	1.85	12.46	5.13	34.63	27.35	67.11	2323.9	0.00	0.80	1.20	3.00	0.51	2399.6	7074.8	1.25	185.66							2.48	88.00	87.05
NORTH PORTION SOMME STREET	18	19	0.00	0.05	0.05	0.05	12.50	0.13	34.75	29.82	63.30	2199.9	0.00	0.76	1.20	3.00	0.72	2476.8	8372.8	1.43	41.86							0.49	87.05	86.75
										30.31																				
EAST SIDE SAPPERS RIDGE	9	10	1.74	0.19	1.93	1.39	1.39	3.86	3.86	15.00	97.85	378.0	0.00	0.41	1.20	3.00	0.50	399.2	6996.6	0.79	147.87							3.11	92.40	91.66
EAST SIDE SAPPERS RIDGE	10	11	1.49	0.14	1.63	1.17	2.56	3.25	7.11	18.11	87.42	622.0	0.00	0.49	1.20	3.00	0.66	735.9	8019.2	1.02	111.04							1.81	91.66	90.93
EAST SIDE SAPPERS RIDGE	11	12	0.73	0.14	0.87	0.64	3.20	1.77	8.88	19.92	82.40	732.0	0.00	0.52	1.20	3.00	0.55	785.5	7304.8	0.97	104.49							1.80	90.93	90.36
EAST SIDE SAPPERS RIDGE	12	7	0.18	0.09	0.27	0.21	3.40	0.58	9.46	21.72	78.02	738.2	0.00	0.49	1.20	3.00	0.81	818.5	8919.0	1.14	72.55							1.06	90.36	89.77
NORTH PORTION SOMME STREET	7	20	1.07	0.23	1.30	0.96	4.36	2.66	12.12	22.79	75.66	916.9	0.00	0.57	1.20	3.00	0.50	956.8	6966.1	0.98	177.39							3.01	89.77	88.89
NORTH PORTION SOMME STREET	20	21	2.27	0.19	2.46	1.76	6.12	4.89	17.01	25.80	69.76	1186.8	0.00	0.62	1.20	3.00	0.50	1200.1	6981.9	1.04	147.49							2.36	88.89	88.16
NORTH PORTION SOMME STREET	21	22	3.43	0.30	3.73	2.67	8.79	7.43	24.44	28.16	65.80	1608.1	0.00	0.70	1.20	3.00	0.56	1759.0	7404.4	1.20	232.84							3.24	88.16	86.85
										31.40																				
SOUTHERN CATCHMENT AREA																														
SOUTH PORTION SOMME STREET	23A	23B	0.00	0.25	0.25	0.23	0.23	0.63	0.63	15.00	97.85	61.2	0.00	0.20	1.20	3.00	0.64	66.3	7883.5	0.55	181.00							5.46	93.65	92.50
CULVERT CROSSING	23B	23C		0.00	0.00	0.00	0.23	0.00	0.63	20.46	81.05	50.7					0.42				24.00	1	500	-----	NO	YES	**0.33**	1.55	92.50	92.40
SOUTH PORTION SOMME STREET	23C	24A	0.00	0.17	0.17	0.15	0.38	0.43	1.05	22.00	77.38	81.3	0.00	0.22	1.20	3.00	0.82	97.0	8946.1	0.67	110.00							2.74	92.40	91.50
CULVERT CROSSING	24A	24B		0.00	0.00	0.00	0.38	0.00	1.05	24.75	71.70	75.3					0.42				24.00	1	500	-----	NO	YES	**0.34**	1.04	91.50	91.40
SOUTH PORTION SOMME STREET	24B	24C	0.00	0.21	0.21	0.19	0.57	0.53	1.58	25.79	69.78	110.0	0.00	0.25	1.20	3.00	0.70	126.0	8258.2	0.67	142.00							3.52	91.40	90.41
ORGAWORLD - SITE	U/S	24C	1:10 year peak flow = 132 L/s, see Table 4 of Orgaworld Stormwater Site Management Plan, Sept. 2008									132.0																		
SOUTH PORTION SOMME STREET	24C	25	3.70	0.32	4.02	2.88	3.44	8.00	9.58	29.31	64.05	745.3	0.00	0.52	1.20	3.00	0.54	783.8	7289.5	0.97	244.84							4.22	90.41	89.08
SOUTH PORTION SOMME STREET	25	26	2.63	0.12	2.75	1.95	5.39	5.42	14.99	33.53	58.41	1007.7	0.00	0.58	1.20	3.00	0.51	1013.1	7041.5	1.00	90.75							1.51	89.08	88.62
SOUTH PORTION SOMME STREET	26	27A	3.15	0.20	3.35	2.39	7.78	6.63	21.63	35.04	56.65	1357.2	0.00	0.62	1.20	3.00	0.65	1370.0	7970.4	1.19	157.06							2.20	88.62	87.60
SOUTH PORTION SOMME STREET	27A	27B	0.00	0.03	0.03	0.03	7.81	0.08	21.70	37.24	54.29	1310.1	0.00	0.61	1.20	3.00	0.65	1312.4	7973.8	1.18	20.00							0.28	87.60	87.47
CULVERT CROSSING	27B	27C		0.00	0.00	0.00	7.81	0.00	21.70	37.53	54.00	1303.8					0.73				15.00	1	-----	1.39 X 0.97	YES	NO	**0.87**	0.20	87.47	87.36
CORNER OF POND	27C	19	0.00	0.11	0.11	0.10	7.88	0.28	21.98	37.73	53.79	1314.2	0.00	0.65	1.20	3.00	0.71	1622.9	8324.0	1.28	72.00							0.94	87.36	86.85
										38.67																				

J.L. RICHARDS AND ASSOCIATES LIMITED, Consulting Engineers, Architects and Planners

DATE : 5/27/2009

Hawthorne Industrial Park

OPEN DITCH/CULVERT DESIGN SHEET

City of Ottawa

Prepared by: M. Buchanan, E.I.T.

JLR 20983

February 2009 (Revised April 2009)

1:10 year Ottawa International Airport IDF Curve

Checked by: G. Forget, P.Eng.

Increase Runoff Coefficient by 0.0%

DETAILS	NODES		DRAINAGE AREA					PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA									CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT						FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)
	FROM	TO	Area at C of 0.70 (ha)	0.90 (ha)	SUM(A)	SUM(A*C)	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D_{10yr} m	D_{max} m	SS X:1	SLOPE %	Q_{10yr} l/s	Q_{100yr} l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL	HW 1:10 (m)			
SW ENTRANCE TO SOMME STREET	1	2	0.18	0.25	0.43	0.35	0.35	0.97	0.97	15.00	97.85	94.6	0.00	0.32	1.20	3.00	0.61	226.9	7702.7	0.74	189.60							4.28	93.65	92.50
CULVERT CROSSING	2	9		0.00	0.00	0.00	0.35	0.00	0.97	19.28	84.12	81.3					0.50				20.00	1	600	-----	NO	**YES**	**0.52**	1.16	92.50	92.40
SOUTH PORTION SOMME STREET	9	28	2.54	0.35	2.89	2.10	2.44	5.83	6.80	20.44	81.10	551.2	0.00	0.47	1.20	3.00	0.73	694.0	8450.7	1.05	272.58							4.34	92.40	90.41
SOUTH PORTION SOMME STREET	28	29A	3.46	0.32	3.78	2.71	5.15	7.53	14.33	24.77	71.65	1026.7	0.00	0.61	1.20	3.00	0.54	1198.8	7283.5	1.07	245.24							3.81	90.41	89.08
SOUTH PORTION SOMME STREET	29A	29B	0.77	0.11	0.88	0.64	5.79	1.78	16.11	28.58	65.15	1049.5	0.00	0.62	1.20	3.00	0.53	1239.6	7212.0	1.07	86.51							1.34	89.08	88.62
SOUTH PORTION SOMME STREET	29B	30	0.32	0.12	0.44	0.33	6.13	0.92	17.03	29.92	63.16	1075.8	0.00	0.58	1.20	3.00	0.70	1191.6	8282.1	1.18	94.12							1.33	88.62	87.96
SOUTH PORTION SOMME STREET	30	22	0.75	0.16	0.91	0.67	6.80	1.86	18.89	31.25	61.31	1158.5	0.00	0.58	1.20	3.00	0.97	1402.6	9748.4	1.39	124.55							1.49	87.96	86.75
										32.74																				
CULVERT CROSSING	22	19		0.00	0.00	0.00	15.59	0.00	43.33	32.74	59.38	2573.1					0.50				20.00	2	-----	1.03 X 0.74	**YES**	NO	**1.30**	0.08	86.85	86.75
										32.82																				
POND INLET	19	POND		0.00	0.00	0.00	35.97	0.00	100.06	38.67	52.87	5422.6	3.09	0.38	1.20	3.00	5.68	5629.1	13135.2	3.50	22.00							0.10	86.75	85.50
POND OUTLET DITCH	POND	DITCH	**1:10 year controlled post development peak flow = 696 l/s, see SWMHYMO output of this Report**									696.0	1.00	0.27	0.38	3.00	2.08	750.9	1506.6	1.54	24.00							0.26	82.50	82.00

Note: Conveyance Capacitites for the Open Ditch/Swale were calculated based on a Manning's Roughness Coefficient (n) of 0.030

DATE : 5/27/2009

Hawthorne Industrial Park

OPEN DITCH/CULVERT DESIGN SHEET

City of Ottawa

Prepared by: M. Buchanan, E.I.T.

JLR 20983

February 2009 (Revised April 2009)

1:100 year Ottawa International Airport IDF Curve

Checked by: G. Forget, P.Eng.

Increase Runoff Coefficient by 25.0%

DETAILS	NODES		DRAINAGE AREA					PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA							CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT					FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)
	FROM	TO	Area at C of 0.70 (ha)	Area at C of 0.90 (ha)	SUM(A)	SUM(A*1.25*C) 25% increase in C factor	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D m	SS X:1	SLOPE %	CAPAC. l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL			
NORTHERN CATCHMENT AREA																											
WEST SIDE SAPPERS RIDGE	2	3	1.86	0.18	2.04	1.81	1.81	5.02	5.02	15.00	142.89	718.0	0.00	1.20	3.00	0.50	6973.0	1.61	136.80						1.41	92.50	91.82
WEST SIDE SAPPERS RIDGE	3	4	1.89	0.14	2.03	1.80	3.61	5.00	10.02	16.41	135.47	1357.9	0.00	1.20	3.00	0.80	8856.1	2.05	111.00						0.90	91.82	90.93
WEST SIDE SAPPERS RIDGE	4	5	1.76	0.15	1.91	1.69	5.29	4.69	14.71	17.31	131.16	1929.7	0.00	1.20	3.00	0.51	7029.1	1.63	112.85						1.16	90.93	90.36
WEST SIDE SAPPERS RIDGE	5	6	2.43	0.11	2.54	2.23	7.53	6.21	20.92	18.47	126.06	2637.5	0.00	1.20	3.00	0.62	7762.6	1.80	82.79						0.77	90.36	89.85
										19.24																	
NORTH ENTRANCE TO SOMME STREET	8	6		0.03	0.03	0.03	0.03	0.08	0.08	15.00	142.89	11.9	0.00	1.20	3.00	1.30	11276.7	2.61	10.00						0.06	89.98	89.85
										15.06																	
CULVERT CROSSING	6	14		0.00	0.00	0.00	7.56	0.00	21.01	19.24	122.91	2581.8				0.50			20.00	2	-----	1.15 x 0.82	NO	YES	0.19	89.85	89.75
										19.43																	
NORTH PORTION SOMME STREET	13	14	0.85	0.03	0.88	0.77	0.77	2.15	2.15	15.00	142.89	307.4	0.00	1.20	3.00	2.30	14999.4	3.47	10.00						0.05	89.98	89.75
										15.05																	
NORTH PORTION SOMME STREET	14	15	2.93	0.24	3.17	2.80	11.13	7.79	30.95	19.43	122.15	3780.5	0.00	1.20	3.00	0.50	6992.8	1.62	184.04						1.89	89.75	88.83
NORTH PORTION SOMME STREET	15	16	2.08	0.18	2.26	2.00	13.13	5.56	36.51	21.32	115.16	4204.4	0.00	1.20	3.00	0.57	7480.8	1.73	145.08						1.40	88.83	88.00
NORTH PORTION SOMME STREET	16	18	2.34	0.23	2.57	2.28	15.41	6.33	42.84	22.72	110.55	4736.0	0.00	1.20	3.00	0.51	7074.8	1.64	185.66						1.89	88.00	87.05
NORTH PORTION SOMME STREET	18	19	0.00	0.05	0.05	0.05	15.46	0.14	42.98	24.61	104.93	4509.7	0.00	1.20	3.00	0.72	8372.8	1.94	41.86						0.36	87.05	86.75
										24.97																	
EAST SIDE SAPPERS RIDGE	9	10	1.74	0.19	1.93	1.71	1.71	4.76	4.76	15.00	142.89	680.4	0.00	1.20	3.00	0.50	6996.6	1.62	147.87						1.52	92.40	91.66
EAST SIDE SAPPERS RIDGE	10	11	1.49	0.14	1.63	1.44	3.16	4.02	8.78	16.52	134.93	1184.3	0.00	1.20	3.00	0.66	8019.2	1.86	111.04						1.00	91.66	90.93
EAST SIDE SAPPERS RIDGE	11	12	0.73	0.14	0.87	0.78	3.94	2.16	10.94	17.52	130.23	1424.7	0.00	1.20	3.00	0.55	7304.8	1.69	104.49						1.03	90.93	90.36
EAST SIDE SAPPERS RIDGE	12	7	0.18	0.09	0.27	0.25	4.18	0.69	11.63	18.55	125.73	1462.2	0.00	1.20	3.00	0.81	8919.0	2.06	72.55						0.59	90.36	89.77
NORTH PORTION SOMME STREET	7	20	1.07	0.23	1.30	1.17	5.35	3.24	14.87	19.13	123.33	1834.1	0.00	1.20	3.00	0.50	6966.1	1.61	177.39						1.83	89.77	88.89
NORTH PORTION SOMME STREET	20	21	2.27	0.19	2.46	2.18	7.53	6.05	20.92	20.97	116.41	2435.6	0.00	1.20	3.00	0.50	6981.9	1.62	147.49						1.52	88.89	88.16
NORTH PORTION SOMME STREET	21	22	3.43	0.30	3.73	3.30	10.83	9.18	30.10	22.49	111.29	3350.0	0.00	1.20	3.00	0.56	7404.4	1.71	232.84						2.26	88.16	86.85
										24.75																	
SOUTHERN CATCHMENT AREA																											
SOUTH PORTION SOMME STREET	23A	23B	0.00	0.25	0.25	0.25	0.25	0.70	0.70	15.00	142.89	99.3	0.00	1.20	3.00	0.64	7883.5	1.82	181.00						1.65	93.65	92.50
CULVERT CROSSING	23B	23C		0.00	0.00	0.00	0.25	0.00	0.70	16.65	134.29	93.3				0.42			24.00	1	500	-----	NO	YES	0.84	92.50	92.40
SOUTH PORTION SOMME STREET	23C	24A	0.00	0.17	0.17	0.17	0.42	0.47	1.17	17.49	130.34	152.2	0.00	1.20	3.00	0.82	8946.1	2.07	110.00						0.89	92.40	91.50
CULVERT CROSSING	24A	24B		0.00	0.00	0.00	0.42	0.00	1.17	18.38	126.45	147.6				0.42			24.00	1	500	-----	NO	YES	0.53	91.50	91.40
SOUTH PORTION SOMME STREET	24B	24C	0.00	0.21	0.21	0.21	0.63	0.58	1.75	18.91	124.24	217.6	0.00	1.20	3.00	0.70	8258.2	1.91	142.00						1.24	91.40	90.41
ORGAWORLD - SITE	U/S	24C	**1:100 year peak flow = 283 l/s, see Table 4 of Orgaworld Stormwater Site Management Plan, Sept. 2008**									283.0															
SOUTH PORTION SOMME STREET	24C	25	3.70	0.32	4.02	3.56	4.19	9.89	11.64	20.15	119.40	1672.8	0.00	1.20	3.00	0.54	7289.5	1.69	244.84						2.42	90.41	89.08
SOUTH PORTION SOMME STREET	25	26	2.63	0.12	2.75	2.42	6.61	6.73	18.37	22.57	111.05	2323.0	0.00	1.20	3.00	0.51	7041.5	1.63	90.75						0.93	89.08	88.62
SOUTH PORTION SOMME STREET	26	27A	3.15	0.20	3.35	2.96	9.57	8.22	26.59	23.49	108.17	3159.5	0.00	1.20	3.00	0.65	7970.4	1.84	157.06						1.42	88.62	87.60
SOUTH PORTION SOMME STREET	27A	27B	0.00	0.03	0.03	0.03	9.60	0.08	26.67	24.91	104.09	3059.5	0.00	1.20	3.00	0.65	7973.8	1.85	20.00						0.18	87.60	87.47
CULVERT CROSSING	27B	27C		0.00	0.00	0.00	9.60	0.00	26.67	25.09	103.59	3046.2				0.73			15.00	1	-----	1.39 X 0.97	YES	NO	0.09	87.47	87.36
CORNER OF POND	27C	19	0.00	0.11	0.11	0.11	9.71	0.31	26.98	25.18	103.36	3071.7	0.00	1.20	3.00	0.71	8324.0	1.93	72.00						0.62	87.36	86.85
										25.80																	

Hawthorne Industrial Park

OPEN DITCH/CULVERT DESIGN SHEET

City of Ottawa

Prepared by: M. Buchanan, E.I.T.

JLR 20983

February 2009 (Revised April 2009)

1:100 year Ottawa International Airport IDF Curve

Checked by: G. Forget, P.Eng.

Increase Runoff Coefficient by 25.0%

DETAILS	NODES		DRAINAGE AREA					PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA							CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT					FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)
	FROM	TO	Area at C of		SUM(A)	SUM(A*1.25*C) 25% increase in C factor	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D m	SS X:1	SLOPE %	CAPAC. l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL			
			0.70 (ha)	0.90 (ha)																							
SW ENTRANCE TO SOMME STREET	1	2	0.18	0.25	0.43	0.40	0.40	1.12	1.12	15.00	142.89	160.5	0.00	1.20	3.00	0.61	7702.7	1.78	189.60						1.77	93.65	92.50
CULVERT CROSSING	2	9		0.00	0.00	0.00	0.40	0.00	1.12	16.77	133.71	150.2				0.50			20.00	1	600	-----	NO	**YES**	0.63	92.50	92.40
SOUTH PORTION SOMME STREET	9	28	2.54	0.35	2.89	2.58	2.98	7.16	8.29	17.40	130.77	1083.6	0.00	1.20	3.00	0.73	8450.7	1.96	272.58						2.32	92.40	90.41
SOUTH PORTION SOMME STREET	28	29A	3.46	0.32	3.78	3.35	6.33	9.31	17.59	19.72	121.01	2128.9	0.00	1.20	3.00	0.54	7283.5	1.69	245.24						2.42	90.41	89.08
SOUTH PORTION SOMME STREET	29A	29B	0.77	0.11	0.88	0.79	7.11	2.19	19.78	22.15	112.40	2223.0	0.00	1.20	3.00	0.53	7212.0	1.67	86.51						0.86	89.08	88.62
SOUTH PORTION SOMME STREET	29B	30	0.32	0.12	0.44	0.40	7.51	1.11	20.89	23.01	109.65	2290.7	0.00	1.20	3.00	0.70	8282.1	1.92	94.12						0.82	88.62	87.96
SOUTH PORTION SOMME STREET	30	22	0.75	0.16	0.91	0.82	8.33	2.27	23.16	23.83	107.18	2482.3	0.00	1.20	3.00	0.97	9748.4	2.26	124.55						0.92	87.96	86.75
										24.75																	
CULVERT CROSSING	22	19		0.00	0.00	0.00	19.16	0.00	53.26	24.75	104.53	5567.5				0.50			20.00	2	-----	1.03 X 0.74	**YES**	NO	0.04	86.85	86.75
										24.79																	
POND INLET	19	POND		0.00	0.00	0.00	44.32	0.00	123.22	25.80	101.69	12813.8	3.09	0.55	5.00	5.68	13135.2	4.09	22.00						0.09	86.75	85.50
POND OUTLET DITCH	POND	DITCH	1:100 year controlled post development peak flow = 1,432 l/s, see SWMHYMO output of this Report									1432.0	1.00	0.38	3.00	2.08	1506.6	1.85	24.00						0.22	82.50	82.00

Note: Conveyance Capacitites for the Open Ditch/Swale were calculated based on a Manning's Roughness Coefficient (n) of 0.030

J.L. RICHARDS AND ASSOCIATES LIMITED, Consulting Engineers, Architects and Planners

DATE : 4/28/2009

Hawthorne Road & Rideau Road

OPEN DITCH/CULVERT DESIGN SHEET

City of Ottawa

Prepared by: M. Buchanan, E.I.T.

JLR 20983

February 2009

10 year Ottawa International Airport IDF Curve

Checked by: G. Forget, P.Eng.

Increase Runoff Coefficient by 0.0% up C = 1.0

DETAILS	NODES		DRAINAGE AREA							PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA									CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT						FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)
	FROM	TO	AREA (A) at C of				SUM(A)	SUM(A*C)	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D_{10yr} m	D_{max} m	SS X:1	SLOPE %	Q_{10yr} l/s	Q_{100yr} l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL	HW 1:10 (m)			
			0.20 (ha)	0.30 (ha)	0.70 (ha)	0.90 (ha)																										
WEST CATCHMENT AREA																																
EST SIDE HAWTHORNE ROAD	1	2		2.46		0.14	2.60	0.86	0.86	2.40	2.40	15.00	97.85	235.0	0.00	0.41	0.50	3.00	0.20	250.1	424.5	0.50	112.00							3.76	103.22	103.00
WEST SIDE HAWTHORNE ROAD	2	3		1.60		0.06	1.66	0.53	1.40	1.48	3.89	18.76	85.54	332.5	0.00	0.25	0.50	3.00	5.00	337.3	2141.9	1.80	50.00							0.46	103.00	100.50
WEST SIDE HAWTHORNE ROAD	3	4		1.58		0.06	1.64	0.53	1.93	1.47	5.35	19.23	84.26	451.1	0.00	0.27	0.50	3.00	7.00	490.1	2534.3	2.24	50.00							0.37	100.50	97.00
EST SIDE HAWTHORNE ROAD	4	5		1.58		0.06	1.64	0.53	2.45	1.47	6.82	19.60	83.26	568.0	0.00	0.34	0.50	3.00	5.00	765.9	2141.9	2.21	50.00							0.38	97.00	94.50
EST SIDE HAWTHORNE ROAD	5	6a		1.95		0.10	2.05	0.68	3.13	1.88	8.70	19.98	82.27	715.6	0.00	0.45	0.65	3.00	1.07	747.0	1991.5	1.23	75.00							1.02	94.50	93.70
CULVERT CROSSING	6a	6b				0.00	0.00	0.00	3.13	0.00	8.70	20.99	79.73	693.6					1.00				10.00	1	800	------	YES	NO	**0.84**	0.12	93.70	93.60
WEST SIDE HAWTHORNE ROAD	6b	7		1.20		0.03	1.23	0.39	3.52	1.08	9.77	21.11	79.45	776.5	0.00	0.53	1.15	3.00	0.53	817.1	6447.9	0.97	15.00							0.26	93.60	93.52
EST SIDE HAWTHORNE ROAD	7	8		1.58		0.06	1.64	0.53	4.04	1.47	11.24	21.37	78.83	886.3	0.00	0.56	1.15	3.00	0.50	916.3	6243.2	0.97	50.00							0.86	93.52	93.27
EST SIDE HAWTHORNE ROAD	8	9		1.58		0.06	1.64	0.53	4.57	1.47	12.71	22.23	76.88	977.2	0.00	0.58	1.15	3.00	0.50	1006.2	6243.2	1.00	50.00							0.84	93.27	93.02
WEST SIDE HAWTHORNE ROAD	9	10		1.58		0.06	1.64	0.53	5.10	1.47	14.18	23.06	75.07	1064.4	0.00	0.60	1.15	3.00	0.50	1101.4	6243.2	1.02	50.00							0.82	93.02	92.77
WEST SIDE HAWTHORNE ROAD	10	11		1.58		0.06	1.64	0.53	5.63	1.47	15.65	23.88	73.39	1148.3	0.00	0.62	1.15	3.00	0.50	1202.1	6243.2	1.04	50.00							0.80	92.77	92.52
EST SIDE HAWTHORNE ROAD	11	12		1.48		0.06	1.54	0.50	6.13	1.38	17.03	24.68	71.83	1223.3	0.00	0.63	1.15	3.00	0.50	1254.5	6243.2	1.05	50.00							0.79	92.52	92.27
EST SIDE HAWTHORNE ROAD	12	13		1.34		0.06	1.40	0.46	6.58	1.27	18.30	25.47	70.35	1287.3	0.00	0.64	1.15	3.00	0.50	1308.3	6243.2	1.06	50.00							0.78	92.27	92.02
EST SIDE HAWTHORNE ROAD	13	14b		1.54		0.21	1.75	0.65	7.23	1.81	20.11	26.25	68.96	1386.6	0.00	0.64	1.15	3.00	0.61	1449.7	6918.0	1.18	158.00							2.23	92.02	91.05
												28.49																				
SW RIDEAU & HAWTHORNE	14a	14b		0.64		0.18	0.82	0.35	0.35	0.98	0.98	15.00	97.85	96.3	0.00	0.20	1.30	3.00	4.06	167.6	24661.5	1.40	140.00							1.67	96.73	91.05
												16.67																				
CULVERT CROSSING	14b	23				0.00	0.00	0.00	7.59	0.00	21.09	28.49	65.29	1377.2					1.40				20.00	1	1000	------	YES	NO	**1.14**	0.19	91.05	90.77
												28.68																				
EAST CATCHMENT AREA																																
AST SIDE HAWTHORNE ROAD	15	16				0.33	0.33	0.30	0.30	0.83	0.83	15.00	97.85	80.8	0.00	0.25	0.30	3.00	0.45	101.7	165.4	0.54	110.00							3.38	103.80	103.30
AST SIDE HAWTHORNE ROAD	16	17				0.14	0.14	0.13	0.42	0.35	1.18	18.38	86.64	101.9	0.00	0.16	0.30	3.00	6.20	114.3	610.8	1.49	100.00							1.12	103.30	97.10
AST SIDE HAWTHORNE ROAD	17	18				0.04	0.04	0.04	0.46	0.10	1.28	19.50	83.52	106.6	0.00	0.16	1.20	3.00	6.36	115.8	24949.6	1.51	33.00							0.36	97.10	95.00
CULVERT CROSSING	18	19				0.00	0.00	0.00	0.46	0.00	1.28	19.86	82.56	105.3					1.77				22.00	1	600	------	YES	NO	**0.30**	0.98	95.00	94.61
AST SIDE HAWTHORNE ROAD	19	20				0.06	0.06	0.05	0.51	0.15	1.43	20.85	80.08	114.2	0.00	0.21	0.70	3.00	2.79	158.3	3925.7	1.20	24.00							0.33	94.61	93.94
CULVERT CROSSING	20	21				0.00	0.00	0.00	0.51	0.00	1.43	21.18	79.28	113.1					0.50				20.00	1	600	------	NO	YES	**0.37**	0.83	93.94	93.84
AST SIDE HAWTHORNE ROAD	21	22a	0.21			0.16	0.37	0.19	0.70	0.52	1.94	22.02	77.35	150.3	0.00	0.29	0.80	3.00	0.50	158.5	2372.0	0.63	82.00							2.18	93.84	93.43
EAST SIDE HAWTHORNE ROAD	22a	22b	0.61			0.29	0.90	0.38	1.08	1.06	3.01	24.19	72.77	218.9	0.00	0.33	1.17	3.00	0.52	228.1	6666.4	0.70	175.00							4.18	93.43	92.52
EAST SIDE HAWTHORNE ROAD	22b	23	0.93			0.34	1.27	0.49	1.57	1.37	4.38	28.37	65.47	286.5	0.00	0.35	1.17	3.00	0.70	309.6	7734.6	0.84	260.00							5.14	92.59	90.77
												33.51																				
SOUTH CATCHMENT AREA																																
SOUTH SIDE RIDEAU ROAD	23	24	0.73			0.28	1.01	0.40	9.56	1.11	26.57	33.51	58.43	1552.8	0.00	0.51	1.74	3.00	2.65	1642.9	43339.8	2.11	235.00							1.86	90.77	84.55
												35.37																				
WEST SIDE SOMME STREET	25	24			0.42	0.12	0.54	0.40	0.40	1.12	1.12	15.00	97.85	109.4	0.00	0.18	1.20	3.00	2.80	105.1	16548.0	1.08	125.74							1.94	89.98	86.46
												16.94																				
CULVERT CROSSING	24	26				0.00	0.00	0.00	9.96	0.00	27.69	35.37	56.28	1558.5					1.00				20.00	1	800	------	NO	YES	**2.31**	0.11	84.55	84.35
												35.48																				
EAST SIDE SOMME STREET	27	26			0.32	0.11	0.43	0.32	0.32	0.90	0.90	15.00	97.85	87.9	0.00	0.17	1.20	3.00	2.80	90.3	16548.0	1.04	125.74							2.01	89.98	86.46
												17.01																				
SOUTH SIDE RIDEAU ROAD	26	28	0.58			0.24	0.82	0.33	10.62	0.92	29.51	35.48	56.16	1657.5	0.00	0.66	2.20	3.00	0.71	1695.7	42043.4	1.30	183.76							2.36	84.35	83.04
												37.84																				

DATE : 4/28/2009

Hawthorne Road & Rideau Road

OPEN DITCH/CULVERT DESIGN SHEET

City of Ottawa

Prepared by: M. Buchanan, E.I.T.

JLR 20983
February 2009

10 year Ottawa International Airport IDF Curve

Checked by: G. Forget, P.Eng.

Increase Runoff Coefficient by 0.0% up C = 1.0

DETAILS	NODES		DRAINAGE AREA							PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA									CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT						FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)
	FROM	TO	AREA (A) at C of 0.20 (ha)	0.30 (ha)	0.70 (ha)	0.90 (ha)	SUM(A)	SUM(A*C)	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D_{10yr} m	D_{max} m	SS X:1	SLOPE %	Q_{10yr} l/s	Q_{100yr} l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL	HW 1:10 (m)			
NORTH CATCHMENT AREA																																
			Existing 900 mm dia. culvert capacity before ditch flows to Findlay Creek											1400.0																		
NORTH SIDE RIDEAU ROAD	31	32	6.66			0.52	7.18	1.80	1.80	5.00	5.00	20.00	97.26	[redacted]	0.00	0.58	1.50	3.00	1.93	1974.3	24880.1	1.96	400.00							3.41	90.71	83.01
												23.41																				
	33	32	0.87			0.10	0.97	0.26	0.26	0.73	0.73	15.00	115.83	[redacted]	0.00	0.40	1.50	3.00	0.16	213.3	7240.8	0.44	92.00							3.45	83.16	83.01
												18.45																				
XISTING CULVERT CROSSING	32	28				0.00	0.00	0.00	2.06	0.00	5.74	23.41	87.93	[redacted]					-0.15				20.00	1	1000					0.14	83.01	83.04
												23.55																				
SOUTH CATCHMENT AREA																																
SOUTH SIDE RIDEAU ROAD	28	29	0.90			0.33	1.23	0.48	13.16	1.33	36.58	37.84	53.68	3363.5	0.00	1.17	2.20	3.00	0.14	3437.1	18513.7	0.84	347.24							6.91	83.04	82.56
SOUTH SIDE RIDEAU ROAD	29	30	0.48			0.31	0.79	0.38	13.53	1.04	37.62	44.76	47.64	3192.1	0.00	0.90	2.20	3.00	0.51	3287.0	35640.2	1.35	236.20							2.91	82.56	81.35

ote: Conveyance Capacitites for the Open Ditch/Swale were calculated based on a Manning's Roughness Coefficient (n) of 0.030

[redacted]

J.L. RICHARDS AND ASSOCIATES LIMITED, Consulting Engineers, Architects and Planners

DATE : 4/28/2009

Hawthorne Road & Rideau Road

OPEN DITCH/CULVERT DESIGN SHEET

City of Ottawa

Prepared by: M. Buchanan, E.I.T.

JLR 20983
February 2009

Checked by: G. Forget, P.Eng.

1:100 year Ottawa International Airport IDF Curve

Increase Runoff Coefficient by 25.0% up C = 1.0

DETAILS	NODES		DRAINAGE AREA							PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA							CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT					FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)
	FROM	TO	AREA (A) at C of 0.20 (ha)	0.30 (ha)	0.70 (ha)	0.90 (ha)	SUM(A)	SUM(A*1.25*C) 25% increase in C factor	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D m	SS X:1	SLOPE %	CAPAC. l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL			
WEST CATCHMENT AREA																													
WEST SIDE HAWTHORNE ROAD	1	2		2.46		0.14	2.60	1.06	1.06	2.95	2.95	15.00	142.89	422.1	0.00	0.50	3.00	0.20	424.5	0.57	112.00						3.30	103.22	103.00
WEST SIDE HAWTHORNE ROAD	2	3		1.60		0.06	1.66	0.66	1.72	1.83	4.79	18.30	126.80	607.2	0.00	0.50	3.00	5.00	2141.9	2.86	50.00						0.29	103.00	100.50
WEST SIDE HAWTHORNE ROAD	3	4		1.58		0.06	1.64	0.65	2.38	1.81	6.60	18.59	125.56	829.0	0.00	0.50	3.00	7.00	2534.3	3.38	50.00						0.25	100.50	97.00
WEST SIDE HAWTHORNE ROAD	4	5		1.58		0.06	1.64	0.65	3.03	1.81	8.42	18.84	124.54	1048.2	0.00	0.50	3.00	5.00	2141.9	2.86	50.00						0.29	97.00	94.50
WEST SIDE HAWTHORNE ROAD	5	6A		1.95		0.10	2.05	0.83	3.86	2.31	10.73	19.13	123.35	1323.2	0.00	0.65	3.00	1.07	1991.5	1.57	75.00						0.80	94.50	93.70
CULVERT CROSSING	6A	6B				0.00	0.00	0.00	3.86	0.00	10.73	19.92	120.24	1289.9				1.00			10.00	1	800	------	**YES**	NO	0.06	93.70	93.60
WEST SIDE HAWTHORNE ROAD	6B	7		1.20		0.03	1.23	0.48	4.34	1.33	12.06	19.99	119.99	1447.3	0.00	1.15	3.00	0.53	6447.9	1.63	15.00						0.15	93.60	93.52
WEST SIDE HAWTHORNE ROAD	7	8		1.58		0.06	1.64	0.65	4.99	1.81	13.88	20.14	119.42	1657.0	0.00	1.15	3.00	0.50	6243.2	1.57	50.00						0.53	93.52	93.27
WEST SIDE HAWTHORNE ROAD	8	9		1.58		0.06	1.64	0.65	5.64	1.81	15.69	20.67	117.47	1843.0	0.00	1.15	3.00	0.50	6243.2	1.57	50.00						0.53	93.27	93.02
WEST SIDE HAWTHORNE ROAD	9	10		1.58		0.06	1.64	0.65	6.30	1.81	17.50	21.20	115.59	2023.3	0.00	1.15	3.00	0.50	6243.2	1.57	50.00						0.53	93.02	92.77
WEST SIDE HAWTHORNE ROAD	10	11		1.58		0.06	1.64	0.65	6.95	1.81	19.32	21.73	113.78	2197.9	0.00	1.15	3.00	0.50	6243.2	1.57	50.00						0.53	92.77	92.52
WEST SIDE HAWTHORNE ROAD	11	12		1.48		0.06	1.54	0.62	7.56	1.71	21.03	22.26	112.03	2355.6	0.00	1.15	3.00	0.50	6243.2	1.57	50.00						0.53	92.52	92.27
WEST SIDE HAWTHORNE ROAD	12	13		1.34		0.06	1.40	0.56	8.13	1.56	22.59	22.79	110.34	2492.6	0.00	1.15	3.00	0.50	6243.2	1.57	50.00						0.53	92.27	92.02
WEST SIDE HAWTHORNE ROAD	13	14B		1.54		0.21	1.75	0.79	8.91	2.19	24.78	23.32	108.70	2693.6	0.00	1.15	3.00	0.61	6918.0	1.74	158.00						1.51	92.02	91.05
												24.83																	
SW RIDEAU & HAWTHORNE	14A	14B		0.64		0.18	0.82	0.42	0.42	1.17	1.17	15.00	142.89	166.8	0.00	1.30	3.00	4.06	24661.5	4.86	140.00						0.48	96.73	91.05
												15.48																	
CULVERT CROSSING	14B	23				0.00	0.00	0.00	9.33	0.00	25.95	24.83	104.32	2706.8				1.40			20.00	1	1000	------	**YES**	NO	0.10	91.05	90.77
												24.93																	
EAST CATCHMENT AREA																													
EAST SIDE HAWTHORNE ROAD	15	16				0.33	0.33	0.33	0.33	0.92	0.92	15.00	142.89	131.1	0.00	0.30	3.00	0.45	165.4	0.61	110.00						2.99	103.80	103.30
EAST SIDE HAWTHORNE ROAD	16	17				0.14	0.14	0.14	0.47	0.39	1.31	17.99	128.11	167.4	0.00	0.30	3.00	6.20	610.8	2.26	100.00						0.74	103.30	97.10
EAST SIDE HAWTHORNE ROAD	17	18				0.04	0.04	0.04	0.51	0.11	1.42	18.73	124.98	177.2	0.00	1.20	3.00	6.36	24949.6	5.78	33.00						0.10	97.10	95.00
CULVERT CROSSING	18	19				0.00	0.00	0.00	0.51	0.00	1.42	18.82	124.58	176.6				1.77			22.00	1	600	------	**YES**	NO	0.59	95.00	94.61
EAST SIDE HAWTHORNE ROAD	19	20				0.06	0.06	0.06	0.57	0.17	1.58	19.41	122.22	193.7	0.00	0.70	3.00	2.79	3925.7	2.67	24.00						0.15	94.61	93.94
CULVERT CROSSING	20	21				0.00	0.00	0.00	0.57	0.00	1.58	19.56	121.63	192.7				0.50			20.00	1	600	------	NO	**YES**	0.49	93.94	93.84
EAST SIDE HAWTHORNE ROAD	21	22A	0.21			0.16	0.37	0.21	0.78	0.59	2.18	20.05	119.76	260.5	0.00	0.80	3.00	0.50	2372.0	1.24	82.00						1.11	93.84	93.43
EAST SIDE HAWTHORNE ROAD	22A	22B	0.61			0.29	0.90	0.44	1.23	1.23	3.41	21.16	115.75	394.2	0.00	1.17	3.00	0.52	6666.4	1.62	175.00						1.80	93.43	92.52
EAST SIDE HAWTHORNE ROAD	22B	23	0.93			0.34	1.27	0.57	1.80	1.59	5.00	22.95	109.83	548.8	0.00	1.17	3.00	0.70	7734.6	1.88	260.00						2.30	92.59	90.77
												25.25																	
SOUTH CATCHMENT AREA																													
SOUTH SIDE RIDEAU ROAD	23	24	0.73			0.28	1.01	0.46	11.59	1.29	32.23	25.25	103.15	3324.7	0.00	1.74	3.00	2.65	43339.8	4.77	235.00						0.82	90.77	84.55
												26.08																	
WEST SIDE SOMME STREET	25	24			0.42	0.12	0.54	0.49	0.49	1.36	1.36	15.00	142.89	193.7	0.00	1.20	3.00	2.80	16548.0	3.83	125.74						0.55	89.98	86.46
												15.55																	
CULVERT CROSSING	24	26				0.00	0.00	0.00	12.08	0.00	33.59	26.08	100.99	3391.7				1.00			20.00	1	800	------	NO	**YES**	0.05	84.55	84.35
												26.12																	
EAST SIDE SOMME STREET	27	26			0.32	0.11	0.43	0.39	0.39	1.08	1.08	15.00	142.89	154.9	0.00	1.20	3.00	2.80	16548.0	3.83	125.74						0.55	89.98	86.46
												15.55																	
SOUTH SIDE RIDEAU ROAD	26	28	0.58			0.24	0.82	0.39	12.86	1.07	35.74	26.12	100.86	3604.7	0.00	2.20	3.00	0.71	42043.4	2.90	183.76						1.06	84.35	83.04
												27.18																	

Hawthorne Road & Rideau Road

OPEN DITCH/CULVERT DESIGN SHEET

City of Ottawa

Prepared by: M. Buchanan, E.I.T.

JLR 20983
February 2009

1:100 year Ottawa International Airport IDF Curve

Checked by: G. Forget, P.Eng.

Increase Runoff Coefficient by 25.0% up C = 1.0

DETAILS	NODES		DRAINAGE AREA							PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA							CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT					FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)
			AREA (A) at C of																										
	FROM	TO	0.20 (ha)	0.30 (ha)	0.70 (ha)	0.90 (ha)	SUM(A)	SUM(A*1.25*C) 25% increase in C factor	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D m	SS X:1	SLOPE %	CAPAC. l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL			
NORTH CATCHMENT AREA																													
			Existing 900 mm dia. Culvert Capacity before ditch flows to Findlay Creek											1400.0															
NORTH SIDE RIDEAU ROAD	31	32	6.66			0.52	7.18	2.19	2.19	6.07	6.07	20.00	119.95	2128.6	0.00	1.50	3.00	1.93	24880.1	3.69	400.00						1.81	90.71	83.01
												21.81																	
NORTH SIDE RIDEAU ROAD	33	32	0.87			0.10	0.97	0.32	0.32	0.88	0.88	15.00	142.89	126.1	0.00	1.50	3.00	0.16	7240.8	1.07	92.00						1.43	83.16	83.01
												16.43																	
EXISTING CULVERT CROSSING	32	28				0.00	0.00	0.00	2.50	0.00	6.96	21.81	113.52	2189.7				-0.15			20.00	1	1000				0.12	83.01	83.04
												21.93																	
SOUTH CATCHMENT AREA																													
SOUTH SIDE RIDEAU ROAD	28	29	0.90			0.33	1.23	0.56	15.91	1.54	44.24	27.18	98.22	5745.1	0.00	2.20	3.00	0.14	18513.7	1.28	347.24						4.54	83.04	82.56
SOUTH SIDE RIDEAU ROAD	29	30	0.48			0.31	0.79	0.43	16.34	1.20	45.44	31.72	88.42	5417.3	0.00	2.20	3.00	0.51	35640.2	2.45	236.20						1.60	82.56	81.35

Note: Conveyance Capacitites for the Open Ditch/Swale were calculated based on a Manning's Roughness Coefficient (n) of 0.030

HAWTHORNE INDUSTRIAL PARK

1:10 YEAR ROADSIDE CULVERT DESIGN

CONVENTIONAL CULVERT DESIGN

Prepared by: Mark Buchanan, E.I.T.
Reviewed by: Guy Forget, P.Eng.
Date: February 2009

	DESIGN DATA							CULVERT DATA						INLET CONTROL			OUTLET CONTROL								GOVERNING	VEL
Station	Q (m³/s)	d (m)	d_e (m)	AHW (m)	Skew No.	L (m)	S (m/m)	Description	B (m)	D or H (m)	N	Q/N (m³/s)	A (each) (m²)	Q/NB (m³/s/m)	HW/D	HW (m)	K_e	H (m)	d_c (m)	$(d_c + D)/2$ (m)	TW (m)	h_o (m)	LS (m)	HW (m)	HW (m)	V_o (m/s)
1	2	3	4	5	6	7	8	9	10a	10b	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
6 to 14	1.296	0.67	0.05	1.1	0	20.0	0.005	CSPA 6	1.15	0.82	2	0.648	0.74	----	0.73	0.60	0.9	0.13	0.33	0.58	0.72	0.72	0.10	0.75	0.75	
23B to 23C	0.051	0.22	0.05	1.15	0	24.0	0.004	CSP 500	N/A	0.5	1	0.051	0.20	----	0.50	0.25	0.9	0.1	0.15	0.33	0.27	0.33	0.10	0.33	0.33	
24A to 24B	0.075	0.25	0.05	1.15	0	24.0	0.004	CSP 500	N/A	0.5	1	0.075	0.20	----	0.54	0.27	0.9	0.1	0.18	0.34	0.30	0.34	0.10	0.34	0.34	
2 to 9	0.081	0.47	0.05	1.15	0	20.0	0.005	CSP 600	N/A	0.6	1	0.081	0.28	----	0.50	0.30	0.9	0.1	0.19	0.40	0.52	0.52	0.10	0.52	0.52	
27B to 27C	1.304	0.61	0.05	1.23	0	15.0	0.007	CSPA 7	1.39	0.97	1	1.304	1.06	----	0.90	0.87	0.9	0.22	0.45	0.71	0.66	0.71	0.11	0.82	0.87	
22 to 19	2.573	0.38	0.05	1.35	0	20.0	0.005	CSPA 5	1.03	0.74	2	1.287	0.61	----	1.75	1.30	0.9	0.74	0.51	0.63	0.43	0.63	0.10	1.27	1.30	

2 From Form PH-D-533, col. 12
3 Flood Depth
4 Embedment below channel invert
5 Col. 3 + col. 4 + allowable backwater
7 Allowance for skew if applicable

8 Culvert Slope
10a/b D (circular) or B x H (arch)
11 Number of Barrels
13 Area per barrel
14 For box only

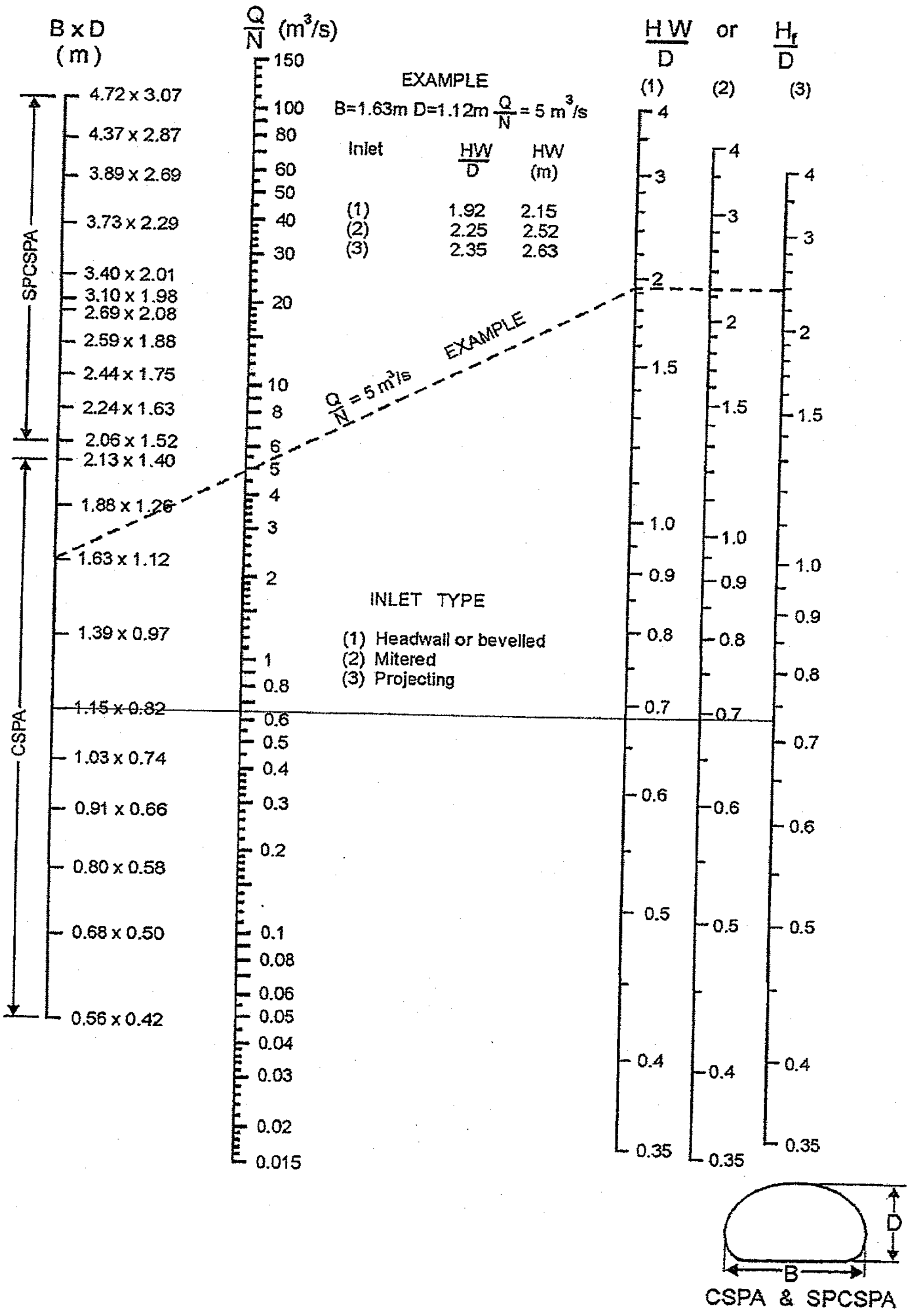
15 Charts D5-1A to C and E to J
16 HW = col. 15 x D (col. 10)
17 Chart D5-8
18 Charts D5-2A to G
19 Charts D5-3A to F: (d_c > D)

21 Col. 3 + col. 4
22 H_o = larger of cols. 20 and 21
23 Col. 7 x col. 8
24 HW = col. 18 + col. 22 - col. 23
25 Larger of cols 16 and 24

26 Outlet velocity if required (Subsection 3.2.3)

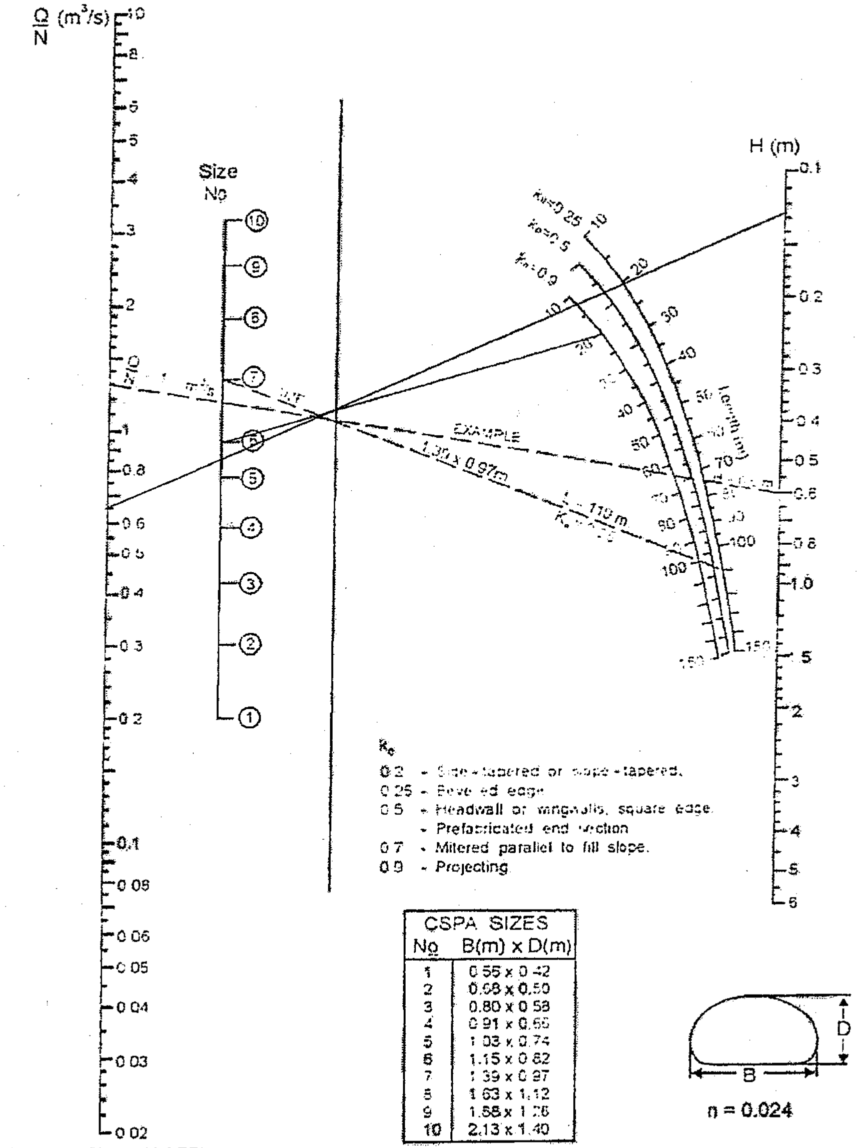
Culvert Crossing 6-14 2x1.15m x 0.82m

Design Chart 5.43: Inlet Control: Steel Pipe Arch Culverts



Source: Herr (1977)

Design Chart 5.47: Outlet Control: Pipe Arch CSP Culvert - Flowing Full



Kₑ

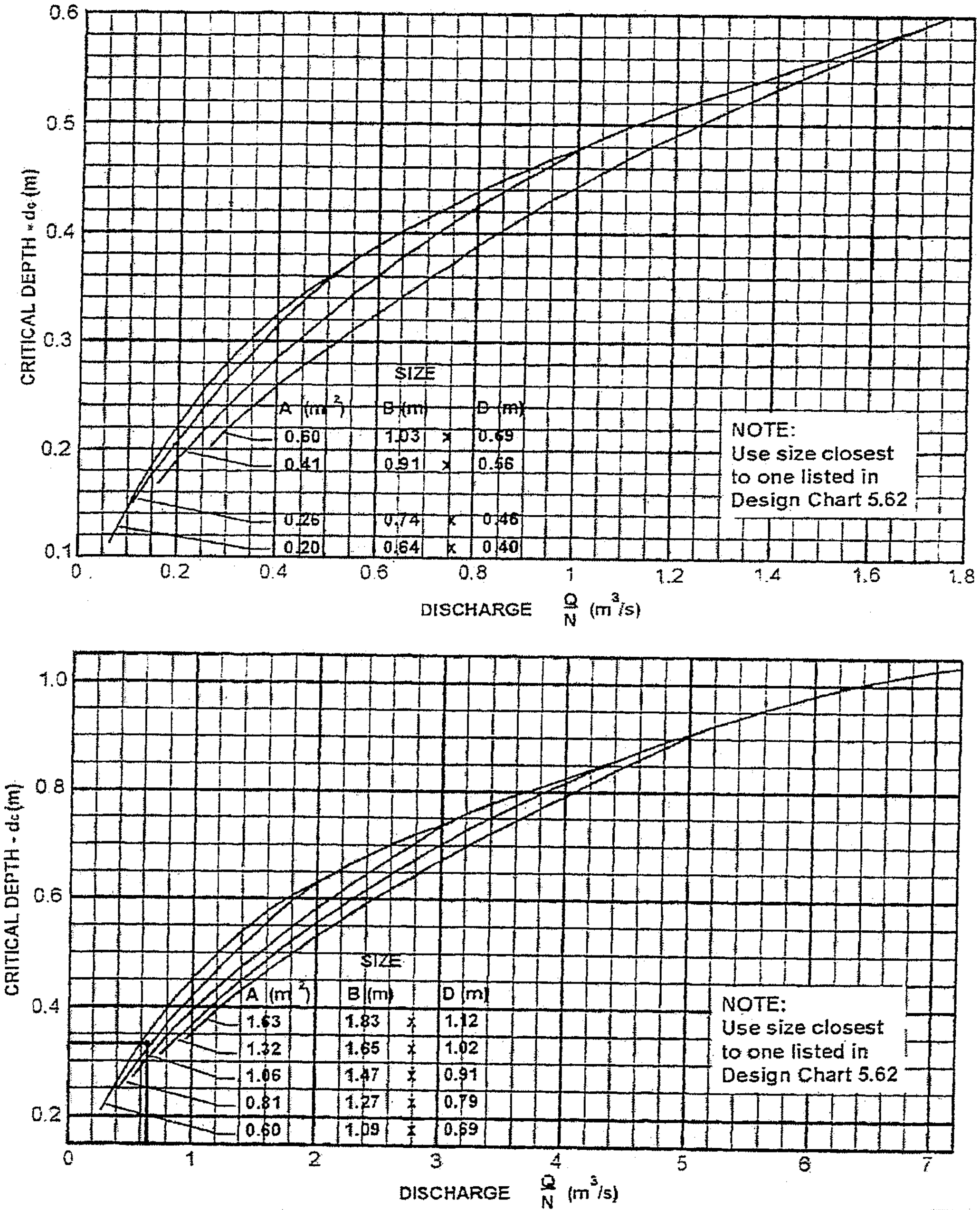
0 2 - Side-tapered or slope-tapered.
0 25 - Beve ed edge
0 5 - Headwall or wingwalls, square edge.
- Prefabricated end section
0 7 - Mitered parallel to fill slope.
0 9 - Projecting

CSPA SIZES	
No	B(m) x D(m)
1	0 55 x 0 42
2	0.68 x 0.50
3	0.80 x 0 58
4	0 91 x 0.66
5	1 03 x 0.74
6	1.15 x 0 82
7	1 39 x 0 97
8	1 63 x 1.12
9	1.88 x 1 26
10	2.13 x 1.40

n = 0.024

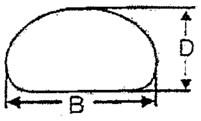
Source: Herr (1977)

Design Chart 5.53: CSP Pipe Arch Culverts



($d_c \ngtr D$)

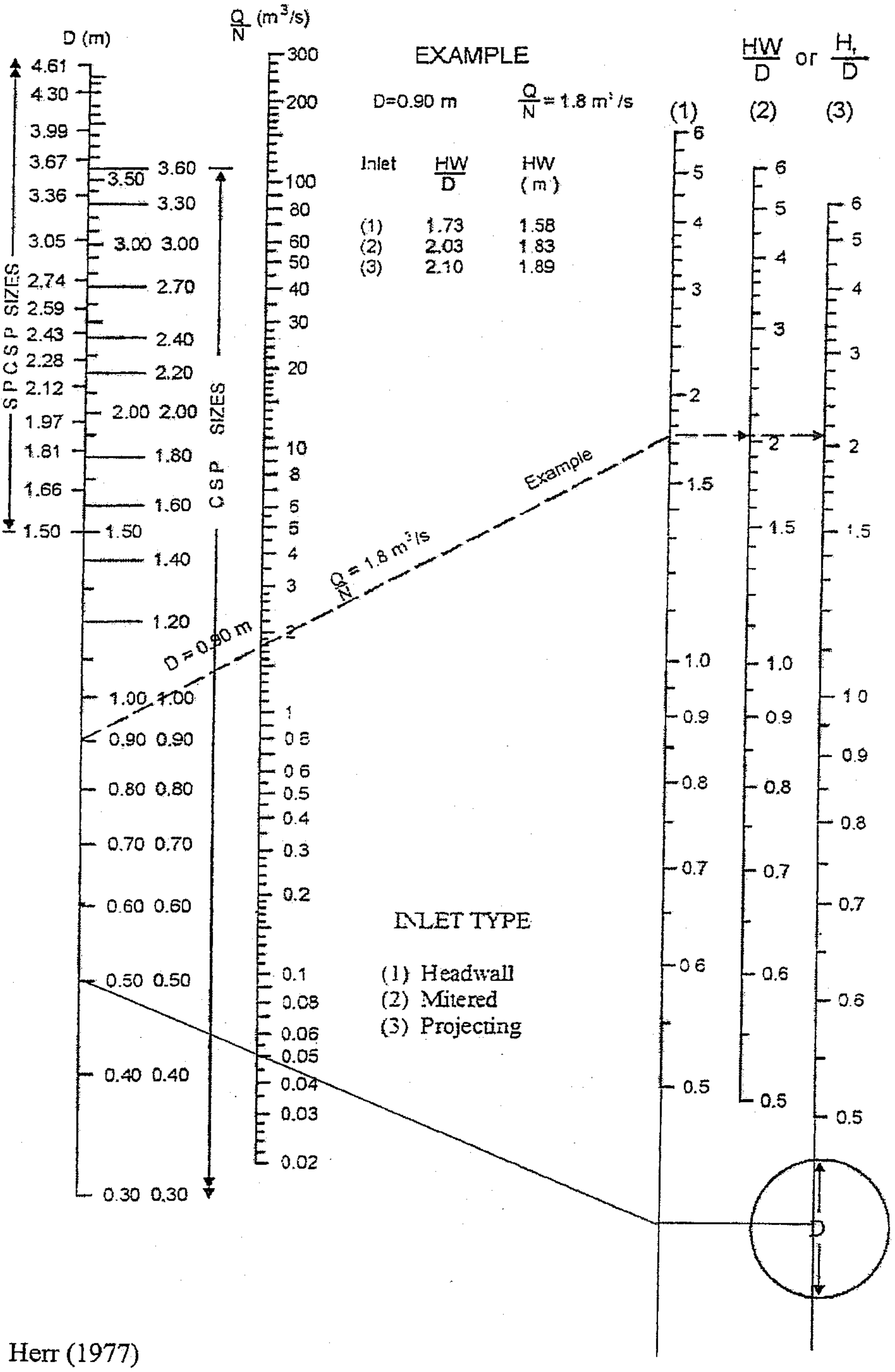
A = Cross-sectional area per barrel
interpolated for other sizes



Source: Herr (1977)

Culvert Crossing 23b to 23c 500mm Ø

Design Chart 2.32: Inlet Control: Circular CSP and SPCSP Culverts

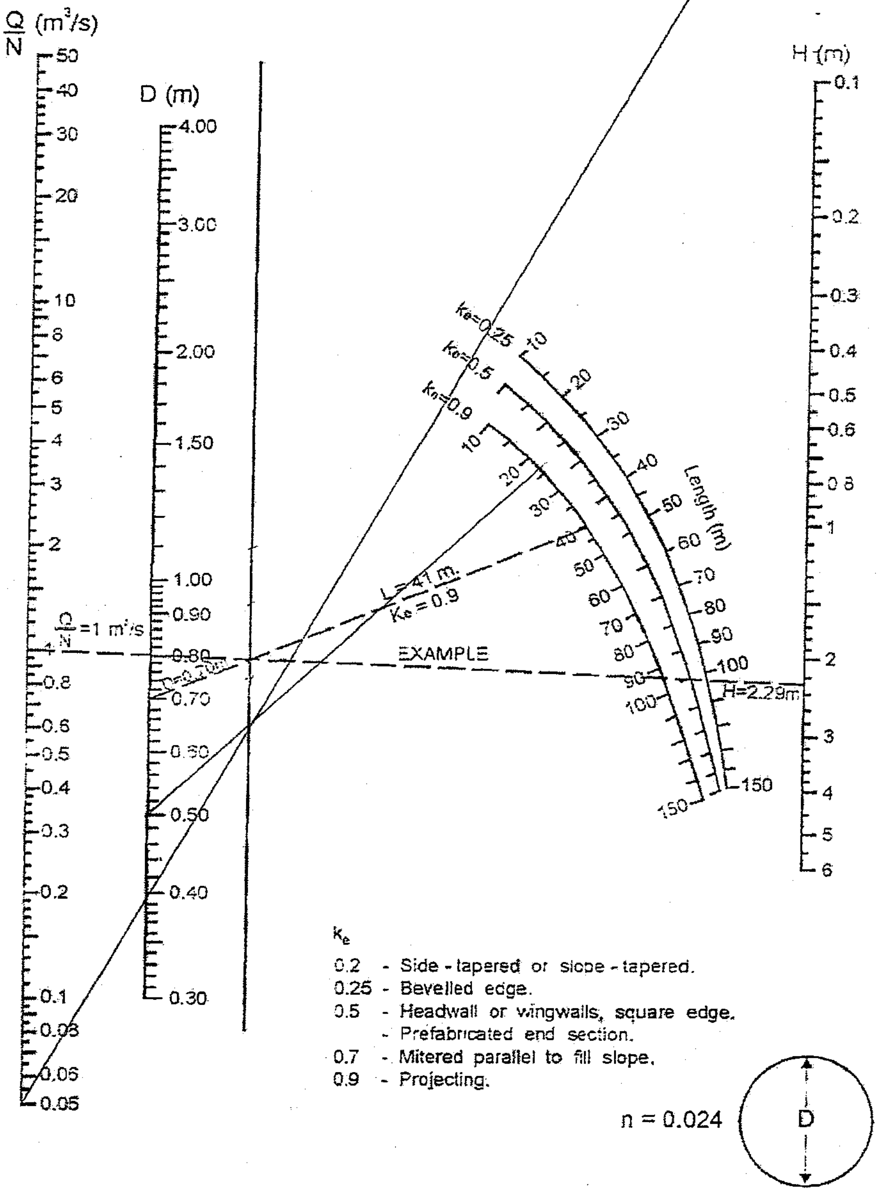


H/D < 0.5

Source: Herr (1977)

Design Chart 2.35: Outlet Control: CSP Culvert - Flowing Full

$H < 0.1$ m



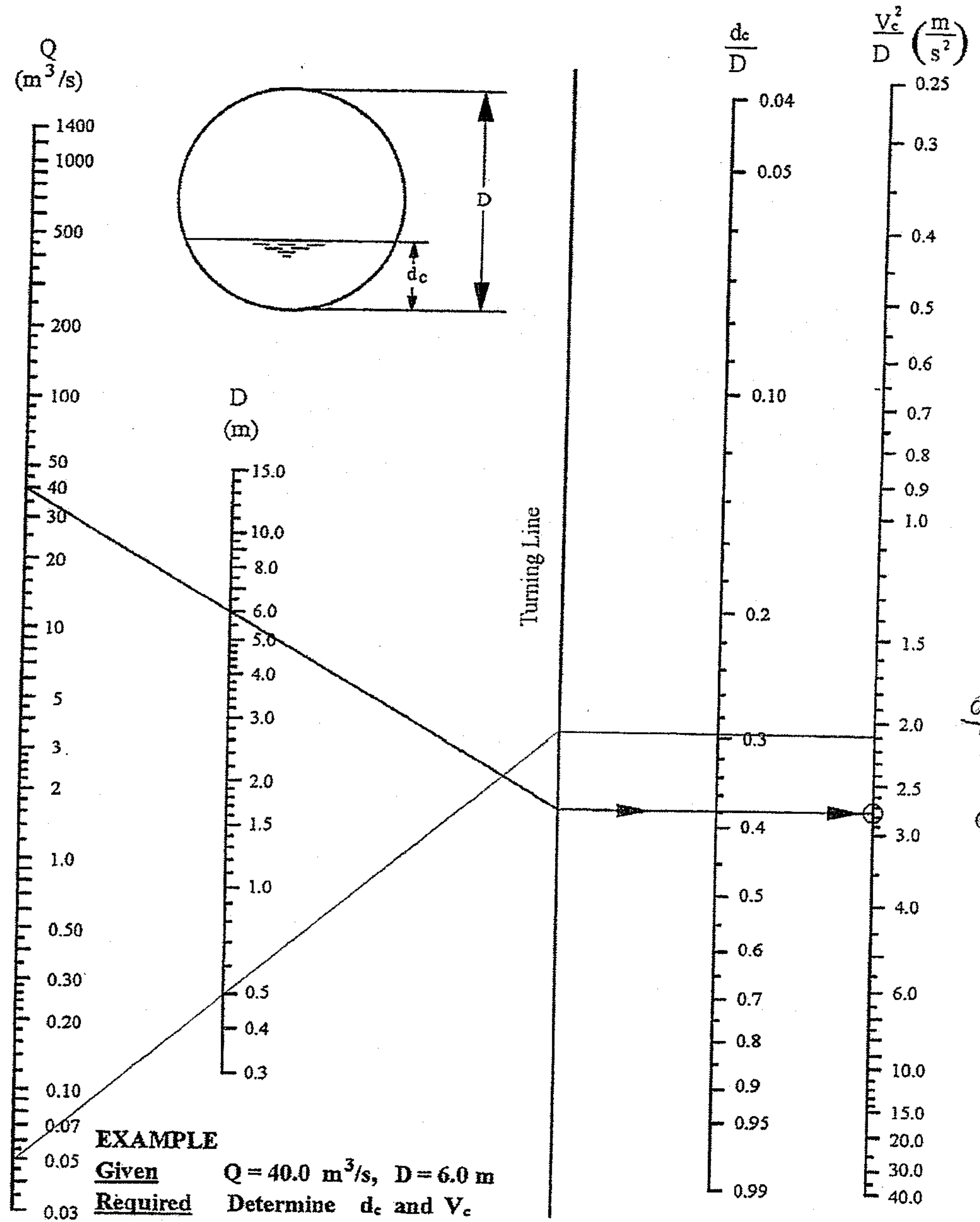
kₑ

- 0.2 - Side - tapered or slope - tapered.
- 0.25 - Bevelled edge.
- 0.5 - Headwall or wingwalls, square edge.
  - Prefabricated end section.
- 0.7 - Mitered parallel to fill slope.
- 0.9 - Projecting.

$n = 0.024$

Source: Herr (1977)

Design Chart 2.38: Critical Depth - Velocity relationships: Circular Pipes



$\frac{d_c}{D} = 0.3$

$d_c: 0.3 \times 0.5$

$= 0.15$

EXAMPLE

Given $Q = 40.0$ m³/s, $D = 6.0$ m

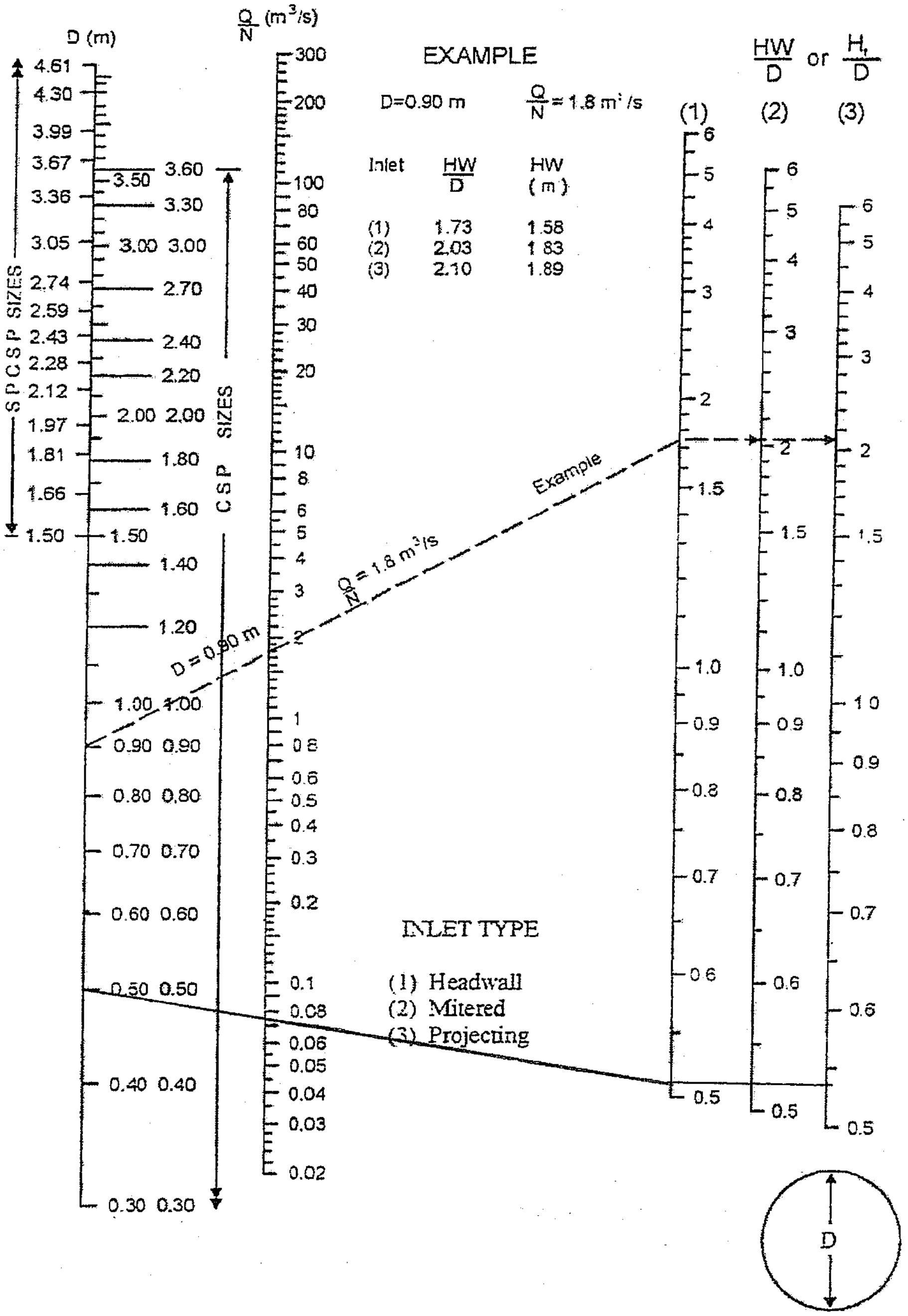
Required Determine d_c and V_c

Solution Join $Q = 40.0$ m³/s to $D = 6.0$ m and extend to turning line.
Draw a horizontal line perpendicular to the turning line to intersect $d_c/D = 0.38$ and $V_c^2/D = 2.76$
Calculate $d_c = 0.38 \times 6.0 = 2.28$ m.
$V_c = (2.76 \times 6.0)^{0.5} = 4.07$ m/s

Source: American Iron and Steel Institute

Culvert Crossing 24a to 24b 500mm Ø

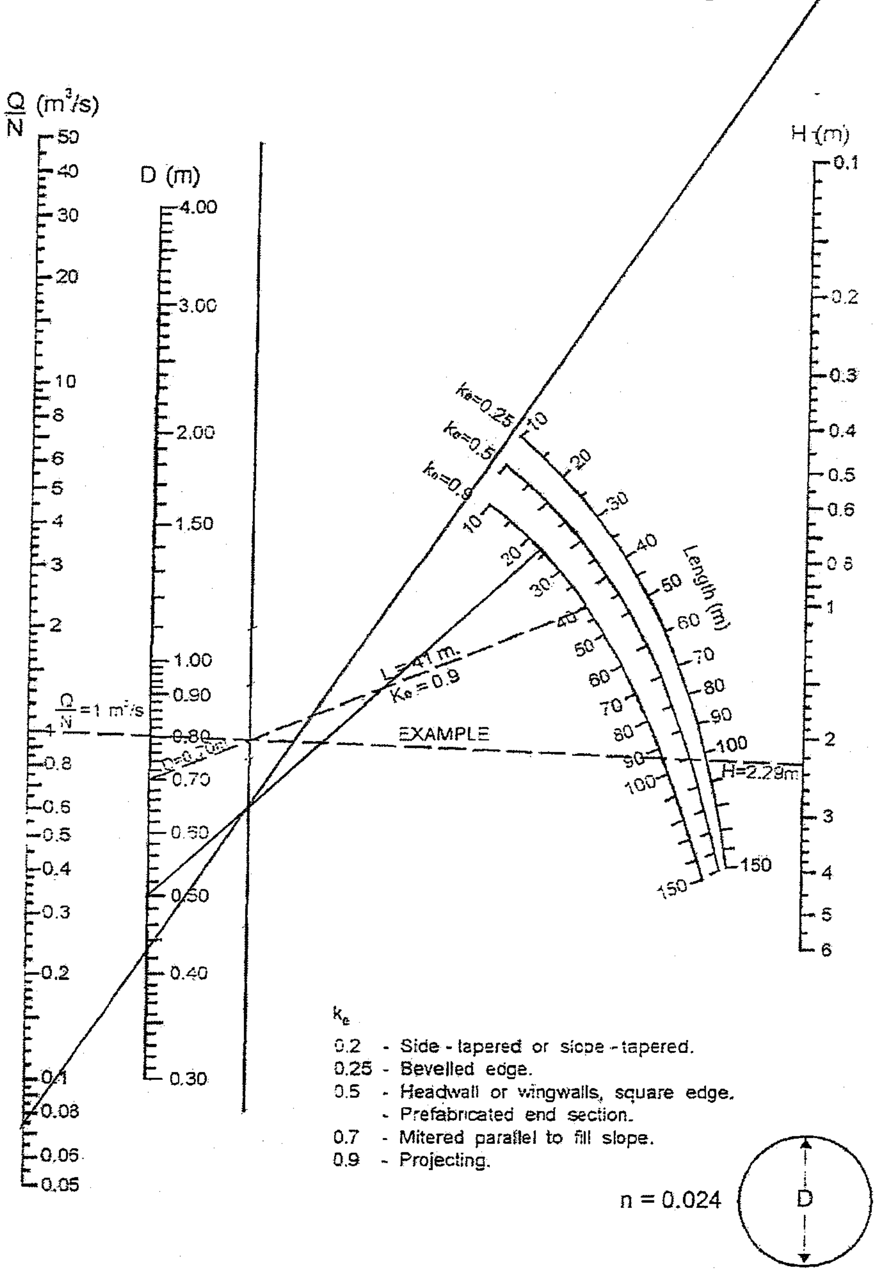
Design Chart 2.32: Inlet Control: Circular CSP and SPCSP Culverts



Source: Herr (1977)

Design Chart 2.35: Outlet Control: CSP Culvert - Flowing Full

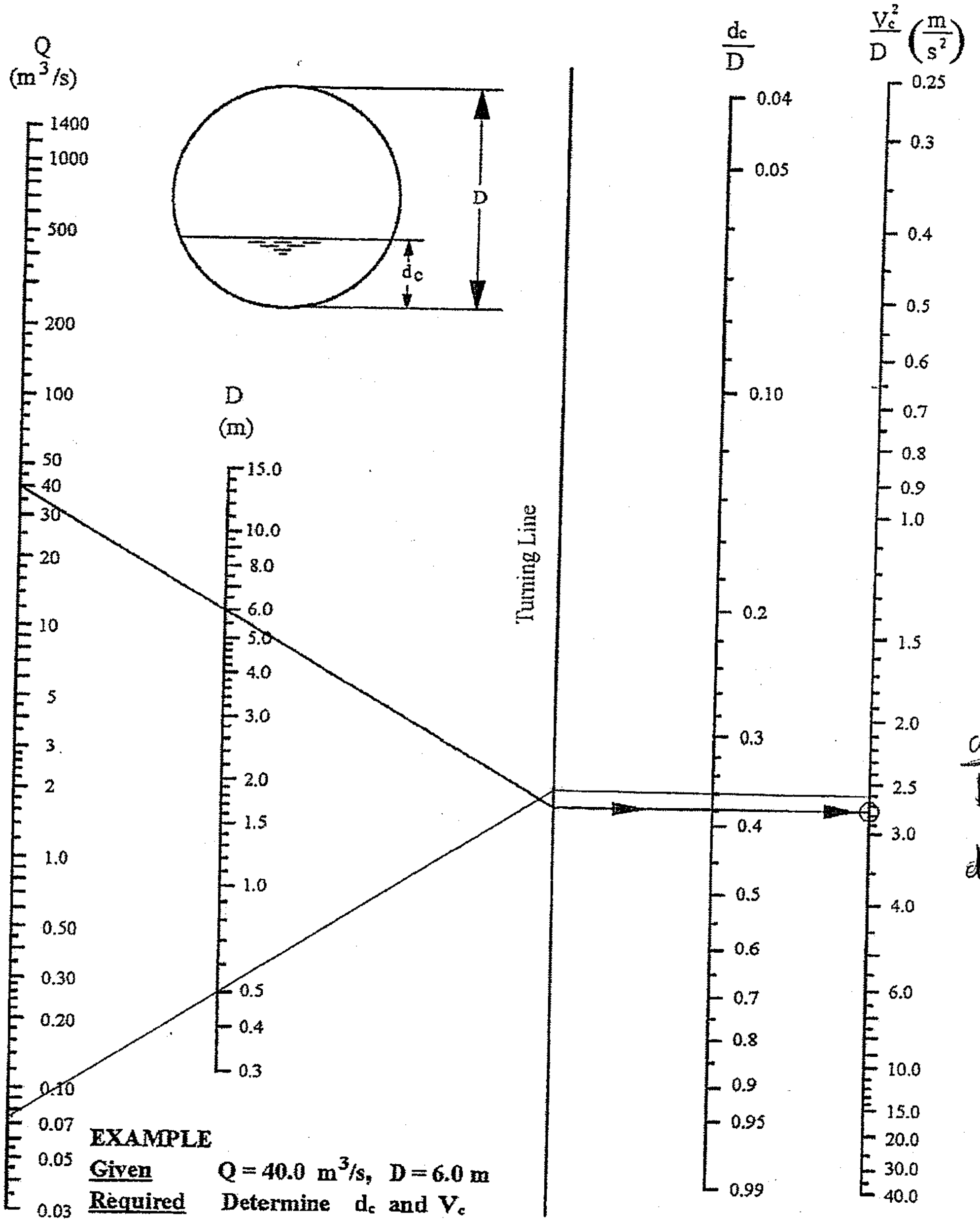
H < 0.1m



k_e
0.2 - Side - tapered or slope - tapered.
0.25 - Bevelled edge.
0.5 - Headwall or wingwalls, square edge.
- Prefabricated end section.
0.7 - Mitered parallel to fill slope.
0.9 - Projecting.

Source: Herr (1977)

Design Chart 2.38: Critical Depth - Velocity relationships: Circular Pipes



$\frac{d_c}{D} \approx 0.36$

$d_c \doteq 0.36 \times 0.5$

$\doteq 0.18$

EXAMPLE

Given $Q = 40.0$ m³/s, $D = 6.0$ m

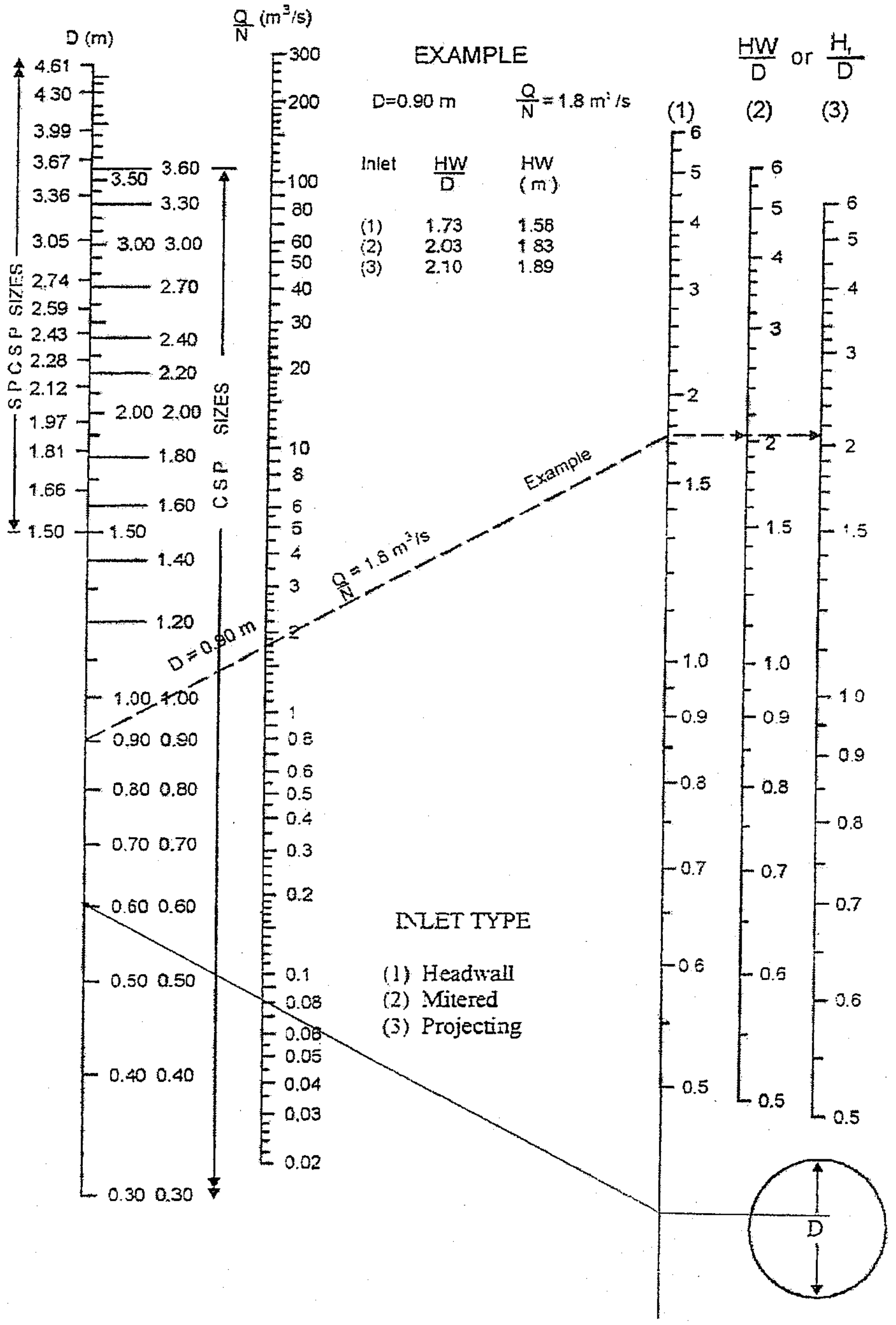
Required Determine d_c and V_c

Solution Join $Q = 40.0$ m³/s to $D = 6.0$ m and extend to turning line.
Draw a horizontal line perpendicular to the turning line to intersect $d_c/D = 0.38$ and $V_c^2/D = 2.76$
Calculate $d_c = 0.38 \times 6.0 = 2.28$ m.
$V_c = (2.76 \times 6.0)^{0.5} = 4.07$ m/s

Source: American Iron and Steel Institute

Culvert Crossing ⟨2⟩ - ⟨9⟩ 600 mm Ø

Design Chart 2.32: Inlet Control: Circular CSP and SPCSP Culverts

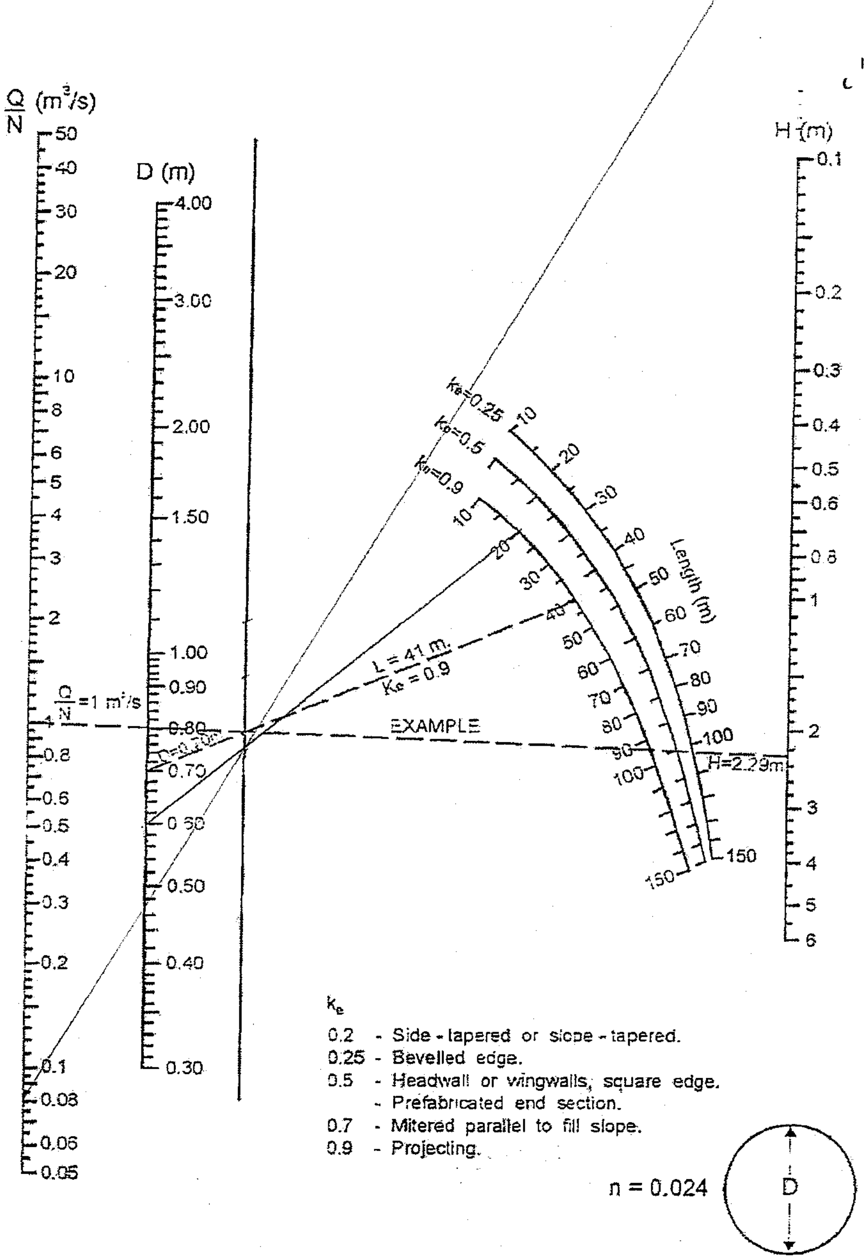


∴ HW/D < 0.5

Source: Herr (1977)

Design Chart 2.35: Outlet Control: CSP Culvert - Flowing Full

∴ H << 0.1m

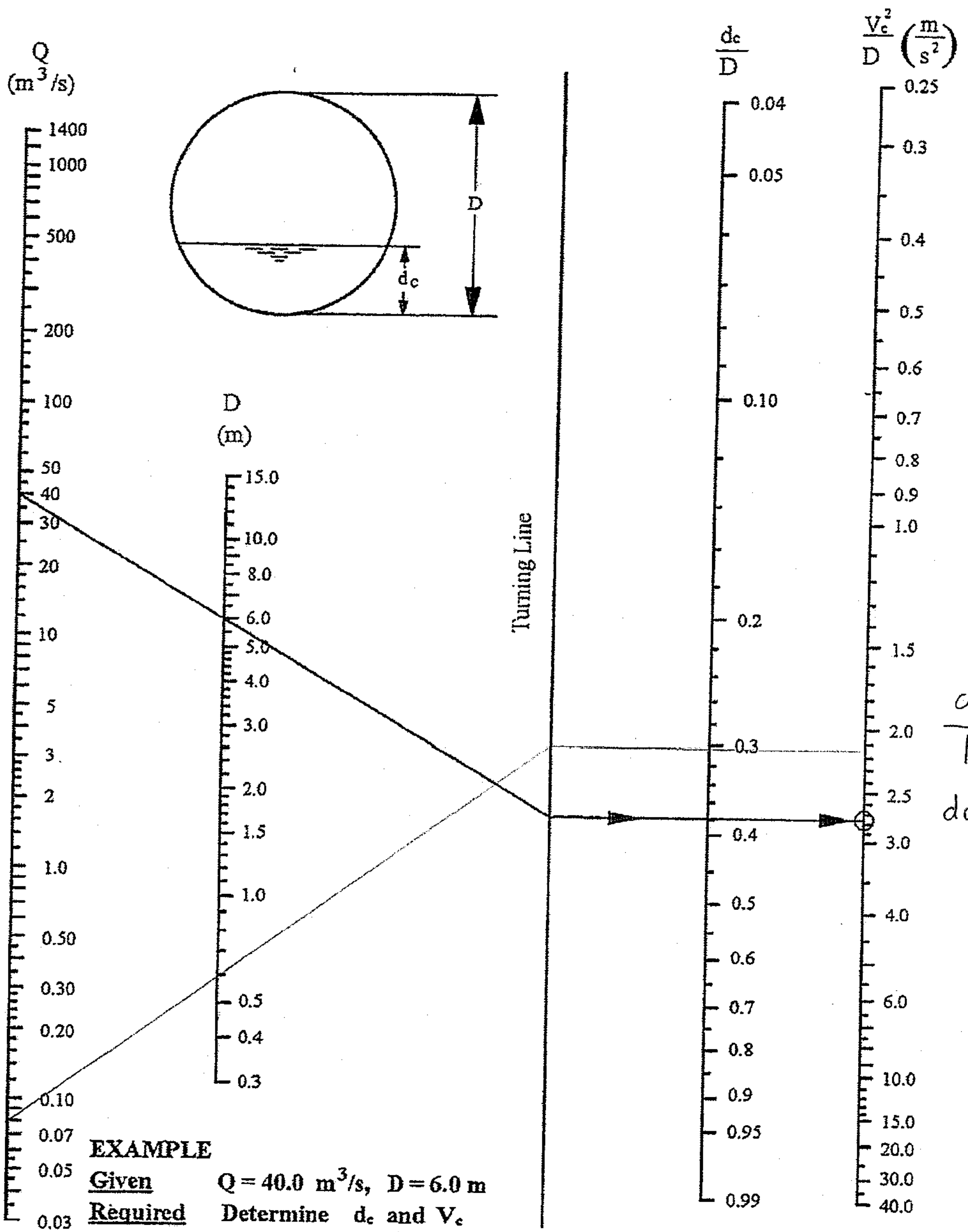


k_e	
0.2	- Side - tapered or slope - tapered.
0.25	- Bevelled edge.
0.5	- Headwall or wingwalls, square edge.
	- Prefabricated end section.
0.7	- Mitered parallel to fill slope.
0.9	- Projecting.

n = 0.024

Source: Herr (1977)

Design Chart 2.38: Critical Depth - Velocity relationships: Circular Pipes



$\frac{dc}{D} = 0.31$

$dc = 0.31 \times 0.6$

$= 0.186$

$= 0.19$

EXAMPLE

Given $Q = 40.0$ m^3/s, $D = 6.0$ m

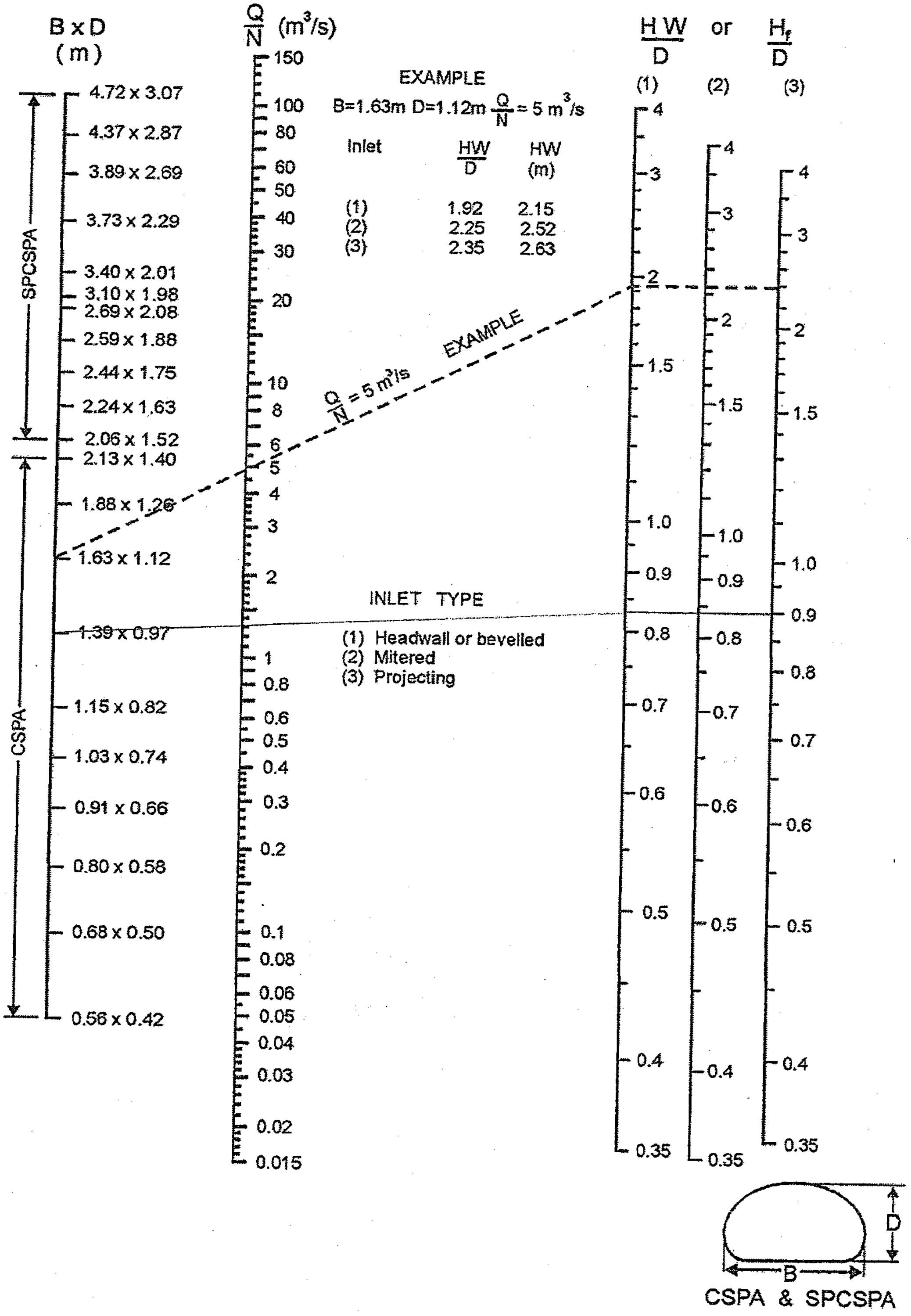
Required Determine d_c and V_c

Solution Join $Q = 40.0$ m^3/s to $D = 6.0$ m and extend to turning line.
Draw a horizontal line perpendicular to the turning line to intersect
$d_c/D = 0.38$ and $V_c^2/D = 2.76$
Calculate $d_c = 0.38 \times 6.0 = 2.28$ m.
$V_c = (2.76 \times 6.0)^{0.5} = 4.07$ m/s

Source: American Iron and Steel Institute

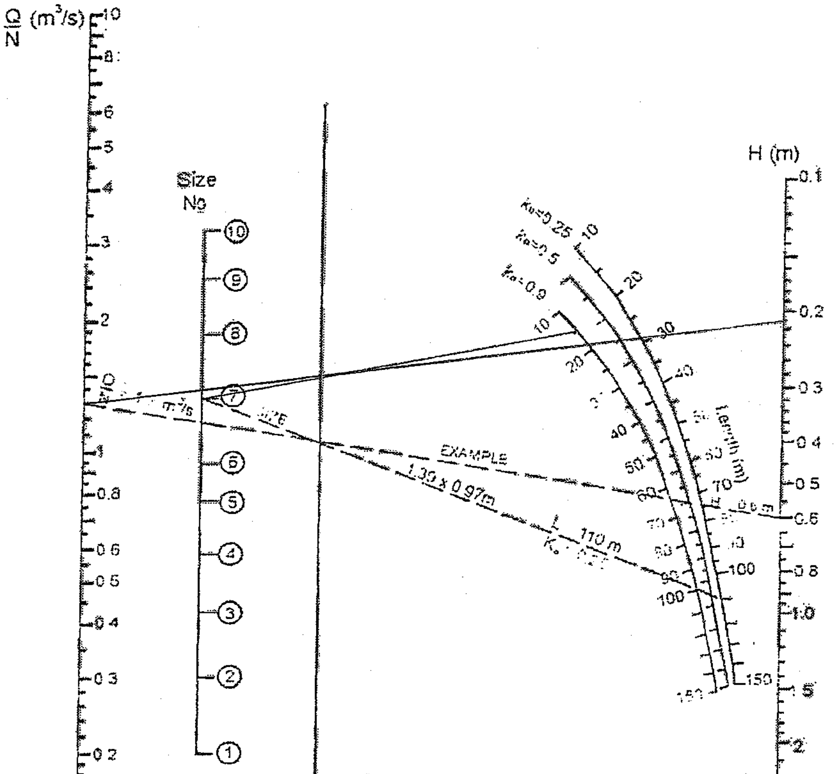
Culvert Crossing 27b to 27c 1.39 x 0.97 m

Design Chart 5.43: Inlet Control: Steel Pipe Arch Culverts



Source: Herr (1977)

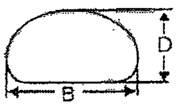
Design Chart 5.47: Outlet Control: Pipe Arch CSP Culvert - Flowing Full



Ke

0.2 = Side-tapered or slope-tapered.
0.25 = Bevelled edge
0.5 = Headwall or wingwalls, square edge
= Prefabricated end section
0.7 = Mitered parallel to fill slope.
0.9 = Projecting.

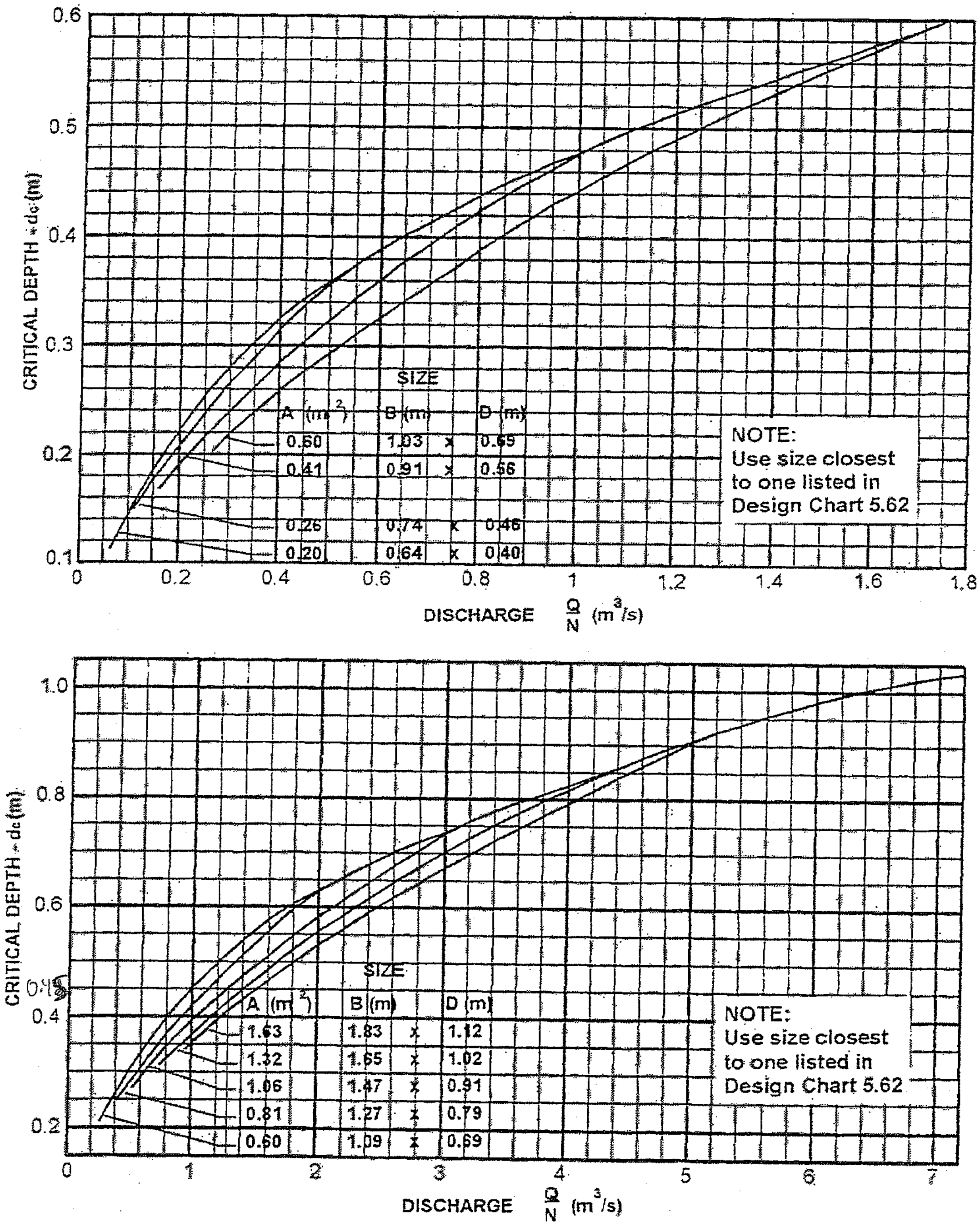
CSPA SIZES	
No	B(m) x D(m)
1	0.56 x 0.42
2	0.68 x 0.50
3	0.80 x 0.58
4	0.91 x 0.66
5	1.03 x 0.74
6	1.15 x 0.82
7	1.39 x 0.97
8	1.63 x 1.12
9	1.85 x 1.26
10	2.13 x 1.40



n = 0.024

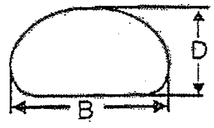
Source: Herr (1977)

Design Chart 5.53: CSP Pipe Arch Culverts



($d_c \not> D$)

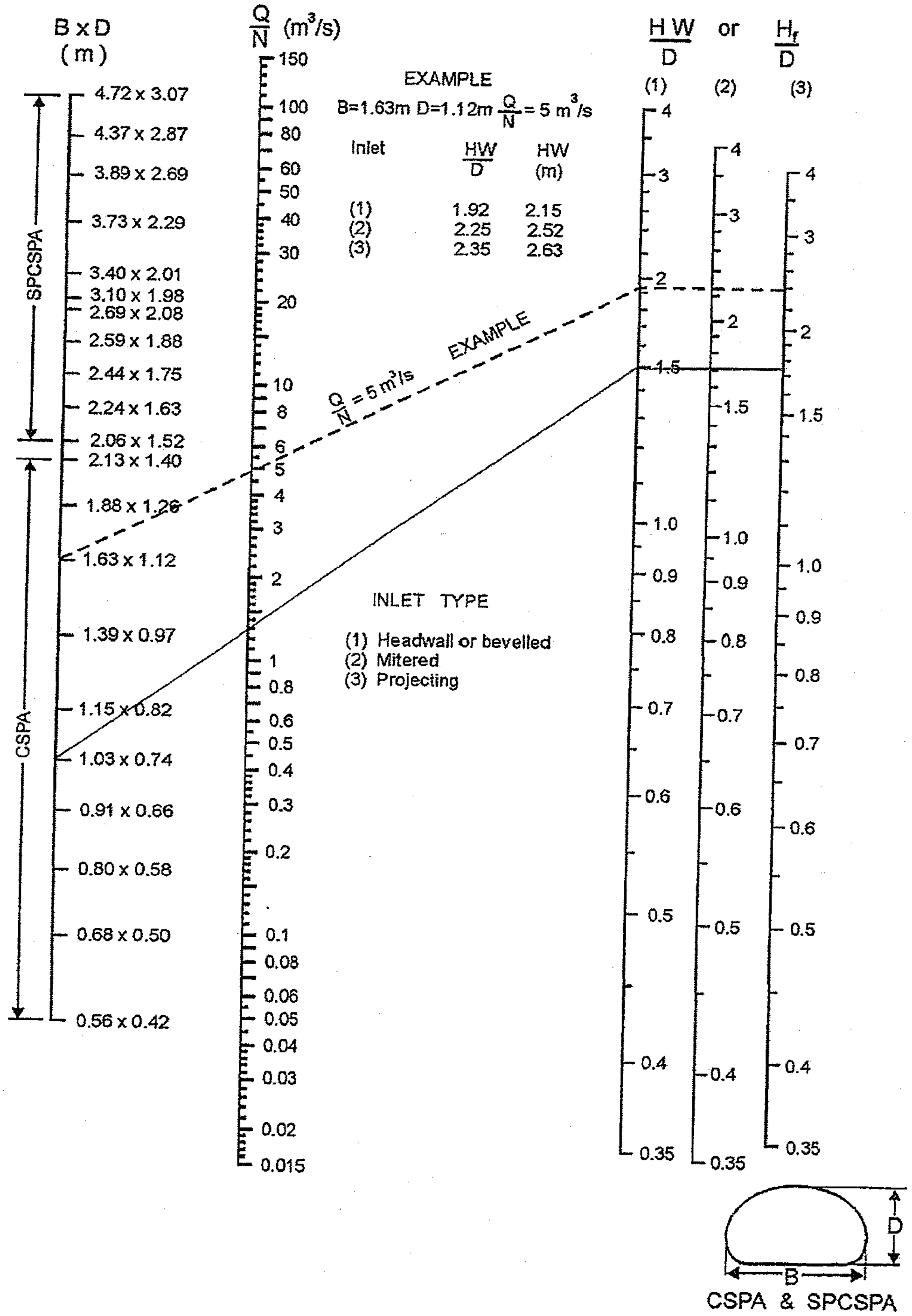
A = Cross-sectional area per barrel interpolated for other sizes



Source: Herr (1977)

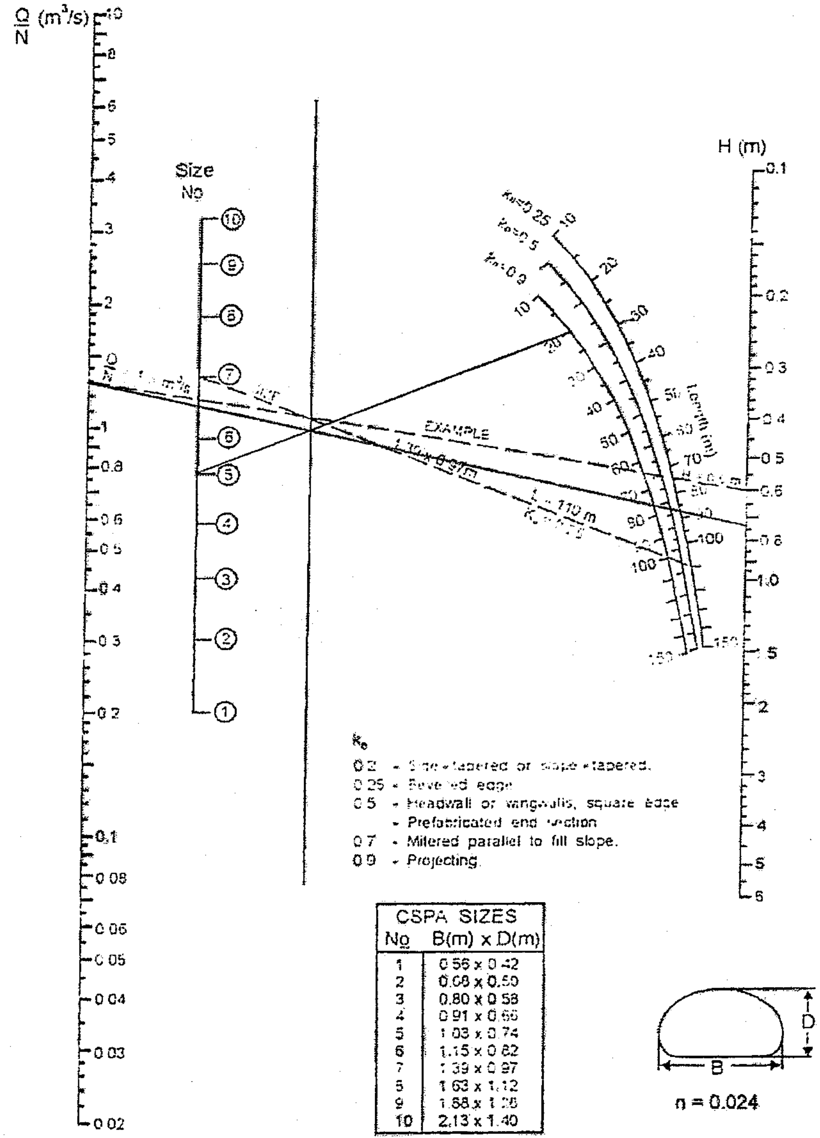
Culvert Crossing 22 - 19 2 x 1.03m x 0.74m

Design Chart 5.43: Inlet Control: Steel Pipe Arch Culverts



Source: Herr (1977)

Design Chart 5.47: Outlet Control: Pipe Arch CSP Culvert - Flowing Full



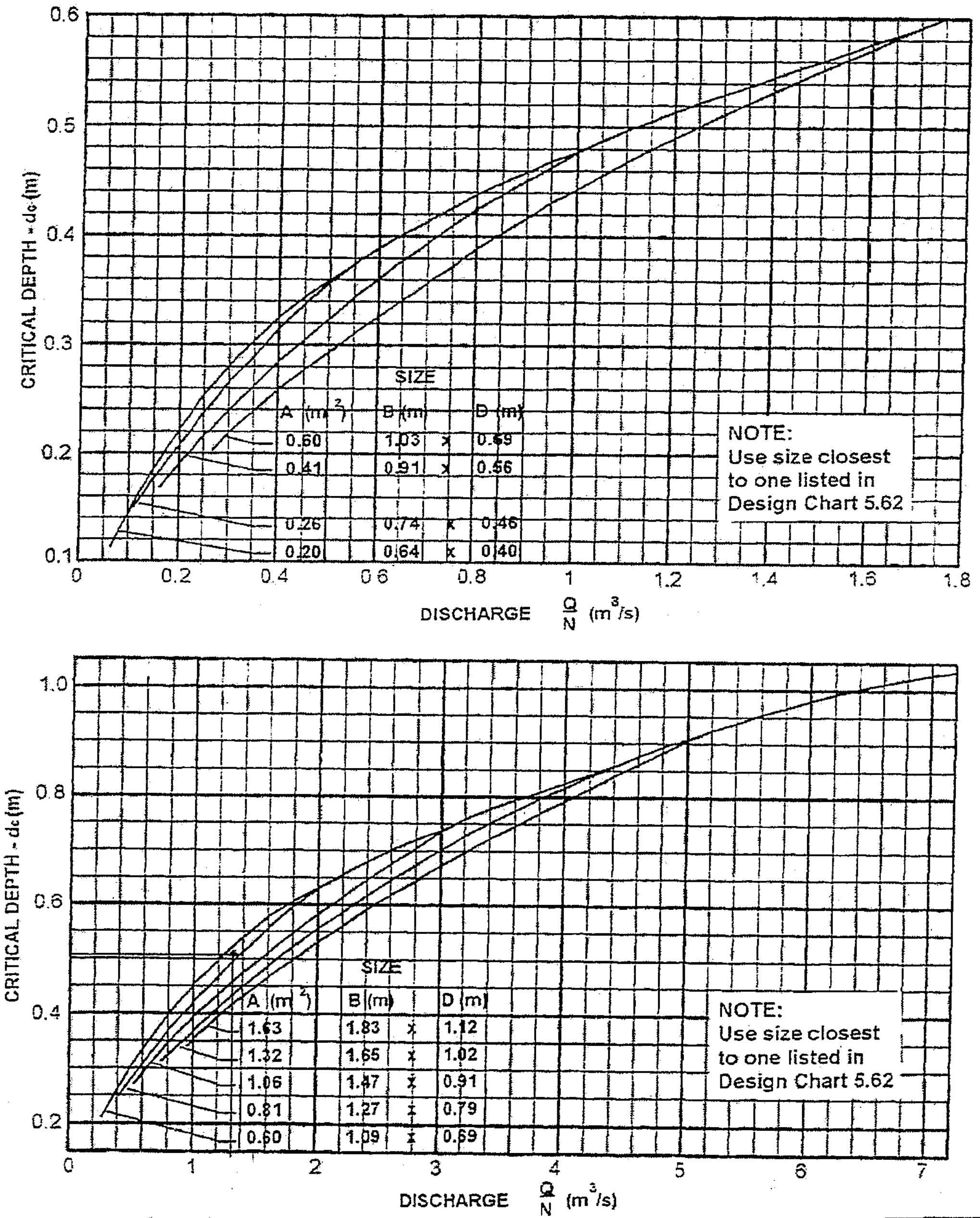
k_e
0.2 - Side-tapered or slope-tapered.
0.25 - Bevelled edge
0.5 - Headwall or wingwalls, square edge
- Prefabricated end section
0.7 - Mitered parallel to fill slope.
0.9 - Projecting.

CSPA SIZES	
No	B(m) x D(m)
1	0.56 x 0.42
2	0.68 x 0.50
3	0.80 x 0.58
4	0.91 x 0.66
5	1.03 x 0.74
6	1.15 x 0.82
7	1.39 x 0.97
8	1.63 x 1.12
9	1.88 x 1.28
10	2.13 x 1.40

n = 0.024

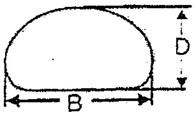
Source: Herr (1977)

Design Chart 5.53: CSP Pipe Arch Culverts



$(d_c \ngtr D)$

A = Cross-sectional area per barrel interpolated for other sizes



Source: Herr (1977)

APPENDIX 'B'

CONVENTIONAL CULVERT DESIGN SHEET

HAWTHORNE ROAD & RIDEAU ROAD

1:10 YEAR ROADSIDE CULVERT DESIGN

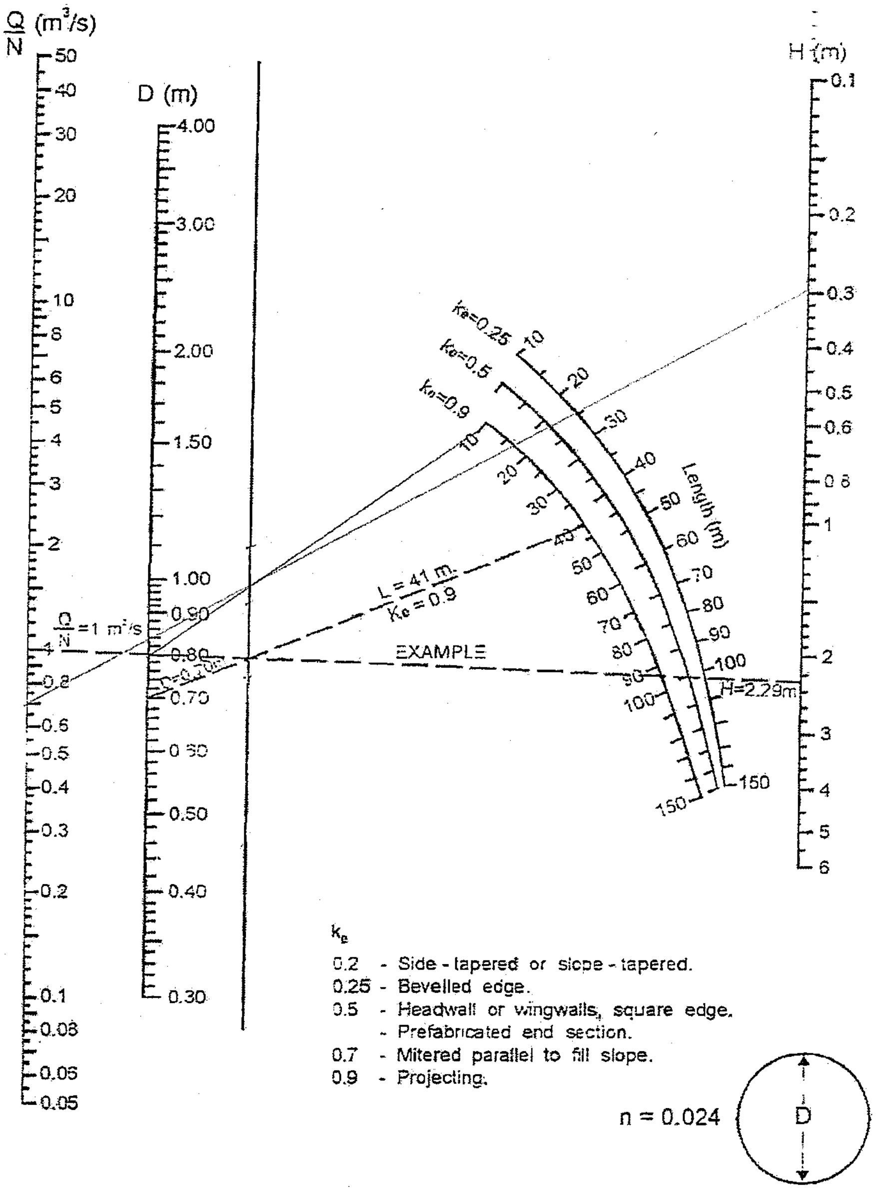
CONVENTIONAL CULVERT DESIGN

Prepared by: Mark Buchanan, E.I.T.
Reviewed by: Guy Forget, P.Eng.
Date: February 2009

Station	DESIGN DATA							CULVERT DATA					INLET CONTROL			OUTLET CONTROL								GOVERNING	VEL
	Q (m^3/s)	d (m)	d_e (m)	AHW (m)	Skew No.	L (m)	S (m/m)	Description	D or B x D (m)	N	Q/N (m^3/s)	A (each) (m^2)	Q/NB (m^3/s/m)	HW/D	HW (m)	K_e	H (m)	d_c (m)	(d_c + D)/2 (m)	TW (m)	h_o (m)	LS (m)	HW (m)	HW (m)	V_o (m/s)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
6A to 6B	0.694	0.53	0.05	1.13	0	10.0	0.010	CSP 800	0.8	1	0.694	0.50	----	1.05	0.84	0.9	0.30	0.44	0.62	0.58	0.62	0.10	0.82	0.84	
18 to 19	0.105	0.21	0.05	1.34	0	22.0	0.018	CSP 600	0.6	1	0.105	0.28	----	0.50	0.30	0.9	0.04	0.22	0.41	0.26	0.41	0.39	0.06	0.30	
20 to 21	0.113	0.29	0.05	0.81	0	20.0	0.005	CSP 600	0.6	1	0.113	0.28	----	0.52	0.31	0.9	0.05	0.26	0.43	0.34	0.43	0.10	0.37	0.37	
14B to 23	1.377	0.51	0.05	1.53	0	20.0	0.014	CSP 1000	1.0	1	1.377	0.79	----	1.14	1.14	0.9	0.55	0.68	0.84	0.56	0.84	0.28	1.11	1.14	
24 to 26	1.559	0.66	0.05	2.42	0	20.0	0.010	CSP 800	0.8	1	1.559	0.50	----	2.55	2.04	0.9	1.75	0.72	0.76	0.71	0.76	0.20	2.31	2.31	

2 From Form PH-D-533, col. 12
3 Flood Depth
4 Embedment below channel invert
5 Col. 3 + col. 4 + allowable backwater
7 Allowance for skew if applicable
8 Culvert Slope
10 D (circular) or B x D (other)
11 Number of Barrels
13 Area per barrel
14 For box only
15 Charts D5-1A to C and E to J
16 HW = col. 15 x D (col. 10)
17 Chart D5-8
18 Charts D5-2A to G
19 Charts D5-3A to F: (d_c > D)
21 Col. 3 + col. 4
22 H_o = larger of cols. 20 and 21
23 Col. 7 x col. 8
24 HW = col. 18 + col. 22 - col. 23
25 Larger of cols 16 and 24
26 Outlet velocity if required (Subsection 3.2.3)

Design Chart 2.35: Outlet Control: CSP Culvert - Flowing Full



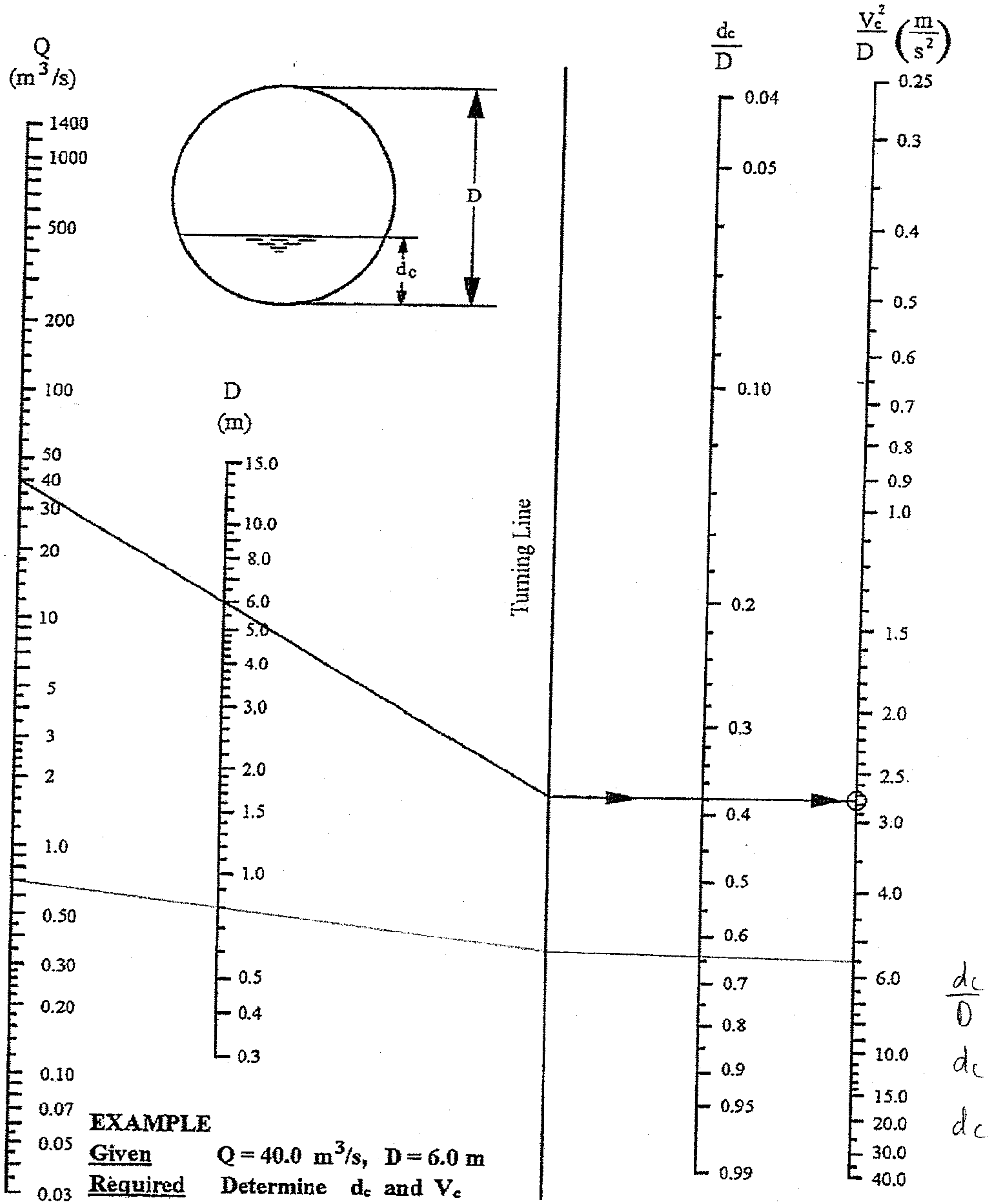
k_e

0.2 - Side - tapered or slope - tapered.
0.25 - Bevelled edge.
0.5 - Headwall or wingwalls, square edge.
 - Prefabricated end section.
0.7 - Mitered parallel to fill slope.
0.9 - Projecting.

n = 0.024

Source: Herr (1977)

Design Chart 2.38: Critical Depth - Velocity relationships: Circular Pipes



EXAMPLE

Given $Q = 40.0\ m^3/s$, $D = 6.0\ m$

Required Determine d_c and V_c

Solution Join $Q = 40.0\ m^3/s$ to $D = 6.0\ m$ and extend to turning line.
Draw a horizontal line perpendicular to the turning line to intersect $d_c/D = 0.38$ and $V_c^2/D = 2.76$
Calculate $d_c = 0.38 \times 6.0 = 2.28$ m.
$V_c = (2.76 \times 6.0)^{0.5} = 4.07$ m/s

$\frac{d_c}{D} = 0.55$

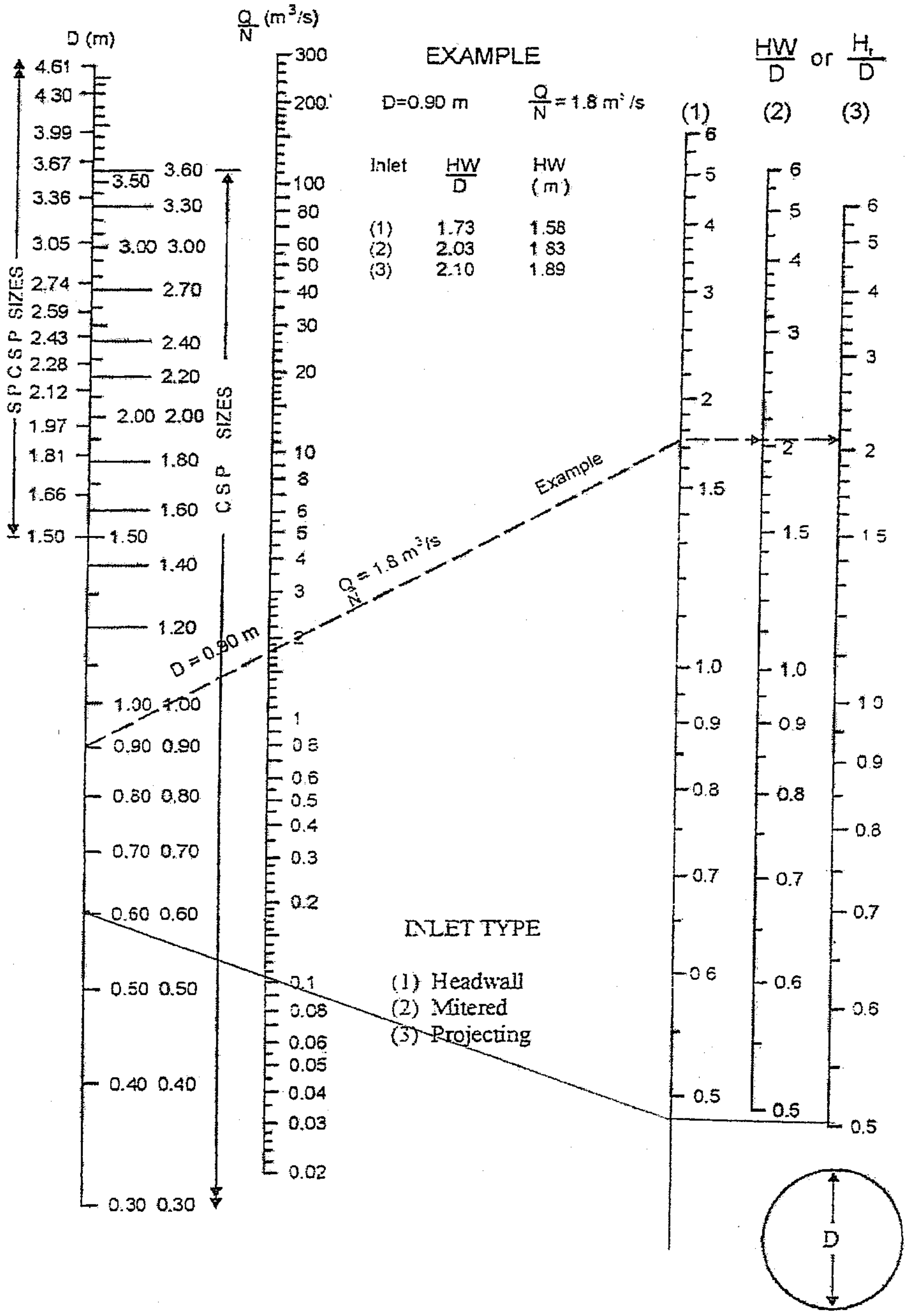
$d_c = 0.55 \times 0.8$

$d_c = 0.44$

Source: American Iron and Steel Institute

Culvert Crossing 18 to 19 600 mm Ø

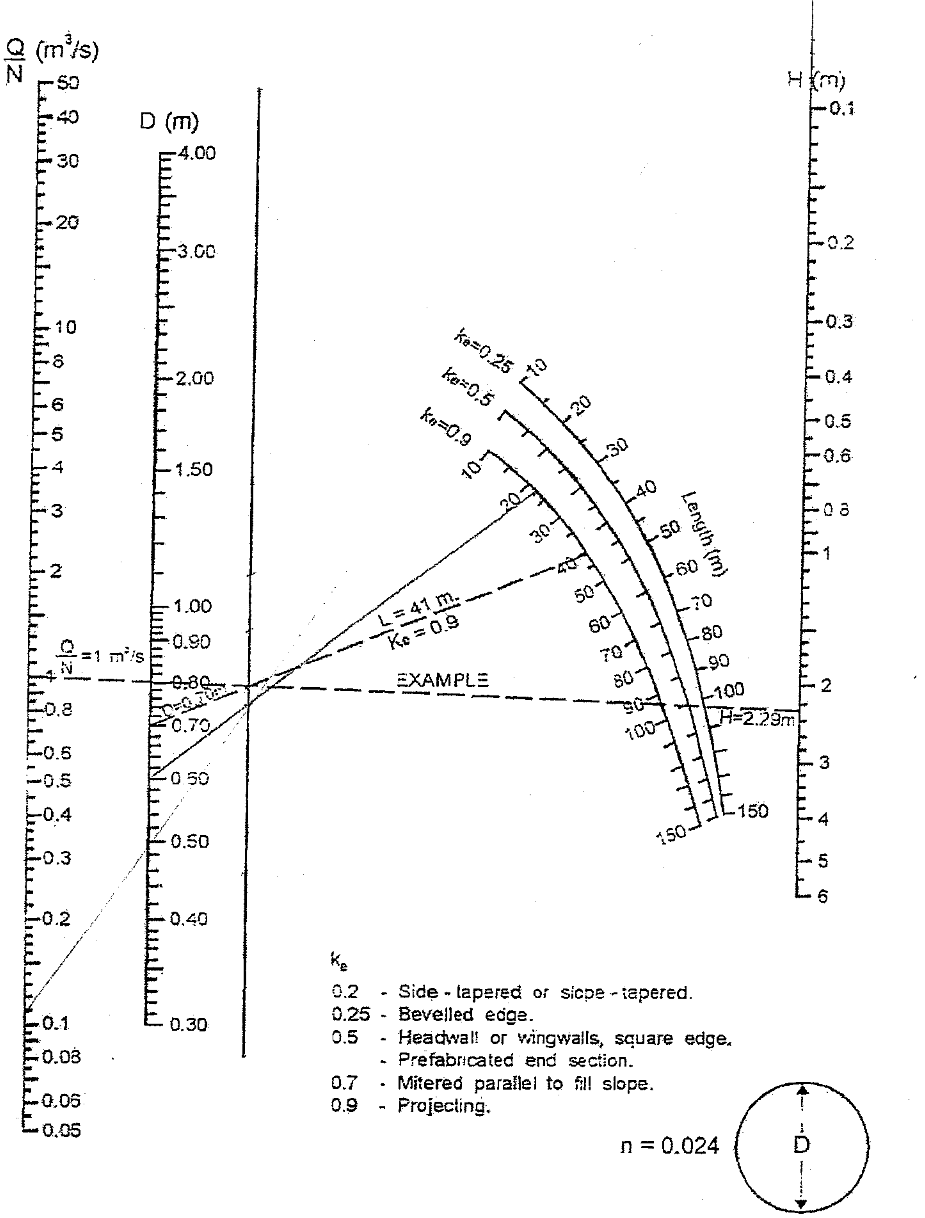
Design Chart 2.32: Inlet Control: Circular CSP and SPCSP Culverts



Source: Herr (1977)

Design Chart 2.35: Outlet Control: CSP Culvert - Flowing Full

0.04



K_e

0.2 - Side - tapered or slope - tapered.

0.25 - Bevelled edge.

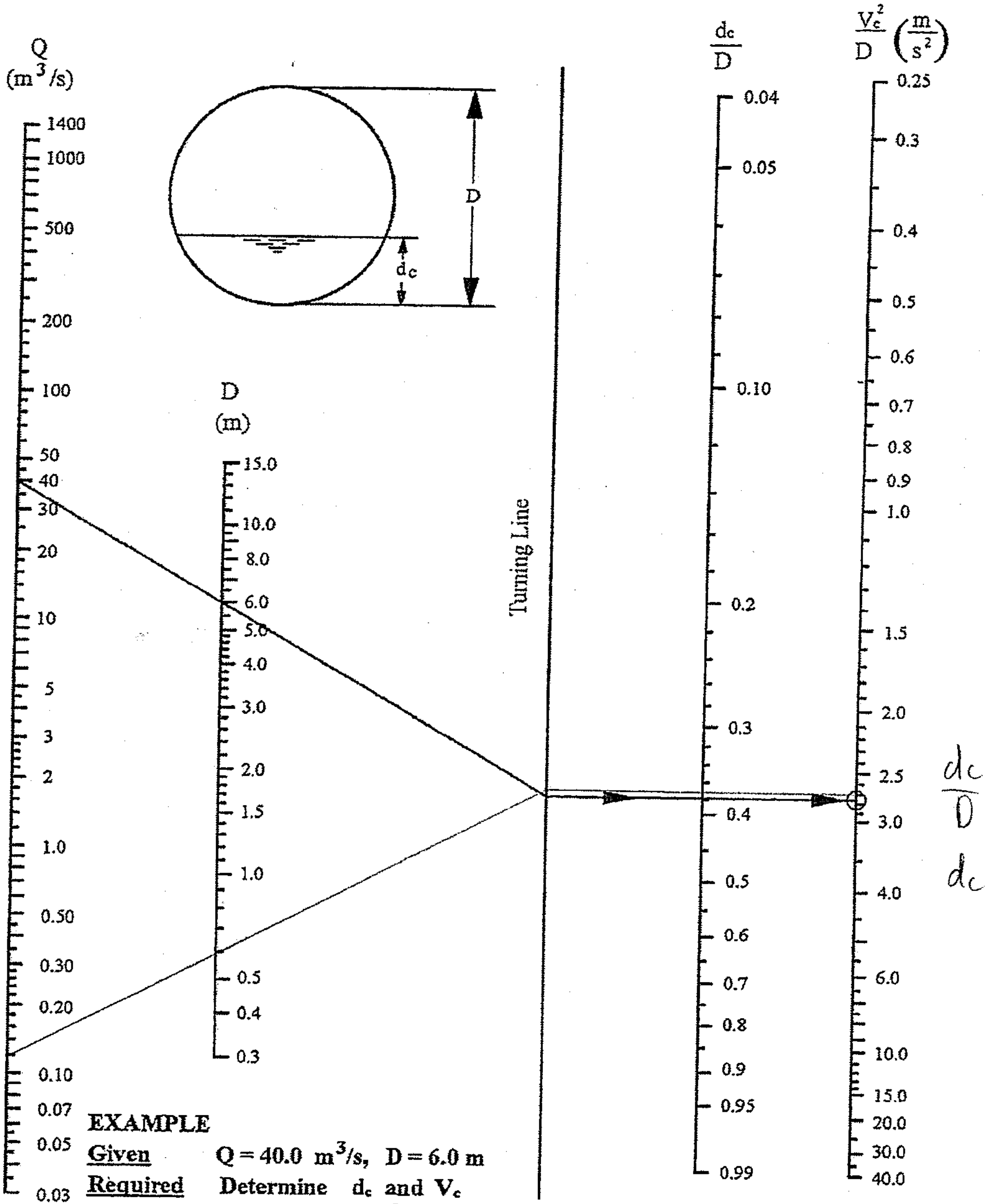
0.5 - Headwall or wingwalls, square edge.
- Prefabricated end section.

0.7 - Mitered parallel to fill slope.

0.9 - Projecting.

Source: Herr (1977)

Design Chart 2.38: Critical Depth - Velocity relationships: Circular Pipes



$\frac{d_c}{D} = 0.425$

$d_c = 0.425 \times 0.6$

$= 0.255$

EXAMPLE

Given $Q = 40.0$ m³/s, $D = 6.0$ m

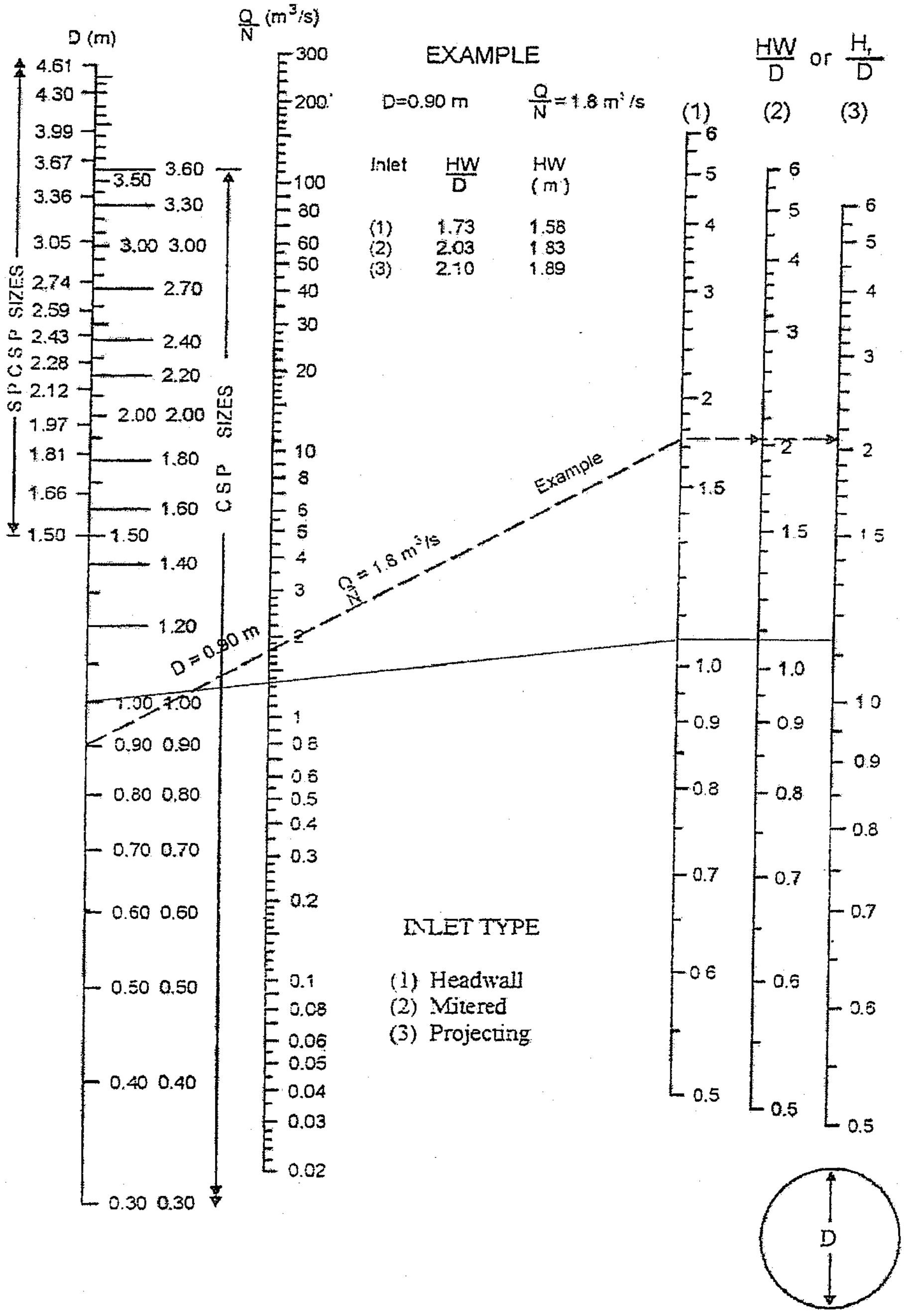
Required Determine d_c and V_c

Solution Join $Q = 40.0$ m³/s to $D = 6.0$ m and extend to turning line.
Draw a horizontal line perpendicular to the turning line to intersect
$d_c/D = 0.38$ and $V_c^2/D = 2.76$
Calculate $d_c = 0.38 \times 6.0 = 2.28$ m.
$V_c = (2.76 \times 6.0)^{0.5} = 4.07$ m/s

Source: American Iron and Steel Institute

Culvert Crossing (14) to (23) 1000mm Ø

Design Chart 2.32: Inlet Control: Circular CSP and SPCSP Culverts



EXAMPLE

D=0.90 m $\frac{Q}{N}$= 1.8 m³/s

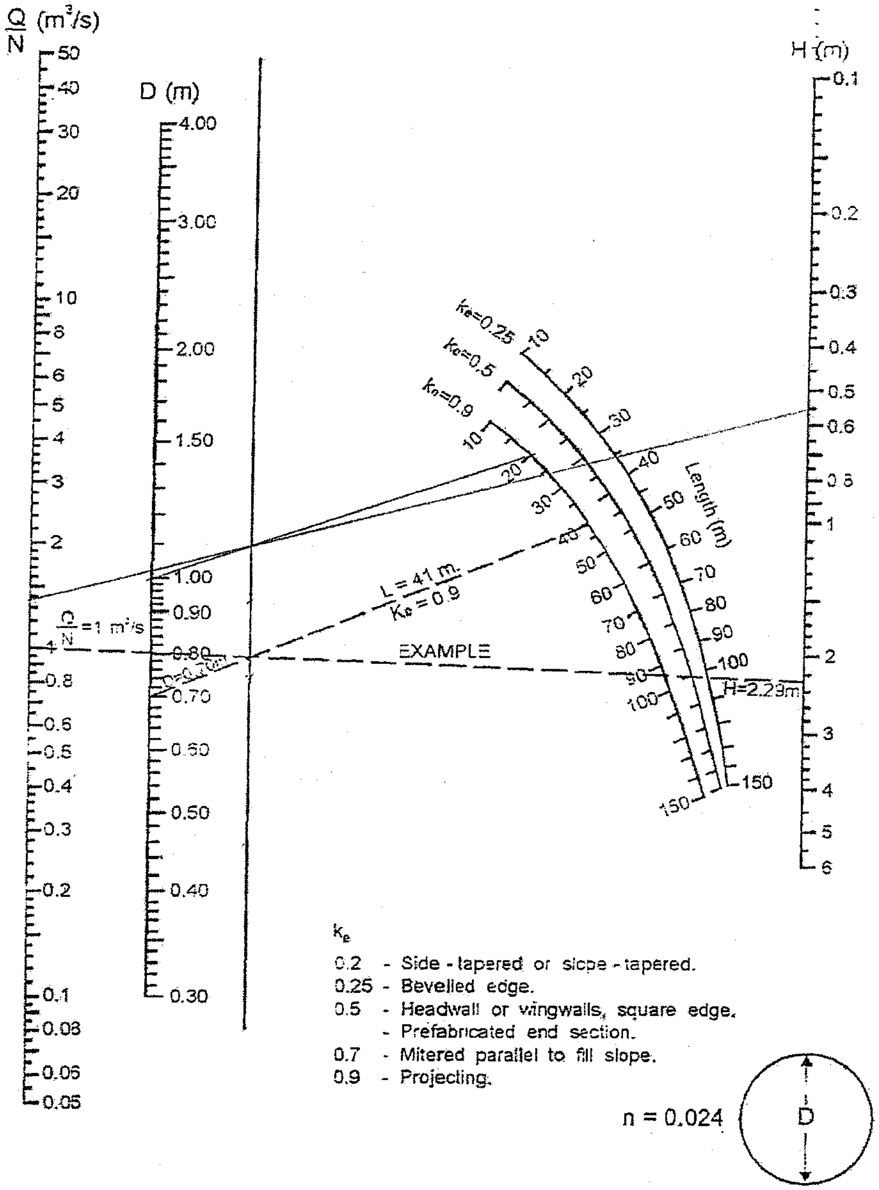
Inlet	$\frac{HW}{D}$	HW (m)
(1)	1.73	1.58
(2)	2.03	1.83
(3)	2.10	1.89

INLET TYPE

(1) Headwall
(2) Mitered
(3) Projecting

Source: Herr (1977)

Design Chart 2.35: Outlet Control: CSP Culvert - Flowing Full

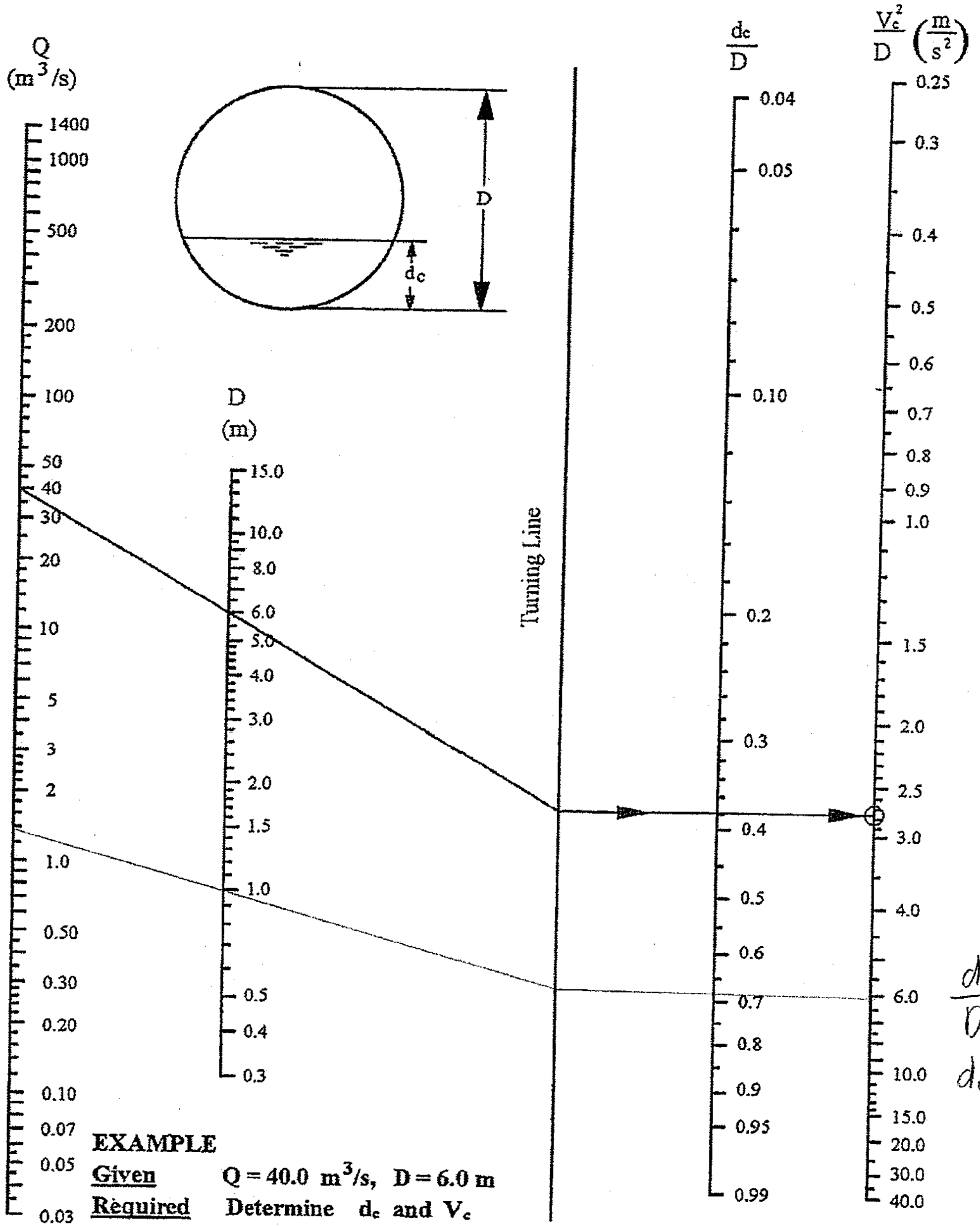


kₑ

0.2 - Side - tapered or slope - tapered.
0.25 - Bevelled edge.
0.5 - Headwall or wingwalls, square edge.
- Prefabricated end section.
0.7 - Mitered parallel to fill slope.
0.9 - Projecting.

Source: Herr (1977)

Design Chart 2.38: Critical Depth - Velocity relationships: Circular Pipes



$\frac{d_c}{D} = 0.72$

$d_c = 0.72 \times 1.0$

$= 0.72$

EXAMPLE

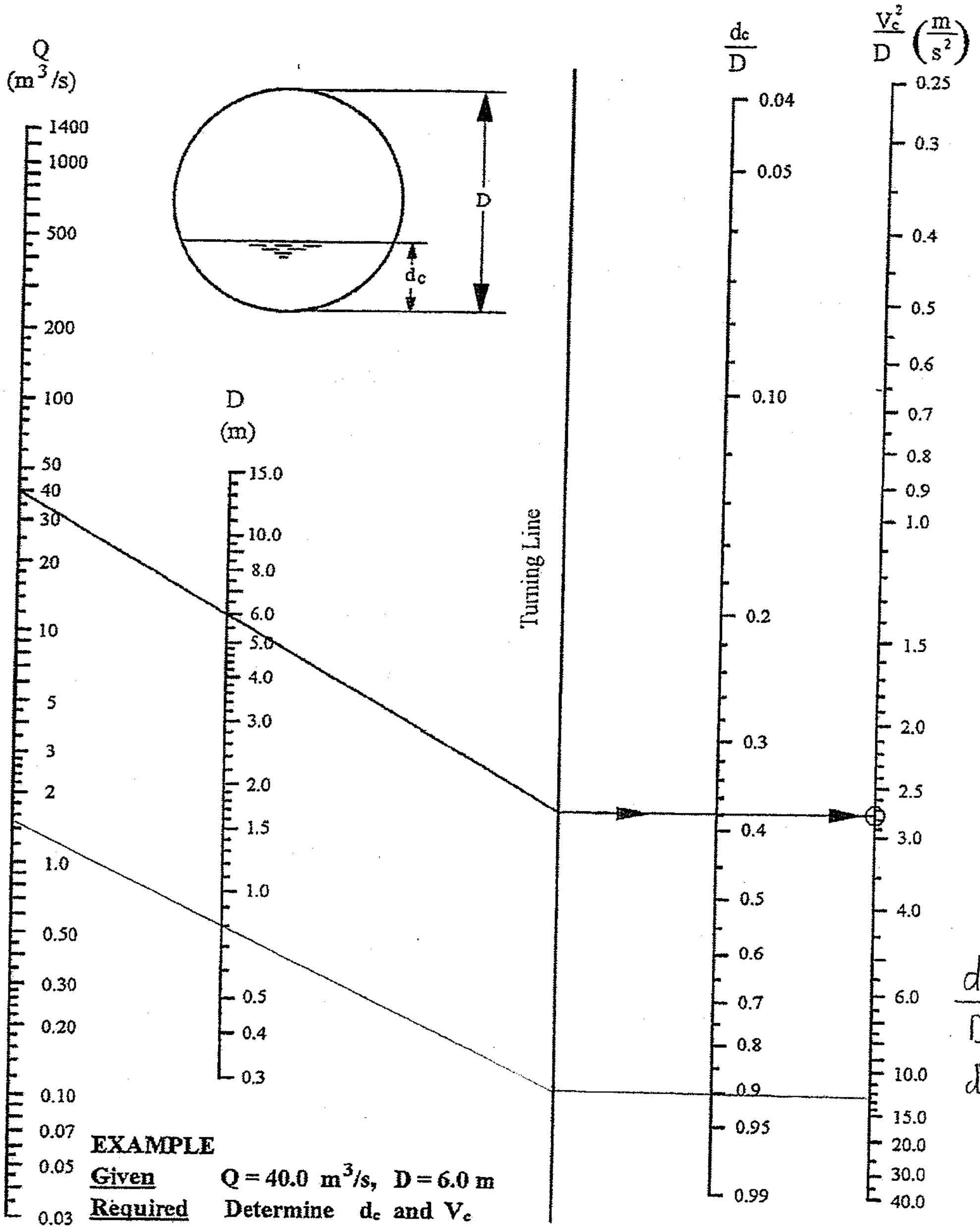
Given $Q = 40.0\ m^3/s,\ D = 6.0\ m$

Required Determine d_c and V_c

Solution Join $Q = 40.0\ m^3/s$ to $D = 6.0\ m$ and extend to turning line.
Draw a horizontal line perpendicular to the turning line to intersect $d_c/D = 0.38$ and $V_c^2/D = 2.76$
Calculate $d_c = 0.38 \times 6.0 = 2.28$ m.
$V_c = (2.76 \times 6.0)^{0.5} = 4.07$ m/s

Source: American Iron and Steel Institute

Design Chart 2.38: Critical Depth - Velocity relationships: Circular Pipes



d_c/D : 0.90

d_c = 0.90 × 0.80

= 0.72

EXAMPLE

Given Q = 40.0 m³/s, D = 6.0 m

Required Determine d_c and V_c

Solution Join Q = 40.0 m³/s to D = 6.0 m and extend to turning line.
Draw a horizontal line perpendicular to the turning line to intersect $d_c/D = 0.38$ and $V_c^2/D = 2.76$
Calculate $d_c = 0.38 \times 6.0 = 2.28$ m.
$V_c = (2.76 \times 6.0)^{0.5} = 4.07$ m/s

Source: American Iron and Steel Institute

APPENDIX 'C'

WATER QUALITY - INFILTRATION CALCULATION

JOB NO. 20983

PROJECT Hawthorne Industrial Park

Length of Perforated Pipe in Ditches

BY MB DATE Apr 14/09

J.L.Richards
ENGINEERS ARCHITECTS PLANNERS

Level of Service

Normal 70% TSS removal

Imperviousness 100% for internal roads

Extrapolating from Table 3.2 SWMPDM

water quality infiltration requirement = $35 \, m^3/ha$

Area of Asphalt

Phase 1	Phase 2
Length = 2250 m width = 7 m 15750 m²	300 m 7 m 2100 m²
Required Storage	
$= 1.575 \, ha \times 35 \frac{m^3}{ha}$	$= 0.21 \, ha \times 35 \frac{m^3}{ha}$
$= 55.1 \, m^3$	$= 7.35 \, m^3$

Required Length of 200mm Ø Perforated Pipe

Length $= \dfrac{55.1 \, m^3}{\pi (0.1)^2 \, m^2}$	$= \dfrac{7.35 \, m^3}{\pi (0.1)^2 \, m^2}$
$= \underline{\underline{1755 \, m}}$	$= \underline{\underline{234 \, m}}$

SHEET ____ OF ____

APPENDIX 'D'

HYDROLOGICAL PARAMETERS
(CN_{pre}, Imperviousness Calculation, Time to Peak Calculation)

J.L.Richards
ENGINEERS ARCHITECTS PLANNERS

JOB NO. 20983

PROJECT Hawthorne Industrial Park
% Impervious Calculation

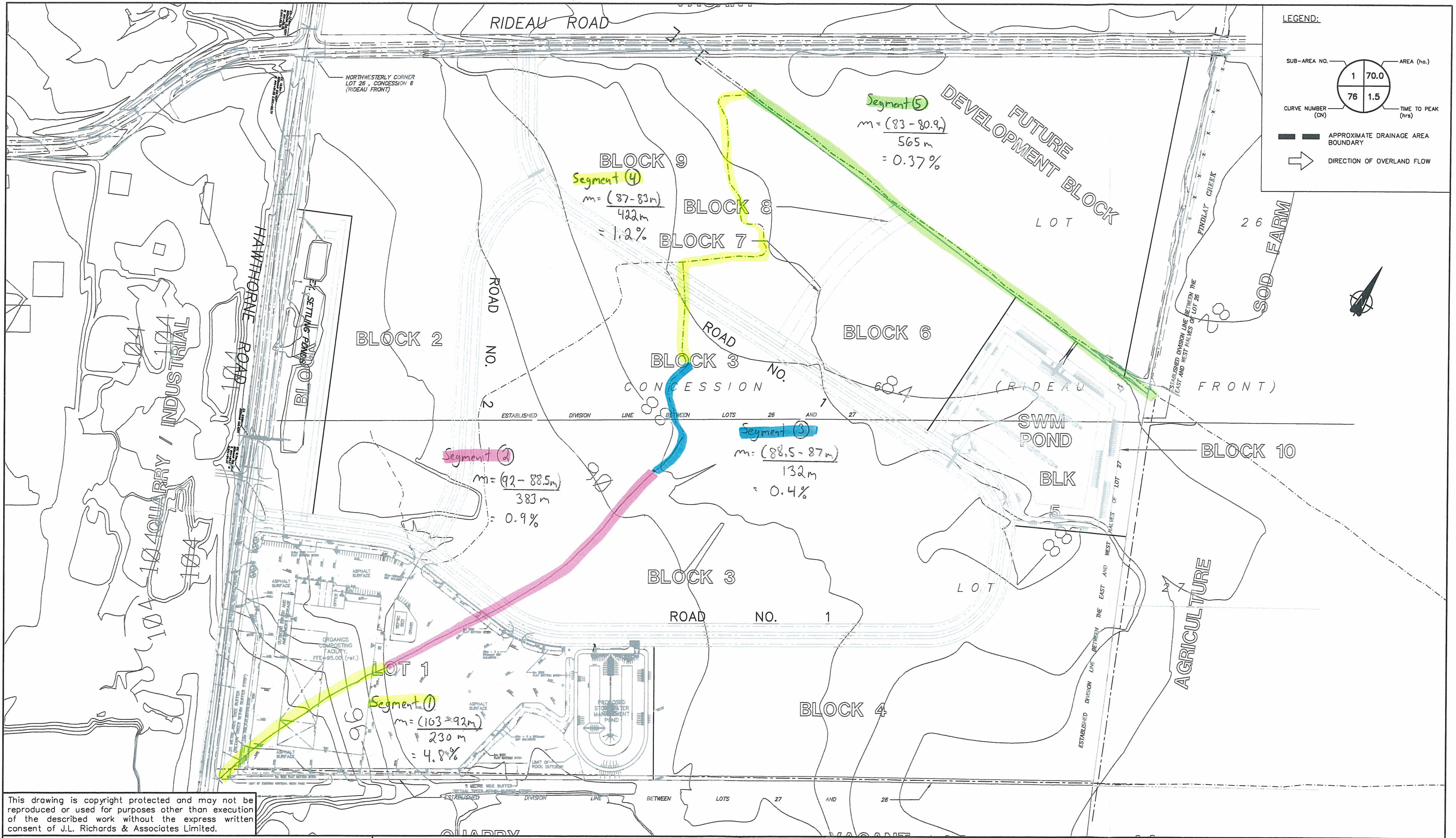
BY MB **DATE** Jan 22/09

Typical Site Development with C = 0.7

Building Footprint	10%
Asphalt Parking	35%
Gravel	35%
Grass	20%
	100%

Building Foot print = 100% Impervious
Asphalt Parking = 100% Impervious
Gravel = 70% Impervious
Grass = 0% Impervious

$$\% \text{ Imp.} = 10\% \times 1 + 35\% \times 1 + 35\% \times 0.7 + 20\% \times 0$$
$$= 70\%$$



V:\20983.DU\20983 C FIGURE 2A.dwg

PROJECT:

HAWTHORNE INDUSTRIAL PARK

DRAWING:

PRE-DEVELOPMENT STORM DRAINAGE AREA PLAN

J.L.Richards
ENGINEERS·ARCHITECTS·PLANNERS

J.L. Richards & Associates Limited
864 Lady Ellen Place
Ottawa, ON Canada
K1Z 5M2
Tel: 613 728 3571
Fax: 613 728 6012

DESIGN: M.B.
DRAWN: ARM
CHECKED: G.F.
PLOTTED: Jan 21, 2009

DRAWING NO.: FIGURE 2
JLR NO: 20983

JOB NO. 20983

PROJECT Hawthorne Industrial Park

Time of Concentration - Pre-development

BY MB **DATE** Jan 22/09

Segment ①

slope $= \frac{(103 - 92)\,m}{230\ m}$

$= 4.8\%$

Uplands Method Curve B - Woodland

Velocity $= 0.32\ m/s$

Time $= \frac{230\ m}{0.32\ m/s}$

$= 719$ sec

Segment ②

slope $= \frac{(92 - 88.5)\,m}{383\ m}$

$= 0.9\ \%$

Uplands Method Curve C - Pasture

Velocity $= 0.21\ m/s$

Time $= \frac{383\ m}{0.21\ m/s}$

$= 1824$ sec

JOB NO. 20983

PROJECT Hawthorne Industrial Park

Time of Concentration - Pre-development

BY MB **DATE** Jan 22/09

Segment ③

slope $= \frac{(88.5 - 87)\,m}{132\ m}$

$= 0.4\ \%$

Uplands Method Curve A - Forest (heavy litter)

Velocity $= 0.05\ m/s$

Time $= \frac{132\ m}{0.05\ m/s}$

$= 2640$ sec.

Segment ④

slope $= \frac{(87 - 83)\,m}{422\ m}$

$= 1.2\%$

Uplands Method Curve F - Grassed waterway

Velocity $= 0.47\ m/s$

Time $= \frac{422\ m}{0.47\ m/s}$

$= 898$ sec

Time of Concentration - Pre - Development

BY MB DATE Jan 22/09

Segment ⑤

slope = $\frac{(83 - 80.9) \text{ m}}{565 \text{ m}}$

= 0.37%

Uplands Method Curve F - Grassed Waterway

Velocity = 0.28 m/s

Time = $\frac{565 \text{ m}}{0.28 \text{ m/s}}$

= 2018 sec

Total Time = ① + ② + ③ + ④ + ⑤
= 719 + 1824 + 2640 + 898 + 2018

= 8099 sec

Time to Peak = $\frac{2}{3}$ x 8099 sec

= 5399 sec

= 90 min

APPENDIX 'E'

SWMHYMO INPUT AND OUTPUT FILES
(Pre - and Uncontrolled Post-Development Conditions)

```
2     Metric units
*#***********************************************************************************
*#  Project Name : Hawthorne Industrial Park        Project Number:   [20983] *
*#  Date         : April, 2009                                                *
*#  Revised      : N/A                                                        *
*#  Developed by : Mark Buchanan, E.I.T.                                      *
*#  Reviewed by  : Guy Forget, P.Eng.                                         *
*#  Company      : J.L. Richards & Associates Limited                         *
*#  License #    : 4418403                                                    *
*#***********************************************************************************
*
*
*#********************************************************************
*#  FILENAME:  V:\20983.DU\ENG\SWMHYMO\20983PST.DAT                   *
*#  FILE DEVELOPED FOR SITE PLAN APPLICATION AND DETAILED DESIGN *
*#   OF  A FACILITY ASSOCIATED WITH THE OTTAWA COMPOSTING SITE    *
*#********************************************************************
*
**********************************************************************************
*          SWMHYMO FILE DEVELOPED TO INVESTIGATE FLOOD FLOWS OF THE              *
*   PROPOSED COMPOSTING SITE UNDER POST-DEVELOPMENT UNCONTROLLED CONDITIONS   *
**********************************************************************************

**********************************************************
* HYDROLOGICAL ANALYSIS UNDER A 4 HR-25 MM STORM AND  *
* FOR DESIGN STORMS OF 1:2, 5, 10, 25, 50, AND 100 YR *
**********************************************************

******************************************************************
*        POST-DEVELOPMENT UNCONTROLLED CONDITIONS                *
******************************************************************

******************************************************************
*              CALCULATION OF 4 HR 25 MM STORM EVENT             *
******************************************************************

START                TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                    [  ] <--storm filename, one per line for NSTORM time
READ STORM           STORM_FILENAME=["4HR25-15.STM"]
*%------------------|---------------------------------------------------------------|
DEFAULT  VALUES      ICASEdef=[1],  read and print values
                     DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%------------------|---------------------------------------------------------------|

**************************************
*           ORGAWORLD FILE           *
**************************************

* SUB-AREA No.1

CALIB STANDHYD       ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                     XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                          LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                          LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|---------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD       ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                     XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                          LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|---------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD       ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                          LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|---------------------------------------------------------------|
ADD HYD              IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%------------------|---------------------------------------------------------------|
ADD HYD              IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%------------------|---------------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD       ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                          LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                          LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|---------------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD       ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                          LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|---------------------------------------------------------------|
ADD HYD              IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%------------------|---------------------------------------------------------------|
ADD HYD              IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%------------------|---------------------------------------------------------------|

ROUTE RESERVOIR      IDout=[10],   NHYD=["POND"],  IDin=[9],
                     RDT=[1.0](min),
                           TABLE of ( OUTFLOW-STORAGE ) values
                                        (cms) - (ha-m)
                                      [   0.000,  0.0000]
                                      [   0.008,  0.0656]
                                      [   0.017,  0.1311]
                                      [   0.093,  0.2831]
                                      [   0.233,  0.3971]
                                      [   0.337,  0.4731]
                                      [   0.465,  0.5491]
                                      [   0.531,  0.5871]
                                      [   0.593,  0.6251]
                                      [   0.654,  0.6631]
                                      [   0.797,  0.7391]
                                      [   0.950,  0.8274]
                                      [   1.304,  0.9157]
                                      [   1.880,  1.0040]
                                      [   2.577,  1.0923]
                                        [   -1   ,  -1    ]  (max twenty pts)

************************************************
*     Remaining Hawthorne Industrial Park     *
************************************************
*
* SUB-AREA No.1

CALIB STANDHYD       ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                          LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|---------------------------------------------------------------|
ADD HYD              IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%------------------|---------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD       ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                          LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|---------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD       ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[18.1](ha),
                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                          LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|---------------------------------------------------------------|
ADD HYD              IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%------------------|---------------------------------------------------------------|
*
*SUB-AREA No.4

DESIGN NASHYD        ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                     DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%------------------|---------------------------------------------------------------|


ADD HYD              IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
*%------------------|---------------------------------------------------------------|

* SUB-AREA NO. 5

DESIGN NASHYD        ID = [10], NHYD=["A2"], DT=[2.5]min, AREA=[6.8](ha),
                     DWF=[0](cms), CNC=[76], TP=[0.37]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%------------------|---------------------------------------------------------------|

* SUB-AREA NO 4

DESIGN NASHYD        ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[5.3](ha),
                     DWF=[0](cms), CNC=[76], TP=[0.804]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%------------------|---------------------------------------------------------------|
ADD HYD              IDsum=[2], NHYD=["0020"], IDs to add=[7+10+1]
*%------------------|---------------------------------------------------------------|

*******************************************************************
*          CALCULATION OF 3HR - 1:2 YEAR STORM EVENT             *
*******************************************************************

START                TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                    [  ] <--storm filename, one per line for NSTORM time
*%------------------|---------------------------------------------------------------|
CHICAGO STORM        IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
                     ICASEcs=[1],
                     A=[732.951],  B=[6.199], and C=[0.810],
*%------------------|---------------------------------------------------------------|
DEFAULT VALUES       ICASEdef=[1],  read and print values
                     DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%------------------|---------------------------------------------------------------|

**************************************
*           ORGAWORLD FILE           *
**************************************

* SUB-AREA No.1

CALIB STANDHYD       ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                     XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                          LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                          LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|---------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD       ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                     XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                          LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|---------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD       ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                          LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|---------------------------------------------------------------|
ADD HYD              IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%------------------|---------------------------------------------------------------|
ADD HYD              IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%------------------|---------------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD       ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
```

```
                        XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                        SCS curve number CN=[81],
                        Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                             LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                        Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                             LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                        RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%---------------------|-----------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD          ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                        XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                        SCS curve number CN=[81],
                        Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                             LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                        Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                             LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                        RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%---------------------|-----------------------------------------------------------|
ADD HYD                 IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%---------------------|-----------------------------------------------------------|
ADD HYD                 IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%---------------------|-----------------------------------------------------------|

ROUTE RESERVOIR         IDout=[10],   NHYD=["POND"],  IDin=[9],
                        RDT=[1.0](min),
                              TABLE of ( OUTFLOW-STORAGE ) values
                                          (cms) - (ha-m)
                                        [   0.000,  0.0000]
                                        [   0.008,  0.0656]
                                        [   0.017,  0.1311]
                                        [   0.093,  0.2831]
                                        [   0.233,  0.3971]
                                        [   0.337,  0.4731]
                                        [   0.465,  0.5491]
                                        [   0.531,  0.5871]
                                        [   0.593,  0.6251]
                                        [   0.654,  0.6631]
                                        [   0.797,  0.7391]
                                        [   0.950,  0.8274]
                                        [   1.304,  0.9157]
                                        [   1.880,  1.0040]
                                        [   2.577,  1.0923]
                                        [   -1   ,  -1    ]  (max twenty pts)

************************************************
*     Remaining Hawthorne Industrial Park      *
************************************************
*
* SUB-AREA No.1

CALIB STANDHYD          ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                        XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                        SCS curve number CN=[81],
                        Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                             LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                        Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                             LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                        RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%---------------------|-----------------------------------------------------------|
ADD HYD                 IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%---------------------|-----------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD          ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                        XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                        SCS curve number CN=[81],
                        Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                             LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                        Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                             LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                        RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%---------------------|-----------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD          ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[18.1](ha),
                        XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                        SCS curve number CN=[81],
                        Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                             LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                        Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                             LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                        RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%---------------------|-----------------------------------------------------------|
ADD HYD                 IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%---------------------|-----------------------------------------------------------|
*
*SUB-AREA No.4

DESIGN NASHYD           ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                        DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                        RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%---------------------|-----------------------------------------------------------|


ADD HYD                 IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
*%---------------------|-----------------------------------------------------------|

* SUB-AREA NO. 5

DESIGN NASHYD           ID = [10], NHYD=["A2"], DT=[2.5]min, AREA=[6.8](ha),
                        DWF=[0](cms), CNC=[76], TP=[0.37]hrs,
                        RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%---------------------|-----------------------------------------------------------|

* SUB-AREA NO 4

DESIGN NASHYD           ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[5.3](ha),
                        DWF=[0](cms), CNC=[76], TP=[0.804]hrs,
                        RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%---------------------|-----------------------------------------------------------|
ADD HYD                 IDsum=[2], NHYD=["0020"], IDs to add=[7+10+1]
*%---------------------|-----------------------------------------------------------|


****************************************************************
*         CALCULATION OF 3HR - 1:5 YEAR STORM EVENT             *
****************************************************************

START                   TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                       [ ] <--storm filename, one per line for NSTORM time
*%---------------------|-----------------------------------------------------------|
CHICAGO STORM           IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
                        ICASEcs=[1],
                        A=[998.071],  B=[6.053], and C=[0.814],
*%---------------------|-----------------------------------------------------------|
DEFAULT VALUES          ICASEdef=[1],  read and print values
                        DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%---------------------|-----------------------------------------------------------|

*************************************
*          ORGAWORLD FILE           *
*************************************

* SUB-AREA No.1

CALIB STANDHYD          ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                        XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                        SCS curve number CN=[81],
                        Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                             LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                        Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                             LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                        RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%---------------------|-----------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD          ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                        XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                        SCS curve number CN=[81],
                        Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                             LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                        Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                             LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                        RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%---------------------|-----------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD          ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                        XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                        SCS curve number CN=[81],
                        Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                             LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                        Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                             LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                        RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%---------------------|-----------------------------------------------------------|
ADD HYD                 IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%---------------------|-----------------------------------------------------------|
ADD HYD                 IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%---------------------|-----------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD          ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                        XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                        SCS curve number CN=[81],
                        Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                             LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                        Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                             LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                        RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%---------------------|-----------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD          ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                        XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                        SCS curve number CN=[81],
                        Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                             LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                        Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                             LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                        RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%---------------------|-----------------------------------------------------------|
ADD HYD                 IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%---------------------|-----------------------------------------------------------|
ADD HYD                 IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%---------------------|-----------------------------------------------------------|

ROUTE RESERVOIR         IDout=[10],   NHYD=["POND"],  IDin=[9],
                        RDT=[1.0](min),
                              TABLE of ( OUTFLOW-STORAGE ) values
                                          (cms) - (ha-m)
                                        [   0.000,  0.0000]
                                        [   0.008,  0.0656]
                                        [   0.017,  0.1311]
                                        [   0.093,  0.2831]
                                        [   0.233,  0.3971]
                                        [   0.337,  0.4731]
                                        [   0.465,  0.5491]
                                        [   0.531,  0.5871]
                                        [   0.593,  0.6251]
                                        [   0.654,  0.6631]
                                        [   0.797,  0.7391]
                                        [   0.950,  0.8274]
                                        [   1.304,  0.9157]
                                        [   1.880,  1.0040]
                                        [   2.577,  1.0923]
                                        [   -1   ,  -1    ]  (max twenty pts)

************************************************
*     Remaining Hawthorne Industrial Park      *
************************************************
*
* SUB-AREA No.1

CALIB STANDHYD          ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                        XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                        SCS curve number CN=[81],
                        Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                             LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                        Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                             LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                        RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%---------------------|-----------------------------------------------------------|
ADD HYD                 IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%---------------------|-----------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD          ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                        XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                        SCS curve number CN=[81],
                        Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                             LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                        Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                             LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                        RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%---------------------|-----------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD          ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[18.1](ha),
                        XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                        SCS curve number CN=[81],
                        Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                             LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                        Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                             LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                        RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%---------------------|-----------------------------------------------------------|
ADD HYD                 IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%---------------------|-----------------------------------------------------------|
*
```

```
*SUB-AREA No.4

DESIGN NASHYD         ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                      DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-------------------|-----------------------------------------------------|


ADD HYD               IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
*%-------------------|-----------------------------------------------------|

* SUB-AREA NO. 5

DESIGN NASHYD         ID = [10], NHYD=["A2"], DT=[2.5]min, AREA=[6.8](ha),
                      DWF=[0](cms), CNC=[76], TP=[0.37]hrs,
                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-------------------|-----------------------------------------------------|

* SUB-AREA NO 4

DESIGN NASHYD         ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[5.3](ha),
                      DWF=[0](cms), CNC=[76], TP=[0.804]hrs,
                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-------------------|-----------------------------------------------------|
ADD HYD               IDsum=[2], NHYD=["0020"], IDs to add=[7+10+1]
*%-------------------|-----------------------------------------------------|

******************************************************************
*          CALCULATION OF 3HR - 1:10 YEAR STORM EVENT            *
******************************************************************

START                 TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                     [  ] <--storm filename, one per line for NSTORM time
*%-------------------|-----------------------------------------------------|
CHICAGO  STORM        IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
                      ICASEcs=[1],
                      A=[1174.184],  B=[6.014], and C=[0.816],
*%-------------------|-----------------------------------------------------|
DEFAULT  VALUES       ICASEdef=[1],  read and print values
                      DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%-------------------|-----------------------------------------------------|

***********************************
*          ORGAWORLD FILE         *
***********************************

* SUB-AREA No.1

CALIB STANDHYD        ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                      XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                      SCS curve number CN=[81],
                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                           LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                           LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-------------------|-----------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD        ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                      XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                      SCS curve number CN=[81],
                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                           LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                           LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-------------------|-----------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD        ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                      XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                      SCS curve number CN=[81],
                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                           LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                           LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-------------------|-----------------------------------------------------|
ADD HYD               IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%-------------------|-----------------------------------------------------|
ADD HYD               IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%-------------------|-----------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD        ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                      XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                      SCS curve number CN=[81],
                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                           LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                           LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-------------------|-----------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD        ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                      XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                      SCS curve number CN=[81],
                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                           LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                           LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-------------------|-----------------------------------------------------|
ADD HYD               IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%-------------------|-----------------------------------------------------|
ADD HYD               IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%-------------------|-----------------------------------------------------|

ROUTE RESERVOIR       IDout=[10],   NHYD=["POND"],  IDin=[9],
                      RDT=[1.0](min),
                           TABLE of ( OUTFLOW-STORAGE ) values
                                      (cms) - (ha-m)
                                    [   0.000,  0.0000]
                                    [   0.008,  0.0656]
                                    [   0.017,  0.1311]
                                    [   0.093,  0.2831]
                                    [   0.233,  0.3971]
                                    [   0.337,  0.4731]
                                    [   0.465,  0.5491]
                                    [   0.531,  0.5871]
                                    [   0.593,  0.6251]
                                    [   0.654,  0.6631]
                                    [   0.797,  0.7391]
                                    [   0.950,  0.8274]
                                    [   1.304,  0.9157]
                                    [   1.880,  1.0040]
                                    [   2.577,  1.0923]
                                    [   -1   ,  -1    ]  (max twenty pts)

*********************************************
*     Remaining Hawthorne Industrial Park     *
*********************************************
*
* SUB-AREA No.1

CALIB STANDHYD        ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                      XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                      SCS curve number CN=[81],
                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                           LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                           LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-------------------|-----------------------------------------------------|
ADD HYD               IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%-------------------|-----------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD        ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                      XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                      SCS curve number CN=[81],
                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                           LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                           LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-------------------|-----------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD        ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[18.1](ha),
                      XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                      SCS curve number CN=[81],
                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                           LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                           LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-------------------|-----------------------------------------------------|
ADD HYD               IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%-------------------|-----------------------------------------------------|
*
*SUB-AREA No.4

DESIGN NASHYD         ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                      DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-------------------|-----------------------------------------------------|


ADD HYD               IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
*%-------------------|-----------------------------------------------------|

* SUB-AREA NO. 5

DESIGN NASHYD         ID = [10], NHYD=["A2"], DT=[2.5]min, AREA=[6.8](ha),
                      DWF=[0](cms), CNC=[76], TP=[0.37]hrs,
                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-------------------|-----------------------------------------------------|

* SUB-AREA NO 4

DESIGN NASHYD         ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[5.3](ha),
                      DWF=[0](cms), CNC=[76], TP=[0.804]hrs,
                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-------------------|-----------------------------------------------------|
ADD HYD               IDsum=[2], NHYD=["0020"], IDs to add=[7+10+1]
*%-------------------|-----------------------------------------------------|

******************************************************************
*          CALCULATION OF 3HR - 1:25 YEAR STORM EVENT            *
******************************************************************

START                 TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                     [  ] <--storm filename, one per line for NSTORM time
*%-------------------|-----------------------------------------------------|
CHICAGO STORM         IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
                      ICASEcs=[1],
                      A=[1402.884],  B=[6.018], and C=[0.819],
*%-------------------|-----------------------------------------------------|
DEFAULT VALUES        ICASEdef=[1],  read and print values
                      DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%-------------------|-----------------------------------------------------|

***********************************
*          ORGAWORLD FILE         *
***********************************

* SUB-AREA No.1

CALIB STANDHYD        ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                      XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                      SCS curve number CN=[81],
                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                           LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                           LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-------------------|-----------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD        ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                      XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                      SCS curve number CN=[81],
                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                           LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                           LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-------------------|-----------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD        ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                      XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                      SCS curve number CN=[81],
                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                           LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                           LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-------------------|-----------------------------------------------------|
ADD HYD               IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%-------------------|-----------------------------------------------------|
ADD HYD               IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%-------------------|-----------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD        ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                      XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                      SCS curve number CN=[81],
```

```
00811>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
00812>                                          LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
00813>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
00814>                                          LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
00815>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00816> *%------------------|---------------------------------------------------------------|
00817> *
00818> * SUB-AREA No.5
00819>
00820> CALIB STANDHYD      ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
00821>                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
00822>                     SCS curve number CN=[81],
00823>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
00824>                                          LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
00825>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
00826>                                          LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
00827>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00828> *%------------------|---------------------------------------------------------------|
00829> ADD HYD             IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
00830> *%------------------|---------------------------------------------------------------|
00831> ADD HYD             IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
00832> *%------------------|---------------------------------------------------------------|
00833>
00834> ROUTE RESERVOIR     IDout=[10],   NHYD=["POND"],  IDin=[9],
00835>                     RDT=[1.0](min),
00836>                           TABLE of ( OUTFLOW-STORAGE ) values
00837>                                      (cms) - (ha-m)
00838>                                    [   0.000,  0.0000]
00839>                                    [   0.008,  0.0656]
00840>                                    [   0.017,  0.1311]
00841>                                    [   0.093,  0.2831]
00842>                                    [   0.233,  0.3971]
00843>                                    [   0.337,  0.4731]
00844>                                    [   0.465,  0.5491]
00845>                                    [   0.531,  0.5871]
00846>                                    [   0.593,  0.6251]
00847>                                    [   0.654,  0.6631]
00848>                                    [   0.797,  0.7391]
00849>                                    [   0.950,  0.8274]
00850>                                    [   1.304,  0.9157]
00851>                                    [   1.880,  1.0040]
00852>                                    [   2.577,  1.0923]
00853>                                    [   -1   ,  -1    ]  (max twenty pts)
00854>
00855> ******* *************************************
00856> *     Remaining Hawthorne Industrial Park     *
00857> ******* *************************************
00858> *
00859> * SUB-AREA No.1
00860>
00861> CALIB STANDHYD      ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
00862>                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
00863>                     SCS curve number CN=[81],
00864>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
00865>                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
00866>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
00867>                                          LGI=[580](m), MNI=[0.03], SCI=[0.0](min
00868>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00869> *%------------------|---------------------------------------------------------------|
00870> ADD HYD             IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
00871> *%------------------|---------------------------------------------------------------|
00872> *
00873> * SUB-AREA No.2
00874>
00875> CALIB STANDHYD      ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
00876>                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
00877>                     SCS curve number CN=[81],
00878>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
00879>                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
00880>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
00881>                                          LGI=[450](m), MNI=[0.03], SCI=[0.0](min
00882>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00883> *%------------------|---------------------------------------------------------------|
00884> *
00885> * SUB-AREA No.3
00886>
00887> CALIB STANDHYD      ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[18.1](ha),
00888>                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
00889>                     SCS curve number CN=[81],
00890>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
00891>                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
00892>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
00893>                                          LGI=[600](m), MNI=[0.03], SCI=[0.0](min
00894>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00895> *%------------------|---------------------------------------------------------------|
00896> ADD HYD             IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
00897> *%------------------|---------------------------------------------------------------|
00898> *
00899> *SUB-AREA No.4
00900>
00901> DESIGN NASHYD       ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
00902>                     DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
00903>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00904> *%------------------|---------------------------------------------------------------|
00905>
00906>
00907> ADD HYD             IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
00908> *%------------------|---------------------------------------------------------------|
00909>
00910> * SUB-AREA NO. 5
00911>
00912> DESIGN NASHYD       ID = [10], NHYD=["A2"], DT=[2.5]min, AREA=[6.8](ha),
00913>                     DWF=[0](cms), CNC=[76], TP=[0.37]hrs,
00914>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00915> *%------------------|---------------------------------------------------------------|
00916>
00917> * SUB-AREA NO 4
00918>
00919> DESIGN NASHYD       ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[5.3](ha),
00920>                     DWF=[0](cms), CNC=[76], TP=[0.804]hrs,
00921>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00922> *%------------------|---------------------------------------------------------------|
00923> ADD HYD             IDsum=[2], NHYD=["0020"], IDs to add=[7+10+1]
00924> *%------------------|---------------------------------------------------------------|
00925>
00926>
00927> *************************************************************
00928> *          CALCULATION OF 3HR - 1:50 YEAR STORM EVENT           *
00929> *************************************************************
00930>
00931> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
00932> *%                   [  ] <--storm filename, one per line for NSTORM time
00933> *%------------------|---------------------------------------------------------------|
00934> CHICAGO STORM       IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
00935>                     ICASEcs=[1],
00936>                     A=[1569.580],  B=[6.014], and C=[0.820],
00937> *%------------------|---------------------------------------------------------------|
00938> DEFAULT VALUES      ICASEdef=[1],  read and print values
00939>                     DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
00940> *%------------------|---------------------------------------------------------------|
00941>
00942> **********************************
00943> *          ORGAWORLD FILE          *
00944> **********************************
00945>
```

```
00946> * SUB-AREA No.1
00947>
00948> CALIB STANDHYD      ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
00949>                     XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
00950>                     SCS curve number CN=[81],
00951>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
00952>                                          LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
00953>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
00954>                                          LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
00955>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00956> *%-----------------|---------------------------------------------------------------|
00957> *
00958> * SUB-AREA No.2
00959>
00960> CALIB STANDHYD      ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
00961>                     XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
00962>                     SCS curve number CN=[81],
00963>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
00964>                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
00965>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
00966>                                          LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
00967>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00968> *%-----------------|---------------------------------------------------------------|
00969> *
00970> * SUB-AREA No.3
00971>
00972> CALIB STANDHYD      ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
00973>                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
00974>                     SCS curve number CN=[81],
00975>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
00976>                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
00977>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
00978>                                          LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
00979>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00980> *%-----------------|---------------------------------------------------------------|
00981> ADD HYD             IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
00982> *%-----------------|---------------------------------------------------------------|
00983> ADD HYD             IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
00984> *%-----------------|---------------------------------------------------------------|
00985> *
00986> * SUB-AREA No.4
00987>
00988> CALIB STANDHYD      ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
00989>                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
00990>                     SCS curve number CN=[81],
00991>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
00992>                                          LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
00993>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
00994>                                          LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
00995>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00996> *%-----------------|---------------------------------------------------------------|
00997> *
00998> * SUB-AREA No.5
00999>
01000> CALIB STANDHYD      ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
01001>                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
01002>                     SCS curve number CN=[81],
01003>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
01004>                                          LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
01005>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
01006>                                          LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
01007>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
01008> *%-----------------|---------------------------------------------------------------|
01009> ADD HYD             IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
01010> *%-----------------|---------------------------------------------------------------|
01011> ADD HYD             IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
01012> *%-----------------|---------------------------------------------------------------|
01013>
01014> ROUTE RESERVOIR     IDout=[10],   NHYD=["POND"],  IDin=[9],
01015>                     RDT=[1.0](min),
01016>                           TABLE of ( OUTFLOW-STORAGE ) values
01017>                                      (cms) - (ha-m)
01018>                                    [   0.000,  0.0000]
01019>                                    [   0.008,  0.0656]
01020>                                    [   0.017,  0.1311]
01021>                                    [   0.093,  0.2831]
01022>                                    [   0.233,  0.3971]
01023>                                    [   0.337,  0.4731]
01024>                                    [   0.465,  0.5491]
01025>                                    [   0.531,  0.5871]
01026>                                    [   0.593,  0.6251]
01027>                                    [   0.654,  0.6631]
01028>                                    [   0.797,  0.7391]
01029>                                    [   0.950,  0.8274]
01030>                                    [   1.304,  0.9157]
01031>                                    [   1.880,  1.0040]
01032>                                    [   2.577,  1.0923]
01033>                                    [   -1   ,  -1    ]  (max twenty pts)
01034>
01035> *********************************************
01036> *     Remaining Hawthorne Industrial Park     *
01037> *********************************************
01038> *
01039> * SUB-AREA No.1
01040>
01041> CALIB STANDHYD      ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
01042>                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
01043>                     SCS curve number CN=[81],
01044>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
01045>                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
01046>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
01047>                                          LGI=[580](m), MNI=[0.03], SCI=[0.0](min
01048>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
01049> *%-----------------|---------------------------------------------------------------|
01050> ADD HYD             IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
01051> *%-----------------|---------------------------------------------------------------|
01052> *
01053> * SUB-AREA No.2
01054>
01055> CALIB STANDHYD      ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
01056>                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
01057>                     SCS curve number CN=[81],
01058>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
01059>                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
01060>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
01061>                                          LGI=[450](m), MNI=[0.03], SCI=[0.0](min
01062>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
01063> *%-----------------|---------------------------------------------------------------|
01064> *
01065> * SUB-AREA No.3
01066>
01067> CALIB STANDHYD      ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[18.1](ha),
01068>                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
01069>                     SCS curve number CN=[81],
01070>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
01071>                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
01072>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
01073>                                          LGI=[600](m), MNI=[0.03], SCI=[0.0](min
01074>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
01075> *%-----------------|---------------------------------------------------------------|
01076> ADD HYD             IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
01077> *%-----------------|---------------------------------------------------------------|
01078> *
01079> *SUB-AREA No.4
01080>
```

```
DESIGN NASHYD       ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                    DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|


ADD HYD             IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
*%-----------------|------------------------------------------------------------|

* SUB-AREA NO. 5

DESIGN NASHYD       ID = [10], NHYD=["A2"], DT=[2.5]min, AREA=[6.8](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.37]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|

* SUB-AREA NO 4

DESIGN NASHYD       ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[5.3](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.804]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[2], NHYD=["0020"], IDs to add=[7+10+1]
*%-----------------|------------------------------------------------------------|

******** *******************************************************
*        CALCULATION OF 3HR - 1:100 YEAR STORM EVENT           *
******** *******************************************************

START               TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                   [  ] <--storm filename, one per line for NSTORM time
*%-----------------|------------------------------------------------------------|
CHICAGO  STORM      IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
                    ICASEcs=[1],
                    A=[1735.688],  B=[6.014], and C=[0.820],
*%-----------------|------------------------------------------------------------|
DEFAULT  VALUES     ICASEdef=[1],  read and print values
                    DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%-----------------|------------------------------------------------------------|

******** ***************************
*           ORGAWORLD FILE         *
******** ***************************

* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                    XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                         LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                    XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                         LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                         LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%-----------------|------------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                         LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                         LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|------------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD      ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                         LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%-----------------|------------------------------------------------------------|

ROUTE RESERVOIR     IDout=[10],   NHYD=["POND"],  IDin=[9],
                    RDT=[1.0](min),
                           TABLE of ( OUTFLOW-STORAGE ) values
                                    (cms) - (ha-m)
                                  [   0.000,  0.0000]
                                  [   0.008,  0.0656]
                                  [   0.017,  0.1311]
                                  [   0.093,  0.2831]
                                  [   0.233,  0.3971]
                                  [   0.337,  0.4731]
                                  [   0.465,  0.5491]
                                  [   0.531,  0.5871]
                                  [   0.593,  0.6251]
                                  [   0.654,  0.6631]
                                  [   0.797,  0.7391]
                                  [   0.950,  0.8274]
                                  [   1.304,  0.9157]
                                  [   1.880,  1.0040]
                                  [   2.577,  1.0923]
                                  [   -1   ,  -1    ]  (max twenty pts)

**********************************************
*     Remaining Hawthorne Industrial Park    *
**********************************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                         LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%-----------------|------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                         LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[18.1](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                         LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%-----------------|------------------------------------------------------------|
*
*SUB-AREA No.4

DESIGN NASHYD       ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                    DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|


ADD HYD             IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
*%-----------------|------------------------------------------------------------|

* SUB-AREA NO. 5

DESIGN NASHYD       ID = [10], NHYD=["A2"], DT=[2.5]min, AREA=[6.8](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.37]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|

* SUB-AREA NO 4

DESIGN NASHYD       ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[5.3](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.804]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|------------------------------------------------------------|
ADD HYD             IDsum=[2], NHYD=["0020"], IDs to add=[7+10+1]
*%-----------------|------------------------------------------------------------|

FINISH

*****Rough Pond 1.87 ha x 1.4 m deep****************
                          TABLE of ( OUTFLOW-STORAGE ) values
                                    (cms) - (ha-m)
                                  [   0.0 , 0.0    ]
                                  [   0.10, 0.374  ]
                                  [   0.25, 0.748  ]
                                  [   0.50, 1.122  ]
                                  [   0.85, 1.496  ]
                                  [   1.20, 1.870  ]
                                  [   1.30, 2.244  ]
                                  [   1.50, 2.618  ]
                                  [   -1  ,  -1    ]


*****Rough Pond 150x150 x 1.4 m deep*****************
                                    ( cms) - (ha-m)
                                  [   0.0 , 0.0    ]
                                  [   0.16, 0.45   ]
                                  [   0.31, 0.900  ]
                                  [   0.60, 1.350  ]
                                  [   0.95, 1.800  ]
                                  [   1.40, 2.25   ]
                                  [   1.45, 2.700  ]
                                  [   1.50, 3.150  ]
                                  [   -1  ,  -1    ]  (max twenty pts)
```

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

 SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999   999  ========
 S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9 9   9
 SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ## 9   9 9   9 Ver. 4.02
     S   W W   M   M  H   H    Y    M   M  O   O      9999  9999 July 1999
 SSSSS   W W   M   M  H   H    Y    M   M   OOO          9     9 ========
                                                     9   9 9   9 # 4418403
       StormWater Management HYdrologic Model          999   999  ========

 *************************************************************************
 ********************* SWMHYMO-99 Ver/4.02 ********************************
 *******  A single event and continuous hydrologic simulation model *******
 *******     based on the principles of HYMO and its successors     *******
 *******                   OTTHYMO-83 and OTTHYMO-89.                *******
 *************************************************************************
 ******* Distributed by:  J.F. Sabourin and Associates Inc.          *******
 *******                 Ottawa,  Ontario: (613) 727-5199            *******
 *******                 Gatineau, Quebec: (819) 243-6858            *******
 *******                 E-Mail: swmhymo@jfsa.Com                    *******
 *************************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++ Licensed user: J. L. Richards & Associates Limited       +++++++
 +++++++                Ottawa                 SERIAL#:4418403     +++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 *************************************************************************
 *******             ++++++ PROGRAM ARRAY DIMENSIONS ++++++          *******
 *******             Maximum value for ID numbers  :    10          *******
 *******             Max. number of rainfall points:  15000         *******
 *******             Max. number of flow points    :  15000         *******
 *************************************************************************


 *******************   D E T A I L E D   O U T P U T   *******************
 *************************************************************************
 *       DATE: 2009-04-21     TIME: 10:30:14     RUN COUNTER: 000173      *
 *************************************************************************
 * Input   filename: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\PSTPH1.dat          *
 * Output  filename: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\PSTPH1.out          *
 * Summary filename: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\PSTPH1.sum          *
 * User comments:                                                         *
 * 1:_____________________________________________________________________*
 * 2:_____________________________________________________________________*
 * 3:_____________________________________________________________________*
 *************************************************************************

---------------------------------------------------------------------------
001:0001-------------------------------------------------------------------
*#*************************************************************************
*#  Project Name : Hawthorne Industrial Park        Project Number:  [20983] *
*#  Date         : April, 2009                                             *
*#  Revised      : N/A                                                     *
*#  Developed by : Mark Buchanan, E.I.T.                                   *
*#  Reviewed by  : Guy Forget, P.Eng.                                      *
*#  Company      : J.L. Richards & Associates Limited                      *
*#  License #    : 4418403                                                 *
*#*************************************************************************
*
*
*#***************************************************************
*#  FILENAME:  V:\20983.DU\ENG\SWMHYMO\20983PST.DAT              *
*#  FILE DEVELOPED FOR SITE PLAN APPLICATION AND DETAILED DESIGN *
*#   OF A FACILITY ASSOCIATED WITH THE OTTAWA COMPOSTING SITE    *
*#***************************************************************
*
***************************************************************************
*          SWMHYMO FILE DEVELOPED TO INVESTIGATE FLOOD FLOWS OF THE        *
*   PROPOSED COMPOSTING SITE UNDER POST-DEVELOPMENT UNCONTROLLED CONDITIONS  *
***************************************************************************
*****************************************************
* HYDROLOGICAL ANALYSIS UNDER A 4 HR-25 MM STORM AND  *
* FOR DESIGN STORMS OF 1:2, 5, 10, 25, 50, AND 100 YR *
*****************************************************
***********************************************************
*        POST-DEVELOPMENT UNCONTROLLED CONDITIONS           *
***********************************************************
***********************************************************
*            CALCULATION OF 4 HR 25 MM STORM EVENT          *
***********************************************************
--------------------
| START              |  Project  dir.: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\
--------------------  Rainfall dir.: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   0
---------------------------------------------------------------------------
001:0002-------------------------------------------------------------------
--------------------
| READ STORM        |   Filename: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\4HR25-1
| Ptotal=  25.00 mm|   Comments: 4hr-15 min 25 MM STORM EVENT (CHICAGO DI
--------------------
                   TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                    .25   1.777 |   1.25  45.631 |   2.25   3.138 |   3.25   1.675
                    .50   2.357 |   1.50  11.911 |   2.50   2.555 |   3.50   1.509
                    .75   3.618 |   1.75   6.051 |   2.75   2.165 |   3.75   1.376
                   1.00   8.975 |   2.00   4.108 |   3.00   1.885 |   4.00   1.266

---------------------------------------------------------------------------
001:0003-------------------------------------------------------------------
----------------------
| DEFAULT VALUES      |  Filename: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\ORGA.VAL
----------------------  ICASEdv = 1 (read and print data)
     FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
                ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
     Horton's infiltration equation parameters:
     [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
     Parameters for PERVIOUS surfaces in STANDHYD:
     [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
     Parameters for IMPERVIOUS surfaces in STANDHYD:
     [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
     Parameters used in NASHYD:
     [Ia=   4.67 mm] [N= 3.00]
---------------------------------------------------------------------------
001:0004-------------------------------------------------------------------
*********************************
*          ORGAWORLD FILE         *
*********************************
* SUB-AREA No.1
----------------------
| CALIB STANDHYD      |   Area    (ha)=    2.07
| 01:010    DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
    Surface Area      (ha)=       1.74          .33
    Dep. Storage      (mm)=       1.57         4.67
    Average Slope      (%)=        .52         1.00
    Length             (m)=     204.72        20.00
    Mannings n            =       .030         .250

    Max.eff.Inten.(mm/hr)=       45.63         5.37
                over (min)       10.00        30.00
    Storage Coeff.   (min)=      10.80 (ii)   29.27 (ii)
    Unit Hyd. Tpeak  (min)=      10.00        30.00
    Unit Hyd. peak   (cms)=        .11          .04
                                                           *TOTALS*
    PEAK FLOW        (cms)=        .16          .00          .158 (iii)
    TIME TO PEAK     (hrs)=       1.29         1.75         1.292
    RUNOFF VOLUME     (mm)=      23.43         5.17        20.508
    TOTAL RAINFALL    (mm)=      25.00        25.00        24.999
    RUNOFF COEFFICIENT   =        .94          .21          .820

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

---------------------------------------------------------------------------
001:0005-------------------------------------------------------------------
*
* SUB-AREA No.2
----------------------
| CALIB STANDHYD      |   Area    (ha)=    1.54
| 02:020    DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
    Surface Area      (ha)=       1.42          .12
    Dep. Storage      (mm)=       1.57         4.67
    Average Slope      (%)=        .50         1.00
    Length             (m)=     244.34         5.00
    Mannings n            =       .030         .030

    Max.eff.Inten.(mm/hr)=       45.63         7.24
                over (min)       12.50        15.00
    Storage Coeff.   (min)=      12.15 (ii)   14.15 (ii)
    Unit Hyd. Tpeak  (min)=      12.50        15.00
    Unit Hyd. peak   (cms)=        .09          .08
                                                           *TOTALS*
    PEAK FLOW        (cms)=        .12          .00          .121 (iii)
    TIME TO PEAK     (hrs)=       1.33         1.46         1.333
    RUNOFF VOLUME     (mm)=      23.43         5.17        21.969
    TOTAL RAINFALL    (mm)=      25.00        25.00        24.999
    RUNOFF COEFFICIENT   =        .94          .21          .879

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

---------------------------------------------------------------------------
001:0006-------------------------------------------------------------------
*
* SUB-AREA No.3
----------------------
| CALIB STANDHYD      |   Area    (ha)=    1.40
| 03:030    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
    Surface Area      (ha)=       1.36          .04
    Dep. Storage      (mm)=       1.57         4.67
    Average Slope      (%)=        .51         1.00
    Length             (m)=     225.63         5.00
    Mannings n            =       .030         .030

    Max.eff.Inten.(mm/hr)=       45.63         7.97
                over (min)       12.50        12.50
    Storage Coeff.   (min)=      11.52 (ii)   13.44 (ii)
    Unit Hyd. Tpeak  (min)=      12.50        12.50
    Unit Hyd. peak   (cms)=        .10          .09
                                                           *TOTALS*
    PEAK FLOW        (cms)=        .12          .00          .118 (iii)
    TIME TO PEAK     (hrs)=       1.33         1.42         1.333
    RUNOFF VOLUME     (mm)=      23.43         5.17        22.881
    TOTAL RAINFALL    (mm)=      25.00        25.00        24.999
    RUNOFF COEFFICIENT   =        .94          .21          .915

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

---------------------------------------------------------------------------
001:0007-------------------------------------------------------------------
--------------------
| ADD HYD (040   ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.    DWF
--------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
                  ID1 01:010        2.07      .158    1.29  20.51    .000
                 +ID2 02:020        1.54      .121    1.33  21.97    .000
                  ===================================================
                  SUM 04:040        3.61      .278    1.33  21.13    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---------------------------------------------------------------------------
001:0008-------------------------------------------------------------------
--------------------
| ADD HYD (050   ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.    DWF
--------------------                (ha)     (cms)   (hrs)   (mm)   (cms)
                  ID1 03:030        1.40      .118    1.33  22.88    .000
                 +ID2 04:040        3.61      .278    1.33  21.13    .000
                  ===================================================
                  SUM 05:050        5.01      .396    1.33  21.62    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---------------------------------------------------------------------------
001:0009-------------------------------------------------------------------
*
* SUB-AREA No.4
----------------------
| CALIB STANDHYD      |   Area    (ha)=     .89
| 06:060    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
    Surface Area      (ha)=        .86          .03
    Dep. Storage      (mm)=       1.57         4.67
    Average Slope      (%)=        .93          .70
    Length             (m)=     164.82        40.00
    Mannings n            =       .030         .250

    Max.eff.Inten.(mm/hr)=       45.63         4.42
                over (min)        7.50        42.50
    Storage Coeff.   (min)=       7.97 (ii)   41.62 (ii)
    Unit Hyd. Tpeak  (min)=       7.50        42.50
    Unit Hyd. peak   (cms)=        .14          .03
                                                           *TOTALS*
    PEAK FLOW        (cms)=        .09          .00          .089 (iii)
    TIME TO PEAK     (hrs)=       1.25         2.00         1.250
    RUNOFF VOLUME     (mm)=      23.43         5.17        22.882
    TOTAL RAINFALL    (mm)=      25.00        25.00        24.999
    RUNOFF COEFFICIENT   =        .94          .21          .915

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

 ------------------------------------------------------------------------------
 001:0010----------------------------------------------------------------------
 *
 * SUB-AREA No.5
 ---------------------
 | CALIB STANDHYD      |   Area     (ha)=    2.66
 | 07:070     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
 ---------------------
                               IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=      2.58          .08
      Dep. Storage      (mm)=      1.57         4.67
      Average Slope      (%)=       .61         1.50
      Length             (m)=    207.25        20.00
      Mannings n            =      .030         .250

      Max.eff.Inten.(mm/hr)=      45.63         5.66
                 over (min)       10.00        27.50
      Storage Coeff.  (min)=      10.37 (ii)   26.38 (ii)
      Unit Hyd. Tpeak (min)=      10.00        27.50
      Unit Hyd. peak  (cms)=        .11          .04
                                                           *TOTALS*
      PEAK FLOW       (cms)=        .24          .00          .238 (iii)
      TIME TO PEAK    (hrs)=       1.29         1.67         1.292
      RUNOFF VOLUME    (mm)=      23.43         5.17        22.882
      TOTAL RAINFALL   (mm)=      25.00        25.00        24.999
      RUNOFF COEFFICIENT   =        .94          .21          .915

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 ------------------------------------------------------------------------------
 001:0011----------------------------------------------------------------------
 --------------------
 | ADD HYD (080    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
 --------------------                 (ha)      (cms)   (hrs)   (mm)   (cms)
                     ID1 06:060        .89       .089    1.25  22.88    .000
                    +ID2 07:070       2.66       .238    1.29  22.88    .000
                     ==================================================
                     SUM 08:080       3.55       .327    1.29  22.88    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 001:0012----------------------------------------------------------------------
 --------------------
 | ADD HYD (090    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
 --------------------                 (ha)      (cms)   (hrs)   (mm)   (cms)
                     ID1 05:050       5.01       .396    1.33  21.62    .000
                    +ID2 08:080       3.55       .327    1.29  22.88    .000
                     ==================================================
                     SUM 09:090       8.56       .716    1.29  22.14    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 001:0013----------------------------------------------------------------------
 --------------------
 | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
 |  IN>09:(090    )  |
 | OUT<10:(POND   )  |    =========  OUTLFOW STORAGE TABLE  =========
 --------------------     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000  .0000E+00    |     .593  .6251E+00
                            .008  .6560E-01    |     .654  .6631E+00
                            .017  .1311E+00    |     .797  .7391E+00
                            .093  .2831E+00    |     .950  .8274E+00
                            .233  .3971E+00    |    1.304  .9157E+00
                            .337  .4731E+00    |    1.880  .1004E+01
                            .465  .5491E+00    |    2.577  .1092E+01
                            .531  .5871E+00    |     .000  .0000E+00

     ROUTING RESULTS                AREA      QPEAK      TPEAK        R.V.
     --------------------           (ha)      (cms)      (hrs)        (mm)
     INFLOW >09: (090    )          8.56       .716      1.292      22.143
     OUTFLOW<10: (POND   )          8.56       .032      3.875      22.141

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    4.470
                    TIME SHIFT OF PEAK FLOW          (min)=   155.00
                    MAXIMUM  STORAGE   USED        (ha.m.)=.1611E+00

 ------------------------------------------------------------------------------
 001:0014----------------------------------------------------------------------
 *********************************************
 *     Remaining Hawthorne Industrial Park    *
 *********************************************
 *
 * SUB-AREA No.1
 ---------------------
 | CALIB STANDHYD      |   Area     (ha)=   19.90
 | 01:HIP01  DT= 2.50  |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                               IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=     14.13         5.77
      Dep. Storage      (mm)=      1.57         4.67
      Average Slope      (%)=       .60         1.50
      Length             (m)=    580.00       100.00
      Mannings n            =      .030         .250

      Max.eff.Inten.(mm/hr)=      34.39        11.90
                 over (min)       22.50        52.50
      Storage Coeff.  (min)=      21.64 (ii)   52.88 (ii)
      Unit Hyd. Tpeak (min)=      22.50        52.50
      Unit Hyd. peak  (cms)=        .05          .02
                                                           *TOTALS*
      PEAK FLOW       (cms)=        .60          .11          .642 (iii)
      TIME TO PEAK    (hrs)=       1.50         2.13         1.542
      RUNOFF VOLUME    (mm)=      23.43         8.74        16.085
      TOTAL RAINFALL   (mm)=      25.00        25.00        24.999
      RUNOFF COEFFICIENT   =        .94          .35          .643

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 ------------------------------------------------------------------------------
 001:0015----------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP02 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
 --------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
                    ID1 10:POND       8.56       .032    3.88  22.14    .000
                   +ID2 01:HIP01     19.90       .642    1.54  16.08    .000
                    ==================================================
                    SUM 02:HIP02     28.46       .655    1.54  17.91    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 001:0016----------------------------------------------------------------------
 *
 * SUB-AREA No.2
 ---------------------
 | CALIB STANDHYD      |   Area     (ha)=   17.00
 | 03:HIP03  DT= 2.50  |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                               IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=     12.07         4.93
      Dep. Storage      (mm)=      1.57         4.67
      Average Slope      (%)=       .65         1.50
      Length             (m)=    450.00       100.00
      Mannings n            =      .030         .250

      Max.eff.Inten.(mm/hr)=      40.81        12.73
                 over (min)       17.50        47.50
      Storage Coeff.  (min)=      16.94 (ii)   47.35 (ii)
      Unit Hyd. Tpeak (min)=      17.50        47.50
      Unit Hyd. peak  (cms)=        .07          .02
                                                           *TOTALS*
      PEAK FLOW       (cms)=        .60          .10          .625 (iii)
      TIME TO PEAK    (hrs)=       1.42         2.00         1.458
      RUNOFF VOLUME    (mm)=      23.43         8.74        16.085
      TOTAL RAINFALL   (mm)=      25.00        25.00        24.999
      RUNOFF COEFFICIENT   =        .94          .35          .643

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 ------------------------------------------------------------------------------
 001:0017----------------------------------------------------------------------
 *
 * SUB-AREA No.3
 ---------------------
 | CALIB STANDHYD      |   Area     (ha)=   18.10
 | 04:HIP04  DT= 2.50  |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                               IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=     12.85         5.25
      Dep. Storage      (mm)=      1.57         4.67
      Average Slope      (%)=       .50         1.50
      Length             (m)=    600.00       100.00
      Mannings n            =      .030         .250

      Max.eff.Inten.(mm/hr)=      34.39        11.54
                 over (min)       22.50        55.00
      Storage Coeff.  (min)=      23.33 (ii)   54.95 (ii)
      Unit Hyd. Tpeak (min)=      22.50        55.00
      Unit Hyd. peak  (cms)=        .05          .02
                                                           *TOTALS*
      PEAK FLOW       (cms)=        .53          .09          .562 (iii)
      TIME TO PEAK    (hrs)=       1.50         2.17         1.542
      RUNOFF VOLUME    (mm)=      23.43         8.74        16.085
      TOTAL RAINFALL   (mm)=      25.00        25.00        24.999
      RUNOFF COEFFICIENT   =        .94          .35          .643

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 ------------------------------------------------------------------------------
 001:0018----------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP05 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
 --------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
                    ID1 03:HIP03     17.00       .625    1.46  16.08    .000
                   +ID2 04:HIP04     18.10       .562    1.54  16.08    .000
                    ==================================================
                    SUM 05:HIP05     35.10      1.166    1.46  16.08    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 001:0019----------------------------------------------------------------------
 *
 *SUB-AREA No.4
 ---------------------
 | DESIGN NASHYD       |   Area     (ha)=    4.00   Curve Number   (CN)=85.00
 | 06:Pond-B DT= 2.50  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
 ---------------------     U.H. Tp(hrs)=     .170

      Unit Hyd Qpeak  (cms)=      .899

      PEAK FLOW       (cms)=      .077 (i)
      TIME TO PEAK    (hrs)=     1.375
      RUNOFF VOLUME    (mm)=     6.343
      TOTAL RAINFALL   (mm)=    24.999
      RUNOFF COEFFICIENT   =      .254

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

 ------------------------------------------------------------------------------
 001:0020----------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP06 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
 --------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
                    ID1 02:HIP02     28.46       .655    1.54  17.91    .000
                   +ID2 05:HIP05     35.10      1.166    1.46  16.08    .000
                   +ID3 06:Pond-B     4.00       .077    1.38   6.34    .000
                    ==================================================
                    SUM 07:HIP06     67.56      1.887    1.50  16.28    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 001:0021----------------------------------------------------------------------
 * SUB-AREA NO. 5
 ---------------------
 | DESIGN NASHYD       |   Area     (ha)=    6.80   Curve Number   (CN)=76.00
 | 10:A2      DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
 ---------------------     U.H. Tp(hrs)=     .370

      Unit Hyd Qpeak  (cms)=      .702

      PEAK FLOW       (cms)=      .053 (i)
      TIME TO PEAK    (hrs)=     1.708
      RUNOFF VOLUME    (mm)=     4.111
      TOTAL RAINFALL   (mm)=    24.999
      RUNOFF COEFFICIENT   =      .164

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

 ------------------------------------------------------------------------------
 001:0022----------------------------------------------------------------------
 * SUB-AREA NO 4
 ---------------------
 | DESIGN NASHYD       |   Area     (ha)=    5.30   Curve Number   (CN)=76.00
 | 01:A3      DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
 ---------------------     U.H. Tp(hrs)=     .804
```

```

     Unit Hyd Qpeak  (cms)=      .252

     PEAK FLOW       (cms)=      .025 (i)
     TIME TO PEAK    (hrs)=     2.333
     RUNOFF VOLUME    (mm)=     4.110
     TOTAL RAINFALL   (mm)=    24.999
     RUNOFF COEFFICIENT   =      .164

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

-------------------------------------------------------------------------------
001:0023-----------------------------------------------------------------------
--------------------
| ADD HYD (0020  ) | ID: NHYD     AREA      QPEAK   TPEAK   R.V.    DWF
--------------------               (ha)     (cms)   (hrs)    (mm)  (cms)
                 ID1 07:HIP06      67.56    1.887    1.50   16.28    .000
                +ID2 10:A2          6.80     .053    1.71    4.11    .000
                +ID3 01:A3          5.30     .025    2.33    4.11    .000
                 =======================================================
                 SUM 02:0020       79.66    1.941    1.50   14.43    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0024-----------------------------------------------------------------------
****************************************************************
*        CALCULATION OF 3HR - 1:2 YEAR STORM EVENT             *
****************************************************************
--------------------
| START             |   Project  dir.: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\
--------------------   Rainfall dir.: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\
    TZERO =   .00 hrs on         0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   0
-------------------------------------------------------------------------------
001:0002-----------------------------------------------------------------------
--------------------
| CHICAGO STORM     |     IDF curve parameters: A= 732.951
| Ptotal= 31.86 mm  |                           B=   6.199
--------------------                            C=    .810
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  3.00 hrs
                         Storm time step    = 10.00 min
                         Time to peak ratio =   .33

               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                .17   2.815 |   1.00  76.805 |   1.83   5.095 |   2.67   2.684
                .33   3.498 |   1.17  24.079 |   2.00   4.291 |   2.83   2.463
                .50   4.687 |   1.33  12.364 |   2.17   3.718 |   3.00   2.279
                .67   7.305 |   1.50   8.324 |   2.33   3.288 |
                .83  18.209 |   1.67   6.303 |   2.50   2.953 |

-------------------------------------------------------------------------------
001:0003-----------------------------------------------------------------------
----------------------
| DEFAULT VALUES     |   Filename: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\ORGA.VAL
----------------------   ICASEdv = 1 (read and print data)
      FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
                 ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
      Horton's infiltration equation parameters:
      [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
      Parameters for PERVIOUS surfaces in STANDHYD:
      [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
      Parameters for IMPERVIOUS surfaces in STANDHYD:
      [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
      Parameters used in NASHYD:
      [Ia=   4.67 mm] [N= 3.00]
-------------------------------------------------------------------------------
001:0004-----------------------------------------------------------------------
*************************************
*          ORGAWORLD FILE           *
*************************************
* SUB-AREA No.1
----------------------
| CALIB STANDHYD     |   Area     (ha)=    2.07
| 01:010    DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
----------------------
                              IMPERVIOUS     PERVIOUS (i)
     Surface Area     (ha)=        1.74          .33
     Dep. Storage     (mm)=        1.57         4.67
     Average Slope     (%)=         .52         1.00
     Length             (m)=      204.72        20.00
     Mannings n            =        .030         .250

     Max.eff.Inten.(mm/hr)=       76.81        11.88
                over (min)        10.00        22.50
     Storage Coeff.  (min)=        8.77 (ii)   22.21 (ii)
     Unit Hyd. Tpeak (min)=       10.00        22.50
     Unit Hyd. peak  (cms)=         .12          .05
                                                            *TOTALS*
     PEAK FLOW       (cms)=         .24          .01            .245 (iii)
     TIME TO PEAK    (hrs)=        1.08         1.38           1.083
     RUNOFF VOLUME    (mm)=       30.29         8.52          26.807
     TOTAL RAINFALL   (mm)=       31.86        31.86          31.860
     RUNOFF COEFFICIENT   =         .95          .27            .841

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-------------------------------------------------------------------------------
001:0005-----------------------------------------------------------------------
*
* SUB-AREA No.2
----------------------
| CALIB STANDHYD     |   Area     (ha)=    1.54
| 02:020    DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
----------------------
                              IMPERVIOUS     PERVIOUS (i)
     Surface Area     (ha)=        1.42          .12
     Dep. Storage     (mm)=        1.57         4.67
     Average Slope     (%)=         .50         1.00
     Length             (m)=      244.34         5.00
     Mannings n            =        .030         .030

     Max.eff.Inten.(mm/hr)=       76.81        15.07
                over (min)        10.00        12.50
     Storage Coeff.  (min)=        9.87 (ii)   11.36 (ii)
     Unit Hyd. Tpeak (min)=       10.00        12.50
     Unit Hyd. peak  (cms)=         .11          .10
                                                            *TOTALS*
     PEAK FLOW       (cms)=         .19          .00            .192 (iii)
     TIME TO PEAK    (hrs)=        1.08         1.17           1.083
     RUNOFF VOLUME    (mm)=       30.29         8.52          28.548
     TOTAL RAINFALL   (mm)=       31.86        31.86          31.860
     RUNOFF COEFFICIENT   =         .95          .27            .896

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-------------------------------------------------------------------------------
001:0006-----------------------------------------------------------------------
*
* SUB-AREA No.3
----------------------
| CALIB STANDHYD     |   Area     (ha)=    1.40
| 03:030    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
----------------------
                              IMPERVIOUS     PERVIOUS (i)
     Surface Area     (ha)=        1.36          .04
     Dep. Storage     (mm)=        1.57         4.67
     Average Slope     (%)=         .51         1.00
     Length             (m)=      225.63         5.00
     Mannings n            =        .030         .030

     Max.eff.Inten.(mm/hr)=       76.81        16.59
                over (min)        10.00        10.00
     Storage Coeff.  (min)=        9.35 (ii)   10.79 (ii)
     Unit Hyd. Tpeak (min)=       10.00        10.00
     Unit Hyd. peak  (cms)=         .12          .11
                                                            *TOTALS*
     PEAK FLOW       (cms)=         .18          .00            .186 (iii)
     TIME TO PEAK    (hrs)=        1.08         1.13           1.083
     RUNOFF VOLUME    (mm)=       30.29         8.52          29.637
     TOTAL RAINFALL   (mm)=       31.86        31.86          31.860
     RUNOFF COEFFICIENT   =         .95          .27            .930

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-------------------------------------------------------------------------------
001:0007-----------------------------------------------------------------------
--------------------
| ADD HYD (040   ) | ID: NHYD     AREA      QPEAK   TPEAK   R.V.    DWF
--------------------               (ha)     (cms)   (hrs)    (mm)  (cms)
                 ID1 01:010         2.07     .245    1.08   26.81    .000
                +ID2 02:020         1.54     .192    1.08   28.55    .000
                 =======================================================
                 SUM 04:040         3.61     .436    1.08   27.55    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0008-----------------------------------------------------------------------
--------------------
| ADD HYD (050   ) | ID: NHYD     AREA      QPEAK   TPEAK   R.V.    DWF
--------------------               (ha)     (cms)   (hrs)    (mm)  (cms)
                 ID1 03:030         1.40     .186    1.08   29.64    .000
                +ID2 04:040         3.61     .436    1.08   27.55    .000
                 =======================================================
                 SUM 05:050         5.01     .623    1.08   28.13    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0009-----------------------------------------------------------------------
*
* SUB-AREA No.4
----------------------
| CALIB STANDHYD     |   Area     (ha)=     .89
| 06:060    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
----------------------
                              IMPERVIOUS     PERVIOUS (i)
     Surface Area     (ha)=         .86          .03
     Dep. Storage     (mm)=        1.57         4.67
     Average Slope     (%)=         .93          .70
     Length             (m)=      164.82        40.00
     Mannings n            =        .030         .250

     Max.eff.Inten.(mm/hr)=       76.81        10.24
                over (min)         7.50        30.00
     Storage Coeff.  (min)=        6.47 (ii)   30.53 (ii)
     Unit Hyd. Tpeak (min)=        7.50        30.00
     Unit Hyd. peak  (cms)=         .16          .04
                                                            *TOTALS*
     PEAK FLOW       (cms)=         .14          .00            .139 (iii)
     TIME TO PEAK    (hrs)=        1.04         1.54           1.042
     RUNOFF VOLUME    (mm)=       30.29         8.52          29.637
     TOTAL RAINFALL   (mm)=       31.86        31.86          31.860
     RUNOFF COEFFICIENT   =         .95          .27            .930

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-------------------------------------------------------------------------------
001:0010-----------------------------------------------------------------------
*
* SUB-AREA No.5
----------------------
| CALIB STANDHYD     |   Area     (ha)=    2.66
| 07:070    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
----------------------
                              IMPERVIOUS     PERVIOUS (i)
     Surface Area     (ha)=        2.58          .08
     Dep. Storage     (mm)=        1.57         4.67
     Average Slope     (%)=         .61         1.50
     Length             (m)=      207.25        20.00
     Mannings n            =        .030         .250

     Max.eff.Inten.(mm/hr)=       76.81        12.71
                over (min)         7.50        20.00
     Storage Coeff.  (min)=        8.42 (ii)   20.00 (ii)
     Unit Hyd. Tpeak (min)=        7.50        20.00
     Unit Hyd. peak  (cms)=         .14          .06
                                                            *TOTALS*
     PEAK FLOW       (cms)=         .38          .00            .379 (iii)
     TIME TO PEAK    (hrs)=        1.04         1.33           1.042
     RUNOFF VOLUME    (mm)=       30.29         8.52          29.637
     TOTAL RAINFALL   (mm)=       31.86        31.86          31.860
     RUNOFF COEFFICIENT   =         .95          .27            .930

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-------------------------------------------------------------------------------
001:0011-----------------------------------------------------------------------
--------------------
| ADD HYD (080   ) | ID: NHYD     AREA      QPEAK   TPEAK   R.V.    DWF
--------------------               (ha)     (cms)   (hrs)    (mm)  (cms)
                 ID1 06:060          .89     .139    1.04   29.64    .000
                +ID2 07:070         2.66     .379    1.04   29.64    .000
                 =======================================================
```

```
00811>                   SUM 08:080       3.55     .518    1.04  29.64     .000
00812>
00813>   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00814>
00815> ---------------------------------------------------------------------------
00816> 001:0012-------------------------------------------------------------------
00817> --------------------
00818> | ADD HYD (090   ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
00819> --------------------              (ha)      (cms)   (hrs)   (mm)    (cms)
00820>                   ID1 05:050       5.01     .623    1.08  28.13     .000
00821>                  +ID2 08:080       3.55     .518    1.04  29.64     .000
00822>                   ==================================================
00823>                   SUM 09:090       8.56    1.118    1.08  28.76     .000
00824>
00825>   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00826>
00827> ---------------------------------------------------------------------------
00828> 001:0013-------------------------------------------------------------------
00829> ---------------------
00830> | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
00831> |  IN>09:(090    )   |
00832> | OUT<10:(POND   )   |    =========  OUTLFOW STORAGE TABLE  =========
00833> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00834>                            (cms)     (ha.m.)   |   (cms)     (ha.m.)
00835>                             .000  .0000E+00    |     .593  .6251E+00
00836>                             .008  .6560E-01    |     .654  .6631E+00
00837>                             .017  .1311E+00    |     .797  .7391E+00
00838>                             .093  .2831E+00    |     .950  .8274E+00
00839>                             .233  .3971E+00    |    1.304  .9157E+00
00840>                             .337  .4731E+00    |    1.880  .1004E+01
00841>                             .465  .5491E+00    |    2.577  .1092E+01
00842>                             .531  .5871E+00    |     .000  .0000E+00
00843>
00844>     ROUTING RESULTS               AREA     QPEAK      TPEAK         R.V.
00845>     --------------------          (ha)     (cms)      (hrs)         (mm)
00846>     INFLOW >09: (090    )         8.56     1.118      1.083       28.757
00847>     OUTFLOW<10: (POND   )         8.56      .056      3.000       28.754
00848>
00849>                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=    5.030
00850>                  TIME SHIFT OF PEAK FLOW          (min)=   115.00
00851>                  MAXIMUM  STORAGE   USED        (ha.m.)=.2095E+00
00852>
00853> ---------------------------------------------------------------------------
00854> 001:0014-------------------------------------------------------------------
00855> *********************************************
00856> *     Remaining Hawthorne Industrial Park     *
00857> *********************************************
00858> *
00859> * SUB-AREA No.1
00860> ----------------------
00861> | CALIB STANDHYD       |   Area     (ha)=   19.90
00862> | 01:HIP01  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
00863> ----------------------
00864>                                IMPERVIOUS    PERVIOUS (i)
00865>      Surface Area      (ha)=     14.13          5.77
00866>      Dep. Storage      (mm)=      1.57          4.67
00867>      Average Slope      (%)=       .60          1.50
00868>      Length             (m)=    580.00        100.00
00869>      Mannings n            =      .030          .250
00870>
00871>      Max.eff.Inten.(mm/hr)=     54.21         23.06
00872>                 over (min)      17.50         42.50
00873>      Storage Coeff.  (min)=     18.04 (ii)    42.02 (ii)
00874>      Unit Hyd. Tpeak (min)=     17.50         42.50
00875>      Unit Hyd. peak  (cms)=       .06           .03
00876>                                                           *TOTALS*
00877>      PEAK FLOW       (cms)=       .95           .21          1.020 (iii)
00878>      TIME TO PEAK    (hrs)=      1.21          1.71          1.250
00879>      RUNOFF VOLUME    (mm)=     30.29         13.34         21.814
00880>      TOTAL RAINFALL   (mm)=     31.86         31.86         31.860
00881>      RUNOFF COEFFICIENT   =       .95           .42           .685
00882>
00883>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00884>            CN* =  81.0    Ia = Dep. Storage  (Above)
00885>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00886>            THAN THE STORAGE COEFFICIENT.
00887>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00888>
00889> ---------------------------------------------------------------------------
00890> 001:0015-------------------------------------------------------------------
00891> --------------------
00892> | ADD HYD (HIP02 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
00893> --------------------              (ha)      (cms)   (hrs)   (mm)    (cms)
00894>                   ID1 10:POND      8.56     .056    3.00  28.75     .000
00895>                  +ID2 01:HIP01    19.90    1.020    1.25  21.81     .000
00896>                   ==================================================
00897>                   SUM 02:HIP02    28.46    1.039    1.25  23.90     .000
00898>
00899>   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00900>
00901> ---------------------------------------------------------------------------
00902> 001:0016-------------------------------------------------------------------
00903> *
00904> * SUB-AREA No.2
00905> ----------------------
00906> | CALIB STANDHYD       |   Area     (ha)=   17.00
00907> | 03:HIP03  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
00908> ----------------------
00909>                                IMPERVIOUS    PERVIOUS (i)
00910>      Surface Area      (ha)=     12.07          4.93
00911>      Dep. Storage      (mm)=      1.57          4.67
00912>      Average Slope      (%)=       .65          1.50
00913>      Length             (m)=    450.00        100.00
00914>      Mannings n            =      .030          .250
00915>
00916>      Max.eff.Inten.(mm/hr)=     59.23         25.04
00917>                 over (min)      15.00         37.50
00918>      Storage Coeff.  (min)=     14.60 (ii)    37.80 (ii)
00919>      Unit Hyd. Tpeak (min)=     15.00         37.50
00920>      Unit Hyd. peak  (cms)=       .08           .03
00921>                                                           *TOTALS*
00922>      PEAK FLOW       (cms)=       .91           .19           .978 (iii)
00923>      TIME TO PEAK    (hrs)=      1.17          1.63          1.167
00924>      RUNOFF VOLUME    (mm)=     30.29         13.34         21.814
00925>      TOTAL RAINFALL   (mm)=     31.86         31.86         31.860
00926>      RUNOFF COEFFICIENT   =       .95           .42           .685
00927>
00928>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00929>            CN* =  81.0    Ia = Dep. Storage  (Above)
00930>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00931>            THAN THE STORAGE COEFFICIENT.
00932>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00933>
00934> ---------------------------------------------------------------------------
00935> 001:0017-------------------------------------------------------------------
00936> *
00937> * SUB-AREA No.3
00938> ----------------------
00939> | CALIB STANDHYD       |   Area     (ha)=   18.10
00940> | 04:HIP04  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
00941> ----------------------
00942>                                IMPERVIOUS    PERVIOUS (i)
00943>      Surface Area      (ha)=     12.85          5.25
00944>      Dep. Storage      (mm)=      1.57          4.67
00945>      Average Slope      (%)=       .50          1.50
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00946>      Length             (m)=    600.00        100.00
00947>      Mannings n            =      .030          .250
00948>
00949>      Max.eff.Inten.(mm/hr)=     50.44         22.17
00950>                 over (min)      20.00         45.00
00951>      Storage Coeff.  (min)=     20.01 (ii)    44.37 (ii)
00952>      Unit Hyd. Tpeak (min)=     20.00         45.00
00953>      Unit Hyd. peak  (cms)=       .06           .03
00954>                                                           *TOTALS*
00955>      PEAK FLOW       (cms)=       .80           .18           .874 (iii)
00956>      TIME TO PEAK    (hrs)=      1.25          1.79          1.292
00957>      RUNOFF VOLUME    (mm)=     30.29         13.34         21.814
00958>      TOTAL RAINFALL   (mm)=     31.86         31.86         31.860
00959>      RUNOFF COEFFICIENT   =       .95           .42           .685
00960>
00961>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00962>            CN* =  81.0    Ia = Dep. Storage  (Above)
00963>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00964>            THAN THE STORAGE COEFFICIENT.
00965>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00966>
00967> ---------------------------------------------------------------------------
00968> 001:0018-------------------------------------------------------------------
00969> --------------------
00970> | ADD HYD (HIP05 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
00971> --------------------              (ha)      (cms)   (hrs)   (mm)    (cms)
00972>                   ID1 03:HIP03    17.00     .978    1.17  21.81     .000
00973>                  +ID2 04:HIP04    18.10     .874    1.29  21.81     .000
00974>                   ==================================================
00975>                   SUM 05:HIP05    35.10    1.814    1.21  21.81     .000
00976>
00977>   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00978>
00979> ---------------------------------------------------------------------------
00980> 001:0019-------------------------------------------------------------------
00981> *
00982> *SUB-AREA No.4
00983> ----------------------
00984> | DESIGN NASHYD        |   Area     (ha)=    4.00   Curve Number   (CN)=85.00
00985> | 06:Pond-B DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00986> ----------------------   U.H. Tp(hrs)=     .170
00987>
00988>      Unit Hyd Qpeak  (cms)=     .899
00989>
00990>      PEAK FLOW       (cms)=     .145 (i)
00991>      TIME TO PEAK    (hrs)=    1.167
00992>      RUNOFF VOLUME    (mm)=   10.266
00993>      TOTAL RAINFALL   (mm)=   31.860
00994>      RUNOFF COEFFICIENT   =     .322
00995>
00996>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00997>
00998> ---------------------------------------------------------------------------
00999> 001:0020-------------------------------------------------------------------
01000> --------------------
01001> | ADD HYD (HIP06 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
01002> --------------------              (ha)      (cms)   (hrs)   (mm)    (cms)
01003>                   ID1 02:HIP02    28.46    1.039    1.25  23.90     .000
01004>                  +ID2 05:HIP05    35.10    1.814    1.21  21.81     .000
01005>                  +ID3 06:Pond-B    4.00     .145    1.17  10.27     .000
01006>                   ==================================================
01007>                   SUM 07:HIP06    67.56    2.992    1.21  22.01     .000
01008>
01009>   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01010>
01011> ---------------------------------------------------------------------------
01012> 001:0021-------------------------------------------------------------------
01013> * SUB-AREA NO. 5
01014> ----------------------
01015> | DESIGN NASHYD        |   Area     (ha)=    6.80   Curve Number   (CN)=76.00
01016> | 10:A2      DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
01017> ----------------------   U.H. Tp(hrs)=     .370
01018>
01019>      Unit Hyd Qpeak  (cms)=     .702
01020>
01021>      PEAK FLOW       (cms)=     .102 (i)
01022>      TIME TO PEAK    (hrs)=    1.458
01023>      RUNOFF VOLUME    (mm)=    6.883
01024>      TOTAL RAINFALL   (mm)=   31.860
01025>      RUNOFF COEFFICIENT   =     .216
01026>
01027>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01028>
01029> ---------------------------------------------------------------------------
01030> 001:0022-------------------------------------------------------------------
01031> * SUB-AREA NO 4
01032> ----------------------
01033> | DESIGN NASHYD        |   Area     (ha)=    5.30   Curve Number   (CN)=76.00
01034> | 01:A3      DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
01035> ----------------------   U.H. Tp(hrs)=     .804
01036>
01037>      Unit Hyd Qpeak  (cms)=     .252
01038>
01039>      PEAK FLOW       (cms)=     .048 (i)
01040>      TIME TO PEAK    (hrs)=    2.083
01041>      RUNOFF VOLUME    (mm)=    6.883
01042>      TOTAL RAINFALL   (mm)=   31.860
01043>      RUNOFF COEFFICIENT   =     .216
01044>
01045>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01046>
01047> ---------------------------------------------------------------------------
01048> 001:0023-------------------------------------------------------------------
01049> --------------------
01050> | ADD HYD (0020  ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
01051> --------------------              (ha)      (cms)   (hrs)   (mm)    (cms)
01052>                   ID1 07:HIP06    67.56    2.992    1.21  22.01     .000
01053>                  +ID2 10:A2        6.80     .102    1.46   6.88     .000
01054>                  +ID3 01:A3        5.30     .048    2.08   6.88     .000
01055>                   ==================================================
01056>                   SUM 02:0020     79.66    3.077    1.21  19.71     .000
01057>
01058>   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01059>
01060> ---------------------------------------------------------------------------
01061> 001:0024-------------------------------------------------------------------
01062> ************************************************************
01063> *        CALCULATION OF 3HR - 1:5 YEAR STORM EVENT          *
01064> ************************************************************
01065> --------------------
01066> | START              |  Project  dir.: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\
01067> --------------------  Rainfall dir.: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\
01068>    TZERO =   .00 hrs on       0
01069>    METOUT=   2 (output = METRIC)
01070>    NRUN  = 001
01071>    NSTORM=   0
01072> ---------------------------------------------------------------------------
01073> 001:0002-------------------------------------------------------------------
01074> --------------------
01075> | CHICAGO STORM    |    IDF curve parameters: A= 998.071
01076> | Ptotal= 42.51 mm |                          B=   6.053
01077> --------------------                          C=    .814
01078>                         used in:   INTENSITY =  A / (t + B)^C
01079>
01080>                         Duration of storm  =  3.00 hrs
```

```
01081>                          Storm time step     = 10.00 min
01082>                          Time to peak ratio =   .33
01083>
01084>                  TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
01085>                   hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
01086>                   .17   3.682 |   1.00 104.193 |   1.83   6.689 |   2.67   3.510
01087>                   .33   4.582 |   1.17  32.037 |   2.00   5.628 |   2.83   3.220
01088>                   .50   6.151 |   1.33  16.337 |   2.17   4.872 |   3.00   2.978
01089>                   .67   9.614 |   1.50  10.965 |   2.33   4.305 |
01090>                   .83  24.170 |   1.67   8.287 |   2.50   3.864 |
01091>
01092> -----------------------------------------------------------------------------
01093> 001:0003---------------------------------------------------------------------
01094> ----------------------
01095> | DEFAULT VALUES      |   Filename: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\ORGA.VAL
01096> ----------------------   ICASEdv = 1 (read and print data)
01097>        FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
01098>                   ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
01099>        Horton's infiltration equation parameters:
01100>        [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
01101>        Parameters for PERVIOUS surfaces in STANDHYD:
01102>        [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
01103>        Parameters for IMPERVIOUS surfaces in STANDHYD:
01104>        [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
01105>        Parameters used in NASHYD:
01106>        [Ia=   4.67 mm] [N= 3.00]
01107> -----------------------------------------------------------------------------
01108> 001:0004---------------------------------------------------------------------
01109> **********************************
01110> *             ORGAWORLD FILE       *
01111> **********************************
01112> * SUB-AREA No.1
01113> ----------------------
01114> | CALIB STANDHYD      |   Area     (ha)=    2.07
01115> | 01:010     DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
01116> ----------------------
01117>                                    IMPERVIOUS    PERVIOUS (i)
01118>       Surface Area       (ha)=        1.74           .33
01119>       Dep. Storage       (mm)=        1.57          4.67
01120>    .  Average Slope       (%)=         .52          1.00
01121>       Length              (m)=      204.72         20.00
01122>       Mannings n              =        .030          .250
01123>
01124>       Max.eff.Inten.(mm/hr)=        104.19         24.26
01125>                  over (min)          7.50         17.50
01126>       Storage Coeff.  (min)=          7.76 (ii)    17.86 (ii)
01127>       Unit Hyd. Tpeak (min)=          7.50         17.50
01128>       Unit Hyd. peak  (cms)=           .15           .06
01129>                                                                *TOTALS*
01130>       PEAK FLOW        (cms)=          .36           .01          .362 (iii)
01131>       TIME TO PEAK     (hrs)=         1.04          1.25         1.042
01132>       RUNOFF VOLUME     (mm)=        40.94         14.70        36.745
01133>       TOTAL RAINFALL    (mm)=        42.51         42.51        42.514
01134>       RUNOFF COEFFICIENT    =          .96           .35          .864
01135>
01136>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01137>             CN* =  81.0     Ia = Dep. Storage  (Above)
01138>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01139>             THAN THE STORAGE COEFFICIENT.
01140>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01141>
01142> -----------------------------------------------------------------------------
01143> 001:0005---------------------------------------------------------------------
01144> *
01145> * SUB-AREA No.2
01146> ----------------------
01147> | CALIB STANDHYD      |   Area     (ha)=    1.54
01148> | 02:020     DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
01149> ----------------------
01150>                                    IMPERVIOUS    PERVIOUS (i)
01151>       Surface Area       (ha)=        1.42           .12
01152>       Dep. Storage       (mm)=        1.57          4.67
01153>       Average Slope       (%)=         .50          1.00
01154>       Length              (m)=      244.34          5.00
01155>       Mannings n              =        .030          .030
01156>
01157>       Max.eff.Inten.(mm/hr)=        104.19         31.02
01158>                  over (min)          7.50         10.00
01159>       Storage Coeff.  (min)=          8.73 (ii)     9.85 (ii)
01160>       Unit Hyd. Tpeak (min)=          7.50         10.00
01161>       Unit Hyd. peak  (cms)=           .14           .11
01162>                                                                *TOTALS*
01163>       PEAK FLOW        (cms)=          .28           .01          .283 (iii)
01164>       TIME TO PEAK     (hrs)=         1.04          1.13         1.042
01165>       RUNOFF VOLUME     (mm)=        40.94         14.70        38.845
01166>       TOTAL RAINFALL    (mm)=        42.51         42.51        42.514
01167>       RUNOFF COEFFICIENT    =          .96           .35          .914
01168>
01169>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01170>             CN* =  81.0     Ia = Dep. Storage  (Above)
01171>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01172>             THAN THE STORAGE COEFFICIENT.
01173>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01174>
01175> -----------------------------------------------------------------------------
01176> 001:0006---------------------------------------------------------------------
01177> *
01178> * SUB-AREA No.3
01179> ----------------------
01180> | CALIB STANDHYD      |   Area     (ha)=    1.40
01181> | 03:030     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
01182> ----------------------
01183>                                    IMPERVIOUS    PERVIOUS (i)
01184>       Surface Area       (ha)=        1.36           .04
01185>       Dep. Storage       (mm)=        1.57          4.67
01186>       Average Slope       (%)=         .51          1.00
01187>       Length              (m)=      225.63          5.00
01188>       Mannings n              =        .030          .030
01189>
01190>       Max.eff.Inten.(mm/hr)=        104.19         31.02
01191>                  over (min)          7.50         10.00
01192>       Storage Coeff.  (min)=          8.28 (ii)     9.39 (ii)
01193>       Unit Hyd. Tpeak (min)=          7.50         10.00
01194>       Unit Hyd. peak  (cms)=           .14           .12
01195>                                                                *TOTALS*
01196>       PEAK FLOW        (cms)=          .27           .00          .274 (iii)
01197>       TIME TO PEAK     (hrs)=         1.04          1.13         1.042
01198>       RUNOFF VOLUME     (mm)=        40.94         14.70        40.157
01199>       TOTAL RAINFALL    (mm)=        42.51         42.51        42.514
01200>       RUNOFF COEFFICIENT    =          .96           .35          .945
01201>
01202>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01203>             CN* =  81.0     Ia = Dep. Storage  (Above)
01204>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01205>             THAN THE STORAGE COEFFICIENT.
01206>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01207>
01208> -----------------------------------------------------------------------------
01209> 001:0007---------------------------------------------------------------------
01210> ----------------------
01211> | ADD HYD (040    ) | ID: NHYD      AREA     QPEAK    TPEAK    R.V.     DWF
01212> ----------------------              (ha)     (cms)    (hrs)    (mm)    (cms)
01213>                      ID1 01:010     2.07      .362     1.04   36.75     .000
01214>                     +ID2 02:020     1.54      .283     1.04   38.84     .000
01215>                     ================================================
01216>                      SUM 04:040     3.61      .645     1.04   37.64     .000
01217>
01218>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01219>
01220> -----------------------------------------------------------------------------
01221> 001:0008---------------------------------------------------------------------
01222> ----------------------
01223> | ADD HYD (050    ) | ID: NHYD      AREA     QPEAK    TPEAK    R.V.     DWF
01224> ----------------------              (ha)     (cms)    (hrs)    (mm)    (cms)
01225>                      ID1 03:030     1.40      .274     1.04   40.16     .000
01226>                     +ID2 04:040     3.61      .645     1.04   37.64     .000
01227>                     ================================================
01228>                      SUM 05:050     5.01      .918     1.04   38.34     .000
01229>
01230>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01231>
01232> -----------------------------------------------------------------------------
01233> 001:0009---------------------------------------------------------------------
01234> *
01235> * SUB-AREA No.4
01236> ----------------------
01237> | CALIB STANDHYD      |   Area     (ha)=     .89
01238> | 06:060     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
01239> ----------------------
01240>                                    IMPERVIOUS    PERVIOUS (i)
01241>       Surface Area       (ha)=         .86           .03
01242>       Dep. Storage       (mm)=        1.57          4.67
01243>       Average Slope       (%)=         .93           .70
01244>       Length              (m)=      164.82         40.00
01245>       Mannings n              =        .030          .250
01246>
01247>       Max.eff.Inten.(mm/hr)=        104.19         20.32
01248>                  over (min)          5.00         25.00
01249>       Storage Coeff.  (min)=          5.72 (ii)    24.02 (ii)
01250>       Unit Hyd. Tpeak (min)=          5.00         25.00
01251>       Unit Hyd. peak  (cms)=           .20           .05
01252>                                                                *TOTALS*
01253>       PEAK FLOW        (cms)=          .20           .00          .205 (iii)
01254>       TIME TO PEAK     (hrs)=         1.00          1.38         1.000
01255>       RUNOFF VOLUME     (mm)=        40.94         14.70        40.157
01256>       TOTAL RAINFALL    (mm)=        42.51         42.51        42.514
01257>       RUNOFF COEFFICIENT    =          .96           .35          .945
01258>
01259>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01260>             CN* =  81.0     Ia = Dep. Storage  (Above)
01261>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01262>             THAN THE STORAGE COEFFICIENT.
01263>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01264>
01265> -----------------------------------------------------------------------------
01266> 001:0010---------------------------------------------------------------------
01267> *
01268> * SUB-AREA No.5
01269> ----------------------
01270> | CALIB STANDHYD      |   Area     (ha)=    2.66
01271> | 07:070     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
01272> ----------------------
01273>                                    IMPERVIOUS    PERVIOUS (i)
01274>       Surface Area       (ha)=        2.58           .08
01275>       Dep. Storage       (mm)=        1.57          4.67
01276>       Average Slope       (%)=         .61          1.50
01277>       Length              (m)=      207.25         20.00
01278>       Mannings n              =        .030          .250
01279>
01280>       Max.eff.Inten.(mm/hr)=        104.19         24.26
01281>                  over (min)          7.50         17.50
01282>       Storage Coeff.  (min)=          7.45 (ii)    16.40 (ii)
01283>       Unit Hyd. Tpeak (min)=          7.50         17.50
01284>       Unit Hyd. peak  (cms)=           .15           .07
01285>                                                                *TOTALS*
01286>       PEAK FLOW        (cms)=          .54           .00          .538 (iii)
01287>       TIME TO PEAK     (hrs)=         1.04          1.25         1.042
01288>       RUNOFF VOLUME     (mm)=        40.94         14.70        40.157
01289>       TOTAL RAINFALL    (mm)=        42.51         42.51        42.514
01290>       RUNOFF COEFFICIENT    =          .96           .35          .945
01291>
01292>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01293>             CN* =  81.0     Ia = Dep. Storage  (Above)
01294>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01295>             THAN THE STORAGE COEFFICIENT.
01296>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01297>
01298> -----------------------------------------------------------------------------
01299> 001:0011---------------------------------------------------------------------
01300> ----------------------
01301> | ADD HYD (080    ) | ID: NHYD      AREA     QPEAK    TPEAK    R.V.     DWF
01302> ----------------------              (ha)     (cms)    (hrs)    (mm)    (cms)
01303>                      ID1 06:060      .89      .205     1.00   40.16     .000
01304>                     +ID2 07:070     2.66      .538     1.04   40.16     .000
01305>                     ================================================
01306>                      SUM 08:080     3.55      .733     1.04   40.16     .000
01307>
01308>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01309>
01310> -----------------------------------------------------------------------------
01311> 001:0012---------------------------------------------------------------------
01312> ----------------------
01313> | ADD HYD (090    ) | ID: NHYD      AREA     QPEAK    TPEAK    R.V.     DWF
01314> ----------------------              (ha)     (cms)    (hrs)    (mm)    (cms)
01315>                      ID1 05:050     5.01      .918     1.04   38.34     .000
01316>                     +ID2 08:080     3.55      .733     1.04   40.16     .000
01317>                     ================================================
01318>                      SUM 09:090     8.56     1.651     1.04   39.10     .000
01319>
01320>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01321>
01322> -----------------------------------------------------------------------------
01323> 001:0013---------------------------------------------------------------------
01324> ----------------------
01325> | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
01326> |   IN>09:(090    )  |
01327> | OUT<10:(POND    )  |    =========  OUTLFOW STORAGE TABLE  =========
01328> ----------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
01329>                             (cms)    (ha.m.)   |   (cms)     (ha.m.)
01330>                              .000  .0000E+00   |     .593  .6251E+00
01331>                              .008  .6560E-01   |     .654  .6631E+00
01332>                              .017  .1311E+00   |     .797  .7391E+00
01333>                              .093  .2831E+00   |     .950  .8274E+00
01334>                              .233  .3971E+00   |    1.304  .9157E+00
01335>                              .337  .4731E+00   |    1.880  .1004E+01
01336>                              .465  .5491E+00   |    2.577  .1092E+01
01337>                              .531  .5871E+00   |     .000  .0000E+00
01338>
01339>      ROUTING RESULTS              AREA     QPEAK     TPEAK       R.V.
01340>      --------------------         (ha)     (cms)     (hrs)       (mm)
01341>      INFLOW >09: (090    )        8.56     1.651     1.042     39.096
01342>      OUTFLOW<10: (POND   )        8.56      .089     2.625     39.093
01343>
01344>                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=     5.413
01345>                   TIME SHIFT OF PEAK FLOW          (min)=    95.00
01346>                   MAXIMUM  STORAGE   USED       (ha.m.)=.2758E+00
01347>
01348> -----------------------------------------------------------------------------
01349> 001:0014---------------------------------------------------------------------
01350> *********************************************
```

```
01351> *     Remaining Hawthorne Industrial Park     *
01352> **********************************************
01353> *
01354> * SUB-AREA No.1
01355> ---------------------
01356> | CALIB STANDHYD     |   Area     (ha)=   19.90
01357> | 01:HIP01  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
01358> ---------------------
01359>                               IMPERVIOUS    PERVIOUS (i)
01360>      Surface Area      (ha)=     14.13         5.77
01361>      Dep. Storage      (mm)=      1.57         4.67
01362>      Average Slope      (%)=       .60         1.50
01363>      Length             (m)=    580.00       100.00
01364>      Mannings n            =      .030         .250
01365>
01366>      Max.eff.Inten.(mm/hr)=     80.14        42.65
01367>                 over (min)      15.00        35.00
01368>      Storage Coeff.  (min)=     15.43 (ii)   34.18 (ii)
01369>      Unit Hyd. Tpeak (min)=     15.00        35.00
01370>      Unit Hyd. peak  (cms)=       .07          .03
01371>                                                             *TOTALS*
01372>      PEAK FLOW       (cms)=      1.41          .40           1.572 (iii)
01373>      TIME TO PEAK    (hrs)=      1.17         1.54           1.208
01374>      RUNOFF VOLUME     (mm)=    40.94        21.31          31.126
01375>      TOTAL RAINFALL    (mm)=    42.51        42.51          42.514
01376>      RUNOFF COEFFICIENT   =       .96          .50            .732
01377>
01378>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01379>            CN* =  81.0    Ia = Dep. Storage  (Above)
01380>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01381>            THAN THE STORAGE COEFFICIENT.
01382>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01383>
01384> -------------------------------------------------------------------------
01385> 001:0015-----------------------------------------------------------------
01386> -------------------
01387> | ADD HYD (HIP02 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
01388> -------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
01389>                  ID1 10:POND       8.56      .089    2.63  39.09     .000
01390>                 +ID2 01:HIP01     19.90     1.572    1.21  31.13     .000
01391>                  ====================================================
01392>                  SUM 02:HIP02     28.46     1.615    1.21  33.52     .000
01393>
01394>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01395>
01396> -------------------------------------------------------------------------
01397> 001:0016-----------------------------------------------------------------
01398> *
01399> * SUB-AREA No.2
01400> ---------------------
01401> | CALIB STANDHYD     |   Area     (ha)=   17.00
01402> | 03:HIP03  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
01403> ---------------------
01404>                               IMPERVIOUS    PERVIOUS (i)
01405>      Surface Area      (ha)=     12.07         4.93
01406>      Dep. Storage      (mm)=      1.57         4.67
01407>      Average Slope      (%)=       .65         1.50
01408>      Length             (m)=    450.00       100.00
01409>      Mannings n            =      .030         .250
01410>
01411>      Max.eff.Inten.(mm/hr)=     89.76        47.48
01412>                 over (min)      12.50        30.00
01413>      Storage Coeff.  (min)=     12.36 (ii)   30.32 (ii)
01414>      Unit Hyd. Tpeak (min)=     12.50        30.00
01415>      Unit Hyd. peak  (cms)=       .09          .04
01416>                                                             *TOTALS*
01417>      PEAK FLOW       (cms)=      1.36          .37           1.504 (iii)
01418>      TIME TO PEAK    (hrs)=      1.13         1.46           1.167
01419>      RUNOFF VOLUME     (mm)=    40.94        21.31          31.126
01420>      TOTAL RAINFALL    (mm)=    42.51        42.51          42.514
01421>      RUNOFF COEFFICIENT   =       .96          .50            .732
01422>
01423>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01424>            CN* =  81.0    Ia = Dep. Storage  (Above)
01425>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01426>            THAN THE STORAGE COEFFICIENT.
01427>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01428>
01429> -------------------------------------------------------------------------
01430> 001:0017-----------------------------------------------------------------
01431> *
01432> * SUB-AREA No.3
01433> ---------------------
01434> | CALIB STANDHYD     |   Area     (ha)=   18.10
01435> | 04:HIP04  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
01436> ---------------------
01437>                               IMPERVIOUS    PERVIOUS (i)
01438>      Surface Area      (ha)=     12.85         5.25
01439>      Dep. Storage      (mm)=      1.57         4.67
01440>      Average Slope      (%)=       .50         1.50
01441>      Length             (m)=    600.00       100.00
01442>      Mannings n            =      .030         .250
01443>
01444>      Max.eff.Inten.(mm/hr)=     73.27        42.65
01445>                 over (min)      17.50        35.00
01446>      Storage Coeff.  (min)=     17.24 (ii)   35.98 (ii)
01447>      Unit Hyd. Tpeak (min)=     17.50        35.00
01448>      Unit Hyd. peak  (cms)=       .07          .03
01449>                                                             *TOTALS*
01450>      PEAK FLOW       (cms)=      1.19          .35           1.364 (iii)
01451>      TIME TO PEAK    (hrs)=      1.21         1.54           1.250
01452>      RUNOFF VOLUME     (mm)=    40.94        21.31          31.126
01453>      TOTAL RAINFALL    (mm)=    42.51        42.51          42.514
01454>      RUNOFF COEFFICIENT   =       .96          .50            .732
01455>
01456>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01457>            CN* =  81.0    Ia = Dep. Storage  (Above)
01458>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01459>            THAN THE STORAGE COEFFICIENT.
01460>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01461>
01462> -------------------------------------------------------------------------
01463> 001:0018-----------------------------------------------------------------
01464> -------------------
01465> | ADD HYD (HIP05 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
01466> -------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
01467>                  ID1 03:HIP03     17.00     1.504    1.17  31.13     .000
01468>                 +ID2 04:HIP04     18.10     1.364    1.25  31.13     .000
01469>                  ====================================================
01470>                  SUM 05:HIP05     35.10     2.800    1.17  31.13     .000
01471>
01472>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01473>
01474> -------------------------------------------------------------------------
01475> 001:0019-----------------------------------------------------------------
01476> *
01477> *SUB-AREA No.4
01478> ----------------------
01479> | DESIGN NASHYD       |   Area     (ha)=    4.00   Curve Number   (CN)=85.00
01480> | 06:Pond-B DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
01481> ----------------------   U.H. Tp(hrs)=    .170
01482>
01483>      Unit Hyd Qpeak  (cms)=      .899
01484>
01485>      PEAK FLOW       (cms)=      .260 (i)
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01486>      TIME TO PEAK    (hrs)=    1.167
01487>      RUNOFF VOLUME     (mm)=  17.325
01488>      TOTAL RAINFALL    (mm)=  42.514
01489>      RUNOFF COEFFICIENT   =     .408
01490>
01491>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01492>
01493> -------------------------------------------------------------------------
01494> 001:0020-----------------------------------------------------------------
01495> -------------------
01496> | ADD HYD (HIP06 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
01497> -------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
01498>                  ID1 02:HIP02     28.46     1.615    1.21  33.52     .000
01499>                 +ID2 05:HIP05     35.10     2.800    1.17  31.13     .000
01500>                 +ID3 06:Pond-B     4.00      .260    1.17  17.32     .000
01501>                  ====================================================
01502>                  SUM 07:HIP06     67.56     4.661    1.17  31.32     .000
01503>
01504>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01505>
01506> -------------------------------------------------------------------------
01507> 001:0021-----------------------------------------------------------------
01508> * SUB-AREA NO. 5
01509> ----------------------
01510> | DESIGN NASHYD       |   Area     (ha)=    6.80   Curve Number   (CN)=76.00
01511> | 10:A2      DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
01512> ----------------------   U.H. Tp(hrs)=    .370
01513>
01514>      Unit Hyd Qpeak  (cms)=      .702
01515>
01516>      PEAK FLOW       (cms)=      .187 (i)
01517>      TIME TO PEAK    (hrs)=    1.458
01518>      RUNOFF VOLUME     (mm)=  12.131
01519>      TOTAL RAINFALL    (mm)=  42.514
01520>      RUNOFF COEFFICIENT   =     .285
01521>
01522>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01523>
01524> -------------------------------------------------------------------------
01525> 001:0022-----------------------------------------------------------------
01526> * SUB-AREA NO 4
01527> ----------------------
01528> | DESIGN NASHYD       |   Area     (ha)=    5.30   Curve Number   (CN)=76.00
01529> | 01:A3      DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
01530> ----------------------   U.H. Tp(hrs)=    .804
01531>
01532>      Unit Hyd Qpeak  (cms)=      .252
01533>
01534>      PEAK FLOW       (cms)=      .086 (i)
01535>      TIME TO PEAK    (hrs)=    2.042
01536>      RUNOFF VOLUME     (mm)=  12.131
01537>      TOTAL RAINFALL    (mm)=  42.514
01538>      RUNOFF COEFFICIENT   =     .285
01539>
01540>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01541>
01542> -------------------------------------------------------------------------
01543> 001:0023-----------------------------------------------------------------
01544> -------------------
01545> | ADD HYD (0020  ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
01546> -------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
01547>                  ID1 07:HIP06     67.56     4.661    1.17  31.32     .000
01548>                 +ID2 10:A2         6.80      .187    1.46  12.13     .000
01549>                 +ID3 01:A3         5.30      .086    2.04  12.13     .000
01550>                  ====================================================
01551>                  SUM 02:0020      79.66     4.812    1.21  28.40     .000
01552>
01553>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01554>
01555> -------------------------------------------------------------------------
01556> 001:0024-----------------------------------------------------------------
01557> ************************************************************
01558> *        CALCULATION OF 3HR - 1:10 YEAR STORM EVENT         *
01559> ************************************************************
01560> -------------------
01561> | START             |   Project  dir.: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\
01562> -------------------   Rainfall dir.: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\
01563>     TZERO =   .00 hrs on       0
01564>     METOUT=   2 (output = METRIC)
01565>     NRUN  = 001
01566>     NSTORM=   0
01567> -------------------------------------------------------------------------
01568> 001:0002-----------------------------------------------------------------
01569> -------------------
01570> | CHICAGO STORM    |    IDF curve parameters: A=1174.184
01571> | Ptotal= 49.50 mm |                          B=   6.014
01572> -------------------                          C=    .816
01573>                         used in:   INTENSITY =  A / (t + B)^C
01574>
01575>                         Duration of storm  =  3.00 hrs
01576>                         Storm time step    = 10.00 min
01577>                         Time to peak ratio =   .33
01578>
01579>                 TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
01580>                  hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
01581>                  .17   4.248 |   1.00 122.142 |   1.83   7.733 |   2.67   4.049
01582>                  .33   5.290 |   1.17  37.285 |   2.00   6.502 |   2.83   3.714
01583>                  .50   7.108 |   1.33  18.954 |   2.17   5.625 |   3.00   3.434
01584>                  .67  11.130 |   1.50  12.700 |   2.33   4.969 |
01585>                  .83  28.100 |   1.67   9.588 |   2.50   4.458 |
01586>
01587> -------------------------------------------------------------------------
01588> 001:0003-----------------------------------------------------------------
01589> ----------------------
01590> | DEFAULT VALUES      |  Filename: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\ORGA.VAL
01591> ----------------------  ICASEdv = 1 (read and print data)
01592>      FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
01593>                 ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
01594>      Horton's infiltration equation parameters:
01595>      [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
01596>      Parameters for PERVIOUS surfaces in STANDHYD:
01597>      [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
01598>      Parameters for IMPERVIOUS surfaces in STANDHYD:
01599>      [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
01600>      Parameters used in NASHYD:
01601>      [Ia=   4.67 mm] [N= 3.00]
01602> -------------------------------------------------------------------------
01603> 001:0004-----------------------------------------------------------------
01604> ***********************************
01605> *          ORGAWORLD FILE         *
01606> ***********************************
01607> * SUB-AREA No.1
01608> ---------------------
01609> | CALIB STANDHYD     |   Area     (ha)=    2.07
01610> | 01:010    DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
01611> ---------------------
01612>                               IMPERVIOUS    PERVIOUS (i)
01613>      Surface Area      (ha)=      1.74          .33
01614>      Dep. Storage      (mm)=      1.57         4.67
01615>      Average Slope      (%)=       .52         1.00
01616>      Length             (m)=    204.72        20.00
01617>      Mannings n            =      .030         .250
01618>
01619>      Max.eff.Inten.(mm/hr)=    122.14        34.69
01620>                 over (min)       7.50        15.00
```

```
01621>      Storage Coeff.  (min)=       7.28 (ii)   16.04 (ii)
01622>      Unit Hyd. Tpeak (min)=       7.50        15.00
01623>      Unit Hyd. peak  (cms)=        .15          .07
01624>                                                          *TOTALS*
01625>      PEAK FLOW       (cms)=        .43          .02         .437 (iii)
01626>      TIME TO PEAK    (hrs)=       1.04         1.21        1.042
01627>      RUNOFF VOLUME    (mm)=      47.93        19.25       43.345
01628>      TOTAL RAINFALL   (mm)=      49.50        49.50       49.505
01629>      RUNOFF COEFFICIENT   =        .97          .39         .876
01630>
01631>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01632>            CN* =  81.0    Ia = Dep. Storage  (Above)
01633>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01634>            THAN THE STORAGE COEFFICIENT.
01635>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01636>
01637> --------------------------------------------------------------------------
01638> 001:0005------------------------------------------------------------------
01639> *
01640> * SUB-AREA No.2
01641> ---------------------
01642> | CALIB STANDHYD      |   Area    (ha)=    1.54
01643> | 02:020     DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
01644> ---------------------
01645>                                 IMPERVIOUS    PERVIOUS (i)
01646>      Surface Area     (ha)=       1.42          .12
01647>      Dep. Storage     (mm)=       1.57         4.67
01648>      Average Slope     (%)=        .50         1.00
01649>      Length            (m)=     244.34         5.00
01650>      Mannings n           =       .030         .030
01651>
01652>      Max.eff.Inten.(mm/hr)=     122.14        42.32
01653>                 over (min)       7.50        10.00
01654>      Storage Coeff.  (min)=       8.20 (ii)    9.18 (ii)
01655>      Unit Hyd. Tpeak (min)=       7.50        10.00
01656>      Unit Hyd. peak  (cms)=        .14          .12
01657>                                                          *TOTALS*
01658>      PEAK FLOW       (cms)=        .33          .01         .341 (iii)
01659>      TIME TO PEAK    (hrs)=       1.04         1.13        1.042
01660>      RUNOFF VOLUME    (mm)=      47.93        19.25       45.640
01661>      TOTAL RAINFALL   (mm)=      49.50        49.50       49.505
01662>      RUNOFF COEFFICIENT   =        .97          .39         .922
01663>
01664>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01665>            CN* =  81.0    Ia = Dep. Storage  (Above)
01666>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01667>            THAN THE STORAGE COEFFICIENT.
01668>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01669>
01670> --------------------------------------------------------------------------
01671> 001:0006------------------------------------------------------------------
01672> *
01673> * SUB-AREA No.3
01674> ---------------------
01675> | CALIB STANDHYD      |   Area    (ha)=    1.40
01676> | 03:030     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
01677> ---------------------
01678>                                 IMPERVIOUS    PERVIOUS (i)
01679>      Surface Area     (ha)=       1.36          .04
01680>      Dep. Storage     (mm)=       1.57         4.67
01681>      Average Slope     (%)=        .51         1.00
01682>      Length            (m)=     225.63         5.00
01683>      Mannings n           =       .030         .030
01684>
01685>      Max.eff.Inten.(mm/hr)=     122.14        48.18
01686>                 over (min)       7.50         7.50
01687>      Storage Coeff.  (min)=       7.77 (ii)    8.70 (ii)
01688>      Unit Hyd. Tpeak (min)=       7.50         7.50
01689>      Unit Hyd. peak  (cms)=        .15          .14
01690>                                                          *TOTALS*
01691>      PEAK FLOW       (cms)=        .33          .00         .329 (iii)
01692>      TIME TO PEAK    (hrs)=       1.04         1.08        1.042
01693>      RUNOFF VOLUME    (mm)=      47.93        19.25       47.074
01694>      TOTAL RAINFALL   (mm)=      49.50        49.50       49.505
01695>      RUNOFF COEFFICIENT   =        .97          .39         .951
01696>
01697>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01698>            CN* =  81.0    Ia = Dep. Storage  (Above)
01699>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01700>            THAN THE STORAGE COEFFICIENT.
01701>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01702>
01703> --------------------------------------------------------------------------
01704> 001:0007------------------------------------------------------------------
01705> -------------------
01706> | ADD HYD (040    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
01707> -------------------                 (ha)      (cms)   (hrs)   (mm)    (cms)
01708>                    ID1 01:010       2.07      .437    1.04  43.35     .000
01709>                   +ID2 02:020       1.54      .341    1.04  45.64     .000
01710>                    ==============================================
01711>                    SUM 04:040       3.61      .778    1.04  44.32     .000
01712>
01713>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01714>
01715> --------------------------------------------------------------------------
01716> 001:0008------------------------------------------------------------------
01717> -------------------
01718> | ADD HYD (050    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
01719> -------------------                 (ha)      (cms)   (hrs)   (mm)    (cms)
01720>                    ID1 03:030       1.40      .329    1.04  47.07     .000
01721>                   +ID2 04:040       3.61      .778    1.04  44.32     .000
01722>                    ==============================================
01723>                    SUM 05:050       5.01     1.107    1.04  45.09     .000
01724>
01725>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01726>
01727> --------------------------------------------------------------------------
01728> 001:0009------------------------------------------------------------------
01729> *
01730> * SUB-AREA No.4
01731> ---------------------
01732> | CALIB STANDHYD      |   Area    (ha)=     .89
01733> | 06:060     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
01734> ---------------------
01735>                                 IMPERVIOUS    PERVIOUS (i)
01736>      Surface Area     (ha)=        .86          .03
01737>      Dep. Storage     (mm)=       1.57         4.67
01738>      Average Slope     (%)=        .93          .70
01739>      Length            (m)=     164.82        40.00
01740>      Mannings n           =       .030         .250
01741>
01742>      Max.eff.Inten.(mm/hr)=     122.14        31.19
01743>                 over (min)       5.00        20.00
01744>      Storage Coeff.  (min)=       5.37 (ii)   20.78 (ii)
01745>      Unit Hyd. Tpeak (min)=       5.00        20.00
01746>      Unit Hyd. peak  (cms)=        .21          .06
01747>                                                          *TOTALS*
01748>      PEAK FLOW       (cms)=        .24          .00         .245 (iii)
01749>      TIME TO PEAK    (hrs)=       1.00         1.29        1.000
01750>      RUNOFF VOLUME    (mm)=      47.93        19.25       47.074
01751>      TOTAL RAINFALL   (mm)=      49.50        49.50       49.505
01752>      RUNOFF COEFFICIENT   =        .97          .39         .951
01753>
01754>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01755>            CN* =  81.0    Ia = Dep. Storage  (Above)
01756>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01757>            THAN THE STORAGE COEFFICIENT.
01758>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01759>
01760> --------------------------------------------------------------------------
01761> 001:0010------------------------------------------------------------------
01762> *
01763> * SUB-AREA No.5
01764> ---------------------
01765> | CALIB STANDHYD      |   Area    (ha)=    2.66
01766> | 07:070     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
01767> ---------------------
01768>                                 IMPERVIOUS    PERVIOUS (i)
01769>      Surface Area     (ha)=       2.58          .08
01770>      Dep. Storage     (mm)=       1.57         4.67
01771>      Average Slope     (%)=        .61         1.50
01772>      Length            (m)=     207.25        20.00
01773>      Mannings n           =       .030         .250
01774>
01775>      Max.eff.Inten.(mm/hr)=     122.14        34.69
01776>                 over (min)       7.50        15.00
01777>      Storage Coeff.  (min)=       7.00 (ii)   14.75 (ii)
01778>      Unit Hyd. Tpeak (min)=       7.50        15.00
01779>      Unit Hyd. peak  (cms)=        .16          .08
01780>                                                          *TOTALS*
01781>      PEAK FLOW       (cms)=        .64          .00         .645 (iii)
01782>      TIME TO PEAK    (hrs)=       1.04         1.21        1.042
01783>      RUNOFF VOLUME    (mm)=      47.93        19.25       47.074
01784>      TOTAL RAINFALL   (mm)=      49.50        49.50       49.505
01785>      RUNOFF COEFFICIENT   =        .97          .39         .951
01786>
01787>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01788>            CN* =  81.0    Ia = Dep. Storage  (Above)
01789>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01790>            THAN THE STORAGE COEFFICIENT.
01791>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01792>
01793> --------------------------------------------------------------------------
01794> 001:0011------------------------------------------------------------------
01795> -------------------
01796> | ADD HYD (080    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
01797> -------------------                 (ha)      (cms)   (hrs)   (mm)    (cms)
01798>                    ID1 06:060        .89      .245    1.00  47.07     .000
01799>                   +ID2 07:070       2.66      .645    1.04  47.07     .000
01800>                    ==============================================
01801>                    SUM 08:080       3.55      .876    1.04  47.07     .000
01802>
01803>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01804>
01805> --------------------------------------------------------------------------
01806> 001:0012------------------------------------------------------------------
01807> -------------------
01808> | ADD HYD (090    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
01809> -------------------                 (ha)      (cms)   (hrs)   (mm)    (cms)
01810>                    ID1 05:050       5.01     1.107    1.04  45.09     .000
01811>                   +ID2 08:080       3.55      .876    1.04  47.07     .000
01812>                    ==============================================
01813>                    SUM 09:090       8.56     1.984    1.04  45.91     .000
01814>
01815>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01816>
01817> --------------------------------------------------------------------------
01818> 001:0013------------------------------------------------------------------
01819> ---------------------
01820> | ROUTE RESERVOIR     |    Requested routing time step =  1.0 min.
01821> |  IN>09:(090    )    |
01822> | OUT<10:(POND   )    |    =========  OUTLFOW STORAGE TABLE  =========
01823> ---------------------     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
01824>                             (cms)     (ha.m.)    |   (cms)     (ha.m.)
01825>                              .000  .0000E+00    |     .593  .6251E+00
01826>                              .008  .6560E-01    |     .654  .6631E+00
01827>                              .017  .1311E+00    |     .797  .7391E+00
01828>                              .093  .2831E+00    |     .950  .8274E+00
01829>                              .233  .3971E+00    |    1.304  .9157E+00
01830>                              .337  .4731E+00    |    1.880  .1004E+01
01831>                              .465  .5491E+00    |    2.577  .1092E+01
01832>                              .531  .5871E+00    |     .000  .0000E+00
01833>
01834>      ROUTING RESULTS              AREA     QPEAK       TPEAK        R.V.
01835>      --------------------         (ha)     (cms)       (hrs)        (mm)
01836>      INFLOW >09: (090    )        8.56     1.984       1.042      45.914
01837>      OUTFLOW<10: (POND   )        8.56      .132       2.278      45.912
01838>
01839>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=    6.640
01840>                     TIME SHIFT OF PEAK FLOW          (min)=   74.17
01841>                     MAXIMUM  STORAGE   USED       (ha.m.)=.3146E+00
01842>
01843> --------------------------------------------------------------------------
01844> 001:0014------------------------------------------------------------------
01845> *******************************************
01846> *     Remaining Hawthorne Industrial Park     *
01847> *******************************************
01848> *
01849> * SUB-AREA No.1
01850> ---------------------
01851> | CALIB STANDHYD      |   Area    (ha)=   19.90
01852> | 01:HIP01   DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
01853> ---------------------
01854>                                 IMPERVIOUS    PERVIOUS (i)
01855>      Surface Area     (ha)=      14.13         5.77
01856>      Dep. Storage     (mm)=       1.57         4.67
01857>      Average Slope     (%)=        .60         1.50
01858>      Length            (m)=     580.00       100.00
01859>      Mannings n           =       .030         .250
01860>
01861>      Max.eff.Inten.(mm/hr)=      93.86        60.56
01862>                 over (min)      15.00        30.00
01863>      Storage Coeff.  (min)=      14.48 (ii)   30.78 (ii)
01864>      Unit Hyd. Tpeak (min)=      15.00        30.00
01865>      Unit Hyd. peak  (cms)=        .08          .04
01866>                                                          *TOTALS*
01867>      PEAK FLOW       (cms)=       1.70          .55        1.983 (iii)
01868>      TIME TO PEAK    (hrs)=       1.17         1.46        1.208
01869>      RUNOFF VOLUME    (mm)=      47.93        26.92       37.426
01870>      TOTAL RAINFALL   (mm)=      49.50        49.50       49.505
01871>      RUNOFF COEFFICIENT   =        .97          .54         .756
01872>
01873>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01874>            CN* =  81.0    Ia = Dep. Storage  (Above)
01875>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01876>            THAN THE STORAGE COEFFICIENT.
01877>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01878>
01879> --------------------------------------------------------------------------
01880> 001:0015------------------------------------------------------------------
01881> -------------------
01882> | ADD HYD (HIP02 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
01883> -------------------                 (ha)      (cms)   (hrs)   (mm)    (cms)
01884>                    ID1 10:POND       8.56      .132    2.28  45.91     .000
01885>                   +ID2 01:HIP01     19.90     1.983    1.21  37.43     .000
01886>                    ==============================================
01887>                    SUM 02:HIP02     28.46     2.044    1.21  39.98     .000
01888>
01889>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01890>
```

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------------------------------------------------------------------------------
001:0016----------------------------------------------------------------------
*
* SUB-AREA No.2
----------------------
| CALIB STANDHYD      |   Area     (ha)=   17.00
| 03:HIP03  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      12.07          4.93
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=        .65          1.50
     Length            (m)=     450.00        100.00
     Mannings n           =       .030          .250

     Max.eff.Inten.(mm/hr)=     105.17         63.81
                over (min)       12.50         27.50
     Storage Coeff.  (min)=      11.60 (ii)    27.56 (ii)
     Unit Hyd. Tpeak (min)=      12.50         27.50
     Unit Hyd. peak  (cms)=        .09           .04
                                                             *TOTALS*
     PEAK FLOW       (cms)=       1.63           .51          1.865 (iii)
     TIME TO PEAK    (hrs)=       1.13          1.42          1.167
     RUNOFF VOLUME    (mm)=      47.93         26.92         37.426
     TOTAL RAINFALL   (mm)=      49.50         49.50         49.505
     RUNOFF COEFFICIENT   =        .97           .54           .756

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

------------------------------------------------------------------------------
001:0017----------------------------------------------------------------------
*
* SUB-AREA No.3
----------------------
| CALIB STANDHYD      |   Area     (ha)=   18.10
| 04:HIP04  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      12.85          5.25
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=        .50          1.50
     Length            (m)=     600.00        100.00
     Mannings n           =       .030          .250

     Max.eff.Inten.(mm/hr)=      93.86         57.19
                over (min)       15.00         32.50
     Storage Coeff.  (min)=      15.61 (ii)    32.28 (ii)
     Unit Hyd. Tpeak (min)=      15.00         32.50
     Unit Hyd. peak  (cms)=        .07           .03
                                                             *TOTALS*
     PEAK FLOW       (cms)=       1.49           .48          1.723 (iii)
     TIME TO PEAK    (hrs)=       1.17          1.50          1.208
     RUNOFF VOLUME    (mm)=      47.93         26.92         37.426
     TOTAL RAINFALL   (mm)=      49.50         49.50         49.505
     RUNOFF COEFFICIENT   =        .97           .54           .756

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

------------------------------------------------------------------------------
001:0018----------------------------------------------------------------------
--------------------
| ADD HYD (HIP05 ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
--------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
                 ID1 03:HIP03      17.00    1.865    1.17  37.43    .000
                +ID2 04:HIP04      18.10    1.723    1.21  37.43    .000
                 ==================================================
                 SUM 05:HIP05      35.10    3.572    1.17  37.43    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
001:0019----------------------------------------------------------------------
*
*SUB-AREA No.4
----------------------
| DESIGN NASHYD       |   Area     (ha)=    4.00   Curve Number   (CN)=85.00
| 06:Pond-B DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .170

     Unit Hyd Qpeak  (cms)=     .899

     PEAK FLOW       (cms)=     .345 (i)
     TIME TO PEAK    (hrs)=    1.167
     RUNOFF VOLUME    (mm)=   22.420
     TOTAL RAINFALL   (mm)=   49.505
     RUNOFF COEFFICIENT   =     .453

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

------------------------------------------------------------------------------
001:0020----------------------------------------------------------------------
--------------------
| ADD HYD (HIP06 ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
--------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
                 ID1 02:HIP02      28.46    2.044    1.21  39.98    .000
                +ID2 05:HIP05      35.10    3.572    1.17  37.43    .000
                +ID3 06:Pond-B      4.00     .345    1.17  22.42    .000
                 ==================================================
                 SUM 07:HIP06      67.56    5.939    1.17  37.61    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
001:0021----------------------------------------------------------------------
* SUB-AREA NO. 5
----------------------
| DESIGN NASHYD       |   Area     (ha)=    6.80   Curve Number   (CN)=76.00
| 10:A2      DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .370

     Unit Hyd Qpeak  (cms)=     .702

     PEAK FLOW       (cms)=     .252 (i)
     TIME TO PEAK    (hrs)=    1.417
     RUNOFF VOLUME    (mm)=   16.075
     TOTAL RAINFALL   (mm)=   49.505
     RUNOFF COEFFICIENT   =     .325

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

------------------------------------------------------------------------------
001:0022----------------------------------------------------------------------
* SUB-AREA NO 4
----------------------
| DESIGN NASHYD       |   Area     (ha)=    5.30   Curve Number   (CN)=76.00
| 01:A3      DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .804

     Unit Hyd Qpeak  (cms)=     .252

     PEAK FLOW       (cms)=     .115 (i)
     TIME TO PEAK    (hrs)=    2.000
     RUNOFF VOLUME    (mm)=   16.075
     TOTAL RAINFALL   (mm)=   49.505
     RUNOFF COEFFICIENT   =     .325

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

------------------------------------------------------------------------------
001:0023----------------------------------------------------------------------
--------------------
| ADD HYD (0020  ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
--------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
                 ID1 07:HIP06      67.56    5.939    1.17  37.61    .000
                +ID2 10:A2          6.80     .252    1.42  16.08    .000
                +ID3 01:A3          5.30     .115    2.00  16.08    .000
                 ==================================================
                 SUM 02:0020       79.66    6.135    1.17  34.34    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
001:0024----------------------------------------------------------------------
*************************************************************
*        CALCULATION OF 3HR - 1:25 YEAR STORM EVENT          *
*************************************************************
--------------------
| START              |  Project  dir.: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\
--------------------  Rainfall dir.: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   0
------------------------------------------------------------------------------
001:0002----------------------------------------------------------------------
--------------------
| CHICAGO STORM     |    IDF curve parameters: A=1402.884
| Ptotal= 58.23 mm |                          B=   6.018
--------------------                          C=    .819
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  3.00 hrs
                         Storm time step    = 10.00 min
                         Time to peak ratio =   .33

                 TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                  .17   4.934 |  1.00 144.693 |  1.83   9.014 |  2.67   4.701
                  .33   6.152 |  1.17  43.904 |  2.00   7.571 |  2.83   4.310
                  .50   8.282 |  1.33  22.224 |  2.17   6.544 |  3.00   3.983
                  .67  13.006 |  1.50  14.852 |  2.33   5.776 |
                  .83  33.041 |  1.67  11.192 |  2.50   5.179 |

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001:0003----------------------------------------------------------------------
----------------------
| DEFAULT VALUES      |  Filename: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\ORGA.VAL
----------------------  ICASEdv = 1 (read and print data)
      FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
                 ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
      Horton's infiltration equation parameters:
      [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
      Parameters for PERVIOUS surfaces in STANDHYD:
      [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
      Parameters for IMPERVIOUS surfaces in STANDHYD:
      [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
      Parameters used in NASHYD:
      [Ia=   4.67 mm] [N= 3.00]
------------------------------------------------------------------------------
001:0004----------------------------------------------------------------------
*********************************
*          ORGAWORLD FILE        *
*********************************
* SUB-AREA No.1
----------------------
| CALIB STANDHYD      |   Area     (ha)=    2.07
| 01:010     DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.74           .33
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=        .52          1.00
     Length            (m)=     204.72         20.00
     Mannings n           =       .030          .250

     Max.eff.Inten.(mm/hr)=     144.69         47.07
                over (min)        7.50         15.00
     Storage Coeff.  (min)=       6.81 (ii)    14.56 (ii)
     Unit Hyd. Tpeak (min)=       7.50         15.00
     Unit Hyd. peak  (cms)=        .16           .08
                                                             *TOTALS*
     PEAK FLOW       (cms)=        .52           .03           .532 (iii)
     TIME TO PEAK    (hrs)=       1.04          1.21          1.042
     RUNOFF VOLUME    (mm)=      56.66         25.35         51.647
     TOTAL RAINFALL   (mm)=      58.23         58.23         58.226
     RUNOFF COEFFICIENT   =        .97           .44           .887

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

------------------------------------------------------------------------------
001:0005----------------------------------------------------------------------
*
* SUB-AREA No.2
----------------------
| CALIB STANDHYD      |   Area     (ha)=    1.54
| 02:020     DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.42           .12
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=        .50          1.00
     Length            (m)=     244.34          5.00
     Mannings n           =       .030          .030

     Max.eff.Inten.(mm/hr)=     144.69         65.19
                over (min)        7.50          7.50
     Storage Coeff.  (min)=       7.66 (ii)     8.49 (ii)
     Unit Hyd. Tpeak (min)=       7.50          7.50
     Unit Hyd. peak  (cms)=        .15           .14
                                                             *TOTALS*
     PEAK FLOW       (cms)=        .40           .01           .418 (iii)
     TIME TO PEAK    (hrs)=       1.04          1.08          1.042
     RUNOFF VOLUME    (mm)=      56.66         25.35         54.152
     TOTAL RAINFALL   (mm)=      58.23         58.23         58.226
     RUNOFF COEFFICIENT   =        .97           .44           .930

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

 -------------------------------------------------------------------------------
 001:0006-----------------------------------------------------------------------
 *
 * SUB-AREA No.3
 ---------------------
 | CALIB STANDHYD      |   Area    (ha)=    1.40
 | 03:030    DT= 2.50  |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
 ---------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=       1.36           .04
      Dep. Storage     (mm)=       1.57          4.67
      Average Slope     (%)=        .51          1.00
      Length            (m)=     225.63          5.00
      Mannings n           =       .030          .030

      Max.eff.Inten.(mm/hr)=     144.69         65.19
                 over (min)        7.50          7.50
      Storage Coeff.  (min)=       7.26 (ii)     8.09 (ii)
      Unit Hyd. Tpeak (min)=       7.50          7.50
      Unit Hyd. peak  (cms)=        .15           .14
                                                             *TOTALS*
      PEAK FLOW       (cms)=        .40           .00          .400 (iii)
      TIME TO PEAK    (hrs)=       1.04          1.08         1.042
      RUNOFF VOLUME    (mm)=      56.66         25.35        55.717
      TOTAL RAINFALL   (mm)=      58.23         58.23        58.226
      RUNOFF COEFFICIENT   =        .97           .44          .957

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 -------------------------------------------------------------------------------
 001:0007-----------------------------------------------------------------------
 --------------------
 | ADD HYD (040    ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
 --------------------                 (ha)      (cms)    (hrs)   (mm)    (cms)
                      ID1 01:010      2.07       .532     1.04  51.65     .000
                     +ID2 02:020      1.54       .418     1.04  54.15     .000
                      ===================================================
                      SUM 04:040      3.61       .950     1.04  52.72     .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 -------------------------------------------------------------------------------
 001:0008-----------------------------------------------------------------------
 --------------------
 | ADD HYD (050    ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
 --------------------                 (ha)      (cms)    (hrs)   (mm)    (cms)
                      ID1 03:030      1.40       .400     1.04  55.72     .000
                     +ID2 04:040      3.61       .950     1.04  52.72     .000
                      ===================================================
                      SUM 05:050      5.01      1.350     1.04  53.55     .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 -------------------------------------------------------------------------------
 001:0009-----------------------------------------------------------------------
 *
 * SUB-AREA No.4
 ---------------------
 | CALIB STANDHYD      |   Area    (ha)=     .89
 | 06:060    DT= 2.50  |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
 ---------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=        .86           .03
      Dep. Storage     (mm)=       1.57          4.67
      Average Slope     (%)=        .93           .70
      Length            (m)=     164.82         40.00
      Mannings n           =       .030          .250

      Max.eff.Inten.(mm/hr)=     144.69         44.12
                 over (min)        5.00         17.50
      Storage Coeff.  (min)=       5.02 (ii)    18.44 (ii)
      Unit Hyd. Tpeak (min)=       5.00         17.50
      Unit Hyd. peak  (cms)=        .22           .06
                                                             *TOTALS*
      PEAK FLOW       (cms)=        .30           .00          .296 (iii)
      TIME TO PEAK    (hrs)=       1.00          1.25         1.000
      RUNOFF VOLUME    (mm)=      56.66         25.35        55.717
      TOTAL RAINFALL   (mm)=      58.23         58.23        58.226
      RUNOFF COEFFICIENT   =        .97           .44          .957

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 -------------------------------------------------------------------------------
 001:0010-----------------------------------------------------------------------
 *
 * SUB-AREA No.5
 ---------------------
 | CALIB STANDHYD      |   Area    (ha)=    2.66
 | 07:070    DT= 2.50  |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
 ---------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=       2.58           .08
      Dep. Storage     (mm)=       1.57          4.67
      Average Slope     (%)=        .61          1.50
      Length            (m)=     207.25         20.00
      Mannings n           =       .030          .250

      Max.eff.Inten.(mm/hr)=     144.69         51.33
                 over (min)        7.50         12.50
      Storage Coeff.  (min)=       6.54 (ii)    13.16 (ii)
      Unit Hyd. Tpeak (min)=       7.50         12.50
      Unit Hyd. peak  (cms)=        .16           .09
                                                             *TOTALS*
      PEAK FLOW       (cms)=        .78           .01          .783 (iii)
      TIME TO PEAK    (hrs)=       1.04          1.17         1.042
      RUNOFF VOLUME    (mm)=      56.66         25.35        55.717
      TOTAL RAINFALL   (mm)=      58.23         58.23        58.226
      RUNOFF COEFFICIENT   =        .97           .44          .957

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 -------------------------------------------------------------------------------
 001:0011-----------------------------------------------------------------------
 --------------------
 | ADD HYD (080    ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
 --------------------                 (ha)      (cms)    (hrs)   (mm)    (cms)
                      ID1 06:060       .89       .296     1.00  55.72     .000
                     +ID2 07:070      2.66       .783     1.04  55.72     .000
                      ===================================================
                      SUM 08:080      3.55      1.060     1.04  55.72     .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 -------------------------------------------------------------------------------
 001:0012-----------------------------------------------------------------------
 --------------------
 | ADD HYD (090    ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
 --------------------                 (ha)      (cms)    (hrs)   (mm)    (cms)
                      ID1 05:050      5.01      1.350     1.04  53.55     .000
                     +ID2 08:080      3.55      1.060     1.04  55.72     .000
                      ===================================================
                      SUM 09:090      8.56      2.410     1.04  54.45     .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 -------------------------------------------------------------------------------
 001:0013-----------------------------------------------------------------------
 ---------------------
 | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
 |   IN>09:(090    )  |
 | OUT<10:(POND   )   |    =========  OUTLFOW STORAGE TABLE  =========
 ---------------------     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                            (cms)     (ha.m.)   |   (cms)     (ha.m.)
                             .000  .0000E+00    |     .593  .6251E+00
                             .008  .6560E-01    |     .654  .6631E+00
                             .017  .1311E+00    |     .797  .7391E+00
                             .093  .2831E+00    |     .950  .8274E+00
                             .233  .3971E+00    |    1.304  .9157E+00
                             .337  .4731E+00    |    1.880  .1004E+01
                             .465  .5491E+00    |    2.577  .1092E+01
                             .531  .5871E+00    |     .000  .0000E+00

      ROUTING RESULTS              AREA      QPEAK      TPEAK        R.V.
      --------------------         (ha)      (cms)      (hrs)        (mm)
      INFLOW >09: (090    )        8.56      2.410      1.042      54.451
      OUTFLOW<10: (POND   )        8.56       .189      2.056      54.449

                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=    7.838
                     TIME SHIFT OF PEAK FLOW          (min)=    60.83
                     MAXIMUM  STORAGE   USED       (ha.m.)=.3612E+00

 -------------------------------------------------------------------------------
 001:0014-----------------------------------------------------------------------
 ***********************************************
 *     Remaining Hawthorne Industrial Park     *
 ***********************************************
 *
 * SUB-AREA No.1
 ---------------------
 | CALIB STANDHYD      |   Area    (ha)=   19.90
 | 01:HIP01  DT= 2.50  |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=      14.13          5.77
      Dep. Storage     (mm)=       1.57          4.67
      Average Slope     (%)=        .60          1.50
      Length            (m)=     580.00        100.00
      Mannings n           =       .030          .250

      Max.eff.Inten.(mm/hr)=     124.54         81.98
                 over (min)       12.50         27.50
      Storage Coeff.  (min)=      12.93 (ii)    27.37 (ii)
      Unit Hyd. Tpeak (min)=      12.50         27.50
      Unit Hyd. peak  (cms)=        .09           .04
                                                             *TOTALS*
      PEAK FLOW       (cms)=       2.16           .77         2.548 (iii)
      TIME TO PEAK    (hrs)=       1.13          1.42         1.167
      RUNOFF VOLUME    (mm)=      56.66         34.22        45.437
      TOTAL RAINFALL   (mm)=      58.23         58.23        58.226
      RUNOFF COEFFICIENT   =        .97           .59          .780

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 -------------------------------------------------------------------------------
 001:0015-----------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP02 ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
 --------------------                 (ha)      (cms)    (hrs)   (mm)    (cms)
                      ID1 10:POND     8.56       .189     2.06  54.45     .000
                     +ID2 01:HIP01   19.90      2.548     1.17  45.44     .000
                      ===================================================
                      SUM 02:HIP02   28.46      2.622     1.17  48.15     .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 -------------------------------------------------------------------------------
 001:0016-----------------------------------------------------------------------
 *
 * SUB-AREA No.2
 ---------------------
 | CALIB STANDHYD      |   Area    (ha)=   17.00
 | 03:HIP03  DT= 2.50  |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=      12.07          4.93
      Dep. Storage     (mm)=       1.57          4.67
      Average Slope     (%)=        .65          1.50
      Length            (m)=     450.00        100.00
      Mannings n           =       .030          .250

      Max.eff.Inten.(mm/hr)=     144.69         87.13
                 over (min)       10.00         25.00
      Storage Coeff.  (min)=      10.21 (ii)    24.30 (ii)
      Unit Hyd. Tpeak (min)=      10.00         25.00
      Unit Hyd. peak  (cms)=        .11           .05
                                                             *TOTALS*
      PEAK FLOW       (cms)=       2.10           .71         2.398 (iii)
      TIME TO PEAK    (hrs)=       1.08          1.38         1.125
      RUNOFF VOLUME    (mm)=      56.66         34.22        45.437
      TOTAL RAINFALL   (mm)=      58.23         58.23        58.226
      RUNOFF COEFFICIENT   =        .97           .59          .780

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 -------------------------------------------------------------------------------
 001:0017-----------------------------------------------------------------------
 *
 * SUB-AREA No.3
 ---------------------
 | CALIB STANDHYD      |   Area    (ha)=   18.10
 | 04:HIP04  DT= 2.50  |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=      12.85          5.25
      Dep. Storage     (mm)=       1.57          4.67
      Average Slope     (%)=        .50          1.50
```

```
02431>      Length          (m)=     600.00       100.00
02432>      Mannings n         =       .030         .250
02433>
02434>      Max.eff.Inten.(mm/hr)=     111.10        77.71
02435>                 over (min)      15.00        30.00
02436>      Storage Coeff.  (min)=      14.59 (ii)   29.34 (ii)
02437>      Unit Hyd. Tpeak (min)=      15.00        30.00
02438>      Unit Hyd. peak  (cms)=        .08          .04
02439>                                                          *TOTALS*
02440>      PEAK FLOW       (cms)=       1.82          .67        2.180 (iii)
02441>      TIME TO PEAK    (hrs)=       1.17         1.46        1.208
02442>      RUNOFF VOLUME    (mm)=      56.66        34.22       45.437
02443>      TOTAL RAINFALL   (mm)=      58.23        58.23       58.226
02444>      RUNOFF COEFFICIENT   =        .97          .59         .780
02445>
02446>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02447>            CN* =  81.0    Ia = Dep. Storage  (Above)
02448>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02449>            THAN THE STORAGE COEFFICIENT.
02450>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02451>
02452> -------------------------------------------------------------------------------
02453> 001:0018-----------------------------------------------------------------------
02454> --------------------
02455> | ADD HYD (HIP05 ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
02456> --------------------              (ha)     (cms)   (hrs)   (mm)   (cms)
02457>                  ID1 03:HIP03    17.00     2.398    1.13  45.44    .000
02458>                 +ID2 04:HIP04    18.10     2.180    1.21  45.44    .000
02459>                  =======================================================
02460>                  SUM 05:HIP05    35.10     4.439    1.13  45.44    .000
02461>
02462>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02463>
02464> -------------------------------------------------------------------------------
02465> 001:0019-----------------------------------------------------------------------
02466> *
02467> *SUB-AREA No.4
02468> ----------------------
02469> | DESIGN NASHYD      |   Area    (ha)=    4.00   Curve Number   (CN)=85.00
02470> | 06:Pond-B DT= 2.50 |   Ia      (mm)=   4.670   # of Linear Res.(N)= 3.00
02471> ----------------------   U.H. Tp(hrs)=    .170
02472>
02473>      Unit Hyd Qpeak  (cms)=      .899
02474>
02475>      PEAK FLOW       (cms)=      .459 (i)
02476>      TIME TO PEAK    (hrs)=     1.167
02477>      RUNOFF VOLUME    (mm)=    29.155
02478>      TOTAL RAINFALL   (mm)=    58.226
02479>      RUNOFF COEFFICIENT   =      .501
02480>
02481>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02482>
02483> -------------------------------------------------------------------------------
02484> 001:0020-----------------------------------------------------------------------
02485> --------------------
02486> | ADD HYD (HIP06 ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
02487> --------------------              (ha)     (cms)   (hrs)   (mm)   (cms)
02488>                  ID1 02:HIP02    28.46     2.622    1.17  48.15    .000
02489>                 +ID2 05:HIP05    35.10     4.439    1.13  45.44    .000
02490>                 +ID3 06:Pond-B    4.00      .459    1.17  29.15    .000
02491>                  =======================================================
02492>                  SUM 07:HIP06    67.56     7.499    1.17  45.61    .000
02493>
02494>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02495>
02496> -------------------------------------------------------------------------------
02497> 001:0021-----------------------------------------------------------------------
02498> * SUB-AREA NO. 5
02499> ----------------------
02500> | DESIGN NASHYD      |   Area    (ha)=    6.80   Curve Number   (CN)=76.00
02501> | 10:A2     DT= 2.50 |   Ia      (mm)=   4.670   # of Linear Res.(N)= 3.00
02502> ----------------------   U.H. Tp(hrs)=    .370
02503>
02504>      Unit Hyd Qpeak  (cms)=      .702
02505>
02506>      PEAK FLOW       (cms)=      .343 (i)
02507>      TIME TO PEAK    (hrs)=     1.417
02508>      RUNOFF VOLUME    (mm)=    21.442
02509>      TOTAL RAINFALL   (mm)=    58.226
02510>      RUNOFF COEFFICIENT   =      .368
02511>
02512>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02513>
02514> -------------------------------------------------------------------------------
02515> 001:0022-----------------------------------------------------------------------
02516> * SUB-AREA NO 4
02517> ----------------------
02518> | DESIGN NASHYD      |   Area    (ha)=    5.30   Curve Number   (CN)=76.00
02519> | 01:A3     DT= 2.50 |   Ia      (mm)=   4.670   # of Linear Res.(N)= 3.00
02520> ----------------------   U.H. Tp(hrs)=    .804
02521>
02522>      Unit Hyd Qpeak  (cms)=      .252
02523>
02524>      PEAK FLOW       (cms)=      .155 (i)
02525>      TIME TO PEAK    (hrs)=     2.000
02526>      RUNOFF VOLUME    (mm)=    21.442
02527>      TOTAL RAINFALL   (mm)=    58.226
02528>      RUNOFF COEFFICIENT   =      .368
02529>
02530>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02531>
02532> -------------------------------------------------------------------------------
02533> 001:0023-----------------------------------------------------------------------
02534> --------------------
02535> | ADD HYD (0020  ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
02536> --------------------              (ha)     (cms)   (hrs)   (mm)   (cms)
02537>                  ID1 07:HIP06    67.56     7.499    1.17  45.61    .000
02538>                 +ID2 10:A2        6.80      .343    1.42  21.44    .000
02539>                 +ID3 01:A3        5.30      .155    2.00  21.44    .000
02540>                  =======================================================
02541>                  SUM 02:0020     79.66     7.772    1.17  41.94    .000
02542>
02543>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02544>
02545> -------------------------------------------------------------------------------
02546> 001:0024-----------------------------------------------------------------------
02547> ***************************************************************
02548> *        CALCULATION OF 3HR - 1:50 YEAR STORM EVENT           *
02549> ***************************************************************
02550> --------------------
02551> | START            |  Project  dir.: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\
02552> --------------------  Rainfall dir.: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\
02553>    TZERO =   .00 hrs on        0
02554>    METOUT=   2 (output = METRIC)
02555>    NRUN  = 001
02556>    NSTORM=   0
02557> -------------------------------------------------------------------------------
02558> 001:0002-----------------------------------------------------------------------
02559> --------------------
02560> | CHICAGO STORM    |    IDF curve parameters: A=1569.580
02561> | Ptotal= 64.81 mm |                          B=   6.014
02562> --------------------                          C=    .820
02563>                        used in:   INTENSITY =  A / (t + B)^C
02564>
02565>                        Duration of storm  =  3.00 hrs
```

```
02566>                        Storm time step    = 10.00 min
02567>                        Time to peak ratio =   .33
02568>
02569>              TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
02570>               hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
02571>               .17   5.467 |  1.00 161.471 |  1.83  10.000 |  2.67   5.209
02572>               .33   6.820 |  1.17  48.876 |  2.00   8.397 |  2.83   4.774
02573>               .50   9.187 |  1.33  24.704 |  2.17   7.256 |  3.00   4.412
02574>               .67  14.441 |  1.50  16.495 |  2.33   6.403 |
02575>               .83  36.764 |  1.67  12.422 |  2.50   5.740 |
02576>
02577> -------------------------------------------------------------------------------
02578> 001:0003-----------------------------------------------------------------------
02579> ----------------------
02580> | DEFAULT VALUES     |  Filename: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\ORGA.VAL
02581> ----------------------  ICASEdv = 1 (read and print data)
02582>       FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
02583>                  ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
02584>       Horton's infiltration equation parameters:
02585>       [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
02586>       Parameters for PERVIOUS surfaces in STANDHYD:
02587>       [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
02588>       Parameters for IMPERVIOUS surfaces in STANDHYD:
02589>       [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
02590>       Parameters used in NASHYD:
02591>       [Ia=   4.67 mm] [N= 3.00]
02592> -------------------------------------------------------------------------------
02593> 001:0004-----------------------------------------------------------------------
02594> ************************************
02595> *          ORGAWORLD FILE          *
02596> ************************************
02597> * SUB-AREA No.1
02598> ----------------------
02599> | CALIB STANDHYD     |   Area    (ha)=    2.07
02600> | 01:010    DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
02601> ----------------------
02602>                            IMPERVIOUS    PERVIOUS (i)
02603>      Surface Area     (ha)=     1.74          .33
02604>      Dep. Storage     (mm)=     1.57         4.67
02605>      Average Slope     (%)=      .52         1.00
02606>      Length            (m)=   204.72        20.00
02607>      Mannings n          =      .030         .250
02608>
02609>      Max.eff.Inten.(mm/hr)=   161.47        62.27
02610>                 over (min)     7.50        12.50
02611>      Storage Coeff.  (min)=     6.51 (ii)   13.44 (ii)
02612>      Unit Hyd. Tpeak (min)=     7.50        12.50
02613>      Unit Hyd. peak  (cms)=      .16          .09
02614>                                                        *TOTALS*
02615>      PEAK FLOW       (cms)=      .59          .03          .609 (iii)
02616>      TIME TO PEAK    (hrs)=     1.04         1.17         1.042
02617>      RUNOFF VOLUME    (mm)=    63.24        30.21        57.952
02618>      TOTAL RAINFALL   (mm)=    64.81        64.81        64.806
02619>      RUNOFF COEFFICIENT   =      .98          .47          .894
02620>
02621>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02622>            CN* =  81.0    Ia = Dep. Storage  (Above)
02623>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02624>            THAN THE STORAGE COEFFICIENT.
02625>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02626>
02627> -------------------------------------------------------------------------------
02628> 001:0005-----------------------------------------------------------------------
02629> *
02630> * SUB-AREA No.2
02631> ----------------------
02632> | CALIB STANDHYD     |   Area    (ha)=    1.54
02633> | 02:020    DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
02634> ----------------------
02635>                            IMPERVIOUS    PERVIOUS (i)
02636>      Surface Area     (ha)=     1.42          .12
02637>      Dep. Storage     (mm)=     1.57         4.67
02638>      Average Slope     (%)=      .50         1.00
02639>      Length            (m)=   244.34         5.00
02640>      Mannings n          =      .030         .030
02641>
02642>      Max.eff.Inten.(mm/hr)=   161.47        78.73
02643>                 over (min)     7.50         7.50
02644>      Storage Coeff.  (min)=     7.33 (ii)    8.10 (ii)
02645>      Unit Hyd. Tpeak (min)=     7.50         7.50
02646>      Unit Hyd. peak  (cms)=      .15          .14
02647>                                                        *TOTALS*
02648>      PEAK FLOW       (cms)=      .46          .02          .475 (iii)
02649>      TIME TO PEAK    (hrs)=     1.04         1.08         1.042
02650>      RUNOFF VOLUME    (mm)=    63.24        30.21        60.594
02651>      TOTAL RAINFALL   (mm)=    64.81        64.81        64.806
02652>      RUNOFF COEFFICIENT   =      .98          .47          .935
02653>
02654>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02655>            CN* =  81.0    Ia = Dep. Storage  (Above)
02656>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02657>            THAN THE STORAGE COEFFICIENT.
02658>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02659>
02660> -------------------------------------------------------------------------------
02661> 001:0006-----------------------------------------------------------------------
02662> *
02663> * SUB-AREA No.3
02664> ----------------------
02665> | CALIB STANDHYD     |   Area    (ha)=    1.40
02666> | 03:030    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
02667> ----------------------
02668>                            IMPERVIOUS    PERVIOUS (i)
02669>      Surface Area     (ha)=     1.36          .04
02670>      Dep. Storage     (mm)=     1.57         4.67
02671>      Average Slope     (%)=      .51         1.00
02672>      Length            (m)=   225.63         5.00
02673>      Mannings n          =      .030         .030
02674>
02675>      Max.eff.Inten.(mm/hr)=   161.47        78.73
02676>                 over (min)     7.50         7.50
02677>      Storage Coeff.  (min)=     6.95 (ii)    7.72 (ii)
02678>      Unit Hyd. Tpeak (min)=     7.50         7.50
02679>      Unit Hyd. peak  (cms)=      .16          .15
02680>                                                        *TOTALS*
02681>      PEAK FLOW       (cms)=      .45          .01          .454 (iii)
02682>      TIME TO PEAK    (hrs)=     1.04         1.08         1.042
02683>      RUNOFF VOLUME    (mm)=    63.24        30.21        62.245
02684>      TOTAL RAINFALL   (mm)=    64.81        64.81        64.806
02685>      RUNOFF COEFFICIENT   =      .98          .47          .960
02686>
02687>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02688>            CN* =  81.0    Ia = Dep. Storage  (Above)
02689>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02690>            THAN THE STORAGE COEFFICIENT.
02691>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02692>
02693> -------------------------------------------------------------------------------
02694> 001:0007-----------------------------------------------------------------------
02695> --------------------
02696> | ADD HYD (040   ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
02697> --------------------              (ha)     (cms)   (hrs)   (mm)   (cms)
02698>                  ID1 01:010       2.07      .609    1.04  57.95    .000
02699>                 +ID2 02:020       1.54      .475    1.04  60.59    .000
02700>                  =======================================================
```

```
                  SUM 04:040         3.61    1.084     1.04  59.08     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0008-------------------------------------------------------------------
 --------------------
 | ADD HYD (050   ) | ID: NHYD       AREA      QPEAK    TPEAK   R.V.    DWF
 --------------------                 (ha)      (cms)    (hrs)   (mm)   (cms)
                  ID1 03:030         1.40      .454     1.04  62.25    .000
                 +ID2 04:040         3.61     1.084     1.04  59.08    .000
                  =======================================================
                  SUM 05:050         5.01     1.538     1.04  59.96    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0009-------------------------------------------------------------------
 *
 * SUB-AREA No.4
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=     .89
 | 06:060     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
 ----------------------
                                  IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=         .86          .03
      Dep. Storage      (mm)=        1.57         4.67
      Average Slope      (%)=         .93          .70
      Length             (m)=      164.82        40.00
      Mannings n           =         .030         .250

      Max.eff.Inten.(mm/hr)=       161.47        53.28
                 over (min)         5.00        17.50
      Storage Coeff.  (min)=         4.80 (ii)   17.24 (ii)
      Unit Hyd. Tpeak (min)=         5.00        17.50
      Unit Hyd. peak  (cms)=          .23          .07
                                                              *TOTALS*
      PEAK FLOW       (cms)=          .33          .00          .335 (iii)
      TIME TO PEAK    (hrs)=         1.00         1.25         1.000
      RUNOFF VOLUME    (mm)=        63.24        30.21        62.245
      TOTAL RAINFALL   (mm)=        64.81        64.81        64.806
      RUNOFF COEFFICIENT   =          .98          .47          .960

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 ---------------------------------------------------------------------------
 001:0010-------------------------------------------------------------------
 *
 * SUB-AREA No.5
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=    2.66
 | 07:070     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
 ----------------------
                                  IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=        2.58          .08
      Dep. Storage      (mm)=        1.57         4.67
      Average Slope      (%)=         .61         1.50
      Length             (m)=      207.25        20.00
      Mannings n           =         .030         .250

      Max.eff.Inten.(mm/hr)=       161.47        62.27
                 over (min)         7.50        12.50
      Storage Coeff.  (min)=         6.26 (ii)   12.39 (ii)
      Unit Hyd. Tpeak (min)=         7.50        12.50
      Unit Hyd. peak  (cms)=          .17          .09
                                                              *TOTALS*
      PEAK FLOW       (cms)=          .88          .01          .886 (iii)
      TIME TO PEAK    (hrs)=         1.04         1.17         1.042
      RUNOFF VOLUME    (mm)=        63.24        30.21        62.245
      TOTAL RAINFALL   (mm)=        64.81        64.81        64.806
      RUNOFF COEFFICIENT   =          .98          .47          .960

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 ---------------------------------------------------------------------------
 001:0011-------------------------------------------------------------------
 --------------------
 | ADD HYD (080   ) | ID: NHYD       AREA      QPEAK    TPEAK   R.V.    DWF
 --------------------                 (ha)      (cms)    (hrs)   (mm)   (cms)
                  ID1 06:060          .89      .335     1.00  62.25    .000
                 +ID2 07:070         2.66      .886     1.04  62.25  . .000
                  =======================================================
                  SUM 08:080         3.55     1.197     1.04  62.25    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0012-------------------------------------------------------------------
 --------------------
 | ADD HYD (090   ) | ID: NHYD       AREA      QPEAK    TPEAK   R.V.    DWF
 --------------------                 (ha)      (cms)    (hrs)   (mm)   (cms)
                  ID1 05:050         5.01     1.538     1.04  59.96    .000
                 +ID2 08:080         3.55     1.197     1.04  62.25    .000
                  =======================================================
                  SUM 09:090         8.56     2.735     1.04  60.91    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0013-------------------------------------------------------------------
 ---------------------
 | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
 |  IN>09:(090   )   |
 | OUT<10:(POND  )   |    ========  OUTLFOW STORAGE TABLE  ========
 ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000  .0000E+00    |     .593  .6251E+00
                            .008  .6560E-01    |     .654  .6631E+00
                            .017  .1311E+00    |     .797  .7391E+00
                            .093  .2831E+00    |     .950  .8274E+00
                            .233  .3971E+00    |    1.304  .9157E+00
                            .337  .4731E+00    |    1.880  .1004E+01
                            .465  .5491E+00    |    2.577  .1092E+01
                            .531  .5871E+00    |     .000  .0000E+00

     ROUTING RESULTS              AREA      QPEAK      TPEAK          R.V.
     -------------------          (ha)      (cms)      (hrs)          (mm)
     INFLOW >09: (090   )         8.56      2.735      1.042        60.910
     OUTFLOW<10: (POND  )         8.56       .233      1.944        60.908

                 PEAK   FLOW   REDUCTION [Qout/Qin](%)=     8.503
                 TIME SHIFT OF PEAK FLOW        (min)=     54.17
                 MAXIMUM  STORAGE   USED       (ha.m.)=.3967E+00

 ---------------------------------------------------------------------------
 001:0014-------------------------------------------------------------------
 **********************************************
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```
 *     Remaining Hawthorne Industrial Park     *
 **********************************************
 *
 * SUB-AREA No.1
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=   19.90
 | 01:HIP01  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ----------------------
                                  IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=       14.13         5.77
      Dep. Storage      (mm)=        1.57         4.67
      Average Slope      (%)=         .60         1.50
      Length             (m)=      580.00       100.00
      Mannings n           =         .030         .250

      Max.eff.Inten.(mm/hr)=       138.95       102.13
                 over (min)        12.50        25.00
      Storage Coeff.  (min)=        12.38 (ii)   25.60 (ii)
      Unit Hyd. Tpeak (min)=        12.50        25.00
      Unit Hyd. peak  (cms)=          .09          .04
                                                              *TOTALS*
      PEAK FLOW       (cms)=         2.46          .95         3.001 (iii)
      TIME TO PEAK    (hrs)=         1.13         1.38         1.167
      RUNOFF VOLUME    (mm)=        63.24        39.90        51.566
      TOTAL RAINFALL   (mm)=        64.81        64.81        64.806
      RUNOFF COEFFICIENT   =          .98          .62          .796

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 ---------------------------------------------------------------------------
 001:0015-------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP02 ) | ID: NHYD       AREA      QPEAK    TPEAK   R.V.    DWF
 --------------------                 (ha)      (cms)    (hrs)   (mm)   (cms)
                  ID1 10:POND        8.56      .233     1.94  60.91    .000
                 +ID2 01:HIP01      19.90     3.001     1.17  51.57    .000
                  =======================================================
                  SUM 02:HIP02      28.46     3.092     1.17  54.37    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0016-------------------------------------------------------------------
 *
 * SUB-AREA No.2
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=   17.00
 | 03:HIP03  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ----------------------
                                  IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=       12.07         4.93
      Dep. Storage      (mm)=        1.57         4.67
      Average Slope      (%)=         .65         1.50
      Length             (m)=      450.00       100.00
      Mannings n           =         .030         .250

      Max.eff.Inten.(mm/hr)=       161.47       109.61
                 over (min)        10.00        22.50
      Storage Coeff.  (min)=         9.77 (ii)   22.63 (ii)
      Unit Hyd. Tpeak (min)=        10.00        22.50
      Unit Hyd. peak  (cms)=          .11          .05
                                                              *TOTALS*
      PEAK FLOW       (cms)=         2.38          .88         2.819 (iii)
      TIME TO PEAK    (hrs)=         1.08         1.33         1.125
      RUNOFF VOLUME    (mm)=        63.24        39.90        51.566
      TOTAL RAINFALL   (mm)=        64.81        64.81        64.806
      RUNOFF COEFFICIENT   =          .98          .62          .796

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 ---------------------------------------------------------------------------
 001:0017-------------------------------------------------------------------
 *
 * SUB-AREA No.3
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=   18.10
 | 04:HIP04  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ----------------------
                                  IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=       12.85         5.25
      Dep. Storage      (mm)=        1.57         4.67
      Average Slope      (%)=         .50         1.50
      Length             (m)=      600.00       100.00
      Mannings n           =         .030         .250

      Max.eff.Inten.(mm/hr)=       138.95        96.02
                 over (min)        12.50        27.50
      Storage Coeff.  (min)=        13.34 (ii)   26.90 (ii)
      Unit Hyd. Tpeak (min)=        12.50        27.50
      Unit Hyd. peak  (cms)=          .09          .04
                                                              *TOTALS*
      PEAK FLOW       (cms)=         2.16          .83         2.596 (iii)
      TIME TO PEAK    (hrs)=         1.13         1.42         1.167
      RUNOFF VOLUME    (mm)=        63.24        39.90        51.566
      TOTAL RAINFALL   (mm)=        64.81        64.81        64.806
      RUNOFF COEFFICIENT   =          .98          .62          .796

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 ---------------------------------------------------------------------------
 001:0018-------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP05 ) | ID: NHYD       AREA      QPEAK    TPEAK   R.V.    DWF
 --------------------                 (ha)      (cms)    (hrs)   (mm)   (cms)
                  ID1 03:HIP03      17.00     2.819     1.13  51.57    .000
                 +ID2 04:HIP04      18.10     2.596     1.17  51.57    .000
                  =======================================================
                  SUM 05:HIP05      35.10     5.372     1.13  51.57    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0019-------------------------------------------------------------------
 *
 *SUB-AREA No.4
 -----------------------
 | DESIGN NASHYD       |   Area      (ha)=     4.00   Curve Number    (CN)=85.00
 | 06:Pond-B DT= 2.50 |   Ia        (mm)=    4.670   # of Linear Res.(N)= 3.00
 -----------------------   U.H. Tp(hrs)=     .170

     Unit Hyd Qpeak  (cms)=       .899

     PEAK FLOW       (cms)=       .551 (i)
```

```
     TIME TO PEAK    (hrs)=    1.125
     RUNOFF VOLUME    (mm)=   34.455
     TOTAL RAINFALL   (mm)=   64.806
     RUNOFF COEFFICIENT   =     .532

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

-----------------------------------------------------------------------------
001:0020---------------------------------------------------------------------
--------------------
| ADD HYD (HIP06 ) | ID: NHYD     AREA    QPEAK   TPEAK   R.V.    DWF
--------------------              (ha)    (cms)   (hrs)   (mm)   (cms)
                 ID1 02:HIP02     28.46   3.092    1.17  54.37    .000
                +ID2 05:HIP05     35.10   5.372    1.13  51.57    .000
                +ID3 06:Pond-B     4.00    .551    1.13  34.45    .000
                 =====================================================
                 SUM 07:HIP06     67.56   8.958    1.13  51.73    .000

   NOTE:   PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
001:0021---------------------------------------------------------------------
* SUB-AREA NO. 5
----------------------
| DESIGN NASHYD      |   Area    (ha)=    6.80   Curve Number   (CN)=76.00
| 10:A2     DT= 2.50 |   Ia      (mm)=   4.670   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .370

     Unit Hyd Qpeak  (cms)=     .702

     PEAK FLOW       (cms)=     .417 (i)
     TIME TO PEAK    (hrs)=    1.417
     RUNOFF VOLUME    (mm)=   25.767
     TOTAL RAINFALL   (mm)=   64.806
     RUNOFF COEFFICIENT   =     .398

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

-----------------------------------------------------------------------------
001:0022---------------------------------------------------------------------
* SUB-AREA NO 4
----------------------
| DESIGN NASHYD      |   Area    (ha)=    5.30   Curve Number   (CN)=76.00
| 01:A3     DT= 2.50 |   Ia      (mm)=   4.670   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .804

     Unit Hyd Qpeak  (cms)=     .252

     PEAK FLOW       (cms)=     .188 (i)
     TIME TO PEAK    (hrs)=    2.000
     RUNOFF VOLUME    (mm)=   25.767
     TOTAL RAINFALL   (mm)=   64.806
     RUNOFF COEFFICIENT   =     .398

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

-----------------------------------------------------------------------------
001:0023---------------------------------------------------------------------
--------------------
| ADD HYD (0020  ) | ID: NHYD     AREA    QPEAK   TPEAK   R.V.    DWF
--------------------              (ha)    (cms)   (hrs)   (mm)   (cms)
                 ID1 07:HIP06     67.56   8.958    1.13  51.73    .000
                +ID2 10:A2         6.80    .417    1.42  25.77    .000
                +ID3 01:A3         5.30    .188    2.00  25.77    .000
                 =====================================================
                 SUM 02:0020      79.66   9.240    1.17  47.79    .000

   NOTE:   PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
001:0024---------------------------------------------------------------------
**************************************************************
*       CALCULATION OF 3HR - 1:100 YEAR STORM EVENT          *
**************************************************************
--------------------
| START            |  Project  dir.: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\
--------------------  Rainfall dir.: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\
    TZERO =   .00 hrs on       0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   0
-----------------------------------------------------------------------------
001:0002---------------------------------------------------------------------
--------------------
| CHICAGO STORM    |   IDF curve parameters: A=1735.688
| Ptotal= 71.66 mm |                         B=   6.014
--------------------                         C=    .820
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  3.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =   .33

              TIME    RAIN |   TIME    RAIN |  TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |   hrs   mm/hr |    hrs   mm/hr
               .17   6.046 |   1.00 178.559 |  1.83  11.059 |   2.67   5.760
               .33   7.542 |   1.17  54.049 |  2.00   9.285 |   2.83   5.280
               .50  10.159 |   1.33  27.319 |  2.17   8.024 |   3.00   4.879
               .67  15.969 |   1.50  18.240 |  2.33   7.080 |
               .83  40.655 |   1.67  13.737 |  2.50   6.347 |

-----------------------------------------------------------------------------
001:0003---------------------------------------------------------------------
----------------------
| DEFAULT VALUES     |  Filename: V:\20983.DU\ENG\3RDSUB~1\SWMHYMO\ORGA.VAL
----------------------  ICASEdv = 1 (read and print data)
      FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
                 ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
      Horton's infiltration equation parameters:
      [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
      Parameters for PERVIOUS surfaces in STANDHYD:
      [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
      Parameters for IMPERVIOUS surfaces in STANDHYD:
      [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
      Parameters used in NASHYD:
      [Ia=   4.67 mm] [N= 3.00]
-----------------------------------------------------------------------------
001:0004---------------------------------------------------------------------
***********************************
*          ORGAWORLD FILE         *
***********************************
* SUB-AREA No.1
----------------------
| CALIB STANDHYD     |   Area    (ha)=    2.07
| 01:010    DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.74         .33
     Dep. Storage     (mm)=       1.57        4.67
     Average Slope     (%)=        .52        1.00
     Length            (m)=     204.72       20.00
     Mannings n          =        .030        .250

     Max.eff.Inten.(mm/hr)=     178.56       74.05
                over (min)        7.50       12.50
     Storage Coeff.   (min)=      6.26 (ii)  12.72 (ii)
     Unit Hyd. Tpeak (min)=       7.50       12.50
     Unit Hyd. peak  (cms)=        .17         .09
                                                         *TOTALS*
     PEAK FLOW       (cms)=        .66         .04          .685 (iii)
     TIME TO PEAK    (hrs)=       1.04        1.17         1.042
     RUNOFF VOLUME    (mm)=      70.09       35.46        64.553
     TOTAL RAINFALL   (mm)=      71.66       71.66        71.665
     RUNOFF COEFFICIENT   =        .98         .49          .901

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

-----------------------------------------------------------------------------
001:0005---------------------------------------------------------------------
*
* SUB-AREA No.2
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.54
| 02:020    DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.42         .12
     Dep. Storage     (mm)=       1.57        4.67
     Average Slope     (%)=        .50        1.00
     Length            (m)=     244.34        5.00
     Mannings n          =        .030        .030

     Max.eff.Inten.(mm/hr)=     178.56       93.23
                over (min)        7.50        7.50
     Storage Coeff.   (min)=      7.04 (ii)   7.76 (ii)
     Unit Hyd. Tpeak (min)=       7.50        7.50
     Unit Hyd. peak  (cms)=        .16         .15
                                                         *TOTALS*
     PEAK FLOW       (cms)=        .51         .02          .534 (iii)
     TIME TO PEAK    (hrs)=       1.04        1.08         1.042
     RUNOFF VOLUME    (mm)=      70.09       35.46        67.324
     TOTAL RAINFALL   (mm)=      71.66       71.66        71.665
     RUNOFF COEFFICIENT   =        .98         .49          .939

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

-----------------------------------------------------------------------------
001:0006---------------------------------------------------------------------
*
* SUB-AREA No.3
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.40
| 03:030    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.36         .04
     Dep. Storage     (mm)=       1.57        4.67
     Average Slope     (%)=        .51        1.00
     Length            (m)=     225.63        5.00
     Mannings n          =        .030        .030

     Max.eff.Inten.(mm/hr)=     178.56       93.23
                over (min)        7.50        7.50
     Storage Coeff.   (min)=      6.67 (ii)   7.39 (ii)
     Unit Hyd. Tpeak (min)=       7.50        7.50
     Unit Hyd. peak  (cms)=        .16         .15
                                                         *TOTALS*
     PEAK FLOW       (cms)=        .50         .01          .509 (iii)
     TIME TO PEAK    (hrs)=       1.04        1.08         1.042
     RUNOFF VOLUME    (mm)=      70.09       35.46        69.056
     TOTAL RAINFALL   (mm)=      71.66       71.66        71.665
     RUNOFF COEFFICIENT   =        .98         .49          .964

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

-----------------------------------------------------------------------------
001:0007---------------------------------------------------------------------
--------------------
| ADD HYD (040   ) | ID: NHYD     AREA    QPEAK   TPEAK   R.V.    DWF
--------------------              (ha)    (cms)   (hrs)   (mm)   (cms)
                 ID1 01:010        2.07    .685    1.04  64.55    .000
                +ID2 02:020        1.54    .534    1.04  67.32    .000
                 =====================================================
                 SUM 04:040        3.61   1.220    1.04  65.74    .000

   NOTE:   PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
001:0008---------------------------------------------------------------------
--------------------
| ADD HYD (050   ) | ID: NHYD     AREA    QPEAK   TPEAK   R.V.    DWF
--------------------              (ha)    (cms)   (hrs)   (mm)   (cms)
                 ID1 03:030        1.40    .509    1.04  69.06    .000
                +ID2 04:040        3.61   1.220    1.04  65.74    .000
                 =====================================================
                 SUM 05:050        5.01   1.729    1.04  66.66    .000

   NOTE:   PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
001:0009---------------------------------------------------------------------
*
* SUB-AREA No.4
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .89
| 06:060    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .86         .03
     Dep. Storage     (mm)=       1.57        4.67
     Average Slope     (%)=        .93         .70
     Length            (m)=     164.82       40.00
     Mannings n          =        .030        .250

     Max.eff.Inten.(mm/hr)=     178.56       67.61
                over (min)        5.00       15.00
     Storage Coeff.   (min)=      4.62 (ii)  15.92 (ii)
     Unit Hyd. Tpeak (min)=       5.00       15.00
     Unit Hyd. peak  (cms)=        .24         .07
                                                         *TOTALS*
     PEAK FLOW       (cms)=        .37         .00          .374 (iii)
     TIME TO PEAK    (hrs)=       1.00        1.21         1.000
     RUNOFF VOLUME    (mm)=      70.09       35.46        69.056
     TOTAL RAINFALL   (mm)=      71.66       71.66        71.665
     RUNOFF COEFFICIENT   =        .98         .49          .964

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    Ia = Dep. Storage  (Above)
```

```

     Unit Hyd Qpeak  (cms)=     .252

     PEAK FLOW       (cms)=     .223 (i)
     TIME TO PEAK    (hrs)=    1.958
     RUNOFF VOLUME    (mm)=   30.490
     TOTAL RAINFALL   (mm)=   71.665
     RUNOFF COEFFICIENT   =     .425

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

---------------------------------------------------------------------------
001:0023-------------------------------------------------------------------
--------------------
| ADD HYD (0020  ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
--------------------              (ha)     (cms)   (hrs)   (mm)    (cms)
                  ID1 07:HIP06    67.56    10.299   1.13  58.18    .000
                 +ID2 10:A2        6.80      .497   1.42  30.49    .000
                 +ID3 01:A3        5.30      .223   1.96  30.49    .000
                  =================================================
                  SUM 02:0020     79.66    10.662   1.17  53.97    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---------------------------------------------------------------------------
001:0024-------------------------------------------------------------------
      FINISH
---------------------------------------------------------------------------
***************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2009-04-21     at 10:30:17
===========================================================================


```

```
2     Metric units
*#****************************************************************************
*#  Project Name : Hawthorne Industrial Park        Project Number:    [20983] *
*#  Date         : January, 2009                                              *
*#  Revised      : N/A                                                        *
*#  Developed by : Mark Buchanan, E.I.T.                                      *
*#  Reviewed by  : Guy Forget, P.Eng.                                         *
*#  Company      : J.L. Richards & Associates Limited                         *
*#  License #    : 4418403                                                    *
*#****************************************************************************
*
*
*#**************************************************************
*#  FILENAME:  V:\20983.DU\ENG\SWMHYMO\20983PST.DAT           *
*#  FILE DEVELOPED FOR SITE PLAN APPLICATION AND DETAILED DESIGN *
*#   OF A FACILITY ASSOCIATED WITH THE OTTAWA COMPOSTING SITE    *
*#**************************************************************
*
*****************************************************************************
*          SWMHYMO FILE DEVELOPED TO INVESTIGATE FLOOD FLOWS OF THE         *
*    PROPOSED COMPOSTING SITE UNDER POST-DEVELOPMENT UNCONTROLLED CONDITIONS   *
*****************************************************************************

******************************************************
* HYDROLOGICAL ANALYSIS UNDER A 4 HR-25 MM STORM AND  *
* FOR DESIGN STORMS OF 1:2, 5, 10, 25, 50, AND 100 YR *
******************************************************

**************************************************************
*         POST-DEVELOPMENT UNCONTROLLED CONDITIONS           *
**************************************************************

**************************************************************
*              CALCULATION OF 4 HR 25 MM STORM EVENT          *
**************************************************************

START               TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                   [  ] <--storm filename, one per line for NSTORM time
READ STORM          STORM_FILENAME=["4HR25-15.STM"]
*%-----------------|----------------------------------------------------------|
DEFAULT VALUES      ICASEdef=[1],  read and print values
                    DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%-----------------|----------------------------------------------------------|

***********************************
*            ORGAWORLD FILE        *
***********************************

* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                    XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                         LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|----------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                    XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                         LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|----------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                         LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|----------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%-----------------|----------------------------------------------------------|
ADD HYD             IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%-----------------|----------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                         LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                         LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|----------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD      ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                         LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|----------------------------------------------------------|
ADD HYD             IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%-----------------|----------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%-----------------|----------------------------------------------------------|

ROUTE RESERVOIR     IDout=[10],   NHYD=["POND"],  IDin=[9],
                    RDT=[1.0](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                    (cms) - (ha-m)
                                  [   0.000,  0.0000]
                                  [   0.008,  0.0656]
                                  [   0.017,  0.1311]
                                  [   0.093,  0.2831]
                                  [   0.233,  0.3971]
                                  [   0.337,  0.4731]
                                  [   0.465,  0.5491]
                                  [   0.531,  0.5871]
                                  [   0.593,  0.6251]
                                  [   0.654,  0.6631]
                                  [   0.797,  0.7391]
                                  [   0.950,  0.8274]
                                  [   1.304,  0.9157]
                                  [   1.880,  1.0040]
                                  [   2.577,  1.0923]
                                  [   -1   ,  -1    ]  (max twenty pts)

*********************************************
*     Remaining Hawthorne Industrial Park    *
*********************************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                         LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|----------------------------------------------------------|
ADD HYD             IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%-----------------|----------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                         LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|----------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[15.6](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                         LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|----------------------------------------------------------|
ADD HYD             IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%-----------------|----------------------------------------------------------|
ADD HYD             IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
*%-----------------|----------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[ 7 ], NHYD=["HIP07"], DT=[2.5](min), AREA=[12.2](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.7](%),
                                         LGI=[210](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1

*%-----------------|----------------------------------------------------------|
*
*SUB-AREA No.5

DESIGN NASHYD       ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                    DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|----------------------------------------------------------|


ADD HYD             IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
*%-----------------|----------------------------------------------------------|
*
*SUB-AREA No. 6
*
DESIGN NASHYD       ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[2.7](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.80]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|----------------------------------------------------------|

ADD HYD             IDsum=[2], NHYD=["Ultimate"], IDs to add=[9+1]
*%-----------------|----------------------------------------------------------|


************************************************************
*        CALCULATION OF 3HR - 1:2 YEAR STORM EVENT          *
************************************************************

START               TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                   [  ] <--storm filename, one per line for NSTORM time
*%-----------------|----------------------------------------------------------|
CHICAGO STORM       IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
                    ICASEcs=[1],
                    A=[732.951],  B=[6.199], and C=[0.810],
*%-----------------|----------------------------------------------------------|
DEFAULT VALUES      ICASEdef=[1],  read and print values
                    DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%-----------------|----------------------------------------------------------|

***********************************
*            ORGAWORLD FILE        *
***********************************

* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                    XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                         LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|----------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                    XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                         LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|----------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                         LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
```

```
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                         LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                         LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD      ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                         LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%-----------------|--------------------------------------------------------------|

ROUTE RESERVOIR     IDout=[10],   NHYD=["POND"],  IDin=[9],
                    RDT=[1.0](min),
                           TABLE of ( OUTFLOW-STORAGE ) values
                                         (cms) - (ha-m)
                                      [   0.000,  0.0000]
                                      [   0.008,  0.0656]
                                      [   0.017,  0.1311]
                                      [   0.093,  0.2831]
                                      [   0.233,  0.3971]
                                      [   0.337,  0.4731]
                                      [   0.465,  0.5491]
                                      [   0.531,  0.5871]
                                      [   0.593,  0.6251]
                                      [   0.654,  0.6631]
                                      [   0.797,  0.7391]
                                      [   0.950,  0.8274]
                                      [   1.304,  0.9157]
                                      [   1.880,  1.0040]
                                      [   2.577,  1.0923]
                                      [   -1   ,  -1    ]  (max twenty pts)

*********************************************
*     Remaining Hawthorne Industrial Park     *
*********************************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                         LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                         LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[15.6](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                         LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[ 7 ], NHYD=["HIP07"], DT=[2.5](min), AREA=[12.2](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.7](%),
                                         LGI=[210](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1

*%-----------------|--------------------------------------------------------------|
*
*SUB-AREA No.5

DESIGN NASHYD       ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                    DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|--------------------------------------------------------------|


ADD HYD             IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
*%-----------------|--------------------------------------------------------------|
*
*SUB-AREA No. 6
*
DESIGN NASHYD       ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[2.7](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.80]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|--------------------------------------------------------------|

ADD HYD             IDsum=[2], NHYD=["Ultimate"], IDs to add=[9+1]
*%-----------------|--------------------------------------------------------------|

*************************************************************
*        CALCULATION OF 3HR - 1:5 YEAR STORM EVENT          *
*************************************************************

START               TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                   [  ] <--storm filename, one per line for NSTORM time
*%-----------------|--------------------------------------------------------------|
CHICAGO STORM       IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
                    ICASEcs=[1],
                    A=[998.071],  B=[6.053], and C=[0.814],
*%-----------------|--------------------------------------------------------------|
DEFAULT VALUES      ICASEdef=[1],  read and print values
                    DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%-----------------|--------------------------------------------------------------|

*********************************
*         ORGAWORLD FILE        *
*********************************

* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                    XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                         LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                    XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                         LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                         LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                         LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                         LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD      ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                         LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%-----------------|--------------------------------------------------------------|

ROUTE RESERVOIR     IDout=[10],   NHYD=["POND"],  IDin=[9],
                    RDT=[1.0](min),
                           TABLE of ( OUTFLOW-STORAGE ) values
                                         (cms) - (ha-m)
                                      [   0.000,  0.0000]
                                      [   0.008,  0.0656]
                                      [   0.017,  0.1311]
                                      [   0.093,  0.2831]
                                      [   0.233,  0.3971]
                                      [   0.337,  0.4731]
                                      [   0.465,  0.5491]
                                      [   0.531,  0.5871]
                                      [   0.593,  0.6251]
                                      [   0.654,  0.6631]
                                      [   0.797,  0.7391]
                                      [   0.950,  0.8274]
                                      [   1.304,  0.9157]
                                      [   1.880,  1.0040]
                                      [   2.577,  1.0923]
                                      [   -1   ,  -1    ]  (max twenty pts)

*********************************************
*     Remaining Hawthorne Industrial Park     *
*********************************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                         LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
```

```
                                         LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[15.6](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                         LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[ 7 ], NHYD=["HIP07"], DT=[2.5](min), AREA=[12.2](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.7](%),
                                         LGI=[210](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1

*%-----------------|--------------------------------------------------------|
*
*SUB-AREA No.5

DESIGN NASHYD       ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                    DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|--------------------------------------------------------|


ADD HYD             IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
*%-----------------|--------------------------------------------------------|
*
*SUB-AREA No. 6
*
DESIGN NASHYD       ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[2.7](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.80]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|--------------------------------------------------------|

ADD HYD             IDsum=[2], NHYD=["Ultimate"], IDs to add=[9+1]
*%-----------------|--------------------------------------------------------|

*****************************************************************
*          CALCULATION OF 3HR - 1:10 YEAR STORM EVENT           *
*****************************************************************

START               TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                   [  ] <--storm filename, one per line for NSTORM time
*%-----------------|--------------------------------------------------------|
CHICAGO STORM       IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
                    ICASEcs=[1],
                    A=[1174.184],  B=[6.014], and C=[0.816],
*%-----------------|--------------------------------------------------------|
DEFAULT VALUES      ICASEdef=[1],  read and print values
                    DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%-----------------|--------------------------------------------------------|

***********************************
*          ORGAWORLD FILE         *
***********************************

* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                    XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                         LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                    XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                         LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                         LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                         LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                         LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD      ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                         LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%-----------------|--------------------------------------------------------|

ROUTE RESERVOIR     IDout=[10],   NHYD=["POND"],  IDin=[9],
                    RDT=[1.0](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                    (cms) - (ha-m)
                                  [   0.000,  0.0000]
                                  [   0.008,  0.0656]
                                  [   0.017,  0.1311]
                                  [   0.093,  0.2831]
                                  [   0.233,  0.3971]
                                  [   0.337,  0.4731]
                                  [   0.465,  0.5491]
                                  [   0.531,  0.5871]
                                  [   0.593,  0.6251]
                                  [   0.654,  0.6631]
                                  [   0.797,  0.7391]
                                  [   0.950,  0.8274]
                                  [   1.304,  0.9157]
                                  [   1.880,  1.0040]
                                  [   2.577,  1.0923]
                                  [   -1   ,  -1    ]  (max twenty pts)

*********************************************
*     Remaining Hawthorne Industrial Park     *
*********************************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                         LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                         LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[15.6](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                         LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[ 7 ], NHYD=["HIP07"], DT=[2.5](min), AREA=[12.2](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.7](%),
                                         LGI=[210](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1

*%-----------------|--------------------------------------------------------|
*
*SUB-AREA No.5

DESIGN NASHYD       ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                    DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|--------------------------------------------------------|


ADD HYD             IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
*%-----------------|--------------------------------------------------------|
*
*SUB-AREA No. 6
*
DESIGN NASHYD       ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[2.7](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.80]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|--------------------------------------------------------|

ADD HYD             IDsum=[2], NHYD=["Ultimate"], IDs to add=[9+1]
*%-----------------|--------------------------------------------------------|

*****************************************************************
*          CALCULATION OF 3HR - 1:25 YEAR STORM EVENT           *
*****************************************************************

START               TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                   [  ] <--storm filename, one per line for NSTORM time
*%-----------------|--------------------------------------------------------|
CHICAGO STORM       IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
                    ICASEcs=[1],
                    A=[1402.884],  B=[6.018], and C=[0.819],
*%-----------------|--------------------------------------------------------|
DEFAULT VALUES      ICASEdef=[1],  read and print values
                    DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%-----------------|--------------------------------------------------------|

***********************************
*          ORGAWORLD FILE         *
***********************************

* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                    XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                         LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
```

```
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD       ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                     XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                          LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD       ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                          LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------|
ADD HYD              IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%------------------|-------------------------------------------------------|
ADD HYD              IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%------------------|-------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD       ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                          LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                          LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD       ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                          LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------|
ADD HYD              IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%------------------|-------------------------------------------------------|
ADD HYD              IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%------------------|-------------------------------------------------------|

ROUTE RESERVOIR      IDout=[10],   NHYD=["POND"],  IDin=[9],
                     RDT=[1.0](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                     (cms) - (ha-m)
                                   [   0.000,  0.0000]
                                   [   0.008,  0.0656]
                                   [   0.017,  0.1311]
                                   [   0.093,  0.2831]
                                   [   0.233,  0.3971]
                                   [   0.337,  0.4731]
                                   [   0.465,  0.5491]
                                   [   0.531,  0.5871]
                                   [   0.593,  0.6251]
                                   [   0.654,  0.6631]
                                   [   0.797,  0.7391]
                                   [   0.950,  0.8274]
                                   [   1.304,  0.9157]
                                   [   1.880,  1.0040]
                                   [   2.577,  1.0923]
                                   [   -1   ,  -1    ]  (max twenty pts)

*********************************************
*     Remaining Hawthorne Industrial Park     *
*********************************************
*
* SUB-AREA No.1

CALIB STANDHYD       ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                          LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------|
ADD HYD              IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%------------------|-------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD       ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                          LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD       ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[15.6](ha),
                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                          LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------|
ADD HYD              IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%------------------|-------------------------------------------------------|
ADD HYD              IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
*%------------------|-------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD       ID=[ 7 ], NHYD=["HIP07"], DT=[2.5](min), AREA=[12.2](ha),
                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.7](%),
                                          LGI=[210](m), MNI=[0.03], SCI=[0.0](min
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1

*%------------------|-------------------------------------------------------|
*
*SUB-AREA No.5

DESIGN NASHYD        ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                     DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%------------------|-------------------------------------------------------|


ADD HYD              IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
*%------------------|-------------------------------------------------------|
*
*SUB-AREA No. 6
*
DESIGN NASHYD        ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[2.7](ha),
                     DWF=[0](cms), CNC=[76], TP=[0.80]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%------------------|-------------------------------------------------------|

ADD HYD              IDsum=[2], NHYD=["Ultimate"], IDs to add=[9+1]
*%------------------|-------------------------------------------------------|

****************************************************************
*         CALCULATION OF 3HR - 1:50 YEAR STORM EVENT           *
****************************************************************

START                TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                    [  ] <--storm filename, one per line for NSTORM time
*%------------------|-------------------------------------------------------|
CHICAGO STORM        IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
                     ICASEcs=[1],
                     A=[1569.580],  B=[6.014], and C=[0.820],
*%------------------|-------------------------------------------------------|
DEFAULT VALUES       ICASEdef=[1],  read and print values
                     DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%------------------|-------------------------------------------------------|

***********************************
*          ORGAWORLD FILE         *
***********************************

* SUB-AREA No.1

CALIB STANDHYD       ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                     XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                          LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                          LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD       ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                     XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                          LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD       ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                          LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------|
ADD HYD              IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%------------------|-------------------------------------------------------|
ADD HYD              IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%------------------|-------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD       ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                          LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                          LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD       ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                          LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------|
ADD HYD              IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%------------------|-------------------------------------------------------|
ADD HYD              IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%------------------|-------------------------------------------------------|

ROUTE RESERVOIR      IDout=[10],   NHYD=["POND"],  IDin=[9],
                     RDT=[1.0](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                     (cms) - (ha-m)
                                   [   0.000,  0.0000]
                                   [   0.008,  0.0656]
                                   [   0.017,  0.1311]
                                   [   0.093,  0.2831]
                                   [   0.233,  0.3971]
                                   [   0.337,  0.4731]
                                   [   0.465,  0.5491]
                                   [   0.531,  0.5871]
                                   [   0.593,  0.6251]
                                   [   0.654,  0.6631]
                                   [   0.797,  0.7391]
                                   [   0.950,  0.8274]
                                   [   1.304,  0.9157]
                                   [   1.880,  1.0040]
                                   [   2.577,  1.0923]
                                   [   -1   ,  -1    ]  (max twenty pts)

*********************************************
*     Remaining Hawthorne Industrial Park     *
```

```
*******************************************************
*
* SUB-AREA No.1

CALIB STANDHYD       ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                          LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------------|
ADD HYD              IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%------------------|-------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD       ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                          LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD       ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[15.6](ha),
                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                          LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------------|
ADD HYD              IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%------------------|-------------------------------------------------------------|
ADD HYD              IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
*%------------------|-------------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD       ID=[ 7 ], NHYD=["HIP07"], DT=[2.5](min), AREA=[12.2](ha),
                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.7](%),
                                          LGI=[210](m), MNI=[0.03], SCI=[0.0](min
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1

*%------------------|-------------------------------------------------------------|
*
*SUB-AREA No.5

DESIGN NASHYD        ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                     DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%------------------|-------------------------------------------------------------|


ADD HYD              IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
*%------------------|-------------------------------------------------------------|
*
*SUB-AREA No. 6
*
DESIGN NASHYD        ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[2.7](ha),
                     DWF=[0](cms), CNC=[76], TP=[0.80]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%------------------|-------------------------------------------------------------|

ADD HYD              IDsum=[2], NHYD=["Ultimate"], IDs to add=[9+1]
*%------------------|-------------------------------------------------------------|

****************************************************************
*        CALCULATION OF 3HR - 1:100 YEAR STORM EVENT           *
****************************************************************

START                TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                    [  ] <--storm filename, one per line for NSTORM time
*%------------------|-------------------------------------------------------------|
CHICAGO STORM        IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
                     ICASEcs=[1],
                     A=[1735.688],  B=[6.014], and C=[0.820],
*%------------------|-------------------------------------------------------------|
DEFAULT VALUES       ICASEdef=[1],  read and print values
                     DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%------------------|-------------------------------------------------------------|

************************************
*          ORGAWORLD FILE          *
************************************

* SUB-AREA No.1

CALIB STANDHYD       ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                     XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                          LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                          LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD       ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                     XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                          LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD       ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                          LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------------|
ADD HYD              IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%------------------|-------------------------------------------------------------|
ADD HYD              IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%------------------|-------------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD       ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                          LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                          LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD       ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                          LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------------|
ADD HYD              IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%------------------|-------------------------------------------------------------|
ADD HYD              IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%------------------|-------------------------------------------------------------|

ROUTE RESERVOIR      IDout=[10],   NHYD=["POND"],  IDin=[9],
                     RDT=[1.0](min),
                           TABLE of ( OUTFLOW-STORAGE ) values
                                       (cms) - (ha-m)
                                     [   0.000,  0.0000]
                                     [   0.008,  0.0656]
                                     [   0.017,  0.1311]
                                     [   0.093,  0.2831]
                                     [   0.233,  0.3971]
                                     [   0.337,  0.4731]
                                     [   0.465,  0.5491]
                                     [   0.531,  0.5871]
                                     [   0.593,  0.6251]
                                     [   0.654,  0.6631]
                                     [   0.797,  0.7391]
                                     [   0.950,  0.8274]
                                     [   1.304,  0.9157]
                                     [   1.880,  1.0040]
                                     [   2.577,  1.0923]
                                     [   -1   ,  -1    ]  (max twenty pts)

**********************************************
*     Remaining Hawthorne Industrial Park    *
**********************************************
*
* SUB-AREA No.1

CALIB STANDHYD       ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                          LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------------|
ADD HYD              IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%------------------|-------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD       ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                          LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD       ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[15.6](ha),
                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                          LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------------|
ADD HYD              IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%------------------|-------------------------------------------------------------|
ADD HYD              IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
*%------------------|-------------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD       ID=[ 7 ], NHYD=["HIP07"], DT=[2.5](min), AREA=[12.2](ha),
                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.7](%),
                                          LGI=[210](m), MNI=[0.03], SCI=[0.0](min
                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1

*%------------------|-------------------------------------------------------------|
*
*SUB-AREA No.5

DESIGN NASHYD        ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                     DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%------------------|-------------------------------------------------------------|


ADD HYD              IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
*%------------------|-------------------------------------------------------------|
*
*SUB-AREA No. 6
*
DESIGN NASHYD        ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[2.7](ha),
                     DWF=[0](cms), CNC=[76], TP=[0.80]hrs,
                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%------------------|-------------------------------------------------------------|

ADD HYD              IDsum=[2], NHYD=["Ultimate"], IDs to add=[9+1]
*%------------------|-------------------------------------------------------------|

FINISH


****1 600 mm culverts @ 84.5 + 2 600 mm culverts @ 85.25 10% Pond reduction*****
```

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

 SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999   999  =========
 S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9 9   9
 SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9 9   9 Ver. 4.02
     S   W W   M   M  H   H    Y    M   M  O   O       9999  9999 July 1999
 SSSSS   W W   M   M  H   H    Y    M   M   OOO           9     9 =========
                                                      9   9 9   9 # 4418403
      StormWater Management HYdrologic Model           999   999  =========

 **************************************************************************
 ********************* SWMHYMO-99 Ver/4.02 ********************************
 *******  A single event and continuous hydrologic simulation model *******
 *******     based on the principles of HYMO and its successors    *******
 *******                OTTHYMO-83 and OTTHYMO-89.                 *******
 **************************************************************************
 ******* Distributed by:  J.F. Sabourin and Associates Inc.         *******
 *******                 Ottawa,  Ontario: (613) 727-5199          *******
 *******                 Gatineau, Quebec: (819) 243-6858          *******
 *******                 E-Mail: swmhymo@jfsa.Com                  *******
 **************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++ Licensed user: J. L. Richards & Associates Limited         +++++++
 +++++++                   Ottawa                 SERIAL#:4418403   +++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 **************************************************************************
 *******             ++++++ PROGRAM ARRAY DIMENSIONS ++++++         *******
 *******             Maximum value for ID numbers  :     10        *******
 *******             Max. number of rainfall points:  15000        *******
 *******             Max. number of flow points    :  15000        *******
 **************************************************************************


 *********************  D E T A I L E D   O U T P U T  *******************
 **************************************************************************
 *        DATE: 2009-02-09      TIME: 14:59:31     RUN COUNTER: 000154     *
 **************************************************************************
 * Input   filename: V:\20983.DU\ENG\SWMHYMO\PSTPH2.dat                    *
 * Output  filename: V:\20983.DU\ENG\SWMHYMO\PSTPH2.out                    *
 * Summary filename: V:\20983.DU\ENG\SWMHYMO\PSTPH2.sum                    *
 * User  comments:                                                         *
 * 1:______________________________________________________________________*
 * 2:______________________________________________________________________*
 * 3:______________________________________________________________________*
 **************************************************************************

----------------------------------------------------------------------------
001:0001--------------------------------------------------------------------
*#****************************************************************************
*#  Project Name : Hawthorne Industrial Park        Project Number:   [20983] *
*#  Date         : January, 2009                                              *
*#  Revised      : N/A                                                        *
*#  Developed by : Mark Buchanan, E.I.T.                                      *
*#  Reviewed by  : Guy Forget, P.Eng.                                         *
*#  Company      : J.L. Richards & Associates Limited                         *
*#  License #    : 4418403                                                    *
*#****************************************************************************
*
*
*#*****************************************************************
*#  FILENAME:  V:\20983.DU\ENG\SWMHYMO\20983PST.DAT               *
*#  FILE DEVELOPED FOR SITE PLAN APPLICATION AND DETAILED DESIGN *
*#   OF A FACILITY ASSOCIATED WITH THE OTTAWA COMPOSTING SITE    *
*#*****************************************************************
*
******************************************************************************
*          SWMHYMO FILE DEVELOPED TO INVESTIGATE FLOOD FLOWS OF THE          *
*   PROPOSED COMPOSTING SITE UNDER POST-DEVELOPMENT UNCONTROLLED CONDITIONS   *
******************************************************************************
****************************************************
* HYDROLOGICAL ANALYSIS UNDER A 4 HR-25 MM STORM AND  *
* FOR DESIGN STORMS OF 1:2, 5, 10, 25, 50, AND 100 YR *
****************************************************
**********************************************************
*         POST-DEVELOPMENT UNCONTROLLED CONDITIONS        *
**********************************************************
**********************************************************
*             CALCULATION OF 4 HR 25 MM STORM EVENT       *
**********************************************************
-------------------
| START             |  Project  dir.: V:\20983.DU\ENG\SWMHYMO\
-------------------  Rainfall dir.: V:\20983.DU\ENG\SWMHYMO\
     TZERO =   .00 hrs on       0
     METOUT=   2 (output = METRIC)
     NRUN   = 001
     NSTORM=   0
----------------------------------------------------------------------------
001:0002--------------------------------------------------------------------
-------------------
| READ STORM        |    Filename: V:\20983.DU\ENG\SWMHYMO\4HR25-15.STM
| Ptotal=  25.00 mm|    Comments: 4hr-15 min 25 MM STORM EVENT (CHICAGO DI
-------------------
                     TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                      hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                      .25   1.777 |   1.25  45.631 |   2.25   3.138 |   3.25   1.675
                      .50   2.357 |   1.50  11.911 |   2.50   2.555 |   3.50   1.509
                      .75   3.618 |   1.75   6.051 |   2.75   2.165 |   3.75   1.376
                     1.00   8.975 |   2.00   4.108 |   3.00   1.885 |   4.00   1.266

----------------------------------------------------------------------------
001:0003--------------------------------------------------------------------
---------------------
| DEFAULT VALUES      |  Filename: V:\20983.DU\ENG\SWMHYMO\ORGA.VAL
---------------------  ICASEdv = 1 (read and print data)
       FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
                  ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
       Horton's infiltration equation parameters:
       [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
       Parameters for PERVIOUS surfaces in STANDHYD:
       [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
       Parameters for IMPERVIOUS surfaces in STANDHYD:
       [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
       Parameters used in NASHYD:
       [Ia=   4.67 mm] [N= 3.00]
----------------------------------------------------------------------------
001:0004--------------------------------------------------------------------
*********************************
*           ORGAWORLD FILE        *
*********************************
* SUB-AREA No.1
--------------------
| CALIB STANDHYD     |   Area    (ha)=    2.07
| 01:010 ,  DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
--------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        1.74          .33
     Dep. Storage      (mm)=        1.57         4.67
     Average Slope      (%)=         .52         1.00
     Length             (m)=      204.72        20.00
     Mannings n            =        .030         .250

     Max.eff.Inten.(mm/hr)=        45.63         5.37
                  over (min)        10.00        30.00
     Storage Coeff.  (min)=       10.80 (ii)   29.27 (ii)
     Unit Hyd. Tpeak (min)=       10.00        30.00
     Unit Hyd. peak  (cms)=         .11          .04
                                                            *TOTALS*
     PEAK FLOW        (cms)=         .16          .00          .158 (iii)
     TIME TO PEAK     (hrs)=        1.29         1.75         1.292
     RUNOFF VOLUME     (mm)=       23.43         5.17        20.508
     TOTAL RAINFALL    (mm)=       25.00        25.00        24.999
     RUNOFF COEFFICIENT   =          .94          .21          .820

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

----------------------------------------------------------------------------
001:0005--------------------------------------------------------------------
*
* SUB-AREA No.2
--------------------
| CALIB STANDHYD     |   Area    (ha)=    1.54
| 02:020    DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
--------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        1.42          .12
     Dep. Storage      (mm)=        1.57         4.67
     Average Slope      (%)=         .50         1.00
     Length             (m)=      244.34         5.00
     Mannings n            =        .030         .030

     Max.eff.Inten.(mm/hr)=        45.63         7.24
                  over (min)        12.50        15.00
     Storage Coeff.  (min)=       12.15 (ii)   14.15 (ii)
     Unit Hyd. Tpeak (min)=       12.50        15.00
     Unit Hyd. peak  (cms)=         .09          .08
                                                            *TOTALS*
     PEAK FLOW        (cms)=         .12          .00          .121 (iii)
     TIME TO PEAK     (hrs)=        1.33         1.46         1.333
     RUNOFF VOLUME     (mm)=       23.43         5.17        21.969
     TOTAL RAINFALL    (mm)=       25.00        25.00        24.999
     RUNOFF COEFFICIENT   =          .94          .21          .879

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

----------------------------------------------------------------------------
001:0006--------------------------------------------------------------------
*
* SUB-AREA No.3
--------------------
| CALIB STANDHYD     |   Area    (ha)=    1.40
| 03:030    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
--------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        1.36          .04
     Dep. Storage      (mm)=        1.57         4.67
     Average Slope      (%)=         .51         1.00
     Length             (m)=      225.63         5.00
     Mannings n            =        .030         .030

     Max.eff.Inten.(mm/hr)=        45.63         7.97
                  over (min)        12.50        12.50
     Storage Coeff.  (min)=       11.52 (ii)   13.44 (ii)
     Unit Hyd. Tpeak (min)=       12.50        12.50
     Unit Hyd. peak  (cms)=         .10          .09
                                                            *TOTALS*
     PEAK FLOW        (cms)=         .12          .00          .118 (iii)
     TIME TO PEAK     (hrs)=        1.33         1.42         1.333
     RUNOFF VOLUME     (mm)=       23.43         5.17        22.881
     TOTAL RAINFALL    (mm)=       25.00        25.00        24.999
     RUNOFF COEFFICIENT   =          .94          .21          .915

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

----------------------------------------------------------------------------
001:0007--------------------------------------------------------------------
------------------
| ADD HYD (040   ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
------------------                 (ha)     (cms)   (hrs)   (mm)    (cms)
                 ID1 01:010        2.07      .158    1.29  20.51     .000
                +ID2 02:020        1.54      .121    1.33  21.97     .000
                 ===================================================
                 SUM 04:040        3.61      .278    1.33  21.13     .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----------------------------------------------------------------------------
001:0008--------------------------------------------------------------------
------------------
| ADD HYD (050   ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
------------------                 (ha)     (cms)   (hrs)   (mm)    (cms)
                 ID1 03:030        1.40      .118    1.33  22.88     .000
                +ID2 04:040        3.61      .278    1.33  21.13     .000
                 ===================================================
                 SUM 05:050        5.01      .396    1.33  21.62     .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----------------------------------------------------------------------------
001:0009--------------------------------------------------------------------
*
* SUB-AREA No.4
--------------------
| CALIB STANDHYD     |   Area    (ha)=     .89
| 06:060    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
--------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=         .86          .03
     Dep. Storage      (mm)=        1.57         4.67
     Average Slope      (%)=         .93          .70
     Length             (m)=      164.82        40.00
     Mannings n            =        .030         .250

     Max.eff.Inten.(mm/hr)=        45.63         4.42
                  over (min)         7.50        42.50
     Storage Coeff.  (min)=        7.97 (ii)   41.62 (ii)
     Unit Hyd. Tpeak (min)=        7.50        42.50
     Unit Hyd. peak  (cms)=         .14          .03
                                                            *TOTALS*
     PEAK FLOW        (cms)=         .09          .00          .089 (iii)
     TIME TO PEAK     (hrs)=        1.25         2.00         1.250
     RUNOFF VOLUME     (mm)=       23.43         5.17        22.882
     TOTAL RAINFALL    (mm)=       25.00        25.00        24.999
     RUNOFF COEFFICIENT   =          .94          .21          .915

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 -----------------------------------------------------------------------------
 001:0010---------------------------------------------------------------------
 *
 * SUB-AREA No.5
 ---------------------
 | CALIB  STANDHYD     |   Area     (ha)=    2.66
 | 07:070    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
 ---------------------
                               IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=      2.58          .08
      Dep. Storage      (mm)=      1.57         4.67
      Average Slope      (%)=       .61         1.50
      Length             (m)=    207.25        20.00
      Mannings n           =       .030         .250

      Max.eff.Inten.(mm/hr)=      45.63         5.66
                 over (min)      10.00        27.50
      Storage Coeff.  (min)=     10.37 (ii)   26.38 (ii)
      Unit Hyd. Tpeak (min)=     10.00        27.50
      Unit Hyd. peak  (cms)=       .11          .04
                                                            *TOTALS*
      PEAK FLOW       (cms)=       .24          .00          .238 (iii)
      TIME TO PEAK    (hrs)=      1.29         1.67         1.292
      RUNOFF VOLUME    (mm)=     23.43         5.17        22.882
      TOTAL RAINFALL   (mm)=     25.00        25.00        24.999
      RUNOFF COEFFICIENT   =       .94          .21          .915

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 -----------------------------------------------------------------------------
 001:0011---------------------------------------------------------------------
 --------------------
 | ADD HYD (080    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
 --------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
                      ID1 06:060      .89      .089    1.25  22.88    .000
                     +ID2 07:070     2.66      .238    1.29  22.88    .000
                      ===============================================
                      SUM 08:080     3.55      .327    1.29  22.88    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 -----------------------------------------------------------------------------
 001:0012---------------------------------------------------------------------
 --------------------
 | ADD HYD (090    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
 --------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
                      ID1 05:050     5.01      .396    1.33  21.62    .000
                     +ID2 08:080     3.55      .327    1.29  22.88    .000
                      ===============================================
                      SUM 09:090     8.56      .716    1.29  22.14    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 -----------------------------------------------------------------------------
 001:0013---------------------------------------------------------------------
 ---------------------
 | ROUTE  RESERVOIR   |     Requested routing time step =  1.0 min.
 |   IN>09:(090    )  |
 | OUT<10:(POND   )  |     =========  OUTLFOW STORAGE TABLE  =========
 ---------------------     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                             (cms)     (ha.m.)   |   (cms)     (ha.m.)
                              .000  .0000E+00   |     .593  .6251E+00
                              .008  .6560E-01   |     .654  .6631E+00
                              .017  .1311E+00   |     .797  .7391E+00
                              .093  .2831E+00   |     .950  .8274E+00
                              .233  .3971E+00   |    1.304  .9157E+00
                              .337  .4731E+00   |    1.880  .1004E+01
                              .465  .5491E+00   |    2.577  .1092E+01
                              .531  .5871E+00   |     .000  .0000E+00

      ROUTING RESULTS              AREA     QPEAK     TPEAK        R.V.
      --------------------         (ha)     (cms)     (hrs)        (mm)
      INFLOW >09: (090    )        8.56      .716     1.292      22.143
      OUTFLOW<10: (POND   )        8.56      .032     3.875      22.141

                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=    4.470
                     TIME SHIFT OF PEAK FLOW          (min)=   155.00
                     MAXIMUM  STORAGE   USED       (ha.m.)=.1611E+00

 -----------------------------------------------------------------------------
 001:0014---------------------------------------------------------------------
 *******************************************
 *     Remaining Hawthorne Industrial Park     *
 *******************************************
 *
 * SUB-AREA No.1
 ---------------------
 | CALIB  STANDHYD     |   Area     (ha)=   19.90
 | 01:HIP01  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                               IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=     14.13         5.77
      Dep. Storage      (mm)=      1.57         4.67
      Average Slope      (%)=       .60         1.50
      Length             (m)=    580.00       100.00
      Mannings n           =       .030         .250

      Max.eff.Inten.(mm/hr)=      34.39        11.90
                 over (min)      22.50        52.50
      Storage Coeff.  (min)=     21.64 (ii)   52.88 (ii)
      Unit Hyd. Tpeak (min)=     22.50        52.50
      Unit Hyd. peak  (cms)=       .05          .02
                                                            *TOTALS*
      PEAK FLOW       (cms)=       .60          .11          .642 (iii)
      TIME TO PEAK    (hrs)=      1.50         2.13         1.542
      RUNOFF VOLUME    (mm)=     23.43         8.74        16.085
      TOTAL RAINFALL   (mm)=     25.00        25.00        24.999
      RUNOFF COEFFICIENT   =       .94          .35          .643

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 -----------------------------------------------------------------------------
 001:0015---------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP02 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
 --------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
                      ID1 10:POND     8.56      .032    3.88  22.14    .000
                     +ID2 01:HIP01   19.90      .642    1.54  16.08    .000
                      ===============================================
                      SUM 02:HIP02   28.46      .655    1.54  17.91    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

```
 -----------------------------------------------------------------------------
 001:0016---------------------------------------------------------------------
 *
 * SUB-AREA No.2
 ---------------------
 | CALIB STANDHYD      |   Area     (ha)=   17.00
 | 03:HIP03  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                               IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=     12.07         4.93
      Dep. Storage      (mm)=      1.57         4.67
      Average Slope      (%)=       .65         1.50
      Length             (m)=    450.00       100.00
      Mannings n           =       .030         .250

      Max.eff.Inten.(mm/hr)=      40.81        12.73
                 over (min)      17.50        47.50
      Storage Coeff.  (min)=     16.94 (ii)   47.35 (ii)
      Unit Hyd. Tpeak (min)=     17.50        47.50
      Unit Hyd. peak  (cms)=       .07          .02
                                                            *TOTALS*
      PEAK FLOW       (cms)=       .60          .10          .625 (iii)
      TIME TO PEAK    (hrs)=      1.42         2.00         1.458
      RUNOFF VOLUME    (mm)=     23.43         8.74        16.085
      TOTAL RAINFALL   (mm)=     25.00        25.00        24.999
      RUNOFF COEFFICIENT   =       .94          .35          .643

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 -----------------------------------------------------------------------------
 001:0017---------------------------------------------------------------------
 *
 * SUB-AREA No.3
 ---------------------
 | CALIB STANDHYD      |   Area     (ha)=   15.60
 | 04:HIP04  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                               IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=     11.08         4.52
      Dep. Storage      (mm)=      1.57         4.67
      Average Slope      (%)=       .50         1.50
      Length             (m)=    600.00       100.00
      Mannings n           =       .030         .250

      Max.eff.Inten.(mm/hr)=      34.39        11.54
                 over (min)      22.50        55.00
      Storage Coeff.  (min)=     23.33 (ii)   54.95 (ii)
      Unit Hyd. Tpeak (min)=     22.50        55.00
      Unit Hyd. peak  (cms)=       .05          .02
                                                            *TOTALS*
      PEAK FLOW       (cms)=       .45          .08          .484 (iii)
      TIME TO PEAK    (hrs)=      1.50         2.17         1.542
      RUNOFF VOLUME    (mm)=     23.43         8.74        16.085
      TOTAL RAINFALL   (mm)=     25.00        25.00        24.999
      RUNOFF COEFFICIENT   =       .94          .35          .643

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 -----------------------------------------------------------------------------
 001:0018---------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP05 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
 --------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
                      ID1 03:HIP03   17.00      .625    1.46  16.08    .000
                     +ID2 04:HIP04   15.60      .484    1.54  16.08    .000
                      ===============================================
                      SUM 05:HIP05   32.60     1.091    1.46  16.08    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 -----------------------------------------------------------------------------
 001:0019---------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP06 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
 --------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
                      ID1 05:HIP05   32.60     1.091    1.46  16.08    .000
                     +ID2 02:HIP02   28.46      .655    1.54  17.91    .000
                      ===============================================
                      SUM 06:HIP06   61.06     1.740    1.50  16.93    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 -----------------------------------------------------------------------------
 001:0020---------------------------------------------------------------------
 *
 * SUB-AREA No.4
 ---------------------
 | CALIB STANDHYD      |   Area     (ha)=   12.20
 | 07:HIP07  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                               IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=      8.66         3.54
      Dep. Storage      (mm)=      1.57         4.67
      Average Slope      (%)=       .70         1.50
      Length             (m)=    210.00       100.00
      Mannings n           =       .030         .250

      Max.eff.Inten.(mm/hr)=      45.63        14.15
                 over (min)      10.00        40.00
      Storage Coeff.  (min)=     10.03 (ii)   39.18 (ii)
      Unit Hyd. Tpeak (min)=     10.00        40.00
      Unit Hyd. peak  (cms)=       .11          .03
                                                            *TOTALS*
      PEAK FLOW       (cms)=       .57          .08          .585 (iii)
      TIME TO PEAK    (hrs)=      1.29         1.88         1.292
      RUNOFF VOLUME    (mm)=     23.43         8.74        16.085
      TOTAL RAINFALL   (mm)=     25.00        25.00        24.999
      RUNOFF COEFFICIENT   =       .94          .35          .643

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 -----------------------------------------------------------------------------
 001:0021---------------------------------------------------------------------
 *
 *SUB-AREA No.5
 ---------------------
 | DESIGN NASHYD       |   Area     (ha)=    4.00   Curve Number   (CN)=85.00
 | 08:Pond-B DT= 2.50 |   Ia        (mm)=   4.670   # of Linear Res.(N)= 3.00
 ---------------------   U.H. Tp(hrs)=    .170

      Unit Hyd Qpeak  (cms)=     .899

      PEAK FLOW       (cms)=     .077 (i)
```

```
00541>     TIME TO PEAK    (hrs)=    1.375
00542>     RUNOFF VOLUME    (mm)=    6.343
00543>     TOTAL RAINFALL   (mm)=   24.999
00544>     RUNOFF COEFFICIENT   =     .254
00545>
00546>     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00547>
00548> ---------------------------------------------------------------------------
00549> 001:0022-------------------------------------------------------------------
00550> ------------------
00551> | ADD HYD (HIP08 ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.    DWF
00552> ------------------                 (ha)     (cms)   (hrs)   (mm)   (cms)
00553>                ID1 06:HIP06      61.06     1.740    1.50  16.93    .000
00554>               +ID2 07:HIP07      12.20      .585    1.29  16.08    .000
00555>               +ID3 08:Pond-B      4.00      .077    1.38   6.34    .000
00556>                ==================================================
00557>                SUM 09:HIP08      77.26     2.227    1.46  16.25    .000
00558>
00559>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00560>
00561> ---------------------------------------------------------------------------
00562> 001:0023-------------------------------------------------------------------
00563> *
00564> *SUB-AREA No. 6
00565> *
00566> --------------------
00567> | DESIGN NASHYD      |   Area    (ha)=    2.70   Curve Number   (CN)=76.00
00568> | 01:A3     DT= 2.50 |   Ia      (mm)=   4.670   # of Linear Res.(N)= 3.00
00569> --------------------   U.H. Tp(hrs)=    .800
00570>
00571>     Uni t Hyd Qpeak  (cms)=     .129
00572>
00573>     PEAK FLOW        (cms)=     .013 (i)
00574>     TIME TO PEAK     (hrs)=    2.292
00575>     RUNOFF VOLUME     (mm)=    4.110
00576>     TOTAL RAINFALL    (mm)=   24.999
00577>     RUNOFF COEFFICIENT   =     .164
00578>
00579>     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00580>
00581> ---------------------------------------------------------------------------
00582> 001:0024 ------------------------------------------------------------------
00583> ------------------
00584> | ADD HYD (Ultima) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.    DWF
00585> ------------------                 (ha)     (cms)   (hrs)   (mm)   (cms)
00586>                ID1 09:HIP08      77.26     2.227    1.46  16.25    .000
00587>               +ID2 01:A3          2.70      .013    2.29   4.11    .000
00588>                ==================================================
00589>                SUM 02:Ultima     79.96     2.231    1.46  15.84    .000
00590>
00591>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00592>
00593> ---------------------------------------------------------------------------
00594> 001:0025 ------------------------------------------------------------------
00595> ******* ***********************************************************
00596> *         CALCULATION OF 3HR - 1:2 YEAR STORM EVENT               *
00597> ******* ***********************************************************
00598> ------------------
00599> | START              |  Project  dir.: V:\20983.DU\ENG\SWMHYMO\
00600> --------------------  Rainfall dir.: V:\20983.DU\ENG\SWMHYMO\
00601>    TZERO =   .00 hrs on        0
00602>    METOUT=   2 (output = METRIC)
00603>    NRUN   = 001
00604>    NSTORM=   0
00605> ---------------------------------------------------------------------------
00606> 001:0002-------------------------------------------------------------------
00607> ------------------
00608> | CHICAGO STORM    |    IDF curve parameters: A= 732.951
00609> | Ptotal= 31.86 mm |                          B=   6.199
00610> ------------------                           C=    .810
00611>                          used in:   INTENSITY =  A / (t + B)^C
00612>
00613>                          Duration of storm   =  3.00 hrs
00614>                          Storm time step     = 10.00 min
00615>                          Time to peak ratio =    .33
00616>
00617>                 TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00618>                  hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00619>                  .17   2.815 |   1.00  76.805 |   1.83   5.095 |   2.67   2.684
00620>                  .33   3.498 |   1.17  24.079 |   2.00   4.291 |   2.83   2.463
00621>                  .50   4.687 |   1.33  12.364 |   2.17   3.718 |   3.00   2.279
00622>                  .67   7.305 |   1.50   8.324 |   2.33   3.288 |
00623>                  .83  18.209 |   1.67   6.303 |   2.50   2.953 |
00624>
00625> ---------------------------------------------------------------------------
00626> 001:0003-------------------------------------------------------------------
00627> --------------------
00628> | DEFAULT VALUES      |   Filename: V:\20983.DU\ENG\SWMHYMO\ORGA.VAL
00629> --------------------   ICASEdv = 1 (read and print data)
00630>      FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
00631>                 ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
00632>      Horton's infiltration equation parameters:
00633>      [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
00634>      Parameters for PERVIOUS surfaces in STANDHYD:
00635>      [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
00636>      Parameters for IMPERVIOUS surfaces in STANDHYD:
00637>      [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
00638>      Parameters used in NASHYD:
00639>      [Ia=   4.67 mm] [N= 3.00]
00640> ---------------------------------------------------------------------------
00641> 001:0004-------------------------------------------------------------------
00642> ********************************
00643> *          ORGAWORLD FILE          *
00644> ********************************
00645> * SUB-AREA No.1
00646> --------------------
00647> | CALIB STANDHYD      |   Area    (ha)=    2.07
00648> | 01:010     DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
00649> --------------------
00650>                               IMPERVIOUS    PERVIOUS (i)
00651>      Surface Area      (ha)=      1.74          .33
00652>      Dep. Storage      (mm)=      1.57         4.67
00653>      Average Slope      (%)=       .52         1.00
00654>      Length             (m)=    204.72        20.00
00655>      Mannings n            =      .030         .250
00656>
00657>      Max.eff.Inten.(mm/hr)=      76.81        11.88
00658>                over (min)       10.00        22.50
00659>      Storage Coeff.  (min)=      8.77 (ii)   22.21 (ii)
00660>      Unit Hyd. Tpeak (min)=     10.00        22.50
00661>      Unit Hyd. peak  (cms)=       .12          .05
00662>                                                          *TOTALS*
00663>      PEAK FLOW        (cms)=       .24          .01          .245 (iii)
00664>      TIME TO PEAK     (hrs)=      1.08         1.38         1.083
00665>      RUNOFF VOLUME     (mm)=     30.29         8.52        26.807
00666>      TOTAL RAINFALL    (mm)=     31.86        31.86        31.860
00667>      RUNOFF COEFFICIENT   =       .95          .27          .841
00668>
00669>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00670>            CN* =  81.0     Ia = Dep. Storage  (Above)
00671>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00672>            THAN THE STORAGE COEFFICIENT.
00673>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00674>
00675> ---------------------------------------------------------------------------
00676> 001:0005-------------------------------------------------------------------
00677> *
00678> * SUB-AREA No.2
00679> --------------------
00680> | CALIB STANDHYD      |   Area    (ha)=    1.54
00681> | 02:020     DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
00682> --------------------
00683>                               IMPERVIOUS    PERVIOUS (i)
00684>      Surface Area      (ha)=      1.42          .12
00685>      Dep. Storage      (mm)=      1.57         4.67
00686>      Average Slope      (%)=       .50         1.00
00687>      Length             (m)=    244.34         5.00
00688>      Mannings n            =      .030         .030
00689>
00690>      Max.eff.Inten.(mm/hr)=      76.81        15.07
00691>                over (min)       10.00        12.50
00692>      Storage Coeff.  (min)=      9.87 (ii)   11.36 (ii)
00693>      Unit Hyd. Tpeak (min)=     10.00        12.50
00694>      Unit Hyd. peak  (cms)=       .11          .10
00695>                                                          *TOTALS*
00696>      PEAK FLOW        (cms)=       .19          .00          .192 (iii)
00697>      TIME TO PEAK     (hrs)=      1.08         1.17         1.083
00698>      RUNOFF VOLUME     (mm)=     30.29         8.52        28.548
00699>      TOTAL RAINFALL    (mm)=     31.86        31.86        31.860
00700>      RUNOFF COEFFICIENT   =       .95          .27          .896
00701>
00702>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00703>            CN* =  81.0     Ia = Dep. Storage  (Above)
00704>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00705>            THAN THE STORAGE COEFFICIENT.
00706>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00707>
00708> ---------------------------------------------------------------------------
00709> 001:0006-------------------------------------------------------------------
00710> *
00711> * SUB-AREA No.3
00712> --------------------
00713> | CALIB STANDHYD      |   Area    (ha)=    1.40
00714> | 03:030     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
00715> --------------------
00716>                               IMPERVIOUS    PERVIOUS (i)
00717>      Surface Area      (ha)=      1.36          .04
00718>      Dep. Storage      (mm)=      1.57         4.67
00719>      Average Slope      (%)=       .51         1.00
00720>      Length             (m)=    225.63         5.00
00721>      Mannings n            =      .030         .030
00722>
00723>      Max.eff.Inten.(mm/hr)=      76.81        16.59
00724>                over (min)       10.00        10.00
00725>      Storage Coeff.  (min)=      9.35 (ii)   10.79 (ii)
00726>      Unit Hyd. Tpeak (min)=     10.00        10.00
00727>      Unit Hyd. peak  (cms)=       .12          .11
00728>                                                          *TOTALS*
00729>      PEAK FLOW        (cms)=       .18          .00          .186 (iii)
00730>      TIME TO PEAK     (hrs)=      1.08         1.13         1.083
00731>      RUNOFF VOLUME     (mm)=     30.29         8.52        29.637
00732>      TOTAL RAINFALL    (mm)=     31.86        31.86        31.860
00733>      RUNOFF COEFFICIENT   =       .95          .27          .930
00734>
00735>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00736>            CN* =  81.0     Ia = Dep. Storage  (Above)
00737>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00738>            THAN THE STORAGE COEFFICIENT.
00739>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00740>
00741> ---------------------------------------------------------------------------
00742> 001:0007-------------------------------------------------------------------
00743> ------------------
00744> | ADD HYD (040    ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.    DWF
00745> ------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00746>                 ID1 01:010         2.07      .245    1.08  26.81    .000
00747>                +ID2 02:020         1.54      .192    1.08  28.55    .000
00748>                 ==================================================
00749>                 SUM 04:040         3.61      .436    1.08  27.55    .000
00750>
00751>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00752>
00753> ---------------------------------------------------------------------------
00754> 001:0008-------------------------------------------------------------------
00755> ------------------
00756> | ADD HYD (050    ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.    DWF
00757> ------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
00758>                 ID1 03:030         1.40      .186    1.08  29.64    .000
00759>                +ID2 04:040         3.61      .436    1.08  27.55    .000
00760>                 ==================================================
00761>                 SUM 05:050         5.01      .623    1.08  28.13    .000
00762>
00763>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00764>
00765> ---------------------------------------------------------------------------
00766> 001:0009-------------------------------------------------------------------
00767> *
00768> * SUB-AREA No.4
00769> --------------------
00770> | CALIB STANDHYD      |   Area    (ha)=     .89
00771> | 06:060     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
00772> --------------------
00773>                               IMPERVIOUS    PERVIOUS (i)
00774>      Surface Area      (ha)=       .86          .03
00775>      Dep. Storage      (mm)=      1.57         4.67
00776>      Average Slope      (%)=       .93          .70
00777>      Length             (m)=    164.82        40.00
00778>      Mannings n            =      .030         .250
00779>
00780>      Max.eff.Inten.(mm/hr)=      76.81        10.24
00781>                over (min)        7.50        30.00
00782>      Storage Coeff.  (min)=      6.47 (ii)   30.53 (ii)
00783>      Unit Hyd. Tpeak (min)=      7.50        30.00
00784>      Unit Hyd. peak  (cms)=       .16          .04
00785>                                                          *TOTALS*
00786>      PEAK FLOW        (cms)=       .14          .00          .139 (iii)
00787>      TIME TO PEAK     (hrs)=      1.04         1.54         1.042
00788>      RUNOFF VOLUME     (mm)=     30.29         8.52        29.637
00789>      TOTAL RAINFALL    (mm)=     31.86        31.86        31.860
00790>      RUNOFF COEFFICIENT   =       .95          .27          .930
00791>
00792>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00793>            CN* =  81.0     Ia = Dep. Storage  (Above)
00794>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00795>            THAN THE STORAGE COEFFICIENT.
00796>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00797>
00798> ---------------------------------------------------------------------------
00799> 001:0010-------------------------------------------------------------------
00800> *
00801> * SUB-AREA No.5
00802> --------------------
00803> | CALIB STANDHYD      |   Area    (ha)=    2.66
00804> | 07:070     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
00805> --------------------
00806>                               IMPERVIOUS    PERVIOUS (i)
00807>      Surface Area      (ha)=      2.58          .08
00808>      Dep. Storage      (mm)=      1.57         4.67
00809>      Average Slope      (%)=       .61         1.50
00810>      Length             (m)=    207.25        20.00
```

```
     Mannings n             =       .030         .250

     Max.eff.Inten.(mm/hr)=       76.81         12.71
                over (min)         7.50         20.00
     Storage Coeff.  (min)=        8.42 (ii)    20.00 (ii)
     Unit Hyd. Tpeak (min)=        7.50         20.00
     Unit Hyd. peak  (cms)=         .14           .06
                                                           *TOTALS*
     PEAK FLOW       (cms)=         .38           .00        .379 (iii)
     TIME TO PEAK    (hrs)=        1.04          1.33       1.042
     RUNOFF VOLUME    (mm)=       30.29          8.52      29.637
     TOTAL RAINFALL   (mm)=       31.86         31.86      31.860
     RUNOFF COEFFICIENT   =         .95           .27        .930

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

-------------------------------------------------------------------------------
001:0011-----------------------------------------------------------------------
---------------------
| ADD HYD (080   ) | ID: NHYD       AREA     QPEAK   TPEAK   R.V.     DWF
---------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
                   ID1 06:060          .89     .139    1.04  29.64    .000
                  +ID2 07:070         2.66     .379    1.04  29.64    .000
                   =======================================================
                   SUM 08:080         3.55     .518    1.04  29.64    .000

  NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0012-----------------------------------------------------------------------
---------------------
| ADD HYD (090   ) | ID: NHYD       AREA     QPEAK   TPEAK   R.V.     DWF
---------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
                   ID1 05:050         5.01     .623    1.08  28.13    .000
                  +ID2 08:080         3.55     .518    1.04  29.64    .000
                   =======================================================
                   SUM 09:090         8.56    1.118    1.08  28.76    .000

  NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0013-----------------------------------------------------------------------
---------------------
| ROUTE  RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>09:(090    )   |
| OUT<10:(POND   )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
                             .000 .0000E+00    |     .593 .6251E+00
                             .008 .6560E-01    |     .654 .6631E+00
                             .017 .1311E+00    |     .797 .7391E+00
                             .093 .2831E+00    |     .950 .8274E+00
                             .233 .3971E+00    |    1.304 .9157E+00
                             .337 .4731E+00    |    1.880 .1004E+01
                             .465 .5491E+00    |    2.577 .1092E+01
                             .531 .5871E+00    |     .000 .0000E+00

     ROUTING RESULTS              AREA     QPEAK     TPEAK          R.V.
     -------------------          (ha)     (cms)     (hrs)          (mm)
     INFLOW >09: (090    )        8.56     1.118     1.083        28.757
     OUTFLOW<10: (POND   )        8.56      .056     3.000        28.754

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    5.030
                    TIME SHIFT OF PEAK FLOW         (min)=  115.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.2095E+00

-------------------------------------------------------------------------------
001:0014-----------------------------------------------------------------------
**************************************************
*     Remaining Hawthorne Industrial Park        *
**************************************************
*
* SUB-AREA No.1
---------------------
| CALIB STANDHYD     |   Area     (ha)=   19.90
| 01:HIP01  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
---------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      14.13         5.77
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=        .60         1.50
     Length            (m)=     580.00       100.00
     Mannings n           =       .030         .250

     Max.eff.Inten.(mm/hr)=      54.21        23.06
                over (min)       17.50        42.50
     Storage Coeff.  (min)=      18.04 (ii)   42.02 (ii)
     Unit Hyd. Tpeak (min)=      17.50        42.50
     Unit Hyd. peak  (cms)=        .06          .03
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .95          .21        1.020 (iii)
     TIME TO PEAK    (hrs)=       1.21         1.71        1.250
     RUNOFF VOLUME    (mm)=      30.29        13.34       21.814
     TOTAL RAINFALL   (mm)=      31.86        31.86       31.860
     RUNOFF COEFFICIENT   =        .95          .42         .685

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

-------------------------------------------------------------------------------
001:0015-----------------------------------------------------------------------
---------------------
| ADD HYD (HIP02 ) | ID: NHYD       AREA     QPEAK   TPEAK   R.V.     DWF
---------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
                   ID1 10:POND         8.56     .056    3.00  28.75    .000
                  +ID2 01:HIP01       19.90    1.020    1.25  21.81    .000
                   =======================================================
                   SUM 02:HIP02       28.46    1.039    1.25  23.90    .000

  NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0016-----------------------------------------------------------------------
*
* SUB-AREA No.2
---------------------
| CALIB STANDHYD     |   Area     (ha)=   17.00
| 03:HIP03  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
---------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      12.07         4.93
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=        .65         1.50
     Length            (m)=     450.00       100.00
     Mannings n           =       .030         .250

     Max.eff.Inten.(mm/hr)=      59.23        25.04
                over (min)       15.00        37.50
```

```
     Storage Coeff.  (min)=      14.60 (ii)   37.80 (ii)
     Unit Hyd. Tpeak (min)=      15.00        37.50
     Unit Hyd. peak  (cms)=        .08          .03
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .91          .19         .978 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.63        1.167
     RUNOFF VOLUME    (mm)=      30.29        13.34       21.814
     TOTAL RAINFALL   (mm)=      31.86        31.86       31.860
     RUNOFF COEFFICIENT   =        .95          .42         .685

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

-------------------------------------------------------------------------------
001:0017-----------------------------------------------------------------------
*
* SUB-AREA No.3
---------------------
| CALIB STANDHYD     |   Area     (ha)=   15.60
| 04:HIP04  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
---------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      11.08         4.52
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=        .50         1.50
     Length            (m)=     600.00       100.00
     Mannings n           =       .030         .250

     Max.eff.Inten.(mm/hr)=      50.44        22.17
                over (min)       20.00        45.00
     Storage Coeff.  (min)=      20.01 (ii)   44.37 (ii)
     Unit Hyd. Tpeak (min)=      20.00        45.00
     Unit Hyd. peak  (cms)=        .06          .03
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .69          .16         .753 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.79        1.292
     RUNOFF VOLUME    (mm)=      30.29        13.34       21.814
     TOTAL RAINFALL   (mm)=      31.86        31.86       31.860
     RUNOFF COEFFICIENT   =        .95          .42         .685

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

-------------------------------------------------------------------------------
001:0018-----------------------------------------------------------------------
---------------------
| ADD HYD (HIP05 ) | ID: NHYD       AREA     QPEAK   TPEAK   R.V.     DWF
---------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
                   ID1 03:HIP03       17.00     .978    1.17  21.81    .000
                  +ID2 04:HIP04       15.60     .753    1.29  21.81    .000
                   =======================================================
                   SUM 05:HIP05       32.60    1.698    1.21  21.81    .000

  NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0019-----------------------------------------------------------------------
---------------------
| ADD HYD (HIP06 ) | ID: NHYD       AREA     QPEAK   TPEAK   R.V.     DWF
---------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
                   ID1 05:HIP05       32.60    1.698    1.21  21.81    .000
                  +ID2 02:HIP02       28.46    1.039    1.25  23.90    .000
                   =======================================================
                   SUM 06:HIP06       61.06    2.733    1.21  22.79    .000

  NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0020-----------------------------------------------------------------------
*
* SUB-AREA No.4
---------------------
| CALIB STANDHYD     |   Area     (ha)=   12.20
| 07:HIP07  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
---------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.66         3.54
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=        .70         1.50
     Length            (m)=     210.00       100.00
     Mannings n           =       .030         .250

     Max.eff.Inten.(mm/hr)=      76.81        29.02
                over (min)        7.50        30.00
     Storage Coeff.  (min)=       8.15 (ii)   30.01 (ii)
     Unit Hyd. Tpeak (min)=       7.50        30.00
     Unit Hyd. peak  (cms)=        .14          .04
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .91          .16         .941 (iii)
     TIME TO PEAK    (hrs)=       1.04         1.50        1.042
     RUNOFF VOLUME    (mm)=      30.29        13.34       21.814
     TOTAL RAINFALL   (mm)=      31.86        31.86       31.860
     RUNOFF COEFFICIENT   =        .95          .42         .685

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

-------------------------------------------------------------------------------
001:0021-----------------------------------------------------------------------
*
*SUB-AREA No.5
---------------------
| DESIGN NASHYD      |   Area     (ha)=    4.00   Curve Number   (CN)=85.00
| 08:Pond-B DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
---------------------    U.H. Tp(hrs)=     .170

     Unit Hyd Qpeak  (cms)=      .899

     PEAK FLOW       (cms)=      .145 (i)
     TIME TO PEAK    (hrs)=     1.167
     RUNOFF VOLUME    (mm)=    10.266
     TOTAL RAINFALL   (mm)=    31.860
     RUNOFF COEFFICIENT   =      .322

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

-------------------------------------------------------------------------------
001:0022-----------------------------------------------------------------------
---------------------
| ADD HYD (HIP08 ) | ID: NHYD       AREA     QPEAK   TPEAK   R.V.     DWF
---------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
                   ID1 06:HIP06       61.06    2.733    1.21  22.79    .000
                  +ID2 07:HIP07       12.20     .941    1.04  21.81    .000
                  +ID3 08:Pond-B       4.00     .145    1.17  10.27    .000
                   =======================================================
                   SUM 09:HIP08       77.26    3.542    1.21  21.98    .000
```

```

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----------------------------------------------------------------------------
001:0023--------------------------------------------------------------------
*
*SUB-AREA No. 6
*
----------------------
| DESIGN NASHYD      |   Area     (ha)=    2.70   Curve Number    (CN)=76.00
| 01:A3     DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=     .800

    Unit Hyd Qpeak  (cms)=      .129

    PEAK FLOW        (cms)=      .024 (i)
    TIME TO PEAK     (hrs)=     2.083
    RUNOFF VOLUME     (mm)=     6.883
    TOTAL RAINFALL    (mm)=    31.860
    RUNOFF COEFFICIENT   =      .216

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

----------------------------------------------------------------------------
001:0024 -------------------------------------------------------------------
--------------------
| ADD HYD (Ultima) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.    DWF
--------------------                (ha)      (cms)    (hrs)   (mm)   (cms)
                ID1 09:HIP08      77.26     3.542     1.21  21.98    .000
               +ID2 01:A3          2.70      .024     2.08   6.88    .000
                ==================================================
                SUM 02:Ultima     79.96     3.548     1.21  21.47    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----------------------------------------------------------------------------
001:0025 -------------------------------------------------------------------
*******************************************************************
*          CALCULATION OF 3HR - 1:5 YEAR STORM EVENT              *
*******************************************************************
--------------------
| START              |  Project  dir.: V:\20983.DU\ENG\SWMHYMO\
--------------------   Rainfall dir.: V:\20983.DU\ENG\SWMHYMO\
   TZERO =   .00 hrs on        0
   METOUT=   2 (output = METRIC)
   NRUN   = 001
   NSTORM=   0
----------------------------------------------------------------------------
001:0002--------------------------------------------------------------------
--------------------
| CHICAGO STORM     |     IDF curve parameters: A= 998.071
| Ptotal= 42.51 mm  |                           B=   6.053
--------------------                            C=    .814
                          used in:   INTENSITY =  A / (t + B)^C

                          Duration of storm  =  3.00 hrs
                          Storm time step    = 10.00 min
                          Time to peak ratio =   .33

               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                .17   3.682 |   1.00 104.193 |   1.83   6.689 |   2.67   3.510
                .33   4.582 |   1.17  32.037 |   2.00   5.628 |   2.83   3.220
                .50   6.151 |   1.33  16.337 |   2.17   4.872 |   3.00   2.978
                .67   9.614 |   1.50  10.965 |   2.33   4.305 |
                .83  24.170 |   1.67   8.287 |   2.50   3.864 |

----------------------------------------------------------------------------
001:0003--------------------------------------------------------------------
----------------------
| DEFAULT VALUES      |   Filename: V:\20983.DU\ENG\SWMHYMO\ORGA.VAL
----------------------   ICASEdv = 1 (read and print data)
     FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
                ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
     Horton's infiltration equation parameters:
     [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
     Parameters for PERVIOUS surfaces in STANDHYD:
     [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
     Parameters for IMPERVIOUS surfaces in STANDHYD:
     [IAimp=   1.57 mm] [CLI= 1.50]    [MNI= .035]
     Parameters used in NASHYD:
     [Ia=   4.67 mm] [N= 3.00]
----------------------------------------------------------------------------
001:0004--------------------------------------------------------------------
*********************************
*          ORGAWORLD FILE       *
*********************************
* SUB-AREA No.1
----------------------
| CALIB  STANDHYD     |   Area     (ha)=    2.07
| 01:010      DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
----------------------
                                  IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=         1.74           .33
     Dep. Storage      (mm)=         1.57          4.67
     Average Slope      (%)=          .52          1.00
     Length             (m)=       204.72         20.00
     Mannings n           =          .030          .250

     Max.eff.Inten.(mm/hr)=       104.19         24.26
                over (min)          7.50         17.50
     Storage Coeff.  (min)=         7.76 (ii)    17.86 (ii)
     Unit Hyd. Tpeak (min)=         7.50         17.50
     Unit Hyd. peak  (cms)=          .15           .06
                                                              *TOTALS*
     PEAK FLOW       (cms)=          .36           .01           .362 (iii)
     TIME TO PEAK    (hrs)=         1.04          1.25          1.042
     RUNOFF VOLUME    (mm)=        40.94         14.70         36.745
     TOTAL RAINFALL   (mm)=        42.51         42.51         42.514
     RUNOFF COEFFICIENT   =          .96           .35           .864

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0     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.

----------------------------------------------------------------------------
001:0005--------------------------------------------------------------------
*
* SUB-AREA No.2 .
----------------------
| CALIB  STANDHYD     |   Area     (ha)=    1.54
| 02:020      DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
----------------------
                                  IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=         1.42           .12
     Dep. Storage      (mm)=         1.57          4.67
     Average Slope      (%)=          .50          1.00
     Length             (m)=       244.34          5.00
     Mannings n           =          .030          .030

     Max.eff.Inten.(mm/hr)=       104.19         31.02
                over (min)          7.50         10.00
     Storage Coeff.  (min)=         8.73 (ii)     9.85 (ii)
     Unit Hyd. Tpeak (min)=         7.50         10.00
     Unit Hyd. peak  (cms)=          .14           .11
                                                              *TOTALS*
     PEAK FLOW       (cms)=          .28           .01           .283 (iii)
     TIME TO PEAK    (hrs)=         1.04          1.13          1.042
     RUNOFF VOLUME    (mm)=        40.94         14.70         38.845
     TOTAL RAINFALL   (mm)=        42.51         42.51         42.514
     RUNOFF COEFFICIENT   =          .96           .35           .914

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0     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.

----------------------------------------------------------------------------
001:0006--------------------------------------------------------------------
*
* SUB-AREA No.3
----------------------
| CALIB STANDHYD      |   Area     (ha)=    1.40
| 03:030     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
----------------------
                                  IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=         1.36           .04
     Dep. Storage      (mm)=         1.57          4.67
     Average Slope      (%)=          .51          1.00
     Length             (m)=       225.63          5.00
     Mannings n           =          .030          .030

     Max.eff.Inten.(mm/hr)=       104.19         31.02
                over (min)          7.50         10.00
     Storage Coeff.  (min)=         8.28 (ii)     9.39 (ii)
     Unit Hyd. Tpeak (min)=         7.50         10.00
     Unit Hyd. peak  (cms)=          .14           .12
                                                              *TOTALS*
     PEAK FLOW       (cms)=          .27           .00           .274 (iii)
     TIME TO PEAK    (hrs)=         1.04          1.13          1.042
     RUNOFF VOLUME    (mm)=        40.94         14.70         40.157
     TOTAL RAINFALL   (mm)=        42.51         42.51         42.514
     RUNOFF COEFFICIENT   =          .96           .35           .945

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0     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.

----------------------------------------------------------------------------
001:0007--------------------------------------------------------------------
--------------------
| ADD HYD (040    ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.    DWF
--------------------                (ha)      (cms)    (hrs)   (mm)   (cms)
                ID1 01:010         2.07      .362     1.04  36.75    .000
               +ID2 02:020         1.54      .283     1.04  38.84    .000
                ==================================================
                SUM 04:040         3.61      .645     1.04  37.64    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----------------------------------------------------------------------------
001:0008--------------------------------------------------------------------
--------------------
| ADD HYD (050    ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.    DWF
--------------------                (ha)      (cms)    (hrs)   (mm)   (cms)
                ID1 03:030         1.40      .274     1.04  40.16    .000
               +ID2 04:040         3.61      .645     1.04  37.64    .000
                ==================================================
                SUM 05:050         5.01      .918     1.04  38.34    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----------------------------------------------------------------------------
001:0009--------------------------------------------------------------------
*
* SUB-AREA No.4
----------------------
| CALIB STANDHYD      |   Area     (ha)=     .89
| 06:060     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
----------------------
                                  IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=          .86           .03
     Dep. Storage      (mm)=         1.57          4.67
     Average Slope      (%)=          .93           .70
     Length             (m)=       164.82         40.00
     Mannings n           =          .030          .250

     Max.eff.Inten.(mm/hr)=       104.19         20.32
                over (min)          5.00         25.00
     Storage Coeff.  (min)=         5.72 (ii)    24.02 (ii)
     Unit Hyd. Tpeak (min)=         5.00         25.00
     Unit Hyd. peak  (cms)=          .20           .05
                                                              *TOTALS*
     PEAK FLOW       (cms)=          .20           .00           .205 (iii)
     TIME TO PEAK    (hrs)=         1.00          1.38          1.000
     RUNOFF VOLUME    (mm)=        40.94         14.70         40.157
     TOTAL RAINFALL   (mm)=        42.51         42.51         42.514
     RUNOFF COEFFICIENT   =          .96           .35           .945

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0     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.

----------------------------------------------------------------------------
001:0010--------------------------------------------------------------------
*
* SUB-AREA No.5
----------------------
| CALIB STANDHYD      |   Area     (ha)=    2.66
| 07:070     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
----------------------
                                  IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=         2.58           .08
     Dep. Storage      (mm)=         1.57          4.67
     Average Slope      (%)=          .61          1.50
     Length             (m)=       207.25         20.00
     Mannings n           =          .030          .250

     Max.eff.Inten.(mm/hr)=       104.19         24.26
                over (min)          7.50         17.50
     Storage Coeff.  (min)=         7.45 (ii)    16.40 (ii)
     Unit Hyd. Tpeak (min)=         7.50         17.50
     Unit Hyd. peak  (cms)=          .15           .07
                                                              *TOTALS*
     PEAK FLOW       (cms)=          .54           .00           .538 (iii)
     TIME TO PEAK    (hrs)=         1.04          1.25          1.042
     RUNOFF VOLUME    (mm)=        40.94         14.70         40.157
     TOTAL RAINFALL   (mm)=        42.51         42.51         42.514
     RUNOFF COEFFICIENT   =          .96           .35           .945

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0     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.

----------------------------------------------------------------------------
001:0011--------------------------------------------------------------------
--------------------
| ADD HYD (080   ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.    DWF
--------------------                 (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 06:060       .89      .205    1.00  40.16    .000
                    +ID2 07:070      2.66      .538    1.04  40.16    .000
                     ===================================================
                     SUM 08:080      3.55      .733    1.04  40.16    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----------------------------------------------------------------------------
001:0012--------------------------------------------------------------------
--------------------
| ADD HYD (090   ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.    DWF
--------------------                 (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 05:050      5.01      .918    1.04  38.34    .000
                    +ID2 08:080      3.55      .733    1.04  40.16    .000
                     ===================================================
                     SUM 09:090      8.56     1.651    1.04  39.10    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----------------------------------------------------------------------------
001:0013--------------------------------------------------------------------
---------------------
| ROUTE  RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>09:(090    )   |
| OUT<10:(POND   )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000  .0000E+00    |     .593  .6251E+00
                            .008  .6560E-01    |     .654  .6631E+00
                            .017  .1311E+00    |     .797  .7391E+00
                            .093  .2831E+00    |     .950  .8274E+00
                            .233  .3971E+00    |    1.304  .9157E+00
                            .337  .4731E+00    |    1.880  .1004E+01
                            .465  .5491E+00    |    2.577  .1092E+01
                            .531  .5871E+00    |     .000  .0000E+00

      ROUTING RESULTS            AREA      QPEAK      TPEAK         R.V.
      -------------------        (ha)      (cms)      (hrs)         (mm)
      INFLOW >09: (090    )      8.56      1.651      1.042       39.096
      OUTFLOW<10: (POND   )      8.56       .089      2.625       39.093

                   PEAK   FLOW    REDUCTION [Qout/Qin](%)=     5.413
                   TIME SHIFT OF PEAK FLOW          (min)=     95.00
                   MAXIMUM   STORAGE    USED       (ha.m.)=.2758E+00

----------------------------------------------------------------------------
001:0014--------------------------------------------------------------------
********************************************
*     Remaining Hawthorne Industrial Park      *
********************************************
*
* SUB-AREA No.1
----------------------
| CALIB  STANDHYD     |   Area     (ha)=    19.90
| 01:HIP01  DT= 2.50 |   Total Imp(%)=    71.00   Dir. Conn.(%)=   50.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=     14.13          5.77
      Dep. Storage      (mm)=      1.57          4.67
      Average Slope      (%)=       .60          1.50
      Length             (m)=    580.00        100.00
      Mannings n            =      .030          .250

      Max.eff.Inten.(mm/hr)=     80.14         42.65
                 over (min)      15.00         35.00
      Storage Coeff.  (min)=     15.43 (ii)    34.18 (ii)
      Unit Hyd. Tpeak (min)=     15.00         35.00
      Unit Hyd. peak  (cms)=       .07           .03
                                                            *TOTALS*
      PEAK FLOW       (cms)=      1.41           .40          1.572 (iii)
      TIME TO PEAK    (hrs)=      1.17          1.54          1.208
      RUNOFF VOLUME    (mm)=     40.94         21.31         31.126
      TOTAL RAINFALL   (mm)=     42.51         42.51         42.514
      RUNOFF COEFFICIENT   =       .96           .50           .732

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

----------------------------------------------------------------------------
001:0015--------------------------------------------------------------------
--------------------
| ADD HYD (HIP02 ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.    DWF
--------------------                 (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 10:POND      8.56      .089    2.63  39.09    .000
                    +ID2 01:HIP01    19.90     1.572    1.21  31.13    .000
                     ===================================================
                     SUM 02:HIP02    28.46     1.615    1.21  33.52    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----------------------------------------------------------------------------
001:0016--------------------------------------------------------------------
*
* SUB-AREA No.2
----------------------
| CALIB  STANDHYD     |   Area     (ha)=    17.00
| 03:HIP03  DT= 2.50 |   Total Imp(%)=    71.00   Dir. Conn.(%)=   50.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=     12.07          4.93
      Dep. Storage      (mm)=      1.57          4.67
      Average Slope      (%)=       .65          1.50
      Length             (m)=    450.00        100.00
      Mannings n            =      .030          .250

      Max.eff.Inten.(mm/hr)=     89.76         47.48
                 over (min)      12.50         30.00
      Storage Coeff.  (min)=     12.36 (ii)    30.32 (ii)
      Unit Hyd. Tpeak (min)=     12.50         30.00
      Unit Hyd. peak  (cms)=       .09           .04
                                                            *TOTALS*
      PEAK FLOW       (cms)=      1.36           .37          1.504 (iii)
      TIME TO PEAK    (hrs)=      1.13          1.46          1.167
      RUNOFF VOLUME    (mm)=     40.94         21.31         31.126
      TOTAL RAINFALL   (mm)=     42.51         42.51         42.514
      RUNOFF COEFFICIENT   =       .96           .50           .732

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

----------------------------------------------------------------------------
001:0017--------------------------------------------------------------------
*
* SUB-AREA No.3
----------------------
| CALIB STANDHYD      |   Area     (ha)=    15.60
| 04:HIP04  DT= 2.50 |   Total Imp(%)=    71.00   Dir. Conn.(%)=   50.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=     11.08          4.52
      Dep. Storage      (mm)=      1.57          4.67
      Average Slope      (%)=       .50          1.50
      Length             (m)=    600.00        100.00
      Mannings n            =      .030          .250

      Max.eff.Inten.(mm/hr)=     73.27         42.65
                 over (min)      17.50         35.00
      Storage Coeff.  (min)=     17.24 (ii)    35.98 (ii)
      Unit Hyd. Tpeak (min)=     17.50         35.00
      Unit Hyd. peak  (cms)=       .07           .03
                                                            *TOTALS*
      PEAK FLOW       (cms)=      1.03           .30          1.176 (iii)
      TIME TO PEAK    (hrs)=      1.21          1.54          1.250
      RUNOFF VOLUME    (mm)=     40.94         21.31         31.126
      TOTAL RAINFALL   (mm)=     42.51         42.51         42.514
      RUNOFF COEFFICIENT   =       .96           .50           .732

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

----------------------------------------------------------------------------
001:0018--------------------------------------------------------------------
--------------------
| ADD HYD (HIP05 ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.    DWF
--------------------                 (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 03:HIP03    17.00     1.504    1.17  31.13    .000
                    +ID2 04:HIP04    15.60     1.176    1.25  31.13    .000
                     ===================================================
                     SUM 05:HIP05    32.60     2.621    1.17  31.13    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----------------------------------------------------------------------------
001:0019--------------------------------------------------------------------
--------------------
| ADD HYD (HIP06 ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.    DWF
--------------------                 (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 05:HIP05    32.60     2.621    1.17  31.13    .000
                    +ID2 02:HIP02    28.46     1.615    1.21  33.52    .000
                     ===================================================
                     SUM 06:HIP06    61.06     4.222    1.17  32.24    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----------------------------------------------------------------------------
001:0020--------------------------------------------------------------------
*
* SUB-AREA No.4
----------------------
| CALIB STANDHYD      |   Area     (ha)=    12.20
| 07:HIP07  DT= 2.50 |   Total Imp(%)=    71.00   Dir. Conn.(%)=   50.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=      8.66          3.54
      Dep. Storage      (mm)=      1.57          4.67
      Average Slope      (%)=       .70          1.50
      Length             (m)=    210.00        100.00
      Mannings n            =      .030          .250

      Max.eff.Inten.(mm/hr)=    104.19         52.96
                 over (min)       7.50         25.00
      Storage Coeff.  (min)=      7.21 (ii)    24.40 (ii)
      Unit Hyd. Tpeak (min)=      7.50         25.00
      Unit Hyd. peak  (cms)=       .15           .05
                                                            *TOTALS*
      PEAK FLOW       (cms)=      1.28           .31          1.375 (iii)
      TIME TO PEAK    (hrs)=      1.04          1.38          1.042
      RUNOFF VOLUME    (mm)=     40.94         21.31         31.126
      TOTAL RAINFALL   (mm)=     42.51         42.51         42.514
      RUNOFF COEFFICIENT   =       .96           .50           .732

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

----------------------------------------------------------------------------
001:0021--------------------------------------------------------------------
*
*SUB-AREA No.5
----------------------
| DESIGN NASHYD       |   Area     (ha)=     4.00   Curve Number   (CN)=85.00
| 08:Pond-B DT= 2.50 |   Ia        (mm)=    4.670   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=      .170

      Unit Hyd Qpeak  (cms)=      .899

      PEAK FLOW       (cms)=      .260 (i)
      TIME TO PEAK    (hrs)=     1.167
      RUNOFF VOLUME    (mm)=    17.325
      TOTAL RAINFALL   (mm)=    42.514
      RUNOFF COEFFICIENT   =      .408

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

----------------------------------------------------------------------------
001:0022--------------------------------------------------------------------
--------------------
| ADD HYD (HIP08 ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.    DWF
--------------------                 (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 06:HIP06    61.06     4.222    1.17  32.24    .000
                    +ID2 07:HIP07    12.20     1.375    1.04  31.13    .000
                    +ID3 08:Pond-B    4.00      .260    1.17  17.32    .000
                     ===================================================
                     SUM 09:HIP08    77.26     5.545    1.17  31.29    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

----------------------------------------------------------------------------
001:0023--------------------------------------------------------------------
*
*SUB-AREA No. 6
*
----------------------
| DESIGN NASHYD       |   Area     (ha)=     2.70   Curve Number   (CN)=76.00
| 01:A3      DT= 2.50 |   Ia        (mm)=    4.670   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=      .800

      Unit Hyd Qpeak  (cms)=      .129

      PEAK FLOW       (cms)=      .044 (i)
      TIME TO PEAK    (hrs)=     2.042
```

```
01621>      RUNOFF VOLUME     (mm)=    12.131
01622>      TOTAL RAINFALL    (mm)=    42.514
01623>      RUNOFF COEFFICIENT    =      .285
01624>
01625>      (i ) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01626>
01627> ---------------------------------------------------------------------------
01628> 001:0024-------------------------------------------------------------------
01629> --------------------
01630> | ADD HYD (Ultima) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
01631> --------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
01632>                  ID1 09:HIP08     77.26     5.545     1.17  31.29     .000
01633>                 +ID2 01:A3         2.70      .044     2.04  12.13     .000
01634>                  ================================================
01635>                  SUM 02:Ultima    79.96     5.554     1.17  30.65     .000
01636>
01637>    NOTE :  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01638>
01639> ---------------------------------------------------------------------------
01640> 001:0025-------------------------------------------------------------------
01641> ******************************************************************
01642> *          CALCULATION OF 3HR - 1:10 YEAR STORM EVENT            *
01643> ******************************************************************
01644> --------------------
01645> | START            |  Project  dir.: V:\20983.DU\ENG\SWMHYMO\
01646> --------------------  Rainfall dir.: V:\20983.DU\ENG\SWMHYMO\
01647>    TZERO =   .00 hrs on       0
01648>    METOUT=   2 (output = METRIC)
01649>    NRUN  = 001
01650>    NSTORM=   0
01651> ---------------------------------------------------------------------------
01652> 001:0002-------------------------------------------------------------------
01653> --------------------
01654> | CHICAGO STORM    |    IDF curve parameters: A=1174.184
01655> | Ptotal= 49.50 mm |                          B=   6.014
01656> --------------------                          C=    .816
01657>                        used in:   INTENSITY =  A / (t + B)^C
01658>
01659>                        Duration of storm  =  3.00 hrs
01660>                        Storm time step    = 10.00 min
01661>                        Time to peak ratio =   .33
01662>
01663>                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
01664>                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
01665>                 .17   4.248 |  1.00 122.142 |  1.83   7.733 |  2.67   4.049
01666>                 .33   5.290 |  1.17  37.285 |  2.00   6.502 |  2.83   3.714
01667>                 .50   7.108 |  1.33  18.954 |  2.17   5.625 |  3.00   3.434
01668>                 .67  11.130 |  1.50  12.700 |  2.33   4.969 |
01669>                 .83  28.100 |  1.67   9.588 |  2.50   4.458 |
01670>
01671> ---------------------------------------------------------------------------
01672> 001:0003-------------------------------------------------------------------
01673> ---------------------
01674> | DEFAULT VALUES     |  Filename: V:\20983.DU\ENG\SWMHYMO\ORGA.VAL
01675> ---------------------  ICASEdv = 1 (read and print data)
01676>      FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
01677>                 ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
01678>      Horton's infiltration equation parameters:
01679>      [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
01680>      Parameters for PERVIOUS surfaces in STANDHYD:
01681>      [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
01682>      Parameters for IMPERVIOUS surfaces in STANDHYD:
01683>      [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
01684>      Parameters used in NASHYD:
01685>      [Ia=   4.67 mm] [N= 3.00]
01686> ---------------------------------------------------------------------------
01687> 001:0004-------------------------------------------------------------------
01688> ***********************************
01689> *            ORGAWORLD FILE       *
01690> ***********************************
01691> * SUB-AREA No.1
01692> ---------------------
01693> | CALIB  STANDHYD    |   Area     (ha)=    2.07
01694> | 01:010     DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
01695> ---------------------
01696>                                IMPERVIOUS    PERVIOUS (i)
01697>      Surface Area     (ha)=        1.74          .33
01698>      Dep. Storage     (mm)=        1.57         4.67
01699>      Average Slope     (%)=         .52         1.00
01700>      Length            (m)=      204.72        20.00
01701>      Mannings n            =        .030         .250
01702>
01703>      Max.eff.Inten.(mm/hr)=      122.14        34.69
01704>                over (min)        7.50        15.00
01705>      Storage Coeff.  (min)=        7.28 (ii)   16.04 (ii)
01706>      Unit Hyd. Tpeak (min)=        7.50        15.00
01707>      Unit Hyd. peak  (cms)=         .15          .07
01708>                                                            *TOTALS*
01709>      PEAK FLOW       (cms)=         .43          .02          .437 (iii)
01710>      TIME TO PEAK    (hrs)=        1.04         1.21         1.042
01711>      RUNOFF VOLUME    (mm)=       47.93        19.25        43.345
01712>      TOTAL RAINFALL   (mm)=       49.50        49.50        49.505
01713>      RUNOFF COEFFICIENT   =         .97          .39          .876
01714>
01715>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01716>            CN* =  81.0     Ia = Dep. Storage  (Above)
01717>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01718>            THAN THE STORAGE COEFFICIENT.
01719>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01720>
01721> ---------------------------------------------------------------------------
01722> 001:0005-------------------------------------------------------------------
01723> *
01724> * SUB-AREA No.2
01725> ---------------------
01726> | CALIB  STANDHYD    |   Area     (ha)=    1.54
01727> | 02:020     DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
01728> ---------------------
01729>                                IMPERVIOUS    PERVIOUS (i)
01730>      Surface Area     (ha)=        1.42          .12
01731>      Dep. Storage     (mm)=        1.57         4.67
01732>      Average Slope     (%)=         .50         1.00
01733>      Length            (m)=      244.34         5.00
01734>      Mannings n            =        .030         .030
01735>
01736>      Max.eff.Inten.(mm/hr)=      122.14        42.32
01737>                over (min)        7.50        10.00
01738>      Storage Coeff.  (min)=        8.20 (ii)    9.18 (ii)
01739>      Unit Hyd. Tpeak (min)=        7.50        10.00
01740>      Unit Hyd. peak  (cms)=         .14          .12
01741>                                                            *TOTALS*
01742>      PEAK FLOW       (cms)=         .33          .01          .341 (iii)
01743>      TIME TO PEAK    (hrs)=        1.04         1.13         1.042
01744>      RUNOFF VOLUME    (mm)=       47.93        19.25        45.640
01745>      TOTAL RAINFALL   (mm)=       49.50        49.50        49.505
01746>      RUNOFF COEFFICIENT   =         .97          .39          .922
01747>
01748>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01749>            CN* =  81.0     Ia = Dep. Storage  (Above)
01750>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01751>            THAN THE STORAGE COEFFICIENT.
01752>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01753>
01754> ---------------------------------------------------------------------------
01755> 001:0006-------------------------------------------------------------------
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01756> *
01757> * SUB-AREA No.3
01758> ---------------------
01759> | CALIB STANDHYD     |   Area     (ha)=    1.40
01760> | 03:030     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
01761> ---------------------
01762>                                IMPERVIOUS    PERVIOUS (i)
01763>      Surface Area     (ha)=        1.36          .04
01764>      Dep. Storage     (mm)=        1.57         4.67
01765>      Average Slope     (%)=         .51         1.00
01766>      Length            (m)=      225.63         5.00
01767>      Mannings n            =        .030         .030
01768>
01769>      Max.eff.Inten.(mm/hr)=      122.14        48.18
01770>                over (min)        7.50         7.50
01771>      Storage Coeff.  (min)=        7.77 (ii)    8.70 (ii)
01772>      Unit Hyd. Tpeak (min)=        7.50         7.50
01773>      Unit Hyd. peak  (cms)=         .15          .14
01774>                                                            *TOTALS*
01775>      PEAK FLOW       (cms)=         .33          .00          .329 (iii)
01776>      TIME TO PEAK    (hrs)=        1.04         1.08         1.042
01777>      RUNOFF VOLUME    (mm)=       47.93        19.25        47.074
01778>      TOTAL RAINFALL   (mm)=       49.50        49.50        49.505
01779>      RUNOFF COEFFICIENT   =         .97          .39          .951
01780>
01781>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01782>            CN* =  81.0     Ia = Dep. Storage  (Above)
01783>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01784>            THAN THE STORAGE COEFFICIENT.
01785>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01786>
01787> ---------------------------------------------------------------------------
01788> 001:0007-------------------------------------------------------------------
01789> --------------------
01790> | ADD HYD (040    ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
01791> --------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
01792>                  ID1 01:010        2.07      .437     1.04  43.35     .000
01793>                 +ID2 02:020        1.54      .341     1.04  45.64     .000
01794>                  ================================================
01795>                  SUM 04:040        3.61      .778     1.04  44.32     .000
01796>
01797>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01798>
01799> ---------------------------------------------------------------------------
01800> 001:0008-------------------------------------------------------------------
01801> --------------------
01802> | ADD HYD (050    ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
01803> --------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
01804>                  ID1 03:030        1.40      .329     1.04  47.07     .000
01805>                 +ID2 04:040        3.61      .778     1.04  44.32     .000
01806>                  ================================================
01807>                  SUM 05:050        5.01     1.107     1.04  45.09     .000
01808>
01809>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01810>
01811> ---------------------------------------------------------------------------
01812> 001:0009-------------------------------------------------------------------
01813> *
01814> * SUB-AREA No.4
01815> ---------------------
01816> | CALIB STANDHYD     |   Area     (ha)=     .89
01817> | 06:060     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
01818> ---------------------
01819>                                IMPERVIOUS    PERVIOUS (i)
01820>      Surface Area     (ha)=         .86          .03
01821>      Dep. Storage     (mm)=        1.57         4.67
01822>      Average Slope     (%)=         .93          .70
01823>      Length            (m)=      164.82        40.00
01824>      Mannings n            =        .030         .250
01825>
01826>      Max.eff.Inten.(mm/hr)=      122.14        31.19
01827>                over (min)        5.00        20.00
01828>      Storage Coeff.  (min)=        5.37 (ii)   20.78 (ii)
01829>      Unit Hyd. Tpeak (min)=        5.00        20.00
01830>      Unit Hyd. peak  (cms)=         .21          .06
01831>                                                            *TOTALS*
01832>      PEAK FLOW       (cms)=         .24          .00          .245 (iii)
01833>      TIME TO PEAK    (hrs)=        1.00         1.29         1.000
01834>      RUNOFF VOLUME    (mm)=       47.93        19.25        47.074
01835>      TOTAL RAINFALL   (mm)=       49.50        49.50        49.505
01836>      RUNOFF COEFFICIENT   =         .97          .39          .951
01837>
01838>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01839>            CN* =  81.0     Ia = Dep. Storage  (Above)
01840>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01841>            THAN THE STORAGE COEFFICIENT.
01842>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01843>
01844> ---------------------------------------------------------------------------
01845> 001:0010-------------------------------------------------------------------
01846> *
01847> * SUB-AREA No.5
01848> ---------------------
01849> | CALIB STANDHYD     |   Area     (ha)=    2.66
01850> | 07:070     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
01851> ---------------------
01852>                                IMPERVIOUS    PERVIOUS (i)
01853>      Surface Area     (ha)=        2.58          .08
01854>      Dep. Storage     (mm)=        1.57         4.67
01855>      Average Slope     (%)=         .61         1.50
01856>      Length            (m)=      207.25        20.00
01857>      Mannings n            =        .030         .250
01858>
01859>      Max.eff.Inten.(mm/hr)=      122.14        34.69
01860>                over (min)        7.50        15.00
01861>      Storage Coeff.  (min)=        7.00 (ii)   14.75 (ii)
01862>      Unit Hyd. Tpeak (min)=        7.50        15.00
01863>      Unit Hyd. peak  (cms)=         .16          .08
01864>                                                            *TOTALS*
01865>      PEAK FLOW       (cms)=         .64          .00          .645 (iii)
01866>      TIME TO PEAK    (hrs)=        1.04         1.21         1.042
01867>      RUNOFF VOLUME    (mm)=       47.93        19.25        47.074
01868>      TOTAL RAINFALL   (mm)=       49.50        49.50        49.505
01869>      RUNOFF COEFFICIENT   =         .97          .39          .951
01870>
01871>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01872>            CN* =  81.0     Ia = Dep. Storage  (Above)
01873>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01874>            THAN THE STORAGE COEFFICIENT.
01875>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01876>
01877> ---------------------------------------------------------------------------
01878> 001:0011-------------------------------------------------------------------
01879> --------------------
01880> | ADD HYD (080    ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
01881> --------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
01882>                  ID1 06:060         .89      .245     1.00  47.07     .000
01883>                 +ID2 07:070        2.66      .645     1.04  47.07     .000
01884>                  ================================================
01885>                  SUM 08:080        3.55      .876     1.04  47.07     .000
01886>
01887>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01888>
01889> ---------------------------------------------------------------------------
01890> 001:0012-------------------------------------------------------------------
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01891> --------------------
01892> | ADD HYD (090    ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
01893> --------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
01894>                    ID1 05:050      5.01    1.107    1.04  45.09     .000
01895>                   +ID2 08:080      3.55     .876    1.04  47.07     .000
01896>                    ==================================================
01897>                    SUM 09:090      8.56    1.984    1.04  45.91     .000
01898>
01899>     NOTE :  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01900>
01901> ------------------------------------------------------------------------
01902> 001:0013----------------------------------------------------------------
01903> ---------------------
01904> | ROUTE  RESERVOIR   |     Requested routing time step =  1.0 min.
01905> |  IN>09:(090     )  |
01906> | OUT<10:(POND   )   |     =========  OUTLFOW STORAGE TABLE  =========
01907> ---------------------     OUTFLOW    STORAGE    |   OUTFLOW    STORAGE
01908>                              (cms)     (ha.m.)    |    (cms)     (ha.m.)
01909>                              .000  .0000E+00    |      .593  .6251E+00
01910>                              .008  .6560E-01    |      .654  .6631E+00
01911>                              .017  .1311E+00    |      .797  .7391E+00
01912>                              .093  .2831E+00    |      .950  .8274E+00
01913>                              .233  .3971E+00    |     1.304  .9157E+00
01914>                              .337  .4731E+00    |     1.880  .1004E+01
01915>                              .465  .5491E+00    |     2.577  .1092E+01
01916>                              .531  .5871E+00    |      .000  .0000E+00
01917>
01918>       ROUTING RESULTS               AREA      QPEAK      TPEAK        R.V.
01919>       -------------------          (ha)      (cms)      (hrs)        (mm)
01920>       INFLOW >09: (090   )         8.56      1.984      1.042      45.914
01921>       OUTFLOW<10: (POND  )         8.56       .132      2.278      45.912
01922>
01923>                        PEAK   FLOW   REDUCTION [Qout/Qin](%)=    6.640
01924>                        TIME SHIFT OF PEAK FLOW          (min)=    74.17
01925>                        MAXIMUM  STORAGE   USED        (ha.m.)=.3146E+00
01926>
01927> ------------------------------------------------------------------------
01928> 001:0014----------------------------------------------------------------
01929> ******************************************
01930> *     Remaining Hawthorne Industrial Park      *
01931> ******************************************
01932> *
01933> * SUB-AREA No.1
01934> ---------------------
01935> | CALIB  STANDHYD     |   Area     (ha)=   19.90
01936> | 01:HIP01  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
01937> ---------------------
01938>                                 IMPERVIOUS    PERVIOUS (i)
01939>       Surface Area      (ha)=      14.13          5.77
01940>       Dep. Storage      (mm)=       1.57          4.67
01941>       Average Slope      (%)=        .60          1.50
01942>       Length             (m)=     580.00        100.00
01943>       Mannings n            =       .030          .250
01944>
01945>       Max.eff.Inten.(mm/hr)=      93.86         60.56
01946>                   over (min)      15.00         30.00
01947>       Storage Coeff.   (min)=      14.48 (ii)    30.78 (ii)
01948>       Unit Hyd. Tpeak  (min)=      15.00         30.00
01949>       Unit Hyd. peak   (cms)=        .08           .04
01950>                                                                *TOTALS*
01951>       PEAK FLOW        (cms)=       1.70           .55          1.983 (iii)
01952>       TIME TO PEAK     (hrs)=       1.17          1.46          1.208
01953>       RUNOFF VOLUME     (mm)=      47.93         26.92         37.426
01954>       TOTAL RAINFALL    (mm)=      49.50         49.50         49.505
01955>       RUNOFF COEFFICIENT   =         .97           .54           .756
01956>
01957>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01958>             CN* =  81.0    Ia = Dep. Storage  (Above)
01959>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01960>             THAN THE STORAGE COEFFICIENT.
01961>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01962>
01963> ------------------------------------------------------------------------
01964> 001:0015----------------------------------------------------------------
01965> --------------------
01966> | ADD HYD (HIP02 ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
01967> --------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
01968>                    ID1 10:POND      8.56     .132    2.28  45.91     .000
01969>                   +ID2 01:HIP01    19.90    1.983    1.21  37.43     .000
01970>                    ==================================================
01971>                    SUM 02:HIP02    28.46    2.044    1.21  39.98     .000
01972>
01973>     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01974>
01975> ------------------------------------------------------------------------
01976> 001:0016----------------------------------------------------------------
01977> *
01978> * SUB-AREA No.2
01979> ---------------------
01980> | CALIB  STANDHYD     |   Area     (ha)=   17.00
01981> | 03:HIP03  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
01982> ---------------------
01983>                                 IMPERVIOUS    PERVIOUS (i)
01984>       Surface Area      (ha)=      12.07          4.93
01985>       Dep. Storage      (mm)=       1.57          4.67
01986>       Average Slope      (%)=        .65          1.50
01987>       Length             (m)=     450.00        100.00
01988>       Mannings n            =       .030          .250
01989>
01990>       Max.eff.Inten.(mm/hr)=     105.17         63.81
01991>                   over (min)      12.50         27.50
01992>       Storage Coeff.   (min)=      11.60 (ii)    27.56 (ii)
01993>       Unit Hyd. Tpeak  (min)=      12.50         27.50
01994>       Unit Hyd. peak   (cms)=        .09           .04
01995>                                                                *TOTALS*
01996>       PEAK FLOW        (cms)=       1.63           .51          1.865 (iii)
01997>       TIME TO PEAK     (hrs)=       1.13          1.42          1.167
01998>       RUNOFF VOLUME     (mm)=      47.93         26.92         37.426
01999>       TOTAL RAINFALL    (mm)=      49.50         49.50         49.505
02000>       RUNOFF COEFFICIENT   =         .97           .54           .756
02001>
02002>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02003>             CN* =  81.0    Ia = Dep. Storage  (Above)
02004>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02005>             THAN THE STORAGE COEFFICIENT.
02006>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02007>
02008> ------------------------------------------------------------------------
02009> 001:0017----------------------------------------------------------------
02010> *
02011> * SUB-AREA No.3
02012> ---------------------
02013> | CALIB  STANDHYD     |   Area     (ha)=   15.60
02014> | 04:HIP04  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
02015> ---------------------
02016>                                 IMPERVIOUS    PERVIOUS (i)
02017>       Surface Area      (ha)=      11.08          4.52
02018>       Dep. Storage      (mm)=       1.57          4.67
02019>       Average Slope      (%)=        .50          1.50
02020>       Length             (m)=     600.00        100.00
02021>       Mannings n            =       .030          .250
02022>
02023>       Max.eff.Inten.(mm/hr)=      93.86         57.19
02024>                   over (min)      15.00         32.50
02025>       Storage Coeff.   (min)=      15.61 (ii)    32.28 (ii)
02026>       Unit Hyd. Tpeak  (min)=      15.00         32.50
02027>       Unit Hyd. peak   (cms)=        .07           .03
02028>                                                                *TOTALS*
02029>       PEAK FLOW        (cms)=       1.29           .42          1.485 (iii)
02030>       TIME TO PEAK     (hrs)=       1.17          1.50          1.208
02031>       RUNOFF VOLUME     (mm)=      47.93         26.92         37.426
02032>       TOTAL RAINFALL    (mm)=      49.50         49.50         49.505
02033>       RUNOFF COEFFICIENT   =         .97           .54           .756
02034>
02035>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02036>             CN* =  81.0    Ia = Dep. Storage  (Above)
02037>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02038>             THAN THE STORAGE COEFFICIENT.
02039>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02040>
02041> ------------------------------------------------------------------------
02042> 001:0018----------------------------------------------------------------
02043> --------------------
02044> | ADD HYD (HIP05 ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
02045> --------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
02046>                    ID1 03:HIP03    17.00    1.865    1.17  37.43     .000
02047>                   +ID2 04:HIP04    15.60    1.485    1.21  37.43     .000
02048>                    ==================================================
02049>                    SUM 05:HIP05    32.60    3.336    1.17  37.43     .000
02050>
02051>     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02052>
02053> ------------------------------------------------------------------------
02054> 001:0019----------------------------------------------------------------
02055> --------------------
02056> | ADD HYD (HIP06 ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
02057> --------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
02058>                    ID1 05:HIP05    32.60    3.336    1.17  37.43     .000
02059>                   +ID2 02:HIP02    28.46    2.044    1.21  39.98     .000
02060>                    ==================================================
02061>                    SUM 06:HIP06    61.06    5.358    1.17  38.61     .000
02062>
02063>     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02064>
02065> ------------------------------------------------------------------------
02066> 001:0020----------------------------------------------------------------
02067> *
02068> * SUB-AREA No.4
02069> ---------------------
02070> | CALIB STANDHYD      |   Area     (ha)=   12.20
02071> | 07:HIP07  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
02072> ---------------------
02073>                                 IMPERVIOUS    PERVIOUS (i)
02074>       Surface Area      (ha)=       8.66          3.54
02075>       Dep. Storage      (mm)=       1.57          4.67
02076>       Average Slope      (%)=        .70          1.50
02077>       Length             (m)=     210.00        100.00
02078>       Mannings n            =       .030          .250
02079>
02080>       Max.eff.Inten.(mm/hr)=     122.14         72.53
02081>                   over (min)       7.50         22.50
02082>       Storage Coeff.   (min)=       6.77 (ii)    21.93 (ii)
02083>       Unit Hyd. Tpeak  (min)=       7.50         22.50
02084>       Unit Hyd. peak   (cms)=        .16           .05
02085>                                                                *TOTALS*
02086>       PEAK FLOW        (cms)=       1.54           .42          1.687 (iii)
02087>       TIME TO PEAK     (hrs)=       1.04          1.33          1.042
02088>       RUNOFF VOLUME     (mm)=      47.93         26.92         37.426
02089>       TOTAL RAINFALL    (mm)=      49.50         49.50         49.505
02090>       RUNOFF COEFFICIENT   =         .97           .54           .756
02091>
02092>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02093>             CN* =  81.0    Ia = Dep. Storage  (Above)
02094>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02095>             THAN THE STORAGE COEFFICIENT.
02096>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02097>
02098> ------------------------------------------------------------------------
02099> 001:0021----------------------------------------------------------------
02100> *
02101> *SUB-AREA No.5
02102> ---------------------
02103> | DESIGN NASHYD       |   Area     (ha)=    4.00   Curve Number   (CN)=85.00
02104> | 08:Pond-B DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
02105> ---------------------   U.H. Tp(hrs)=    .170
02106>
02107>       Unit Hyd Qpeak  (cms)=      .899
02108>
02109>       PEAK FLOW       (cms)=      .345 (i)
02110>       TIME TO PEAK    (hrs)=     1.167
02111>       RUNOFF VOLUME    (mm)=    22.420
02112>       TOTAL RAINFALL   (mm)=    49.505
02113>       RUNOFF COEFFICIENT   =      .453
02114>
02115>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02116>
02117> ------------------------------------------------------------------------
02118> 001:0022----------------------------------------------------------------
02119> --------------------
02120> | ADD HYD (HIP08 ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
02121> --------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
02122>                    ID1 06:HIP06    61.06    5.358    1.17  38.61     .000
02123>                   +ID2 07:HIP07    12.20    1.687    1.04  37.43     .000
02124>                   +ID3 08:Pond-B    4.00     .345    1.17  22.42     .000
02125>                    ==================================================
02126>                    SUM 09:HIP08    77.26    7.016    1.17  37.59     .000
02127>
02128>     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02129>
02130> ------------------------------------------------------------------------
02131> 001:0023----------------------------------------------------------------
02132> *
02133> *SUB-AREA No. 6
02134> *
02135> ---------------------
02136> | DESIGN NASHYD       |   Area     (ha)=    2.70   Curve Number   (CN)=76.00
02137> | 01:A3       DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
02138> ---------------------   U.H. Tp(hrs)=    .800
02139>
02140>       Unit Hyd Qpeak  (cms)=      .129
02141>
02142>       PEAK FLOW       (cms)=      .059 (i)
02143>       TIME TO PEAK    (hrs)=     2.000
02144>       RUNOFF VOLUME    (mm)=    16.075
02145>       TOTAL RAINFALL   (mm)=    49.505
02146>       RUNOFF COEFFICIENT   =      .325
02147>
02148>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02149>
02150> ------------------------------------------------------------------------
02151> 001:0024----------------------------------------------------------------
02152> --------------------
02153> | ADD HYD (Ultima) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
02154> --------------------                (ha)     (cms)   (hrs)   (mm)    (cms)
02155>                    ID1 09:HIP08    77.26    7.016    1.17  37.59     .000
02156>                   +ID2 01:A3        2.70     .059    2.00  16.08     .000
02157>                    ==================================================
02158>                    SUM 02:Ultima   79.96    7.029    1.17  36.86     .000
02159>
02160>     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
02161>
02162> ----------------------------------------------------------------------------
02163> 001:0025-----------------------------------------------------------------------
02164> ***************************************************************
02165> *          CALCULATION OF 3HR - 1:25 YEAR STORM EVENT            *
02166> ***************************************************************
02167> --------------------
02168> | START              |   Project  dir.: V:\20983.DU\ENG\SWMHYMO\
02169> --------------------   Rainfall dir.: V:\20983.DU\ENG\SWMHYMO\
02170>     TZERO =   .00 hrs on        0
02171>     METOUT=  2 (output = METRIC)
02172>     NRUN  = 001
02173>     NSTORM=  0
02174> ----------------------------------------------------------------------------
02175> 001:0002-----------------------------------------------------------------------
02176> --------------------
02177> | CHICAGO STORM    |     IDF curve parameters: A=1402.884
02178> | Ptotal= 58.23 mm |                           B=   6.018
02179> --------------------                          C=    .819
02180>                          used in:    INTENSITY =  A / (t + B)^C
02181>
02182>                          Duration of storm  =  3.00 hrs
02183>                          Storm time step    = 10.00 min
02184>                          Time to peak ratio =   .33
02185>
02186>                   TIME     RAIN |   TIME     RAIN |   TIME     RAIN |   TIME     RAIN
02187>                    hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr
02188>                    .17    4.934 |   1.00 144.693 |   1.83    9.014 |   2.67    4.701
02189>                    .33    6.152 |   1.17  43.904 |   2.00    7.571 |   2.83    4.310
02190>                    .50    8.282 |   1.33  22.224 |   2.17    6.544 |   3.00    3.983
02191>                    .67   13.006 |   1.50  14.852 |   2.33    5.776 |
02192>                    .83   33.041 |   1.67  11.192 |   2.50    5.179 |
02193>
02194> ----------------------------------------------------------------------------
02195> 001:0003-----------------------------------------------------------------------
02196> ----------------------
02197> | DEFAULT VALUES     |   Filename: V:\20983.DU\ENG\SWMHYMO\ORGA.VAL
02198> ----------------------   ICASEdv = 1 (read and print data)
02199>       FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
02200>                  ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
02201>       Horton's infiltration equation parameters:
02202>       [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
02203>       Parameters for PERVIOUS surfaces in STANDHYD:
02204>       [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
02205>       Parameters for IMPERVIOUS surfaces in STANDHYD:
02206>       [IAimp=   1.57 mm] [CLI= 1.50]    [MNI= .035]
02207>       Parameters used in NASHYD:
02208>       [Ia=   4.67 mm] [N= 3.00]
02209> ----------------------------------------------------------------------------
02210> 001:0004-----------------------------------------------------------------------
02211> ********************************
02212> *          ORGAWORLD FILE       *
02213> ********************************
02214> * SUB-AREA No.1
02215> --------------------
02216> | CALIB  STANDHYD     |   Area     (ha)=    2.07
02217> | 01:010     DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
02218> --------------------
02219>                                 IMPERVIOUS    PERVIOUS (i)
02220>      Surface Area      (ha)=       1.74          .33
02221>      Dep. Storage      (mm)=       1.57         4.67
02222>      Average Slope      (%)=        .52         1.00
02223>      Length             (m)=     204.72        20.00
02224>      Mannings n             =       .030         .250
02225>
02226>      Max.eff.Inten.(mm/hr)=     144.69        47.07
02227>                 over (min)        7.50        15.00
02228>      Storage Coeff.  (min)=       6.81 (ii)   14.56 (ii)
02229>      Unit Hyd. Tpeak (min)=       7.50        15.00
02230>      Unit Hyd. peak  (cms)=        .16          .08
02231>                                                          *TOTALS*
02232>      PEAK FLOW        (cms)=        .52          .03          .532 (iii)
02233>      TIME TO PEAK     (hrs)=       1.04         1.21         1.042
02234>      RUNOFF VOLUME     (mm)=      56.66        25.35        51.647
02235>      TOTAL RAINFALL    (mm)=      58.23        58.23        58.226
02236>      RUNOFF COEFFICIENT   =        .97          .44          .887
02237>
02238>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02239>            CN* =  81.0    Ia = Dep. Storage  (Above)
02240>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02241>            THAN THE STORAGE COEFFICIENT.
02242>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02243>
02244> ----------------------------------------------------------------------------
02245> 001:0005-----------------------------------------------------------------------
02246> *
02247> * SUB-AREA No.2
02248> --------------------
02249> | CALIB  STANDHYD     |   Area     (ha)=    1.54
02250> | 02:020     DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
02251> --------------------
02252>                                 IMPERVIOUS    PERVIOUS (i)
02253>      Surface Area      (ha)=       1.42          .12
02254>      Dep. Storage      (mm)=       1.57         4.67
02255>      Average Slope      (%)=        .50         1.00
02256>      Length             (m)=     244.34         5.00
02257>      Mannings n             =       .030         .030
02258>
02259>      Max.eff.Inten.(mm/hr)=     144.69        65.19
02260>                 over (min)        7.50         7.50
02261>      Storage Coeff.  (min)=       7.66 (ii)    8.49 (ii)
02262>      Unit Hyd. Tpeak (min)=       7.50         7.50
02263>      Unit Hyd. peak  (cms)=        .15          .14
02264>                                                          *TOTALS*
02265>      PEAK FLOW        (cms)=        .40          .01          .418 (iii)
02266>      TIME TO PEAK     (hrs)=       1.04         1.08         1.042
02267>      RUNOFF VOLUME     (mm)=      56.66        25.35        54.152
02268>      TOTAL RAINFALL    (mm)=      58.23        58.23        58.226
02269>      RUNOFF COEFFICIENT   =        .97          .44          .930
02270>
02271>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02272>            CN* =  81.0    Ia = Dep. Storage  (Above)
02273>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02274>            THAN THE STORAGE COEFFICIENT.
02275>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02276>
02277> ----------------------------------------------------------------------------
02278> 001:0006-----------------------------------------------------------------------
02279> *
02280> * SUB-AREA No.3
02281> --------------------
02282> | CALIB  STANDHYD     |   Area     (ha)=    1.40
02283> | 03:030     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
02284> --------------------
02285>                                 IMPERVIOUS    PERVIOUS (i)
02286>      Surface Area      (ha)=       1.36          .04
02287>      Dep. Storage      (mm)=       1.57         4.67
02288>      Average Slope      (%)=        .51         1.00
02289>      Length             (m)=     225.63         5.00
02290>      Mannings n             =       .030         .030
02291>
02292>      Max.eff.Inten.(mm/hr)=     144.69        65.19
02293>                 over (min)        7.50         7.50
02294>      Storage Coeff.  (min)=       7.26 (ii)    8.09 (ii)
02295>      Unit Hyd. Tpeak (min)=       7.50         7.50
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```
02296>      Unit Hyd. peak  (cms)=        .15          .14
02297>                                                          *TOTALS*
02298>      PEAK FLOW        (cms)=        .40          .00          .400 (iii)
02299>      TIME TO PEAK     (hrs)=       1.04         1.08         1.042
02300>      RUNOFF VOLUME     (mm)=      56.66        25.35        55.717
02301>      TOTAL RAINFALL    (mm)=      58.23        58.23        58.226
02302>      RUNOFF COEFFICIENT   =        .97          .44          .957
02303>
02304>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02305>            CN* =  81.0    Ia = Dep. Storage  (Above)
02306>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02307>            THAN THE STORAGE COEFFICIENT.
02308>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02309>
02310> ----------------------------------------------------------------------------
02311> 001:0007-----------------------------------------------------------------------
02312> ------------------
02313> | ADD HYD (040   ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
02314> ------------------                 (ha)      (cms)    (hrs)   (mm)    (cms)
02315>                     ID1 01:010     2.07      .532     1.04  51.65    .000
02316>                    +ID2 02:020     1.54      .418     1.04  54.15    .000
02317>                     ===================================================
02318>                     SUM 04:040     3.61      .950     1.04  52.72    .000
02319>
02320>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02321>
02322> ----------------------------------------------------------------------------
02323> 001:0008-----------------------------------------------------------------------
02324> ------------------
02325> | ADD HYD (050   ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
02326> ------------------                 (ha)      (cms)    (hrs)   (mm)    (cms)
02327>                     ID1 03:030     1.40      .400     1.04  55.72    .000
02328>                    +ID2 04:040     3.61      .950     1.04  52.72    .000
02329>                     ===================================================
02330>                     SUM 05:050     5.01     1.350     1.04  53.55    .000
02331>
02332>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02333>
02334> ----------------------------------------------------------------------------
02335> 001:0009-----------------------------------------------------------------------
02336> *
02337> * SUB-AREA No.4
02338> --------------------
02339> | CALIB STANDHYD      |   Area     (ha)=     .89
02340> | 06:060     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
02341> --------------------
02342>                                 IMPERVIOUS    PERVIOUS (i)
02343>      Surface Area      (ha)=        .86          .03
02344>      Dep. Storage      (mm)=       1.57         4.67
02345>      Average Slope      (%)=        .93          .70
02346>      Length             (m)=     164.82        40.00
02347>      Mannings n             =       .030         .250
02348>
02349>      Max.eff.Inten.(mm/hr)=     144.69        44.12
02350>                 over (min)        5.00        17.50
02351>      Storage Coeff.  (min)=       5.02 (ii)   18.44 (ii)
02352>      Unit Hyd. Tpeak (min)=       5.00        17.50
02353>      Unit Hyd. peak  (cms)=        .22          .06
02354>                                                          *TOTALS*
02355>      PEAK FLOW        (cms)=        .30          .00          .296 (iii)
02356>      TIME TO PEAK     (hrs)=       1.00         1.25         1.000
02357>      RUNOFF VOLUME     (mm)=      56.66        25.35        55.717
02358>      TOTAL RAINFALL    (mm)=      58.23        58.23        58.226
02359>      RUNOFF COEFFICIENT   =        .97          .44          .957
02360>
02361>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02362>            CN* =  81.0    Ia = Dep. Storage  (Above)
02363>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02364>            THAN THE STORAGE COEFFICIENT.
02365>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02366>
02367> ----------------------------------------------------------------------------
02368> 001:0010-----------------------------------------------------------------------
02369> *
02370> * SUB-AREA No.5
02371> --------------------
02372> | CALIB STANDHYD      |   Area     (ha)=    2.66
02373> | 07:070     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
02374> --------------------
02375>                                 IMPERVIOUS    PERVIOUS (i)
02376>      Surface Area      (ha)=       2.58          .08
02377>      Dep. Storage      (mm)=       1.57         4.67
02378>      Average Slope      (%)=        .61         1.50
02379>      Length             (m)=     207.25        20.00
02380>      Mannings n             =       .030         .250
02381>
02382>      Max.eff.Inten.(mm/hr)=     144.69        51.33
02383>                 over (min)        7.50        12.50
02384>      Storage Coeff.  (min)=       6.54 (ii)   13.16 (ii)
02385>      Unit Hyd. Tpeak (min)=       7.50        12.50
02386>      Unit Hyd. peak  (cms)=        .16          .09
02387>                                                          *TOTALS*
02388>      PEAK FLOW        (cms)=        .78          .01          .783 (iii)
02389>      TIME TO PEAK     (hrs)=       1.04         1.17         1.042
02390>      RUNOFF VOLUME     (mm)=      56.66        25.35        55.717
02391>      TOTAL RAINFALL    (mm)=      58.23        58.23        58.226
02392>      RUNOFF COEFFICIENT   =        .97          .44          .957
02393>
02394>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02395>            CN* =  81.0    Ia = Dep. Storage  (Above)
02396>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02397>            THAN THE STORAGE COEFFICIENT.
02398>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02399>
02400> ----------------------------------------------------------------------------
02401> 001:0011-----------------------------------------------------------------------
02402> ------------------
02403> | ADD HYD (080   ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
02404> ------------------                 (ha)      (cms)    (hrs)   (mm)    (cms)
02405>                     ID1 06:060      .89      .296     1.00  55.72    .000
02406>                    +ID2 07:070     2.66      .783     1.04  55.72    .000
02407>                     ===================================================
02408>                     SUM 08:080     3.55     1.060     1.04  55.72    .000
02409>
02410>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02411>
02412> ----------------------------------------------------------------------------
02413> 001:0012-----------------------------------------------------------------------
02414> ------------------
02415> | ADD HYD (090   ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
02416> ------------------                 (ha)      (cms)    (hrs)   (mm)    (cms)
02417>                     ID1 05:050     5.01     1.350     1.04  53.55    .000
02418>                    +ID2 08:080     3.55     1.060     1.04  55.72    .000
02419>                     ===================================================
02420>                     SUM 09:090     8.56     2.410     1.04  54.45    .000
02421>
02422>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02423>
02424> ----------------------------------------------------------------------------
02425> 001:0013-----------------------------------------------------------------------
02426> --------------------
02427> | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
02428> |  IN>09:(090   )    |
02429> | OUT<10:(POND  )    |    =========  OUTLFOW STORAGE TABLE  =========
02430> --------------------      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
```

```
                                  (cms)    (ha.m.)   |    (cms)    (ha.m.)
                                   .000  .0000E+00   |     .593  .6251E+00
                                   .008  .6560E-01   |     .654  .6631E+00
                                   .017  .1311E+00   |     .797  .7391E+00
                                   .093  .2831E+00   |     .950  .8274E+00
                                   .233  .3971E+00   |    1.304  .9157E+00
                                   .337  .4731E+00   |    1.880  .1004E+01
                                   .465  .5491E+00   |    2.577  .1092E+01
                                   .531  .5871E+00   |     .000  .0000E+00

      ROUTING RESULTS               AREA     QPEAK     TPEAK        R.V.
      -------------------           (ha)     (cms)     (hrs)        (mm)
      INFLOW >09: (090   )          8.56     2.410     1.042      54.451
      OUTFLOW<10: (POND  )          8.56      .189     2.056      54.449

                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=     7.838
                     TIME SHIFT OF PEAK FLOW         (min)=     60.83
                     MAXIMUM  STORAGE   USED       (ha.m.)=.3612E+00

 ---------------------------------------------------------------------------
 001:0014-------------------------------------------------------------------
 *****************************************
 *    Remaining Hawthorne Industrial Park     *
 *****************************************
 *
 * SUB-AREA No.1
 ---------------------
 | CALIB  STANDHYD     |   Area     (ha)=   19.90
 | 01:HIP01  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                                 IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=       14.13         5.77
      Dep. Storage      (mm)=        1.57         4.67
      Average Slope      (%)=         .60         1.50
      Length             (m)=      580.00       100.00
      Mannings n            =        .030         .250

      Max.eff.Inten.(mm/hr)=       124.54        81.98
                     over (min)     12.50        27.50
      Storage Coeff.  (min)=        12.93 (ii)   27.37 (ii)
      Unit Hyd. Tpeak (min)=        12.50        27.50
      Unit Hyd. peak  (cms)=          .09          .04
                                                             *TOTALS*
      PEAK FLOW       (cms)=         2.16          .77         2.548 (iii)
      TIME TO PEAK    (hrs)=         1.13         1.42         1.167
      RUNOFF VOLUME    (mm)=        56.66        34.22        45.437
      TOTAL RAINFALL   (mm)=        58.23        58.23        58.226
      RUNOFF COEFFICIENT   =          .97          .59          .780

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 ---------------------------------------------------------------------------
 001:0015-------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP02 ) | ID: NHYD       AREA      QPEAK   TPEAK   R.V.     DWF
 --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
                    ID1 10:POND       8.56      .189    2.06  54.45    .000
                   +ID2 01:HIP01     19.90     2.548    1.17  45.44    .000
                    ===================================================
                    SUM 02:HIP02     28.46     2.622    1.17  48.15    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0016-------------------------------------------------------------------
 *
 * SUB-AREA No.2
 ---------------------
 | CALIB STANDHYD      |   Area     (ha)=   17.00
 | 03:HIP03  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                                 IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=       12.07         4.93
      Dep. Storage      (mm)=        1.57         4.67
      Average Slope      (%)=         .65         1.50
      Length             (m)=      450.00       100.00
      Mannings n            =        .030         .250

      Max.eff.Inten.(mm/hr)=       144.69        87.13
                     over (min)     10.00        25.00
      Storage Coeff.  (min)=        10.21 (ii)   24.30 (ii)
      Unit Hyd. Tpeak (min)=        10.00        25.00
      Unit Hyd. peak  (cms)=          .11          .05
                                                             *TOTALS*
      PEAK FLOW       (cms)=         2.10          .71         2.398 (iii)
      TIME TO PEAK    (hrs)=         1.08         1.38         1.125
      RUNOFF VOLUME    (mm)=        56.66        34.22        45.437
      TOTAL RAINFALL   (mm)=        58.23        58.23        58.226
      RUNOFF COEFFICIENT   =          .97          .59          .780

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 ---------------------------------------------------------------------------
 001:0017-------------------------------------------------------------------
 *
 * SUB-AREA No.3
 ---------------------
 | CALIB  STANDHYD     |   Area     (ha)=   15.60
 | 04:HIP04  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                                 IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=       11.08         4.52
      Dep. Storage      (mm)=        1.57         4.67
      Average Slope      (%)=         .50         1.50
      Length             (m)=      600.00       100.00
      Mannings n            =        .030         .250

      Max.eff.Inten.(mm/hr)=       111.10        77.71
                     over (min)     15.00        30.00
      Storage Coeff.  (min)=        14.59 (ii)   29.34 (ii)
      Unit Hyd. Tpeak (min)=        15.00        30.00
      Unit Hyd. peak  (cms)=          .08          .04
                                                             *TOTALS*
      PEAK FLOW       (cms)=         1.57          .57         1.879 (iii)
      TIME TO PEAK    (hrs)=         1.17         1.46         1.208
      RUNOFF VOLUME    (mm)=        56.66        34.22        45.437
      TOTAL RAINFALL   (mm)=        58.23        58.23        58.226
      RUNOFF COEFFICIENT   =          .97          .59          .780

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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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 001:0018-------------------------------------------------------------------
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 --------------------
 | ADD HYD (HIP05 ) | ID: NHYD       AREA      QPEAK   TPEAK   R.V.     DWF
 --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
                    ID1 03:HIP03     17.00     2.398    1.13  45.44    .000
                   +ID2 04:HIP04     15.60     1.879    1.21  45.44    .000
                    ===================================================
                    SUM 05:HIP05     32.60     4.157    1.13  45.44    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0019-------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP06 ) | ID: NHYD       AREA      QPEAK   TPEAK   R.V.     DWF
 --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
                    ID1 05:HIP05     32.60     4.157    1.13  45.44    .000
                   +ID2 02:HIP02     28.46     2.622    1.17  48.15    .000
                    ===================================================
                    SUM 06:HIP06     61.06     6.741    1.17  46.70    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0020-------------------------------------------------------------------
 *
 * SUB-AREA No.4
 ---------------------
 | CALIB STANDHYD      |   Area     (ha)=   12.20
 | 07:HIP07  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                                 IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=        8.66         3.54
      Dep. Storage      (mm)=        1.57         4.67
      Average Slope      (%)=         .70         1.50
      Length             (m)=      210.00       100.00
      Mannings n            =        .030         .250

      Max.eff.Inten.(mm/hr)=       144.69       101.36
                     over (min)      7.50        20.00
      Storage Coeff.  (min)=         6.32 (ii)   19.58 (ii)
      Unit Hyd. Tpeak (min)=         7.50        20.00
      Unit Hyd. peak  (cms)=          .17          .06
                                                             *TOTALS*
      PEAK FLOW       (cms)=         1.86          .59         2.109 (iii)
      TIME TO PEAK    (hrs)=         1.04         1.29         1.042
      RUNOFF VOLUME    (mm)=        56.66        34.22        45.437
      TOTAL RAINFALL   (mm)=        58.23        58.23        58.226
      RUNOFF COEFFICIENT   =          .97          .59          .780

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 ---------------------------------------------------------------------------
 001:0021-------------------------------------------------------------------
 *
 *SUB-AREA No.5
 ---------------------
 | DESIGN NASHYD       |   Area     (ha)=     4.00   Curve Number   (CN)=85.00
 | 08:Pond-B DT= 2.50 |   Ia       (mm)=    4.670   # of Linear Res.(N)= 3.00
 ---------------------     U.H. Tp(hrs)=     .170

      Unit Hyd Qpeak  (cms)=      .899

      PEAK FLOW       (cms)=      .459 (i)
      TIME TO PEAK    (hrs)=     1.167
      RUNOFF VOLUME    (mm)=    29.155
      TOTAL RAINFALL   (mm)=    58.226
      RUNOFF COEFFICIENT   =      .501

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

 ---------------------------------------------------------------------------
 001:0022-------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP08 ) | ID: NHYD       AREA      QPEAK   TPEAK   R.V.     DWF
 --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
                    ID1 06:HIP06     61.06     6.741    1.17  46.70    .000
                   +ID2 07:HIP07     12.20     2.109    1.04  45.44    .000
                   +ID3 08:Pond-B     4.00      .459    1.17  29.15    .000
                    ===================================================
                    SUM 09:HIP08     77.26     8.998    1.13  45.59    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0023-------------------------------------------------------------------
 *
 *SUB-AREA No. 6
 *
 ---------------------
 | DESIGN NASHYD       |   Area     (ha)=     2.70   Curve Number   (CN)=76.00
 | 01:A3      DT= 2.50 |   Ia       (mm)=    4.670   # of Linear Res.(N)= 3.00
 ---------------------     U.H. Tp(hrs)=     .800

      Unit Hyd Qpeak  (cms)=      .129

      PEAK FLOW       (cms)=      .079 (i)
      TIME TO PEAK    (hrs)=     2.000
      RUNOFF VOLUME    (mm)=    21.442
      TOTAL RAINFALL   (mm)=    58.226
      RUNOFF COEFFICIENT   =      .368

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

 ---------------------------------------------------------------------------
 001:0024-------------------------------------------------------------------
 --------------------
 | ADD HYD (Ultima) | ID: NHYD       AREA      QPEAK   TPEAK   R.V.     DWF
 --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
                    ID1 09:HIP08     77.26     8.998    1.13  45.59    .000
                   +ID2 01:A3         2.70      .079    2.00  21.44    .000
                    ===================================================
                    SUM 02:Ultima    79.96     9.013    1.13  44.78    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0025-------------------------------------------------------------------
 ***********************************************************
 *        CALCULATION OF 3HR - 1:50 YEAR STORM EVENT            *
 ***********************************************************
 --------------------
 | START              |  Project  dir.: V:\20983.DU\ENG\SWMHYMO\
 --------------------  Rainfall dir.: V:\20983.DU\ENG\SWMHYMO\
     TZERO =   .00 hrs on        0
     METOUT=   2 (output = METRIC)
     NRUN  = 001
     NSTORM=   0
 ---------------------------------------------------------------------------
 001:0002-------------------------------------------------------------------
 --------------------
 | CHICAGO STORM     |    IDF curve parameters: A=1569.580
```

```
| Ptotal= 64.81 mm |                        B=   6.014
--------------------                        C=    .820
                              used in:   INTENSITY =  A / (t + B)^C

                              Duration of storm   =  3.00 hrs
                              Storm time step     = 10.00 min
                              Time to peak ratio  =   .33

                     TIME     RAIN |  TIME     RAIN |  TIME     RAIN |  TIME     RAIN
                      hrs    mm/hr |   hrs    mm/hr |   hrs    mm/hr |   hrs    mm/hr
                      .17    5.467 |  1.00  161.471 |  1.83   10.000 |  2.67    5.209
                      .33    6.820 |  1.17   48.876 |  2.00    8.397 |  2.83    4.774
                      .50    9.187 |  1.33   24.704 |  2.17    7.256 |  3.00    4.412
                      .67   14.441 |  1.50   16.495 |  2.33    6.403 |
                      .83   36.764 |  1.67   12.422 |  2.50    5.740 |

-------------------------------------------------------------------------
001:0003-----------------------------------------------------------------
---------------------
| DEFAULT VALUES      |  Filename: V:\20983.DU\ENG\SWMHYMO\ORGA.VAL
---------------------    ICASEdv = 1 (read and print data)
      FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
                 ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
      Horton's infiltration equation parameters:
      [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
      Parameters for PERVIOUS surfaces in STANDHYD:
      [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
      Parameters for IMPERVIOUS surfaces in STANDHYD:
      [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
      Parameters used in NASHYD:
      [Ia=   4.67 mm] [N= 3.00]
-------------------------------------------------------------------------
001:0004-----------------------------------------------------------------
*********************************************
*              ORGAWORLD FILE               *
*********************************************
* SUB-AREA No.1
---------------------
| CALIB  STANDHYD     |   Area     (ha)=    2.07
| 01:010     DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
---------------------
                                  IMPERVIOUS    PERVIOUS (i)
     Surface Area       (ha)=        1.74          .33
     Dep. Storage       (mm)=        1.57         4.67
     Average Slope       (%)=         .52         1.00
     Length              (m)=      204.72        20.00
     Mannings n             =        .030         .250

     Max.eff.Inten.(mm/hr)=        161.47        62.27
                 over (min)          7.50        12.50
     Storage Coeff.  (min)=          6.51 (ii)   13.44 (ii)
     Unit Hyd. Tpeak (min)=          7.50        12.50
     Unit Hyd. peak  (cms)=           .16          .09
                                                               *TOTALS*
     PEAK FLOW       (cms)=           .59          .03           .609 (iii)
     TIME TO PEAK    (hrs)=          1.04         1.17          1.042
     RUNOFF VOLUME    (mm)=         63.24        30.21         57.952
     TOTAL RAINFALL   (mm)=         64.81        64.81         64.806
     RUNOFF COEFFICIENT   =           .98          .47           .894

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

-------------------------------------------------------------------------
001:0005-----------------------------------------------------------------
*
* SUB-AREA No.2
---------------------
| CALIB  STANDHYD     |   Area     (ha)=    1.54
| 02:020     DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
---------------------
                                  IMPERVIOUS    PERVIOUS (i)
     Surface Area       (ha)=        1.42          .12
     Dep. Storage       (mm)=        1.57         4.67
     Average Slope       (%)=         .50         1.00
     Length              (m)=      244.34         5.00
     Mannings n             =        .030         .030

     Max.eff.Inten.(mm/hr)=        161.47        78.73
                 over (min)          7.50         7.50
     Storage Coeff.  (min)=          7.33 (ii)    8.10 (ii)
     Unit Hyd. Tpeak (min)=          7.50         7.50
     Unit Hyd. peak  (cms)=           .15          .14
                                                               *TOTALS*
     PEAK FLOW       (cms)=           .46          .02           .475 (iii)
     TIME TO PEAK    (hrs)=          1.04         1.08          1.042
     RUNOFF VOLUME    (mm)=         63.24        30.21         60.594
     TOTAL RAINFALL   (mm)=         64.81        64.81         64.806
     RUNOFF COEFFICIENT   =           .98          .47           .935

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

-------------------------------------------------------------------------
001:0006-----------------------------------------------------------------
*
* SUB-AREA No.3
---------------------
| CALIB  STANDHYD     |   Area     (ha)=    1.40
| 03:030     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
---------------------
                                  IMPERVIOUS    PERVIOUS (i)
     Surface Area       (ha)=        1.36          .04
     Dep. Storage       (mm)=        1.57         4.67
     Average Slope       (%)=         .51         1.00
     Length              (m)=      225.63         5.00
     Mannings n             =        .030         .030

     Max.eff.Inten.(mm/hr)=        161.47        78.73
                 over (min)          7.50         7.50
     Storage Coeff.  (min)=          6.95 (ii)    7.72 (ii)
     Unit Hyd. Tpeak (min)=          7.50         7.50
     Unit Hyd. peak  (cms)=           .16          .15
                                                               *TOTALS*
     PEAK FLOW       (cms)=           .45          .01           .454 (iii)
     TIME TO PEAK    (hrs)=          1.04         1.08          1.042
     RUNOFF VOLUME    (mm)=         63.24        30.21         62.245
     TOTAL RAINFALL   (mm)=         64.81        64.81         64.806
     RUNOFF COEFFICIENT   =           .98          .47           .960

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

-------------------------------------------------------------------------
001:0007-----------------------------------------------------------------
--------------------
| ADD HYD (040   ) | ID: NHYD     AREA     QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)     (cms)    (hrs)   (mm)    (cms)
                   ID1 01:010       2.07      .609     1.04  57.95     .000
                  +ID2 02:020       1.54      .475     1.04  60.59     .000
                   ===================================================
                   SUM 04:040       3.61     1.084     1.04  59.08     .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------
001:0008-----------------------------------------------------------------
--------------------
| ADD HYD (050   ) | ID: NHYD     AREA     QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)     (cms)    (hrs)   (mm)    (cms)
                   ID1 03:030       1.40      .454     1.04  62.25     .000
                  +ID2 04:040       3.61     1.084     1.04  59.08     .000
                   ===================================================
                   SUM 05:050       5.01     1.538     1.04  59.96     .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------
001:0009-----------------------------------------------------------------
*
* SUB-AREA No.4
---------------------
| CALIB STANDHYD      |   Area     (ha)=     .89
| 06:060     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
---------------------
                                  IMPERVIOUS    PERVIOUS (i)
     Surface Area       (ha)=         .86          .03
     Dep. Storage       (mm)=        1.57         4.67
     Average Slope       (%)=         .93          .70
     Length              (m)=      164.82        40.00
     Mannings n             =        .030         .250

     Max.eff.Inten.(mm/hr)=        161.47        53.28
                 over (min)          5.00        17.50
     Storage Coeff.  (min)=          4.80 (ii)   17.24 (ii)
     Unit Hyd. Tpeak (min)=          5.00        17.50
     Unit Hyd. peak  (cms)=           .23          .07
                                                               *TOTALS*
     PEAK FLOW       (cms)=           .33          .00           .335 (iii)
     TIME TO PEAK    (hrs)=          1.00         1.25          1.000
     RUNOFF VOLUME    (mm)=         63.24        30.21         62.245
     TOTAL RAINFALL   (mm)=         64.81        64.81         64.806
     RUNOFF COEFFICIENT   =           .98          .47           .960

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

-------------------------------------------------------------------------
001:0010-----------------------------------------------------------------
*
* SUB-AREA No.5
---------------------
| CALIB STANDHYD      |   Area     (ha)=    2.66
| 07:070     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
---------------------
                                  IMPERVIOUS    PERVIOUS (i)
     Surface Area       (ha)=        2.58          .08
     Dep. Storage       (mm)=        1.57         4.67
     Average Slope       (%)=         .61         1.50
     Length              (m)=      207.25        20.00
     Mannings n             =        .030         .250

     Max.eff.Inten.(mm/hr)=        161.47        62.27
                 over (min)          7.50        12.50
     Storage Coeff.  (min)=          6.26 (ii)   12.39 (ii)
     Unit Hyd. Tpeak (min)=          7.50        12.50
     Unit Hyd. peak  (cms)=           .17          .09
                                                               *TOTALS*
     PEAK FLOW       (cms)=           .88          .01           .886 (iii)
     TIME TO PEAK    (hrs)=          1.04         1.17          1.042
     RUNOFF VOLUME    (mm)=         63.24        30.21         62.245
     TOTAL RAINFALL   (mm)=         64.81        64.81         64.806
     RUNOFF COEFFICIENT   =           .98          .47           .960

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

-------------------------------------------------------------------------
001:0011-----------------------------------------------------------------
--------------------
| ADD HYD (080   ) | ID: NHYD     AREA     QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)     (cms)    (hrs)   (mm)    (cms)
                   ID1 06:060        .89      .335     1.00  62.25     .000
                  +ID2 07:070       2.66      .886     1.04  62.25     .000
                   ===================================================
                   SUM 08:080       3.55     1.197     1.04  62.25     .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------
001:0012-----------------------------------------------------------------
--------------------
| ADD HYD (090   ) | ID: NHYD     AREA     QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)     (cms)    (hrs)   (mm)    (cms)
                   ID1 05:050       5.01     1.538     1.04  59.96     .000
                  +ID2 08:080       3.55     1.197     1.04  62.25     .000
                   ===================================================
                   SUM 09:090       8.56     2.735     1.04  60.91     .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------
001:0013-----------------------------------------------------------------
--------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>09:(090   )    |
| OUT<10:(POND  )    |    =========  OUTLFOW STORAGE TABLE  =========
--------------------      OUTFLOW     STORAGE   |  OUTFLOW    STORAGE
                           (cms)     (ha.m.)    |   (cms)     (ha.m.)
                            .000  .0000E+00     |     .593  .6251E+00
                            .008  .6560E-01     |     .654  .6631E+00
                            .017  .1311E+00     |     .797  .7391E+00
                            .093  .2831E+00     |     .950  .8274E+00
                            .233  .3971E+00     |    1.304  .9157E+00
                            .337  .4731E+00     |    1.880  .1004E+01
                            .465  .5491E+00     |    2.577  .1092E+01
                            .531  .5871E+00     |     .000  .0000E+00

      ROUTING RESULTS               AREA      QPEAK     TPEAK        R.V.
      -------------------           (ha)      (cms)     (hrs)        (mm)
      INFLOW >09: (090   )          8.56      2.735     1.042      60.910
      OUTFLOW<10: (POND  )          8.56       .233     1.944      60.908

                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=      8.503
                     TIME SHIFT OF PEAK FLOW          (min)=     54.17
```

```
02971>                  MAXIMUM  STORAGE   USED       (ha.m.)=.3967E+00
02972>
02973> -----------------------------------------------------------------------------
02974> 001:0014---------------------------------------------------------------------
02975> ***********************************************
02976> *     Remaining Hawthorne Industrial Park     *
02977> ***********************************************
02978> *
02979> * SUB-AREA No.1
02980> ----------------------
02981> | CALIB  STANDHYD     |   Area     (ha)=   19.90
02982> | 01:HIP01  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
02983> ----------------------
02984>                               IMPERVIOUS    PERVIOUS (i)
02985>      Surface Area      (ha)=     14.13         5.77
02986>      Dep. Storage      (mm)=      1.57         4.67
02987>      Average Slope      (%)=       .60         1.50
02988>      Length             (m)=    580.00       100.00
02989>      Mannings n            =      .030         .250
02990>
02991>      Max.eff.Inten.(mm/hr)=    138.95       102.13
02992>                over (min)      12.50        25.00
02993>      Storage Coeff.  (min)=     12.38 (ii)   25.60 (ii)
02994>      Unit Hyd. Tpeak (min)=     12.50        25.00
02995>      Unit Hyd. peak  (cms)=       .09          .04
02996>                                                         *TOTALS*
02997>      PEAK FLOW       (cms)=      2.46          .95        3.001 (iii)
02998>      TIME TO PEAK    (hrs)=      1.13         1.38        1.167
02999>      RUNOFF VOLUME    (mm)=     63.24        39.90       51.566
03000>      TOTAL RAINFALL   (mm)=     64.81        64.81       64.806
03001>      RUNOFF COEFFICIENT   =       .98          .62         .796
03002>
03003>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03004>            CN* =  81.0    Ia = Dep. Storage  (Above)
03005>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03006>            THAN THE STORAGE COEFFICIENT.
03007>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03008>
03009> -----------------------------------------------------------------------------
03010> 001:0015---------------------------------------------------------------------
03011> --------------------
03012> | ADD HYD (HIP02 ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
03013> --------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
03014>                  ID1 10:POND      8.56      .233    1.94  60.91    .000
03015>                 +ID2 01:HIP01    19.90     3.001    1.17  51.57    .000
03016>                  ===============================================
03017>                  SUM 02:HIP02    28.46     3.092    1.17  54.37    .000
03018>
03019>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03020>
03021> -----------------------------------------------------------------------------
03022> 001:0016---------------------------------------------------------------------
03023> *
03024> * SUB-AREA No.2
03025> ----------------------
03026> | CALIB  STANDHYD     |   Area     (ha)=   17.00
03027> | 03:HIP03  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
03028> ----------------------
03029>                               IMPERVIOUS    PERVIOUS (i)
03030>      Surface Area      (ha)=     12.07         4.93
03031>      Dep. Storage      (mm)=      1.57         4.67
03032>      Average Slope      (%)=       .65         1.50
03033>      Length             (m)=    450.00       100.00
03034>      Mannings n            =      .030         .250
03035>
03036>      Max.eff.Inten.(mm/hr)=    161.47       109.61
03037>                over (min)      10.00        22.50
03038>      Storage Coeff.  (min)=      9.77 (ii)   22.63 (ii)
03039>      Unit Hyd. Tpeak (min)=     10.00        22.50
03040>      Unit Hyd. peak  (cms)=       .11          .05
03041>                                                         *TOTALS*
03042>      PEAK FLOW       (cms)=      2.38          .88        2.819 (iii)
03043>      TIME TO PEAK    (hrs)=      1.08         1.33        1.125
03044>      RUNOFF VOLUME    (mm)=     63.24        39.90      · 51.566
03045>      TOTAL RAINFALL   (mm)=     64.81        64.81       64.806
03046>      RUNOFF COEFFICIENT   =       .98          .62         .796
03047>
03048>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03049>            CN* =  81.0    Ia = Dep. Storage  (Above)
03050>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03051>            THAN THE STORAGE COEFFICIENT.
03052>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03053>
03054> -----------------------------------------------------------------------------
03055> 001:0017---------------------------------------------------------------------
03056> *
03057> * SUB-AREA No.3
03058> ----------------------
03059> | CALIB  STANDHYD     |   Area     (ha)=   15.60
03060> | 04:HIP04  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
03061> ----------------------
03062>                               IMPERVIOUS    PERVIOUS (i)
03063>      Surface Area      (ha)=     11.08         4.52
03064>      Dep. Storage      (mm)=      1.57         4.67
03065>      Average Slope      (%)=       .50         1.50
03066>      Length             (m)=    600.00       100.00
03067>      Mannings n            =      .030         .250
03068>
03069>      Max.eff.Inten.(mm/hr)=    138.95        96.02
03070>                over (min)      12.50        27.50
03071>      Storage Coeff.  (min)=     13.34 (ii)   26.90 (ii)
03072>      Unit Hyd. Tpeak (min)=     12.50        27.50
03073>      Unit Hyd. peak  (cms)=       .09          .04
03074>                                                         *TOTALS*
03075>      PEAK FLOW       (cms)=      1.86          .72        2.237 (iii)
03076>      TIME TO PEAK    (hrs)=      1.13         1.42        1.167
03077>      RUNOFF VOLUME    (mm)=     63.24        39.90       51.566
03078>      TOTAL RAINFALL   (mm)=     64.81        64.81       64.806
03079>      RUNOFF COEFFICIENT   =       .98          .62         .796
03080>
03081>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03082>            CN* =  81.0    Ia = Dep. Storage  (Above)
03083>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03084>            THAN THE STORAGE COEFFICIENT.
03085>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03086>
03087> -----------------------------------------------------------------------------
03088> 001:0018---------------------------------------------------------------------
03089> --------------------
03090> | ADD HYD (HIP05 ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
03091> --------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
03092>                  ID1 03:HIP03    17.00     2.819    1.13  51.57    .000
03093>                 +ID2 04:HIP04    15.60     2.237    1.17  51.57    .000
03094>                  ===============================================
03095>                  SUM 05:HIP05    32.60     5.019    1.13  51.57    .000
03096>
03097>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03098>
03099> -----------------------------------------------------------------------------
03100> 001:0019---------------------------------------------------------------------
03101> --------------------
03102> | ADD HYD (HIP06 ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
03103> --------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
03104>                  ID1 05:HIP05    32.60     5.019    1.13  51.57    .000
03105>                 +ID2 02:HIP02    28.46     3.092    1.17  54.37    .000
```

```
03106>                  ===============================================
03107>                  SUM 06:HIP06    61.06     8.054    1.13  52.87    .000
03108>
03109>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03110>
03111> -----------------------------------------------------------------------------
03112> 001:0020---------------------------------------------------------------------
03113> *
03114> * SUB-AREA No.4
03115> ----------------------
03116> | CALIB STANDHYD      |   Area     (ha)=   12.20
03117> | 07:HIP07  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
03118> ----------------------
03119>                               IMPERVIOUS    PERVIOUS (i)
03120>      Surface Area      (ha)=      8.66         3.54
03121>      Dep. Storage      (mm)=      1.57         4.67
03122>      Average Slope      (%)=       .70         1.50
03123>      Length             (m)=    210.00       100.00
03124>      Mannings n            =      .030         .250
03125>
03126>      Max.eff.Inten.(mm/hr)=    161.47       126.32
03127>                over (min)       5.00        17.50
03128>      Storage Coeff.  (min)=      6.05 (ii)   18.19 (ii)
03129>      Unit Hyd. Tpeak (min)=      5.00        17.50
03130>      Unit Hyd. peak  (cms)=       .20          .06
03131>                                                         *TOTALS*
03132>      PEAK FLOW       (cms)=      2.19          .73        2.470 (iii)
03133>      TIME TO PEAK    (hrs)=      1.00         1.25        1.042
03134>      RUNOFF VOLUME    (mm)=     63.24        39.90       51.566
03135>      TOTAL RAINFALL   (mm)=     64.81        64.81       64.806
03136>      RUNOFF COEFFICIENT   =       .98          .62         .796
03137>
03138>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03139>            CN* =  81.0    Ia = Dep. Storage  (Above)
03140>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03141>            THAN THE STORAGE COEFFICIENT.
03142>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03143>
03144> -----------------------------------------------------------------------------
03145> 001:0021---------------------------------------------------------------------
03146> *
03147> *SUB-AREA No.5
03148> ---------------------
03149> | DESIGN NASHYD       |   Area     (ha)=    4.00   Curve Number   (CN)=85.00
03150> | 08:Pond-B DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
03151> ---------------------    U.H. Tp(hrs)=    .170
03152>
03153>      Unit Hyd Qpeak  (cms)=      .899
03154>
03155>      PEAK FLOW       (cms)=      .551 (i)
03156>      TIME TO PEAK    (hrs)=     1.125
03157>      RUNOFF VOLUME    (mm)=    34.455
03158>      TOTAL RAINFALL   (mm)=    64.806
03159>      RUNOFF COEFFICIENT   =      .532
03160>
03161>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03162>
03163> -----------------------------------------------------------------------------
03164> 001:0022---------------------------------------------------------------------
03165> --------------------
03166> | ADD HYD (HIP08 ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
03167> --------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
03168>                  ID1 06:HIP06    61.06     8.054    1.13  52.87    .000
03169>                 +ID2 07:HIP07    12.20     2.470    1.04  51.57    .000
03170>                 +ID3 08:Pond-B    4.00      .551    1.13  34.45    .000
03171>                  ===============================================
03172>                  SUM 09:HIP08    77.26    10.570    1.13  51.71    .000
03173>
03174>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03175>
03176> -----------------------------------------------------------------------------
03177> 001:0023---------------------------------------------------------------------
03178> *
03179> *SUB-AREA No. 6
03180> *
03181> ---------------------
03182> | DESIGN NASHYD       |   Area     (ha)=    2.70   Curve Number   (CN)=76.00
03183> | 01:A3      DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
03184> ---------------------    U.H. Tp(hrs)=    .800
03185>
03186>      Unit Hyd Qpeak  (cms)=      .129
03187>
03188>      PEAK FLOW       (cms)=      .096 (i)
03189>      TIME TO PEAK    (hrs)=     1.958
03190>      RUNOFF VOLUME    (mm)=    25.767
03191>      TOTAL RAINFALL   (mm)=    64.806
03192>      RUNOFF COEFFICIENT   =      .398
03193>
03194>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03195>
03196> -----------------------------------------------------------------------------
03197> 001:0024---------------------------------------------------------------------
03198> --------------------
03199> | ADD HYD (Ultima) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
03200> --------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
03201>                  ID1 09:HIP08    77.26    10.570    1.13  51.71    .000
03202>                 +ID2 01:A3        2.70      .096    1.96  25.77    .000
03203>                  ===============================================
03204>                  SUM 02:Ultima   79.96    10.588    1.13  50.84    .000
03205>
03206>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03207>
03208> -----------------------------------------------------------------------------
03209> 001:0025---------------------------------------------------------------------
03210> ************************************************************
03211> *        CALCULATION OF 3HR - 1:100 YEAR STORM EVENT        *
03212> ************************************************************
03213> --------------------
03214> | START              |  Project  dir.: V:\20983.DU\ENG\SWMHYMO\
03215> --------------------  Rainfall dir.: V:\20983.DU\ENG\SWMHYMO\
03216>     TZERO =    .00 hrs on       0
03217>     METOUT=    2 (output = METRIC)
03218>     NRUN  = 001
03219>     NSTORM=    0
03220> -----------------------------------------------------------------------------
03221> 001:0002---------------------------------------------------------------------
03222> --------------------
03223> | CHICAGO STORM      |     IDF curve parameters: A=1735.688
03224> | Ptotal= 71.66 mm |                             B=    6.014
03225> --------------------                             C=     .820
03226>                          used in:   INTENSITY =  A / (t + B)^C
03227>
03228>                          Duration of storm  =  3.00 hrs
03229>                          Storm time step    = 10.00 min
03230>                          Time to peak ratio =   .33
03231>
03232>              TIME     RAIN |   TIME     RAIN |   TIME     RAIN |   TIME     RAIN
03233>               hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr
03234>               .17    6.046 |   1.00  178.559 |   1.83   11.059 |   2.67    5.760
03235>               .33    7.542 |   1.17   54.049 |   2.00    9.285 |   2.83    5.280
03236>               .50   10.159 |   1.33   27.319 |   2.17    8.024 |   3.00    4.879
03237>               .67   15.969 |   1.50   18.240 |   2.33    7.080 |
03238>               .83   40.655 |   1.67   13.737 |   2.50    6.347 |
03239>
03240> -----------------------------------------------------------------------------
```

```
001:0003-------------------------------------------------------------------
---------------------
| DEFAULT VALUES      |  Filename: V:\20983.DU\ENG\SWMHYMO\ORGA.VAL
---------------------   ICASEdv = 1 (read and print data)
    FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
               ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
    Horton's infiltration equation parameters:
    [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
    Parameters for PERVIOUS surfaces in STANDHYD:
    [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
    Parameters for IMPERVIOUS surfaces in STANDHYD:
    [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
    Parameters used in NASHYD:
    [Ia=   4.67 mm] [N= 3.00]
---------------------------------------------------------------------------
001:0004-------------------------------------------------------------------
*********************************
*          ORGAWORLD FILE       *
*********************************
* SUB-AREA No.1
---------------------
| CALIB  STANDHYD     |   Area     (ha)=    2.07
| 01:010     DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
---------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area       (ha)=      1.74           .33
     Dep. Storage       (mm)=      1.57          4.67
     Average Slope       (%)=       .52          1.00
     Length              (m)=    204.72         20.00
     Mannings n             =      .030          .250

     Max.eff.Inten.(mm/hr)=      178.56         74.05
                over (min)         7.50         12.50
     Storage Coeff.  (min)=        6.26 (ii)    12.72 (ii)
     Unit Hyd. Tpeak (min)=        7.50         12.50
     Unit Hyd. peak  (cms)=         .17           .09
                                                                *TOTALS*
     PEAK FLOW       (cms)=         .66           .04             .685 (iii)
     TIME TO PEAK    (hrs)=        1.04          1.17            1.042
     RUNOFF VOLUME    (mm)=       70.09         35.46           64.553
     TOTAL RAINFALL   (mm)=       71.66         71.66           71.665
     RUNOFF COEFFICIENT   =         .98           .49             .901

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0     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.

---------------------------------------------------------------------------
001:0005-------------------------------------------------------------------
*
* SUB-AREA No.2
---------------------
| CALIB  STANDHYD     |   Area     (ha)=    1.54
| 02:020     DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
---------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area       (ha)=      1.42           .12
     Dep. Storage       (mm)=      1.57          4.67
     Average Slope       (%)=       .50          1.00
     Length              (m)=    244.34          5.00
     Mannings n             =      .030          .030

     Max.eff.Inten.(mm/hr)=      178.56         93.23
                over (min)         7.50          7.50
     Storage Coeff.  (min)=        7.04 (ii)     7.76 (ii)
     Unit Hyd. Tpeak (min)=        7.50          7.50
     Unit Hyd. peak  (cms)=         .16           .15
                                                                *TOTALS*
     PEAK FLOW       (cms)=         .51           .02             .534 (iii)
     TIME TO PEAK    (hrs)=        1.04          1.08            1.042
     RUNOFF VOLUME    (mm)=       70.09         35.46           67.324
     TOTAL RAINFALL   (mm)=       71.66         71.66           71.665
     RUNOFF COEFFICIENT   =         .98           .49             .939

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0     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.

---------------------------------------------------------------------------
001:0006-------------------------------------------------------------------
*
* SUB-AREA No.3
---------------------
| CALIB  STANDHYD     |   Area     (ha)=    1.40
| 03:030     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
---------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area       (ha)=      1.36           .04
     Dep. Storage       (mm)=      1.57          4.67
     Average Slope       (%)=       .51          1.00
     Length              (m)=    225.63          5.00
     Mannings n             =      .030          .030

     Max.eff.Inten.(mm/hr)=      178.56         93.23
                over (min)         7.50          7.50
     Storage Coeff.  (min)=        6.67 (ii)     7.39 (ii)
     Unit Hyd. Tpeak (min)=        7.50          7.50
     Unit Hyd. peak  (cms)=         .16           .15
                                                                *TOTALS*
     PEAK FLOW       (cms)=         .50           .01             .509 (iii)
     TIME TO PEAK    (hrs)=        1.04          1.08            1.042
     RUNOFF VOLUME    (mm)=       70.09         35.46           69.056
     TOTAL RAINFALL   (mm)=       71.66         71.66           71.665
     RUNOFF COEFFICIENT   =         .98           .49             .964

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0     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.

---------------------------------------------------------------------------
001:0007-------------------------------------------------------------------
--------------------
| ADD HYD (040    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
--------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
                   ID1 01:010       2.07      .685    1.04  64.55    .000
                  +ID2 02:020       1.54      .534    1.04  67.32    .000
                   =====================================================
                   SUM 04:040       3.61     1.220    1.04  65.74    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---------------------------------------------------------------------------
001:0008-------------------------------------------------------------------
--------------------
| ADD HYD (050    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
--------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
                   ID1 03:030       1.40      .509    1.04  69.06    .000
                  +ID2 04:040       3.61     1.220    1.04  65.74    .000
                   =====================================================
                   SUM 05:050       5.01     1.729    1.04  66.66    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---------------------------------------------------------------------------
001:0009-------------------------------------------------------------------
*
* SUB-AREA No.4
---------------------
| CALIB  STANDHYD     |   Area     (ha)=     .89
| 06:060     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
---------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area       (ha)=       .86           .03
     Dep. Storage       (mm)=      1.57          4.67
     Average Slope       (%)=       .93           .70
     Length              (m)=    164.82         40.00
     Mannings n             =      .030          .250

     Max.eff.Inten.(mm/hr)=      178.56         67.61
                over (min)         5.00         15.00
     Storage Coeff.  (min)=        4.62 (ii)    15.92 (ii)
     Unit Hyd. Tpeak (min)=        5.00         15.00
     Unit Hyd. peak  (cms)=         .24           .07
                                                                *TOTALS*
     PEAK FLOW       (cms)=         .37           .00             .374 (iii)
     TIME TO PEAK    (hrs)=        1.00          1.21            1.000
     RUNOFF VOLUME    (mm)=       70.09         35.46           69.056
     TOTAL RAINFALL   (mm)=       71.66         71.66           71.665
     RUNOFF COEFFICIENT   =         .98           .49             .964

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0     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.

---------------------------------------------------------------------------
001:0010-------------------------------------------------------------------
*
* SUB-AREA No.5
---------------------
| CALIB  STANDHYD     |   Area     (ha)=    2.66
| 07:070     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
---------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area       (ha)=      2.58           .08
     Dep. Storage       (mm)=      1.57          4.67
     Average Slope       (%)=       .61          1.50
     Length              (m)=    207.25         20.00
     Mannings n             =      .030          .250

     Max.eff.Inten.(mm/hr)=      178.56         74.05
                over (min)         5.00         12.50
     Storage Coeff.  (min)=        6.01 (ii)    11.73 (ii)
     Unit Hyd. Tpeak (min)=        5.00         12.50
     Unit Hyd. peak  (cms)=         .20           .09
                                                                *TOTALS*
     PEAK FLOW       (cms)=        1.03           .01            1.034 (iii)
     TIME TO PEAK    (hrs)=        1.00          1.17            1.000
     RUNOFF VOLUME    (mm)=       70.09         35.46           69.056
     TOTAL RAINFALL   (mm)=       71.66         71.66           71.665
     RUNOFF COEFFICIENT   =         .98           .49             .964

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0     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.

---------------------------------------------------------------------------
001:0011-------------------------------------------------------------------
--------------------
| ADD HYD (080    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
--------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
                   ID1 06:060        .89      .374    1.00  69.06    .000
                  +ID2 07:070       2.66     1.034    1.00  69.06    .000
                   =====================================================
                   SUM 08:080       3.55     1.408    1.00  69.06    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---------------------------------------------------------------------------
001:0012-------------------------------------------------------------------
--------------------
| ADD HYD (090    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
--------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
                   ID1 05:050       5.01     1.729    1.04  66.66    .000
                  +ID2 08:080       3.55     1.408    1.00  69.06    .000
                   =====================================================
                   SUM 09:090       8.56     3.067    1.04  67.66    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---------------------------------------------------------------------------
001:0013-------------------------------------------------------------------
---------------------
| ROUTE RESERVOIR     |     Requested routing time step =  1.0 min.
|  IN>09:(090     )   |
| OUT<10:(POND    )   |     =========  OUTLFOW STORAGE TABLE  =========
---------------------      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                             (cms)     (ha.m.)   |   (cms)      (ha.m.)
                              .000  .0000E+00   |     .593  .6251E+00
                              .008  .6560E-01   |     .654  .6631E+00
                              .017  .1311E+00   |     .797  .7391E+00
                              .093  .2831E+00   |     .950  .8274E+00
                              .233  .3971E+00   |    1.304  .9157E+00
                              .337  .4731E+00   |    1.880  .1004E+01
                              .465  .5491E+00   |    2.577  .1092E+01
                              .531  .5871E+00   |     .000  .0000E+00

     ROUTING RESULTS               AREA      QPEAK      TPEAK        R.V.
     --------------------          (ha)      (cms)      (hrs)        (mm)
     INFLOW >09: (090    )         8.56      3.067      1.042      67.655
     OUTFLOW<10: (POND   )         8.56       .283      1.861      67.653

                        PEAK   FLOW   REDUCTION [Qout/Qin](%)=     9.214
                        TIME SHIFT OF PEAK FLOW         (min)=     49.17
                        MAXIMUM  STORAGE   USED       (ha.m.)=.4333E+00

---------------------------------------------------------------------------
001:0014-------------------------------------------------------------------
*********************************************
*     Remaining Hawthorne Industrial Park     *
*********************************************
*
* SUB-AREA No.1
---------------------
| CALIB STANDHYD      |   Area     (ha)=   19.90
| 01:HIP01  DT= 2.50  |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
---------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area       (ha)=     14.13          5.77
     Dep. Storage       (mm)=      1.57          4.67
     Average Slope       (%)=       .60          1.50
```

```
03511>       Length            (m)=     580.00        100.00
03512>       Mannings n          =        .030          .250
03513>
03514>       Max.eff.Inten.(mm/hr)=     153.66        117.89
03515>                over (min)       12.50         25.00
03516>       Storage Coeff.  (min)=      11.89 (ii)    24.37 (ii)
03517>       Unit Hyd. Tpeak (min)=      12.50         25.00
03518>       Unit Hyd. peak  (cms)=        .09           .05
03519>                                                            *TOTALS*
03520>       PEAK FLOW       (cms)=       2.77          1.13         3.419 (iii)
03521>       TIME TO PEAK    (hrs)=       1.13          1.38         1.167
03522>       RUNOFF VOLUME    (mm)=      70.09         45.94        58.015
03523>       TOTAL RAINFALL   (mm)=      71.66         71.66        71.665
03524>       RUNOFF COEFFICIENT   =        .98           .64          .810
03525>
03526>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03527>             CN* =  81.0    Ia = Dep. Storage  (Above)
03528>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03529>             THAN THE STORAGE COEFFICIENT.
03530>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03531>
03532> ----------------------------------------------------------------------------
03533> 001:0015--------------------------------------------------------------------
03534> --------------------
03535> | ADD HYD (HIP02 ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
03536> --------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
03537>                   ID1 10:POND       8.56      .283     1.86  67.65    .000
03538>                  +ID2 01:HIP01     19.90     3.419     1.17  58.02    .000
03539>                  ==================================================
03540>                   SUM 02:HIP02     28.46     3.554     1.17  60.91    .000
03541>
03542>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03543>
03544> ----------------------------------------------------------------------------
03545> 001:0016--------------------------------------------------------------------
03546> *
03547> * SUB-AREA No.2
03548> ----------------------
03549> | CALIB  STANDHYD     |   Area    (ha)=   17.00
03550> | 03:HIP03  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
03551> ----------------------
03552>                               IMPERVIOUS    PERVIOUS (i)
03553>       Surface Area     (ha)=     12.07         4.93
03554>       Dep. Storage     (mm)=      1.57         4.67
03555>       Average Slope     (%)=       .65         1.50
03556>       Length            (m)=    450.00       100.00
03557>       Mannings n          =       .030          .250
03558>
03559>       Max.eff.Inten.(mm/hr)=    178.56       126.60
03560>                over (min)      10.00         22.50
03561>       Storage Coeff.  (min)=      9.39 (ii)    21.52 (ii)
03562>       Unit Hyd. Tpeak (min)=     10.00         22.50
03563>       Unit Hyd. peak  (cms)=       .12           .05
03564>                                                           *TOTALS*
03565>       PEAK FLOW       (cms)=      2.68          1.05         3.203 (iii)
03566>       TIME TO PEAK    (hrs)=      1.08          1.33         1.125
03567>       RUNOFF VOLUME    (mm)=     70.09         45.94        58.015
03568>       TOTAL RAINFALL   (mm)=     71.66         71.66        71.665
03569>       RUNOFF COEFFICIENT   =       .98           .64          .810
03570>
03571>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03572>             CN* =  81.0    Ia = Dep. Storage  (Above)
03573>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03574>             THAN THE STORAGE COEFFICIENT.
03575>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03576>
03577> ----------------------------------------------------------------------------
03578> 001:0017--------------------------------------------------------------------
03579> *
03580> * SUB-AREA No.3
03581> ----------------------
03582> | CALIB  STANDHYD     |   Area    (ha)=   15.60
03583> | 04:HIP04  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
03584> ----------------------
03585>                               IMPERVIOUS    PERVIOUS (i)
03586>       Surface Area     (ha)=     11.08         4.52
03587>       Dep. Storage     (mm)=      1.57         4.67
03588>       Average Slope     (%)=       .50         1.50
03589>       Length            (m)=    600.00       100.00
03590>       Mannings n          =       .030          .250
03591>
03592>       Max.eff.Inten.(mm/hr)=    153.66       117.89
03593>                over (min)      12.50         25.00
03594>       Storage Coeff.  (min)=     12.82 (ii)    25.30 (ii)
03595>       Unit Hyd. Tpeak (min)=     12.50         25.00
03596>       Unit Hyd. peak  (cms)=       .09           .04
03597>                                                           *TOTALS*
03598>       PEAK FLOW       (cms)=      2.10           .87         2.612 (iii)
03599>       TIME TO PEAK    (hrs)=      1.13          1.38         1.167
03600>       RUNOFF VOLUME    (mm)=     70.09         45.94        58.015
03601>       TOTAL RAINFALL   (mm)=     71.66         71.66        71.665
03602>       RUNOFF COEFFICIENT   =       .98           .64          .810
03603>
03604>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03605>             CN* =  81.0    Ia = Dep. Storage  (Above)
03606>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03607>             THAN THE STORAGE COEFFICIENT.
03608>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03609>
03610> ----------------------------------------------------------------------------
03611> 001:0018--------------------------------------------------------------------
03612> --------------------
03613> | ADD HYD (HIP05 ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
03614> --------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
03615>                   ID1 03:HIP03     17.00     3.203     1.13  58.02    .000
03616>                  +ID2 04:HIP04     15.60     2.612     1.17  58.02    .000
03617>                  ==================================================
03618>                   SUM 05:HIP05     32.60     5.767     1.13  58.02    .000
03619>
03620>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03621>
03622> ----------------------------------------------------------------------------
03623> 001:0019--------------------------------------------------------------------
03624> --------------------
03625> | ADD HYD (HIP06 ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
03626> --------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
03627>                   ID1 05:HIP05     32.60     5.767     1.13  58.02    .000
03628>                  +ID2 02:HIP02     28.46     3.554     1.17  60.91    .000
03629>                  ==================================================
03630>                   SUM 06:HIP06     61.06     9.239     1.13  59.36    .000
03631>
03632>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03633>
03634> ----------------------------------------------------------------------------
03635> 001:0020--------------------------------------------------------------------
03636> *
03637> * SUB-AREA No.4
03638> ----------------------
03639> | CALIB STANDHYD      |   Area    (ha)=   12.20
03640> | 07:HIP07  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
03641> ----------------------
03642>                               IMPERVIOUS    PERVIOUS (i)
03643>       Surface Area     (ha)=      8.66         3.54
03644>       Dep. Storage     (mm)=      1.57         4.67
03645>       Average Slope     (%)=       .70         1.50
```

```
03646>       Length            (m)=    210.00        100.00
03647>       Mannings n          =       .030           .250
03648>
03649>       Max.eff.Inten.(mm/hr)=    178.56        146.17
03650>                over (min)       5.00         17.50
03651>       Storage Coeff.  (min)=      5.81 (ii)    17.27 (ii)
03652>       Unit Hyd. Tpeak (min)=      5.00         17.50
03653>       Unit Hyd. peak  (cms)=       .20           .07
03654>                                                           *TOTALS*
03655>       PEAK FLOW       (cms)=      2.46           .87         2.793 (iii)
03656>       TIME TO PEAK    (hrs)=      1.00          1.25         1.042
03657>       RUNOFF VOLUME    (mm)=     70.09         45.94        58.015
03658>       TOTAL RAINFALL   (mm)=     71.66         71.66        71.665
03659>       RUNOFF COEFFICIENT   =       .98           .64          .810
03660>
03661>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03662>             CN* =  81.0    Ia = Dep. Storage  (Above)
03663>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03664>             THAN THE STORAGE COEFFICIENT.
03665>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03666>
03667> ----------------------------------------------------------------------------
03668> 001:0021--------------------------------------------------------------------
03669> *
03670> *SUB-AREA No.5
03671> ----------------------
03672> | DESIGN NASHYD       |   Area    (ha)=    4.00   Curve Number   (CN)=85.00
03673> | 08:Pond-B DT= 2.50 |   Ia      (mm)=   4.670   # of Linear Res.(N)= 3.00
03674> ----------------------   U.H. Tp(hrs)=    .170
03675>
03676>       Unit Hyd Qpeak  (cms)=      .899
03677>
03678>       PEAK FLOW       (cms)=      .649 (i)
03679>       TIME TO PEAK    (hrs)=     1.125
03680>       RUNOFF VOLUME    (mm)=    40.139
03681>       TOTAL RAINFALL   (mm)=    71.665
03682>       RUNOFF COEFFICIENT   =      .560
03683>
03684>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03685>
03686> ----------------------------------------------------------------------------
03687> 001:0022--------------------------------------------------------------------
03688> --------------------
03689> | ADD HYD (HIP08 ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
03690> --------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
03691>                   ID1 06:HIP06     61.06     9.239     1.13  59.36    .000
03692>                  +ID2 07:HIP07     12.20     2.793     1.04  58.02    .000
03693>                  +ID3 08:Pond-B     4.00      .649     1.13  40.14    .000
03694>                  ==================================================
03695>                   SUM 09:HIP08     77.26    12.109     1.13  58.16    .000
03696>
03697>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03698>
03699> ----------------------------------------------------------------------------
03700> 001:0023--------------------------------------------------------------------
03701> *
03702> *SUB-AREA No. 6
03703> *
03704> ----------------------
03705> | DESIGN NASHYD       |   Area    (ha)=    2.70   Curve Number   (CN)=76.00
03706> | 01:A3      DT= 2.50 |   Ia      (mm)=   4.670   # of Linear Res.(N)= 3.00
03707> ----------------------   U.H. Tp(hrs)=    .800
03708>
03709>       Unit Hyd Qpeak  (cms)=      .129
03710>
03711>       PEAK FLOW       (cms)=      .114 (i)
03712>       TIME TO PEAK    (hrs)=     1.958
03713>       RUNOFF VOLUME    (mm)=    30.490
03714>       TOTAL RAINFALL   (mm)=    71.665
03715>       RUNOFF COEFFICIENT   =      .425
03716>
03717>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03718>
03719> ----------------------------------------------------------------------------
03720> 001:0024--------------------------------------------------------------------
03721> --------------------
03722> | ADD HYD (Ultima) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
03723> --------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
03724>                   ID1 09:HIP08     77.26    12.109     1.13  58.16    .000
03725>                  +ID2 01:A3         2.70      .114     1.96  30.49    .000
03726>                  ==================================================
03727>                   SUM 02:Ultima    79.96    12.132     1.13  57.22    .000
03728>
03729>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03730>
03731> ----------------------------------------------------------------------------
03732> 001:0025--------------------------------------------------------------------
03733>        FINISH
03734> ----------------------------------------------------------------------------
03735> ****************************************************************************
03736>       WARNINGS / ERRORS / NOTES
03737>       -------------------------
03738>    Simulation ended on 2009-02-09     at 14:59:34
03739> ============================================================================
03740>
03741>
03742>
```

APPENDIX 'F'

STAGE-STORAGE-DISCHARGE TABLE

Hawthorne Industrial Park
Configuration of Storage Facility

	RESTRICTOR FLOW (L/S)	RESTRICTOR FLOW (L/S)	WEIR FLOW (L/S)	TOTAL OUTFLOW (L/S)	Storage Cell Configuration		
Invert Elevation (m):	82.90	84.80	86.15				
Dia. or Width (mm):	150	600	6000				
# of restrictors/weirs:	1	2	1		SWMHYMO DATA		
Discharge Coeff. (C_d):	0.61	0.61	1.87		AREA	VOLUME	VOLUME
ELEV. (m)	DISCH. (L/S)	DISCH. (L/S)	DISCH. (L/S)		m^2	m^3	ha-m
82.900	0.0	0.0	0.0	0	0	0	0.0000
84.000	48.3	0.0	0.0	48	3093	574	0.0574
84.250	53.9	0.0	0.0	54	11192	2434	0.2434
84.500	59.0	0.0	0.0	59	16913	5834	0.5834
84.650	61.8	0.0	0.0	62	17299	8400	0.8400
84.800	64.5	0.0	0.0	64	17684	11024	1.1024
84.950	67.1	80.0	0.0	147	18070	13705	1.3705
85.100	69.6	210.0	0.0	280	18456	16444	1.6444
85.250	72.0	400.0	0.0	472	18842	19242	1.9242
85.400	74.3	650.0	0.0	724	19227	22097	2.2097
85.550	76.6	860.0	0.0	937	19613	25010	2.5010
85.700	78.8	1183.3	0.0	1262	19999	27981	2.7981
85.850	80.9	1323.0	0.0	1404	20384	31009	3.1009
86.000	83.0	1449.3	0.0	1532	20770	34096	3.4096
86.150	85.1	1565.4	0.0	1650	21156	37240	3.7240
86.300	87.1	1673.5	648.6	2409	21541	40442	4.0442
86.450	89.0	1775.0	1825.2	3689	21927	43702	4.3702

Note: Restrictor flows estimated by MTO Design Chart 2.32: Inlet Control for elevations ≤ 85.55 for double 600 mm culverts.

APPENDIX 'G'

SWMHYMO INPUT AND OUTPUT FILES
(Post-Development Controlled Phase 1 Conditions)

```
2     Metric units
*#**************************************************************************
*#  Project Name : Hawthorne Industrial Park        Project Number:   [20983] *
*#  Date         : January, 2009                                            *
*#  Revised      : N/A                                                       *
*#  Developed by : Mark Buchanan, E.I.T.                                     *
*#  Revi ewed by : Guy Forget, P.Eng.                                        *
*#  Company      : J.L. Richards & Associates Limited                        *
*#  License #    : 4418403                                                   *
*#**************************************************************************
*
*
*#*************************************************************
*#  FILENAME:  V:\20983.DU\ENG\SWMHYMO\20983PST.DAT           *
*#  FILE DEVELOPED FOR SITE PLAN APPLICATION AND DETAILED DESIGN *
*#   OF A FACILITY ASSOCIATED WITH THE OTTAWA COMPOSTING SITE    *
*#*************************************************************
*
*************************************************************************
*          SWMHYMO FILE DEVELOPED TO INVESTIGATE FLOOD FLOWS OF THE     *
*   PROPOSED COMPOSTING SITE UNDER POST-DEVELOPMENT UNCONTROLLED CONDITIONS   *
*************************************************************************

*******************************************************
* HYDROLOGICAL ANALYSIS UNDER A 4 HR-25 MM STORM AND  *
* FOR DESIGN STORMS OF 1:2, 5, 10, 25, 50, AND 100 YR *
*******************************************************

*************************************************************
*       POST-DEVELOPMENT UNCONTROLLED CONDITIONS            *
*************************************************************

*************************************************************
*             CALCULATION OF 4 HR 25 MM STORM EVENT         *
*************************************************************

START               TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                   [  ] <--storm filename, one per line for NSTORM time
READ STORM          STORM_FILENAME=["4HR25-15.STM"]
*%-----------------|-------------------------------------------------------------|
DEFAULT VALUES      ICASEdef=[1],  read and print values
                    DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%-----------------|-------------------------------------------------------------|

*********************************
*          ORGAWORLD FILE       *
*********************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                    XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                   .Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                         LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                    XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                         LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                         LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                         LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                         LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD      ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                         LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%-----------------|-------------------------------------------------------------|

ROUTE RESERVOIR     IDout=[10],   NHYD=["POND"],  IDin=[9],
                    RDT=[1.0](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                (cms) - (ha-m)
                              [   0.000,  0.0000]
                              [   0.008,  0.0656]
                              [   0.017,  0.1311]
                              [   0.093,  0.2831]
                              [   0.233,  0.3971]
                              [   0.337,  0.4731]
                              [   0.465,  0.5491]
                              [   0.531,  0.5871]
                              [   0.593,  0.6251]
                              [   0.654,  0.6631]
                              [   0.797,  0.7391]
                              [   0.950,  0.8274]
                              [   1.304,  0.9157]
                              [   1.880,  1.0040]
                              [   2.577,  1.0923]
                              [   -1   ,  -1    ]  (max twenty pts)

*********************************************
*     Remaining Hawthorne Industrial Park    *
*********************************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                         LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                         LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[18.1](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                         LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%-----------------|-------------------------------------------------------------|
*
*SUB-AREA No.4

DESIGN NASHYD       ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                    DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|


ADD HYD             IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
*%-----------------|-------------------------------------------------------------|

ROUTE RESERVOIR     IDout=[ 8 ],   NHYD=["HIP-POND"],  IDin=[ 7 ],
                    RDT=[1.0](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                (cms) - (ha-m)
                              [   0.0  , 0.0     ]
                              [   0.048, 0.0574 ]
                              [   0.054, 0.2434 ]
                              [   0.059, 0.5834 ]
                              [   0.062, 0.8400 ]
                              [   0.064, 1.1024 ]
                              [   0.147, 1.3705 ]
                              [   0.280, 1.6444 ]
                              [   0.472, 1.9242 ]
                              [   0.724, 2.2097 ]
                              [   0.937, 2.5010 ]
                              [   1.262, 2.7981 ]
                              [   1.404, 3.1009 ]
                              [   1.532, 3.4096 ]
                              [   1.650, 3.7240 ]
                              [   2.409, 4.0442 ]
                              [   3.689, 4.3702 ]
                              [   -1  ,  -1    ]  (max twenty pts)


*%-----------------|-------------------------------------------------------------|
*
*SUB-AREA No. 5
*
DESIGN NASHYD       ID = [9], NHYD=["A2"], DT=[2.5]min, AREA=[6.8](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.37]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|
*
*SUB-AREA No. 6
*
DESIGN NASHYD       ID = [10], NHYD=["A3"], DT=[2.5]min, AREA=[5.3](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.804]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[1], NHYD=["Interim"], IDs to add=[8+9+10]
*%-----------------|-------------------------------------------------------------|


*************************************************************
*         CALCULATION OF 3HR - 1:2 YEAR STORM EVENT          *
*************************************************************

START               TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                   [  ] <--storm filename, one per line for NSTORM time
*%-----------------|-------------------------------------------------------------|
CHICAGO STORM       IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
                    ICASEcs=[1],
                    A=[732.951],  B=[6.199], and C=[0.810],
*%-----------------|-------------------------------------------------------------|.
DEFAULT VALUES      ICASEdef=[1],  read and print values
                    DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%-----------------|-------------------------------------------------------------|

*********************************
*          ORGAWORLD FILE       *
*********************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                    XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                         LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                    XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
```

```
00271>                     SCS curve number CN=[81],
00272>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
00273>                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
00274>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
00275>                                          LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
00276>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00277> *%-----------------|-------------------------------------------------------------|
00278> *
00279> * SUB-AREA No.3
00280>
00281> CALIB STANDHYD      ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
00282>                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
00283>                     SCS curve number CN=[81],
00284>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
00285>                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
00286>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
00287>                                          LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
00288>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00289> *%-----------------|-------------------------------------------------------------|
00290> ADD HYD             IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
00291> *%-----------------|-------------------------------------------------------------|
00292> ADD HYD             IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
00293> *%-----------------|-------------------------------------------------------------|
00294> *
00295> * SUB-AREA No.4
00296>
00297> CALIB STANDHYD      ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
00298>                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
00299>                     SCS curve number CN=[81],
00300>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
00301>                                          LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
00302>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
00303>                                          LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
00304>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00305> *%-----------------|-------------------------------------------------------------|
00306> *
00307> * SUB-AREA No.5
00308>
00309> CALIB STANDHYD      ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
00310>                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
00311>                     SCS curve number CN=[81],
00312>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
00313>                                          LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
00314>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
00315>                                          LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
00316>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00317> *%-----------------|-------------------------------------------------------------|
00318> ADD HYD             IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
00319> *%-----------------|-------------------------------------------------------------|
00320> ADD HYD             IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
00321> *%-----------------|-------------------------------------------------------------|
00322>
00323> ROUTE RESERVOIR     IDout=[10],   NHYD=["POND"],  IDin=[9],
00324>                     RDT=[1.0](min),
00325>                          TABLE of ( OUTFLOW-STORAGE ) values
00326>                                     (cms) - (ha-m)
00327>                                  [   0.000,  0.0000]
00328>                                  [   0.008,  0.0656]
00329>                                  [   0.017,  0.1311]
00330>                                  [   0.093,  0.2831]
00331>                                  [   0.233,  0.3971]
00332>                                  [   0.337,  0.4731]
00333>                                  [   0.465,  0.5491]
00334>                                  [   0.531,  0.5871]
00335>                                  [   0.593,  0.6251]
00336>                                  [   0.654,  0.6631]
00337>                                  [   0.797,  0.7391]
00338>                                  [   0.950,  0.8274]
00339>                                  [   1.304,  0.9157]
00340>                                  [   1.880,  1.0040]
00341>                                  [   2.577,  1.0923]
00342>                                  [   -1   ,  -1    ]  (max twenty pts)
00343>
00344> ************************************************
00345> *     Remaining Hawthorne Industrial Park      *
00346> ************************************************
00347> *
00348> * SUB-AREA No.1
00349>
00350> CALIB STANDHYD      ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
00351>                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
00352>                     SCS curve number CN=[81],
00353>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
00354>                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
00355>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
00356>                                          LGI=[580](m), MNI=[0.03], SCI=[0.0](min
00357>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00358> *%-----------------|-------------------------------------------------------------|
00359> ADD HYD             IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
00360> *%-----------------|-------------------------------------------------------------|
00361> *
00362> * SUB-AREA No.2
00363>
00364> CALIB STANDHYD      ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
00365>                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
00366>                     SCS curve number CN=[81],
00367>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
00368>                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
00369>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
00370>                                          LGI=[450](m), MNI=[0.03], SCI=[0.0](min
00371>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00372> *%-----------------|-------------------------------------------------------------|
00373> *
00374> * SUB-AREA No.3
00375>
00376> CALIB STANDHYD      ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[18.1](ha),
00377>                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
00378>                     SCS curve number CN=[81],
00379>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
00380>                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
00381>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
00382>                                          LGI=[600](m), MNI=[0.03], SCI=[0.0](min
00383>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00384> *%-----------------|-------------------------------------------------------------|
00385> ADD HYD             IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
00386> *%-----------------|-------------------------------------------------------------|
00387> *
00388> *SUB-AREA No.4
00389>
00390> DESIGN NASHYD       ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
00391>                     DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
00392>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00393> *%-----------------|-------------------------------------------------------------|
00394>
00395>
00396> ADD HYD             IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
00397> *%-----------------|-------------------------------------------------------------|
00398>
00399> ROUTE RESERVOIR     IDout=[ 8 ],   NHYD=["HIP-POND"],  IDin=[ 7 ],
00400>                     RDT=[1.0](min),
00401>                          TABLE of ( OUTFLOW-STORAGE ) values
00402>                                     (cms) - (ha-m)
00403>                                  [   0.0  , 0.0    ]
00404>                                  [   0.048, 0.0574 ]
00405>                                  [   0.054, 0.2434 ]
00406>                                  [   0.059, 0.5834 ]
00407>                                  [   0.062, 0.8400 ]
00408>                                  [   0.064, 1.1024 ]
00409>                                  [   0.147, 1.3705 ]
00410>                                  [   0.280, 1.6444 ]
00411>                                  [   0.472, 1.9242 ]
00412>                                  [   0.724, 2.2097 ]
00413>                                  [   0.937, 2.5010 ]
00414>                                  [   1.262, 2.7981 ]
00415>                                  [   1.404, 3.1009 ]
00416>                                  [   1.532, 3.4096 ]
00417>                                  [   1.650, 3.7240 ]
00418>                                  [   2.409, 4.0442 ]
00419>                                  [   3.689, 4.3702 ]
00420>                                  [   -1  ,  -1    ]  (max twenty pts)
00421>
00422> *%-----------------|-------------------------------------------------------------|
00423> *
00424> *SUB-AREA No. 5
00425> *
00426> DESIGN NASHYD       ID = [9], NHYD=["A2"], DT=[2.5]min, AREA=[6.8](ha),
00427>                     DWF=[0](cms), CNC=[76], TP=[0.37]hrs,
00428>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00429> *%-----------------|-------------------------------------------------------------|
00430> *
00431> *SUB-AREA No. 6
00432> *
00433> DESIGN NASHYD       ID = [10], NHYD=["A3"], DT=[2.5]min, AREA=[5.3](ha),
00434>                     DWF=[0](cms), CNC=[76], TP=[0.804]hrs,
00435>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00436> *%-----------------|-------------------------------------------------------------|
00437> ADD HYD             IDsum=[1], NHYD=["Interim"], IDs to add=[8+9+10]
00438> *%-----------------|-------------------------------------------------------------|
00439>
00440>
00441> ***************************************************************
00442> *        CALCULATION OF 3HR - 1:5 YEAR STORM EVENT            *
00443> ***************************************************************
00444>
00445> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
00446> *%                   [  ] <--storm filename, one per line for NSTORM time
00447> *%-----------------|-------------------------------------------------------------|
00448> CHICAGO STORM       IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
00449>                     ICASEcs=[1],
00450>                     A=[998.071],  B=[6.053], and C=[0.814],
00451> *%-----------------|-------------------------------------------------------------|
00452> DEFAULT VALUES      ICASEdef=[1],  read and print values
00453>                     DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
00454> *%-----------------|-------------------------------------------------------------|
00455>
00456> ***********************************
00457> *          ORGAWORLD FILE         *
00458> ***********************************
00459> *
00460> * SUB-AREA No.1
00461>
00462> CALIB STANDHYD      ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
00463>                     XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
00464>                     SCS curve number CN=[81],
00465>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
00466>                                          LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
00467>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
00468>                                          LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
00469>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00470> *%-----------------|-------------------------------------------------------------|
00471> *
00472> * SUB-AREA No.2
00473>
00474> CALIB STANDHYD      ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
00475>                     XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
00476>                     SCS curve number CN=[81],
00477>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
00478>                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
00479>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
00480>                                          LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
00481>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00482> *%-----------------|-------------------------------------------------------------|
00483> *
00484> * SUB-AREA No.3
00485>
00486> CALIB STANDHYD      ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
00487>                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
00488>                     SCS curve number CN=[81],
00489>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
00490>                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
00491>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
00492>                                          LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
00493>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00494> *%-----------------|-------------------------------------------------------------|
00495> ADD HYD             IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
00496> *%-----------------|-------------------------------------------------------------|
00497> ADD HYD             IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
00498> *%-----------------|-------------------------------------------------------------|
00499> *
00500> * SUB-AREA No.4
00501>
00502> CALIB STANDHYD      ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
00503>                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
00504>                     SCS curve number CN=[81],
00505>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
00506>                                          LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
00507>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
00508>                                          LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
00509>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00510> *%-----------------|-------------------------------------------------------------|
00511> *
00512> * SUB-AREA No.5
00513>
00514> CALIB STANDHYD      ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
00515>                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
00516>                     SCS curve number CN=[81],
00517>                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
00518>                                          LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
00519>                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
00520>                                          LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
00521>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00522> *%-----------------|-------------------------------------------------------------|
00523> ADD HYD             IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
00524> *%-----------------|-------------------------------------------------------------|
00525> ADD HYD             IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
00526> *%-----------------|-------------------------------------------------------------|
00527>
00528> ROUTE RESERVOIR     IDout=[10],   NHYD=["POND"],  IDin=[9],
00529>                     RDT=[1.0](min),
00530>                          TABLE of ( OUTFLOW-STORAGE ) values
00531>                                     (cms) - (ha-m)
00532>                                  [   0.000,  0.0000]
00533>                                  [   0.008,  0.0656]
00534>                                  [   0.017,  0.1311]
00535>                                  [   0.093,  0.2831]
00536>                                  [   0.233,  0.3971]
00537>                                  [   0.337,  0.4731]
00538>                                  [   0.465,  0.5491]
00539>                                  [   0.531,  0.5871]
00540>                                  [   0.593,  0.6251]
```

```
                                             [    0.654,   0.6631]
                                             [    0.797,   0.7391]
                                             [    0.950,   0.8274]
                                             [    1.304,   0.9157]
                                             [    1.880,   1.0040]
                                             [    2.577,   1.0923]
                                             [    -1   ,   -1    ]  (max twenty pts)

**************************************************
*      Remaining Hawthorne Industrial Park       *
**************************************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                         LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                         LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[18.1](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                         LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%-----------------|--------------------------------------------------------|
*
*SUB-AREA No.4

DESIGN NASHYD       ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                    DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|--------------------------------------------------------|


ADD HYD             IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
*%-----------------|--------------------------------------------------------|

ROUTE RESERVOIR     IDout=[ 8 ],   NHYD=["HIP-POND"],  IDin=[ 7 ],
                    RDT=[1.0](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                      (cms) - (ha-m)
                                   [    0.0  , 0.0    ]
                                   [    0.048, 0.0574 ]
                                   [    0.054, 0.2434 ]
                                   [    0.059, 0.5834 ]
                                   [    0.062, 0.8400 ]
                                   [    0.064, 1.1024 ]
                                   [    0.147, 1.3705 ]
                                   [    0.280, 1.6444 ]
                                   [    0.472, 1.9242 ]
                                   [    0.724, 2.2097 ]
                                   [    0.937, 2.5010 ]
                                   [    1.262, 2.7981 ]
                                   [    1.404, 3.1009 ]
                                   [    1.532, 3.4096 ]
                                   [    1.650, 3.7240 ]
                                   [    2.409, 4.0442 ]
                                   [    3.689, 4.3702 ]
                                   [    -1   ,  -1    ]  (max twenty pts)

*%-----------------|--------------------------------------------------------|
*
*SUB-AREA No. 5
*
DESIGN NASHYD       ID = [9], NHYD=["A2"], DT=[2.5]min, AREA=[6.8](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.37]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|--------------------------------------------------------|
*
*SUB-AREA No. 6
*
DESIGN NASHYD       ID = [10], NHYD=["A3"], DT=[2.5]min, AREA=[5.3](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.804]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[1], NHYD=["Interim"], IDs to add=[8+9+10]
*%-----------------|--------------------------------------------------------|

******************************************************************
*           CALCULATION OF 3HR - 1:10 YEAR STORM EVENT           *
******************************************************************

START               TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                   [  ] <--storm filename, one per line for NSTORM time
*%-----------------|--------------------------------------------------------|
CHICAGO STORM       IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
                    ICASEcs=[1],
                    A=[1174.184],  B=[6.014], and C=[0.816],
*%-----------------|--------------------------------------------------------|
DEFAULT VALUES      ICASEdef=[1],  read and print values
                    DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%-----------------|--------------------------------------------------------|

**************************************
*          ORGAWORLD FILE            *
**************************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                    XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                         LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                    XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                         LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                         LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                         LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                         LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD      ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                         LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%-----------------|--------------------------------------------------------|

ROUTE RESERVOIR     IDout=[10],   NHYD=["POND"],  IDin=[9],
                    RDT=[1.0](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                      (cms) - (ha-m)
                                   [    0.000,   0.0000]
                                   [    0.008,   0.0656]
                                   [    0.017,   0.1311]
                                   [    0.093,   0.2831]
                                   [    0.233,   0.3971]
                                   [    0.337,   0.4731]
                                   [    0.465,   0.5491]
                                   [    0.531,   0.5871]
                                   [    0.593,   0.6251]
                                   [    0.654,   0.6631]
                                   [    0.797,   0.7391]
                                   [    0.950,   0.8274]
                                   [    1.304,   0.9157]
                                   [    1.880,   1.0040]
                                   [    2.577,   1.0923]
                                   [    -1   ,   -1    ]  (max twenty pts)

**************************************************
*      Remaining Hawthorne Industrial Park       *
**************************************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                         LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                         LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[18.1](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                         LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%-----------------|--------------------------------------------------------|
*
*SUB-AREA No.4

DESIGN NASHYD       ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                    DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|--------------------------------------------------------|


ADD HYD             IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
*%-----------------|--------------------------------------------------------|

ROUTE RESERVOIR     IDout=[ 8 ],   NHYD=["HIP-POND"],  IDin=[ 7 ],
                    RDT=[1.0](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
```

```
                                        (cms) - (ha-m)
                                      [   0.0  , 0.0    ]
                                      [   0.048, 0.0574 ]
                                      [   0.054, 0.2434 ]
                                      [   0.059, 0.5834 ]
                                      [   0.062, 0.8400 ]
                                      [   0.064, 1.1024 ]
                                      [   0.147, 1.3705 ]
                                      [   0.280, 1.6444 ]
                                      [   0.472, 1.9242 ]
                                      [   0.724, 2.2097 ]
                                      [   0.937, 2.5010 ]
                                      [   1.262, 2.7981 ]
                                      [   1.404, 3.1009 ]
                                      [   1.532, 3.4096 ]
                                      [   1.650, 3.7240 ]
                                      [   2.409, 4.0442 ]
                                      [   3.689, 4.3702 ]
                                      [   -1  ,  -1    ]  (max twenty pts)

*%-----------------|-------------------------------------------------------|
*
*SUB-AREA No. 5
*
DESIGN NASHYD       ID = [9], NHYD=["A2"], DT=[2.5]min, AREA=[6.8](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.37]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------|
*
*SUB-AREA No. 6
*
DESIGN NASHYD       ID = [10], NHYD=["A3"], DT=[2.5]min, AREA=[5.3](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.804]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------|
ADD HYD             IDsum=[1], NHYD=["Interim"], IDs to add=[8+9+10]
*%-----------------|-------------------------------------------------------|

**************************************************************
*          CALCULATION OF 3HR - 1:25 YEAR STORM EVENT           *
**************************************************************

START               TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                   [  ] <--storm filename, one per line for NSTORM time
*%-----------------|-------------------------------------------------------|
CHICAGO STORM       IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
                    ICASEcs=[1],
                    A=[1402.884],  B=[6.018], and C=[0.819],
*%-----------------|-------------------------------------------------------|
DEFAULT VALUES      ICASEdef=[1],  read and print values
                    DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%-----------------|-------------------------------------------------------|

***********************************
*          ORGAWORLD FILE         *
***********************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                    XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                         LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                    XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                         LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                         LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%-----------------|-------------------------------------------------------|
ADD HYD             IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%-----------------|-------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                         LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                         LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD      ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                         LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
ADD HYD             IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%-----------------|-------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%-----------------|-------------------------------------------------------|

ROUTE RESERVOIR     IDout=[10],   NHYD=["POND"],  IDin=[9],
                    RDT=[1.0](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                    (cms) - (ha-m)
                                 [    0.000,  0.0000]
                                 [    0.008,  0.0656]
                                 [    0.017,  0.1311]
                                 [    0.093,  0.2831]
                                 [    0.233,  0.3971]
                                 [    0.337,  0.4731]
                                 [    0.465,  0.5491]
                                 [    0.531,  0.5871]
                                 [    0.593,  0.6251]
                                 [    0.654,  0.6631]
                                 [    0.797,  0.7391]
                                 [    0.950,  0.8274]
                                 [    1.304,  0.9157]
                                 [    1.880,  1.0040]
                                 [    2.577,  1.0923]
                                 [    -1   ,  -1    ]  (max twenty pts)

***********************************************
*     Remaining Hawthorne Industrial Park     *
***********************************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                         LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
ADD HYD             IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%-----------------|-------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                         LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[18.1](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                         LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
ADD HYD             IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%-----------------|-------------------------------------------------------|
*
*SUB-AREA No.4

DESIGN NASHYD       ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                    DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------|


ADD HYD             IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
*%-----------------|-------------------------------------------------------|

ROUTE RESERVOIR     IDout=[ 8 ],   NHYD=["HIP-POND"],  IDin=[ 7 ],
                    RDT=[1.0](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                    (cms) - (ha-m)
                                 [   0.0  , 0.0    ]
                                 [   0.048, 0.0574 ]
                                 [   0.054, 0.2434 ]
                                 [   0.059, 0.5834 ]
                                 [   0.062, 0.8400 ]
                                 [   0.064, 1.1024 ]
                                 [   0.147, 1.3705 ]
                                 [   0.280, 1.6444 ]
                                 [   0.472, 1.9242 ]
                                 [   0.724, 2.2097 ]
                                 [   0.937, 2.5010 ]
                                 [   1.262, 2.7981 ]
                                 [   1.404, 3.1009 ]
                                 [   1.532, 3.4096 ]
                                 [   1.650, 3.7240 ]
                                 [   2.409, 4.0442 ]
                                 [   3.689, 4.3702 ]
                                 [   -1  ,  -1    ]  (max twenty pts)

*%-----------------|-------------------------------------------------------|
*
*SUB-AREA No. 5
*
DESIGN NASHYD       ID = [9], NHYD=["A2"], DT=[2.5]min, AREA=[6.8](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.37]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------|
*
*SUB-AREA No. 6
*
DESIGN NASHYD       ID = [10], NHYD=["A3"], DT=[2.5]min, AREA=[5.3](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.804]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------|
ADD HYD             IDsum=[1], NHYD=["Interim"], IDs to add=[8+9+10]
*%-----------------|-------------------------------------------------------|

**************************************************************
*          CALCULATION OF 3HR - 1:50 YEAR STORM EVENT           *
**************************************************************

START               TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                   [  ] <--storm filename, one per line for NSTORM time
*%-----------------|-------------------------------------------------------|
CHICAGO STORM       IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
                    ICASEcs=[1],
                    A=[1569.580],  B=[6.014], and C=[0.820],
*%-----------------|-------------------------------------------------------|
DEFAULT VALUES      ICASEdef=[1],  read and print values
                    DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%-----------------|-------------------------------------------------------|

***********************************
*          ORGAWORLD FILE         *
***********************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                    XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                         LGI=[204.72](m), MNI=[0.03 ), SCI=[0.0]
```

```
                     RAINFALL=[ ,   ,   ,   , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD       ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                     XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                          LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                     RAINFALL=[ ,   ,   ,   , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD       ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                          LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                     RAINFALL=[ ,   ,   ,   , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD              IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%-----------------|-------------------------------------------------------------|
ADD HYD              IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD       ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                          LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                          LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                     RAINFALL=[ ,   ,   ,   , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD       ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                          LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                     RAINFALL=[ ,   ,   ,   , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD              IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%-----------------|-------------------------------------------------------------|
ADD HYD              IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%-----------------|-------------------------------------------------------------|

ROUTE RESERVOIR      IDout=[10],   NHYD=["POND"],  IDin=[9],
                     RDT=[1.0](min),
                           TABLE of ( OUTFLOW-STORAGE ) values
                                        (cms) - (ha-m)
                                      [   0.000,  0.0000]
                                      [   0.008,  0.0656]
                                      [   0.017,  0.1311]
                                      [   0.093,  0.2831]
                                      [   0.233,  0.3971]
                                      [   0.337,  0.4731]
                                      [   0.465,  0.5491]
                                      [   0.531,  0.5871]
                                      [   0.593,  0.6251]
                                      [   0.654,  0.6631]
                                      [   0.797,  0.7391]
                                      [   0.950,  0.8274]
                                      [   1.304,  0.9157]
                                      [   1.880,  1.0040]
                                      [   2.577,  1.0923]
                                      [   -1   ,  -1    ]  (max twenty pts)

*********************************************
*     Remaining Hawthorne Industrial Park     *
*********************************************
*
* SUB-AREA No.1

CALIB STANDHYD       ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                          LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                     RAINFALL=[ ,   ,   ,   , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD              IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD       ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                          LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                     RAINFALL=[ ,   ,   ,   , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD       ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[18.1](ha),
                     XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                          LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                     RAINFALL=[ ,   ,   ,   , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD              IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%-----------------|-------------------------------------------------------------|
*
*SUB-AREA No.4

DESIGN NASHYD        ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                     DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                     RAINFALL=[ ,   ,   ,   , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|


ADD HYD              IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
*%-----------------|-------------------------------------------------------------|

ROUTE RESERVOIR      IDout=[ 8 ],   NHYD=["HIP-POND"],  IDin=[ 7 ],
                     RDT=[1.0](min),
                           TABLE of ( OUTFLOW-STORAGE ) values
                                        (cms) - (ha-m)
                                      [   0.0  , 0.0     ]
                                      [   0.048, 0.0574 ]
                                      [   0.054, 0.2434 ]
                                      [   0.059, 0.5834 ]
                                      [   0.062, 0.8400 ]
                                      [   0.064, 1.1024 ]
                                      [   0.147, 1.3705 ]
                                      [   0.280, 1.6444 ]
                                      [   0.472, 1.9242 ]
                                      [   0.724, 2.2097 ]
                                      [   0.937, 2.5010 ]
                                      [   1.262, 2.7981 ]
                                      [   1.404, 3.1009 ]
                                      [   1.532, 3.4096 ]
                                      [   1.650, 3.7240 ]
                                      [   2.409, 4.0442 ]
                                      [   3.689, 4.3702 ]
                                      [   -1  ,  -1    ]  (max twenty pts)

*%-----------------|-------------------------------------------------------------|
*
*SUB-AREA No. 5
*
DESIGN NASHYD        ID = [9], NHYD=["A2"], DT=[2.5]min, AREA=[6.8](ha),
                     DWF=[0](cms), CNC=[76], TP=[0.37]hrs,
                     RAINFALL=[ ,   ,   ,   , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|
*
*SUB-AREA No. 6
*
DESIGN NASHYD        ID = [10], NHYD=["A3"], DT=[2.5]min, AREA=[5.3](ha),
                     DWF=[0](cms), CNC=[76], TP=[0.804]hrs,
                     RAINFALL=[ ,   ,   ,   , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD              IDsum=[1], NHYD=["Interim"], IDs to add=[8+9+10]
*%-----------------|-------------------------------------------------------------|

************************************************************
*       CALCULATION OF 3HR - 1:100 YEAR STORM EVENT        *
************************************************************

START                TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                    [  ] <--storm filename, one per line for NSTORM time
*%-----------------|-------------------------------------------------------------|
CHICAGO STORM        IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
                     ICASEcs=[1],
                     A=[1735.688],  B=[6.014], and C=[0.820],
*%-----------------|-------------------------------------------------------------|
DEFAULT VALUES       ICASEdef=[1],  read and print values
                     DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%-----------------|-------------------------------------------------------------|

*********************************
*          ORGAWORLD FILE       *
*********************************
*
* SUB-AREA No.1

CALIB STANDHYD       ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                     XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                          LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                          LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                     RAINFALL=[ ,   ,   ,   , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD       ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                     XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                          LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                     RAINFALL=[ ,   ,   ,   , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD       ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                          LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                          LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                     RAINFALL=[ ,   ,   ,   , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD              IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%-----------------|-------------------------------------------------------------|
ADD HYD              IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD       ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                          LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                          LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                     RAINFALL=[ ,   ,   ,   , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD       ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                     XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                     SCS curve number CN=[81],
                     Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                          LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                     Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                          LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                     RAINFALL=[ ,   ,   ,   , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD              IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%-----------------|-------------------------------------------------------------|
ADD HYD              IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%-----------------|-------------------------------------------------------------|

ROUTE RESERVOIR      IDout=[10],   NHYD=["POND"],  IDin=[9],
                     RDT=[1.0](min),
                           TABLE of ( OUTFLOW-STORAGE ) values
                                        (cms) - (ha-m)
                                      [   0.000,  0.0000]
                                      [   0.008,  0.0656]
                                      [   0.017,  0.1311]
```

```
                                     [   0.093,  0.2831]
                                     [   0.233,  0.3971]
                                     [   0.337,  0.4731]
                                     [   0.465,  0.5491]
                                     [   0.531,  0.5871]
                                     [   0.593,  0.6251]
                                     [   0.654,  0.6631]
                                     [   0.797,  0.7391]
                                     [   0.950,  0.8274]
                                     [   1.304,  0.9157]
                                     [   1.880,  1.0040]
                                     [   2.577,  1.0923]
                                     [   -1   ,  -1    ]  (max twenty pts)

************************************************
*     Remaining Hawthorne Industrial Park     *
************************************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                         LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|------------------------------------------------------------|
ADD HYD             IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%------------------|------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                         LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[18.1](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                         LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|------------------------------------------------------------|
ADD HYD             IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%------------------|------------------------------------------------------------|
*
*SUB-AREA No.4

DESIGN NASHYD       ID=[ 6 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                    DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%------------------|------------------------------------------------------------|


ADD HYD             IDsum=[ 7 ], NHYD=["HIP06"], IDs to add=[2+5+6]
*%------------------|------------------------------------------------------------|

ROUTE RESERVOIR     IDout=[ 8 ],   NHYD=["HIP-POND"],  IDin=[ 7 ],
                    RDT=[1.0](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                    (cms) - (ha-m)
                                  [   0.0  , 0.0    ]
                                  [   0.048, 0.0574 ]
                                  [   0.054, 0.2434 ]
                                  [   0.059, 0.5834 ]
                                  [   0.062, 0.8400 ]
                                  [   0.064, 1.1024 ]
                                  [   0.147, 1.3705 ]
                                  [   0.280, 1.6444 ]
                                  [   0.472, 1.9242 ]
                                  [   0.724, 2.2097 ]
                                  [   0.937, 2.5010 ]
                                  [   1.262, 2.7981 ]
                                  [   1.404, 3.1009 ]
                                  [   1.532, 3.4096 ]
                                  [   1.650, 3.7240 ]
                                  [   2.409, 4.0442 ]
                                  [   3.689, 4.3702 ]
                                  [   -1  ,  -1    ]  (max twenty pts)

*%------------------|------------------------------------------------------------|
*
*SUB-AREA No. 5
*
DESIGN NASHYD       ID = [9], NHYD=["A2"], DT=[2.5]min, AREA=[6.8](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.37]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%------------------|------------------------------------------------------------|
*
*SUB-AREA No. 6
*
DESIGN NASHYD       ID = [10], NHYD=["A3"], DT=[2.5]min, AREA=[5.3](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.804]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%------------------|------------------------------------------------------------|
ADD HYD             IDsum=[1], NHYD=["Interim"], IDs to add=[8+9+10]
*%------------------|------------------------------------------------------------|


FINISH
```

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

 SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999  ========
 S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
 SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9 Ver. 4.02
     S   W W   M   M  H   H    Y    M   M  O   O       9999   9999 July 1999
 SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9 ========
                                                      9   9  9   9 # 4418403
       StormWater Management HYdrologic Model          999    999  ========

 **************************************************************************
 *************************** SWMHYMO-99 Ver/4.02 **************************
 *******  A single event and continuous hydrologic simulation model *******
 *******     based on the principles of HYMO and its successors     *******
 *******                 OTTHYMO-83 and OTTHYMO-89.                 *******
 **************************************************************************
 ******* Distributed by:  J.F. Sabourin and Associates Inc.          *******
 *******                  Ottawa,  Ontario: (613) 727-5199          *******
 *******                  Gatineau, Quebec: (819) 243-6858          *******
 *******                  E-Mail: swmhymo@jfsa.Com                  *******
 **************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++ Licensed user: J. L. Richards & Associates Limited         +++++++
 +++++++                 Ottawa                 SERIAL#:4418403     +++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 **************************************************************************
 *******              ++++++ PROGRAM ARRAY DIMENSIONS ++++++        *******
 *******              Maximum value for ID numbers  :     10        *******
 *******              Max. number of rainfall points:  15000        *******
 *******              Max. number of flow points    :  15000        *******
 **************************************************************************


 *******************   D E T A I L E D   O U T P U T   ******************
 **************************************************************************
 *       DATE: 2009-05-15     TIME: 08:57:02     RUN COUNTER: 000199       *
 **************************************************************************
 * Input   filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\SWM-INT.dat         *
 * Output  filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\SWM-INT.out         *
 * Summary filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\SWM-INT.sum         *
 * User comments:                                                          *
 * 1:______________________________________________________________________*
 * 2:______________________________________________________________________*
 * 3:______________________________________________________________________*
 **************************************************************************

 ----------------------------------------------------------------------------
 001:0001--------------------------------------------------------------------
 *#***************************************************************************
 *#  Project Name : Hawthorne Industrial Park       Project Number:   [20983] *
 *#  Date         : January, 2009                                           *
 *#  Revised      : N/A                                                      *
 *#  Developed by : Mark Buchanan, E.I.T.                                    *
 *#  Reviewed by  : Guy Forget, P.Eng.                                       *
 *#  Company      : J.L. Richards & Associates Limited                       *
 *#  License #    : 4418403                                                  *
 *#***************************************************************************
 *
 *
 *#***************************************************************
 *#  FILENAME:  V:\20983.DU\ENG\SWMHYMO\20983PST.DAT              *
 *#  FILE DEVELOPED FOR SITE PLAN APPLICATION AND DETAILED DESIGN *
 *#   OF A FACILITY ASSOCIATED WITH THE OTTAWA COMPOSTING SITE    *
 *#***************************************************************
 *
 ****************************************************************************
 *         SWMHYMO FILE DEVELOPED TO INVESTIGATE FLOOD FLOWS OF THE         *
 *   PROPOSED COMPOSTING SITE UNDER POST-DEVELOPMENT UNCONTROLLED CONDITIONS *
 ****************************************************************************
 ****************************************************
 * HYDROLOGICAL ANALYSIS UNDER A 4 HR-25 MM STORM AND  *
 * FOR DESIGN STORMS OF 1:2, 5, 10, 25, 50, AND 100 YR *
 ****************************************************
 **********************************************************
 *        POST-DEVELOPMENT UNCONTROLLED CONDITIONS         *
 **********************************************************
 **********************************************************
 *          CALCULATION OF 4 HR 25 MM STORM EVENT          *
 **********************************************************
 --------------------
 | START              |  Project  dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
 --------------------   Rainfall dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   0
 ----------------------------------------------------------------------------
 001:0002--------------------------------------------------------------------
 --------------------
 | READ STORM        |    Filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\4HR25-
 | Ptotal=  25.00 mm|    Comments: 4hr-15 min 25 MM STORM EVENT (CHICAGO DI
 --------------------
                 TIME     RAIN |   TIME     RAIN |   TIME     RAIN |   TIME     RAIN
                  hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr
                  .25    1.777 |   1.25   45.631 |   2.25    3.138 |   3.25    1.675
                  .50    2.357 |   1.50   11.911 |   2.50    2.555 |   3.50    1.509
                  .75    3.618 |   1.75    6.051 |   2.75    2.165 |   3.75    1.376
                 1.00    8.975 |   2.00    4.108 |   3.00    1.885 |   4.00    1.266

 ----------------------------------------------------------------------------
 001:0003--------------------------------------------------------------------
 ---------------------
 | DEFAULT VALUES      |   Filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\ORGA.VAL
 ---------------------   ICASEdv = 1 (read and print data)
       FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
                  ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----▯
       Horton's infiltration equation parameters:
       [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
       Parameters for PERVIOUS surfaces in STANDHYD:
       [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
       Parameters for IMPERVIOUS surfaces in STANDHYD:
       [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
       Parameters used in NASHYD:
       [Ia=   4.67 mm] [N= 3.00]
 ----------------------------------------------------------------------------
 001:0004--------------------------------------------------------------------
 **********************************
 *          ORGAWORLD FILE         *
 **********************************
 *
 * SUB-AREA No.1
 ---------------------
 | CALIB STANDHYD      |   Area    (ha)=    2.07
 | 01:010    DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
 ---------------------
                                   IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=         1.74          .33
      Dep. Storage      (mm)=         1.57         4.67
      Average Slope      (%)=          .52         1.00
      Length             (m)=       204.72        20.00
      Mannings n            =         .030         .250

      Max.eff.Inten.(mm/hr)=         45.63         5.37
                over (min)           10.00        30.00
      Storage Coeff.   (min)=        10.80 (ii)   29.27 (ii)
      Unit Hyd. Tpeak  (min)=        10.00        30.00
      Unit Hyd. peak   (cms)=          .11          .04
                                                              *TOTALS*
      PEAK FLOW        (cms)=          .16          .00           .158 (iii)
      TIME TO PEAK     (hrs)=         1.29         1.75          1.292
      RUNOFF VOLUME     (mm)=        23.43         5.17         20.508
      TOTAL RAINFALL    (mm)=        25.00        25.00         24.999
      RUNOFF COEFFICIENT   =          .94          .21           .820

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 ----------------------------------------------------------------------------
 001:0005--------------------------------------------------------------------
 *
 * SUB-AREA No.2
 ---------------------
 | CALIB STANDHYD      |   Area    (ha)=    1.54
 | 02:020    DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
 ---------------------
                                   IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=         1.42          .12
      Dep. Storage      (mm)=         1.57         4.67
      Average Slope      (%)=          .50         1.00
      Length             (m)=       244.34         5.00
      Mannings n            =         .030         .030

      Max.eff.Inten.(mm/hr)=         45.63         7.24
                over (min)           12.50        15.00
      Storage Coeff.   (min)=        12.15 (ii)   14.15 (ii)
      Unit Hyd. Tpeak  (min)=        12.50        15.00
      Unit Hyd. peak   (cms)=          .09          .08
                                                              *TOTALS*
      PEAK FLOW        (cms)=          .12          .00           .121 (iii)
      TIME TO PEAK     (hrs)=         1.33         1.46          1.333
      RUNOFF VOLUME     (mm)=        23.43         5.17         21.969
      TOTAL RAINFALL    (mm)=        25.00        25.00         24.999
      RUNOFF COEFFICIENT   =          .94          .21           .879

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 ----------------------------------------------------------------------------
 001:0006--------------------------------------------------------------------
 *
 * SUB-AREA No.3
 ---------------------
 | CALIB STANDHYD      |   Area    (ha)=    1.40
 | 03:030    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
 ---------------------
                                   IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=         1.36          .04
      Dep. Storage      (mm)=         1.57         4.67
      Average Slope      (%)=          .51         1.00
      Length             (m)=       225.63         5.00
      Mannings n            =         .030         .030

      Max.eff.Inten.(mm/hr)=         45.63         7.97
                over (min)           12.50        12.50
      Storage Coeff.   (min)=        11.52 (ii)   13.44 (ii)
      Unit Hyd. Tpeak  (min)=        12.50        12.50
      Unit Hyd. peak   (cms)=          .10          .09
                                                              *TOTALS*
      PEAK FLOW        (cms)=          .12          .00           .118 (iii)
      TIME TO PEAK     (hrs)=         1.33         1.42          1.333
      RUNOFF VOLUME     (mm)=        23.43         5.17         22.881
      TOTAL RAINFALL    (mm)=        25.00        25.00         24.999
      RUNOFF COEFFICIENT   =          .94          .21           .915

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 ----------------------------------------------------------------------------
 001:0007--------------------------------------------------------------------
 --------------------
 | ADD HYD (040    ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
 --------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                    ID1 01:010       2.07       .158     1.29  20.51     .000
                   +ID2 02:020       1.54       .121     1.33  21.97     .000
                    ===================================================
                    SUM 04:040       3.61       .278     1.33  21.13     .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ----------------------------------------------------------------------------
 001:0008--------------------------------------------------------------------
 --------------------
 | ADD HYD (050    ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
 --------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                    ID1 03:030       1.40       .118     1.33  22.88     .000
                   +ID2 04:040       3.61       .278     1.33  21.13     .000
                    ===================================================
                    SUM 05:050       5.01       .396     1.33  21.62     .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ----------------------------------------------------------------------------
 001:0009--------------------------------------------------------------------
 *
 * SUB-AREA No.4
 ---------------------
 | CALIB STANDHYD      |   Area    (ha)=     .89
 | 06:060    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
 ---------------------
                                   IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=          .86          .03
      Dep. Storage      (mm)=         1.57         4.67
      Average Slope      (%)=          .93          .70
      Length             (m)=       164.82        40.00
      Mannings n            =         .030         .250

      Max.eff.Inten.(mm/hr)=         45.63         4.42
                over (min)            7.50        42.50
      Storage Coeff.   (min)=         7.97 (ii)   41.62 (ii)
      Unit Hyd. Tpeak  (min)=         7.50        42.50
      Unit Hyd. peak   (cms)=          .14          .03
                                                              *TOTALS*
      PEAK FLOW        (cms)=          .09          .00           .089 (iii)
      TIME TO PEAK     (hrs)=         1.25         2.00          1.250
      RUNOFF VOLUME     (mm)=        23.43         5.17         22.882
      TOTAL RAINFALL    (mm)=        25.00        25.00         24.999
      RUNOFF COEFFICIENT   =          .94          .21           .915

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
```

```
           CN* =  81.0    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.

 ------------------------------------------------------------------------------
 001:0010----------------------------------------------------------------------
 *
 * SUB-AREA No.5
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=    2.66
 | 07:070    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
 ----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       2.58          .08
     Dep. Storage      (mm)=       1.57         4.67
     Average Slope      (%)=        .61         1.50
     Length             (m)=     207.25        20.00
     Mannings n            =       .030         .250

     Max.eff.Inten.(mm/hr)=       45.63         5.66
               over (min)        10.00        27.50
     Storage Coeff.  (min)=       10.37 (ii)   26.38 (ii)
     Unit Hyd. Tpeak (min)=       10.00        27.50
     Unit Hyd. peak  (cms)=         .11          .04
                                                             *TOTALS*
     PEAK FLOW       (cms)=         .24          .00            .238 (iii)
     TIME TO PEAK    (hrs)=        1.29         1.67           1.292
     RUNOFF VOLUME    (mm)=       23.43         5.17          22.882
     TOTAL RAINFALL   (mm)=       25.00        25.00          24.999
     RUNOFF COEFFICIENT   =         .94          .21            .915

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

 ------------------------------------------------------------------------------
 001:0011----------------------------------------------------------------------
 --------------------
 | ADD HYD (080   ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
 --------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                 ID1 06:060           .89       .089     1.25  22.88    .000
                +ID2 07:070          2.66       .238     1.29  22.88    .000
                 =======================================================
                 SUM 08:080          3.55       .327     1.29  22.88    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 001:0012----------------------------------------------------------------------
 --------------------
 | ADD HYD (090   ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
 --------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                 ID1 05:050          5.01       .396     1.33  21.62    .000
                +ID2 08:080          3.55       .327     1.29  22.88    .000
                 =======================================================
                 SUM 09:090          8.56       .716     1.29  22.14    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 001:0013----------------------------------------------------------------------
 ---------------------
 | ROUTE RESERVOIR    |     Requested routing time step =  1.0 min.
 |   IN>09:(090    )  |
 | OUT<10:(POND    )  |     =========  OUTLFOW STORAGE TABLE  =========
 ---------------------      OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
                             (cms)     (ha.m.)    |   (cms)     (ha.m.)
                              .000  .0000E+00     |     .593  .6251E+00
                              .008  .6560E-01     |     .654  .6631E+00
                              .017  .1311E+00     |     .797  .7391E+00
                              .093  .2831E+00     |     .950  .8274E+00
                              .233  .3971E+00     |    1.304  .9157E+00
                              .337  .4731E+00     |    1.880  .1004E+01
                              .465  .5491E+00     |    2.577  .1092E+01
                              .531  .5871E+00     |     .000  .0000E+00

    ROUTING RESULTS                 AREA       QPEAK       TPEAK        R.V.
    ---------------------           (ha)       (cms)       (hrs)        (mm)
    INFLOW >09: (090    )           8.56        .716       1.292      22.143
    OUTFLOW<10: (POND   )           8.56        .032       3.875      22.141

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    4.470
                   TIME SHIFT OF PEAK FLOW          (min)=  155.00
                   MAXIMUM  STORAGE   USED        (ha.m.)=.1611E+00

 ------------------------------------------------------------------------------
 001:0014----------------------------------------------------------------------
 *******************************************************
 *     Remaining Hawthorne Industrial Park              *
 *******************************************************
 *
 * SUB-AREA No.1
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=   19.90
 | 01:HIP01  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=      14.13         5.77
     Dep. Storage      (mm)=       1.57         4.67
     Average Slope      (%)=        .60         1.50
     Length             (m)=     580.00       100.00
     Mannings n            =       .030         .250

     Max.eff.Inten.(mm/hr)=       34.39        11.90
               over (min)        22.50        52.50
     Storage Coeff.  (min)=       21.64 (ii)   52.88 (ii)
     Unit Hyd. Tpeak (min)=       22.50        52.50
     Unit Hyd. peak  (cms)=         .05          .02
                                                             *TOTALS*
     PEAK FLOW       (cms)=         .60          .11            .642 (iii)
     TIME TO PEAK    (hrs)=        1.50         2.13           1.542
     RUNOFF VOLUME    (mm)=       23.43         8.74          16.085
     TOTAL RAINFALL   (mm)=       25.00        25.00          24.999
     RUNOFF COEFFICIENT   =         .94          .35            .643

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

 ------------------------------------------------------------------------------
 001:0015----------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP02 ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
 --------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                 ID1 10:POND         8.56       .032     3.88  22.14    .000
                +ID2 01:HIP01       19.90       .642     1.54  16.08    .000
                 =======================================================
                 SUM 02:HIP02       28.46       .655     1.54  17.91    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 001:0016----------------------------------------------------------------------
 *
 * SUB-AREA No.2
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=   17.00
 | 03:HIP03  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=      12.07         4.93
     Dep. Storage      (mm)=       1.57         4.67
     Average Slope      (%)=        .65         1.50
     Length             (m)=     450.00       100.00
     Mannings n            =       .030         .250

     Max.eff.Inten.(mm/hr)=       40.81        12.73
               over (min)        17.50        47.50
     Storage Coeff.  (min)=       16.94 (ii)   47.35 (ii)
     Unit Hyd. Tpeak (min)=       17.50        47.50
     Unit Hyd. peak  (cms)=         .07          .02
                                                             *TOTALS*
     PEAK FLOW       (cms)=         .60          .10            .625 (iii)
     TIME TO PEAK    (hrs)=        1.42         2.00           1.458
     RUNOFF VOLUME    (mm)=       23.43         8.74          16.085
     TOTAL RAINFALL   (mm)=       25.00        25.00          24.999
     RUNOFF COEFFICIENT   =         .94          .35            .643

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

 ------------------------------------------------------------------------------
 001:0017----------------------------------------------------------------------
 *
 * SUB-AREA No.3
 ----------------------
 | CALIB STANDHYD     |   Area    (ha)=   18.10
 | 04:HIP04  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=      12.85         5.25
     Dep. Storage      (mm)=       1.57         4.67
     Average Slope      (%)=        .50         1.50
     Length             (m)=     600.00       100.00
     Mannings n            =       .030         .250

     Max.eff.Inten.(mm/hr)=       34.39        11.54
               over (min)        22.50        55.00
     Storage Coeff.  (min)=       23.33 (ii)   54.95 (ii)
     Unit Hyd. Tpeak (min)=       22.50        55.00
     Unit Hyd. peak  (cms)=         .05          .02
                                                             *TOTALS*
     PEAK FLOW       (cms)=         .53          .09            .562 (iii)
     TIME TO PEAK    (hrs)=        1.50         2.17           1.542
     RUNOFF VOLUME    (mm)=       23.43         8.74          16.085
     TOTAL RAINFALL   (mm)=       25.00        25.00          24.999
     RUNOFF COEFFICIENT   =         .94          .35            .643

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

 ------------------------------------------------------------------------------
 001:0018----------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP05 ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
 --------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                 ID1 03:HIP03       17.00       .625     1.46  16.08    .000
                +ID2 04:HIP04       18.10       .562     1.54  16.08    .000
                 =======================================================
                 SUM 05:HIP05       35.10      1.166     1.46  16.08    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 001:0019----------------------------------------------------------------------
 *
 *SUB-AREA No.4
 ---------------------
 | DESIGN NASHYD      |   Area     (ha)=    4.00   Curve Number   (CN)=85.00
 | 06:Pond-B DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
 ---------------------    U.H. Tp(hrs)=     .170

    Unit Hyd Qpeak  (cms)=     .899

    PEAK FLOW       (cms)=     .077 (i)
    TIME TO PEAK    (hrs)=    1.375
    RUNOFF VOLUME    (mm)=    6.343
    TOTAL RAINFALL   (mm)=   24.999
    RUNOFF COEFFICIENT   =     .254

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

 ------------------------------------------------------------------------------
 001:0020----------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP06 ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
 --------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                 ID1 02:HIP02       28.46       .655     1.54  17.91    .000
                +ID2 05:HIP05       35.10      1.166     1.46  16.08    .000
                +ID3 06:Pond-B       4.00       .077     1.38   6.34    .000
                 =======================================================
                 SUM 07:HIP06       67.56      1.887     1.50  16.28    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 001:0021----------------------------------------------------------------------
 ---------------------
 | ROUTE RESERVOIR    |     Requested routing time step =  1.0 min.
 |   IN>07:(HIP06 )   |
 | OUT<08:(HIP-PO)    |     =========  OUTLFOW STORAGE TABLE  =========
 ---------------------      OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
                             (cms)     (ha.m.)    |   (cms)     (ha.m.)
                              .000  .0000E+00     |     .724  .2210E+01
                              .048  .5740E-01     |     .937  .2501E+01
                              .054  .2434E+00     |    1.262  .2798E+01
                              .059  .5834E+00     |    1.404  .3101E+01
                              .062  .8400E+00     |    1.532  .3410E+01
                              .064  .1102E+01     |    1.650  .3724E+01
                              .147  .1370E+01     |    2.409  .4044E+01
                              .280  .1644E+01     |    3.689  .4370E+01
                              .472  .1924E+01     |     .000  .0000E+00

    ROUTING RESULTS                 AREA       QPEAK       TPEAK        R.V.
    ---------------------           (ha)       (cms)       (hrs)        (mm)
    INFLOW >07: (HIP06 )           67.56       1.887       1.500      16.275
    OUTFLOW<08: (HIP-PO)           67.56        .062       5.417      16.275

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    3.289
```

```
00541>                      TIME SHIFT OF PEAK FLOW         (min)=   235.00
00542>                      MAXIMUM  STORAGE   USED       (ha.m.)=.8484E+00
00543>
00544> ---------------------------------------------------------------------------
00545> 001:0022-------------------------------------------------------------------
00546> *
00547> *SUB-AREA No. 5
00548> *
00549> ---------------------
00550> | DESIGN NASHYD      |   Area     (ha)=     6.80   Curve Number    (CN)=76.00
00551> | 09:A2      DT= 2.50 |   Ia       (mm)=    4.670   # of Linear Res.(N)= 3.00
00552> ---------------------   U.H. Tp(hrs)=     .370
00553>
00554>       Unit Hyd Qpeak  (cms)=      .702
00555>
00556>       PEAK FLOW       (cms)=      .053 (i)
00557>       TIME TO PEAK    (hrs)=     1.708
00558>       RUNOFF VOLUME     (mm)=    4.111
00559>       TOTAL RAINFALL    (mm)=   24.999
00560>       RUNOFF COEFFICIENT   =      .164
00561>
00562>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00563>
00564> ---------------------------------------------------------------------------
00565> 001:0023-------------------------------------------------------------------
00566> *
00567> *SUB-AREA No. 6
00568> *
00569> ---------------------
00570> | DESIGN NASHYD      |   Area     (ha)=     5.30   Curve Number    (CN)=76.00
00571> | 10:A3      DT= 2.50 |   Ia       (mm)=    4.670   # of Linear Res.(N)= 3.00
00572> ---------------------   U.H. Tp(hrs)=     .804
00573>
00574>       Unit Hyd Qpeak  (cms)=      .252
00575>
00576>       PEAK FLOW       (cms)=      .025 (i)
00577>       TIME TO PEAK    (hrs)=     2.333
00578>       RUNOFF VOLUME     (mm)=    4.110
00579>       TOTAL RAINFALL    (mm)=   24.999
00580>       RUNOFF COEFFICIENT   =      .164
00581>
00582>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00583>
00584> ---------------------------------------------------------------------------
00585> 001:0024-------------------------------------------------------------------
00586> -------------------
00587> | ADD HYD (Interi) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
00588> -------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
00589>                    ID1 08:HIP-PO   67.56      .062     5.42  16.28     .000
00590>                   +ID2 09:A2        6.80      .053     1.71   4.11     .000
00591>                   +ID3 10:A3        5.30      .025     2.33   4.11     .000
00592>                    ===================================================
00593>                    SUM 01:Interi   79.66      .127     1.83  14.43     .000
00594>
00595>     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00596>
00597> ---------------------------------------------------------------------------
00598> 001:0025-------------------------------------------------------------------
00599> ************************************************************
00600> *        CALCULATION OF 3HR - 1:2 YEAR STORM EVENT           *
00601> ************************************************************
00602> -------------------
00603> | START            |   Project  dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
00604> -------------------   Rainfall dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
00605>     TZERO =    .00 hrs on        0
00606>     METOUT=    2 (output = METRIC)
00607>     NRUN  = 001
00608>     NSTORM=    0
00609> ---------------------------------------------------------------------------
00610> 001:0002-------------------------------------------------------------------
00611> -------------------
00612> | CHICAGO STORM    |      IDF curve parameters: A= 732.951
00613> | Ptotal= 31.86 mm |                            B=   6.199
00614> -------------------                            C=    .810
00615>                        used in:   INTENSITY =  A / (t + B)^C
00616>
00617>                        Duration of storm   =  3.00 hrs
00618>                        Storm time step     = 10.00 min
00619>                        Time to peak ratio =    .33
00620>
00621>                TIME     RAIN |   TIME     RAIN |   TIME     RAIN |   TIME     RAIN
00622>                 hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr
00623>                 .17    2.815 |   1.00   76.805 |   1.83    5.095 |   2.67    2.684
00624>                 .33    3.498 |   1.17   24.079 |   2.00    4.291 |   2.83    2.463
00625>                 .50    4.687 |   1.33   12.364 |   2.17    3.718 |   3.00    2.279
00626>                 .67    7.305 |   1.50    8.324 |   2.33    3.288 |
00627>                 .83   18.209 |   1.67    6.303 |   2.50    2.953 |
00628>
00629> ---------------------------------------------------------------------------
00630> 001:0003-------------------------------------------------------------------
00631> ----------------------
00632> | DEFAULT VALUES      |   Filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\ORGA.VAL
00633> ----------------------   ICASEdv = 1 (read and print data)
00634>       FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
00635>                  ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
00636>       Horton's infiltration equation parameters:
00637>       [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
00638>       Parameters for PERVIOUS surfaces in STANDHYD:
00639>       [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
00640>       Parameters for IMPERVIOUS surfaces in STANDHYD:
00641>       [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
00642>       Parameters used in NASHYD:
00643>       [Ia=   4.67 mm] [N= 3.00]
00644> ---------------------------------------------------------------------------
00645> 001:0004-------------------------------------------------------------------
00646> **********************************
00647> *          ORGAWORLD FILE        *
00648> **********************************
00649> *
00650> * SUB-AREA No.1
00651> ----------------------
00652> | CALIB STANDHYD      |   Area     (ha)=    2.07
00653> | 01:010     DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
00654> ----------------------
00655>                                IMPERVIOUS    PERVIOUS (i)
00656>       Surface Area      (ha)=       1.74          .33
00657>       Dep. Storage      (mm)=       1.57         4.67
00658>       Average Slope      (%)=        .52         1.00
00659>       Length             (m)=     204.72        20.00
00660>       Mannings n            =       .030         .250
00661>
00662>       Max.eff.Inten.(mm/hr)=      76.81        11.88
00663>                  over (min)      10.00        22.50
00664>       Storage Coeff.   (min)=       8.77 (ii)   22.21 (ii)
00665>       Unit Hyd. Tpeak (min)=      10.00        22.50
00666>       Unit Hyd. peak   (cms)=        .12          .05
00667>                                                            *TOTALS*
00668>       PEAK FLOW        (cms)=        .24          .01          .245 (iii)
00669>       TIME TO PEAK     (hrs)=       1.08         1.38         1.083
00670>       RUNOFF VOLUME     (mm)=      30.29         8.52        26.807
00671>       TOTAL RAINFALL    (mm)=      31.86        31.86        31.860
00672>       RUNOFF COEFFICIENT   =        .95          .27          .841
00673>
00674>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00675>             CN* =  81.0     Ia = Dep. Storage  (Above)
```

```
00676>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00677>             THAN THE STORAGE COEFFICIENT.
00678>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00679>
00680> ---------------------------------------------------------------------------
00681> 001:0005-------------------------------------------------------------------
00682> *
00683> * SUB-AREA No.2
00684> ----------------------
00685> | CALIB STANDHYD      |   Area     (ha)=    1.54
00686> | 02:020     DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
00687> ----------------------
00688>                                IMPERVIOUS    PERVIOUS (i)
00689>       Surface Area      (ha)=       1.42          .12
00690>       Dep. Storage      (mm)=       1.57         4.67
00691>       Average Slope      (%)=        .50         1.00
00692>       Length             (m)=     244.34         5.00
00693>       Mannings n            =       .030         .030
00694>
00695>       Max.eff.Inten.(mm/hr)=      76.81        15.07
00696>                  over (min)      10.00        12.50
00697>       Storage Coeff.   (min)=       9.87 (ii)   11.36 (ii)
00698>       Unit Hyd. Tpeak (min)=      10.00        12.50
00699>       Unit Hyd. peak   (cms)=        .11          .10
00700>                                                            *TOTALS*
00701>       PEAK FLOW        (cms)=        .19          .00          .192 (iii)
00702>       TIME TO PEAK     (hrs)=       1.08         1.17         1.083
00703>       RUNOFF VOLUME     (mm)=      30.29         8.52        28.548
00704>       TOTAL RAINFALL    (mm)=      31.86        31.86        31.860
00705>       RUNOFF COEFFICIENT   =        .95          .27          .896
00706>
00707>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00708>             CN* =  81.0     Ia = Dep. Storage  (Above)
00709>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00710>             THAN THE STORAGE COEFFICIENT.
00711>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00712>
00713> ---------------------------------------------------------------------------
00714> 001:0006-------------------------------------------------------------------
00715> *
00716> * SUB-AREA No.3
00717> ----------------------
00718> | CALIB STANDHYD      |   Area     (ha)=    1.40
00719> | 03:030     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
00720> ----------------------
00721>                                IMPERVIOUS    PERVIOUS (i)
00722>       Surface Area      (ha)=       1.36          .04
00723>       Dep. Storage      (mm)=       1.57         4.67
00724>       Average Slope      (%)=        .51         1.00
00725>       Length             (m)=     225.63         5.00
00726>       Mannings n            =       .030         .030
00727>
00728>       Max.eff.Inten.(mm/hr)=      76.81        16.59
00729>                  over (min)      10.00        10.00
00730>       Storage Coeff.   (min)=       9.35 (ii)   10.79 (ii)
00731>       Unit Hyd. Tpeak (min)=      10.00        10.00
00732>       Unit Hyd. peak   (cms)=        .12          .11
00733>                                                            *TOTALS*
00734>       PEAK FLOW        (cms)=        .18          .00          .186 (iii)
00735>       TIME TO PEAK     (hrs)=       1.08         1.13         1.083
00736>       RUNOFF VOLUME     (mm)=      30.29         8.52        29.637
00737>       TOTAL RAINFALL    (mm)=      31.86        31.86        31.860
00738>       RUNOFF COEFFICIENT   =        .95          .27          .930
00739>
00740>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00741>             CN* =  81.0     Ia = Dep. Storage  (Above)
00742>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00743>             THAN THE STORAGE COEFFICIENT.
00744>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00745>
00746> ---------------------------------------------------------------------------
00747> 001:0007-------------------------------------------------------------------
00748> -------------------
00749> | ADD HYD (040   ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
00750> -------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
00751>                    ID1 01:010       2.07      .245     1.08  26.81     .000
00752>                   +ID2 02:020       1.54      .192     1.08  28.55     .000
00753>                    ===================================================
00754>                    SUM 04:040       3.61      .436     1.08  27.55     .000
00755>
00756>     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00757>
00758> ---------------------------------------------------------------------------
00759> 001:0008-------------------------------------------------------------------
00760> -------------------
00761> | ADD HYD (050   ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
00762> -------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
00763>                    ID1 03:030       1.40      .186     1.08  29.64     .000
00764>                   +ID2 04:040       3.61      .436     1.08  27.55     .000
00765>                    ===================================================
00766>                    SUM 05:050       5.01      .623     1.08  28.13     .000
00767>
00768>     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00769>
00770> ---------------------------------------------------------------------------
00771> 001:0009-------------------------------------------------------------------
00772> *
00773> * SUB-AREA No.4
00774> ----------------------
00775> | CALIB STANDHYD      |   Area     (ha)=     .89
00776> | 06:060     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
00777> ----------------------
00778>                                IMPERVIOUS    PERVIOUS (i)
00779>       Surface Area      (ha)=        .86          .03
00780>       Dep. Storage      (mm)=       1.57         4.67
00781>       Average Slope      (%)=        .93          .70
00782>       Length             (m)=     164.82        40.00
00783>       Mannings n            =       .030         .250
00784>
00785>       Max.eff.Inten.(mm/hr)=      76.81        10.24
00786>                  over (min)       7.50        30.00
00787>       Storage Coeff.   (min)=       6.47 (ii)   30.53 (ii)
00788>       Unit Hyd. Tpeak (min)=       7.50        30.00
00789>       Unit Hyd. peak   (cms)=        .16          .04
00790>                                                            *TOTALS*
00791>       PEAK FLOW        (cms)=        .14          .00          .139 (iii)
00792>       TIME TO PEAK     (hrs)=       1.04         1.54         1.042
00793>       RUNOFF VOLUME     (mm)=      30.29         8.52        29.637
00794>       TOTAL RAINFALL    (mm)=      31.86        31.86        31.860
00795>       RUNOFF COEFFICIENT   =        .95          .27          .930
00796>
00797>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00798>             CN* =  81.0     Ia = Dep. Storage  (Above)
00799>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00800>             THAN THE STORAGE COEFFICIENT.
00801>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00802>
00803> ---------------------------------------------------------------------------
00804> 001:0010-------------------------------------------------------------------
00805> *
00806> * SUB-AREA No.5
00807> ----------------------
00808> | CALIB STANDHYD      |   Area     (ha)=    2.66
00809> | 07:070     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
00810> ----------------------
```

```
                                 IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=      2.58          .08
      Dep. Storage      (mm)=      1.57         4.67
      Average Slope      (%)=       .61         1.50
      Length             (m)=    207.25        20.00
      Mannings n            =      .030         .250

      Max.eff.Inten.(mm/hr)=      76.81        12.71
                 over (min)        7.50        20.00
      Storage Coeff.   (min)=      8.42 (ii)   20.00 (ii)
      Unit Hyd. Tpeak (min)=       7.50        20.00
      Unit Hyd. peak  (cms)=        .14          .06
                                                          *TOTALS*
      PEAK FLOW        (cms)=       .38          .00         .379 (iii)
      TIME TO PEAK     (hrs)=      1.04         1.33        1.042
      RUNOFF VOLUME     (mm)=     30.29         8.52       29.637
      TOTAL RAINFALL    (mm)=     31.86        31.86       31.860
      RUNOFF COEFFICIENT   =        .95          .27         .930

        (i)  CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

 ----------------------------------------------------------------------
 001:0011--------------------------------------------------------------
 --------------------
 | ADD HYD  (080   ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
 --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
                      ID1 06:060      .89      .139    1.04  29.64    .000
                     +ID2 07:070     2.66      .379    1.04  29.64    .000
                      ===================================================
                      SUM 08:080     3.55      .518    1.04  29.64    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ----------------------------------------------------------------------
 001:0012--------------------------------------------------------------
 --------------------
 | ADD HYD  (090   ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
 --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
                      ID1 05:050     5.01      .623    1.08  28.13    .000
                     +ID2 08:080     3.55      .518    1.04  29.64    .000
                      ===================================================
                      SUM 09:090     8.56     1.118    1.08  28.76    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ----------------------------------------------------------------------
 001:0013--------------------------------------------------------------
 --------------------
 | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
 |  IN>09:(090   )   |
 | OUT<10:(POND  )   |    =========  OUTLFOW STORAGE TABLE  =========
 --------------------     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000  .0000E+00    |    .593  .6251E+00
                            .008  .6560E-01    |    .654  .6631E+00
                            .017  .1311E+00    |    .797  .7391E+00
                            .093  .2831E+00    |    .950  .8274E+00
                            .233  .3971E+00    |   1.304  .9157E+00
                            .337  .4731E+00    |   1.880  .1004E+01
                            .465  .5491E+00    |   2.577  .1092E+01
                            .531  .5871E+00    |    .000  .0000E+00

      ROUTING RESULTS               AREA     QPEAK     TPEAK        R.V.
      ------------------            (ha)     (cms)     (hrs)        (mm)
      INFLOW >09: (090   )          8.56     1.118     1.083      28.757
      OUTFLOW<10: (POND  )          8.56      .056     3.000      28.754

                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=     5.030
                     TIME SHIFT OF PEAK FLOW          (min)=   115.00
                     MAXIMUM  STORAGE   USED        (ha.m.)=.2095E+00

 ----------------------------------------------------------------------
 001:0014--------------------------------------------------------------
 **********************************************
 *      Remaining Hawthorne Industrial Park     *
 **********************************************
 *
 * SUB-AREA No.1
 ---------------------
 | CALIB STANDHYD      |   Area     (ha)=    19.90
 | 01:HIP01   DT= 2.50 |   Total Imp(%)=    71.00   Dir. Conn.(%)=   50.00
 ---------------------
                                 IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=     14.13         5.77
      Dep. Storage      (mm)=      1.57         4.67
      Average Slope      (%)=       .60         1.50
      Length             (m)=    580.00       100.00
      Mannings n            =      .030         .250

      Max.eff.Inten.(mm/hr)=      54.21        23.06
                 over (min)       17.50        42.50
      Storage Coeff.   (min)=     18.04 (ii)   42.02 (ii)
      Unit Hyd. Tpeak (min)=      17.50        42.50
      Unit Hyd. peak  (cms)=        .06          .03
                                                          *TOTALS*
      PEAK FLOW        (cms)=       .95          .21        1.020 (iii)
      TIME TO PEAK     (hrs)=      1.21         1.71        1.250
      RUNOFF VOLUME     (mm)=     30.29        13.34       21.814
      TOTAL RAINFALL    (mm)=     31.86        31.86       31.860
      RUNOFF COEFFICIENT   =        .95          .42         .685

        (i)  CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

 ----------------------------------------------------------------------
 001:0015--------------------------------------------------------------
 --------------------
 | ADD HYD (HIP02 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
 --------------------               (ha)      (cms)   (hrs)   (mm)    (cms)
                     ID1 10:POND     8.56      .056    3.00  28.75    .000
                    +ID2 01:HIP01   19.90     1.020    1.25  21.81    .000
                     ===================================================
                     SUM 02:HIP02   28.46     1.039    1.25  23.90    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ----------------------------------------------------------------------
 001:0016--------------------------------------------------------------
 *
 * SUB-AREA No.2
 ---------------------
 | CALIB STANDHYD      |   Area     (ha)=    17.00
 | 03:HIP03   DT= 2.50 |   Total Imp(%)=    71.00   Dir. Conn.(%)=   50.00
 ---------------------
                                 IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=     12.07         4.93
      Dep. Storage      (mm)=      1.57         4.67
      Average Slope      (%)=       .65         1.50
      Length             (m)=    450.00       100.00
      Mannings n            =      .030         .250

      Max.eff.Inten.(mm/hr)=      59.23        25.04
                 over (min)       15.00        37.50
      Storage Coeff.   (min)=     14.60 (ii)   37.80 (ii)
      Unit Hyd. Tpeak (min)=      15.00        37.50
      Unit Hyd. peak  (cms)=        .08          .03
                                                          *TOTALS*
      PEAK FLOW        (cms)=       .91          .19         .978 (iii)
      TIME TO PEAK     (hrs)=      1.17         1.63        1.167
      RUNOFF VOLUME     (mm)=     30.29        13.34       21.814
      TOTAL RAINFALL    (mm)=     31.86        31.86       31.860
      RUNOFF COEFFICIENT   =        .95          .42         .685

        (i)  CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

 ----------------------------------------------------------------------
 001:0017--------------------------------------------------------------
 *
 * SUB-AREA No.3
 ---------------------
 | CALIB STANDHYD      |   Area     (ha)=    18.10
 | 04:HIP04   DT= 2.50 |   Total Imp(%)=    71.00   Dir. Conn.(%)=   50.00
 ---------------------
                                 IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=     12.85         5.25
      Dep. Storage      (mm)=      1.57         4.67
      Average Slope      (%)=       .50         1.50
      Length             (m)=    600.00       100.00
      Mannings n            =      .030         .250

      Max.eff.Inten.(mm/hr)=      50.44        22.17
                 over (min)       20.00        45.00
      Storage Coeff.   (min)=     20.01 (ii)   44.37 (ii)
      Unit Hyd. Tpeak (min)=      20.00        45.00
      Unit Hyd. peak  (cms)=        .06          .03
                                                          *TOTALS*
      PEAK FLOW        (cms)=       .80          .18         .874 (iii)
      TIME TO PEAK     (hrs)=      1.25         1.79        1.292
      RUNOFF VOLUME     (mm)=     30.29        13.34       21.814
      TOTAL RAINFALL    (mm)=     31.86        31.86       31.860
      RUNOFF COEFFICIENT   =        .95          .42         .685

        (i)  CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

 ----------------------------------------------------------------------
 001:0018--------------------------------------------------------------
 --------------------
 | ADD HYD (HIP05 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
 --------------------               (ha)      (cms)   (hrs)   (mm)    (cms)
                     ID1 03:HIP03   17.00      .978    1.17  21.81    .000
                    +ID2 04:HIP04   18.10      .874    1.29  21.81    .000
                     ===================================================
                     SUM 05:HIP05   35.10     1.814    1.21  21.81    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ----------------------------------------------------------------------
 001:0019--------------------------------------------------------------
 *
 *SUB-AREA No.4
 ---------------------
 | DESIGN NASHYD       |   Area     (ha)=     4.00   Curve Number   (CN)=85.00
 | 06:Pond-B DT= 2.50  |   Ia       (mm)=    4.670   # of Linear Res.(N)= 3.00
 ---------------------     U.H. Tp(hrs)=      .170

      Unit Hyd Qpeak  (cms)=      .899

      PEAK FLOW        (cms)=      .145 (i)
      TIME TO PEAK     (hrs)=     1.167
      RUNOFF VOLUME     (mm)=    10.266
      TOTAL RAINFALL    (mm)=    31.860
      RUNOFF COEFFICIENT   =       .322

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

 ----------------------------------------------------------------------
 001:0020--------------------------------------------------------------
 --------------------
 | ADD HYD (HIP06 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
 --------------------               (ha)      (cms)   (hrs)   (mm)    (cms)
                     ID1 02:HIP02   28.46     1.039    1.25  23.90    .000
                    +ID2 05:HIP05   35.10     1.814    1.21  21.81    .000
                    +ID3 06:Pond-B   4.00      .145    1.17  10.27    .000
                     ===================================================
                     SUM 07:HIP06   67.56     2.992    1.21  22.01    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ----------------------------------------------------------------------
 001:0021--------------------------------------------------------------
 --------------------
 | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
 |  IN>07:(HIP06 )   |
 | OUT<08:(HIP-PO)   |    =========  OUTLFOW STORAGE TABLE  =========
 --------------------     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000  .0000E+00    |    .724  .2210E+01
                            .048  .5740E-01    |    .937  .2501E+01
                            .054  .2434E+00    |   1.262  .2798E+01
                            .059  .5834E+00    |   1.404  .3101E+01
                            .062  .8400E+00    |   1.532  .3410E+01
                            .064  .1102E+01    |   1.650  .3724E+01
                            .147  .1370E+01    |   2.409  .4044E+01
                            .280  .1644E+01    |   3.689  .4370E+01
                            .472  .1924E+01    |    .000  .0000E+00

      ROUTING RESULTS               AREA     QPEAK     TPEAK        R.V.
      ------------------            (ha)     (cms)     (hrs)        (mm)
      INFLOW >07: (HIP06 )         67.56     2.992     1.208      22.009
      OUTFLOW<08: (HIP-PO)         67.56      .093     4.444      22.009

                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=     3.122
                     TIME SHIFT OF PEAK FLOW          (min)=   194.17
                     MAXIMUM  STORAGE   USED        (ha.m.)=.1197E+01

 ----------------------------------------------------------------------
 001:0022--------------------------------------------------------------
 *
 *SUB-AREA No. 5
 *
 ---------------------
 | DESIGN NASHYD       |   Area     (ha)=     6.80   Curve Number   (CN)=76.00
 | 09:A2      DT= 2.50 |   Ia       (mm)=    4.670   # of Linear Res.(N)= 3.00
 ---------------------     U.H. Tp(hrs)=      .370

```

```
      Unit Hyd Qpeak  (cms)=     .702

      PEAK FLOW       (cms)=     .102 (i)
      TIME TO PEAK    (hrs)=    1.458
      RUNOFF VOLUME    (mm)=    6.883
      TOTAL RAINFALL   (mm)=   31.860
      RUNOFF COEFFICIENT   =     .216

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

 -------------------------------------------------------------------------------
 001:0023-----------------------------------------------------------------------
 *
 *SUB-AREA No. 6
 *
 ----------------------
 | DESIGN NASHYD       |   Area     (ha)=    5.30   Curve Number   (CN)=76.00
 | 10:A3      DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
 ----------------------    U.H. Tp(hrs)=     .804

      Unit Hyd Qpeak  (cms)=     .252

      PEAK FLOW       (cms)=     .048 (i)
      TIME TO PEAK    (hrs)=    2.083
      RUNOFF VOLUME    (mm)=    6.883
      TOTAL RAINFALL   (mm)=   31.860
      RUNOFF COEFFICIENT   =     .216

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

 -------------------------------------------------------------------------------
 001:0024-----------------------------------------------------------------------
 --------------------
 | ADD HYD (Interi) | ID: NHYD     AREA     QPEAK   TPEAK  R.V.    DWF
 --------------------               (ha)     (cms)   (hrs)  (mm)   (cms)
                   ID1 08:HIP-PO   67.56     .093    4.44  22.01    .000
                  +ID2 09:A2        6.80     .102    1.46   6.88    .000
                  +ID3 10:A3        5.30     .048    2.08   6.88    .000
                   =================================================
                   SUM 01:Interi   79.66     .194    1.58  19.71    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 -------------------------------------------------------------------------------
 001:0025-----------------------------------------------------------------------
 ******************************************************************
 *         CALCULATION OF 3HR - 1:5 YEAR STORM EVENT              *
 ******************************************************************
 --------------------
 | START            |   Project  dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
 --------------------   Rainfall dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
     TZERO =   .00 hrs on        0
     METOUT=   2 (output = METRIC)
     NRUN  = 001
     NSTORM=   0
 -------------------------------------------------------------------------------
 001:0002-----------------------------------------------------------------------
 --------------------
 | CHICAGO STORM    |    IDF curve parameters: A= 998.071
 | Ptotal= 42.51 mm |                          B=   6.053
 --------------------                          C=    .814
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  3.00 hrs
                         Storm time step    = 10.00 min
                         Time to peak ratio =   .33

                TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                 hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                 .17   3.682 |   1.00 104.193 |   1.83   6.689 |   2.67   3.510
                 .33   4.582 |   1.17  32.037 |   2.00   5.628 |   2.83   3.220
                 .50   6.151 |   1.33  16.337 |   2.17   4.872 |   3.00   2.978
                 .67   9.614 |   1.50  10.965 |   2.33   4.305 |
                 .83  24.170 |   1.67   8.287 |   2.50   3.864 |

 -------------------------------------------------------------------------------
 001:0003-----------------------------------------------------------------------
 ----------------------
 | DEFAULT VALUES      |  Filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\ORGA.VAL
 ----------------------   ICASEdv = 1 (read and print data)
      FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
                 ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
      Horton's infiltration equation parameters:
      [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
      Parameters for PERVIOUS surfaces in STANDHYD:
      [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
      Parameters for IMPERVIOUS surfaces in STANDHYD:
      [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
      Parameters used in NASHYD:
      [Ia=   4.67 mm] [N= 3.00]
 -------------------------------------------------------------------------------
 001:0004-----------------------------------------------------------------------
 **********************************
 *          ORGAWORLD FILE        *
 **********************************
 *
 * SUB-AREA No.1
 ----------------------
 | CALIB STANDHYD      |   Area     (ha)=    2.07
 | 01:010     DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
 ----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       1.74          .33
     Dep. Storage      (mm)=       1.57         4.67
     Average Slope      (%)=        .52         1.00
     Length             (m)=     204.72        20.00
     Mannings n            =       .030         .250

     Max.eff.Inten.(mm/hr)=     104.19        24.26
                over (min)        7.50        17.50
     Storage Coeff.  (min)=       7.76 (ii)   17.86 (ii)
     Unit Hyd. Tpeak (min)=       7.50        17.50
     Unit Hyd. peak  (cms)=        .15          .06
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .36          .01           .362 (iii)
     TIME TO PEAK    (hrs)=       1.04         1.25          1.042
     RUNOFF VOLUME    (mm)=      40.94        14.70         36.745
     TOTAL RAINFALL   (mm)=      42.51        42.51         42.514
     RUNOFF COEFFICIENT   =        .96          .35           .864

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 -------------------------------------------------------------------------------
 001:0005-----------------------------------------------------------------------
 *
 * SUB-AREA No.2
 ----------------------
 | CALIB STANDHYD      |   Area     (ha)=    1.54
 | 02:020     DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
 ----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       1.42          .12
     Dep. Storage      (mm)=       1.57         4.67
     Average Slope      (%)=        .50         1.00
     Length             (m)=     244.34         5.00
     Mannings n            =       .030         .030

     Max.eff.Inten.(mm/hr)=     104.19        31.02
                over (min)        7.50        10.00
     Storage Coeff.  (min)=       8.73 (ii)    9.85 (ii)
     Unit Hyd. Tpeak (min)=       7.50        10.00
     Unit Hyd. peak  (cms)=        .14          .11
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .28          .01           .283 (iii)
     TIME TO PEAK    (hrs)=       1.04         1.13          1.042
     RUNOFF VOLUME    (mm)=      40.94        14.70         38.845
     TOTAL RAINFALL   (mm)=      42.51        42.51         42.514
     RUNOFF COEFFICIENT   =        .96          .35           .914

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 -------------------------------------------------------------------------------
 001:0006-----------------------------------------------------------------------
 *
 * SUB-AREA No.3
 ----------------------
 | CALIB STANDHYD      |   Area     (ha)=    1.40
 | 03:030     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
 ----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       1.36          .04
     Dep. Storage      (mm)=       1.57         4.67
     Average Slope      (%)=        .51         1.00
     Length             (m)=     225.63         5.00
     Mannings n            =       .030         .030

     Max.eff.Inten.(mm/hr)=     104.19        31.02
                over (min)        7.50        10.00
     Storage Coeff.  (min)=       8.28 (ii)    9.39 (ii)
     Unit Hyd. Tpeak (min)=       7.50        10.00
     Unit Hyd. peak  (cms)=        .14          .12
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .27          .00           .274 (iii)
     TIME TO PEAK    (hrs)=       1.04         1.13          1.042
     RUNOFF VOLUME    (mm)=      40.94        14.70         40.157
     TOTAL RAINFALL   (mm)=      42.51        42.51         42.514
     RUNOFF COEFFICIENT   =        .96          .35           .945

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 -------------------------------------------------------------------------------
 001:0007-----------------------------------------------------------------------
 --------------------
 | ADD HYD (040   ) | ID: NHYD     AREA     QPEAK   TPEAK  R.V.    DWF
 --------------------               (ha)     (cms)   (hrs)  (mm)   (cms)
                   ID1 01:010       2.07     .362    1.04  36.75    .000
                  +ID2 02:020       1.54     .283    1.04  38.84    .000
                   =================================================
                   SUM 04:040       3.61     .645    1.04  37.64    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 -------------------------------------------------------------------------------
 001:0008-----------------------------------------------------------------------
 --------------------
 | ADD HYD (050   ) | ID: NHYD     AREA     QPEAK   TPEAK  R.V.    DWF
 --------------------               (ha)     (cms)   (hrs)  (mm)   (cms)
                   ID1 03:030       1.40     .274    1.04  40.16    .000
                  +ID2 04:040       3.61     .645    1.04  37.64    .000
                   =================================================
                   SUM 05:050       5.01     .918    1.04  38.34    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 -------------------------------------------------------------------------------
 001:0009-----------------------------------------------------------------------
 *
 * SUB-AREA No.4
 ----------------------
 | CALIB STANDHYD      |   Area     (ha)=     .89
 | 06:060     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
 ----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        .86          .03
     Dep. Storage      (mm)=       1.57         4.67
     Average Slope      (%)=        .93          .70
     Length             (m)=     164.82        40.00
     Mannings n            =       .030         .250

     Max.eff.Inten.(mm/hr)=     104.19        20.32
                over (min)        5.00        25.00
     Storage Coeff.  (min)=       5.72 (ii)   24.02 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=        .20          .05
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .20          .00           .205 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.38          1.000
     RUNOFF VOLUME    (mm)=      40.94        14.70         40.157
     TOTAL RAINFALL   (mm)=      42.51        42.51         42.514
     RUNOFF COEFFICIENT   =        .96          .35           .945

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 -------------------------------------------------------------------------------
 001:0010-----------------------------------------------------------------------
 *
 * SUB-AREA No.5
 ----------------------
 | CALIB STANDHYD      |   Area     (ha)=    2.66
 | 07:070     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
 ----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       2.58          .08
     Dep. Storage      (mm)=       1.57         4.67
     Average Slope      (%)=        .61         1.50
     Length             (m)=     207.25        20.00
     Mannings n            =       .030         .250

     Max.eff.Inten.(mm/hr)=     104.19        24.26
                over (min)        7.50        17.50
     Storage Coeff.  (min)=       7.45 (ii)   16.40 (ii)
     Unit Hyd. Tpeak (min)=       7.50        17.50
     Unit Hyd. peak  (cms)=        .15          .07
                                                            *TOTALS*
```

```
01351>      PEAK FLOW        (cms)=        .54           .00            .538 (iii)
01352>      TIME TO PEAK     (hrs)=       1.04          1.25           1.042
01353>      RUNOFF VOLUME     (mm)=      40.94         14.70          40.157
01354>      TOTAL RAINFALL    (mm)=      42.51         42.51          42.514
01355>      RUNOFF COEFFICIENT   =        .96           .35            .945
01356>
01357>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01358>            CN* =  81.0    Ia = Dep. Storage  (Above)
01359>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01360>            THAN THE STORAGE COEFFICIENT.
01361>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01362>
01363> ----------------------------------------------------------------------------
01364> 001:0011--------------------------------------------------------------------
01365> --------------------
01366> | ADD HYD (080    ) | ID: NHYD       AREA      QPEAK   TPEAK   R.V.     DWF
01367> --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
01368>                    ID1 06:060        .89       .205    1.00  40.16    .000
01369>                   +ID2 07:070       2.66       .538    1.04  40.16    .000
01370>                    ==================================================
01371>                    SUM 08:080       3.55       .733    1.04  40.16    .000
01372>
01373>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01374>
01375> ----------------------------------------------------------------------------
01376> 001:0012--------------------------------------------------------------------
01377> --------------------
01378> | ADD HYD (090    ) | ID: NHYD       AREA      QPEAK   TPEAK   R.V.     DWF
01379> --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
01380>                    ID1 05:050       5.01       .918    1.04  38.34    .000
01381>                   +ID2 08:080       3.55       .733    1.04  40.16    .000
01382>                    ==================================================
01383>                    SUM 09:090       8.56      1.651    1.04  39.10    .000
01384>
01385>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01386>
01387> ----------------------------------------------------------------------------
01388> 001:0013--------------------------------------------------------------------
01389> ---------------------
01390> | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
01391> |  IN>09:(090    )   |
01392> | OUT<10:(POND   )   |    =========  OUTLFOW STORAGE TABLE  =========
01393> ---------------------     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
01394>                             (cms)     (ha.m.)   |   (cms)     (ha.m.)
01395>                              .000  .0000E+00   |     .593  .6251E+00
01396>                              .008  .6560E-01   |     .654  .6631E+00
01397>                              .017  .1311E+00   |     .797  .7391E+00
01398>                              .093  .2831E+00   |     .950  .8274E+00
01399>                              .233  .3971E+00   |    1.304  .9157E+00
01400>                              .337  .4731E+00   |    1.880  .1004E+01
01401>                              .465  .5491E+00   |    2.577  .1092E+01
01402>                              .531  .5871E+00   |     .000  .0000E+00
01403>
01404>      ROUTING RESULTS             AREA      QPEAK      TPEAK        R.V.
01405>      --------------------        (ha)      (cms)      (hrs)        (mm)
01406>      INFLOW >09: (090    )       8.56      1.651      1.042       39.096
01407>      OUTFLOW<10: (POND   )       8.56       .089      2.625       39.093
01408>
01409>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=     5.413
01410>                     TIME SHIFT OF PEAK FLOW          (min)=    95.00
01411>                     MAXIMUM  STORAGE   USED        (ha.m.)=.2758E+00
01412>
01413> ----------------------------------------------------------------------------
01414> 001:0014--------------------------------------------------------------------
01415> **************************************************
01416> *     Remaining Hawthorne Industrial Park        *
01417> **************************************************
01418> *
01419> * SUB-AREA No.1
01420> ---------------------
01421> | CALIB STANDHYD     |   Area     (ha)=   19.90
01422> | 01:HIP01  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
01423> ---------------------
01424>                              IMPERVIOUS    PERVIOUS (i)
01425>      Surface Area      (ha)=      14.13         5.77
01426>      Dep. Storage      (mm)=       1.57         4.67
01427>      Average Slope      (%)=        .60         1.50
01428>      Length             (m)=     580.00       100.00
01429>      Mannings n            =       .030         .250
01430>
01431>      Max.eff.Inten.(mm/hr)=      80.14        42.65
01432>                 over (min)      15.00        35.00
01433>      Storage Coeff.  (min)=      15.43 (ii)   34.18 (ii)
01434>      Unit Hyd. Tpeak (min)=      15.00        35.00
01435>      Unit Hyd. peak  (cms)=        .07          .03
01436>                                                           *TOTALS*
01437>      PEAK FLOW        (cms)=       1.41          .40           1.572 (iii)
01438>      TIME TO PEAK     (hrs)=       1.17         1.54           1.208
01439>      RUNOFF VOLUME     (mm)=      40.94        21.31          31.126
01440>      TOTAL RAINFALL    (mm)=      42.51        42.51          42.514
01441>      RUNOFF COEFFICIENT   =        .96          .50            .732
01442>
01443>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01444>            CN* =  81.0    Ia = Dep. Storage  (Above)
01445>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01446>            THAN THE STORAGE COEFFICIENT.
01447>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01448>
01449> ----------------------------------------------------------------------------
01450> 001:0015--------------------------------------------------------------------
01451> --------------------
01452> | ADD HYD (HIP02 ) | ID: NHYD       AREA      QPEAK   TPEAK   R.V.     DWF
01453> --------------------               (ha)      (cms)   (hrs)   (mm)    (cms)
01454>                   ID1 10:POND       8.56       .089    2.63  39.09    .000
01455>                  +ID2 01:HIP01     19.90      1.572    1.21  31.13    .000
01456>                   ==================================================
01457>                   SUM 02:HIP02     28.46      1.615    1.21  33.52    .000
01458>
01459>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01460>
01461> ----------------------------------------------------------------------------
01462> 001:0016--------------------------------------------------------------------
01463> *
01464> * SUB-AREA No.2
01465> ---------------------
01466> | CALIB STANDHYD     |   Area     (ha)=   17.00
01467> | 03:HIP03  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
01468> ---------------------
01469>                              IMPERVIOUS    PERVIOUS (i)
01470>      Surface Area      (ha)=      12.07         4.93
01471>      Dep. Storage      (mm)=       1.57         4.67
01472>      Average Slope      (%)=        .65         1.50
01473>      Length             (m)=     450.00       100.00
01474>      Mannings n            =       .030         .250
01475>
01476>      Max.eff.Inten.(mm/hr)=      89.76        47.48
01477>                 over (min)      12.50        30.00
01478>      Storage Coeff.  (min)=      12.36 (ii)   30.32 (ii)
01479>      Unit Hyd. Tpeak (min)=      12.50        30.00
01480>      Unit Hyd. peak  (cms)=        .09          .04
01481>                                                           *TOTALS*
01482>      PEAK FLOW        (cms)=       1.36          .37           1.504 (iii)
01483>      TIME TO PEAK     (hrs)=       1.13         1.46           1.167
01484>      RUNOFF VOLUME     (mm)=      40.94        21.31          31.126
01485>      TOTAL RAINFALL    (mm)=      42.51        42.51          42.514
01486>      RUNOFF COEFFICIENT   =        .96          .50            .732
01487>
01488>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01489>            CN* =  81.0    Ia = Dep. Storage  (Above)
01490>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01491>            THAN THE STORAGE COEFFICIENT.
01492>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01493>
01494> ----------------------------------------------------------------------------
01495> 001:0017--------------------------------------------------------------------
01496> *
01497> * SUB-AREA No.3
01498> ---------------------
01499> | CALIB STANDHYD     |   Area     (ha)=   18.10
01500> | 04:HIP04  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
01501> ---------------------
01502>                              IMPERVIOUS    PERVIOUS (i)
01503>      Surface Area      (ha)=      12.85         5.25
01504>      Dep. Storage      (mm)=       1.57         4.67
01505>      Average Slope      (%)=        .50         1.50
01506>      Length             (m)=     600.00       100.00
01507>      Mannings n            =       .030         .250
01508>
01509>      Max.eff.Inten.(mm/hr)=      73.27        42.65
01510>                 over (min)      17.50        35.00
01511>      Storage Coeff.  (min)=      17.24 (ii)   35.98 (ii)
01512>      Unit Hyd. Tpeak (min)=      17.50        35.00
01513>      Unit Hyd. peak  (cms)=        .07          .03
01514>                                                           *TOTALS*
01515>      PEAK FLOW        (cms)=       1.19          .35           1.364 (iii)
01516>      TIME TO PEAK     (hrs)=       1.21         1.54           1.250
01517>      RUNOFF VOLUME     (mm)=      40.94        21.31          31.126
01518>      TOTAL RAINFALL    (mm)=      42.51        42.51          42.514
01519>      RUNOFF COEFFICIENT   =        .96          .50            .732
01520>
01521>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01522>            CN* =  81.0    Ia = Dep. Storage  (Above)
01523>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01524>            THAN THE STORAGE COEFFICIENT.
01525>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01526>
01527> ----------------------------------------------------------------------------
01528> 001:0018--------------------------------------------------------------------
01529> --------------------
01530> | ADD HYD (HIP05 ) | ID: NHYD       AREA      QPEAK   TPEAK   R.V.     DWF
01531> --------------------               (ha)      (cms)   (hrs)   (mm)    (cms)
01532>                   ID1 03:HIP03     17.00      1.504    1.17  31.13    .000
01533>                  +ID2 04:HIP04     18.10      1.364    1.25  31.13    .000
01534>                   ==================================================
01535>                   SUM 05:HIP05     35.10      2.800    1.17  31.13    .000
01536>
01537>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01538>
01539> ----------------------------------------------------------------------------
01540> 001:0019--------------------------------------------------------------------
01541> *
01542> *SUB-AREA No.4
01543> ---------------------
01544> | DESIGN NASHYD      |   Area     (ha)=    4.00   Curve Number   (CN)=85.00
01545> | 06:Pond-B DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
01546> ---------------------    U.H. Tp(hrs)=    .170
01547>
01548>      Unit Hyd Qpeak  (cms)=      .899
01549>
01550>      PEAK FLOW       (cms)=      .260 (i)
01551>      TIME TO PEAK    (hrs)=     1.167
01552>      RUNOFF VOLUME    (mm)=    17.325
01553>      TOTAL RAINFALL   (mm)=    42.514
01554>      RUNOFF COEFFICIENT   =      .408
01555>
01556>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01557>
01558> ----------------------------------------------------------------------------
01559> 001:0020--------------------------------------------------------------------
01560> --------------------
01561> | ADD HYD (HIP06 ) | ID: NHYD       AREA      QPEAK   TPEAK   R.V.     DWF
01562> --------------------               (ha)      (cms)   (hrs)   (mm)    (cms)
01563>                   ID1 02:HIP02     28.46      1.615    1.21  33.52    .000
01564>                  +ID2 05:HIP05     35.10      2.800    1.17  31.13    .000
01565>                  +ID3 06:Pond-B     4.00       .260    1.17  17.32    .000
01566>                   ==================================================
01567>                   SUM 07:HIP06     67.56      4.661    1.17  31.32    .000
01568>
01569>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01570>
01571> ----------------------------------------------------------------------------
01572> 001:0021--------------------------------------------------------------------
01573> ---------------------
01574> | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
01575> |  IN>07:(HIP06 )    |
01576> | OUT<08:(HIP-PO)    |    =========  OUTLFOW STORAGE TABLE  =========
01577> ---------------------     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
01578>                             (cms)     (ha.m.)   |   (cms)     (ha.m.)
01579>                              .000  .0000E+00   |     .724  .2210E+01
01580>                              .048  .5740E-01   |     .937  .2501E+01
01581>                              .054  .2434E+00   |    1.262  .2798E+01
01582>                              .059  .5834E+00   |    1.404  .3101E+01
01583>                              .062  .8400E+00   |    1.532  .3410E+01
01584>                              .064  .1102E+01   |    1.650  .3724E+01
01585>                              .147  .1370E+01   |    2.409  .4044E+01
01586>                              .280  .1644E+01   |    3.689  .4370E+01
01587>                              .472  .1924E+01   |     .000  .0000E+00
01588>
01589>      ROUTING RESULTS             AREA      QPEAK      TPEAK        R.V.
01590>      --------------------        (ha)      (cms)      (hrs)        (mm)
01591>      INFLOW >07: (HIP06 )       67.56      4.661      1.167       31.317
01592>      OUTFLOW<08: (HIP-PO)       67.56       .288      3.597       31.317
01593>
01594>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=     6.182
01595>                     TIME SHIFT OF PEAK FLOW          (min)=   145.83
01596>                     MAXIMUM  STORAGE   USED        (ha.m.)=.1656E+01
01597>
01598> ----------------------------------------------------------------------------
01599> 001:0022--------------------------------------------------------------------
01600> *
01601> *SUB-AREA No. 5
01602> *
01603> ---------------------
01604> | DESIGN NASHYD      |   Area     (ha)=    6.80   Curve Number   (CN)=76.00
01605> | 09:A2     DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
01606> ---------------------    U.H. Tp(hrs)=    .370
01607>
01608>      Unit Hyd Qpeak  (cms)=      .702
01609>
01610>      PEAK FLOW       (cms)=      .187 (i)
01611>      TIME TO PEAK    (hrs)=     1.458
01612>      RUNOFF VOLUME    (mm)=    12.131
01613>      TOTAL RAINFALL   (mm)=    42.514
01614>      RUNOFF COEFFICIENT   =      .285
01615>
01616>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01617>
01618> ----------------------------------------------------------------------------
01619> 001:0023--------------------------------------------------------------------
01620> *
```

```
*SUB-AREA No. 6
*
---------------------
| DESIGN NASHYD       |   Area     (ha)=     5.30   Curve Number   (CN)=76.00
| 10:A3      DT= 2.50 |   Ia       (mm)=    4.670   # of Linear Res.(N)= 3.00
---------------------   U.H. Tp(hrs)=      .804

      Unit Hyd Qpeak  (cms)=      .252

      PEAK FLOW       (cms)=      .086 (i)
      TIME TO PEAK    (hrs)=     2.042
      RUNOFF VOLUME    (mm)=    12.131
      TOTAL RAINFALL   (mm)=    42.514
      RUNOFF COEFFICIENT   =      .285

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

-----------------------------------------------------------------------------
001:0024---------------------------------------------------------------------
--------------------
| ADD HYD (Interi) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
--------------------               (ha)      (cms)   (hrs)   (mm)    (cms)
                  ID1 08:HIP-PO    67.56      .288    3.60  31.32     .000
                 +ID2 09:A2         6.80      .187    1.46  12.13     .000
                 +ID3 10:A3         5.30      .086    2.04  12.13     .000
                  ==================================================
                  SUM 01:Interi    79.66      .359    3.08  28.40     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
001:0025---------------------------------------------------------------------
*************************************************************
*          CALCULATION OF 3HR - 1:10 YEAR STORM EVENT       *
*************************************************************
--------------------
[ START              |  Project  dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
--------------------  Rainfall dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
    TZERO =   .00 hrs on       0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   0
-----------------------------------------------------------------------------
001:0002---------------------------------------------------------------------
--------------------
| CHICAGO STORM    |     IDF curve parameters: A=1174.184
| Ptotal= 49.50 mm |                           B=   6.014
--------------------                           C=    .816
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  3.00 hrs
                         Storm time step    = 10.00 min
                         Time to peak ratio =   .33

              TIME     RAIN |   TIME     RAIN |   TIME     RAIN |   TIME     RAIN
               hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr
               .17    4.248 |   1.00  122.142 |   1.83    7.733 |   2.67    4.049
               .33    5.290 |   1.17   37.285 |   2.00    6.502 |   2.83    3.714
               .50    7.108 |   1.33   18.954 |   2.17    5.625 |   3.00    3.434
               .67   11.130 |   1.50   12.700 |   2.33    4.969 |
               .83   28.100 |   1.67    9.588 |   2.50    4.458 |

-----------------------------------------------------------------------------
001:0003---------------------------------------------------------------------
---------------------
| DEFAULT VALUES      |   Filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\ORGA.VAL
---------------------   ICASEdv = 1 (read and print data)
      FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
                 ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
      Horton's infiltration equation parameters:
      [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
      Parameters for PERVIOUS surfaces in STANDHYD:
      [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
      Parameters for IMPERVIOUS surfaces in STANDHYD:
      [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
      Parameters used in NASHYD:
      [Ia=   4.67 mm] [N= 3.00]
-----------------------------------------------------------------------------
001:0004---------------------------------------------------------------------
**********************************
*          ORGAWORLD FILE        *
**********************************
*
* SUB-AREA No.1
---------------------
| CALIB STANDHYD      |   Area     (ha)=     2.07
| 01:010      DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
---------------------
                                   IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=         1.74          .33
      Dep. Storage      (mm)=         1.57         4.67
      Average Slope      (%)=          .52         1.00
      Length             (m)=       204.72        20.00
      Mannings n            =         .030         .250

      Max.eff.Inten.(mm/hr)=        122.14        34.69
                 over (min)          7.50        15.00
      Storage Coeff.  (min)=         7.28 (ii)    16.04 (ii)
      Unit Hyd. Tpeak (min)=         7.50        15.00
      Unit Hyd. peak  (cms)=          .15          .07
                                                                *TOTALS*
      PEAK FLOW       (cms)=          .43          .02             .437 (iii)
      TIME TO PEAK    (hrs)=         1.04         1.21            1.042
      RUNOFF VOLUME    (mm)=        47.93        19.25           43.345
      TOTAL RAINFALL   (mm)=        49.50        49.50           49.505
      RUNOFF COEFFICIENT   =          .97          .39             .876

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

-----------------------------------------------------------------------------
001:0005---------------------------------------------------------------------
*
* SUB-AREA No.2
---------------------
| CALIB STANDHYD      |   Area     (ha)=     1.54
| 02:020      DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
---------------------
                                   IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=         1.42          .12
      Dep. Storage      (mm)=         1.57         4.67
      Average Slope      (%)=          .50         1.00
      Length             (m)=       244.34         5.00
      Mannings n            =         .030         .030

      Max.eff.Inten.(mm/hr)=        122.14        42.32
                 over (min)          7.50        10.00
      Storage Coeff.  (min)=         8.20 (ii)     9.18 (ii)
      Unit Hyd. Tpeak (min)=         7.50        10.00
      Unit Hyd. peak  (cms)=          .14          .12
                                                                *TOTALS*
      PEAK FLOW       (cms)=          .33          .01             .341 (iii)
      TIME TO PEAK    (hrs)=         1.04         1.13            1.042
      RUNOFF VOLUME    (mm)=        47.93        19.25           45.640
      TOTAL RAINFALL   (mm)=        49.50        49.50           49.505
      RUNOFF COEFFICIENT   =          .97          .39             .922

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

-----------------------------------------------------------------------------
001:0006---------------------------------------------------------------------
*
* SUB-AREA No.3
---------------------
| CALIB STANDHYD      |   Area     (ha)=     1.40
| 03:030      DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
---------------------
                                   IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=         1.36          .04
      Dep. Storage      (mm)=         1.57         4.67
      Average Slope      (%)=          .51         1.00
      Length             (m)=       225.63         5.00
      Mannings n            =         .030         .030

      Max.eff.Inten.(mm/hr)=        122.14        48.18
                 over (min)          7.50         7.50
      Storage Coeff.  (min)=         7.77 (ii)     8.70 (ii)
      Unit Hyd. Tpeak (min)=         7.50         7.50
      Unit Hyd. peak  (cms)=          .15          .14
                                                                *TOTALS*
      PEAK FLOW       (cms)=          .33          .00             .329 (iii)
      TIME TO PEAK    (hrs)=         1.04         1.08            1.042
      RUNOFF VOLUME    (mm)=        47.93        19.25           47.074
      TOTAL RAINFALL   (mm)=        49.50        49.50           49.505
      RUNOFF COEFFICIENT   =          .97          .39             .951

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

-----------------------------------------------------------------------------
001:0007---------------------------------------------------------------------
--------------------
| ADD HYD (040    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
--------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
                  ID1 01:010        2.07      .437    1.04  43.35     .000
                 +ID2 02:020        1.54      .341    1.04  45.64     .000
                  ==================================================
                  SUM 04:040        3.61      .778    1.04  44.32     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
001:0008---------------------------------------------------------------------
--------------------
| ADD HYD (050    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
--------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
                  ID1 03:030        1.40      .329    1.04  47.07     .000
                 +ID2 04:040        3.61      .778    1.04  44.32     .000
                  ==================================================
                  SUM 05:050        5.01     1.107    1.04  45.09     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
001:0009---------------------------------------------------------------------
*
* SUB-AREA No.4
---------------------
| CALIB STANDHYD      |   Area     (ha)=      .89
| 06:060      DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
---------------------
                                   IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=          .86          .03
      Dep. Storage      (mm)=         1.57         4.67
      Average Slope      (%)=          .93          .70
      Length             (m)=       164.82        40.00
      Mannings n            =         .030         .250

      Max.eff.Inten.(mm/hr)=        122.14        31.19
                 over (min)          5.00        20.00
      Storage Coeff.  (min)=         5.37 (ii)    20.78 (ii)
      Unit Hyd. Tpeak (min)=         5.00        20.00
      Unit Hyd. peak  (cms)=          .21          .06
                                                                *TOTALS*
      PEAK FLOW       (cms)=          .24          .00             .245 (iii)
      TIME TO PEAK    (hrs)=         1.00         1.29            1.000
      RUNOFF VOLUME    (mm)=        47.93        19.25           47.074
      TOTAL RAINFALL   (mm)=        49.50        49.50           49.505
      RUNOFF COEFFICIENT   =          .97          .39             .951

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

-----------------------------------------------------------------------------
001:0010---------------------------------------------------------------------
*
* SUB-AREA No.5
---------------------
| CALIB STANDHYD      |   Area     (ha)=     2.66
| 07:070      DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
---------------------
                                   IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=         2.58          .08
      Dep. Storage      (mm)=         1.57         4.67
      Average Slope      (%)=          .61         1.50
      Length             (m)=       207.25        20.00
      Mannings n            =         .030         .250

      Max.eff.Inten.(mm/hr)=        122.14        34.69
                 over (min)          7.50        15.00
      Storage Coeff.  (min)=         7.00 (ii)    14.75 (ii)
      Unit Hyd. Tpeak (min)=         7.50        15.00
      Unit Hyd. peak  (cms)=          .16          .08
                                                                *TOTALS*
      PEAK FLOW       (cms)=          .64          .00             .645 (iii)
      TIME TO PEAK    (hrs)=         1.04         1.21            1.042
      RUNOFF VOLUME    (mm)=        47.93        19.25           47.074
      TOTAL RAINFALL   (mm)=        49.50        49.50           49.505
      RUNOFF COEFFICIENT   =          .97          .39             .951

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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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001:0011-----------------------------------------------------------------------
---------------------
| ADD HYD (080    ) | ID: NHYD       AREA      QPEAK    TPEAK    R.V.     DWF
---------------------                (ha)      (cms)    (hrs)    (mm)    (cms)
                     ID1 06:060        .89      .245     1.00   47.07    .000
                    +ID2 07:070       2.66      .645     1.04   47.07    .000
                     ==================================================
                     SUM 08:080       3.55      .876     1.04   47.07    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0012-----------------------------------------------------------------------
---------------------
| ADD HYD (090    ) | ID: NHYD       AREA      QPEAK    TPEAK    R.V.     DWF
---------------------                (ha)      (cms)    (hrs)    (mm)    (cms)
                     ID1 05:050       5.01     1.107     1.04   45.09    .000
                    +ID2 08:080       3.55      .876     1.04   47.07    .000
                     ==================================================
                     SUM 09:090       8.56     1.984     1.04   45.91    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0013-----------------------------------------------------------------------
----------------------
| ROUTE RESERVOIR    |      Requested routing time step =  1.0 min.
|  IN>09:(090    )   |
| OUT<10:(POND   )   |      =========  OUTLFOW STORAGE TABLE  =========
----------------------      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                             (cms)     (ha.m.)   |   (cms)     (ha.m.)
                              .000  .0000E+00    |     .593  .6251E+00
                              .008  .6560E-01    |     .654  .6631E+00
                              .017  .1311E+00    |     .797  .7391E+00
                              .093  .2831E+00    |     .950  .8274E+00
                              .233  .3971E+00    |    1.304  .9157E+00
                              .337  .4731E+00    |    1.880  .1004E+01
                              .465  .5491E+00    |    2.577  .1092E+01
                              .531  .5871E+00    |     .000  .0000E+00

      ROUTING RESULTS               AREA      QPEAK      TPEAK         R.V.
      --------------------          (ha)      (cms)      (hrs)         (mm)
      INFLOW >09: (090    )         8.56      1.984      1.042       45.914
      OUTFLOW<10: (POND   )         8.56       .132      2.278       45.912

                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=     6.640
                     TIME SHIFT OF PEAK FLOW         (min)=    74.17
                     MAXIMUM  STORAGE   USED       (ha.m.)=.3146E+00

-------------------------------------------------------------------------------
001:0014-----------------------------------------------------------------------
**********************************************
*      Remaining Hawthorne Industrial Park     *
**********************************************
*
* SUB-AREA No.1
----------------------
| CALIB STANDHYD      |   Area     (ha)=   19.90
| 01:HIP01  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
----------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       14.13          5.77
     Dep. Storage      (mm)=        1.57          4.67
     Average Slope      (%)=         .60          1.50
     Length             (m)=      580.00        100.00
     Mannings n            =        .030          .250

     Max.eff.Inten.(mm/hr)=        93.86         60.56
                over (min)         15.00         30.00
     Storage Coeff.   (min)=       14.48 (ii)    30.78 (ii)
     Unit Hyd. Tpeak  (min)=       15.00         30.00
     Unit Hyd. peak   (cms)=         .08           .04
                                                                *TOTALS*
     PEAK FLOW        (cms)=        1.70           .55           1.983 (iii)
     TIME TO PEAK     (hrs)=        1.17          1.46           1.208
     RUNOFF VOLUME     (mm)=       47.93         26.92          37.426
     TOTAL RAINFALL    (mm)=       49.50         49.50          49.505
     RUNOFF COEFFICIENT    =         .97           .54            .756

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0     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.

-------------------------------------------------------------------------------
001:0015-----------------------------------------------------------------------
---------------------
| ADD HYD (HIP02 ) | ID: NHYD       AREA      QPEAK    TPEAK    R.V.     DWF
---------------------               (ha)      (cms)    (hrs)    (mm)    (cms)
                    ID1 10:POND       8.56      .132     2.28   45.91    .000
                   +ID2 01:HIP01     19.90     1.983     1.21   37.43    .000
                    ==================================================
                    SUM 02:HIP02     28.46     2.044     1.21   39.98    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0016-----------------------------------------------------------------------
*
* SUB-AREA No.2
----------------------
| CALIB STANDHYD      |   Area     (ha)=   17.00
| 03:HIP03  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
----------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       12.07          4.93
     Dep. Storage      (mm)=        1.57          4.67
     Average Slope      (%)=         .65          1.50
     Length             (m)=      450.00        100.00
     Mannings n            =        .030          .250

     Max.eff.Inten.(mm/hr)=       105.17         63.81
                over (min)         12.50         27.50
     Storage Coeff.   (min)=       11.60 (ii)    27.56 (ii)
     Unit Hyd. Tpeak  (min)=       12.50         27.50
     Unit Hyd. peak   (cms)=         .09           .04
                                                                *TOTALS*
     PEAK FLOW        (cms)=        1.63           .51           1.865 (iii)
     TIME TO PEAK     (hrs)=        1.13          1.42           1.167
     RUNOFF VOLUME     (mm)=       47.93         26.92          37.426
     TOTAL RAINFALL    (mm)=       49.50         49.50          49.505
     RUNOFF COEFFICIENT    =         .97           .54            .756

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0     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.

-------------------------------------------------------------------------------
001:0017-----------------------------------------------------------------------
*
* SUB-AREA No.3
----------------------
| CALIB STANDHYD      |   Area     (ha)=   18.10
| 04:HIP04  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
----------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       12.85          5.25
     Dep. Storage      (mm)=        1.57          4.67
     Average Slope      (%)=         .50          1.50
     Length             (m)=      600.00        100.00
     Mannings n            =        .030          .250

     Max.eff.Inten.(mm/hr)=        93.86         57.19
                over (min)         15.00         32.50
     Storage Coeff.   (min)=       15.61 (ii)    32.28 (ii)
     Unit Hyd. Tpeak  (min)=       15.00         32.50
     Unit Hyd. peak   (cms)=         .07           .03
                                                                *TOTALS*
     PEAK FLOW        (cms)=        1.49           .48           1.723 (iii)
     TIME TO PEAK     (hrs)=        1.17          1.50           1.208
     RUNOFF VOLUME     (mm)=       47.93         26.92          37.426
     TOTAL RAINFALL    (mm)=       49.50         49.50          49.505
     RUNOFF COEFFICIENT    =         .97           .54            .756

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0     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.

-------------------------------------------------------------------------------
001:0018-----------------------------------------------------------------------
---------------------
| ADD HYD (HIP05 ) | ID: NHYD       AREA      QPEAK    TPEAK    R.V.     DWF
---------------------               (ha)      (cms)    (hrs)    (mm)    (cms)
                    ID1 03:HIP03     17.00     1.865     1.17   37.43    .000
                   +ID2 04:HIP04     18.10     1.723     1.21   37.43    .000
                    ==================================================
                    SUM 05:HIP05     35.10     3.572     1.17   37.43    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0019-----------------------------------------------------------------------
*
*SUB-AREA No.4
----------------------
| DESIGN NASHYD       |   Area     (ha)=    4.00   Curve Number   (CN)=85.00
| 06:Pond-B DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=     .170

     Unit Hyd Qpeak  (cms)=      .899

     PEAK FLOW       (cms)=      .345 (i)
     TIME TO PEAK    (hrs)=     1.167
     RUNOFF VOLUME    (mm)=    22.420
     TOTAL RAINFALL   (mm)=    49.505
     RUNOFF COEFFICIENT   =      .453

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

-------------------------------------------------------------------------------
001:0020-----------------------------------------------------------------------
---------------------
| ADD HYD (HIP06 ) | ID: NHYD       AREA      QPEAK    TPEAK    R.V.     DWF
---------------------               (ha)      (cms)    (hrs)    (mm)    (cms)
                    ID1 02:HIP02     28.46     2.044     1.21   39.98    .000
                   +ID2 05:HIP05     35.10     3.572     1.17   37.43    .000
                   +ID3 06:Pond-B     4.00      .345     1.17   22.42    .000
                    ==================================================
                    SUM 07:HIP06     67.56     5.939     1.17   37.61    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0021-----------------------------------------------------------------------
----------------------
| ROUTE RESERVOIR    |      Requested routing time step =  1.0 min.
|  IN>07:(HIP06 )    |
| OUT<08:(HIP-PO)    |      =========  OUTLFOW STORAGE TABLE  =========
----------------------      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                             (cms)     (ha.m.)   |   (cms)     (ha.m.)
                              .000  .0000E+00    |     .724  .2210E+01
                              .048  .5740E-01    |     .937  .2501E+01
                              .054  .2434E+00    |    1.262  .2798E+01
                              .059  .5834E+00    |    1.404  .3101E+01
                              .062  .8400E+00    |    1.532  .3410E+01
                              .064  .1102E+01    |    1.650  .3724E+01
                              .147  .1370E+01    |    2.409  .4044E+01
                              .280  .1644E+01    |    3.689  .4370E+01
                              .472  .1924E+01    |     .000  .0000E+00

      ROUTING RESULTS               AREA      QPEAK      TPEAK         R.V.
      --------------------          (ha)      (cms)      (hrs)         (mm)
      INFLOW >07: (HIP06 )         67.56      5.939      1.167       37.611
      OUTFLOW<08: (HIP-PO)         67.56       .487      3.361       37.611

                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=     8.200
                     TIME SHIFT OF PEAK FLOW         (min)=   131.67
                     MAXIMUM  STORAGE   USED       (ha.m.)=.1941E+01

-------------------------------------------------------------------------------
001:0022-----------------------------------------------------------------------
*
*SUB-AREA No. 5
*
----------------------
| DESIGN NASHYD       |   Area     (ha)=    6.80   Curve Number   (CN)=76.00
| 09:A2      DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=     .370

     Unit Hyd Qpeak  (cms)=      .702

     PEAK FLOW       (cms)=      .252 (i)
     TIME TO PEAK    (hrs)=     1.417
     RUNOFF VOLUME    (mm)=    16.075
     TOTAL RAINFALL   (mm)=    49.505
     RUNOFF COEFFICIENT   =      .325

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

-------------------------------------------------------------------------------
001:0023-----------------------------------------------------------------------
*
*SUB-AREA No. 6
*
----------------------
| DESIGN NASHYD       |   Area     (ha)=    5.30   Curve Number   (CN)=76.00
| 10:A3      DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=     .804

     Unit Hyd Qpeak  (cms)=      .252

     PEAK FLOW       (cms)=      .115 (i)
     TIME TO PEAK    (hrs)=     2.000
     RUNOFF VOLUME    (mm)=    16.075
     TOTAL RAINFALL   (mm)=    49.505
```

```
02161>      RUNOFF COEFFICIENT   =     .325
02162>
02163>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02164>
02165> ---------------------------------------------------------------------------
02166> 001:0024-------------------------------------------------------------------
02167> --------------------
02168> | ADD HYD (Interi) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
02169> --------------------               (ha)     (cms)   (hrs)   (mm)    (cms)
02170>                  ID1 08:HIP-PO    67.56     .487    3.36  37.61    .000
02171>                 +ID2 09:A2         6.80     .252    1.42  16.08    .000
02172>                 +ID3 10:A3         5.30     .115    2.00  16.08    .000
02173>                  ===================================================
02174>                  SUM 01:Interi    79.66     .589    3.04  34.34    .000
02175>
02176>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02177>
02178> ---------------------------------------------------------------------------
02179> 001:0025-------------------------------------------------------------------
02180> ***************************************************************
02181> *         CALCULATION OF 3HR - 1:25 YEAR STORM EVENT          *
02182> ***************************************************************
02183> --------------------
02184> | START            |   Project  dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
02185> --------------------   Rainfall dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
02186>     TZERO =   .00 hrs on        0
02187>     METOUT=   2 (output = METRIC)
02188>     NRUN   = 001
02189>     NSTORM=   0
02190> ---------------------------------------------------------------------------
02191> 001:0002-------------------------------------------------------------------
02192> --------------------
02193> | CHICAGO STORM    |    IDF curve parameters: A=1402.884
02194> | Ptotal= 58.23 mm |                          B=   6.018
02195> --------------------                          C=    .819
02196>                        used in:   INTENSITY =  A / (t + B)^C
02197>
02198>                        Duration of storm  =  3.00 hrs
02199>                        Storm time step    = 10.00 min
02200>                        Time to peak ratio =   .33
02201>
02202>               TIME     RAIN |   TIME     RAIN |   TIME     RAIN |   TIME     RAIN
02203>                hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr
02204>                .17    4.934 |   1.00  144.693 |   1.83    9.014 |   2.67    4.701
02205>                .33    6.152 |   1.17   43.904 |   2.00    7.571 |   2.83    4.310
02206>                .50    8.282 |   1.33   22.224 |   2.17    6.544 |   3.00    3.983
02207>                .67   13.006 |   1.50   14.852 |   2.33    5.776 |
02208>                .83   33.041 |   1.67   11.192 |   2.50    5.179 |
02209>
02210> ---------------------------------------------------------------------------
02211> 001:0003-------------------------------------------------------------------
02212> ----------------------
02213> | DEFAULT VALUES     |  Filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\ORGA.VAL
02214> ----------------------  ICASEdv = 1 (read and print data)
02215>      FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
02216>                 ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
02217>      Horton's infiltration equation parameters:
02218>      [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
02219>      Parameters for PERVIOUS surfaces in STANDHYD:
02220>      [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
02221>      Parameters for IMPERVIOUS surfaces in STANDHYD:
02222>      [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
02223>      Parameters used in NASHYD:
02224>      [Ia=   4.67 mm] [N= 3.00]
02225> ---------------------------------------------------------------------------
02226> 001:0004-------------------------------------------------------------------
02227> **********************************
02228> *          ORGAWORLD FILE        *
02229> **********************************
02230> *
02231> * SUB-AREA No.1
02232> ----------------------
02233> | CALIB STANDHYD     |   Area    (ha)=    2.07
02234> | 01:010     DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
02235> ----------------------
02236>                               IMPERVIOUS    PERVIOUS (i)
02237>      Surface Area      (ha)=       1.74          .33
02238>      Dep. Storage      (mm)=       1.57         4.67
02239>      Average Slope      (%)=        .52         1.00
02240>      Length              (m)=     204.72        20.00
02241>      Mannings n             =       .030         .250
02242>
02243>      Max.eff.Inten.(mm/hr)=     144.69        47.07
02244>                  over (min)       7.50        15.00
02245>      Storage Coeff.   (min)=       6.81 (ii)   14.56 (ii)
02246>      Unit Hyd. Tpeak (min)=       7.50        15.00
02247>      Unit Hyd. peak  (cms)=        .16          .08
02248>                                                             *TOTALS*
02249>      PEAK FLOW        (cms)=        .52          .03           .532 (iii)
02250>      TIME TO PEAK     (hrs)=       1.04         1.21          1.042
02251>      RUNOFF VOLUME     (mm)=      56.66        25.35         51.647
02252>      TOTAL RAINFALL    (mm)=      58.23        58.23         58.226
02253>      RUNOFF COEFFICIENT   =        .97          .44           .887
02254>
02255>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02256>            CN* =  81.0    Ia = Dep. Storage  (Above)
02257>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02258>            THAN THE STORAGE COEFFICIENT.
02259>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02260>
02261> ---------------------------------------------------------------------------
02262> 001:0005-------------------------------------------------------------------
02263> *
02264> * SUB-AREA No.2
02265> ----------------------
02266> | CALIB STANDHYD     |   Area    (ha)=    1.54
02267> | 02:020     DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
02268> ----------------------
02269>                               IMPERVIOUS    PERVIOUS (i)
02270>      Surface Area      (ha)=       1.42          .12
02271>      Dep. Storage      (mm)=       1.57         4.67
02272>      Average Slope      (%)=        .50         1.00
02273>      Length              (m)=     244.34         5.00
02274>      Mannings n             =       .030         .030
02275>
02276>      Max.eff.Inten.(mm/hr)=     144.69        65.19
02277>                  over (min)       7.50         7.50
02278>      Storage Coeff.   (min)=       7.66 (ii)    8.49 (ii)
02279>      Unit Hyd. Tpeak (min)=       7.50         7.50
02280>      Unit Hyd. peak  (cms)=        .15          .14
02281>                                                             *TOTALS*
02282>      PEAK FLOW        (cms)=        .40          .01           .418 (iii)
02283>      TIME TO PEAK     (hrs)=       1.04         1.08          1.042
02284>      RUNOFF VOLUME     (mm)=      56.66        25.35         54.152
02285>      TOTAL RAINFALL    (mm)=      58.23        58.23         58.226
02286>      RUNOFF COEFFICIENT   =        .97          .44           .930
02287>
02288>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02289>            CN* =  81.0    Ia = Dep. Storage  (Above)
02290>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02291>            THAN THE STORAGE COEFFICIENT.
02292>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02293>
02294> ---------------------------------------------------------------------------
02295> 001:0006-------------------------------------------------------------------
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02296> *
02297> * SUB-AREA No.3
02298> ----------------------
02299> | CALIB STANDHYD     |   Area    (ha)=    1.40
02300> | 03:030     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
02301> ----------------------
02302>                               IMPERVIOUS    PERVIOUS (i)
02303>      Surface Area      (ha)=       1.36          .04
02304>      Dep. Storage      (mm)=       1.57         4.67
02305>      Average Slope      (%)=        .51         1.00
02306>      Length              (m)=     225.63         5.00
02307>      Mannings n             =       .030         .030
02308>
02309>      Max.eff.Inten.(mm/hr)=     144.69        65.19
02310>                  over (min)       7.50         7.50
02311>      Storage Coeff.   (min)=       7.26 (ii)    8.09 (ii)
02312>      Unit Hyd. Tpeak (min)=       7.50         7.50
02313>      Unit Hyd. peak  (cms)=        .15          .14
02314>                                                             *TOTALS*
02315>      PEAK FLOW        (cms)=        .40          .00           .400 (iii)
02316>      TIME TO PEAK     (hrs)=       1.04         1.08          1.042
02317>      RUNOFF VOLUME     (mm)=      56.66        25.35         55.717
02318>      TOTAL RAINFALL    (mm)=      58.23        58.23         58.226
02319>      RUNOFF COEFFICIENT   =        .97          .44           .957
02320>
02321>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02322>            CN* =  81.0    Ia = Dep. Storage  (Above)
02323>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02324>            THAN THE STORAGE COEFFICIENT.
02325>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02326>
02327> ---------------------------------------------------------------------------
02328> 001:0007-------------------------------------------------------------------
02329> --------------------
02330> | ADD HYD (040   ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
02331> --------------------               (ha)     (cms)   (hrs)   (mm)    (cms)
02332>                  ID1 01:010        2.07     .532    1.04  51.65    .000
02333>                 +ID2 02:020        1.54     .418    1.04  54.15    .000
02334>                  ===================================================
02335>                  SUM 04:040        3.61     .950    1.04  52.72    .000
02336>
02337>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02338>
02339> ---------------------------------------------------------------------------
02340> 001:0008-------------------------------------------------------------------
02341> --------------------
02342> | ADD HYD (050   ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
02343> --------------------               (ha)     (cms)   (hrs)   (mm)    (cms)
02344>                  ID1 03:030        1.40     .400    1.04  55.72    .000
02345>                 +ID2 04:040        3.61     .950    1.04  52.72    .000
02346>                  ===================================================
02347>                  SUM 05:050        5.01    1.350    1.04  53.55    .000
02348>
02349>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02350>
02351> ---------------------------------------------------------------------------
02352> 001:0009-------------------------------------------------------------------
02353> *
02354> * SUB-AREA No.4
02355> ----------------------
02356> | CALIB STANDHYD     |   Area    (ha)=     .89
02357> | 06:060     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
02358> ----------------------
02359>                               IMPERVIOUS    PERVIOUS (i)
02360>      Surface Area      (ha)=        .86          .03
02361>      Dep. Storage      (mm)=       1.57         4.67
02362>      Average Slope      (%)=        .93          .70
02363>      Length              (m)=     164.82        40.00
02364>      Mannings n             =       .030         .250
02365>
02366>      Max.eff.Inten.(mm/hr)=     144.69        44.12
02367>                  over (min)       5.00        17.50
02368>      Storage Coeff.   (min)=       5.02 (ii)   18.44 (ii)
02369>      Unit Hyd. Tpeak (min)=       5.00        17.50
02370>      Unit Hyd. peak  (cms)=        .22          .06
02371>                                                             *TOTALS*
02372>      PEAK FLOW        (cms)=        .30          .00           .296 (iii)
02373>      TIME TO PEAK     (hrs)=       1.00         1.25          1.000
02374>      RUNOFF VOLUME     (mm)=      56.66        25.35         55.717
02375>      TOTAL RAINFALL    (mm)=      58.23        58.23         58.226
02376>      RUNOFF COEFFICIENT   =        .97          .44           .957
02377>
02378>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02379>            CN* =  81.0    Ia = Dep. Storage  (Above)
02380>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02381>            THAN THE STORAGE COEFFICIENT.
02382>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02383>
02384> ---------------------------------------------------------------------------
02385> 001:0010-------------------------------------------------------------------
02386> *
02387> * SUB-AREA No.5
02388> ----------------------
02389> | CALIB STANDHYD     |   Area    (ha)=    2.66
02390> | 07:070     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
02391> ----------------------
02392>                               IMPERVIOUS    PERVIOUS (i)
02393>      Surface Area      (ha)=       2.58          .08
02394>      Dep. Storage      (mm)=       1.57         4.67
02395>      Average Slope      (%)=        .61         1.50
02396>      Length              (m)=     207.25        20.00
02397>      Mannings n             =       .030         .250
02398>
02399>      Max.eff.Inten.(mm/hr)=     144.69        51.33
02400>                  over (min)       7.50        12.50
02401>      Storage Coeff.   (min)=       6.54 (ii)   13.16 (ii)
02402>      Unit Hyd. Tpeak (min)=       7.50        12.50
02403>      Unit Hyd. peak  (cms)=        .16          .09
02404>                                                             *TOTALS*
02405>      PEAK FLOW        (cms)=        .78          .01           .783 (iii)
02406>      TIME TO PEAK     (hrs)=       1.04         1.17          1.042
02407>      RUNOFF VOLUME     (mm)=      56.66        25.35         55.717
02408>      TOTAL RAINFALL    (mm)=      58.23        58.23         58.226
02409>      RUNOFF COEFFICIENT   =        .97          .44           .957
02410>
02411>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02412>            CN* =  81.0    Ia = Dep. Storage  (Above)
02413>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02414>            THAN THE STORAGE COEFFICIENT.
02415>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02416>
02417> ---------------------------------------------------------------------------
02418> 001:0011-------------------------------------------------------------------
02419> --------------------
02420> | ADD HYD (080   ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
02421> --------------------               (ha)     (cms)   (hrs)   (mm)    (cms)
02422>                  ID1 06:060         .89     .296    1.00  55.72    .000
02423>                 +ID2 07:070        2.66     .783    1.04  55.72    .000
02424>                  ===================================================
02425>                  SUM 08:080        3.55    1.060    1.04  55.72    .000
02426>
02427>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02428>
02429> ---------------------------------------------------------------------------
02430> 001:0012-------------------------------------------------------------------
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--------------------
| ADD HYD (090    ) | ID: NHYD       AREA      QPEAK    TPEAK   R.V.     DWF
--------------------                 (ha)      (cms)    (hrs)   (mm)    (cms)
                 ID1 05:050          5.01      1.350     1.04  53.55     .000
                +ID2 08:080          3.55      1.060     1.04  55.72     .000
                 ====================================================
                 SUM 09:090          8.56      2.410     1.04  54.45     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
001:0013----------------------------------------------------------------------
---------------------
| ROUTE RESERVOIR    |     Requested routing time step =  1.0 min.
|   IN>09:(090     )  |
| OUT<10:(POND    )  |     =========  OUTLFOW STORAGE TABLE  =========
---------------------      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                             (cms)    (ha.m.)   |    (cms)    (ha.m.)
                              .000  .0000E+00   |     .593  .6251E+00
                              .008  .6560E-01   |     .654  .6631E+00
                              .017  .1311E+00   |     .797  .7391E+00
                              .093  .2831E+00   |     .950  .8274E+00
                              .233  .3971E+00   |    1.304  .9157E+00
                              .337  .4731E+00   |    1.880  .1004E+01
                              .465  .5491E+00   |    2.577  .1092E+01
                              .531  .5871E+00   |     .000  .0000E+00

     ROUTING RESULTS                AREA     QPEAK     TPEAK         R.V.
     -------------------            (ha)     (cms)     (hrs)         (mm)
     INFLOW >09:  (090    )         8.56     2.410     1.042       54.451
     OUTFLOW<10:  (POND   )         8.56      .189     2.056       54.449

                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=     7.838
                     TIME SHIFT OF PEAK FLOW         (min)=     60.83
                     MAXIMUM  STORAGE   USED        (ha.m.)=.3612E+00

------------------------------------------------------------------------------
001:0014----------------------------------------------------------------------
*********************************************
*     Remaining Hawthorne Industrial Park     *
*********************************************
*
* SUB-AREA No.1
---------------------
| CALIB STANDHYD      |   Area     (ha)=    19.90
| 01:HIP01   DT= 2.50 |   Total Imp(%)=    71.00   Dir. Conn.(%)=   50.00
---------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area       (ha)=      14.13         5.77
     Dep. Storage       (mm)=       1.57         4.67
     Average Slope       (%)=        .60         1.50
     Length              (m)=     580.00       100.00
     Mannings n             =       .030         .250

     Max.eff.Inten.(mm/hr)=       124.54        81.98
                 over (min)        12.50        27.50
     Storage Coeff.   (min)=       12.93 (ii)   27.37 (ii)
     Unit Hyd. Tpeak  (min)=       12.50        27.50
     Unit Hyd. peak   (cms)=         .09          .04
                                                           *TOTALS*
     PEAK FLOW        (cms)=        2.16          .77       2.548 (iii)
     TIME TO PEAK     (hrs)=        1.13         1.42       1.167
     RUNOFF VOLUME     (mm)=       56.66        34.22      45.437
     TOTAL RAINFALL    (mm)=       58.23        58.23      58.226
     RUNOFF COEFFICIENT   =          .97          .59        .780

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

------------------------------------------------------------------------------
001:0015----------------------------------------------------------------------
--------------------
| ADD HYD (HIP02 ) | ID: NHYD       AREA      QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                ID1 10:POND          8.56       .189     2.06  54.45     .000
               +ID2 01:HIP01        19.90      2.548     1.17  45.44     .000
                ====================================================
                SUM 02:HIP02        28.46      2.622     1.17  48.15     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
001:0016----------------------------------------------------------------------
*
* SUB-AREA No.2
---------------------
| CALIB STANDHYD      |   Area     (ha)=    17.00
| 03:HIP03   DT= 2.50 |   Total Imp(%)=    71.00   Dir. Conn.(%)=   50.00
---------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area       (ha)=      12.07         4.93
     Dep. Storage       (mm)=       1.57         4.67
     Average Slope       (%)=        .65         1.50
     Length              (m)=     450.00       100.00
     Mannings n             =       .030         .250

     Max.eff.Inten.(mm/hr)=       144.69        87.13
                 over (min)        10.00        25.00
     Storage Coeff.   (min)=       10.21 (ii)   24.30 (ii)
     Unit Hyd. Tpeak  (min)=       10.00        25.00
     Unit Hyd. peak   (cms)=         .11          .05
                                                           *TOTALS*
     PEAK FLOW        (cms)=        2.10          .71       2.398 (iii)
     TIME TO PEAK     (hrs)=        1.08         1.38       1.125
     RUNOFF VOLUME     (mm)=       56.66        34.22      45.437
     TOTAL RAINFALL    (mm)=       58.23        58.23      58.226
     RUNOFF COEFFICIENT   =          .97          .59        .780

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

------------------------------------------------------------------------------
001:0017----------------------------------------------------------------------
*
* SUB-AREA No.3
---------------------
| CALIB STANDHYD      |   Area     (ha)=    18.10
| 04:HIP04   DT= 2.50 |   Total Imp(%)=    71.00   Dir. Conn.(%)=   50.00
---------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area       (ha)=      12.85         5.25
     Dep. Storage       (mm)=       1.57         4.67
     Average Slope       (%)=        .50         1.50
     Length              (m)=     600.00       100.00
     Mannings n             =       .030         .250

     Max.eff.Inten.(mm/hr)=       111.10        77.71
                 over (min)        15.00        30.00
     Storage Coeff.   (min)=       14.59 (ii)   29.34 (ii)
     Unit Hyd. Tpeak  (min)=       15.00        30.00
     Unit Hyd. peak   (cms)=         .08          .04
                                                           *TOTALS*
     PEAK FLOW        (cms)=        1.82          .67       2.180 (iii)
     TIME TO PEAK     (hrs)=        1.17         1.46       1.208
     RUNOFF VOLUME     (mm)=       56.66        34.22      45.437
     TOTAL RAINFALL    (mm)=       58.23        58.23      58.226
     RUNOFF COEFFICIENT   =          .97          .59        .780

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

------------------------------------------------------------------------------
001:0018----------------------------------------------------------------------
--------------------
| ADD HYD (HIP05 ) | ID: NHYD       AREA      QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                ID1 03:HIP03        17.00      2.398     1.13  45.44     .000
               +ID2 04:HIP04        18.10      2.180     1.21  45.44     .000
                ====================================================
                SUM 05:HIP05        35.10      4.439     1.13  45.44     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
001:0019----------------------------------------------------------------------
*
*SUB-AREA No.4
---------------------
| DESIGN NASHYD       |   Area     (ha)=     4.00   Curve Number   (CN)=85.00
| 06:Pond-B DT= 2.50  |   Ia       (mm)=    4.670   # of Linear Res.(N)= 3.00
---------------------     U.H. Tp(hrs)=      .170

     Unit Hyd Qpeak  (cms)=      .899

     PEAK FLOW       (cms)=      .459 (i)
     TIME TO PEAK    (hrs)=     1.167
     RUNOFF VOLUME    (mm)=    29.155
     TOTAL RAINFALL   (mm)=    58.226
     RUNOFF COEFFICIENT  =       .501

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

------------------------------------------------------------------------------
001:0020----------------------------------------------------------------------
--------------------
| ADD HYD (HIP06 ) | ID: NHYD       AREA      QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                ID1 02:HIP02        28.46      2.622     1.17  48.15     .000
               +ID2 05:HIP05        35.10      4.439     1.13  45.44     .000
               +ID3 06:Pond-B        4.00       .459     1.17  29.15     .000
                ====================================================
                SUM 07:HIP06        67.56      7.499     1.17  45.61     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
001:0021----------------------------------------------------------------------
---------------------
| ROUTE RESERVOIR    |     Requested routing time step =  1.0 min.
|   IN>07:(HIP06 )   |
| OUT<08:(HIP-PO)    |     =========  OUTLFOW STORAGE TABLE  =========
---------------------      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                             (cms)    (ha.m.)   |    (cms)    (ha.m.)
                              .000  .0000E+00   |     .724  .2210E+01
                              .048  .5740E-01   |     .937  .2501E+01
                              .054  .2434E+00   |    1.262  .2798E+01
                              .059  .5834E+00   |    1.404  .3101E+01
                              .062  .8400E+00   |    1.532  .3410E+01
                              .064  .1102E+01   |    1.650  .3724E+01
                              .147  .1370E+01   |    2.409  .4044E+01
                              .280  .1644E+01   |    3.689  .4370E+01
                              .472  .1924E+01   |     .000  .0000E+00

     ROUTING RESULTS                AREA     QPEAK     TPEAK         R.V.
     -------------------            (ha)     (cms)     (hrs)         (mm)
     INFLOW >07:  (HIP06 )         67.56     7.499     1.167       45.613
     OUTFLOW<08:  (HIP-PO)         67.56      .773     3.181       45.613

                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=    10.306
                     TIME SHIFT OF PEAK FLOW         (min)=    120.83
                     MAXIMUM  STORAGE   USED        (ha.m.)=.2276E+01

------------------------------------------------------------------------------
001:0022----------------------------------------------------------------------
*
*SUB-AREA No. 5
*
---------------------
| DESIGN NASHYD       |   Area     (ha)=     6.80   Curve Number   (CN)=76.00
| 09:A2      DT= 2.50 |   Ia       (mm)=    4.670   # of Linear Res.(N)= 3.00
---------------------     U.H. Tp(hrs)=      .370

     Unit Hyd Qpeak  (cms)=      .702

     PEAK FLOW       (cms)=      .343 (i)
     TIME TO PEAK    (hrs)=     1.417
     RUNOFF VOLUME    (mm)=    21.442
     TOTAL RAINFALL   (mm)=    58.226
     RUNOFF COEFFICIENT  =       .368

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

------------------------------------------------------------------------------
001:0023----------------------------------------------------------------------
*
*SUB-AREA No. 6
*
---------------------
| DESIGN NASHYD       |   Area     (ha)=     5.30   Curve Number   (CN)=76.00
| 10:A3      DT= 2.50 |   Ia       (mm)=    4.670   # of Linear Res.(N)= 3.00
---------------------     U.H. Tp(hrs)=      .804

     Unit Hyd Qpeak  (cms)=      .252

     PEAK FLOW       (cms)=      .155 (i)
     TIME TO PEAK    (hrs)=     2.000
     RUNOFF VOLUME    (mm)=    21.442
     TOTAL RAINFALL   (mm)=    58.226
     RUNOFF COEFFICIENT  =       .368

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

------------------------------------------------------------------------------
001:0024----------------------------------------------------------------------
--------------------
| ADD HYD (Interi) | ID: NHYD       AREA      QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                ID1 08:HIP-PO       67.56       .773     3.18  45.61     .000
               +ID2 09:A2            6.80       .343     1.42  21.44     .000
               +ID3 10:A3            5.30       .155     2.00  21.44     .000
                ====================================================
```

```
02701>                    SUM 01:Interi    79.66     .939    2.60  41.94    .000
02702>
02703>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02704>
02705> ------------------------------------------------------------------
02706> 001:0025----------------------------------------------------------
02707> *****************************************************
02708> *        CALCULATION OF 3HR - 1:50 YEAR STORM EVENT          *
02709> *****************************************************
02710> --------------------
02711> | START              |  Project  dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
02712> --------------------  Rainfall dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
02713>     TZERO =   .00 hrs on        0
02714>     METOUT=   2 (output = METRIC)
02715>     NRUN  = 001
02716>     NSTORM=   0
02717> ------------------------------------------------------------------
02718> 001:0002----------------------------------------------------------
02719> --------------------
02720> | CHICAGO STORM    |     IDF curve parameters: A=1569.580
02721> | Ptotal= 64.81 mm |                           B=   6.014
02722> --------------------                           C=    .820
02723>                          used in:   INTENSITY =  A / (t + B)^C
02724>
02725>                          Duration of storm  =  3.00 hrs
02726>                          Storm time step    = 10.00 min
02727>                          Time to peak ratio =   .33
02728>
02729>                TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
02730>                 hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
02731>                 .17   5.467 |   1.00 161.471 |   1.83  10.000 |   2.67   5.209
02732>                 .33   6.820 |   1.17  48.876 |   2.00   8.397 |   2.83   4.774
02733>                 .50   9.187 |   1.33  24.704 |   2.17   7.256 |   3.00   4.412
02734>                 .67  14.441 |   1.50  16.495 |   2.33   6.403 |
02735>                 .83  36.764 |   1.67  12.422 |   2.50   5.740 |
02736>
02737> ------------------------------------------------------------------
02738> 001:0003----------------------------------------------------------
02739> ----------------------
02740> | DEFAULT VALUES       |  Filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\ORGA.VAL
02741> ----------------------  ICASEdv = 1 (read and print data)
02742>       FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
02743>                  ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
02744>       Horton's infiltration equation parameters:
02745>       [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
02746>       Parameters for PERVIOUS surfaces in STANDHYD:
02747>       [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
02748>       Parameters for IMPERVIOUS surfaces in STANDHYD:
02749>       [IAimp=   1.57 mm] [CLI= 1.50]    [MNI= .035]
02750>       Parameters used in NASHYD:
02751>       [Ia=   4.67 mm] [N= 3.00]
02752> ------------------------------------------------------------------
02753> 001:0004----------------------------------------------------------
02754> *******************************
02755> *          ORGAWORLD FILE          *
02756> *******************************
02757> *
02758> * SUB-AREA No.1
02759> ----------------------
02760> | CALIB STANDHYD       |   Area    (ha)=    2.07
02761> | 01:010     DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
02762> ----------------------
02763>                                IMPERVIOUS    PERVIOUS (i)
02764>      Surface Area      (ha)=       1.74          .33
02765>      Dep. Storage      (mm)=       1.57         4.67
02766>      Average Slope      (%)=        .52         1.00
02767>      Length             (m)=     204.72        20.00
02768>      Mannings n            =       .030         .250
02769>
02770>      Max.eff.Inten.(mm/hr)=     161.47        62.27
02771>                over (min)        7.50        12.50
02772>      Storage Coeff.  (min)=       6.51 (ii)   13.44 (ii)
02773>      Unit Hyd. Tpeak (min)=       7.50        12.50
02774>      Unit Hyd. peak  (cms)=        .16          .09
02775>                                                          *TOTALS*
02776>      PEAK FLOW        (cms)=        .59          .03          .609 (iii)
02777>      TIME TO PEAK     (hrs)=       1.04         1.17         1.042
02778>      RUNOFF VOLUME     (mm)=      63.24        30.21        57.952
02779>      TOTAL RAINFALL    (mm)=      64.81        64.81        64.806
02780>      RUNOFF COEFFICIENT   =        .98          .47          .894
02781>
02782>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02783>            CN* =  81.0     Ia = Dep. Storage  (Above)
02784>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02785>            THAN THE STORAGE COEFFICIENT.
02786>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02787>
02788> ------------------------------------------------------------------
02789> 001:0005----------------------------------------------------------
02790> *
02791> * SUB-AREA No.2
02792> ----------------------
02793> | CALIB STANDHYD       |   Area    (ha)=    1.54
02794> | 02:020     DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
02795> ----------------------
02796>                                IMPERVIOUS    PERVIOUS (i)
02797>      Surface Area      (ha)=       1.42          .12
02798>      Dep. Storage      (mm)=       1.57         4.67
02799>      Average Slope      (%)=        .50         1.00
02800>      Length             (m)=     244.34         5.00
02801>      Mannings n            =       .030         .030
02802>
02803>      Max.eff.Inten.(mm/hr)=     161.47        78.73
02804>                over (min)        7.50         7.50
02805>      Storage Coeff.  (min)=       7.33 (ii)    8.10 (ii)
02806>      Unit Hyd. Tpeak (min)=       7.50         7.50
02807>      Unit Hyd. peak  (cms)=        .15          .14
02808>                                                          *TOTALS*
02809>      PEAK FLOW        (cms)=        .46          .02          .475 (iii)
02810>      TIME TO PEAK     (hrs)=       1.04         1.08         1.042
02811>      RUNOFF VOLUME     (mm)=      63.24        30.21        60.594
02812>      TOTAL RAINFALL    (mm)=      64.81        64.81        64.806
02813>      RUNOFF COEFFICIENT   =        .98          .47          .935
02814>
02815>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02816>            CN* =  81.0     Ia = Dep. Storage  (Above)
02817>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02818>            THAN THE STORAGE COEFFICIENT.
02819>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02820>
02821> ------------------------------------------------------------------
02822> 001:0006----------------------------------------------------------
02823> *
02824> * SUB-AREA No.3
02825> ----------------------
02826> | CALIB STANDHYD       |   Area    (ha)=    1.40
02827> | 03:030     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
02828> ----------------------
02829>                                IMPERVIOUS    PERVIOUS (i)
02830>      Surface Area      (ha)=       1.36          .04
02831>      Dep. Storage      (mm)=       1.57         4.67
02832>      Average Slope      (%)=        .51         1.00
02833>      Length             (m)=     225.63         5.00
02834>      Mannings n            =       .030         .030
02835>
```

```
02836>      Max.eff.Inten.(mm/hr)=     161.47        78.73
02837>                over (min)        7.50         7.50
02838>      Storage Coeff.  (min)=       6.95 (ii)    7.72 (ii)
02839>      Unit Hyd. Tpeak (min)=       7.50         7.50
02840>      Unit Hyd. peak  (cms)=        .16          .15
02841>                                                          *TOTALS*
02842>      PEAK FLOW        (cms)=        .45          .01          .454 (iii)
02843>      TIME TO PEAK     (hrs)=       1.04         1.08         1.042
02844>      RUNOFF VOLUME     (mm)=      63.24        30.21        62.245
02845>      TOTAL RAINFALL    (mm)=      64.81        64.81        64.806
02846>      RUNOFF COEFFICIENT   =        .98          .47          .960
02847>
02848>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02849>            CN* =  81.0     Ia = Dep. Storage  (Above)
02850>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02851>            THAN THE STORAGE COEFFICIENT.
02852>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02853>
02854> ------------------------------------------------------------------
02855> 001:0007----------------------------------------------------------
02856> --------------------
02857> | ADD HYD (040    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
02858> --------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
02859>                   ID1 01:010        2.07       .609    1.04  57.95    .000
02860>                  +ID2 02:020        1.54       .475    1.04  60.59    .000
02861>                   ==================================================
02862>                   SUM 04:040        3.61      1.084    1.04  59.08    .000
02863>
02864>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02865>
02866> ------------------------------------------------------------------
02867> 001:0008----------------------------------------------------------
02868> --------------------
02869> | ADD HYD (050    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
02870> --------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
02871>                   ID1 03:030        1.40       .454    1.04  62.25    .000
02872>                  +ID2 04:040        3.61      1.084    1.04  59.08    .000
02873>                   ==================================================
02874>                   SUM 05:050        5.01      1.538    1.04  59.96    .000
02875>
02876>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02877>
02878> ------------------------------------------------------------------
02879> 001:0009----------------------------------------------------------
02880> *
02881> * SUB-AREA No.4
02882> ----------------------
02883> | CALIB STANDHYD       |   Area    (ha)=     .89
02884> | 06:060     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
02885> ----------------------
02886>                                IMPERVIOUS    PERVIOUS (i)
02887>      Surface Area      (ha)=        .86          .03
02888>      Dep. Storage      (mm)=       1.57         4.67
02889>      Average Slope      (%)=        .93          .70
02890>      Length             (m)=     164.82        40.00
02891>      Mannings n            =       .030         .250
02892>
02893>      Max.eff.Inten.(mm/hr)=     161.47        53.28
02894>                over (min)        5.00        17.50
02895>      Storage Coeff.  (min)=       4.80 (ii)   17.24 (ii)
02896>      Unit Hyd. Tpeak (min)=       5.00        17.50
02897>      Unit Hyd. peak  (cms)=        .23          .07
02898>                                                          *TOTALS*
02899>      PEAK FLOW        (cms)=        .33          .00          .335 (iii)
02900>      TIME TO PEAK     (hrs)=       1.00         1.25         1.000
02901>      RUNOFF VOLUME     (mm)=      63.24        30.21        62.245
02902>      TOTAL RAINFALL    (mm)=      64.81        64.81        64.806
02903>      RUNOFF COEFFICIENT   =        .98          .47          .960
02904>
02905>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02906>            CN* =  81.0     Ia = Dep. Storage  (Above)
02907>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02908>            THAN THE STORAGE COEFFICIENT.
02909>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02910>
02911> ------------------------------------------------------------------
02912> 001:0010----------------------------------------------------------
02913> *
02914> * SUB-AREA No.5
02915> ----------------------
02916> | CALIB STANDHYD       |   Area    (ha)=    2.66
02917> | 07:070     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
02918> ----------------------
02919>                                IMPERVIOUS    PERVIOUS (i)
02920>      Surface Area      (ha)=       2.58          .08
02921>      Dep. Storage      (mm)=       1.57         4.67
02922>      Average Slope      (%)=        .61         1.50
02923>      Length             (m)=     207.25        20.00
02924>      Mannings n            =       .030         .250
02925>
02926>      Max.eff.Inten.(mm/hr)=     161.47        62.27
02927>                over (min)        7.50        12.50
02928>      Storage Coeff.  (min)=       6.26 (ii)   12.39 (ii)
02929>      Unit Hyd. Tpeak (min)=       7.50        12.50
02930>      Unit Hyd. peak  (cms)=        .17          .09
02931>                                                          *TOTALS*
02932>      PEAK FLOW        (cms)=        .88          .01          .886 (iii)
02933>      TIME TO PEAK     (hrs)=       1.04         1.17         1.042
02934>      RUNOFF VOLUME     (mm)=      63.24        30.21        62.245
02935>      TOTAL RAINFALL    (mm)=      64.81        64.81        64.806
02936>      RUNOFF COEFFICIENT   =        .98          .47          .960
02937>
02938>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02939>            CN* =  81.0     Ia = Dep. Storage  (Above)
02940>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02941>            THAN THE STORAGE COEFFICIENT.
02942>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02943>
02944> ------------------------------------------------------------------
02945> 001:0011----------------------------------------------------------
02946> --------------------
02947> | ADD HYD (080    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
02948> --------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
02949>                   ID1 06:060         .89       .335    1.00  62.25    .000
02950>                  +ID2 07:070        2.66       .886    1.04  62.25    .000
02951>                   ==================================================
02952>                   SUM 08:080        3.55      1.197    1.04  62.25    .000
02953>
02954>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02955>
02956> ------------------------------------------------------------------
02957> 001:0012----------------------------------------------------------
02958> --------------------
02959> | ADD HYD (090    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
02960> --------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
02961>                   ID1 05:050        5.01      1.538    1.04  59.96    .000
02962>                  +ID2 08:080        3.55      1.197    1.04  62.25    .000
02963>                   ==================================================
02964>                   SUM 09:090        8.56      2.735    1.04  60.91    .000
02965>
02966>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02967>
02968> ------------------------------------------------------------------
02969> 001:0013----------------------------------------------------------
02970> --------------------
```

```
| ROUTE RESERVOIR    |     Requested routing time step =  1.0 min.
|   IN>09:(090    )  |
| OUT<10:(POND    )  |     =========  OUTLFOW STORAGE TABLE  =========
--------------------      OUTFLOW     STORAGE   |  OUTFLOW    STORAGE
                            (cms)     (ha.m.)   |   (cms)     (ha.m.)
                             .000  .0000E+00    |     .593  .6251E+00
                             .008  .6560E-01    |     .654  .6631E+00
                             .017  .1311E+00    |     .797  .7391E+00
                             .093  .2831E+00    |     .950  .8274E+00
                             .233  .3971E+00    |    1.304  .9157E+00
                             .337  .4731E+00    |    1.880  .1004E+01
                             .465  .5491E+00    |    2.577  .1092E+01
                             .531  .5871E+00    |     .000  .0000E+00

     ROUTING RESULTS               AREA      QPEAK      TPEAK        R.V.
     -------------------           (ha)      (cms)      (hrs)        (mm)
     INFLOW >09: (090    )         8.56      2.735      1.042      60.910
     OUTFLOW<10: (POND   )         8.56       .233      1.944      60.908

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=     8.503
                    TIME SHIFT OF PEAK FLOW          (min)=    54.17
                    MAXIMUM  STORAGE   USED        (ha.m.)=.3967E+00

-----------------------------------------------------------------------------
001:0014---------------------------------------------------------------------
*********************************************
*     Remaining Hawthorne Industrial Park     *
*********************************************
*
* SUB-AREA No.1
---------------------
| CALIB STANDHYD      |   Area     (ha)=    19.90
| 01:HIP01  DT= 2.50  |   Total Imp(%)=    71.00   Dir. Conn.(%)=   50.00
---------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        14.13         5.77
     Dep. Storage      (mm)=         1.57         4.67
     Average Slope      (%)=          .60         1.50
     Length             (m)=       580.00       100.00
     Mannings n            =         .030         .250

     Max.eff.Inten.(mm/hr)=        138.95       102.13
                over (min)          12.50        25.00
     Storage Coeff.   (min)=        12.38 (ii)   25.60 (ii)
     Unit Hyd. Tpeak  (min)=        12.50        25.00
     Unit Hyd. peak   (cms)=          .09          .04
                                                              *TOTALS*
     PEAK FLOW        (cms)=         2.46          .95          3.001 (iii)
     TIME TO PEAK     (hrs)=         1.13         1.38          1.167
     RUNOFF VOLUME     (mm)=        63.24        39.90         51.566
     TOTAL RAINFALL    (mm)=        64.81        64.81         64.806
     RUNOFF COEFFICIENT    =          .98          .62           .796

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-----------------------------------------------------------------------------
001:0015---------------------------------------------------------------------
-------------------
| ADD HYD (HIP02 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
-------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
                 ID1 10:POND        8.56      .233    1.94  60.91     .000
                +ID2 01:HIP01      19.90     3.001    1.17  51.57     .000
                 ===============================================================
                 SUM 02:HIP02      28.46     3.092    1.17  54.37     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
001:0016---------------------------------------------------------------------
*
* SUB-AREA No.2
---------------------
| CALIB STANDHYD      |   Area     (ha)=    17.00
| 03:HIP03  DT= 2.50  |   Total Imp(%)=    71.00   Dir. Conn.(%)=   50.00
---------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        12.07         4.93
     Dep. Storage      (mm)=         1.57         4.67
     Average Slope      (%)=          .65         1.50
     Length             (m)=       450.00       100.00
     Mannings n            =         .030         .250

     Max.eff.Inten.(mm/hr)=        161.47       109.61
                over (min)          10.00        22.50
     Storage Coeff.   (min)=         9.77 (ii)   22.63 (ii)
     Unit Hyd. Tpeak  (min)=        10.00        22.50
     Unit Hyd. peak   (cms)=          .11          .05
                                                              *TOTALS*
     PEAK FLOW        (cms)=         2.38          .88          2.819 (iii)
     TIME TO PEAK     (hrs)=         1.08         1.33          1.125
     RUNOFF VOLUME     (mm)=        63.24        39.90         51.566
     TOTAL RAINFALL    (mm)=        64.81        64.81         64.806
     RUNOFF COEFFICIENT    =          .98          .62           .796

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-----------------------------------------------------------------------------
001:0017---------------------------------------------------------------------
*
* SUB-AREA No.3
---------------------
| CALIB STANDHYD      |   Area     (ha)=    18.10
| 04:HIP04  DT= 2.50  |   Total Imp(%)=    71.00   Dir. Conn.(%)=   50.00
---------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        12.85         5.25
     Dep. Storage      (mm)=         1.57         4.67
     Average Slope      (%)=          .50         1.50
     Length             (m)=       600.00       100.00
     Mannings n            =         .030         .250

     Max.eff.Inten.(mm/hr)=        138.95        96.02
                over (min)          12.50        27.50
     Storage Coeff.   (min)=        13.34 (ii)   26.90 (ii)
     Unit Hyd. Tpeak  (min)=        12.50        27.50
     Unit Hyd. peak   (cms)=          .09          .04
                                                              *TOTALS*
     PEAK FLOW        (cms)=         2.16          .83          2.596 (iii)
     TIME TO PEAK     (hrs)=         1.13         1.42          1.167
     RUNOFF VOLUME     (mm)=        63.24        39.90         51.566
     TOTAL RAINFALL    (mm)=        64.81        64.81         64.806
     RUNOFF COEFFICIENT    =          .98          .62           .796

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-----------------------------------------------------------------------------
001:0018---------------------------------------------------------------------
-------------------
| ADD HYD (HIP05 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
-------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
                 ID1 03:HIP03      17.00     2.819    1.13  51.57     .000
                +ID2 04:HIP04      18.10     2.596    1.17  51.57     .000
                 ===============================================================
                 SUM 05:HIP05      35.10     5.372    1.13  51.57     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
001:0019---------------------------------------------------------------------
*
*SUB-AREA No.4
---------------------
| DESIGN NASHYD       |   Area     (ha)=     4.00   Curve Number   (CN)=85.00
| 06:Pond-B DT= 2.50  |   Ia       (mm)=    4.670   # of Linear Res.(N)= 3.00
---------------------     U.H. Tp(hrs)=      .170

     Unit Hyd Qpeak   (cms)=      .899

     PEAK FLOW        (cms)=      .551 (i)
     TIME TO PEAK     (hrs)=     1.125
     RUNOFF VOLUME     (mm)=    34.455
     TOTAL RAINFALL    (mm)=    64.806
     RUNOFF COEFFICIENT    =      .532

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

-----------------------------------------------------------------------------
001:0020---------------------------------------------------------------------
-------------------
| ADD HYD (HIP06 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
-------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
                 ID1 02:HIP02      28.46     3.092    1.17  54.37     .000
                +ID2 05:HIP05      35.10     5.372    1.13  51.57     .000
                +ID3 06:Pond-B      4.00      .551    1.13  34.45     .000
                 ===============================================================
                 SUM 07:HIP06      67.56     8.958    1.13  51.73     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
001:0021---------------------------------------------------------------------
--------------------
| ROUTE RESERVOIR    |     Requested routing time step =  1.0 min.
|   IN>07:(HIP06 )   |
| OUT<08:(HIP-PO)    |     =========  OUTLFOW STORAGE TABLE  =========
--------------------      OUTFLOW     STORAGE   |  OUTFLOW    STORAGE
                            (cms)     (ha.m.)   |   (cms)     (ha.m.)
                             .000  .0000E+00    |     .724  .2210E+01
                             .048  .5740E-01    |     .937  .2501E+01
                             .054  .2434E+00    |    1.262  .2798E+01
                             .059  .5834E+00    |    1.404  .3101E+01
                             .062  .8400E+00    |    1.532  .3410E+01
                             .064  .1102E+01    |    1.650  .3724E+01
                             .147  .1370E+01    |    2.409  .4044E+01
                             .280  .1644E+01    |    3.689  .4370E+01
                             .472  .1924E+01    |     .000  .0000E+00

     ROUTING RESULTS               AREA      QPEAK      TPEAK        R.V.
     -------------------           (ha)      (cms)      (hrs)        (mm)
     INFLOW >07: (HIP06 )         67.56      8.958      1.125      51.735
     OUTFLOW<08: (HIP-PO)         67.56       .973      3.097      51.735

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    10.864
                    TIME SHIFT OF PEAK FLOW          (min)=   118.33
                    MAXIMUM  STORAGE   USED        (ha.m.)=.2534E+01

-----------------------------------------------------------------------------
001:0022---------------------------------------------------------------------
*
*SUB-AREA No. 5
*
---------------------
| DESIGN NASHYD       |   Area     (ha)=     6.80   Curve Number   (CN)=76.00
| 09:A2     DT= 2.50  |   Ia       (mm)=    4.670   # of Linear Res.(N)= 3.00
---------------------     U.H. Tp(hrs)=      .370

     Unit Hyd Qpeak   (cms)=      .702

     PEAK FLOW        (cms)=      .417 (i)
     TIME TO PEAK     (hrs)=     1.417
     RUNOFF VOLUME     (mm)=    25.767
     TOTAL RAINFALL    (mm)=    64.806
     RUNOFF COEFFICIENT    =      .398

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

-----------------------------------------------------------------------------
001:0023---------------------------------------------------------------------
*
*SUB-AREA No. 6
*
---------------------
| DESIGN NASHYD       |   Area     (ha)=     5.30   Curve Number   (CN)=76.00
| 10:A3     DT= 2.50  |   Ia       (mm)=    4.670   # of Linear Res.(N)= 3.00
---------------------     U.H. Tp(hrs)=      .804

     Unit Hyd Qpeak   (cms)=      .252

     PEAK FLOW        (cms)=      .188 (i)
     TIME TO PEAK     (hrs)=     2.000
     RUNOFF VOLUME     (mm)=    25.767
     TOTAL RAINFALL    (mm)=    64.806
     RUNOFF COEFFICIENT    =      .398

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

-----------------------------------------------------------------------------
001:0024---------------------------------------------------------------------
-------------------
| ADD HYD (Interi) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
-------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
                 ID1 08:HIP-PO     67.56      .973    3.10  51.73     .000
                +ID2 09:A2          6.80      .417    1.42  25.77     .000
                +ID3 10:A3          5.30      .188    2.00  25.77     .000
                 ===============================================================
                 SUM 01:Interi     79.66     1.191    2.31  47.79     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
001:0025---------------------------------------------------------------------
************************************************************
*       CALCULATION OF 3HR - 1:100 YEAR STORM EVENT         *
************************************************************
-------------------
| START              |  Project  dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
-------------------     Rainfall dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
    TZERO =   .00 hrs on        0
```

```
03241>     METOUT=   2 (output = METRIC)
03242>     NRUN  = 001
03243>     NSTORM=   0
03244> --------------------------------------------------------------------------------
03245> 001:0002------------------------------------------------------------------------
03246> ------------------
03247> | CHICAGO STORM    |    IDF curve parameters: A=1735.688
03248> | Ptotal= 71.66 mm |                          B=   6.014
03249> ------------------                           C=    .820
03250>                       used in:   INTENSITY =  A / (t + B)^C
03251>
03252>                       Duration of storm  =  3.00 hrs
03253>                       Storm time step    = 10.00 min
03254>                       Time to peak ratio =   .33
03255>
03256>               TIME     RAIN |   TIME     RAIN |   TIME     RAIN |   TIME     RAIN
03257>                hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr
03258>                .17    6.046 |   1.00 178.559 |   1.83   11.059 |   2.67    5.760
03259>                .33    7.542 |   1.17  54.049 |   2.00    9.285 |   2.83    5.280
03260>                .50   10.159 |   1.33  27.319 |   2.17    8.024 |   3.00    4.879
03261>                .67   15.969 |   1.50  18.240 |   2.33    7.080 |
03262>                .83   40.655 |   1.67  13.737 |   2.50    6.347 |
03263>
03264> --------------------------------------------------------------------------------
03265> 001:0003------------------------------------------------------------------------
03266> ---------------------
03267> | DEFAULT VALUES      |  Filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\ORGA.VAL
03268> ---------------------  ICASEdv = 1 (read and print data)
03269>       FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
03270>                  ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
03271>       Horton's infiltration equation parameters:
03272>       [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
03273>       Parameters for PERVIOUS surfaces in STANDHYD:
03274>       [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
03275>       Parameters for IMPERVIOUS surfaces in STANDHYD:
03276>       [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
03277>       Parameters used in NASHYD:
03278>       [Ia=   4.67 mm] [N= 3.00]
03279> --------------------------------------------------------------------------------
03280> 001:0004------------------------------------------------------------------------
03281> **********************************
03282> *           ORGAWORLD FILE       *
03283> **********************************
03284> *
03285> * SUB-AREA No.1
03286> ---------------------
03287> | CALIB STANDHYD      |   Area     (ha)=    2.07
03288> | 01:010     DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
03289> ---------------------
03290>                                  IMPERVIOUS    PERVIOUS (i)
03291>      Surface Area      (ha)=        1.74          .33
03292>      Dep. Storage      (mm)=        1.57         4.67
03293>      Average Slope      (%)=         .52         1.00
03294>      Length             (m)=      204.72        20.00
03295>      Mannings n            =        .030         .250
03296>
03297>      Max.eff.Inten.(mm/hr)=       178.56        74.05
03298>                over (min)         7.50        12.50
03299>      Storage Coeff.  (min)=        6.26 (ii)   12.72 (ii)
03300>      Unit Hyd. Tpeak (min)=        7.50        12.50
03301>      Unit Hyd. peak  (cms)=         .17          .09
03302>                                                           *TOTALS*
03303>      PEAK FLOW        (cms)=         .66          .04         .685 (iii)
03304>      TIME TO PEAK     (hrs)=        1.04         1.17        1.042
03305>      RUNOFF VOLUME     (mm)=       70.09        35.46       64.553
03306>      TOTAL RAINFALL    (mm)=       71.66        71.66       71.665
03307>      RUNOFF COEFFICIENT   =         .98          .49         .901
03308>
03309>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03310>            CN* =  81.0    Ia = Dep. Storage  (Above)
03311>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03312>            THAN THE STORAGE COEFFICIENT.
03313>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03314>
03315> --------------------------------------------------------------------------------
03316> 001:0005------------------------------------------------------------------------
03317> *
03318> * SUB-AREA No.2
03319> ---------------------
03320> | CALIB STANDHYD      |   Area     (ha)=    1.54
03321> | 02:020     DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
03322> ---------------------
03323>                                  IMPERVIOUS    PERVIOUS (i)
03324>      Surface Area      (ha)=        1.42          .12
03325>      Dep. Storage      (mm)=        1.57         4.67
03326>      Average Slope      (%)=         .50         1.00
03327>      Length             (m)=      244.34         5.00
03328>      Mannings n            =        .030         .030
03329>
03330>      Max.eff.Inten.(mm/hr)=       178.56        93.23
03331>                over (min)         7.50         7.50
03332>      Storage Coeff.  (min)=        7.04 (ii)    7.76 (ii)
03333>      Unit Hyd. Tpeak (min)=        7.50         7.50
03334>      Unit Hyd. peak  (cms)=         .16          .15
03335>                                                           *TOTALS*
03336>      PEAK FLOW        (cms)=         .51          .02         .534 (iii)
03337>      TIME TO PEAK     (hrs)=        1.04         1.08        1.042
03338>      RUNOFF VOLUME     (mm)=       70.09        35.46       67.324
03339>      TOTAL RAINFALL    (mm)=       71.66        71.66       71.665
03340>      RUNOFF COEFFICIENT   =         .98          .49         .939
03341>
03342>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03343>            CN* =  81.0    Ia = Dep. Storage  (Above)
03344>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03345>            THAN THE STORAGE COEFFICIENT.
03346>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03347>
03348> --------------------------------------------------------------------------------
03349> 001:0006------------------------------------------------------------------------
03350> *
03351> * SUB-AREA No.3
03352> ---------------------
03353> | CALIB STANDHYD      |   Area     (ha)=    1.40
03354> | 03:030     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
03355> ---------------------
03356>                                  IMPERVIOUS    PERVIOUS (i)
03357>      Surface Area      (ha)=        1.36          .04
03358>      Dep. Storage      (mm)=        1.57         4.67
03359>      Average Slope      (%)=         .51         1.00
03360>      Length             (m)=      225.63         5.00
03361>      Mannings n            =        .030         .030
03362>
03363>      Max.eff.Inten.(mm/hr)=       178.56        93.23
03364>                over (min)         7.50         7.50
03365>      Storage Coeff.  (min)=        6.67 (ii)    7.39 (ii)
03366>      Unit Hyd. Tpeak (min)=        7.50         7.50
03367>      Unit Hyd. peak  (cms)=         .16          .15
03368>                                                           *TOTALS*
03369>      PEAK FLOW        (cms)=         .50          .01         .509 (iii)
03370>      TIME TO PEAK     (hrs)=        1.04         1.08        1.042
03371>      RUNOFF VOLUME     (mm)=       70.09        35.46       69.056
03372>      TOTAL RAINFALL    (mm)=       71.66        71.66       71.665
03373>      RUNOFF COEFFICIENT   =         .98          .49         .964
03374>
03375>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03376>            CN* =  81.0    Ia = Dep. Storage  (Above)
03377>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03378>            THAN THE STORAGE COEFFICIENT.
03379>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03380>
03381> --------------------------------------------------------------------------------
03382> 001:0007------------------------------------------------------------------------
03383> --------------------
03384> | ADD HYD (040    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
03385> --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
03386>                   ID1 01:010       2.07       .685    1.04  64.55     .000
03387>                  +ID2 02:020       1.54       .534    1.04  67.32     .000
03388>                   =======================================================
03389>                   SUM 04:040       3.61      1.220    1.04  65.74     .000
03390>
03391>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03392>
03393> --------------------------------------------------------------------------------
03394> 001:0008------------------------------------------------------------------------
03395> --------------------
03396> | ADD HYD (050    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
03397> --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
03398>                   ID1 03:030       1.40       .509    1.04  69.06     .000
03399>                  +ID2 04:040       3.61      1.220    1.04  65.74     .000
03400>                   =======================================================
03401>                   SUM 05:050       5.01      1.729    1.04  66.66     .000
03402>
03403>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03404>
03405> --------------------------------------------------------------------------------
03406> 001:0009------------------------------------------------------------------------
03407> *
03408> * SUB-AREA No.4
03409> ---------------------
03410> | CALIB STANDHYD      |   Area     (ha)=     .89
03411> | 06:060     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
03412> ---------------------
03413>                                  IMPERVIOUS    PERVIOUS (i)
03414>      Surface Area      (ha)=         .86          .03
03415>      Dep. Storage      (mm)=        1.57         4.67
03416>      Average Slope      (%)=         .93          .70
03417>      Length             (m)=      164.82        40.00
03418>      Mannings n            =        .030         .250
03419>
03420>      Max.eff.Inten.(mm/hr)=       178.56        67.61
03421>                over (min)         5.00        15.00
03422>      Storage Coeff.  (min)=        4.62 (ii)   15.92 (ii)
03423>      Unit Hyd. Tpeak (min)=        5.00        15.00
03424>      Unit Hyd. peak  (cms)=         .24          .07
03425>                                                           *TOTALS*
03426>      PEAK FLOW        (cms)=         .37          .00         .374 (iii)
03427>      TIME TO PEAK     (hrs)=        1.00         1.21        1.000
03428>      RUNOFF VOLUME     (mm)=       70.09        35.46       69.056
03429>      TOTAL RAINFALL    (mm)=       71.66        71.66       71.665
03430>      RUNOFF COEFFICIENT   =         .98          .49         .964
03431>
03432>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03433>            CN* =  81.0    Ia = Dep. Storage  (Above)
03434>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03435>            THAN THE STORAGE COEFFICIENT.
03436>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03437>
03438> --------------------------------------------------------------------------------
03439> 001:0010------------------------------------------------------------------------
03440> *
03441> * SUB-AREA No.5
03442> ---------------------
03443> | CALIB STANDHYD      |   Area     (ha)=    2.66
03444> | 07:070     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
03445> ---------------------
03446>                                  IMPERVIOUS    PERVIOUS (i)
03447>      Surface Area      (ha)=        2.58          .08
03448>      Dep. Storage      (mm)=        1.57         4.67
03449>      Average Slope      (%)=         .61         1.50
03450>      Length             (m)=      207.25        20.00
03451>      Mannings n            =        .030         .250
03452>
03453>      Max.eff.Inten.(mm/hr)=       178.56        74.05
03454>                over (min)         5.00        12.50
03455>      Storage Coeff.  (min)=        6.01 (ii)   11.73 (ii)
03456>      Unit Hyd. Tpeak (min)=        5.00        12.50
03457>      Unit Hyd. peak  (cms)=         .20          .09
03458>                                                           *TOTALS*
03459>      PEAK FLOW        (cms)=        1.03          .01        1.034 (iii)
03460>      TIME TO PEAK     (hrs)=        1.00         1.17        1.000
03461>      RUNOFF VOLUME     (mm)=       70.09        35.46       69.056
03462>      TOTAL RAINFALL    (mm)=       71.66        71.66       71.665
03463>      RUNOFF COEFFICIENT   =         .98          .49         .964
03464>
03465>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03466>            CN* =  81.0    Ia = Dep. Storage  (Above)
03467>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03468>            THAN THE STORAGE COEFFICIENT.
03469>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03470>
03471> --------------------------------------------------------------------------------
03472> 001:0011------------------------------------------------------------------------
03473> --------------------
03474> | ADD HYD (080    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
03475> --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
03476>                   ID1 06:060        .89       .374    1.00  69.06     .000
03477>                  +ID2 07:070       2.66      1.034    1.00  69.06     .000
03478>                   =======================================================
03479>                   SUM 08:080       3.55      1.408    1.00  69.06     .000
03480>
03481>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03482>
03483> --------------------------------------------------------------------------------
03484> 001:0012------------------------------------------------------------------------
03485> --------------------
03486> | ADD HYD (090    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
03487> --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
03488>                   ID1 05:050       5.01      1.729    1.04  66.66     .000
03489>                  +ID2 08:080       3.55      1.408    1.00  69.06     .000
03490>                   =======================================================
03491>                   SUM 09:090       8.56      3.067    1.04  67.66     .000
03492>
03493>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03494>
03495> --------------------------------------------------------------------------------
03496> 001:0013------------------------------------------------------------------------
03497> --------------------
03498> | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
03499> |   IN>09:(090   )   |
03500> | OUT<10:(POND   )   |    =========  OUTLFOW STORAGE TABLE  =========
03501> --------------------     OUTFLOW     STORAGE   |  OUTFLOW     STORAGE
03502>                            (cms)     (ha.m.)   |    (cms)     (ha.m.)
03503>                             .000  .0000E+00    |     .593  .6251E+00
03504>                             .008  .6560E-01    |     .654  .6631E+00
03505>                             .017  .1311E+00    |     .797  .7391E+00
03506>                             .093  .2831E+00    |     .950  .8274E+00
03507>                             .233  .3971E+00    |    1.304  .9157E+00
03508>                             .337  .4731E+00    |    1.880  .1004E+01
03509>                             .465  .5491E+00    |    2.577  .1092E+01
03510>                             .531  .5871E+00    |     .000  .0000E+00
```

```

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >09: (090    )      8.56     3.067     1.042     67.655
     OUTFLOW<10: (POND   )      8.56      .283     1.861     67.653

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    9.214
                   TIME SHIFT OF PEAK FLOW         (min)=    49.17
                   MAXIMUM  STORAGE   USED       (ha.m.)=.4333E+00

--------------------------------------------------------------------------------
001:0014------------------------------------------------------------------------
***********************************************
*     Remaining Hawthorne Industrial Park     *
***********************************************
*
* SUB-AREA No.1
----------------------
| CALIB STANDHYD      |   Area     (ha)=   19.90
| 01:HIP01  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=     14.13         5.77
     Dep. Storage      (mm)=      1.57         4.67
     Average Slope      (%)=       .60         1.50
     Length             (m)=    580.00       100.00
     Mannings n           =       .030         .250

     Max.eff.Inten.(mm/hr)=    153.66       117.89
                over (min)      12.50        25.00
     Storage Coeff.  (min)=     11.89 (ii)   24.37 (ii)
     Unit Hyd. Tpeak (min)=     12.50        25.00
     Unit Hyd. peak  (cms)=       .09          .05
                                                          *TOTALS*
     PEAK FLOW       (cms)=      2.77         1.13         3.419 (iii)
     TIME TO PEAK    (hrs)=      1.13         1.38         1.167
     RUNOFF VOLUME    (mm)=     70.09        45.94        58.015
     TOTAL RAINFALL   (mm)=     71.66        71.66        71.665
     RUNOFF COEFFICIENT   =       .98          .64          .810

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

--------------------------------------------------------------------------------
001:0015------------------------------------------------------------------------
--------------------
| ADD HYD (HIP02 ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
--------------------               (ha)     (cms)   (hrs)   (mm)    (cms)
                 ID1 10:POND        8.56     .283    1.86  67.65     .000
                +ID2 01:HIP01      19.90    3.419    1.17  58.02     .000
                 ==================================================
                 SUM 02:HIP02      28.46    3.554    1.17  60.91     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
001:0016------------------------------------------------------------------------
*
* SUB-AREA No.2
----------------------
| CALIB STANDHYD      |   Area     (ha)=   17.00
| 03:HIP03  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=     12.07         4.93
     Dep. Storage      (mm)=      1.57         4.67
     Average Slope      (%)=       .65         1.50
     Length             (m)=    450.00       100.00
     Mannings n           =       .030         .250

     Max.eff.Inten.(mm/hr)=    178.56       126.60
                over (min)      10.00        22.50
     Storage Coeff.  (min)=      9.39 (ii)   21.52 (ii)
     Unit Hyd. Tpeak (min)=     10.00        22.50
     Unit Hyd. peak  (cms)=       .12          .05
                                                          *TOTALS*
     PEAK FLOW       (cms)=      2.68         1.05         3.203 (iii)
     TIME TO PEAK    (hrs)=      1.08         1.33         1.125
     RUNOFF VOLUME    (mm)=     70.09        45.94        58.015
     TOTAL RAINFALL   (mm)=     71.66        71.66        71.665
     RUNOFF COEFFICIENT   =       .98          .64          .810

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

--------------------------------------------------------------------------------
001:0017------------------------------------------------------------------------
*
* SUB-AREA No.3
----------------------
| CALIB STANDHYD      |   Area     (ha)=   18.10
| 04:HIP04  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=     12.85         5.25
     Dep. Storage      (mm)=      1.57         4.67
     Average Slope      (%)=       .50         1.50
     Length             (m)=    600.00       100.00
     Mannings n           =       .030         .250

     Max.eff.Inten.(mm/hr)=    153.66       117.89
                over (min)      12.50        25.00
     Storage Coeff.  (min)=     12.82 (ii)   25.30 (ii)
     Unit Hyd. Tpeak (min)=     12.50        25.00
     Unit Hyd. peak  (cms)=       .09          .04
                                                          *TOTALS*
     PEAK FLOW       (cms)=      2.43         1.01         3.031 (iii)
     TIME TO PEAK    (hrs)=      1.13         1.38         1.167
     RUNOFF VOLUME    (mm)=     70.09        45.94        58.015
     TOTAL RAINFALL   (mm)=     71.66        71.66        71.665
     RUNOFF COEFFICIENT   =       .98          .64          .810

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

--------------------------------------------------------------------------------
001:0018------------------------------------------------------------------------
--------------------
| ADD HYD (HIP05 ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
--------------------               (ha)     (cms)   (hrs)   (mm)    (cms)
                 ID1 03:HIP03      17.00    3.203    1.13  58.02     .000
                +ID2 04:HIP04      18.10    3.031    1.17  58.02     .000
                 ==================================================
                 SUM 05:HIP05      35.10    6.178    1.13  58.02     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
001:0019------------------------------------------------------------------------
*
*SUB-AREA No.4
----------------------
| DESIGN NASHYD       |   Area     (ha)=    4.00   Curve Number   (CN)=85.00
| 06:Pond-B DT= 2.50 |   Ia        (mm)=   4.670   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=     .170

     Unit Hyd Qpeak  (cms)=     .899

     PEAK FLOW       (cms)=     .649 (i)
     TIME TO PEAK    (hrs)=    1.125
     RUNOFF VOLUME    (mm)=   40.139
     TOTAL RAINFALL   (mm)=   71.665
     RUNOFF COEFFICIENT   =     .560

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

--------------------------------------------------------------------------------
001:0020------------------------------------------------------------------------
--------------------
| ADD HYD (HIP06 ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
--------------------               (ha)     (cms)   (hrs)   (mm)    (cms)
                 ID1 02:HIP02      28.46    3.554    1.17  60.91     .000
                +ID2 05:HIP05      35.10    6.178    1.13  58.02     .000
                +ID3 06:Pond-B      4.00     .649    1.13  40.14     .000
                 ==================================================
                 SUM 07:HIP06      67.56   10.299    1.13  58.18     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
001:0021------------------------------------------------------------------------
----------------------
| ROUTE RESERVOIR     |   Requested routing time step =  1.0 min.
|   IN>07:(HIP06 )    |
| OUT<08:(HIP-PO)     |   =========  OUTLFOW STORAGE TABLE  =========
----------------------   OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |   (cms)     (ha.m.)
                            .000  .0000E+00   |     .724  .2210E+01
                            .048  .5740E-01   |     .937  .2501E+01
                            .054  .2434E+00   |    1.262  .2798E+01
                            .059  .5834E+00   |    1.404  .3101E+01
                            .062  .8400E+00   |    1.532  .3410E+01
                            .064  .1102E+01   |    1.650  .3724E+01
                            .147  .1370E+01   |    2.409  .4044E+01
                            .280  .1644E+01   |    3.689  .4370E+01
                            .472  .1924E+01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >07: (HIP06 )      67.56    10.299     1.125     58.176
     OUTFLOW<08: (HIP-PO)      67.56     1.246     2.958     58.176

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   12.102
                   TIME SHIFT OF PEAK FLOW         (min)=   110.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.2784E+01

--------------------------------------------------------------------------------
001:0022------------------------------------------------------------------------
*
*SUB-AREA No. 5
*
----------------------
| DESIGN NASHYD       |   Area     (ha)=    6.80   Curve Number   (CN)=76.00
| 09:A2      DT= 2.50 |   Ia        (mm)=   4.670   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=     .370

     Unit Hyd Qpeak  (cms)=     .702

     PEAK FLOW       (cms)=     .497 (i)
     TIME TO PEAK    (hrs)=    1.417
     RUNOFF VOLUME    (mm)=   30.490
     TOTAL RAINFALL   (mm)=   71.665
     RUNOFF COEFFICIENT   =     .425

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

--------------------------------------------------------------------------------
001:0023------------------------------------------------------------------------
*
*SUB-AREA No. 6
*
----------------------
| DESIGN NASHYD       |   Area     (ha)=    5.30   Curve Number   (CN)=76.00
| 10:A3      DT= 2.50 |   Ia        (mm)=   4.670   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=     .804

     Unit Hyd Qpeak  (cms)=     .252

     PEAK FLOW       (cms)=     .223 (i)
     TIME TO PEAK    (hrs)=    1.958
     RUNOFF VOLUME    (mm)=   30.490
     TOTAL RAINFALL   (mm)=   71.665
     RUNOFF COEFFICIENT   =     .425

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

--------------------------------------------------------------------------------
001:0024------------------------------------------------------------------------
--------------------
| ADD HYD (Interi) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
--------------------               (ha)     (cms)   (hrs)   (mm)    (cms)
                 ID1 08:HIP-PO     67.56    1.246    2.96  58.18     .000
                +ID2 09:A2          6.80     .497    1.42  30.49     .000
                +ID3 10:A3          5.30     .223    1.96  30.49     .000
                 ==================================================
                 SUM 01:Interi     79.66    1.531    2.39  53.97     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
001:0025------------------------------------------------------------------------
     FINISH
--------------------------------------------------------------------------------
********************************************************************************
      WARNINGS / ERRORS / NOTES
      -------------------------
   Simulation ended on 2009-05-15      at 08:57:05
================================================================================


```

APPENDIX 'H'

SWMHYMO INPUT AND OUTPUT FILES
(Post-Development Controlled Phase 2 Conditions)

```
00001> 2     Metric units
00002> *#******************************************************************************
00003> *#  Project Name : Hawthorne Industrial Park        Project Number:    [20983] *
00004> *#  Date         : January, 2009                                            *
00005> *#  Revised      : N/A                                                       *
00006> *#  Developed by : Mark Buchanan, E.I.T.                                     *
00007> *#  Reviewed by  : Guy Forget, P.Eng.                                        *
00008> *#  Company      : J.L. Richards & Associates Limited                        *
00009> *#  License #    : 4418403                                                   *
00010> *#******************************************************************************
00011> *
00012> *
00013> *#****************************************************************
00014> *#  FILENAME:  V:\20983.DU\ENG\SWMHYMO\20983PST.DAT                *
00015> *#  FILE DEVELOPED FOR SITE PLAN APPLICATION AND DETAILED DESIGN *
00016> *#   OF A FACILITY ASSOCIATED WITH THE OTTAWA COMPOSTING SITE    *
00017> *#****************************************************************
00018> *
00019> *******************************************************************************
00020> *        SWMHYMO FILE DEVELOPED TO INVESTIGATE FLOOD FLOWS OF THE            *
00021> *   PROPOSED COMPOSTING SITE UNDER POST-DEVELOPMENT UNCONTROLLED CONDITIONS   *
00022> *******************************************************************************
00023>
00024> *******************************************************
00025> * HYDROLOGICAL ANALYSIS UNDER A 4 HR-25 MM STORM AND  *
00026> * FOR DESIGN STORMS OF 1:2, 5, 10, 25, 50, AND 100 YR *
00027> *******************************************************
00028>
00029> ***************************************************************
00030> *       POST-DEVELOPMENT UNCONTROLLED CONDITIONS              *
00031> ***************************************************************
00032>
00033> ***************************************************************
00034> *          CALCULATION OF 4 HR 25 MM STORM EVENT              *
00035> ***************************************************************
00036>
00037> START                TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
00038> *%                    [  ] <--storm filename, one per line for NSTORM time
00039> READ STORM           STORM_FILENAME=["4HR25-15.STM"]
00040> *%-----------------|-----------------------------------------------------------|
00041> DEFAULT VALUES       ICASEdef=[1],  read and print values
00042>                      DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
00043> *%-----------------|-----------------------------------------------------------|
00044>
00045> ************************************
00046> *          ORGAWORLD FILE          *
00047> ************************************
00048> *
00049> * SUB-AREA No.1
00050>
00051> CALIB STANDHYD       ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
00052>                      XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
00053>                      SCS curve number CN=[81],
00054>                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
00055>                                           LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
00056>                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
00057>                                           LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
00058>                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00059> *%-----------------|-----------------------------------------------------------|
00060> *
00061> * SUB-AREA No.2
00062>
00063> CALIB STANDHYD       ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
00064>                      XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
00065>                      SCS curve number CN=[81],
00066>                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
00067>                                           LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
00068>                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
00069>                                           LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
00070>                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00071> *%-----------------|-----------------------------------------------------------|
00072> *
00073> * SUB-AREA No.3
00074>
00075> CALIB STANDHYD       ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
00076>                      XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
00077>                      SCS curve number CN=[81],
00078>                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
00079>                                           LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
00080>                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
00081>                                           LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
00082>                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00083> *%-----------------|-----------------------------------------------------------|
00084> ADD HYD              IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
00085> *%-----------------|-----------------------------------------------------------|
00086> ADD HYD              IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
00087> *%-----------------|-----------------------------------------------------------|
00088> *
00089> * SUB-AREA No.4
00090>
00091> CALIB STANDHYD       ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
00092>                      XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
00093>                      SCS curve number CN=[81],
00094>                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
00095>                                           LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
00096>                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
00097>                                           LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
00098>                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00099> *%-----------------|-----------------------------------------------------------|
00100> *
00101> * SUB-AREA No.5
00102>
00103> CALIB STANDHYD       ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
00104>                      XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
00105>                      SCS curve number CN=[81],
00106>                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
00107>                                           LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
00108>                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
00109>                                           LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
00110>                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00111> *%-----------------|-----------------------------------------------------------|
00112> ADD HYD              IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
00113> *%-----------------|-----------------------------------------------------------|
00114> ADD HYD              IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
00115> *%-----------------|-----------------------------------------------------------|
00116>
00117> ROUTE RESERVOIR      IDout=[10],   NHYD=["POND"],  IDin=[9],
00118>                      RDT=[1.0](min),
00119>                             TABLE of ( OUTFLOW-STORAGE ) values
00120>                                          (cms) - (ha-m)
00121>                                        [   0.000,  0.0000]
00122>                                        [   0.008,  0.0656]
00123>                                        [   0.017,  0.1311]
00124>                                        [   0.093,  0.2831]
00125>                                        [   0.233,  0.3971]
00126>                                        [   0.337,  0.4731]
00127>                                        [   0.465,  0.5491]
00128>                                        [   0.531,  0.5871]
00129>                                        [   0.593,  0.6251]
00130>                                        [   0.654,  0.6631]
00131>                                        [   0.797,  0.7391]
00132>                                        [   0.950,  0.8274]
00133>                                        [   1.304,  0.9157]
00134>                                        [   1.880,  1.0040]
00135>                                        [   2.577,  1.0923]
00136>                                        [   -1    ,  -1    ]  (max twenty pts)
00137>
00138> **********************************************
00139> *     Remaining Hawthorne Industrial Park    *
00140> **********************************************
00141> *
00142> * SUB-AREA No.1
00143>
00144> CALIB STANDHYD       ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
00145>                      XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
00146>                      SCS curve number CN=[81],
00147>                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
00148>                                           LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
00149>                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
00150>                                           LGI=[580](m), MNI=[0.03], SCI=[0.0](min
00151>                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00152> *%-----------------|-----------------------------------------------------------|
00153> ADD HYD              IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
00154> *%-----------------|-----------------------------------------------------------|
00155> *
00156> * SUB-AREA No.2
00157>
00158> CALIB STANDHYD       ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
00159>                      XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
00160>                      SCS curve number CN=[81],
00161>                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
00162>                                           LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
00163>                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
00164>                                           LGI=[450](m), MNI=[0.03], SCI=[0.0](min
00165>                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00166> *%-----------------|-----------------------------------------------------------|
00167> *
00168> * SUB-AREA No.3
00169>
00170> CALIB STANDHYD       ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[15.6](ha),
00171>                      XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
00172>                      SCS curve number CN=[81],
00173>                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
00174>                                           LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
00175>                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
00176>                                           LGI=[600](m), MNI=[0.03], SCI=[0.0](min
00177>                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00178> *%-----------------|-----------------------------------------------------------|
00179> ADD HYD              IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
00180> *%-----------------|-----------------------------------------------------------|
00181> ADD HYD              IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
00182> *%-----------------|-----------------------------------------------------------|
00183> *
00184> * SUB-AREA No.4
00185>
00186> CALIB STANDHYD       ID=[ 7 ], NHYD=["HIP07"], DT=[2.5](min), AREA=[12.2](ha),
00187>                      XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
00188>                      SCS curve number CN=[81],
00189>                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
00190>                                           LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
00191>                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.7](%),
00192>                                           LGI=[210](m), MNI=[0.03], SCI=[0.0](min
00193>                      RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00194>
00195> *%-----------------|-----------------------------------------------------------|
00196> *
00197> *SUB-AREA No.5
00198>
00199> DESIGN NASHYD        ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
00200>                      DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
00201>                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00202> *%-----------------|-----------------------------------------------------------|
00203>
00204> ADD HYD              IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
00205> *%-----------------|-----------------------------------------------------------|
00206>
00207> ROUTE RESERVOIR      IDout=[ 10 ],   NHYD=["HIP-POND"],  IDin=[ 9 ],
00208>                      RDT=[1.0](min),
00209>                            TABLE of ( OUTFLOW-STORAGE ) values
00210>                                        (cms) - (ha-m)
00211>                                      [   0.0  , 0.0    ]
00212>                                      [   0.048, 0.0574 ]
00213>                                      [   0.054, 0.2434 ]
00214>                                      [   0.059, 0.5834 ]
00215>                                      [   0.062, 0.8400 ]
00216>                                      [   0.064, 1.1024 ]
00217>                                      [   0.147, 1.3705 ]
00218>                                      [   0.280, 1.6444 ]
00219>                                      [   0.472, 1.9242 ]
00220>                                      [   0.724, 2.2097 ]
00221>                                      [   0.937, 2.5010 ]
00222>                                      [   1.262, 2.7981 ]
00223>                                      [   1.404, 3.1009 ]
00224>                                      [   1.532, 3.4096 ]
00225>                                      [   1.650, 3.7240 ]
00226>                                      [   2.409, 4.0442 ]
00227>                                      [   3.689, 4.3702 ]
00228>                                      [   -1   ,  -1    ]  (max twenty pts)
00229>
00230> *%-----------------|-----------------------------------------------------------|
00231> *
00232> *SUB-AREA No. 6
00233>
00234> DESIGN NASHYD        ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[2.7](ha),
00235>                      DWF=[0](cms), CNC=[76], TP=[0.80]hrs,
00236>                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00237> *%-----------------|-----------------------------------------------------------|
00238>
00239> ADD HYD              IDsum=[2], NHYD=["Ultimate"], IDs to add=[10+1]
00240> *%-----------------|-----------------------------------------------------------|
00241>
00242>
00243> **************************************************************
00244> *          CALCULATION OF 3HR - 1:2 YEAR STORM EVENT          *
00245> **************************************************************
00246>
00247> START                TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
00248> *%                    [  ] <--storm filename, one per line for NSTORM time
00249> *%-----------------|-----------------------------------------------------------|
00250> CHICAGO STORM        IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
00251>                      ICASEcs=[1],
00252>                      A=[732.951],  B=[6.199], and C=[0.810],
00253> *%-----------------|-----------------------------------------------------------|
00254> DEFAULT VALUES       ICASEdef=[1],  read and print values
00255>                      DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
00256> *%-----------------|-----------------------------------------------------------|
00257>
00258> ***********************************
00259> *          ORGAWORLD FILE         *
00260> ***********************************
00261> *
00262> * SUB-AREA No.1
00263>
00264> CALIB STANDHYD       ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
00265>                      XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
00266>                      SCS curve number CN=[81],
00267>                      Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
00268>                                           LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
00269>                      Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
00270>                                           LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
```

```
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                    XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                         LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                         LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                         LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                         LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD      ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                         LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%-----------------|--------------------------------------------------------------|

ROUTE RESERVOIR     IDout=[10],   NHYD=["POND"],  IDin=[9],
                    RDT=[1.0](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                    (cms) - (ha-m)
                                  [   0.000,  0.0000]
                                  [   0.008,  0.0656]
                                  [   0.017,  0.1311]
                                  [   0.093,  0.2831]
                                  [   0.233,  0.3971]
                                  [   0.337,  0.4731]
                                  [   0.465,  0.5491]
                                  [   0.531,  0.5871]
                                  [   0.593,  0.6251]
                                  [   0.654,  0.6631]
                                  [   0.797,  0.7391]
                                  [   0.950,  0.8274]
                                  [   1.304,  0.9157]
                                  [   1.880,  1.0040]
                                  [   2.577,  1.0923]
                                  [   -1   ,  -1    ]  (max twenty pts)

***************************************************
*     Remaining Hawthorne Industrial Park         *
***************************************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                         LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                         LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[15.6](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                         LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[ 7 ], NHYD=["HIP07"], DT=[2.5](min), AREA=[12.2](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.7](%),
                                         LGI=[210](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1

*%-----------------|--------------------------------------------------------------|
*
*SUB-AREA No.5

DESIGN NASHYD       ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                    DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|--------------------------------------------------------------|

ADD HYD             IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
*%-----------------|--------------------------------------------------------------|

ROUTE RESERVOIR     IDout=[ 10 ],   NHYD=["HIP-POND"],  IDin=[ 9 ],
                    RDT=[1.0](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                    (cms) - (ha-m)
                                  [   0.0  , 0.0    ]
                                  [   0.048, 0.0574 ]
                                  [   0.054, 0.2434 ]
                                  [   0.059, 0.5834 ]
                                  [   0.062, 0.8400 ]
                                  [   0.064, 1.1024 ]
                                  [   0.147, 1.3705 ]
                                  [   0.280, 1.6444 ]
                                  [   0.472, 1.9242 ]
                                  [   0.724, 2.2097 ]
                                  [   0.937, 2.5010 ]
                                  [   1.262, 2.7981 ]
                                  [   1.404, 3.1009 ]
                                  [   1.532, 3.4096 ]
                                  [   1.650, 3.7240 ]
                                  [   2.409, 4.0442 ]
                                  [   3.689, 4.3702 ]
                                  [   -1   ,  -1    ]  (max twenty pts)

*%-----------------|--------------------------------------------------------------|
*
*SUB-AREA No. 6

DESIGN NASHYD       ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[2.7](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.80]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|--------------------------------------------------------------|

ADD HYD             IDsum=[2], NHYD=["Ultimate"], IDs to add=[10+1]
*%-----------------|--------------------------------------------------------------|

***************************************************************
*         CALCULATION OF 3HR - 1:5 YEAR STORM EVENT           *
***************************************************************

START               TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                   [  ] <--storm filename, one per line for NSTORM time
*%-----------------|--------------------------------------------------------------|
CHICAGO STORM       IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
                    ICASEcs=[1],
                    A=[998.071],  B=[6.053], and C=[0.814],
*%-----------------|--------------------------------------------------------------|
DEFAULT VALUES      ICASEdef=[1],  read and print values
                    DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%-----------------|--------------------------------------------------------------|

*********************************
*          ORGAWORLD FILE       *
*********************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                    XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                         LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                    XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                         LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                         LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                         LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                         LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD      ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                         LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%-----------------|--------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%-----------------|--------------------------------------------------------------|
```

```

ROUTE RESERVOIR     IDout=[10],   NHYD=["POND"],  IDin=[9],
                    RDT=[1.0](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                       (cms) - (ha-m)
                                     [   0.000,  0.0000]
                                     [   0.008,  0.0656]
                                     [   0.017,  0.1311]
                                     [   0.093,  0.2831]
                                     [   0.233,  0.3971]
                                     [   0.337,  0.4731]
                                     [   0.465,  0.5491]
                                     [   0.531,  0.5871]
                                     [   0.593,  0.6251]
                                     [   0.654,  0.6631]
                                     [   0.797,  0.7391]
                                     [   0.950,  0.8274]
                                     [   1.304,  0.9157]
                                     [   1.880,  1.0040]
                                     [   2.577,  1.0923]
                                     [   -1   ,  -1    ]  (max twenty pts)

*********************************************
*     Remaining Hawthorne Industrial Park    *
*********************************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                         LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                         LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[15.6](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                         LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[ 7 ], NHYD=["HIP07"], DT=[2.5](min), AREA=[12.2](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.7](%),
                                         LGI=[210](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1

*%-----------------|-------------------------------------------------------------|
*
*SUB-AREA No.5

DESIGN NASHYD       ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                    DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|

ADD HYD             IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
*%-----------------|-------------------------------------------------------------|

ROUTE RESERVOIR     IDout=[ 10 ],   NHYD=["HIP-POND"],  IDin=[ 9 ],
                    RDT=[1.0](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                       (cms) - (ha-m)
                                     [   0.0  , 0.0    ]
                                     [   0.048, 0.0574 ]
                                     [   0.054, 0.2434 ]
                                     [   0.059, 0.5834 ]
                                     [   0.062, 0.8400 ]
                                     [   0.064, 1.1024 ]
                                     [   0.147, 1.3705 ]
                                     [   0.280, 1.6444 ]
                                     [   0.472, 1.9242 ]
                                     [   0.724, 2.2097 ]
                                     [   0.937, 2.5010 ]
                                     [   1.262, 2.7981 ]
                                     [   1.404, 3.1009 ]
                                     [   1.532, 3.4096 ]
                                     [   1.650, 3.7240 ]
                                     [   2.409, 4.0442 ]
                                     [   3.689, 4.3702 ]
                                     [   -1  ,  -1    ]  (max twenty pts)

*%-----------------|-------------------------------------------------------------|
*
*SUB-AREA No. 6

DESIGN NASHYD       ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[2.7](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.80]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|

ADD HYD             IDsum=[2], NHYD=["Ultimate"], IDs to add=[10+1]
*%-----------------|-------------------------------------------------------------|

***************************************************************
*          CALCULATION OF 3HR - 1:10 YEAR STORM EVENT          *
***************************************************************

START               TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                   [  ] <--storm filename, one per line for NSTORM time
*%-----------------|-------------------------------------------------------------|
CHICAGO STORM       IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
                    ICASEcs=[1],
                    A=[1174.184],  B=[6.014], and C=[0.816],
*%-----------------|-------------------------------------------------------------|
DEFAULT VALUES      ICASEdef=[1],  read and print values
                    DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%-----------------|-------------------------------------------------------------|

***********************************
*         ORGAWORLD FILE          *
***********************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                    XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                         LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                    XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                         LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                         LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                         LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                         LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD      ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                         LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%-----------------|-------------------------------------------------------------|

ROUTE RESERVOIR     IDout=[10],   NHYD=["POND"],  IDin=[9],
                    RDT=[1.0](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                       (cms) - (ha-m)
                                     [   0.000,  0.0000]
                                     [   0.008,  0.0656]
                                     [   0.017,  0.1311]
                                     [   0.093,  0.2831]
                                     [   0.233,  0.3971]
                                     [   0.337,  0.4731]
                                     [   0.465,  0.5491]
                                     [   0.531,  0.5871]
                                     [   0.593,  0.6251]
                                     [   0.654,  0.6631]
                                     [   0.797,  0.7391]
                                     [   0.950,  0.8274]
                                     [   1.304,  0.9157]
                                     [   1.880,  1.0040]
                                     [   2.577,  1.0923]
                                     [   -1   ,  -1    ]  (max twenty pts)

*********************************************
*     Remaining Hawthorne Industrial Park    *
*********************************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                         LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                         LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[15.6](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
```

```
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                         LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[ 7 ], NHYD=["HIP07"], DT=[2.5](min), AREA=[12.2](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.7](%),
                                         LGI=[210](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1

*%-----------------|--------------------------------------------------------|
*
*SUB-AREA No.5

DESIGN NASHYD       ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                    DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|--------------------------------------------------------|

ADD HYD             IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
*%-----------------|--------------------------------------------------------|

ROUTE RESERVOIR     IDout=[ 10 ],   NHYD=["HIP-POND"],  IDin=[ 9 ],
                    RDT=[1.0](min),
                         TABLE of ( OUTFLOW-STORAGE ) values
                                  (cms) - (ha-m)
                                [   0.0  , 0.0    ]
                                [   0.048, 0.0574 ]
                                [   0.054, 0.2434 ]
                                [   0.059, 0.5834 ]
                                [   0.062, 0.8400 ]
                                [   0.064, 1.1024 ]
                                [   0.147, 1.3705 ]
                                [   0.280, 1.6444 ]
                                [   0.472, 1.9242 ]
                                [   0.724, 2.2097 ]
                                [   0.937, 2.5010 ]
                                [   1.262, 2.7981 ]
                                [   1.404, 3.1009 ]
                                [   1.532, 3.4096 ]
                                [   1.650, 3.7240 ]
                                [   2.409, 4.0442 ]
                                [   3.689, 4.3702 ]
                                [   -1   ,  -1    ]  (max twenty pts)

*%-----------------|--------------------------------------------------------|
*
*SUB-AREA No. 6

DESIGN NASHYD       ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[2.7](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.80]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|--------------------------------------------------------|

ADD HYD             IDsum=[2], NHYD=["Ultimate"], IDs to add=[10+1]
*%-----------------|--------------------------------------------------------|


************************************************************
*        CALCULATION OF 3HR - 1:25 YEAR STORM EVENT        *
************************************************************

START               TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                   [  ] <--storm filename, one per line for NSTORM time
*%-----------------|--------------------------------------------------------|
CHICAGO STORM       IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
                    ICASEcs=[1],
                    A=[1402.884],  B=[6.018], and C=[0.819],
*%-----------------|--------------------------------------------------------|
DEFAULT VALUES      ICASEdef=[1],  read and print values
                    DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%-----------------|--------------------------------------------------------|

***********************************
*         ORGAWORLD FILE          *
***********************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                    XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                         LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                    XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                         LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                         LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                         LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                         LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD      ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                         LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%-----------------|--------------------------------------------------------|

ROUTE RESERVOIR     IDout=[10],   NHYD=["POND"],  IDin=[9],
                    RDT=[1.0](min),
                         TABLE of ( OUTFLOW-STORAGE ) values
                                  (cms) - (ha-m)
                                [   0.000,  0.0000]
                                [   0.008,  0.0656]
                                [   0.017,  0.1311]
                                [   0.093,  0.2831]
                                [   0.233,  0.3971]
                                [   0.337,  0.4731]
                                [   0.465,  0.5491]
                                [   0.531,  0.5871]
                                [   0.593,  0.6251]
                                [   0.654,  0.6631]
                                [   0.797,  0.7391]
                                [   0.950,  0.8274]
                                [   1.304,  0.9157]
                                [   1.880,  1.0040]
                                [   2.577,  1.0923]
                                [   -1   ,  -1    ]  (max twenty pts)

*********************************************
*     Remaining Hawthorne Industrial Park    *
*********************************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                         LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                         LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[15.6](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                         LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%-----------------|--------------------------------------------------------|
ADD HYD             IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
*%-----------------|--------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[ 7 ], NHYD=["HIP07"], DT=[2.5](min), AREA=[12.2](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.7](%),
                                         LGI=[210](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1

*%-----------------|--------------------------------------------------------|
*
*SUB-AREA No.5

DESIGN NASHYD       ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                    DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|--------------------------------------------------------|

ADD HYD             IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
*%-----------------|--------------------------------------------------------|

ROUTE RESERVOIR     IDout=[ 10 ],   NHYD=["HIP-POND"],  IDin=[ 9 ],
                    RDT=[1.0](min),
                         TABLE of ( OUTFLOW-STORAGE ) values
                                  (cms) - (ha-m)
                                [   0.0  , 0.0    ]
                                [   0.048, 0.0574 ]
                                [   0.054, 0.2434 ]
                                [   0.059, 0.5834 ]
                                [   0.062, 0.8400 ]
                                [   0.064, 1.1024 ]
                                [   0.147, 1.3705 ]
                                [   0.280, 1.6444 ]
                                [   0.472, 1.9242 ]
                                [   0.724, 2.2097 ]
                                [   0.937, 2.5010 ]
                                [   1.262, 2.7981 ]
                                [   1.404, 3.1009 ]
                                [   1.532, 3.4096 ]
                                [   1.650, 3.7240 ]
                                [   2.409, 4.0442 ]
                                [   3.689, 4.3702 ]
                                [   -1   ,  -1    ]  (max twenty pts)

*%-----------------|--------------------------------------------------------|
```

```
01081> *
01082> *SUB-AREA No. 6
01083>
01084> DESIGN NASHYD         ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[2.7](ha),
01085>                       DWF=[0](cms), CNC=[76], TP=[0.80]hrs,
01086>                       RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
01087> *%-----------------|--------------------------------------------------------------|
01088>
01089> ADD HYD               IDsum=[2], NHYD=["Ultimate"], IDs to add=[10+1]
01090> *%-----------------|--------------------------------------------------------------|
01091>
01092> ***************************************************************
01093> *        CALCULATION OF 3HR - 1:50 YEAR STORM EVENT            *
01094> ***************************************************************
01095>
01096> START                 TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
01097> *%                     [  ] <--storm filename, one per line for NSTORM time
01098> *%-----------------|--------------------------------------------------------------|
01099> CHICAGO STORM         IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
01100>                       ICASEcs=[1],
01101>                       A=[1569.580],  B=[6.014], and C=[0.820],
01102> *%-----------------|--------------------------------------------------------------|
01103> DEFAULT VALUES        ICASEdef=[1],  read and print values
01104>                       DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
01105> *%-----------------|--------------------------------------------------------------|
01106>
01107> ************************************
01108> *          ORGAWORLD FILE          *
01109> ************************************
01110> *
01111> * SUB-AREA No.1
01112>
01113> CALIB STANDHYD        ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
01114>                       XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
01115>                       SCS curve number CN=[81],
01116>                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
01117>                                            LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
01118>                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
01119>                                            LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
01120>                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
01121> *%-----------------|--------------------------------------------------------------|
01122> *
01123> * SUB-AREA No.2
01124>
01125> CALIB STANDHYD        ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
01126>                       XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
01127>                       SCS curve number CN=[81],
01128>                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
01129>                                            LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
01130>                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
01131>                                            LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
01132>                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
01133> *%-----------------|--------------------------------------------------------------|
01134> *
01135> * SUB-AREA No.3
01136>
01137> CALIB STANDHYD        ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
01138>                       XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
01139>                       SCS curve number CN=[81],
01140>                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
01141>                                            LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
01142>                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
01143>                                            LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
01144>                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
01145> *%-----------------|--------------------------------------------------------------|
01146> ADD HYD               IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
01147> *%-----------------|--------------------------------------------------------------|
01148> ADD HYD               IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
01149> *%-----------------|--------------------------------------------------------------|
01150> *
01151> * SUB-AREA No.4
01152>
01153> CALIB STANDHYD        ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
01154>                       XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
01155>                       SCS curve number CN=[81],
01156>                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
01157>                                            LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
01158>                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
01159>                                            LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
01160>                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
01161> *%-----------------|--------------------------------------------------------------|
01162> *
01163> * SUB-AREA No.5
01164>
01165> CALIB STANDHYD        ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
01166>                       XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
01167>                       SCS curve number CN=[81],
01168>                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
01169>                                            LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
01170>                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
01171>                                            LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
01172>                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
01173> *%-----------------|--------------------------------------------------------------|
01174> ADD HYD               IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
01175> *%-----------------|--------------------------------------------------------------|
01176> ADD HYD               IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
01177> *%-----------------|--------------------------------------------------------------|
01178>
01179> ROUTE RESERVOIR       IDout=[10],   NHYD=["POND"],  IDin=[9],
01180>                       RDT=[1.0](min),
01181>                             TABLE of ( OUTFLOW-STORAGE ) values
01182>                                         (cms) - (ha-m)
01183>                                      [   0.000,  0.0000]
01184>                                      [   0.008,  0.0656]
01185>                                      [   0.017,  0.1311]
01186>                                      [   0.093,  0.2831]
01187>                                      [   0.233,  0.3971]
01188>                                      [   0.337,  0.4731]
01189>                                      [   0.465,  0.5491]
01190>                                      [   0.531,  0.5871]
01191>                                      [   0.593,  0.6251]
01192>                                      [   0.654,  0.6631]
01193>                                      [   0.797,  0.7391]
01194>                                      [   0.950,  0.8274]
01195>                                      [   1.304,  0.9157]
01196>                                      [   1.880,  1.0040]
01197>                                      [   2.577,  1.0923]
01198>                                      [   -1   ,  -1    ]  (max twenty pts)
01199>
01200> ***********************************************
01201> *     Remaining Hawthorne Industrial Park     *
01202> ***********************************************
01203> *
01204> * SUB-AREA No.1
01205>
01206> CALIB STANDHYD        ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
01207>                       XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
01208>                       SCS curve number CN=[81],
01209>                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
01210>                                            LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
01211>                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
01212>                                            LGI=[580](m), MNI=[0.03], SCI=[0.0](min
01213>                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
01214> *%-----------------|--------------------------------------------------------------|
01215> ADD HYD               IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
01216> *%-----------------|--------------------------------------------------------------|
01217> *
01218> * SUB-AREA No.2
01219>
01220> CALIB STANDHYD        ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
01221>                       XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
01222>                       SCS curve number CN=[81],
01223>                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
01224>                                            LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
01225>                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
01226>                                            LGI=[450](m), MNI=[0.03], SCI=[0.0](min
01227>                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
01228> *%-----------------|--------------------------------------------------------------|
01229> *
01230> * SUB-AREA No.3
01231>
01232> CALIB STANDHYD        ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[15.6](ha),
01233>                       XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
01234>                       SCS curve number CN=[81],
01235>                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
01236>                                            LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
01237>                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
01238>                                            LGI=[600](m), MNI=[0.03], SCI=[0.0](min
01239>                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
01240> *%-----------------|--------------------------------------------------------------|
01241> ADD HYD               IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
01242> *%-----------------|--------------------------------------------------------------|
01243> ADD HYD               IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
01244> *%-----------------|--------------------------------------------------------------|
01245> *
01246> * SUB-AREA No.4
01247>
01248> CALIB STANDHYD        ID=[ 7 ], NHYD=["HIP07"], DT=[2.5](min), AREA=[12.2](ha),
01249>                       XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
01250>                       SCS curve number CN=[81],
01251>                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
01252>                                            LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
01253>                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.7](%),
01254>                                            LGI=[210](m), MNI=[0.03], SCI=[0.0](min
01255>                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
01256>
01257> *%-----------------|--------------------------------------------------------------|
01258> *
01259> *SUB-AREA No.5
01260>
01261> DESIGN NASHYD         ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
01262>                       DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
01263>                       RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
01264> *%-----------------|--------------------------------------------------------------|
01265>
01266> ADD HYD               IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
01267> *%-----------------|--------------------------------------------------------------|
01268>
01269> ROUTE RESERVOIR       IDout=[ 10 ],   NHYD=["HIP-POND"],  IDin=[ 9 ],
01270>                       RDT=[1.0](min),
01271>                             TABLE of ( OUTFLOW-STORAGE ) values
01272>                                         (cms) - (ha-m)
01273>                                      [   0.0  , 0.0    ]
01274>                                      [   0.048, 0.0574 ]
01275>                                      [   0.054, 0.2434 ]
01276>                                      [   0.059, 0.5834 ]
01277>                                      [   0.062, 0.8400 ]
01278>                                      [   0.064, 1.1024 ]
01279>                                      [   0.147, 1.3705 ]
01280>                                      [   0.280, 1.6444 ]
01281>                                      [   0.472, 1.9242 ]
01282>                                      [   0.724, 2.2097 ]
01283>                                      [   0.937, 2.5010 ]
01284>                                      [   1.262, 2.7981 ]
01285>                                      [   1.404, 3.1009 ]
01286>                                      [   1.532, 3.4096 ]
01287>                                      [   1.650, 3.7240 ]
01288>                                      [   2.409, 4.0442 ]
01289>                                      [   3.689, 4.3702 ]
01290>                                      [   -1   ,  -1    ]  (max twenty pts)
01291>
01292> *%-----------------|--------------------------------------------------------------|
01293> *
01294> *SUB-AREA No. 6
01295>
01296> DESIGN NASHYD         ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[2.7](ha),
01297>                       DWF=[0](cms), CNC=[76], TP=[0.80]hrs,
01298>                       RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
01299> *%-----------------|--------------------------------------------------------------|
01300>
01301> ADD HYD               IDsum=[2], NHYD=["Ultimate"], IDs to add=[10+1]
01302> *%-----------------|--------------------------------------------------------------|
01303>
01304> ***************************************************************
01305> *        CALCULATION OF 3HR - 1:100 YEAR STORM EVENT           *
01306> ***************************************************************
01307>
01308> START                 TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
01309> *%                     [  ] <--storm filename, one per line for NSTORM time
01310> *%-----------------|--------------------------------------------------------------|
01311> CHICAGO STORM         IUNITS=[2],  TD=[3.0](hrs), TPRAT=[0.333],  CSDT=[10.0](min)
01312>                       ICASEcs=[1],
01313>                       A=[1735.688],  B=[6.014], and C=[0.820],
01314> *%-----------------|--------------------------------------------------------------|
01315> DEFAULT VALUES        ICASEdef=[1],  read and print values
01316>                       DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
01317> *%-----------------|--------------------------------------------------------------|
01318>
01319> ************************************
01320> *          ORGAWORLD FILE          *
01321> ************************************
01322> *
01323> * SUB-AREA No.1
01324>
01325> CALIB STANDHYD        ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
01326>                       XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
01327>                       SCS curve number CN=[81],
01328>                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
01329>                                            LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
01330>                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
01331>                                            LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
01332>                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
01333> *%-----------------|--------------------------------------------------------------|
01334> *
01335> * SUB-AREA No.2
01336>
01337> CALIB STANDHYD        ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
01338>                       XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
01339>                       SCS curve number CN=[81],
01340>                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
01341>                                            LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
01342>                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
01343>                                            LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
01344>                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
01345> *%-----------------|--------------------------------------------------------------|
01346> *
01347> * SUB-AREA No.3
01348>
01349> CALIB STANDHYD        ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
01350>                       XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
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```
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                         LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                         LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                         LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                         LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD      ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                    XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                         LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%-----------------|-------------------------------------------------------------|

ROUTE RESERVOIR     IDout=[10],   NHYD=["POND"],  IDin=[9],
                    RDT=[1.0](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                 (cms) - (ha-m)
                               [   0.000,  0.0000]
                               [   0.008,  0.0656]
                               [   0.017,  0.1311]
                               [   0.093,  0.2831]
                               [   0.233,  0.3971]
                               [   0.337,  0.4731]
                               [   0.465,  0.5491]
                               [   0.531,  0.5871]
                               [   0.593,  0.6251]
                               [   0.654,  0.6631]
                               [   0.797,  0.7391]
                               [   0.950,  0.8274]
                               [   1.304,  0.9157]
                               [   1.880,  1.0040]
                               [   2.577,  1.0923]
                               [   -1   ,  -1    ]  (max twenty pts)

**********************************************
*     Remaining Hawthorne Industrial Park    *
**********************************************
*
* SUB-AREA No.1

CALIB STANDHYD      ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                         LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD      ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                         LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD      ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[15.6](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                         LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
*%-----------------|-------------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD      ID=[ 7 ], NHYD=["HIP07"], DT=[2.5](min), AREA=[12.2](ha),
                    XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[81],
                    Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                         LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                    Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.7](%),
                                         LGI=[210](m), MNI=[0.03], SCI=[0.0](min
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1

*%-----------------|-------------------------------------------------------------|
*
*SUB-AREA No.5

DESIGN NASHYD       ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                    DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|

ADD HYD             IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
*%-----------------|-------------------------------------------------------------|

ROUTE RESERVOIR     IDout=[ 10 ],   NHYD=["HIP-POND"],  IDin=[ 9 ],
                    RDT=[1.0](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                 (cms) - (ha-m)
                               [   0.0  , 0.0    ]
                               [   0.048, 0.0574 ]
                               [   0.054, 0.2434 ]
                               [   0.059, 0.5834 ]
                               [   0.062, 0.8400 ]
                               [   0.064, 1.1024 ]
                               [   0.147, 1.3705 ]
                               [   0.280, 1.6444 ]
                               [   0.472, 1.9242 ]
                               [   0.724, 2.2097 ]
                               [   0.937, 2.5010 ]
                               [   1.262, 2.7981 ]
                               [   1.404, 3.1009 ]
                               [   1.532, 3.4096 ]
                               [   1.650, 3.7240 ]
                               [   2.409, 4.0442 ]
                               [   3.689, 4.3702 ]
                               [   -1   , -1    ]  (max twenty pts)

*%-----------------|-------------------------------------------------------------|
*
*SUB-AREA No. 6

DESIGN NASHYD       ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[2.7](ha),
                    DWF=[0](cms), CNC=[76], TP=[0.80]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|

ADD HYD             IDsum=[2], NHYD=["Ultimate"], IDs to add=[10+1]
*%-----------------|-------------------------------------------------------------|




FINISH
```

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

 SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999   999  ========
 S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9 9   9
 SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9 9   9 Ver. 4.02
     S   W W   M   M  H   H    Y    M   M  O   O       9999  9999 July 1999
 SSSSS   W W   M   M  H   H    Y    M   M   OOO           9     9 ========
                                                      9   9 9   9 # 4418403
      StormWater Management HYdrologic Model           999   999  ========

 ***********************************************************************
 ************************* SWMHYMO-99 Ver/4.02 *************************
 *******  A single event and continuous hydrologic simulation model  *******
 *******     based on the principles of HYMO and its successors     *******
 *******                OTTHYMO-83 and OTTHYMO-89.                  *******
 ***********************************************************************
 ******* Distributed by:  J.F. Sabourin and Associates Inc.          *******
 *******                 Ottawa,  Ontario: (613) 727-5199           *******
 *******                 Gatineau, Quebec: (819) 243-6858           *******
 *******                 E-Mail: swmhymo@jfsa.Com                   *******
 ***********************************************************************

 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++ Licensed user: J. L. Richards & Associates Limited         +++++++
 +++++++                Ottawa              SERIAL#:4418403          +++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ***********************************************************************
 *******              ++++++ PROGRAM ARRAY DIMENSIONS ++++++         *******
 *******              Maximum value for ID numbers  :     10         *******
 *******              Max. number of rainfall points:  15000         *******
 *******              Max. number of flow points    :  15000         *******
 ***********************************************************************


 *******************   D E T A I L E D   O U T P U T   *******************
 ***********************************************************************
 *       DATE: 2009-05-15     TIME: 08:45:21     RUN COUNTER: 000198      *
 ***********************************************************************
 * Input   filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\SWM-ALL.dat        *
 * Output  filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\SWM-ALL.out        *
 * Summary filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\SWM-ALL.sum        *
 * User comments:                                                         *
 * 1:______________________________________________________________________*
 * 2:______________________________________________________________________*
 * 3:______________________________________________________________________*
 ***********************************************************************

--------------------------------------------------------------------------
001:0001------------------------------------------------------------------
*#*************************************************************************
*#  Project Name : Hawthorne Industrial Park         Project Number:   [20983] *
*#  Date         : January, 2009                                          *
*#  Revised      : N/A                                                     *
*#  Developed by : Mark Buchanan, E.I.T.                                   *
*#  Reviewed by  : Guy Forget, P.Eng.                                      *
*#  Company      : J.L. Richards & Associates Limited                      *
*#  License #    : 4418403                                                 *
*#*************************************************************************
*
*
*#***********************************************************
*#  FILENAME:  V:\20983.DU\ENG\SWMHYMO\20983PST.DAT           *
*#  FILE DEVELOPED FOR SITE PLAN APPLICATION AND DETAILED DESIGN *
*#   OF A FACILITY ASSOCIATED WITH THE OTTAWA COMPOSTING SITE    *
*#***********************************************************
*
***************************************************************************
*        SWMHYMO FILE DEVELOPED TO INVESTIGATE FLOOD FLOWS OF THE          *
*   PROPOSED COMPOSTING SITE UNDER POST-DEVELOPMENT UNCONTROLLED CONDITIONS  *
***************************************************************************
*************************************************
* HYDROLOGICAL ANALYSIS UNDER A 4 HR-25 MM STORM AND  *
* FOR DESIGN STORMS OF 1:2, 5, 10, 25, 50, AND 100 YR *
*************************************************
**********************************************************
*        POST-DEVELOPMENT UNCONTROLLED CONDITIONS            *
**********************************************************
**********************************************************
*          CALCULATION OF 4 HR 25 MM STORM EVENT            *
**********************************************************
--------------------
| START              |  Project  dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
--------------------  Rainfall dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
    TZERO =   .00 hrs on       0
    METOUT=   2 (output = METRIC)
    NRUN   = 001
    NSTORM=   0
--------------------------------------------------------------------------
001:0002------------------------------------------------------------------
--------------------
| READ STORM        |    Filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\4HR25-
| Ptotal=  25.00 mm|    Comments: 4hr-15 min 25 MM STORM EVENT (CHICAGO DI
--------------------
                TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                 hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                 .25   1.777 |   1.25  45.631 |   2.25   3.138 |   3.25   1.675
                 .50   2.357 |   1.50  11.911 |   2.50   2.555 |   3.50   1.509
                 .75   3.618 |   1.75   6.051 |   2.75   2.165 |   3.75   1.376
                1.00   8.975 |   2.00   4.108 |   3.00   1.885 |   4.00   1.266

--------------------------------------------------------------------------
001:0003------------------------------------------------------------------
---------------------
| DEFAULT VALUES      |  Filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\ORGA.VAL
---------------------  ICASEdv = 1 (read and print data)
      FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
                 ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
      Horton's infiltration equation parameters:
      [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
      Parameters for PERVIOUS surfaces in STANDHYD:
      [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
      Parameters for IMPERVIOUS surfaces in STANDHYD:
      [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
      Parameters used in NASHYD:
      [Ia=   4.67 mm] [N= 3.00]
--------------------------------------------------------------------------
001:0004------------------------------------------------------------------
**********************************
*          ORGAWORLD FILE          *
**********************************
*
* SUB-AREA No.1
---------------------
| CALIB STANDHYD      |   Area     (ha)=    2.07
| 01:010     DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
---------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        1.74          .33
     Dep. Storage      (mm)=        1.57         4.67
     Average Slope      (%)=         .52         1.00
     Length             (m)=      204.72        20.00
     Mannings n            =        .030         .250

     Max.eff.Inten.(mm/hr)=        45.63         5.37
                over (min)         10.00        30.00
     Storage Coeff.  (min)=        10.80 (ii)   29.27 (ii)
     Unit Hyd. Tpeak (min)=        10.00        30.00
     Unit Hyd. peak  (cms)=          .11          .04
                                                             *TOTALS*
     PEAK FLOW        (cms)=          .16          .00          .158 (iii)
     TIME TO PEAK     (hrs)=         1.29         1.75         1.292
     RUNOFF VOLUME     (mm)=        23.43         5.17        20.508
     TOTAL RAINFALL    (mm)=        25.00        25.00        24.999
     RUNOFF COEFFICIENT   =          .94          .21          .820

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0     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.

--------------------------------------------------------------------------
001:0005------------------------------------------------------------------
*
* SUB-AREA No.2
---------------------
| CALIB STANDHYD      |   Area     (ha)=    1.54
| 02:020     DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
---------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        1.42          .12
     Dep. Storage      (mm)=        1.57         4.67
     Average Slope      (%)=         .50         1.00
     Length             (m)=      244.34         5.00
     Mannings n            =        .030         .030

     Max.eff.Inten.(mm/hr)=        45.63         7.24
                over (min)         12.50        15.00
     Storage Coeff.  (min)=        12.15 (ii)   14.15 (ii)
     Unit Hyd. Tpeak (min)=        12.50        15.00
     Unit Hyd. peak  (cms)=          .09          .08
                                                             *TOTALS*
     PEAK FLOW        (cms)=          .12          .00          .121 (iii)
     TIME TO PEAK     (hrs)=         1.33         1.46         1.333
     RUNOFF VOLUME     (mm)=        23.43         5.17        21.969
     TOTAL RAINFALL    (mm)=        25.00        25.00        24.999
     RUNOFF COEFFICIENT   =          .94          .21          .879

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0     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.

--------------------------------------------------------------------------
001:0006------------------------------------------------------------------
*
* SUB-AREA No.3
---------------------
| CALIB STANDHYD      |   Area     (ha)=    1.40
| 03:030     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
---------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        1.36          .04
     Dep. Storage      (mm)=        1.57         4.67
     Average Slope      (%)=         .51         1.00
     Length             (m)=      225.63         5.00
     Mannings n            =        .030         .030

     Max.eff.Inten.(mm/hr)=        45.63         7.97
                over (min)         12.50        12.50
     Storage Coeff.  (min)=        11.52 (ii)   13.44 (ii)
     Unit Hyd. Tpeak (min)=        12.50        12.50
     Unit Hyd. peak  (cms)=          .10          .09
                                                             *TOTALS*
     PEAK FLOW        (cms)=          .12          .00          .118 (iii)
     TIME TO PEAK     (hrs)=         1.33         1.42         1.333
     RUNOFF VOLUME     (mm)=        23.43         5.17        22.881
     TOTAL RAINFALL    (mm)=        25.00        25.00        24.999
     RUNOFF COEFFICIENT   =          .94          .21          .915

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0     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.

--------------------------------------------------------------------------
001:0007------------------------------------------------------------------
--------------------
| ADD HYD (040    ) | ID: NHYD       AREA      QPEAK    TPEAK   R.V.     DWF
--------------------                 (ha)      (cms)    (hrs)   (mm)    (cms)
               ID1 01:010            2.07       .158     1.29  20.51     .000
              +ID2 02:020            1.54       .121     1.33  21.97     .000
               =========================================================
               SUM 04:040            3.61       .278     1.33  21.13     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------
001:0008------------------------------------------------------------------
--------------------
| ADD HYD (050    ) | ID: NHYD       AREA      QPEAK    TPEAK   R.V.     DWF
--------------------                 (ha)      (cms)    (hrs)   (mm)    (cms)
               ID1 03:030            1.40       .118     1.33  22.88     .000
              +ID2 04:040            3.61       .278     1.33  21.13     .000
               =========================================================
               SUM 05:050            5.01       .396     1.33  21.62     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------
001:0009------------------------------------------------------------------
*
* SUB-AREA No.4
---------------------
| CALIB STANDHYD      |   Area     (ha)=     .89
| 06:060     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
---------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=         .86          .03
     Dep. Storage      (mm)=        1.57         4.67
     Average Slope      (%)=         .93          .70
     Length             (m)=      164.82        40.00
     Mannings n            =        .030         .250

     Max.eff.Inten.(mm/hr)=        45.63         4.42
                over (min)          7.50        42.50
     Storage Coeff.  (min)=         7.97 (ii)   41.62 (ii)
     Unit Hyd. Tpeak (min)=         7.50        42.50
     Unit Hyd. peak  (cms)=          .14          .03
                                                             *TOTALS*
     PEAK FLOW        (cms)=          .09          .00          .089 (iii)
     TIME TO PEAK     (hrs)=         1.25         2.00         1.250
     RUNOFF VOLUME     (mm)=        23.43         5.17        22.882
     TOTAL RAINFALL    (mm)=        25.00        25.00        24.999
     RUNOFF COEFFICIENT   =          .94          .21          .915

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
```

```
             CN* =  81.0    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.

 ----------------------------------------------------------------------------
 001:0010--------------------------------------------------------------------
 *
 * SUB-AREA No.5
 ---------------------
 | CALIB STANDHYD     |   Area    (ha)=    2.66
 | 07:070    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
 ---------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=       2.58          .08
      Dep. Storage     (mm)=       1.57         4.67
      Average Slope     (%)=        .61         1.50
      Length            (m)=     207.25        20.00
      Mannings n           =       .030         .250

      Max.eff.Inten.(mm/hr)=      45.63         5.66
                 over (min)      10.00        27.50
      Storage Coeff.  (min)=      10.37 (ii)   26.38 (ii)
      Unit Hyd. Tpeak (min)=      10.00        27.50
      Unit Hyd. peak  (cms)=        .11          .04
                                                             *TOTALS*
      PEAK FLOW       (cms)=        .24          .00            .238 (iii)
      TIME TO PEAK    (hrs)=       1.29         1.67           1.292
      RUNOFF VOLUME    (mm)=      23.43         5.17          22.882
      TOTAL RAINFALL   (mm)=      25.00        25.00          24.999
      RUNOFF COEFFICIENT   =        .94          .21            .915

         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

 ----------------------------------------------------------------------------
 001:0011--------------------------------------------------------------------
 --------------------
 | ADD HYD (080    ) | ID: NHYD       AREA      QPEAK    TPEAK   R.V.    DWF
 --------------------                  (ha)      (cms)    (hrs)   (mm)   (cms)
                   ID1 06:060           .89      .089     1.25  22.88    .000
                  +ID2 07:070          2.66      .238     1.29  22.88    .000
                   =======================================================
                   SUM 08:080          3.55      .327     1.29  22.88    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ----------------------------------------------------------------------------
 001:0012--------------------------------------------------------------------
 --------------------
 | ADD HYD (090    ) | ID: NHYD       AREA      QPEAK    TPEAK   R.V.    DWF
 --------------------                  (ha)      (cms)    (hrs)   (mm)   (cms)
                   ID1 05:050          5.01      .396     1.33  21.62    .000
                  +ID2 08:080          3.55      .327     1.29  22.88    .000
                   =======================================================
                   SUM 09:090          8.56      .716     1.29  22.14    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ----------------------------------------------------------------------------
 001:0013--------------------------------------------------------------------
 ---------------------
 | ROUTE RESERVOIR    |     Requested routing time step =  1.0 min.
 |   IN>09:(090    )  |
 | OUT<10:(POND    )  |     =========  OUTLFOW STORAGE TABLE  =========
 ---------------------     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
                             (cms)     (ha.m.)    |    (cms)     (ha.m.)
                              .000   .0000E+00   |     .593   .6251E+00
                              .008   .6560E-01   |     .654   .6631E+00
                              .017   .1311E+00   |     .797   .7391E+00
                              .093   .2831E+00   |     .950   .8274E+00
                              .233   .3971E+00   |    1.304   .9157E+00
                              .337   .4731E+00   |    1.880   .1004E+01
                              .465   .5491E+00   |    2.577   .1092E+01
                              .531   .5871E+00   |     .000   .0000E+00

      ROUTING RESULTS                AREA      QPEAK      TPEAK        R.V.
      --------------------            (ha)      (cms)      (hrs)        (mm)
      INFLOW >09: (090   )           8.56       .716      1.292      22.143
      OUTFLOW<10: (POND  )           8.56       .032      3.875      22.141

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    4.470
                    TIME SHIFT OF PEAK FLOW          (min)=   155.00
                    MAXIMUM  STORAGE    USED        (ha.m.)=.1611E+00

 ----------------------------------------------------------------------------
 001:0014--------------------------------------------------------------------
 ***********************************************
 *      Remaining Hawthorne Industrial Park    *
 ***********************************************
 *
 * SUB-AREA No.1
 ---------------------
 | CALIB STANDHYD     |   Area    (ha)=   19.90
 | 01:HIP01  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=      14.13         5.77
      Dep. Storage     (mm)=       1.57         4.67
      Average Slope     (%)=        .60         1.50
      Length            (m)=     580.00       100.00
      Mannings n           =       .030         .250

      Max.eff.Inten.(mm/hr)=      34.39        11.90
                 over (min)      22.50        52.50
      Storage Coeff.  (min)=      21.64 (ii)   52.88 (ii)
      Unit Hyd. Tpeak (min)=      22.50        52.50
      Unit Hyd. peak  (cms)=        .05          .02
                                                             *TOTALS*
      PEAK FLOW       (cms)=        .60          .11            .642 (iii)
      TIME TO PEAK    (hrs)=       1.50         2.13           1.542
      RUNOFF VOLUME    (mm)=      23.43         8.74          16.085
      TOTAL RAINFALL   (mm)=      25.00        25.00          24.999
      RUNOFF COEFFICIENT   =        .94          .35            .643

         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

 ----------------------------------------------------------------------------
 001:0015--------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP02 ) | ID: NHYD        AREA      QPEAK    TPEAK   R.V.    DWF
 --------------------                  (ha)      (cms)    (hrs)   (mm)   (cms)
                   ID1 10:POND         8.56      .032     3.88  22.14    .000
                  +ID2 01:HIP01       19.90      .642     1.54  16.08    .000
                   =======================================================
                   SUM 02:HIP02       28.46      .655     1.54  17.91    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.


 ----------------------------------------------------------------------------
 001:0016--------------------------------------------------------------------
 *
 * SUB-AREA No.2
 ---------------------
 | CALIB STANDHYD     |   Area    (ha)=   17.00
 | 03:HIP03  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=      12.07         4.93
      Dep. Storage     (mm)=       1.57         4.67
      Average Slope     (%)=        .65         1.50
      Length            (m)=     450.00       100.00
      Mannings n           =       .030         .250

      Max.eff.Inten.(mm/hr)=      40.81        12.73
                 over (min)      17.50        47.50
      Storage Coeff.  (min)=      16.94 (ii)   47.35 (ii)
      Unit Hyd. Tpeak (min)=      17.50        47.50
      Unit Hyd. peak  (cms)=        .07          .02
                                                             *TOTALS*
      PEAK FLOW       (cms)=        .60          .10            .625 (iii)
      TIME TO PEAK    (hrs)=       1.42         2.00           1.458
      RUNOFF VOLUME    (mm)=      23.43         8.74          16.085
      TOTAL RAINFALL   (mm)=      25.00        25.00          24.999
      RUNOFF COEFFICIENT   =        .94          .35            .643

         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

 ----------------------------------------------------------------------------
 001:0017--------------------------------------------------------------------
 *
 * SUB-AREA No.3
 ---------------------
 | CALIB STANDHYD     |   Area    (ha)=   15.60
 | 04:HIP04  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=      11.08         4.52
      Dep. Storage     (mm)=       1.57         4.67
      Average Slope     (%)=        .50         1.50
      Length            (m)=     600.00       100.00
      Mannings n           =       .030         .250

      Max.eff.Inten.(mm/hr)=      34.39        11.54
                 over (min)      22.50        55.00
      Storage Coeff.  (min)=      23.33 (ii)   54.95 (ii)
      Unit Hyd. Tpeak (min)=      22.50        55.00
      Unit Hyd. peak  (cms)=        .05          .02
                                                             *TOTALS*
      PEAK FLOW       (cms)=        .45          .08            .484 (iii)
      TIME TO PEAK    (hrs)=       1.50         2.17           1.542
      RUNOFF VOLUME    (mm)=      23.43         8.74          16.085
      TOTAL RAINFALL   (mm)=      25.00        25.00          24.999
      RUNOFF COEFFICIENT   =        .94          .35            .643

         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

 ----------------------------------------------------------------------------
 001:0018--------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP05 ) | ID: NHYD        AREA      QPEAK    TPEAK   R.V.    DWF
 --------------------                  (ha)      (cms)    (hrs)   (mm)   (cms)
                   ID1 03:HIP03       17.00      .625     1.46  16.08    .000
                  +ID2 04:HIP04       15.60      .484     1.54  16.08    .000
                   =======================================================
                   SUM 05:HIP05       32.60     1.091     1.46  16.08    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ----------------------------------------------------------------------------
 001:0019--------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP06 ) | ID: NHYD        AREA      QPEAK    TPEAK   R.V.    DWF
 --------------------                  (ha)      (cms)    (hrs)   (mm)   (cms)
                   ID1 05:HIP05       32.60     1.091     1.46  16.08    .000
                  +ID2 02:HIP02       28.46      .655     1.54  17.91    .000
                   =======================================================
                   SUM 06:HIP06       61.06     1.740     1.50  16.93    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ----------------------------------------------------------------------------
 001:0020--------------------------------------------------------------------
 *
 * SUB-AREA No.4
 ---------------------
 | CALIB STANDHYD     |   Area    (ha)=   12.20
 | 07:HIP07  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=       8.66         3.54
      Dep. Storage     (mm)=       1.57         4.67
      Average Slope     (%)=        .70         1.50
      Length            (m)=     210.00       100.00
      Mannings n           =       .030         .250

      Max.eff.Inten.(mm/hr)=      45.63        14.15
                 over (min)      10.00        40.00
      Storage Coeff.  (min)=      10.03 (ii)   39.18 (ii)
      Unit Hyd. Tpeak (min)=      10.00        40.00
      Unit Hyd. peak  (cms)=        .11          .03
                                                             *TOTALS*
      PEAK FLOW       (cms)=        .57          .08            .585 (iii)
      TIME TO PEAK    (hrs)=       1.29         1.88           1.292
      RUNOFF VOLUME    (mm)=      23.43         8.74          16.085
      TOTAL RAINFALL   (mm)=      25.00        25.00          24.999
      RUNOFF COEFFICIENT   =        .94          .35            .643

         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

 ----------------------------------------------------------------------------
 001:0021--------------------------------------------------------------------
 *
 *SUB-AREA No.5
 ---------------------
 | DESIGN NASHYD      |   Area     (ha)=    4.00   Curve Number   (CN)=85.00
 | 08:Pond-B DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
 ---------------------    U.H. Tp(hrs)=     .170

      Unit Hyd Qpeak  (cms)=      .899

```

```
      PEAK FLOW        (cms)=      .077 (i)
      TIME TO PEAK     (hrs)=     1.375
      RUNOFF VOLUME     (mm)=     6.343
      TOTAL RAINFALL    (mm)=    24.999
      RUNOFF COEFFICIENT   =       .254

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

 ---------------------------------------------------------------------------
 001:0022-------------------------------------------------------------------
 -------------------
 | ADD HYD (HIP08 ) | ID: NHYD       AREA      QPEAK   TPEAK   R.V.     DWF
 -------------------                 (ha)      (cms)   (hrs)   (mm)    (cms)
                    ID1 06:HIP06     61.06     1.740    1.50  16.93    .000
                   +ID2 07:HIP07     12.20      .585    1.29  16.08    .000
                   +ID3 08:Pond-B     4.00      .077    1.38   6.34    .000
                    ===================================================
                    SUM 09:HIP08     77.26     2.227    1.46  16.25    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0023-------------------------------------------------------------------
 --------------------
 | ROUTE RESERVOIR    |     Requested routing time step =  1.0 min.
 |  IN>09:(HIP08 )    |
 | OUT<10:(HIP-PO)    |     ========  OUTLFOW STORAGE TABLE  ========
 --------------------       OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                              (cms)    (ha.m.)   |    (cms)    (ha.m.)
                               .000  .0000E+00   |     .724  .2210E+01
                               .048  .5740E-01   |     .937  .2501E+01
                               .054  .2434E+00   |    1.262  .2798E+01
                               .059  .5834E+00   |    1.404  .3101E+01
                               .062  .8400E+00   |    1.532  .3410E+01
                               .064  .1102E+01   |    1.650  .3724E+01
                               .147  .1370E+01   |    2.409  .4044E+01
                               .280  .1644E+01   |    3.689  .4370E+01
                               .472  .1924E+01   |     .000  .0000E+00

      ROUTING RESULTS              AREA      QPEAK      TPEAK          R.V.
      --------------------         (ha)      (cms)      (hrs)          (mm)
      INFLOW >09: (HIP08 )        77.26      2.227      1.458        16.251
      OUTFLOW<10: (HIP-PO)        77.26       .063      5.431        16.251

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    2.839
                   TIME SHIFT OF PEAK FLOW          (min)=   238.33
                   MAXIMUM  STORAGE   USED         (ha.m.)=.1001E+01

 ---------------------------------------------------------------------------
 001:0024-------------------------------------------------------------------
 *
 *SUB-AREA No. 6
 --------------------
 | DESIGN NASHYD      |   Area     (ha)=     2.70   Curve Number   (CN)=76.00
 | 01:A3      DT= 2.50 |  Ia       (mm)=    4.670   # of Linear Res.(N)= 3.00
 --------------------     U.H. Tp(hrs)=      .800

      Unit Hyd Qpeak  (cms)=      .129

      PEAK FLOW        (cms)=      .013 (i)
      TIME TO PEAK     (hrs)=     2.292
      RUNOFF VOLUME     (mm)=     4.110
      TOTAL RAINFALL    (mm)=    24.999
      RUNOFF COEFFICIENT   =       .164

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

 ---------------------------------------------------------------------------
 001:0025-------------------------------------------------------------------
 -------------------
 | ADD HYD (Ultima) | ID: NHYD       AREA      QPEAK   TPEAK   R.V.     DWF
 -------------------                 (ha)      (cms)   (hrs)   (mm)    (cms)
                    ID1 10:HIP-PO    77.26      .063    5.43  16.25    .000
                   +ID2 01:A3         2.70      .013    2.29   4.11    .000
                    ===================================================
                    SUM 02:Ultima    79.96      .073    2.50  15.84    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0026-------------------------------------------------------------------
 *************************************************************
 *       CALCULATION OF 3HR - 1:2 YEAR STORM EVENT           *
 *************************************************************
 -------------------
 | START             |   Project  dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
 -------------------     Rainfall dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
     TZERO =   .00 hrs on        0
     METOUT=   2 (output = METRIC)
     NRUN  = 001
     NSTORM=   0
 ---------------------------------------------------------------------------
 001:0002-------------------------------------------------------------------
 -------------------
 | CHICAGO STORM     |    IDF curve parameters: A= 732.951
 | Ptotal= 31.86 mm |                          B=   6.199
 -------------------                           C=    .810
                          used in:   INTENSITY =  A / (t + B)^C

                          Duration of storm  =  3.00 hrs
                          Storm time step    = 10.00 min
                          Time to peak ratio =   .33

                 TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                  hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                  .17   2.815 |   1.00  76.805 |   1.83   5.095 |   2.67   2.684
                  .33   3.498 |   1.17  24.079 |   2.00   4.291 |   2.83   2.463
                  .50   4.687 |   1.33  12.364 |   2.17   3.718 |   3.00   2.279
                  .67   7.305 |   1.50   8.324 |   2.33   3.288 |
                  .83  18.209 |   1.67   6.303 |   2.50   2.953 |

 ---------------------------------------------------------------------------
 001:0003-------------------------------------------------------------------
 --------------------
 | DEFAULT VALUES      |   Filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\ORGA.VAL
 --------------------      ICASEdv = 1 (read and print data)
       FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
                  ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
       Horton's infiltration equation parameters:
       [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
       Parameters for PERVIOUS surfaces in STANDHYD:
       [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
       Parameters for IMPERVIOUS surfaces in STANDHYD:
       [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
       Parameters used in NASHYD:
       [Ia=   4.67 mm] [N= 3.00]
 ---------------------------------------------------------------------------
 001:0004-------------------------------------------------------------------
 *********************************
 *          ORGAWORLD FILE       *
 *********************************
 *
 * SUB-AREA No.1
 --------------------
 | CALIB STANDHYD      |   Area     (ha)=     2.07
 | 01:010     DT= 2.50 |   Total Imp(%)=    84.00   Dir. Conn.(%)=    84.00
 --------------------
                                  IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=         1.74          .33
      Dep. Storage      (mm)=         1.57         4.67
      Average Slope      (%)=          .52         1.00
      Length             (m)=       204.72        20.00
      Mannings n            =         .030         .250

      Max.eff.Inten.(mm/hr)=         76.81        11.88
                  over (min)         10.00        22.50
      Storage Coeff.   (min)=         8.77 (ii)   22.21 (ii)
      Unit Hyd. Tpeak  (min)=        10.00        22.50
      Unit Hyd. peak   (cms)=          .12          .05
                                                                 *TOTALS*
      PEAK FLOW        (cms)=          .24          .01           .245 (iii)
      TIME TO PEAK     (hrs)=         1.08         1.38          1.083
      RUNOFF VOLUME     (mm)=        30.29         8.52         26.807
      TOTAL RAINFALL    (mm)=        31.86        31.86         31.860
      RUNOFF COEFFICIENT   =           .95          .27           .841

         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0     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.

 ---------------------------------------------------------------------------
 001:0005-------------------------------------------------------------------
 *
 * SUB-AREA No.2
 --------------------
 | CALIB STANDHYD      |   Area     (ha)=     1.54
 | 02:020     DT= 2.50 |   Total Imp(%)=    92.00   Dir. Conn.(%)=    92.00
 --------------------
                                  IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=         1.42          .12
      Dep. Storage      (mm)=         1.57         4.67
      Average Slope      (%)=          .50         1.00
      Length             (m)=       244.34         5.00
      Mannings n            =         .030         .030

      Max.eff.Inten.(mm/hr)=         76.81        15.07
                  over (min)         10.00        12.50
      Storage Coeff.   (min)=         9.87 (ii)   11.36 (ii)
      Unit Hyd. Tpeak  (min)=        10.00        12.50
      Unit Hyd. peak   (cms)=          .11          .10
                                                                 *TOTALS*
      PEAK FLOW        (cms)=          .19          .00           .192 (iii)
      TIME TO PEAK     (hrs)=         1.08         1.17          1.083
      RUNOFF VOLUME     (mm)=        30.29         8.52         28.548
      TOTAL RAINFALL    (mm)=        31.86        31.86         31.860
      RUNOFF COEFFICIENT   =           .95          .27           .896

         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0     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.

 ---------------------------------------------------------------------------
 001:0006-------------------------------------------------------------------
 *
 * SUB-AREA No.3
 --------------------
 | CALIB STANDHYD      |   Area     (ha)=     1.40
 | 03:030     DT= 2.50 |   Total Imp(%)=    97.00   Dir. Conn.(%)=    97.00
 --------------------
                                  IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=         1.36          .04
      Dep. Storage      (mm)=         1.57         4.67
      Average Slope      (%)=          .51         1.00
      Length             (m)=       225.63         5.00
      Mannings n            =         .030         .030

      Max.eff.Inten.(mm/hr)=         76.81        16.59
                  over (min)         10.00        10.00
      Storage Coeff.   (min)=         9.35 (ii)   10.79 (ii)
      Unit Hyd. Tpeak  (min)=        10.00        10.00
      Unit Hyd. peak   (cms)=          .12          .11
                                                                 *TOTALS*
      PEAK FLOW        (cms)=          .18          .00           .186 (iii)
      TIME TO PEAK     (hrs)=         1.08         1.13          1.083
      RUNOFF VOLUME     (mm)=        30.29         8.52         29.637
      TOTAL RAINFALL    (mm)=        31.86        31.86         31.860
      RUNOFF COEFFICIENT   =           .95          .27           .930

         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0     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.

 ---------------------------------------------------------------------------
 001:0007-------------------------------------------------------------------
 -------------------
 | ADD HYD (040   ) | ID: NHYD       AREA      QPEAK   TPEAK   R.V.     DWF
 -------------------                 (ha)      (cms)   (hrs)   (mm)    (cms)
                    ID1 01:010        2.07      .245    1.08  26.81    .000
                   +ID2 02:020        1.54      .192    1.08  28.55    .000
                    ===================================================
                    SUM 04:040        3.61      .436    1.08  27.55    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0008-------------------------------------------------------------------
 -------------------
 | ADD HYD (050   ) | ID: NHYD       AREA      QPEAK   TPEAK   R.V.     DWF
 -------------------                 (ha)      (cms)   (hrs)   (mm)    (cms)
                    ID1 03:030        1.40      .186    1.08  29.64    .000
                   +ID2 04:040        3.61      .436    1.08  27.55    .000
                    ===================================================
                    SUM 05:050        5.01      .623    1.08  28.13    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0009-------------------------------------------------------------------
 *
 * SUB-AREA No.4
 --------------------
 | CALIB STANDHYD      |   Area     (ha)=      .89
 | 06:060     DT= 2.50 |   Total Imp(%)=    97.00   Dir. Conn.(%)=    97.00
 --------------------
                                  IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=          .86          .03
      Dep. Storage      (mm)=         1.57         4.67
      Average Slope      (%)=          .93          .70
      Length             (m)=       164.82        40.00
      Mannings n            =         .030         .250

      Max.eff.Inten.(mm/hr)=         76.81        10.24
                  over (min)          7.50        30.00
      Storage Coeff.   (min)=         6.47 (ii)   30.53 (ii)
```

```
      Unit Hyd. Tpeak (min)=        7.50          30.00
      Unit Hyd. peak  (cms)=         .16            .04
                                                             *TOTALS*
      PEAK FLOW       (cms)=         .14            .00          .139 (iii)
      TIME TO PEAK    (hrs)=        1.04           1.54         1.042
      RUNOFF VOLUME    (mm)=       30.29           8.52        29.637
      TOTAL RAINFALL   (mm)=       31.86          31.86        31.860
      RUNOFF COEFFICIENT   =         .95            .27          .930

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 ----------------------------------------------------------------------------
 001:0010--------------------------------------------------------------------
 *
 * SUB-AREA No.5
 ---------------------
 | CALIB STANDHYD      |   Area    (ha)=    2.66
 | 07:070     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
 ---------------------
                                   IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=        2.58           .08
      Dep. Storage     (mm)=        1.57          4.67
      Average Slope     (%)=         .61          1.50
      Length            (m)=      207.25         20.00
      Mannings n           =        .030          .250

      Max.eff.Inten.(mm/hr)=       76.81         12.71
                 over (min)         7.50         20.00
      Storage Coeff.  (min)=        8.42 (ii)    20.00 (ii)
      Unit Hyd. Tpeak (min)=        7.50         20.00
      Unit Hyd. peak  (cms)=         .14           .06
                                                            *TOTALS*
      PEAK FLOW       (cms)=         .38           .00          .379 (iii)
      TIME TO PEAK    (hrs)=        1.04          1.33         1.042
      RUNOFF VOLUME    (mm)=       30.29          8.52        29.637
      TOTAL RAINFALL   (mm)=       31.86         31.86        31.860
      RUNOFF COEFFICIENT   =         .95           .27          .930

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 ----------------------------------------------------------------------------
 001:0011--------------------------------------------------------------------
 --------------------
 | ADD HYD (080    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
 --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
                    ID1 06:060        .89       .139    1.04  29.64     .000
                   +ID2 07:070       2.66       .379    1.04  29.64     .000
                    ============================================================
                    SUM 08:080       3.55       .518    1.04  29.64     .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ----------------------------------------------------------------------------
 001:0012--------------------------------------------------------------------
 --------------------
 | ADD HYD (090    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
 --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
                    ID1 05:050       5.01       .623    1.08  28.13     .000
                   +ID2 08:080       3.55       .518    1.04  29.64     .000
                    ============================================================
                    SUM 09:090       8.56      1.118    1.08  28.76     .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ----------------------------------------------------------------------------
 001:0013--------------------------------------------------------------------
 ---------------------
 | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
 |   IN>09:(090    )  |
 | OUT<10:(POND    )  |    =========  OUTLFOW STORAGE TABLE  =========
 ---------------------     OUTFLOW     STORAGE   |  OUTFLOW    STORAGE
                            (cms)      (ha.m.)   |   (cms)     (ha.m.)
                              .000  .0000E+00    |     .593  .6251E+00
                              .008  .6560E-01    |     .654  .6631E+00
                              .017  .1311E+00    |     .797  .7391E+00
                              .093  .2831E+00    |     .950  .8274E+00
                              .233  .3971E+00    |    1.304  .9157E+00
                              .337  .4731E+00    |    1.880  .1004E+01
                              .465  .5491E+00    |    2.577  .1092E+01
                              .531  .5871E+00    |     .000  .0000E+00

      ROUTING RESULTS               AREA      QPEAK      TPEAK         R.V.
      --------------------          (ha)      (cms)      (hrs)         (mm)
      INFLOW >09: (090    )         8.56      1.118      1.083       28.757
      OUTFLOW<10: (POND   )         8.56       .056      3.000       28.754

                      PEAK    FLOW    REDUCTION [Qout/Qin](%)=     5.030
                      TIME SHIFT OF PEAK FLOW          (min)=   115.00
                      MAXIMUM   STORAGE    USED       (ha.m.)=.2095E+00

 ----------------------------------------------------------------------------
 001:0014--------------------------------------------------------------------
 *********************************************
 *      Remaining Hawthorne Industrial Park     *
 *********************************************
 *
 * SUB-AREA No.1
 ---------------------
 | CALIB STANDHYD      |   Area    (ha)=   19.90
 | 01:HIP01  DT= 2.50  |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                                   IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=       14.13          5.77
      Dep. Storage     (mm)=        1.57          4.67
      Average Slope     (%)=         .60          1.50
      Length            (m)=      580.00        100.00
      Mannings n           =        .030          .250

      Max.eff.Inten.(mm/hr)=       54.21         23.06
                 over (min)        17.50         42.50
      Storage Coeff.  (min)=       18.04 (ii)    42.02 (ii)
      Unit Hyd. Tpeak (min)=       17.50         42.50
      Unit Hyd. peak  (cms)=         .06           .03
                                                            *TOTALS*
      PEAK FLOW       (cms)=         .95           .21         1.020 (iii)
      TIME TO PEAK    (hrs)=        1.21          1.71         1.250
      RUNOFF VOLUME    (mm)=       30.29         13.34        21.814
      TOTAL RAINFALL   (mm)=       31.86         31.86        31.860
      RUNOFF COEFFICIENT   =         .95           .42          .685

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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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 001:0015--------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP02 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
 --------------------               (ha)      (cms)   (hrs)   (mm)    (cms)
                    ID1 10:POND      8.56       .056    3.00  28.75     .000
                   +ID2 01:HIP01    19.90      1.020    1.25  21.81     .000
                    ============================================================
                    SUM 02:HIP02    28.46      1.039    1.25  23.90     .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ----------------------------------------------------------------------------
 001:0016--------------------------------------------------------------------
 *
 * SUB-AREA No.2
 ---------------------
 | CALIB STANDHYD      |   Area    (ha)=   17.00
 | 03:HIP03  DT= 2.50  |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                                   IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=       12.07          4.93
      Dep. Storage     (mm)=        1.57          4.67
      Average Slope     (%)=         .65          1.50
      Length            (m)=      450.00        100.00
      Mannings n           =        .030          .250

      Max.eff.Inten.(mm/hr)=       59.23         25.04
                 over (min)        15.00         37.50
      Storage Coeff.  (min)=       14.60 (ii)    37.80 (ii)
      Unit Hyd. Tpeak (min)=       15.00         37.50
      Unit Hyd. peak  (cms)=         .08           .03
                                                            *TOTALS*
      PEAK FLOW       (cms)=         .91           .19          .978 (iii)
      TIME TO PEAK    (hrs)=        1.17          1.63         1.167
      RUNOFF VOLUME    (mm)=       30.29         13.34        21.814
      TOTAL RAINFALL   (mm)=       31.86         31.86        31.860
      RUNOFF COEFFICIENT   =         .95           .42          .685

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 ----------------------------------------------------------------------------
 001:0017--------------------------------------------------------------------
 *
 * SUB-AREA No.3
 ---------------------
 | CALIB STANDHYD      |   Area    (ha)=   15.60
 | 04:HIP04  DT= 2.50  |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                                   IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=       11.08          4.52
      Dep. Storage     (mm)=        1.57          4.67
      Average Slope     (%)=         .50          1.50
      Length            (m)=      600.00        100.00
      Mannings n           =        .030          .250

      Max.eff.Inten.(mm/hr)=       50.44         22.17
                 over (min)        20.00         45.00
      Storage Coeff.  (min)=       20.01 (ii)    44.37 (ii)
      Unit Hyd. Tpeak (min)=       20.00         45.00
      Unit Hyd. peak  (cms)=         .06           .03
                                                            *TOTALS*
      PEAK FLOW       (cms)=         .69           .16          .753 (iii)
      TIME TO PEAK    (hrs)=        1.25          1.79         1.292
      RUNOFF VOLUME    (mm)=       30.29         13.34        21.814
      TOTAL RAINFALL   (mm)=       31.86         31.86        31.860
      RUNOFF COEFFICIENT   =         .95           .42          .685

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

 ----------------------------------------------------------------------------
 001:0018--------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP05 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
 --------------------               (ha)      (cms)   (hrs)   (mm)    (cms)
                    ID1 03:HIP03    17.00       .978    1.17  21.81     .000
                   +ID2 04:HIP04    15.60       .753    1.29  21.81     .000
                    ============================================================
                    SUM 05:HIP05    32.60      1.698    1.21  21.81     .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ----------------------------------------------------------------------------
 001:0019--------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP06 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
 --------------------               (ha)      (cms)   (hrs)   (mm)    (cms)
                    ID1 05:HIP05    32.60      1.698    1.21  21.81     .000
                   +ID2 02:HIP02    28.46      1.039    1.25  23.90     .000
                    ============================================================
                    SUM 06:HIP06    61.06      2.733    1.21  22.79     .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ----------------------------------------------------------------------------
 001:0020--------------------------------------------------------------------
 *
 * SUB-AREA No.4
 ---------------------
 | CALIB STANDHYD      |   Area    (ha)=   12.20
 | 07:HIP07  DT= 2.50  |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ---------------------
                                   IMPERVIOUS    PERVIOUS (i)
      Surface Area     (ha)=        8.66          3.54
      Dep. Storage     (mm)=        1.57          4.67
      Average Slope     (%)=         .70          1.50
      Length            (m)=      210.00        100.00
      Mannings n           =        .030          .250

      Max.eff.Inten.(mm/hr)=       76.81         29.02
                 over (min)         7.50         30.00
      Storage Coeff.  (min)=        8.15 (ii)    30.01 (ii)
      Unit Hyd. Tpeak (min)=        7.50         30.00
      Unit Hyd. peak  (cms)=         .14           .04
                                                            *TOTALS*
      PEAK FLOW       (cms)=         .91           .16          .941 (iii)
      TIME TO PEAK    (hrs)=        1.04          1.50         1.042
      RUNOFF VOLUME    (mm)=       30.29         13.34        21.814
      TOTAL RAINFALL   (mm)=       31.86         31.86        31.860
      RUNOFF COEFFICIENT   =         .95           .42          .685

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  81.0    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.

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

```
001:0021-----------------------------------------------------------------------
*
*SUB-AREA No.5
----------------------
| DESIGN NASHYD       |   Area     (ha)=    4.00   Curve Number   (CN)=85.00
| 08:Pond-B DT= 2.50  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
----------------------    U.H. Tp(hrs)=     .170

     Unit Hyd Qpeak  (cms)=      .899

     PEAK FLOW       (cms)=      .145 (i)
     TIME TO PEAK    (hrs)=     1.167
     RUNOFF VOLUME    (mm)=    10.266
     TOTAL RAINFALL   (mm)=    31.860
     RUNOFF COEFFICIENT  =      .322

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

-------------------------------------------------------------------------------
001:0022-----------------------------------------------------------------------
--------------------
| ADD HYD (HIP08 ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
--------------------              (ha)     (cms)   (hrs)   (mm)   (cms)
                 ID1 06:HIP06     61.06    2.733    1.21  22.79    .000
                +ID2 07:HIP07     12.20     .941    1.04  21.81    .000
                +ID3 08:Pond-B     4.00     .145    1.17  10.27    .000
                 ======================================================
                 SUM 09:HIP08     77.26    3.542    1.21  21.98    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0023-----------------------------------------------------------------------
---------------------
| ROUTE RESERVOIR    |     Requested routing time step =  1.0 min.
|  IN>09:(HIP08 )    |
| OUT<10:(HIP-PO)    |     =========  OUTLFOW STORAGE TABLE  =========
---------------------      OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                             (cms)    (ha.m.)   |    (cms)    (ha.m.)
                              .000  .0000E+00   |     .724  .2210E+01
                              .048  .5740E-01   |     .937  .2501E+01
                              .054  .2434E+00   |    1.262  .2798E+01
                              .059  .5834E+00   |    1.404  .3101E+01
                              .062  .8400E+00   |    1.532  .3410E+01
                              .064  .1102E+01   |    1.650  .3724E+01
                              .147  .1370E+01   |    2.409  .4044E+01
                              .280  .1644E+01   |    3.689  .4370E+01
                              .472  .1924E+01   |     .000  .0000E+00

     ROUTING RESULTS               AREA      QPEAK     TPEAK         R.V.
     --------------------          (ha)      (cms)     (hrs)         (mm)
     INFLOW >09: (HIP08 )         77.26      3.542     1.208       21.985
     OUTFLOW<10: (HIP-PO)         77.26       .148     4.014       21.985

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=     4.179
                   TIME SHIFT OF PEAK FLOW          (min)=   168.33
                   MAXIMUM  STORAGE   USED        (ha.m.)=.1373E+01

-------------------------------------------------------------------------------
001:0024-----------------------------------------------------------------------
*
*SUB-AREA No. 6
----------------------
| DESIGN NASHYD       |   Area     (ha)=    2.70   Curve Number   (CN)=76.00
| 01:A3      DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
----------------------    U.H. Tp(hrs)=     .800

     Unit Hyd Qpeak  (cms)=      .129

     PEAK FLOW       (cms)=      .024 (i)
     TIME TO PEAK    (hrs)=     2.083
     RUNOFF VOLUME    (mm)=     6.883
     TOTAL RAINFALL   (mm)=    31.860
     RUNOFF COEFFICIENT  =      .216

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

-------------------------------------------------------------------------------
001:0025-----------------------------------------------------------------------
--------------------
| ADD HYD (Ultima) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
--------------------              (ha)     (cms)   (hrs)   (mm)   (cms)
                 ID1 10:HIP-PO    77.26     .148    4.01  21.98    .000
                +ID2 01:A3         2.70     .024    2.08   6.88    .000
                 ======================================================
                 SUM 02:Ultima    79.96     .156    3.65  21.47    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0026-----------------------------------------------------------------------
***************************************************************
*        CALCULATION OF 3HR - 1:5 YEAR STORM EVENT            *
***************************************************************
--------------------
| START              |  Project  dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
--------------------    Rainfall dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
    TZERO =    .00 hrs on        0
    METOUT=    2 (output = METRIC)
    NRUN   = 001
    NSTORM=    0
-------------------------------------------------------------------------------
001:0002-----------------------------------------------------------------------
--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 998.071
| Ptotal= 42.51 mm |                          B=    6.053
--------------------                          C=     .814
                        used in:    INTENSITY =  A / (t + B)^C

                        Duration of storm   =  3.00 hrs
                        Storm time step     = 10.00 min
                        Time to peak ratio =    .33

              TIME     RAIN |   TIME     RAIN |   TIME     RAIN |   TIME     RAIN
               hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr
               .17    3.682 |   1.00  104.193 |   1.83    6.689 |   2.67    3.510
               .33    4.582 |   1.17   32.037 |   2.00    5.628 |   2.83    3.220
               .50    6.151 |   1.33   16.337 |   2.17    4.872 |   3.00    2.978
               .67    9.614 |   1.50   10.965 |   2.33    4.305 |
               .83   24.170 |   1.67    8.287 |   2.50    3.864 |

-------------------------------------------------------------------------------
001:0003-----------------------------------------------------------------------
----------------------
| DEFAULT VALUES      |   Filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\ORGA.VAL
----------------------    ICASEdv = 1 (read and print data)
      FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
                 ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
      Horton's infiltration equation parameters:
      [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
      Parameters for PERVIOUS surfaces in STANDHYD:
      [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
      Parameters for IMPERVIOUS surfaces in STANDHYD:
      [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
      Parameters used in NASHYD:
      [Ia=   4.67 mm] [N= 3.00]
-------------------------------------------------------------------------------
001:0004-----------------------------------------------------------------------
************************************
*          ORGAWORLD FILE          *
************************************
*
* SUB-AREA No.1
---------------------
| CALIB STANDHYD      |   Area     (ha)=    2.07
| 01:010     DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
---------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.74          .33
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=        .52         1.00
     Length            (m)=     204.72        20.00
     Mannings n           =       .030         .250

     Max.eff.Inten.(mm/hr)=     104.19        24.26
                over (min)        7.50        17.50
     Storage Coeff.  (min)=       7.76 (ii)   17.86 (ii)
     Unit Hyd. Tpeak (min)=       7.50        17.50
     Unit Hyd. peak  (cms)=        .15          .06
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .36          .01          .362 (iii)
     TIME TO PEAK    (hrs)=       1.04         1.25         1.042
     RUNOFF VOLUME    (mm)=      40.94        14.70        36.745
     TOTAL RAINFALL   (mm)=      42.51        42.51        42.514
     RUNOFF COEFFICIENT  =         .96          .35          .864

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-------------------------------------------------------------------------------
001:0005-----------------------------------------------------------------------
*
* SUB-AREA No.2
---------------------
| CALIB STANDHYD      |   Area     (ha)=    1.54
| 02:020     DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
---------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.42          .12
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=        .50         1.00
     Length            (m)=     244.34         5.00
     Mannings n           =       .030         .030

     Max.eff.Inten.(mm/hr)=     104.19        31.02
                over (min)        7.50        10.00
     Storage Coeff.  (min)=       8.73 (ii)    9.85 (ii)
     Unit Hyd. Tpeak (min)=       7.50        10.00
     Unit Hyd. peak  (cms)=        .14          .11
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .28          .01          .283 (iii)
     TIME TO PEAK    (hrs)=       1.04         1.13         1.042
     RUNOFF VOLUME    (mm)=      40.94        14.70        38.845
     TOTAL RAINFALL   (mm)=      42.51        42.51        42.514
     RUNOFF COEFFICIENT  =         .96          .35          .914

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-------------------------------------------------------------------------------
001:0006-----------------------------------------------------------------------
*
* SUB-AREA No.3
---------------------
| CALIB STANDHYD      |   Area     (ha)=    1.40
| 03:030     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
---------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.36          .04
     Dep. Storage     (mm)=       1.57         4.67
     Average Slope     (%)=        .51         1.00
     Length            (m)=     225.63         5.00
     Mannings n           =       .030         .030

     Max.eff.Inten.(mm/hr)=     104.19        31.02
                over (min)        7.50        10.00
     Storage Coeff.  (min)=       8.28 (ii)    9.39 (ii)
     Unit Hyd. Tpeak (min)=       7.50        10.00
     Unit Hyd. peak  (cms)=        .14          .12
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .27          .00          .274 (iii)
     TIME TO PEAK    (hrs)=       1.04         1.13         1.042
     RUNOFF VOLUME    (mm)=      40.94        14.70        40.157
     TOTAL RAINFALL   (mm)=      42.51        42.51        42.514
     RUNOFF COEFFICIENT  =         .96          .35          .945

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-------------------------------------------------------------------------------
001:0007-----------------------------------------------------------------------
--------------------
| ADD HYD (040   ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
--------------------              (ha)     (cms)   (hrs)   (mm)   (cms)
                 ID1 01:010        2.07     .362    1.04  36.75    .000
                +ID2 02:020        1.54     .283    1.04  38.84    .000
                 ======================================================
                 SUM 04:040        3.61     .645    1.04  37.64    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0008-----------------------------------------------------------------------
--------------------
| ADD HYD (050   ) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.    DWF
--------------------              (ha)     (cms)   (hrs)   (mm)   (cms)
                 ID1 03:030        1.40     .274    1.04  40.16    .000
                +ID2 04:040        3.61     .645    1.04  37.64    .000
                 ======================================================
                 SUM 05:050        5.01     .918    1.04  38.34    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0009-----------------------------------------------------------------------
*
* SUB-AREA No.4
---------------------
| CALIB STANDHYD      |   Area     (ha)=     .89
| 06:060     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
---------------------
```

```
01351>                              IMPERVIOUS   PERVIOUS (i)
01352>      Surface Area     (ha)=       .86          .03
01353>      Dep. Storage     (mm)=      1.57         4.67
01354>      Average Slope     (%)=       .93          .70
01355>      Length            (m)=    164.82        40.00
01356>      Mannings n           =      .030         .250
01357>
01358>      Max.eff.Inten.(mm/hr)=    104.19        20.32
01359>                over (min)        5.00        25.00
01360>      Storage Coeff.  (min)=      5.72 (ii)   24.02 (ii)
01361>      Unit Hyd. Tpeak (min)=      5.00        25.00
01362>      Unit Hyd. peak  (cms)=       .20          .05
01363>                                                          *TOTALS*
01364>      PEAK FLOW       (cms)=       .20          .00          .205 (iii)
01365>      TIME TO PEAK    (hrs)=      1.00         1.38         1.000
01366>      RUNOFF VOLUME    (mm)=     40.94        14.70        40.157
01367>      TOTAL RAINFALL   (mm)=     42.51        42.51        42.514
01368>      RUNOFF COEFFICIENT   =       .96          .35          .945
01369>
01370>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01371>            CN* =  81.0    Ia = Dep. Storage  (Above)
01372>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01373>            THAN THE STORAGE COEFFICIENT.
01374>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01375>
01376> ---------------------------------------------------------------------------
01377> 001:0010-------------------------------------------------------------------
01378> *
01379> * SUB-AREA No.5
01380> ---------------------
01381> | CALIB STANDHYD     |   Area    (ha)=    2.66
01382> | 07:070    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
01383> ---------------------
01384>                             ,IMPERVIOUS   PERVIOUS (i)
01385>      Surface Area     (ha)=      2.58          .08
01386>      Dep. Storage     (mm)=      1.57         4.67
01387>      Average Slope     (%)=       .61         1.50
01388>      Length            (m)=    207.25        20.00
01389>      Mannings n           =      .030         .250
01390>
01391>      Max.eff.Inten.(mm/hr)=    104.19        24.26
01392>                over (min)        7.50        17.50
01393>      Storage Coeff.  (min)=      7.45 (ii)   16.40 (ii)
01394>      Unit Hyd. Tpeak (min)=      7.50        17.50
01395>      Unit Hyd. peak  (cms)=       .15          .07
01396>                                                          *TOTALS*
01397>      PEAK FLOW       (cms)=       .54          .00          .538 (iii)
01398>      TIME TO PEAK    (hrs)=      1.04         1.25         1.042
01399>      RUNOFF VOLUME    (mm)=     40.94        14.70        40.157
01400>      TOTAL RAINFALL   (mm)=     42.51        42.51        42.514
01401>      RUNOFF COEFFICIENT   =       .96          .35          .945
01402>
01403>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01404>            CN* =  81.0    Ia = Dep. Storage  (Above)
01405>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01406>            THAN THE STORAGE COEFFICIENT.
01407>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01408>
01409> ---------------------------------------------------------------------------
01410> 001:0011-------------------------------------------------------------------
01411> --------------------
01412> | ADD HYD (080    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
01413> --------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
01414>                  ID1 06:060         .89      .205    1.00  40.16    .000
01415>                 +ID2 07:070        2.66      .538    1.04  40.16    .000
01416>                  =======================================================
01417>                  SUM 08:080        3.55   .  .733    1.04  40.16    .000
01418>
01419>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01420>
01421> ---------------------------------------------------------------------------
01422> 001:0012-------------------------------------------------------------------
01423> --------------------
01424> | ADD HYD (090    ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
01425> --------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
01426>                  ID1 05:050        5.01      .918    1.04  38.34    .000
01427>                 +ID2 08:080        3.55      .733    1.04  40.16    .000
01428>                  =======================================================
01429>                  SUM 09:090        8.56     1.651    1.04  39.10    .000
01430>
01431>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01432>
01433> ---------------------------------------------------------------------------
01434> 001:0013-------------------------------------------------------------------
01435> ---------------------
01436> | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
01437> |  IN>09:(090   )    |
01438> | OUT<10:(POND  )    |    =========  OUTLFOW STORAGE TABLE  =========
01439> ---------------------     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
01440>                             (cms)    (ha.m.)   |   (cms)     (ha.m.)
01441>                              .000  .0000E+00   |     .593  .6251E+00
01442>                              .008  .6560E-01   |     .654  .6631E+00
01443>                              .017  .1311E+00   |     .797  .7391E+00
01444>                              .093  .2831E+00   |     .950  .8274E+00
01445>                              .233  .3971E+00   |    1.304  .9157E+00
01446>                              .337  .4731E+00   |    1.880  .1004E+01
01447>                              .465  .5491E+00   |    2.577  .1092E+01
01448>                              .531  .5871E+00   |     .000  .0000E+00
01449>
01450>      ROUTING RESULTS             AREA     QPEAK      TPEAK        R.V.
01451>      -------------------         (ha)     (cms)      (hrs)        (mm)
01452>      INFLOW >09: (090   )        8.56     1.651      1.042      39.096
01453>      OUTFLOW<10: (POND  )        8.56      .089      2.625      39.093
01454>
01455>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=     5.413
01456>                     TIME SHIFT OF PEAK FLOW         (min)=     95.00
01457>                     MAXIMUM  STORAGE   USED       (ha.m.)=.2758E+00
01458>
01459> ---------------------------------------------------------------------------
01460> 001:0014-------------------------------------------------------------------
01461> *********************************************
01462> *     Remaining Hawthorne Industrial Park    *
01463> *********************************************
01464> *
01465> * SUB-AREA No.1
01466> ---------------------
01467> | CALIB STANDHYD     |   Area    (ha)=   19.90
01468> | 01:HIP01  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
01469> ---------------------
01470>                              IMPERVIOUS   PERVIOUS (i)
01471>      Surface Area     (ha)=     14.13         5.77
01472>      Dep. Storage     (mm)=      1.57         4.67
01473>      Average Slope     (%)=       .60         1.50
01474>      Length            (m)=    580.00       100.00
01475>      Mannings n           =      .030         .250
01476>
01477>      Max.eff.Inten.(mm/hr)=     80.14        42.65
01478>                over (min)       15.00        35.00
01479>      Storage Coeff.  (min)=     15.43 (ii)   34.18 (ii)
01480>      Unit Hyd. Tpeak (min)=     15.00        35.00
01481>      Unit Hyd. peak  (cms)=       .07          .03
01482>                                                          *TOTALS*
01483>      PEAK FLOW       (cms)=      1.41          .40         1.572 (iii)
01484>      TIME TO PEAK    (hrs)=      1.17         1.54         1.208
01485>      RUNOFF VOLUME    (mm)=     40.94        21.31        31.126
01486>      TOTAL RAINFALL   (mm)=     42.51        42.51        42.514
01487>      RUNOFF COEFFICIENT   =       .96          .50          .732
01488>
01489>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01490>            CN* =  81.0    Ia = Dep. Storage  (Above)
01491>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01492>            THAN THE STORAGE COEFFICIENT.
01493>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01494>
01495> ---------------------------------------------------------------------------
01496> 001:0015-------------------------------------------------------------------
01497> --------------------
01498> | ADD HYD (HIP02 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
01499> --------------------               (ha)      (cms)   (hrs)   (mm)   (cms)
01500>                  ID1 10:POND       8.56      .089    2.63  39.09    .000
01501>                 +ID2 01:HIP01     19.90     1.572    1.21  31.13    .000
01502>                  =======================================================
01503>                  SUM 02:HIP02     28.46     1.615    1.21  33.52    .000
01504>
01505>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01506>
01507> ---------------------------------------------------------------------------
01508> 001:0016-------------------------------------------------------------------
01509> *
01510> * SUB-AREA No.2
01511> ---------------------
01512> | CALIB STANDHYD     |   Area    (ha)=   17.00
01513> | 03:HIP03  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
01514> ---------------------
01515>                              IMPERVIOUS   PERVIOUS (i)
01516>      Surface Area     (ha)=     12.07         4.93
01517>      Dep. Storage     (mm)=      1.57         4.67
01518>      Average Slope     (%)=       .65         1.50
01519>      Length            (m)=    450.00       100.00
01520>      Mannings n           =      .030         .250
01521>
01522>      Max.eff.Inten.(mm/hr)=     89.76        47.48
01523>                over (min)       12.50        30.00
01524>      Storage Coeff.  (min)=     12.36 (ii)   30.32 (ii)
01525>      Unit Hyd. Tpeak (min)=     12.50        30.00
01526>      Unit Hyd. peak  (cms)=       .09          .04
01527>                                                          *TOTALS*
01528>      PEAK FLOW       (cms)=      1.36          .37         1.504 (iii)
01529>      TIME TO PEAK    (hrs)=      1.13         1.46         1.167
01530>      RUNOFF VOLUME    (mm)=     40.94        21.31        31.126
01531>      TOTAL RAINFALL   (mm)=     42.51        42.51        42.514
01532>      RUNOFF COEFFICIENT   =       .96          .50          .732
01533>
01534>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01535>            CN* =  81.0    Ia = Dep. Storage  (Above)
01536>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01537>            THAN THE STORAGE COEFFICIENT.
01538>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01539>
01540> ---------------------------------------------------------------------------
01541> 001:0017-------------------------------------------------------------------
01542> *
01543> * SUB-AREA No.3
01544> ---------------------
01545> | CALIB STANDHYD     |   Area    (ha)=   15.60
01546> | 04:HIP04  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
01547> ---------------------
01548>                              IMPERVIOUS   PERVIOUS (i)
01549>      Surface Area     (ha)=     11.08         4.52
01550>      Dep. Storage     (mm)=      1.57         4.67
01551>      Average Slope     (%)=       .50         1.50
01552>      Length            (m)=    600.00       100.00
01553>      Mannings n           =      .030         .250
01554>
01555>      Max.eff.Inten.(mm/hr)=     73.27        42.65
01556>                over (min)       17.50        35.00
01557>      Storage Coeff.  (min)=     17.24 (ii)   35.98 (ii)
01558>      Unit Hyd. Tpeak (min)=     17.50        35.00
01559>      Unit Hyd. peak  (cms)=       .07          .03
01560>                                                          *TOTALS*
01561>      PEAK FLOW       (cms)=      1.03          .30         1.176 (iii)
01562>      TIME TO PEAK    (hrs)=      1.21         1.54         1.250
01563>      RUNOFF VOLUME    (mm)=     40.94        21.31        31.126
01564>      TOTAL RAINFALL   (mm)=     42.51        42.51        42.514
01565>      RUNOFF COEFFICIENT   =       .96          .50          .732
01566>
01567>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01568>            CN* =  81.0    Ia = Dep. Storage  (Above)
01569>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01570>            THAN THE STORAGE COEFFICIENT.
01571>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01572>
01573> ---------------------------------------------------------------------------
01574> 001:0018-------------------------------------------------------------------
01575> --------------------
01576> | ADD HYD (HIP05 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
01577> --------------------               (ha)      (cms)   (hrs)   (mm)   (cms)
01578>                  ID1 03:HIP03     17.00     1.504    1.17  31.13    .000
01579>                 +ID2 04:HIP04     15.60     1.176    1.25  31.13    .000
01580>                  =======================================================
01581>                  SUM 05:HIP05     32.60     2.621    1.17  31.13    .000
01582>
01583>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01584>
01585> ---------------------------------------------------------------------------
01586> 001:0019-------------------------------------------------------------------
01587> --------------------
01588> | ADD HYD (HIP06 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
01589> --------------------               (ha)      (cms)   (hrs)   (mm)   (cms)
01590>                  ID1 05:HIP05     32.60     2.621    1.17  31.13    .000
01591>                 +ID2 02:HIP02     28.46     1.615    1.21  33.52    .000
01592>                  =======================================================
01593>                  SUM 06:HIP06     61.06     4.222    1.17  32.24    .000
01594>
01595>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01596>
01597> ---------------------------------------------------------------------------
01598> 001:0020-------------------------------------------------------------------
01599> *
01600> * SUB-AREA No.4
01601> ---------------------
01602> | CALIB STANDHYD     |   Area    (ha)=   12.20
01603> | 07:HIP07  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
01604> ---------------------
01605>                              IMPERVIOUS   PERVIOUS (i)
01606>      Surface Area     (ha)=      8.66         3.54
01607>      Dep. Storage     (mm)=      1.57         4.67
01608>      Average Slope     (%)=       .70         1.50
01609>      Length            (m)=    210.00       100.00
01610>      Mannings n           =      .030         .250
01611>
01612>      Max.eff.Inten.(mm/hr)=    104.19        52.96
01613>                over (min)        7.50        25.00
01614>      Storage Coeff.  (min)=      7.21 (ii)   24.40 (ii)
01615>      Unit Hyd. Tpeak (min)=      7.50        25.00
01616>      Unit Hyd. peak  (cms)=       .15          .05
01617>                                                          *TOTALS*
01618>      PEAK FLOW       (cms)=      1.28          .31         1.375 (iii)
01619>      TIME TO PEAK    (hrs)=      1.04         1.38         1.042
01620>      RUNOFF VOLUME    (mm)=     40.94        21.31        31.126
```

```
      TOTAL RAINFALL   (mm)=      42.51          42.51           42.514
      RUNOFF COEFFICIENT   =        .96            .50             .732

         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

-------------------------------------------------------------------------------
001:0021-----------------------------------------------------------------------
*
*SUB-AREA No.5
----------------------
| DESIGN NASHYD       |   Area     (ha)=    4.00   Curve Number   (CN)=85.00
| 08:Pond-B DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .170

      Unit Hyd Qpeak  (cms)=     .899

      PEAK FLOW       (cms)=     .260 (i)
      TIME TO PEAK    (hrs)=    1.167
      RUNOFF VOLUME    (mm)=   17.325
      TOTAL RAINFALL   (mm)=   42.514
      RUNOFF COEFFICIENT   =     .408

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

-------------------------------------------------------------------------------
001:0022-----------------------------------------------------------------------
--------------------
| ADD HYD (HIP08 ) | ID: NHYD      AREA     QPEAK    TPEAK   R.V.    DWF
--------------------                (ha)     (cms)    (hrs)   (mm)   (cms)
                  ID1 06:HIP06     61.06    4.222     1.17  32.24    .000
                 +ID2 07:HIP07     12.20    1.375     1.04  31.13    .000
                 +ID3 08:Pond-B     4.00     .260     1.17  17.32    .000
                  ==================================================
                  SUM 09:HIP08     77.26    5.545     1.17  31.29    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0023-----------------------------------------------------------------------
----------------------
| ROUTE RESERVOIR     |    Requested routing time step =  1.0 min.
|  IN>09:(HIP08 )    |
| OUT<10:(HIP-PO)    |    =========  OUTLFOW STORAGE TABLE  =========
----------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)     (ha.m.)   |   (cms)     (ha.m.)
                            .000  .0000E+00   |     .724  .2210E+01
                            .048  .5740E-01   |     .937  .2501E+01
                            .054  .2434E+00   |    1.262  .2798E+01
                            .059  .5834E+00   |    1.404  .3101E+01
                            .062  .8400E+00   |    1.532  .3410E+01
                            .064  .1102E+01   |    1.650  .3724E+01
                            .147  .1370E+01   |    2.409  .4044E+01
                            .280  .1644E+01   |    3.689  .4370E+01
                            .472  .1924E+01   |     .000  .0000E+00

      ROUTING RESULTS               AREA      QPEAK      TPEAK        R.V.
      --------------------          (ha)      (cms)      (hrs)        (mm)
      INFLOW >09: (HIP08 )        77.26      5.545      1.167      31.292
      OUTFLOW<10: (HIP-PO)        77.26       .435      3.389      31.292

                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=    7.850
                     TIME SHIFT OF PEAK FLOW          (min)=   133.33
                     MAXIMUM  STORAGE   USED        (ha.m.)=.1871E+01

-------------------------------------------------------------------------------
001:0024-----------------------------------------------------------------------
*
*SUB-AREA No. 6
----------------------
| DESIGN NASHYD       |   Area     (ha)=    2.70   Curve Number   (CN)=76.00
| 01:A3      DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .800

      Unit Hyd Qpeak  (cms)=     .129

      PEAK FLOW       (cms)=     .044 (i)
      TIME TO PEAK    (hrs)=    2.042
      RUNOFF VOLUME    (mm)=   12.131
      TOTAL RAINFALL   (mm)=   42.514
      RUNOFF COEFFICIENT   =     .285

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

-------------------------------------------------------------------------------
001:0025-----------------------------------------------------------------------
--------------------
| ADD HYD (Ultima) | ID: NHYD      AREA     QPEAK    TPEAK   R.V.    DWF
--------------------                (ha)     (cms)    (hrs)   (mm)   (cms)
                  ID1 10:HIP-PO    77.26     .435     3.39  31.29    .000
                 +ID2 01:A3         2.70     .044     2.04  12.13    .000
                  ==================================================
                  SUM 02:Ultima    79.96     .457     3.29  30.65    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0026-----------------------------------------------------------------------
**************************************************************
*        CALCULATION OF 3HR - 1:10 YEAR STORM EVENT          *
**************************************************************
--------------------
| START             |  Project  dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
--------------------  Rainfall dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   0
-------------------------------------------------------------------------------
001:0002-----------------------------------------------------------------------
--------------------
| CHICAGO STORM     |    IDF curve parameters: A=1174.184
| Ptotal= 49.50 mm |                          B=   6.014
--------------------                          C=    .816
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  3.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =    .33

                 TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                  hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                  .17   4.248 |   1.00 122.142 |   1.83   7.733 |   2.67   4.049
                  .33   5.290 |   1.17  37.285 |   2.00   6.502 |   2.83   3.714
                  .50   7.108 |   1.33  18.954 |   2.17   5.625 |   3.00   3.434
                  .67  11.130 |   1.50  12.700 |   2.33   4.969 |
                  .83  28.100 |   1.67   9.588 |   2.50   4.458 |

-------------------------------------------------------------------------------
001:0003-----------------------------------------------------------------------
--------------------
| DEFAULT VALUES      |  Filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\ORGA.VAL
--------------------  ICASEdv = 1 (read and print data)
      FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
                 ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
      Horton's infiltration equation parameters:
      [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
      Parameters for PERVIOUS surfaces in STANDHYD:
      [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
      Parameters for IMPERVIOUS surfaces in STANDHYD:
      [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
      Parameters used in NASHYD:
      [Ia=   4.67 mm] [N= 3.00]
-------------------------------------------------------------------------------
001:0004-----------------------------------------------------------------------
************************************
*           ORGAWORLD FILE         *
************************************
*
* SUB-AREA No.1
----------------------
| CALIB STANDHYD      |   Area     (ha)=    2.07
| 01:010     DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
----------------------
                                    IMPERVIOUS    PERVIOUS (i)
      Surface Area       (ha)=        1.74           .33
      Dep. Storage       (mm)=        1.57          4.67
      Average Slope       (%)=         .52          1.00
      Length              (m)=      204.72         20.00
      Mannings n             =        .030          .250

      Max.eff.Inten.(mm/hr)=      122.14         34.69
                over (min)          7.50         15.00
      Storage Coeff.  (min)=        7.28 (ii)    16.04 (ii)
      Unit Hyd. Tpeak (min)=        7.50         15.00
      Unit Hyd. peak  (cms)=         .15           .07
                                                                 *TOTALS*
      PEAK FLOW       (cms)=         .43           .02             .437 (iii)
      TIME TO PEAK    (hrs)=        1.04          1.21            1.042
      RUNOFF VOLUME    (mm)=       47.93         19.25           43.345
      TOTAL RAINFALL   (mm)=       49.50         49.50           49.505
      RUNOFF COEFFICIENT   =         .97           .39             .876

         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

-------------------------------------------------------------------------------
001:0005-----------------------------------------------------------------------
*
* SUB-AREA No.2
----------------------
| CALIB STANDHYD      |   Area     (ha)=    1.54
| 02:020     DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
----------------------
                                    IMPERVIOUS    PERVIOUS (i)
      Surface Area       (ha)=        1.42           .12
      Dep. Storage       (mm)=        1.57          4.67
      Average Slope       (%)=         .50          1.00
      Length              (m)=      244.34          5.00
      Mannings n             =        .030          .030

      Max.eff.Inten.(mm/hr)=      122.14         42.32
                over (min)          7.50         10.00
      Storage Coeff.  (min)=        8.20 (ii)     9.18 (ii)
      Unit Hyd. Tpeak (min)=        7.50         10.00
      Unit Hyd. peak  (cms)=         .14           .12
                                                                 *TOTALS*
      PEAK FLOW       (cms)=         .33           .01             .341 (iii)
      TIME TO PEAK    (hrs)=        1.04          1.13            1.042
      RUNOFF VOLUME    (mm)=       47.93         19.25           45.640
      TOTAL RAINFALL   (mm)=       49.50         49.50           49.505
      RUNOFF COEFFICIENT   =         .97           .39             .922

         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

-------------------------------------------------------------------------------
001:0006-----------------------------------------------------------------------
*
* SUB-AREA No.3
----------------------
| CALIB STANDHYD      |   Area     (ha)=    1.40
| 03:030     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
----------------------
                                    IMPERVIOUS    PERVIOUS (i)
      Surface Area       (ha)=        1.36           .04
      Dep. Storage       (mm)=        1.57          4.67
      Average Slope       (%)=         .51          1.00
      Length              (m)=      225.63          5.00
      Mannings n             =        .030          .030

      Max.eff.Inten.(mm/hr)=      122.14         48.18
                over (min)          7.50          7.50
      Storage Coeff.  (min)=        7.77 (ii)     8.70 (ii)
      Unit Hyd. Tpeak (min)=        7.50          7.50
      Unit Hyd. peak  (cms)=         .15           .14
                                                                 *TOTALS*
      PEAK FLOW       (cms)=         .33           .00             .329 (iii)
      TIME TO PEAK    (hrs)=        1.04          1.08            1.042
      RUNOFF VOLUME    (mm)=       47.93         19.25           47.074
      TOTAL RAINFALL   (mm)=       49.50         49.50           49.505
      RUNOFF COEFFICIENT   =         .97           .39             .951

         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

-------------------------------------------------------------------------------
001:0007-----------------------------------------------------------------------
--------------------
| ADD HYD (040    ) | ID: NHYD      AREA     QPEAK    TPEAK   R.V.    DWF
--------------------                (ha)     (cms)    (hrs)   (mm)   (cms)
                  ID1 01:010        2.07     .437     1.04  43.35    .000
                 +ID2 02:020        1.54     .341     1.04  45.64    .000
                  ==================================================
                  SUM 04:040        3.61     .778     1.04  44.32    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
001:0008-----------------------------------------------------------------------
--------------------
| ADD HYD (050    ) | ID: NHYD      AREA     QPEAK    TPEAK   R.V.    DWF
--------------------                (ha)     (cms)    (hrs)   (mm)   (cms)
                  ID1 03:030        1.40     .329     1.04  47.07    .000
                 +ID2 04:040        3.61     .778     1.04  44.32    .000
                  ==================================================
                  SUM 05:050        5.01    1.107     1.04  45.09    .000

```

```
02161>
02162>      Max.eff.Inten.(mm/hr)=     122.14          72.53
02163>                 over (min)        7.50          22.50
02164>      Storage Coeff.  (min)=       6.77 (ii)     21.93 (ii)
02165>      Unit Hyd. Tpeak (min)=       7.50          22.50
02166>      Unit Hyd. peak  (cms)=        .16            .05
02167>                                                              *TOTALS*
02168>      PEAK FLOW       (cms)=       1.54            .42          1.687 (iii)
02169>      TIME TO PEAK    (hrs)=       1.04           1.33          1.042
02170>      RUNOFF VOLUME    (mm)=      47.93          26.92         37.426
02171>      TOTAL RAINFALL   (mm)=      49.50          49.50         49.505
02172>      RUNOFF COEFFICIENT   =        .97            .54           .756
02173>
02174>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02175>            CN* =  81.0    Ia = Dep. Storage  (Above)
02176>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02177>            THAN THE STORAGE COEFFICIENT.
02178>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02179>
02180> ----------------------------------------------------------------------
02181> 001:0021--------------------------------------------------------------
02182> *
02183> *SUB-AREA No.5
02184> ---------------------
02185> | DESIGN NASHYD      |   Area     (ha)=    4.00   Curve Number   (CN)=85.00
02186> | 08:Pond-B DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
02187> ---------------------   U.H. Tp(hrs)=     .170
02188>
02189>      Unit Hyd Qpeak  (cms)=      .899
02190>
02191>      PEAK FLOW       (cms)=      .345 (i)
02192>      TIME TO PEAK    (hrs)=     1.167
02193>      RUNOFF VOLUME    (mm)=    22.420
02194>      TOTAL RAINFALL   (mm)=    49.505
02195>      RUNOFF COEFFICIENT   =      .453
02196>
02197>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02198>
02199> ----------------------------------------------------------------------
02200> 001:0022--------------------------------------------------------------
02201> --------------------
02202> | ADD HYD (HIP08 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
02203> --------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
02204>                  ID1 06:HIP06      61.06     5.358    1.17  38.61    .000
02205>                 +ID2 07:HIP07      12.20     1.687    1.04  37.43    .000
02206>                 +ID3 08:Pond-B      4.00      .345    1.17  22.42    .000
02207>                  ====================================================
02208>                  SUM 09:HIP08      77.26     7.016    1.17  37.59    .000
02209>
02210>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02211>
02212> ----------------------------------------------------------------------
02213> 001:0023--------------------------------------------------------------
02214> ---------------------
02215> | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
02216> |   IN>09:(HIP08 )   |
02217> | OUT<10:(HIP-PO)    |    =========  OUTLFOW STORAGE TABLE  =========
02218> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
02219>                            (cms)     (ha.m.)   |   (cms)     (ha.m.)
02220>                             .000  .0000E+00   |     .724  .2210E+01
02221>                             .048  .5740E-01   |     .937  .2501E+01
02222>                             .054  .2434E+00   |    1.262  .2798E+01
02223>                             .059  .5834E+00   |    1.404  .3101E+01
02224>                             .062  .8400E+00   |    1.532  .3410E+01
02225>                             .064  .1102E+01   |    1.650  .3724E+01
02226>                             .147  .1370E+01   |    2.409  .4044E+01
02227>                             .280  .1644E+01   |    3.689  .4370E+01
02228>                             .472  .1924E+01   |     .000  .0000E+00
02229>
02230>      ROUTING RESULTS            AREA      QPEAK      TPEAK        R.V.
02231>      --------------------       (ha)      (cms)      (hrs)        (mm)
02232>      INFLOW >09: (HIP08 )      77.26      7.016      1.167      37.588
02233>      OUTFLOW<10: (HIP-PO)      77.26       .696      3.208      37.588
02234>
02235>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    9.919
02236>                    TIME SHIFT OF PEAK FLOW          (min)=  122.50
02237>                    MAXIMUM  STORAGE   USED        (ha.m.)=.2178E+01
02238>
02239> ----------------------------------------------------------------------
02240> 001:0024--------------------------------------------------------------
02241> *
02242> *SUB-AREA No. 6
02243> ---------------------
02244> | DESIGN NASHYD      |   Area     (ha)=    2.70   Curve Number   (CN)=76.00
02245> | 01:A3     DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
02246> ---------------------   U.H. Tp(hrs)=     .800
02247>
02248>      Unit Hyd Qpeak  (cms)=      .129
02249>
02250>      PEAK FLOW       (cms)=      .059 (i)
02251>      TIME TO PEAK    (hrs)=     2.000
02252>      RUNOFF VOLUME    (mm)=    16.075
02253>      TOTAL RAINFALL   (mm)=    49.505
02254>      RUNOFF COEFFICIENT   =      .325
02255>
02256>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02257>
02258> ----------------------------------------------------------------------
02259> 001:0025--------------------------------------------------------------
02260> --------------------
02261> | ADD HYD (Ultima) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
02262> --------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
02263>                  ID1 10:HIP-PO     77.26      .696    3.21  37.59    .000
02264>                 +ID2 01:A3          2.70      .059    2.00  16.08    .000
02265>                  ====================================================
02266>                  SUM 02:Ultima     79.96      .729    3.15  36.86    .000
02267>
02268>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02269>
02270> ----------------------------------------------------------------------
02271> 001:0026--------------------------------------------------------------
02272> ***********************************************************
02273> *       CALCULATION OF 3HR - 1:25 YEAR STORM EVENT        *
02274> ***********************************************************
02275> --------------------
02276> | START            |  Project  dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
02277> --------------------  Rainfall dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
02278>     TZERO =   .00 hrs on       0
02279>     METOUT=   2 (output = METRIC)
02280>     NRUN  = 001
02281>     NSTORM=   0
02282> ----------------------------------------------------------------------
02283> 001:0002--------------------------------------------------------------
02284> --------------------
02285> | CHICAGO STORM    |     IDF curve parameters: A=1402.884
02286> | Ptotal= 58.23 mm |                           B=   6.018
02287> --------------------                           C=    .819
02288>                        used in:    INTENSITY =  A / (t + B)^C
02289>
02290>                        Duration of storm    =  3.00 hrs
02291>                        Storm time step      = 10.00 min
02292>                        Time to peak ratio =    .33
02293>
02294>              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
02295>               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
02296>               .17   4.934 |   1.00 144.693 |   1.83   9.014 |   2.67   4.701
02297>               .33   6.152 |   1.17  43.904 |   2.00   7.571 |   2.83   4.310
02298>               .50   8.282 |   1.33  22.224 |   2.17   6.544 |   3.00   3.983
02299>               .67  13.006 |   1.50  14.852 |   2.33   5.776 |
02300>               .83  33.041 |   1.67  11.192 |   2.50   5.179 |
02301>
02302> ----------------------------------------------------------------------
02303> 001:0003--------------------------------------------------------------
02304> ---------------------
02305> | DEFAULT VALUES      |  Filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\ORGA.VAL
02306> ---------------------  ICASEdv = 1 (read and print data)
02307>      FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
02308>                 ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
02309>      Horton's infiltration equation parameters:
02310>      [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
02311>      Parameters for PERVIOUS surfaces in STANDHYD:
02312>      [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
02313>      Parameters for IMPERVIOUS surfaces in STANDHYD:
02314>      [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
02315>      Parameters used in NASHYD:
02316>      [Ia=   4.67 mm] [N= 3.00]
02317> ----------------------------------------------------------------------
02318> 001:0004--------------------------------------------------------------
02319> **********************************
02320> *          ORGAWORLD FILE        *
02321> **********************************
02322> *
02323> * SUB-AREA No.1
02324> ---------------------
02325> | CALIB STANDHYD     |   Area    (ha)=    2.07
02326> | 01:010    DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
02327> ---------------------
02328>                                   IMPERVIOUS    PERVIOUS (i)
02329>      Surface Area      (ha)=         1.74          .33
02330>      Dep. Storage      (mm)=         1.57         4.67
02331>      Average Slope      (%)=          .52         1.00
02332>      Length             (m)=       204.72        20.00
02333>      Mannings n            =         .030         .250
02334>
02335>      Max.eff.Inten.(mm/hr)=       144.69        47.07
02336>                 over (min)         7.50        15.00
02337>      Storage Coeff.  (min)=         6.81 (ii)    14.56 (ii)
02338>      Unit Hyd. Tpeak (min)=         7.50        15.00
02339>      Unit Hyd. peak  (cms)=          .16          .08
02340>                                                              *TOTALS*
02341>      PEAK FLOW       (cms)=          .52          .03            .532 (iii)
02342>      TIME TO PEAK    (hrs)=         1.04         1.21           1.042
02343>      RUNOFF VOLUME    (mm)=        56.66        25.35          51.647
02344>      TOTAL RAINFALL   (mm)=        58.23        58.23          58.226
02345>      RUNOFF COEFFICIENT   =          .97          .44            .887
02346>
02347>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02348>            CN* =  81.0    Ia = Dep. Storage  (Above)
02349>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02350>            THAN THE STORAGE COEFFICIENT.
02351>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02352>
02353> ----------------------------------------------------------------------
02354> 001:0005--------------------------------------------------------------
02355> *
02356> * SUB-AREA No.2
02357> ---------------------
02358> | CALIB STANDHYD     |   Area    (ha)=    1.54
02359> | 02:020    DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
02360> ---------------------
02361>                                   IMPERVIOUS    PERVIOUS (i)
02362>      Surface Area      (ha)=         1.42          .12
02363>      Dep. Storage      (mm)=         1.57         4.67
02364>      Average Slope      (%)=          .50         1.00
02365>      Length             (m)=       244.34         5.00
02366>      Mannings n            =         .030         .030
02367>
02368>      Max.eff.Inten.(mm/hr)=       144.69        65.19
02369>                 over (min)         7.50         7.50
02370>      Storage Coeff.  (min)=         7.66 (ii)     8.49 (ii)
02371>      Unit Hyd. Tpeak (min)=         7.50         7.50
02372>      Unit Hyd. peak  (cms)=          .15          .14
02373>                                                              *TOTALS*
02374>      PEAK FLOW       (cms)=          .40          .01            .418 (iii)
02375>      TIME TO PEAK    (hrs)=         1.04         1.08           1.042
02376>      RUNOFF VOLUME    (mm)=        56.66        25.35          54.152
02377>      TOTAL RAINFALL   (mm)=        58.23        58.23          58.226
02378>      RUNOFF COEFFICIENT   =          .97          .44            .930
02379>
02380>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02381>            CN* =  81.0    Ia = Dep. Storage  (Above)
02382>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02383>            THAN THE STORAGE COEFFICIENT.
02384>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02385>
02386> ----------------------------------------------------------------------
02387> 001:0006--------------------------------------------------------------
02388> *
02389> * SUB-AREA No.3
02390> ---------------------
02391> | CALIB STANDHYD     |   Area    (ha)=    1.40
02392> | 03:030    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
02393> ---------------------
02394>                                   IMPERVIOUS    PERVIOUS (i)
02395>      Surface Area      (ha)=         1.36          .04
02396>      Dep. Storage      (mm)=         1.57         4.67
02397>      Average Slope      (%)=          .51         1.00
02398>      Length             (m)=       225.63         5.00
02399>      Mannings n            =         .030         .030
02400>
02401>      Max.eff.Inten.(mm/hr)=       144.69        65.19
02402>                 over (min)         7.50         7.50
02403>      Storage Coeff.  (min)=         7.26 (ii)     8.09 (ii)
02404>      Unit Hyd. Tpeak (min)=         7.50         7.50
02405>      Unit Hyd. peak  (cms)=          .15          .14
02406>                                                              *TOTALS*
02407>      PEAK FLOW       (cms)=          .40          .00            .400 (iii)
02408>      TIME TO PEAK    (hrs)=         1.04         1.08           1.042
02409>      RUNOFF VOLUME    (mm)=        56.66        25.35          55.717
02410>      TOTAL RAINFALL   (mm)=        58.23        58.23          58.226
02411>      RUNOFF COEFFICIENT   =          .97          .44            .957
02412>
02413>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02414>            CN* =  81.0    Ia = Dep. Storage  (Above)
02415>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02416>            THAN THE STORAGE COEFFICIENT.
02417>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02418>
02419> ----------------------------------------------------------------------
02420> 001:0007--------------------------------------------------------------
02421> --------------------
02422> | ADD HYD (040   ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
02423> --------------------                (ha)      (cms)   (hrs)   (mm)   (cms)
02424>                  ID1 01:010         2.07      .532    1.04  51.65    .000
02425>                 +ID2 02:020         1.54      .418    1.04  54.15    .000
02426>                  ====================================================
02427>                  SUM 04:040         3.61      .950    1.04  52.72    .000
02428>
02429>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02430>
```

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-----------------------------------------------------------------------------
001:0008---------------------------------------------------------------------
--------------------
| ADD HYD (050    ) | ID: NHYD      AREA     QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)     (cms)    (hrs)   (mm)    (cms)
                ID1 03:030          1.40      .400     1.04  55.72    .000
               +ID2 04:040          3.61      .950     1.04  52.72    .000
                    ===================================================
                    SUM 05:050      5.01     1.350     1.04  53.55    .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
001:0009---------------------------------------------------------------------
*
* SUB-AREA No.4
----------------------
| CALIB STANDHYD      |   Area    (ha)=      .89
| 06:060    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=        .86          .03
      Dep. Storage      (mm)=       1.57         4.67
      Average Slope      (%)=        .93          .70
      Length             (m)=     164.82        40.00
      Mannings n            =       .030         .250

      Max.eff.Inten.(mm/hr)=     144.69        44.12
                  over (min)       5.00        17.50
      Storage Coeff.   (min)=       5.02 (ii)   18.44 (ii)
      Unit Hyd. Tpeak  (min)=       5.00        17.50
      Unit Hyd. peak   (cms)=        .22          .06
                                                              *TOTALS*
      PEAK FLOW        (cms)=        .30          .00            .296 (iii)
      TIME TO PEAK     (hrs)=       1.00         1.25           1.000
      RUNOFF VOLUME     (mm)=      56.66        25.35          55.717
      TOTAL RAINFALL    (mm)=      58.23        58.23          58.226
      RUNOFF COEFFICIENT    =        .97          .44            .957

         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

-----------------------------------------------------------------------------
001:0010---------------------------------------------------------------------
*
* SUB-AREA No.5
----------------------
| CALIB STANDHYD      |   Area    (ha)=     2.66
| 07:070    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=       2.58          .08
      Dep. Storage      (mm)=       1.57         4.67
      Average Slope      (%)=        .61         1.50
      Length             (m)=     207.25        20.00
      Mannings n            =       .030         .250

      Max.eff.Inten.(mm/hr)=     144.69        51.33
                  over (min)       7.50        12.50
      Storage Coeff.   (min)=       6.54 (ii)   13.16 (ii)
      Unit Hyd. Tpeak  (min)=       7.50        12.50
      Unit Hyd. peak   (cms)=        .16          .09
                                                              *TOTALS*
      PEAK FLOW        (cms)=        .78          .01            .783 (iii)
      TIME TO PEAK     (hrs)=       1.04         1.17           1.042
      RUNOFF VOLUME     (mm)=      56.66        25.35          55.717
      TOTAL RAINFALL    (mm)=      58.23        58.23          58.226
      RUNOFF COEFFICIENT    =        .97          .44            .957

         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

-----------------------------------------------------------------------------
001:0011---------------------------------------------------------------------
--------------------
| ADD HYD (080    ) | ID: NHYD      AREA     QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)     (cms)    (hrs)   (mm)    (cms)
                ID1 06:060           .89      .296     1.00  55.72    .000
               +ID2 07:070          2.66      .783     1.04  55.72    .000
                    ===================================================
                    SUM 08:080      3.55     1.060     1.04  55.72    .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
001:0012---------------------------------------------------------------------
--------------------
| ADD HYD (090    ) | ID: NHYD      AREA     QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)     (cms)    (hrs)   (mm)    (cms)
                ID1 05:050          5.01     1.350     1.04  53.55    .000
               +ID2 08:080          3.55     1.060     1.04  55.72    .000
                    ===================================================
                    SUM 09:090      8.56     2.410     1.04  54.45    .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
001:0013---------------------------------------------------------------------
---------------------
| ROUTE RESERVOIR    |     Requested routing time step =  1.0 min.
|  IN>09:(090    )   |
| OUT<10:(POND   )   |     =========  OUTLFOW STORAGE TABLE  =========
---------------------      OUTFLOW     STORAGE    |  OUTFLOW    STORAGE
                            (cms)      (ha.m.)    |   (cms)     (ha.m.)
                             .000   .0000E+00     |     .593   .6251E+00
                             .008   .6560E-01     |     .654   .6631E+00
                             .017   .1311E+00     |     .797   .7391E+00
                             .093   .2831E+00     |     .950   .8274E+00
                             .233   .3971E+00     |    1.304   .9157E+00
                             .337   .4731E+00     |    1.880   .1004E+01
                             .465   .5491E+00     |    2.577   .1092E+01
                             .531   .5871E+00     |     .000   .0000E+00

      ROUTING RESULTS              AREA      QPEAK      TPEAK         R.V.
      --------------------         (ha)      (cms)      (hrs)         (mm)
      INFLOW >09: (090    )        8.56      2.410      1.042       54.451
      OUTFLOW<10: (POND   )        8.56       .189      2.056       54.449

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    7.838
                    TIME SHIFT OF PEAK FLOW         (min)=    60.83
                    MAXIMUM  STORAGE   USED       (ha.m.)=.3612E+00

-----------------------------------------------------------------------------
001:0014---------------------------------------------------------------------
**********************************************
*     Remaining Hawthorne Industrial Park    *
**********************************************
*
* SUB-AREA No.1
----------------------
| CALIB STANDHYD      |   Area    (ha)=    19.90
| 01:HIP01  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=      14.13         5.77
      Dep. Storage      (mm)=       1.57         4.67
      Average Slope      (%)=        .60         1.50
      Length             (m)=     580.00       100.00
      Mannings n            =       .030         .250

      Max.eff.Inten.(mm/hr)=     124.54        81.98
                  over (min)      12.50        27.50
      Storage Coeff.   (min)=      12.93 (ii)   27.37 (ii)
      Unit Hyd. Tpeak  (min)=      12.50        27.50
      Unit Hyd. peak   (cms)=        .09          .04
                                                              *TOTALS*
      PEAK FLOW        (cms)=       2.16          .77           2.548 (iii)
      TIME TO PEAK     (hrs)=       1.13         1.42           1.167
      RUNOFF VOLUME     (mm)=      56.66        34.22          45.437
      TOTAL RAINFALL    (mm)=      58.23        58.23          58.226
      RUNOFF COEFFICIENT    =        .97          .59            .780

         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

-----------------------------------------------------------------------------
001:0015---------------------------------------------------------------------
--------------------
| ADD HYD (HIP02 ) | ID: NHYD       AREA     QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)     (cms)    (hrs)   (mm)    (cms)
                ID1 10:POND         8.56      .189     2.06  54.45    .000
               +ID2 01:HIP01       19.90     2.548     1.17  45.44    .000
                    ===================================================
                    SUM 02:HIP02   28.46     2.622     1.17  48.15    .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
001:0016---------------------------------------------------------------------
*
* SUB-AREA No.2
----------------------
| CALIB STANDHYD      |   Area    (ha)=    17.00
| 03:HIP03  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=      12.07         4.93
      Dep. Storage      (mm)=       1.57         4.67
      Average Slope      (%)=        .65         1.50
      Length             (m)=     450.00       100.00
      Mannings n            =       .030         .250

      Max.eff.Inten.(mm/hr)=     144.69        87.13
                  over (min)      10.00        25.00
      Storage Coeff.   (min)=      10.21 (ii)   24.30 (ii)
      Unit Hyd. Tpeak  (min)=      10.00        25.00
      Unit Hyd. peak   (cms)=        .11          .05
                                                              *TOTALS*
      PEAK FLOW        (cms)=       2.10          .71           2.398 (iii)
      TIME TO PEAK     (hrs)=       1.08         1.38           1.125
      RUNOFF VOLUME     (mm)=      56.66        34.22          45.437
      TOTAL RAINFALL    (mm)=      58.23        58.23          58.226
      RUNOFF COEFFICIENT    =        .97          .59            .780

         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

-----------------------------------------------------------------------------
001:0017---------------------------------------------------------------------
*
* SUB-AREA No.3
----------------------
| CALIB STANDHYD      |   Area    (ha)=    15.60
| 04:HIP04  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
      Surface Area      (ha)=      11.08         4.52
      Dep. Storage      (mm)=       1.57         4.67
      Average Slope      (%)=        .50         1.50
      Length             (m)=     600.00       100.00
      Mannings n            =       .030         .250

      Max.eff.Inten.(mm/hr)=     111.10        77.71
                  over (min)      15.00        30.00
      Storage Coeff.   (min)=      14.59 (ii)   29.34 (ii)
      Unit Hyd. Tpeak  (min)=      15.00        30.00
      Unit Hyd. peak   (cms)=        .08          .04
                                                              *TOTALS*
      PEAK FLOW        (cms)=       1.57          .57           1.879 (iii)
      TIME TO PEAK     (hrs)=       1.17         1.46           1.208
      RUNOFF VOLUME     (mm)=      56.66        34.22          45.437
      TOTAL RAINFALL    (mm)=      58.23        58.23          58.226
      RUNOFF COEFFICIENT    =        .97          .59            .780

         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN* =  81.0    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.

-----------------------------------------------------------------------------
001:0018---------------------------------------------------------------------
--------------------
| ADD HYD (HIP05 ) | ID: NHYD       AREA     QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)     (cms)    (hrs)   (mm)    (cms)
                ID1 03:HIP03       17.00     2.398     1.13  45.44    .000
               +ID2 04:HIP04       15.60     1.879     1.21  45.44    .000
                    ===================================================
                    SUM 05:HIP05   32.60     4.157     1.13  45.44    .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
001:0019---------------------------------------------------------------------
--------------------
| ADD HYD (HIP06 ) | ID: NHYD       AREA     QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)     (cms)    (hrs)   (mm)    (cms)
                ID1 05:HIP05       32.60     4.157     1.13  45.44    .000
               +ID2 02:HIP02       28.46     2.622     1.17  48.15    .000
                    ===================================================
                    SUM 06:HIP06   61.06     6.741     1.17  46.70    .000

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
001:0020---------------------------------------------------------------------
*
* SUB-AREA No.4
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```
02701> ---------------------
02702> | CALIB STANDHYD      |   Area    (ha)=   12.20
02703> | 07:HIP07  DT= 2.50  |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
02704> ---------------------
02705>                                IMPERVIOUS    PERVIOUS (i)
02706>      Surface Area     (ha)=        8.66          3.54
02707>      Dep. Storage     (mm)=        1.57          4.67
02708>      Average Slope     (%)=         .70          1.50
02709>      Length            (m)=      210.00        100.00
02710>      Mannings n           =        .030          .250
02711>
02712>      Max.eff.Inten.(mm/hr)=      144.69        101.36
02713>                over (min)        7.50         20.00
02714>      Storage Coeff.  (min)=        6.32 (ii)    19.58 (ii)
02715>      Unit Hyd. Tpeak (min)=        7.50         20.00
02716>      Unit Hyd. peak  (cms)=         .17           .06
02717>                                                            *TOTALS*
02718>      PEAK FLOW       (cms)=        1.86           .59         2.109 (iii)
02719>      TIME TO PEAK    (hrs)=        1.04          1.29         1.042
02720>      RUNOFF VOLUME    (mm)=       56.66         34.22        45.437
02721>      TOTAL RAINFALL   (mm)=       58.23         58.23        58.226
02722>      RUNOFF COEFFICIENT   =         .97           .59          .780
02723>
02724>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02725>            CN* =  81.0    Ia = Dep. Storage  (Above)
02726>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02727>            THAN THE STORAGE COEFFICIENT.
02728>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02729>
02730> ---------------------------------------------------------------------------
02731> 001:0021-------------------------------------------------------------------
02732> *
02733> *SUB-AREA No.5
02734> ---------------------
02735> | DESIGN NASHYD       |   Area    (ha)=    4.00   Curve Number   (CN)=85.00
02736> | 08:Pond-B DT= 2.50  |   Ia      (mm)=   4.670   # of Linear Res.(N)= 3.00
02737> ---------------------    U.H. Tp(hrs)=    .170
02738>
02739>      Unit Hyd Qpeak  (cms)=     .899
02740>
02741>      PEAK FLOW       (cms)=     .459 (i)
02742>      TIME TO PEAK    (hrs)=    1.167
02743>      RUNOFF VOLUME    (mm)=   29.155
02744>      TOTAL RAINFALL   (mm)=   58.226
02745>      RUNOFF COEFFICIENT   =     .501
02746>
02747>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02748>
02749> ---------------------------------------------------------------------------
02750> 001:0022-------------------------------------------------------------------
02751> --------------------
02752> | ADD HYD (HIP08 ) | ID: NHYD      AREA     QPEAK   TPEAK  R.V.    DWF
02753> --------------------                (ha)     (cms)   (hrs)  (mm)   (cms)
02754>                 ID1 06:HIP06     61.06     6.741    1.17  46.70   .000
02755>                +ID2 07:HIP07     12.20     2.109    1.04  45.44   .000
02756>                +ID3 08:Pond-B     4.00      .459    1.17  29.15   .000
02757>                 ===================================================
02758>                 SUM 09:HIP08     77.26     8.998    1.13  45.59   .000
02759>
02760>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02761>
02762> ---------------------------------------------------------------------------
02763> 001:0023-------------------------------------------------------------------
02764> ---------------------
02765> | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
02766> |   IN>09:(HIP08 )   |
02767> | OUT<10:(HIP-PO)    |    =========  OUTLFOW STORAGE TABLE  =========
02768> ---------------------     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
02769>                            (cms)    (ha.m.)   |   (cms)     (ha.m.)
02770>                             .000  .0000E+00   |     .724  .2210E+01
02771>                             .048  .5740E-01   |     .937  .2501E+01
02772>                             .054  .2434E+00   |    1.262  .2798E+01
02773>                             .059  .5834E+00   |    1.404  .3101E+01
02774>                             .062  .8400E+00   |    1.532  .3410E+01
02775>                             .064  .1102E+01   |    1.650  .3724E+01
02776>                             .147  .1370E+01   |    2.409  .4044E+01
02777>                             .280  .1644E+01   |    3.689  .4370E+01
02778>                             .472  .1924E+01   |     .000  .0000E+00
02779>
02780>      ROUTING RESULTS             AREA     QPEAK     TPEAK        R.V.
02781>      -------------------         (ha)     (cms)     (hrs)        (mm)
02782>      INFLOW >09: (HIP08 )       77.26     8.998     1.125      45.591
02783>      OUTFLOW<10: (HIP-PO)       77.26     1.004     3.083      45.591
02784>
02785>                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   11.160
02786>                   TIME SHIFT OF PEAK FLOW         (min)=   117.50
02787>                   MAXIMUM  STORAGE   USED       (ha.m.)=.2562E+01
02788>
02789> ---------------------------------------------------------------------------
02790> 001:0024-------------------------------------------------------------------
02791> *
02792> *SUB-AREA No. 6
02793> ---------------------
02794> | DESIGN NASHYD       |   Area    (ha)=    2.70   Curve Number   (CN)=76.00
02795> | 01:A3     DT= 2.50  |   Ia      (mm)=   4.670   # of Linear Res.(N)= 3.00
02796> ---------------------    U.H. Tp(hrs)=    .800
02797>
02798>      Unit Hyd Qpeak  (cms)=     .129
02799>
02800>      PEAK FLOW       (cms)=     .079 (i)
02801>      TIME TO PEAK    (hrs)=    2.000
02802>      RUNOFF VOLUME    (mm)=   21.442
02803>      TOTAL RAINFALL   (mm)=   58.226
02804>      RUNOFF COEFFICIENT   =     .368
02805>
02806>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02807>
02808> ---------------------------------------------------------------------------
02809> 001:0025-------------------------------------------------------------------
02810> --------------------
02811> | ADD HYD (Ultima) | ID: NHYD      AREA     QPEAK   TPEAK  R.V.    DWF
02812> --------------------                (ha)     (cms)   (hrs)  (mm)   (cms)
02813>                 ID1 10:HIP-PO    77.26     1.004    3.08  45.59   .000
02814>                +ID2 01:A3         2.70      .079    2.00  21.44   .000
02815>                 ===================================================
02816>                 SUM 02:Ultima    79.96     1.051    3.01  44.78   .000
02817>
02818>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
02819>
02820> ---------------------------------------------------------------------------
02821> 001:0026-------------------------------------------------------------------
02822> ***************************************************************
02823> *        CALCULATION OF 3HR - 1:50 YEAR STORM EVENT           *
02824> ***************************************************************
02825> --------------------
02826> | START              |  Project  dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
02827> --------------------   Rainfall dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
02828>     TZERO =   .00 hrs on        0
02829>     METOUT=   2 (output = METRIC)
02830>     NRUN  = 001
02831>     NSTORM=   0
02832> ---------------------------------------------------------------------------
02833> 001:0002-------------------------------------------------------------------
02834> --------------------
02835> | CHICAGO STORM    |    IDF curve parameters: A=1569.580
```

```
02836> | Ptotal= 64.81 mm |                             B=   6.014
02837> --------------------                             C=    .820
02838>                        used in:   INTENSITY =  A / (t + B)^C
02839>
02840>                        Duration of storm  =  3.00 hrs
02841>                        Storm time step    = 10.00 min
02842>                        Time to peak ratio =   .33
02843>
02844>             TIME     RAIN |   TIME     RAIN |   TIME     RAIN |   TIME     RAIN
02845>              hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr
02846>              .17    5.467 |   1.00  161.471 |   1.83   10.000 |   2.67    5.209
02847>              .33    6.820 |   1.17   48.876 |   2.00    8.397 |   2.83    4.774
02848>              .50    9.187 |   1.33   24.704 |   2.17    7.256 |   3.00    4.412
02849>              .67   14.441 |   1.50   16.495 |   2.33    6.403 |
02850>              .83   36.764 |   1.67   12.422 |   2.50    5.740 |
02851>
02852> ---------------------------------------------------------------------------
02853> 001:0003-------------------------------------------------------------------
02854> ----------------------
02855> | DEFAULT VALUES       |  Filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\ORGA.VAL
02856> ----------------------   ICASEdv = 1 (read and print data)
02857>       FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
02858>                  ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
02859>       Horton's infiltration equation parameters:
02860>       [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
02861>       Parameters for PERVIOUS surfaces in STANDHYD:
02862>       [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
02863>       Parameters for IMPERVIOUS surfaces in STANDHYD:
02864>       [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
02865>       Parameters used in NASHYD:
02866>       [Ia=   4.67 mm] [N= 3.00]
02867> ---------------------------------------------------------------------------
02868> 001:0004-------------------------------------------------------------------
02869> ***********************************
02870> *          ORGAWORLD FILE         *
02871> ***********************************
02872> *
02873> * SUB-AREA No.1
02874> ---------------------
02875> | CALIB STANDHYD      |   Area    (ha)=    2.07
02876> | 01:010    DT= 2.50  |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
02877> ---------------------
02878>                                IMPERVIOUS    PERVIOUS (i)
02879>      Surface Area     (ha)=        1.74           .33
02880>      Dep. Storage     (mm)=        1.57          4.67
02881>      Average Slope     (%)=         .52          1.00
02882>      Length            (m)=      204.72         20.00
02883>      Mannings n           =        .030          .250
02884>
02885>      Max.eff.Inten.(mm/hr)=      161.47         62.27
02886>                over (min)        7.50         12.50
02887>      Storage Coeff.  (min)=        6.51 (ii)    13.44 (ii)
02888>      Unit Hyd. Tpeak (min)=        7.50         12.50
02889>      Unit Hyd. peak  (cms)=         .16           .09
02890>                                                            *TOTALS*
02891>      PEAK FLOW       (cms)=         .59           .03          .609 (iii)
02892>      TIME TO PEAK    (hrs)=        1.04          1.17         1.042
02893>      RUNOFF VOLUME    (mm)=       63.24         30.21        57.952
02894>      TOTAL RAINFALL   (mm)=       64.81         64.81        64.806
02895>      RUNOFF COEFFICIENT   =         .98           .47          .894
02896>
02897>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02898>            CN* =  81.0    Ia = Dep. Storage  (Above)
02899>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02900>            THAN THE STORAGE COEFFICIENT.
02901>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02902>
02903> ---------------------------------------------------------------------------
02904> 001:0005-------------------------------------------------------------------
02905> *
02906> * SUB-AREA No.2
02907> ---------------------
02908> | CALIB STANDHYD      |   Area    (ha)=    1.54
02909> | 02:020    DT= 2.50  |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
02910> ---------------------
02911>                                IMPERVIOUS    PERVIOUS (i)
02912>      Surface Area     (ha)=        1.42           .12
02913>      Dep. Storage     (mm)=        1.57          4.67
02914>      Average Slope     (%)=         .50          1.00
02915>      Length            (m)=      244.34          5.00
02916>      Mannings n           =        .030          .030
02917>
02918>      Max.eff.Inten.(mm/hr)=      161.47         78.73
02919>                over (min)        7.50          7.50
02920>      Storage Coeff.  (min)=        7.33 (ii)     8.10 (ii)
02921>      Unit Hyd. Tpeak (min)=        7.50          7.50
02922>      Unit Hyd. peak  (cms)=         .15           .14
02923>                                                            *TOTALS*
02924>      PEAK FLOW       (cms)=         .46           .02          .475 (iii)
02925>      TIME TO PEAK    (hrs)=        1.04          1.08         1.042
02926>      RUNOFF VOLUME    (mm)=       63.24         30.21        60.594
02927>      TOTAL RAINFALL   (mm)=       64.81         64.81        64.806
02928>      RUNOFF COEFFICIENT   =         .98           .47          .935
02929>
02930>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02931>            CN* =  81.0    Ia = Dep. Storage  (Above)
02932>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02933>            THAN THE STORAGE COEFFICIENT.
02934>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02935>
02936> ---------------------------------------------------------------------------
02937> 001:0006-------------------------------------------------------------------
02938> *
02939> * SUB-AREA No.3
02940> ---------------------
02941> | CALIB STANDHYD      |   Area    (ha)=    1.40
02942> | 03:030    DT= 2.50  |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
02943> ---------------------
02944>                                IMPERVIOUS    PERVIOUS (i)
02945>      Surface Area     (ha)=        1.36           .04
02946>      Dep. Storage     (mm)=        1.57          4.67
02947>      Average Slope     (%)=         .51          1.00
02948>      Length            (m)=      225.63          5.00
02949>      Mannings n           =        .030          .030
02950>
02951>      Max.eff.Inten.(mm/hr)=      161.47         78.73
02952>                over (min)        7.50          7.50
02953>      Storage Coeff.  (min)=        6.95 (ii)     7.72 (ii)
02954>      Unit Hyd. Tpeak (min)=        7.50          7.50
02955>      Unit Hyd. peak  (cms)=         .16           .15
02956>                                                            *TOTALS*
02957>      PEAK FLOW       (cms)=         .45           .01          .454 (iii)
02958>      TIME TO PEAK    (hrs)=        1.04          1.08         1.042
02959>      RUNOFF VOLUME    (mm)=       63.24         30.21        62.245
02960>      TOTAL RAINFALL   (mm)=       64.81         64.81        64.806
02961>      RUNOFF COEFFICIENT   =         .98           .47          .960
02962>
02963>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
02964>            CN* =  81.0    Ia = Dep. Storage  (Above)
02965>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
02966>            THAN THE STORAGE COEFFICIENT.
02967>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
02968>
02969> ---------------------------------------------------------------------------
02970> 001:0007-------------------------------------------------------------------
```

```
--------------------
| ADD HYD (040   ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                   ID1 01:010       2.07       .609     1.04  57.95     .000
                  +ID2 02:020       1.54       .475     1.04  60.59     .000
                   ==================================================
                   SUM 04:040       3.61      1.084     1.04  59.08     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---------------------------------------------------------------------------
001:0008-------------------------------------------------------------------
--------------------
| ADD HYD (050   ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                   ID1 03:030       1.40       .454     1.04  62.25     .000
                  +ID2 04:040       3.61      1.084     1.04  59.08     .000
                   ==================================================
                   SUM 05:050       5.01      1.538     1.04  59.96     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---------------------------------------------------------------------------
001:0009-------------------------------------------------------------------
*
* SUB-AREA No.4
----------------------
| CALIB STANDHYD     |   Area    (ha)=      .89
| 06:060    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        .86          .03
     Dep. Storage      (mm)=       1.57         4.67
     Average Slope      (%)=        .93          .70
     Length             (m)=     164.82        40.00
     Mannings n            =       .030         .250

     Max.eff.Inten.(mm/hr)=     161.47        53.28
                over (min)        5.00        17.50
     Storage Coeff.  (min)=       4.80 (ii)   17.24 (ii)
     Unit Hyd. Tpeak (min)=       5.00        17.50
     Unit Hyd. peak  (cms)=        .23          .07
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .33          .00           .335 (iii)
     TIME TO PEAK    (hrs)=       1.00         1.25          1.000
     RUNOFF VOLUME    (mm)=      63.24        30.21         62.245
     TOTAL RAINFALL   (mm)=      64.81        64.81         64.806
     RUNOFF COEFFICIENT   =        .98          .47           .960

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

---------------------------------------------------------------------------
001:0010-------------------------------------------------------------------
*
* SUB-AREA No.5
----------------------
| CALIB STANDHYD     |   Area    (ha)=     2.66
| 07:070    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       2.58          .08
     Dep. Storage      (mm)=       1.57         4.67
     Average Slope      (%)=        .61         1.50
     Length             (m)=     207.25        20.00
     Mannings n            =       .030         .250

     Max.eff.Inten.(mm/hr)=     161.47        62.27
                over (min)        7.50        12.50
     Storage Coeff.  (min)=       6.26 (ii)   12.39 (ii)
     Unit Hyd. Tpeak (min)=       7.50        12.50
     Unit Hyd. peak  (cms)=        .17          .09
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .88          .01           .886 (iii)
     TIME TO PEAK    (hrs)=       1.04         1.17          1.042
     RUNOFF VOLUME    (mm)=      63.24        30.21         62.245
     TOTAL RAINFALL   (mm)=      64.81        64.81         64.806
     RUNOFF COEFFICIENT   =        .98          .47           .960

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

---------------------------------------------------------------------------
001:0011-------------------------------------------------------------------
--------------------
| ADD HYD (080   ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                   ID1 06:060        .89       .335     1.00  62.25     .000
                  +ID2 07:070       2.66       .886     1.04  62.25     .000
                   ==================================================
                   SUM 08:080       3.55      1.197     1.04  62.25     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---------------------------------------------------------------------------
001:0012-------------------------------------------------------------------
--------------------
| ADD HYD (090   ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                   ID1 05:050       5.01      1.538     1.04  59.96     .000
                  +ID2 08:080       3.55      1.197     1.04  62.25     .000
                   ==================================================
                   SUM 09:090       8.56      2.735     1.04  60.91     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---------------------------------------------------------------------------
001:0013-------------------------------------------------------------------
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>09:(090    )  |
| OUT<10:(POND   )  |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW     STORAGE    |  OUTFLOW    STORAGE
                          (cms)      (ha.m.)    |   (cms)     (ha.m.)
                           .000   .0000E+00     |     .593   .6251E+00
                           .008   .6560E-01     |     .654   .6631E+00
                           .017   .1311E+00     |     .797   .7391E+00
                           .093   .2831E+00     |     .950   .8274E+00
                           .233   .3971E+00     |    1.304   .9157E+00
                           .337   .4731E+00     |    1.880   .1004E+01
                           .465   .5491E+00     |    2.577   .1092E+01
                           .531   .5871E+00     |     .000   .0000E+00

    ROUTING RESULTS               AREA      QPEAK      TPEAK         R.V.
    --------------------          (ha)      (cms)      (hrs)         (mm)
    INFLOW >09: (090    )         8.56      2.735      1.042       60.910
    OUTFLOW<10: (POND   )         8.56       .233      1.944       60.908

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=    8.503
                  TIME SHIFT OF PEAK FLOW          (min)=    54.17
                  MAXIMUM  STORAGE   USED       (ha.m.)=.3967E+00

---------------------------------------------------------------------------
001:0014-------------------------------------------------------------------
*********************************************
*     Remaining Hawthorne Industrial Park   *
*********************************************
*
* SUB-AREA No.1
----------------------
| CALIB STANDHYD     |   Area    (ha)=   19.90
| 01:HIP01  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=      14.13         5.77
     Dep. Storage      (mm)=       1.57         4.67
     Average Slope      (%)=        .60         1.50
     Length             (m)=     580.00       100.00
     Mannings n            =       .030         .250

     Max.eff.Inten.(mm/hr)=     138.95       102.13
                over (min)       12.50        25.00
     Storage Coeff.  (min)=      12.38 (ii)   25.60 (ii)
     Unit Hyd. Tpeak (min)=      12.50        25.00
     Unit Hyd. peak  (cms)=        .09          .04
                                                           *TOTALS*
     PEAK FLOW       (cms)=       2.46          .95          3.001 (iii)
     TIME TO PEAK    (hrs)=       1.13         1.38          1.167
     RUNOFF VOLUME    (mm)=      63.24        39.90         51.566
     TOTAL RAINFALL   (mm)=      64.81        64.81         64.806
     RUNOFF COEFFICIENT   =        .98          .62           .796

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

---------------------------------------------------------------------------
001:0015-------------------------------------------------------------------
--------------------
| ADD HYD (HIP02 ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                   ID1 10:POND       8.56       .233     1.94  60.91     .000
                  +ID2 01:HIP01     19.90      3.001     1.17  51.57     .000
                   ==================================================
                   SUM 02:HIP02     28.46      3.092     1.17  54.37     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---------------------------------------------------------------------------
001:0016-------------------------------------------------------------------
*
* SUB-AREA No.2
----------------------
| CALIB STANDHYD     |   Area    (ha)=   17.00
| 03:HIP03  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=      12.07         4.93
     Dep. Storage      (mm)=       1.57         4.67
     Average Slope      (%)=        .65         1.50
     Length             (m)=     450.00       100.00
     Mannings n            =       .030         .250

     Max.eff.Inten.(mm/hr)=     161.47       109.61
                over (min)       10.00        22.50
     Storage Coeff.  (min)=       9.77 (ii)   22.63 (ii)
     Unit Hyd. Tpeak (min)=      10.00        22.50
     Unit Hyd. peak  (cms)=        .11          .05
                                                           *TOTALS*
     PEAK FLOW       (cms)=       2.38          .88          2.819 (iii)
     TIME TO PEAK    (hrs)=       1.08         1.33          1.125
     RUNOFF VOLUME    (mm)=      63.24        39.90         51.566
     TOTAL RAINFALL   (mm)=      64.81        64.81         64.806
     RUNOFF COEFFICIENT   =        .98          .62           .796

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

---------------------------------------------------------------------------
001:0017-------------------------------------------------------------------
*
* SUB-AREA No.3
----------------------
| CALIB STANDHYD     |   Area    (ha)=   15.60
| 04:HIP04  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=      11.08         4.52
     Dep. Storage      (mm)=       1.57         4.67
     Average Slope      (%)=        .50         1.50
     Length             (m)=     600.00       100.00
     Mannings n            =       .030         .250

     Max.eff.Inten.(mm/hr)=     138.95        96.02
                over (min)       12.50        27.50
     Storage Coeff.  (min)=      13.34 (ii)   26.90 (ii)
     Unit Hyd. Tpeak (min)=      12.50        27.50
     Unit Hyd. peak  (cms)=        .09          .04
                                                           *TOTALS*
     PEAK FLOW       (cms)=       1.86          .72          2.237 (iii)
     TIME TO PEAK    (hrs)=       1.13         1.42          1.167
     RUNOFF VOLUME    (mm)=      63.24        39.90         51.566
     TOTAL RAINFALL   (mm)=      64.81        64.81         64.806
     RUNOFF COEFFICIENT   =        .98          .62           .796

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

---------------------------------------------------------------------------
001:0018-------------------------------------------------------------------
--------------------
| ADD HYD (HIP05 ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                   ID1 03:HIP03     17.00      2.819     1.13  51.57     .000
                  +ID2 04:HIP04     15.60      2.237     1.17  51.57     .000
                   ==================================================
                   SUM 05:HIP05     32.60      5.019     1.13  51.57     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---------------------------------------------------------------------------
001:0019-------------------------------------------------------------------
--------------------
| ADD HYD (HIP06 ) | ID: NHYD      AREA      QPEAK    TPEAK   R.V.     DWF
--------------------                (ha)      (cms)    (hrs)   (mm)    (cms)
                   ID1 05:HIP05     32.60      5.019     1.13  51.57     .000
```

```
03241>                +ID2 02:HIP02     28.46    3.092    1.17  54.37    .000
03242>                 =====================================================
03243>                 SUM 06:HIP06     61.06    8.054    1.13  52.87    .000
03244>
03245>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03246>
03247> ---------------------------------------------------------------------------
03248> 001:0020-------------------------------------------------------------------
03249> *
03250> * SUB-AREA No.4
03251> ----------------------
03252> | CALIB STANDHYD     |   Area    (ha)=   12.20
03253> | 07:HIP07  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
03254> ----------------------
03255>                               IMPERVIOUS    PERVIOUS (i)
03256>      Surface Area     (ha)=       8.66         3.54
03257>      Dep. Storage     (mm)=       1.57         4.67
03258>      Average Slope     (%)=        .70         1.50
03259>      Length            (m)=     210.00       100.00
03260>      Mannings n           =       .030         .250
03261>
03262>      Max.eff.Inten.(mm/hr)=     161.47       126.32
03263>                over (min)       5.00        17.50
03264>      Storage Coeff.  (min)=       6.05 (ii)   18.19 (ii)
03265>      Unit Hyd. Tpeak (min)=       5.00        17.50
03266>      Unit Hyd. peak  (cms)=        .20          .06
03267>                                                           *TOTALS*
03268>      PEAK FLOW       (cms)=       2.19          .73         2.470 (iii)
03269>      TIME TO PEAK    (hrs)=       1.00         1.25         1.042
03270>      RUNOFF VOLUME    (mm)=      63.24        39.90        51.566
03271>      TOTAL RAINFALL   (mm)=      64.81        64.81        64.806
03272>      RUNOFF COEFFICIENT   =        .98          .62          .796
03273>
03274>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03275>            CN* =  81.0    Ia = Dep. Storage  (Above)
03276>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03277>            THAN THE STORAGE COEFFICIENT.
03278>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03279>
03280> ---------------------------------------------------------------------------
03281> 001:0021-------------------------------------------------------------------
03282> *
03283> *SUB-AREA No.5
03284> ----------------------
03285> | DESIGN NASHYD      |   Area    (ha)=    4.00   Curve Number   (CN)=85.00
03286> | 08:Pond-B DT= 2.50 |   Ia      (mm)=   4.670   # of Linear Res.(N)= 3.00
03287> ----------------------   U.H. Tp(hrs)=    .170
03288>
03289>      Unit Hyd Qpeak  (cms)=     .899
03290>
03291>      PEAK FLOW       (cms)=     .551 (i)
03292>      TIME TO PEAK    (hrs)=    1.125
03293>      RUNOFF VOLUME    (mm)=   34.455
03294>      TOTAL RAINFALL   (mm)=   64.806
03295>      RUNOFF COEFFICIENT   =     .532
03296>
03297>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03298>
03299> ---------------------------------------------------------------------------
03300> 001:0022-------------------------------------------------------------------
03301> --------------------
03302> | ADD HYD (HIP08 ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.    DWF
03303> --------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
03304>                ID1 06:HIP06      61.06    8.054    1.13  52.87    .000
03305>               +ID2 07:HIP07      12.20    2.470    1.04  51.57    .000
03306>               +ID3 08:Pond-B      4.00     .551    1.13  34.45    .000
03307>                ====================================================
03308>                SUM 09:HIP08      77.26   10.570    1.13  51.71    .000
03309>
03310>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03311>
03312> ---------------------------------------------------------------------------
03313> 001:0023-------------------------------------------------------------------
03314> ---------------------
03315> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
03316> |  IN>09:(HIP08 )   |
03317> | OUT<10:(HIP-PO)   |    =========  OUTLFOW STORAGE TABLE  =========
03318> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
03319>                           (cms)     (ha.m.)   |   (cms)     (ha.m.)
03320>                            .000  .0000E+00   |     .724  .2210E+01
03321>                            .048  .5740E-01   |     .937  .2501E+01
03322>                            .054  .2434E+00   |    1.262  .2798E+01
03323>                            .059  .5834E+00   |    1.404  .3101E+01
03324>                            .062  .8400E+00   |    1.532  .3410E+01
03325>                            .064  .1102E+01   |    1.650  .3724E+01
03326>                            .147  .1370E+01   |    2.409  .4044E+01
03327>                            .280  .1644E+01   |    3.689  .4370E+01
03328>                            .472  .1924E+01   |     .000  .0000E+00
03329>
03330>      ROUTING RESULTS             AREA     QPEAK     TPEAK        R.V.
03331>      -------------------         (ha)     (cms)     (hrs)        (mm)
03332>      INFLOW >09: (HIP08 )       77.26    10.570     1.125      51.714
03333>      OUTFLOW<10: (HIP-PO)       77.26     1.280     2.917      51.714
03334>
03335>                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   12.106
03336>                  TIME SHIFT OF PEAK FLOW         (min)=   107.50
03337>                  MAXIMUM  STORAGE   USED        (ha.m.)=.2836E+01
03338>
03339> ---------------------------------------------------------------------------
03340> 001:0024-------------------------------------------------------------------
03341> *
03342> *SUB-AREA No. 6
03343> ----------------------
03344> | DESIGN NASHYD      |   Area    (ha)=    2.70   Curve Number   (CN)=76.00
03345> | 01:A3     DT= 2.50 |   Ia      (mm)=   4.670   # of Linear Res.(N)= 3.00
03346> ----------------------   U.H. Tp(hrs)=    .800
03347>
03348>      Unit Hyd Qpeak  (cms)=     .129
03349>
03350>      PEAK FLOW       (cms)=     .096 (i)
03351>      TIME TO PEAK    (hrs)=    1.958
03352>      RUNOFF VOLUME    (mm)=   25.767
03353>      TOTAL RAINFALL   (mm)=   64.806
03354>      RUNOFF COEFFICIENT   =     .398
03355>
03356>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03357>
03358> ---------------------------------------------------------------------------
03359> 001:0025-------------------------------------------------------------------
03360> --------------------
03361> | ADD HYD (Ultima) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.    DWF
03362> --------------------               (ha)     (cms)   (hrs)   (mm)   (cms)
03363>                ID1 10:HIP-PO     77.26    1.280    2.92  51.71    .000
03364>               +ID2 01:A3          2.70     .096    1.96  25.77    .000
03365>                ====================================================
03366>                SUM 02:Ultima     79.96    1.348    2.63  50.84    .000
03367>
03368>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03369>
03370> ---------------------------------------------------------------------------
03371> 001:0026-------------------------------------------------------------------
03372> ****************************************************************
03373> *       CALCULATION OF 3HR - 1:100 YEAR STORM EVENT            *
03374> ****************************************************************
03375> --------------------
```

```
03376> | START              |  Project  dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
03377> --------------------  Rainfall dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
03378>     TZERO =   .00 hrs on        0
03379>     METOUT=   2 (output = METRIC)
03380>     NRUN  = 001
03381>     NSTORM=   0
03382> ---------------------------------------------------------------------------
03383> 001:0002-------------------------------------------------------------------
03384> --------------------
03385> | CHICAGO STORM    |     IDF curve parameters: A=1735.688
03386> | Ptotal= 71.66 mm |                           B=   6.014
03387> --------------------                           C=    .820
03388>                          used in:   INTENSITY =  A / (t + B)^C
03389>
03390>                          Duration of storm  =  3.00 hrs
03391>                          Storm time step    = 10.00 min
03392>                          Time to peak ratio =   .33
03393>
03394>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
03395>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
03396>                .17   6.046 |   1.00 178.559 |   1.83  11.059 |   2.67   5.760
03397>                .33   7.542 |   1.17  54.049 |   2.00   9.285 |   2.83   5.280
03398>                .50  10.159 |   1.33  27.319 |   2.17   8.024 |   3.00   4.879
03399>                .67  15.969 |   1.50  18.240 |   2.33   7.080 |
03400>                .83  40.655 |   1.67  13.737 |   2.50   6.347 |
03401>
03402> ---------------------------------------------------------------------------
03403> 001:0003-------------------------------------------------------------------
03404> ----------------------
03405> | DEFAULT VALUES     |  Filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\ORGA.VAL
03406> ----------------------  ICASEdv = 1 (read and print data)
03407>       FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
03408>                  ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
03409>       Horton's infiltration equation parameters:
03410>       [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
03411>       Parameters for PERVIOUS surfaces in STANDHYD:
03412>       [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
03413>       Parameters for IMPERVIOUS surfaces in STANDHYD:
03414>       [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
03415>       Parameters used in NASHYD:
03416>       [Ia=   4.67 mm] [N= 3.00]
03417> ---------------------------------------------------------------------------
03418> 001:0004-------------------------------------------------------------------
03419> ***********************************
03420> *          ORGAWORLD FILE         *
03421> ***********************************
03422> *
03423> * SUB-AREA No.1
03424> ----------------------
03425> | CALIB STANDHYD     |   Area    (ha)=    2.07
03426> | 01:010    DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
03427> ----------------------
03428>                               IMPERVIOUS    PERVIOUS (i)
03429>      Surface Area     (ha)=       1.74          .33
03430>      Dep. Storage     (mm)=       1.57         4.67
03431>      Average Slope     (%)=        .52         1.00
03432>      Length            (m)=     204.72        20.00
03433>      Mannings n           =       .030         .250
03434>
03435>      Max.eff.Inten.(mm/hr)=     178.56        74.05
03436>                over (min)       7.50        12.50
03437>      Storage Coeff.  (min)=       6.26 (ii)   12.72 (ii)
03438>      Unit Hyd. Tpeak (min)=       7.50        12.50
03439>      Unit Hyd. peak  (cms)=        .17          .09
03440>                                                           *TOTALS*
03441>      PEAK FLOW       (cms)=        .66          .04          .685 (iii)
03442>      TIME TO PEAK    (hrs)=       1.04         1.17         1.042
03443>      RUNOFF VOLUME    (mm)=      70.09        35.46        64.553
03444>      TOTAL RAINFALL   (mm)=      71.66        71.66        71.665
03445>      RUNOFF COEFFICIENT   =        .98          .49          .901
03446>
03447>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03448>            CN* =  81.0    Ia = Dep. Storage  (Above)
03449>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03450>            THAN THE STORAGE COEFFICIENT.
03451>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03452>
03453> ---------------------------------------------------------------------------
03454> 001:0005-------------------------------------------------------------------
03455> *
03456> * SUB-AREA No.2
03457> ----------------------
03458> | CALIB STANDHYD     |   Area    (ha)=    1.54
03459> | 02:020    DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
03460> ----------------------
03461>                               IMPERVIOUS    PERVIOUS (i)
03462>      Surface Area     (ha)=       1.42          .12
03463>      Dep. Storage     (mm)=       1.57         4.67
03464>      Average Slope     (%)=        .50         1.00
03465>      Length            (m)=     244.34         5.00
03466>      Mannings n           =       .030         .030
03467>
03468>      Max.eff.Inten.(mm/hr)=     178.56        93.23
03469>                over (min)       7.50         7.50
03470>      Storage Coeff.  (min)=       7.04 (ii)    7.76 (ii)
03471>      Unit Hyd. Tpeak (min)=       7.50         7.50
03472>      Unit Hyd. peak  (cms)=        .16          .15
03473>                                                           *TOTALS*
03474>      PEAK FLOW       (cms)=        .51          .02          .534 (iii)
03475>      TIME TO PEAK    (hrs)=       1.04         1.08         1.042
03476>      RUNOFF VOLUME    (mm)=      70.09        35.46        67.324
03477>      TOTAL RAINFALL   (mm)=      71.66        71.66        71.665
03478>      RUNOFF COEFFICIENT   =        .98          .49          .939
03479>
03480>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03481>            CN* =  81.0    Ia = Dep. Storage  (Above)
03482>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03483>            THAN THE STORAGE COEFFICIENT.
03484>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03485>
03486> ---------------------------------------------------------------------------
03487> 001:0006-------------------------------------------------------------------
03488> *
03489> * SUB-AREA No.3
03490> ----------------------
03491> | CALIB STANDHYD     |   Area    (ha)=    1.40
03492> | 03:030    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
03493> ----------------------
03494>                               IMPERVIOUS    PERVIOUS (i)
03495>      Surface Area     (ha)=       1.36          .04
03496>      Dep. Storage     (mm)=       1.57         4.67
03497>      Average Slope     (%)=        .51         1.00
03498>      Length            (m)=     225.63         5.00
03499>      Mannings n           =       .030         .030
03500>
03501>      Max.eff.Inten.(mm/hr)=     178.56        93.23
03502>                over (min)       7.50         7.50
03503>      Storage Coeff.  (min)=       6.67 (ii)    7.39 (ii)
03504>      Unit Hyd. Tpeak (min)=       7.50         7.50
03505>      Unit Hyd. peak  (cms)=        .16          .15
03506>                                                           *TOTALS*
03507>      PEAK FLOW       (cms)=        .50          .01          .509 (iii)
03508>      TIME TO PEAK    (hrs)=       1.04         1.08         1.042
03509>      RUNOFF VOLUME    (mm)=      70.09        35.46        69.056
03510>      TOTAL RAINFALL   (mm)=      71.66        71.66        71.665
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03511>      RUNOFF COEFFICIENT   =         .98            .49             .964
03512>
03513>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03514>             CN* =  81.0     Ia = Dep. Storage  (Above)
03515>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03516>             THAN THE STORAGE COEFFICIENT.
03517>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03518>
03519> -----------------------------------------------------------------------------
03520> 001:0007---------------------------------------------------------------------
03521> --------------------
03522> | ADD HYD (040   ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
03523> --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
03524>                    ID1 01:010       2.07      .685    1.04  64.55    .000
03525>                   +ID2 02:020       1.54      .534    1.04  67.32    .000
03526>                    ==================================================
03527>                    SUM 04:040       3.61     1.220    1.04  65.74    .000
03528>
03529>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03530>
03531> -----------------------------------------------------------------------------
03532> 001:0008---------------------------------------------------------------------
03533> --------------------
03534> | ADD HYD (050   ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
03535> --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
03536>                    ID1 03:030       1.40      .509    1.04  69.06    .000
03537>                   +ID2 04:040       3.61     1.220    1.04  65.74    .000
03538>                    ==================================================
03539>                    SUM 05:050       5.01     1.729    1.04  66.66    .000
03540>
03541>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03542>
03543> -----------------------------------------------------------------------------
03544> 001:0009---------------------------------------------------------------------
03545> *
03546> * SUB-AREA No.4
03547> ---------------------
03548> | CALIB STANDHYD      |   Area    (ha)=     .89
03549> | 06:060    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
03550> ---------------------
03551>                                  IMPERVIOUS    PERVIOUS (i)
03552>      Surface Area      (ha)=         .86           .03
03553>      Dep. Storage      (mm)=        1.57          4.67
03554>      Average Slope      (%)=         .93           .70
03555>      Length             (m)=      164.82         40.00
03556>      Mannings n            =        .030          .250
03557>
03558>      Max.eff.Inten.(mm/hr)=      178.56         67.61
03559>                 over (min)         5.00         15.00
03560>      Storage Coeff.  (min)=        4.62 (ii)    15.92 (ii)
03561>      Unit Hyd. Tpeak (min)=        5.00         15.00
03562>      Unit Hyd. peak  (cms)=         .24           .07
03563>                                                                *TOTALS*
03564>      PEAK FLOW        (cms)=         .37           .00            .374 (iii)
03565>      TIME TO PEAK     (hrs)=        1.00          1.21           1.000
03566>      RUNOFF VOLUME     (mm)=       70.09         35.46          69.056
03567>      TOTAL RAINFALL    (mm)=       71.66         71.66          71.665
03568>      RUNOFF COEFFICIENT   =         .98           .49            .964
03569>
03570>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03571>             CN* =  81.0     Ia = Dep. Storage  (Above)
03572>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03573>             THAN THE STORAGE COEFFICIENT.
03574>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03575>
03576> -----------------------------------------------------------------------------
03577> 001:0010---------------------------------------------------------------------
03578> *
03579> * SUB-AREA No.5
03580> ---------------------
03581> | CALIB STANDHYD      |   Area    (ha)=    2.66
03582> | 07:070    DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
03583> ---------------------
03584>                                  IMPERVIOUS    PERVIOUS (i)
03585>      Surface Area      (ha)=        2.58           .08
03586>      Dep. Storage      (mm)=        1.57          4.67
03587>      Average Slope      (%)=         .61          1.50
03588>      Length             (m)=      207.25         20.00
03589>      Mannings n            =        .030          .250
03590>
03591>      Max.eff.Inten.(mm/hr)=      178.56         74.05
03592>                 over (min)         5.00         12.50
03593>      Storage Coeff.  (min)=        6.01 (ii)    11.73 (ii)
03594>      Unit Hyd. Tpeak (min)=        5.00         12.50
03595>      Unit Hyd. peak  (cms)=         .20           .09
03596>                                                                *TOTALS*
03597>      PEAK FLOW        (cms)=        1.03           .01           1.034 (iii)
03598>      TIME TO PEAK     (hrs)=        1.00          1.17           1.000
03599>      RUNOFF VOLUME     (mm)=       70.09         35.46          69.056
03600>      TOTAL RAINFALL    (mm)=       71.66         71.66          71.665
03601>      RUNOFF COEFFICIENT   =         .98           .49            .964
03602>
03603>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03604>             CN* =  81.0     Ia = Dep. Storage  (Above)
03605>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03606>             THAN THE STORAGE COEFFICIENT.
03607>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03608>
03609> -----------------------------------------------------------------------------
03610> 001:0011---------------------------------------------------------------------
03611> --------------------
03612> | ADD HYD (080   ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
03613> --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
03614>                    ID1 06:060        .89      .374    1.00  69.06    .000
03615>                   +ID2 07:070       2.66     1.034    1.00  69.06    .000
03616>                    ==================================================
03617>                    SUM 08:080       3.55     1.408    1.00  69.06    .000
03618>
03619>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03620>
03621> -----------------------------------------------------------------------------
03622> 001:0012---------------------------------------------------------------------
03623> --------------------
03624> | ADD HYD (090   ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
03625> --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
03626>                    ID1 05:050       5.01     1.729    1.04  66.66    .000
03627>                   +ID2 08:080       3.55     1.408    1.00  69.06    .000
03628>                    ==================================================
03629>                    SUM 09:090       8.56     3.067    1.04  67.66    .000
03630>
03631>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03632>
03633> -----------------------------------------------------------------------------
03634> 001:0013---------------------------------------------------------------------
03635> ---------------------
03636> | ROUTE RESERVOIR     |    Requested routing time step =  1.0 min.
03637> |   IN>09:(090    )   |
03638> | OUT<10:(POND   )    |    ========  OUTFLOW STORAGE TABLE  ========
03639> ---------------------     OUTFLOW     STORAGE   |  OUTFLOW     STORAGE
03640>                             (cms)     (ha.m.)   |   (cms)      (ha.m.)
03641>                             .000   .0000E+00   |     .593  .6251E+00
03642>                             .008   .6560E-01   |     .654  .6631E+00
03643>                             .017   .1311E+00   |     .797  .7391E+00
03644>                             .093   .2831E+00   |     .950  .8274E+00
03645>                             .233   .3971E+00   |    1.304  .9157E+00
03646>                             .337   .4731E+00   |    1.880  .1004E+01
03647>                             .465   .5491E+00   |    2.577  .1092E+01
03648>                             .531   .5871E+00   |     .000  .0000E+00
03649>
03650>      ROUTING RESULTS            AREA     QPEAK     TPEAK        R.V.
03651>      -------------------        (ha)     (cms)     (hrs)        (mm)
03652>      INFLOW >09: (090    )      8.56     3.067     1.042      67.655
03653>      OUTFLOW<10: (POND   )      8.56      .283     1.861      67.653
03654>
03655>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=    9.214
03656>                    TIME SHIFT OF PEAK FLOW          (min)=    49.17
03657>                    MAXIMUM  STORAGE   USED       (ha.m.)=.4333E+00
03658>
03659> -----------------------------------------------------------------------------
03660> 001:0014---------------------------------------------------------------------
03661> ********************************************
03662> *     Remaining Hawthorne Industrial Park      *
03663> ********************************************
03664> *
03665> * SUB-AREA No.1
03666> ---------------------
03667> | CALIB STANDHYD      |   Area    (ha)=   19.90
03668> | 01:HIP01  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
03669> ---------------------
03670>                                  IMPERVIOUS    PERVIOUS (i)
03671>      Surface Area      (ha)=       14.13          5.77
03672>      Dep. Storage      (mm)=        1.57          4.67
03673>      Average Slope      (%)=         .60          1.50
03674>      Length             (m)=      580.00        100.00
03675>      Mannings n            =        .030          .250
03676>
03677>      Max.eff.Inten.(mm/hr)=      153.66        117.89
03678>                 over (min)        12.50         25.00
03679>      Storage Coeff.  (min)=       11.89 (ii)    24.37 (ii)
03680>      Unit Hyd. Tpeak (min)=       12.50         25.00
03681>      Unit Hyd. peak  (cms)=         .09           .05
03682>                                                                *TOTALS*
03683>      PEAK FLOW        (cms)=        2.77          1.13           3.419 (iii)
03684>      TIME TO PEAK     (hrs)=        1.13          1.38           1.167
03685>      RUNOFF VOLUME     (mm)=       70.09         45.94          58.015
03686>      TOTAL RAINFALL    (mm)=       71.66         71.66          71.665
03687>      RUNOFF COEFFICIENT   =         .98           .64            .810
03688>
03689>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03690>             CN* =  81.0     Ia = Dep. Storage  (Above)
03691>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03692>             THAN THE STORAGE COEFFICIENT.
03693>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03694>
03695> -----------------------------------------------------------------------------
03696> 001:0015---------------------------------------------------------------------
03697> --------------------
03698> | ADD HYD (HIP02 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
03699> --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
03700>                    ID1 10:POND       8.56      .283    1.86  67.65    .000
03701>                   +ID2 01:HIP01     19.90     3.419    1.17  58.02    .000
03702>                    ==================================================
03703>                    SUM 02:HIP02     28.46     3.554    1.17  60.91    .000
03704>
03705>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
03706>
03707> -----------------------------------------------------------------------------
03708> 001:0016---------------------------------------------------------------------
03709> *
03710> * SUB-AREA No.2
03711> ---------------------
03712> | CALIB STANDHYD      |   Area    (ha)=   17.00
03713> | 03:HIP03  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
03714> ---------------------
03715>                                  IMPERVIOUS    PERVIOUS (i)
03716>      Surface Area      (ha)=       12.07          4.93
03717>      Dep. Storage      (mm)=        1.57          4.67
03718>      Average Slope      (%)=         .65          1.50
03719>      Length             (m)=      450.00        100.00
03720>      Mannings n            =        .030          .250
03721>
03722>      Max.eff.Inten.(mm/hr)=      178.56        126.60
03723>                 over (min)        10.00         22.50
03724>      Storage Coeff.  (min)=        9.39 (ii)    21.52 (ii)
03725>      Unit Hyd. Tpeak (min)=       10.00         22.50
03726>      Unit Hyd. peak  (cms)=         .12           .05
03727>                                                                *TOTALS*
03728>      PEAK FLOW        (cms)=        2.68          1.05           3.203 (iii)
03729>      TIME TO PEAK     (hrs)=        1.08          1.33           1.125
03730>      RUNOFF VOLUME     (mm)=       70.09         45.94          58.015
03731>      TOTAL RAINFALL    (mm)=       71.66         71.66          71.665
03732>      RUNOFF COEFFICIENT   =         .98           .64            .810
03733>
03734>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03735>             CN* =  81.0     Ia = Dep. Storage  (Above)
03736>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03737>             THAN THE STORAGE COEFFICIENT.
03738>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03739>
03740> -----------------------------------------------------------------------------
03741> 001:0017---------------------------------------------------------------------
03742> *
03743> * SUB-AREA No.3
03744> ---------------------
03745> | CALIB STANDHYD      |   Area    (ha)=   15.60
03746> | 04:HIP04  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
03747> ---------------------
03748>                                  IMPERVIOUS    PERVIOUS (i)
03749>      Surface Area      (ha)=       11.08          4.52
03750>      Dep. Storage      (mm)=        1.57          4.67
03751>      Average Slope      (%)=         .50          1.50
03752>      Length             (m)=      600.00        100.00
03753>      Mannings n            =        .030          .250
03754>
03755>      Max.eff.Inten.(mm/hr)=      153.66        117.89
03756>                 over (min)        12.50         25.00
03757>      Storage Coeff.  (min)=       12.82 (ii)    25.30 (ii)
03758>      Unit Hyd. Tpeak (min)=       12.50         25.00
03759>      Unit Hyd. peak  (cms)=         .09           .04
03760>                                                                *TOTALS*
03761>      PEAK FLOW        (cms)=        2.10           .87           2.612 (iii)
03762>      TIME TO PEAK     (hrs)=        1.13          1.38           1.167
03763>      RUNOFF VOLUME     (mm)=       70.09         45.94          58.015
03764>      TOTAL RAINFALL    (mm)=       71.66         71.66          71.665
03765>      RUNOFF COEFFICIENT   =         .98           .64            .810
03766>
03767>         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
03768>             CN* =  81.0     Ia = Dep. Storage  (Above)
03769>        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
03770>             THAN THE STORAGE COEFFICIENT.
03771>       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
03772>
03773> -----------------------------------------------------------------------------
03774> 001:0018---------------------------------------------------------------------
03775> --------------------
03776> | ADD HYD (HIP05 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.     DWF
03777> --------------------                (ha)      (cms)   (hrs)   (mm)    (cms)
03778>                    ID1 03:HIP03     17.00     3.203    1.13  58.02    .000
03779>                   +ID2 04:HIP04     15.60     2.612    1.17  58.02    .000
03780>                    ==================================================
```

```
                 SUM 05:HIP05     32.60    5.767    1.13  58.02    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0019-------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP06 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
 --------------------               (ha)      (cms)   (hrs)   (mm)   (cms)
                  ID1 05:HIP05     32.60    5.767    1.13  58.02    .000
                 +ID2 02:HIP02     28.46    3.554    1.17  60.91    .000
                 ==================================================
                 SUM 06:HIP06     61.06    9.239    1.13  59.36    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0020-------------------------------------------------------------------
 *
 * SUB-AREA No.4
 ----------------------
 | CALIB STANDHYD      |   Area    (ha)=   12.20
 | 07:HIP07  DT= 2.50 |   Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 ----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.66          3.54
     Dep. Storage     (mm)=       1.57          4.67
     Average Slope     (%)=        .70          1.50
     Length            (m)=     210.00        100.00
     Mannings n          =        .030          .250

     Max.eff.Inten.(mm/hr)=     178.56        146.17
                over (min)        5.00         17.50
     Storage Coeff.  (min)=       5.81 (ii)    17.27 (ii)
     Unit Hyd. Tpeak (min)=       5.00         17.50
     Unit Hyd. peak  (cms)=        .20           .07
                                                             *TOTALS*
     PEAK FLOW       (cms)=       2.46           .87           2.793 (iii)
     TIME TO PEAK    (hrs)=       1.00          1.25           1.042
     RUNOFF VOLUME    (mm)=      70.09         45.94          58.015
     TOTAL RAINFALL   (mm)=      71.66         71.66          71.665
     RUNOFF COEFFICIENT   =        .98           .64            .810

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

 ---------------------------------------------------------------------------
 001:0021-------------------------------------------------------------------
 *
 *SUB-AREA No.5
 ----------------------
 | DESIGN NASHYD       |   Area    (ha)=    4.00   Curve Number   (CN)=85.00
 | 08:Pond-B DT= 2.50 |   Ia      (mm)=   4.670   # of Linear Res.(N)= 3.00
 ----------------------   U.H. Tp(hrs)=    .170

     Unit Hyd Qpeak  (cms)=      .899

     PEAK FLOW       (cms)=      .649 (i)
     TIME TO PEAK    (hrs)=     1.125
     RUNOFF VOLUME    (mm)=    40.139
     TOTAL RAINFALL   (mm)=    71.665
     RUNOFF COEFFICIENT   =      .560

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

 ---------------------------------------------------------------------------
 001:0022-------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP08 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
 --------------------               (ha)      (cms)   (hrs)   (mm)   (cms)
                  ID1 06:HIP06     61.06    9.239    1.13  59.36    .000
                 +ID2 07:HIP07     12.20    2.793    1.04  58.02    .000
                 +ID3 08:Pond-B     4.00     .649    1.13  40.14    .000
                 ==================================================
                 SUM 09:HIP08     77.26   12.109    1.13  58.16    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0023-------------------------------------------------------------------
 ---------------------
 | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
 |  IN>09:(HIP08 )    |
 | OUT<10:(HIP-PO)    |    =========  OUTLFOW STORAGE TABLE  =========
 ---------------------     OUTFLOW     STORAGE   |  OUTFLOW    STORAGE
                            (cms)     (ha.m.)   |   (cms)     (ha.m.)
                             .000  .0000E+00   |     .724  .2210E+01
                             .048  .5740E-01   |     .937  .2501E+01
                             .054  .2434E+00   |    1.262  .2798E+01
                             .059  .5834E+00   |    1.404  .3101E+01
                             .062  .8400E+00   |    1.532  .3410E+01
                             .064  .1102E+01   |    1.650  .3724E+01
                             .147  .1370E+01   |    2.409  .4044E+01
                             .280  .1644E+01   |    3.689  .4370E+01
                             .472  .1924E+01   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK      TPEAK       R.V.
     -------------------        (ha)     (cms)      (hrs)       (mm)
     INFLOW >09: (HIP08 )      77.26    12.109      1.125      58.156
     OUTFLOW<10: (HIP-PO)      77.26     1.432      2.889      58.156

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   11.826
                   TIME SHIFT OF PEAK FLOW         (min)=   105.83
                   MAXIMUM  STORAGE   USED       (ha.m.)=.3168E+01

 ---------------------------------------------------------------------------
 001:0024-------------------------------------------------------------------
 *
 *SUB-AREA No. 6
 ----------------------
 | DESIGN NASHYD       |   Area     (ha)=    2.70   Curve Number   (CN)=76.00
 | 01:A3      DT= 2.50 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
 ----------------------   U.H. Tp(hrs)=     .800

     Unit Hyd Qpeak  (cms)=      .129

     PEAK FLOW       (cms)=      .114 (i)
     TIME TO PEAK    (hrs)=     1.958
     RUNOFF VOLUME    (mm)=    30.490
     TOTAL RAINFALL   (mm)=    71.665
     RUNOFF COEFFICIENT   =      .425

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

 ---------------------------------------------------------------------------
 001:0025-------------------------------------------------------------------
 --------------------
 | ADD HYD (Ultima) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
 --------------------               (ha)      (cms)   (hrs)   (mm)   (cms)
                  ID1 10:HIP-PO    77.26    1.432    2.89  58.16    .000
                 +ID2 01:A3         2.70     .114    1.96  30.49    .000
                 ==================================================
                 SUM 02:Ultima    79.96    1.515    2.57  57.22    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0026-------------------------------------------------------------------
       FINISH
 ---------------------------------------------------------------------------
 ***************************************************************************
      WARNINGS / ERRORS / NOTES
      -------------------------
   Simulation ended on 2009-05-15     at 08:45:24
 ===========================================================================


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APPENDIX 'I'

MINISTRY OF THE ENVIRONMENT CERTIFICATE OF APPROVAL EXISTING SETTLING PONDS

NK

Ministry of the Environment
Ministère de l'Environnement
Ontario

GOLDER ASSOCIATES
MAY 25 2004
RECEIVED — OTTAWA

CERTIFICATE OF APPROVAL
INDUSTRIAL SEWAGE WORKS
NUMBER 6924-5YWQ3U

R. W. Tomlinson Limited
5597 Power Road, R.R. No. 6
Gloucester, Ontario
K1G 3N4

Site Location: Tomlinson Property, east side of Hawthorne Road
Lot 26 & 27, Concession VI
Ottawa City

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

the establishment of sewage works for the collection, transmission, treatment and disposal of excess wash plant wash water, consisting of the following:

- 410 millimeter pipeline extending from the wash plant, located on the Rideau Road Quarry #1 site, to the settling ponds;
- three (3) settling ponds, in series, Cell #1 having an effective volume of 3,275 cubic metres (and an operating freeboard of 0.6 metres), Cell #2 having an effective volume of 2,347 cubic metres (and an operating freeboard of 0.6 metres) and Cell #3 having an effective volume of 1,154 cubic metres (and an operating freeboard of 0.6 metres), including temporary floating pumping station in Cell #1, floating recycle pumping station in Cell #2, baffle in Cell #2 and mixing manhole between Cell #2 and Cell #3 (if required), with an overflow discharge from Cell #3 to the roadside ditch along Hawthorne Road;
- all other controls, electrical equipment, instrumentation, piping, pumps, valves and appurtenances essential for the proper operation of the aforementioned sewage works;

all in accordance with the following submitted supporting documents:

1. Application for Approval of Industrial Sewage Works submitted by Ronald Tomlinson of R. W. Tomlinson Limited dated March 8, 2004;

2. Report on Application for Industrial Sewage Works Approval under Section 53 of the Ontario Water Resources Act, R.W. Tomlinson Limited, Aggregate Wash Water Management Associated with Rideau Road Quarry No. 1, Geographic City of Gloucester, City of Ottawa, Ontario prepared by Golder Associates, dated March 2004; and

3. Letter and attachments dated May 11, 2004 from Nural Kuyucak and K. Marentette of Golder Associates to Randy Chin of the Ministry of the Environment.

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

"Certificate" means this entire certificate of approval document, issued in accordance with Section 53 of the *Ontario Water Resources Act*, and includes any schedules;

"Director" means any Ministry employee appointed by the Minister pursuant to section 5 of the *Ontario Water Resources Act*;

"District Manager" means the District Manager of the Ottawa District Office of the Ministry;

"Ministry" means the Ontario Ministry of the Environment;

"Owner" means R. W. Tomlinson Limited and includes its successors and assignees; and

"works" means the sewage works described in the Owner's application, this certificate and in the supporting documentation referred to herein, to the extent approved by this certificate.

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

TERMS AND CONDITIONS

1. GENERAL CONDITION

(1) 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 Certificate, the application for approval of the works and the submitted supporting documents and plans and specifications as listed in this Certificate.

(2) Where there is a conflict between a provision of any submitted document referred to in this Certificate and the Conditions of this Certificate, the Conditions in this Certificate shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

2. CHANGE OF OWNER

(1) The Owner shall notify the District Manager and the Director, in writing, of any of the following changes within 30 days of the change occurring:

(a) change of Owner or operating authority, or both;

(b) change of address of Owner or operating authority or address of new owner or operating authority;

(c) change of partners where the Owner or operating authority is or at any time becomes a partnership, and a copy of the most recent declaration filed under the *Partnerships Registration Act*; and

(d) change of name of the corporation where the Owner or operator is or at any time becomes a corporation, and a copy of the most current "Initial Notice or Notice of Change" (Form 1, 2 or 3 of O. Reg. 189, R.R.O. 1980, as amended from time to time), filed under the *Corporations Informations Act* shall be included in the notification to the District Manager.

(2) In the event of any change in ownership of the works, the Owner shall notify in writing the succeeding owner of the existence of this certificate, and a copy of such notice shall be forwarded to the District Manager.

(3) The Owner shall ensure that all communications made pursuant to this condition will refer to this certificate's number.

3. OPERATIONS MANUAL

(1) The Owner shall prepare an operations manual prior to the commencement of operation of the sewage works, that includes, but not necessarily limited to, the following information:

(a) operating 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 spill, bypasses and any other abnormal situations and for notifying the District Manager; and

(e) complaint procedures for receiving and responding to public complaints.

(2) The Owner shall maintain the operations manual up to date through revisions undertaken from time to time and retain a copy at the location of the sewage works. Upon request, the Owner shall make the manual available for inspection and copying by Ministry personnel.

4. CLOSED LOOP OPERATION

(1) The Owner shall ensure that the works are normally operated as a closed loop system with treated water being recycled back to the wash plant.

(2) In the event that excess accumulation of water occurs and a discharge is necessary, the Owner shall undertake the monitoring outlined in Condition 6 and shall adhere to the effluent limits in Condition 5.

5. EFFLUENT LIMITS

(1) The Owner shall design, construct and operate the works such that the concentration of Total Suspended Solids does not exceed 25 milligrams per litre in the effluent from the works.

(2) For the purposes of determining compliance with and enforcing subsection (1), non-compliance with respect to the Total Suspended Solids concentration limit is deemed to have occurred when any single sample (along with a follow-up confirmation sample collected within 7 days of the receipt of the original sample result that indicated that an exceedance had occurred) analyzed for Total Suspended Solids is greater than the corresponding maximum concentration set out in subsection (1).

6. EFFLUENT MONITORING AND RECORDING

The Owner shall, upon commencement of operation of the sewage works, carry out the following monitoring program:

(1) All samples and measurements taken for the purposes of this certificate are to be taken at a time and in a location characteristic of the quality and quantity of the effluent stream over the time period being monitored.

(2) Samples shall be collected of the discharge from Cell #3 to the Hawthorne Road ditch and analyzed, at the sampling frequencies and using the sample type specified for each parameter listed:

Table 1 - Effluent Monitoring	
Frequency	Once each Month During Periods of Effluent Discharge
Sample Type	Grab
Parameters	Total Suspended Solids

(3) The methods and protocols for sampling, analysis, and recording shall conform, in order of precedence, to the methods and protocols specified in the following:

(a) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (August 1994), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions; and

(b) the publication "Standard Methods for the Examination of Water and Wastewater" (17th edition) as amended from time to time by more recently published editions.

(4) The Owner shall measure, record and calculate the flowrate from Cell #3 to the Hawthorne Road ditch daily (during periods of discharge), within an accuracy of plus or minus 15 per cent of the actual flowrate.

(5) The Owner shall retain for a minimum of three (3) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this certificate.

7. REPORTING

(1) The Owner shall report to the District Manager or designate, of any exceedence of any parameter specified in Conditions 5 orally, as soon as reasonably possible, and in writing within seven (7) days of the exceedence.

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

1. Condition 1 is imposed to ensure that the works are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the Certificate 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 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 certificate and continue to operate the works in compliance with it.

3. Condition 3 is included to ensure that a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the owner and made available to the Ministry. Such a manual is an integral part of the operation of the works. Its compilation and use should assist the owner in staff training, in proper plant operation and in identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for Ministry staff when reviewing the owner's operation of the work.

4. Condition 4 is included to ensure that the works are operated as designed.

5. Condition 5 is imposed to ensure that the effluent discharged from the works meets the Ministry's effluent quality requirements thus minimizing environmental impact on the receiver.

6. Conditions 6 and 7 are included to require the owner to demonstrate on a continual basis that the quality of the effluent from the approved works is consistent with the effluent limits specified in the certificate and that the approved works does not cause any impairment to the receiving watercourse.

In accordance with Section 100 of the <u>Ontario Water Resources Act</u>, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal and in accordance with Section 47 of the <u>Environmental Bill of Rights</u>, S.O. 1993, Chapter 28, the Environmental Commissioner, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 101 of the <u>Ontario Water Resources Act</u>, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to <u>each</u> portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

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

This Notice must be served upon:

The Secretary* Environmental Review Tribunal 2300 Yonge St., 12th Floor P.O. Box 2382 Toronto, Ontario M4P 1E4	<u>AND</u>	The Environmental Commissioner 1075 Bay Street, 6th Floor Suite 605 Toronto, Ontario M5S 2B1	<u>AND</u>	The Director Section 53, *Ontario Water Resources Act* Ministry of the Environment 2 St. Clair Avenue West, Floor 12A Toronto, Ontario M4V 1L5

* **Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

This instrument is subject to Section 38 of the <u>Environmental Bill of Rights</u>, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek leave to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry at www.ene.gov.on.ca, you can determine when the leave to appeal period ends.

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 19th day of May, 2004

THIS CERTIFICATE WAS MAILED
ON May 20, 2004
RC
(Signed)

Mohamed Dhalla, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

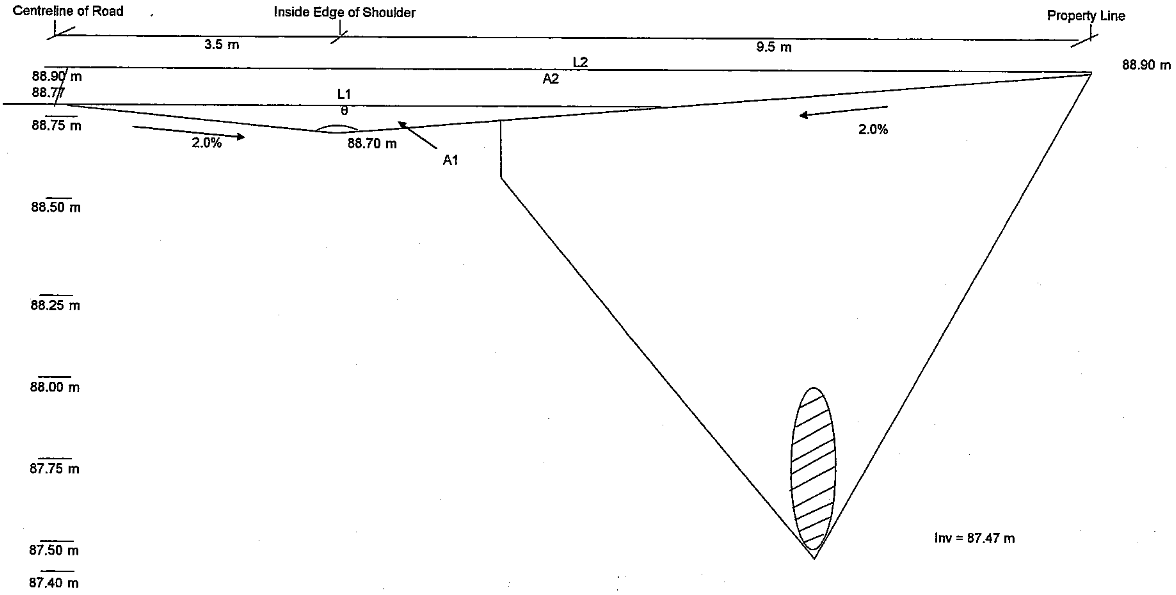
RC/
c: District Manager, MOE Ottawa
Nural Kuyucak, Golder Associates Ltd. ✓

APPENDIX 'J'

ASSESSMENT OF CULVERT CROSSING DURING AN EXTREME STORM EVENT

ENTRANCE TO POND ACCESS ROAD - OPEN DITCH/CULVERT CONFIGURATION

Typical open ditch/culvert configuration: 1390x970mm CSPA culvert, invert approx. 1.43 m below elevation at property line.
Proposed Terrace Elevation is approx. 0.13 m above road centreline.



A1:	0.24 m2	L1:	7.000 m
A2:	1.30 m2	L2:	13.000 m
θ:	178 Degrees		

FLOW ABOVE CULVERT THRU A1:	FLOW ABOVE CULVERT THRU A2:
Since θ is equal to approx. 180 degrees Use the Rectangular Weir Equation to Estimate the Flow Thru A1:	Using the Rectangular Weir Equation to Estimate the Flow Thru A2:
Q = C x L x H ^ 1.5 C = 1.84 L' = L1 - (0.1 x n x h) , where n= no. of end contractions	Q = C x L x H ^ 1.5 C = 1.84 L' = L3 - (0.1 x n x h) , where n= no. of end contractions
use h = 88.77 - 88.7 = 0.07 m h = 0.07 m L' = 6.99 m	use h = 88.9 - 88.77 = 0.13 m h = 0.13 m L3 = (L1 + L2) / 2 = 10m (Avg. Length) L '= 9.97 m
Q_{A1} = 0.24 m3/s	Q_{A2} = 0.86 m3/s

1:100 year Peak Flow Rate of 3.0 m^3/s (From Storm Design Sheet : 100 Year Flow 27B-27C)

Flow through the 1390 x 970 mm CSPA Culvert under Inlet Control Conditions = 1.9 m^3/s (From Culvert Sizing Nomograph 27B-27C)
Total flow above culvert = Q_{A1} + Q_{A2} = 0.24 m^3/s + 0.86 m^3/s = 1.10 m^3/s
Therefore, Total Flow = 1.9 m^3/s + 1.1 m^3 /s
= 3.0 m^3/s
=1:100 year Peak Flow Rate

APPENDIX 'K'

SWMHYMO INPUT AND OUTPUT FILES
(July 1, 1979 Historical Storm Event)

```
2     Metric units
*#****************************************************************************
*#  Project Name : Hawthorne Industrial Park        Project Number:    [20983] *
*#  Date         : January, 2009                                               *
*#  Revised      : N/A                                                         *
*#  Developed by : Mark Buchanan, E.I.T.                                       *
*#  Reviewed by  : Guy Forget, P.Eng.                                          *
*#  Company      : J.L. Richards & Associates Limited                          *
*#  License #    : 4418403                                                     *
*#****************************************************************************
*
*
*#***************************************************************
*#  FILENAME:  V:\20983.DU\ENG\SWMHYMO\20983PST.DAT              *
*#  FILE DEVELOPED FOR SITE PLAN APPLICATION AND DETAILED DESIGN *
*#   OF A FACILITY ASSOCIATED WITH THE OTTAWA COMPOSTING SITE    *
*#***************************************************************
*
****************************************************************************
*          SWMHYMO FILE DEVELOPED TO INVESTIGATE FLOOD FLOWS OF THE          *
*   PROPOSED COMPOSTING SITE UNDER POST-DEVELOPMENT UNCONTROLLED CONDITIONS   *
****************************************************************************

*****************************************************
* HYDROLOGICAL ANALYSIS UNDER A 4 HR-25 MM STORM AND  *
* FOR DESIGN STORMS OF 1:2, 5, 10, 25, 50, AND 100 YR *
*****************************************************
************************************************************
*            CALCULATION OF JULY 1st 1979 STORM EVENT           *
************************************************************

START                  TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
*%                      [  ] <--storm filename, one per line for NSTORM time
READ STORM             STORM_FILENAME=["JUL_1_79.STM"]
*%-----------------|-----------------------------------------------------------|
DEFAULT VALUES         ICASEdef=[1],  read and print values
                       DEFVAL_FILENAME=[V:\22973.DU\ENG\SWMHYMO\"ORGA.VAL"]
*%-----------------|-----------------------------------------------------------|

**********************************
*          ORGAWORLD FILE         *
**********************************
*
* SUB-AREA No.1

CALIB STANDHYD         ID=[ 1  ], NHYD=["010"], DT=[2.5](min), AREA=[ 2.07 ](ha),
                       XIMP=[0.84], TIMP=[0.84], DWF=[0.0](cms), LOSS=[2],
                       SCS curve number CN=[81],
                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                            LGP=[20](m), MNP=[ 0.25 ], SCP=[0.0](mi
                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.52](%),
                                            LGI=[204.72](m), MNI=[0.03 ], SCI=[0.0]
                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-----------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD         ID=[ 2  ], NHYD=["020"], DT=[2.5](min), AREA=[ 1.54 ](ha),
                       XIMP=[0.92], TIMP=[0.92], DWF=[0.0](cms), LOSS=[2],
                       SCS curve number CN=[81],
                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                            LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.50](%),
                                            LGI=[244.34](m), MNI=[0.03 ], SCI=[0.0]
                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-----------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD         ID=[ 3 ], NHYD=["030"], DT=[2.5](min), AREA=[1.4](ha),
                       XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                       SCS curve number CN=[81],
                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.0](%),
                                            LGP=[5](m), MNP=[0.03], SCP=[0.0](min),
                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[ 0.51 ](%),
                                            LGI=[ 225.63 ](m), MNI=[0.03], SCI=[0.0
                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-----------------------------------------------------------|
ADD HYD                IDsum=[4], NHYD=[ "040"], IDs to add=[1+2]
*%-----------------|-----------------------------------------------------------|
ADD HYD                IDsum=[5], NHYD=[ "050"], IDs to add=[3+4]
*%-----------------|-----------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD         ID=[6], NHYD=["060"], DT=[2.5](min), AREA=[0.89](ha),
                       XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                       SCS curve number CN=[81],
                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[0.7](%),
                                            LGP=[40](m), MNP=[0.25], SCP=[0.0](min)
                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.93](%),
                                            LGI=[164.82](m), MNI=[0.03], SCI=[0.0](
                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-----------------------------------------------------------|
*
* SUB-AREA No.5

CALIB STANDHYD         ID=[ 7  ], NHYD=["070"], DT=[2.5](min), AREA=[2.66](ha),
                       XIMP=[0.97], TIMP=[0.97], DWF=[0.0](cms), LOSS=[2],
                       SCS curve number CN=[81],
                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                            LGP=[20.0](m), MNP=[0.25], SCP=[0.0](mi
                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.61](%),
                                            LGI=[207.25](m), MNI=[0.03], SCI=[0.0](
                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-----------------------------------------------------------|
ADD HYD                IDsum=[8], NHYD=[ "080"], IDs to add=[6+7]
*%-----------------|-----------------------------------------------------------|
ADD HYD                IDsum=[9], NHYD=[ "090"], IDs to add=[5+8]
*%-----------------|-----------------------------------------------------------|

ROUTE RESERVOIR        IDout=[10],   NHYD=["POND"],  IDin=[9],
                       RDT=[1.0](min),
                             TABLE of ( OUTFLOW-STORAGE ) values
                                         (cms) - (ha-m)
                                       [   0.000,  0.0000]
                                       [   0.008,  0.0656]
                                       [   0.017,  0.1311]
                                       [   0.093,  0.2831]
                                       [   0.233,  0.3971]
                                       [   0.337,  0.4731]
                                       [   0.465,  0.5491]
                                       [   0.531,  0.5871]
                                       [   0.593,  0.6251]
                                       [   0.654,  0.6631]
                                       [   0.797,  0.7391]
                                       [   0.950,  0.8274]
                                       [   1.304,  0.9157]
                                       [   1.880,  1.0040]
                                       [   2.577,  1.0923]
                                       [   -1   ,  -1    ]  (max twenty pts)

*********************************************
*     Remaining Hawthorne Industrial Park     *
*********************************************
*
* SUB-AREA No.1

CALIB STANDHYD         ID=[ 1 ], NHYD=["HIP01"], DT=[2.5](min), AREA=[19.9](ha),
                       XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                       SCS curve number CN=[81],
                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                            LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.6](%),
                                            LGI=[580](m), MNI=[0.03], SCI=[0.0](min
                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-----------------------------------------------------------|
ADD HYD                IDsum=[ 2 ], NHYD=["HIP02"], IDs to add=[10+1]
*%-----------------|-----------------------------------------------------------|
*
* SUB-AREA No.2

CALIB STANDHYD         ID=[ 3 ], NHYD=["HIP03"], DT=[2.5](min), AREA=[17](ha),
                       XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                       SCS curve number CN=[81],
                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                            LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.65](%),
                                            LGI=[450](m), MNI=[0.03], SCI=[0.0](min
                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-----------------------------------------------------------|
*
* SUB-AREA No.3

CALIB STANDHYD         ID=[ 4 ], NHYD=["HIP04"], DT=[2.5](min), AREA=[15.6](ha),
                       XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                       SCS curve number CN=[81],
                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                            LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.5](%),
                                            LGI=[600](m), MNI=[0.03], SCI=[0.0](min
                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-----------------------------------------------------------|
ADD HYD                IDsum=[ 5 ], NHYD=["HIP05"], IDs to add=[3+4]
*%-----------------|-----------------------------------------------------------|
ADD HYD                IDsum=[ 6 ], NHYD=["HIP06"], IDs to add=[5+2]
*%-----------------|-----------------------------------------------------------|
*
* SUB-AREA No.4

CALIB STANDHYD         ID=[ 7 ], NHYD=["HIP07"], DT=[2.5](min), AREA=[12.2](ha),
                       XIMP=[0.50], TIMP=[0.71], DWF=[0.0](cms), LOSS=[2],
                       SCS curve number CN=[81],
                       Pervious   surfaces: IAper=[4.67](mm), SLPP=[1.5](%),
                                            LGP=[100.0](m), MNP=[0.25], SCP=[0.0](m
                       Impervious surfaces: IAimp=[1.57](mm), SLPI=[0.7](%),
                                            LGI=[210](m), MNI=[0.03], SCI=[0.0](min
                       RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1

*%-----------------|-----------------------------------------------------------|
*
*SUB-AREA No.5

DESIGN NASHYD          ID=[ 8 ], NHYD=["Pond-Block"], DT=[2.5]min, AREA=[4.0](ha),
                       DWF=[ 0 ](cms), CN/C=[ 85 ], TP=[0.17]hrs,
                       RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

ADD HYD                IDsum=[ 9 ], NHYD=["HIP08"], IDs to add=[6+7+8]
*%-----------------|-----------------------------------------------------------|

ROUTE RESERVOIR        IDout=[ 10 ],   NHYD=["HIP-POND"],  IDin=[ 9 ],
                       RDT=[1.0](min),
                             TABLE of ( OUTFLOW-STORAGE ) values
                                         (cms) - (ha-m)
                                      [   0.0  , 0.0    ]
                                      [   0.048, 0.0574 ]
                                      [   0.054, 0.2434 ]
                                      [   0.059, 0.5834 ]
                                      [   0.062, 0.8400 ]
                                      [   0.064, 1.1024 ]
                                      [   0.147, 1.3705 ]
                                      [   0.280, 1.6444 ]
                                      [   0.472, 1.9242 ]
                                      [   0.724, 2.2097 ]
                                      [   0.937, 2.5010 ]
                                      [   1.262, 2.7981 ]
                                      [   1.404, 3.1009 ]
                                      [   1.532, 3.4096 ]
                                      [   1.650, 3.7240 ]
                                      [   2.409, 4.0442 ]
                                      [   3.689, 4.3702 ]
                                      [   -1   ,  -1    ]  (max twenty pts)

*%-----------------|-----------------------------------------------------------|
*
*SUB-AREA No. 6

DESIGN NASHYD          ID = [1], NHYD=["A3"], DT=[2.5]min, AREA=[2.7](ha),
                       DWF=[0](cms), CNC=[76], TP=[0.80]hrs,
                       RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
*%-----------------|-----------------------------------------------------------|

ADD HYD                IDsum=[2], NHYD=["Ultimate"], IDs to add=[10+1]
*%-----------------|-----------------------------------------------------------|

FINISH





```

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

 SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999  =========
 S       W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
 SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9 Ver. 4.02
     S   W W   M   M  H   H    Y    M   M  O   O      9999   9999 July 1999
 SSSSS   W W   M   M  H   H    Y    M   M   OOO          9      9 =========
                                                      9   9  9   9 # 4418403
      StormWater Management HYdrologic Model           999    999  =========

 **************************************************************************
 *************************** SWMHYMO-99 Ver/4.02 **************************
 *******  A single event and continuous hydrologic simulation model  *******
 *******     based on the principles of HYMO and its successors      *******
 *******                OTTHYMO-83 and OTTHYMO-89.                   *******
 **************************************************************************
 ******* Distributed by:  J.F. Sabourin and Associates Inc.           *******
 *******                  Ottawa,  Ontario: (613) 727-5199           *******
 *******                  Gatineau, Quebec: (819) 243-6858           *******
 *******                  E-Mail: swmhymo@jfsa.Com                   *******
 **************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++ Licensed user: J. L. Richards & Associates Limited          +++++++
 +++++++                 Ottawa                  SERIAL#:4418403      +++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 **************************************************************************
 *******              ++++++ PROGRAM ARRAY DIMENSIONS ++++++          *******
 *******              Maximum value for ID numbers  :     10          *******
 *******              Max. number of rainfall points:  15000          *******
 *******              Max. number of flow points    :  15000          *******
 **************************************************************************


 ********************  D E T A I L E D   O U T P U T  *******************
 **************************************************************************
 *        DATE: 2009-05-15     TIME: 09:03:53     RUN COUNTER: 000200      *
 **************************************************************************
 * Input   filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\July1979.dat        *
 * Output  filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\July1979.out        *
 * Summary filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\July1979.sum        *
 * User comments:                                                         *
 * 1:______________________________________________________________________*
 * 2:______________________________________________________________________*
 * 3:______________________________________________________________________*
 **************************************************************************

-----------------------------------------------------------------------------
001:0001---------------------------------------------------------------------
*#****************************************************************************
*#  Project Name : Hawthorne Industrial Park        Project Number:   [20983] *
*#  Date         : January, 2009                                              *
*#  Revised      : N/A                                                        *
*#  Developed by : Mark Buchanan, E.I.T.                                      *
*#  Reviewed by  : Guy Forget, P.Eng.                                         *
*#  Company      : J.L. Richards & Associates Limited                         *
*#  License #    : 4418403                                                    *
*#****************************************************************************
*
*
*#*******************************************************************
*#  FILENAME:  V:\20983.DU\ENG\SWMHYMO\20983PST.DAT                  *
*#  FILE DEVELOPED FOR SITE PLAN APPLICATION AND DETAILED DESIGN *
*#   OF A FACILITY ASSOCIATED WITH THE OTTAWA COMPOSTING SITE    *
*#*******************************************************************
*
******************************************************************************
*          SWMHYMO FILE DEVELOPED TO INVESTIGATE FLOOD FLOWS OF THE           *
*   PROPOSED COMPOSTING SITE UNDER POST-DEVELOPMENT UNCONTROLLED CONDITIONS   *
******************************************************************************
*******************************************************
* HYDROLOGICAL ANALYSIS UNDER A 4 HR-25 MM STORM AND  *
* FOR DESIGN STORMS OF 1:2, 5, 10, 25, 50, AND 100 YR *
*******************************************************
*************************************************************
*           CALCULATION OF JULY 1st 1979 STORM EVENT        *
*************************************************************
-------------------
| START             |  Project  dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
-------------------  Rainfall dir.: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   0
-----------------------------------------------------------------------------
001:0002---------------------------------------------------------------------
-------------------
| READ STORM      |    Filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\JUL_1_
| Ptotal=  88.86 mm|    Comments: HISTORICAL STORM - JULY 1, 1979
-------------------
                TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                 hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                 .08   2.300 |    .83  38.100 |   1.58  71.100 |   2.33   3.800
                 .17   2.300 |    .92  38.100 |   1.67  71.100 |   2.42   3.800
                 .25   8.890 |   1.00  38.100 |   1.75  30.500 |   2.50   3.800
                 .33   8.890 |   1.08  38.100 |   1.83  30.500 |   2.58   3.800
                 .42  38.100 |   1.17  50.800 |   1.92  30.500 |   2.67   3.800
                 .50  38.100 |   1.25  50.800 |   2.00  30.500 |   2.75   3.800
                 .58  38.100 |   1.33  76.200 |   2.08   3.800 |   2.83   3.800
                 .67  38.100 |   1.42 106.700 |   2.17   3.800 |   2.92   3.800
                 .75  38.100 |   1.50 106.700 |   2.25   3.800 |   3.00   3.800

-----------------------------------------------------------------------------
001:0003---------------------------------------------------------------------
---------------------
| DEFAULT VALUES      |  Filename: V:\20983.DU\ENG\FINALS~1\SWMHYM~1\ORGA.VAL
---------------------  ICASEdv = 1 (read and print data)
      FileTitle= ------ ENTER YOUR COMMENTS ON THIS LINE AND THE NEXT ONE ---
                 ------ PARAMETER VALUES MUST BE ENTERD AFTER COLUMN 60 ----□
      Horton's infiltration equation parameters:
      [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
      Parameters for PERVIOUS surfaces in STANDHYD:
      [IAper=   4.67 mm] [LGP=40.00 m] [MNP= .250]
      Parameters for IMPERVIOUS surfaces in STANDHYD:
      [IAimp=   1.57 mm] [CLI= 1.50]   [MNI= .035]
      Parameters used in NASHYD:
      [Ia=   4.67 mm] [N= 3.00]
-----------------------------------------------------------------------------
001:0004---------------------------------------------------------------------
************************************
*          ORGAWORLD FILE          *
************************************
*
* SUB-AREA No.1
---------------------
| CALIB STANDHYD      |   Area    (ha)=    2.07
| 01:010     DT= 2.50 |   Total Imp(%)=   84.00   Dir. Conn.(%)=   84.00
---------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        1.74          .33
     Dep. Storage      (mm)=        1.57         4.67
     Average Slope      (%)=         .52         1.00
     Length             (m)=      204.72        20.00
     Mannings n            =        .030         .250

     Max.eff.Inten.(mm/hr)=       106.70        67.70
               over (min)          7.50        15.00
     Storage Coeff.  (min)=         7.69 (ii)    14.39 (ii)
     Unit Hyd. Tpeak (min)=         7.50        15.00
     Unit Hyd. peak  (cms)=          .15          .08
                                                              *TOTALS*
     PEAK FLOW        (cms)=          .44          .05          .476 (iii)
     TIME TO PEAK     (hrs)=         1.54         1.71         1.542
     RUNOFF VOLUME     (mm)=        87.29        49.30        81.209
     TOTAL RAINFALL    (mm)=        88.86        88.86        88.857
     RUNOFF COEFFICIENT   =          .98          .55          .914

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-----------------------------------------------------------------------------
001:0005---------------------------------------------------------------------
*
* SUB-AREA No.2
---------------------
| CALIB STANDHYD      |   Area    (ha)=    1.54
| 02:020     DT= 2.50 |   Total Imp(%)=   92.00   Dir. Conn.(%)=   92.00
---------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        1.42          .12
     Dep. Storage      (mm)=        1.57         4.67
     Average Slope      (%)=         .50         1.00
     Length             (m)=      244.34         5.00
     Mannings n            =        .030         .030

     Max.eff.Inten.(mm/hr)=       106.70        74.64
               over (min)          7.50        10.00
     Storage Coeff.  (min)=         8.65 (ii)     9.44 (ii)
     Unit Hyd. Tpeak (min)=         7.50        10.00
     Unit Hyd. peak  (cms)=          .14          .12
                                                              *TOTALS*
     PEAK FLOW        (cms)=          .35          .02          .367 (iii)
     TIME TO PEAK     (hrs)=         1.54         1.63         1.542
     RUNOFF VOLUME     (mm)=        87.29        49.30        84.248
     TOTAL RAINFALL    (mm)=        88.86        88.86        88.857
     RUNOFF COEFFICIENT   =          .98          .55          .948

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-----------------------------------------------------------------------------
001:0006---------------------------------------------------------------------
*
* SUB-AREA No.3
---------------------
| CALIB STANDHYD      |   Area    (ha)=    1.40
| 03:030     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
---------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        1.36          .04
     Dep. Storage      (mm)=        1.57         4.67
     Average Slope      (%)=         .51         1.00
     Length             (m)=      225.63         5.00
     Mannings n            =        .030         .030

     Max.eff.Inten.(mm/hr)=       106.70        74.64
               over (min)          7.50        10.00
     Storage Coeff.  (min)=         8.20 (ii)     8.98 (ii)
     Unit Hyd. Tpeak (min)=         7.50        10.00
     Unit Hyd. peak  (cms)=          .14          .12
                                                              *TOTALS*
     PEAK FLOW        (cms)=          .34          .01          .344 (iii)
     TIME TO PEAK     (hrs)=         1.54         1.63         1.542
     RUNOFF VOLUME     (mm)=        87.29        49.30        86.147
     TOTAL RAINFALL    (mm)=        88.86        88.86        88.857
     RUNOFF COEFFICIENT   =          .98          .55          .970

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

-----------------------------------------------------------------------------
001:0007---------------------------------------------------------------------
-------------------
| ADD HYD (040   ) | ID: NHYD       AREA      QPEAK    TPEAK   R.V.     DWF
-------------------                  (ha)      (cms)    (hrs)   (mm)    (cms)
                   ID1 01:010        2.07      .476     1.54  81.21     .000
                  +ID2 02:020        1.54      .367     1.54  84.25     .000
                   ==================================================
                   SUM 04:040        3.61      .844     1.54  82.50     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
001:0008---------------------------------------------------------------------
-------------------
| ADD HYD (050   ) | ID: NHYD       AREA      QPEAK    TPEAK   R.V.     DWF
-------------------                  (ha)      (cms)    (hrs)   (mm)    (cms)
                   ID1 03:030        1.40      .344     1.54  86.15     .000
                  +ID2 04:040        3.61      .844     1.54  82.50     .000
                   ==================================================
                   SUM 05:050        5.01     1.188     1.54  83.52     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----------------------------------------------------------------------------
001:0009---------------------------------------------------------------------
*
* SUB-AREA No.4
---------------------
| CALIB STANDHYD      |   Area    (ha)=     .89
| 06:060     DT= 2.50 |   Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
---------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=         .86          .03
     Dep. Storage      (mm)=        1.57         4.67
     Average Slope      (%)=         .93          .70
     Length             (m)=      164.82        40.00
     Mannings n            =        .030         .250

     Max.eff.Inten.(mm/hr)=       106.70        65.89
               over (min)          5.00        17.50
     Storage Coeff.  (min)=         5.67 (ii)    17.10 (ii)
     Unit Hyd. Tpeak (min)=         5.00        17.50
     Unit Hyd. peak  (cms)=          .21          .07
                                                              *TOTALS*
     PEAK FLOW        (cms)=          .23          .00          .235 (iii)
     TIME TO PEAK     (hrs)=         1.50         1.75         1.500
     RUNOFF VOLUME     (mm)=        87.29        49.30        86.147
     TOTAL RAINFALL    (mm)=        88.86        88.86        88.857
     RUNOFF COEFFICIENT   =          .98          .55          .970
```

```

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

 ---------------------------------------------------------------------------
 001:0010-------------------------------------------------------------------
 *
 * SUB-AREA No.5
 --------------------
 | CALIB STANDHYD     |    Area    (ha)=    2.66
 | 07:070    DT= 2.50 |    Total Imp(%)=   97.00   Dir. Conn.(%)=   97.00
 --------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       2.58          .08
     Dep. Storage      (mm)=       1.57         4.67
     Average Slope      (%)=        .61         1.50
     Length             (m)=     207.25        20.00
     Mannings n           =        .030         .250

     Max.eff.Inten.(mm/hr)=     106.70        70.39
                over (min)        7.50        12.50
     Storage Coeff.  (min)=       7.38 (ii)   13.23 (ii)
     Unit Hyd. Tpeak (min)=       7.50        12.50
     Unit Hyd. peak  (cms)=        .15          .09
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .65          .01          .665 (iii)
     TIME TO PEAK    (hrs)=       1.54         1.67         1.542
     RUNOFF VOLUME    (mm)=      87.29        49.30        86.147
     TOTAL RAINFALL   (mm)=      88.86        88.86        88.857
     RUNOFF COEFFICIENT  =         .98          .55          .970

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

 ---------------------------------------------------------------------------
 001:0011-------------------------------------------------------------------
 --------------------
 | ADD HYD (080   ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
 --------------------               (ha)     (cms)   (hrs)   (mm)    (cms)
                     ID1 06:060      .89      .235    1.50  86.15    .000
                    +ID2 07:070     2.66      .665    1.54  86.15    .000
                     ===================================================
                     SUM 08:080     3.55      .896    1.54  86.15    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0012-------------------------------------------------------------------
 --------------------
 | ADD HYD (090   ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
 --------------------               (ha)     (cms)   (hrs)   (mm)    (cms)
                     ID1 05:050     5.01     1.188    1.54  83.52    .000
                    +ID2 08:080     3.55      .896    1.54  86.15    .000
                     ===================================================
                     SUM 09:090     8.56     2.084    1.54  84.61    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0013-------------------------------------------------------------------
 --------------------
 | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
 |   IN>09:(090    ) |
 | OUT<10:(POND    ) |    =========  OUTLFOW STORAGE TABLE  =========
 --------------------     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)    |   (cms)     (ha.m.)
                            .000  .0000E+00    |     .593  .6251E+00
                            .008  .6560E-01    |     .654  .6631E+00
                            .017  .1311E+00    |     .797  .7391E+00
                            .093  .2831E+00    |     .950  .8274E+00
                            .233  .3971E+00    |    1.304  .9157E+00
                            .337  .4731E+00    |    1.880  .1004E+01
                            .465  .5491E+00    |    2.577  .1092E+01
                            .531  .5871E+00    |     .000  .0000E+00

    ROUTING RESULTS                AREA      QPEAK      TPEAK         R.V.
    --------------------           (ha)      (cms)      (hrs)         (mm)
    INFLOW >09: (090    )          8.56      2.084      1.542       84.611
    OUTFLOW<10: (POND   )          8.56       .496      2.125       84.607

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   23.815
                   TIME SHIFT OF PEAK FLOW         (min)=    35.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.5671E+00

 ---------------------------------------------------------------------------
 001:0014-------------------------------------------------------------------
 *********************************************
 *     Remaining Hawthorne Industrial Park     *
 *********************************************
 *
 * SUB-AREA No.1
 --------------------
 | CALIB STANDHYD     |    Area    (ha)=   19.90
 | 01:HIP01  DT= 2.50 |    Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 --------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=      14.13         5.77
     Dep. Storage      (mm)=       1.57         4.67
     Average Slope      (%)=        .60         1.50
     Length             (m)=     580.00       100.00
     Mannings n           =        .030         .250

     Max.eff.Inten.(mm/hr)=      96.53       119.96
                over (min)       15.00        27.50
     Storage Coeff.  (min)=      14.32 (ii)   26.72 (ii)
     Unit Hyd. Tpeak (min)=      15.00        27.50
     Unit Hyd. peak  (cms)=        .08          .04
                                                          *TOTALS*
     PEAK FLOW       (cms)=       2.14         1.33         3.264 (iii)
     TIME TO PEAK    (hrs)=       1.67         1.92         1.708
     RUNOFF VOLUME    (mm)=      87.29        61.48        74.386
     TOTAL RAINFALL   (mm)=      88.86        88.86        88.857
     RUNOFF COEFFICIENT  =         .98          .69          .837

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

 ---------------------------------------------------------------------------
 001:0015-------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP02 ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
 --------------------               (ha)     (cms)   (hrs)   (mm)    (cms)
                     ID1 10:POND    8.56      .496    2.13  84.61    .000
                    +ID2 01:HIP01  19.90     3.264    1.71  74.39    .000
                     ===================================================
                     SUM 02:HIP02  28.46     3.642    1.75  77.46    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0016-------------------------------------------------------------------
 *
 * SUB-AREA No.2
 --------------------
 | CALIB STANDHYD     |    Area    (ha)=   17.00
 | 03:HIP03  DT= 2.50 |    Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 --------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=      12.07         4.93
     Dep. Storage      (mm)=       1.57         4.67
     Average Slope      (%)=        .65         1.50
     Length             (m)=     450.00       100.00
     Mannings n           =        .030         .250

     Max.eff.Inten.(mm/hr)=     100.60       125.35
                over (min)       12.50        25.00
     Storage Coeff.  (min)=      11.81 (ii)   23.99 (ii)
     Unit Hyd. Tpeak (min)=      12.50        25.00
     Unit Hyd. peak  (cms)=        .09          .05
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.92         1.20         2.923 (iii)
     TIME TO PEAK    (hrs)=       1.63         1.88         1.667
     RUNOFF VOLUME    (mm)=      87.29        61.48        74.386
     TOTAL RAINFALL   (mm)=      88.86        88.86        88.857
     RUNOFF COEFFICIENT  =         .98          .69          .837

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

 ---------------------------------------------------------------------------
 001:0017-------------------------------------------------------------------
 *
 * SUB-AREA No.3
 --------------------
 | CALIB STANDHYD     |    Area    (ha)=   15.60
 | 04:HIP04  DT= 2.50 |    Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 --------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=      11.08         4.52
     Dep. Storage      (mm)=       1.57         4.67
     Average Slope      (%)=        .50         1.50
     Length             (m)=     600.00       100.00
     Mannings n           =        .030         .250

     Max.eff.Inten.(mm/hr)=      96.53       119.96
                over (min)       15.00        27.50
     Storage Coeff.  (min)=      15.44 (ii)   27.83 (ii)
     Unit Hyd. Tpeak (min)=      15.00        27.50
     Unit Hyd. peak  (cms)=        .07          .04
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.64         1.03         2.519 (iii)
     TIME TO PEAK    (hrs)=       1.67         1.92         1.750
     RUNOFF VOLUME    (mm)=      87.29        61.48        74.386
     TOTAL RAINFALL   (mm)=      88.86        88.86        88.857
     RUNOFF COEFFICIENT  =         .98          .69          .837

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

 ---------------------------------------------------------------------------
 001:0018-------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP05 ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
 --------------------               (ha)     (cms)   (hrs)   (mm)    (cms)
                     ID1 03:HIP03  17.00     2.923    1.67  74.39    .000
                    +ID2 04:HIP04  15.60     2.519    1.75  74.39    .000
                     ===================================================
                     SUM 05:HIP05  32.60     5.435    1.71  74.39    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0019-------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP06 ) | ID: NHYD      AREA     QPEAK   TPEAK   R.V.     DWF
 --------------------               (ha)     (cms)   (hrs)   (mm)    (cms)
                     ID1 05:HIP05  32.60     5.435    1.71  74.39    .000
                    +ID2 02:HIP02  28.46     3.642    1.75  77.46    .000
                     ===================================================
                     SUM 06:HIP06  61.06     9.050    1.74  75.82    .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ---------------------------------------------------------------------------
 001:0020-------------------------------------------------------------------
 *
 * SUB-AREA No.4
 --------------------
 | CALIB STANDHYD     |    Area    (ha)=   12.20
 | 07:HIP07  DT= 2.50 |    Total Imp(%)=   71.00   Dir. Conn.(%)=   50.00
 --------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       8.66         3.54
     Dep. Storage      (mm)=       1.57         4.67
     Average Slope      (%)=        .70         1.50
     Length             (m)=     210.00       100.00
     Mannings n           =        .030         .250

     Max.eff.Inten.(mm/hr)=     106.70       131.04
                over (min)        7.50        20.00
     Storage Coeff.  (min)=       7.14 (ii)   19.11 (ii)
     Unit Hyd. Tpeak (min)=       7.50        20.00
     Unit Hyd. peak  (cms)=        .15          .06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.56          .95         2.287 (iii)
     TIME TO PEAK    (hrs)=       1.54         1.79         1.583
     RUNOFF VOLUME    (mm)=      87.29        61.48        74.386
     TOTAL RAINFALL   (mm)=      88.86        88.86        88.857
     RUNOFF COEFFICIENT  =         .98          .69          .837

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  81.0    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.

 ---------------------------------------------------------------------------
 001:0021-------------------------------------------------------------------
 *
 *SUB-AREA No.5
 --------------------
 | DESIGN NASHYD      |    Area    (ha)=    4.00   Curve Number   (CN)=85.00
 | 08:Pond-B DT= 2.50 |    Ia      (mm)=   4.670   # of Linear Res.(N)= 3.00
 --------------------      U.H. Tp(hrs)=    .170

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```
      Unit Hyd Qpeak  (cms)=     .899

      PEAK FLOW       (cms)=     .721 (i)
      TIME TO PEAK    (hrs)=    1.667
      RUNOFF VOLUME    (mm)=   54.937
      TOTAL RAINFALL   (mm)=   88.857
      RUNOFF COEFFICIENT   =     .618

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

 ------------------------------------------------------------------------------
 001:0022----------------------------------------------------------------------
 --------------------
 | ADD HYD (HIP08 ) | ID: NHYD      AREA     QPEAK    TPEAK   R.V.     DWF
 --------------------               (ha)     (cms)    (hrs)   (mm)    (cms)
                 ID1 06:HIP06      61.06     9.050     1.74  75.82     .000
                +ID2 07:HIP07      12.20     2.287     1.58  74.39     .000
                +ID3 08:Pond-B      4.00      .721     1.67  54.94     .000
                 ==================================================
                 SUM 09:HIP08      77.26    11.944     1.71  74.51     .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 001:0023----------------------------------------------------------------------
 ---------------------
 | ROUTE RESERVOIR   |     Requested routing time step =  1.0 min.
 |  IN>09:(HIP08 )   |
 | OUT<10:(HIP-PO)   |     =========  OUTLFOW STORAGE TABLE  =========
 ---------------------     OUTFLOW     STORAGE   |  OUTFLOW    STORAGE
                            (cms)      (ha.m.)   |   (cms)     (ha.m.)
                              .000  .0000E+00    |     .724  .2210E+01
                              .048  .5740E-01    |     .937  .2501E+01
                              .054  .2434E+00    |    1.262  .2798E+01
                              .059  .5834E+00    |    1.404  .3101E+01
                              .062  .8400E+00    |    1.532  .3410E+01
                              .064  .1102E+01    |    1.650  .3724E+01
                              .147  .1370E+01    |    2.409  .4044E+01
                              .280  .1644E+01    |    3.689  .4370E+01
                              .472  .1924E+01    |     .000  .0000E+00

      ROUTING RESULTS              AREA     QPEAK     TPEAK        R.V.
      --------------------         (ha)     (cms)     (hrs)        (mm)
      INFLOW >09: (HIP08 )        77.26    11.944     1.708      74.508
      OUTFLOW<10: (HIP-PO)        77.26     2.666     2.625      74.508

                      PEAK   FLOW   REDUCTION [Qout/Qin](%)=   22.321
                      TIME SHIFT OF PEAK FLOW          (min)=    55.00
                      MAXIMUM  STORAGE   USED        (ha.m.)=.4110E+01

 ------------------------------------------------------------------------------
 001:0024----------------------------------------------------------------------
 *
 *SUB-AREA No. 6
 ----------------------
 | DESIGN NASHYD      |   Area     (ha)=     2.70   Curve Number   (CN)=76.00
 | 01:A3      DT= 2.50 |   Ia       (mm)=    4.670   # of Linear Res.(N)= 3.00
 ----------------------   U.H. Tp(hrs)=     .800

      Unit Hyd Qpeak  (cms)=     .129

      PEAK FLOW       (cms)=     .180 (i)
      TIME TO PEAK    (hrs)=    2.333
      RUNOFF VOLUME    (mm)=   43.111
      TOTAL RAINFALL   (mm)=   88.857
      RUNOFF COEFFICIENT   =     .485

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

 ------------------------------------------------------------------------------
 001:0025----------------------------------------------------------------------
 --------------------
 | ADD HYD (Ultima) | ID: NHYD      AREA     QPEAK    TPEAK   R.V.     DWF
 --------------------               (ha)     (cms)    (hrs)   (mm)    (cms)
                 ID1 10:HIP-PO     77.26     2.666     2.63  74.51     .000
                +ID2 01:A3          2.70      .180     2.33  43.11     .000
                 ==================================================
                 SUM 02:Ultima     79.96     2.830     2.61  73.45     .000

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 ------------------------------------------------------------------------------
 001:0026----------------------------------------------------------------------
       FINISH
 ------------------------------------------------------------------------------
 ******************************************************************************
      WARNINGS / ERRORS / NOTES
      -------------------------
    Simulation ended on 2009-05-15     at 09:03:53
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A

Appendix A-2
MOE Certificate of Approval Hawthorne Industrial Park

Ontario

Ministry of the Environment
Ministère de l'Environnement

CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 4660-7UNPRJ
Issue Date: November 9, 2009

Tomlinson Development Corporation
5597 Power Rd
Ottawa, Ontario K1G 3N4

Site Location: Hawthorne Industrial Park (HIP) - Phase 1
Lot 26 and 27, Concession 6 (R.F.)
City of Ottawa, Ontario

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

the establishment of sewage works for the collection, transmission, treatment and disposal of stormwater runoff from a catchment area of approximately 70 hectares, servicing the Hawthorne Industrial Park, located immediately southeast of the Hawthorne Road/Rideau Road intersection in the City of Ottawa, to provide partial water quality protection (Normal Protection Level) and to attenuate post-development peak flows to pre-development levels, discharging to Findlay Creek, which is a tributary to the North Castor River, for all storm events up to and including the 100 year return storm, consisting of the following stormwater works:

Stormwater Management System

Outlet No. 1, HIP to a dry pond facility (Service area of 69.81 ha):

- A dry pond facility to provide quantity control by attenuating post development peak flows to pre-development levels for all storm events up to and including the 100 year return storm, having a design minimum liquid retention volume of approximately 37,240 m^3 at elevation 86.15 m (0.23 m above 100-year surface pond elevation), with side slopes of 4:1, and servicing approximately 69.81 hectares, which includes Orgaworld Canada Ltd's stormwater treated effluent (10.14 ha). The SWM pond is designed to provide a controlled maximum discharge flow rate of 1,531 L/s for the 100-year storm event, discharging to Findlay Creek; and equipped with:
    - An outlet structure consisting of a 150 mm diameter orifice within a 200 mm diameter polyvinyl chloride (PVC) pipe at an invert elevation of 82.90 m, which serves as outlet to the facility;
    - Two (2) 600 mm diameter corrugated steel pipe (CSP) culvert placed at an invert elevation of 84.80 m, which also serves as an outlet to the facility; and
    - An emergency spillway of 0.35 m deep with a 6.0 m wide base to convey surface flow toward the

receiving channel during extreme storm events.

- The simulated modelling estimate and drainage pattern draining to Outlet No.1 is as follows:

Storm Events (catchment for Outlet #1 – 70 ha)	**2-year**	**5-year**	**25-year**	**100-year**
Existing flows, pre-development ($m^3/s.$)	0.467	0.826	1.468	2.093
Post-development flows (m^3/s)	3.077	4.812	7.772	10.662
Post-development attenuated flows (m^3/s)	0.194	0.359	0.939	1.531

- A new roadside ditch system draining to the dry pond facility, equipped with CSP culverts and approximately 1,755 m of 200 mm diameter HDPE perforated pipe sub-drains and clear stone bedding wrapped in geotextile located at the base of the ditches to meet a Normal water quality Protection Level (70% Total Suspended Solids removal) for the contributing catchment area of 1.58 ha which includes the paved portion of the industrial park road network located within the subdivision right-of-way as per the SWM Report (J.L.Richards, 2009).

- The requirement for quality protection for the remaining 68.23 ha is provided by the individual industrial lots within HIP as per the following Certificates of Approval (this list will be amended as future CofAs for other lots within HIP are developed, as per Condition 7 of this Certificate):

    - CofA # 9465-7NVRWT, issued on September 16, 2009, providing Normal water quality Protection Level for 10.14 ha.

Outlet No.2, to Findlay Creek (Service area of 39.16 ha):

- A new roadside ditch system draining to Findlay Creek via an existing roadside ditch located adjacent to Rideau Road, servicing a catchment area along the Hawthorne Road extension and includes the Tomlinson Quarry, as per the SWM Report (J.L.Richards, 2009). This service area is not part of the HIP site.

All 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 following supporting documents:

1. Application for Approval of Industrial Sewage Works submitted by Domenic Idone, P.Eng., Planning Engineer of Tomlinson Development Corporation, dated March 12, 2009, and received on June 8 , 2009;

2. Stormwater Management Report - Hawthorne Industrial Park, dated February 2009 (revised May 2009), and prepared by J.L Richards & Associates Limited.

3. Geotechnical Study Subdivision Plan - Hawthorne Industrial Park, Lots 26 and 27, Concession 6, Southeast of Hawthorne and Rideau Roads, Ottawa, dated May 4, 2009, and prepared by

Inspec-Sol Inc.

4. Certificate of Approval 6924-5YWQ3U, issued on May 19, 2004, for R.W. Tomlinson Limited for a lagoon system to treat sewage from the Tomlinson Quarry.

5. s.53 OWRA Certificate of Approval, Orgaworld Canada Ltd. (9465-7NVRWT, issued on September 16, 2009).

6. Revised Fish Habitat Ehnacement Strategy - Hawthorne Industrial Park Stormwater Management Pond, prepared by Stantec (Jacques Whitford Stantec Limited), dated May 13, 2009.

7. Clearance Letter from the South Nation Conservation dated May 26, 2009, issued to the City of Ottawa for the Tomlinson / Hawthorne Industrial Park Subdivision.

8. Emails from Derrick P. Upton, P.Eng., of J.L. Richards & Associates Limited to Edgardo Tovilla, P.Eng., of the MOE, dated August 7 & 11, 2009, with additional information requested.

9. Letter from Derrick P. Upton, P.Eng., of J.L. Richards & Associates Limited to Edgardo Tovilla, P.Eng., of the MOE, dated August 31, 2009, with additional information requested.

10. Email from Tim Chadder of J.L. Richards & Associates Limited to Edgardo Tovilla, P.Eng., of the MOE, dated October 9, 2009, with final comments to the CofA.

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

"*Certificate* " means this entire certificate of approval document, issued in accordance with Section 53 of the Ontario Water Resources Act, and includes any schedules;

"*Director* " means any *Ministry* employee appointed by the Minister pursuant to section 5 of the Ontario Water Resources Act;

"*District Manager* " means the District Manager of the Ottawa District Office of the *Ministry* ;

"*Ministry* " means the Ontario Ministry of the Environment;

"*Owner* " means Tomlinson Development Corporation and includes its successors and assignees; and

"*Works* " means the sewage works described in the *Owner* 's application, this *Certificate* and in the supporting documentation referred to herein, to the extent approved by this *Certificate* .

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

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

(1) 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 *Certificate* , the application for approval of the works and the submitted supporting documents and plans and specifications as listed in this *Certificate* .

(2) Where there is a conflict between a provision of any submitted document referred to in this *Certificate* and the Conditions of this *Certificate* , the Conditions in this *Certificate* shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

(3) Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

2. EXPIRY OF APPROVAL

The approval issued by this *Certificate* will cease to apply to those parts of the *Works* which have not been constructed within five (5) years of the date of this *Certificate* .

3. CHANGE OF OWNER

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* ; and

(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* .

4. OPERATION AND MAINTENANCE.

(1) The *Owner* shall ensure that the design minimum liquid retention volume(s) is maintained at all times.

(2) The *Owner* shall inspect the *Works* at least once a year and, if necessary, clean and maintain the

Works to prevent the excessive build-up of sediments and/or vegetation.

(3) 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 office for inspection by the *Ministry* . The logbook shall include the following:

(a) the name of the *Works* ;

(b) the date and results of each inspection, maintenance, monitoring reports and cleaning, including an estimate of the quantity of any materials removed; and

(c) the date of each spill within the catchment area, including follow-up actions / remedial measures undertaken.

(4) The *Owner* shall operate the *Works* with an objective of achieving Normal water quality Protection Level (70% long-term Total Suspended Solids removal) for the portion of the land being treated with the proposed Works.

5. MONITORING AND RECORDING

The *Owner* shall, upon commencement of operation of the *Works* , carry out the following monitoring program:

(1) All samples and measurements taken for the purposes of this *Certificate* are to be taken at a time and in a location characteristic of the quality and quantity of the effluent stream over the time period being monitored.

(2) For the purposes of this condition, Semi-annually means once twice per year;

(3) Samples shall be collected at the following sampling points, at the frequency specified, by means of the specified sample type and analyzed for each parameter listed and all results recorded:

Table 1 - Surface Water Monitoring

Sample location: at the inlet of the dry pond facility

Frequency	Semi-annually; at least once being for the snowmelt freshets and another being 72 hours after the fall of precipitation of more than 25 mm.
Sample Type	Grab
Parameters	*CBOD5* , Total Suspended Solids, Total Phosphorus, *E. Coli* , pH, Temperature, Acute Lethality.

(4) The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following:

(a) the Ministry's Procedure F-10-1, "Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only), as amended from time to time by more recently published editions;

(b) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions;

(c) the publication "Standard Methods for the Examination of Water and Wastewater" (21st edition), as amended from time to time by more recently published editions;

(d) the Environment Canada publications "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout" (July 1990) and "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia magna" (July 1990), as amended from time to time by more recently published editions; and,

(6) The measurement frequencies and the overall monitoring program specified in subsection (3) are minimum requirements which may, after three (3) years of monitoring in accordance with this Condition or after a minimum 75% build-up of the site, whichever occurs first, be modified by the *District Manager* in writing from time to time.

(7) The *Owner* shall retain for a minimum of three (3) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this *Certificate* .

(8) The *Owner* shall enter into an agreement with the owner of the composting facility located within HIP, located at Part of Lot 27, Concession 6, 5123 Hawthorne Road, for the long-term acess to private wells for its operation, maintenance and testing to ensure that the provisions of a groundwater monitoring program can be administered. A copy of such Agreement shall be provided to the *District Manager* prior to the commencement of operation of the *Works* .

6. RECORD KEEPING

The *Owner* shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the operation and maintenance and activities required by this *Certificate* .

7. SPECIAL CONDITION

(1) The *Owner* shall ensure through the Site Plan Approval process that individual lots developed within the industrial park will obtain a approval, in accordance with section 53 of the OWRA, before discharging into the roadside ditches and ultimately to the dry pond facility.

(2) The *Owner* shall not approve any additional flow from storm sewers, catchbasin leads, and storm service drains to the individual industrial plots to connect with the dry pond unless this Certificate of Approval is amended with adequate quality treatment proposed via provision of additional sewage treatment works, best management practices and hydraulic capacity servicing them has been designed and reviewed by the Ministry concluding that the additional quality of stormwater will not overload the

downstream collection system, pond and/or alter the stormwater quality of effluent discharged to the receiver of this *Certificate*.

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

1. Condition 1 is imposed to ensure that the *Works* are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the *Certificate* 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 the *Works* are constructed in a timely manner so that standards applicable at the time of Approval of the *Works* are still applicable 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 certificate and continue to operate the works in compliance with it.

4. Condition 4 is included to require that the *Works* be properly operated and maintained such that the environment is protected .

5. Conditions 5 and 7 are included to enable the *Owner* to evaluate and demonstrate the performance of the *Works* , on a continual basis, so that the *Works* are properly operated and maintained at a level which is consistent with the design objectives specified in the *Certificate* and that the *Works* does not cause any impairment to the receiving watercourse.

6. Condition 6 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the *Works* .

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, 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 101 of the Ontario Water Resources Act , R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to eachportion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

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, 15th Floor
Toronto, Ontario
M5G 1E5

AND

The Director
Section 53, *Ontario Water Resources Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

* **Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 9th day of November, 2009

Mansoor Mahmood

Mansoor Mahmood, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

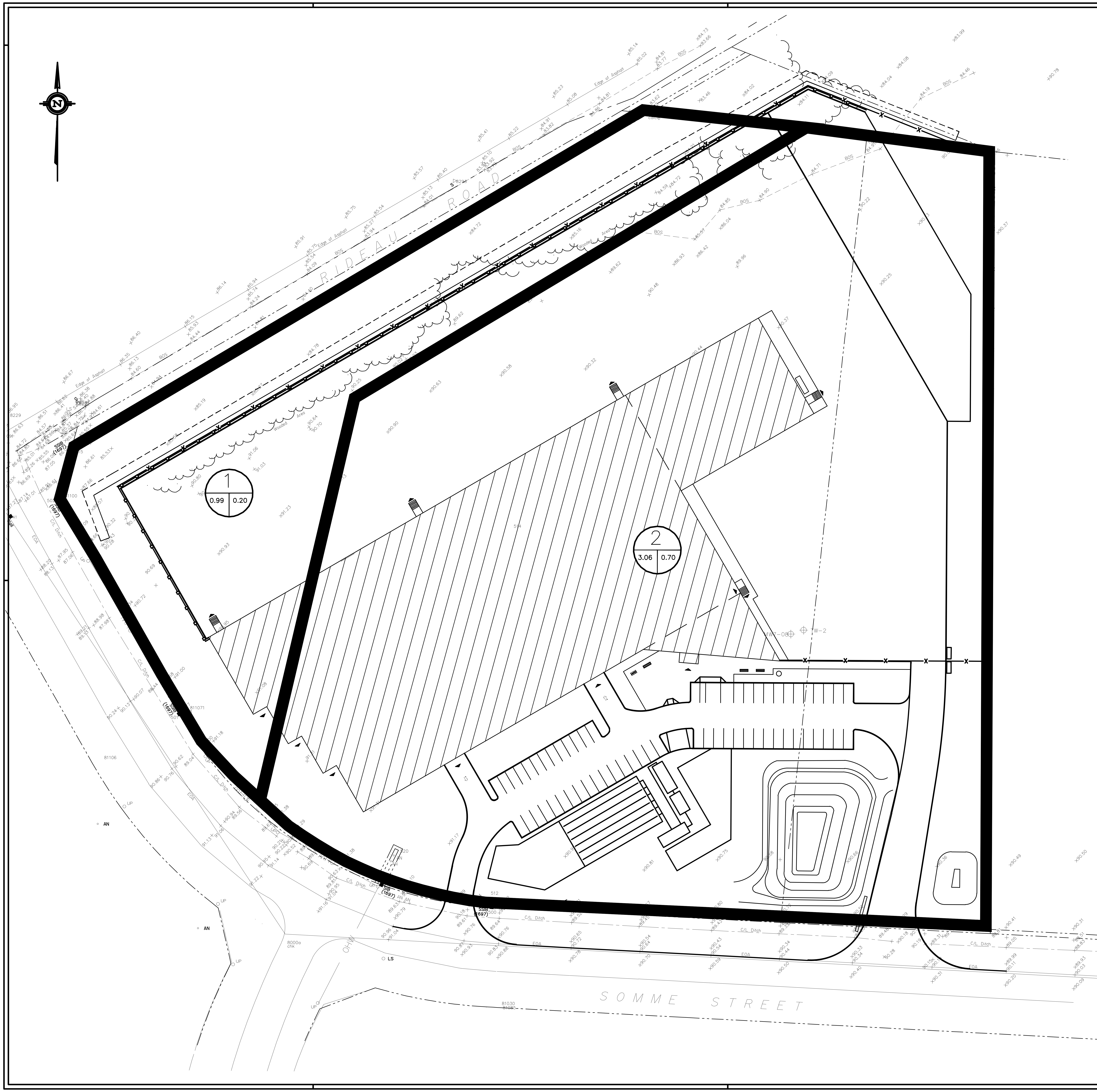
ET/

c: District Manager, MOE Ottawa District Office
Derrick Upton, P.Eng., J.L. Richards & Associates Limited ✓

B

Appendix B-1

SWM DRAWING PRE-DEVELOPMENT



LEGEND **PROPOSED**

STORM DRAINAGE BOUNDARY	▬
AREA ID	A1.1
AREA IN HECTARES	0.102
RUNOFF COEFFICIENT	0.20
OVERLAND FLOW	⇨

AREA 1: TO DRAIN INTO CHRISTIE CREEK AS PER J.L.RICHARD SWM REPORT

AREA 2: TO DRAIN INTO HIP SWM POND AS PER J.L.RICHARD SWM REPORT

0 5 10 20 30 40 50

NOTE OF CAUTION

THE GEODETIC COORDINATES OF EVERY ITEM INCLUDED AS PART OF THIS DOCUMENT HAVE NO LEGAL VALUE. THE SITE LAYOUT MUST BE COMPLETED USING THE OFFICIAL BENCHMARKS OF AN ACCREDITED LAND SURVEYOR.

THE UNDERGROUND FEATURES AND INFORMATION THAT APPEAR ON THE DRAWINGS WERE OBTAINED FROM THE PUBLIC UTILITY COMPANIES AND/OR FROM THE CITY EACH RESPECTIVELY.

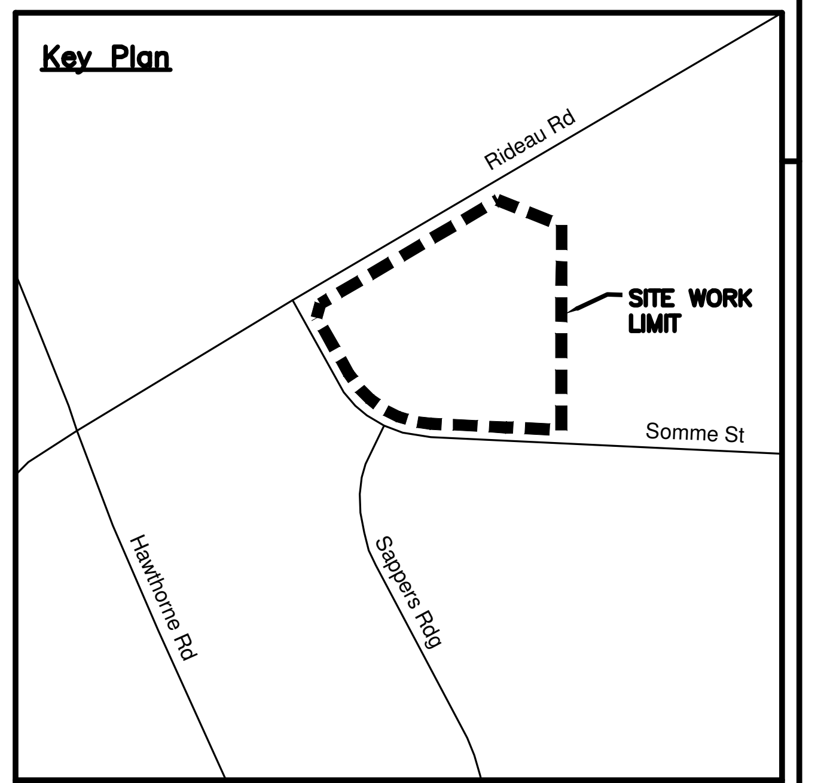
ALL INFORMATION UNDER THE LEGEND 'EXISTING' IS FOR INFORMATION ONLY. COMPLETE OR EXACT LOCATION AND ELEVATION OF UNDERGROUND SERVICES ARE NOT GUARANTEED.

CERTAIN UNDERGROUND FEATURES ON PRIVATE PROPERTY ARE NOT SHOWN ON THE CURRENT DRAWING.

ANYONE WHO PROCEEDS WITH EXCAVATION WORK SHALL VERIFY THE EXACT LOCATION OF ALL UNDERGROUND FEATURES, BY EXPLORATORY EXCAVATIONS, AND SHALL ASSUME FULL RESPONSIBILITY IF THERE IS ANY DAMAGE THAT OCCURS DURING WORK.

THE CONTRACTOR WILL HAVE THE RESPONSIBILITY AND THE OBLIGATION TO VALIDATE, BY EXPLORATORY EXCAVATION, THE SIZE OF THE PUBLIC UTILITIES UNDERGROUND SERVICES AND TO WARN THE ENGINEER OF ANY CONFLICT WITH THE PROJECTED WORK.

Key Plan



no.	date	revision/issue	by
1	JUNE 3, 2022	ISSUED FOR SITE PLAN CONTROL	J.S.

CIVITAS GROUP
ARCHITECTURE & LANDSCAPE ARCHITECTURE

consultant

CIMA+

northpoint

professional stamp

project title

SOMME STREET, OTTAWA, ONTARIO FASTFRATE FACILITY

drawing title

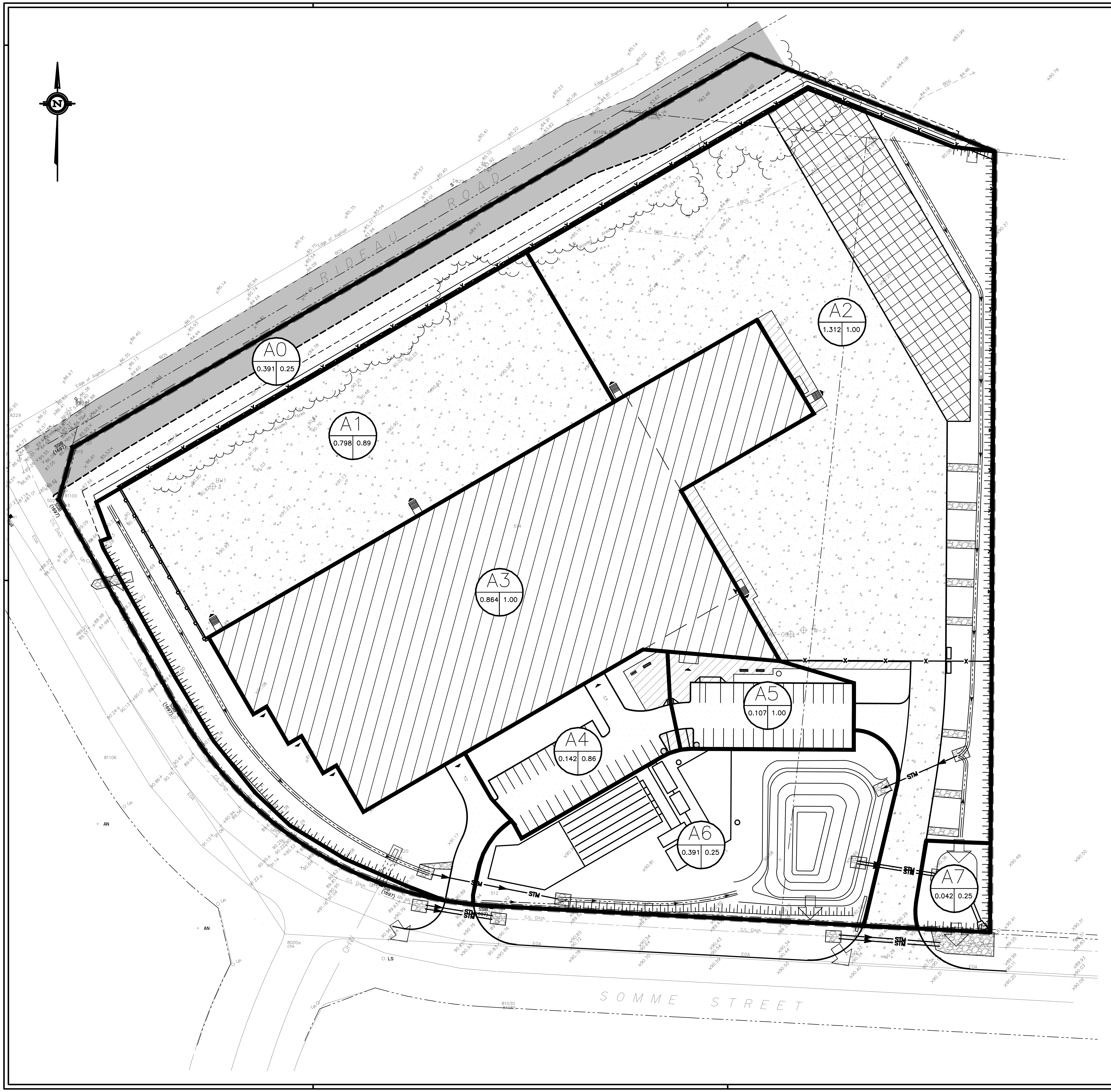
STORMWATER MANAGEMENT PLAN (PRE-DEVELOPMENT)

date	MARCH 08, 2021	job. no.	A001083
scale	1 : 500		
drawn	D.CANN	drawing no.	SWM
approved			
plot date	1/13/2021 3:31:05 PM		

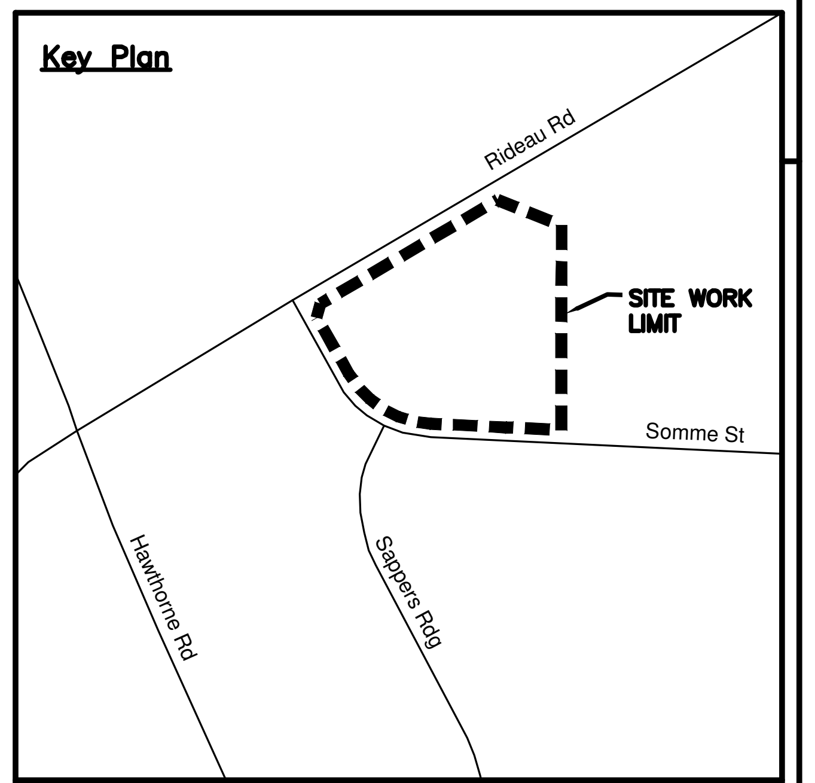
1. DO NOT SCALE FROM THIS DRAWING
2. CONTRACTOR TO VERIFY ALL DIMENSIONS AND NOTIFY THE ARCHITECT OF ANY DISCREPANCIES BEFORE WORK COMMENCES
3. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE FOLLOWING DRAWINGS: STRUCTURAL, MECHANICAL, ELECTRICAL

B

Appendix B-2
SWM DRAWING POST-DEVELOPMENT



Key Plan



LEGEND	PROPOSED
STORM DRAINAGE BOUNDARY	▬
AREA ID	A1.1
AREA IN HECTARES	0.102
RUNOFF COEFFICIENT	0.20
OVERLAND FLOW	⇨

0 5 10 20 30 40 50

NOTE OF CAUTION

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THE CONTRACTOR WILL HAVE THE RESPONSIBILITY AND THE OBLIGATION TO VALIDATE, BY EXPLORATORY EXCAVATION, THE SIZE OF THE PUBLIC UTILITIES UNDERGROUND SERVICES AND TO WARN THE ENGINEER OF ANY CONFLICT WITH THE PROJECTED WORK.

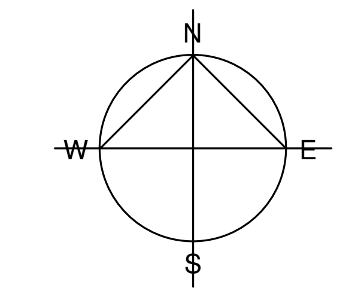
no.	date	revision/issue	by
2	JUNE 07, 2022	ISSUED FOR SITE PLAN CONTROL REV 2	J.S.
1	JULY 26, 2021	ISSUED FOR REVIEW	

CIVITAS GROUP
ARCHITECTURE & LANDSCAPE ARCHITECTURE

consultant

CIMA+

northpoint



professional stamp

project title

SOMME STREET,
OTTAWA, ONTARIO
FASTFRATE FACILITY

drawing title

STORMWATER MANAGEMENT PLAN (POST-DEVELOPMENT)

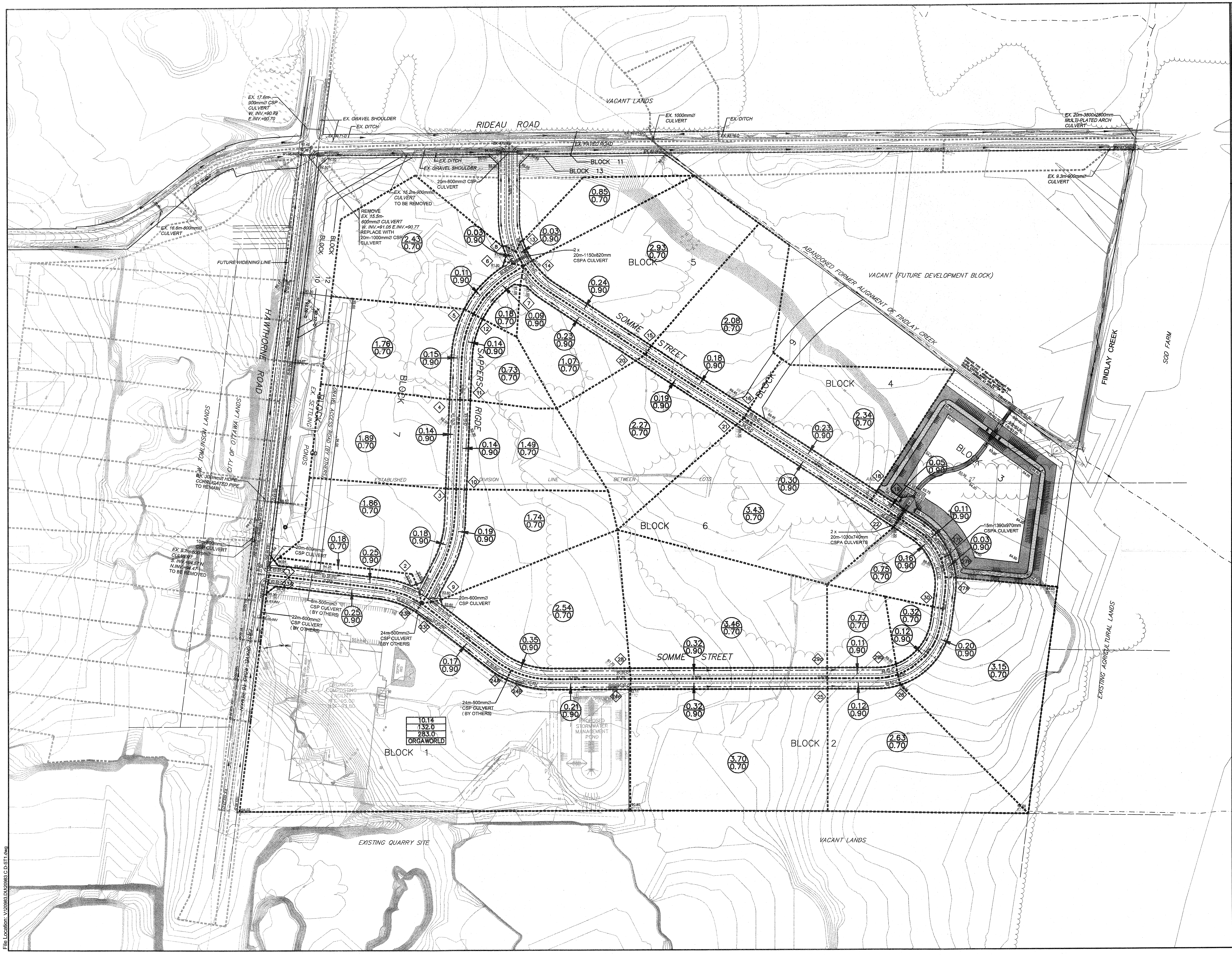
date	MARCH 08, 2021	job. no. A001083
scale	1 : 500	
drawn	D.CANN	drawing no. SWM
approved		
plot date	1/13/2021 3:31:05 PM	

1. DO NOT SCALE FROM THIS DRAWING
2. CONTRACTOR TO VERIFY ALL DIMENSIONS AND NOTIFY THE ARCHITECT OF ANY DISCREPANCIES BEFORE WORK COMMENCES
3. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE FOLLOWING DRAWINGS: STRUCTURAL, MECHANICAL, ELECTRICAL

B

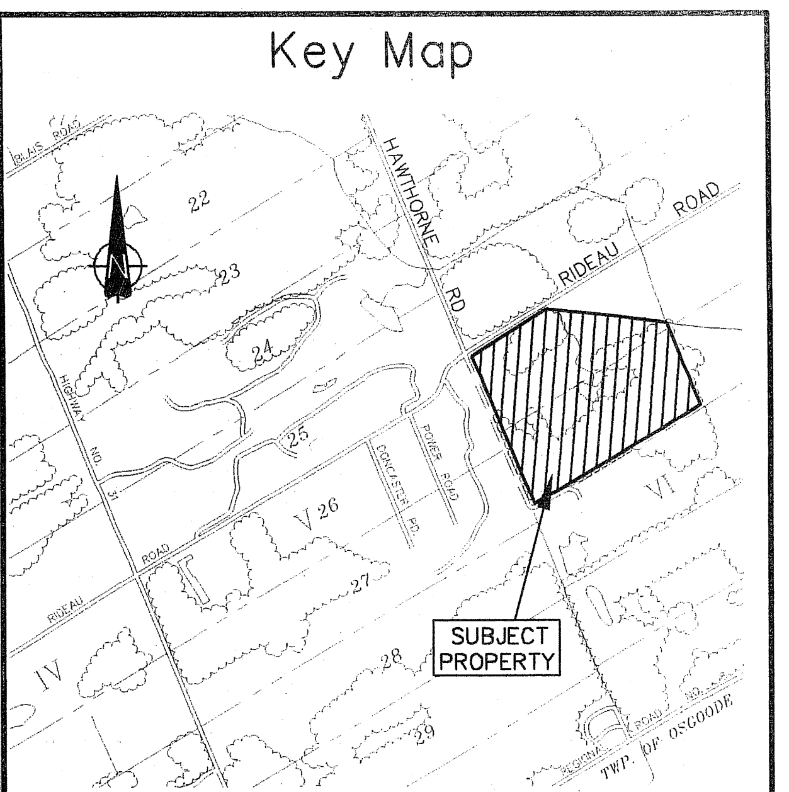
Appendix B-3

STORM AREA DRAINAGE PLAN FOR HIP FROM J.L. RICHARDS



File Location: V:\20983.0\20983 C D-ST1.dwg

Key Map



NOT TO SCALE

LEGEND

▪▪▪▪▪▪▪▪	*DRAINAGE BOUNDARY*
2.91 / 0.70	*AREA IN HECTARES* ** RUNOFF COEFFICIENT (C)*
10.14 132.0 283.0 ORGAWORLD	*DRAINAGE AREA (ha)* *10 YEAR PEAK FLOW (l/s)* *100 YEAR PEAK FLOW (l/s)* *ORGAWORLD SITE*
◇28	*NODE LOCATION NUMBER*
◀- - -	PROPOSED DITCH AND FLOW DIRECTION

* NOTE: RUNOFF COEFFICIENT (C) FOR DEVELOPMENT AREA IS BASED ON A WEIGHTED AVERAGE OF 0.70, WHILE ROADWAYS ARE 0.90.

NO.	ISSUE	DATE
03	ISSUED FOR M.O.E. APPROVAL	28/05/09
02	REVISED PER CITY COMMENTS	30/04/09
01	ISSUED FOR CITY APPROVAL	12/02/09

SCALE: 1:2000

0 25 50 100 150

J.L.Richards
ENGINEERS·ARCHITECTS·PLANNERS

J.L. Richards
& Associates Limited
203-863 Princess Street
Kingston, ON Canada
K7L 5N4
Tel: 613 544 1424
Fax: 613 544 5679

PROFESSIONAL STAMP

D. P. UPTON

PROJECT NORTH

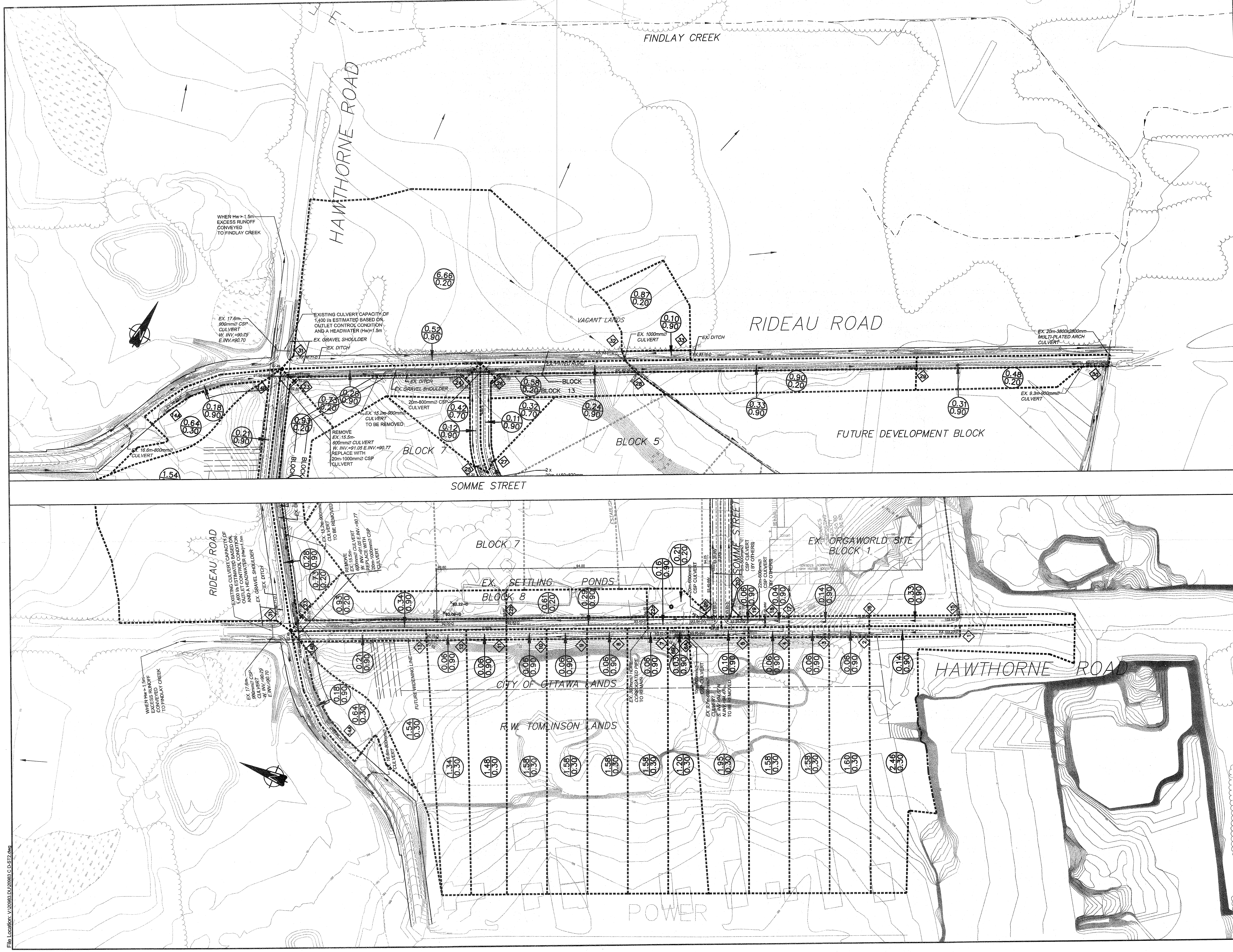
PROJECT:

HAWTHORNE
INDUSTRIAL
PARK

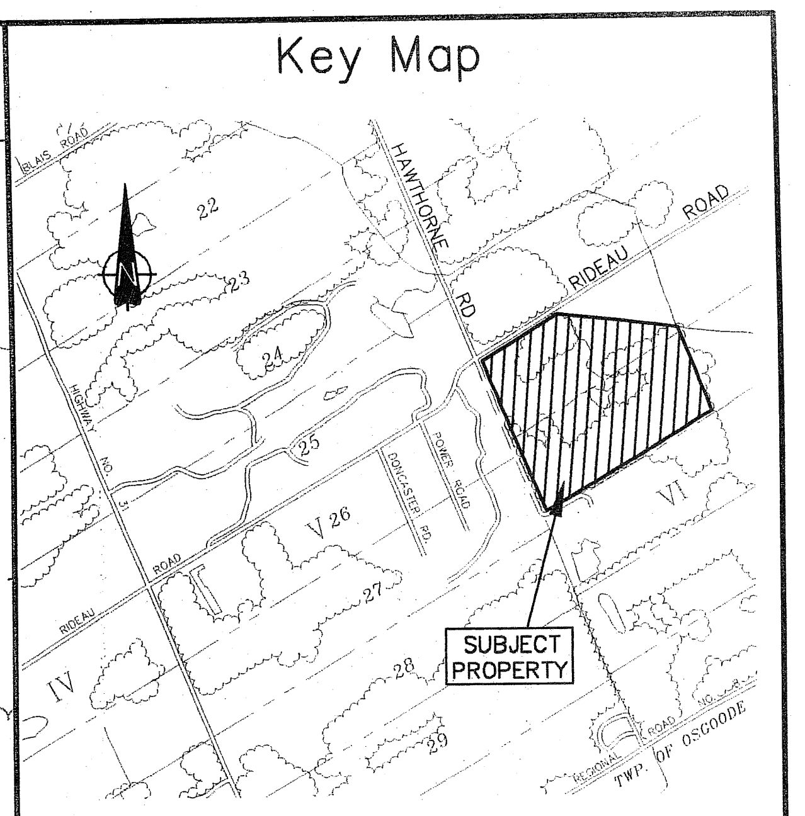
DRAWING:

STORM DRAINAGE
AREA PLAN

DESIGN: M.B.
DRAWN: T.S.
CHECKED: D.U.
PLOTTED: May 28, 2009
DRAWING NO.: D-ST1
JLR NO: 20983



Key Map



NOT TO SCALE

LEGEND

■■■■■■■■■	DRAINAGE BOUNDARY
2.91 / 0.70	AREA IN HECTARES * RUNOFF COEFFICIENT (C)
◇28	NODE LOCATION NUMBER
◄- - - -	PROPOSED DITCH AND FLOW DIRECTION
◄———	EXISTING SURFACE FLOW DIRECTION

* NOTE: RUNOFF COEFFICIENT (C) FOR DEVELOPMENT AREA IS BASED ON A WEIGHTED AVERAGE OF 0.70, WHILE ROADWAYS ARE 0.90.

NO.	ISSUE	DATE
03	ISSUED FOR M.O.E. APPROVAL	28/05/09
02	REVISED PER CITY COMMENTS	30/04/09
01	ISSUED FOR CITY APPROVAL	12/02/09

SCALE: 1:2000

0 25 50 100 150

J.L.Richards
ENGINEERS·ARCHITECTS·PLANNERS

J.L. Richards
& Associates Limited
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K7L 5N4
Tel: 613 544 1424
Fax: 613 544 5679

PROFESSIONAL STAMP

LICENSED PROFESSIONAL ENGINEER
D. P. UPTON
May 29/09
PROVINCE OF ONTARIO

PROJECT NORTH

PROJECT:

HAWTHORNE
INDUSTRIAL
PARK

DRAWING:

STORM DRAINAGE
AREA PLAN

DESIGN: M.B.
DRAWN: T.S.
CHECKED: D.U.
PLOTTED: May 28, 2009

DRAWING NO.: D-ST2
JLR NO: 20983

File Location: V:\20983.DU\20983 C D-ST2.dwg

B

Appendix B-4

IDENTIFICATION OF SOURCE DATA FROM HIP SWM REPORT BY J.L. RICHARDS

J.L. RICHARDS AND ASSOCIATES LIMITED, Consulting Engineers, Architects and Planners

IDENTIFICATION OF SOURCE DATA FROM HIP SWM REPORT
Project: Fastfrate Warehouse Development – CIMA+ Ref: A001083
Prepared by : Guillaume LeBlond, M.A.Sc., EIT
Date : 2022-06-01

Hawthorne Industrial Park

City of Ottawa

JLR 20983
February 2009 (Revised April 2009)

Legend:
☐ Source Data Identification

DATE : 5/27/2009

OPEN DITCH/CULVERT DESIGN SHEET

Prepared by: M. Buchanan, E.I.T.

Checked by: G. Forget, P.Eng.

1:10 year Ottawa International Airport IDF Curve

Increase Runoff Coefficient by 0.0%

DETAILS	NODES		DRAINAGE AREA					PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA									CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT						FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)
	FROM	TO	Area at C of 0.70 (ha)	Area at C of 0.90 (ha)	SUM(A)	SUM(A*C)	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D_{10yr} m	D_{max} m	SS X:1	SLOPE %	Q_{10yr} l/s	Q_{100yr} l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL	HW 1:10 (m)			
NORTHERN CATCHMENT AREA																														
WEST SIDE SAPPERS RIDGE	2	3	1.86	0.18	2.04	1.46	1.46	4.07	4.07	15.00	97.85	398.2	0.00	0.42	1.20	3.00	0.50	424.2	6973.0	0.80	136.80							2.84	92.50	91.82
WEST SIDE SAPPERS RIDGE	3	4	1.89	0.14	2.03	1.45	2.92	4.04	8.11	17.84	88.22	715.4	0.00	0.51	1.20	3.00	0.80	904.2	8856.1	1.16	111.00							1.60	91.82	90.93
WEST SIDE SAPPERS RIDGE	4	5	1.76	0.15	1.91	1.36	4.28	3.79	11.90	19.44	83.68	995.9	0.00	0.58	1.20	3.00	0.51	1011.3	7029.1	1.00	112.85							1.88	90.93	90.36
WEST SIDE SAPPERS RIDGE	5	6	2.43	0.11	2.54	1.80	6.08	5.00	16.90	21.32	78.96	1334.4	0.00	0.65	1.20	3.00	0.62	1513.4	7762.6	1.19	82.79							1.16	90.36	89.85
										22.47																				
NORTH ENTRANCE TO SOMME STREET	8	6		0.03	0.03	0.03	0.03	0.08	0.08	15.00	97.85	7.3	0.00	0.20	1.20	3.00	1.30	94.9	11276.7	0.79	10.00							0.21	89.98	89.85
										15.21																				
CULVERT CROSSING	6	14		0.00	0.00	0.00	6.11	0.00	16.97	22.47	76.34	1295.8					0.50				20.00	2	-----	1.15 x 0.82	NO	YES	**0.75**	0.38	89.85	89.75
										22.85																				
NORTH PORTION SOMME STREET	13	14	0.85	0.03	0.88	0.62	0.62	1.73	1.73	15.00	97.85	169.2	0.00	0.30	1.20	3.00	2.30	372.0	14999.4	1.38	10.00							0.12	89.98	89.75
										15.12																				
NORTH PORTION SOMME STREET	14	15	2.93	0.24	3.17	2.27	8.99	6.30	25.00	22.85	75.52	1888.2	0.00	0.74	1.20	3.00	0.50	1926.6	6992.8	1.17	184.04							2.62	89.75	88.83
NORTH PORTION SOMME STREET	15	16	2.08	0.18	2.26	1.62	10.61	4.50	29.50	25.47	70.36	2075.4	0.00	0.77	1.20	3.00	0.57	2291.4	7480.8	1.29	145.08							1.88	88.83	88.00
NORTH PORTION SOMME STREET	16	18	2.34	0.23	2.57	1.85	12.46	5.13	34.63	27.35	67.11	2323.9	0.00	0.80	1.20	3.00	0.51	2399.6	7074.8	1.25	185.66							2.48	88.00	87.05
NORTH PORTION SOMME STREET	18	19	0.00	0.05	0.05	0.05	12.50	0.13	34.75	29.82	63.30	2199.9	0.00	0.76	1.20	3.00	0.72	2476.8	8372.8	1.43	41.86							0.49	87.05	86.75
										30.31																				
EAST SIDE SAPPERS RIDGE	9	10	1.74	0.19	1.93	1.39	1.39	3.86	3.86	15.00	97.85	378.0	0.00	0.41	1.20	3.00	0.50	399.2	6996.6	0.79	147.87							3.11	92.40	91.66
EAST SIDE SAPPERS RIDGE	10	11	1.49	0.14	1.63	1.17	2.56	3.25	7.11	18.11	87.42	622.0	0.00	0.49	1.20	3.00	0.66	735.9	8019.2	1.02	111.04							1.81	91.66	90.93
EAST SIDE SAPPERS RIDGE	11	12	0.73	0.14	0.87	0.64	3.20	1.77	8.88	19.92	82.40	732.0	0.00	0.52	1.20	3.00	0.55	785.5	7304.8	0.97	104.49							1.80	90.93	90.36
EAST SIDE SAPPERS RIDGE	12	7	0.18	0.09	0.27	0.21	3.40	0.58	9.46	21.72	78.02	738.2	0.00	0.49	1.20	3.00	0.81	818.5	8919.0	1.14	72.55							1.06	90.36	89.77
NORTH PORTION SOMME STREET	7	20	1.07	0.23	1.30	0.96	4.36	2.66	12.12	22.79	75.66	916.9	0.00	0.57	1.20	3.00	0.50	956.8	6966.1	0.98	177.39							3.01	89.77	88.89
NORTH PORTION SOMME STREET	20	21	2.27	0.19	2.46	1.76	6.12	4.89	17.01	25.80	69.76	1186.8	0.00	0.62	1.20	3.00	0.50	1200.1	6981.9	1.04	147.49							2.36	88.89	88.16
NORTH PORTION SOMME STREET	21	22	3.43	0.30	3.73	2.67	8.79	7.43	24.44	28.16	65.80	1608.1	0.00	0.70	1.20	3.00	0.56	1759.0	7404.4	1.20	232.84							3.24	88.16	86.85
										31.40																				
SOUTHERN CATCHMENT AREA																														
SOUTH PORTION SOMME STREET	23A	23B	0.00	0.25	0.25	0.23	0.23	0.63	0.63	15.00	97.85	61.2	0.00	0.20	1.20	3.00	0.64	66.3	7883.5	0.55	181.00							5.46	93.65	92.50
CULVERT CROSSING	23B	23C		0.00	0.00	0.00	0.23	0.00	0.63	20.46	81.05	50.7					0.42				24.00	1	500	-----	NO	YES	**0.33**	1.55	92.50	92.40
SOUTH PORTION SOMME STREET	23C	24A	0.00	0.17	0.17	0.15	0.38	0.43	1.05	22.00	77.38	81.3	0.00	0.22	1.20	3.00	0.82	97.0	8946.1	0.67	110.00							2.74	92.40	91.50
CULVERT CROSSING	24A	24B		0.00	0.00	0.00	0.38	0.00	1.05	24.75	71.70	75.3					0.42				24.00	1	500	-----	NO	YES	**0.34**	1.04	91.50	91.40
SOUTH PORTION SOMME STREET	24B	24C	0.00	0.21	0.21	0.19	0.57	0.53	1.58	25.79	69.78	110.0	0.00	0.25	1.20	3.00	0.70	126.0	8258.2	0.67	142.00							3.52	91.40	90.41
ORGAWORLD - SITE	U/S	24C	**1:10 year peak flow = 132 L/s, see Table 4 of Orgaworld Stormwater Site Management Plan, Sept. 2008**									132.0																		
SOUTH PORTION SOMME STREET	24C	25	3.70	0.32	4.02	2.88	3.44	8.00	9.58	29.31	64.05	745.3	0.00	0.52	1.20	3.00	0.54	783.8	7289.5	0.97	244.84							4.22	90.41	89.08
SOUTH PORTION SOMME STREET	25	26	2.63	0.12	2.75	1.95	5.39	5.42	14.99	33.53	58.41	1007.7	0.00	0.58	1.20	3.00	0.51	1013.1	7041.5	1.00	90.75							1.51	89.08	88.62
SOUTH PORTION SOMME STREET	26	27A	3.15	0.20	3.35	2.39	7.78	6.63	21.63	35.04	56.65	1357.2	0.00	0.62	1.20	3.00	0.65	1370.0	7970.4	1.19	157.06							2.20	88.62	87.60
SOUTH PORTION SOMME STREET	27A	27B	0.00	0.03	0.03	0.03	7.81	0.08	21.70	37.24	54.29	1310.1	0.00	0.61	1.20	3.00	0.65	1312.4	7973.8	1.18	20.00							0.28	87.60	87.47
CULVERT CROSSING	27B	27C		0.00	0.00	0.00	7.81	0.00	21.70	37.53	54.00	1303.8					0.73				15.00	1	-----	1.39 X 0.97	YES	NO	**0.87**	0.20	87.47	87.36
CORNER OF POND	27C	19	0.00	0.11	0.11	0.10	7.88	0.28	21.98	37.73	53.79	1314.2	0.00	0.65	1.20	3.00	0.71	1622.9	8324.0	1.28	72.00							0.94	87.36	86.85
										38.67																				

SHEET : 10 year

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J.L. RICHARDS AND ASSOCIATES LIMITED, Consulting Engineers, Architects and Planners

DATE : 5/27/2009

IDENTIFICATION OF SOURCE DATA FROM HIP SWM REPORT
Project: Fastfrate Warehouse Development – CIMA+ Ref: A001083
Prepared by : Guillaume LeBlond, M.A.Sc., EIT
Date : 2022-06-01

Hawthorne Industrial Park

City of Ottawa

JLR 20983
February 2009 (Revised April 2009)

Legend:

☐ Source Data Identification

OPEN DITCH/CULVERT DESIGN SHEET

Prepared by: M. Buchanan, E.I.T.

Checked by: G. Forget, P.Eng.

1:10 year Ottawa International Airport IDF Curve

Increase Runoff Coefficient by 0.0%

DETAILS	NODES		DRAINAGE AREA					PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA									CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT						FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)
	FROM	TO	Area at C of 0.70 (ha)	Area at C of 0.90 (ha)	SUM(A)	SUM(A*C)	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D_{10yr} m	D_{max} m	SS X:1	SLOPE %	Q_{10yr} l/s	Q_{100yr} l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL	HW 1:10 (m)			
SW ENTRANCE TO SOMME STREET	1	2	0.18	0.25	0.43	0.35	0.35	0.97	0.97	15.00	97.85	94.6	0.00	0.32	1.20	3.00	0.61	226.9	7702.7	0.74	189.60							4.28	93.65	92.50
CULVERT CROSSING	2	9		0.00	0.00	0.00	0.35	0.00	0.97	19.28	84.12	81.3					0.50				20.00	1	600	-----	NO	**YES**	**0.52**	1.16	92.50	92.40
SOUTH PORTION SOMME STREET	9	28	2.54	0.35	2.89	2.10	2.44	5.83	6.80	20.44	81.10	551.2	0.00	0.47	1.20	3.00	0.73	694.0	8450.7	1.05	272.58							4.34	92.40	90.41
SOUTH PORTION SOMME STREET	28	29A	3.46	0.32	3.78	2.71	5.15	7.53	14.33	24.77	71.65	1026.7	0.00	0.61	1.20	3.00	0.54	1198.8	7283.5	1.07	245.24							3.81	90.41	89.08
SOUTH PORTION SOMME STREET	29A	29B	0.77	0.11	0.88	0.64	5.79	1.78	16.11	28.58	65.15	1049.5	0.00	0.62	1.20	3.00	0.53	1239.6	7212.0	1.07	86.51							1.34	89.08	88.62
SOUTH PORTION SOMME STREET	29B	30	0.32	0.12	0.44	0.33	6.13	0.92	17.03	29.92	63.16	1075.8	0.00	0.58	1.20	3.00	0.70	1191.6	8282.1	1.18	94.12							1.33	88.62	87.96
SOUTH PORTION SOMME STREET	30	22	0.75	0.16	0.91	0.67	6.80	1.86	18.89	31.25	61.31	1158.5	0.00	0.58	1.20	3.00	0.97	1402.6	9748.4	1.39	124.55							1.49	87.96	86.75
										32.74																				
CULVERT CROSSING	22	19		0.00	0.00	0.00	15.59	0.00	43.33	32.74	59.38	2573.1					0.50				20.00	2	-----	1.03 X 0.74	**YES**	NO	**1.30**	0.08	86.85	86.75
										32.82																				
POND INLET	19	POND		0.00	0.00	0.00	35.97	0.00	100.06	38.67	52.87	5422.6	3.09	0.38	1.20	3.00	5.68	5629.1	13135.2	3.50	22.00							0.10	86.75	85.50
POND OUTLET DITCH	POND	DITCH	**1:10 year controlled post development peak flow = 696 l/s, see SWMHYMO output of this Report**									696.0	1.00	0.27	0.38	3.00	2.08	750.9	1506.6	1.54	24.00							0.26	82.50	82.00

Note: Conveyance Capacitites for the Open Ditch/Swale were calculated based on a Manning's Roughness Coefficient (n) of 0.030

J.L. RICHARDS AND ASSOCIATES LIMITED, Consulting Engineers, Architects and Planners

DATE : 5/27/2009

IDENTIFICATION OF SOURCE DATA FROM HIP SWM REPORT
Project: Fastfrate Warehouse Development – CIMA+ Ref: A001083
Prepared by : Guillaume LeBlond, M.A.Sc., EIT
Date : 2022-06-01

Hawthorne Industrial Park

City of Ottawa

JLR 20983
February 2009 (Revised April 2009)

Legend:

☐ Source Data Identification

OPEN DITCH/CULVERT DESIGN SHEET

Prepared by: M. Buchanan, E.I.T.

Checked by: G. Forget, P.Eng.

1:100 year Ottawa International Airport IDF Curve

Increase Runoff Coefficient by 25.0%

DETAILS	NODES		DRAINAGE AREA					PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA							CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT					FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)
	FROM	TO	Area at C of 0.70 (ha)	0.90 (ha)	SUM(A)	SUM(A*1.25*C) 25% increase in C factor	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D m	SS X:1	SLOPE %	CAPAC. l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL			
NORTHERN CATCHMENT AREA																											
WEST SIDE SAPPERS RIDGE	2	3	1.86	0.18	2.04	1.81	1.81	5.02	5.02	15.00	142.89	718.0	0.00	1.20	3.00	0.50	6973.0	1.61	136.80						1.41	92.50	91.82
WEST SIDE SAPPERS RIDGE	3	4	1.89	0.14	2.03	1.80	3.61	5.00	10.02	16.41	135.47	1357.9	0.00	1.20	3.00	0.80	8856.1	2.05	111.00						0.90	91.82	90.93
WEST SIDE SAPPERS RIDGE	4	5	1.76	0.15	1.91	1.69	5.29	4.69	14.71	17.31	131.16	1929.7	0.00	1.20	3.00	0.51	7029.1	1.63	112.85						1.16	90.93	90.36
WEST SIDE SAPPERS RIDGE	5	6	2.43	0.11	2.54	2.23	7.53	6.21	20.92	18.47	126.06	2637.5	0.00	1.20	3.00	0.62	7762.6	1.80	82.79						0.77	90.36	89.85
										19.24																	
NORTH ENTRANCE TO SOMME STREET	8	6		0.03	0.03	0.03	0.03	0.08	0.08	15.00	142.89	11.9	0.00	1.20	3.00	1.30	11276.7	2.61	10.00						0.06	89.98	89.85
										15.06																	
CULVERT CROSSING	6	14		0.00	0.00	0.00	7.56	0.00	21.01	19.24	122.91	2581.8				0.50			20.00	2	-----	1.15 x 0.82	NO	YES	0.19	89.85	89.75
										19.43																	
NORTH PORTION SOMME STREET	13	14	0.85	0.03	0.88	0.77	0.77	2.15	2.15	15.00	142.89	307.4	0.00	1.20	3.00	2.30	14999.4	3.47	10.00						0.05	89.98	89.75
										15.05																	
NORTH PORTION SOMME STREET	14	15	2.93	0.24	3.17	2.80	11.13	7.79	30.95	19.43	122.15	3780.5	0.00	1.20	3.00	0.50	6992.8	1.62	184.04						1.89	89.75	88.83
NORTH PORTION SOMME STREET	15	16	2.08	0.18	2.26	2.00	13.13	5.56	36.51	21.32	115.16	4204.4	0.00	1.20	3.00	0.57	7480.8	1.73	145.08						1.40	88.83	88.00
NORTH PORTION SOMME STREET	16	18	2.34	0.23	2.57	2.28	15.41	6.33	42.84	22.72	110.55	4736.0	0.00	1.20	3.00	0.51	7074.8	1.64	185.66						1.89	88.00	87.05
NORTH PORTION SOMME STREET	18	19	0.00	0.05	0.05	0.05	15.46	0.14	42.98	24.61	104.93	4509.7	0.00	1.20	3.00	0.72	8372.8	1.94	41.86						0.36	87.05	86.75
										24.97																	
EAST SIDE SAPPERS RIDGE	9	10	1.74	0.19	1.93	1.71	1.71	4.76	4.76	15.00	142.89	680.4	0.00	1.20	3.00	0.50	6996.6	1.62	147.87						1.52	92.40	91.66
EAST SIDE SAPPERS RIDGE	10	11	1.49	0.14	1.63	1.44	3.16	4.02	8.78	16.52	134.93	1184.3	0.00	1.20	3.00	0.66	8019.2	1.86	111.04						1.00	91.66	90.93
EAST SIDE SAPPERS RIDGE	11	12	0.73	0.14	0.87	0.78	3.94	2.16	10.94	17.52	130.23	1424.7	0.00	1.20	3.00	0.55	7304.8	1.69	104.49						1.03	90.93	90.36
EAST SIDE SAPPERS RIDGE	12	7	0.18	0.09	0.27	0.25	4.18	0.69	11.63	18.55	125.73	1462.2	0.00	1.20	3.00	0.81	8919.0	2.06	72.55						0.59	90.36	89.77
NORTH PORTION SOMME STREET	7	20	1.07	0.23	1.30	1.17	5.35	3.24	14.87	19.13	123.33	1834.1	0.00	1.20	3.00	0.50	6966.1	1.61	177.39						1.83	89.77	88.89
NORTH PORTION SOMME STREET	20	21	2.27	0.19	2.46	2.18	7.53	6.05	20.92	20.97	116.41	2435.6	0.00	1.20	3.00	0.50	6981.9	1.62	147.49						1.52	88.89	88.16
NORTH PORTION SOMME STREET	21	22	3.43	0.30	3.73	3.30	10.83	9.18	30.10	22.49	111.29	3350.0	0.00	1.20	3.00	0.56	7404.4	1.71	232.84						2.26	88.16	86.85
										24.75																	
SOUTHERN CATCHMENT AREA																											
SOUTH PORTION SOMME STREET	23A	23B	0.00	0.25	0.25	0.25	0.25	0.70	0.70	15.00	142.89	99.3	0.00	1.20	3.00	0.64	7883.5	1.82	181.00						1.65	93.65	92.50
CULVERT CROSSING	23B	23C		0.00	0.00	0.00	0.25	0.00	0.70	16.65	134.29	93.3				0.42			24.00	1	500	-----	NO	YES	0.84	92.50	92.40
SOUTH PORTION SOMME STREET	23C	24A	0.00	0.17	0.17	0.17	0.42	0.47	1.17	17.49	130.34	152.2	0.00	1.20	3.00	0.82	8946.1	2.07	110.00						0.89	92.40	91.50
CULVERT CROSSING	24A	24B		0.00	0.00	0.00	0.42	0.00	1.17	18.38	126.45	147.6				0.42			24.00	1	500	-----	NO	YES	0.53	91.50	91.40
SOUTH PORTION SOMME STREET	24B	24C	0.00	0.21	0.21	0.21	0.63	0.58	1.75	18.91	124.24	217.6	0.00	1.20	3.00	0.70	8258.2	1.91	142.00						1.24	91.40	90.41
ORGAWORLD - SITE	U/S	24C	1:100 year peak flow = 283 l/s, see Table 4 of Orgaworld Stormwater Site Management Plan, Sept. 2008									283.0															
SOUTH PORTION SOMME STREET	24C	25	3.70	0.32	4.02	3.56	4.19	9.89	11.64	20.15	119.40	1672.8	0.00	1.20	3.00	0.54	7289.5	1.69	244.84						2.42	90.41	89.08
SOUTH PORTION SOMME STREET	25	26	2.63	0.12	2.75	2.42	6.61	6.73	18.37	22.57	111.05	2323.0	0.00	1.20	3.00	0.51	7041.5	1.63	90.75						0.93	89.08	88.62
SOUTH PORTION SOMME STREET	26	27A	3.15	0.20	3.35	2.96	9.57	8.22	26.59	23.49	108.17	3159.5	0.00	1.20	3.00	0.65	7970.4	1.84	157.06						1.42	88.62	87.60
SOUTH PORTION SOMME STREET	27A	27B	0.00	0.03	0.03	0.03	9.60	0.08	26.67	24.91	104.09	3059.5	0.00	1.20	3.00	0.65	7973.8	1.85	20.00						0.18	87.60	87.47
CULVERT CROSSING	27B	27C		0.00	0.00	0.00	9.60	0.00	26.67	25.09	103.59	3046.2				0.73			15.00	1	-----	1.39 X 0.97	YES	NO	0.09	87.47	87.36
CORNER OF POND	27C	19	0.00	0.11	0.11	0.11	9.71	0.31	26.98	25.18	103.36	3071.7	0.00	1.20	3.00	0.71	8324.0	1.93	72.00						0.62	87.36	86.85
										25.80																	

SHEET : 100 year

V:\20983.DU\ENG\Final Submission to City\Ditch Sizing_Rev5.xls

J.L. RICHARDS AND ASSOCIATES LIMITED, Consulting Engineers, Architects and Planners

DATE : 5/27/2009

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Project: Fastfrate Warehouse Development – CIMA+ Ref: A001083
Prepared by : Guillaume LeBlond, M.A.Sc., EIT
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Hawthorne Industrial Park

City of Ottawa

JLR 20983
February 2009 (Revised April 2009)

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OPEN DITCH/CULVERT DESIGN SHEET

Prepared by: M. Buchanan, E.I.T.

Checked by: G. Forget, P.Eng.

1:100 year Ottawa International Airport IDF Curve

Increase Runoff Coefficient by 25.0%

DETAILS	NODES		DRAINAGE AREA					PEAK FLOW GENERATION				
	FROM	TO	Area at C of 0.70 (ha)	0.90 (ha)	SUM(A)	SUM(A*1.25*C) 25% increase in C factor	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s
SW ENTRANCE TO SOMME STREET	1	2	0.18	0.25	0.43	0.40	0.40	1.12	1.12	15.00	142.89	160.5
CULVERT CROSSING	2	9		0.00	0.00	0.00	0.40	0.00	1.12	16.77	133.71	150.2
SOUTH PORTION SOMME STREET	9	28	2.54	0.35	2.89	2.58	2.98	7.16	8.29	17.40	130.77	1083.6
SOUTH PORTION SOMME STREET	28	29A	3.46	0.32	3.78	3.35	6.33	9.31	17.59	19.72	121.01	2128.9
SOUTH PORTION SOMME STREET	29A	29B	0.77	0.11	0.88	0.79	7.11	2.19	19.78	22.15	112.40	2223.0
SOUTH PORTION SOMME STREET	29B	30	0.32	0.12	0.44	0.40	7.51	1.11	20.89	23.01	109.65	2290.7
SOUTH PORTION SOMME STREET	30	22	0.75	0.16	0.91	0.82	8.33	2.27	23.16	23.83	107.18	2482.3
										24.75		
CULVERT CROSSING	22	19		0.00	0.00	0.00	19.16	0.00	53.26	24.75	104.53	5567.5
										24.79		
POND INLET	19	POND		0.00	0.00	0.00	44.32	0.00	123.22	25.80	101.69	12813.8
POND OUTLET DITCH	POND	DITCH	1:100 year controlled post development peak flow = 1,432 l/s, see SWMHYMO output of this Report									1432.0

DETAILS	OPEN DITCH/SWALE DATA							CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT					FLOW	U/S	D/S
	BW m	D m	SS X:1	SLOPE %	CAPAC. l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL	TIME (min)	Inv (m)	Inv (m)
SW ENTRANCE TO SOMME STREET	0.00	1.20	3.00	0.61	7702.7	1.78	189.60						1.77	93.65	92.50
CULVERT CROSSING				0.50			20.00	1	600	-----	NO	**YES**	0.63	92.50	92.40
SOUTH PORTION SOMME STREET	0.00	1.20	3.00	0.73	8450.7	1.96	272.58						2.32	92.40	90.41
SOUTH PORTION SOMME STREET	0.00	1.20	3.00	0.54	7283.5	1.69	245.24						2.42	90.41	89.08
SOUTH PORTION SOMME STREET	0.00	1.20	3.00	0.53	7212.0	1.67	86.51						0.86	89.08	88.62
SOUTH PORTION SOMME STREET	0.00	1.20	3.00	0.70	8282.1	1.92	94.12						0.82	88.62	87.96
SOUTH PORTION SOMME STREET	0.00	1.20	3.00	0.97	9748.4	2.26	124.55						0.92	87.96	86.75
CULVERT CROSSING				0.50			20.00	2	-----	1.03 X 0.74	**YES**	NO	0.04	86.85	86.75
POND INLET	3.09	0.55	5.00	5.68	13135.2	4.09	22.00						0.09	86.75	85.50
POND OUTLET DITCH	1.00	0.38	3.00	2.08	1506.6	1.85	24.00						0.22	82.50	82.00

Note: Conveyance Capacitites for the Open Ditch/Swale were calculated based on a Manning's Roughness Coefficient (n) of 0.030

J.L. RICHARDS AND ASSOCIATES LIMITED, Consulting Engineers, Architects and Planners

DATE : 4/28/2009

IDENTIFICATION OF SOURCE DATA FROM HIP SWM REPORT
Project: Fastfrate Warehouse Development – CIMA+ Ref: A001083
Prepared by : Guillaume LeBlond, M.A.Sc., EIT
Date : 2022-06-01

Hawthorne Road & Rideau Road

City of Ottawa

JLR 20983
February 2009

Legend:

☐ Source Data Identification

OPEN DITCH/CULVERT DESIGN SHEET

Prepared by: M. Buchanan, E.I.T.

Checked by: G. Forget, P.Eng.

10 year Ottawa International Airport IDF Curve

Increase Runoff Coefficient by 0.0% up C = 1.0

DETAILS	NODES		DRAINAGE AREA							PEAK FLOW GENERATION				
			AREA (A) at C of											
	FROM	TO	0.20 (ha)	0.30 (ha)	0.70 (ha)	0.90 (ha)	SUM(A)	SUM(A*C)	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s
WEST CATCHMENT AREA														
WEST SIDE HAWTHORNE ROAD	1	2		2.46		0.14	2.60	0.86	0.86	2.40	2.40	15.00	97.85	235.0
WEST SIDE HAWTHORNE ROAD	2	3		1.60		0.06	1.66	0.53	1.40	1.48	3.89	18.76	85.54	332.5
WEST SIDE HAWTHORNE ROAD	3	4		1.58		0.06	1.64	0.53	1.93	1.47	5.35	19.23	84.26	451.1
WEST SIDE HAWTHORNE ROAD	4	5		1.58		0.06	1.64	0.53	2.45	1.47	6.82	19.60	83.26	568.0
WEST SIDE HAWTHORNE ROAD	5	6a		1.95		0.10	2.05	0.68	3.13	1.88	8.70	19.98	82.27	715.6
CULVERT CROSSING	6a	6b				0.00	0.00	0.00	3.13	0.00	8.70	20.99	79.73	693.6
WEST SIDE HAWTHORNE ROAD	6b	7		1.20		0.03	1.23	0.39	3.52	1.08	9.77	21.11	79.45	776.5
WEST SIDE HAWTHORNE ROAD	7	8		1.58		0.06	1.64	0.53	4.04	1.47	11.24	21.37	78.83	886.3
WEST SIDE HAWTHORNE ROAD	8	9		1.58		0.06	1.64	0.53	4.57	1.47	12.71	22.23	76.88	977.2
WEST SIDE HAWTHORNE ROAD	9	10		1.58		0.06	1.64	0.53	5.10	1.47	14.18	23.06	75.07	1064.4
WEST SIDE HAWTHORNE ROAD	10	11		1.58		0.06	1.64	0.53	5.63	1.47	15.65	23.88	73.39	1148.3
WEST SIDE HAWTHORNE ROAD	11	12		1.48		0.06	1.54	0.50	6.13	1.38	17.03	24.68	71.83	1223.3
WEST SIDE HAWTHORNE ROAD	12	13		1.34		0.06	1.40	0.46	6.58	1.27	18.30	25.47	70.35	1287.3
WEST SIDE HAWTHORNE ROAD	13	14b		1.54		0.21	1.75	0.65	7.23	1.81	20.11	26.25	68.96	1386.6
												28.49		
SW RIDEAU & HAWTHORNE	14a	14b		0.64		0.18	0.82	0.35	0.35	0.98	0.98	15.00	97.85	96.3
												16.67		
CULVERT CROSSING	14b	23				0.00	0.00	0.00	7.59	0.00	21.09	28.49	65.29	1377.2
												28.68		
EAST CATCHMENT AREA														
EAST SIDE HAWTHORNE ROAD	15	16				0.33	0.33	0.30	0.30	0.83	0.83	15.00	97.85	80.8
EAST SIDE HAWTHORNE ROAD	16	17				0.14	0.14	0.13	0.42	0.35	1.18	18.38	86.64	101.9
EAST SIDE HAWTHORNE ROAD	17	18				0.04	0.04	0.04	0.46	0.10	1.28	19.50	83.52	106.6
CULVERT CROSSING	18	19				0.00	0.00	0.00	0.46	0.00	1.28	19.86	82.56	105.3
EAST SIDE HAWTHORNE ROAD	19	20				0.06	0.06	0.05	0.51	0.15	1.43	20.85	80.08	114.2
CULVERT CROSSING	20	21				0.00	0.00	0.00	0.51	0.00	1.43	21.18	79.28	113.1
EAST SIDE HAWTHORNE ROAD	21	22a	0.21			0.16	0.37	0.19	0.70	0.52	1.94	22.02	77.35	150.3
EAST SIDE HAWTHORNE ROAD	22a	22b	0.61			0.29	0.90	0.38	1.08	1.06	3.01	24.19	72.77	218.9
EAST SIDE HAWTHORNE ROAD	22b	23	0.93			0.34	1.27	0.49	1.57	1.37	4.38	28.37	65.47	286.5
												33.51		
SOUTH CATCHMENT AREA														
SOUTH SIDE RIDEAU ROAD	23	24	0.73			0.28	1.01	0.40	9.56	1.11	26.57	33.51	58.43	1552.8
												35.37		
WEST SIDE SOMME STREET	25	24			0.42	0.12	0.54	0.40	0.40	1.12	1.12	15.00	97.85	109.4
												16.94		
CULVERT CROSSING	24	26				0.00	0.00	0.00	9.96	0.00	27.69	35.37	56.28	1558.5
												35.48		
EAST SIDE SOMME STREET	27	26			0.32	0.11	0.43	0.32	0.32	0.90	0.90	15.00	97.85	87.9
												17.01		
SOUTH SIDE RIDEAU ROAD	26	28	0.58			0.24	0.82	0.33	10.62	0.92	29.51	35.48	56.16	1657.5
												37.84		

DETAILS	NODES		OPEN DITCH/SWALE DATA									CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT						FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)
	FROM	TO	BW m	D_{10yr} m	D_{max} m	SS X:1	SLOPE %	Q_{10yr} l/s	Q_{100yr} l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL	HW 1:10 (m)			
WEST CATCHMENT AREA																				
WEST SIDE HAWTHORNE ROAD	1	2	0.00	0.41	0.50	3.00	0.20	250.1	424.5	0.50	112.00							3.76	103.22	103.00
WEST SIDE HAWTHORNE ROAD	2	3	0.00	0.25	0.50	3.00	5.00	337.3	2141.9	1.80	50.00							0.46	103.00	100.50
WEST SIDE HAWTHORNE ROAD	3	4	0.00	0.27	0.50	3.00	7.00	490.1	2534.3	2.24	50.00							0.37	100.50	97.00
WEST SIDE HAWTHORNE ROAD	4	5	0.00	0.34	0.50	3.00	5.00	765.9	2141.9	2.21	50.00							0.38	97.00	94.50
WEST SIDE HAWTHORNE ROAD	5	6a	0.00	0.45	0.65	3.00	1.07	747.0	1991.5	1.23	75.00							1.02	94.50	93.70
CULVERT CROSSING	6a	6b					1.00				10.00	1	800	------	**YES**	NO	**0.84**	0.12	93.70	93.60
WEST SIDE HAWTHORNE ROAD	6b	7	0.00	0.53	1.15	3.00	0.53	817.1	6447.9	0.97	15.00							0.26	93.60	93.52
WEST SIDE HAWTHORNE ROAD	7	8	0.00	0.56	1.15	3.00	0.50	916.3	6243.2	0.97	50.00							0.86	93.52	93.27
WEST SIDE HAWTHORNE ROAD	8	9	0.00	0.58	1.15	3.00	0.50	1006.2	6243.2	1.00	50.00							0.84	93.27	93.02
WEST SIDE HAWTHORNE ROAD	9	10	0.00	0.60	1.15	3.00	0.50	1101.4	6243.2	1.02	50.00							0.82	93.02	92.77
WEST SIDE HAWTHORNE ROAD	10	11	0.00	0.62	1.15	3.00	0.50	1202.1	6243.2	1.04	50.00							0.80	92.77	92.52
WEST SIDE HAWTHORNE ROAD	11	12	0.00	0.63	1.15	3.00	0.50	1254.5	6243.2	1.05	50.00							0.79	92.52	92.27
WEST SIDE HAWTHORNE ROAD	12	13	0.00	0.64	1.15	3.00	0.50	1308.3	6243.2	1.06	50.00							0.78	92.27	92.02
WEST SIDE HAWTHORNE ROAD	13	14b	0.00	0.64	1.15	3.00	0.61	1449.7	6918.0	1.18	158.00							2.23	92.02	91.05
SW RIDEAU & HAWTHORNE	14a	14b	0.00	0.20	1.30	3.00	4.06	167.6	24661.5	1.40	140.00							1.67	96.73	91.05
CULVERT CROSSING	14b	23					1.40				20.00	1	1000	------	**YES**	NO	**1.14**	0.19	91.05	90.77
EAST CATCHMENT AREA																				
EAST SIDE HAWTHORNE ROAD	15	16	0.00	0.25	0.30	3.00	0.45	101.7	165.4	0.54	110.00							3.38	103.80	103.30
EAST SIDE HAWTHORNE ROAD	16	17	0.00	0.16	0.30	3.00	6.20	114.3	610.8	1.49	100.00							1.12	103.30	97.10
EAST SIDE HAWTHORNE ROAD	17	18	0.00	0.16	1.20	3.00	6.36	115.8	24949.6	1.51	33.00							0.36	97.10	95.00
CULVERT CROSSING	18	19					1.77				22.00	1	600	------	**YES**	NO	**0.30**	0.98	95.00	94.61
EAST SIDE HAWTHORNE ROAD	19	20	0.00	0.21	0.70	3.00	2.79	158.3	3925.7	1.20	24.00							0.33	94.61	93.94
CULVERT CROSSING	20	21					0.50				20.00	1	600	------	NO	**YES**	**0.37**	0.83	93.94	93.84
EAST SIDE HAWTHORNE ROAD	21	22a	0.00	0.29	0.80	3.00	0.50	158.5	2372.0	0.63	82.00							2.18	93.84	93.43
EAST SIDE HAWTHORNE ROAD	22a	22b	0.00	0.33	1.17	3.00	0.52	228.1	6666.4	0.70	175.00							4.18	93.43	92.52
EAST SIDE HAWTHORNE ROAD	22b	23	0.00	0.35	1.17	3.00	0.70	309.6	7734.6	0.84	260.00							5.14	92.59	90.77
SOUTH CATCHMENT AREA																				
SOUTH SIDE RIDEAU ROAD	23	24	0.00	0.51	1.74	3.00	2.65	1642.9	43339.8	2.11	235.00							1.86	90.77	84.55
WEST SIDE SOMME STREET	25	24	0.00	0.18	1.20	3.00	2.80	105.1	16548.0	1.08	125.74							1.94	89.98	86.46
CULVERT CROSSING	24	26					1.00				20.00	1	800	------	NO	**YES**	**2.31**	0.11	84.55	84.35
EAST SIDE SOMME STREET	27	26	0.00	0.17	1.20	3.00	2.80	90.3	16548.0	1.04	125.74							2.01	89.98	86.46
SOUTH SIDE RIDEAU ROAD	26	28	0.00	0.66	2.20	3.00	0.71	1695.7	42043.4	1.30	183.76							2.36	84.35	83.04

SHEET : 10 yr Hawt Rd

V:\20983.DU\ENG\3rd Submission to City\Ditch Sizing_Rev5.xls

J.L. RICHARDS AND ASSOCIATES LIMITED, Consulting Engineers, Architects and Planners

DATE : 4/28/2009

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Project: Fastfrate Warehouse Development – CIMA+ Ref: A001083
Prepared by : Guillaume LeBlond, M.A.Sc., EIT
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City of Ottawa

JLR 20983
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Legend:

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OPEN DITCH/CULVERT DESIGN SHEET

Prepared by: M. Buchanan, E.I.T.

Checked by: G. Forget, P.Eng.

10 year Ottawa International Airport IDF Curve

Increase Runoff Coefficient by 0.0% up C = 1.0

DETAILS	NODES		DRAINAGE AREA							PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA									CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT						FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)
	FROM	TO	AREA (A) at C of 0.20 (ha)	0.30 (ha)	0.70 (ha)	0.90 (ha)	SUM(A)	SUM(A*C)	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D_{10yr} m	D_{max} m	SS X:1	SLOPE %	Q_{10yr} l/s	Q_{100yr} l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL	HW 1:10 (m)			
NORTH CATCHMENT AREA																																
			Existing 900 mm dia. culvert capacity before ditch flows to Findlay Creek											1400.0																		
NORTH SIDE RIDEAU ROAD	31	32	6.66			0.52	7.18	1.80	1.80	5.00	5.00	20.00	97.26	[redacted]	0.00	0.58	1.50	3.00	1.93	1974.3	24880.1	1.96	400.00							3.41	90.71	83.01
												23.41																				
	33	32	0.87			0.10	0.97	0.26	0.26	0.73	0.73	15.00	115.83	[redacted]	0.00	0.40	1.50	3.00	0.16	213.3	7240.8	0.44	92.00							3.45	83.16	83.01
												18.45																				
XISTING CULVERT CROSSING	32	28				0.00	0.00	0.00	2.06	0.00	5.74	23.41	87.93	[redacted]					-0.15				20.00	1	1000					0.14	83.01	83.04
												23.55																				
SOUTH CATCHMENT AREA																																
SOUTH SIDE RIDEAU ROAD	28	29	0.90			0.33	1.23	0.48	13.16	1.33	36.58	37.84	53.68	3363.5	0.00	1.17	2.20	3.00	0.14	3437.1	18513.7	0.84	347.24							6.91	83.04	82.56
SOUTH SIDE RIDEAU ROAD	29	30	0.48			0.31	0.79	0.38	13.53	1.04	37.62	44.76	47.64	3192.1	0.00	0.90	2.20	3.00	0.51	3287.0	35640.2	1.35	236.20							2.91	82.56	81.35

ote: Conveyance Capacitites for the Open Ditch/Swale were calculated based on a Manning's Roughness Coefficient (n) of 0.030

[redacted]

J.L. RICHARDS AND ASSOCIATES LIMITED, Consulting Engineers, Architects and Planners

DATE : 4/28/2009

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OPEN DITCH/CULVERT DESIGN SHEET

City of Ottawa

Prepared by: M. Buchanan, E.I.T.

JLR 20983
February 2009

1:100 year Ottawa International Airport IDF Curve

Checked by: G. Forget, P.Eng.

Increase Runoff Coefficient by 25.0% up C = 1.0

DETAILS	NODES		DRAINAGE AREA							PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA							CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT					FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)
			AREA (A) at C of				SUM(A)	SUM(A*1.25*C) 25% increase in C factor	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D m	SS X:1	SLOPE %	CAPAC. l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL			
	FROM	TO	0.20 (ha)	0.30 (ha)	0.70 (ha)	0.90 (ha)																							
WEST CATCHMENT AREA																													
WEST SIDE HAWTHORNE ROAD	1	2		2.46		0.14	2.60	1.06	1.06	2.95	2.95	15.00	142.89	422.1	0.00	0.50	3.00	0.20	424.5	0.57	112.00						3.30	103.22	103.00
WEST SIDE HAWTHORNE ROAD	2	3		1.60		0.06	1.66	0.66	1.72	1.83	4.79	18.30	126.80	607.2	0.00	0.50	3.00	5.00	2141.9	2.86	50.00						0.29	103.00	100.50
WEST SIDE HAWTHORNE ROAD	3	4		1.58		0.06	1.64	0.65	2.38	1.81	6.60	18.59	125.56	829.0	0.00	0.50	3.00	7.00	2534.3	3.38	50.00						0.25	100.50	97.00
WEST SIDE HAWTHORNE ROAD	4	5		1.58		0.06	1.64	0.65	3.03	1.81	8.42	18.84	124.54	1048.2	0.00	0.50	3.00	5.00	2141.9	2.86	50.00						0.29	97.00	94.50
WEST SIDE HAWTHORNE ROAD	5	6A		1.95		0.10	2.05	0.83	3.86	2.31	10.73	19.13	123.35	1323.2	0.00	0.65	3.00	1.07	1991.5	1.57	75.00						0.80	94.50	93.70
CULVERT CROSSING	6A	6B				0.00	0.00	0.00	3.86	0.00	10.73	19.92	120.24	1289.9				1.00			10.00	1	800	------	**YES**	NO	0.06	93.70	93.60
WEST SIDE HAWTHORNE ROAD	6B	7		1.20		0.03	1.23	0.48	4.34	1.33	12.06	19.99	119.99	1447.3	0.00	1.15	3.00	0.53	6447.9	1.63	15.00						0.15	93.60	93.52
WEST SIDE HAWTHORNE ROAD	7	8		1.58		0.06	1.64	0.65	4.99	1.81	13.88	20.14	119.42	1657.0	0.00	1.15	3.00	0.50	6243.2	1.57	50.00						0.53	93.52	93.27
WEST SIDE HAWTHORNE ROAD	8	9		1.58		0.06	1.64	0.65	5.64	1.81	15.69	20.67	117.47	1843.0	0.00	1.15	3.00	0.50	6243.2	1.57	50.00						0.53	93.27	93.02
WEST SIDE HAWTHORNE ROAD	9	10		1.58		0.06	1.64	0.65	6.30	1.81	17.50	21.20	115.59	2023.3	0.00	1.15	3.00	0.50	6243.2	1.57	50.00						0.53	93.02	92.77
WEST SIDE HAWTHORNE ROAD	10	11		1.58		0.06	1.64	0.65	6.95	1.81	19.32	21.73	113.78	2197.9	0.00	1.15	3.00	0.50	6243.2	1.57	50.00						0.53	92.77	92.52
WEST SIDE HAWTHORNE ROAD	11	12		1.48		0.06	1.54	0.62	7.56	1.71	21.03	22.26	112.03	2355.6	0.00	1.15	3.00	0.50	6243.2	1.57	50.00						0.53	92.52	92.27
WEST SIDE HAWTHORNE ROAD	12	13		1.34		0.06	1.40	0.56	8.13	1.56	22.59	22.79	110.34	2492.6	0.00	1.15	3.00	0.50	6243.2	1.57	50.00						0.53	92.27	92.02
WEST SIDE HAWTHORNE ROAD	13	14B		1.54		0.21	1.75	0.79	8.91	2.19	24.78	23.32	108.70	2693.6	0.00	1.15	3.00	0.61	6918.0	1.74	158.00						1.51	92.02	91.05
												24.83																	
SW RIDEAU & HAWTHORNE	14A	14B		0.64		0.18	0.82	0.42	0.42	1.17	1.17	15.00	142.89	166.8	0.00	1.30	3.00	4.06	24661.5	4.86	140.00						0.48	96.73	91.05
												15.48																	
CULVERT CROSSING	14B	23				0.00	0.00	0.00	9.33	0.00	25.95	24.83	104.32	2706.8				1.40			20.00	1	1000	------	**YES**	NO	0.10	91.05	90.77
												24.93																	
EAST CATCHMENT AREA																													
EAST SIDE HAWTHORNE ROAD	15	16				0.33	0.33	0.33	0.33	0.92	0.92	15.00	142.89	131.1	0.00	0.30	3.00	0.45	165.4	0.61	110.00						2.99	103.80	103.30
EAST SIDE HAWTHORNE ROAD	16	17				0.14	0.14	0.14	0.47	0.39	1.31	17.99	128.11	167.4	0.00	0.30	3.00	6.20	610.8	2.26	100.00						0.74	103.30	97.10
EAST SIDE HAWTHORNE ROAD	17	18				0.04	0.04	0.04	0.51	0.11	1.42	18.73	124.98	177.2	0.00	1.20	3.00	6.36	24949.6	5.78	33.00						0.10	97.10	95.00
CULVERT CROSSING	18	19				0.00	0.00	0.00	0.51	0.00	1.42	18.82	124.58	176.6				1.77			22.00	1	600	------	**YES**	NO	0.59	95.00	94.61
EAST SIDE HAWTHORNE ROAD	19	20				0.06	0.06	0.06	0.57	0.17	1.58	19.41	122.22	193.7	0.00	0.70	3.00	2.79	3925.7	2.67	24.00						0.15	94.61	93.94
CULVERT CROSSING	20	21				0.00	0.00	0.00	0.57	0.00	1.58	19.56	121.63	192.7				0.50			20.00	1	600	------	NO	**YES**	0.49	93.94	93.84
EAST SIDE HAWTHORNE ROAD	21	22A	0.21			0.16	0.37	0.21	0.78	0.59	2.18	20.05	119.76	260.5	0.00	0.80	3.00	0.50	2372.0	1.24	82.00						1.11	93.84	93.43
EAST SIDE HAWTHORNE ROAD	22A	22B	0.61			0.29	0.90	0.44	1.23	1.23	3.41	21.16	115.75	394.2	0.00	1.17	3.00	0.52	6666.4	1.62	175.00						1.80	93.43	92.52
EAST SIDE HAWTHORNE ROAD	22B	23	0.93			0.34	1.27	0.57	1.80	1.59	5.00	22.95	109.83	548.8	0.00	1.17	3.00	0.70	7734.6	1.88	260.00						2.30	92.59	90.77
												25.25																	
SOUTH CATCHMENT AREA																													
SOUTH SIDE RIDEAU ROAD	23	24	0.73			0.28	1.01	0.46	11.59	1.29	32.23	25.25	103.15	3324.7	0.00	1.74	3.00	2.65	43339.8	4.77	235.00						0.82	90.77	84.55
												26.08																	
WEST SIDE SOMME STREET	25	24			0.42	0.12	0.54	0.49	0.49	1.36	1.36	15.00	142.89	193.7	0.00	1.20	3.00	2.80	16548.0	3.83	125.74						0.55	89.98	86.46
												15.55																	
CULVERT CROSSING	24	26				0.00	0.00	0.00	12.08	0.00	33.59	26.08	100.99	3391.7				1.00			20.00	1	800	------	NO	**YES**	0.05	84.55	84.35
												26.12																	
EAST SIDE SOMME STREET	27	26			0.32	0.11	0.43	0.39	0.39	1.08	1.08	15.00	142.89	154.9	0.00	1.20	3.00	2.80	16548.0	3.83	125.74						0.55	89.98	86.46
												15.55																	
SOUTH SIDE RIDEAU ROAD	26	28	0.58			0.24	0.82	0.39	12.86	1.07	35.74	26.12	100.86	3604.7	0.00	2.20	3.00	0.71	42043.4	2.90	183.76						1.06	84.35	83.04
												27.18																	

DATE : 4/28/2009

IDENTIFICATION OF SOURCE DATA FROM HIP SWM REPORT
Project: Fastfrate Warehouse Development – CIMA+ Ref: A001083
Prepared by : Guillaume LeBlond, M.A.Sc., EIT
Date : 2022-06-01

Hawthorne Road & Rideau Road

City of Ottawa

JLR 20983
February 2009

Legend:

☐ Source Data Identification

OPEN DITCH/CULVERT DESIGN SHEET

Prepared by: M. Buchanan, E.I.T.

Checked by: G. Forget, P.Eng.

1:100 year Ottawa International Airport IDF Curve

Increase Runoff Coefficient by 25.0% up C = 1.0

DETAILS	NODES		DRAINAGE AREA							PEAK FLOW GENERATION					OPEN DITCH/SWALE DATA							CULVERTS SIZED UNDER 1:10 YEAR STORM EVENT					FLOW TIME (min)	U/S Inv (m)	D/S Inv (m)
	FROM	TO	AREA (A) at C of				SUM(A)	SUM(A*1.25*C) 25% increase in C factor	TOTAL A*C	2.78AR	2.78AR CUM	TIME min.	INTENS. mm/hr	PEAK FL. l/s	BW m	D m	SS X:1	SLOPE %	CAPAC. l/s	VEL. m/s	LENGTH m	No. of Barrels	DIA (mm)	B x D (m)	INLET CONTROL	OUTLET CONTROL			
			0.20 (ha)	0.30 (ha)	0.70 (ha)	0.90 (ha)																							
NORTH CATCHMENT AREA																													
			Existing 900 mm dia. Culvert Capacity before ditch flows to Findlay Creek											1400.0															
NORTH SIDE RIDEAU ROAD	31	32	6.66			0.52	7.18	2.19	2.19	6.07	6.07	20.00	119.95	2128.6	0.00	1.50	3.00	1.93	24880.1	3.69	400.00						1.81	90.71	83.01
												21.81																	
NORTH SIDE RIDEAU ROAD	33	32	0.87			0.10	0.97	0.32	0.32	0.88	0.88	15.00	142.89	126.1	0.00	1.50	3.00	0.16	7240.8	1.07	92.00						1.43	83.16	83.01
												16.43																	
EXISTING CULVERT CROSSING	32	28				0.00	0.00	0.00	2.50	0.00	6.96	21.81	113.52	2189.7				-0.15			20.00	1	1000				0.12	83.01	83.04
												21.93																	
SOUTH CATCHMENT AREA																													
SOUTH SIDE RIDEAU ROAD	28	29	0.90			0.33	1.23	0.56	15.91	1.54	44.24	27.18	98.22	5745.1	0.00	2.20	3.00	0.14	18513.7	1.28	347.24						4.54	83.04	82.56
SOUTH SIDE RIDEAU ROAD	29	30	0.48			0.31	0.79	0.43	16.34	1.20	45.44	31.72	88.42	5417.3	0.00	2.20	3.00	0.51	35640.2	2.45	236.20						1.60	82.56	81.35

Note: Conveyance Capacitites for the Open Ditch/Swale were calculated based on a Manning's Roughness Coefficient (n) of 0.030

J. L. Richards Associates Limited

Printed on: 4/28/2009

IDENTIFICATION OF SOURCE DATA FROM HIP SWM REPORT
Project: Fastfrate Warehouse Development – CIMA+ Ref: A001083
Prepared by : Guillaume LeBlond, M.A.Sc., EIT
Date : 2022-06-01

Legend:

☐ Source Data Identification

HAWTHORNE INDUSTRIAL PARK

CONVENTIONAL CULVERT DESIGN

1:10 YEAR ROADSIDE CULVERT DESIGN

Prepared by: Mark Buchanan, E.I.T.
Reviewed by: Guy Forget, P.Eng.
Date: February 2009

	DESIGN DATA							CULVERT DATA						INLET CONTROL			OUTLET CONTROL								GOVERNING	VEL
Station	Q (m³/s)	d (m)	d_e (m)	AHW (m)	Skew No.	L (m)	S (m/m)	Description	B (m)	D or H (m)	N	Q/N (m³/s)	A (each) (m²)	Q/NB (m³/s/m)	HW/D	HW (m)	K_e	H (m)	d_c (m)	$(d_c + D)/2$ (m)	TW (m)	h_o (m)	LS (m)	HW (m)	HW (m)	V_o (m/s)
1	2	3	4	5	6	7	8	9	10a	10b	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
6 to 14	1.296	0.67	0.05	1.1	0	20.0	0.005	CSPA 6	1.15	0.82	2	0.648	0.74	----	0.73	0.60	0.9	0.13	0.33	0.58	0.72	0.72	0.10	0.75	0.75	
23B to 23C	0.051	0.22	0.05	1.15	0	24.0	0.004	CSP 500	N/A	0.5	1	0.051	0.20	----	0.50	0.25	0.9	0.1	0.15	0.33	0.27	0.33	0.10	0.33	0.33	
24A to 24B	0.075	0.25	0.05	1.15	0	24.0	0.004	CSP 500	N/A	0.5	1	0.075	0.20	----	0.54	0.27	0.9	0.1	0.18	0.34	0.30	0.34	0.10	0.34	0.34	
2 to 9	0.081	0.47	0.05	1.15	0	20.0	0.005	CSP 600	N/A	0.6	1	0.081	0.28	----	0.50	0.30	0.9	0.1	0.19	0.40	0.52	0.52	0.10	0.52	0.52	
27B to 27C	1.304	0.61	0.05	1.23	0	15.0	0.007	CSPA 7	1.39	0.97	1	1.304	1.06	----	0.90	0.87	0.9	0.22	0.45	0.71	0.66	0.71	0.11	0.82	0.87	
22 to 19	2.573	0.38	0.05	1.35	0	20.0	0.005	CSPA 5	1.03	0.74	2	1.287	0.61	----	1.75	1.30	0.9	0.74	0.51	0.63	0.43	0.63	0.10	1.27	1.30	

2 From Form PH-D-533, col. 12
3 Flood Depth
4 Embedment below channel invert
5 Col. 3 + col. 4 + allowable backwater
7 Allowance for skew if applicable
8 Culvert Slope
10a/b D (circular) or B x H (arch)
11 Number of Barrels
13 Area per barrel
14 For box only
15 Charts D5-1A to C and E to J
16 HW = col. 15 x D (col. 10)
17 Chart D5-8
18 Charts D5-2A to G
19 Charts D5-3A to F: (d_c > D)
21 Col. 3 + col. 4
22 H_o = larger of cols. 20 and 21
23 Col. 7 x col. 8
24 HW = col. 18 + col. 22 - col. 23
25 Larger of cols 16 and 24
26 Outlet velocity if required (Subsection 3.2.3)

B

Appendix B-5

STORM RUNOFF COEFFICIENT

EVALUATION OF RUNOFF COEFFICIENTS

Client: Fastfrate (Ottawa) Holdings Inc.
Project: Fastfrate Warehouse Development
Location: Ottawa, Ontario
Project #: A001083
Project Status: Revision - 3 for S.P.A.

Area	Total Area (m²)	Grassed Area (m²)	Runoff Coefficient	Gravel Area (m²)	Runoff Coefficient	Hard Surface Area (m²)	Runoff Coefficient	Runoff Coefficient (10-year event)	Runoff Coefficient (100-year)
A0	3907	3907	0.20	0	0.50	0	0.90	0.20	0.25
TOTAL - Christie Creek	3907	3907		0		0		0.20	0.25
A1	7979	2165	0.20	0	0.50	5814	0.90	0.71	0.89
A2	13124	682	0.20	1798	0.50	10644	0.90	0.81	1.00
A3	8636	0	0.20	0	0.50	8636	0.90	0.90	1.00
A4	1425	429	0.20	0	0.50	996	0.90	0.69	0.86
A5	1067	79	0.20	0	0.50	988	0.90	0.85	1.00
A6	3906	3906	0.20	0	0.50	0	0.90	0.20	0.25
A7	426	426	0.20	0	0.50	0	0.90	0.20	0.25
TOTAL - Somme Street SWMF	36563	7687		1798		27078		0.73	0.92

Impervious Area Calculation - Quality Control		
Impervious Area	27057	m²
TOTAL - Somme Street SWMF	36563	m²
% Impervious	0.74001039	-

Prepared by: Guillaume LeBlond, M.A.Sc., EIT
PEO No.: 100530467
Date: 2022-05-30

Verified by: Christian Lavoie-Lebel, P.Eng.
PEO No.: 100067842
Date: 2022-05-30

\\cima.plus\cima\Cima-C10\Ott_Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\01-SWM\220527_SWM redesign\01_Runoff C\[220527_Storm Runoff Coefficients.xlsx]TABLEAU

B

Appendix B-6

STORM POST-DEV 10 & 100-YEAR UNCONTROLLED

PROJECT NAME:	Fastfrate Warehouse Development Industrial/Commercial Development
CIMA+ PROJECT NUMBER:	A001083
CLIENT:	Fastfrate
PROJECT STATUS:	Detailed Design

STORM POST-DEVELOPMENT FLOW (UNCONTROLLED)
Proposed Stormwater Management

DESCRIPTION

This calculation reflects the proposed stormwater management for the subject site areas discharging to the HIP SWMF. This calculation serves to determine the uncontrolled release rate as proposed.

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

PRE-DEVELOPMENT FLOW DETERMINATION:
DESIGN CRITERIA:

Design Storm (year):	10	
IDF Regression Constants: (a)	1174.184	
(b)	6.014	
(c)	0.816	
IDF Curve Equation (mm/hr):	I = a / (Time in min + b)^c	
Rational Formula (L/s):	Q = 2.78C*I*A	where: Q = Flow (L/s) C = Runoff Coefficient I = Rainfall Intensity (mm/hr) A = Area

ALLOWABLE RELEASE RATE - SUMMARY:

Catchment ID	Area (A) ha	Runoff Coefficient (C)	Time of Concentration (tc) min	Intensity (I) mm/hr	Release Rate (Q) L/s	Release Flow Per Unit Area (Q/ha) L/s/ha
A1	0.80	0.71	22.85	75.52	**118.86**	**148.96**
A2	1.31	0.81	22.85	75.52	**222.69**	**169.68**
A3	0.86	0.90	22.85	75.52	**163.06**	**188.81**
A4	0.14	0.69	22.85	75.52	**20.61**	**144.60**
A5	0.11	0.85	22.85	75.52	**18.99**	**177.94**
A6	0.39	0.20	22.85	75.52	**16.39**	**41.96**
A7	0.04	0.20	22.85	75.52	**1.79**	**41.96**
Total	**3.66**				**562.373**	**153.81**

NOTES:

1. Time of concentration taken from SWM report (JL Richards, 2009). It is assumed that the resulting time of concentration is identical to JL Richards SWM report.
2. IDF Parameters per City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier International Airport)

Prepared by: Guillaume LeBlond, M.A.Sc., EIT
PEO No.: 100530467
Date: May 27, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.
PEO No.: 100067842
Date: May 27, 2022

PROJECT NAME:	Fastfrate Warehouse Development Industrial/Commercial Development
CIMA+ PROJECT NUMBER:	A001083
CLIENT:	Fastfrate
PROJECT STATUS:	Detailed Design

STORM POST-DEVELOPMENT FLOW (UNCONTROLLED)
Per Master Stormwater Management Report (J.L. Richards, 2009)

DESCRIPTION

This calculation reflects the stormwater management for the subject site areas discharging to the HIP SWMF - per the HIP SWM report. This calculation demonstrates the allowable release rate for the proposed SWM to match the HIP SWM report.

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

PRE-DEVELOPMENT FLOW DETERMINATION:
DESIGN CRITERIA:

Design Storm (year):	10	
IDF Regression Constants: (a)	1174.184	
(b)	6.014	
(c)	0.816	
IDF Curve Equation (mm/hr):	$I = a / (\text{Time in min} + b)^c$	
Rational Formula (L/s):	Q = 2.78C*I*A	where: Q = Flow (L/s) C = Runoff Coefficient I = Rainfall Intensity (mm/hr) A = Area

ALLOWABLE RELEASE RATE - SUMMARY:

Catchment ID	Total Area (A) ha	Runoff Coefficient (C)	Time of Concentration (tc) min	Intensity (I) mm/hr	Allowable Release Rate (Q) L/s	Allowable Release Flow Per Unit Area (Q/ha) L/s/ha
Total Site Area Draining to SWMF per JLR 2009 SWM	3.05	0.70	22.85	75.52	**448.57**	**146.85**
Total - JLR 2009 SWM	**3.05**				**448.567**	**146.85**
Proposed SWM	**3.66**				**448.567**	**122.68**

NOTES:

1. Time of concentration taken from SWM report (JL Richards, 2009).
2. Runoff coefficients taken from SWM report (JL Richards, 2009).
3. IDF Parameters per City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier International Airport)

Prepared by: Guillaume LeBlond, M.A.Sc., EIT
PEO No.: 100530467
Date: May 27, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.
PEO No.: 100067842
Date: May 27, 2022

PROJECT NAME: Fastfrate Warehouse Development
Industrial/Commercial Development
CIMA+ PROJECT NUMBER: A001083
CLIENT: Fastfrate
PROJECT STATUS: Detailed Design

STORM POST-DEVELOPMENT FLOW (UNCONTROLLED)
Proposed Stormwater Management

DESCRIPTION

This calculation reflects the proposed stormwater management for the subject site areas discharging to the HIP SWMF. This calculation serves to determine the uncontrolled release rate as proposed.

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

PRE-DEVELOPMENT FLOW DETERMINATION:
DESIGN CRITERIA:

Design Storm (year):	**100**	
IDF Regression Constants: (a)	1735.688	
(b)	6.014	
(c)	0.820	
IDF Curve Equation (mm/hr):	$I = a / (\text{Time in min} + b)^c$	
Rational Formula (L/s):	Q = 2.78C*I*A	where: Q = Flow (L/s) C = Runoff Coefficient I = Rainfall Intensity (mm/hr) A = Area

ALLOWABLE RELEASE RATE - SUMMARY:

Catchment ID	Area (A) ha	Runoff Coefficient (C) (factored)	Time of Concentration (tc) min	Intensity (I) mm/hr	Release Rate (Q) L/s	Release Flow Per Unit Area (Q/ha) L/s/ha
A1	0.80	0.89	19.43	122.15	240.295	**301.16**
A2	1.31	1.00	19.43	122.15	445.303	**339.30**
A3	0.86	1.00	19.43	122.15	293.023	**339.30**
A4	0.14	0.86	19.43	122.15	41.658	**292.34**
A5	0.11	1.00	19.43	122.15	36.204	**339.30**
A6	0.39	0.25	19.43	122.15	33.133	**84.83**
A7	0.04	0.25	19.43	122.15	3.614	**84.83**
Total	**3.66**				**1093.229**	**299.00**

NOTES:

1. Time of concentration taken from SWM report (JL Richards, 2009). It is assumed that the resulting time of concentration is identical to JL Richards SWM report.
2. IDF Parameters per City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier International Airport)
3. Runoff coefficients are increased by 25% for the 100y storm per City of Ottawa Sewer Design Guidelines.

Prepared by: Guillaume LeBlond, M.A.Sc., EIT Date: May 27, 2022
PEO No.: 100530467

Verified by: Christian Lavoie-Lebel, P.Eng. Date: May 27, 2022
PEO No.: 100067842

PROJECT NAME: Fastfrate Warehouse Development
Industrial/Commercial Development
CIMA+ PROJECT NUMBER: A001083
CLIENT: Fastfrate
PROJECT STATUS: Detailed Design

STORM POST-DEVELOPMENT FLOW (UNCONTROLLED)
Per Master Stormwater Management Report (J.L. Richards, 2009)

DESCRIPTION

This calculation reflects the stormwater management for the subject site areas discharging to the HIP SWMF - per the HIP SWM report. This calculation demonstrates the allowable release rate for the proposed SWM to match HIP SWM report.

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

PRE-DEVELOPMENT FLOW DETERMINATION:
DESIGN CRITERIA:

Design Storm (year):	100	
IDF Regression Constants: (a)	1735.688	
(b)	6.014	
(c)	0.820	
IDF Curve Equation (mm/hr):	$I = a / (\text{Time in min} + b)^c$	
Rational Formula (L/s):	Q = 2.78C*I*A	where: Q = Flow (L/s) C = Runoff Coefficient I = Rainfall Intensity (mm/hr) A = Area

ALLOWABLE RELEASE RATE - SUMMARY:

Catchment ID	Area (A) ha	Runoff Coefficient (C) (factored)	Time of Concentration (tc) min	Intensity (I) mm/hr	Allowable Release Rate (Q) L/s	Allowable Release Flow Per Unit Area (Q/ha) L/s/ha
Total Site Area Draining to SWMF per JLR 2009 SWM	3.05	0.70	19.43	122.15	**906.87**	**296.89**
Total - JLR 2009 SWM	**3.05**				**906.867**	**296.89**
Proposed SWM	**3.66**				**906.867**	**248.03**

NOTES:

1. Time of concentration taken from SWM report (JL Richards, 2009).
2. Runoff coefficients taken from SWM report (JL Richards, 2009).
3. IDF Parameters per City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier International Airport)
4. Runoff coefficients are increased by 25% for the 100y storm per City of Ottawa Sewer Design Guidelines.

Prepared by: Guillaume LeBlond, M.A.Sc., EI
PEO No.: 100530467
Date: May 27, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.
PEO No.: 100067842
Date: May 27, 2022

PROJECT NAME:	Fastfrate Warehouse Development Industrial/Commercial Development
CIMA+ PROJECT NUMBER:	A001083
CLIENT:	Fastfrate
PROJECT STATUS:	Detailed Design

STORM POST-DEVELOPMENT FLOW (UNCONTROLLED)
SWM Comparison of Areas Draining to Christie Creek

DESCRIPTION

This calculation compares the HIP SWM and Proposed SWM for the subject site areas discharging to Christie Creek. This calculation demonstrates the allowable release rate for the proposed SWM for it to match the HIP SWM report.

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012

PRE-DEVELOPMENT FLOW DETERMINATION:
DESIGN CRITERIA:

Design Storm (year):	100	
IDF Regression Constants: (a)	1735.688	
(b)	6.014	
(c)	0.820	
IDF Curve Equation (mm/hr):	$I = a / (\text{Time in min} + b)^c$	
Rational Formula (L/s):	Q = 2.78C*I*A	where: Q = Flow (L/s) C = Runoff Coefficient I = Rainfall Intensity (mm/hr) A = Area

ALLOWABLE RELEASE RATE - SUMMARY:

Catchment ID	Area (A) ha	Runoff Coefficient (C) (factored)	Time of Concentration (tc) min	Intensity (I) mm/hr	Allowable Release Rate (Q) L/s	Release Flow Per Unit Area (Q/ha) L/s/ha
East Side Somme Street	0.32	0.88	15.00	142.89	111.140	**347.31**
South Side Rideau Road	0.58	0.25	26.12	100.87	40.628	**70.05**
East Side Somme Street (Revised	0.00	0.88	15.00	142.89	0.000	**-**
South Side Rideau Road (Revised	0.26	0.25	26.12	100.87	18.072	**70.05**
Total - JLR 2009 SWM	**0.90**				**151.768**	**168.63**
Proposed SWM	**0.26**			**Actual Release Rate:** **Residual Release Rate:**	**18.072** **133.695**	**70.05**

NOTES:

1. Time of concentration taken from SWM report (JL Richards, 2009).
2. Runoff coefficients taken from SWM report (JL Richards, 2009).
3. IDF Parameters per City of Ottawa Sewer Design Guidelines, 2012 (Macdonald-Cartier International Airport)
4. Runoff coefficients are increased by 25% for the 100y storm per City of Ottawa Sewer Design Guidelines.

Prepared by: Guillaume LeBlond, M.A.Sc., EIT Date: May 27, 2022
PEO No.: 100530467

Verified by: Christian Lavoie-Lebel, P.Eng. Date: May 27, 2022
PEO No.: 100067842

B

Appendix B-7

STORM WATER MANAGEMENT – STORAGE AND DRAWDOWN FULL RELEASE RATE

Date: **2022-05-30**

Fastfrate Warehouse Development
Industrial/Commercial Development
A001083 (360)
STORM WATER MANAGEMENT - SUMMARY - FULL RELEASE RATE

Rainfall event 100 years

Sub-Area	Total Area (m^2)	Capacity Area (m^2)	Y_{max} (m)	V_{max} (m^3)	V_{rain} (m^3)	Difference (m^3)	V_{acc} (m^3)	Y_{rain} (m)	A_{rain} (m^2)	Q_{ave} (L/s)	Drawdown Time (min)	Comments
A1	7979	2394	0.00	0.00	95.85	-95.85	0.00	0.00	0	191.429	0	NC
A2	13124	3937	0.00	0.00	201.60	-201.60	0.00	0.00	0	314.866	0	NC
A3 - Building	8636	8636	0.05	143.93	115.00	28.93	115.00	0.04	7719	234.988	8	
A4	1425	428	0.00	0.00	16.06	-16.06	0.00	0.00	0	34.188	0	NC
A5	1067	320	0.00	0.00	16.39	-16.39	0.00	0.00	0	25.599	0	NC
A6	3906	1172	0.00	0.00	0.00	0.00	0.00	0.00	0	93.711	0	NC
A7	426	128	0.00	0.00	0.00	0.00	0.00	0.00	0	10.220	0	NC
Total	36563	17014		143.93	444.90	-300.97	115.00					

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Legend:

NC = Non-controlled areas (no storage available)
Capacity Area = Area of water accumulated in sub-area at Max. Elev.
~~Catchbasin Elev. = Elevation of catchbasin inlet (top of grate).~~
~~Max. Elev. = Maximum elevation of water that may be accumulated within sub-area.~~
Y_{max} = Maximum depth of water that may be accumulated within the sub-area.
V_{max} = Maximum volume of water (capacity) that may be accumulated within the sub-area.
V_{rain} = Volume of water generated by rainfall.
Difference = Difference between V_{max} and V_{rain} (remaining capacity of sub-area)
V_{acc} = Total volume of water accumulated within the sub-area in the event of a specific rainfall.
Y_{rain} = Depth of water generated by rainfall.
~~$Elev_{rain}$ = Elevation of water generated by rainfall.~~
A_{rain} = Area of water generated by rainfall.
Q_{ave} = Average flow (for drawdown time calculation).
Drawdown Time = Time required for the total volume of water accumulated within sub-area to evacuate (following rainfall event).

Design Criteria:

1) Maximum Allowable Total Release Rate = 248.03 L/s/ha
2) ~~Pipe size for 10 years~~
3) Rainfall event of 100 years
4) ~~Pre-development flow (5 year) = ____ L/s (or ____ L/s/ha)~~

Prepared by: Guillaume LeBlond, M.A.Sc., EIT Date: May 27, 2022
PEO No.: 100530467

Verified by: Christian Lavoie-Lebel, P.Eng. Date: May 27, 2022
PEO No.: 100067842

ment

Date: **2022-05-30**

Industrial/Commercial Development

A001083 (360)

STORM WATER MANAGEMENT - AVERAGE FLOW CALCULATION FOR RELEASE RATES

Catchment ID	Release Rate	Specified Flow rate	Calculated area
	L/s/ha	L/s	(mm^2)
A1	239.98	191.48	52255
A2	239.98	314.95	85950
A3 - Building	274.06	236.68	63773
A4	239.98	34.20	9332
A5	239.98	25.61	6988
A6	239.98	93.74	25581
A7	239.98	10.22	2790
	Total	906.87	
	Allowable	906.87	
	Difference	0.00	

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Préparé par: Guillaume LeBlond, M.A.Sc., EIT   Date: May 27, 2022
PEO No.: 100530467

Vérifié par: Christian Lavoie-Lebel, P.Eng.   Date: May 27, 2022
PEO No.: 100067842

STORAGE VOLUME CALCULATIONS

Project: Fastfrate Warehouse Development
Industrial/Commercial Development
Project #: A001083 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 2022-05-30 14:00

File Location: ***\\cima.plus\cima\Cima-C10\Ott_Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\01-SWM\220527_SWM redesign\03_Storm Release Rates\[220525_Storm Water***

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 239.9793771 L/s/ha

Area : A1 0.7979 ha
Runoff Coefficient C (unfactorec 0.71
C_runoff factor: 1.25
Runoff Coefficient C : 0.8875
Rainfall Event : 100 year
Discharge Flow Q : 0.191479545 m³/s
Discharge Factor K : 1

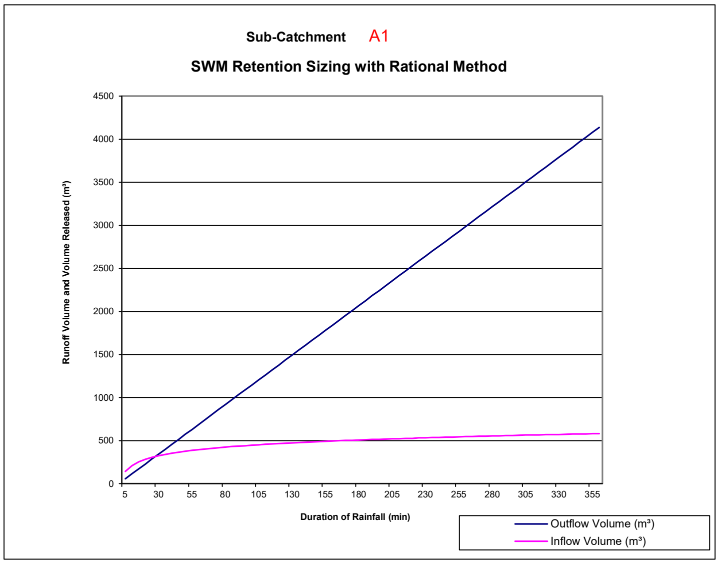
Design Volume: **95.85 m³**

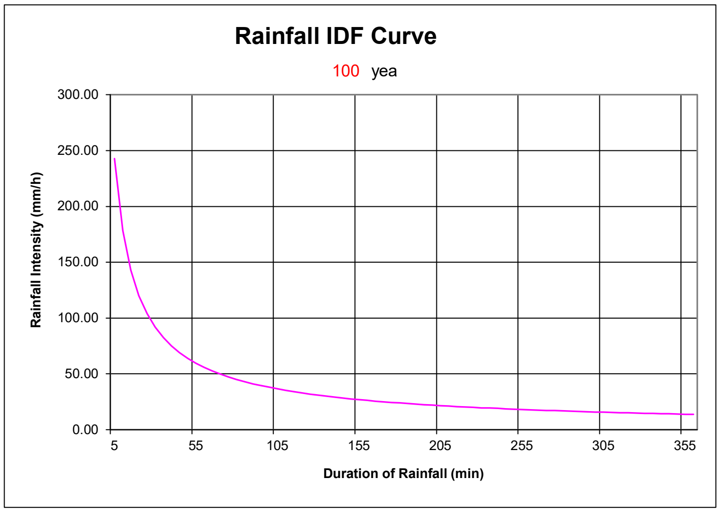
Rainfall	2 year		5 year		10 year	
IDF Curve Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.810	0.810	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
IDF Curve Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.820	0.820	0.820	0.820

Prepared by: Guillaume LeBlond, M.A.Sc., EIT
PEO No.: 100530467
Date: May 27, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.
PEO No.: 100067842
Date: May 27, 2022

Fastfrate Warehouse Development
Industrial/Commercial Development





Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m³) *CIAT* (4)	**Output Volume** (m³) *kQT* (5)	**Retention Volume** (m³) *(4)-(5)* (6)
5.0	242.70	143.22	57.4438635	85.78
10.0	178.56	210.74	114.887727	95.85
15.0	142.89	252.97	172.33159	80.64
20.0	119.95	283.14	229.775454	53.36
25.0	103.85	306.41	287.219317	19.19
30.0	91.87	325.28	344.663181	-19.39
35.0	82.58	341.12	402.107044	-60.99
40.0	75.15	354.75	459.550908	-104.80
45.0	69.05	366.73	516.994771	-150.27
50.0	63.95	377.40	574.438635	-197.04
55.0	59.62	387.03	631.882498	-244.85
60.0	55.89	395.81	689.326362	-293.52
65.0	52.65	403.88	746.770225	-342.89
70.0	49.79	411.34	804.214089	-392.87
75.0	47.26	418.29	861.657952	-443.37
80.0	44.99	424.80	919.101816	-494.31
85.0	42.95	430.91	976.545679	-545.63
90.0	41.11	436.68	1033.98954	-597.31
95.0	39.43	442.15	1091.43341	-649.29
100.0	37.90	447.34	1148.87727	-701.54
105.0	36.50	452.29	1206.32113	-754.03
110.0	35.20	457.02	1263.765	-806.75
115.0	34.01	461.54	1321.20886	-859.67
120.0	32.89	465.88	1378.65272	-912.77
125.0	31.86	470.05	1436.09659	-966.04
130.0	30.90	474.07	1493.54045	-1019.47
135.0	30.00	477.94	1550.98431	-1073.04
140.0	29.15	481.68	1608.42818	-1126.74
145.0	28.36	485.30	1665.87204	-1180.57
150.0	27.61	488.80	1723.3159	-1234.51
155.0	26.91	492.20	1780.75977	-1288.56
160.0	26.24	495.49	1838.20363	-1342.71
165.0	25.61	498.70	1895.6475	-1396.95
170.0	25.01	501.81	1953.09136	-1451.28
175.0	24.44	504.84	2010.53522	-1505.70
180.0	23.90	507.79	2067.97909	-1560.19
185.0	23.39	510.66	2125.42295	-1614.76
190.0	22.90	513.47	2182.86681	-1669.40
195.0	22.43	516.21	2240.31068	-1724.10
200.0	21.98	518.89	2297.75454	-1778.87
205.0	21.55	521.50	2355.1984	-1833.70
210.0	21.14	524.06	2412.64227	-1888.58
215.0	20.75	526.56	2470.08613	-1943.52
220.0	20.37	529.02	2527.52999	-1998.51
225.0	20.01	531.42	2584.97386	-2053.56
230.0	19.66	533.77	2642.41772	-2108.65
235.0	19.33	536.08	2699.86158	-2163.78
240.0	19.01	538.35	2757.30545	-2218.96
245.0	18.69	540.57	2814.74931	-2274.18
250.0	18.39	542.75	2872.19317	-2329.44
255.0	18.11	544.90	2929.63704	-2384.74
260.0	17.83	547.00	2987.0809	-2440.08
265.0	17.56	549.07	3044.52476	-2495.45
270.0	17.29	551.11	3101.96863	-2550.86
275.0	17.04	553.11	3159.41249	-2606.30
280.0	16.80	555.08	3216.85636	-2661.77
285.0	16.56	557.02	3274.30022	-2717.28
290.0	16.33	558.93	3331.74408	-2772.81
295.0	16.11	560.81	3389.18795	-2828.37
300.0	15.89	562.67	3446.63181	-2883.97
305.0	15.68	564.49	3504.07567	-2939.58
310.0	15.48	566.29	3561.51954	-2995.23
315.0	15.28	568.07	3618.9634	-3050.90
320.0	15.09	569.81	3676.40726	-3106.59
325.0	14.90	571.54	3733.85113	-3162.31
330.0	14.72	573.24	3791.29499	-3218.05
335.0	14.54	574.92	3848.73885	-3273.82
340.0	14.37	576.58	3906.18272	-3329.60
345.0	14.20	578.22	3963.62658	-3385.41
350.0	14.04	579.83	4021.07044	-3441.24
355.0	13.88	581.43	4078.51431	-3497.09
360.0	13.72	583.00	4135.95817	-3552.95
Max Volume (V max):				95.85
Design Volume (V design) :				**95.85**

Init.________

STORAGE VOLUME CALCULATIONS

Project: Fastfrate Warehouse Development
Industrial/Commercial Development
Project #: A001083 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 2022-05-30 14:00

File Location: ***\\cima.plus\cima\Cima-C10\Ott_Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\01-SWM\220527_SWM redesign\03_Storm Release Rates\[220525_Storm Water***

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 239.9793771 L/s/ha

Area : A2 1.3124 ha
Runoff Coefficient C (unfactore 0.81
C_runoff factor: 1.25
Runoff Coefficient C : 1
Rainfall Event : 100 year
Discharge Flow Q : 0.314948934 m³/s
Discharge Factor K : 1

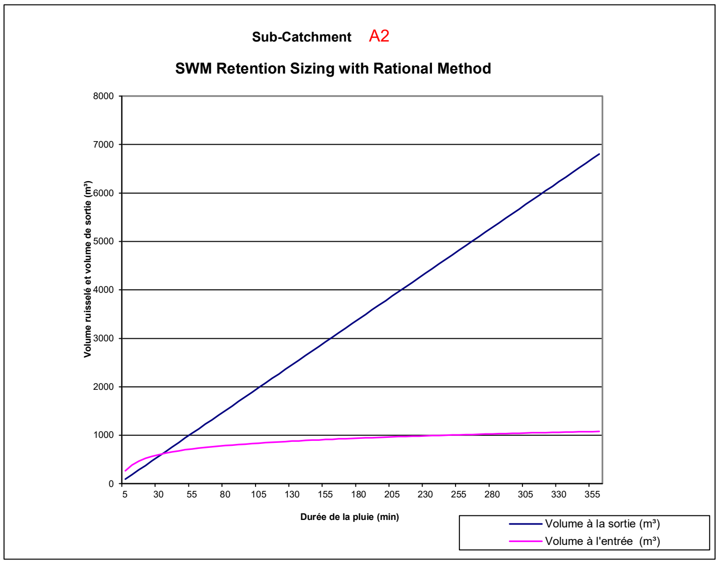
Design Volume: **201.60 m³**

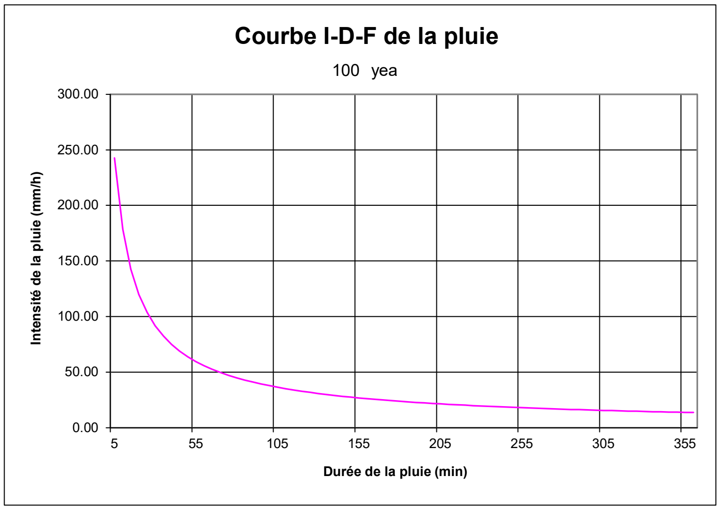
Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Guillaume LeBlond, M.A.Sc., EIT Date: May 27, 2022
PEO No.: 100530467

Verified by: Christian Lavoie-Lebel, P.Eng. Date: May 27, 2022
PEO No.: 100067842

Fastfrate Warehouse Development
Industrial/Commercial Development





Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m³) *CIAT* (4)	**Output Volume** (m³) *kQT* (5)	**Retention Volume** (m³) *(4)-(5)* (6)
5.0	242.70	265.44	94.4846803	170.95
10.0	178.56	390.57	188.969361	201.60
15.0	142.89	468.84	283.454041	185.38
20.0	119.95	524.74	377.938721	146.80
25.0	103.85	567.87	472.423402	95.45
30.0	91.87	602.84	566.908082	35.93
35.0	82.58	632.19	661.392762	-29.20
40.0	75.15	657.47	755.877443	-98.41
45.0	69.05	679.66	850.362123	-170.70
50.0	63.95	699.44	944.846803	-245.40
55.0	59.62	717.29	1039.33148	-322.04
60.0	55.89	733.56	1133.81616	-400.26
65.0	52.65	748.51	1228.30084	-479.79
70.0	49.79	762.35	1322.78552	-560.44
75.0	47.26	775.23	1417.27021	-642.04
80.0	44.99	787.28	1511.75489	-724.47
85.0	42.95	798.61	1606.23957	-807.63
90.0	41.11	809.31	1700.72425	-891.41
95.0	39.43	819.44	1795.20893	-975.77
100.0	37.90	829.07	1889.69361	-1060.63
105.0	36.50	838.24	1984.17829	-1145.94
110.0	35.20	846.99	2078.66297	-1231.67
115.0	34.01	855.38	2173.14765	-1317.77
120.0	32.89	863.42	2267.63233	-1404.21
125.0	31.86	871.16	2362.11701	-1490.96
130.0	30.90	878.60	2456.60169	-1578.00
135.0	30.00	885.78	2551.08637	-1665.31
140.0	29.15	892.71	2645.57105	-1752.86
145.0	28.36	899.42	2740.05573	-1840.64
150.0	27.61	905.91	2834.54041	-1928.63
155.0	26.91	912.20	2929.02509	-2016.82
160.0	26.24	918.31	3023.50977	-2105.20
165.0	25.61	924.24	3117.99445	-2193.75
170.0	25.01	930.01	3212.47913	-2282.47
175.0	24.44	935.62	3306.96381	-2371.34
180.0	23.90	941.09	3401.44849	-2460.36
185.0	23.39	946.42	3495.93317	-2549.51
190.0	22.90	951.62	3590.41785	-2638.80
195.0	22.43	956.70	3684.90253	-2728.20
200.0	21.98	961.66	3779.38721	-2817.73
205.0	21.55	966.51	3873.87189	-2907.36
210.0	21.14	971.25	3968.35657	-2997.11
215.0	20.75	975.89	4062.84125	-3086.95
220.0	20.37	980.43	4157.32593	-3176.89
225.0	20.01	984.89	4251.81062	-3266.93
230.0	19.66	989.25	4346.2953	-3357.05
235.0	19.33	993.53	4440.77998	-3447.25
240.0	19.01	997.72	4535.26466	-3537.54
245.0	18.69	1001.84	4629.74934	-3627.90
250.0	18.39	1005.89	4724.23402	-3718.34
255.0	18.11	1009.86	4818.7187	-3808.86
260.0	17.83	1013.77	4913.20338	-3899.44
265.0	17.56	1017.61	5007.68806	-3990.08
270.0	17.29	1021.38	5102.17274	-4080.79
275.0	17.04	1025.09	5196.65742	-4171.57
280.0	16.80	1028.74	5291.1421	-4262.40
285.0	16.56	1032.34	5385.62678	-4353.29
290.0	16.33	1035.88	5480.11146	-4444.23
295.0	16.11	1039.36	5574.59614	-4535.23
300.0	15.89	1042.80	5669.08082	-4626.28
305.0	15.68	1046.18	5763.5655	-4717.38
310.0	15.48	1049.52	5858.05018	-4808.53
315.0	15.28	1052.80	5952.53486	-4899.73
320.0	15.09	1056.05	6047.01954	-4990.97
325.0	14.90	1059.24	6141.50422	-5082.26
330.0	14.72	1062.40	6235.9889	-5173.59
335.0	14.54	1065.51	6330.47358	-5264.96
340.0	14.37	1068.58	6424.95826	-5356.37
345.0	14.20	1071.62	6519.44294	-5447.83
350.0	14.04	1074.61	6613.92762	-5539.32
355.0	13.88	1077.57	6708.4123	-5630.84
360.0	13.72	1080.49	6802.89698	-5722.41
Max Volume (V max):				201.60
Design Volume (V design) :				**201.60**

STORAGE VOLUME CALCULATIONS

Project: Fastfrate Warehouse Development
Industrial/Commercial Development
Project #: A001083 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 2022-05-30 14:00

File Location: ***\\cima.plus\cima\Cima-C10\Ott_Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\01-SWM\220527_SWM redesign\03_Storm Release Rates\[220525_Storm Water***

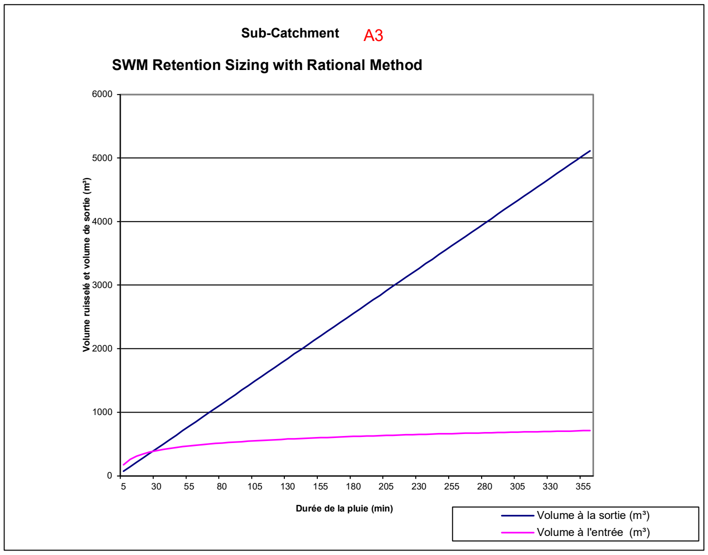
Description: **Storage volume calculations with the rational method**

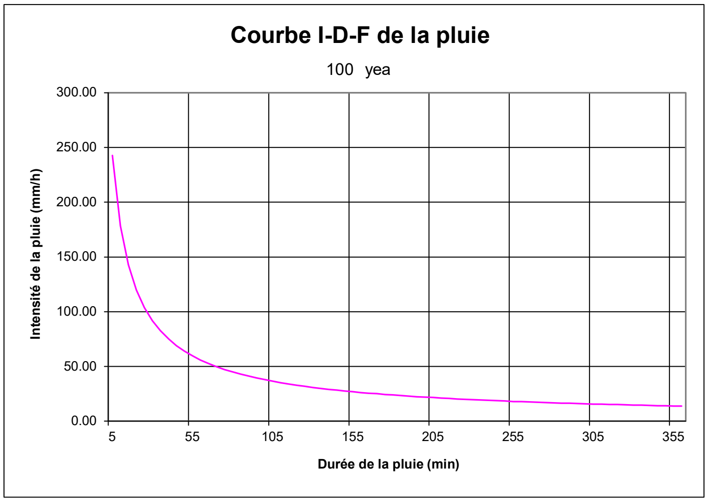
Specified Release Rate:	274.0581214	L/s/ha
Area : A3 - Building	0.8636	ha
Runoff Coefficient C (unfactored):	0.9	
C_runoff factor:	1.25	
Runoff Coefficient C :	1	
Rainfall Event :	100	year
Discharge Flow Q :	0.236676594	m³/s
Discharge Factor K :	1	
Design Volume:	**115.00**	**m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Guillaume LeBlond, M.A.Sc., EIT
PEO No.: 100530467
Date: May 27, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.
PEO No.: 100067842
Date: May 27, 2022


Sub-Catchment A3
SWM Retention Sizing with Rational Method
6000
5000
4000
3000
2000
1000
0
Volume ruisselé et volume de sortie (m³)
5
30
55
80
105
130
155
180
205
230
255
280
305
330
355
Durée de la pluie (min)
Volume à la sortie (m³)
Volume à l'entrée (m³)


Courbe I-D-F de la pluie
100 yea
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Intensité de la pluie (mm/h)
5
55
105
155
205
255
305
355
Durée de la pluie (min)

Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m³) *CIAT* (4)	**Output Volume** (m³) *kQT* (5)	**Retention Volume** (m³) *(4)-(5)* (6)
5.0	242.70	174.67	71.0029781	103.66
10.0	178.56	257.01	142.005956	115.00
15.0	142.89	308.51	213.008934	95.50
20.0	119.95	345.30	284.011912	61.29
25.0	103.85	373.68	355.01489	18.66
30.0	91.87	396.69	426.017869	-29.33
35.0	82.58	416.00	497.020847	-81.02
40.0	75.15	432.64	568.023825	-135.39
45.0	69.05	447.24	639.026803	-191.79
50.0	63.95	460.26	710.029781	-249.77
55.0	59.62	472.00	781.032759	-309.03
60.0	55.89	482.71	852.035737	-369.33
65.0	52.65	492.54	923.038715	-430.50
70.0	49.79	501.65	994.041693	-492.39
75.0	47.26	510.12	1065.04467	-554.92
80.0	44.99	518.06	1136.04765	-617.99
85.0	42.95	525.51	1207.05063	-681.54
90.0	41.11	532.55	1278.05361	-745.50
95.0	39.43	539.22	1349.05658	-809.84
100.0	37.90	545.55	1420.05956	-874.51
105.0	36.50	551.59	1491.06254	-939.48
110.0	35.20	557.35	1562.06552	-1004.72
115.0	34.01	562.87	1633.0685	-1070.20
120.0	32.89	568.16	1704.07147	-1135.91
125.0	31.86	573.25	1775.07445	-1201.83
130.0	30.90	578.15	1846.07743	-1267.93
135.0	30.00	582.87	1917.08041	-1334.21
140.0	29.15	587.43	1988.08339	-1400.65
145.0	28.36	591.84	2059.08636	-1467.24
150.0	27.61	596.12	2130.08934	-1533.97
155.0	26.91	600.26	2201.09232	-1600.84
160.0	26.24	604.27	2272.0953	-1667.82
165.0	25.61	608.18	2343.09828	-1734.92
170.0	25.01	611.97	2414.10126	-1802.13
175.0	24.44	615.67	2485.10423	-1869.44
180.0	23.90	619.27	2556.10721	-1936.84
185.0	23.39	622.78	2627.11019	-2004.33
190.0	22.90	626.20	2698.11317	-2071.92
195.0	22.43	629.54	2769.11615	-2139.58
200.0	21.98	632.80	2840.11912	-2207.32
205.0	21.55	635.99	2911.1221	-2275.13
210.0	21.14	639.11	2982.12508	-2343.01
215.0	20.75	642.17	3053.12806	-2410.96
220.0	20.37	645.16	3124.13104	-2478.98
225.0	20.01	648.09	3195.13401	-2547.05
230.0	19.66	650.96	3266.13699	-2615.18
235.0	19.33	653.77	3337.13997	-2683.37
240.0	19.01	656.53	3408.14295	-2751.61
245.0	18.69	659.24	3479.14593	-2819.90
250.0	18.39	661.91	3550.1489	-2888.24
255.0	18.11	664.52	3621.15188	-2956.63
260.0	17.83	667.09	3692.15486	-3025.06
265.0	17.56	669.62	3763.15784	-3093.54
270.0	17.29	672.10	3834.16082	-3162.06
275.0	17.04	674.54	3905.1638	-3230.62
280.0	16.80	676.95	3976.16677	-3299.22
285.0	16.56	679.31	4047.16975	-3367.86
290.0	16.33	681.64	4118.17273	-3436.53
295.0	16.11	683.93	4189.17571	-3505.24
300.0	15.89	686.19	4260.17869	-3573.99
305.0	15.68	688.42	4331.18166	-3642.76
310.0	15.48	690.61	4402.18464	-3711.57
315.0	15.28	692.78	4473.18762	-3780.41
320.0	15.09	694.91	4544.1906	-3849.28
325.0	14.90	697.02	4615.19358	-3918.18
330.0	14.72	699.09	4686.19655	-3987.11
335.0	14.54	701.14	4757.19953	-4056.06
340.0	14.37	703.16	4828.20251	-4125.04
345.0	14.20	705.16	4899.20549	-4194.05
350.0	14.04	707.13	4970.20847	-4263.08
355.0	13.88	709.07	5041.21144	-4332.14
360.0	13.72	711.00	5112.21442	-4401.22
Max Volume (V max):				115.00
Design Volume (V design) :				**115.00**

STORAGE VOLUME CALCULATIONS

Project: Fastfrate Warehouse Development
Industrial/Commercial Development
Project #: A001083 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 2022-05-30 14:00

File Location: ***\\cima.plus\cima\Cima-C10\Ott_Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\01-SWM\220527_SWM redesign\03_Storm Release Rates\[220525_Storm Water***

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 239.9793771 L/s/ha

Area : A4 0.1425 ha
Runoff Coefficient C (unfactorec 0.69
C_runoff factor: 1.25
Runoff Coefficient C : 0.8625
Rainfall Event : 100 year
Discharge Flow Q : 0.034197061 m³/s
Discharge Factor K : 1

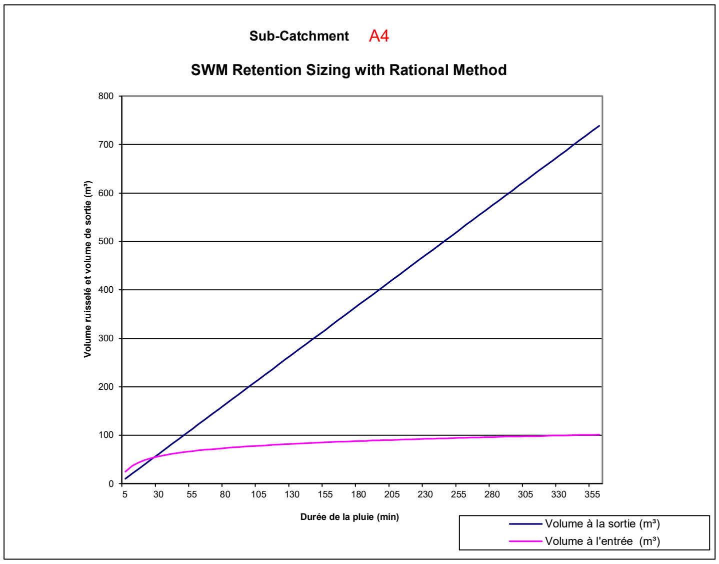
Design Volume: **16.06 m³**

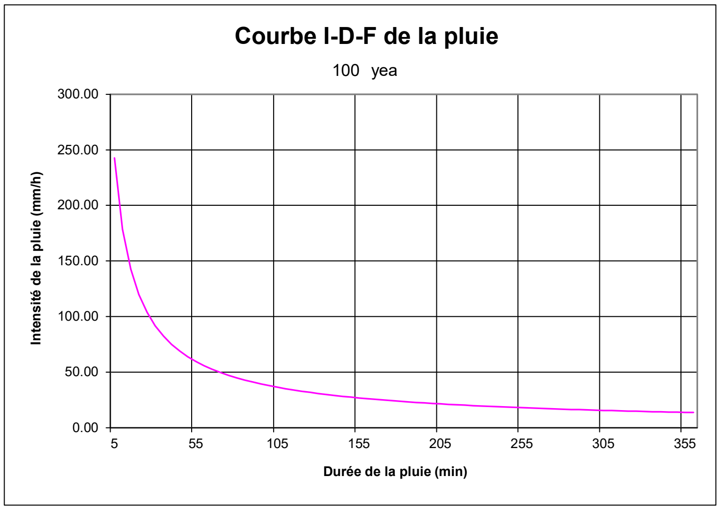
Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Guillaume LeBlond, M.A.Sc., EIT
PEO No.: 100530467
Date: May 27, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.
PEO No.: 100067842
Date: May 27, 2022

Fastfrate Warehouse Development
Industrial/Commercial Development





Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m³) *CIAT* (4)	**Output Volume** (m³) *kQT* (5)	**Retention Volume** (m³) *(4)-(5)* (6)
5.0	242.70	24.86	10.2591184	14.60
10.0	178.56	36.58	20.5182367	16.06
15.0	142.89	43.91	30.7773551	13.13
20.0	119.95	49.14	41.0364735	8.11
25.0	103.85	53.18	51.2955918	1.89
30.0	91.87	56.46	61.5547102	-5.10
35.0	82.58	59.20	71.8138286	-12.61
40.0	75.15	61.57	82.072947	-20.50
45.0	69.05	63.65	92.3320653	-28.68
50.0	63.95	65.50	102.591184	-37.09
55.0	59.62	67.17	112.850302	-45.68
60.0	55.89	68.70	123.10942	-54.41
65.0	52.65	70.10	133.368539	-63.27
70.0	49.79	71.39	143.627657	-72.23
75.0	47.26	72.60	153.886776	-81.29
80.0	44.99	73.73	164.145894	-90.42
85.0	42.95	74.79	174.405012	-99.61
90.0	41.11	75.79	184.664131	-108.87
95.0	39.43	76.74	194.923249	-118.18
100.0	37.90	77.64	205.182367	-127.54
105.0	36.50	78.50	215.441486	-136.94
110.0	35.20	79.32	225.700604	-146.38
115.0	34.01	80.11	235.959723	-155.85
120.0	32.89	80.86	246.218841	-165.36
125.0	31.86	81.58	256.477959	-174.89
130.0	30.90	82.28	266.737078	-184.46
135.0	30.00	82.95	276.996196	-194.04
140.0	29.15	83.60	287.255314	-203.65
145.0	28.36	84.23	297.514433	-213.28
150.0	27.61	84.84	307.773551	-222.94
155.0	26.91	85.43	318.032669	-232.61
160.0	26.24	86.00	328.291788	-242.29
165.0	25.61	86.56	338.550906	-252.00
170.0	25.01	87.10	348.810025	-261.71
175.0	24.44	87.62	359.069143	-271.45
180.0	23.90	88.13	369.328261	-281.20
185.0	23.39	88.63	379.58738	-290.95
190.0	22.90	89.12	389.846498	-300.73
195.0	22.43	89.59	400.105616	-310.51
200.0	21.98	90.06	410.364735	-320.31
205.0	21.55	90.51	420.623853	-330.11
210.0	21.14	90.96	430.882972	-339.93
215.0	20.75	91.39	441.14209	-349.75
220.0	20.37	91.82	451.401208	-359.58
225.0	20.01	92.23	461.660327	-369.43
230.0	19.66	92.64	471.919445	-379.28
235.0	19.33	93.04	482.178563	-389.13
240.0	19.01	93.44	492.437682	-399.00
245.0	18.69	93.82	502.6968	-408.87
250.0	18.39	94.20	512.955918	-418.75
255.0	18.11	94.57	523.215037	-428.64
260.0	17.83	94.94	533.474155	-438.53
265.0	17.56	95.30	543.733274	-448.43
270.0	17.29	95.65	553.992392	-458.34
275.0	17.04	96.00	564.25151	-468.25
280.0	16.80	96.34	574.510629	-478.17
285.0	16.56	96.68	584.769747	-488.09
290.0	16.33	97.01	595.028865	-498.02
295.0	16.11	97.34	605.287984	-507.95
300.0	15.89	97.66	615.547102	-517.89
305.0	15.68	97.97	625.806221	-527.83
310.0	15.48	98.29	636.065339	-537.78
315.0	15.28	98.60	646.324457	-547.73
320.0	15.09	98.90	656.583576	-557.68
325.0	14.90	99.20	666.842694	-567.64
330.0	14.72	99.49	677.101812	-577.61
335.0	14.54	99.79	687.360931	-587.58
340.0	14.37	100.07	697.620049	-597.55
345.0	14.20	100.36	707.879168	-607.52
350.0	14.04	100.64	718.138286	-617.50
355.0	13.88	100.91	728.397404	-627.48
360.0	13.72	101.19	738.656523	-637.47
Max Volume (V max):				16.06
Design Volume (V design) :				**16.06**

STORAGE VOLUME CALCULATIONS

Project: Fastfrate Warehouse Development
Industrial/Commercial Development
Project #: A001083 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 2022-05-30 14:00

File Location: ***\\cima.plus\cima\Cima-C10\Ott_Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\01-SWM\220527_SWM redesign\03_Storm Release Rates\[220525_Storm Water***

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 239.9793771 L/s/ha

Area : A5 0.1067 ha
Runoff Coefficient C (unfactorec 0.85
C_runoff factor: 1.25
Runoff Coefficient C : 1
Rainfall Event : 100 year
Discharge Flow Q : 0.0256058 m³/s
Discharge Factor K : 1

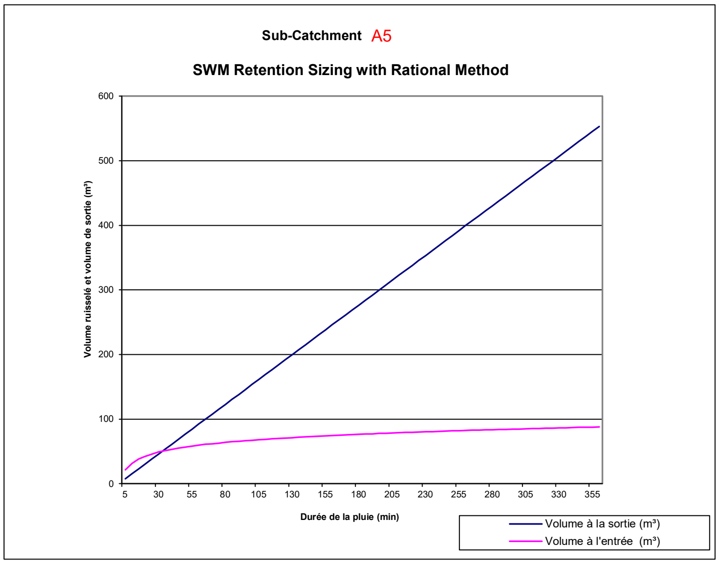
Design Volume: **16.39 m³**

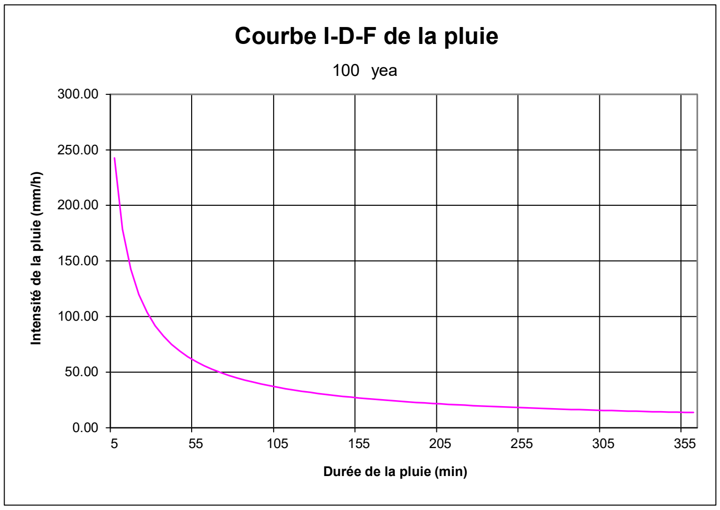
Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Guillaume LeBlond, M.A.Sc., EIT
PEO No.: 100530467
Date: May 27, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.
PEO No.: 100067842
Date: May 27, 2022

Fastfrate Warehouse Development
Industrial/Commercial Development





Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	21.58	7.68173986	13.90
10.0	178.56	31.75	15.3634797	16.39
15.0	142.89	38.12	23.0452196	15.07
20.0	119.95	42.66	30.7269594	11.94
25.0	103.85	46.17	38.4086993	7.76
30.0	91.87	49.01	46.0904392	2.92
35.0	82.58	51.40	53.772179	-2.37
40.0	75.15	53.45	61.4539189	-8.00
45.0	69.05	55.26	69.1356587	-13.88
50.0	63.95	56.87	76.8173986	-19.95
55.0	59.62	58.32	84.4991385	-26.18
60.0	55.89	59.64	92.1808783	-32.54
65.0	52.65	60.85	99.8626182	-39.01
70.0	49.79	61.98	107.544358	-45.56
75.0	47.26	63.03	115.226098	-52.20
80.0	44.99	64.01	122.907838	-58.90
85.0	42.95	64.93	130.589578	-65.66
90.0	41.11	65.80	138.271317	-72.47
95.0	39.43	66.62	145.953057	-79.33
100.0	37.90	67.40	153.634797	-86.23
105.0	36.50	68.15	161.316537	-93.17
110.0	35.20	68.86	168.998277	-100.14
115.0	34.01	69.54	176.680017	-107.14
120.0	32.89	70.20	184.361757	-114.16
125.0	31.86	70.83	192.043497	-121.22
130.0	30.90	71.43	199.725236	-128.29
135.0	30.00	72.02	207.406976	-135.39
140.0	29.15	72.58	215.088716	-142.51
145.0	28.36	73.12	222.770456	-149.65
150.0	27.61	73.65	230.452196	-156.80
155.0	26.91	74.16	238.133936	-163.97
160.0	26.24	74.66	245.815676	-171.16
165.0	25.61	75.14	253.497415	-178.36
170.0	25.01	75.61	261.179155	-185.57
175.0	24.44	76.07	268.860895	-192.79
180.0	23.90	76.51	276.542635	-200.03
185.0	23.39	76.95	284.224375	-207.28
190.0	22.90	77.37	291.906115	-214.54
195.0	22.43	77.78	299.587855	-221.81
200.0	21.98	78.18	307.269594	-229.09
205.0	21.55	78.58	314.951334	-236.37
210.0	21.14	78.96	322.633074	-243.67
215.0	20.75	79.34	330.314814	-250.97
220.0	20.37	79.71	337.996554	-258.29
225.0	20.01	80.07	345.678294	-265.61
230.0	19.66	80.43	353.360034	-272.93
235.0	19.33	80.78	361.041773	-280.27
240.0	19.01	81.12	368.723513	-287.61
245.0	18.69	81.45	376.405253	-294.95
250.0	18.39	81.78	384.086993	-302.31
255.0	18.11	82.10	391.768733	-309.67
260.0	17.83	82.42	399.450473	-317.03
265.0	17.56	82.73	407.132213	-324.40
270.0	17.29	83.04	414.813952	-331.77
275.0	17.04	83.34	422.495692	-339.15
280.0	16.80	83.64	430.177432	-346.54
285.0	16.56	83.93	437.859172	-353.93
290.0	16.33	84.22	445.540912	-361.32
295.0	16.11	84.50	453.222652	-368.72
300.0	15.89	84.78	460.904392	-376.12
305.0	15.68	85.06	468.586131	-383.53
310.0	15.48	85.33	476.267871	-390.94
315.0	15.28	85.59	483.949611	-398.36
320.0	15.09	85.86	491.631351	-405.77
325.0	14.90	86.12	499.313091	-413.20
330.0	14.72	86.37	506.994831	-420.62
335.0	14.54	86.63	514.676571	-428.05
340.0	14.37	86.88	522.35831	-435.48
345.0	14.20	87.12	530.04005	-442.92
350.0	14.04	87.37	537.72179	-450.35
355.0	13.88	87.61	545.40353	-457.80
360.0	13.72	87.85	553.08527	-465.24
Max Volume (V max):				16.39
Design Volume (V design) :				**16.39**

STORAGE VOLUME CALCULATIONS

Project: Fastfrate Warehouse Development
Industrial/Commercial Development
Project #: A001083 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 2022-05-30 14:00

File Location: ***\\cima.plus\cima\Cima-C10\Ott_Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\01-SWM\220527_SWM redesign\03_Storm Release Rates\[220525_Storm Water***

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 239.9793771 L/s/ha

Area : A6 0.3906 ha
Runoff Coefficient C (unfactore 0.2
C_runoff factor: 1.25
Runoff Coefficient C : 0.25
Rainfall Event : 100 year
Discharge Flow Q : 0.093735945 m³/s
Discharge Factor K : 1

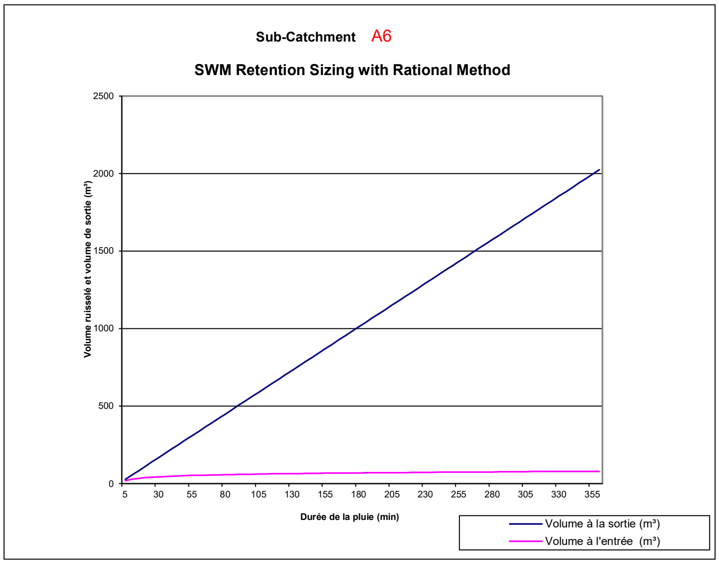
Design Volume: **0.00 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Guillaume LeBlond, M.A.Sc., EIT Date: May 27, 2022
PEO No.: 100530467

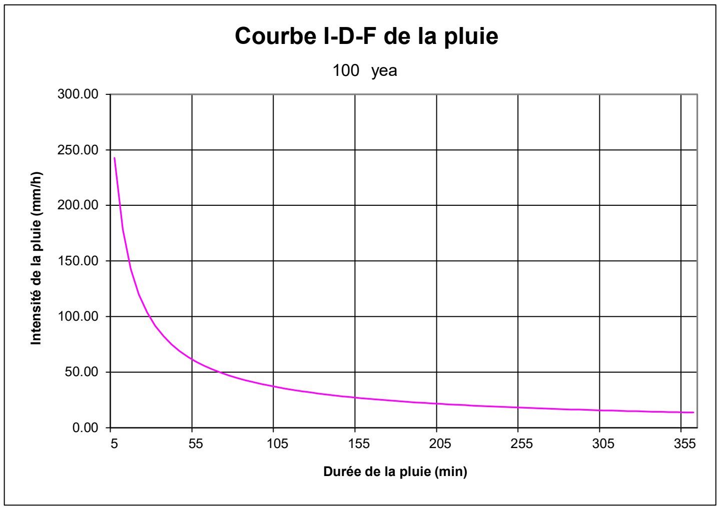
Verified by: Christian Lavoie-Lebel, P.Eng. Date: May 27, 2022
PEO No.: 100067842

Fastfrate Warehouse Development
Industrial/Commercial Development



Sub-Catchment A6

SWM Retention Sizing with Rational Method



Courbe I-D-F de la pluie

100 yea

Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	19.75	28.1207834	-8.37
10.0	178.56	29.06	56.2415668	-27.18
15.0	142.89	34.88	84.3623502	-49.48
20.0	119.95	39.04	112.483134	-73.44
25.0	103.85	42.25	140.603917	-98.35
30.0	91.87	44.85	168.7247	-123.87
35.0	82.58	47.04	196.845484	-149.81
40.0	75.15	48.92	224.966267	-176.05
45.0	69.05	50.57	253.087051	-202.52
50.0	63.95	52.04	281.207834	-229.17
55.0	59.62	53.37	309.328617	-255.96
60.0	55.89	54.58	337.449401	-282.87
65.0	52.65	55.69	365.570184	-309.88
70.0	49.79	56.72	393.690968	-336.97
75.0	47.26	57.68	421.811751	-364.13
80.0	44.99	58.58	449.932534	-391.35
85.0	42.95	59.42	478.053318	-418.63
90.0	41.11	60.22	506.174101	-445.96
95.0	39.43	60.97	534.294885	-473.32
100.0	37.90	61.69	562.415668	-500.73
105.0	36.50	62.37	590.536452	-528.17
110.0	35.20	63.02	618.657235	-555.64
115.0	34.01	63.65	646.778018	-583.13
120.0	32.89	64.24	674.898802	-610.66
125.0	31.86	64.82	703.019585	-638.20
130.0	30.90	65.37	731.140369	-665.77
135.0	30.00	65.91	759.261152	-693.35
140.0	29.15	66.42	787.381935	-720.96
145.0	28.36	66.92	815.502719	-748.58
150.0	27.61	67.40	843.623502	-776.22
155.0	26.91	67.87	871.744286	-803.87
160.0	26.24	68.33	899.865069	-831.54
165.0	25.61	68.77	927.985852	-859.22
170.0	25.01	69.20	956.106636	-886.91
175.0	24.44	69.62	984.227419	-914.61
180.0	23.90	70.02	1012.3482	-942.33
185.0	23.39	70.42	1040.46899	-970.05
190.0	22.90	70.81	1068.58977	-997.78
195.0	22.43	71.18	1096.71055	-1025.53
200.0	21.98	71.55	1124.83134	-1053.28
205.0	21.55	71.91	1152.95212	-1081.04
210.0	21.14	72.27	1181.0729	-1108.81
215.0	20.75	72.61	1209.19369	-1136.58
220.0	20.37	72.95	1237.31447	-1164.36
225.0	20.01	73.28	1265.43525	-1192.15
230.0	19.66	73.61	1293.55604	-1219.95
235.0	19.33	73.92	1321.67682	-1247.75
240.0	19.01	74.24	1349.7976	-1275.56
245.0	18.69	74.54	1377.91839	-1303.38
250.0	18.39	74.84	1406.03917	-1331.20
255.0	18.11	75.14	1434.15995	-1359.02
260.0	17.83	75.43	1462.28074	-1386.85
265.0	17.56	75.72	1490.40152	-1414.69
270.0	17.29	76.00	1518.5223	-1442.53
275.0	17.04	76.27	1546.64309	-1470.37
280.0	16.80	76.54	1574.76387	-1498.22
285.0	16.56	76.81	1602.88465	-1526.07
290.0	16.33	77.08	1631.00544	-1553.93
295.0	16.11	77.33	1659.12622	-1581.79
300.0	15.89	77.59	1687.247	-1609.66
305.0	15.68	77.84	1715.36779	-1637.53
310.0	15.48	78.09	1743.48857	-1665.40
315.0	15.28	78.33	1771.60935	-1693.27
320.0	15.09	78.58	1799.73014	-1721.15
325.0	14.90	78.81	1827.85092	-1749.04
330.0	14.72	79.05	1855.9717	-1776.92
335.0	14.54	79.28	1884.09249	-1804.81
340.0	14.37	79.51	1912.21327	-1832.70
345.0	14.20	79.73	1940.33405	-1860.60
350.0	14.04	79.96	1968.45484	-1888.50
355.0	13.88	80.18	1996.57562	-1916.40
360.0	13.72	80.39	2024.69641	-1944.30
Max Volume (V max):				-8.37
Design Volume (V design) :				**-8.37**

STORAGE VOLUME CALCULATIONS

Project: Fastfrate Warehouse Development
Industrial/Commercial Development
Project #: A001083 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 2022-05-30 14:00

File Location: ***\\cima.plus\cima\Cima-C10\Ott_Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\01-SWM\220527_SWM redesign\03_Storm Release Rates\[220525_Storm Water Management - Storage and Drawdown_full RR.xlsx]A7***

Description: **Storage volume calculations with the rational method**

Specified Release Rate:	239.9793771	L/s/ha
Area : A7	0.0426	ha
Runoff Coefficient C (unfactore	0.2	
C_runoff factor:	1.25	
Runoff Coefficient C :	0.25	
Rainfall Event :	100	year
Discharge Flow Q :	0.010223121	m³/s
Discharge Factor K :	1	

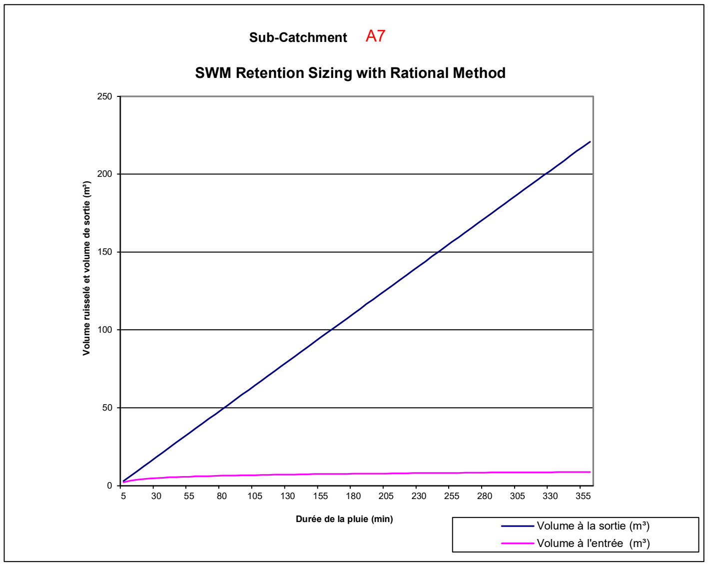
Design Volume: **0.00 m³**

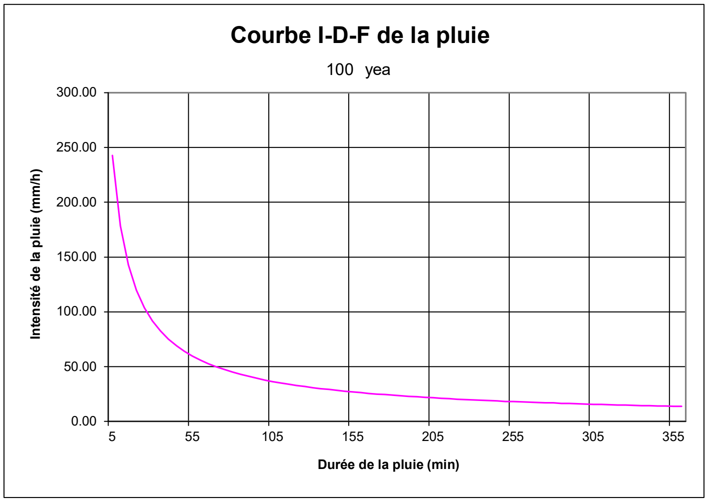
Rainfall	2 year		5 year		10 year	
Pluviometry	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
Coefficients						
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
Coefficients						
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Guillaume LeBlond, M.A.Sc., EIT
Date: May 27, 2022
PEO No.: 100530467

Verified by: Christian Lavoie-Lebel, P.Eng.
Date: May 27, 2022
PEO No.: 100067842

Fastfrate Warehouse Development
Industrial/Commercial Development





Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m³) *CIAT* (4)	**Output Volume** (m³) *kQT* (5)	**Retention Volume** (m³) *(4)-(5)* (6)
5.0	242.70	2.15	3.06693644	-0.91
10.0	178.56	3.17	6.13387288	-2.96
15.0	142.89	3.80	9.20080932	-5.40
20.0	119.95	4.26	12.2677458	-8.01
25.0	103.85	4.61	15.3346822	-10.73
30.0	91.87	4.89	18.4016186	-13.51
35.0	82.58	5.13	21.4685551	-16.34
40.0	75.15	5.34	24.5354915	-19.20
45.0	69.05	5.52	27.602428	-22.09
50.0	63.95	5.68	30.6693644	-24.99
55.0	59.62	5.82	33.7363008	-27.92
60.0	55.89	5.95	36.8032373	-30.85
65.0	52.65	6.07	39.8701737	-33.80
70.0	49.79	6.19	42.9371101	-36.75
75.0	47.26	6.29	46.0040466	-39.71
80.0	44.99	6.39	49.070983	-42.68
85.0	42.95	6.48	52.1379195	-45.66
90.0	41.11	6.57	55.2048559	-48.64
95.0	39.43	6.65	58.2717923	-51.62
100.0	37.90	6.73	61.3387288	-54.61
105.0	36.50	6.80	64.4056652	-57.60
110.0	35.20	6.87	67.4726017	-60.60
115.0	34.01	6.94	70.5395381	-63.60
120.0	32.89	7.01	73.6064745	-66.60
125.0	31.86	7.07	76.673411	-69.60
130.0	30.90	7.13	79.7403474	-72.61
135.0	30.00	7.19	82.8072839	-75.62
140.0	29.15	7.24	85.8742203	-78.63
145.0	28.36	7.30	88.9411567	-81.64
150.0	27.61	7.35	92.0080932	-84.66
155.0	26.91	7.40	95.0750296	-87.67
160.0	26.24	7.45	98.141966	-90.69
165.0	25.61	7.50	101.208902	-93.71
170.0	25.01	7.55	104.275839	-96.73
175.0	24.44	7.59	107.342775	-99.75
180.0	23.90	7.64	110.409712	-102.77
185.0	23.39	7.68	113.476648	-105.80
190.0	22.90	7.72	116.543585	-108.82
195.0	22.43	7.76	119.610521	-111.85
200.0	21.98	7.80	122.677458	-114.87
205.0	21.55	7.84	125.744394	-117.90
210.0	21.14	7.88	128.81133	-120.93
215.0	20.75	7.92	131.878267	-123.96
220.0	20.37	7.96	134.945203	-126.99
225.0	20.01	7.99	138.01214	-130.02
230.0	19.66	8.03	141.079076	-133.05
235.0	19.33	8.06	144.146013	-136.08
240.0	19.01	8.10	147.212949	-139.12
245.0	18.69	8.13	150.279886	-142.15
250.0	18.39	8.16	153.346822	-145.18
255.0	18.11	8.19	156.413758	-148.22
260.0	17.83	8.23	159.480695	-151.25
265.0	17.56	8.26	162.547631	-154.29
270.0	17.29	8.29	165.614568	-157.33
275.0	17.04	8.32	168.681504	-160.36
280.0	16.80	8.35	171.748441	-163.40
285.0	16.56	8.38	174.815377	-166.44
290.0	16.33	8.41	177.882313	-169.48
295.0	16.11	8.43	180.94925	-172.51
300.0	15.89	8.46	184.016186	-175.55
305.0	15.68	8.49	187.083123	-178.59
310.0	15.48	8.52	190.150059	-181.63
315.0	15.28	8.54	193.216996	-184.67
320.0	15.09	8.57	196.283932	-187.71
325.0	14.90	8.60	199.350869	-190.76
330.0	14.72	8.62	202.417805	-193.80
335.0	14.54	8.65	205.484741	-196.84
340.0	14.37	8.67	208.551678	-199.88
345.0	14.20	8.70	211.618614	-202.92
350.0	14.04	8.72	214.685551	-205.97
355.0	13.88	8.74	217.752487	-209.01
360.0	13.72	8.77	220.819424	-212.05
Max Volume (V max):				-0.91
Design Volume (V design) :				**-0.91**

B

Appendix B-8

STORM WATER MANAGEMENT – STORAGE AND DRAWDOWN HALF RELEASE RATE

Date: **2022-05-30**

Fastfrate Warehouse Development
Industrial/Commercial Development
A001083 (360)
STORM WATER MANAGEMENT - SUMMARY - HALF RELEASE RATE

Rainfall event 100 years

Sub-Area	Total Area (m^2)	Capacity Area (m^2)	Y_{max} (m)	V_{max} (m^3)	V_{rain} (m^3)	Difference (m^3)	V_{acc} (m^3)	Y_{rain} (m)	A_{rain} (m^2)	Q_{ave} (L/s)	Drawdown Time (min)	Comments
A1	7979	2394	0.00	0.00	213.80	-213.80	0.00	0.00	0	61.913	0	NC
A2	13124	3937	0.00	0.00	419.49	-419.49	0.00	0.00	0	101.836	0	NC
A3 - Building	8636	8636	0.05	143.93	115.00	28.93	115.00	0.04	7719	234.988	8	
A4	1425	428	0.00	0.00	36.59	-36.59	0.00	0.00	0	11.057	0	NC
A5	1067	320	0.00	0.00	34.10	-34.10	0.00	0.00	0	8.279	0	NC
A6	3906	1172	0.00	0.00	10.87	-10.87	0.00	0.00	0	30.309	0	NC
A7	426	128	0.00	0.00	1.19	-1.19	0.00	0.00	0	3.306	0	NC
Total	36563	17014		143.93	831.04	-687.11	115.00					

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Legend:

NC = Non-controlled areas (no storage available)
Capacity Area = Area of water accumulated in sub-area at Max. Elev.
~~Catchbasin Elev. = Elevation of catchbasin inlet (top of grate).~~
~~Max. Elev. = Maximum elevation of water that may be accumulated within sub-area.~~
Y_{max} = Maximum depth of water that may be accumulated within the sub-area.
V_{max} = Maximum volume of water (capacity) that may be accumulated within the sub-area.
V_{rain} = Volume of water generated by rainfall.
Difference = Difference between V_{max} and V_{rain} (remaining capacity of sub-area)
V_{acc} = Total volume of water accumulated within the sub-area in the event of a specific rainfall.
Y_{rain} = Depth of water generated by rainfall.
~~$Elev_{rain}$ = Elevation of water generated by rainfall.~~
A_{rain} = Area of water generated by rainfall.
Q_{ave} = Average flow (for drawndown time calculation).
Drawdown Time = Time required for the total volume of water accumulated within sub-area to evacuate (following rainfall event).

Design Criteria:

1) Maximum Allowable Total Release Rate = 248.03 L/s/ha
~~2) Pipe size for 10 years~~
3) Rainfall event of 100 years
~~4) Pre-development flow (5 year) = ____ L/s (or ____ L/s/ha)~~

Prepared by: Guillaume LeBlond, M.A.Sc., EIT Date: May 30, 2022
PEO No.: 100530467

Verified by: Christian Lavoie-Lebel, P.Eng. Date: May 30, 2022
PEO No.: 100067842

ment

Date: **2022-05-30**

Industrial/Commercial Development

A001083 (360)

STORM WATER MANAGEMENT - AVERAGE FLOW CALCULATION FOR RELEASE RATES - HALF RELEASE RATE

Catchment ID	Release Rate	Specified Flow rate	Calculated area
	L/s/ha	L/s	(mm^2)
A1	77.62	61.93	16901
A2	77.62	101.86	27799
A3 - Building	274.06	236.68	63773
A4	77.62	11.06	3018
A5	77.62	8.28	2260
A6	77.62	30.32	8273
A7	77.62	3.31	902
	Total	453.43	
	Allowable	453.43	
	Difference	0.00	

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Préparé par: Guillaume LeBlond, M.A.Sc., EIT
Date: May 30, 2022
PEO No.: 100530467

Vérifié par: Christian Lavoie-Lebel, P.Eng.
Date: May 30, 2022
PEO No.: 100067842

STORAGE VOLUME CALCULATIONS

Project: Fastfrate Warehouse Development
Industrial/Commercial Development
Project #: A001083 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 2022-05-30 14:06

File Location: ***\\cima.plus\cima\Cima-C10\Ott_Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\01-SWM\220527_SWM redesign\03_Storm Release Rates & Storage - Half***

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 77.61553563 L/s/ha

Area : A1 0.7979 ha
Runoff Coefficient C (unfactored 0.71
C_runoff factor: 1.25
Runoff Coefficient C : 0.8875
Rainfall Event : 100 year
Discharge Flow Q : 0.061929436 m³/s
Discharge Factor K : 1

Design Volume: **213.80 m³**

Rainfall	2 year		5 year		10 year	
IDF Curve Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.810	0.810	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
IDF Curve Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.820	0.820	0.820	0.820

Prepared by: Guillaume LeBlond, M.A.Sc., EIT
PEO No.: 100530467
Date: May 30, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.
PEO No.: 100067842
Date: May 30, 2022

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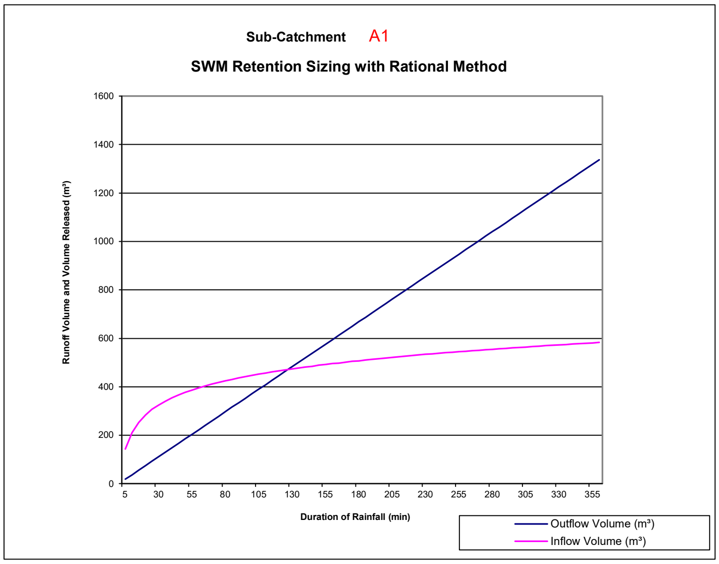
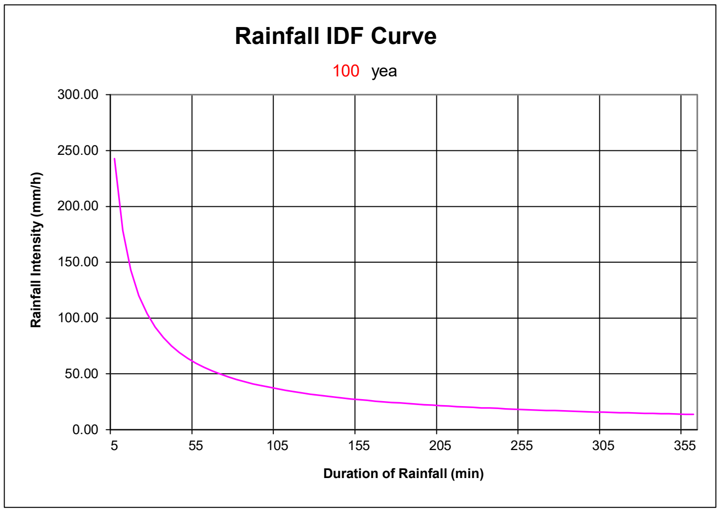
Fastfrate Warehouse Development
Industrial/Commercial Development


Sub-Catchment A1

SWM Retention Sizing with Rational Method


Rainfall IDF Curve

100 yea

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Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	143.22	18.5788308	124.64
10.0	178.56	210.74	37.1576615	173.58
15.0	142.89	252.97	55.7364923	197.23
20.0	119.95	283.14	74.3153231	208.82
25.0	103.85	306.41	92.8941538	213.51
30.0	91.87	325.28	111.472985	213.80
35.0	82.58	341.12	130.051815	211.06
40.0	75.15	354.75	148.630646	206.12
45.0	69.05	366.73	167.209477	199.52
50.0	63.95	377.40	185.788308	191.61
55.0	59.62	387.03	204.367138	182.67
60.0	55.89	395.81	222.945969	172.86
65.0	52.65	403.88	241.5248	162.35
70.0	49.79	411.34	260.103631	151.24
75.0	47.26	418.29	278.682461	139.61
80.0	44.99	424.80	297.261292	127.53
85.0	42.95	430.91	315.840123	115.07
90.0	41.11	436.68	334.418954	102.26
95.0	39.43	442.15	352.997784	89.15
100.0	37.90	447.34	371.576615	75.77
105.0	36.50	452.29	390.155446	62.13
110.0	35.20	457.02	408.734277	48.28
115.0	34.01	461.54	427.313108	34.23
120.0	32.89	465.88	445.891938	19.99
125.0	31.86	470.05	464.470769	5.58
130.0	30.90	474.07	483.0496	-8.98
135.0	30.00	477.94	501.628431	-23.69
140.0	29.15	481.68	520.207261	-38.52
145.0	28.36	485.30	538.786092	-53.49
150.0	27.61	488.80	557.364923	-68.56
155.0	26.91	492.20	575.943754	-83.74
160.0	26.24	495.49	594.522584	-99.03
165.0	25.61	498.70	613.101415	-114.41
170.0	25.01	501.81	631.680246	-129.87
175.0	24.44	504.84	650.259077	-145.42
180.0	23.90	507.79	668.837907	-161.05
185.0	23.39	510.66	687.416738	-176.75
190.0	22.90	513.47	705.995569	-192.53
195.0	22.43	516.21	724.5744	-208.36
200.0	21.98	518.89	743.153231	-224.27
205.0	21.55	521.50	761.732061	-240.23
210.0	21.14	524.06	780.310892	-256.25
215.0	20.75	526.56	798.889723	-272.33
220.0	20.37	529.02	817.468554	-288.45
225.0	20.01	531.42	836.047384	-304.63
230.0	19.66	533.77	854.626215	-320.85
235.0	19.33	536.08	873.205046	-337.12
240.0	19.01	538.35	891.783877	-353.44
245.0	18.69	540.57	910.362707	-369.79
250.0	18.39	542.75	928.941538	-386.19
255.0	18.11	544.90	947.520369	-402.63
260.0	17.83	547.00	966.0992	-419.10
265.0	17.56	549.07	984.67803	-435.61
270.0	17.29	551.11	1003.25686	-452.15
275.0	17.04	553.11	1021.83569	-468.72
280.0	16.80	555.08	1040.41452	-485.33
285.0	16.56	557.02	1058.99335	-501.97
290.0	16.33	558.93	1077.57218	-518.64
295.0	16.11	560.81	1096.15102	-535.34
300.0	15.89	562.67	1114.72985	-552.06
305.0	15.68	564.49	1133.30868	-568.82
310.0	15.48	566.29	1151.88751	-585.60
315.0	15.28	568.07	1170.46634	-602.40
320.0	15.09	569.81	1189.04517	-619.23
325.0	14.90	571.54	1207.624	-636.08
330.0	14.72	573.24	1226.20283	-652.96
335.0	14.54	574.92	1244.78166	-669.86
340.0	14.37	576.58	1263.36049	-686.78
345.0	14.20	578.22	1281.93932	-703.72
350.0	14.04	579.83	1300.51815	-720.69
355.0	13.88	581.43	1319.09698	-737.67
360.0	13.72	583.00	1337.67581	-754.67
Max Volume (V max):				213.80
Design Volume (V design) :				**213.80**

STORAGE VOLUME CALCULATIONS

Project: Fastfrate Warehouse Development
Industrial/Commercial Development
Project #: A001083 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 2022-05-30 14:06

File Location: ***\\cima.plus\cima\Cima-C10\Ott_Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\01-SWM\220527_SWM redesign\03_Storm Release Rates & Storage - Half***

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 77.61553563 L/s/ha

Area : A2 1.3124 ha
Runoff Coefficient C (unfactore 0.81
C_runoff factor: 1.25
Runoff Coefficient C : 1
Rainfall Event : 100 year
Discharge Flow Q : 0.101862629 m³/s
Discharge Factor K : 1

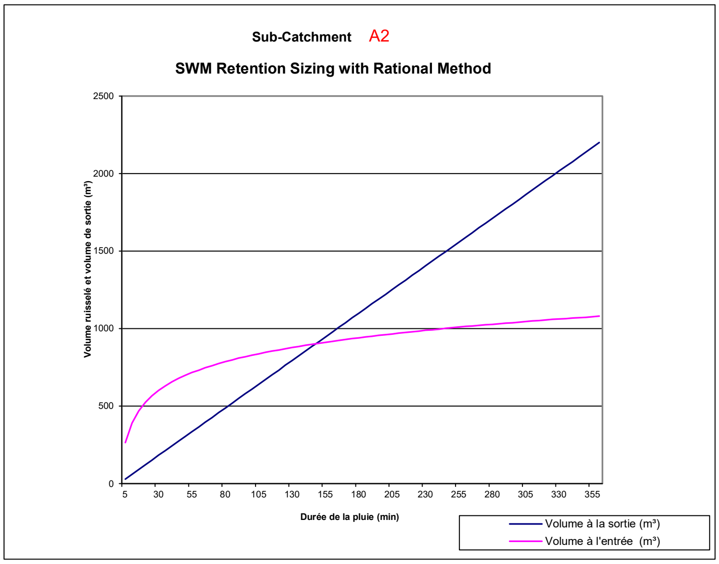
Design Volume: **419.49 m³**

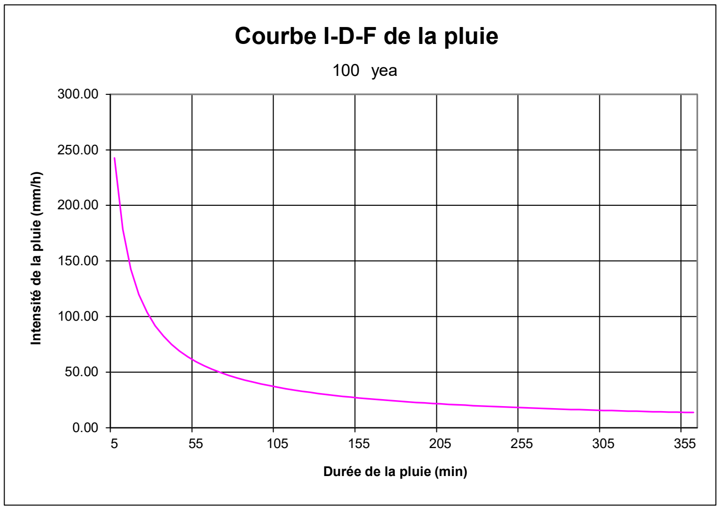
Rainfall	2 year		5 year		10 year	
Pluviometry	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
Coefficients						
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
Coefficients						
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Guillaume LeBlond, M.A.Sc., EIT Date: May 30, 2022
PEO No.: 100530467

Verified by: Christian Lavoie-Lebel, P.Eng. Date: May 30, 2022
PEO No.: 100067842

Fastfrate Warehouse Development
Industrial/Commercial Development





Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	265.44	30.5587887	234.88
10.0	178.56	390.57	61.1175774	329.45
15.0	142.89	468.84	91.6763661	377.16
20.0	119.95	524.74	122.235155	402.51
25.0	103.85	567.87	152.793943	415.08
30.0	91.87	602.84	183.352732	419.49
35.0	82.58	632.19	213.911521	418.28
40.0	75.15	657.47	244.470309	413.00
45.0	69.05	679.66	275.029098	404.63
50.0	63.95	699.44	305.587887	393.86
55.0	59.62	717.29	336.146676	381.15
60.0	55.89	733.56	366.705464	366.86
65.0	52.65	748.51	397.264253	351.25
70.0	49.79	762.35	427.823042	334.52
75.0	47.26	775.23	458.38183	316.84
80.0	44.99	787.28	488.940619	298.34
85.0	42.95	798.61	519.499408	279.11
90.0	41.11	809.31	550.058196	259.25
95.0	39.43	819.44	580.616985	238.82
100.0	37.90	829.07	611.175774	217.89
105.0	36.50	838.24	641.734562	196.50
110.0	35.20	846.99	672.293351	174.70
115.0	34.01	855.38	702.85214	152.53
120.0	32.89	863.42	733.410928	130.01
125.0	31.86	871.16	763.969717	107.19
130.0	30.90	878.60	794.528506	84.07
135.0	30.00	885.78	825.087295	60.69
140.0	29.15	892.71	855.646083	37.07
145.0	28.36	899.42	886.204872	13.21
150.0	27.61	905.91	916.763661	-10.86
155.0	26.91	912.20	947.322449	-35.12
160.0	26.24	918.31	977.881238	-59.57
165.0	25.61	924.24	1008.44003	-84.20
170.0	25.01	930.01	1038.99882	-108.99
175.0	24.44	935.62	1069.5576	-133.94
180.0	23.90	941.09	1100.11639	-159.03
185.0	23.39	946.42	1130.67518	-184.25
190.0	22.90	951.62	1161.23397	-209.61
195.0	22.43	956.70	1191.79276	-235.09
200.0	21.98	961.66	1222.35155	-260.69
205.0	21.55	966.51	1252.91034	-286.40
210.0	21.14	971.25	1283.46912	-312.22
215.0	20.75	975.89	1314.02791	-338.14
220.0	20.37	980.43	1344.5867	-364.15
225.0	20.01	984.89	1375.14549	-390.26
230.0	19.66	989.25	1405.70428	-416.46
235.0	19.33	993.53	1436.26307	-442.74
240.0	19.01	997.72	1466.82186	-469.10
245.0	18.69	1001.84	1497.38065	-495.54
250.0	18.39	1005.89	1527.93943	-522.05
255.0	18.11	1009.86	1558.49822	-548.64
260.0	17.83	1013.77	1589.05701	-575.29
265.0	17.56	1017.61	1619.6158	-602.01
270.0	17.29	1021.38	1650.17459	-628.80
275.0	17.04	1025.09	1680.73338	-655.64
280.0	16.80	1028.74	1711.29217	-682.55
285.0	16.56	1032.34	1741.85096	-709.51
290.0	16.33	1035.88	1772.40974	-736.53
295.0	16.11	1039.36	1802.96853	-763.60
300.0	15.89	1042.80	1833.52732	-790.73
305.0	15.68	1046.18	1864.08611	-817.90
310.0	15.48	1049.52	1894.6449	-845.13
315.0	15.28	1052.80	1925.20369	-872.40
320.0	15.09	1056.05	1955.76248	-899.72
325.0	14.90	1059.24	1986.32126	-927.08
330.0	14.72	1062.40	2016.88005	-954.48
335.0	14.54	1065.51	2047.43884	-981.93
340.0	14.37	1068.58	2077.99763	-1009.41
345.0	14.20	1071.62	2108.55642	-1036.94
350.0	14.04	1074.61	2139.11521	-1064.50
355.0	13.88	1077.57	2169.674	-1092.10
360.0	13.72	1080.49	2200.23279	-1119.74
Max Volume (V max):				419.49
Design Volume (V design) :				**419.49**

STORAGE VOLUME CALCULATIONS

Project: Fastfrate Warehouse Development
Industrial/Commercial Development
Project #: A001083 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 2022-05-30 14:06

File Location: ***\\cima.plus\cima\Cima-C10\Ott_Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\01-SWM\220527_SWM redesign\03_Storm Release Rates & Storage - Half***

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 274.0581214 L/s/ha

Area : A3 - Building 0.8636 ha
Runoff Coefficient C (unfactored): 0.9
C_runoff factor: 1.25
Runoff Coefficient C : 1
Rainfall Event : 100 year
Discharge Flow Q : 0.236676594 m³/s
Discharge Factor K : 1

Design Volume: **115.00 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

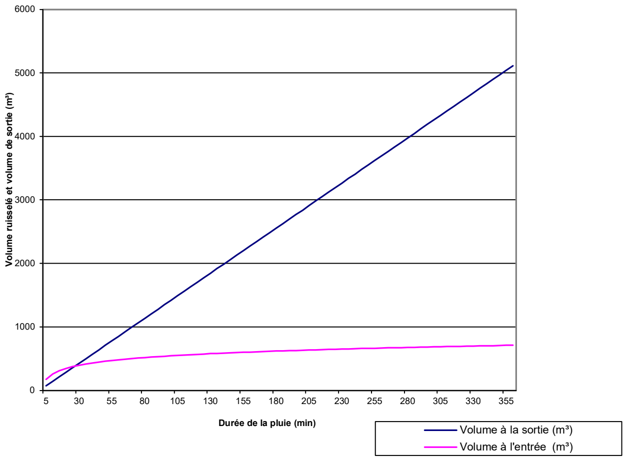
Prepared by: Guillaume LeBlond, M.A.Sc., EIT
PEO No.: 100530467
Date: May 30, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.
PEO No.: 100067842
Date: May 30, 2022

Fastfrate Warehouse Development
Industrial/Commercial Development

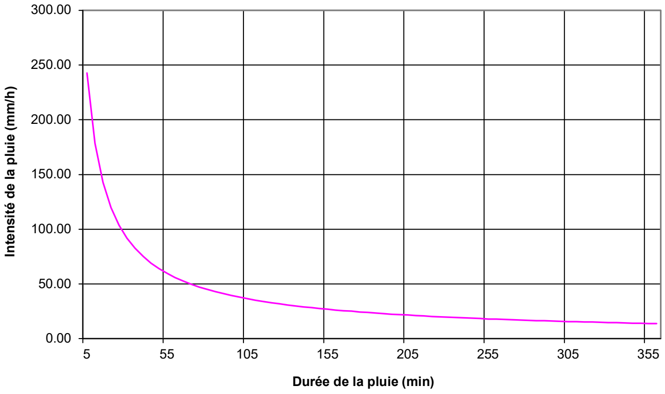
Sub-Catchment A3

SWM Retention Sizing with Rational Method



Courbe I-D-F de la pluie

100 yea



Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	174.67	71.0029781	103.66
10.0	178.56	257.01	142.005956	115.00
15.0	142.89	308.51	213.008934	95.50
20.0	119.95	345.30	284.011912	61.29
25.0	103.85	373.68	355.01489	18.66
30.0	91.87	396.69	426.017869	-29.33
35.0	82.58	416.00	497.020847	-81.02
40.0	75.15	432.64	568.023825	-135.39
45.0	69.05	447.24	639.026803	-191.79
50.0	63.95	460.26	710.029781	-249.77
55.0	59.62	472.00	781.032759	-309.03
60.0	55.89	482.71	852.035737	-369.33
65.0	52.65	492.54	923.038715	-430.50
70.0	49.79	501.65	994.041693	-492.39
75.0	47.26	510.12	1065.04467	-554.92
80.0	44.99	518.06	1136.04765	-617.99
85.0	42.95	525.51	1207.05063	-681.54
90.0	41.11	532.55	1278.05361	-745.50
95.0	39.43	539.22	1349.05658	-809.84
100.0	37.90	545.55	1420.05956	-874.51
105.0	36.50	551.59	1491.06254	-939.48
110.0	35.20	557.35	1562.06552	-1004.72
115.0	34.01	562.87	1633.0685	-1070.20
120.0	32.89	568.16	1704.07147	-1135.91
125.0	31.86	573.25	1775.07445	-1201.83
130.0	30.90	578.15	1846.07743	-1267.93
135.0	30.00	582.87	1917.08041	-1334.21
140.0	29.15	587.43	1988.08339	-1400.65
145.0	28.36	591.84	2059.08636	-1467.24
150.0	27.61	596.12	2130.08934	-1533.97
155.0	26.91	600.26	2201.09232	-1600.84
160.0	26.24	604.27	2272.0953	-1667.82
165.0	25.61	608.18	2343.09828	-1734.92
170.0	25.01	611.97	2414.10126	-1802.13
175.0	24.44	615.67	2485.10423	-1869.44
180.0	23.90	619.27	2556.10721	-1936.84
185.0	23.39	622.78	2627.11019	-2004.33
190.0	22.90	626.20	2698.11317	-2071.92
195.0	22.43	629.54	2769.11615	-2139.58
200.0	21.98	632.80	2840.11912	-2207.32
205.0	21.55	635.99	2911.1221	-2275.13
210.0	21.14	639.11	2982.12508	-2343.01
215.0	20.75	642.17	3053.12806	-2410.96
220.0	20.37	645.16	3124.13104	-2478.98
225.0	20.01	648.09	3195.13401	-2547.05
230.0	19.66	650.96	3266.13699	-2615.18
235.0	19.33	653.77	3337.13997	-2683.37
240.0	19.01	656.53	3408.14295	-2751.61
245.0	18.69	659.24	3479.14593	-2819.90
250.0	18.39	661.91	3550.1489	-2888.24
255.0	18.11	664.52	3621.15188	-2956.63
260.0	17.83	667.09	3692.15486	-3025.06
265.0	17.56	669.62	3763.15784	-3093.54
270.0	17.29	672.10	3834.16082	-3162.06
275.0	17.04	674.54	3905.1638	-3230.62
280.0	16.80	676.95	3976.16677	-3299.22
285.0	16.56	679.31	4047.16975	-3367.86
290.0	16.33	681.64	4118.17273	-3436.53
295.0	16.11	683.93	4189.17571	-3505.24
300.0	15.89	686.19	4260.17869	-3573.99
305.0	15.68	688.42	4331.18166	-3642.76
310.0	15.48	690.61	4402.18464	-3711.57
315.0	15.28	692.78	4473.18762	-3780.41
320.0	15.09	694.91	4544.1906	-3849.28
325.0	14.90	697.02	4615.19358	-3918.18
330.0	14.72	699.09	4686.19655	-3987.11
335.0	14.54	701.14	4757.19953	-4056.06
340.0	14.37	703.16	4828.20251	-4125.04
345.0	14.20	705.16	4899.20549	-4194.05
350.0	14.04	707.13	4970.20847	-4263.08
355.0	13.88	709.07	5041.21144	-4332.14
360.0	13.72	711.00	5112.21442	-4401.22
Max Volume (V max):				115.00
Design Volume (V design) :				**115.00**

STORAGE VOLUME CALCULATIONS

Project: Fastfrate Warehouse Development
Industrial/Commercial Development
Project #: A001083 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 2022-05-30 14:06

File Location: ***\\cima.plus\cima\Cima-C10\Ott_Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\01-SWM\220527_SWM redesign\03_Storm Release Rates & Storage - Half***

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 77.61553563 L/s/ha

Area : A4 0.1425 ha
Runoff Coefficient C (unfactore 0.69
C_runoff factor: 1.25
Runoff Coefficient C : 0.8625
Rainfall Event : 100 year
Discharge Flow Q : 0.011060214 m³/s
Discharge Factor K : 1

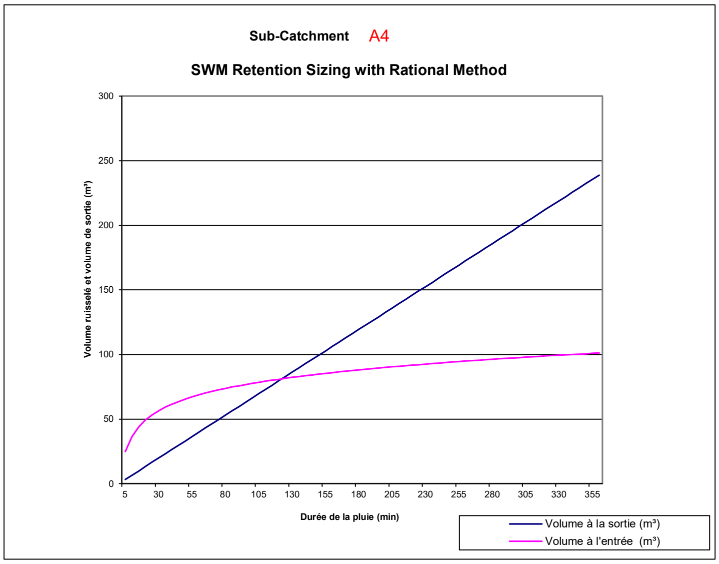
Design Volume: **36.59 m³**

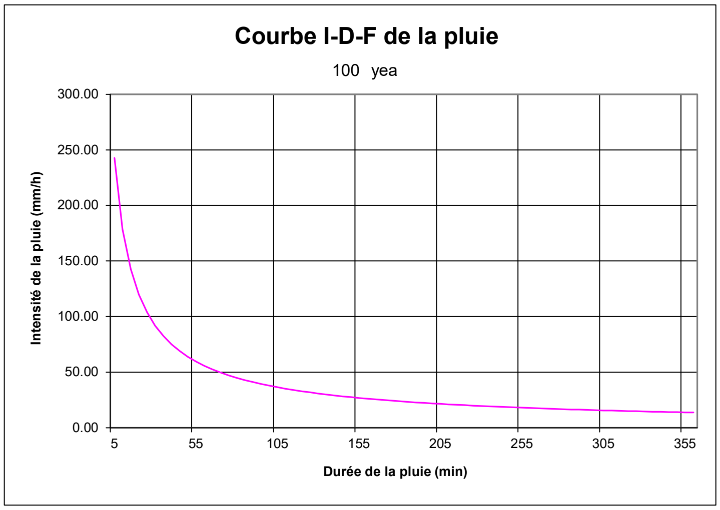
Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Guillaume LeBlond, M.A.Sc., EIT Date: May 30, 2022
PEO No.: 100530467

Verified by: Christian Lavoie-Lebel, P.Eng. Date: May 30, 2022
PEO No.: 100067842

Fastfrate Warehouse Development
Industrial/Commercial Development





Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m³) *CIAT* (4)	**Output Volume** (m³) *kQT* (5)	**Retention Volume** (m³) *(4)-(5)* (6)
5.0	242.70	24.86	3.31806415	21.54
10.0	178.56	36.58	6.6361283	29.94
15.0	142.89	43.91	9.95419244	33.95
20.0	119.95	49.14	13.2722566	35.87
25.0	103.85	53.18	16.5903207	36.59
30.0	91.87	56.46	19.9083849	36.55
35.0	82.58	59.20	23.226449	35.98
40.0	75.15	61.57	26.5445132	35.03
45.0	69.05	63.65	29.8625773	33.79
50.0	63.95	65.50	33.1806415	32.32
55.0	59.62	67.17	36.4987056	30.68
60.0	55.89	68.70	39.8167698	28.88
65.0	52.65	70.10	43.1348339	26.96
70.0	49.79	71.39	46.4528981	24.94
75.0	47.26	72.60	49.7709622	22.83
80.0	44.99	73.73	53.0890264	20.64
85.0	42.95	74.79	56.4070905	18.38
90.0	41.11	75.79	59.7251547	16.07
95.0	39.43	76.74	63.0432188	13.70
100.0	37.90	77.64	66.361283	11.28
105.0	36.50	78.50	69.6793471	8.82
110.0	35.20	79.32	72.9974113	6.32
115.0	34.01	80.11	76.3154754	3.79
120.0	32.89	80.86	79.6335396	1.23
125.0	31.86	81.58	82.9516037	-1.37
130.0	30.90	82.28	86.2696678	-3.99
135.0	30.00	82.95	89.587732	-6.63
140.0	29.15	83.60	92.9057961	-9.30
145.0	28.36	84.23	96.2238603	-11.99
150.0	27.61	84.84	99.5419244	-14.70
155.0	26.91	85.43	102.859989	-17.43
160.0	26.24	86.00	106.178053	-20.18
165.0	25.61	86.56	109.496117	-22.94
170.0	25.01	87.10	112.814181	-25.72
175.0	24.44	87.62	116.132245	-28.51
180.0	23.90	88.13	119.450309	-31.32
185.0	23.39	88.63	122.768373	-34.14
190.0	22.90	89.12	126.086438	-36.97
195.0	22.43	89.59	129.404502	-39.81
200.0	21.98	90.06	132.722566	-42.66
205.0	21.55	90.51	136.04063	-45.53
210.0	21.14	90.96	139.358694	-48.40
215.0	20.75	91.39	142.676758	-51.28
220.0	20.37	91.82	145.994823	-54.18
225.0	20.01	92.23	149.312887	-57.08
230.0	19.66	92.64	152.630951	-59.99
235.0	19.33	93.04	155.949015	-62.91
240.0	19.01	93.44	159.267079	-65.83
245.0	18.69	93.82	162.585143	-68.76
250.0	18.39	94.20	165.903207	-71.70
255.0	18.11	94.57	169.221272	-74.65
260.0	17.83	94.94	172.539336	-77.60
265.0	17.56	95.30	175.8574	-80.56
270.0	17.29	95.65	179.175464	-83.52
275.0	17.04	96.00	182.493528	-86.49
280.0	16.80	96.34	185.811592	-89.47
285.0	16.56	96.68	189.129656	-92.45
290.0	16.33	97.01	192.447721	-95.44
295.0	16.11	97.34	195.765785	-98.43
300.0	15.89	97.66	199.083849	-101.43
305.0	15.68	97.97	202.401913	-104.43
310.0	15.48	98.29	205.719977	-107.43
315.0	15.28	98.60	209.038041	-110.44
320.0	15.09	98.90	212.356105	-113.46
325.0	14.90	99.20	215.67417	-116.48
330.0	14.72	99.49	218.992234	-119.50
335.0	14.54	99.79	222.310298	-122.53
340.0	14.37	100.07	225.628362	-125.56
345.0	14.20	100.36	228.946426	-128.59
350.0	14.04	100.64	232.26449	-131.63
355.0	13.88	100.91	235.582555	-134.67
360.0	13.72	101.19	238.900619	-137.71
Max Volume (V max):				36.59
Design Volume (V design) :				**36.59**

STORAGE VOLUME CALCULATIONS

Project: Fastfrate Warehouse Development
Industrial/Commercial Development
Project #: A001083 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 2022-05-30 14:06

File Location: ***\\cima.plus\cima\Cima-C10\Ott_Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\01-SWM\220527_SWM redesign\03_Storm Release Rates & Storage - Half***

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 77.61553563 L/s/ha

Area : A5 0.1067 ha
Runoff Coefficient C (unfactore 0.85
C_runoff factor: 1.25
Runoff Coefficient C : 1
Rainfall Event : 100 year
Discharge Flow Q : 0.008281578 m³/s
Discharge Factor K : 1

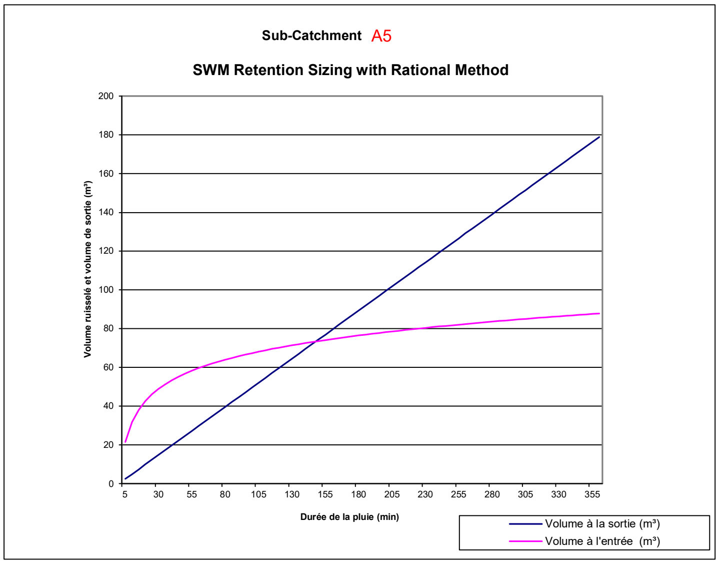
Design Volume: **34.10 m³**

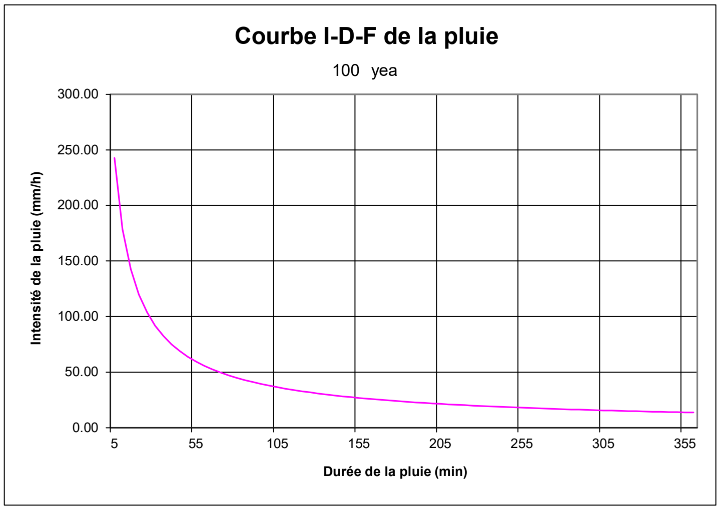
Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

Prepared by: Guillaume LeBlond, M.A.Sc., EIT
PEO No.: 100530467
Date: May 30, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.
PEO No.: 100067842
Date: May 30, 2022

Fastfrate Warehouse Development
Industrial/Commercial Development





Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	21.58	2.4844733	19.10
10.0	178.56	31.75	4.96894659	26.78
15.0	142.89	38.12	7.45341989	30.66
20.0	119.95	42.66	9.93789318	32.72
25.0	103.85	46.17	12.4223665	33.75
30.0	91.87	49.01	14.9068398	34.10
35.0	82.58	51.40	17.3913131	34.01
40.0	75.15	53.45	19.8757864	33.58
45.0	69.05	55.26	22.3602597	32.90
50.0	63.95	56.87	24.844733	32.02
55.0	59.62	58.32	27.3292062	30.99
60.0	55.89	59.64	29.8136795	29.83
65.0	52.65	60.85	32.2981528	28.56
70.0	49.79	61.98	34.7826261	27.20
75.0	47.26	63.03	37.2670994	25.76
80.0	44.99	64.01	39.7515727	24.26
85.0	42.95	64.93	42.236046	22.69
90.0	41.11	65.80	44.7205193	21.08
95.0	39.43	66.62	47.2049926	19.42
100.0	37.90	67.40	49.6894659	17.71
105.0	36.50	68.15	52.1739392	15.98
110.0	35.20	68.86	54.6584125	14.20
115.0	34.01	69.54	57.1428858	12.40
120.0	32.89	70.20	59.6273591	10.57
125.0	31.86	70.83	62.1118324	8.71
130.0	30.90	71.43	64.5963057	6.84
135.0	30.00	72.02	67.080779	4.93
140.0	29.15	72.58	69.5652523	3.01
145.0	28.36	73.12	72.0497256	1.07
150.0	27.61	73.65	74.5341989	-0.88
155.0	26.91	74.16	77.0186722	-2.86
160.0	26.24	74.66	79.5031455	-4.84
165.0	25.61	75.14	81.9876187	-6.85
170.0	25.01	75.61	84.472092	-8.86
175.0	24.44	76.07	86.9565653	-10.89
180.0	23.90	76.51	89.4410386	-12.93
185.0	23.39	76.95	91.9255119	-14.98
190.0	22.90	77.37	94.4099852	-17.04
195.0	22.43	77.78	96.8944585	-19.11
200.0	21.98	78.18	99.3789318	-21.19
205.0	21.55	78.58	101.863405	-23.28
210.0	21.14	78.96	104.347878	-25.38
215.0	20.75	79.34	106.832352	-27.49
220.0	20.37	79.71	109.316825	-29.61
225.0	20.01	80.07	111.801298	-31.73
230.0	19.66	80.43	114.285772	-33.86
235.0	19.33	80.78	116.770245	-36.00
240.0	19.01	81.12	119.254718	-38.14
245.0	18.69	81.45	121.739191	-40.29
250.0	18.39	81.78	124.223665	-42.44
255.0	18.11	82.10	126.708138	-44.60
260.0	17.83	82.42	129.192611	-46.77
265.0	17.56	82.73	131.677085	-48.94
270.0	17.29	83.04	134.161558	-51.12
275.0	17.04	83.34	136.646031	-53.30
280.0	16.80	83.64	139.130505	-55.49
285.0	16.56	83.93	141.614978	-57.68
290.0	16.33	84.22	144.099451	-59.88
295.0	16.11	84.50	146.583924	-62.08
300.0	15.89	84.78	149.068398	-64.29
305.0	15.68	85.06	151.552871	-66.50
310.0	15.48	85.33	154.037344	-68.71
315.0	15.28	85.59	156.521818	-70.93
320.0	15.09	85.86	159.006291	-73.15
325.0	14.90	86.12	161.490764	-75.37
330.0	14.72	86.37	163.975237	-77.60
335.0	14.54	86.63	166.459711	-79.83
340.0	14.37	86.88	168.944184	-82.07
345.0	14.20	87.12	171.428657	-84.30
350.0	14.04	87.37	173.913131	-86.55
355.0	13.88	87.61	176.397604	-88.79
360.0	13.72	87.85	178.882077	-91.04
Max Volume (V max):				34.10
Design Volume (V design) :				**34.10**

STORAGE VOLUME CALCULATIONS

Project: Fastfrate Warehouse Development
Industrial/Commercial Development
Project #: A001083 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 2022-05-30 14:06

File Location: ***\\cima.plus\cima\Cima-C10\Ott_Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\01-SWM\220527_SWM redesign\03_Storm Release Rates & Storage - Half***

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 77.61553563 L/s/ha

Area : A6 0.3906 ha
Runoff Coefficient C (unfactore 0.2
C_runoff factor: 1.25
Runoff Coefficient C : 0.25
Rainfall Event : 100 year
Discharge Flow Q : 0.030316628 m³/s
Discharge Factor K : 1

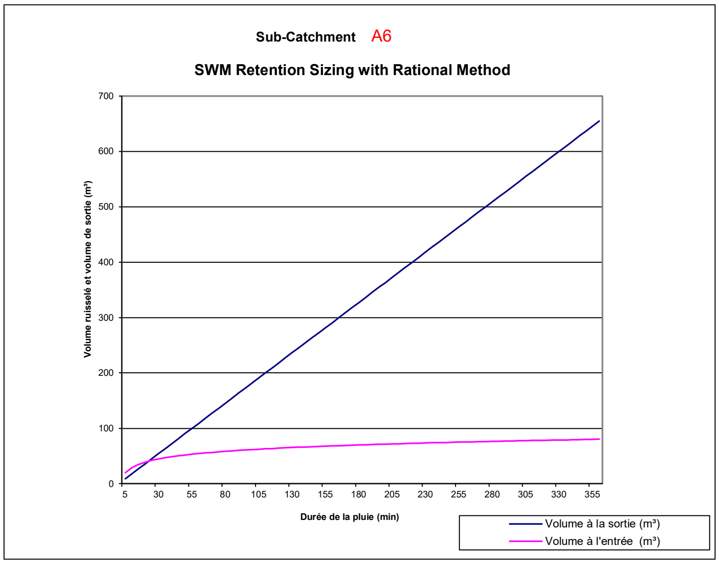
Design Volume: **10.87 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

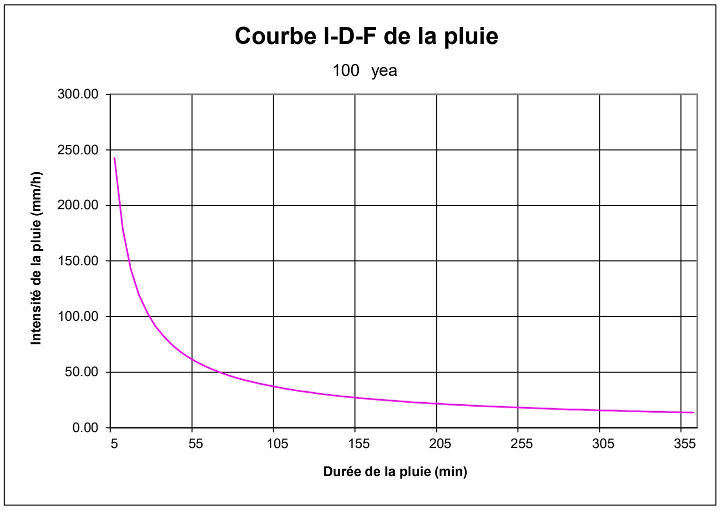
Prepared by: Guillaume LeBlond, M.A.Sc., EIT   Date: May 30, 2022
PEO No.: 100530467

Verified by: Christian Lavoie-Lebel, P.Eng.   Date: May 30, 2022
PEO No.: 100067842

Fastfrate Warehouse Development
Industrial/Commercial Development


Sub-Catchment A6

SWM Retention Sizing with Rational Method


Courbe I-D-F de la pluie

100 yea

Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	19.75	9.09498846	10.66
10.0	178.56	29.06	18.1899769	10.87
15.0	142.89	34.88	27.2849654	7.60
20.0	119.95	39.04	36.3799539	2.66
25.0	103.85	42.25	45.4749423	-3.22
30.0	91.87	44.85	54.5699308	-9.72
35.0	82.58	47.04	63.6649193	-16.63
40.0	75.15	48.92	72.7599077	-23.84
45.0	69.05	50.57	81.8548962	-31.28
50.0	63.95	52.04	90.9498846	-38.91
55.0	59.62	53.37	100.044873	-46.67
60.0	55.89	54.58	109.139862	-54.56
65.0	52.65	55.69	118.23485	-62.54
70.0	49.79	56.72	127.329839	-70.61
75.0	47.26	57.68	136.424827	-78.74
80.0	44.99	58.58	145.519815	-86.94
85.0	42.95	59.42	154.614804	-95.19
90.0	41.11	60.22	163.709792	-103.49
95.0	39.43	60.97	172.804781	-111.83
100.0	37.90	61.69	181.899769	-120.21
105.0	36.50	62.37	190.994758	-128.63
110.0	35.20	63.02	200.089746	-137.07
115.0	34.01	63.65	209.184735	-145.54
120.0	32.89	64.24	218.279723	-154.04
125.0	31.86	64.82	227.374712	-162.56
130.0	30.90	65.37	236.4697	-171.10
135.0	30.00	65.91	245.564689	-179.66
140.0	29.15	66.42	254.659677	-188.24
145.0	28.36	66.92	263.754665	-196.83
150.0	27.61	67.40	272.849654	-205.45
155.0	26.91	67.87	281.944642	-214.07
160.0	26.24	68.33	291.039631	-222.71
165.0	25.61	68.77	300.134619	-231.37
170.0	25.01	69.20	309.229608	-240.03
175.0	24.44	69.62	318.324596	-248.71
180.0	23.90	70.02	327.419585	-257.40
185.0	23.39	70.42	336.514573	-266.10
190.0	22.90	70.81	345.609562	-274.80
195.0	22.43	71.18	354.70455	-283.52
200.0	21.98	71.55	363.799539	-292.25
205.0	21.55	71.91	372.894527	-300.98
210.0	21.14	72.27	381.989516	-309.72
215.0	20.75	72.61	391.084504	-318.47
220.0	20.37	72.95	400.179492	-327.23
225.0	20.01	73.28	409.274481	-335.99
230.0	19.66	73.61	418.369469	-344.76
235.0	19.33	73.92	427.464458	-353.54
240.0	19.01	74.24	436.559446	-362.32
245.0	18.69	74.54	445.654435	-371.11
250.0	18.39	74.84	454.749423	-379.91
255.0	18.11	75.14	463.844412	-388.70
260.0	17.83	75.43	472.9394	-397.51
265.0	17.56	75.72	482.034389	-406.32
270.0	17.29	76.00	491.129377	-415.13
275.0	17.04	76.27	500.224366	-423.95
280.0	16.80	76.54	509.319354	-432.78
285.0	16.56	76.81	518.414342	-441.60
290.0	16.33	77.08	527.509331	-450.43
295.0	16.11	77.33	536.604319	-459.27
300.0	15.89	77.59	545.699308	-468.11
305.0	15.68	77.84	554.794296	-476.95
310.0	15.48	78.09	563.889285	-485.80
315.0	15.28	78.33	572.984273	-494.65
320.0	15.09	78.58	582.079262	-503.50
325.0	14.90	78.81	591.17425	-512.36
330.0	14.72	79.05	600.269239	-521.22
335.0	14.54	79.28	609.364227	-530.08
340.0	14.37	79.51	618.459216	-538.95
345.0	14.20	79.73	627.554204	-547.82
350.0	14.04	79.96	636.649193	-556.69
355.0	13.88	80.18	645.744181	-565.57
360.0	13.72	80.39	654.839169	-574.44
Max Volume (V max):				10.87
Design Volume (V design) :				**10.87**

STORAGE VOLUME CALCULATIONS

Project: Fastfrate Warehouse Development
Industrial/Commercial Development
Project #: A001083 (360)
Station OTTAWA SEWER DESIGN GUIDELINES
Date: 2022-05-30 14:06

File Location: ***\\cima.plus\cima\Cima-C10\Ott_Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\01-SWM\220527_SWM redesign\03_Storm Release Rates & Storage - Half RR\[220530_Storm Water Management - Storage and Drawdown_Half RR.xlsx]A7***

Description: **Storage volume calculations with the rational method**

Specified Release Rate: 77.61553563 L/s/ha

Area : A7 0.0426 ha
Runoff Coefficient C (unfactore 0.2
C_runoff factor: 1.25
Runoff Coefficient C : 0.25
Rainfall Event : 100 year
Discharge Flow Q : 0.003306422 m³/s
Discharge Factor K : 1

Design Volume: **1.19 m³**

Rainfall	2 year		5 year		10 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	732.951	732.951	998.071	998.071	1174.184	1174.184
B	6.199	6.199	6.053	6.053	6.014	6.014
C	0.81	0.81	0.814	0.814	0.816	0.816
Rainfall	25 year		50 year		100 year	
Pluviometry Coefficients	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.	30 min. or less	Over 30 min.
A	1402.884	1402.884	1569.58	1569.58	1735.688	1735.688
B	6.018	6.018	6.014	6.014	6.014	6.014
C	0.819	0.819	0.82	0.82	0.82	0.82

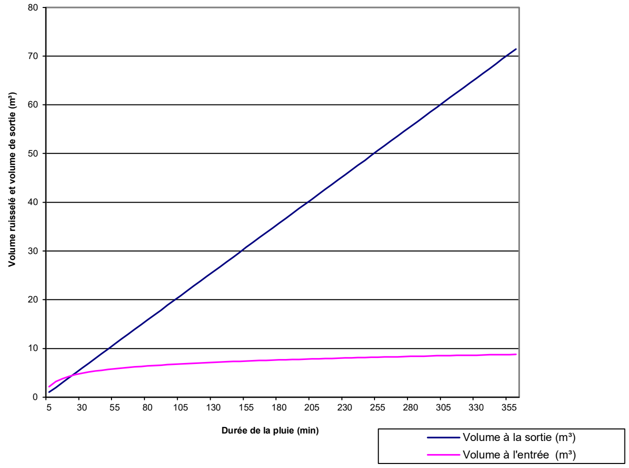
Prepared by: Guillaume LeBlond, M.A.Sc., EIT
PEO No.: 100530467
Date: May 30, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.
PEO No.: 100067842
Date: May 30, 2022

Fastfrate Warehouse Development
Industrial/Commercial Development

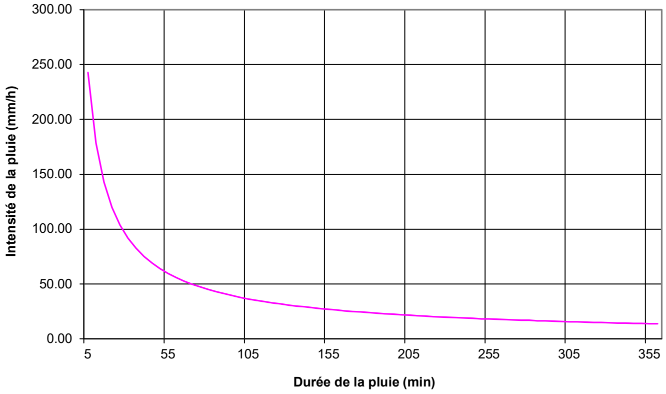
Sub-Catchment A7

SWM Retention Sizing with Rational Method



Courbe I-D-F de la pluie

100 yea



Rainfall Duration (min) *T* (1)	**Rainfall Intensity** (mm/h) *I* (2)	**Runoff Volume** (m^3) *CIAT* (4)	**Output Volume** (m^3) *kQT* (5)	**Retention Volume** (m^3) *(4)-(5)* (6)
5.0	242.70	2.15	0.99192655	1.16
10.0	178.56	3.17	1.98385309	1.19
15.0	142.89	3.80	2.97577964	0.83
20.0	119.95	4.26	3.96770618	0.29
25.0	103.85	4.61	4.95963273	-0.35
30.0	91.87	4.89	5.95155927	-1.06
35.0	82.58	5.13	6.94348582	-1.81
40.0	75.15	5.34	7.93541236	-2.60
45.0	69.05	5.52	8.92733891	-3.41
50.0	63.95	5.68	9.91926545	-4.24
55.0	59.62	5.82	10.911192	-5.09
60.0	55.89	5.95	11.9031185	-5.95
65.0	52.65	6.07	12.8950451	-6.82
70.0	49.79	6.19	13.8869716	-7.70
75.0	47.26	6.29	14.8788982	-8.59
80.0	44.99	6.39	15.8708247	-9.48
85.0	42.95	6.48	16.8627513	-10.38
90.0	41.11	6.57	17.8546778	-11.29
95.0	39.43	6.65	18.8466044	-12.20
100.0	37.90	6.73	19.8385309	-13.11
105.0	36.50	6.80	20.8304575	-14.03
110.0	35.20	6.87	21.822384	-14.95
115.0	34.01	6.94	22.8143105	-15.87
120.0	32.89	7.01	23.8062371	-16.80
125.0	31.86	7.07	24.7981636	-17.73
130.0	30.90	7.13	25.7900902	-18.66
135.0	30.00	7.19	26.7820167	-19.59
140.0	29.15	7.24	27.7739433	-20.53
145.0	28.36	7.30	28.7658698	-21.47
150.0	27.61	7.35	29.7577964	-22.41
155.0	26.91	7.40	30.7497229	-23.35
160.0	26.24	7.45	31.7416494	-24.29
165.0	25.61	7.50	32.733576	-25.23
170.0	25.01	7.55	33.7255025	-26.18
175.0	24.44	7.59	34.7174291	-27.12
180.0	23.90	7.64	35.7093556	-28.07
185.0	23.39	7.68	36.7012822	-29.02
190.0	22.90	7.72	37.6932087	-29.97
195.0	22.43	7.76	38.6851353	-30.92
200.0	21.98	7.80	39.6770618	-31.87
205.0	21.55	7.84	40.6689884	-32.83
210.0	21.14	7.88	41.6609149	-33.78
215.0	20.75	7.92	42.6528414	-34.73
220.0	20.37	7.96	43.644768	-35.69
225.0	20.01	7.99	44.6366945	-36.64
230.0	19.66	8.03	45.6286211	-37.60
235.0	19.33	8.06	46.6205476	-38.56
240.0	19.01	8.10	47.6124742	-39.52
245.0	18.69	8.13	48.6044007	-40.47
250.0	18.39	8.16	49.5963273	-41.43
255.0	18.11	8.19	50.5882538	-42.39
260.0	17.83	8.23	51.5801804	-43.35
265.0	17.56	8.26	52.5721069	-44.31
270.0	17.29	8.29	53.5640334	-45.28
275.0	17.04	8.32	54.55596	-46.24
280.0	16.80	8.35	55.5478865	-47.20
285.0	16.56	8.38	56.5398131	-48.16
290.0	16.33	8.41	57.5317396	-49.13
295.0	16.11	8.43	58.5236662	-50.09
300.0	15.89	8.46	59.5155927	-51.05
305.0	15.68	8.49	60.5075193	-52.02
310.0	15.48	8.52	61.4994458	-52.98
315.0	15.28	8.54	62.4913724	-53.95
320.0	15.09	8.57	63.4832989	-54.91
325.0	14.90	8.60	64.4752254	-55.88
330.0	14.72	8.62	65.467152	-56.85
335.0	14.54	8.65	66.4590785	-57.81
340.0	14.37	8.67	67.4510051	-58.78
345.0	14.20	8.70	68.4429316	-59.75
350.0	14.04	8.72	69.4348582	-60.71
355.0	13.88	8.74	70.4267847	-61.68
360.0	13.72	8.77	71.4187113	-62.65
Max Volume (V max):				1.19
Design Volume (V design) :				**1.19**

B

Appendix B-9

SOMME STREET DITCH ELEVATION (100-YEAR)

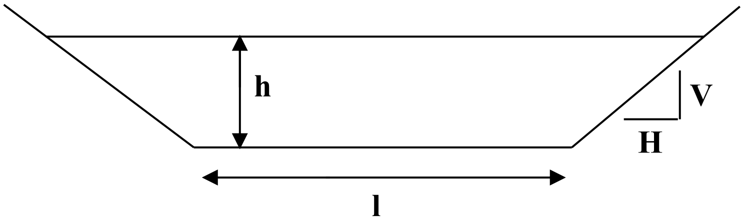
Date: **2021-08-13**

FASTFRATE

A001083 (360)

CHANNEL CHECK AT DITCH ON SOMME STREET (100-YEAR)

Bed Length (l)	m	0.000		
Side Slopes (H:V)	H/V	3.0000	1.0000	
Slope (S)	m/m	0.0050	%	0.50
Roughness Coefficient	n	0.0300		
Flow (Q)	m^3/s	3.857	l/s	3,857
Velocity (V)	m/s	1.395	cm/s	140
Hydraulic Radius (R_h)	m	0.455		
Wetted Area	m^2	2.765		
Wetted Perimeter	m	6.072		
Height of water (h)	m	0.960		



Notes: The ditch on Somme street at which our site is connecting will have a headwater height of 0.96m during the 100-year storm event. The bottom of the ditch at that location is 89.110 which means the hydraulic grade line within the ditch will be at 90.07.

Prepared by: Julien Sauvé, P.Eng

100200100

Date: July 20, 2021

Verified by: Julien Sauvé, P.Eng

PEO No.: 100200100

Date: July 20, 2021

##

B

Appendix B-10

STORM HYDRAULIC GRADE LINE

Piezometric line calculation
Calculation sheet

Aquapraxis

Erase

Graphic

Project Title: Fastfrate Warehouse Development
Project Number: A001083 (360)
Designed by: Guillaume LeBlond, M.A.Sc. **Date:** 2022-06-06
Verified by: Christian Lavoie-Lebel, P.En **Date:** 2022-06-06

Location: Outfall - Freeflow Condition
Road: n.a.
Initial water level (m): 89.2
Initial velocity (m/s): 1.4
Manning number: 0.013

Initial EGL$_s$ (m):
Initial HGL (m):

Manhole Num. (1)	D (mm) (2)	Q (m^3/s) (3)	S (m/m) (4)	L (m) (5)	V (m/s) (6)	y (m) (7)	A (m^2) (8)	y_c (m) (9)	$V^2/2g$ (m) (10)	S_f (m/m) (11)	h_f (m) (12)	EGL$_s$ (m) (13)	K (14)	$K(V^2/2g)$ (m) (15)	EGL$_e$ (m) (16)	HGL$_e$ (m) (17)	Cur. Elev. (m) (18)	Surface Elev. (m) (19)	Flow Type (20)	Surface Elev. - LGH (m) (21)
Outlet	900	0.907			1.4				0.100			90.107			90.128	90.007	90.18	91	super-critical	
STM 900	900	0.907	0.0022	6.1	1.537	0.788	0.5903	0.555	0.120	0.002	0.013	90.141	0.5	0.060	90.201	90.081	90.19342	91	sub-critical	0.919

Comment:

\\cima.plus\cima\Cima-C10\Ott_Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\01-SWM\220527_SWM redesign\05_Effluent Storm to Ditch Hydraulic Grade Line\[220606_Storm Hydraulic Grade Line - Freeflow.xlsm]Piézo

Piezometric line calculation
Calculation sheet

Aquapraxis

Project Title: Fastfrate Warehouse Development
Project Number: A001083 (360)
Designed by: Guillaume LeBlond, M.A.Sc. **Date:** 2021-07-23
Verified by: Christian Lavoie-Lebel, P.En **Date:** 2021-07-23

Location: Outfall - Surcharged Condition
Road: n.a.
Initial water level (m): 90.07
Initial velocity (m/s): 1.4
Manning number: 0.013
Initial EGL_s (m):
Initial HGL (m):

Erase **Graphic**

Manhole Num. (1)	D (mm) (2)	Q (m^3/s) (3)	S (m/m) (4)	L (m) (5)	V (m/s) (6)	y (m) (7)	A (m^2) (8)	y_c (m) (9)	$V^2/2g$ (m) (10)	S_f (m/m) (11)	h_f (m) (12)	EGL_s (m) (13)	K (14)	$K(V^2/2g)$ (m) (15)	EGL_e (m) (16)	HGL_e (m) (17)	Cur. Elev. (m) (18)	Surface Elev. (m) (19)	Flow Type (20)	Surface Elev. - LGH (m) (21)
Outlet	900	0.907			1.4				0.100			90.170			90.190	90.070	90.18	91	super-critical	
STM 900	900	0.907	0.0022	6.1	1.537	0.788	0.5903	0.555	0.120	0.002	0.013	90.204	0.5	0.060	90.264	90.144	90.19342	91	sub-critical	0.856

Comment:

B

Appendix B-11
SWM POND CONTROL SIZING

PROJECT NAME: Fastfrate (Ottawa) Warehouse Development
CIMA+ PROJECT NUMBER: A001083
CLIENT: Fastfrate (Ottawa) Holdings Inc.
PROJECT STATUS: 90 % Design (Site plan Approval)

Prepared by: Guillaume LeBlond, M.A.Sc., EIT
PEO No.: 100530467
Date: May 31, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.
PEO No.: 100067842
Date: May 31, 2022

Numerical Analysis; Orifice sizing

Extended Detention Control

Extended Detention Orifice

Control Type	Circular Orifice plate
Elevation Range (m)	89.3 to 89.5
Base elevation (m)	89.3
Initial head over Orifice	0
Orifice Diameter (mm)	80
No. of orifices	1
Gravitational Acceleration, g (m/s^2)	9.81
Discharge Coefficient, C_d	0.63

Weir Equation Comparison	Values	Notes
Weir Elevation (m)	89.3	
Head over weir, H_w (m)	0.20	
Weir Discharge Coeff., C_w	0.61	
Weir Length, L_w (m):	0.1	

Water Elevation (m)	Head over Orifice, hf (m)	Head differential, dh (m)	Pond Area "A" (m2)	Orifice Area "a" (m2)	Orifice Q=a*C*sqrt(2*g*hf) (m3/s)	Weir Q=2/3*C_w*L_w*sqrt(2*g)	Flow all conditions Q (m3/s)	Time differential, dt (s)
89.30	0.00	0	846.29	5.03E-03	1.00E-06	0.00E+00	0.00E+00	0.00E+00
89.31	0.01	0.01	849.30	5.03E-03	1.40E-03	1.80E-04	1.80E-04	4.71E+04
89.32	0.02	0.01	852.32	5.03E-03	1.98E-03	5.09E-04	5.09E-04	1.67E+04
89.33	0.03	0.01	855.34	5.03E-03	2.43E-03	9.36E-04	9.36E-04	9.14E+03
89.34	0.04	0.01	858.37	5.03E-03	2.81E-03	1.44E-03	1.44E-03	5.96E+03
89.35	0.05	0.01	861.40	5.03E-03	3.14E-03	2.01E-03	2.01E-03	4.28E+03
89.36	0.06	0.01	864.44	5.03E-03	3.44E-03	2.65E-03	2.65E-03	3.27E+03
89.37	0.07	0.01	867.48	5.03E-03	3.71E-03	3.34E-03	3.34E-03	2.60E+03
89.38	0.08	0.01	870.53	5.03E-03	3.97E-03	4.08E-03	3.97E-03	2.19E+03
89.39	0.09	0.01	873.59	5.03E-03	4.21E-03	4.86E-03	4.21E-03	2.08E+03
89.40	0.10	0.01	876.65	5.03E-03	4.44E-03	5.70E-03	4.44E-03	1.98E+03
89.41	0.11	0.01	879.71	5.03E-03	4.65E-03	6.57E-03	4.65E-03	1.89E+03
89.42	0.12	0.01	882.78	5.03E-03	4.86E-03	7.49E-03	4.86E-03	1.82E+03
89.43	0.13	0.01	885.86	5.03E-03	5.06E-03	8.44E-03	5.06E-03	1.75E+03
89.44	0.14	0.01	888.94	5.03E-03	5.25E-03	9.44E-03	5.25E-03	1.69E+03
89.45	0.15	0.01	892.03	5.03E-03	5.43E-03	1.05E-02	5.43E-03	1.64E+03
89.46	0.16	0.01	895.12	5.03E-03	5.61E-03	1.15E-02	5.61E-03	1.60E+03
89.47	0.17	0.01	898.22	5.03E-03	5.78E-03	1.26E-02	5.78E-03	1.55E+03
89.48	0.18	0.01	901.32	5.03E-03	5.95E-03	1.38E-02	5.95E-03	1.51E+03
89.49	0.19	0.01	904.43	5.03E-03	6.11E-03	1.49E-02	6.11E-03	1.48E+03
89.50	0.20	0.01	907.55	5.03E-03	6.27E-03	1.61E-02	6.27E-03	1.45E+03

Numerical Results:

Parameter	Value	Units
Peak Flowrate (L/s)	6.27	L/s
Average Flowrate (L/s)	4.12	L/s
Water Quality Volume (m^3)	175.65	m^3
Drawdown Time (h)	31.0	h
90% Drawdown Time (h)	17.9	h

MOE Equation 4.10 Results:

Parameter	Value	Units
Area of Pond	876.75	m2
Orifice Discharge Coeff. C	0.63	unls.
Orifice Area, A_0	5.03E-03	m2
g	9.81	m/s^2
h1	0.2	m
h2	0.0	m
Drawdown Time, t	5.6E+04	s
Drawdown Time, t	**15.5**	**h**

Prepared by: Guillaume LeBlond, M.A.Sc., EIT
PEO No.: 100530467

Date: May 31, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.
PEO No.: 100067842

Date: May 31, 2022

Retention Control - Freeflow condition

Retention Control Orifice

Control Type	Rectangular Orifice
Elevation Range (m)	89.5- 89.85
Base elevation (m)	89.5
Initial head over Orifice	0
Orifice Depth (mm)	450
Orifice Width (mm)	830
No. of orifices	1
Gravitational Acceleration, g (m/s^2)	9.81
Orifice Discharge Coeff., C_d	0.63

Weir Equation	Values	Notes
Weir Elevation (m)	89.5	
Weir Discharge Coeff., C_w	0.61	
Weir Length, L_w (m):	0.83	

Water Elevation (m)	Head over Orifice, hf (m)	Head differential, dh (m)	Pond Area "A" (m2)	Orifice Area "a" (m2)	Orifice Q=a*C_d*sqrt(2*g*hf) (m3/s)	Weir Q=2/3*C_w*L_w*sqrt(2*g)*h_	Flow all conditions Q (m3/s)	Time differential, dt (s)
89.50	0.00	0	907.55	3.74E-01	0.00	0.00	0.00	0.00
89.51	0.01	0.01	910.67	3.74E-01	0.10	0.00	0.00	6091.08
89.52	0.02	0.01	913.79	3.74E-01	0.15	0.00	0.00	4321.83
89.53	0.03	0.01	916.93	3.74E-01	0.18	0.01	0.01	3540.85
89.54	0.04	0.01	920.06	3.74E-01	0.21	0.01	0.01	3076.96
89.55	0.05	0.01	923.21	3.74E-01	0.23	0.02	0.02	2761.51
89.56	0.06	0.01	926.35	3.74E-01	0.26	0.02	0.02	2529.50
89.57	0.07	0.01	929.51	3.74E-01	0.28	0.03	0.03	2349.83
89.58	0.08	0.01	932.67	3.74E-01	0.29	0.03	0.03	2205.54
89.59	0.09	0.01	935.83	3.74E-01	0.31	0.04	0.04	2086.46
89.60	0.10	0.01	939.00	3.74E-01	0.33	0.05	0.05	1986.09
89.61	0.11	0.01	942.18	3.74E-01	0.35	0.05	0.05	1900.07
89.62	0.12	0.01	945.36	3.74E-01	0.36	0.06	0.06	1825.32
89.63	0.13	0.01	948.54	3.74E-01	0.38	0.07	0.07	1759.62
89.64	0.14	0.01	951.73	3.74E-01	0.39	0.08	0.08	1701.32
89.65	0.15	0.01	954.93	3.74E-01	0.40	0.09	0.09	1649.15
89.66	0.16	0.01	958.13	3.74E-01	0.42	0.10	0.10	1602.14
89.67	0.17	0.01	961.34	3.74E-01	0.43	0.10	0.10	1559.51
89.68	0.18	0.01	964.56	3.74E-01	0.44	0.11	0.11	1520.64
89.69	0.19	0.01	967.78	3.74E-01	0.45	0.12	0.12	1485.02
89.70	0.20	0.01	971.00	3.74E-01	0.47	0.13	0.13	1452.24
89.71	0.21	0.01	974.23	3.74E-01	0.48	0.14	0.14	1421.96
89.72	0.22	0.01	977.47	3.74E-01	0.49	0.15	0.15	1393.88
89.73	0.23	0.01	980.71	3.74E-01	0.50	0.16	0.16	1367.76
89.74	0.24	0.01	983.95	3.74E-01	0.51	0.18	0.18	1343.39
89.75	0.25	0.01	987.21	3.74E-01	0.52	0.19	0.19	1320.60
89.76	0.26	0.01	990.46	3.74E-01	0.53	0.20	0.20	1299.23
89.77	0.27	0.01	993.73	3.74E-01	0.54	0.21	0.21	1279.14
89.78	0.28	0.01	997.00	3.74E-01	0.55	0.22	0.22	1260.23
89.79	0.29	0.01	1000.27	3.74E-01	0.56	0.23	0.23	1242.37
89.80	0.30	0.01	1003.55	3.74E-01	0.57	0.25	0.25	1225.50
89.81	0.31	0.01	1006.84	3.74E-01	0.58	0.26	0.26	1209.52
89.82	0.32	0.01	1010.13	3.74E-01	0.59	0.27	0.27	1194.36
89.83	0.33	0.01	1013.42	3.74E-01	0.60	0.28	0.28	1179.96
89.84	0.34	0.01	1016.72	3.74E-01	0.61	0.30	0.30	1166.27
89.85	0.35	0.01	1020.03	3.74E-01	0.62	0.31	0.31	1153.22
89.86	0.36	0.01	1023.34	3.74E-01	0.63	0.32	0.32	1140.79
89.87	0.37	0.01	1026.66	3.74E-01	0.63	0.34	0.34	1128.91
89.88	0.38	0.01	1029.99	3.74E-01	0.64	0.35	0.35	1117.57
89.89	0.39	0.01	1033.32	3.74E-01	0.65	0.36	0.36	1106.71
89.90	0.40	0.01	1036.65	3.74E-01	0.66	0.38	0.38	1096.32
89.91	0.41	0.01	1039.99	3.74E-01	0.67	0.39	0.39	1086.35
89.92	0.42	0.01	1043.34	3.74E-01	0.68	0.41	0.41	1076.80
89.93	0.43	0.01	1046.69	3.74E-01	0.68	0.42	0.42	1067.62
89.94	0.44	0.01	1050.04	3.74E-01	0.69	0.44	0.44	1058.80
89.95	0.45	0.01	1053.41	3.74E-01	0.70	0.45	0.70	677.99
89.96	0.46	0.01	1056.77	3.74E-01	0.71	0.47	0.71	687.67
89.97	0.47	0.01	1060.15	3.74E-01	0.71	0.48	0.71	697.32
89.98	0.48	0.01	1063.53	3.74E-01	0.72	0.50	0.72	706.95
89.99	0.49	0.01	1066.91	3.74E-01	0.73	0.51	0.73	716.55
90.00	0.50	0.01	1070.30	3.74E-01	0.74	0.53	0.74	726.12
90.01	0.51	0.01	1073.70	3.74E-01	0.74	0.54	0.74	735.67
90.02	0.52	0.01	1077.10	3.74E-01	0.75	0.56	0.75	745.20
90.03	0.53	0.01	1080.50	3.74E-01	0.76	0.58	0.76	754.71
90.04	0.54	0.01	1083.91	3.74E-01	0.77	0.59	0.77	764.21
90.05	0.55	0.01	1087.33	3.74E-01	0.77	0.61	0.77	773.68
90.06	0.56	0.01	1090.75	3.74E-01	0.78	0.63	0.78	783.14
90.07	0.57	0.01	1094.18	3.74E-01	0.79	0.64	0.79	792.59
90.08	0.58	0.01	1097.62	3.74E-01	0.79	0.66	0.79	802.02
90.09	0.59	0.01	1101.05	3.74E-01	0.80	0.68	0.80	811.44

Numerical Results:

Maximum Flowrate - Quantity Control Orifice 1	800.6	L/s
Maximum Flowrate - Quantity Control Orifice 2	93.6	L/s
Maximum Flowrate - Extended Detention Orifice	12.5	L/s
Total Maximum Flowrate	906.6	L/s
Allowable Flowrate	906.9	L/s

Prepared by: Guillaume LeBlond, M.A.Sc., EIT
PEO No.: 100530467

Date: May 31, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.
PEO No.: 100067842

Date: May 31, 2022

Retention Control - Freeflow condition

Retention Control Orifice 2

Control Type	Rectangular Orifice
Elevation Range (m)	90.07-90.15
Base elevation (m)	89.5
Initial net head over Orifice	0
Orifice Depth (mm)	200
Orifice Width (mm)	775
No. of orifices	1
Gravitational Acceleration, g (m/s^2)	9.81
Discharge Coefficient, C_d	0.63

Weir Equation	Values	Notes
Weir Elevation (m)	89.925	
Weir Discharge Coeff., C_w	0.61	
Weir Length, L_w (m):	0.775	

Water Elevation (m)	Head over Orifice, hf (m)	Head differential, dh (m)	Pond Area "A" (m2)	Orifice Area "a" (m2)	Orifice Q=a*C*sqrt(2*g*hf) (m3/s)	Weir Q=2/3*C_w*L_w*sqrt(2*g)	Flow all conditions Q (m3/s)	Time differential, dt (s)
89.50	-0.42	0	907.55	0.155	0.00	0.00	0.00	0.00
89.51	-0.41	0.01	910.67	0.155	0.00	0.00	0.00	0.00
89.52	-0.40	0.01	913.79	0.155	0.00	0.00	0.00	0.00
89.53	-0.39	0.01	916.93	0.155	0.00	0.00	0.00	0.00
89.54	-0.38	0.01	920.06	0.155	0.00	0.00	0.00	0.00
89.55	-0.37	0.01	923.21	0.155	0.00	0.00	0.00	0.00
89.56	-0.36	0.01	926.35	0.155	0.00	0.00	0.00	0.00
89.57	-0.35	0.01	929.51	0.155	0.00	0.00	0.00	0.00
89.58	-0.34	0.01	932.67	0.155	0.00	0.00	0.00	0.00
89.59	-0.33	0.01	935.83	0.155	0.00	0.00	0.00	0.00
89.60	-0.32	0.01	939.00	0.155	0.00	0.00	0.00	0.00
89.61	-0.31	0.01	942.18	0.155	0.00	0.00	0.00	0.00
89.62	-0.30	0.01	945.36	0.155	0.00	0.00	0.00	0.00
89.63	-0.29	0.01	948.54	0.155	0.00	0.00	0.00	0.00
89.64	-0.28	0.01	951.73	0.155	0.00	0.00	0.00	0.00
89.65	-0.27	0.01	954.93	0.155	0.00	0.00	0.00	0.00
89.66	-0.26	0.01	958.13	0.155	0.00	0.00	0.00	0.00
89.67	-0.25	0.01	961.34	0.155	0.00	0.00	0.00	0.00
89.68	-0.24	0.01	964.56	0.155	0.00	0.00	0.00	0.00
89.69	-0.23	0.01	967.78	0.155	0.00	0.00	0.00	0.00
89.70	-0.22	0.01	971.00	0.155	0.00	0.00	0.00	0.00
89.71	-0.21	0.01	974.23	0.155	0.00	0.00	0.00	0.00
89.72	-0.20	0.01	977.47	0.155	0.00	0.00	0.00	0.00
89.73	-0.19	0.01	980.71	0.155	0.00	0.00	0.00	0.00
89.74	-0.18	0.01	983.95	0.155	0.00	0.00	0.00	0.00
89.75	-0.17	0.01	987.21	0.155	0.00	0.00	0.00	0.00
89.76	-0.16	0.01	990.46	0.155	0.00	0.00	0.00	0.00
89.77	-0.15	0.01	993.73	0.155	0.00	0.00	0.00	0.00
89.78	-0.14	0.01	997.00	0.155	0.00	0.00	0.00	0.00
89.79	-0.13	0.01	1000.27	0.155	0.00	0.00	0.00	0.00
89.80	-0.12	0.01	1003.55	0.155	0.00	0.00	0.00	0.00
89.81	-0.11	0.01	1006.84	0.155	0.00	0.00	0.00	0.00
89.82	-0.10	0.01	1010.13	0.155	0.00	0.00	0.00	0.00
89.83	-0.09	0.01	1013.42	0.155	0.00	0.00	0.00	0.00
89.84	-0.08	0.01	1016.72	0.155	0.00	0.00	0.00	0.00
89.85	-0.07	0.01	1020.03	0.155	0.00	0.00	0.00	0.00
89.86	-0.06	0.01	1023.34	0.155	0.00	0.00	0.00	0.00
89.87	-0.05	0.01	1026.66	0.155	0.00	0.00	0.00	0.00
89.88	-0.04	0.01	1029.99	0.155	0.00	0.00	0.00	0.00
89.89	-0.03	0.01	1033.32	0.155	0.00	0.00	0.00	0.00
89.90	-0.02	0.01	1036.65	0.155	0.00	0.00	0.00	0.00
89.91	-0.01	0.01	1039.99	0.155	0.00	0.00	0.00	0.00
89.92	0.00	0.01	1043.34	0.155	0.00	0.00	0.00	0.00
89.93	0.01	0.01	1046.69	0.155	0.03	0.00	0.00	21206.67
89.94	0.02	0.01	1050.04	0.155	0.05	0.00	0.00	4094.31
89.95	0.03	0.01	1053.41	0.155	0.07	0.01	0.01	1908.96
89.96	0.04	0.01	1056.77	0.155	0.08	0.01	0.01	1156.09
89.97	0.05	0.01	1060.15	0.155	0.09	0.01	0.01	795.53
89.98	0.06	0.01	1063.53	0.155	0.10	0.02	0.02	590.63
89.99	0.07	0.01	1066.91	0.155	0.11	0.02	0.02	461.18
90.00	0.08	0.01	1070.30	0.155	0.12	0.03	0.03	373.27
90.01	0.09	0.01	1073.70	0.155	0.13	0.03	0.03	310.36
90.02	0.10	0.01	1077.10	0.155	0.13	0.04	0.04	263.50
90.03	0.11	0.01	1080.50	0.155	0.14	0.05	0.05	227.48
90.04	0.12	0.01	1083.91	0.155	0.15	0.05	0.05	199.09
90.05	0.13	0.01	1087.33	0.155	0.15	0.06	0.06	176.24
90.06	0.14	0.01	1090.75	0.155	0.16	0.07	0.07	157.52
90.07	0.15	0.01	1094.18	0.155	0.16	0.08	0.08	141.95
90.08	0.16	0.01	1097.62	0.155	0.17	0.09	0.09	128.84
90.09	0.17	0.01	1101.05	0.155	0.18	0.09	0.09	117.68

Prepared by: Guillaume LeBlond, M.A.Sc., EIT
PEO No.: 100530467

Date: May 31, 2022

Retention Control - Freeflow condition

Verified by: Christian Lavoie-Lebel, P.Eng.
PEO No.: 100067842

Date: May 31, 2022

Extended Detention Orifice

Control Type	Circular Orifice plate
Elevation Range (m)	89.5- 89.85
Base elevation (m)	89.5
Initial head over Orifice	0.2
Orifice Diameter (mm)	80
No. of orifices	1
Gravitational Acceleration, g (	9.81
Discharge Coefficient, C_d	0.63

Water Elevation (m)	Head over Orifice, hf (m	Head differential, dh (m)	Pond Area "A" (m2)	Orifice Area "a" (m2)	Q=a*C*sqrt(2*g*hf) (m3/s)	Time differential, dt (s)
89.50	0.20	0	907.55	5.03E-03	1.00E-06	0.00
89.51	0.21	0.01	910.67	5.03E-03	6.43E-03	1416.74
89.52	0.22	0.01	913.79	5.03E-03	6.58E-03	1388.92
89.53	0.23	0.01	916.93	5.03E-03	6.73E-03	1363.05
89.54	0.24	0.01	920.06	5.03E-03	6.87E-03	1338.91
89.55	0.25	0.01	923.21	5.03E-03	7.01E-03	1316.34
89.56	0.26	0.01	926.35	5.03E-03	7.15E-03	1295.18
89.57	0.27	0.01	929.51	5.03E-03	7.29E-03	1275.30
89.58	0.28	0.01	932.67	5.03E-03	7.42E-03	1256.57
89.59	0.29	0.01	935.83	5.03E-03	7.55E-03	1238.90
89.60	0.30	0.01	939.00	5.03E-03	7.68E-03	1222.21
89.61	0.31	0.01	942.18	5.03E-03	7.81E-03	1206.40
89.62	0.32	0.01	945.36	5.03E-03	7.93E-03	1191.41
89.63	0.33	0.01	948.54	5.03E-03	8.06E-03	1177.17
89.64	0.34	0.01	951.73	5.03E-03	8.18E-03	1163.63
89.65	0.35	0.01	954.93	5.03E-03	8.30E-03	1150.74
89.66	0.36	0.01	958.13	5.03E-03	8.42E-03	1138.45
89.67	0.37	0.01	961.34	5.03E-03	8.53E-03	1126.72
89.68	0.38	0.01	964.56	5.03E-03	8.65E-03	1115.52
89.69	0.39	0.01	967.78	5.03E-03	8.76E-03	1104.80
89.70	0.40	0.01	971.00	5.03E-03	8.87E-03	1094.53
89.71	0.41	0.01	974.23	5.03E-03	8.98E-03	1084.70
89.72	0.42	0.01	977.47	5.03E-03	9.09E-03	1075.27
89.73	0.43	0.01	980.71	5.03E-03	9.20E-03	1066.22
89.74	0.44	0.01	983.95	5.03E-03	9.30E-03	1057.52
89.75	0.45	0.01	987.21	5.03E-03	9.41E-03	1049.16
89.76	0.46	0.01	990.46	5.03E-03	9.51E-03	1041.12
89.77	0.47	0.01	993.73	5.03E-03	9.62E-03	1033.38
89.78	0.48	0.01	997.00	5.03E-03	9.72E-03	1025.92
89.79	0.49	0.01	1000.27	5.03E-03	9.82E-03	1018.73
89.80	0.50	0.01	1003.55	5.03E-03	9.92E-03	1011.80
89.81	0.51	0.01	1006.84	5.03E-03	1.00E-02	1005.11
89.82	0.52	0.01	1010.13	5.03E-03	1.01E-02	998.65
89.83	0.53	0.01	1013.42	5.03E-03	1.02E-02	992.41
89.84	0.54	0.01	1016.72	5.03E-03	1.03E-02	986.39
89.85	0.55	0.01	1020.03	5.03E-03	1.04E-02	980.56
89.86	0.56	0.01	1023.34	5.03E-03	1.05E-02	974.92
89.87	0.57	0.01	1026.66	5.03E-03	1.06E-02	969.46
89.88	0.58	0.01	1029.99	5.03E-03	1.07E-02	964.18
89.89	0.59	0.01	1033.32	5.03E-03	1.08E-02	959.06
89.90	0.60	0.01	1036.65	5.03E-03	1.09E-02	954.11
89.91	0.61	0.01	1039.99	5.03E-03	1.10E-02	949.30
89.92	0.62	0.01	1043.34	5.03E-03	1.10E-02	944.65
89.93	0.63	0.01	1046.69	5.03E-03	1.11E-02	940.13
89.94	0.64	0.01	1050.04	5.03E-03	1.12E-02	935.75
89.95	0.65	0.01	1053.41	5.03E-03	1.13E-02	931.49
89.96	0.66	0.01	1056.77	5.03E-03	1.14E-02	927.36
89.97	0.67	0.01	1060.15	5.03E-03	1.15E-02	923.36
89.98	0.68	0.01	1063.53	5.03E-03	1.16E-02	919.46
89.99	0.69	0.01	1066.91	5.03E-03	1.17E-02	915.68
90.00	0.70	0.01	1070.30	5.03E-03	1.17E-02	912.00
90.01	0.71	0.01	1073.70	5.03E-03	1.18E-02	908.43
90.02	0.72	0.01	1077.10	5.03E-03	1.19E-02	904.96
90.03	0.73	0.01	1080.50	5.03E-03	1.20E-02	901.58
90.04	0.74	0.01	1083.91	5.03E-03	1.21E-02	898.29
90.05	0.75	0.01	1087.33	5.03E-03	1.21E-02	895.10
90.06	0.76	0.01	1090.75	5.03E-03	1.22E-02	891.99
90.07	0.77	0.01	1094.18	5.03E-03	1.23E-02	888.96
90.08	0.78	0.01	1097.62	5.03E-03	1.24E-02	886.02
90.09	0.79	0.01	1101.05	5.03E-03	1.25E-02	883.15

Prepared by: Guillaume LeBlond, M.A.Sc., EIT
PEO No.: 100530467

Date: May 31, 2022

Retention Control - Surcharged condition

Verified by: Christian Lavoie-Lebel, P.Eng.
PEO No.: 100067842

Date: May 31, 2022

Retention Control Orifice

Control Type	Rectangular Orifice
Elevation Range (m)	90.07-90.15
Base elevation (m)	90.07
Initial net head over Orifice	0
Orifice Depth (mm)	450
Orifice Width (mm)	830
No. of orifices	1
Gravitational Acceleration, g (m/s^2)	9.81
Discharge Coefficient, C_d	0.63

Weir Equation	Values	Notes
Weir Elevation (m)	89.5	
Weir Discharge Coeff., C_w	0.61	
Weir Length, L_w (m):	0.83	

Water Elevation (m)	Head over Orifice, hf (m)	Head differential, dh (m)	Pond Area "A" (m2)	Orifice Area "a" (m2)	Orifice Q=a*C*sqrt(2*g*hf) (m3/s)	Weir Q=2/3*C_w*L_w*sqrt(2*g)*h_	Flow all conditions Q (m3/s)	Time differential, dt (s)
90.07	0.00	0	1094.18	0.374	0.00	0.00	0.00	0.00
90.08	0.01	0.01	1097.62	0.374	0.10	0.00	0.10	105.31
90.09	0.02	0.01	1101.05	0.374	0.15	0.00	0.15	74.70
90.10	0.03	0.01	1104.50	0.374	0.18	0.01	0.18	61.18
90.11	0.04	0.01	1107.95	0.374	0.21	0.01	0.21	53.15
90.12	0.05	0.01	1111.40	0.374	0.23	0.02	0.23	47.69
90.13	0.06	0.01	1114.87	0.374	0.26	0.02	0.26	43.67
90.14	0.07	0.01	1118.33	0.374	0.28	0.03	0.28	40.55
90.15	0.08	0.01	1121.80	0.374	0.29	0.03	0.29	38.05
90.16	0.09	0.01	1125.28	0.374	0.31	0.04	0.31	35.99
90.17	0.10	0.01	1128.76	0.374	0.33	0.05	0.33	34.25

Numerical Results:

Maximum Flowrate - Quantity Control Orifice 1	329.60	L/s
Maximum Flowrate - Quantity Control Orifice 2	136.78	L/s
Maximum Flowrate - Extended Detention Orifice	4.44	L/s
Total Flowrate	470.8	L/s
Half of Allowable Flowrate	453.43	L/s

Prepared by: Guillaume LeBlond, M.A.Sc., EIT
PEO No.: 100530467

Date: May 31, 2022

Verified by: Christian Lavoie-Lebel, P.Eng.
PEO No.: 100067842

Date: May 31, 2022

Retention Control - Surcharged condition

Retention Control Orifice

Control Type	Rectangular Orifice			
Elevation Range (m)	90.07-90.15	**Weir Equation**	Values	Notes
Base elevation (m)	90.07	Weir Elevation (m)	89.925	
Initial net head over Orifice	0	Weir Discharge Coeff., C_w	0.61	
Orifice Depth (mm)	200	Weir Length, L_w (m):	0.775	
Orifice Width (mm)	775			
No. of orifices	1			
Gravitational Acceleration, g (m/s^2)	9.81			
Discharge Coefficient, C_d	0.63			

Water Elevation (m)	Head over Orifice, hf (m)	Head differential, dh (m)	Pond Area "A" (m2)	Orifice Area "a" (m2)	Orifice Q=a*C*sqrt(2*g*hf) (m3/s)	Weir Q=2/3*C_w*L_w*sqrt(2*g)	Flow all conditions Q (m3/s)	Time differential, dt (s)
90.07	0.00	0	1094.18	0.155	0.00	0.00	0.00	0.00
90.08	0.01	0.01	1097.62	0.155	0.04	0.00	0.00	7862.49
90.09	0.02	0.01	1101.05	0.155	0.06	0.00	0.00	2788.52
90.10	0.03	0.01	1104.50	0.155	0.07	0.01	0.01	1522.63
90.11	0.04	0.01	1107.95	0.155	0.09	0.01	0.01	992.06
90.12	0.05	0.01	1111.40	0.155	0.10	0.02	0.02	712.08
90.13	0.06	0.01	1114.87	0.155	0.11	0.02	0.11	105.23
90.14	0.07	0.01	1118.33	0.155	0.11	0.03	0.11	97.72
90.15	0.08	0.01	1121.80	0.155	0.12	0.03	0.12	91.70
90.16	0.09	0.01	1125.28	0.155	0.13	0.04	0.13	86.72
90.17	0.10	0.01	1128.76	0.155	0.14	0.04	0.14	82.52

Prepared by: Guillaume LeBlond, M.A.Sc., EIT   Date: May 31, 2022
PEO No.: 1E+08

Retention Control - S Verified by: Christian Lavoie-Lebel, P.Eng.   Date: May 31, 2022
PEO No.: 1E+08

Extended Detention Orifice

Control Ty	Circular Orifice plate
Elevation R	90.07-90.15
Base eleva	90.07
Initial net h	0
Orifice Dia	80
No. of orifi	1
Gravitatio	9.81
Discharge	0.63

Water Elev	Head over	Head diffe	Pond Area	Orifice Area "a" (m2)	Q=a*C*sqrt(2*g*hf) (m3/s)	Time differential, dt (s)
90.07	0.00	0	1094.18	5.03E-03	1.00E-06	0
90.08	0.01	0.01	1097.62	5.03E-03	1.40E-03	7825
90.09	0.02	0.01	1101.05	5.03E-03	1.98E-03	5551
90.10	0.03	0.01	1104.50	5.03E-03	2.43E-03	4546
90.11	0.04	0.01	1107.95	5.03E-03	2.81E-03	3949
90.12	0.05	0.01	1111.40	5.03E-03	3.14E-03	3543
90.13	0.06	0.01	1114.87	5.03E-03	3.44E-03	3245
90.14	0.07	0.01	1118.33	5.03E-03	3.71E-03	3013
90.15	0.08	0.01	1121.80	5.03E-03	3.97E-03	2828
90.16	0.09	0.01	1125.28	5.03E-03	4.21E-03	2674
90.17	0.10	0.01	1128.76	5.03E-03	4.44E-03	2545

B

Appendix B-12

STORM SERVICE CONNECTION SIZING

PROJECT NAME: Warehouse Development
CIMA+ PROJECT NUMBER: A001083
CLIENT: Fastfrate (Ottawa) Holdings Inc.
PROJECT STATUS: Issued for Site Plan Approval

October 6, 2021

HYDRAULIC CALCULATIONS FOR STORM SEWERS

APPLICABLE DESIGN GUIDELINES:

1. City of Ottawa Sewer Design Guidelines, 2012
2. City of Ottawa Technical Bulletins up to and including ISTB-2018-01

DESIGN BASIS:

Manning Coefficient : 0.013
Maximum permitted velocity : 3.00 **m/s**
Minimum permitted velocity : 0.80 **m/s**

Section	Dia. mm	Length m	Slope %	Invert upstream m	Invert downstream m	Capacity (full) m^3/s	Velocity (full) m/s	Flow m^3/s	Velocity (actual) m/s	% Full
Building Service Connection --> STM #1	600	22.4	1.00%	89.750	89.525	0.614	2.17	0.213	1.96	35%
STM #1 --> STM #2	600	27.9	0.50%	89.515	89.375	0.435	1.54	0.283	1.64	65%
STM #2 --> Outlet (Wet Pond)	600	9.0	0.50%	89.345	89.300	0.435	1.54	0.283	1.64	65%

Remarks

The data in green has been calculated or modified by the designer
The data in blue has been calculated using formulas inserted by the designer

Notes :

1. Storm Sewer Peak Flow Determined per Roof Restricted flow of 213 L/s; and uncontrolled flow from Catchements A4 of 35.792 L/s and from Catchment A5 of 34.458 L/s.

Prepared by: Guillaume LeBlond, M.A.Sc., EIT Date: 2021-07-25
PEO No.: 100530467

Updated by: Joseph Lolli, P.Eng. Date: 2021-10-06
PEO No.: 100505343

Verified by: Christian Lavoie-Lebel, P.Eng. Date: 2021-10-06
PEO No.: 100067842

B

Appendix B-13-1

ROAD CULVERT CALCULATION REPORTS

HY-8 Culvert Analysis Report

Project Notes

Project Title:

Designer:

Project Date:Wednesday, July 7, 2021

Notes:

Table 1 - Culvert Summary Table: East Entrance Road Culvert

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	89.99	0.000	0.710	0-NF	0.000	0.000	0.740	0.740	0.000	0.000
0.13	0.13	89.99	0.118	0.712	6-FFt	0.199	0.070	0.740	0.740	0.084	0.000
0.26	0.26	90.00	0.185	0.719	6-FFt	0.308	0.110	0.740	0.740	0.169	0.000
0.39	0.39	90.01	0.240	0.730	6-FFt	0.406	0.143	0.740	0.740	0.253	0.000
0.52	0.52	90.02	0.289	0.743	6-FFt	0.507	0.173	0.740	0.740	0.337	0.000
0.65	0.65	90.04	0.334	0.760	6-FFt	0.636	0.200	0.740	0.740	0.422	0.000
0.78	0.78	90.07	0.376	0.795	6-FFt	0.758	0.224	0.740	0.740	0.506	0.000
0.91	0.91	90.10	0.419	0.824	6-FFt	0.758	0.247	0.740	0.740	0.590	0.000
1.04	1.04	90.14	0.463	0.858	6-FFt	0.758	0.269	0.740	0.740	0.674	0.000
1.17	1.17	90.17	0.507	0.895	6-FFt	0.758	0.290	0.740	0.740	0.759	0.000
1.29	1.29	90.22	0.550	0.936	6-FFt	0.758	0.310	0.740	0.740	0.843	0.000

```
*******************************************************************************
                              Straight Culvert
Inlet Elevation (invert): 89.28 m,    Outlet Elevation (invert): 89.25 m
          Culvert Length: 27.30 m,    Culvert Slope: 0.0011
*******************************************************************************
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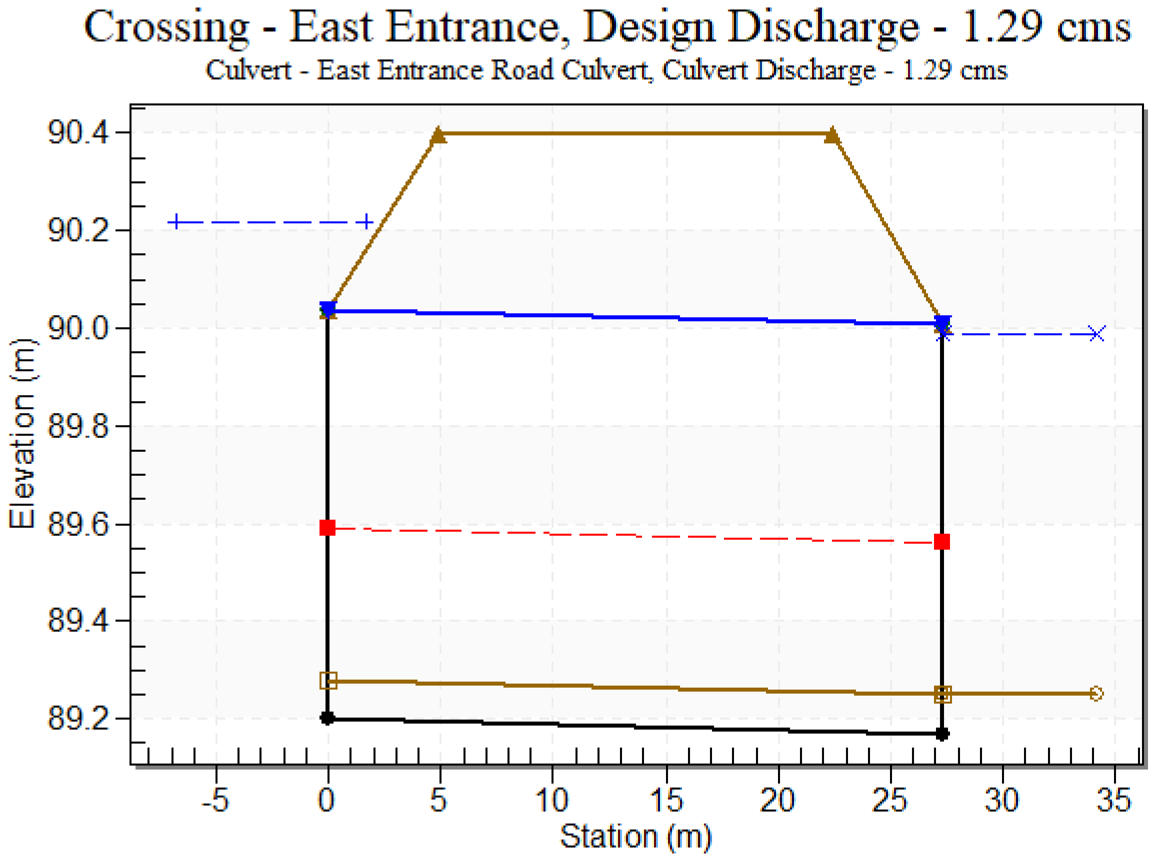
Water Surface Profile Plot for Culvert: East Entrance Road Culvert



Culvert Data Summary - East Entrance Road Culvert

Barrel Shape: Pipe Arch

Barrel Span: 1244.60 mm

Barrel Rise: 838.20 mm

Barrel Material: Steel or Aluminum

Embedment: 80.00 mm

Barrel Manning's n: 0.0240 (top and sides)

Manning's n: 0.0350 (bottom)

Culvert Type: Straight

Inlet Configuration: Projecting

Inlet Depression: None

HY-8 Culvert Analysis Report

Project Notes

Project Title:

Designer:

Project Date:Wednesday, July 7, 2021

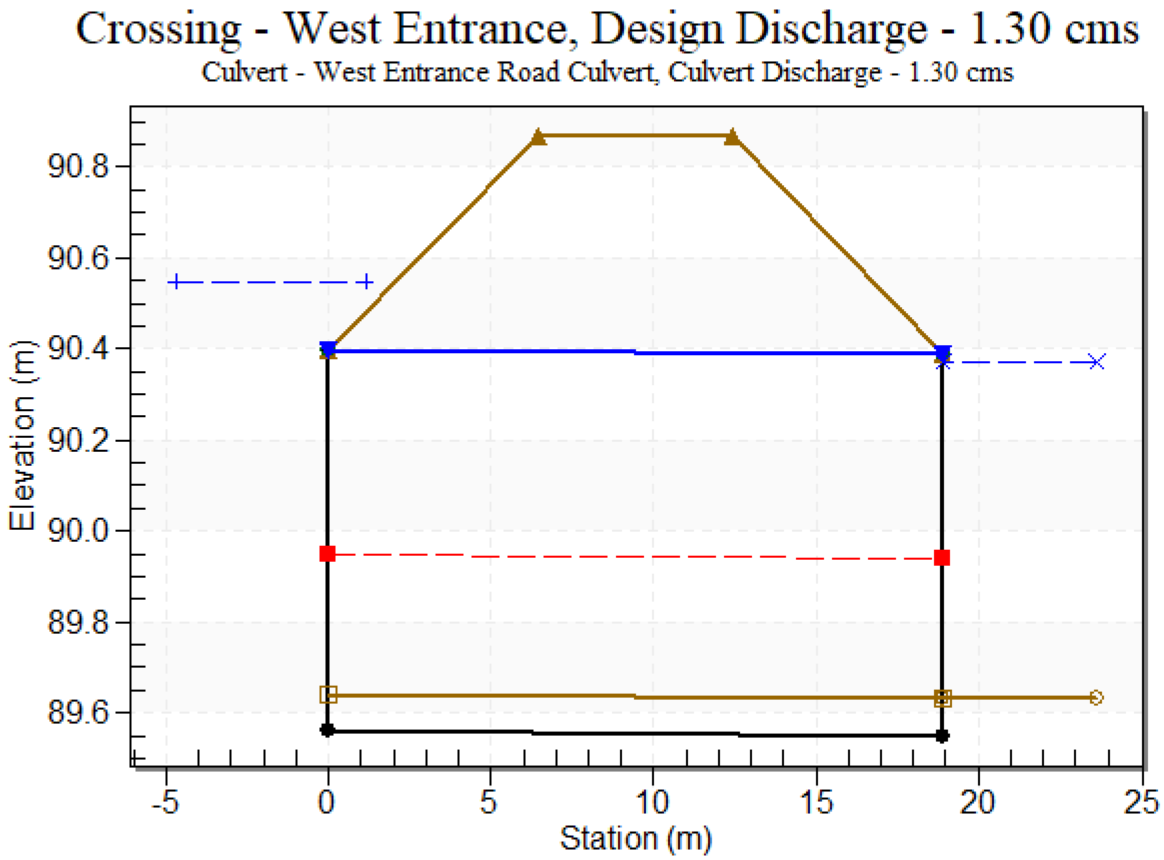
Notes:

Table 1 - Culvert Summary Table: West Entrance Road Culvert

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	90.37	0.000	0.730	0-NF	0.000	0.000	0.740	0.740	0.000	0.000
0.13	0.13	90.37	0.118	0.732	6-FFt	0.250	0.070	0.740	0.740	0.084	0.000
0.26	0.26	90.38	0.185	0.737	6-FFt	0.395	0.110	0.740	0.740	0.169	0.000
0.39	0.39	90.38	0.240	0.745	6-FFt	0.544	0.144	0.740	0.740	0.253	0.000
0.52	0.52	90.40	0.289	0.760	6-FFt	0.758	0.173	0.740	0.740	0.338	0.000
0.65	0.65	90.42	0.334	0.776	6-FFt	0.758	0.200	0.740	0.740	0.422	0.000
0.78	0.78	90.44	0.376	0.796	6-FFt	0.758	0.224	0.740	0.740	0.506	0.000
0.91	0.91	90.46	0.420	0.819	6-FFt	0.758	0.247	0.740	0.740	0.591	0.000
1.04	1.04	90.49	0.463	0.846	6-FFt	0.758	0.269	0.740	0.740	0.675	0.000
1.17	1.17	90.52	0.507	0.875	6-FFt	0.758	0.290	0.740	0.740	0.759	0.000
1.30	1.30	90.55	0.551	0.908	6-FFt	0.758	0.310	0.740	0.740	0.844	0.000

```
********************************************************************************
                              Straight Culvert
Inlet Elevation (invert): 89.64 m,    Outlet Elevation (invert): 89.63 m
             Culvert Length: 18.90 m,    Culvert Slope: 0.0005
********************************************************************************
```

Water Surface Profile Plot for Culvert: West Entrance Road Culvert



Culvert Data Summary - West Entrance Road Culvert

Barrel Shape: Pipe Arch

Barrel Span: 1244.60 mm

Barrel Rise: 838.20 mm

Barrel Material: Steel or Aluminum

Embedment: 80.00 mm

Barrel Manning's n: 0.0240 (top and sides)

Manning's n: 0.0350 (bottom)

Culvert Type: Straight

Inlet Configuration: Projecting

Inlet Depression: None

B

Appendix B-13-2

SITE CULVERT CALCULATION REPORTS
FREEFLOW OUTLET CONDITION

HY-8 Culvert Analysis Report

Project Notes

Project Title:

Designer:

Project Date:Wednesday, July 7, 2021

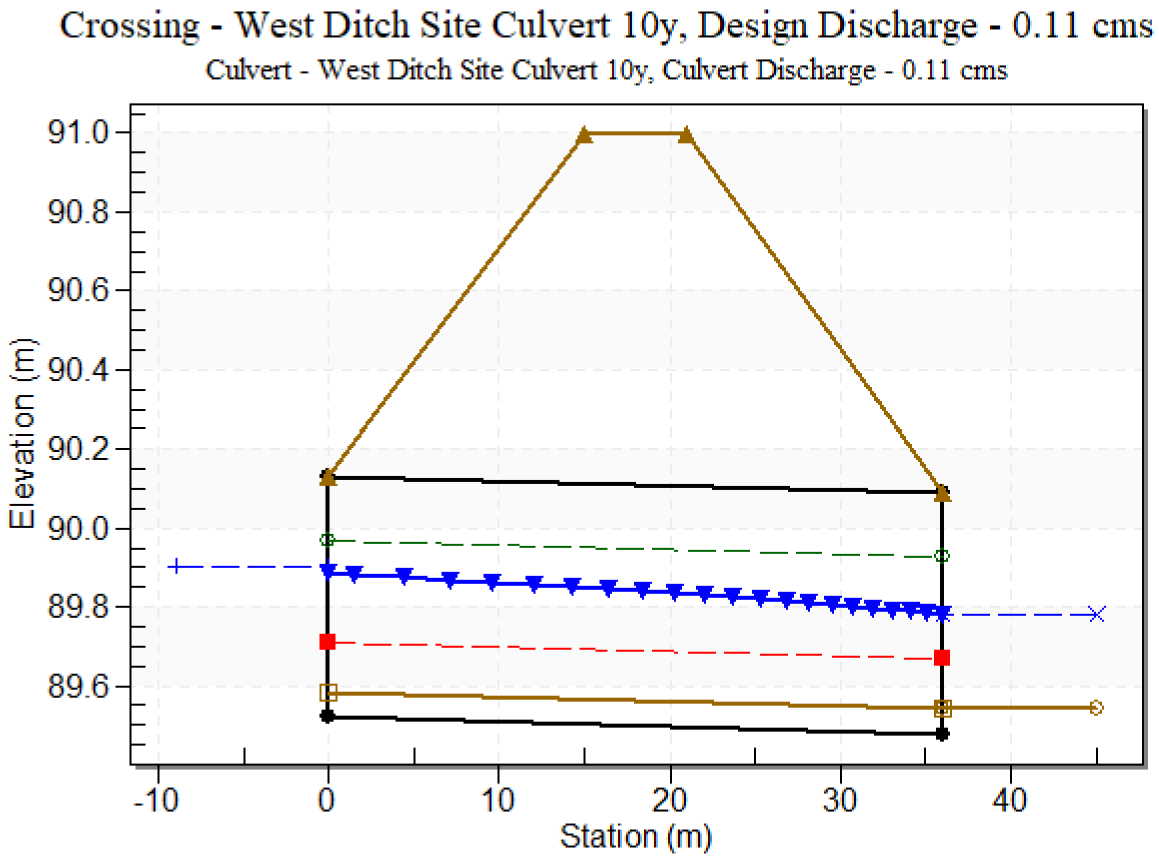
Notes:

Table 1 - Culvert Summary Table: West Ditch Site Culvert 10y

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	89.78	0.000	0.195	0-NF	0.000	0.000	0.236	0.240	0.000	0.000
0.02	0.02	89.79	0.075	0.204	3-M1t	0.129	0.044	0.236	0.240	0.114	0.000
0.05	0.05	89.81	0.119	0.227	3-M1t	0.199	0.069	0.236	0.240	0.228	0.000
0.07	0.07	89.84	0.154	0.256	3-M2t	0.261	0.090	0.236	0.240	0.341	0.000
0.09	0.09	89.87	0.186	0.287	3-M2t	0.321	0.109	0.236	0.240	0.455	0.000
0.11	0.11	89.90	0.213	0.317	3-M2t	0.382	0.125	0.236	0.240	0.561	0.000
0.14	0.14	89.94	0.242	0.351	3-M2t	0.480	0.141	0.236	0.240	0.683	0.000
0.16	0.16	89.97	0.267	0.382	3-M2t	0.545	0.156	0.236	0.240	0.796	0.000
0.18	0.18	90.00	0.290	0.414	3-M2t	0.545	0.170	0.236	0.240	0.910	0.000
0.21	0.21	90.03	0.311	0.445	3-M2t	0.545	0.183	0.236	0.240	1.024	0.000
0.23	0.23	90.06	0.333	0.477	3-M2t	0.545	0.196	0.236	0.240	1.138	0.000

```
********************************************************************************
                              Straight Culvert
 Inlet Elevation (invert): 89.58 m,    Outlet Elevation (invert): 89.54 m
           Culvert Length: 36.00 m,    Culvert Slope: 0.0011
********************************************************************************
```

Water Surface Profile Plot for Culvert: West Ditch Site Culvert 10y



Culvert Data Summary - West Ditch Site Culvert 10y

Barrel Shape: Pipe Arch

Barrel Span: 889.00 mm

Barrel Rise: 609.60 mm

Barrel Material: Steel or Aluminum

Embedment: 65.00 mm

Barrel Manning's n: 0.0250 (top and sides)

Manning's n: 0.0350 (bottom)

Culvert Type: Straight

Inlet Configuration: Mitered

Inlet Depression: None

HY-8 Culvert Analysis Report

Project Notes

Project Title:

Designer:

Project Date:Wednesday, July 7, 2021

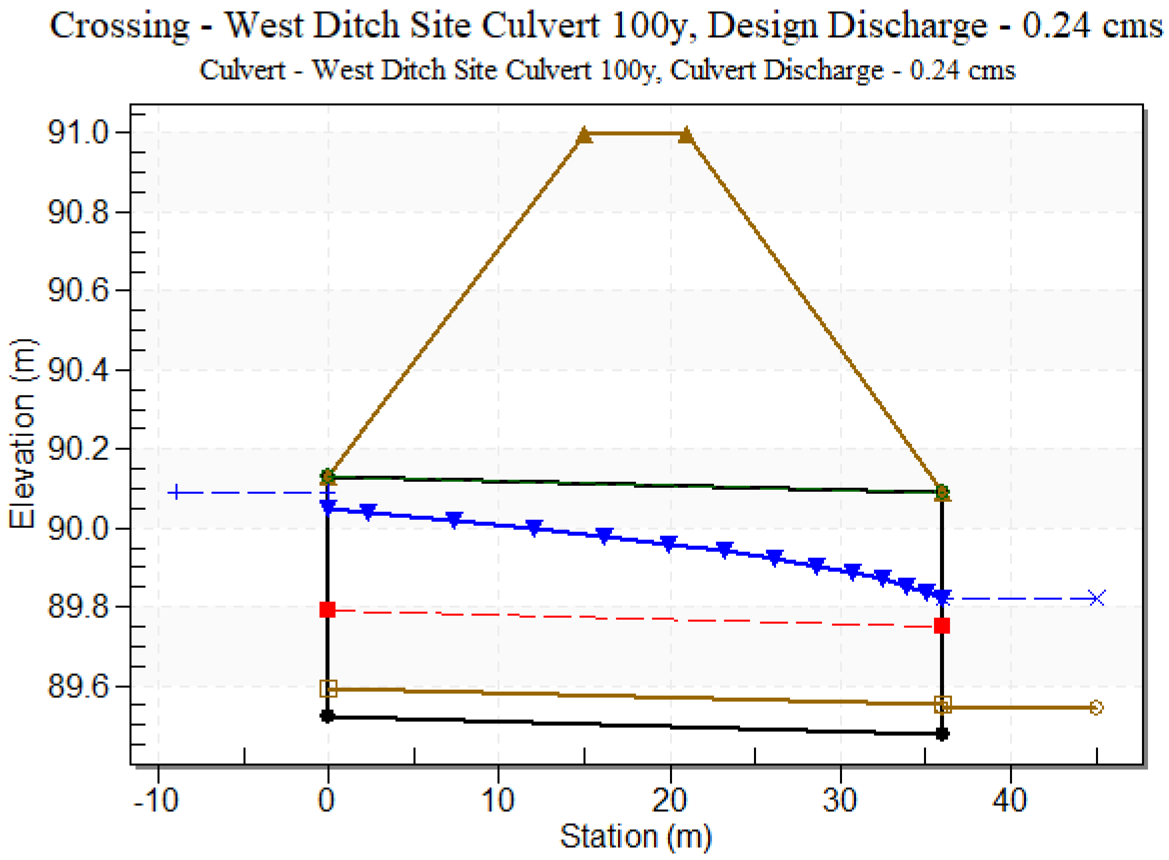
Notes:

Table 1 - Culvert Summary Table: West Ditch Site Culvert 100y

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	89.82	0.000	0.227	0-NF	0.000	0.000	0.268	0.280	0.000	0.000
0.02	0.02	89.83	0.078	0.234	3-M1t	0.132	0.045	0.268	0.280	0.105	0.000
0.05	0.05	89.84	0.122	0.252	3-M1t	0.204	0.071	0.268	0.280	0.209	0.000
0.07	0.07	89.87	0.159	0.277	3-M2t	0.268	0.093	0.268	0.280	0.314	0.000
0.10	0.10	89.90	0.191	0.305	3-M2t	0.333	0.112	0.268	0.280	0.419	0.000
0.12	0.12	89.93	0.221	0.336	3-M2t	0.406	0.129	0.268	0.280	0.523	0.000
0.14	0.14	89.96	0.248	0.367	3-M2t	0.537	0.145	0.268	0.280	0.628	0.000
0.17	0.17	89.99	0.274	0.398	3-M2t	0.537	0.160	0.268	0.280	0.733	0.000
0.19	0.19	90.02	0.297	0.430	3-M2t	0.537	0.174	0.268	0.280	0.837	0.000
0.22	0.22	90.06	0.320	0.462	3-M2t	0.537	0.187	0.268	0.280	0.942	0.000
0.24	0.24	90.09	0.343	0.496	3-M2t	0.537	0.200	0.268	0.280	1.047	0.000

```
********************************************************************************
                              Straight Culvert
        Inlet Elevation (invert): 89.59 m,    Outlet Elevation (invert): 89.55 m
                  Culvert Length: 36.00 m,    Culvert Slope: 0.0011
********************************************************************************
```

Water Surface Profile Plot for Culvert: West Ditch Site Culvert 100y



Culvert Data Summary - West Ditch Site Culvert 100y

Barrel Shape: Pipe Arch

Barrel Span: 889.00 mm

Barrel Rise: 609.60 mm

Barrel Material: Steel or Aluminum

Embedment: 73.00 mm

Barrel Manning's n: 0.0250 (top and sides)

Manning's n: 0.0350 (bottom)

Culvert Type: Straight

Inlet Configuration: Mitered

Inlet Depression: None

HY-8 Culvert Analysis Report

Project Notes

Project Title:

Designer:

Project Date:Wednesday, July 7, 2021

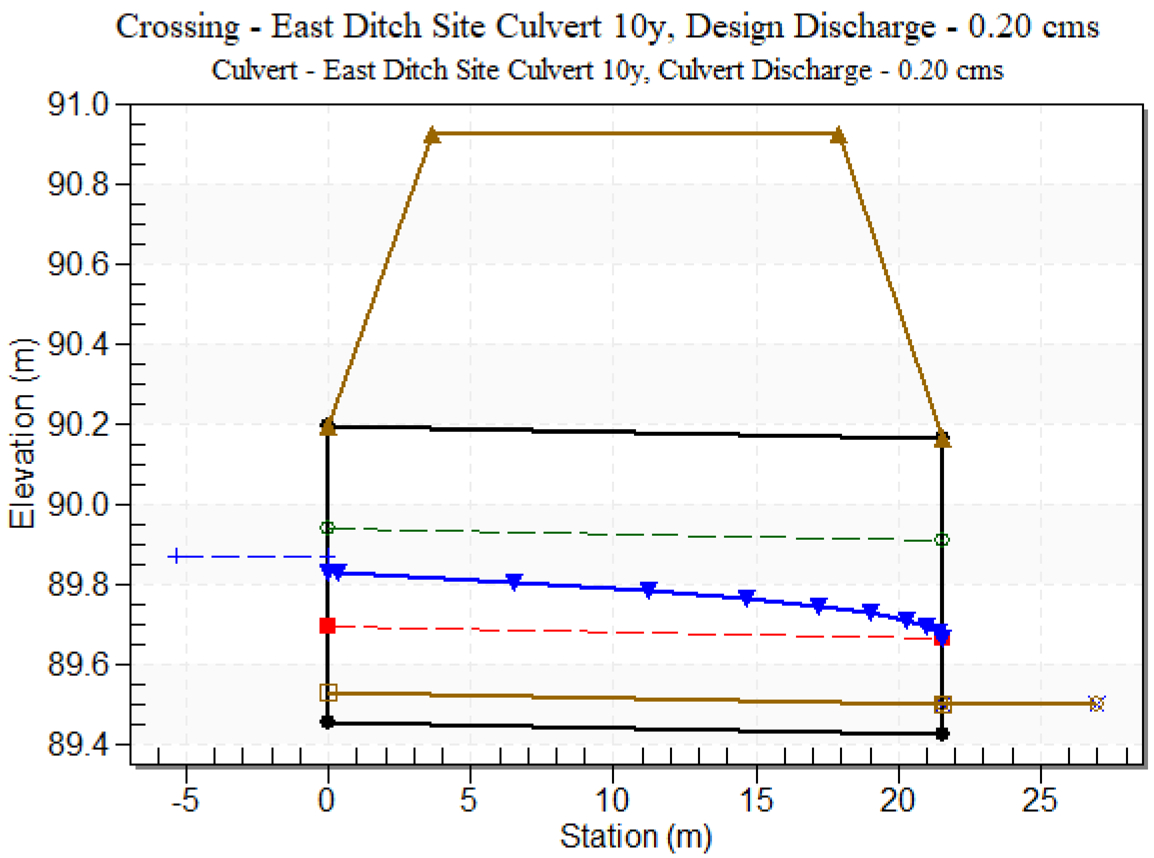
Notes:

Table 1 - Culvert Summary Table: East Ditch Site Culvert 10y

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	89.53	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
0.04	0.04	89.66	0.096	0.132	2-M2c	0.137	0.056	0.056	0.000	0.732	0.000
0.08	0.08	89.73	0.151	0.196	2-M2c	0.213	0.089	0.089	0.000	0.914	0.000
0.12	0.12	89.78	0.196	0.247	2-M2c	0.278	0.115	0.115	0.000	1.040	0.000
0.16	0.16	89.82	0.237	0.293	2-M2c	0.340	0.139	0.139	0.000	1.140	0.000
0.20	0.20	89.87	0.274	0.336	2-M2c	0.405	0.161	0.161	0.000	1.228	0.000
0.24	0.24	89.90	0.308	0.373	2-M2c	0.474	0.180	0.180	0.000	1.303	0.000
0.28	0.28	89.94	0.339	0.410	2-M2c	0.575	0.199	0.199	0.000	1.373	0.000
0.32	0.32	89.98	0.368	0.446	2-M2c	0.662	0.216	0.216	0.000	1.437	0.000
0.36	0.36	90.01	0.396	0.481	2-M2c	0.662	0.233	0.233	0.000	1.498	0.000
0.40	0.40	90.04	0.425	0.515	2-M2c	0.662	0.249	0.249	0.000	1.554	0.000

```
*********************************************************************************************
                              Straight Culvert
Inlet Elevation (invert): 89.53 m,    Outlet Elevation (invert): 89.50 m
            Culvert Length: 21.55 m,    Culvert Slope: 0.0014
*********************************************************************************************
```

Water Surface Profile Plot for Culvert: East Ditch Site Culvert 10y



Culvert Data Summary - East Ditch Site Culvert 10y

Barrel Shape: Pipe Arch

Barrel Span: 1066.80 mm

Barrel Rise: 736.60 mm

Barrel Material: Steel or Aluminum

Embedment: 75.00 mm

Barrel Manning's n: 0.0250 (top and sides)

Manning's n: 0.0300 (bottom)

Culvert Type: Straight

Inlet Configuration: Mitered

Inlet Depression: None

HY-8 Culvert Analysis Report

Project Notes

Project Title:

Designer:

Project Date:Wednesday, July 7, 2021

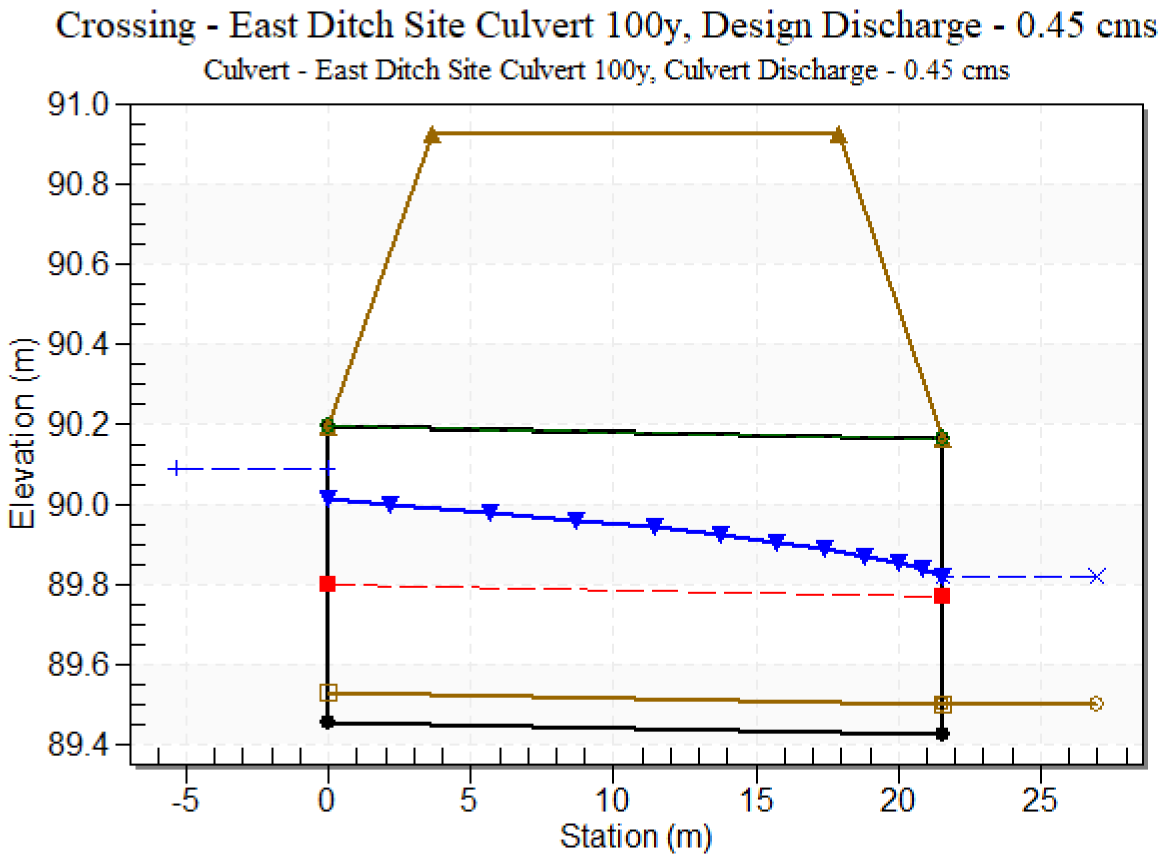
Notes:

Table 1 - Culvert Summary Table: East Ditch Site Culvert 100y

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	89.82	0.000	0.290	0-NF	0.000	0.000	0.320	0.320	0.000	0.000
0.04	0.04	89.82	0.103	0.295	3-M1t	0.147	0.060	0.320	0.320	0.135	0.000
0.09	0.09	89.84	0.162	0.309	3-M1t	0.228	0.095	0.320	0.320	0.270	0.000
0.13	0.13	89.86	0.211	0.330	3-M1t	0.299	0.124	0.320	0.320	0.405	0.000
0.18	0.18	89.89	0.254	0.356	3-M2t	0.369	0.149	0.320	0.320	0.540	0.000
0.22	0.22	89.92	0.293	0.386	3-M2t	0.443	0.172	0.320	0.320	0.675	0.000
0.27	0.27	89.95	0.330	0.418	3-M2t	0.536	0.193	0.320	0.320	0.811	0.000
0.31	0.31	89.98	0.362	0.452	3-M2t	0.662	0.213	0.320	0.320	0.946	0.000
0.36	0.36	90.02	0.394	0.486	3-M2t	0.662	0.232	0.320	0.320	1.081	0.000
0.40	0.40	90.05	0.426	0.521	3-M2t	0.662	0.250	0.320	0.320	1.216	0.000
0.45	0.45	90.09	0.457	0.556	3-M2t	0.662	0.267	0.320	0.320	1.351	0.000

```
************************************************************************************************
                                      Straight Culvert
        Inlet Elevation (invert): 89.53 m,    Outlet Elevation (invert): 89.50 m
                      Culvert Length: 21.55 m,    Culvert Slope: 0.0014
************************************************************************************************
```

Water Surface Profile Plot for Culvert: East Ditch Site Culvert 100y



Culvert Data Summary - East Ditch Site Culvert 100y

Barrel Shape: Pipe Arch

Barrel Span: 1066.80 mm

Barrel Rise: 736.60 mm

Barrel Material: Steel or Aluminum

Embedment: 75.00 mm

Barrel Manning's n: 0.0250 (top and sides)

Manning's n: 0.0300 (bottom)

Culvert Type: Straight

Inlet Configuration: Mitered

Inlet Depression: None

HY-8 Culvert Analysis Report

Project Notes

Project Title:

Designer:

Project Date:Wednesday, July 7, 2021

Notes:

Table 1 - Culvert Summary Table: Transfer Culvert 100y

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	89.50	0.000	0.200	0-NF	0.000	0.000	0.325	0.325	0.000	0.000
0.09	0.09	89.51	0.105	0.208	3-M1t	0.096	0.061	0.325	0.325	0.135	0.000
0.18	0.18	89.53	0.165	0.231	3-M1t	0.148	0.096	0.325	0.325	0.271	0.000
0.27	0.27	89.56	0.214	0.262	3-M1t	0.191	0.125	0.325	0.325	0.406	0.000
0.36	0.36	89.60	0.258	0.297	3-M1t	0.229	0.151	0.325	0.325	0.541	0.000
0.45	0.45	89.63	0.298	0.334	3-M1t	0.266	0.174	0.325	0.325	0.676	0.000
0.54	0.54	89.67	0.336	0.371	3-M1t	0.301	0.195	0.325	0.325	0.812	0.000
0.63	0.63	89.71	0.368	0.407	3-M2t	0.336	0.215	0.325	0.325	0.947	0.000
0.73	0.73	89.74	0.400	0.444	3-M2t	0.371	0.234	0.325	0.325	1.082	0.000
0.82	0.82	89.78	0.432	0.479	3-M2t	0.407	0.253	0.325	0.325	1.218	0.000
0.91	0.91	89.82	0.465	0.515	3-M2t	0.446	0.270	0.325	0.325	1.353	0.000

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

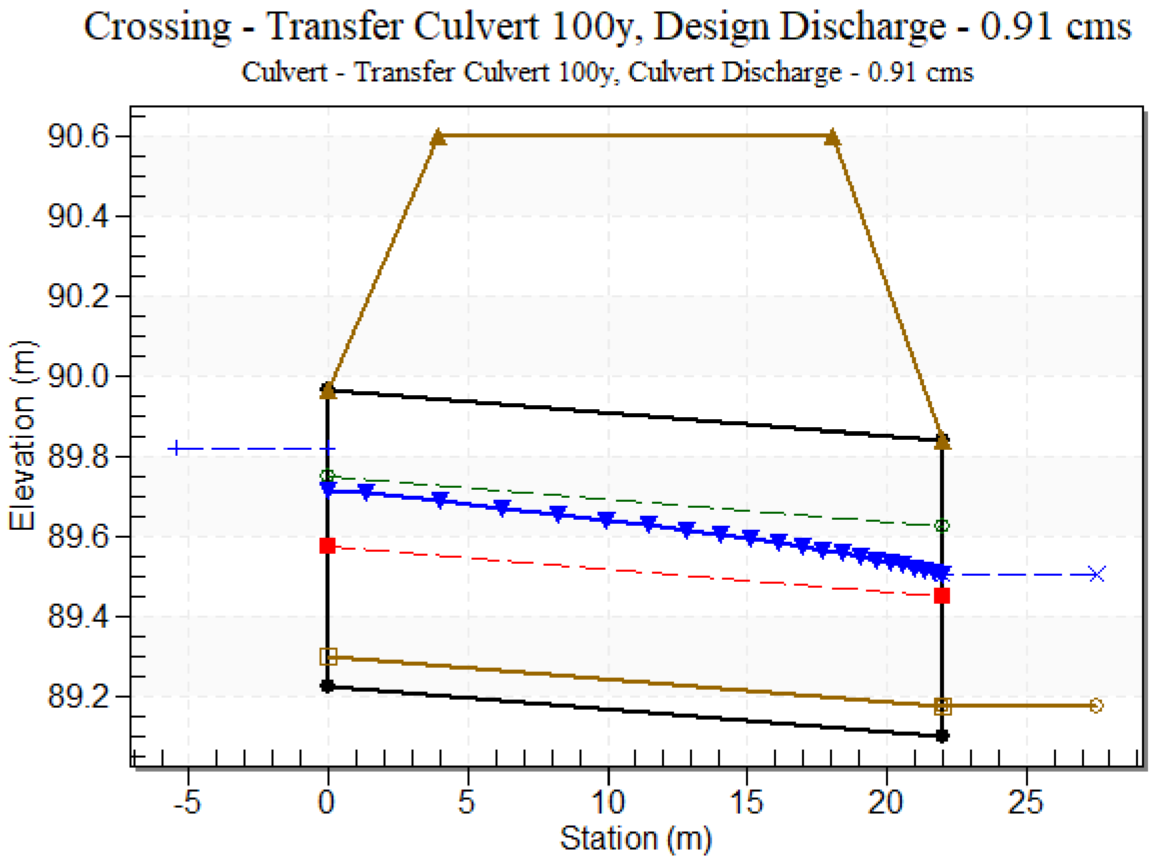
                                  Straight Culvert

     Inlet Elevation (invert): 89.30 m,    Outlet Elevation (invert): 89.18 m

              Culvert Length: 22.00 m,    Culvert Slope: 0.0057

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

Water Surface Profile Plot for Culvert: Transfer Culvert 100y



Culvert Data Summary - Transfer Culvert 100y

Barrel Shape: Pipe Arch

Barrel Span: 1066.80 mm

Barrel Rise: 736.60 mm

Barrel Material: Steel or Aluminum

Embedment: 75.00 mm

Barrel Manning's n: 0.0250 (top and sides)

Manning's n: 0.0300 (bottom)

Culvert Type: Straight

Inlet Configuration: Mitered

Inlet Depression: None

B

Appendix B-13-3

SITE CULVERT CALCULATION REPORTS SUBMERGED OUTLET CONDITION

HY-8 Culvert Analysis Report

Project Notes

Project Title:

Designer:

Project Date:Wednesday, July 7, 2021

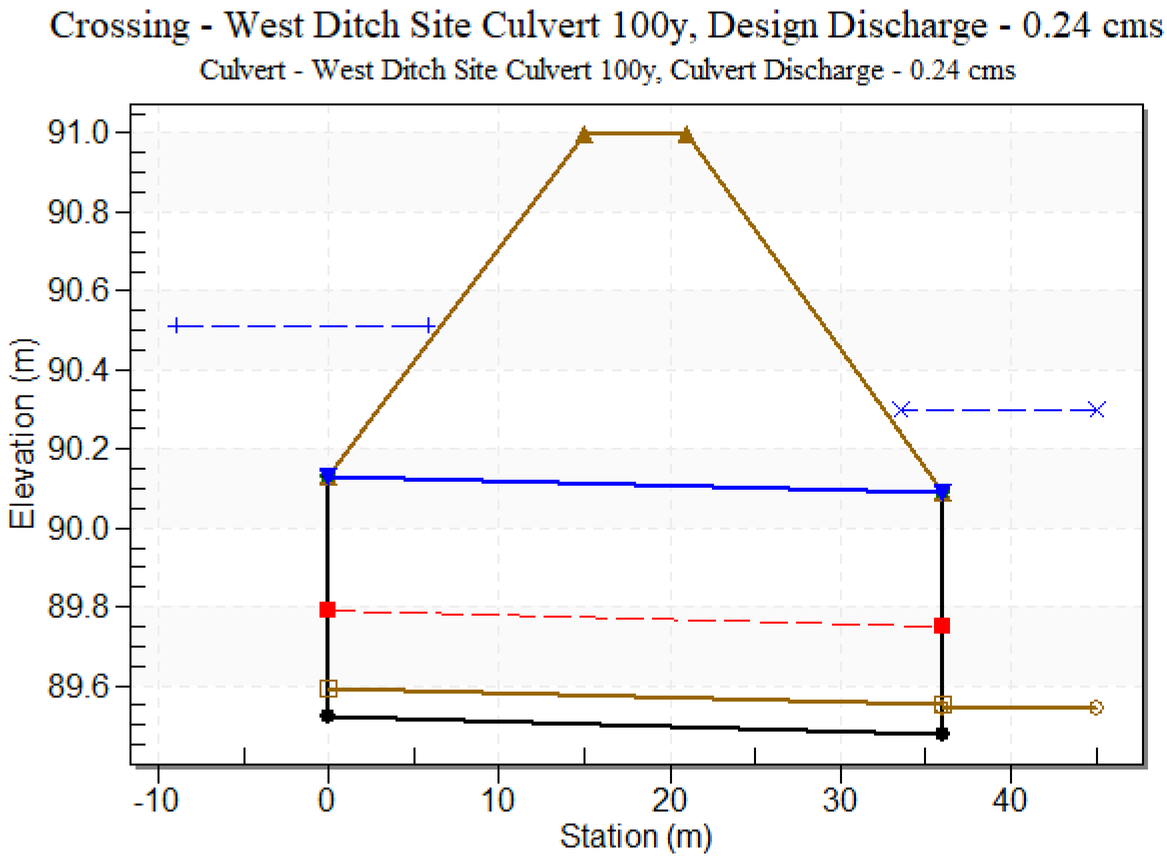
Notes:

Table 1 - Culvert Summary Table: West Ditch Site Culvert 100y

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	90.30	0.000	0.707	0-NF	0.000	0.000	0.537	0.760	0.000	0.000
0.02	0.02	90.30	0.078	0.709	4-FFf	0.132	0.045	0.537	0.760	0.062	0.000
0.05	0.05	90.31	0.122	0.716	4-FFf	0.204	0.071	0.537	0.760	0.124	0.000
0.07	0.07	90.32	0.159	0.725	4-FFf	0.268	0.093	0.537	0.760	0.186	0.000
0.10	0.10	90.33	0.191	0.738	4-FFf	0.333	0.112	0.537	0.760	0.248	0.000
0.12	0.12	90.35	0.221	0.754	4-FFf	0.406	0.129	0.537	0.760	0.310	0.000
0.14	0.14	90.38	0.248	0.787	4-FFf	0.537	0.145	0.537	0.760	0.371	0.000
0.17	0.17	90.41	0.274	0.815	4-FFf	0.537	0.160	0.537	0.760	0.433	0.000
0.19	0.19	90.44	0.297	0.846	4-FFf	0.537	0.174	0.537	0.760	0.495	0.000
0.22	0.22	90.47	0.320	0.881	4-FFf	0.537	0.187	0.537	0.760	0.557	0.000
0.24	0.24	90.51	0.343	0.920	4-FFf	0.537	0.200	0.537	0.760	0.619	0.000

```
*******************************************************************************
                              Straight Culvert
     Inlet Elevation (invert): 89.59 m,    Outlet Elevation (invert): 89.55 m
              Culvert Length: 36.00 m,    Culvert Slope: 0.0011
*******************************************************************************
```

Water Surface Profile Plot for Culvert: West Ditch Site Culvert 100y



Culvert Data Summary - West Ditch Site Culvert 100y

Barrel Shape: Pipe Arch

Barrel Span: 889.00 mm

Barrel Rise: 609.60 mm

Barrel Material: Steel or Aluminum

Embedment: 73.00 mm

Barrel Manning's n: 0.0250 (top and sides)

Manning's n: 0.0350 (bottom)

Culvert Type: Straight

Inlet Configuration: Mitered

Inlet Depression: None

HY-8 Culvert Analysis Report

Project Notes

Project Title:

Designer:

Project Date:Wednesday, July 7, 2021

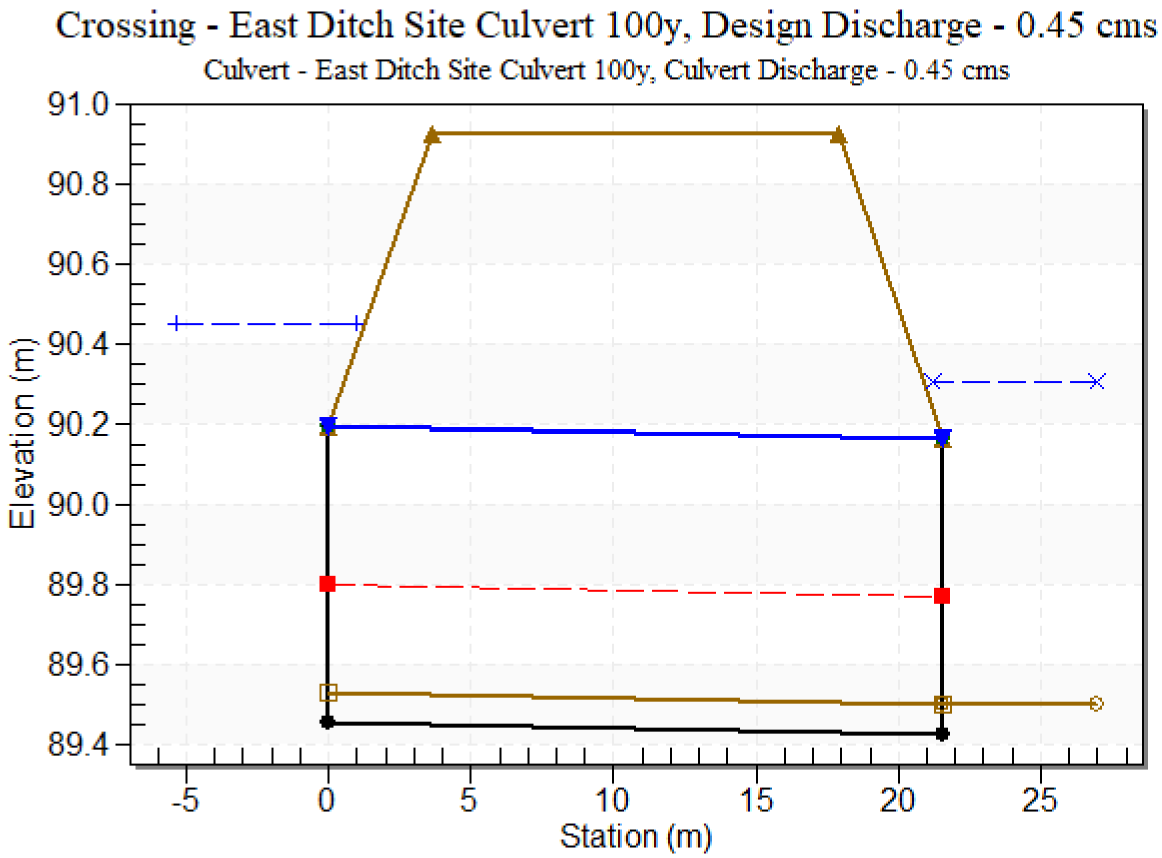
Notes:

Table 1 - Culvert Summary Table: East Ditch Site Culvert 100y

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	90.30	0.000	0.770	0-NF	0.000	0.000	0.662	0.800	0.000	0.000
0.04	0.04	90.30	0.103	0.772	4-FFf	0.147	0.060	0.662	0.800	0.077	0.000
0.09	0.09	90.31	0.162	0.776	4-FFf	0.228	0.095	0.662	0.800	0.154	0.000
0.13	0.13	90.31	0.211	0.783	4-FFf	0.299	0.124	0.662	0.800	0.231	0.000
0.18	0.18	90.32	0.254	0.793	4-FFf	0.369	0.149	0.662	0.800	0.308	0.000
0.22	0.22	90.34	0.293	0.805	4-FFf	0.443	0.172	0.662	0.800	0.385	0.000
0.27	0.27	90.35	0.330	0.820	4-FFf	0.536	0.193	0.662	0.800	0.462	0.000
0.31	0.31	90.37	0.362	0.843	4-FFf	0.662	0.213	0.662	0.800	0.539	0.000
0.36	0.36	90.39	0.394	0.865	4-FFf	0.662	0.232	0.662	0.800	0.616	0.000
0.40	0.40	90.42	0.426	0.889	4-FFf	0.662	0.250	0.662	0.800	0.694	0.000
0.45	0.45	90.45	0.457	0.917	4-FFf	0.662	0.267	0.662	0.800	0.771	0.000

```
*******************************************************************************
                              Straight Culvert
   Inlet Elevation (invert): 89.53 m,    Outlet Elevation (invert): 89.50 m
               Culvert Length: 21.55 m,    Culvert Slope: 0.0014
*******************************************************************************
```

Water Surface Profile Plot for Culvert: East Ditch Site Culvert 100y



Culvert Data Summary - East Ditch Site Culvert 100y

Barrel Shape: Pipe Arch

Barrel Span: 1066.80 mm

Barrel Rise: 736.60 mm

Barrel Material: Steel or Aluminum

Embedment: 75.00 mm

Barrel Manning's n: 0.0250 (top and sides)

Manning's n: 0.0300 (bottom)

Culvert Type: Straight

Inlet Configuration: Mitered

Inlet Depression: None

HY-8 Culvert Analysis Report

Project Notes

Project Title:

Designer:

Project Date:Wednesday, July 7, 2021

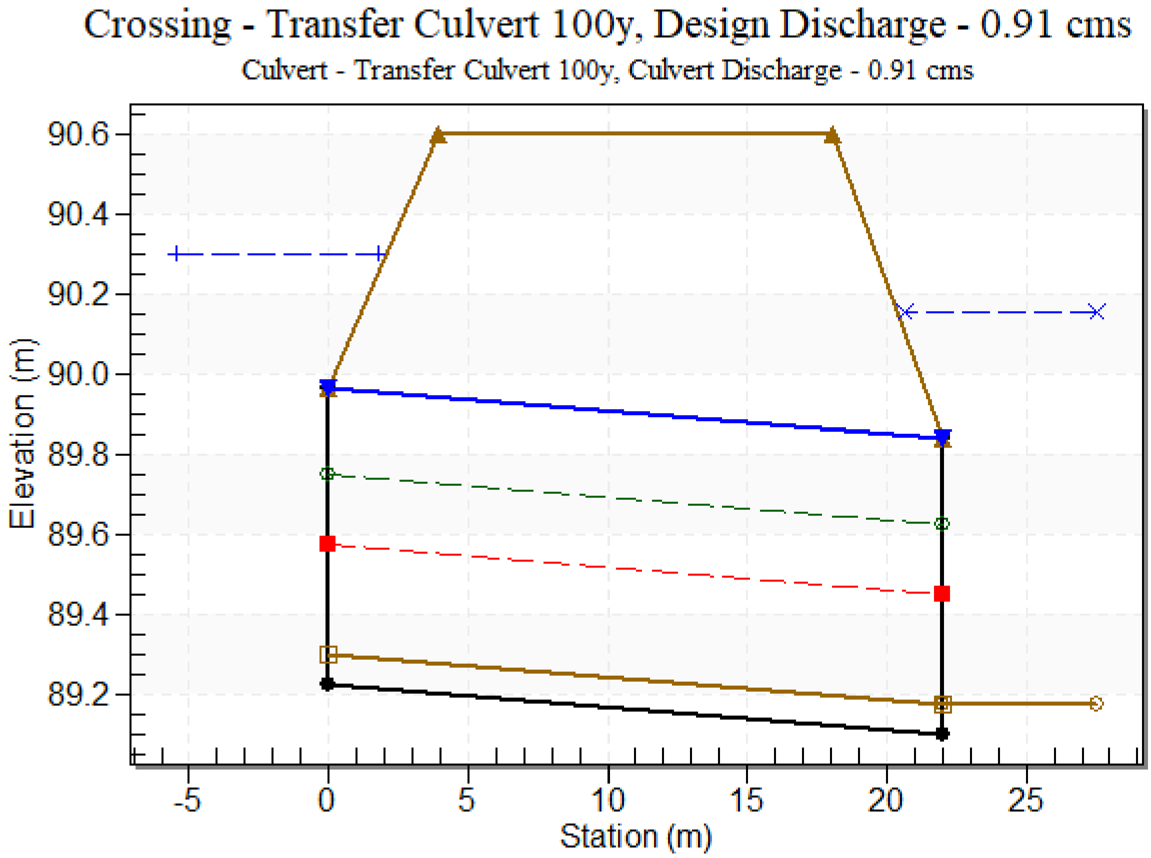
Notes:

Table 1 - Culvert Summary Table: Transfer Culvert 100y

Total Discharge (cms)	Culvert Discharge (cms)	Headwater Elevation (m)	Inlet Control Depth (m)	Outlet Control Depth (m)	Flow Type	Normal Depth (m)	Critical Depth (m)	Outlet Depth (m)	Tailwater Depth (m)	Outlet Velocity (m/s)	Tailwater Velocity (m/s)
0.00	0.00	90.15	0.000	0.850	0-NF	0.000	0.000	0.662	0.975	0.000	0.000
0.09	0.09	90.15	0.105	0.852	4-FFf	0.096	0.061	0.662	0.975	0.078	0.000
0.18	0.18	90.16	0.165	0.856	4-FFf	0.148	0.096	0.662	0.975	0.157	0.000
0.27	0.27	90.16	0.214	0.864	4-FFf	0.191	0.125	0.662	0.975	0.235	0.000
0.36	0.36	90.17	0.258	0.875	4-FFf	0.229	0.151	0.662	0.975	0.313	0.000
0.45	0.45	90.19	0.298	0.888	4-FFf	0.266	0.174	0.662	0.975	0.392	0.000
0.54	0.54	90.20	0.336	0.905	4-FFf	0.301	0.195	0.662	0.975	0.470	0.000
0.63	0.63	90.22	0.368	0.924	4-FFf	0.336	0.215	0.662	0.975	0.548	0.000
0.73	0.73	90.25	0.400	0.946	4-FFf	0.371	0.234	0.662	0.975	0.627	0.000
0.82	0.82	90.27	0.432	0.971	4-FFf	0.407	0.253	0.662	0.975	0.705	0.000
0.91	0.91	90.30	0.465	0.997	4-FFf	0.446	0.270	0.662	0.975	0.784	0.000

```
********************************************************************************
                              Straight Culvert
   Inlet Elevation (invert): 89.30 m,    Outlet Elevation (invert): 89.18 m
             Culvert Length: 22.00 m,    Culvert Slope: 0.0057
********************************************************************************
```

Water Surface Profile Plot for Culvert: Transfer Culvert 100y



Culvert Data Summary - Transfer Culvert 100y

Barrel Shape: Pipe Arch

Barrel Span: 1066.80 mm

Barrel Rise: 736.60 mm

Barrel Material: Steel or Aluminum

Embedment: 75.00 mm

Barrel Manning's n: 0.0250 (top and sides)

Manning's n: 0.0300 (bottom)

Culvert Type: Straight

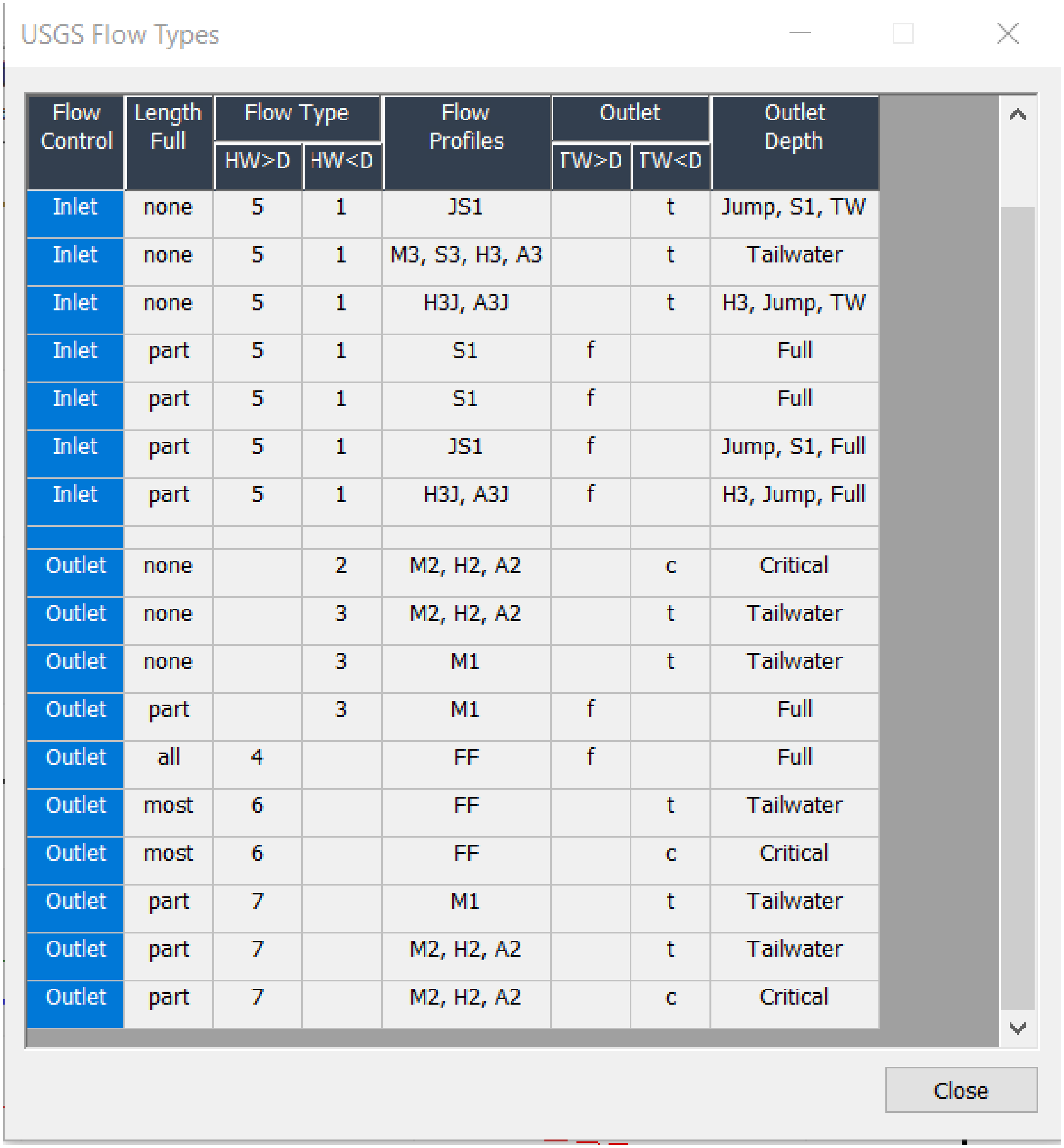
Inlet Configuration: Mitered

Inlet Depression: None

B

Appendix B-13-4
CULVERT FLOW PROFILE TYPES

Fastfrate Site Servicing Report
Appendix B-13-4 - Summary of flow types.



Flow Control	Length Full	Flow Type		Flow Profiles	Outlet		Outlet Depth
		HW>D	HW<D		TW>D	TW<D	
Inlet	none	5	1	JS1		t	Jump, S1, TW
Inlet	none	5	1	M3, S3, H3, A3		t	Tailwater
Inlet	none	5	1	H3J, A3J		t	H3, Jump, TW
Inlet	part	5	1	S1	f		Full
Inlet	part	5	1	S1	f		Full
Inlet	part	5	1	JS1	f		Jump, S1, Full
Inlet	part	5	1	H3J, A3J	f		H3, Jump, Full
Outlet	none		2	M2, H2, A2		c	Critical
Outlet	none		3	M2, H2, A2		t	Tailwater
Outlet	none		3	M1		t	Tailwater
Outlet	part		3	M1	f		Full
Outlet	all	4		FF	f		Full
Outlet	most	6		FF		t	Tailwater
Outlet	most	6		FF		c	Critical
Outlet	part	7		M1		t	Tailwater
Outlet	part	7		M2, H2, A2		t	Tailwater
Outlet	part	7		M2, H2, A2		c	Critical

B

Appendix B-14
DITCH CALCULATION REPORTS

CIMA+

Hydraulic Analysis Report

Project Data

Project Title: A001183 - Fastfrate Swales

Designer:

Project Date: Wednesday, June 6, 2022

Project Units: SI Units (Metric)

Notes:

Channel Analysis: Channel West_100y

Notes:

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 4.5000 m/m

Side Slope 2 (Z2): 3.0000 m/m

Channel Width 1.00 m

Longitudinal Slope: 0.0010 m/m

Manning's n: 0.0300

Flow 0.2310 cms

Result Parameters

Depth 0.3050 m

Area of Flow 0.6539 m^2

Wetted Perimeter 3.3707 m

Hydraulic Radius 0.1940 m

Average Velocity 0.3533 m/s

Top Width 3.2877 m

Froude Number: 0.2528

Critical Depth 0.1455 m

Critical Velocity 1.0273 m/s

Critical Slope: 0.0190 m/m

Critical Top Width 2.09 m

Calculated Max Shear Stress 2.9899 N/m^2

Calculated Avg Shear Stress 1.9017 N/m^2

Channel Analysis: Channel West_10y

Notes:

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 4.5000 m/m

Side Slope 2 (Z2): 3.0000 m/m

Channel Width 1.00 m

Longitudinal Slope: 0.0010 m/m

Manning's n: 0.0300

Flow 0.1140 cms

Result Parameters

Depth 0.2158 m

Area of Flow 0.3903 m^2

Wetted Perimeter 2.6769 m

Hydraulic Radius 0.1458 m

Average Velocity 0.2921 m/s

Top Width 2.6182 m

Froude Number: 0.2415

Critical Depth 0.0967 m

Critical Velocity 0.8656 m/s

Critical Slope: 0.0212 m/m

Critical Top Width 1.72 m

Calculated Max Shear Stress 2.1149 N/m^2

Calculated Avg Shear Stress 1.4293 N/m^2

Channel Analysis: Channel East_100y

Notes:

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 3.0000 m/m

Side Slope 2 (Z2): 3.0000 m/m

Channel Width 1.00 m

Longitudinal Slope: 0.0010 m/m

Manning's n: 0.0300

Flow 0.4453 cms

Result Parameters

Depth 0.4381 m

Area of Flow 1.0139 m^2

Wetted Perimeter 3.7708 m

Hydraulic Radius 0.2689 m

Average Velocity 0.4392 m/s

Top Width 3.6286 m

Froude Number: 0.2652

Critical Depth 0.2177 m

Critical Velocity 1.2374 m/s

Critical Slope: 0.0171 m/m

Critical Top Width 2.31 m

Calculated Max Shear Stress 4.2944 N/m^2

Calculated Avg Shear Stress 2.6357 N/m^2

Channel Analysis: Channel East_10y

Notes:

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 3.0000 m/m

Side Slope 2 (Z2): 3.0000 m/m

Channel Width 1.00 m

Longitudinal Slope: 0.0010 m/m

Manning's n: 0.0300

Flow 0.2226 cms

Result Parameters

Depth 0.3138 m

Area of Flow 0.6092 m^2

Wetted Perimeter 2.9846 m

Hydraulic Radius 0.2041 m

Average Velocity 0.3654 m/s

Top Width 2.8827 m

Froude Number: 0.2537

Critical Depth 0.1470 m

Critical Velocity 1.0509 m/s

Critical Slope: 0.0189 m/m

Critical Top Width 1.88 m

Calculated Max Shear Stress 3.0758 N/m^2

Calculated Avg Shear Stress 2.0007 N/m^2

B

Appendix B-15

SITE STORAGE VOLUME CALCULATIONS

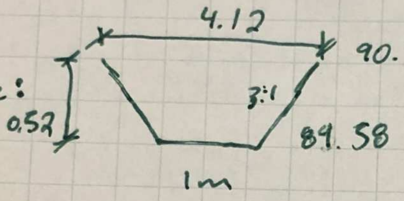
CIMA+

Project Fastfrate
By Julien Sauvé
Date 21-07-23
Subject Total Volume Calculation
By
Date
File
Page of

Main Pond: Area @ 89.5 = 946 m^2 ⎫ $1050.5m^2 \times 0.6m = \boxed{630m^3}$
Area @ 90.1 = 1155 m^2 ⎭
0.6m

Small Pond: Area @ 89.5 = 181 m^2 ⎫ $230.5m^2 \times 0.6m = \boxed{138m^3}$
@ 90.1 = 280 m^2 ⎭

Western Swale:



$0.52m^2 + 0.81m^2 = 1.33m^2$

$0.38m^2 + 0.44m^2 = 0.82m^2$

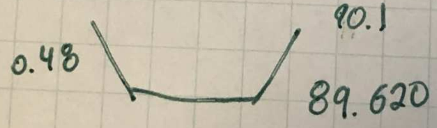
$L = 131m \times \left(\frac{1.33+0.82}{2}\right) = \boxed{141m^3}$

Central Swale:

$0.58m^2 + 1m^2 = 1.58m^2$

$L = 47m \times 1.58m^2 = \boxed{74m^3}$

Eastern Swale



$0.48m^2 + 0.69m^2 = 1.17m^2$

$L = 189m \times 1.17m^2 = \boxed{221m^3}$

Detention Volume:

Main Pond
895 = 946 m^2 ⎫ $\boxed{182m^3}$
89.3 = 871 m^2 ⎭

Small Pond
89.5 = 181 m^2 ⎫ $\boxed{33.3m^3}$
89.3 = 152 m^2 ⎭

Total Volume

$= \underline{1419\ m^3}$

B

Appendix B-16

CULVERT ENDS (ROADSIDE SAFETY ASSESSMENT)

Input - Printable

Project Name:	Fastfrate Warehouse Development - East Entrance
Name of Analyst:	Jaymeson Adams, P.Eng.

Unadjusted Obstacle's Offset from the Travelled Lane		4.95	m
Design Speed of the Road		60	km/h
Encroachment Rate		0.00045	enc/km/yr/vpd
Initial Year		2022	
Project Life		50	yr
Discount Rate		5.0	%
Choose one of:	Initial Year AADT	400	vpd
	Design Year AADT	0	vpd
Which Costing System is to be used?		MTO 2011	
Traffic Growth Rate		3.0	%
One-Way Highway or Two-Way Highway		Two-Way Highway	
Divided or Undivided		Undivided	
Number of Lanes		2	
Lane Width		3.6	m
Directional Split (Adjacent)		50	%
Severity Index of Upstream Side of Obstacle		2.5	
Severity Index of Upstream Corner of Obstacle		2.6	
Severity Index of Face of Obstacle		2.5	
Severity Index of Downstream Side of Obstacle		0	
Severity Index of Downstream Corner of Obstacle		0	

Location of Obstacle		Shoulder	
Width of Obstacle		3.03	m
Length of Obstacle		2.92	m
Swath Width of Vehicle		3.6	m
Grade		0.4	%
Radius of Curvature		0	m
Shoulder Width		0	m
Distance Between Edge of Shoulder and Beginning of Slope		0	m
Slope 1		-0.02	
	for a horizontal distance of	2.48	m
Distance Between Base Slope 1 and Edge Slope 2		0	m
Slope 2		0.4	
	for a horizontal distance of	2.47	m
Distance Between Base Slope 2 and Edge Slope 3		0	m
Slope 3		0	
	for a horizontal distance of	0	m
Distance Between End of Slope and Obstacle		0	m
*Average Damage Repair Cost of Feature after collision for:			
	upstream side	$ 30,000.00	/collision
	upstream corner	$ 30,000.00	/collision
	face	$ 30,000.00	/collision
	downstream side	$ 30,000.00	/collision
	downstream corner	$ 30,000.00	/collision

OPTION 1

Method of Improvement		Install SBGR	
*Obstacle's Offset from the Travelled Lane		2.48	m
*Width of Obstacle		0.2	m
*Length of Obstacle		5.9	m
Grade		0.4	%
Radius of Curvature		0	m
*Shoulder Width		0	m
Distance Between Edge of Shoulder and Beginning of Slope		0	m
Slope 1		0	
For a horizontal distance of		0	m
Distance Between Base Slope 1 and Edge Slope 2		0	m
Slope 2		0	
For a horizontal distance of		0	m
Distance Between Base Slope 2 and Edge Slope 3		0	m
Slope 3		0	
For a horizontal distance of		0	m
Distance Between End of Slope and Obstacle		0	m
*Severity Index of Upstream Side of Obstacle		2.3	
*Severity Index of Upstream Corner		2.3	
*Severity Index of Face of Obstacle		2.3	
*Severity Index of Downstream Side of Obstacle		2.3	
*Severity Index of Downstream Corner of Obstacle		2.3	
*Installation Cost		$ 800.00	
*Average Damage Repair Cost of improvement option after collision for:			
	upstream side	$ 400.00	/collision
	upstream corner	$ 400.00	/collision
	face	$ 800.00	/collision
	downstream side	$ 400.00	/collision
	downstream corner	$ 400.00	/collision
Annual Maintenance Cost		$ 80.00	/yr
Salvage Value of Studied Feature		$ -	

OPTION

Method of Improvement		0	
*Obstacle's Offset from the Travelled Lane		0	m
*Width of Obstacle		0	m
*Length of Obstacle		0	m
Grade		0.0	%
Radius of Curvature		0	m
Shoulder Width		0	m
Distance Between Edge of Shoulder and Beginning of Slope		0	m
Slope 1		0	
For a horizontal distance of		0	m
Distance Between Base Slope 1 and Edge Slope 2		0	m
Slope 2		0	
For a horizontal distance of		0	m
Distance Between Base Slope 2 and Edge Slope 3		0	m
Slope 3		0	
For a horizontal distance of		0	m
Distance Between End of Slope and Obstacle		0	m
*Severity Index of Upstream Side of Obstacle		0	
*Severity Index of Upstream Corner		0	
*Severity Index of Face of Obstacle		0	
*Severity Index of Downstream Side of Obstacle		0	
*Severity Index of Downstream Corner of Obstacle		0	
*Installation Cost		$ -	
*Average Damage Repair Cost of improvement option after collision for:			
	upstream side	$ -	/collision
	upstream corner	$ -	/collision
	face	$ -	/collision
	downstream side	$ -	/collision
	downstream corner	$ -	/collision
Annual Maintenance Cost		$ -	/yr
Salvage Value of Studied Feature		$ -	

Output (Separated) - Printable

Project Name: Fastfrate Warehouse Development - East Entrance
Name of Analyst: Jaymeson Adams, P.Eng.

BASE CASE Do Nothing

For the Direction Being Considered		
Initial AADT is:	200	vpd
Initial Encroachment Rate is :	0.09	enc/yr/km
The number of impacts with the upstream side is:	0.00002	impacts/yr
The number of impacts with the upstream corner is:	0.00007	impacts/yr
The number of impacts with the face from adjacent traffic is:	0.00002	impacts/yr
The number of impacts with the downstream side is:	0.00000	impacts/yr
The number of impacts with the downstream corner is:	0.00002	impacts/yr
The number of impacts with the face due to opposing traffic is:	0.00001	impacts/yr
CFTA	0.00012	
CFTO	0.00003	
Initial Collision Frequency:	0.00015	
Expected Impacts over Project Life:	0.01685	
Project Life:	50	

Average Cost per Impact		
upstream side:	$	25,047.48
upstream corner :	$	27,603.08
face:	$	25,047.48
downstream side:	-$	1,697.90
downstream corner:	-$	1,697.90

Cost Analysis

	Total		**Annual**	
Total Present Worth :	$	124.49	$	6.82
Accident Costs :	$	101.27	$	5.55
Installation Cost :	$	-	$	-
Accident Repair Costs :	$	23.22	$	1.27
Annual Maintenance Cost :	$	-	$	-
Salvage Value :	$	-	$	-

Option 1 Install SBGR

For the Direction Being Considered		
Initial AADT is:	200	vpd
Initial Encroachment Rate is :	0.09	enc/yr/km
The number of impacts with the upstream side is:	0.00001	impacts/yr
The number of impacts with the upstream corner is:	0.00032	impacts/yr
The number of impacts with the face from adjacent traffic is:	0.00019	impacts/yr
The number of impacts with the downstream side is:	0.00000	impacts/yr
The number of impacts with the downstream corner is:	0.00011	impacts/yr
The number of impacts with the face due to opposing traffic is:	0.00006	impacts/yr
CFTA	0.00052	
CFTO	0.00017	
Initial Collision Frequency:	0.00069	
Expected Impacts over Project Life:	0.07760	
Project Life:	50	

Average Cost per Impact		
upstream side:	$	20,555.13
upstream corner :	$	20,555.13
face:	$	20,555.13
downstream side:	$	20,555.13
downstream corner:	$	20,555.13

Cost Analysis

	Total		**Annual**	
Total Present Worth :	$	2,708.17	$	148.34
Accident Costs :	$	447.18	$	24.49
Installation Cost :	$	800.00	$	43.82
Accident Repair Costs :	$	0.52	$	0.03
Annual Maintenance Cost :	$	1,460.47	$	80.00
Salvage Value :	$	-	$	-

Option 0

For the Direction Being Considered		
Initial AADT is:	200	vpd
Initial Encroachment Rate is :	0.09	enc/yr/km
The number of impacts with the upstream side is:	0.00018	impacts/yr
The number of impacts with the upstream corner is:	0.00073	impacts/yr
The number of impacts with the face from adjacent traffic is:	0.00000	impacts/yr
The number of impacts with the downstream side is:	0.00000	impacts/yr
The number of impacts with the downstream corner is:	0.00022	impacts/yr
The number of impacts with the face due to opposing traffic is:	0.00000	impacts/yr
CFTA	0.00090	
CFTO	0.00022	
Initial Collision Frequency:	0.00113	
Expected Impacts over Project Life:	0.12714	
Project Life:	50	

Average Cost per Impact		
upstream side:	-$	1,697.90
upstream corner :	-$	1,697.90
face:	-$	1,697.90
downstream side:	-$	1,697.90
downstream corner:	-$	1,697.90

Cost Analysis

	Total		**Annual**	
Total Present Worth :	-$	60.52	-$	3.32
Accident Costs :	-$	60.52	-$	3.32
Installation Cost :	$	-	$	-
Accident Repair Costs :	$	-	$	-
Annual Maintenance Cost :	$	-	$	-
Salvage Value :	$	-	$	-

Summary of Benefits and Costs

Option 1	Install SBGR	
Net Costs	$	800.00
Total Benefits	-$	1,783.68
Net Present Value	-$	2,583.68
Benefit/Cost Ratio		-2.23
Change in Total Impacts		0.06

Option	0	
Net Costs	$	-
Total Benefits	$	185.01
Net Present Value	$	185.01
Benefit/Cost Ratio		#DIV/0!
Change in Total Impacts		0.11

Output (Comparison) - Printable

Project Name: Fastfrate Warehouse Development - East Entrance
Name of Analyst: Jaymeson Adams, P.Eng.

	Do Nothing		OPTION 1		OPTION	
The Number of impacts with			Install SBGR		0	
the upstream side is:	0.00002	impacts/yr	0.00001	impacts/yr	0.00018	impacts/yr
the upstream corner is:	0.00007	impacts/yr	0.00032	impacts/yr	0.00073	impacts/yr
the face from adjacent traffic is:	0.00002	impacts/yr	0.00019	impacts/yr	0.00000	impacts/yr
the downstream side is:	0.00000	impacts/yr	0.00000	impacts/yr	0.00000	impacts/yr
the downstream corner is:	0.00002	impacts/yr	0.00011	impacts/yr	0.00022	impacts/yr
the face due to opposing traffic is:	0.00001	impacts/yr	0.00006	impacts/yr	0.00000	impacts/yr

Cost Analysis

	Total	Annual	Total	Annual	Total	Annual
Total Present Worth :	$ 124.49	$ 6.82	$ 2,708.17	$ 148.34	-$ 60.52	-$ 3.32
Accident Costs :	$ 101.27	$ 5.55	$ 447.18	$ 24.49	-$ 60.52	-$ 3.32
Installation Cost :	$ -	$ -	$ 800.00	$ 43.82	$ -	$ -
Accident Repair Costs :	$ 23.22	$ 1.27	$ 0.52	$ 0.03	$ -	$ -
Annual Maintenance Cost :	$ -	$ -	$ 1,460.47	$ 80.00	$ -	$ -
Salvage Value :	$ -	$ -	$ -	$ -	$ -	$ -

CFTA	0.00012	0.00052	0.00090
CFTO	0.00003	0.00017	0.00022
Initial Collision Frequency:	0.00015	0.00069	0.00113
Expected Impacts over Project Life:	0.01685	0.07760	0.12714
Project Life:	50	50	50
For the Direction Being Considered			
Initial AADT is (vpd):	200	200	200
Initial Encroachment Rate is (enc/yr/km):	0.09	0.09	0.09
Average Cost per Impact			
upstream side:	$ 25,047.48	$ 20,555.13	-$ 1,697.90
upstream corner :	$ 27,603.08	$ 20,555.13	-$ 1,697.90
face:	$ 25,047.48	$ 20,555.13	-$ 1,697.90
downstream side:	-$ 1,697.90	$ 20,555.13	-$ 1,697.90
downstream corner:	-$ 1,697.90	$ 20,555.13	-$ 1,697.90

Summary of Benefits and Costs

Net Costs	$ -	$ 800.00	$ -
Total Benefits	$ -	-$ 1,783.68	$ 185.01
Net Present Value	0.00	-2583.68	$ 185.01
Benefit/Cost Ratio	0.00	-2.23	#DIV/0!
Change in Total Impacts	0.00	0.06	0.11

Prepared by: Jaymeson Adams, P.Eng.

PEO#: 100519478

Date: 2022-06-09

Reviewed by: Jaymeson Adams, P.Eng.

PEO#: 100519478

Date: 2022-06-09

PROJECT NAME:	Fastfrate Warehouse Development
CIMA+ PROJECT NUMBER:	A001083
CLIENT:	Fastfrate
PROJECT STATUS:	TENDER

STEEL BEAM GUIDERAIL – LENGTH AND COST

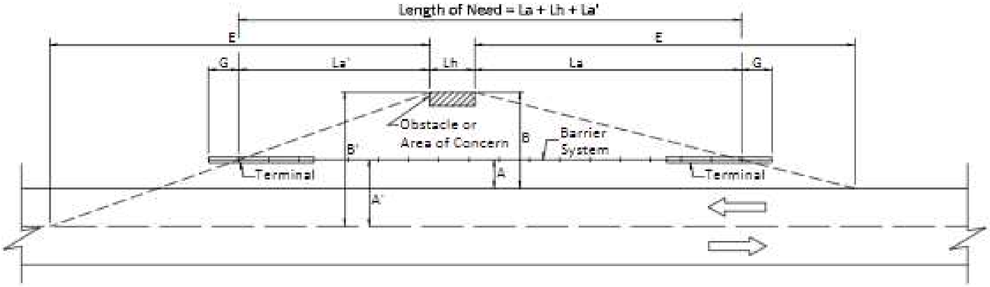
APPLICABLE DESIGN GUIDELINES:

1. MTO Roadside Design Manual, December 2017
2. MTO Roadside Evaluation Manual, July 2018

STEEL BEAM GUIDERAIL – LENGTH OF NEED CALCULATION:

ROADWAY INFORMATION:

Road Name:	Fastfrate East Entrance (Somme St)		
Direction Considered:	East	side	
Design Speed:	60	km/h	
Construction year AADT (est'd):	400	vpd	*Initial Year AADT as described on Roadside.xlsx
Linear Growth Rate:	3.00	%	



LENGTH OF NEED – APPROACHING TRAFFIC:

La = E (1 - A/B) where: La = Approach Length of Barrier for Approaching Traffic
A = Distance from Edge of Travel Way to Face of Barrier.
B = Distance from Edge of Travel Way to Back of Obstacle or Area of Concern. B should not exceed Desirable Clear Zone according to Table 2-2
G = Gating length of terminal
E = Runout Length according to Table 2-15

A value (from CAD):	2.7	m	
B value (from CAD):	7.1	m	
Desirable Clear Zone (Table 2-2 RDM):	3.0	m	
E value (Table 2-15 RDM):	30.0	m	
Approach Length (La):	**3.0**	**m**	
Length of Hazard (Lh):	**2.9**	**m**	*Outside span to outside span of proposed culvert

LENGTH OF NEED – OPPOSING TRAFFIC:

La' = E (1 – A'/B') where: La, Lh and G according to above example
La' = Approach Length of Barrier for Opposing Traffic
A'= Distance from Centreline to Face of Barrier
B' = Distance from Centreline to Back of Obstacle or Area of Concern. B' should not exceed Desirable Clear Zone according to Table 2-2
E = Runout Length according to Table 2-15

A' value (from CAD):	0.0	m
B' value (from CAD):	0.0	m
Desirable Clear Zone (Table 2-2 RDM):	3.0	m
E value (Table 2-15 RDM):	30.0	m
Approach Length for Opposing Traffic (La'):	**0.0**	**m**

LENGTH OF NEED:	**5.9**	**m**

STEEL BEAM GUIDERAIL – COST CALCULATION:

Cost of new Steel Beam Guiderail:	120.00	$/m	
Length of Need:	5.9	m	
COST FOR NEW SBGR:	**800.00**	**$**	(Rounded to nearest $100)

PROJECT NAME: Fastfrate Warehouse Development

CIMA+ PROJECT NUMBER: A001083
CLIENT: Fastfrate
PROJECT STATUS: TENDER

STEEL BEAM GUIDERAIL – LENGTH AND COST

APPLICABLE DESIGN GUIDELINES:

1. **MTO Roadside Design Manual, December 2017**
2. **MTO Roadside Evaluation Manual, July 2018**

NOTES:

1. Culvert ends are the only roadside hazards considered in these calculations.
2. Somme St - undivided highway, 1 lane per direction of travel.

Prepared by: Jaymeson Adams, P.Eng.
PEO # 100519478
Date: 2022-06-09

Verified by: Jaymeson Adams, P.Eng.
PEO # 100519478
Date: 2022-06-09

Z:\Cima-C10\Ott_Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\10-Culvert Safety\220608_East Entrance Culvert\[220608_SBGR Length and Cost east.xlsx]Sheet1

Input - Printable

Project Name:	Fastfrate Warehouse Development - West Entrance
Name of Analyst:	Jaymeson Adams, P.Eng.

Unadjusted Obstacle's Offset from the Travelled Lane	5.46	m
Design Speed of the Road	60	km/h
Encroachment Rate	0.00045	enc/km/yr/vpd
Initial Year	2022	
Project Life	50	yr
Discount Rate	5.0	%

Choose one of:	Initial Year AADT	400	vpd
	Design Year AADT	0	vpd

Which Costing System is to be used?	MTO 2011	
Traffic Growth Rate	3.0	%
One-Way Highway or Two-Way Highway	Two-Way Highway	
Divided or Undivided	Undivided	
Number of Lanes	2	
Lane Width	3.6	m
Directional Split (Adjacent)	50	%

Severity Index of Upstream Side of Obstacle	2.5
Severity Index of Upstream Corner of Obstacle	2.6
Severity Index of Face of Obstacle	2.5
Severity Index of Downstream Side of Obstacle	0
Severity Index of Downstream Corner of Obstacle	0

Location of Obstacle	Shoulder	
Width of Obstacle	3.03	m
Length of Obstacle	3.49	m
Swath Width of Vehicle	3.6	m
Grade	0.4	%
Radius of Curvature	197.97	m
Shoulder Width	0	m
Distance Between Edge of Shoulder and Beginning of Slope	0	m
Slope 1	-0.03	
for a horizontal distance of	2.36	m
Distance Between Base Slope 1 and Edge Slope 2	0	m
Slope 2	0.41	
for a horizontal distance of	3.11	m
Distance Between Base Slope 2 and Edge Slope 3	0	m
Slope 3	0	
for a horizontal distance of	0	m
Distance Between End of Slope and Obstacle	0	m

*Average Damage Repair Cost of Feature after collision for:

upstream side	$	30,000.00	/collision
upstream corner	$	30,000.00	/collision
face	$	30,000.00	/collision
downstream side	$	30,000.00	/collision
downstream corner	$	30,000.00	/collision

OPTION 1

Method of Improvement	Install SBGR	
*Obstacle's Offset from the Travelled Lane	0	m
*Width of Obstacle	0.2	m
*Length of Obstacle	10.2	m
Grade	0.4	%
Radius of Curvature	197.97	m
*Shoulder Width	0	m
Distance Between Edge of Shoulder and Beginning of Slope	0	m
Slope 1	0	
For a horizontal distance of	0	m
Distance Between Base Slope 1 and Edge Slope 2	0	m
Slope 2	0	
For a horizontal distance of	0	m
Distance Between Base Slope 2 and Edge Slope 3	0	m
Slope 3	0	
For a horizontal distance of	0	m
Distance Between End of Slope and Obstacle	0	m

*Severity Index of Upstream Side of Obstacle	2.3
*Severity Index of Upstream Corner	2.3
*Severity Index of Face of Obstacle	2.3
*Severity Index of Downstream Side of Obstacle	2.3
*Severity Index of Downstream Corner of Obstacle	2.3

*Installation Cost	$	1,300.00	
*Average Damage Repair Cost of improvement option after collision for:			
upstream side	$	650.00	/collision
upstream corner	$	650.00	/collision
face	$	1,300.00	/collision
downstream side	$	650.00	/collision
downstream corner	$	650.00	/collision
Annual Maintenance Cost	$	130.00	/yr
Salvage Value of Studied Feature	$	-	

OPTION

Method of Improvement	0	
*Obstacle's Offset from the Travelled Lane	0	m
*Width of Obstacle	0	m
*Length of Obstacle	0	m
Grade	0.0	%
Radius of Curvature	0	m
Shoulder Width	0	m
Distance Between Edge of Shoulder and Beginning of Slope	0	m
Slope 1	0	
For a horizontal distance of	0	m
Distance Between Base Slope 1 and Edge Slope 2	0	m
Slope 2	0	
For a horizontal distance of	0	m
Distance Between Base Slope 2 and Edge Slope 3	0	m
Slope 3	0	
For a horizontal distance of	0	m
Distance Between End of Slope and Obstacle	0	m

*Severity Index of Upstream Side of Obstacle	0
*Severity Index of Upstream Corner	0
*Severity Index of Face of Obstacle	0
*Severity Index of Downstream Side of Obstacle	0
*Severity Index of Downstream Corner of Obstacle	0

*Installation Cost	$	-	
*Average Damage Repair Cost of improvement option after collision for:			
upstream side	$	-	/collision
upstream corner	$	-	/collision
face	$	-	/collision
downstream side	$	-	/collision
downstream corner	$	-	/collision
Annual Maintenance Cost	$	-	/yr
Salvage Value of Studied Feature	$	-	

Output (Separated) - Printable

Project Name: Fastfrate Warehouse Development - West Entrance
Name of Analyst: Jaymeson Adams, P.Eng.

BASE CASE Do Nothing

For the Direction Being Considered		
Initial AADT is:	200	vpd
Initial Encroachment Rate is :	0.18	enc/yr/km
The number of impacts with the upstream side is:	0.00003	impacts/yr
The number of impacts with the upstream corner is:	0.00010	impacts/yr
The number of impacts with the face from adjacent traffic is:	0.00004	impacts/yr
The number of impacts with the downstream side is:	0.00001	impacts/yr
The number of impacts with the downstream corner is:	0.00006	impacts/yr
The number of impacts with the face due to opposing traffic is:	0.00002	impacts/yr
CFTA	0.00016	
CFTO	0.00009	
Initial Collision Frequency:	0.00025	
Expected Impacts over Project Life:	0.02852	
Project Life:	50	

Average Cost per Impact	
upstream side:	$ 25,047.48
upstream corner :	$ 27,603.08
face:	$ 25,047.48
downstream side:	-$ 1,697.90
downstream corner:	-$ 1,697.90

Cost Analysis

	Total	Annual
Total Present Worth :	$ 182.35	$ 9.99
Accident Costs :	$ 150.55	$ 8.25
Installation Cost :	$ -	$ -
Accident Repair Costs :	$ 31.80	$ 1.74
Annual Maintenance Cost :	$ -	$ -
Salvage Value :	$ -	$ -

Option 1 Install SBGR

For the Direction Being Considered		
Initial AADT is:	200	vpd
Initial Encroachment Rate is :	0.18	enc/yr/km
The number of impacts with the upstream side is:	0.00005	impacts/yr
The number of impacts with the upstream corner is:	0.00145	impacts/yr
The number of impacts with the face from adjacent traffic is:	0.00184	impacts/yr
The number of impacts with the downstream side is:	0.00003	impacts/yr
The number of impacts with the downstream corner is:	0.00089	impacts/yr
The number of impacts with the face due to opposing traffic is:	0.00091	impacts/yr
CFTA	0.00334	
CFTO	0.00183	
Initial Collision Frequency:	0.00517	
Expected Impacts over Project Life:	0.58262	
Project Life:	50	

Average Cost per Impact	
upstream side:	$ 20,555.13
upstream corner :	$ 20,555.13
face:	$ 20,555.13
downstream side:	$ 20,555.13
downstream corner:	$ 20,555.13

Cost Analysis

	Total	Annual
Total Present Worth :	$ 7,036.88	$ 385.46
Accident Costs :	$ 3,357.50	$ 183.91
Installation Cost :	$ 1,300.00	$ 71.21
Accident Repair Costs :	$ 6.11	$ 0.33
Annual Maintenance Cost :	$ 2,373.27	$ 130.00
Salvage Value :	$ -	$ -

Option 0

For the Direction Being Considered		
Initial AADT is:	200	vpd
Initial Encroachment Rate is :	0.18	enc/yr/km
The number of impacts with the upstream side is:	0.00001	impacts/yr
The number of impacts with the upstream corner is:	0.00073	impacts/yr
The number of impacts with the face from adjacent traffic is:	0.00000	impacts/yr
The number of impacts with the downstream side is:	0.00000	impacts/yr
The number of impacts with the downstream corner is:	0.00022	impacts/yr
The number of impacts with the face due to opposing traffic is:	0.00000	impacts/yr
CFTA	0.00073	
CFTO	0.00022	
Initial Collision Frequency:	0.00096	
Expected Impacts over Project Life:	0.10780	
Project Life:	50	

Average Cost per Impact	
upstream side:	-$ 1,697.90
upstream corner :	-$ 1,697.90
face:	-$ 1,697.90
downstream side:	-$ 1,697.90
downstream corner:	-$ 1,697.90

Cost Analysis

	Total	Annual
Total Present Worth :	-$ 51.31	-$ 2.81
Accident Costs :	-$ 51.31	-$ 2.81
Installation Cost :	$ -	$ -
Accident Repair Costs :	$ -	$ -
Annual Maintenance Cost :	$ -	$ -
Salvage Value :	$ -	$ -

Summary of Benefits and Costs

Option 1	Install SBGR
Net Costs	$ 1,300.00
Total Benefits	-$ 5,554.53
Net Present Value	-$ 6,854.53
Benefit/Cost Ratio	-4.27
Change in Total Impacts	0.55

Option	0
Net Costs	$ -
Total Benefits	$ 233.66
Net Present Value	$ 233.66
Benefit/Cost Ratio	#DIV/0!
Change in Total Impacts	0.08

Output (Comparison) - Printable

Project Name: Fastfrate Warehouse Development - West Entrance
Name of Analyst: Jaymeson Adams, P.Eng.

	Do Nothing		OPTION 1		OPTION	
The Number of impacts with			Install SBGR		0	
the upstream side is:	0.00003	impacts/yr	0.00005	impacts/yr	0.00001	impacts/yr
the upstream corner is:	0.00010	impacts/yr	0.00145	impacts/yr	0.00073	impacts/yr
the face from adjacent traffic is:	0.00004	impacts/yr	0.00184	impacts/yr	0.00000	impacts/yr
the downstream side is:	0.00001	impacts/yr	0.00003	impacts/yr	0.00000	impacts/yr
the downstream corner is:	0.00006	impacts/yr	0.00089	impacts/yr	0.00022	impacts/yr
the face due to opposing traffic is:	0.00002	impacts/yr	0.00091	impacts/yr	0.00000	impacts/yr

Cost Analysis

	Total	Annual	Total	Annual	Total	Annual
Total Present Worth :	$ 182.35	$ 9.99	$ 7,036.88	$ 385.46	-$ 51.31	-$ 2.81
Accident Costs :	$ 150.55	$ 8.25	$ 3,357.50	$ 183.91	-$ 51.31	-$ 2.81
Installation Cost :	$ -	$ -	$ 1,300.00	$ 71.21	$ -	$ -
Accident Repair Costs :	$ 31.80	$ 1.74	$ 6.11	$ 0.33	$ -	$ -
Annual Maintenance Cost :	$ -	$ -	$ 2,373.27	$ 130.00	$ -	$ -
Salvage Value :	$ -	$ -	$ -	$ -	$ -	$ -

	Do Nothing	OPTION 1	OPTION
CFTA	0.00016	0.00334	0.00073
CFTO	0.00009	0.00183	0.00022
Initial Collision Frequency:	0.00025	0.00517	0.00096
Expected Impacts over Project Life:	0.02852	0.58262	0.10780
Project Life:	50	50	50
For the Direction Being Considered			
Initial AADT is (vpd):	200	200	200
Initial Encroachment Rate is (enc/yr/km):	0.18	0.18	0.18
Average Cost per Impact			
upstream side:	$ 25,047.48	$ 20,555.13	-$ 1,697.90
upstream corner :	$ 27,603.08	$ 20,555.13	-$ 1,697.90
face:	$ 25,047.48	$ 20,555.13	-$ 1,697.90
downstream side:	-$ 1,697.90	$ 20,555.13	-$ 1,697.90
downstream corner:	-$ 1,697.90	$ 20,555.13	-$ 1,697.90

Summary of Benefits and Costs

	Do Nothing	OPTION 1	OPTION
Net Costs	$ -	$ 1,300.00	$ -
Total Benefits	$ -	-$ 5,554.53	$ 233.66
Net Present Value	0.00	-6854.53	$ 233.66
Benefit/Cost Ratio	0.00	-4.27	#DIV/0!
Change in Total Impacts	0.00	0.55	0.08

Prepared by: Jaymeson Adams, P.Eng.

PEO#: 100519478

Date: 2022-06-09

Reviewed by: Jaymeson Adams, P.Eng.

PEO#: 100519478

Date: 2022-06-09

PROJECT NAME:	Fastfrate Warehouse Development
CIMA+ PROJECT NUMBER:	A001083
CLIENT:	Fastfrate
PROJECT STATUS:	TENDER

STEEL BEAM GUIDERAIL – LENGTH AND COST

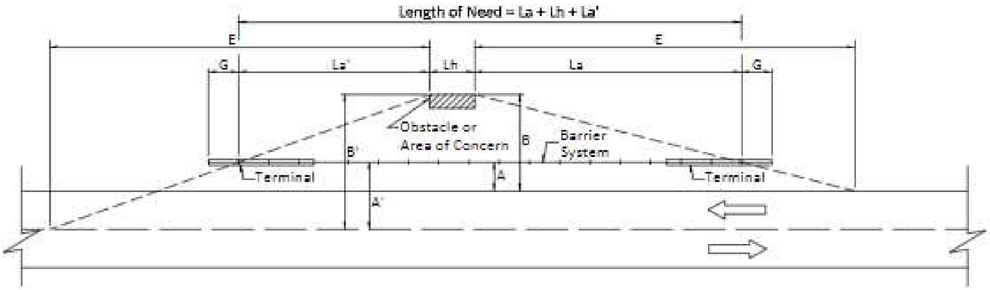
APPLICABLE DESIGN GUIDELINES:

1. MTO Roadside Design Manual, December 2017
2. MTO Roadside Evaluation Manual, July 2018

STEEL BEAM GUIDERAIL – LENGTH OF NEED CALCULATION:

ROADWAY INFORMATION:

Road Name:	Fastfrate West Entrance (Somme St)		
Direction Considered:	East	side	
Design Speed:	60	km/h	
Construction year AADT (est'd):	400	vpd	*Initial Year AADT as described on Roadside.xlsx
Linear Growth Rate:	3.00	%	



LENGTH OF NEED – APPROACHING TRAFFIC:

La = E (1 - A/B) where: La = Approach Length of Barrier for Approaching Traffic
A = Distance from Edge of Travel Way to Face of Barrier.
B = Distance from Edge of Travel Way to Back of Obstacle or Area of Concern. B should not exceed Desirable Clear Zone according to Table 2-2
G = Gating length of terminal
E = Runout Length according to Table 2-15

A value (from CAD):	2.4	m
B value (from CAD):	7.7	m
Desirable Clear Zone (Table 2-2 RDM):	3.0	m
E value (Table 2-15 RDM):	30.0	m
Approach Length (La):	**6.0**	**m**
Length of Hazard (Lh):	**4.2**	**m**

*Outside span to outside span of proposed culvert

LENGTH OF NEED – OPPOSING TRAFFIC:

La' = E (1 – A'/B') where: La, Lh and G according to above example
La' = Approach Length of Barrier for Opposing Traffic
A'= Distance from Centreline to Face of Barrier
B' = Distance from Centreline to Back of Obstacle or Area of Concern. B' should not exceed Desirable Clear Zone according to Table 2-2
E = Runout Length according to Table 2-15

A' value (from CAD):	0.0	m
B' value (from CAD):	0.0	m
Desirable Clear Zone (Table 2-2 RDM):	3.0	m
E value (Table 2-15 RDM):	30.0	m
Approach Length for Opposing Traffic (La'):	**0.0**	**m**

LENGTH OF NEED: 10.2 m

STEEL BEAM GUIDERAIL – COST CALCULATION:

Cost of new Steel Beam Guiderail:	120.00	$/m
Length of Need:	10.2	m

COST FOR NEW SBGR: 1,300.00 $

(Rounded to nearest $100)

PROJECT NAME: Fastfrate Warehouse Development

CIMA+ PROJECT NUMBER: A001083
CLIENT: Fastfrate
PROJECT STATUS: TENDER

STEEL BEAM GUIDERAIL – LENGTH AND COST

APPLICABLE DESIGN GUIDELINES:

1. MTO Roadside Design Manual, December 2017
2. MTO Roadside Evaluation Manual, July 2018

NOTES:

1. Culvert ends are the only roadside hazards considered in these calculations.
2. Somme St - undivided highway, 1 lane per direction of travel.

Prepared by: Jaymeson Adams, P.Eng. Date: 2022-06-09
PEO # 100519478

Verified by: Jaymeson Adams, P.Eng. Date: 2022-06-09
PEO # 100519478

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C

Appendix C-1
WATER SUPPLY

PROJECT NAME: Fastfrate Warehouse Development

CIMA+ PROJECT NUMBER: A001083
CLIENT: Fastfrate (Ottawa) Holdings Inc.
PROJECT STATUS: 90 % Design (Site Plan Approval)

WATER CONSUMPTION CALCULATIONS

APPLICABLE DESIGN GUIDELINES:

1. Ottawa Design Guidelines - Water Distribution (2010)
2. City of Ottawa Technical Bulletin ISTB-2021-03, ISTB-2018-02, ISDTB-2014-02 and ISD-2010-02
3. MOE Design Guidelines for Drinking-Water Systems

COMMERCIAL WATER DEMANDS:

COMMERCIAL DESIGN CRITERIA:

Contributing Commercial Area:	0.860	gross ha (Building Area)
Commercial Average Day Demand:	28,000	L/gross ha/d
Maximum Day Peaking Factor:	1.5	x Average Daily Demand
Maximum (Peak Hour) Peaking Factor:	1.8	x Maximum Daily Demand

WATER DEMANDS:

Demand Type	Average Daily Demand (L/s)	Maximum Daily Demand (L/s)	Maximum (Peak) Hour Demand (L/s)
Commercial	0.28	0.42	0.75
Total	**0.28**	**0.42**	**0.75**

NOTES:

1. Maximum Day and Maximum Hour residential peaking factors determined from City of Ottawa Water Design Guidelines 2010 - as ammended by all technical bulletins.

Prepared by: Guillaume LeBlond, M.A.Sc., E Date: 2022/06/01
PEO# 100530467

Verified by: Christian Lavoie-Lebel, P.Eng. Date: 2022/06/01
PEO# 100173201

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C

Appendix C-2
FIRE FLOW

TEL. : (514) 337-2600
FAX : (514) 337-2610

CIVELEC CONSULTANTS INC.
3900 COTE VERTU SUITE 200
ST-LAURENT (QUÉBEC) H4R 1V4

August 18, 2022

Civitas Group
203-6 Hamilton Avenue North
Ottawa, Ontario
K1Y 4R1

Attention: Douglas Rancier, Architect

Subject: **CBRE – Fastfrate Warehouse – Required Fire Flow Proposal**
Ottawa, Ontario
O/Ref.: 2206-09A

Dear Sir,

To determine the water demand for fire protection based on the Fire Underwriters Survey, a document has been prepared by the Opta Information Intelligence Corp (formerly Insurance Advisory Organization). Part 2 of the document, contains a guide (“Guide for Determination of Required Fire Flows for Public Fire Protection in Canada), from here on referred to as the “Guide”.

The subsection entitled “Risk Quantification with Required Fire Flows” states the following:

“*The Guide to calculate required fire flows is made available to municipal officials, consulting engineers and other interested stakeholders as an aid in estimating water supply requirements for public fire protection. This document is a guide and requires specialized knowledge and experience in public fire protection engineering for its effective application*.”

The guide provides the following formula for estimating the fire flow required for a given area:

$RFF=220\ CA^{0.5}$

where RFF = Required Fire Flow
C = coefficient related to the type of construction
A is the total floor area of the building in m²

This formula only takes into consideration the building construction and the building area. The use of this formula provides a reasonable estimation for a building that does not have an adequate sprinkler system or that has a control mode density-area sprinkler system. The firefighting is based on a fire involving a majority of the building and the main objective is to limit the fire from spreading to other buildings and if possible extinguish the fire.

The modern-day sprinkler systems are designed to limit the fire to a relatively small area (by using Quick response sprinklers) and some are actually designed to extinguish the fire by using “Early Suppression Fast Response” sprinkler technology, as is the case in our situation. Since the proposed sprinkler design is based on the specific combustible loading of the building’s occupancy content, the actual storage configuration, the actual height of the building and the clearances of the sprinklers with respect to the combustibles, it would be almost impossible to create a simple equation to estimate the fire flow. As a number of sprinkler systems for speculative buildings are not designed for the actual combustible contents nor do they necessarily use ESFR sprinkler technology, the Guide uses a very conservative credit for sprinklered buildings.

The following examples will demonstrate the typical exceptions where the Guide would provide unreasonable flows (at times under-estimated and at times over-estimated) and where fire protection knowledge is required to determine the reasonable fire flows.

Example 1

We have a 1000 m^2 building of non-combustible construction. The building is used for storage of Class 1B flammable liquids in relieving-type metal drums 25 ft high on racks. The building is fully sprinklered. There is no required exposure protection.

In this example, the estimated fire flow would be:

220 x 0.8 x 10000.5 = 5,565 L/min

If we increase the flow by 25% for rapid burning fire, we get 6,957 L/min.

Assuming that we have a fully supervised sprinkler system, we can reduce the flow up to 50% yielding thus a RFF of 3,478 L/min or 920 usgpm.

The sprinkler system design for such an occupancy would require a density of 0.60 gpm/sq ft over an area of 3000 sq ft (flow of 1,800 gpm) plus in-rack sprinklers flowing 18 sprinklers at 30 gpm (flow of 540 gpm) and 500 gpm for hose streams yielding a total demand flow of 2840 usgpm or 10,750 L/min.

As we can see in this example, the real fire flow required to control the fire is approximately 3 times the flow calculated as per the Guide.

Example 2

We have a 150,000 m^2 building of non-combustible construction. The building is used for storage of car parts. The building is fully sprinklered. There is no required exposure protection.

In this case the required flow is:

220 x 0.8 x 150,0000.5 = 68,164 L/min

We did not increase the flow for medium hazard.

Assuming that we have a fully supervised sprinkler system, we can reduce the flow up to 50% and we obtain 34,082 L/min or 9,005 usgpm.

Giving a 50% credit for sprinklers is not reasonable. The sprinkler system is typically designed to control the fire within an area of 140 m^2. If the fire is not extinguished or controlled within the sprinkler design area, the fire will probably spread to the entire building and the credit for 50% would not work as the fire would behave as if the sprinkler system would not be present.

To protect this warehouse, there is almost no municipal water system that can provide these flows based on the Guide's estimation equation. These large warehouses are installed in industrial parks and the typical fire flows required to extinguish the fire are in the range of 5,000 L/min to 10,000 L/min (1320 usgpm – 2640 usgpm).

In this case, the calculations based on the guide require over 4 times more the water flow that is actually required to extinguish the fire.

These examples show why the experience in fire protection engineering is required to correctly determine the actual fire flows required to extinguish a fire.

Fastfrate Fire Flow Calculations

As the sprinkler system at Fastfrate warehouse will be designed to extinguish the fire within a very limited area by using ESFR sprinkler technology, the use of the Guide's empirical formula to estimate the fire flow yields unrealistic results since it does not give sufficient credit for using ESFR sprinklers.

The Fastfrate warehouse's sprinkler design criteria is based on site specific conditions that go far beyond the parameters of the Guide and include features such as building height, height of storage, type of combustibles, type of sprinkler system, etc. Calculations to determine the required fire flow are based on a single fire incident at a time. This is also the case for the Guide.

The design of the sprinkler protection for the warehouse high piled storage section is based on using K16.8 ESFR sprinklers with a very large orifice size at a minimum end head pressure of 52 psi. In most cases, only 4 such sprinklers are expected to flow in a fire scenario. NFPA requires an additional safety margin whereby the design criteria is based on 12 sprinklers flowing at a minimum end head pressure of 52 psi. Although the sprinkler flow would only be expected to be in the range of 500 gpm (1893 L/min), the actual required NFPA design criteria is based on a sprinkler flow rate of 1500 usgpm (5677 L/min). In addition, it is expected that the fire department will require to use fire hoses to fully extinguish the fire. NFPA requires 250 gpm (946 L/min) to be reserved for outside hoses when using an ESFR sprinkler design approach. The calculated total water flow is 1750 usgpm (6,624 L/min).

Calculations based on the FUS Guide yield a required fire flow of 10,000 L/min (2642 usgpm) (see attached calculations). We recommend to apply an additional reduction due to the ESFR sprinkler system which is actually designed to extinguish the fire. With this additional reduction the required fire flow would be 1982 usgpm (7500 L/min).

We have also compared the recommended flow with the required sprinkler flow based on the NFPA requirements. The NFPA water flow, including hose streams for the fire department, is 1750 usgpm (6624 L/min) as discussed above. For sprinkler designs that are based on a control mode density-area approach (ie. conventional sprinklers), the required hose stream allowance would be 500 usgpm (1892 L/min). By considering 500 usgpm (1892 L/min) for outside hose streams rather than the 250 usgpm required for an ESFR design approach, the resulting total fire flow would be approximately 2000 usgpm (7570 L/min). This is consistent with our assessment above.

Fire Duration

With ESFR sprinklers, the required fire duration is expected to be 60 minutes. We recommend adding a 50% safety factor yielding thus a duration of 90 minutes. The overall volume of water required would therefore be 1982 GPM x 90 MINUTES = 178,380 US GALLONS or 675 cu. m.

Discussion on High One Storey Buildings

Although FUS has special considerations for tall one storey buildings, for which the guide recommends to treat as a 3 storey building and to consider the potential of fire spreading to all three floors, our alternative objective based design already takes into consideration the higher combustible loading within an uncompartmentalized building as described below.

The water demand calculations in this report have been based on an uncompartmentalized building that contains a relatively high combustible loading in a single fire area for the full height of the building (37.5 ft). When comparing this scenario to a building that is vertically compartmentalized (ie multi-storey building), the fire demand and fire hazard for the latter are significantly decreased. To demonstrate this point, we will compare the NFPA 13 sprinkler demand requirement for a 3-storey building of the same total height versus the sprinkler demand requirement for the subject building.

If the building were deemed to be equivalent to a 3-storey building with a height of 12.5 ft per floor, the sprinkler demand as per NFPA 13 would be 600 us gpm based on the same commodity classification that the subject building will contain. The subject building has a proposed sprinkler demand of 1482 gpm (based on an ESFR sprinkler design). In the case of a 3 storey building, the vertically compartmentalized areas would significantly reduce the fire severity as demonstrated by the much lower sprinkler demand. Furthermore, a 3-storey building of this size would be required to have fire separations between floors (as per OBC) which would limit fire spread.

Consequently, the alternative solution (using an ESFR suppression-based design) presented in this report would still be valid and provide an equivalent level of protection to the FUS recommended practice.

The attached Fire Flow Calculation Sheet represents the probable flows based on experience and fire protection engineering knowledge.

If you require any additional information, please do not hesitate to contact us.

Sincerely Yours,

Civelec Consultants Inc.

Paul Lhotsky

Paul Lhotsky, PhD, P. Eng., P. E.

LICENSED PROFESSIONAL ENGINEER
P. LHOTSKY
PROVINCE OF ONTARIO

Civelec Consultant Inc.

Project: Fastfrate Warehouse
O/Ref.: 2206-09A
Client: Fastfrate (Ottawa) Holdings Inc.

FIRE FLOW ASSESSMENT

Applicable design guidelines:

1. Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection, 2020
2. Ottawa Design Guidelines - Water Distribution (2010) ISTB-2018-02
3. Technical Bulletin ISTB-2021-03

STEP A - Determine the type of construction

Type of construction	**Coefficient (C)**	**Value selected (C)**
Fire-resistive construction (> 3 hours)	0.6	**1.0**
Non-combustible construction	0.8	
Ordinary construction	1.0	
Wood frame construction	1.5	

STEP B - Determine the floor area

Floor / Level	**Floor area per level (sq. ft.)**	**Floor area per level (m^2)**
Gross floor area (GFA) ground level	92,376	8582
Total floor area (A)	**92,376**	**8582**

STEP C - Determine the height in storeys

Floor / Level	**Number of storeys**	**Percent of floor area considered**
Ground level	1	100%
Height in storeys	**1**	

STEP D - Determine base fire flow *(round to nearest 1,000 L/min)*

$$\boxed{F = 220C\sqrt{A}}$$

Where:
F is the required fire flow in L/min
C is the coefficient related to the type of construction, and;
A is the total floor area of the building in m^2

Coefficient related to type of construction (C) = **1.0**
Floor area considered (A) = **8582 m^2**

REQUIRED (BASE) FIRE FLOW (F) = **20,000** **L/min** (r*ounded to nearest 1,000 L/min)*

FIRE FLOW ASSESSMENT

STEP E = Determine the increase or decrease for occupancy and apply to Step D *(Step D x Step E, do not round)*

Occupancy Class	**Occupancy factor**	**Value selected (C)**
Non-combustible	0.75	**1.0**
Limited combustible	0.85	
Combustible	1.00	
Free burning	1.15	
Rapid burning	1.25	

REQUIRED (BASE) FIRE FLOW (F) = **20,000** **L/min** *(not rounded)*

STEP F - Determine the decrease, if any, for automatic sprinkler protection and apply to value in Step D above *(do not round)*

Sprinkler system design	**Sprinkler design charge**	**Value selected (C)**	**Total charge**
Automatic sprinkler system conforming to NFPA standards	-30%	Yes	-30%
Standard water supply	-10%	Yes	-10%
Fully supervised system	-10%	Yes	-10%
Total charge for sprinkler system			**-50%**

DECREASE FOR SPRINKLER PROTECTION = **10,000** **L/min** *(not rounded)*

STEP G - Determine the total increase for exposures and apply to value in Step D above *(do not round)*

Façade	**Separation distance (m)**	**Length-height factor of exposed wall (m-storeys)**	**Assumed construction of exposed wall of adjacent**	**Total charge**
North façade	> 45	N/A	N/A	0%
East façade (fire/party wall)	> 45	N/A	N/A	0%
South façade	> 45	N/A	N/A	0%
West façade	> 45	N/A	N/A	0%
Total charge for exposures				**0%**

INCREASE FOR EXPOSURES = **0** **L/min** *(not rounded)*

STEP H - Determine fire flow including all increases and reductions (Step E + Step F + Step G, *round to nearest 1,000 L/min*)

TOTAL REQUIRED FIRE FLOW (RFF) =	**10,000**	**L/min** ***(rounded to nearest 1,000 L/min)***
	166.6	**L/s**
	2642	**USGPM**

Civelec Consultant Inc.

Project: Fastfrate Warehouse
O/Ref.: 2206-09A
Client: Fastfrate (Ottawa) Holdings Inc.

FIRE FLOW ASSESSMENT

STEP I - Additional adjustemnt for engineering judgement. Justification: Reduction for ESFR sprinkler: 25%

TOTAL REQUIRED FIRE FLOW (RFF) =	**7,500**	**L/min** ***(rounded to nearest 1,000 L/min)***
	125	**L/s**
	1982	**USGPM**

Prepared by: Paul Lhotsky

Date: July 14, 2022

LICENSED PROFESSIONAL ENGINEER
P. LHOTSKY
PROVINCE OF ONTARIO

C

Appendix C-3

GRAVITY WATERMAIN FOR FIRE PROTECTION

PROJECT NAME: Warehouse Development
CIMA+ PROJECT NUMBER: A001083
CLIENT: Fastfrate (Ottawa) Holdings Inc.
PROJECT STATUS: Site Plan Control

################

HYDRAULIC CALCULATIONS FOR GRAVITY FIRE PROTECTION WATERMAIN

APPLICABLE DESIGN GUIDELINES:

NFPA 13

DESIGN BASIS:

Manning Coefficient : 0.013
Maximum permitted velocity : 3.00 **m/s**
Minimum permitted velocity : 0.60 **m/s**

Section	Dia. mm	Length m	Slope %	Invert upstream m	Invert downstream m	Capacity (full) m^3/s	Velocity (full) m/s	Required Flow m^3/s	Velocity (actual) m/s	% Full	F.S.
Fire Protection WM	450	60.1	0.20%	87.100	86.985	0.127	0.80	0.110000	0.90	87%	1.15

Remarks

The data in green has been calculated or modified by the designer
The data in blue has been calculated using formulas inserted by the designer

Notes :

1. Slope of 3.00% has been assumed for all building connections.

Prepared by: Guillaume LeBlond, M.A.Sc., EIT
PEO No.: 100530467
Date: 10/3/2021

Verified by: Julien Sauvé, P.Eng.
PEO No.: 100200100
Date: 10/3/2021

C

Appendix C-4

ICE THICKNESS CALCULATION

PROJECT NAME: Fastfrate (Ottawa) Warehouse Development
NUMBER: A001083
CLIENT: Fastfrate (Ottawa) Holdings Inc.
PROJECT STATUS: 90 % Design (Site Plan Approval)

$$AFDD = \sum_{day=1}^{n} FDD_{day}$$

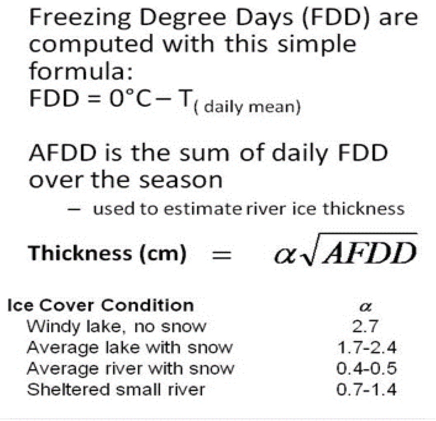
AFDD	785	°C.day

$$Thickness\ (cm) = \alpha\sqrt{AFDD}$$

α	2.4	
T (cm)	67.24	cm
T (ft)	2.21	ft
T (ft, in)	2'3"	

α	1.7	
T (cm)	47.63	cm
T (ft)	1.56	ft
T (ft, in)	1'7"	

α	2.7	
T (cm)	75.65	cm
T (ft)	2.48	ft
T (ft, in)	2'6"	



Freezing Degree Days (FDD) are computed with this simple formula:

$FDD = 0°C – T_{(\text{ daily mean})}$

AFDD is the sum of daily FDD over the season

- used to estimate river ice thickness

Thickness (cm) $= \alpha\sqrt{AFDD}$

Ice Cover Condition	α
Windy lake, no snow	2.7
Average lake with snow	1.7-2.4
Average river with snow	0.4-0.5
Sheltered small river	0.7-1.4

Only temperatures from
winter (Dec 21 – March 21)
are used for calculation.

Prepared b Jaymeson Adams, EIT Date: 2020-11-25

Verified by Christian Lavoie-Lebel, P.Eng. Date: 2020-11-25

D

Appendix D-1
SANITARY SEWER FLOW

CIMA+

PROJECT NAME: Fastfrate (Ottawa)
CIMA+ PROJECT A001083
CLIENT: Fastfrate (Ottawa) Holdings Inc.
PROJECT STATUS: 90 % Design (Site plan Approval)

WASTEWATER PEAK FLOW DETERMINATION - COMMERCIAL & INSTITUTIONAL

APPLICABLE DESIGN GUIDELINES:

1. **City of Ottawa Sewer Design Guidelines, 2012**
2. **City of Ottawa Technical Bulletin ISTB-2018-01**

DOMESTIC CONTRIBUTIONS:

COMMERCIAL & INSTITUTIONAL DESIGN CRITERIA:

Base Flow:	2.8	$L/m^2/d$
Peaking factor:	1.5	unitless
Extreneous Flows + Infiltration:	0.33	L/s/ha
OBC Baseflow:	12800	L/d
	0.148	L/s

Commercial and Institutional Average Design Flow = 28,000 L/gross ha/day

Commercial Peak factor:	1.5 if commercial contribution >20%[1], otherwise use 1.0
Institutional Peak factor:	1.5 if institutional contribution >20%[1], otherwise use 1.0
Industrial Peak Factor:	Per Figure in Appendix 4-B

AVERAGE FLOW - DOMESTIC:

Buildings	Building Area ft^2	Building Area m^2	Proportional Area ha	Average Base Flow (L/s)	Peaking Factor	Peak Flow (L/s)	Extraneous Flow (L/s)	Maximum Flow (L/s)
Warehouse - Ottawa Sewer Desgin Guidelines	76503	7107	0.250	0.23	1.50	0.35	0.08	0.43
Total	76503	7107				Qmax - Total (L/s) =		**0.43**

Note: -The value obtained from the City of Ottawa Sewer Design Guidelines for maximum flow was used since it is more conservative.
-The Area used for the Extraneous flow is the entire front parking lot

[1] If the commercial or institutional area is less than 20% of the total area, then a factor of 1.0 can be used.

Ottawa
Sewer Design Guidelines
Second Edition, October 2012
SDG002

Prepared by: Guillaume LeBlond, M.A.Sc., EIT. Date: June 06 2022
PEO No.: 100530467

Verified by: Christian Lavoie-Lebel, P.Eng. Date: June 06 2022
PEO No.: 100067842

Z:\Cima-C10\Ott_Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\02-Sanitary Sewer\220601_Redesign for Comments\[220606_CIMA+ Sanitary Sewer Flow - Commercial.xlsx]SANITARY FLOWS

D

Appendix D-2
SANITARY SEWER SIZING

PROJECT NAME: Warehouse Development
CIMA+ PROJECT NUMBER: A001083
CLIENT: Fastfrate (Ottawa) Holdings Inc.
PROJECT STATUS: 90 % Design (Site Plan Approval)

###############

HYDRAULIC CALCULATIONS FOR SANITARY SEWERS

APPLICABLE DESIGN GUIDELINES:

1. **City of Ottawa Sewer Design Guidelines, 2012**
2. **City of Ottawa Technical Bulletin ISTB-2018-01**

DESIGN BASIS:

Manning Coefficient : 0.013
Maximum permitted velocity : 3.00 **m/s**
Minimum permitted velocity : 0.60 **m/s**

Section	Dia. mm	Length m	Slope %	Invert upstream m	Invert downstream m	Capacity (full) m³/s	Velocity (full) m/s	Flow m³/s	Velocity (actual) m/s	% Full
Building to SAN #1	200	12.2	2.00%	89.850	89.605	0.046	1.48	0.000430	0.46	1%
SAN #1 to Septic tank	200	14.7	2.00%	89.595	89.300	0.046	1.48	0.000430	0.46	1%
Outlet				89.300						

Remarks

The data in green has been calculated or modified by the designer

The data in blue has been calculated using formulas inserted by the designer

Notes :

1. Slope of 2.00% has been assumed for all building connections.

Prepared by: Guillaume LeBlond, M.A.Sc., EIT — Date: June 06 2022
PEO No.: 100530467

Verified by: Christian Lavoie-Lebel, P.Eng. — Date: June 06 2022
PEO No.: 100067842

E

Appendix E -
Septic System Detailed Calculations

Project:	Fastfrate Warehouse
Task:	Saniatry Sewage Flows per OBC
Project Number:	A001083
Created By:	Kayla Schmidt, P.Eng.
PEO No.	100524348
Date:	19-Jul-21
Reviewed By:	Kayla Schmidt, P.Eng.
PEO No.	100524348
Date:	19-Jul-21
Notes:	Hazen Williams was used to calculate the TDH. There are 6 pumps total (2 for the Pumping Chamber, 2 for the Level IV treatment, and 1 for the recycle line).

Table 1: Dosing Criteria

Parameter	**Value**	**Unit**
Daily Design Flow Rate	12,800	L/d
Required Dosing per day	24	times
Time for each dosing	15	minutes
Hourly Design Flow Rate	533.3333333	L/hr
Design Flow Rate	8.888888889	L/min
Design Flow Rate	0.148148148	L/s
Assumed Pump Chamber Volume	17578	L
Where a pump or siphon is required, the pump or siphon shall be designed to discharge a dose of at least 75% of the internal volume of the *distribution pipe* within a time period not exceeding fifteen minutes.		

Table 2: Dosing Requirements			
Parameter	**Value**	**Unit**	**Notes**
Length of Each Distibution Pipe	25	m	
Number of Distribution Pi	7		
Total Length	175	m	
Diameter	0.025	m	
Cross Sectional Area	0.000491	m2	
Total Volume of Distribution Pipe	0.086	m3	
Total Volume of Distribution Pipe	85.90	L	
75% of Volume of Distibution Pipe	64.43	L	
Max time	15.0	minutes	
Flow Rate Required	4.30	L/min	
Flow Rate Required	0.071586	L/s	
Daily Volume for Flow Rate	2061.67	L/d	below the daily flow rate
Minimum Required Flow Rate per hour	533.33	L/hr	
Flow Rate require for 15 minute time frame	35.56	L/min (per 15 minutes)	
Flow Rate require for 15 minute time frame	0.59	L/s (per 15 minutes)	
Check	**12800**	**L/d**	
Pump Design Flow Rate	**1**	**L/s**	
Daily Flow Rate	**21600**	**L/d**	

Pumping Chamber Pumps (to Waterloo Biofilter)

Parameter	Value	Unit	Notes
Low Water Level	86.712		
Top of Pipe	89.212		
Static Head	2.5	m	
Pipe Diameter	0.05	m	
Pipe Area	0.001963495	m2	
Pipe Length	5	m	
Pressure at end	10	m	

Fittings	K Value	Qty	Total
90 degree elbows	0.81	3	2.43
Tees	1.62	1	1.62
Subtotal			4.05
Safety Factor			1.2
Total			**5.25**

Flow		**Velocity**	**Fitting Loss (K*V^2/2*g)**	**Pipe Friction Losses Friction Coefficient (C) in m**			**Static Head**	**Pressure to be dosed**	**Total Dynamic Head Loss (m)**		
L/s	**m3/s**	**m/s**	**m**	**140**	**150**	**160**	**m**	**m**	**140**	**150**	**160**
0	0	0	0	0.00	0.00	0.00	2.5	10	12.50	12.50	12.50
0.5	0.0005	9.8E-07	2.579E-13	0.01	0.01	0.01	2.5	10	12.51	12.51	12.51
1	0.0010	2E-06	1.032E-12	0.03	0.03	0.03	2.5	10	12.53	12.53	12.53
1.5	0.0015	2.9E-06	2.321E-12	0.07	0.06	0.06	2.5	10	12.57	12.56	12.56
2	0.0020	3.9E-06	4.126E-12	0.12	0.11	0.10	2.5	10	12.62	12.61	12.60
2.5	0.0025	4.9E-06	6.448E-12	0.19	0.16	0.15	2.5	10	12.69	12.66	12.65
3	0.0030	5.9E-06	9.285E-12	0.26	0.23	0.20	2.5	10	12.76	12.73	12.70
3.5	0.0035	6.9E-06	1.264E-11	0.35	0.31	0.27	2.5	10	12.85	12.81	12.77
4	0.0040	7.9E-06	1.651E-11	0.45	0.39	0.35	2.5	10	12.95	12.89	12.85
4.5	0.0045	8.8E-06	2.089E-11	0.55	0.49	0.43	2.5	10	13.05	12.99	12.93
5	0.0050	9.8E-06	2.579E-11	0.67	0.59	0.53	2.5	10	13.17	13.09	13.03
5.5	0.0055	1.1E-05	3.121E-11	0.80	0.71	0.63	2.5	10	13.30	13.21	13.13

Level IV Treatment Unit Discharge Pumps (to SBT Leaching Bed)

Parameter	**Value**	**Unit**	**Notes**
Low Water Level			
Top of Pipe			
Static Head	2.5	m	
Pipe Diameter	0.05	m	
Pipe Area	0.00196	m2	
Pipe Length	18	m	
Pipe Diameter	0.025	m	
Pipe Area	0.000491	m2	
Pipe Length	26	m	
Pressure at end	0.6	m	per OOWA best practices

Fittings	**K Value**	**Qty**	**Total**
90 degree elbows	0.81	3	2.43
Tees	1.62	1	1.62
Reducer (50 to 25 mm)	0.02	1	0.02
Check Valve	10.8	1	10.8
Ball Valve	0.08	1	0.08
Subtotal			14.95
Safety Factor			1.2
Total			**16.15**

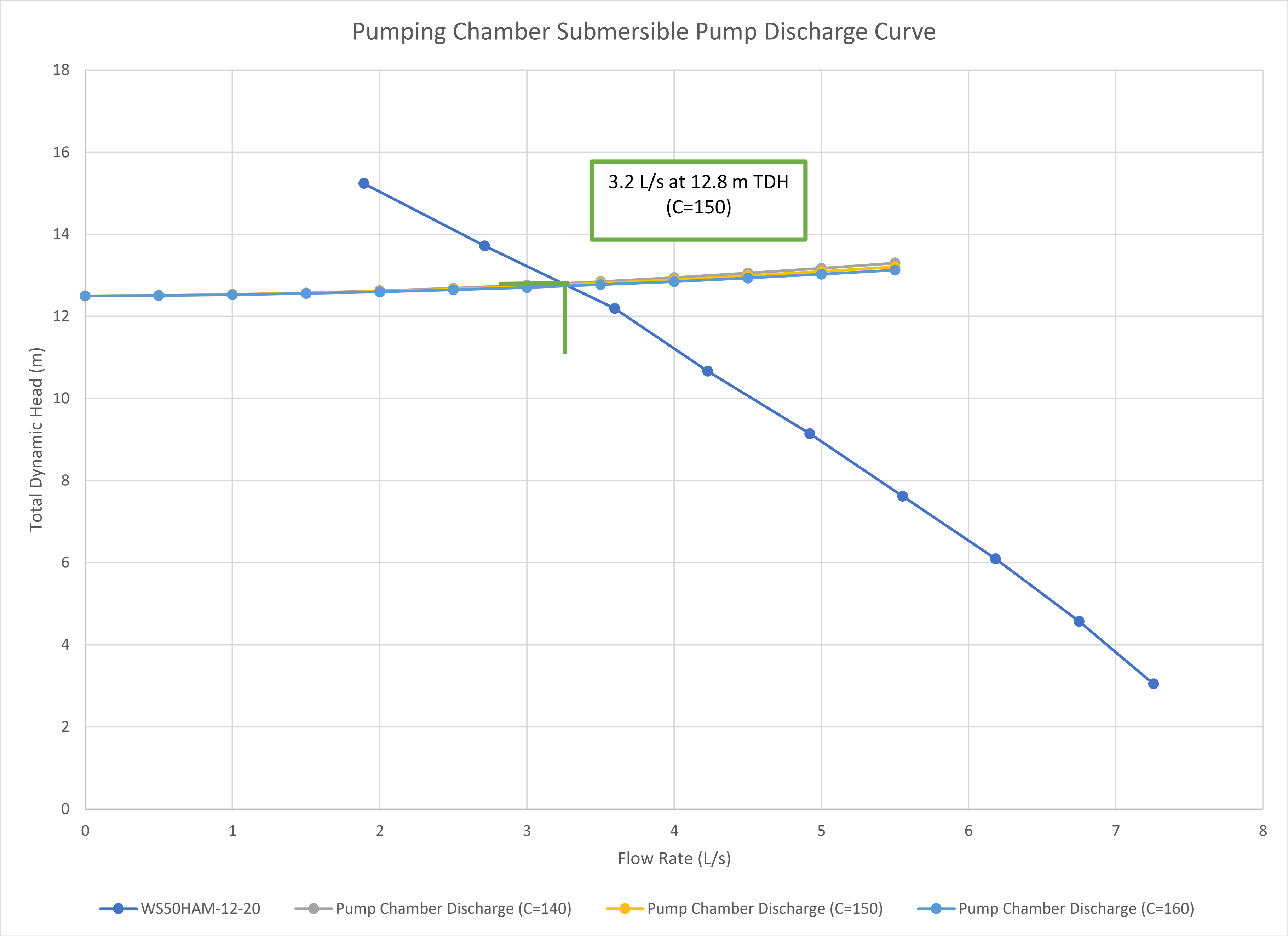
Flow		**Velocity**	**Fitting Loss (K*V^2/2*g)**	**Pipe Friction Losses Friction Coefficient (C) in m 50 mm Forcemain & Manifold**			**Pipe Friction Losses Friction Coefficient (C) in m 25 mm Forcemain & Manifold**			**Static Head**	**Pressure to be dosed**	**Total Dynamic Head Loss (m)**		
L/s	**m3/s**	**m/s**	**m**	**140**	**150**	**160**	**140**	**150**	**160**	**m**	**m**	**140**	**150**	**160**
0	0	0	0	0	0	0	0	0	0	2.5	0.6	3.1	3.1	3.1
0.5	0.0005	9.8E-07	7.934E-13	0.03	0.03	0.03	1.44	1.27	1.12	2.5	0.6	4.57	4.40	4.25
1	0.0010	2E-06	3.173E-12	0.12	0.11	0.10	5.20	4.57	4.06	2.5	0.6	8.42	7.78	7.25
1.5	0.0015	2.9E-06	7.14E-12	0.26	0.23	0.20	11.01	9.69	8.60	2.5	0.6	14.37	13.02	11.90
2	0.0020	3.9E-06	1.269E-11	0.44	0.39	0.35	18.76	16.51	14.65	2.5	0.6	22.31	20.00	18.10
2.5	0.0025	4.9E-06	1.983E-11	0.67	0.59	0.52	28.36	24.96	22.15	2.5	0.6	32.13	28.65	25.77
3	0.0030	5.9E-06	2.856E-11	0.94	0.83	0.73	39.75	34.99	31.04	2.5	0.6	43.80	38.91	34.88
3.5	0.0035	6.9E-06	3.887E-11	1.25	1.10	0.98	52.89	46.55	41.30	2.5	0.6	57.24	50.75	45.38
4	0.0040	7.9E-06	5.078E-11	1.60	1.41	1.25	67.73	59.61	52.89	2.5	0.6	72.43	64.12	57.24
4.5	0.0045	8.8E-06	6.426E-11	1.99	1.76	1.56	84.24	74.13	65.78	2.5	0.6	89.33	78.99	70.44
5	0.0050	9.8E-06	7.934E-11	2.42	2.13	1.89	102.39	90.11	79.96	2.5	0.6	107.91	95.34	84.95
5.5	0.0055	1.1E-05	9.6E-11	2.89	2.55	2.26	122.16	107.50	95.39	2.5	0.6	128.15	113.15	100.75

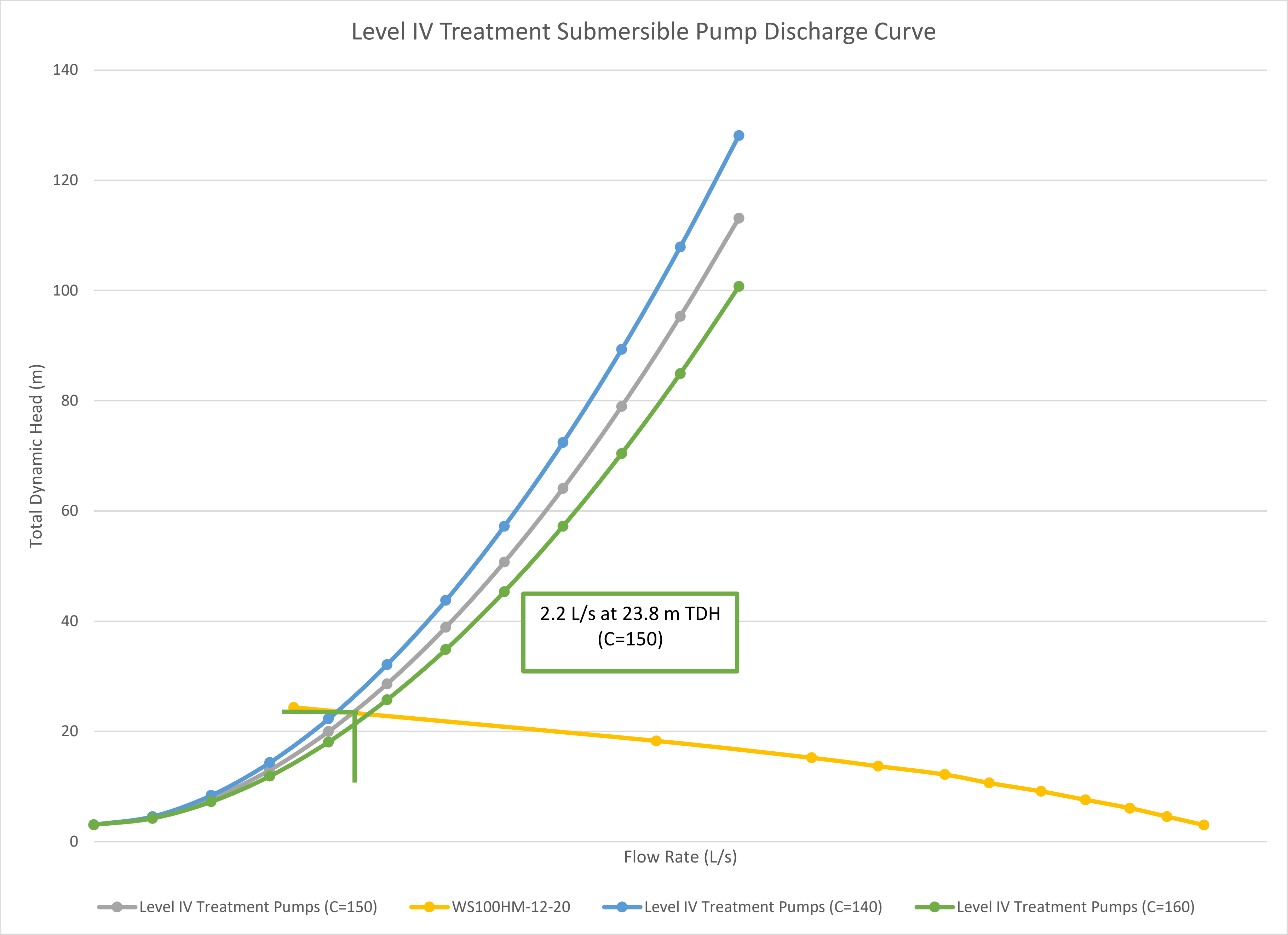
Recycle Line Pump (from Level IV Treatment to Upstream of the Septic System)

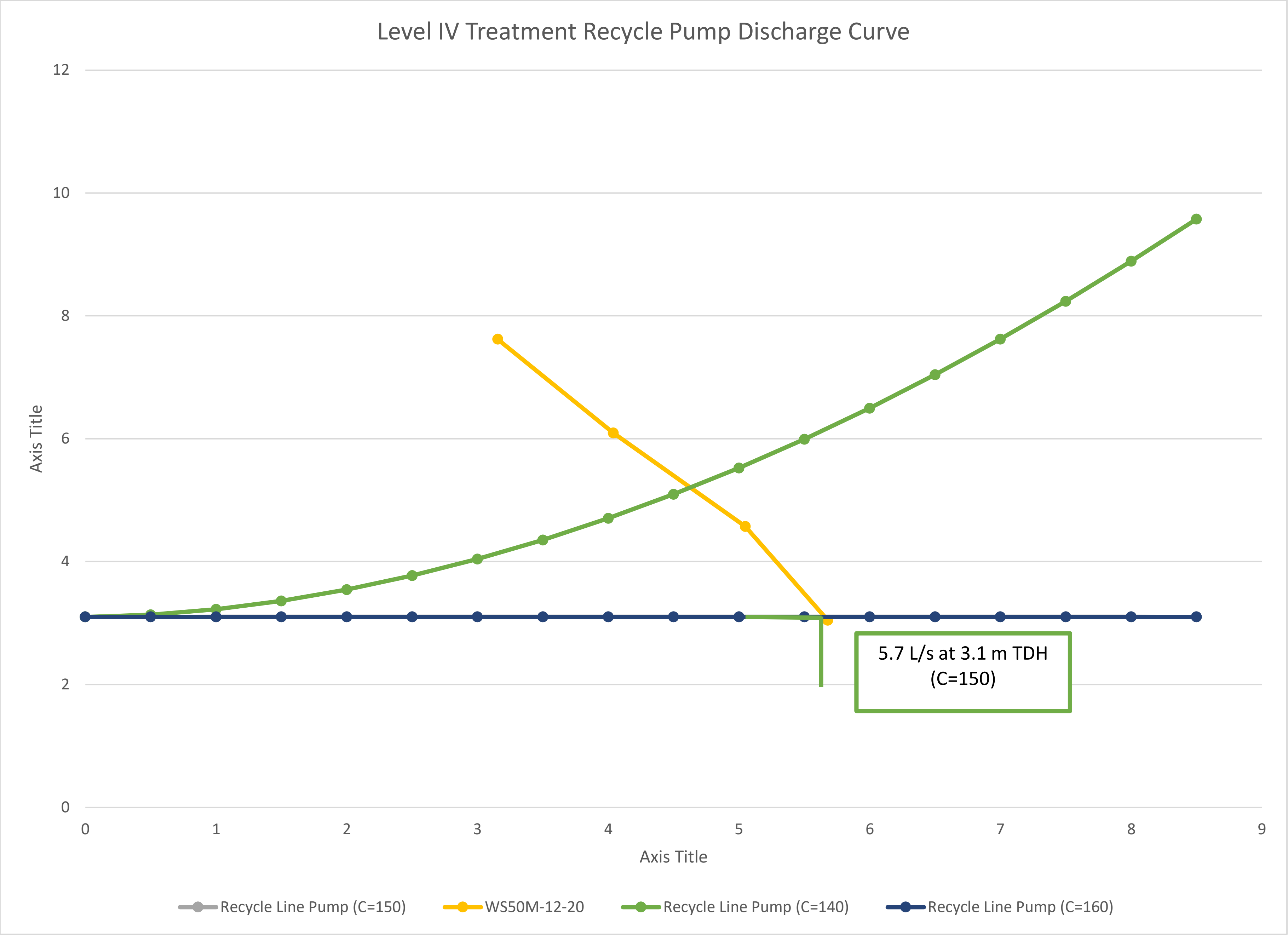
Parameter	Value	Unit	Notes
Low Water Level			
Top of Pipe			
Static Head	2.5	m	
Pipe Diameter	0.05	m	
Pipe Area	0.00196	m2	
Pipe Length	18	m	
Pressure at end	0.6	m	

Fittings	K Value	Qty	Total
90 degree elbows	0.81	3	2.43
Check Valve	10.8	1	10.8
Ball Valve	0.08	1	0.08
		Subtotal	13.31
		Safety Factor	1.2
		Total	**14.51**

Flow		Velocity	Fitting Loss (K*V^2/2*g)	Pipe Friction Losses Friction Coefficient (C) in m			Static Head	Pressure to be dosed	Total Dynamic Head Loss (m)		
L/s	**m3/s**	**m/s**	**m**	**140**	**150**	**160**	**m**	**m**	**140**	**150**	**160**
0	0	0	0	0	0	0	2.5	0.6	3.1	3.1	3.1
########	0.0005	9.8E-07	7.128E-13	0.03	0.00	0.00	2.5	0.6	3.13	3.10	3.10
1	0.0010	2E-06	2.851E-12	0.12	0.00	0.00	2.5	0.6	3.22	3.10	3.10
########	0.0015	2.9E-06	6.415E-12	0.26	0.00	0.00	2.5	0.6	3.36	3.10	3.10
2	0.0020	3.9E-06	1.14E-11	0.44	0.00	0.00	2.5	0.6	3.54	3.10	3.10
########	0.0025	4.9E-06	1.782E-11	0.67	0.00	0.00	2.5	0.6	3.77	3.10	3.10
3	0.0030	5.9E-06	2.566E-11	0.94	0.00	0.00	2.5	0.6	4.04	3.10	3.10
########	0.0035	6.9E-06	3.493E-11	1.25	0.00	0.00	2.5	0.6	4.35	3.10	3.10
4	0.0040	7.9E-06	4.562E-11	1.60	0.00	0.00	2.5	0.6	4.70	3.10	3.10
########	0.0045	8.8E-06	5.774E-11	1.99	0.00	0.00	2.5	0.6	5.09	3.10	3.10
5	0.0050	9.8E-06	7.128E-11	2.42	0.00	0.00	2.5	0.6	5.52	3.10	3.10
########	0.0055	1.1E-05	8.625E-11	2.89	0.00	0.00	2.5	0.6	5.99	3.10	3.10
6	0.0060	1.2E-05	1.026E-10	3.40	0.00	0.00	2.5	0.6	6.50	3.10	3.10
########	0.0065	1.3E-05	1.205E-10	3.94	0.00	0.00	2.5	0.6	7.04	3.10	3.10
7	0.0070	1.4E-05	1.397E-10	4.52	0.00	0.00	2.5	0.6	7.62	3.10	3.10
########	0.0075	1.5E-05	1.604E-10	5.14	0.00	0.00	2.5	0.6	8.24	3.10	3.10
8	0.0080	1.6E-05	1.825E-10	5.79	0.00	0.00	2.5	0.6	8.89	3.10	3.10
########	0.0085	1.7E-05	2.06E-10	6.48	0.00	0.00	2.5	0.6	9.58	3.10	3.10


Pumping Chamber Submersible Pump Discharge Curve
3.2 L/s at 12.8 m TDH
(C=150)
Total Dynamic Head (m)
0
2
4
6
8
10
12
14
16
18
Flow Rate (L/s)
0
1
2
3
4
5
6
7
8
WS50HAM-12-20
Pump Chamber Discharge (C=140)
Pump Chamber Discharge (C=150)
Pump Chamber Discharge (C=160)


Level IV Treatment Submersible Pump Discharge Curve
140
120
100
80
60
40
20
0
Total Dynamic Head (m)
Flow Rate (L/s)
2.2 L/s at 23.8 m TDH
(C=150)
Level IV Treatment Pumps (C=150)
WS100HM-12-20
Level IV Treatment Pumps (C=140)
Level IV Treatment Pumps (C=160)


Level IV Treatment Recycle Pump Discharge Curve
12
10
8
6
4
2
0
Axis Title
0
1
2
3
4
5
6
7
8
9
Axis Title
5.7 L/s at 3.1 m TDH
(C=150)
Recycle Line Pump (C=150)
WS50M-12-20
Recycle Line Pump (C=140)
Recycle Line Pump (C=160)

F

Appendix F - Correspondence

Julien Sauvé

From: James Holland <jholland@nation.on.ca>
Sent: Tuesday, May 4, 2021 11:35 AM
To: Julien Sauvé
Subject: FW: Fastfrate Site Water Quality Requirements
Attachments: FW_ South Nation Conservation Property Inquiry Letters _ (Roll_ 061460008029995.msg; 200608 2009 05 Hawthorne Industrial Park-SWM REPORT FEB09.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

EXTERNAL EMAIL

Hi Julien,

Thanks for confirming with the Conservation Authority; this question has come up for every property in the subdivision. The current standard is 80% TSS removal.

The pre-constitution for the site plan focussed on the adjacent watercourse and encroachment into the 30m setback. Our review will look to confirm that the stormwater management design implements the recommendations of an environmental impact statement that addresses this issue. We have not received a study so I cannot provide any additional information.

Feel free to contact me if there are any other questions about the site plan application.
Regards,
James

From: Julien Sauvé <Julien.Sauve@cima.ca>
Sent: May 3, 2021 3:33 PM
To: Laura Crites <lcrites@nation.on.ca>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>; Douglas Rancier <drancier@civitasgroup.ca>
Subject: Fastfrate Site Water Quality Requirements

Hi Laura,

My name is Julien and I am working with Fastfrate to help design their new facility at the intersection of Rideau road and Somme Street. Refer to attached email for previous correspondence about the subject site.

The reason we are contacting you is to get confirmation on the water quality requirements. The attached SWM report 2009 for the Hawthorne Industrial site (see attached) states that individual site will need to fulfil the normal level of protection (TSS 70% removal). Can you confirm if this requirement is still valid? Refer to section 5 p. 14 of 30.

Please advise us on the water quality requirement and let us know if you have any questions.

Regards,

JULIEN SAUVÉ, P.Eng.
Engineer / Infrastructure
Ingénieur / Infrastructure

T 613-860-2462 ext. 6623 **M** 613-668-1298 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

AON
BESTEMPLOYER
PLATINUM | CANADA | 2018

From: Uzoechina Ukeje <uukeje@gwal.com>
Sent: July 8, 2021 1:23 PM
To: Guillaume LeBlond
Cc: Christian Lavoie-Lebel; Peter Chan; Tim Kennedy; Julien Sauvé
Subject: RE: [EXTERNAL]RE: A001083 - CBRE Fastfrate - Building Stormwater Management

EXTERNAL EMAIL

Hi Guillaume,
The architectural drawings we have on hand do not show any roof drain positions.
However, if we are to assume a horizontal roof with no adjacent walls, the **tota**l release rate will be **173.45L/s.**

1) With a 6in capacity Rain Water Leader, a total of 13 Roof drains will be required (each having a release rate of 14L/s)
2) With an 8in capacity Rain Water Leader, a total of 6 Roof drains will be required (each having a release rate of 30L/s)

Let me know if you have further questions.

Thank you

From: Guillaume LeBlond <Guillaume.LeBlond@cima.ca>
Sent: July-08-21 11:53 AM
To: Uzoechina Ukeje <uukeje@gwal.com>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>; Peter Chan <pchan@gwal.com>; Tim Kennedy <Tim.Kennedy@cima.ca>; Julien Sauvé <Julien.Sauve@cima.ca>
Subject: [EXTERNAL]RE: A001083 - CBRE Fastfrate - Building Stormwater Management

Hi Uzo,

Just to clarify what I need from my last email:
I need the number of roof drains as well as the flowrate per drain .
Hope this clears up any confusion.

Thanks,

GUILLAUME LEBLOND, M.A.Sc., EIT
EIT / Infrastructures
EIT / Infrastructure

T 613-860-2462 ext. 6667 **C** 613 868-5747 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

Avis pour nos clients sur la COVID-19

CIMA+ L'humain au centre de l'ingénierie 30 ANS KINCENTRIC Employeur CANADA 2019

From: Guillaume LeBlond
Sent: July 8, 2021 10:44 AM
To: Uzoechina Ukeje <uukeje@gwal.com>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>; pchan@gwal.com; Tim Kennedy <Tim.Kennedy@cima.ca>; Julien Sauvé <Julien.Sauve@cima.ca>
Subject: A001083 - CBRE Fastfrate - Building Stormwater Management

Good morning Uzo,

I work with Julien Sauvé and Christian Lavoie-Lebel on the Fastfrate project and we are currently finalizing the stormwater management design for the site.
Could you please provide us with the release rates of the building roof drains? We are looking for both the 10 year and 100 year rainfall.

Thank you,

GUILLAUME LEBLOND, M.A.Sc., EIT
EIT / Infrastructures
EIT / Infrastructure

T 613-860-2462 ext. 6667 **C** 613 868-5747 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

Avis pour nos clients sur la COVID-19

L'**humain** au centre
de l'ingénierie

30 ANS

KINCENTRIC
Employeur
CANADA 2019

EXTERNAL EMAIL

Jaymeson

Answers below in red font for ease of reference.

Arthur Gordon

Castleglenn Consultants Inc.
2460 Lancaster Road
Ottawa, Ontario
K1B 4S5
(T) (613) 731-4052 / (F) (613) 731-0253
agordon@castleglenn.ca

Castleglenn Consultants
Engineers, Project Managers & Planners

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: June 7, 2022 4:13 PM
To: agordoncastleglenn@gmail.com; Douglas Rancier <drancier@civitasgroup.ca>; Julien Sauvé <Julien.Sauve@cima.ca>; 'Courteau, Pierre @ CBRE GCS Canada' <Pierre.Courteau@cbre.com>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>; 'Primett, Keefe @ Ottawa' <keefe.primett@cbre.com>; 'Nadia Toulaimat' <ntoulaimat@civitasgroup.ca>
Subject: RE: A001083 Fastfrate: Culvert Safety analysis

A001083

Hi Arthur,

I am responsible for the culvert safety analysis calculations on the CIMA+ team.

I was wondering if you could provide the following information:

- The AADT (or projected AADT) of Somme Street **at the site entrance**: To the best of my knowledge, our TIA estimated a build-out year for this development to be 2022. Exhibit 6-1 estimated the 2-way traffic on Somme in front of the development to be about 40 vph at the entrance in 2022. Translating this to AADT would imply 400 vpd 2-way AADT, once again in 2022. However, the culvert safety review should really examine buildout of the entire sub-division along Somme to determine the required flows. This was not done for our TIA as you can see that several exemptions (See Section 3.0) were granted given the size and the estimated traffic generation of the individual development.
- Confirm that a traffic growth rate of 3% is reasonable, as mentioned in the traffic study for the area. This we leave to you. The 3% figure was agreed to with the City of Ottawa in preparation of the TIA and was adopted. There is no rationale that the figure was based upon other than agreement with City staff.

I would also like to confirm whether the 3% traffic growth is linear or compounded. Unlike population growth, I have yet to ever see anyone apply compound growth to motor-vehicle travel, especially for long term horizons. I suggest using lowing formula.

$$TV_{future} = TV_{existing}\left[1 + \left(n \times \frac{\%}{100}\right)\right]$$
$$TV = traffic\ volume$$
$$n = number\ of\ years$$

If you’d like to discuss, feel free to give me a call when you get a chance (343-204-5387).

Thanks,

JAYMESON ADAMS, P.Eng.
Engineer / Infrastructure
Ingénieur / Infrastructures

M 343 204-5387 Contact me on Teams / Contactez-moi sur Teams
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

Notice to our customers on the COVID-19

From: agordoncastleglenn@gmail.com <agordoncastleglenn@gmail.com>
Sent: June 7, 2022 2:32 PM
To: Douglas Rancier <drancier@civitasgroup.ca>; Julien Sauvé <Julien.Sauve@cima.ca>; 'Courteau, Pierre @ CBRE GCS Canada' <Pierre.Courteau@cbre.com>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>; Jaymeson Adams <Jaymeson.Adams@cima.ca>; 'Primett, Keefe @ Ottawa' <keefe.primett@cbre.com>; 'Nadia Toulaimat' <ntoulaimat@civitasgroup.ca>
Subject: RE: A001083 Fastfrate: Culvert Safety analysis

EXTERNAL EMAIL

Hi Douglas

We left a message for Julien Sauvé over at CIMA to give us a call.
We'll be happy to provide what ever information he requires.

Arthur Gordon

Castleglenn Consultants Inc.
2460 Lancaster Road
Ottawa, Ontario
K1B 4S5
(T) (613) 731-4052 / (F) (613) 731-0253
agordon@castleglenn.ca

Castleglenn
Consultants
Engineers, Project Managers & Planners

From: Douglas Rancier <DRancier@civitasgroup.ca>
Sent: June 7, 2022 9:33 AM
To: Julien Sauvé <Julien.Sauve@cima.ca>; Courteau, Pierre @ CBRE GCS Canada <Pierre.Courteau@cbre.com>; agordoncastleglenn@gmail.com
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>; Jaymeson Adams <Jaymeson.Adams@cima.ca>; Primett, Keefe @ Ottawa <keefe.primett@cbre.com>; Nadia Toulaimat <ntoulaimat@civitasgroup.ca>
Subject: RE: A001083 Fastfrate: Culvert Safety analysis
Importance: High

Good Morning Julien,

By way of this email we forwarding your question to Castleglenn for their verification as soon as possible.

Regards,

CIVITAS
GROUP

DOUGLAS RANCIER
PRINCIPAL, DESIGN ARCHITECT
B.ARCH., DIPL.ARCH.TECH.
OAA, MRAIC, LEED® AP

Office: 613.742.7482 Ext. 101
Mobile: 613.447.2550
203-6 Hamilton Avenue N
Ottawa, Ontario K1Y 4R1

From: Julien Sauvé <Julien.Sauve@cima.ca>
Sent: June 7, 2022 9:29 AM
To: Douglas Rancier <DRancier@civitasgroup.ca>; Courteau, Pierre @ CBRE GCS Canada <Pierre.Courteau@cbre.com>
Cc: Christian Lavoie-Lebel <Christian.Lavoie-Lebel@cima.ca>; Jaymeson Adams <Jaymeson.Adams@cima.ca>
Subject: FW: A001083 Fastfrate: Culvert Safety analysis

Hi Doug / Pierre,

We are in the process of completing the Culvert Safety Analysis as per requirement from the City of Ottawa comments. In order to perform this task, we need to have the AADT (Average Annual Daily Traffic) value. The traffic study done by Castleglenn Consultants Inc does not provide this value. Could you reach out to them to obtain this value? Since the current site does not have any traffic at the current moment, they will most likely need to assume a certain value for future traffic.

Would it also be possible to confirm with the traffic team that a traffic growth rate of 3% is accurate at this location, and whether the 3% would be linear or compounded growth rate?

Regards,,

JULIEN SAUVÉ, P.Eng.
Engineer / Infrastructure
Ingénieur / Infrastructure

T 613-860-2462 ext. 6623 **M** 613-668-1298 **F** 613-860-1870
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

From: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Sent: Tuesday, June 7, 2022 9:15 AM
To: Julien Sauvé <Julien.Sauve@cima.ca>
Subject: RE: A001083 Fastfrate: Culvert Security

A001083

Good morning Julien,

After reviewing the Traffic Study, there is no mention of an AADT (Average Annual Daily Traffic) to use or assume for Somme Street. I will require this number to do the culvert safety analysis as required per City comments.

Could you please check if there is an AADT available for Somme at the Fastfrate location?

Also, could you please confirm with the Traffic group that a traffic growth rate of 3% is accurate at this location, and whether the 3% would be linear or compounded growth rate?

Thanks,

JAYMESON ADAMS, P.Eng.
Engineer / Infrastructure
Ingénieur / Infrastructures

M 343 204-5387 Contact me on Teams / Contactez-moi sur Teams
110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

Notice to our customers on the COVID-19

From: Julien Sauvé <Julien.Sauve@cima.ca>
Sent: June 7, 2022 8:00 AM
To: Jaymeson Adams <Jaymeson.Adams@cima.ca>
Subject: A001083 Fastfrate: Culvert Security

Hi Jaymeson,

For the Culvert transportation review safety please put all your documents in the link below:

Z:\Cima-C10\Ott_Projects\A\A001000-A001499\A001083_Fastfrate Warehouse Development\300\360_Civil\10-Culvert Safety

The CAD drawing are located in the 400 file. Grading is C006 and Servicing C007. Please make yourself a copy because I Simon needs to work in those drawings this morning.

Let me know if you need anything else.

Regards,

JULIEN SAUVÉ, P.Eng.
Engineer / Infrastructure
Ingénieur / Infrastructure

T 613-860-2462 ext. 6623 **M** 613-668-1298 **F** 613-860-1870
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110–240 Catherine Street, Ottawa, ON K2P 2G8 CANADA

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F

Appendix F-2

DEVELOPMENT SERVICING STUDY CHECKLIST

Servicing Study Guidelines for Development Applications

4. Development Servicing Study Checklist

4.1 General Content

Required Content		Reference Location
☐	Executive Summary (for larger reports only).	N/A
☑	Date and revision number of the report.	Cover Sheet
☑	Location map and plan showing municipal address, boundary, and layout of proposed development.	Report Figures, Appendix
☑	Plan showing the site and location of all existing services.	Project Drawings - Under separate cover
☑	Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	Section 1.1
☑	Summary of Pre-consultation Meetings with City and other approval agencies.	Section 1.4, Appendix L
☑	Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	Section 1.3 & 4.3.2
☑	Statement of objectives and servicing criteria.	Section 1 , 2.2.1, 3.2 & 4.2
☑	Identification of existing and proposed infrastructure available in the immediate area.	Section 1.2 & Appendix B
☐	Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	Section 1.1
☐	Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	Project Drawings - Under separate cover
☐	Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	Geotechnical, Hydrogeological, and septic assessment - Under separate cover
☐	Proposed phasing of the development, if applicable.	N/A
☐	Reference to geotechnical studies and recommendations concerning servicing.	Section 7. References
☐	All preliminary and formal site plan submissions should have the following information: - Metric scale; - North Arrow (including construction North); - Key Plan; - Name and contact information of applicant and property owner; - Property limits including bearings and dimensions; - Existing and proposed structures and parking areas; - Easements, road widening and rights-of-way; - Adjacent street names.	Project Drawings - Under separate cover

4.2 Development Servicing Report: Water

Required Content		Reference Location
☐	Confirm consistency with Master Servicing Study, if available	N/A
☑	Availability of public infrastructure to service proposed development	Section 1.2 & 3.1
☑	Identification of system constraints	
☑	Identify boundary conditions	Geotechnical, Hydrogeological, and septic assessment - Under separate cover
☑	Confirmation of adequate domestic supply and pressure	Section 3.2 & 3.3
☑	Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Section 3.2.2
☐	Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	N/A
☐	Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	N/A
☑	Address reliability requirements such as appropriate location of shut-off valves	Project Drawings - Under separate cover

Servicing Study Guidelines for Development Applications

☐	Check on the necessity of a pressure zone boundary modification.	N/A
☑	Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range	Section 3.3 & Geotechnical, Hydrogeological, and septic assessment - Under separate cover
☐	Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	N/A
☐	Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A
☑	Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Section 3.2, Appendix D
☐	Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	N/A

4.3 Development Servicing Report: Wastewater

Required Content		Reference Location
☑	Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	Section 2.2
☐	Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A
☐	Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N/A
☑	Description of existing sanitary sewer available for discharge of wastewater from proposed development	N/A
☑	Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	N/A
☑	Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	Section 2.2 & Appendix F
☑	Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 2.2
☐	Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	N/A
☐	Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	N/A
☐	Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A
☐	Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A
☐	Special considerations such as contamination, corrosive environment etc.	N/A

4.4 Development Servicing Report: Stormwater Checklist

Required Content		Reference Location
☑	Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 4.1
☑	Analysis of available capacity in existing public infrastructure.	Section 4.1, 4.3
☑	A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Appendix A, B
☑	Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Section 4.2
☑	Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Section 4.2
☑	Description of the stormwater management concept with facility locations and descriptions with references and supporting information.	Section 4.3, 4.4 & Appendix C
☐	Set-back from private sewage disposal systems.	Project Drawings - Under separate cover

☐	Watercourse and hazard lands setbacks.	Project Drawings - Under separate cover
☑	Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	Section 1.4 & Appendix G
☐	Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	Section 4
☑	Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).	Section 4.3 & Project Drawings - Under separate cover
☐	Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	Section 4
☑	Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Section 4.1 & 4.3
☐	Any proposed diversion of drainage catchment areas from one outlet to another.	Section 4.2, Appendix B
☐	Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Project Drawings - Under separate cover
☐	If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100 year return period storm event.	N/A
☐	Identification of potential impacts to receiving watercourses	Section 1.3.4
☐	Identification of municipal drains and related approval requirements.	N/A
☑	Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 4.3 and 4.4
☐	100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	Project Drawings - Under separate cover
☐	Inclusion of hydraulic analysis including hydraulic grade line elevations.	Appendix C
☐	Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 5
☐	Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A
☐	Identification of fill constraints related to floodplain and geotechnical investigation.	N/A

4.5 Approval and Permit Requirements: Checklist

Required Content		Reference Location
☐	Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	N/A
☐	Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	N/A
☐	Changes to Municipal Drains.	N/A
☐	Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	N/A

4.6 Conclusion Checklist

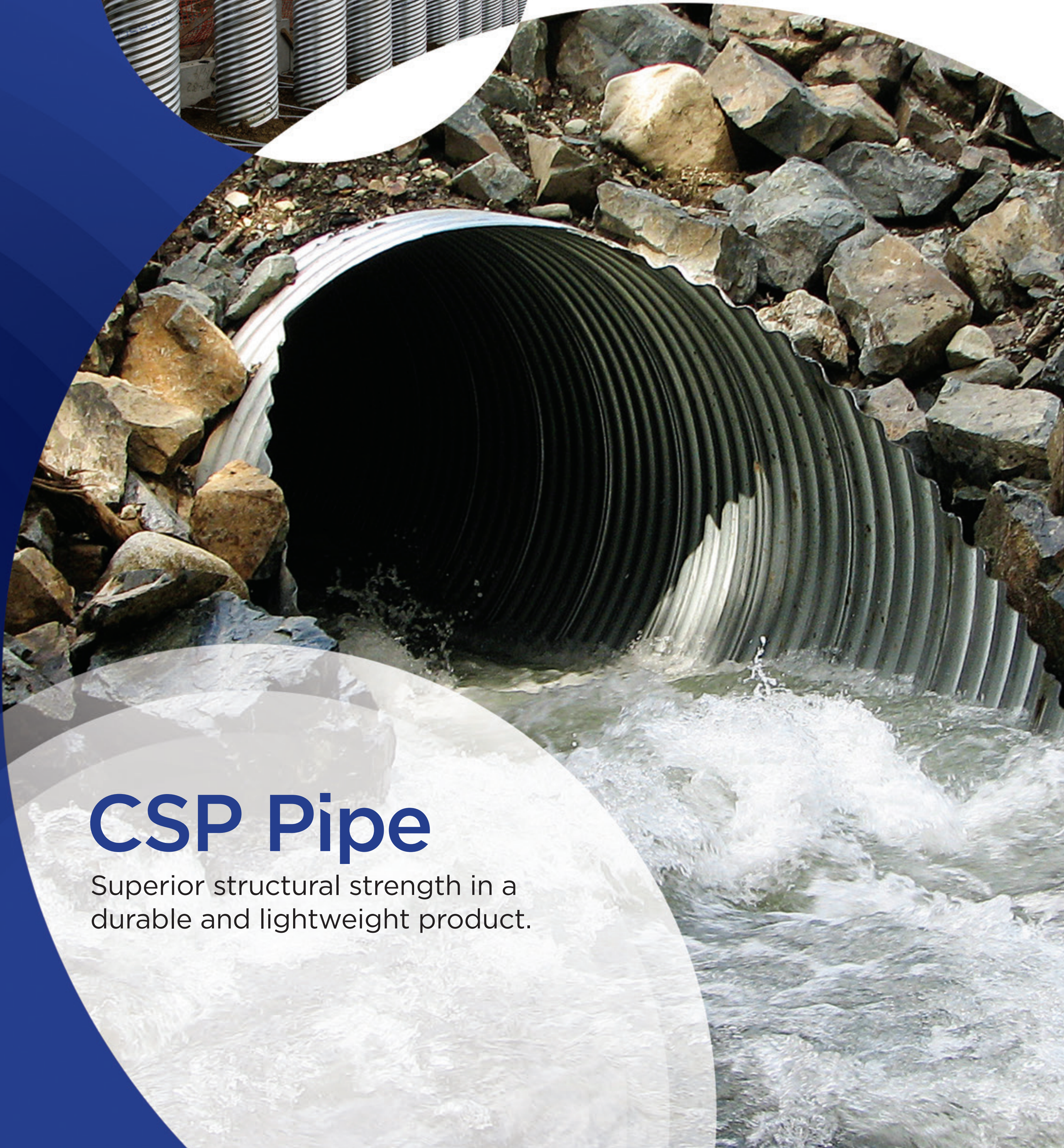
Required Content		Reference Location
☑	Clearly stated conclusions and recommendations	Section 6
☐	Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	
☐	All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	

G

Appendix G-1
ARMTECH CORRUGATED STEEL PIPE

armtec

A division of
WGI Westman Group Inc.



CSP Pipe

Superior structural strength in a
durable and lightweight product.

APPLICATIONS INCLUDE:

Culverts | Storm Sewers | Storm Water Detention Tanks | Utilidors | More!

From culverts to pole cribs, no other product works harder than **CSP.**

CORRUGATED STEEL PIPE (CSP) AND RELATED PRODUCTS

Corrugated steel pipe has been successfully used in infrastructure across North America and around the world since the late 1890s. It is a trusted material that combines strength, light weight, flexibility and adaptability. The economy of CSP is second to none. No other material can beat its low up-front and total life cycle costs. Combine this with a service life of up to 100 years, and the choice is clear!

Armtec CSP is manufactured in Canada to the highest standard of quality and performance. With a variety of shapes, sizes, coating and material options, Armtec CSP products will meet the demands of your most challenging drainage projects.

NESTABLE PIPE

Versatile half-round segments of corrugated steel in flange or notch type configuration for ease of transportation.

STEELCOR

Galvanized CSP formed with helical corrugations and a continuous lock-seam combines flexibility with high compressive strength.

ULTRA-FLO

Large diameter storm sewer pipe delivering superior hydraulic performance.

ARMTEC IS A MEMBER OF THE
CORRUGATED STEEL PIPE INSTITUTE (CSPI)

CSP END SECTIONS

Lightweight end sections for improved hydraulic performance and erosion control.

ARMTEC CSP can tackle any condition Canada can throw at it.

Steel Pipe Coatings to Match the Environment

Surface Water Sensitivity to Atmospheric Pollutants

● Highly sensitive to acidification (i.e. low pH, elevated chloride and sulphate levels, low calcium carbonate levels [soft water]). Polymer laminated coating may be required.

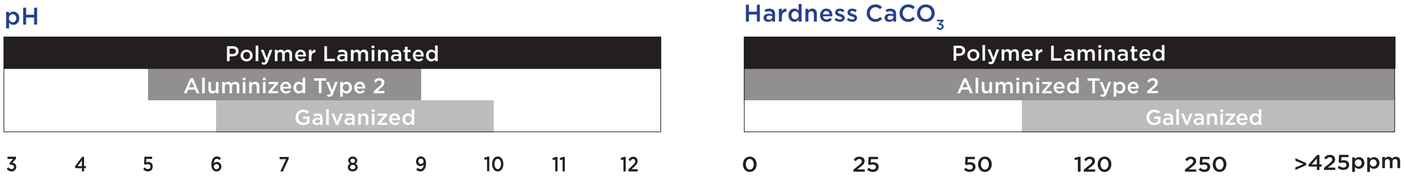
● Moderately sensitive to acidification (i.e. moderate pH, medium to low calcium carbonate levels). Aluminized Type 2 coating may be required.

● Unlikely to be negatively influenced by atmospheric pollutants. Galvanized steel should be sufficient.

● Unrated

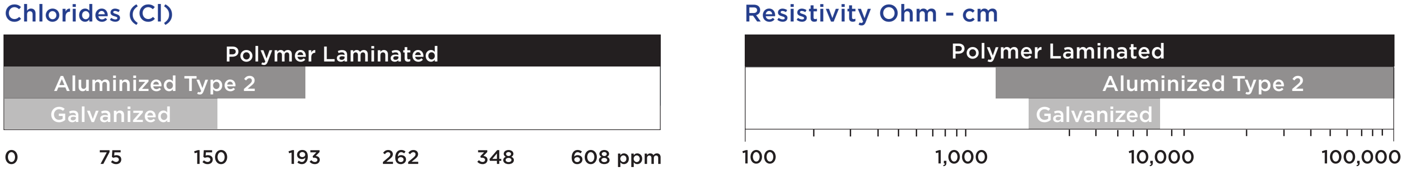
BACKED BY SCIENCE – Armtec can provide industry technical bulletins (for pH, chlorides, hardness and resisitivity) to help you specify the right coating for your required service life.

OPTIMUM OPERATING RANGE OF VARIOUS PIPE COATINGS



pH

Hardness $CaCO_3$



Chlorides (Cl)

Resistivity Ohm - cm

NOTE: BASED ON CSPI TECHNICAL BULLETIN ISSUE 1

CSP COATINGS AND DESIGN SERVICE LIFE

50

YEARS

GALVANIZED STEEL

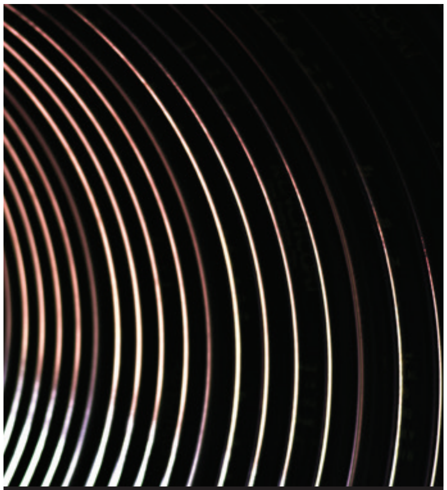
Galvanized steel is the standard finish for corrugated steel pipe. It performs well in low abrasion applications and in site conditions with a relatively neutral environment. Galvanized steel has a proven service life of 50 years minimum in non-aggressive (or ideal) site conditions. This is extended in hard water environments when the zinc coating reacts with the calcium carbonate ($CaCO_3$) in the water to form an additional protective mineral scale.

75

YEARS

ALUMINIZED STEEL TYPE 2

Aluminized Steel Type 2 pipe combines the corrosion resistant properties of aluminum with the strength and durability of CSP. It is fabricated from steel coils, and hot-dip coated with a uniform thickness on both sides. It tolerates soft water and slightly more acidic and saline conditions than galvanized steel. With a 75 year service life in its optimal operating range, it is an economical alternative to concrete pipe.



100

YEARS

POLYMER-LAMINATE

Polymer-Laminate coating such as Trenchcoat can extend the service life of CSP to 100 years. The strong adhesion characteristics of the polyolefin laminate with the galvanized sheet makes it the most durable coating available today. This rugged laminate creates a protective barrier against corrosive and abrasive conditions, and maintains its service life across a broad pH spectrum.

Find out more about the durability of CSP at **www.cspi.ca**

STEELCOR CORRUGATED STEEL PIPE

Since 1934, SteelCor pipe has proven its effectiveness and durability in countless installations under diverse conditions. Its helical corrugations and continuous lock-seam provide high compressive strength in a lightweight, thin-walled structure. SteelCor is available in a wide variety of sizes and various coating options. For ground water drainage, perforated SteelCor offers exceptional performance in low-lying areas, especially where high strength and hydraulic capacity are required.

TYPICAL APPLICATIONS

- Culverts
- Storm sewers
- Stormwater detention tanks
- Stream enclosures
- Underpasses
- Pipeline intakes
- Pipeline outfalls
- Storage relief tanks
- Caissons
- Cooling water lines
- Fish baffles

FLEXIBILITY AND STRENGTH

Helical corrugation combines strength and flexibility in a thin walled structure

HUGGER BAND

Hugger band couplers provide superior pull apart resistance, critical in soft soils

VERSATILE

Variety of sizes, corrugation profiles and coating options

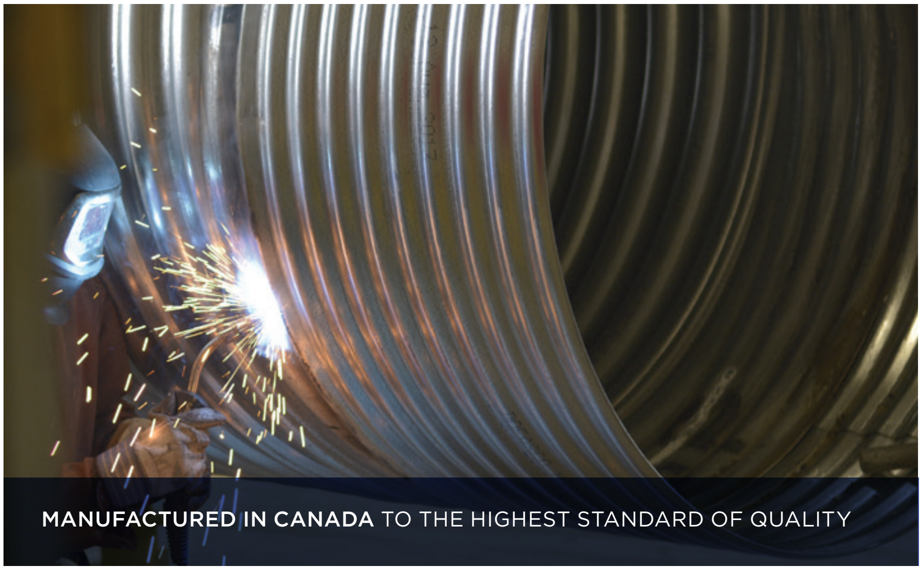
QUICK INSTALLATION

Lightweight and available in long lengths, minimizing installation time

COST-EFFECTIVE

- Low installed cost
- Nestable pieces for economical shipping

STEELCOR IS AVAILABLE IN LONG LENGTHS, MINIMIZING INSTALLATION TIME

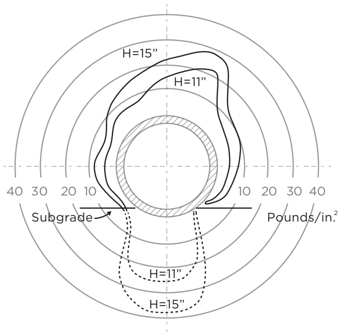


MANUFACTURED IN CANADA TO THE HIGHEST STANDARD OF QUALITY

FLEXIBILITY AND HIGH COMPRESSIVE STRENGTH

CSP is categorized as a flexible pipe. The corrugated profile of the pipe wall provides a high degree of relative stiffness which, when combined with a properly-installed engineered backfill, provides for high circumferential strength in a thin-walled structure. The compacted fill acts together with the pipe wall to form a composite soil-steel structure.

Load Distribution - Rigid Pipe



RING COMPRESSION THEORY

The compressive thrust in the pipe wall is equal to the radial pressure acting on the wall multiplied by the wall radius. In other words, pressure distribution around a flexible pipe is more uniform and load is more evenly distributed in the flexible pipe vs. the rigid pipe (i.e. concrete). Pipe wall thickness can be reduced and less bedding material is required for flexible CSP to achieve the same buried strength as a rigid pipe system.

Load Distribution - Flexible Pipe

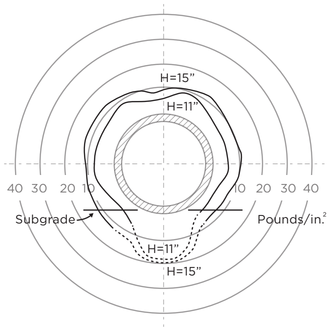
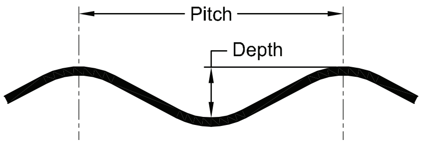
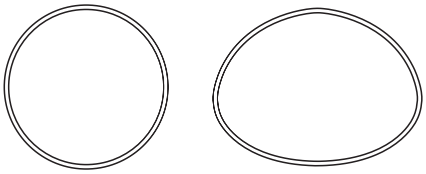


Table 1: Available Corrugation Profiles & Diameters of CSP Pipe

Corrugation	Pitch	Depth	Inside Diameter
(mm x mm)	(mm)	(mm)	(mm)
38 x 6.5	38	6.5	150, 200, 250
68 x 13	68	13	300 - 2,000
125 x 25	125	25	1,200 - 3,600



SteelCor Shapes



STEELCOR CSP IS AVAILABLE IN LARGE DIAMETERS UP TO 3,600MM

CSP PIPE ARCH

PIPE ARCHING is available for projects where headroom is limited.

COUPLERS

SteelCor pipe features universal annular corrugated ends, so a variety of couplings may be used for the pipe and pipe-arch. Annular corrugated couplers are standard for municipal and highway drainage. Hugger Band couplers are standard for storm sewer applications and Dimpled couplers are often used in forestry.

Three types of couplers are available:

- Annular corrugated standard bolt and angle coupler
- Dimpled coupling band
- Hugger Band

STANDARD ANNULAR CORRUGATED COUPLER

The standard annular corrugated coupler, fitted with bolt and angle attachments, seats snugly onto the pipe-end corrugations, and is suitable for most general-purpose applications. It comes in one, two or three piece configurations depending on the pipe diameter.

DIMPLED COUPLING BAND

This coupler is used where helical and/or annular corrugated pipe ends are to be coupled. Dimpled couplers are available with steel angles or with wedge connectors as shown.

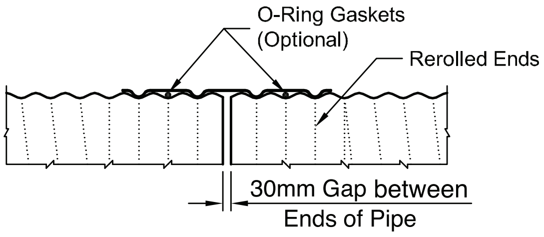
HUGGER BAND

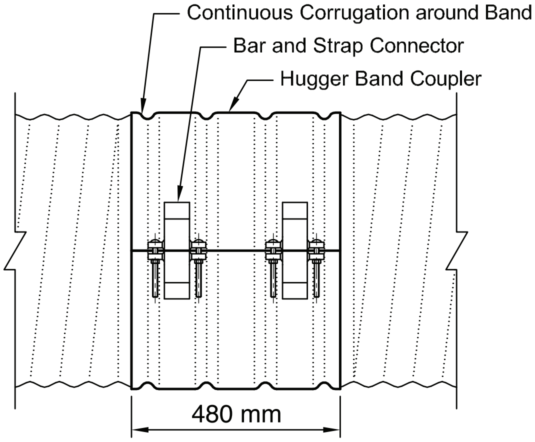
Armtec offers a highly effective Hugger Band joint. These 500mm wide bands are recommended for storm sewers and other installations where low leakage rates and resistance to longitudinal disjointing are prime requirements. When used with O-ring gaskets, the Hugger Band provides an extremely tight joint with low infiltration and exfiltration rates.

Hugger Band Couplers for CSP joints are comprised of the following components:

- Semi-corrugated coupler sheet to accommodate placing elastomeric O-rings at both re-corrugated pipe ends
- Bolted bar and strap connector at coupler sheet lap(s) to maximize joint pull-apart strength
- O-rings in combination with neoprene gasket at coupler sheet lap(s) to minimize joint leakage and/or joint infiltration

H-500 HUGGER BAND (DOUBLE BOLT, BAR AND STRAP)





Fittings

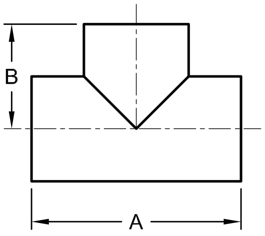
Standard fittings such as tees, wyes and elbows are available. Special fittings such as saddle branches, manholes and catch-basins can be custom-fabricated to suit individual requirements.

CSP CAN BE FABRICATED TO SUIT A MULTITUDE OF CONFIGURATIONS

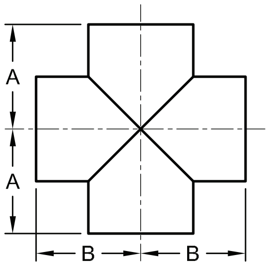
CUSTOM FITTINGS AVAILABLE

GALVANIZED CSP FIREWATER TANK SYSTEM

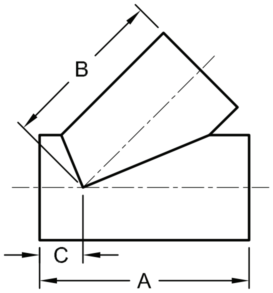
Typical Fittings



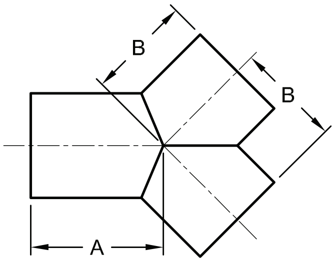
Tee



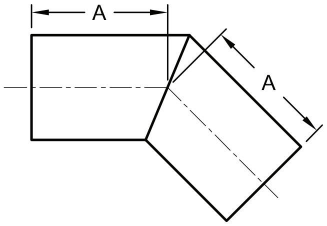
Cross



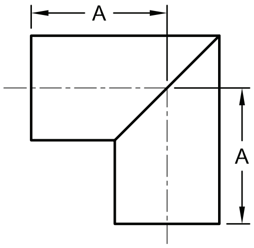
45° Lateral



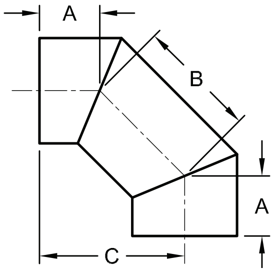
45° Wye



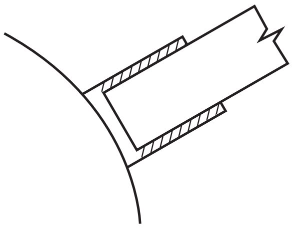
2 Piece Elbow 5° to 45°



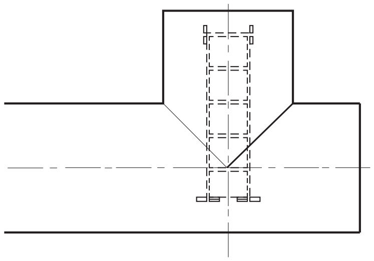
2 Piece Elbow 46° to 90°



3 Piece Elbow 46° to 90°



Saddle Branch



Catch Basin with Manhole

STEELCOR PIPE AND PIPE-ARCH TECHNICAL SPECIFICATIONS

68mm x 13mm Corrugations

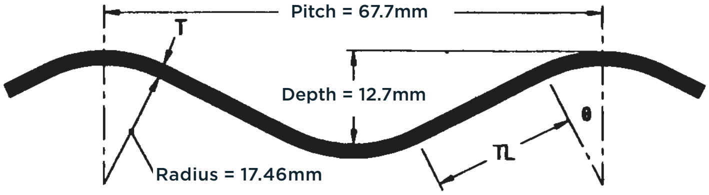


Table 2: Section Properties of 68mm x 13mm Corrugated CSP

Coated Thickness	Design Thickness	Area of Section	Moment of Inertia	Section Modulus	Radius of Gyration	Tangent Length	Tangent Angle	Developed Width Factor[1]
mm	mm	mm^2/mm	mm^4/mm	mm^3/mm	mm	mm	△° degrees	
1.6	1.42	1.512	28.367	4.024	4.332	19.578	26.734	1.080
2.0	1.82	1.966	37.108	5.111	4.345	19.304	26.867	1.080
2.8	2.64	2.852	54.565	7.114	4.374	18.765	27.136	1.080
3.5	3.35	3.621	70.159	8.743	4.402	18.269	27.381	1.081
4.2	4.08	4.411	86.706	10.334	4.433	17.755	27.643	1.081

NOTE:

[1] DEVELOPED WIDTH FACTOR IS THE AMOUNT BY WHICH THE STEEL COIL OR SHEET IS REDUCED IN COVERING WIDTH DUE TO CORRUGATING

Table 3: Handling Weight and End Area of 68mm x 13mm Corrugated CSP

Pipe Diameter	End Area	Handling Weight - Galvanized (kg/m) for the Following Specified Wall Thickness (mm)					
mm	m^2	1.3mm	1.6mm	2.0mm	2.8mm	3.5mm	4.2mm
150[1]	0.018	5.9	7.2	-	-	-	-
200[1]	0.031	7.7	9.5	-	-	-	-
250[1]	0.049	9.6	12	-	-	-	-
300	0.071	-	14	18	-	-	-
400	0.126	-	19	24	-	-	-
500	0.196	-	24	30	-	-	-
600	0.283	-	28	35	49	-	-
700	0.385	-	33	41	57	-	-
800	0.503	-	37	47	65	-	-
900	0.636	-	42	53	73	90	-
1,000	0.785	-	-	58	81	100	-
1,200	1.131	-	-	70	97	120	-
1,400	1.539	-	-	-	113	140	168
1,600	2.011	-	-	-	130	160	192
1,800	2.545	-	-	-	-	179	215
2,000	3.142	-	-	-	-	-	239

NOTE:

1. 150MM TO 250MM PIPE DIAMETER FABRICATED WITH 38 X 6.5 CORRUGATION PROFILE

STEELCOR PIPE AND PIPE-ARCH TECHNICAL SPECIFICATIONS

125mm x 25mm Corrugations

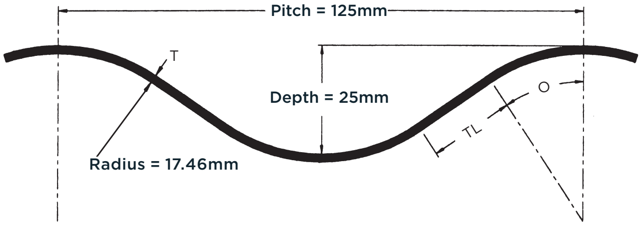


Table 4: Section Properties of 125mm x 25mm Corrugated CSP

Coated Thickness	Design Thickness	Area of Section	Moment of Inertia	Section Modulus	Radius of Gyration	Tangent Length	Tangent Angle	Developed Width Factor[1]
mm	mm	mm^2/mm	mm^4/mm	mm^3/mm	mm	mm	△° degrees	
1.6	1.40	1.549	133.300	9.730	9.277	18.568	35.564	1.106
2.0	1.82	2.014	173.720	12.489	9.287	17.970	35.811	1.107
2.8	2.64	2.923	253.237	17.684	9.308	16.742	36.330	1.107
3.5	3.35	3.711	322.743	21.993	9.326	15.600	36.826	1.108

NOTE:

1. DEVELOPED WIDTH FACTOR IS THE AMOUNT BY WHICH THE STEEL COIL OR SHEET IS REDUCED IN COVERING WIDTH DUE TO CORRUGATING

Table 5: Handling Weight and End Area of 125mm x 25mm Corrugated CSP

Pipe Diameter	End Area	Handling Weight - Galvanized (kg/m) for the Following Specified Wall Thickness (mm)			
mm	m^2	1.6mm	2.0mm	2.8mm	3.5mm
1,200	1.131	57	71	100	124
1,400	1.539	-	83	116	144
1,600	2.011	-	95	132	165
1,800	2.545	-	106	148	185
2,000	3.142	-	118	165	205
2,200	3.801	-	129	181	225
2,400	4.524	-	141	197	245
2,700	5.726	-	159	222	276
3,000	7.069	-	-	246	306
3,300	8.553	-	-	270	336
3,600	10.179	-	-	-	367

STEELCOR PIPE HEIGHT OF COVER LIMITS

CL-625 and AREMA Cooper E-80 Live Loading

Table 6: 68mm x 13mm Corrugations

Minimum Cover (mm)			Maximum Height of Cover (m) for the Following Specified Wall Thickness (mm)				
Diameter	Highway	Railway	1.6mm	2.0mm	2.8mm	3.5mm	4.2mm
mm	CL-625	E-80					
300	300	300	70	91	-	-	-
400	300	300	53	68	-	-	-
500	300	300	42	54	-	-	-
600	300	300	35	45	66	-	-
700	300	300	30	39	57	-	-
800	300	300	26	34	50	-	-
900	300	300	23	30	44	56	70
1,000	300	300	21	27	40	50	63
1,200	300	300	-	23	33	42	52
1,400	300	500	-	-	27	35	43
1,600	300	500	-	-	22	28	35
1,800	500	500	-	-	-	22	27
2,000	500	500	-	-	-	-	22

Table 7: 125mm x 25mm Corrugations

Minimum Cover (mm)			Maximum Height of Cover (m) for the Following Specified Wall Thickness (mm)			
Diameter	Highway	Railway	1.6mm	2.0mm	2.8mm	3.5mm
mm	CL-625	E-80				
1,200	300	500	18	23	34	-
1,400	300	500	15	20	29	35
1,600	300	500	13	18	25	31
1,800	300	500	12	16	22	28
2,000	300	500	11	14	20	25
2,200	300	700	10	12	18	23
2,400	500	700	-	11	17	21
2,700	500	700	-	-	15	18
3,000	500	1,000	-	-	13	16
3,300	500	1,000	-	-	-	14
3,600*	700	1,000	-	-	-	12*

NOTES:

* FLEXIBILITY LIMIT EXCEEDED – FOR SPECIFIED USE ONLY
1. DEAD LOAD IS BASED ON A UNIT WEIGHT OF BACKFILL OF 19 KN/M^3
2. WHERE HEIGHT OF COVER EXCEEDS THE DIAMETER, A REDUCTION LOAD FACTOR OF 0.86 HAS BEEN USED
3. LIVE LOAD INCLUDES IMPACT
4. MINIMUM COVER IS TAKEN FROM TOP OF PIPE TO PROFILE GRADE OR TO THE TOP OF THE FINISHED GRANULAR BASE
5. SPECIAL CARE MUST BE TAKEN WITH TRUCK LOADS DURING CONSTRUCTION
6. FOUNDATION INVESTIGATION IS RECOMMENDED PRACTICE
7. THE ABOVE HEIGHT OF COVER TABLES ARE INDUSTRY STANDARDS. LOCAL, PROVINCIAL OR FEDERAL STANDARDS MAY DIFFER

STEELCOR PIPE-ARCH DETAILS

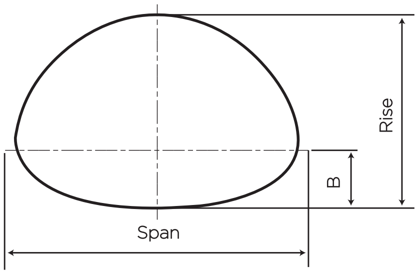


Table 8a: 68mm x 13mm Corrugations

Diameter of Pipe of Equal Periphery	Span	Rise	B	Waterway Area
mm	mm	mm	mm	m²
400	450	340	130	0.11
500	560	420	165	0.19
600	680	500	190	0.27
700	800	580	220	0.37
800	910	660	255	0.48
900	1,030	740	265	0.61
1,000	1,150	820	310	0.74
1,200	1,390	970	375	1.06
1,400	1,630	1,120	430	1.44
1,600	1,880	1,260	500	1.87
1,800	2,130	1,400	560	2.36

Table 8b: 125mm x 25mm Corrugations (where available)

Diameter of Pipe of Equal Periphery	Span	Rise	B	Waterway Area
mm	mm	mm	mm	m²
1,600	1,780	1,360	635	1.93
1,800	2,010	1,530	650	2.44
2,000	2,230	1,700	660	2.97
2,200	2,500	1,830	750	3.44
2,400	2,800	1,950	805	4.27
2,700	3,300	2,080	905	5.39
3,000	3,650	2,280	1,005	6.60
3,300	3,890	2,690	1,090	8.29
3,600	4,370	2,890	1,195	9.76

NOTES:

FOR WEIGHTS OF PIPE-ARCHES WITH THE 68 X 13 CORRUGATION REFER TO THE WEIGHT OF THE CIRCULAR PIPE WITH THE EQUIVALENT PERIPHERY. NOT ALL SIZES ARE AVAILABLE IN ALL LOCATIONS. PLEASE CONTACT AN ARMTEC REPRESENTATIVE FOR FURTHER DETAILS

Table 9a: Height of Cover Limits for 68mm x 13mm Corrugated Steel Pipe-Arch CL-625 Live Load

Span	Rise	Mininum Cover	Maximum Height of Cover (m) for Corner Bearing Pressure Limited to 200 kPa and the Following Specified Wall thickness				
mm	mm	mm	1.6mm	2.0mm	2.8mm	3.5mm	4.2mm
560	420	300	4.1				
680	500	300	4.2				
800	580	300	4.1				
910	660	300	4.1				
1030	740	300	4.0				
1150	820	300		4.0			
1390	970	300		3.9			
1630	1120	300			3.9		
1880	1260	350				3.8	
2130	1400	400				3.7	

Table 9b: Height of Cover Limits for 125mm x 25mm Corrugated Steel Pipe-Arch CL-625 Live Load

Span	Rise	Mininum Cover	Maximum Height of Cover (m) for Corner Bearing Pressure Limited to 200 kPa and the Following Specified Wall thickness				
mm	mm	mm	1.6mm	2.0mm	2.8mm	3.5mm	4.2mm
1780	1360	300			4.4		
2010	1530	350			4.3		
2230	1700	400			4.6		
2500	1830	450			4.5		
2800	1950	500			4.4		
3300	2080	550			4.3		
3650	2280	650			4.2		
3890	2690	650				3.5	
4370	2870	750				3.0[4]	3.0

NOTES:

1. FILL HEIGHTS BASED ON AISI DESIGN METHOD
2. CL-625 LIVE LOAD
3. MAXIMUM APPLIED CORNER BEARING PRESSURE 200 KPA
4. EXCEEDS FLEXIBILITY, SPECIAL ATTENTION REQUIRED FOR BACKFILL MATERIAL AND CONSTRUCTION PROCESS

PERFORATED STEELCOR PIPE FOR GROUND WATER CONTROL

Perforated SteelCor is widely accepted as a practical, durable and economical means of controlling unwanted ground water. It is an efficient solution and costs less than repeated surface repairs, virtually eliminating maintenance concerns. Perforated SteelCor pipe is available in plain galvanized and suitable for most applications, however it is strongly recommended that consideration be given to using either Aluminized Steel Type 2 or Polymer Coated in particularly aggressive environments.

Pipe Size Selection

For normal subdrainage, the infiltration of ground water is very slow. Therefore, approximately 150 metres of 150mm diameter pipe may be used as an interceptor before any increase in pipe diameter is required. Where extremely pervious material is being drained or where springs are encountered, larger sizes may be required.

Pipe Outlets

Perforated pipe's cantilever strength makes it ideal for use as a projecting pipe outlet.

Free outlets are important, and the failure of subdrains to properly function can often be attributed to plugged, damaged or improper outlets. Outlet pipes should be protected from damage by maintenance equipment. A suitable barrier such as a hinged rodent trap should be used to keep out wildlife whose nests could cause clogging.

Spacing of Laterals

Draining large, comparatively flat areas usually requires a parallel or herringbone system of drainage pipe. The spacing used on highways and railways is controlled by the location of the water-bearing strata.

Filter Sock and Geotextiles

Geotextile is widely used in perforated pipe applications, particularly where graded filter material is not available. More critical installations call for a high quality non-woven geotextile to separate the trenchfill from the native material. Armtec can also provide a low-cost knitted polyester sock to encase the pipe. This polyester sock is available custom sewn around the pipe.

Recommended Backfill

The trench should be excavated with approximately 100mm of clearance at the sides of the pipe so that pervious backfill can surround the pipe. For the filter backfill, concrete sand or other commonly available coarse sand-gravel mixtures perform satisfactorily for perforated pipe in most soils.

Placing of Perforations

Armtec recommends that the pipe be placed with the perforations down. This hinders solids from entering the pipe and keeps the water table lower.

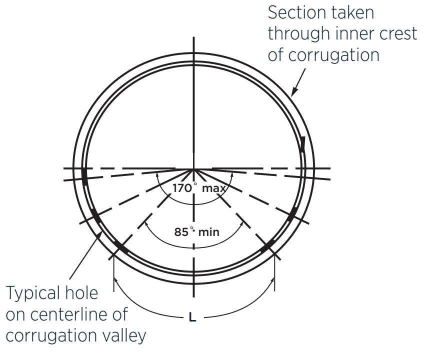
Table 10: Dimensions, Thicknesses and Spacing of Perforations*

Nominal Internal Diameter	Corrugation Profile	Normal Thickness Specified	Minimum No. of Rows of Perforations	Minimum Width Unperforated Segment	Distance Between Holes Along the Longitudinal Axis	Perforated Area
mm	mm	mm		mm	mm	cm²/m
150	38 x 6.5	1.6	4	125	38	74.61
200	38 x 6.5	1.6	4	160	38	74.61
250	38 x 6.5	1.6	4	195	38	74.61
300	68 x 13	1.6	6	235	136	31.27
400	68 x 13	1.6	6	310	136	31.27

NOTE:

* ALL PERFORATIONS ARE A NOMINAL 9.5MM DIAMETER

INVERT PERFORATING DETAIL



NOTE :

* RANDOM HOLE SPACING AROUND THE CIRCUMFERENCE IS AVAILABLE ON REQUEST

STEELCOR CSP INSTALLATION

Bedding and Backfilling

Well graded, free draining backfill is recommended for good compaction. The designer may wish to refer to the gradation and backfill specifications of the appropriate provincial highway standard. Stumps, rocks, frozen lumps and other debris should be removed from the bedding site.

Round pipe can be installed on a flat sand cushion with rodding and tamping of the backfill around the haunches. Alternatively, the pipe can be installed on a pre-shaped granular base.

The pipe-arch bottom arc must be erected on a pre-shaped sand cushion. The support under the bottom arc should be relatively yielding but under the corner haunches the supporting ground must be highly stable. Special attention should be given to compacting the backfill around the corner arcs where the highest soil pressures develop.

Backfill should be spread in 150mm to 200mm lifts alternating from one side of the pipe to the other, and should extend above the pipe to a minimum height of 300mm or one sixth the span, whichever is greater.

Compaction using suitable mechanical equipment should be carried out to achieve the specified backfill density. Care must be taken to ensure that the pipe or pipe-arch is not damaged by heavy equipment traffic during construction.

STEELCOR'S LIGHTWEIGHT SECTIONS ALLOW INSTALLATION WITHOUT THE NEED FOR HEAVY EQUIPMENT

HELICAL CORRUGATIONS AND CONTINUOUS LOCK-SEAM PROVIDE STRENGTH IN A LIGHTWEIGHT STRUCTURE

ULTRA FLO CORRUGATED STEEL PIPE

TYPICAL APPLICATIONS

- Municipal storm sewers, in large diameter
- Highway median drainage
- Industrial storm sewers
- Large diameter culverts
- Slip-lines
- Stormwater detention tanks

Ultra Flo is a durable storm sewer pipe with a unique external rib corrugation and smooth pipe interior that provides superior hydraulic performance at an economical price. It is available in round or pipe arch shapes for restricted headroom applications. Materials include Galvanized Steel, Aluminized Steel Type 2 and Polymer-Laminate.

Ultra Flo pipe is produced by a continuous spiral seam method. Stiffness is provided by 19mm x 19mm x 190mm continuous external box-shaped rib corrugations. Ultra Flo performs as a flexible compression ring under load, redistributing pressure radially into the surrounding high-density soil. The unit pressure at the pipe invert can be as little as one-third of the unit pressure under a concrete pipe in identical loading conditions.

ULTRA FLO'S EXTERIOR BOX RIBS AND SMOOTH INTERIOR COMBINES STRENGTH WITH SUPERIOR HYDRAULIC PERFORMANCE

DURABLE

Available in a wide variety of coatings to suit environmental conditions

EFFICIENT HYDRAULICS

Ultra Flo's low "n" factor is equivalent to or less than the standard 0.013 usually used in storm sewer design

NESTABLE

Efficient shipping for remote locations

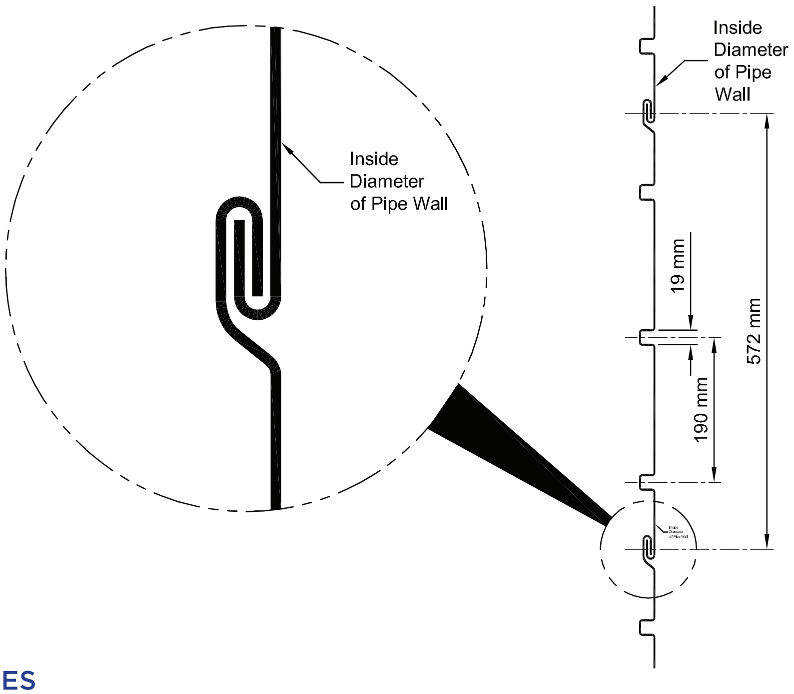
QUICK INSTALLATION

Lightweight and available in long lengths with minimal joints

$ ECONOMICAL

Lowest installed cost compared to large-diameter concrete storm sewers

RIB PROFILE



PIPE SIZES

Round (mm)	450, 525, 600, 750, 900, 1050, 1200, 1350, 1500, 1650, 1800, 2100, 2400
Arch, span x rise (mm)	500 x 410, 580 x 490, 680 x 540, 830 x 660, 1010 x 790, 1160 x 920, 1340 x 1050, 1520 x 1200, 1670 x 1300, 1850 x 1400

FOR DETAILED PRODUCT INFORMATION, SEE ULTRA FLO PRODUCT GUIDE

Table 11: Height of Cover Table for Ultra Flo Round Pipe

			Maximum Height of Fill (m) for Metal Thickness (mm)		
Diameter	Area	Minimum Height of Fill	1.6mm	2.0mm	2.8mm
mm	m^2	mm			
450	0.16	300	22.7	22.7	
525	0.22	300	19.4	28.8	50.6
600	0.28	300	17.0	25.2	44.3
750	0.44	300	13.6	20.2	35.4
900	0.64	300	11.3	16.8	29.5
1,050	0.87	300	9.7	14.4	25.3
1,200	1.13	300	8.5*	12.6	22.1
1,350	1.43	340	7.5*	11.2	19.7
1,500	1.77	380	6.8*	10.1*	17.7
1,650	2.14	410		9.1*	16.1
1,800	2.54	450		8.4*	14.7
2,100	3.46	530			12.6*
2,400	4.52	600			11.0*
2,600	5.31	650			9.0*

NOTES:

1. ALLOWABLE MINIMUM COVER IS MEASURED FROM THE TOP OF PIPE TO THE BOTTOM OF A FLEXIBLE PAVEMENT OR TOP OF A RIGID PAVEMENT. MINIMUM COVER IN UNPAVED AREAS MUST BE MAINTAINED. BACKFILL IS ASSUMED TO BE COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DRY DENSITY.
2. ALL HEIGHTS OF COVER ARE BASED ON INSTALLATION IN A TRENCH. IF EMBANKMENT CONDITIONS EXIST, THERE MAY BE RESTRICTIONS ON GAUGES FOR LARGE DIAMETERS. YOUR ARMTEC REGION ENGINEER CAN PROVIDE YOU WITH FURTHER GUIDANCE.
3. TABLES ARE FOR CL-625 LOADING ONLY. FOR HEAVY CONSTRUCTION LOADS, HIGHER MINIMUM COVERS MAY BE REQUIRED. YOUR ARMTEC REGION ENGINEER CAN PROVIDE YOU WITH FURTHER GUIDANCE.

* THESE SIZES AND GAUGES REQUIRE SPECIAL ATTENTION TO BACKFILL MATERIAL AND CONSTRUCTION METHODS.

Table 12: Height of Cover Table for Ultra Flo Arch Pipe

					Maximum Height of Fill (m) to Limit Corner Bearing Pressure to a Maximum of 200 kPa for Metal Thickness (mm)		
Span	Rise	Equivalent Diameter	Area	Minimum Height of Fill	1.6mm	2.0mm	2.8mm
mm	mm	mm	m^2	mm			
500	410	450	0.15	300	4.0	4.0	
580	490	525	0.21	300	5.2	5.2	5.2
680	540	600	0.27	300	5.2	5.2	5.2
830	660	750	0.43	300	5.2	5.2	5.2
1,010	790	900	0.62	300	4.4	4.4	4.4
1,160	920	1,050	0.85	300	5.1	5.1	5.1
1,340	1,050	1,200	1.12	300		4.4	4.4
1,520	1,200	1,350	1.44	340		5.3*	5.3
1,670	1,300	1,500	1.79	380		5.1*	5.1
1,850	1,400	1,650	2.15	410		4.7*	4.7

NOTES:

1. ALLOWABLE MINIMUM COVER IS MEASURED FROM THE TOP OF PIPE TO THE BOTTOM OF A FLEXIBLE PAVEMENT OR TOP OF A RIGID PAVEMENT. MINIMUM COVER IN UNPAVED AREAS MUST BE MAINTAINED. BACKFILL IS ASSUMED TO BE COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DRY DENSITY.
2. ALL HEIGHTS OF COVER ARE BASED ON INSTALLATION IN A TRENCH. IF EMBANKMENT CONDITIONS EXIST, THERE MAY BE RESTRICTIONS ON GAUGES FOR LARGE DIAMETERS. YOUR ARMTEC REGION ENGINEER CAN PROVIDE YOU WITH FURTHER GUIDANCE.
3. TABLES ARE FOR CL-625 LOADING ONLY. FOR HEAVY CONSTRUCTION LOADS, HIGHER MINIMUM COVERS MAY BE REQUIRED. YOUR ARMTEC REGION ENGINEER CAN PROVIDE YOU WITH FURTHER GUIDANCE.

* THESE SIZES AND GAUGES REQUIRE SPECIAL ATTENTION TO BACKFILL MATERIAL AND CONSTRUCTION METHODS.

END TREATMENTS

CSP END SECTIONS

Armtec supplies durable, lightweight end sections for improved hydraulic efficiency and erosion control. These sections help reduce scour at inlets, undermining at outlets, and provide an attractive and economical means of blending culvert ends with a sloping embankment.

The end sections clamp onto the culvert and are positioned with light equipment. In the case of the smaller available sections, no equipment is required to position the end sections. Earth is tamped around the sloping ends to complete the installation.

Standard end sections suit corrugated steel pipes up to 2,400mm diameter and pipe arches up to 2,130mm span x 1,400mm rise. They are available as twins, triplets and quads for multiple-pipe installations. Safety-slope end sections are also available with parallel cross bars and are built-in 4:1 or 6:1 slope.

CSP END SECTION WITH FUNCTIONAL GRATE

CSP END SECTION WITH OPTIONAL TOE PLATE EXTENSION

SLOPE RETENTION

Designed to support and retain slope grade and material

ECONOMICAL

Culvert repairs are reduced with the reduction of scour at the inlet and undermining at the outlet

ATTRACTIVE SOLUTION

End sections blend culvert ends with the slope embankment

HEADWALLS

Headwalls can be constructed of concrete, stone, rip rap stone or steel sheeting.

Pro-Eco-Lite headwalls are engineered from a composite reinforced polymer concrete. They combine the lightweight characteristics of plastic with the strength of concrete. Flow control accessories such as pre-fabricated trash racks, security grids and handrails, bolt-on scour aprons, pre-fabricated weir boards and frames, and pre-installed flap gates and slide gates can be added to enhance performance without affecting appearance.

For large SteelCor pipe, headwalls constructed of Armtec sheeting combined with wing walls constructed from Armtec Bin-Wall provide an economic solution.

CUT-OFFS

Armtec steel sheeting can be used as cut-offs under the SteelCor pipe inlet and outlet. Depth of cut-off is usually 1m to 1.5m below the invert. Steel sheeting can often be used as a partial headwall with clay or other materials used to further seal the embankment.

PRO ECO-LITE HEADWALL

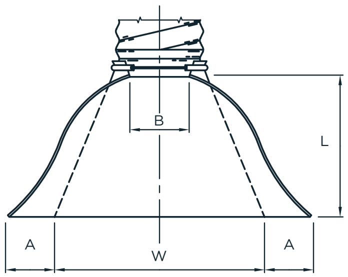
SHEETING HEADWALL

SPECIFICATIONS

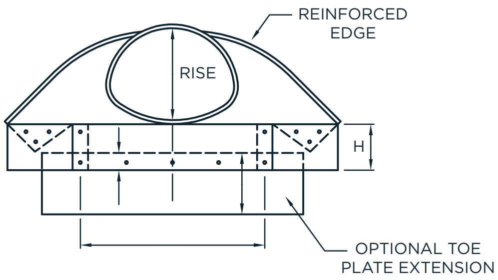
Table 13: End Sections for Pipe-Arch Shapes

Span x Rise	Equiv. Round	Thickness	A	B	H	L	W	Approx. Slope	Weight
mm	mm		mm	mm	mm	mm	mm		kg
560 x 420	450	1.6	180	255	150	585	915	2-1/2	19
680 x 500	600	1.6	230	355	150	810	1,220	2-1/2	24
910 x 660	800	2.0	255	405	200	990	1,525	2-1/2	42
1,030 x 740	900	2.0	305	455	230	1,170	1,905	2-1/2	73
1,150 x 820	1,000	2.8	330	535	230	1,345	2,160	2-1/2	105
1,390 x 970	1,200	2.8	455	660	305	1,600	2,285	2-1/2	143
1,630 x 1,120	1,400	2.8/3.5	455	840	305	1,955	2,895	1-1/2	217
1,880 x 1,260	1,600	2.8/3.5	455	915	305	1,955	3,200	1-1/2	284
2,130 x 1,400	1,800	2.8/3.5	455	990	305	1,955	3,505	1-1/2	304

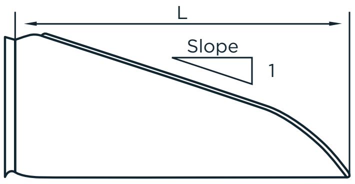
PLAN



ELEVATION



TYPICAL CROSS SECTION

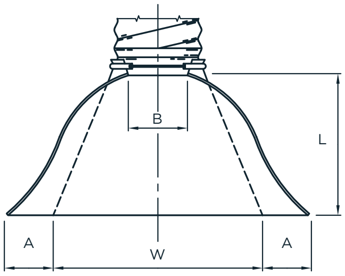


SPECIFICATIONS

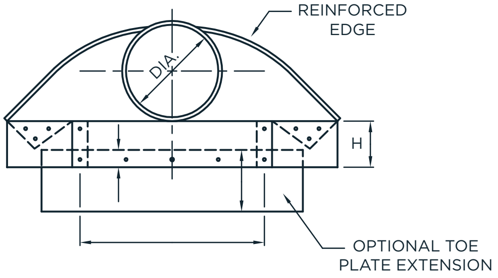
Table 14: End Sections for Round Pipe Shapes

Pipe Diameter	Thickness	A	B	H	L	W	Approx. Slope	Weight
mm		mm	mm	mm	mm	mm		kg
300	1.6	150	150	150	530	610	2-1/2	11
400	1.6	175	200	150	660	760	2-1/2	15
450	1.6	200	255	150	785	915	2-1/2	19
500	1.6	230	300	150	915	1,065	2-1/2	22
600	1.6	255	330	150	1,040	1,220	2-1/2	30
800	2.0	305	405	200	1,295	1,525	2-1/2	55
900	2.0	355	480	230	1,525	1,830	2-1/2	61
1,000	2.8	405	560	280	1,750	2,135	2-1/2	145
1,200	2.8	460	685	305	1,980	2,285	2-1/4	170
1,400	2.8	460	760	305	2,135	2,590	2-1/4	200
1,600	2.8/3.5	460	915	305	2,210	3,050	2	316
1,800	2.8/3.5	460	990	305	2,210	3,200	2	327
2,000	2.8/3.5	460	1,065	305	2,210	3,350	1-1/2	367
2,200	2.8/3.5	460	1,145	305	2,210	3,505	1-1/2	386
2,400	2.8/3.5	635	890	305	2,210	3,810	1-1/2	447

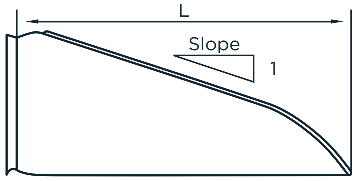
PLAN



ELEVATION



TYPICAL CROSS SECTION



NESTABLE PIPE

Nestable corrugated steel pipe is available as flange-type and notch-type. Flange-type nestable CSP consists of half-round 610mm long sections with side flanges that can be easily bolted together to form a circular corrugated steel pipe. Notch-type nestable CSP consists of matching half-round segments of corrugated steel, assembled using stitch type or hook and eye bolts to become lengths of full-round corrugated steel pipe. Nestable pipe is typically galvanized and therefore highly durable under normal conditions. Aluminized Steel Type 2 is also available for added durability.

Nestable pipe sections are shipped nested and bundled together to save space during shipping. This is ideal for remote locations and overseas projects where shipping of factory-made pipe would be uneconomical. Both flange-type and notch-type products are useful where a casing is to be installed around an existing utility without disrupting its operation.

TYPICAL APPLICATIONS

- Culverts
- Storm Sewers
- Drains
- Casings
- Utilidors


HOOK AND EYE BOLTS PROVIDE A SECURE SOIL-TIGHT CONNECTION

ECONOMICAL

Sections are nested and bundled together for economical shipping

DURABLE

Available in Aluminized Steel Type 2 for added protection and extended service life

VERSATILE

Suitable for a wide range of applications

FLANGE-TYPE NESTABLE PIPE

Assembly

Flanged Nestable Pipe is easily assembled and no special instructions are necessary. Simple tools such as spud or socket wrenches are all that are required.

Five corrugation long pieces are used on the top at both ends to introduce a circumferential seam stagger. The 50mm wide flanges have slotted holes spaced at 68mm centre to centre on both sides and are bolted together using galvanized 10mm diameter bolts and nuts. All circumferential laps should be assembled in the direction of fluid flow.

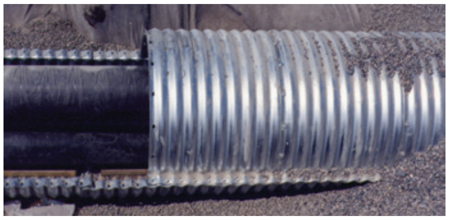
NOTCH-TYPE NESTABLE PIPE

Assembly

There are three standard methods used in attaching the half-round pipe segments together. The method used is dictated by the pipe diameter. The stitch type method (using #1 or #2 type stitches) is used up to 800mm in pipe diameter and the hook and eye bolt method is used for pipe diameters 900mm and over.

When assembling Armtec Nestable Pipe, the bottom ten corrugation sections are placed into position with each succeeding section overlapping the previous one by one corrugation. The top ten corrugation sections are staggered by using five corrugation sections at the ends.

All laps should be assembled in the direction of fluid flow. The half sections will be drawn together at the notched seams with a bending bar and the appropriate fastener inserted through the matching holes. There are two fasteners every 600mm on each side.


FLANGE-TYPE NESTABLE PIPE REQUIRES ONLY SIMPLE TOOLS FOR ASSEMBLY


NESTABLE PIPE IS IDEAL FOR MINING APPLICATIONS


NESTED SECTIONS ARE BUNDLED FOR ECONOMICAL TRANSPORTATION

Table 15: Flange-Type Pipe Height of Cover Table – Live Load – AASHTO H-25 and CS-625

Diameter	Area	Minimun Cover	Maximum Height of Cover (m) for Following Specified Wall Thickness		
mm	mm²	mm	1.6mm	2.0mm	2.8mm
300	0.17	300	9.0	-	-
400	0.13	300	9.0	-	-
450	0.16	300	6.0	9.0	-
500	0.20	300	6.0	9.0	-
600	0.28	300	4.5	9.0	-
700	0.38	300	-	7.5	9.0
800	0.50	300	-	6.0	9.0
900	0.64	300	-	6.0	9.0
1,000	0.79	300	-	4.5	9.0
1,200	1.13	300	-	-	7.5
1,400	1.51	500	-	-	6.0
1,600	2.01	500	-	-	4.5

NOTES:

STRUCTURES SHOULD BE BACKFILLED WITH WELL COMPACTED GRANULAR BACKFILL TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY.
E-80 LOADING CAN ALSO BE MET. PLEASE CONTACT AN ARMTEC REPRESENTATIVE FOR FURTHER DETAILS.

Table 16: Flange-Type Pipe Approximate Weights (kg/m)

Diameter	Approximate Weight (kg/m) for Following Specified Wall Thickness		
mm	1.6mm	2.0mm	2.8mm
300	18	22	-
400	22	28	-
450	24	31	43
500	27	34	48
600	31	39	54
700	36	45	62
800	41	51	70
900	45	56	77
1,000	48	61	83
1,200	59	74	102
1,400	68	85	118
1,600	78	97	134

SPECIFICATIONS

Half round sections are manufactured from 68mm x 13mm corrugated steel:

- Corrugations and steel thickness per ASTM A 760A, CSA G401, AASHTO M 36
- Galvanized and Aluminized Type 2 per ASTM A 929A, AASHTO M 218-87
- Zinc coating mass will not be less than 610 g/m² per AASHTO M 218
- Milling sampling and marking per ASTM A924 A 924M
- Minimum aluminum coating thickness of 47µm
- Installation per ASTM A798
- Hardware is zinc plated

Table 17: Notch-Type Height of Cover Table – CS -625 Loading

Diameter	Area	Minimun Cover	Maximum Height of Cover (m) for Following Specified Wall Thickness			
mm	mm^2	mm	1.6mm	2.0mm	2.8mm	3.5mm
300	0.07	300	9.2	13.17	-	-
400	0.13	300	6.1	12.2	13.7	-
450	0.16	300	6.1	12.2	13.7	-
500	0.20	300	6.1	10.7	13.7	-
600	0.28	300	4.6	9.2	13.7	-
700	0.38	300	-	7.6	13.7	-
800	0.50	300	-	7.6	13.7	-
900	0.64	300	-	6.1	10.7	-
1,000	0.79	300	-	4.6	9.2	-
1,200	1.13	300	-	-	7.6	9.0
1,400	1.54	500	-	-	6.1	9.0
1,600	2.01	500	-	-	-	9.0
1,800	2.54	500	-	-	-	-
2,000	3.14	500	-	-	-	-

NOTES:

STRUCTURES SHOULD BE BACKFILLED WITH WELL COMPACTED GRANULAR BACKFILL TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY.
E-80 LOADING CAN ALSO BE MET. PLEASE CONTACT AN ARMTEC REPRESENTATIVE FOR FURTHER DETAILS.

Table 18: Notch-Type Pipe Approximate Weights (kg/m)

Diameter	Approximate Weight (kg/m) for Following Specified Wall Thickness				
mm	1.6mm	2.0mm	2.8mm	3.5mm	4.2mm
300	15	19	26	-	-
400	20	25	34	-	-
450	23	29	38	47	-
500	25	32	43	53	-
600	29	37	51	63	-
700	34	43	59	73	-
800	39	49	68	84	-
900	44	56	77	95	113
1,000	49	61	85	105	126
1,200	59	74	102	126	151
1,400	69	85	119	147	176
1,600	78	98	137	168	202
1,800	88	110	153	188	226
2,000	98	122	170	210	252

SPECIFICATIONS

Half round sections are manufactured from 68mm x 13mm corrugated steel:

- Corrugations and steel thickness per ASTM A 760A, CSA G401, AASHTO M 36
- Galvanized and Aluminized Type 2 per ASTM A 929A, AASHTO M 218-87
- Zinc coating mass will not be less than 610 g/m^2 per AASHTO M 218
- Milling sampling and marking per ASTM A924 A 924M
- Minimum aluminum coating thickness of 47µm
- Installation per ASTM A798
- Hardware is zinc plated

Armtec is environmentally conscious
by supporting limited paper usage.

ATLANTIC

Shediac, NB
Sackville, NB
Truro, NS
Bishop's Falls, NL
St. John's, NL

CENTRAL

Cambridge, ON
Comber, ON
Forest, ON
Guelph, ON
Orangeville, ON
Peterborough, ON
Sudbury, ON
Thunder Bay, ON
Walkerton, ON
Woodstock, ON
St-Augustin, QC
St-Clet, QC

PRAIRIES

Calgary, AB
Edmonton, AB
Grande Prairie, AB
Ponoka, AB
Redwater, AB
Winnipeg, MB
Regina, SK
Saskatoon, SK

WEST COAST

Dawson Creek, BC
Genelle, BC
Langley, BC
Nanaimo, BC
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Platinum member

Find out how **CSP** pipe can be used on your next project.
Call **1-800-565-1152** or visit **armtec.com**

G

Appendix G-2
FT SOLMAX – GEOMEMBRANE HDPE 1.0mm BLACK
TECHNICAL DATA SHEET

SOLMAX

TECHNICAL DATA SHEET

HDPE 1.00 mm Black Smooth

PROPERTY(1)	TEST METHOD	FREQUENCY	UNIT Metric	1047812
SPECIFICATIONS				
Thickness (min. avg.)	ASTM D5199	Every roll	mm	1.00
Thickness (min.)	ASTM D5199	Every roll	mm	0.90
Resin Density	ASTM D1505	1/Batch	g/cc	> 0.932
Melt Index - 190/2.16 (max.)	ASTM D1238	1/Batch	g/10 min	1.0
Sheet Density	ASTM D792	Every 10 rolls	g/cc	≥ 0.940
Carbon Black Content	ASTM D4218	Every 2 rolls	%	2.0 - 3.0
Carbon Black Dispersion	ASTM D5596	Every 10 rolls	Category	Cat. 1 / Cat. 2
OIT - standard (avg.)	ASTM D3895	1/Batch	min	100
Tensile Properties (min. avg) (2)	ASTM D6693	Every 2 rolls		
Strength at Yield			kN/m	15
Elongation at Yield			%	13
Strength at Break			kN/m	28
Elongation at Break			%	700
Tear Resistance (min. avg.)	ASTM D1004	Every 5 rolls	N	125
Puncture Resistance (min. avg.)	ASTM D4833	Every 5 rolls	N	356
Dimensional Stability	ASTM D1204	Certified	%	± 2
Stress Crack Resistance (SP-NCTL)	ASTM D5397	1/Batch	hr	500
Oven Aging - % retained after 90 days	ASTM D5721	Per formulation		
HP OIT (min. avg.)	ASTM D5885		%	80
UV Res. - % retained after 1600 hr	ASTM D7238	Per formulation		
HP-OIT (min. avg.)	ASTM D5885		%	50
Low Temperature Brittleness	ASTM D746	Certified	°C	- 77
SUPPLY SPECIFICATIONS(Roll dimensions may vary ±1%)				
Roll Dimension - Width	-		m	6.80
Roll Dimension - Length	-		m	237.7
Area (Surface/Roll)	-		m²	1616.36

NOTES

1. Testing frequency based on standard roll dimensions and one batch is approximately180,000 lbs (or one railcar).

* All values are nominal test results, except when specified as minimum or maximum.
* The information contained herein is provided for reference purposes only and is not intended as a warranty of guarantee. Final determination of suitability for use contemplated is the sole responsibility of the user. SOLMAX assumes no liability in connection with the use of this information.

Solmax is not a design professional and has not performed any design services to determine if Solmax's goods comply with any project plans or specifications, or with the application or use of Solmax's goods to any particular system, project, purpose, installation or specification.

SOLMAX.COM

Revision date: 31-May-2018

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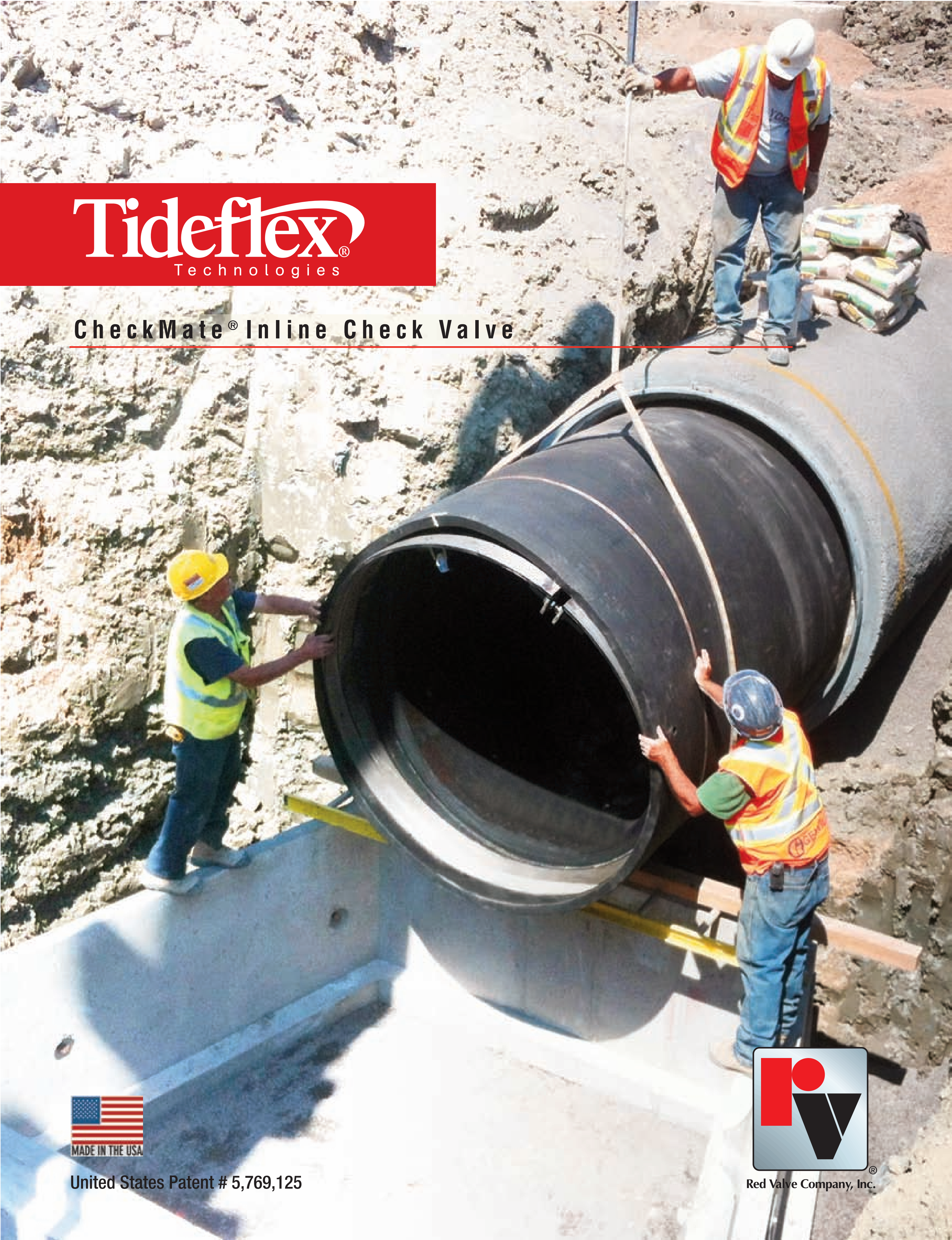
Appendix G-3

BACKFLOW PREVENTER – CHECKMATE BROCHURE



Tideflex®
Technologies

CheckMate® Inline Check Valve

MADE IN THE USA

United States Patent # 5,769,125

Red Valve Company, Inc.

CheckMate®: Your Final Move to Eliminate Backflow!

CHECKMATE® VALVE

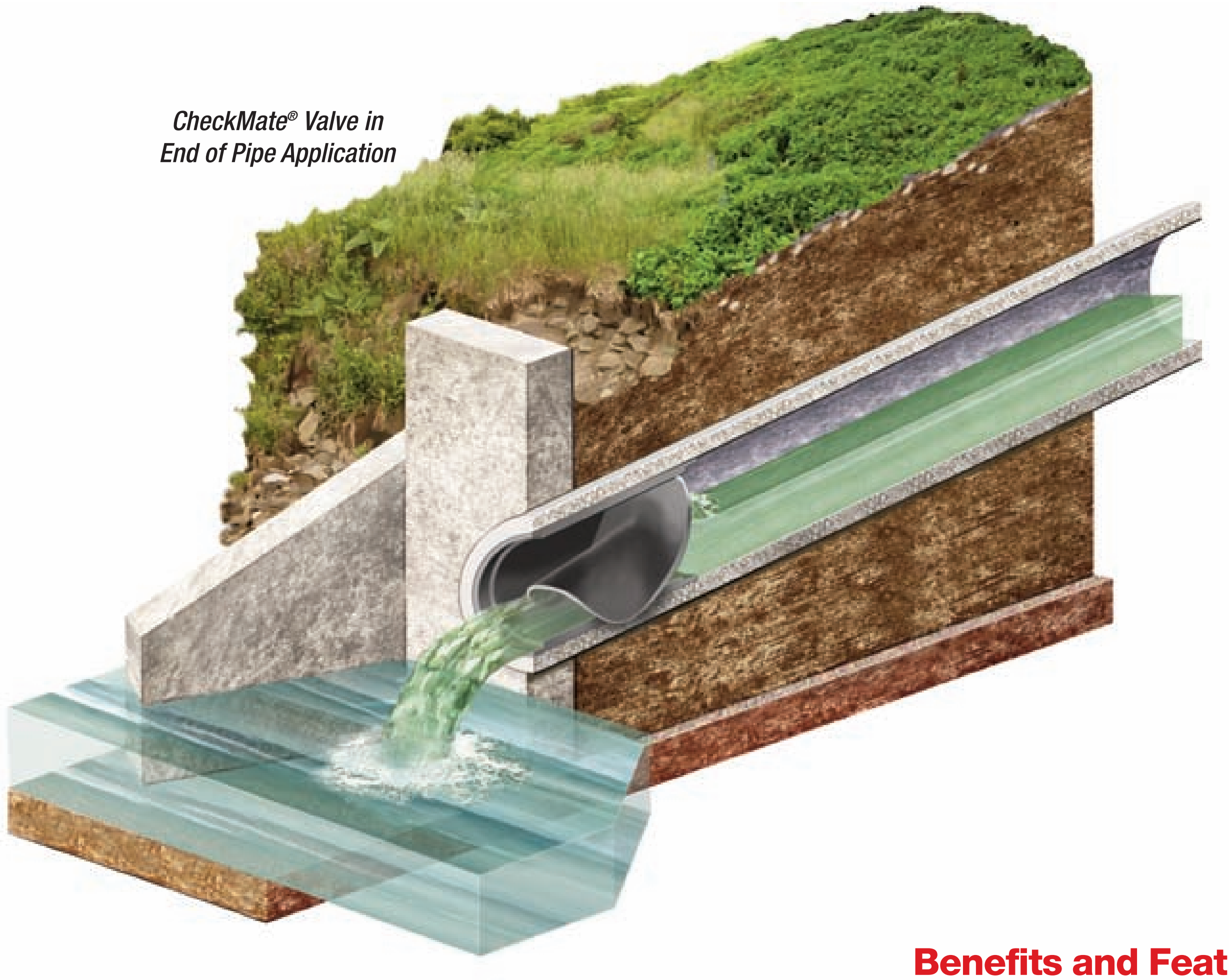
Designed for Inline Service

Dependable Backflow Prevention

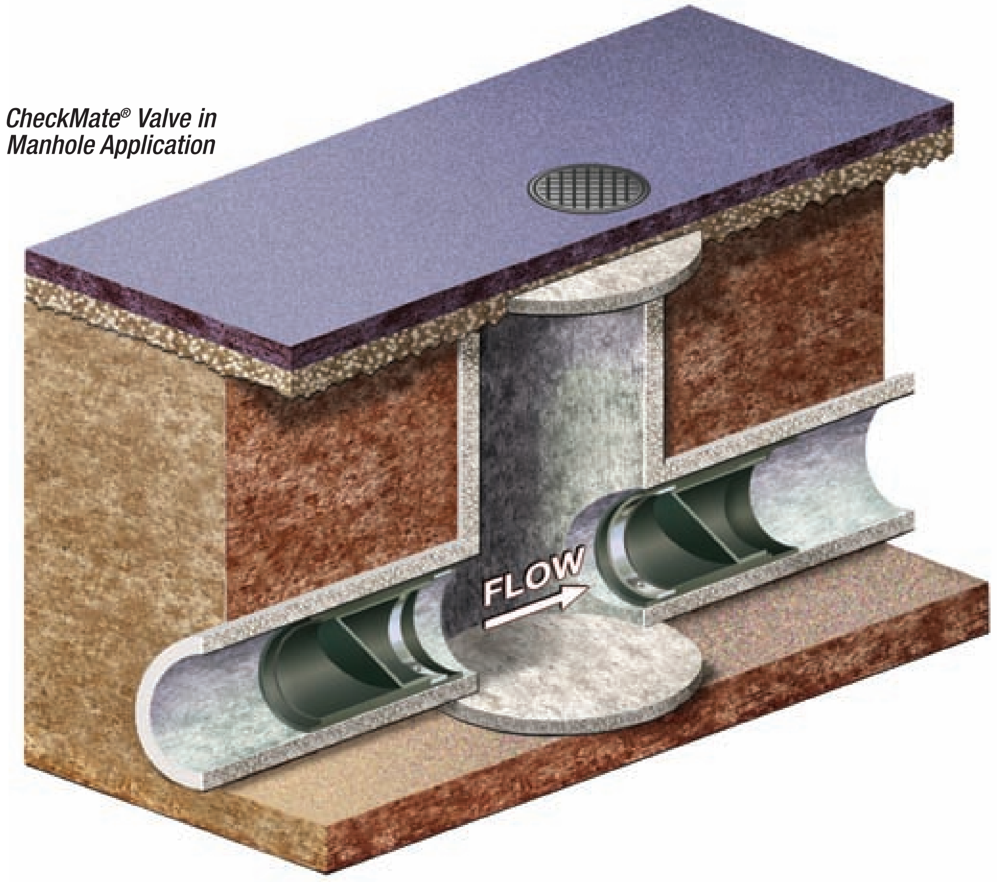
The CheckMate® Inline Check Valve is the valve of choice for both municipal and industrial applications - including stormwater, wastewater, highway run-off, CSO, SSO and flood control. CheckMate® Valves prevent unwanted backflow that can cause surcharging and flooding.

CheckMate® Inline Check Valves have become the specified solution for residential and commercial areas where complete, dependable backflow prevention is necessary. The CheckMate® is not simply a molded part. Rather it is hand-fabricated, utilizing various natural and synthetic elastomers and fabric ply reinforcement to create a unibody construction. There are no mechanical parts or fasteners to catch debris, corrode, or fail, making the CheckMate® maintenance-free. With seven elastomers to select from, the CheckMate® can be custom engineered to resist chemicals, grease and oils typically found in stormwater, wastewater and industrial applications.

The CheckMate® Valve boasts extremely low headloss, allowing for near 100% flow capacity. Its inherent design makes it the most user-friendly inline check valve on the market today. From the upstream or downstream end of the pipe, simply insert the valve into position and clamp it into place. Typically no modification to the pipe or structure is required to install the CheckMate®. Because the CheckMate® is recessed inside of the pipe, additional permitting is not required. The result is savings in both installation time and operational cost.


CheckMate® Valve in End of Pipe Application

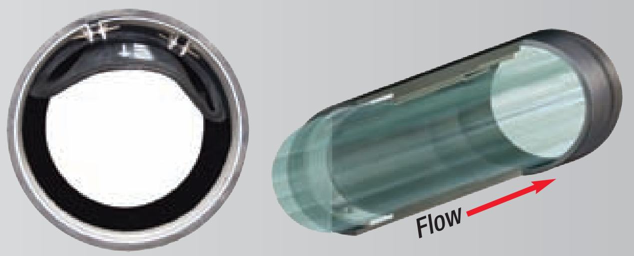
The valve can successfully withstand severe winter freezes, typhoons, hurricanes and flooding. The CheckMate® also minimizes damage to wetlands, beaches and residential areas, eliminates hydraulic surges to wastewater treatment plants and saves municipalities millions of dollars in maintenance and treatment costs.


CheckMate® Valve in Manhole Application

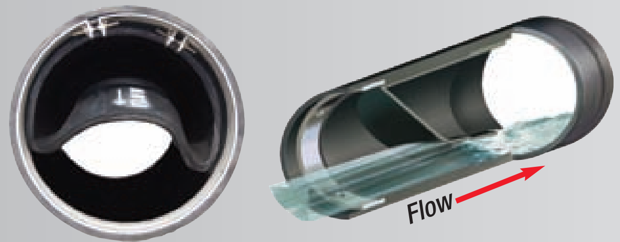
Benefits and Features of CheckMate®:

- Extremely Low Headloss
- No Moving Mechanical Parts to Corrode, Catch Debris or Fail
- Heavy Duty Elastomer Unibody Construction
- Quick and Easy Installation
- Seals Around Debris
- Operates on Differential Pressure, Totally Passive
- Virtually No Maintenance
- Self-draining, 1" of Cracking Pressure
- Silent, Non-slamming
- Available in Sizes 3" (75 mm) to 78" (1950 mm)
- Extensive Independent Hydraulic Testing

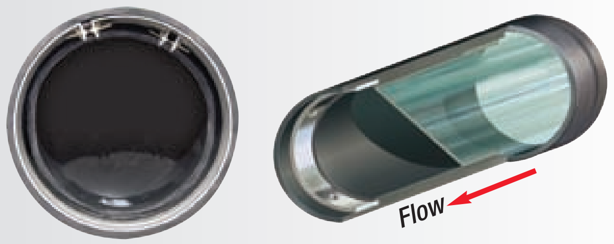
For an animated demonstration of the CheckMate® in operation, please visit: **http://www.tideflex.com/checkmate.**



FULLY OPEN



FLOWING



FULLY CLOSED

CheckMate® Applications: Simply Versatile!

48" CheckMate® installed in a storm sewer drain to stop backflow from flooding a residential area.

Residential and Municipal Sewers

CheckMate® Inline Check Valves have become a frequently specified solution for residential and municipal areas where complete, dependable backflow prevention is necessary. The CheckMate® Valve's maintenance-free, passive operation provides years of trouble-free service.

CSO, SSO and Outfalls

CheckMate® Valves are used for interceptor, manhole and outfall pipelines because they maximize pipeline storage and capacity while preventing water from backflowing into a sewage treatment plant. The CheckMate® Valve's innovative inline design allows it to be easily installed without modifications to structures.

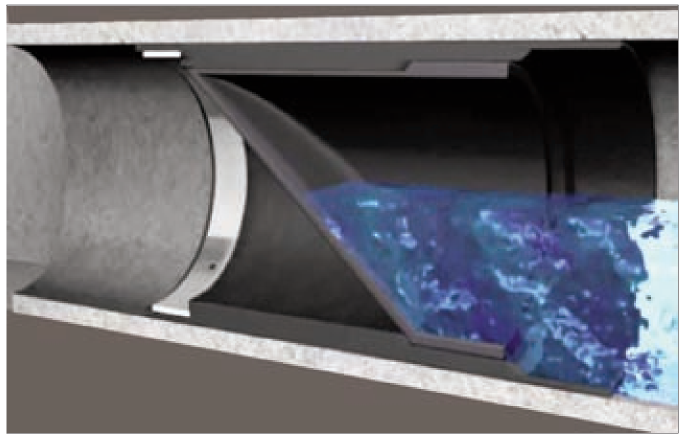
Stormwater, MS4, Highway Run-off and Site Drainage

CheckMate® Inline Check Valves are the valve of choice for both municipalities and commercial property owners to prevent costly flood damage and to maximize system storage. The CheckMate's® low cracking pressure and headloss provide rapid drainage.

Flow Equalization Basins, Pump Stations and Effluent Discharge

CheckMate® Valves provide backflow prevention in between basins and also protect pumps and capital equipment. The CheckMate's® low headloss characteristics maximize flow efficiency.

24" CheckMate® is easily installed in a municipal sewer.



The CheckMate's® rugged unibody construction prevents backflow.

48" CheckMate® installed at the Freedom Tower for stormwater drainage.

CHECKMATE® VALVE

Designed for Inline Service

48" CheckMate® Valve replacing a faulty flapgate in a CSO application.

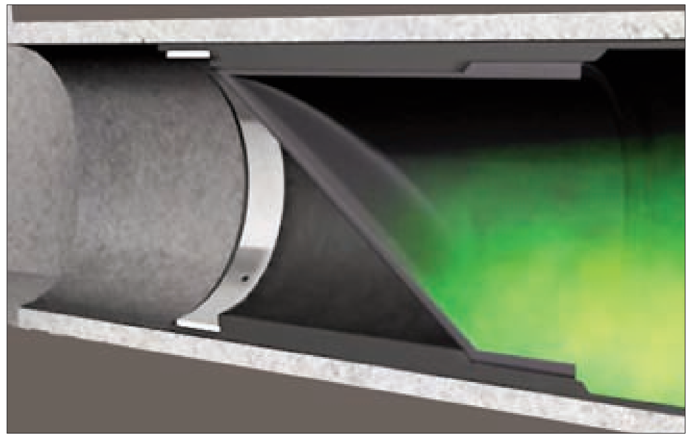
Odor Control

CheckMate® Inline Check Valves prevent sewer systems' offending odors from escaping, while still allowing water to discharge when needed. The CheckMate® Valve is designed to eliminate the backflow of unwanted methane and hydrogen sulfide gases that typically result in complaints about odor from the general public.

Levees, Marinas and Wetlands

In low lying areas where headloss is at a premium, CheckMate® Valves efficiently drain with the added benefit of providing absolute backflow prevention.

The CheckMate® is also easily installed by hand.



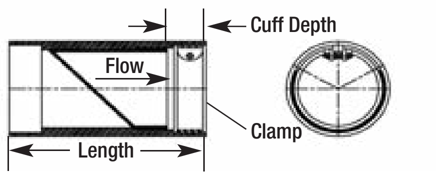
The CheckMate® provides odor control.

Independent Hydraulic Testing

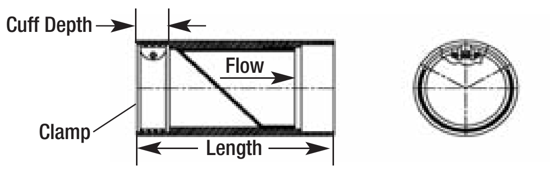
CheckMate® Inline Check Valves are independently tested to determine their hydraulic characteristics in both free and submerged discharge applications. Red Valve's published hydraulic data is validated through this independent testing.

CheckMate® Configurations and Custom Designs

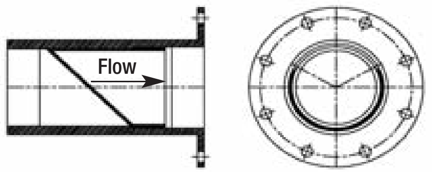
Downstream Clamp



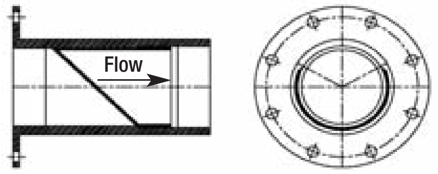
Upstream Clamp



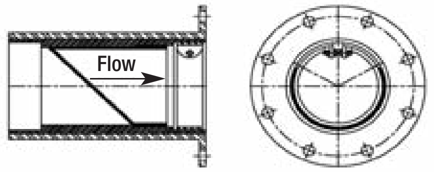
Downstream Flanged



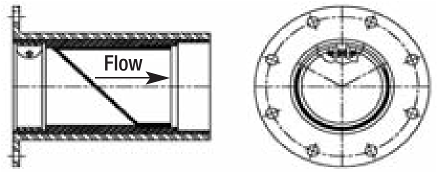
Upstream Flanged



Downstream Flanged Thimble Insert



Upstream Flanged Thimble Insert



CheckMates® can be made for any pipe I.D.
Built to fit in sizes from 3" to 78".

Flange shape and bolt pattern can be customized.
Flangeless thimble inserts are available.

CHECKMATE® VALVE

	NOMINAL PIPE SIZE I.D.		OVERALL LENGTH*		NUMBER OF CLAMPS	CUFF DEPTH		BACK PRESSURE RATING**		WEIGHT	
	Inches	Millimeters	Inches	Millimeters		Inches	Millimeters	Feet	Meters	lbs	Kg
Low Pressure	3	75	5.1	130	1	1.5	38	5	1.5	1.5	0.7
	4	100	7.9	201	1	1.5	38	5	1.5	1.5	0.7
Standard Pressure	3	75	5.1	130	1	1.5	38	85	26.0	3	1.4
	4	100	7.9	201	1	1.5	38	85	26.0	3	1.5
	5	125	9.5	241	1	1.5	38	83	25.3	4	2
	6	150	11.0	279	1	2.0	51	83	25.3	9	4
	7	175	12.8	325	1	2.0	51	79	24.1	11	5
	8	200	15.2	386	1	2.0	51	79	24.1	13	6
	9	225	15.4	391	1	2.0	51	75	22.9	17	8
	10	250	16.1	409	1	2.0	51	71	21.6	20	10
	12	300	19.8	503	1	2.0	51	68	20.1	37	17
	14	350	25.8	655	1	4.0	102	64	20.0	110	50
	16	400	28.6	726	1	4.0	102	60	18.3	133	52
	18	450	31.0	787	1	4.0	102	56	17.1	143	65
	20	500	42.1	1069	2	8.0	203	53	16.2	223	102
	24	600	47.5	1207	2	8.0	203	45	13.7	304	137
	30	750	54.9	1395	2	8.0	203	38	11.6	500	227
	36	900	62.3	1582	2	8.0	203	30	9.1	828	376
	42	1050	70.6	1793	2	8.0	203	26	7.9	1423	646
	48	1200	79.0	2007	2	8.0	203	23	7.0	1801	817
	54	1350	86.4	2195	2	8.0	203	17	5.2	2700	1225
	60	1500	96.8	2459	2	9.0	229	15	4.6	3315	1504
	72	1800	119.0	3023	3	12.0	305	13	4.0	6100	2767
	78	1950	119.0	3023	3	12.0	305	13	4.0	7000	3176

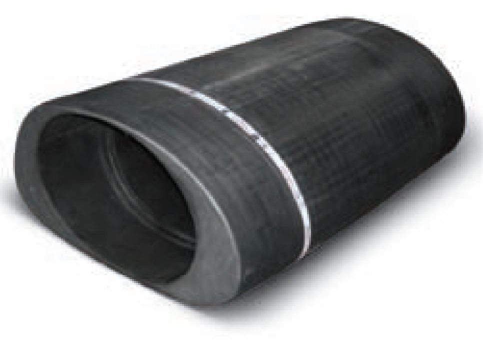
*Shorter lengths available.

**Back pressure measured from pipe invert.
Higher back pressure ratings available. Consult factory.

CHECKMATE® VALVE

Designed for Inline Service


Elliptical Pipe CheckMate®


Arch Pipe CheckMate®


Rectangular Pipe CheckMate®

Elliptical, Arch and Rectangular Pipes

Elliptical, arch and rectangular pipes for drainage and flood prevention projects have become popular, particularly in high water table areas with shallow surface gradients. CheckMate® Inline Check Valves are the perfect solution for backflow prevention in elliptical, arch and rectangular pipes.

Rubber Flanged

Rubber Flanged CheckMate® Valves can be manufactured with an integral rubber upstream or downstream flange. The flanged CheckMate® gets inserted into the host pipe then can be bolted to a mating flange or anchored to a concrete headwall. The flange can be circular with standard drilling; or circular, square or rectangular with custom flange drilling. The valve is supplied with retaining rings for mounting.


Upstream Flanged CheckMate®

Thimble Inserts

A CheckMate® Thimble Insert is a CheckMate® Valve that is factory-installed, clamped, and pinned into flanged or plain end pipe. The thimble insert assembly can either be inserted into the I.D. of the host pipe, or can be mounted to a mating flange or concrete headwall and extend beyond the pipe. Plain end thimble inserts are inserted into the host pipe and non-shrink grout is placed between the thimble insert O.D. and host pipe I.D. to form the seal.

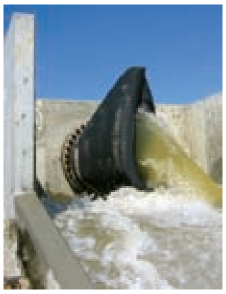

CheckMate® Thimble Insert

The best choice for the toughest applications.

In addition to the Checkmate® Inline Check Valve, Tideflex® Technologies offers a complete line of check valves.

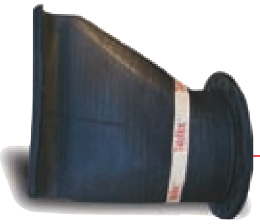
TF-1 CHECK VALVES

The Tideflex® TF-1 Curved Bill Check Valve is designed with enhanced sealing to improve headloss. The improved TF-1 design allows the valve to handle long-term water weight while maintaining structural integrity. The spine is at a greater vertical angle, making it able to withstand the cantilever effect when water is flowing through the valve. The TF-1 is constructed of rubber, making it immune to rust, corrosion and weathering.



SERIES 35-1 CHECK VALVES

The flat-bottom Series 35-1 features an integral rubber flange, allowing them to be mounted to flanged outfall pipes or directly to headwalls where the pipe is flush. The flange size drilling conforms to ANSI B16.10, Class 150#, or can be constructed with DIN, 2632 and other standards. The Series 35-1 Check Valve is furnished complete with steel or stainless steel backup rings for installation.



SERIES 39 CHECK VALVES

The Tideflex® Series 39 Inline Check Valve features a fabric-reinforced elastomer check sleeve housed in a cast iron body with ANSI 125/150 flanges, allowing for easy installation into any piping system. The valve's operation is silent, non-slamming and maintenance free. Sliding, rotating, swinging and plunging parts are completely eliminated. The body is equipped with flush ports and a clean-out port and can be epoxy coated.

Tideflex® Technologies

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