Emerald Creek Subdivision
Revised Stormwater Management Report

Stantec

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Emerald Creek Subdivision
Revised Stormwater Management Report

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REVISED STORMWATER MANAGEMENT REPORT
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June 23, 2005

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1.0 Introduction

In response to the comments received from the City of Ottawa and Rideau Valley Conservation Authority regarding the June 2004 stormwater management (SWM) report submission and subsequent revisions to the draft plan, the following revised SWM report is submitted.

It should also be noted that since the initial submission of this report, the City of Ottawa has completed the Shield's Creek Subwatershed Study (June 2004) which supersedes the 2002 Greely/Shield's Creek report by Stantec. As such, some of the 'Interim Drainage Guidelines' presented in the 2002 report have been revised. These revisions are based on a detailed review and analysis of the hydrologic, hydrogeologic, and geomorphic processes within the subwatershed. Specifically, the erosion control targets no longer include the requirement to restrict postdevelopment peak flow rates to 50% of the predevelopment peak rate. This criteria was replaced by erosion control targets that the report indicates, "... will be provided through runoff volume control as part of the infiltration targets and MOE guidelines (2003)." This revised criteria has a significant impact on the stormwater management approach and design for the Emerald Creek Subdivision as presented herein.

1.1 OVERVIEW AND OBJECTIVES

This revised stormwater management (SWM) report is prepared in support of the subdivision application to construct eighty-nine (89) lots designated for residential occupancy. The development property is located west of Albion Road and north of Mitch Owens Road in the City of Ottawa and occupies a total area of 68 hectares. The site is relatively flat with an average slope of less than 0.5% from north to south. Drainage flows overland into the Spratt Municipal Drain (MD), located on the southwest corner of the site. Agricultural ditches exist within some areas adjacent to the MD, which aid in increasing the efficiency of drainage in these local areas. The site is currently undeveloped and is generally covered with tall grasses, shrubs and small trees along the southern edge, while a section in the north consists of woodland.

The proposal is to develop an area of 68 ha into rural estate lots of at least 0.75 acres each. The lots will maintain much of the existing topography with grading restricted to areas in the vicinity of the houses and streets. The remaining area, which represents a significant portion of the property, is to remain as open space with existing land use maintained. Recreational pathways are proposed through a portion of these open spaces.

The proposed drainage network will utilize roadside ditches as well as grassed channels to convey stormwater from the property towards the municipal drain. A section of the Spratt MD that was abandoned during the recent MD realignment is proposed as the outlet from the site.

1.2 BACKGROUND INFORMATION

Several sources have been used in the preparation of this document.

- *Shield's Creek Subwatershed Study* – City of Ottawa, June 2004.
- *Conditions for Draft Approval: Emerald Creek Estate Subdivision* – City of Ottawa, April 2004.
- *Comments – Emerald Creek Estates Plan of Subdivision* – Rideau Valley Conservation Authority, April 2004.
- *Shield's Creek Subwatershed Study* – City of Ottawa, Revised Draft – February 2004.
- *Stormwater Management Planning and Design Manual,* Ministry of the Environment, March 2003.
- *Greely/Shield's Creek Stormwater and Drainage Study* – Stantec, October 2002.
- *Terrain Analysis and Hydrogeological Study: Proposed Emerald Creek Estates Subdivision* – J.D. Paterson & Associates Limited, January 2002.
- *MTO Drainage Manual,* Ministry of Transportation of Ontario, 1997.
- *South Urban Community Master Drainage Plan* – Gore & Storrie, June 1992.

2.0 Stormwater Management Criteria and Objectives

Stormwater management criteria were established in the Conditions for Draft Approval by the City of Ottawa as well as through communications with the Rideau Valley Conservation Authority.

In reviewing the June 2004 Shield's Creek report from the City of Ottawa, the stormwater management control targets are presented as follows:

- Quantity Control - Post to predevelopment peak flow attenuation for the 2 to 100 year design storm events inclusive
- Quality Control - Normal Level of Protection (MOE 2003)
- Erosion Control - Generally to be provided through runoff volume control as part of infiltration targets and MOE guidelines

SWM criteria were also provided in the draft plan conditions and the 2004 City of Ottawa design guidelines, as well as through consultation with the Rideau Valley Conservation Authority. The criteria obtained from these sources were in agreement with those from the revised Shield's Creek report, and are presented below. Excerpts from the draft plan conditions are provided in Appendix F.

Therefore, stormwater management criteria as they pertain to this proposal are outlined as follows:

- Water quantity control such that peak post development release rates are maintained at or below predevelopment rates during the 2yr, 5 yr, 10 yr, 25 yr, and 100 yr events
- Water quality control to the Spratt Municipal Drain for 'Normal' level of protection
- In-stream erosion control through volume control and/or infiltrative measures
- Stormwater management measures shall not negatively affect groundwater levels, infiltrative capacities or baseflows within Mosquito Creek
- Account for any external drainage area impacts to the proposed drainage system
- Driveway culverts to be sized to convey the 10 year storm as per City of Ottawa design guidelines, except where conveying external drainage area, then to be sized for the 25 year storm
- Provide adequate major system conveyance (100 year) via ditches, swales and roads through the site without flooding private property

3.0 Existing Conditions

3.1 TOPOGRAPHY AND SURFACE DRAINAGE

The site generally drains southwest to the Spratt Municipal Drain at a grade of 0.5%. Stormwater originating from within the property flows via sheet flow to the Spratt MD before entering Mosquito Creek. Drainage from external areas enters the site at two primary locations:

- Approximately 120 hectares crosses Albion Road through a CSP and enters the site from the east
- Approximately 102 hectares drains through the north of the site as provided in Drawings SD-1 "Off-Site Storm Drainage Plan" and SD-2 "Storm Drainage Plan"

The design of grassed channels through the site will account for the conveyance of runoff from these external drainage areas. The hydrologic parameters provided in Appendix B agree with those found in the 2002 model and the Appendix 6 "Hydrologic Parameters" from the 2002 report.

3.2 SOILS AND HYDROLOGIC PARAMETERS

Soil information from the appended geotechnical report by Paterson Group Inc. indicates that generally, the surficial conditions consist of topsoil over a sandy soil. A silty clay layer was found beneath the sandy soil at an average depth of over 1.0 metre. The sandy soils experience high permeability rates and according to MTO Design Chart 1.08, correspond to Hydrologic Soil Group B in the Natural Resources Conservation Service (NRCS, previously SCS) Curve Number (CN) method for abstractions. The land use most closely associated with the existing site is a combination of meadow and woods. In MTO Design Chart 1.09, meadow and woods with soil group B correspond to CN values of 58 and 60, respectively. According to calculations provided in Appendix E, this corresponds to a modified curve number CN* of 59. This value also correlates well with the CN* value of 60 used in the Stantec 2002 report. Therefore, for consistency with the hydrologic modeling, the CN* value of 60 was used in the NASHYD subroutine in the SWMHYMO model for existing conditions.

The time to peak (Tp) parameter was calculated using the Uplands Method. Given an average slope and land cover, a nomograph indicating average velocity of runoff can be used. This velocity is used to calculate a time of concentration (Tc) using the length of the flow path. Tc was then converted to time to peak (Tp) by the following standard equation:

$$Tp = 0.60xTc$$

As in the 2002 Stantec Report, the 3-hr Chicago distribution design storm was used. Appendix B provides calculations for the derivation of the various hydrologic parameters.

3.3 PREDEVELOPMENT HYDROLOGIC MODELLING

A SWMHYMO hydrologic model was used to generate the hydrographs for the 2yr, 5yr, 10yr, 25yr and 100yr design storm events. Predevelopment peak flows, that represent the target flow to be met under postdevelopment conditions, are presented in Table 3.1. Figure 3.1 displays the timing and shape of the predevelopment runoff hydrographs during the 100 yr event. Predevelopment modeling input/output files are presented in Appendix C.

Table 3.1: Predevelopment Peak Flows and Target Postdevelopment Flows

Area ID[1]	Peak Flows for Design Storm Event (m^3/s)				
	2 year	5 year	10 year	25 year	100 year
A1	0.24	0.45	0.61	0.84	1.24
A2	0.38	0.69	0.94	1.30	1.92
A3	0.02	0.04	0.06	0.08	0.12
A4	0.06	0.11	0.15	0.21	0.31
A5	0.02	0.04	0.05	0.07	1.75
A6	0.02	0.04	0.06	0.08	0.13
Combined External Area	**0.72**	**1.32**	**1.80**	**2.47**	**3.66**
Site	0.27	0.51	0.69	0.96	1.42
Combined Overall Peak Flow[2]	**0.98**	**1.80**	**2.46**	**3.38**	**5.01**

1. Area IDs referenced above are provided on attached drawings SD-1 and SD-2
2. Note that the combined peak flow is not necessarily the sum of the local peak flows due to the different times at which peaks are occurring

4.0 Stormwater Management Design

4.1 PROPOSED CONDITIONS

The proposal for the site involves the development of the existing property to include 89 buildings designated for residential occupancy. Lot level and conveyance controls have been imposed, including:

- Reduced lot grading (0.5%-existing conditions) and limited disturbance to existing condition, to promote reduced velocities through sheetflow and increased depression storage (initial abstraction)
- Use of flat (<2%) grassed swales and channels to promote filtration, infiltration and nutrient uptake
- Grassed channel/swale storage to reduce peak flows and velocities, and to promote TSS removal (settling) and infiltration

The proposed drainage network allows for any runoff from impervious surfaces to flow either across pervious surfaces directly (as in the case of rooftop or driveway runoff) or to flow into the roadside ditching (roadway runoff) prior to discharge into the flat swales where additional filtration and infiltration will occur.

The areas have been remodeled to reflect the tributary areas shown on the enclosed storm drainage plans (as opposed to trying to match the areas from the 2002 Greely report, which was the approach in the initial report). Since the overall development has an impervious percentage less than 20%, the developed area was modeled by subdividing it into two areas representing the pervious (NASHYD) and impervious (STANDHYD) portions. An equivalent area at 25% imperviousness was modeled using the STANDHYD subroutine with 8% directly connected imperviousness. The remainder was modeled using the NASHYD subroutine with existing condition parameters. This method is consistent with that presented in the 2002 Greely report.

On-site culverts have been sized to convey the 10 year storm, while culverts tributary to external areas have been sized to the 25 year storm. Major system conveyance via ditches, swales and the roadway to be sized for the 100 year storm. Design calculations provided in Appendix E.

4.2 WATER QUANTITY CONTROL

Postdevelopment peak flows were calculated using the SWMHYMO model. The external areas were modeled using a NASHYD command while the site was divided into an urban section (modeled using the STANDHYD command) and a rural section (modeled using the NASHYD command). The resulting postdevelopment peak flows are presented in Table 4.2, and input/output modeling files are presented in Appendix D.

Table 4.2: Postdevelopment Peak Flows

Condition	Peak Flows for Design Storm Event (m^3/s)				
	2 year	5 year	10 year	25 year	100 year
Combined External Area	**0.72**	**1.32**	**1.80**	**2.47**	**3.66**
Site - Urban	0.19	0.29	0.38	0.53	0.88
Site - Rural	0.19	0.36	0.49	0.68	1.01
Combined Internal Area (Routed)	**0.26**	**0.50**	**0.69**	**0.96**	**1.43**
Combined Overall Peak Flow[1]	**0.97**	**1.82**	**2.49**	**3.42**	**5.06**

1. Note that the combined peak flow is not necessarily the sum of the local peak flows due to the different times at which peaks are occurring

Since the 68 ha area has an overall imperviousness of 7%, as presented in Appendix B, the area was subdivided into two areas: a 19.9 ha urban area with 25% imperviousness; and a 48.1 ha rural area with 0% imperviousness (19.9 ha x 25% + 48.1 ha x 0% = 68.0 ha x 7%). The effect of channel routing (to represent storage and friction losses in ditches and culverts) further decreases the peak flow from within the development. The combined length of ditches and channels exceeds 5000m within the development. In order to maintain the conservative nature of the analysis, routing was limited to a 1400m section of roadside ditch (0.5% slope) and a 475m section of channel (3m bottom, 0.36% slope).

The results indicate that the postdevelopment peak flow rate from the site is generally lower and occurs at a similar time as the predevelopment peak. Consequently, the overall downstream peak flow is either unaffected or only slightly different depending on the rainfall event with a maximum increase of less than 1% during the 100 yr event. This result is considered acceptable given the relative accuracy of the modeling software, and the conservative parameter assumptions used. In addition, the effect of storage upstream of culverts during larger storm events will further act to attenuate peak flows. Therefore, for all practical design purposes, the peak release rates are considered unchanged from predevelopment conditions. This suggests that a stormwater detention pond will not be required in order to meet quantity control targets. Table 4.3 and presents a comparison of the predevelopment and postdevelopment peak flow rates and demonstrates that quantity controls are not required.

Table 4.3: Comparison of Predevelopment and Postdevelopment Peak Flows.

Condition	Peak Flows for Design Storm Event (m^3/s)				
	2 year	5 year	10 year	25 year	100 year
Postdevelopment Internal	0.26	0.50	0.69	0.96	1.43
Predevelopment Internal	0.27	0.51	0.69	0.96	1.42
Increase (Decrease)	**(0.01)**	**(0.01)**	**(0.00)**	**(0.00)**	**0.01**
Postdevelopment Overall	0.97	1.82	2.49	3.42	5.06
Predevelopment Overall	0.98	1.80	2.46	3.38	5.01
Increase (Decrease)	**(0.01)**	**0.02**	**0.03**	**0.04**	**0.05**

4.3 WATER QUALITY CONTROL

The water quality control criteria for the development requires 70% total suspended solids (TSS) removal prior to discharge to the Spratt MD. The design of grassed channels at shallow grades will allow for the deposition of suspended solids prior to reaching the outlet. Since the imperviousness of the development is approximately 7%, it is expected that the TSS loading will be low. According to Table 6.03 of the 2003 MOE Stormwater Management Planning and Design Manual (SWMPDM) entitled "Annual Sediment Loadings", which provides a relationship between annual solids loading and catchment imperviousness, a development with 35% imperviousness will produce 770 kg/ha of annual solids. Table 6.03 does not provide annual loading data for catchments with imperviousness less than 35%, however when plotted, the relationship between imperviousness and mass of loading is linear. If extrapolated, the values indicate that no loading is expected from an area with imperviousness of 7%. Therefore, given the low-density rural estate nature of the proposed land use, it is expected that the amount of solids released to the drain will be negligible.

Nonetheless, lot level and conveyance controls are to be implemented for the proposed development to mitigate any sediment loadings that do occur. These measures will promote infiltration through shallow lot grades and depression storage, and filtration through overland flow and grassed swales. Wherever possible, grading has been kept as per existing conditions so as not to disturb the surficial soil infiltrative capacity as well as to maintain the existing vegetation and overland flow routes.

As recommended in section 4.5.4 of the MOE SWPDM, reduced lot grading can be implemented as a stormwater management practice for water quality where soil percolation rates are greater than 15mm/hr. From the geotechnical reports (see Appendix A), average percolation rates are in the range of 30-60 mm/hr (as converted from T-times). This indicates that the existing soils have sufficient capacity to promote suitable infiltration rates.

While low annual sediment loadings are expected, the percent removal of TSS and other pollutants is difficult to directly quantify for the proposed quality control measures. Notwithstanding, the proposed treatment train approach incorporates several design features known to improve the quality of runoff discharging from the site, and is considered to satisfy the MOE Normal Level treatment requirement.

4.4 WATER-BALANCE

A water-balance was prepared in order to quantify any reduced infiltration due to the change in land-use and increase in imperviousness, and is provided in Appendix B. For the purpose of the water-balance calculations, the site was broken down into two areas. One 41.8 ha area which would remain as forest growth (assumes 20% of lot area remains forested on average) and one 26.2 ha area which would be converted from forest/brush to urban lawns and road ROW). This calculation indicated that annual infiltration would be reduced by 14mm resulting in an annual deficit of 3,800 m^3. In order to augment infiltration, infiltration trenches beneath roadside ditches are proposed as provided in Figure 4.1. These trenches will capture runoff from ditches and infiltrate small volumes of water during frequent events, as outlined in the detailed calculations.

4.5 IN-STREAM EROSION CONTROL

As indicated in the introduction, the '2yr post = 50% of the 2yr pre' criteria which was intended to control erosion, was removed from the final subwatershed study. Instead, a provision for erosion control via infiltration measures was proposed which eliminates the requirement for stormwater detention if infiltration rates can be shown to match predevelopment rates, as presented in Section 4.4 above.

The MOE presents several methods to promote infiltration and thereby decrease peak runoff and total runoff volume during storm events. Of those methods presented in Table 4.1 of the MOE SWMPDM, the Emerald Creek development will include reduced lot grading, grassed swales and infiltration trenches to promote infiltration. As indicated in the geotechnical reports, the surficial sandy soils experience high infiltration rates and are suitable for infiltrative SWM practices as demonstrated in Section 4.3.

The proposed development is low at an overall imperviousness of 7% (see Appendix B). Runoff from all of the impervious areas will flow over grassed areas, either overland in the case of house and driveway runoff, or through grassed ditches and swales from road runoff. It is assumed that infiltration is unaffected by the house and driveway areas, since runoff is given ample opportunity to infiltrate prior to reaching the conveyance system. Also, any decreased infiltration from the roadways will be offset by the introduction of infiltration trenches, grassed ditches and swales throughout the development. Therefore, since postdevelopment infiltration rates will closely match predevelopment rates, no in-line stormwater detention (pond) for erosion control is required for this development. This removes the hydraulic implications of an in-line facility to potential future flows from upstream lands.

4.6 EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

Erosion prevention during construction is to be achieved through the installation and monitoring of erosion control practices. Silt fences are proposed at locations where overland flow will pass through construction areas en route to the Spratt Municipal Drain. Straw bale barriers are to be installed in roadside ditches throughout the construction site as shown on the Erosion Control plan. All erosion control practices are to be monitored throughout construction, especially after significant rainfall events (>13mm). Note 7 on drawing EC1 instructs the contractor to monitor and clean all erosion control structures as written in the contract.

5.0 Conclusions and Recommendations

Based on the preceding report, the following conclusions can be drawn:

- Quantity control criteria of postdevelopment peak flows less than predevelopment peak flows have been satisfied for the 2yr to 100yr storm events inclusive
- Quality control can be provided through lot level (reduced grading) and conveyance (grassed swale) controls, in combination with the infiltration trench design. Since anticipated annual sediment loading levels are low due to the low-density, rural estate nature of the proposed development
- Erosion control for the Spratt Municipal Drain has been provided through the implementation of infiltration measures including reduced lot grading, grassed ditches and shallow swales, and infiltration trenches prior to discharge to the drain
- Erosion and sediment control measures will be implemented and monitored throughout construction to protect the Spratt Municipal Drain from migration of sediment-laden runoff

All of which is respectfully submitted,

STANTEC CONSULTING LTD.

Prepared by:

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E.I.T., Urban Land

Reviewed by:

David F. Eadie, P. Eng.
Water Resources Engineer

Appendix A
Borehole Logs and Excerpts From:

- Terrain Analysis and Hydrogeotechnical Study (John D. Patterson and Associates Limited, January 2002)
- Report on Terrain Evaluation (Morey, Houle Chevrier Engineering, April 2005)

- **Report on Terrain Evaluation (Morey, Houle Chevrier Engineering, April 2005)**

REPORT ON

TERRAIN EVALUATION
PROPOSED RESIDENTIAL SUBDIVISION
PART OF LOTS 29 AND 30
CONCESSION 3, FORMERLY THE CITY OF GLOUCESTER
NOW IN THE CITY OF OTTAWA, ONTARIO

Submitted to:

Emerald Creek Properties
R.R. #2
Ashton, ON
K0A 1B0

DISTRIBUTION:

copies - Emerald Creek Properties.
copies - Morey Houle Chevrier Engineering Ltd.

April 2005

04-402

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ATION: Refer to Site Plan, Figure 2

IF EXCAVATION: March 17, 2005

RECORD OF TEST PIT 1

SHEET 1 OF 1

DATUM:

TYPE OF EXCAVATOR: Hydraulic Shovel

SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE NUMBER	SHEAR STRENGTH, Cu (kPa) — Natural, V • ; Remoulded, V ⊕ (20 40 60 80)	WATER CONTENT (PERCENT) — Wp ⊢ W ⊣ WI (20 40 60 80)	ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION
Ground Surface							
Dark brown silty sand TOPSOIL, some organic material							
		0.42					
Grey brown fine to medium SAND, trace to some silt			1				▽
		1.80					
Estimated firm to stiff grey SILTY CLAY			2				
Sides of test pit caving End of test pit		2.90					Groundwater inflow at 0.85 metres below ground surface on March 17, 2005.

JECT: 04-402

RECORD OF TEST PIT 2

SHEET 1 OF 1

CATION: Refer to Site Plan, Figure 2

DATUM:

TE OF EXCAVATION: March 17, 2005

TYPE OF EXCAVATOR: Hydraulic Shovel

SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLE NUMBER	SHEAR STRENGTH, Cu (kPa) Natural, V. + Remoulded, V. ⊕ (20 40 60 80)	WATER CONTENT (PERCENT) Wp W Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION
Ground Surface							
Dark brown silty sand TOPSOIL, some organic material							
		0.20					
Grey brown fine to medium SAND, trace silt							
		0.88					
Grey brown SILTY SAND							
		1.25					
Estimated firm to stiff grey SILTY CLAY							
Sides of test pit caving							
End of test pit		4.50					

Groundwater inflow at 0.78 metres below ground surface on March 17, 2005.

EPTH SCALE

LOGGED: BW

...CT: 04-402

RECORD OF TEST PIT 3

SHEET 1 OF 1

...TION: Refer to Site Plan, Figure 2

DATUM:

F EXCAVATION: March 17, 2005

TYPE OF EXCAVATOR: Hydraulic Shovel

SOIL PROFILE				SHEAR STRENGTH, Cu (kPa) Natural, V + Remoulded, V - ⊕	WATER CONTENT (PERCENT) Wp W Wl		WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION
DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE NUMBER	20 40 60 80	20 40 60 80	ADDITIONAL LAB. TESTING	
...round Surface							
Dark brown silty sand TOPSOIL, some organic material							
		0.30					
Grey brown to brown fine to medium SAND, trace silt							
...ey CLAYEY SILT, trace gravel		1.30					
		1.50					
...timated firm to stiff grey SILTY CLAY							
...d of test pit		2.80					

Groundwater inflow at 0.9 metres below ground surface on March 17, 2005.

RECORD OF TEST PIT 4

IECT: 04-402

ATION: Refer to Site Plan, Figure 2

E OF EXCAVATION: March 17, 2005

SHEET 1 OF 1

DATUM:

TYPE OF EXCAVATOR: Hydraulic Shovel

SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE NUMBER
Ground Surface			
Dark brown silty sand TOPSOIL, some organic material		0.15	
Grey brown fine to medium SAND, trace silt		0.65	
Grey brown SILTY CLAY (weathered crust)		1.65	
Estimated firm to stiff grey SILTY CLAY		3.00	
End of test pit			

SHEAR STRENGTH, Cu (kPa)
Natural, V - +
Remoulded, V - ⊕
20 40 60 80

WATER CONTENT (PERCENT)
Wp W Wl
20 40 60 80

ADDITIONAL LAB. TESTING

WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION

Groundwater inflow at 0.7 metres below ground surface on March 17, 2005.

LOGGED: BW

RECORD OF TEST PIT 5

JOB: 04-402

LOCATION: Refer to Site Plan, Figure 2

DATE EXCAVATION: March 17, 2005

SHEET 1 OF 1

DATUM:

TYPE OF EXCAVATOR: Hydraulic Shovel

SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE NUMBER
Ground Surface			
Dark brown silty sand TOPSOIL, some organic material			
		0.30	
Grey brown fine to medium SAND, trace silt			1
Grey SILTY CLAY		1.05	
Bottom of test pit		4.30	

SHEAR STRENGTH, Cu (kPa)
Natural, V- +
Remoulded, V- ⊕
20 40 60 80

WATER CONTENT (PERCENT)
Wp W Wl
20 40 60 80

ADDITIONAL LAB. TESTING

WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION

Groundwater inflow at 0.88 metres below ground surface on March 17, 2005.

RECORD OF TEST PIT 6

SHEET 1 OF 1

JECT: 04-402

ATION: Refer to Site Plan, Figure 2

DATUM:

E OF EXCAVATION: March 17, 2005

TYPE OF EXCAVATOR: Hydraulic Shovel

SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE NUMBER	SHEAR STRENGTH, Cu (kPa) Natural, V+ Remoulded, V- + φ (20 40 60 80)	WATER CONTENT (PERCENT) Wp W Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION
Ground Surface							
Dark brown silty sand TOPSOIL, some organic material		0.20					
Red brown fine to coarse SAND, trace to some gravel, trace silt		0.74					
Grey brown fine to coarse SAND, trace silt		1.90					
Grey SILTY SAND		2.10					
Estimated firm to stiff grey SILTY CLAY		3.00					
End of test pit							

Groundwater inflow at 2.1 metres below ground surface on March 17, 2005.

DEPTH SCALE

LOGGED: BW

ECT: 04-402

TION: Refer to Site Plan, Figure 2

EXCAVATION: March 17, 2005

RECORD OF TEST PIT 7

SHEET 1 OF 1

DATUM:

TYPE OF EXCAVATOR: Hydraulic Shovel

SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE NUMBER	SHEAR STRENGTH, Cu (kPa) — Natural, V - ; Remoulded, V - ⊕ (20 40 60 80)	WATER CONTENT (PERCENT) — Wp W Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION
Ground Surface							
Blast rock and organic material (FILL)							
Dark brown silty sand (FORMER TOPSOIL)		0.35					
Grey brown fine to medium SAND, trace silt		0.50					
Grey fine to coarse SAND, some silt and shells		2.10					
End of test pit		3.55					

Groundwater inflow at 1.3 metres below ground surface on March 17, 2005.

RECORD OF TEST PIT 8

UECT: 04-402

ATION: Refer to Site Plan, Figure 2

E OF EXCAVATION: March 17, 2005

SHEET 1 OF 1

DATUM:

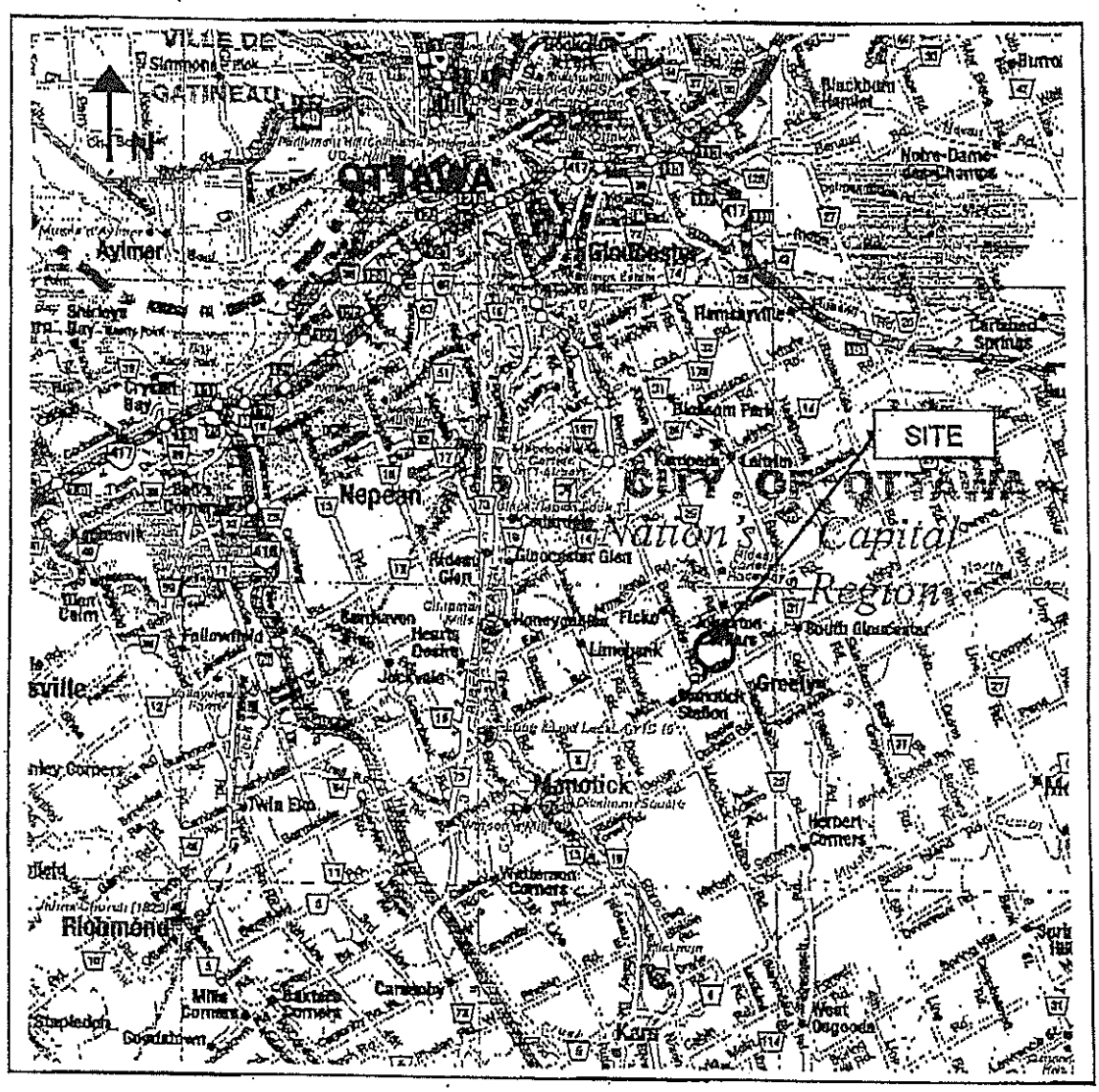
TYPE OF EXCAVATOR: Hydraulic Shoval

SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLE NUMBER	SHEAR STRENGTH, Cu (kPa) Natural, V - + Remoulded, V - ⊕ (20 40 60 80)	WATER CONTENT (PERCENT) Wp W Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	WATER LEVEL IN OPEN TEST PIT OR STANDPIPE INSTALLATION
Ground Surface							
Dark brown silty sand TOPSOIL, some organic material							
		0.15					
Grey brown fine to medium SAND, trace silt							▽
		0.90					
Grey brown SILTY CLAY (weathered crust)							
		1.45					
Grey SILTY CLAY							
End of test pit		3.30					Groundwater inflow at 0.8 metres below ground surface on March 17, 2005.

LOGGED: BW

KEY PLAN

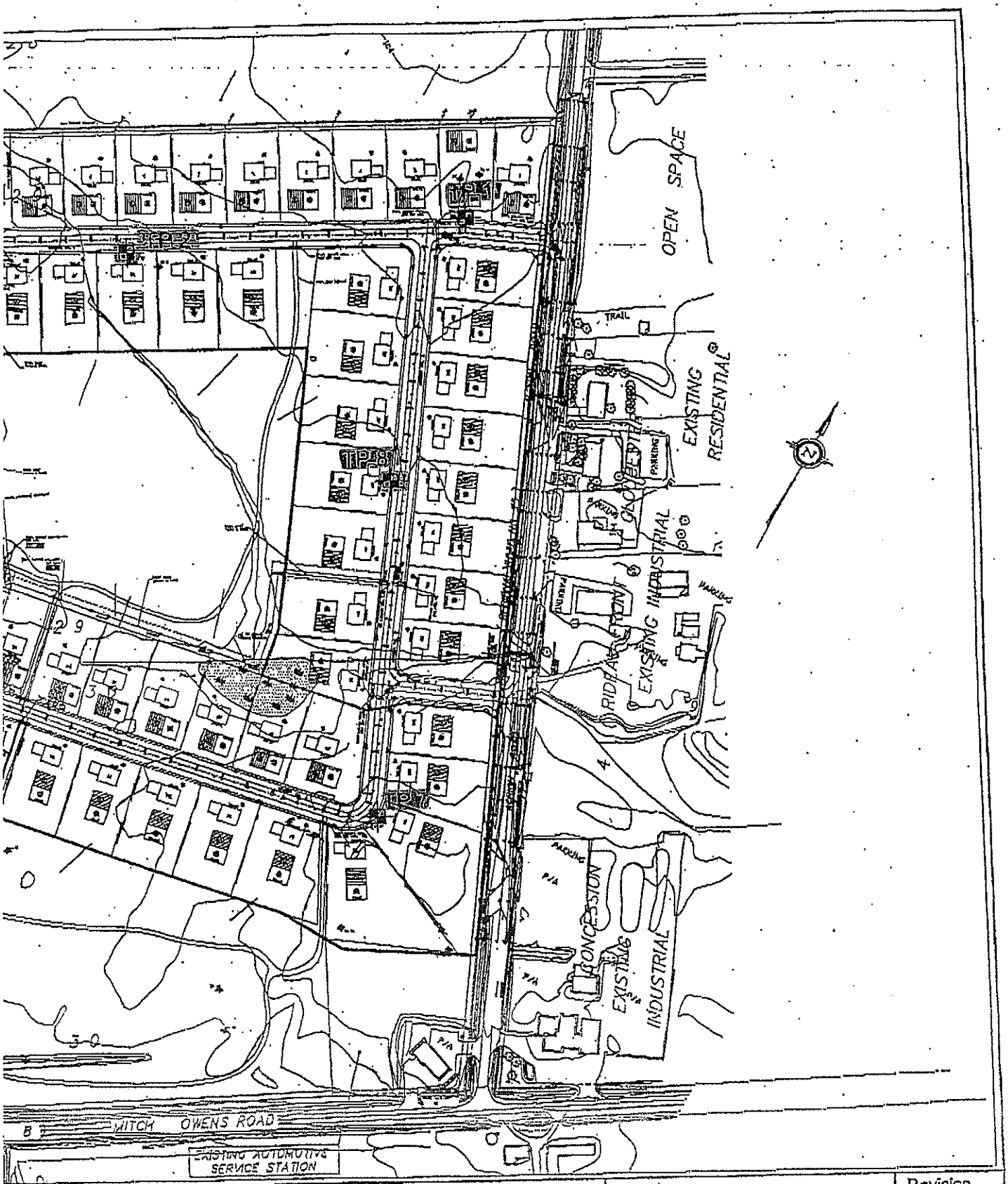
FIGURE 1



SCALE
1:250, 000

MOREY
HOULE
CHEVRIER
ENGINEERING LTD

Date: April 2005



Client: EMERALD CREEK PROPERTIES	Location: ALBION RD., OTTAWA, ON		Revision: 0
Drawn by: M.R.	Approved by: C.H.	Project No.: 04-402	Scale: 1 : 4000
MOREY HOULE CHEVRIER	Sheet Title: SITE PLAN		

N PLAN, PRESENT
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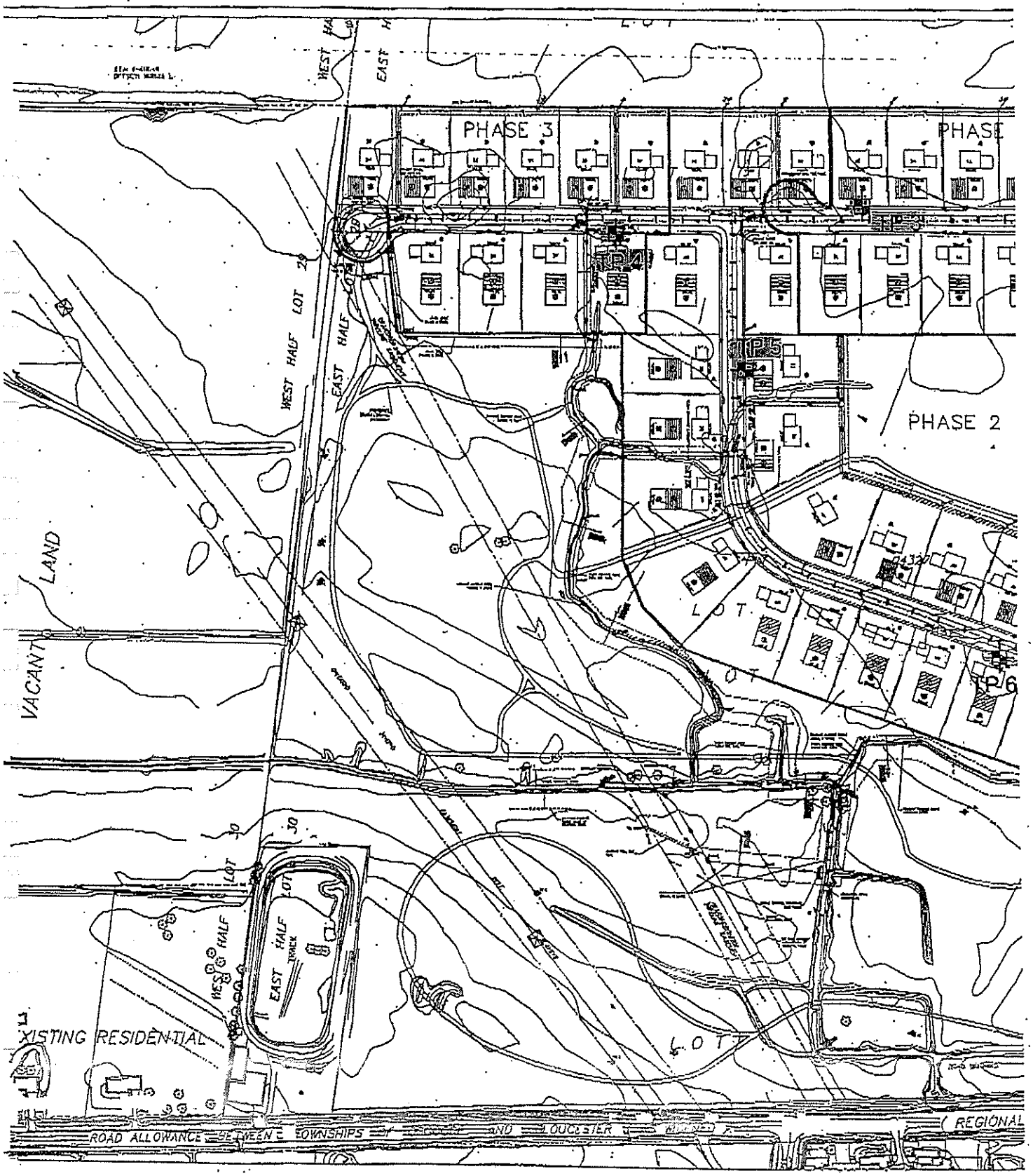

LEGEND

TP# APPROXIMATE TEST PI
INVESTIGATION BY MCI

- Terrain Analysis and Hydrogeotechical Study (John D.Patterson and Associates Limited, January 2002)

JOHN D. PATERSON AND ASSOCIATES LIMITED
Consulting Engineers
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TERRAIN ANALYSIS AND HYDROGEOLOGICAL STUDY PROPOSED EMERALD CREEK ESTATES SUBDIVISION MITCH OWENS AT ALBION ROADS CITY OF OTTAWA, ONTARIO

Prepared for

Mr. Gerald Lalonde

Report No. G8329-01

January 10, 2002

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

1.1 Terms of Reference

As requested by Mr. Steve Pichette, with Stantec Consulting, on behalf of the owners, this firm was commissioned to conduct a Terrain Analysis and Hydrogeological Study for the land identified as the proposed Emerald Creek Estates residential subdivision on Mitch Owens at Albion Roads, City of Ottawa, Ontario (refer to Figure 1).

1.2 Background

The proposed development is seen to consist of 89 residential lots in combination with a nine hole golf course. The proposed lot sizes average 0.3 hectares, with an average lot density of 2.8 hectares, when incorporating the green space associated with the golf course.

The purpose of this study has been to specifically determine the hydrogeological conditions under the proposed residential lots as shown on Drawing No. G8329-01, as they relate to water supply and private sewage disposal. Specifically, the intent of this report is to determine whether or not a potable water supply exists under the site, and to determine if the proposed residential development will have an acceptable and minimal impact on groundwater resources of the site and the neighbouring properties.

2.0 METHOD OF STUDY

2.1 Terrain Analysis

Sixteen (16) test holes were put down using hand auger methods, to provide a thorough delineation of the stratigraphic profile across the property on September 17, 2001. The soil profiles in each test hole were recorded by a technologist from this firm.

Test hole locations were selected (where access permitted) by John D. Paterson and Associates personnel. The soil profiles observed in the test holes, including the depth to the groundwater table, were recorded in detail in the field. The subsurface conditions observed at the test hole locations are shown on the Test Hole Location Plan, in Appendix 4, and on the Soil Profile and Test Data sheets, in Appendix 1 of this report.

Representative samples of the soils were recovered from the test holes. All samples were classified texturally in the field and sealed in proper containers for further perusal in our laboratory. The depths at which the grab samples were recovered from the test holes are shown as "G" on the Soil Profile and Test Data sheets.

2.2 Test Wells

Three (3) test wells (TW 1 to TW 3) were drilled by Capital Water Supply Ltd. of Stittsville, Ontario, and the drilling and grouting operations were supervised by this firm. The wells were spread out across the property, in order to determine aquifer differences across the entire site. In situ pump testing was carried out on each test well, and water samples from the wells were also preserved for chemical analyses.

- Test well TW 1 was completed on August 30, 2001. A six-hour pump test, with recovery measurements was conducted on TW 1 on September 7, 2001.
- Test well TW 2 was completed on August 30, 2001. A six-hour pump test, with recovery measurements was conducted on TW 2 on September 6, 2001.
- Test well TW 3 was completed on August 31, 2001. A six-hour pump test, with recovery measurements was conducted on TW 2 on September 5, 2001.

In addition to the field testing component of this study, published MOE Water Well Records were reviewed to assess the general aquifer characteristics of the area. The specific details and results of the testing program are discussed in more detail later in this report.

2.3 Laboratory Testing

Three (3) samples of the representative in situ soils were selected for grain size analyses in our laboratory. The results of the testing are provided on the Grain Size Distribution sheets in Appendix 3.

Based on the results of this testing (sample grading), the soils are estimated to have the following percolation rates:

- Sand with silt from HA 1 - G2: T = 10 to 20 min/cm.
- Sand with silt from HA 5 - G4: T = 10 to 20 min/cm.
- Poorly graded Sand from HA 8 - G6: T = 10 to 20 min/cm.

Three (3) water samples were recovered from each of the three (3) test wells during the pump testing program at 3 hours of pumping and 6 hours of pumping, respectively, and were preserved for chemical analyses. The analyses were conducted by Accutest Laboratories, of Nepean, Ontario. The groundwater test results are presented in Appendix 3, and are discussed under Section 4.3.

All soil samples will be stored in our laboratory for a period of three months after issuance of this report. They will then be discarded unless we are directed otherwise.

3.0 GEOLOGY

The following sections describe the regional and site-specific geology of the study area(s).

3.1 Bedrock Geology

Published mapping shows the study area is underlain by dolomite and limestone of the Oxford Formation. The primary source of water supply is expected to lie within this formation.

3.2 Surficial Geology

The surficial geology of each of the parcels was mapped by putting down a series of test holes. The test hole locations and profiles are presented graphically on Drawing No. G8329-1, and the details of the soil profile at each test hole location are provided on the Soil Profile and Test Data sheets in Appendix 1.

In general, the surficial soil conditions consist primarily of topsoil over silty sand, followed by silty clay in approximately half of the test holes. The layer of silty clay/clayey silt was encountered at AH 1 through AH 7, and AH 15. Reference should be made to the Soil Profile and Test Data sheets in Appendix 1 for the details of the Soil Profile at each test hole location.

At the time of the fieldwork, the groundwater level encountered tanged from 0.3 to 1.6 m, with an average of 0.8 m. It is expected that the seasonal high groundwater levels will be considerably higher. Stormwater management practices will tend have a stabilizing effect on the long-term groundwater levels.

4.0 PHYSICAL HYDROGEOLOGY

The following sections describe the results of the regional and local hydrogeological analysis conducted in this study.

4.1 Regional Hydrogeology

The available MOE Water Well records were reviewed within the vicinity of the sites. The primary source of water supply consists of the limestone / dolomite and sandstone beds of the Oxford Formation. Well yields are generally considered to be moderate in the area (suitable for residential development), and no significant indication of any quantitative or qualitative problems were noted in our review.

4.2 Test Wells

Three (3) test wells were drilled, on the subject site, by Capital Water Supply Ltd. of Stittsville, Ontario. The wells were drilled by means of an air rotary drill. A copy of the drillers Well Record for each of the test wells has been provided in Appendix 2.

The details of the well construction for each of the test wells (from the Well Records) are summarized in Table 1, below. In each of the wells drilled as part of this study, steel casing was installed and grouted to a minimum depth of 9.8 m.

Each test well was pumped at constant rates, varying from 0.53 to 1.20 litres/sec for a period of 6 hours. Limited drawdown was observed in each well; the maximum drawdown ranged between 0.17 and 4.93 m, after 6 hours. In situ turbidity testing was conducted at the well head using a field turbidimeter. When the pump was stopped, the water level returned to the near static level almost immediately in each of the test wells.

TABLE 1
SUMMARY OF WELL CHARACTERISTICS

Item	TW 1	TW 2	TW 3
Depth of Overburden (m)	7.6	13.7	14.6
Depth of Well (m)	22.9	38.1	42.7
Depth of Casing (m)	9.8	15.5	16.5
Depth to Aquifers (m)	18.0 18.9	36	41.1
Static Water Level (m)	1.8	4.4	6.3
Recorded Pumping Rate (IGPM)	30	15	20

4.3 Aquifer Analysis

The following sections discuss the results of the physical and bacteriological and chemical analysis completed on the aquifer.

Physical Analysis

A six hour constant discharge aquifer test was completed on each of the test wells. During pumping, drawdown measurements were recorded, and our observations in this regard are summarized in Appendix 2. Subsequent to the completion of pumping, the recovery was recorded and determined to be essentially immediate.

The drawdown data obtained during each of the pump tests was analysed using the Cooper and Jacob Drawdown method (using Aquifer Test software). The results of those analyses are provided in Appendix 2 and in Table 2. The results yielded transmissivities in the range of 4.94×10^{-1} m^2/min to 5.43×10^{-3} m^2/min, which demonstrate that the aquifer produces an abundant water supply, more than capable of servicing single family homes. Water samples were taken at the halfway point and the completion of the pump test, and were subsequently submitted to Accutest Laboratories for chemical testing.

TABLE 2
AQUIFER TEST RESULTS

Item	TW 1	TW 2	TW 3
Pumping Rate (litres/sec)	1.14-1.20	1.2	0.53-1.14
Depth of Well (m)	22.9	38.1	42.7
Static Water Level (m)	1.8	4.4	6.3
Available Drawdown (m)	21.1	33.9	36.4
Maximum Drawdown (m)	0.2	1.5	4.9
% Available Drawdown	0.9	4.4	13.5
Transmissivity (m^2/min)	4.94×10^{-1}	6.30×10^{-2}	5.43×10^{-3}

Groundwater Geochemistry

Water samples were taken at the three hour and six hour mark of each of the aquifer tests (pump tests). The samples were submitted to Accutest Laboratories Limited for bacteriological and chemical analyses. The laboratory reports are found in Appendix 3, and are summarized below. The analytical results are summarized in Tables 3 and 4 and compared to the MOE limits and targets.

The water quality in the test wells is generally satisfactory, and all health-related parameters are met. In the sample from TW 3, high **sodium** levels were delineated. These elevated levels are above the MOE Water Quality Objective (20 mg/L) but below the ODW objective (200 mg/L) and are aesthetic parameters. These levels of sodium are treatable using reverse osmosis units. In any event, these levels should be flagged in the subdivision agreement, as a warning to people on salt restricted diets. The groundwater in this area is considered to be **hard.** The **TDS** for the sample taken from TW 1 is above the ODWO (MOE Ontario Drinking Water Objective) of 500 mg/L, which is also where the water is hardest. These are all aesthetic parameters and not health-related. A commercial water softener will likely remove the hardness from the water.

Iron concentrations in TW 1 and TW 3 exceeded the MOE Water Quality Objectives (0.3 mg/L). This is an aesthetic related parameter and can be treated with a standard commercial water softener. The same is true for the elevated manganese concentration in TW 3.

Elevated **turbidity** levels were encountered in the laboratory samples from the test wells. As a matter of routine, the turbidity was measured for each sample in the field using a portable field turbidimeter. All of the field turbidity results were within acceptable limits by the end of the pump tests.

TABLE 3
SUMMARY OF HEALTH RELATED PARAMETERS

PARAMETER	TW 1 3 hrs.	TW 1 6 hrs.	TW 2 3 hrs.	TW 2 6 hrs.	TW 3 3 hrs.	TW 3 6 hrs.	MOE Water Quality Objective
Sodium	19	19	16	15	25	24	20 (200)
Fluoride	0.16	0.2	0.31	0.36	0.35	0.36	2.4
Ammonia	0.08	0.08	0.1	0.04	0.07	0.09	-
Nitrite	nd	nd	nd	nd	nd	nd	1
Nitrate	nd	nd	nd	nd	nd	nd	10
Turbidity (NTU) Laboratory Field Field Sup. Pumping	**2.3** 0.7	**2.5** 0.48	**1.9** **2.85**	0.7 0.97	**>100** **83.8**	**40** **23.4** 0.97	1
E. Coli	0	0	0	0	***<10***	0	0
Total Coliform	0	0	0	0	***<10***	0	5
Faecal Coliform	0	0	0	0	***<10***	0	<2
Faecal Streptococcus	0	0	0	0	0	0	0
Heterotrophic Plate Count	20	0	2	1	1	0	500

Note: All parameters are in mg/L unless otherwise indicated.
Bacteria counts are in counts per 100 mL.
ND means below method detection limit.
At sodium concentrations in excess of 20 mg/L, the Medical Officer of Health should be notified as it pertains to people on sodium-reduced diets.
<10 - Due to elevated levels of sediment in this sample, the volume was diluted to 10 mL and the count was 0cts/10mL; however, the concentration for 100 mL must be documented as <10.
Highlighted concentrations exceed the recommended guidelines.
** The field turbidity measured at the completion of the six hour portion of the pump tests were above the objective due to inadequate development of the wells. As such, the pumping of the wells was continued to further monitor turbidity at the well head, and pumping was terminated when the measured turbidity met the MOE ODWO of 1.*

TABLE 4
SUMMARY OF AESTHETIC RELATED PARAMETERS

PARAMETER	TW 1 3 hrs.	TW 1 6 hrs.	TW 2 3 hrs.	TW 2 6 hrs.	TW 3 3 hrs.	TW 3 6 hrs.	MOE Water Quality Objective
Conductivity (µS/cm)	721	702	367	366	435	429	N/V
Colour (TCU)	2	3	2	3	nd	nd	5
Hardness	338	337	172	176	179	177	80 - 100
Alkalinity	236	234	188	185	191	189	500
Total Dissolved Solids	448	536	220	224	268	256	500
pH	7.77	7.8	7.79	7.77	7.94	7.94	6.5 to 8.5
Chloride	72	69	8	7	19	17	250
Sulphate	76	75	18	18	32	31	500
Calcium	76	74	36	36	37	38	N/V
Magnesium	36	37	20	21	21	20	N/V
Potassium	3	3	4	4	5	5	N/V
TKN	0.16	0.16	0.11	0.11	0.13	0.18	N/V
Dissolved Organic Carbon	1.1	1	1.2	1.2	0.6	nd	5
Iron	0.36	0.36	0.3	0.22	3.38	0.92	0.3
Manganese	0.02	0.02	0.04	0.03	0.07	0.03	0.05
Hydrogen Sulphide	nd	nd	nd	nd	0.03	0.01	0.08
Phenols	nd	nd	nd	nd	nd	nd	0.002
Tannin & Lignin	nd	nd	nd	nd	nd	0.1	N/V

Note: All parameters are in mg/L unless otherwise indicated.
nd - Parameter concentration not detected (i.e. below the Method Detection Limit)
N/V - No specified MOE concentration guideline.

5.0 DEVELOPMENT RECOMMENDATIONS

The following sections outline the recommendations for development which have been formulated from the data collected in this investigation.

5.1 Site Development

Based on the results of our investigation, this site is considered to be suitable for the development of the lots as described in the introduction of this report. The on-site sewage disposal can be handled with partially or fully-raised Class 4 septic systems, as per Part 8 of the Ontario Building Code, and an adequate water supply can be obtained with private wells.

5.2 Lot Development Plans

One objective of the hydrogeological study is to enhance development and minimize the effects of sewage systems on the surrounding environment. This is achieved through prevention of accumulation of surface water, by ensuring proper construction of water supply and sewage systems, and by coordinating the overall positioning of the services to maximize separations. A minimum separation of 15 m (18 m for fully-raised systems) is required between a well and sewage system, whether they are servicing a single lot, or are on neighbouring lots.

Drawing No. G8329-01 shows the proposed lot development plan for the site. The purpose of this drawing is to show that a typical home and services will fit onto the proposed lot, and can meet all pertinent regulations without causing environmental constraints. The house shown in this drawing covers a plan area of 120 m^2 , assuming a two-storey 240 m^2 (2600 ft^2) home, with a garage of 50 m^2, and is serviced by a sewage system with the capacity of 3000 L/day. In actuality, the daily sewage flows will likely be significantly lower than this figure.

It is not the intent of the drawing to restrict placement of the home on each lot. While the position of the home may change, the relative position of the home, sewage system and well should be maintained. In all cases, the separation criteria for the immediate and neighbouring lots should be followed.

5.3 Sewage System Impact

The tile beds which will serve the proposed subdivisions have the potential of increasing the nitrate levels in the underlying aquifers (which are now at "non-detected" levels). The potential for contamination of the aquifer can be reduced by ensuring that the tile beds are correctly sized and positioned on the proposed lots.

In our analysis, it is important to look at the overall development for this site, in that the residential portion of the study only represents approximately one-third of the overall area. Although the typical lot size is of the order of 0.3 hectares, the overall land-use density is actually of the order of 2.8 hectares per lot, when the greenspace and pond areas are incorporated in the calculation.

Typically, runoff coefficients of the order of 0.2 exist for developments of this nature; however, it is our understanding that the majority of runoff will be directed towards the ponds that will exist on the property. Also, with the significant green-space areas that exist on this site, the overall runoff would actually be reduced significantly, to approximately 0.15.

It is our understanding that as part of the proposed development, the runoff from precipitation will remain on site, with stormwater management being provided by the series of ponds. This would mean that all of the runoff would be available for infiltration. In our analysis, we assume that 50 % of the runoff reaches the lakes. As such, the combined runoff and evoraporation / evapotranspiration should not exceed 550 mm per year, leaving a surplus water for infiltration of approximately 360 mm per year. This would equate to an infiltration coefficient of 0.4 for this site.

A Mass Balance Model has been used to determine the cumulative nitrate impact using recharge from infiltration only. With the permeable soils and the presence of the series of lakes, groundwater flushing will occur, which will lead to further dilution of the nitrates, however, this is not accounted for in our analysis.

Based on the results of our analysis, the proposed residential development will result in a long term nitrate concentration of 4.4 mg/l, which is below the Ontario Drinking Water Objectives of 10 mg/l.

5.4 Sewage System Design

Sewage systems must be designed according to Part 8 of the Ontario Building Code. The regulations state that 0.9 m of suitable soil above an unacceptable layer (bedrock) and 0.9 m of suitable soil above the high water table are required below absorption trenches.

A large 4 bedroom luxury residence may produce up to 3000 L/day of sewage effluent, although generally, design sewage flows will be less than 2500 L/day. Partially or fully raised leaching beds are recommended in this subdivision, due to the high water levels that occur in the spring months.

An imported soil with a percolation time (T) of between 6 and 8 min/cm will be required for raised tile bed and mantle construction. The Lot Development Plan illustrates the septic areas based on a typical tile field (based on 3000 L/day) for the general soil conditions in the area. The area designated for a spare bed is also indicated. The sewage system should be placed down slope from any nearby wells, where possible.

5.5 Well Design

Drilled wells, completed in the bedrock aquifer, should be used for the water supply in this development. The wells should be drilled by a licensed well driller experienced in the study area. A minimum well yield of 0.23 litres/sec is recommended for an average residence. Figure 2 (Appendix 4) shows the recommended well design.

A rotary drill has been proven to provide satisfactory water supply results in the test wells. Drilling should continue down into the bedrock so that the casing is seated firmly into the bedrock. The space between the casing and hole should be cement grouted using a method recommended by the MOE (Appendix 4).

After allowing the cement to set (24 hours for quick-set cement, 72 hours for regular cement), drilling should continue at a 150 mm diameter until the necessary water yield is intercepted. The well should be developed by surging or pumping until the water is clear.

The well should be completed with a submersible pump, pitless adaptor and well cap. The casing should project for approximately 0.30 m above the final lot grade. The grading around the well casing should be slightly elevated to direct surface runoff away from the well.

6.0 CONCLUSIONS

A terrain analysis and hydrogeological investigation were completed on a property identified as the proposed Emerald Creek Estates Subdivision, located at Mitch Owens at Albion Roads, in the City of Ottawa, Ontario. The long term site development calls for 89 residential lots. The proposed development consists of lot sizes averaging 0.3 hectares.

The terrain consists primarily of topsoil and silty sand over silty clay within the subdivision. Sewage systems with partially or fully raised leaching beds are suitable for this development.

The water supply was confirmed with the drilling of three (3) test wells. The yields obtained have more than the required capacities to provide a water supply for a typical residences. The water was determined to meet the health related Ontario Drinking Water Objectives, and some easily treated aesthetic parameters (hardness, sodium, TDS) were slightly elevated in some wells. These aesthetic problems can be reduced noticeably if the water supply is treated with a water softener.

In summary, it is our opinion that this site is suitable for development as a residential subdivision at the proposed density. The hydrogeological recommendations of this report, if followed, will ensure that the development takes place in an effective manner, with a minimal impact on the environment.

JOHN D. PATERSON AND ASSOCIATES LIMITED

Stephen J. Walker, P. Eng.

Report Distribution:

Mr. Steve Pichette, Stantec Consulting (2 copies)
Mr. Bob Pearce, Fotenn Consultants (3 copies)
John D. Paterson and Associates Limited (1 copy)

APPENDIX 1

Soil Profile & Test Data Sheets

JOHN D. PATERSON & ASSOCIATES LTD.
Consulting Engineers
28 Concourse Gate, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Emerald Creek Estates, Albion Road
Ottawa, Ontario

M

ARKS

FILE NO. G8329

IGS BY Hand Auger DATE 17 SEP 01

HOLE NO. HA 1

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	PIEZOMETER CONSTRUCTION
IND SURFACE						0		20 40 60 80	
brown to black silty TOPSOIL		G	1						
0.27									
'' grade, brown SAND silt									
by 0.6m depth		G	2						
1.05						1			
SILTY CLAY, trace		G	3						
1.75									
of Hand Auger Hole								20 40 60 80 100	

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SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Emerald Creek Estates, Albion Road
Ottawa, Ontario

ATUM

MARKS

FILE NO. G8329

HOLE NO. HA 2

RINGS BY Hand Auger DATE 17 SEP 01

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone; ○ Water Content %	PIEZOMETER CONSTRUCTION
ROUND SURFACE						0		20 40 60 80	
rk brown to black silty nd TOPSOIL									
0.21									
orly graded, brown ND with silt									
0.97						1			
ey SILTY CLAY									
1.70									
d of Hand Auger Hole									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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28 Concourse Gate, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Emerald Creek Estates, Albion Road
Ottawa, Ontario

M

MARKS

FILE NO. G8329

HOLE NO. HA 3

IGS BY Hand Auger DATE 17 SEP 01

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % (20 40 60 80)	PIEZOMETER CONSTRUCTION
ND SURFACE						0			
k brown to black silty TOPSOIL									
0.17									
rly grade, brown SAND silt									
by 0.6m depth						1			
1.15									
SILTY CLAY									
1.70									
Hand Auger Hole									

20 40 60 80 100

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SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Emerald Creek Estates, Albion Road
Ottawa, Ontario

ATUM

EMARKS

FILE NO. G8329

HOLE NO. HA 4

ORINGS BY Hand Auger DATE 17 SEP 01

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone; ○ Water Content % (20 40 60 80)	PIEZOMETER CONSTRUCTION
ROUND SURFACE						0			
ark brown silty sand. OPSOIL									
0.20									
oorly graded, brown AND grey by 0.3m depth									
0.54									
						1			
ey SILTY CLAY									
1.70									
id of Hand Auger Hole									

Shear Strength (kPa) 20 40 60 80 100
▲ Undisturbed △ Remoulded

JOHN D. PATERSON & ASSOCIATES LTD.
Consulting Engineers
28 Concourse Gate, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Emerald Creek Estates, Albion Road
Ottawa, Ontario

IM

MARKS

FILE NO. G8329

HOLE NO. HA 5

GS BY Hand Auger DATE 17 SEP 01

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone; ○ Water Content % (20 40 60 80)	PIEZOMETER CONSTRUCTION
ND SURFACE						0			
k brown to black silty d TOPSOIL									
0.14									
y graded, brown), with silt									
		G	4						
by 0.7m depth									
						1			
1.06									
SILTY CLAY									
1.70									
r Hand Auger Hole									

20 40 60 80 100

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SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Emerald Creek Estates, Albion Road
Ottawa, Ontario

ATUM

EMARKS

FILE NO. G8329

HOLE NO. HA 6

ORINGS BY Hand Auger

DATE 17 SEP 01

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone; ○ Water Content %	PIEZOMETER CONSTRUCTION
ROUND SURFACE						0		20 40 60 80	
ark brown silty sand OPSOIL									
0.11									
oorly graded, brown AND									
grey by 0.7m depth						1			
1.17									
rey SILTY CLAY									
1.70									
nd of Hand Auger Hole									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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Consulting Engineers
28 Concourse Gate, Nepean, Ont. K2E 7T7

SOIL PROFILE & TEST DATA

Hydrogeological Study and Terrain Analysis
Emerald Creek Estates, Albion Road
Ottawa, Ontario

M

IARKS

FILE NO. G8329

GS BY Hand Auger DATE 17 SEP 01

HOLE NO. HA 7

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone; ○ Water Content %	PIEZOMETER CONSTRUCTION
IND SURFACE						0		20 40 60 80	
< brown silty sand ?SOIL 0.07									
rly graded, brown JD with silt									
.. by 0.3m depth		G	5			1			
1.33									
ILTY CLAY									
1.70									
ɔT Hand Auger Hole								20 40 60 80 100	

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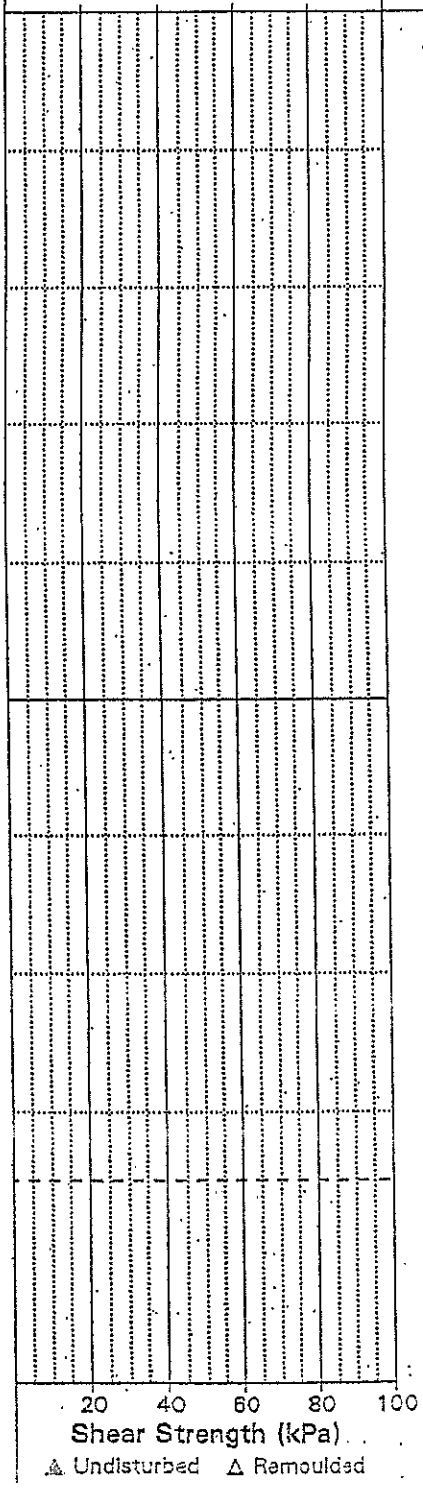
EMARKS

FILE NO. G8329

HOLE NO. HA 8

ORINGS BY Hand Auger DATE 17 SEP 01

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone; ○ Water Content %	PIEZOMETER CONSTRUCTION
ROUND SURFACE						0		20 40 60 80	
ark brown silty sand OPSOIL									
0.18									
oorly graded, brown AND with silt									
grey by 0.7m depth		G	6			1			
1.70									
id of Hand Auger Hole									



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ARKS

FILE NO. G8329

IGS BY Hand Auger

DATE 17 SEP 01

HOLE NO. HA 9

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % (20 40 60 80)	PIEZOMETER CONSTRUCTION
IND SURFACE									
/n silty sand TOPSOIL						0			
0.10									
y graded, brown D with silt									
						1			
		G	1						
by 1.5m depth									
1.68									
Hand Auger Hole								20 40 60 80 100	

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MARKS

FILE NO. G8329

HOLE NO. HA10

RINGS BY Hand Auger DATE 17 SEP 01

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone; ○ Water Content %	PIEZOMETER CONSTRUCTION
OUND SURFACE						0		20 40 60 80	
ıck silty sand TOPSOIL		G	2						
0.36									
orly graded, black to wn SAND with silt		G	3			1			
1.22									
d of Hand Auger Hole									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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MARKS

FILE NO. G8329

HOLE NO. HA11

IGS BY Hand Auger DATE 17 SEP 01

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	PIEZOMETER CONSTRUCTION
JND SURFACE						0		20 40 60 80	
silty sand TOPSOIL									
0.30									
graded, grey SAND silt						1			
1.37									
Hand Auger Hole									
n hole WL @ 0.3m depth)								20 40 60 80 100	

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MARKS

FILE NO. G8329

HOLE NO. HA12

RINGS BY Hand Auger DATE 17 SEP 01

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone; ○ Water Content %	PIEZOMETER CONSTRUCTION
ROUND SURFACE						0		20 40 60 80	
ark brown silty sand OPSOIL 0.10									
orly graded, grey SILTY AND						1			
race clay from 1.4m pth									
1.52 id of Hand Auger Hole									
pen hole WL @ 0.5m depth)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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MARKS

FILE NO. G8329

HOLE NO. HA13

IGS BY Hand Auger DATE 17 SEP 01

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone; ○ Water Content % (20 40 60 80)	PIEZOMETER CONSTRUCTION
IND SURFACE						0			
wn silty sand TOPSOIL									
0.13									
ly graded, brown with silt						1			
1.22									
of Hand Auger Hole									

20 40 60 80 100

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EMARKS

FILE NO. G8329

HOLE NO. HA14

ORINGS BY Hand Auger

DATE 17 SEP 01

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone; ○ Water Content %	PIEZOMETER CONSTRUCTION
ROUND SURFACE						0		20 40 60 80	
		G	14						
oorly graded, brown AND with silt						1			
grey by 1.2m depth									▽
1.68									
nd of Hand Auger Hole									
Open hole WL @ 1.2m depth)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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MARKS

FILE NO. G8329

HOLE NO. HA15

GS BY Hand Auger DATE 17 SEP 01

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % (20 40 60 80)	PIEZOMETER CONSTRUCTION
JND SURFACE						0			
rly graded, grey SAND silt									
0.60									
ILTY CLAY with		G	5			1			
1.52									
Hand Auger Hole									
hole WL @ 0.45m depth)									

20 40 60 80 100

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Hydrogeological Study and Terrain Analysis
Emerald Creek Estates, Albion Road
Ottawa, Ontario

ATUM

EMARKS

FILE NO. G8329

HOLE NO. HA16

ORINGS BY Hand Auger

DATE 17 SEP 01

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone; ○ Water Content %	PIEZOMETER CONSTRUCTION
ROUND SURFACE						0		20 40 60 80	
oorly graded, brown AND with silt									
grey by 0.6m depth						1			▽
1.52									
id of Hand Auger Hole									
)pen hole WL @ 0.6m depth)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

Relative Density	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SOIL DESCRIPTION (continued)

Cohesive soils can also classified according to their "sensitivity". The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NXL size core. However, it can be used on smaller core sizes, such as BX, if the bulk of the fractures caused by drilling stresses (called "mechanical breaks") are easily distinguishable from the normal in-situ fractures.

RQD %	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.) Rock core samples are obtained with the use of standard diamond drilling bits

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture content or water content of sample, %
LL	-	Liquid limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic limit, % (water content above which soil behaves plastically)
PI	-	Plasticity index, % (difference between LL and PL)
Dxx	-	Grain size at which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2$ / (D10 x D60)
Cu	-	Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sand and gravels not meeting the above requirements are poorly-graded or uniformly-graded. Cc and Cu are not applicable for the description of soils with more than 10% silt and clay (more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

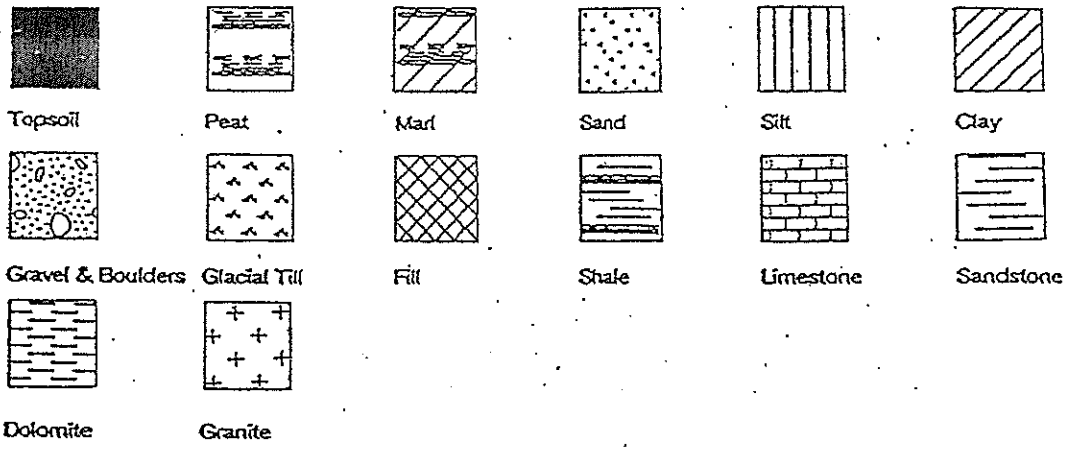
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidation ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

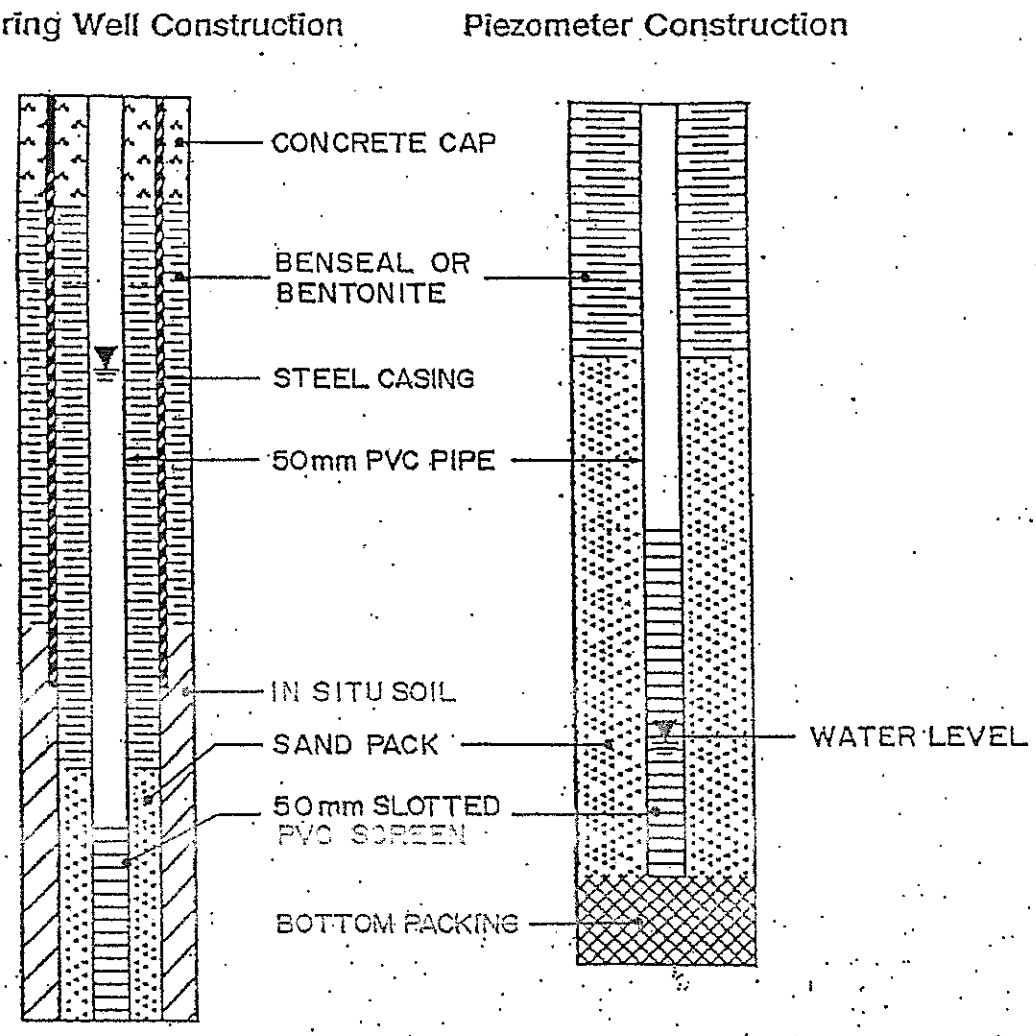
k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

SYMBOLS AND TERMS (continued)

STRATA PLOT



MONITORING WELL AND PIEZOMETER CONSTRUCTION



Appendix B
SWM Parameters, Calculations and Water-Balance

Design Chart 1.08: Hydrologic Soil Groups

- Based on Surficial Geology Maps

Map Ref.No.	Soil Type or Texture	Hydrologic Soil Group (Tentative)
	Ground Moraine	
1a	Usually sandy till, stony, varying depth. (Most widespread type in Shield).	Usually B (shallow); may be A or AB
1b	Clayey till, varying depth.	BC-C
	End or Interlobate Moraine	
2a	Sand & stones, deep. (May be rough topography).	A
2b	Sand & stones capped by till, deep.	A-C depending on type of till.
2c	Sand & stones, deep. (Smoother topography).	A
	Kames & Eskers	
3a	Sand & stones, deep. (May be rough topography).	A
3b	Sand & stones capped by till, deep.	A-C depending on type of till.
3c	Sand & stones, deep. (Smoother topography).	A
	Lacustrine	
4a	Clay & silt, in lowlands.	BC-C
4b	Fine sand, in lowlands.	AB-B
4c	Sand, in lowlands.	AB
4d	Sand (deltas & valley trains).	A-AB
	Outwash	
5	Sand, some gravel, deep.	A
	Aeolian	
6	Very fine sand & silt, shallow. (Loess)	B
	Bedrock	
7	Bare bedrock (normally negligible areas).	Varies according to rock type.

Source: Ministry of Natural Resources - MNR

Design Chart 1.08: Hydrologic Soil Groups (Continued)

- Based on Soil Texture

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

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

Design Chart 1.09: Soil/Land Use Curve Numbers

Land Use	Treatment or Practice	Hydrologic Condition[4]	Hydrologic Soil Group			
			A	B	C	D
Fallow	Straight row	—	77	86	91	94
Row crops	"	Poor	72	81	88	91
	"	Good	67	78	85	89
	Contoured	Poor	70	79	84	88
	"	Good	65	75	82	86
	" and terraced	Poor	66	74	8	82
	" " "	Good	62	71	78	81
Small grain	Straight row	Poor	65	76	84	88
		Good	63	75	83	87
	Contoured	Poor	63	74	82	85
		Good	61	73	81	84
	" and terraced	Poor	61	72	79	82
		Good	59	70	78	81
Close-seeded legumes[2] or rotation meadow	Straight row	Poor	66	77	85	89
	" "	Good	58	72	81	85
	Contoured	Poor	64	75	83	85
	"	Good	55	69	78	83
	" and terraced	Poor	63	73	80	83
	" and terraced	Good	51	67	76	80
Pasture or range		Poor	68	79	86	89
		Fair	49	69	79	84
	Contoured	Good	39	61	74	80
	"	Poor	47	67	81	88
	"	Fair	25	59	75	83
		Good	6	35	70	79
Meadow		Good	30	58	71	78
Woods		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	25	55	70	77
Farmsteads		—	59	74	82	86
		—	72	82	87	89
		—	74	84	90	92

For average anticedent soil moisture condition (AMC II).
[2] Close-drilled or broadcast.

[4] The hydrologic condition of cropland is good if a good crop rotation practice is used; it is poor if one crop is grown continuously.

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

Design Chart 1.09: Soil Conservation Service Curve Numbers (Continued)

Land Use or Surface	Hydrologic Soil Group						
	A	AB	B	BC	C	CD	D
Fallow (special cases only)	77	82	86	89	91	93	94
Crop and other improved land	66** (62)	70** (68)	74	78	82	84	86 AMC I
Pasture & other unimproved land	58* (38)	62* (51)	65	71	76	79	81
Woodlots and forest	50* (30)	54* (44)	58	65	71	74	77
Impervious areas (paved)							98
Bare bedrock draining directly to stream by surface flow							98
Bare bedrock draining indirectly to stream as groundwater (usual case)							70
Lakes and wetlands							50

Notes

(i) All values are based on AMC II except those marked by * (AMC III) or ** (mean of AMC II and AMC III).

(ii) Values in brackets are AMC II and are to be used only for special cases.

(iii) Table is not applicable to frozen soils or to periods in which snowmelt contributes to runoff.

These graphs can be used to determine the required sediment removal frequency given the SWMP type, storage volume, and imperviousness level of catchment basin.

Figures 6.1 to 6.4 also indicate that increased storage capacity increases the maintenance interval (i.e., less frequent maintenance required). These curves are based on the assumption of 5% loss of performance and should not be used for over-sized facilities. In order to allow users to calculate the required maintenance frequency for an oversized SWMP, annual suspended solids loadings in runoff from catchments with different levels of imperviousness and estimated sediment density are provided in Table 6.3.

The values of suspended solids loadings in Table 6.3 were derived from US Environmental Protection Agency (EPA) Stormwater Management Model (SWMM) simulation results and are only intended to be used as estimates for planning purposes. The density of suspended solids was based on a review of the literature of stormwater sediment characteristics and recent pond sediment removal data. The following methodology should be used to calculate the maintenance frequency if storage for the SWMP is oversized (calculation can be easily automated in a spreadsheet format):

1. Determine the appropriate total suspended solid (TSS) removal efficiency based on level of protection required for receiving stream (See Table 3.2).

2. Subtract 5% to obtain the target maintenance removal efficiency.

3. Determine the projected TSS removal efficiency based on the storage provided.

4. Calculate the loss in removal performance and loss in storage for each year based on the removal performance at the start of the year, the suspended solids loading rate, and the sediment density. The removal efficiency at the start of the next year will be based on the resulting available storage volume at the end of the year. These calculations are continued until the removal efficiency of the facility at the start of the year is equal to the target maintenance removal efficiency.

Table 6.3: Annual Sediment Loadings

Catchment Imperviousness	Annual Loading (kg/ha)	Wet Density (kg/m^3)	Annual Loading (m^3/ha)
35%	770	1,230	0.6
55%	2,300	1,230	1.9
70%	3,495	1,230	2.8
85%	4,680	1,230	3.8

Emerald Creek Estates Subdivision
NRCS (SCS) Curve Number Determination
Existing Conditions

Site Soils: (as per J.D. Paine 1998 Step 2 SWM Requirements Report)

Soil Type	Hydrologic Soil Group
Sand	B

TABLE OF CURVE NUMBERS (CN's)									
Land Use	Hydrologic Soil Type							Manning's 'n'	Source
	A	AB	B	BC	C	CD	D		
Meadow "Good"	30	44	58	64.5	71	74.5	78	0.40	MTO
Woodlot "Fair"	36	48	60	66.5	73	76	79	0.40	MTO
Gravel	76	80.5	85	87	89	90	91	0.30	Chin
Lawns "Good"	39	50	61	67.5	74	77	80	0.25	Chin
Pasture/Range	58	61.5	65	70.5	76	78.5	81	0.17	MTO
Crop	66	70	74	78	82	84	86	0.13	MTO
Fallow (Bare)	77	82	86	89	91	93	94	0.05	MTO
Low Density Residences	57	64.5	72	76.5	81	83.5	86	0.25	Chin
Streets, paved	98	98	98	98	98	98	98	0.01	Chin

1. MTO Drainage Manual (1997), Design Chart 1.09-Soil/Land Use Curve Numbers
2. Chin (2000), Water-Resources Engineering, Table 6.13-Curve Numbers for Various Urban Land Uses

HYDROLOGIC SOIL TYPE (%) - Existing Conditions								
Catchment	Hydrologic Soil Type							TOTAL
	A	AB	B	BC	C	CD	D	
1			100					100

LAND USE (%) - Existing Conditions										
Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Total
1	50.0	50.0								100.0

CURVE NUMBER (CN) - Existing Conditions												
Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Weighted CN**	IA	Manning's 'n'
1	29.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	[illegible]	35.30	0.40

** post development catchments concerned with pervious CN values only
** AMC II assumed
** Hydrological Soil Group taken from MTO Drainage Manual for each soil type

Emerald Creek Estates Subdivision

IRSC (SCS) Modified Curve Number Calculation: Existing Conditions

Step	Input Values		
	Subcatchment:	1	
1	**CN (AMC II):**	59	
2	CN (AMC III) =	77	
3	100 Year Precipitation, P =	71.7	mm

$$Q = \frac{(P - Ia)^2}{(P - Ia) + S} \qquad S = \frac{(P - Ia)^2}{Q} - (P - Ia)$$

Q = rainfall excess or runoff, mm
S = potential maximum retention or available storage, mm

$$CN = \frac{25400}{S + 254} \qquad S = \frac{25400}{CN} - 254$$

CN* = modified SCS curve # that better reflects Ia conditions in Ontario

	Output Values		
	Subcatchment:	1	
	S_{III} =	75.87	mm
	SCS Assumption of 0.2 S = Ia =	15.17	mm
4	Q_{III} =	24.13	mm
	Preferred Initial Abstraction, Ia =	1.5	mm
5	S^*_{III} =	134.00	mm
6	CN^*_{III} =	65.46	mm
	CN^*_{III}=	**65**	Rounded
7	**CN^*_{II}=**	**44**	convert
	CN^*_{II}=	**59**	0.9 CN^*_{III}

Explanation of Procedure

1 Determine CN based on typical AMC II conditions (from our normal spreads
2 Convert CN from AMC II to AMC III conditions (standard SCS tables, as sh
3 Get precipitation depth P for 100 year storm
4 Using CN_{III} with Ia = 0.2S, compute Q_{III} for 100 year precipitation
5 For the same Q_{III}, compute S^*_{III} using Ia=1.5mm (or otherwise determined fi
6 Compute CN^*_{III} using S^*_{III}
7 Calculate CN^*_{II} using standard SCS conversion table

SWM CALCULATIONS AND MODEL PARAMETERS

Method for calculating imperviousness

Total Area Developed		68.0	ha
Total Road Length	2290		m
Total Road Width (w/ shoulder)	7		m
Total Road Area		1.60	ha
Average House Area	275		m2
# of houses	89		
Total House Area		2.45	ha
Avg Driveway length	26		m
Avg Driveway Width	4		m
# of Driveways	89		
Driveway Area		0.93	ha
Total impervious area		**5.0**	ha
Overall impervious area		**7.3%**	
Area @ 25% impervious		**19.9**	ha model using STANDHYD
		48.1	ha model using NASHYD

SWMHYMO Value File Parameters

STANDHYD Parameters:

Depression storage over pervious areas		6.2	mm
Increased initial abstractions to account for reduced lot grading (4.7mm+1.5mm; MOE SWMPDM 2003 Table 3.2 page 4-109)			
Depth of typical lot in an urban area		70	m
as measured			
Depression storage over imp areas		1.57	mm
2004 City of Ottawa Sewer Guidelines			
Length Coefficient for imp areas	CLI =	0.31	
CLI = Area/(L^2)			
Area		199000	m2
Length		800	m

NASHYD Parameters:

Initial Abstraction		4.67	mm
2004 City of Ottawa Sewer Guidelines			
Number of Linear Reservoirs		3	
2002 Greely Shield's Creek Report			

Water Balance Areas

	Number of Lots:	89	
	Lot area	0.75	ac
		0.30	ha
	% Urban Lawn per lot	80%	
	Total Urban Lawn area	21.6	ha
	Impervious Area		
	Road Length	2290	m
	Road ROW	20	m
	ROW Area	4.6	ha
Part #1	TotalConverted Forest Area	28.2	ha
	Road Width	7	m
	Road Area	1.6	ha
	Percent Impervious	**6.1%**	
Part #2	**Maintained Forest Area**	**41.8**	ha

1604-00144

Emerald Creek Estates Rural Subdivision

Water Balance and Infiltration Calculations Part #1

Existing Drainage Conditions

The soils are:	Average For Stage	236	mm/yr Infiltration Rate (1)		
		506	mm/yr Evapotranspiration Rate (1)		
Area with:	Average For Stage	26.2 ha	% Impervious	0%	
	Total	26.2 ha	% Impervious	0%	

Topography
Flat Land
Soils
Fine Sand
Cover
Mature Forests

	Average For Stage		
Precipitation	871	mm/yr (2)	
Evapotranspiration	506	mm/yr	(ET*(1-%IMP))
Infiltration	310	mm/yr	(INFIL*(1-%IMP))
Evaporation (Open Water)	0	mm/yr (3)	
Runoff	55	mm/yr	

Precipitation	228,202 m^3/yr	871.0 mm/yr
Total Evapotranspiration (pre)	132,551 m^3/yr	505.9 mm/yr
Total Predevelopment Infiltration	81,303 m^3/yr	310.3 mm/yr
Total Evaporation (pre)	0 m^3/yr	0.0 mm/yr
Total Runoff (pre)	14,348 m^3/yr	54.8 mm/yr

Proposed Drainage Conditions

Surface Water Regime

The soils are:	Average For Stage	315	mm/yr Infiltration Rate (1)		
		477	mm/yr Evapotranspiration Rate (1)		
Area with:	Average For Stage	26.2 ha	% Impervious	6.1%	
	Total	26.2 ha	% Impervious	6.1%	

Topography
Flat Land
Soils
Fine Sand
Cover
Urban Lawns/Shallow Rooted Crops (spinach, beans, beets, carrots)

	Average For Stage		
Precipitation	871	mm/yr (2)	
Evapotranspiration	448	mm/yr	(ET*(1-%IMP))
Infiltration	296	mm/yr	(INFIL*(1-%IMP))
Evaporation	0	mm/yr (3)	
Runoff	127	mm/yr	

Precipitation	228,202 m^3/yr	871.0 mm/yr
Total Evapotranspiration (post)	117,399 m^3/yr	448.1 mm/yr
Total Infiltration (post)	77,506 m^3/yr	295.8 mm/yr
Total Evaporation (post)	0 m^3/yr	0.0 mm/yr
Total Runoff (post)	33,297 m^3/yr	127.1 mm/yr

Infiltration Post Development is	**77,506 m^3/yr**	**295.8 mm/yr**
Total Infiltration Deficit:	**-3,797 m^3/yr**	**-14 mm/yr**
Total Runoff Surplus:	**18,949 m^3/yr**	**72.3 mm/yr**

Infiltration Augmentation

Number of rainfall events in a typical year (24 hour interevent time)	53
Required annual augmentation (mm/yr)	14.5 mm/yr
Required storage depth per event	0.27 mm/event
Required Site Storage per event	71.6 m3
Trench width	1.2 m
Trench depth	0.8 m
porosity	0.4 m
Cross-section area (voids)	0.384 m2
Required length of trench	187 m
Length of trench provided	190
Total Added Infiltration:	3,367 m^3/yr
Total Post Development Infiltration (part 1 + part 2 + trenches)	218,716 m^3/yr
Total Pre Development Infiltration	**218,646 m^3/yr**
Final Runoff Surplus:	**18,949 m^3/yr**

(1) Infiltration and Evapotranspiration rates based on MOE SWMPD Manual (2003), Table 3.1 Hydrologic Cycle Component Values, prorated to local precipitation
(2) Precipitation based on: *Canadian Climate Normals 1971-2000 for the Ottawa Airport (http://www.climate.weatheroffice.ec.gc.ca/climate_normals)*

Emerald Creek Estates Rural Subdivision (1604-00144)
Water Balance Parameter Estimates - Part #1

Site Precipitation 871 mm

	Pre-Development	Post-Development
Toporaphy	Flat Land	Flat Land
Cover	Pasture/Brush	Cultivated

Pro-rated Data	Water Holding Capacity (mm)	Hydrologic Soil Group	Precipitation (mm)	Evapo-transpiration (mm)	Surplus Water (mm)	Infiltration (mm)	Runoff (mm)	Total Infiltration Factor	Cover Factor	Topography Factor	Soils Factor
Pre-Development											
Mature Forests									0.15	0.30	
Fine Sand	100	A	871	506	365	310	55	0.85	0.15	0.30	0.40
Fine Sandy Loam	150	B	871	508	363	272	91	0.75	0.15	0.30	0.30
Silt Loam	250	C	871	510	361	235	126	0.65	0.15	0.30	0.20
Clay Loam	250	CD	871	510	361	217	145	0.60	0.15	0.30	0.15
Clay	200	D	871	509	362	199	163	0.55	0.15	0.30	0.10
Post Development											
Urban Lawns/Shallow Rooted Crops (spinach, beans, beets, carrots)									0.10	0.30	
Fine Sand	50	A	871	477	394	315	79	0.80	0.10	0.30	0.40
Fine Sandy Loam	75	B	871	486	385	269	115	0.70	0.10	0.30	0.30
Silt Loam	125	C	871	497	374	225	150	0.60	0.10	0.30	0.20
Clay Loam	100	CD	871	492	379	208	171	0.55	0.10	0.30	0.15
Clay	75	D	871	486	385	192	192	0.50	0.10	0.30	0.10

Source: "Table 3.1: Hydrologic Cycle Component Values", *Stormwater Management Planning and Design Manual*, MOE, 2003

Baseline Data	Water Holding Capacity (mm)	Hydrologic Soil Group	Precipitation (mm)	Evapo-transpiration (mm)	% ET	Runoff (mm)	% RO	Infiltration (mm)	%Infil.
Urban Lawns/Shallow Rooted Crops (spinach, beans, beets, carrots)									
Fine Sand	50	A	940	515	54.8%	149	15.9%	276	29.4%
Fine Sandy Loam	75	B	940	525	55.9%	187	19.9%	228	24.3%
Silt Loam	125	C	940	536	57.0%	222	23.6%	182	19.4%
Clay Loam	100	CD	940	531	56.5%	245	26.1%	164	17.4%
Clay	75	D	940	525	55.9%	270	28.7%	145	15.4%
Moderately Rooted Crops (corn and cereal grains)									
Fine Sand	75	A	940	525	55.9%	125	13.3%	291	31.0%
Fine Sandy Loam	150	B	940	539	57.3%	160	17.0%	241	25.6%
Silt Loam	200	C	940	543	57.8%	199	21.2%	199	21.2%
Clay Loam	200	CD	940	543	57.8%	218	23.2%	179	19.0%
Clay	150	D	940	539	57.3%	241	25.6%	160	17.0%
Pasture and Shrubs									
Fine Sand	100	A	940	531	56.5%	102	10.9%	307	32.7%
Fine Sandy Loam	150	B	940	539	57.3%	140	14.9%	261	27.8%
Silt Loam	250	C	940	546	58.1%	177	18.8%	217	23.1%
Clay Loam	250	CD	940	546	58.1%	197	21.0%	197	21.0%
Clay	200	D	940	543	57.8%	218	23.2%	179	19.0%
Mature Forests									
Fine Sand	100	A	940	546	58.1%	79	8.4%	315	33.5%
Fine Sandy Loam	150	B	940	548	58.3%	118	12.6%	274	29.1%
Silt Loam	250	C	940	550	58.5%	156	16.6%	234	24.9%
Clay Loam	250	CD	940	550	58.5%	176	18.7%	215	22.9%
Clay	200	D	940	549	58.4%	196	20.9%	196	20.9%

Use this table to make design selections. The table to the left will update automatically.

		INDEX		
Pre-Dev't Land Cover	4	1	Urban Lawns/Shallow Rooted Crops (spinach, beans, beets, carrots)	
Post-Dev't Land Cover	1	2	Moderately Rooted Crops (corn and cereal grains)	
		3	Pasture and Shrubs	
		4	Mature Forests	
Pre-Dev't Topography	1	1	Flat Land average slope <0.6 m/km	0.3
Post-Dev't Topography	1	2	Rolling Land average slope 2.8 to 3.8 m/km	0.2
		3	Hilly Land average slope 28 to 47 m/km	0.1
Pre-Dev't Cover	2	1	Cultivated	0.1
Post-Dev't Cover	1	2	Pasture/Brush	0.15

How this table works

Determine the cover, topo, and soils factors, according to MOE method, outlined in draft SWMPD Manual (2003).
Sum to determine infiltration factor.
Apply infiltration factor to surplus water (P - ET)
Resulting value goes to infiltration.
Remaining to runoff.

1604-00144

Emerald Creek Estates Rural Subdivision

Water Balance and Infiltration Calculations Part #2

Existing Drainage Conditions

		236		
The soils are:	Average For Stage	329 mm/yr Infiltration Rate (1)		
		506 mm/yr Evapotranspiration Rate (1)		
Area with:	Average For Stage	41.8 ha	% Impervious	0%
	Total	41.8 ha	% Impervious	0%

Topography
Flat Land
Soils
Fine Sand
Cover
Mature Forests

	Average For Stage		
Precipitation	871	mm/yr (2)	
Evapotranspiration	506	mm/yr	(ET*(1-%IMP))
Infiltration	329	mm/yr	(INFIL*(1-%IMP))
Evaporation (Open Water)	0	mm/yr (3)	
Runoff	37	mm/yr	

Precipitation	364,078 m^3/yr	871.0 mm/yr
Total Evapotranspiration (pre)	211,475 m^3/yr	505.9 mm/yr
Total Predevelopment Infiltration	137,343 m^3/yr	328.6 mm/yr
Total Evaporation (pre)	0 m^3/yr	0.0 mm/yr
Total Runoff (pre)	15,260 m^3/yr	36.5 mm/yr

Proposed Drainage Conditions

Surface Water Regime

The soils are:	Average For Stage	329 mm/yr Infiltration Rate (1)		
		506 mm/yr Evapotranspiration Rate (1)		
Area with:	Average For Stage	41.8 ha	% Impervious	0%
	Total	41.8 ha	% Impervious	0%

Topography
Flat Land
Soils
Fine Sand
Cover
Mature Forests

	Average For Stage		
Precipitation	871	mm/yr (2)	
Evapotranspiration	506	mm/yr	(ET*(1-%IMP))
Infiltration	329	mm/yr	(INFIL*(1-%IMP))
Evaporation	0	mm/yr (3)	
Runoff	37	mm/yr	

Precipitation	364,078 m^3/yr	871.0 mm/yr
Total Evapotranspiration (post)	211,475 m^3/yr	505.9 mm/yr
Total Infiltration (post)	137,343 m^3/yr	328.6 mm/yr
Total Evaporation (post)	0 m^3/yr	0.0 mm/yr
Total Runoff (post)	15,260 m^3/yr	36.5 mm/yr

Infiltration Post Development is	137,343 m^3/yr	328.6 mm/yr
Total Infiltration Deficit:	0 m^3/yr	0 mm/yr
Total Runoff Surplus:	0 m^3/yr	0.0 mm/yr

(1) Infiltration and Evapotranspiration rates based on MOE SWMPD Manual (2003), Table 3.1 Hydrologic Cycle Component Values, prorated to local precipitation
2) Precipitation based on: *Canadian Climate Normals 1971-2000 for the Ottawa Airport (http://www.climate.weatheroffice.ec.gc.ca/climate_normals)*

Emerald Creek Estates Rural Subdivision (1604-00144)
Water Balance Parameter Estimates - Part #2

Site Precipitation 871 mm

	Pre-Development	Post-Development
Topography	Flat Land	Flat Land
Cover	Woodland	Woodland

Pre-rated Data	Water Holding Capacity (mm)	Hydrologic Soil Group	Precipitation (mm)	Evapo-transpiration (mm)	Surplus Water (mm)	Infiltration (mm)	Runoff (mm)	Total Infiltration Factor	Cover Factor	Topography Factor	Soils Factor
Pre-Development											
Mature Forests									0.20	0.30	
Fine Sand	100	A	871	506	365	329	37	0.90	0.20	0.30	0.40
Fine Sandy Loam	150	B	871	508	363	291	73	0.80	0.20	0.30	0.30
Silt Loam	250	C	871	510	361	253	108	0.70	0.20	0.30	0.20
Clay Loam	250	CD	871	510	361	235	126	0.65	0.20	0.30	0.15
Clay	200	D	871	509	362	217	145	0.60	0.20	0.30	0.10
Post Development											
Mature Forests									0.20	0.30	
Fine Sand	50	A	871	506	365	329	37	0.90	0.20	0.30	0.40
Fine Sandy Loam	75	B	871	508	363	291	73	0.80	0.20	0.30	0.30
Silt Loam	125	C	871	510	361	253	108	0.70	0.20	0.30	0.20
Clay Loam	100	CD	871	510	361	235	126	0.65	0.20	0.30	0.15
Clay	75	D	871	509	362	217	145	0.60	0.20	0.30	0.10

Source: "Table 3.1: Hydrologic Cycle Component Values", *Stormwater Management Planning and Design Manual*, MOE, 2003

Baseline Data	Water Holding Capacity (mm)	Hydrologic Soil Group	Precipitation (mm)	Evapo-transpiration (mm)	% ET	Runoff (mm)	% RO	Infiltration (mm)	%Infilt.
Urban Lawns/Shallow Rooted Crops (spinach, beans, beets, carrots)									
Fine Sand	50	A	940	515	54.8%	149	15.9%	276	29.4%
Fine Sandy Loam	75	B	940	525	55.9%	187	19.9%	228	24.3%
Silt Loam	125	C	940	536	57.0%	222	23.6%	182	19.4%
Clay Loam	100	CD	940	531	56.5%	245	26.1%	164	17.4%
Clay	75	D	940	525	55.9%	270	28.7%	145	15.4%
Moderately Rooted Crops (corn and cereal grains)									
Fine Sand	75	A	940	525	55.9%	125	13.3%	291	31.0%
Fine Sandy Loam	150	B	940	539	57.3%	160	17.0%	241	25.6%
Silt Loam	200	C	940	543	57.8%	199	21.2%	199	21.2%
Clay Loam	200	CD	940	543	57.8%	218	23.2%	179	19.0%
Clay	150	D	940	539	57.3%	241	25.6%	160	17.0%
Pasture and Shrubs									
Fine Sand	100	A	940	531	56.5%	102	10.9%	307	32.7%
Fine Sandy Loam	150	B	940	539	57.3%	140	14.9%	261	27.8%
Silt Loam	250	C	940	546	58.1%	177	18.8%	217	23.1%
Clay Loam	250	CD	940	546	58.1%	197	21.0%	197	21.0%
Clay	200	D	940	543	57.8%	218	23.2%	179	19.0%
Mature Forests									
Fine Sand	100	A	940	546	58.1%	79	8.4%	315	33.5%
Fine Sandy Loam	150	B	940	548	58.3%	118	12.5%	274	29.1%
Silt Loam	250	C	940	550	58.5%	156	16.6%	234	24.9%
Clay Loam	250	CD	940	550	58.5%	176	18.7%	215	22.9%
Clay	200	D	940	549	58.4%	196	20.9%	196	20.9%

Use this table to make design selections. The table to the left

		INDEX
Pre-Dev't Land Cover	4	1
Post-Dev't Land Cover	4	2
		3
		4
Pre-Dev't Topography	1	1
Post-Dev't Topography	1	2
		3
Pre-Dev't Cover	2	1
Post-Dev't Cover	2	2

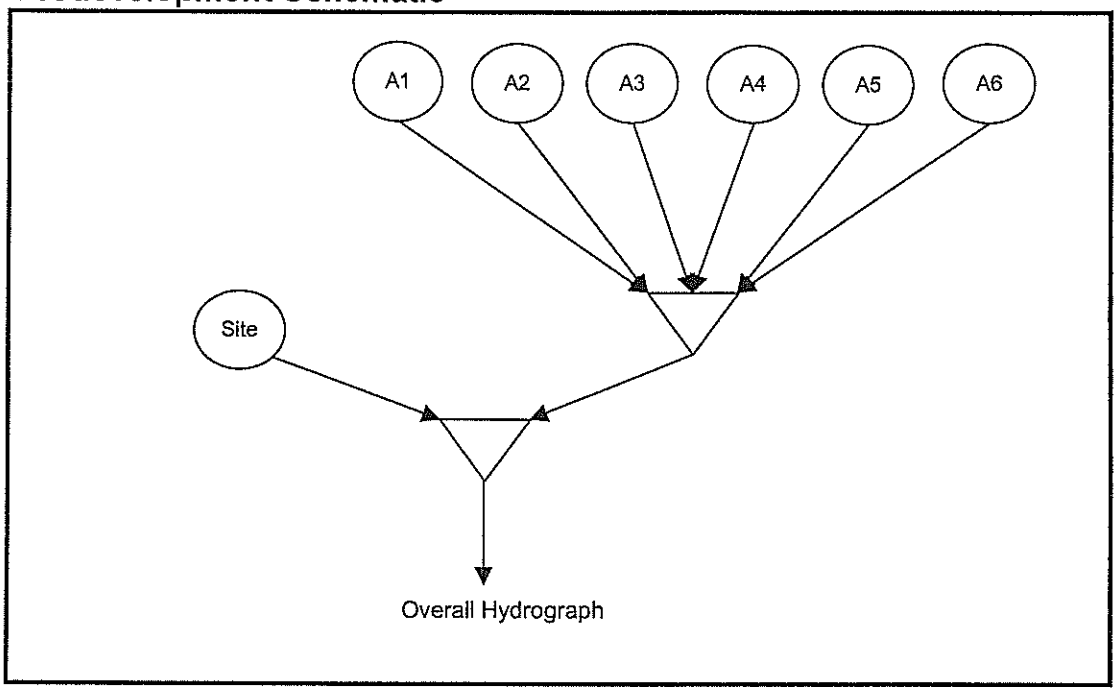
How this table works

Determine the cover, topo, and soils factors, according to MOE method, outlined in draft SWMPD Manual (2003).
Sum to determine Infiltration factor.
Apply Infiltration factor to surplus water (P - ET)
Resulting value goes to Infiltration.
Remaining to runoff.

Appendix C
Predevelopment Modelling

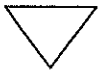
Job # 1604-00144
Project Emerald Creek Estates SWM Schematic
Date 23-Jun-05

Predevelopment Schematic



Legend:

Generate Hydrograph for Area A1



Add Hydrographs

Route Hydrograph (open channel)

```
00001> 2     Metric units
 0002> *#*************************************************************************
 0003> *#  Project Name: [Emerald Creek]    Project Number: [604-00144]
00004> *#  Date         : 06-18-2004
00005> *#  Modeller     : [MAF]
 0006> *#  Company      : McNeely Engineering Consultants Limited
 0007> *#  License #    :  5695479
00008> *#*************************************************************************
00009> START                TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
 0010> *%                    [] <--storm filename, one per line for NSTORM time
 0011> *%-----------------|-------------------------------------------------------|
00012> *# EXISTING CONDITIONS
00013>
 0014> *# 2-YEAR IDF CHICAGO STORM
 0015> CHICAGO STORM         IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00016>                      ICASEcs=[2],
00017>                      Enter ordinates of IDF curve below, at least seven ponts
 0018>                         TIME (min)    Intensity(mm/hr)
 0019>                            [5]         [102.80]
00020>                            [10]        [77.10]
00021>                           [15]        [63.30]
 0022>                            [30]        [39.90]
 0023>                            [60]        [24.20]
00024>                            [120]       [14.30]
00025>                            [360]       [6.20]
 0026>                            [720]       [3.60]
 0027>                           [1440]      [2.00]
00028>                              -1              -1
00029> *%-----------------|-------------------------------------------------------|
 0030> * 5-YEAR IDF CHICAGO STORM
 0031> *CHICAGO STORM        IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00032> *                    ICASEcs=[2],
00033> *                    Enter ordinates of IDF curve below, at least seven points
 0034> *                       TIME (min)    Intensity(mm/hr)
 0035> *                          [5]         [140.20]
00036> *                          [10]        [104.40]
00037> *                          [15]        [85.60]
 0038> *                          [30]        [53.90]
 0039> *                          [60]        [32.00]
00040> *                          [120]       [18.90]
00041> *                          [360]       [8.40]
 0042> *                          [720]       [4.80]
 0043> *                          [1440]      [2.60]
00044> *                             -1              -1
00045> *%-----------------|-------------------------------------------------------|
 0046> * 10-YEAR IDF CHICAGO STORM
 0047> *CHICAGO STORM        IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
 0048> *                    ICASEcs=[2],
00049> *                    Enter ordinates of IDF curve below, at least seven points
 0050> *                       TIME (min)    Intensity(mm/hr)
 0051> *                          [5]         [165.00]
 0052> *                          [10]        [122.50]
00053> *                          [15]        [100.40]
 0054> *                          [30]        [63.10]
 0055> *                         [60]        [37.10]
 0056> *                         [120]       [22.00]
00057> *                          [360]       [9.90]
 0058> *                          [720]       [5.60]
 0059> *                          [1440]      [3.00]
 0060> *                             -1              -1
00061> *%-----------------|-------------------------------------------------------|
 0062> * 25-YEAR IDF CHICAGO STORM
 0063> *CHICAGO STORM        IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min)
 0064> *                    ICASEcs=[2],
00065> *                    Enter ordinates of IDF curve below, at least seven points
```

```
00066> *                          TIME (min)     Intensity(mm/hr)
00067> *                            [5]          [196.00]
00068> *                            [10]         [145.30]
00069> *                            [15]         [119.10]
00070> *                            [30]         [74.70]
00071> *                            [60]         [43.60]
00072> *                            [120]        [25.80]
00073> *                            [360]        [11.70]
00074> *                            [720]        [6.60]
00075> *                            [1440]       [3.50]
00076> *                              -1             -1
00077> *%-----------------|-------------------------------------------------------------|
00078> * 100-YEAR IDF CHICAGO STORM
00079> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00080> *                   ICASEcs=[2],
00081> *                  Enter ordinates of IDF curve below, at least seven points
00082> *                     TIME (min)    Intensity(mm/hr)
00083> *                         [5]         [242.60]
00084> *                         [10]        [179.00]
00085> *                         [15]        [146.80]
00086> *                         [30]        [91.90]
00087> *                         [60]        [53.20]
00088> *                         [120]       [31.50]
00089> *                         [360]       [14.50]
00090> *                         [720]       [8.00]
00091> *                         [1440]      [4.30]
00092> *                           -1             -1
00093> *%-----------------|-------------------------------------------------------------|
00094> DEFAULT VALUES      ICASEdef=[1],  read and print values
00095>                     DEFVAL_FILENAME=["SHIELDS2.VAL"]
00096> *%-----------------|-------------------------------------------------------------|
00097>
00098> *# Area A1 (see DWG SD2)
00099> DESIGN NASHYD       ID=[1], NHYD=["A1"], DT=[5]min, AREA=[73.9](ha),
00100>                     DWF=[0](cms), CN/C=[60], TP=[1.44]hrs,
00101>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00102> *%-----------------|-------------------------------------------------------------|
00103> *# Area A2
00104> DESIGN NASHYD       ID=[2], NHYD=["A2"], DT=[5]min, AREA=[120](ha),
00105>                     DWF=[0](cms), CN/C=[60], TP=[1.54]hrs,
00106>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00107> *%-----------------|-------------------------------------------------------------|
00108> *# Area A3
00109> DESIGN NASHYD       ID=[3], NHYD=["A3"], DT=[5]min, AREA=[5.6](ha),
00110>                     DWF=[0](cms), CN/C=[60], TP=[1.05]hrs,
00111>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00112> *%-----------------|-------------------------------------------------------------|
00113> *# Area A4
00114> DESIGN NASHYD       ID=[4], NHYD=["A4"], DT=[5]min, AREA=[14.7](ha),
00115>                     DWF=[0](cms), CN/C=[60], TP=[1.04]hrs,
00116>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00117> *%-----------------|-------------------------------------------------------------|
00118> *# Area A5
00119> DESIGN NASHYD       ID=[5], NHYD=["A5"], DT=[5]min, AREA=[3.5](ha),
00120>                     DWF=[0](cms), CN/C=[60], TP=[0.63]hrs,
00121>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00122> *%-----------------|-------------------------------------------------------------|
00123> *# Area A6
00124> DESIGN NASHYD       ID=[6], NHYD=[1006], DT=[5.0]min, AREA=[4.1](ha),
00125>                     DWF=[0](cms), CN/C=[60], TP=[0.63]hrs,
00126>                     RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00127> *%-----------------|-------------------------------------------------------------|
00128> *# External Flows Pre-Development
00129> ADD HYD             IDsum=[9], NHYD=["extpre"], IDs to add=[1 2 3 4 5 6]
00130> *%-----------------|-------------------------------------------------------------|
```

```
00131> SAVE HYD              ID=[9],    # OF PCYCLES=[1],  ICASEsh=[1]
00132>                       HYD_COMMENT=["Pre External Flows"]
00133> *%-----------------|-------------------------------------------------------|
00134> *# Site Area
00135> DESIGN NASHYD         ID=[7], NHYD=["site"], DT=[5]min, AREA=[68](ha),
00136>                       DWF=[0](cms), CN/C=[60], TP=[1.07 hr]hrs,
00137>                       RAINFALL=[ ,  ,  ,  ,](mm/hr), END=-1
00138> *%-----------------|-------------------------------------------------------|
00139> SAVE HYD              ID=[7],    # OF PCYCLES=[1],  ICASEsh=[1]
00140>                       HYD_COMMENT=["Pre Site Flows"]
00141> *%-----------------|-------------------------------------------------------|
00142> ADD HYD              IDsum=[8], NHYD=["sumpre"], IDs to add=[9 7]
00143> *%-----------------|-------------------------------------------------------|
00144> SAVE HYD              ID=[8],    # OF PCYCLES=[1],  ICASEsh=[1]
00145>                       HYD_COMMENT=["Overall Predev Hydrograph"]
00146> *%-----------------|-------------------------------------------------------|
00147> FINISH
00148>
00149>
00150>
00151>
00152>
00153>
00154>
00155>
00156>
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```

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1: 2 yr SWMHYMO

```
00001> ================================================================================
 0002>
 0003>  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO         999     999  =========
00004>  S      W W W  MM MM  H   H   Y Y   MM MM  O   O       9   9   9   9
00005>  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##   9   9   9   9 Ver. 4.02
 0006>      S   W W   M   M  H   H    Y    M   M  O   O        9999    9999 July 1999
 0007>  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9       9  =========
00008>                                                        9   9   9   9 # 3824306
00009>       StormWater Management HYdrologic Model            999     999  =========
 0010>
 0011>  ********************************************************************************
00012>  ************************** SWMHYMO-99 Ver/4.02 ***************************
00013>  *******  A single event and continuous hydrologic simulation model  *******
 0014>  *******     based on the principles of HYMO and its successors       *******
 0015>  *******                  OTTHYMO-83 and OTTHYMO-89.                  *******
00016>  ********************************************************************************
00017>  ******* Distributed by:  J.F. Sabourin and Associates Inc.           *******
 0018>  *******                  Ottawa,  Ontario: (613) 727-5199           *******
 0019>  *******                  Gatineau, Quebec: (819) 243-6858           *******
00020>  *******                  E-Mail: swmhymo@jfsa.Com                   *******
00021>  ********************************************************************************
 0022>
 0023>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++ Licensed user: Stantec Consulting Ltd. 604                    +++++++
00025>  +++++++                 Ottawa                SERIAL#:3824306        +++++++
 0026>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 0027>
00028>  ********************************************************************************
00029>  *******          ++++++ PROGRAM ARRAY DIMENSIONS ++++++              *******
 0030>  *******          Maximum value for ID numbers  :     10              *******
 0031>  *******          Max. number of rainfall points:  15000              *******
00032>  *******          Max. number of flow points    :  15000              *******
00033>  ********************************************************************************
 0034>
 0035>
00036>  ********************   D E T A I L E D   O U T P U T   ********************
00037>  ********************************************************************************
 0038>  *       DATE: 2005-05-04      TIME: 10:05:47      RUN COUNTER: 000187       *
 0039>  ********************************************************************************
00040>  * Input   filename: W:\active\60400144\design\analysis\SWMAPR~1\144pre0.da*
00041>  * Output  filename: W:\active\60400144\design\analysis\SWMAPR~1\144pre0.ou*
 0042>  * Summary filename: W:\active\60400144\design\analysis\SWMAPR~1\144pre0.su*
 0043>  * User comments:                                                          *
00044>  * 1:_____________________________________________________________________*
00045>  * 2:_____________________________________________________________________*
 0046>  * 3:_____________________________________________________________________*
 0047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
 0050> 001:0001-----------------------------------------------------------------------
 0051> *#*************************************************************************
00052> *#  Project Name: [Emerald Creek]     Project Number: [604-00144]
00053> *#  Date         : 06-18-2004
 0054> *#  Modeller     : [MAF]
 0055> *#  Company      : McNeely Engineering Consultants Limited
00056> *#  License #    :  5695479
00057> *#*************************************************************************
 0058> --------------------
 0059> | START            |  Project dir.: W:\active\60400144\design\analysis\SWMAPR~1
00060> --------------------  Rainfall dir.: W:\active\60400144\design\analysis\SWMAPR~1
00061>      TZERO =.   .00 hrs on       0
 0062>      METOUT=    2 (output = METRIC)
 0063>      NRUN   = 001
00064>      NSTORM=    0
00065> --------------------------------------------------------------------------------
```

```
00066> 001:0002--------------------------------------------------------------------------
00067> *# EXISTING CONDITIONS
00068> *# 2-YEAR IDF CHICAGO STORM
00069> --------------------
00070> | CHICAGO STORM    |     IDF curve parameters: A= 732.951
00071> | Ptotal= 31.86 mm |                           B=   6.199
00072> --------------------                           C=    .810
00073>                          used in:   INTENSITY =  A / (t + B)^C
00074>
00075>                          Duration of storm   =  3.00 hrs
00076>                          Storm time step     = 10.00 min
00077>                          Time to peak ratio =   .33
00078>
00079>                      The CORRELATION coefficient is = .9999453
00080>
00081>                       TIME        ENTERED              COMPUTED
00082>                      (min)        (mm/hr)              (mm/hr)
00083>                         5.         102.80               103.57
00084>                        10.          77.10                76.81
00085>                        15.          63.30                61.77
00086>                        30.          39.90                40.04
00087>                        60.          24.20                24.56
00088>                       120.          14.30                14.56
00089>                       360.           6.20                 6.14
00090>                       720.           3.60                 3.53
00091>                      1440.           2.00                 2.02
00092>
00093>              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00094>               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00095>               .17   2.815 |   1.00  76.805 |   1.83   5.095 |   2.67   2.684
00096>               .33   3.498 |   1.17  24.079 |   2.00   4.291 |   2.83   2.463
00097>               .50   4.687 |   1.33  12.364 |   2.17   3.718 |   3.00   2.279
00098>               .67   7.305 |   1.50   8.324 |   2.33   3.288 |
00099>               .83  18.209 |   1.67   6.303 |   2.50   2.953 |
00100>
00101> --------------------------------------------------------------------------------
00102> 001:0003--------------------------------------------------------------------------
00103> * 5-YEAR IDF CHICAGO STORM
00104> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00105> *                  ICASEcs=[2],
00106> *                    Enter ordinates of IDF curve below, at least seven points
00107> *                       TIME (min)    Intensity(mm/hr)
00108> *                           [5]         [140.20]
00109> *                           [10]        [104.40]
00110> *                           [15]        [85.60]
00111> *                           [30]        [53.90]
00112> *                           [60]        [32.00]
00113> *                           [120]       [18.90]
00114> *                           [360]       [8.40]
00115> *                           [720]       [4.80]
00116> *                           [1440]      [2.60]
00117> *                              -1             -1
00118> * 10-YEAR IDF CHICAGO STORM
00119> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00120> *                    ICASEcs=[2],
00121> *                  Enter ordinates of IDF curve below, at least seven points
00122> *                       TIME (min)    Intensity(mm/hr)
00123> *                          [5]         [165.00]
00124> *                          [10]        [122.50]
00125> *                          [15]        [100.40]
00126> *                          [30]        [63.10]
00127> *                         [60]        [37.10]
00128> *                         [120]       [22.00]
00129> *                          [360]       [9.90]
00130> *                          [720]       [5.60]
```

```
00131> *                              [1440]      [3.00]
 0132> *                                -1              -1
 0133> * 25-YEAR IDF CHICAGO STORM
00134> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min)
00135> *                    ICASEcs=[2],
 0136> *                    Enter ordinates of IDF curve below, at least seven points
 0137> *                        TIME (min)     Intensity(mm/hr)
00138> *                          [5]          [196.00]
00139> *                          [10]         [145.30]
 0140> *                          [15]         [119.10]
 0141> *                          [30]         [74.70]
00142> *                          [60]         [43.60]
00143> *                          [120]        [25.80]
 0144> *                          [360]        [11.70]
 0145> *                          [720]        [6.60]
00146> *                          [1440]       [3.50]
00147> *                            -1              -1
 0148> * 100-YEAR IDF CHICAGO STORM
 0149> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00150> *                    ICASEcs=[2],
00151> *                   Enter ordinates of IDF curve below, at least seven points
 0152> *                       TIME (min)     Intensity(mm/hr)
 0153> *                          [5]          [242.60]
00154> *                          [10]         [179.00]
00155> *                          [15]         [146.80]
 0156> *                          [30]         [91.90]
 0157> *                          [60]         [53.20]
00158> *                          [120]        [31.50]
00159> *                          [360]        [14.50]
 0160> *                          [720]        [8.00]
 0161> *                          [1440]       [4.30]
00162> *                            -1              -1
00163> ----------------------
 0164> | DEFAULT VALUES      |  Filename: W:\active\60400144\design\analysis\SWMAPR~1\SH
 0165> ----------------------  ICASEdv = 1 (read and print data)
00166>       FileTitle= File comment: [                    ]
00167>                  THE FOLLOWING PARAMETERS ARE USED IN THE DESIGN STANDHYD COM
 0168>       Horton's infiltration equation parameters:
 0169>       [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
00170>       Parameters for PERVIOUS surfaces in STANDHYD:
00171>       [IAper=   6.20 mm] [LGP=70.00 m] [MNP= .250]
 0172>       Parameters for IMPERVIOUS surfaces in STANDHYD:
 0173>       [IAimp=   1.57 mm] [CLI=  .31]   [MNI= .013]
00174>       Parameters used in NASHYD:
00175>       [Ia=   4.67 mm] [N= 3.00]
 0176> ------------------------------------------------------------------------------
 0177> 001:0004----------------------------------------------------------------------
00178> *# Area A1 (see DWG SD2)
00179> ----------------------
 0180> | DESIGN NASHYD       |   Area     (ha)=   73.90   Curve Number    (CN)=60.00
 0181> | 01:A1     DT= 5.00  |   Ia       (mm)=    4.67   # of Linear Res.(N)= 3.00
00182> ----------------------   U.H. Tp(hrs)=    1.440
00183>
 0184>       Unit Hyd Qpeak  (cms)=     1.960
 0185>
00186>       PEAK FLOW       (cms)=      .243 (i)
00187>       TIME TO PEAK    (hrs)=     3.000
 0188>       RUNOFF VOLUME    (mm)=     3.762
 0189>       TOTAL RAINFALL   (mm)=    31.860
00190>       RUNOFF COEFFICIENT   =      .118
00191>
 0192>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
 0193>
00194> ------------------------------------------------------------------------------
00195> 001:0005----------------------------------------------------------------------
```

```
00196> *# Area A2
00197> ----------------------
00198> | DESIGN NASHYD       |   Area     (ha)=  120.00   Curve Number    (CN)=60.00
00199> | 02:A2     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00200> ----------------------   U.H. Tp(hrs)=   1.540
00201>
00202>      Unit Hyd Qpeak  (cms)=    2.976
00203>
00204>      PEAK FLOW       (cms)=     .376 (i)
00205>      TIME TO PEAK    (hrs)=    3.083
00206>      RUNOFF VOLUME    (mm)=    3.762
00207>      TOTAL RAINFALL   (mm)=   31.860
00208>      RUNOFF COEFFICIENT   =     .118
00209>
00210>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00211>
00212> ---------------------------------------------------------------------------
00213> 001:0006-----------------------------------------------------------------------
00214> *# Area A3
00215> ----------------------
00216> | DESIGN NASHYD       |   Area     (ha)=    5.60   Curve Number    (CN)=60.00
00217> | 03:A3     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00218> ----------------------   U.H. Tp(hrs)=   1.050
00219>
00220>      Unit Hyd Qpeak  (cms)=     .204
00221>
00222>      PEAK FLOW       (cms)=     .023 (i)
00223>      TIME TO PEAK    (hrs)=    2.417
00224>      RUNOFF VOLUME    (mm)=    3.762
00225>      TOTAL RAINFALL   (mm)=   31.860
00226>      RUNOFF COEFFICIENT   =     .118
00227>
00228>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00229>
00230> ---------------------------------------------------------------------------
00231> 001:0007-----------------------------------------------------------------------
00232> *# Area A4
00233> ----------------------
00234> | DESIGN NASHYD       |   Area     (ha)=   14.70   Curve Number    (CN)=60.00
00235> | 04:A4     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00236> ----------------------   U.H. Tp(hrs)=   1.040
00237>
00238>      Unit Hyd Qpeak  (cms)=     .540
00239>
00240>      PEAK FLOW       (cms)=     .060 (i)
00241>      TIME TO PEAK    (hrs)=    2.417
00242>      RUNOFF VOLUME    (mm)=    3.762
00243>      TOTAL RAINFALL   (mm)=   31.860
00244>      RUNOFF COEFFICIENT   =     .118
00245>
00246>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00247>
00248> ---------------------------------------------------------------------------
00249> 001:0008-----------------------------------------------------------------------
00250> *# Area A5
00251> ----------------------
00252> | DESIGN NASHYD       |   Area     (ha)=    3.50   Curve Number    (CN)=60.00
00253> | 05:A5     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00254> ----------------------   U.H. Tp(hrs)=    .630
00255>
00256>      Unit Hyd Qpeak  (cms)=     .212
00257>
00258>      PEAK FLOW       (cms)=     .020 (i)
00259>      TIME TO PEAK    (hrs)=    1.833
00260>      RUNOFF VOLUME    (mm)=    3.762
```

```
00261>       TOTAL RAINFALL  . (mm)=   31.860
 0262>       RUNOFF COEFFICIENT   =     .118
 0263>
00264>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00265>
 0266> ---------------------------------------------------------------------------
 0267> 001:0009-----------------------------------------------------------------
00268> *# Area A6
00269> ----------------------
 0270> | DESIGN NASHYD       |   Area     (ha)=    4.10   Curve Number    (CN)=60.00
 0271> | 06:001006 DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00272> ----------------------   U.H. Tp(hrs)=    .630
00273>
 0274>       Unit Hyd Qpeak  (cms)=     .249
 0275>
00276>       PEAK FLOW       (cms)=     .023 (i)
00277>       TIME TO PEAK    (hrs)=    1.833
 0278>       RUNOFF VOLUME    (mm)=    3.762
 0279>       TOTAL RAINFALL   (mm)=   31.860
00280>       RUNOFF COEFFICIENT   =     .118
00281>
 0282>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
 0283>
00284> ---------------------------------------------------------------------------
00285> 001:0010-----------------------------------------------------------------
 0286> *# External Flows Pre-Development
 0287> --------------------
00288> | ADD HYD (extpre) | ID: NHYD      AREA      QPEAK    TPEAK    R.V.     DWF
00289> --------------------                (ha)      (cms)    (hrs)    (mm)    (cms)
 0290>                     ID1 01:A1       73.90      .243     3.00    3.76     .000
 0291>                    +ID2 02:A2      120.00      .376     3.08    3.76     .000
00292>                    +ID3 03:A3        5.60      .023     2.42    3.76     .000
00293>                    +ID4 04:A4       14.70      .060     2.42    3.76     .000
 0294>                    +ID5 05:A5        3.50      .020     1.83    3.76     .000
00295>                    +ID6 06:001006    4.10      .023     1.83    3.76     .000
00296>                     ==========================================================
00297>                     SUM 09:extpre   221.80      .716     2.92    3.76     .000
 0298>
 0299>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00300>
00301> ---------------------------------------------------------------------------
 0302> 001:0011-----------------------------------------------------------------
 0303> --------------------
00304> | SAVE HYD           |   AREA      (ha)=  221.800
00305> | ID=09 (extpre)     |   QPEAK    (cms)=     .716 (i)
 0306> | DT= 5.00 PCYC= 1   |   TPEAK    (hrs)=    2.917
 0307> --------------------   VOLUME     (mm)=    3.762
00308>   Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-extpre.001
00309>   Comments: Pre External Flows
 0310>
 0311>       (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00312>   TIME     FLOW |  TIME     FLOW |  TIME     FLOW |  TIME     FLOW |  TIME     FLOW
00313>    hrs      cms |   hrs      cms |   hrs      cms |   hrs      cms |   hrs      cms
 0314>     .00     .000|    2.33    .650|    4.67    .363|    7.00    .052|    9.33    .005
 0315>     .08     .000|    2.42    .669|    4.75    .344|    7.08    .048|    9.42    .004
00316>     .17     .000|    2.50    .684|    4.83    .324|    7.17    .044|    9.50    .004
00317>     .25     .000|    2.58    .696|    4.92    .306|    7.25    .041|    9.58    .003
 0318>     .33     .000|    2.67    .705|    5.00    .288|    7.33    .038|    9.67    .003
 0319>     .42     .000|    2.75    .711|    5.08    .271|    7.42    .035|    9.75    .002
00320>     .50     .000|    2.83    .715|    5.17    .254|    7.50    .032|    9.83    .002
00321>     .58     .000|    2.92    .716|    5.25    .239|    7.58    .030|    9.92    .002
 0322>     .67     .000|    3.00    .715|    5.33    .224|    7.67    .027|   10.00    .002
 0323>     .75     .000|    3.08    .711|    5.42    .210|    7.75    .025|   10.08    .001
00324>     .83     .000|    3.17    .705|    5.50    .196|    7.83    .023|   10.17    .001
00325>     .92     .003|    3.25    .696|    5.58    .183|    7.92    .021|   10.25    .001
```

00326>	1.00	.014	3.33	.685	5.67	.171	8.00	.020	10.33	.001
00327>	1.08	.036	3.42	.672	5.75	.160	8.08	.018	10.42	.001
00328>	1.17	.069	3.50	.657	5.83	.149	8.17	.017	10.50	.001
00329>	1.25	.111	3.58	.640	5.92	.139	8.25	.015	10.58	.001
00330>	1.33	.157	3.67	.621	6.00	.129	8.33	.014	10.67	.000
00331>	1.42	.208	3.75	.601	6.08	.120	8.42	.013	10.75	.000
00332>	1.50	.260	3.83	.581	6.17	.112	8.50	.012	10.83	.000
00333>	1.58	.312	3.92	.559	6.25	.104	8.58	.011	10.92	.000
00334>	1.67	.362	4.00	.537	6.33	.096	8.67	.010	11.00	.000
00335>	1.75	.410	4.08	.515	6.42	.089	8.75	.009	11.08	.000
00336>	1.83	.456	4.17	.493	6.50	.083	8.83	.008	11.17	.000
00337>	1.92	.498	4.25	.470	6.58	.077	8.92	.008	11.25	.000
00338>	2.00	.536	4.33	.448	6.67	.071	9.00	.007	11.33	.000
00339>	2.08	.570	4.42	.426	6.75	.066	9.08	.006	11.42	.000
00340>	2.17	.601	4.50	.405	6.83	.061	9.17	.006	11.50	.000
00341>	2.25	.627	4.58	.384	6.92	.056	9.25	.005		

00342> ----------
00343> 001:0012----------
00344> *# Site Area
00345> ----------
00346> | DESIGN NASHYD | Area (ha)= 68.00 Curve Number (CN)=60.00
00347> | 07:site DT= 5.00 | Ia (mm)= 4.670 # of Linear Res.(N)= 3.00
00348> ---------- U.H. Tp(hrs)= 1.070
00349>
00350> Unit Hyd Qpeak (cms)= 2.427
00351>
00352> PEAK FLOW (cms)= .273 (i)
00353> TIME TO PEAK (hrs)= 2.417
00354> RUNOFF VOLUME (mm)= 3.762
00355> TOTAL RAINFALL (mm)= 31.860
00356> RUNOFF COEFFICIENT = .118
00357>
00358> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00359>
00360> ----------
00361> 001:0013----------
00362> ----------
00363> | SAVE HYD | AREA (ha)= 68.000
00364> | ID=07 (site) | QPEAK (cms)= .273 (i)
00365> | DT= 5.00 PCYC= 1 | TPEAK (hrs)= 2.417
00366> ---------- VOLUME (mm)= 3.762
00367> Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-site.001
00368> Comments: Pre Site Flows
00369>
00370> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

	TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW
00371>	hrs	cms	hrs	cms	hrs	cms	hrs	cms	hrs	cms
00372>	.00	.000	1.83	.217	3.67	.177	5.50	.026	7.33	.002
00373>	.08	.000	1.92	.232	3.75	.166	5.58	.023	7.42	.001
00374>	.17	.000	2.00	.245	3.83	.156	5.67	.021	7.50	.001
00375>	.25	.000	2.08	.255	3.92	.146	5.75	.019	7.58	.001
00376>	.33	.000	2.17	.263	4.00	.136	5.83	.017	7.67	.001
00377>	.42	.000	2.25	.268	4.08	.126	5.92	.015	7.75	.001
00378>	.50	.000	2.33	.272	4.17	.117	6.00	.013	7.83	.001
00379>	.58	.000	2.42	.273	4.25	.108	6.08	.012	7.92	.001
00380>	.67	.000	2.50	.273	4.33	.099	6.17	.011	8.00	.000
00381>	.75	.000	2.58	.271	4.42	.091	6.25	.009	8.09	.000
00382>	.83	.000	2.67	.268	4.50	.084	6.33	.008	8.17	.000
00383>	.92	.001	2.75	.264	4.58	.076	6.42	.007	8.25	.000
00384>	1.00	.007	2.83	.260	4.67	.070	6.50	.007	8.33	.000
00385>	1.08	.019	2.92	.254	4.75	.064	6.58	.006	8.42	.000
00386>	1.17	.036	3.00	.248	4.83	.058	6.67	.005	8.50	.000
00387>	1.25	.058	3.08	.241	4.92	.053	6.75	.005	8.58	.000
00388>	1.33	.082	3.17	.234	5.00	.048	6.83	.004	8.67	.000
00389>	1.42	.107	3.25	.226	5.08	.043	6.92	.004	8.75	.000

00391>	1.50	.132	3.33	.217	5.17	.039	7.00	.003	8.83	.000
00392>	1.58	.156	3.42	.207	5.25	.035	7.08	.003	8.92	.000
00393>	1.67	.178	3.50	.197	5.33	.032	7.17	.002		
00394>	1.75	.199	3.58	.187	5.42	.029	7.25	.002		

00395> ----------
00396> 001:0014----------
00397> ----------

00398> | ADD HYD (sumpre) |	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
00399> ----------						
00400>	ID1	09:extpre	221.80	.716	2.92	3.76	.000
00401>	+ID2	07:site	68.00	.273	2.42	3.76	.000
00402>			==========	==========	==========	==========	==========
00403>	SUM	08:sumpre	289.80	.976	2.75	3.76	.000

00404>
00405> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00406>
00407> ----------
00408> 001:0015----------
00409> ----------

00410> | SAVE HYD |	AREA	(ha)=	289.800	
00411> | ID=08 (sumpre) |	QPEAK	(cms)=	.976	(i)
00412> | DT= 5.00 PCYC= 1 |	TPEAK	(hrs)=	2.750	
00413> ----------	VOLUME	(mm)=	3.762	

00414> Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-sumpre.001
00415> Comments: Overall Predev Hydrograph
00416>
00417> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

00418> TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW
00419> hrs	cms	hrs	cms	hrs	cms	hrs	cms	hrs	cms
00420> .00	.000	2.33	.921	4.67	.433	7.00	.055	9.33	.005
00421> .08	.000	2.42	.942	4.75	.407	7.08	.051	9.42	.004
00422> .17	.000	2.50	.957	4.83	.382	7.17	.047	9.50	.004
00423> .25	.000	2.58	.968	4.92	.358	7.25	.043	9.58	.003
00424> .33	.000	2.67	.974	5.00	.336	7.33	.039	9.67	.003
00425> .42	.000	2.75	.976	5.08	.314	7.42	.036	9.75	.002
00426> .50	.000	2.83	.974	5.17	.293	7.50	.033	9.83	.002
00427> .58	.000	2.92	.970	5.25	.274	7.58	.031	9.92	.002
00428> .67	.000	3.00	.962	5.33	.255	7.67	.028	10.00	.002
00429> .75	.000	3.08	.952	5.42	.238	7.75	.026	10.08	.001
00430> .83	.000	3.17	.939	5.50	.222	7.83	.024	10.17	.001
00431> .92	.004	3.25	.922	5.58	.206	7.92	.022	10.25	.001
00432> 1.00	.021	3.33	.902	5.67	.192	8.00	.020	10.33	.001
00433> 1.08	.055	3.42	.879	5.75	.178	8.08	.018	10.42	.001
00434> 1.17	.106	3.50	.854	5.83	.166	8.17	.017	10.50	.001
00435> 1.25	.168	3.58	.827	5.92	.154	8.25	.015	10.58	.001
00436> 1.33	.239	3.67	.798	6.00	.142	8.33	.014	10.67	.000
00437> 1.42	.315	3.75	.768	6.08	.132	8.42	.013	10.75	.000
00438> 1.50	.392	3.83	.737	6.17	.122	8.50	.012	10.83	.000
00439> 1.58	.468	3.92	.705	6.25	.113	8.58	.011	10.92	.000
00440> 1.67	.541	4.00	.673	6.33	.105	8.67	.010	11.00	.000
00441> 1.75	.609	4.08	.641	6.42	.097	8.75	.009	11.08	.000
00442> 1.83	.672	4.17	.609	6.50	.090	8.83	.008	11.17	.000
00443> 1.92	.730	4.25	.578	6.58	.083	8.92	.008	11.25	.000
00444> 2.00	.781	4.33	.548	6.67	.076	9.00	.007	11.33	.000
00445> 2.08	.825	4.42	.518	6.75	.071	9.08	.006	11.42	.000
00446> 2.17	.863	4.50	.489	6.83	.065	9.17	.006	11.50	.000
00447> 2.25	.895	4.58	.460	6.92	.060	9.25	.005		

00448> ----------
00449> 001:0016----------
00450> FINISH
00451> ----------
00452> **********
00453> WARNINGS / ERRORS / NOTES
00454> ----------
00455> Simulation ended on 2005-05-04 at 10:05:48

```
0456> ================================================================================
0457>
0458>
```

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1: 5 yr SWMHYMO

```
00001> ================================================================================
 0002>
 0003>  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO         999    999  =========
00004>  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9 Ver. 4.02
 0006>      S   W W   M   M  H   H    Y    M   M  O   O       9999   9999 July 1999
 0007>  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9  =========
00008>                                                       9   9  9   9 # 3824306
00009>       StormWater Management HYdrologic Model           999    999  =========
 0010>
 0011>  ********************************************************************************
00012>  ************************** SWMHYMO-99 Ver/4.02 ***************************
00013>  *******  A single event and continuous hydrologic simulation model  *******
 0014>  *******     based on the principles of HYMO and its successors      *******
 0015>  *******                OTTHYMO-83 and OTTHYMO-89.                   *******
00016>  ********************************************************************************
00017>  ******* Distributed by:  J.F. Sabourin and Associates Inc.          *******
 0018>  *******                  Ottawa,  Ontario: (613) 727-5199          *******
 0019>  *******                  Gatineau, Quebec: (819) 243-6858          *******
00020>  *******                  E-Mail: swmhymo@jfsa.Com                  *******
00021>  ********************************************************************************
 0022>
 0023>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++ Licensed user: Stantec Consulting Ltd. 604                    +++++++
00025>  +++++++                  Ottawa                 SERIAL#:3824306      +++++++
 0026>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 0027>
00028>  ********************************************************************************
00029>  *******          ++++++ PROGRAM ARRAY DIMENSIONS ++++++              *******
 0030>  *******          Maximum value for ID numbers  :    10              *******
 0031>  *******          Max. number of rainfall points:  15000             *******
00032>  *******          Max. number of flow points    :  15000             *******
00033>  ********************************************************************************
 0034>
 0035>
00036>  ********************   D E T A I L E D   O U T P U T   ********************
00037>  ********************************************************************************
 0038>  *       DATE: 2005-05-04      TIME: 10:08:08      RUN COUNTER: 000188       *
 0039>  ********************************************************************************
00040>  * Input   filename: W:\active\60400144\design\analysis\SWMAPR~1\144pre0.da*
00041>  * Output  filename: W:\active\60400144\design\analysis\SWMAPR~1\144pre0.ou*
 0042>  * Summary filename: W:\active\60400144\design\analysis\SWMAPR~1\144pre0.su*
 0043>  * User comments:                                                          *
00044>  * 1:_____________________________________________________________________*
00045>  * 2:_____________________________________________________________________*
 0046>  * 3:_____________________________________________________________________*
 0047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
 0050> 001:0001-----------------------------------------------------------------------
 0051> *#*************************************************************************
00052> *#  Project Name: [Emerald Creek]     Project Number: [604-00144]
00053> *#  Date         : 06-18-2004
 0054> *#  Modeller     : [MAF]
 0055> *#  Company      : McNeely Engineering Consultants Limited
00056> *#  License #    :  5695479
00057> *#*************************************************************************
 0058> --------------------
 0059> | START            |  Project dir.: W:\active\60400144\design\analysis\SWMAPR~1
00060> --------------------  Rainfall dir.: W:\active\60400144\design\analysis\SWMAPR~1
00061>      TZERO =    .00 hrs on      0
 0062>      METOUT=   2 (output = METRIC)
 0063>      NRUN  = 001
00064>      NSTORM=    0
00065> --------------------------------------------------------------------------------
```

```
00066> 001:0002----------------------------------------------------------------------
00067> *# EXISTING CONDITIONS
00068> * 2-YEAR IDF CHICAGO STORM
00069> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00070> *                    ICASEcs=[2],
00071> *                    Enter ordinates of IDF curve below, at least seven ponts
00072> *                       TIME (min)    Intensity(mm/hr)
00073> *                          [5]         [102.80]
00074> *                          [10]        [77.10]
00075> *                         [15]        [63.30]
00076> *                          [30]        [39.90]
00077> *                          [60]        [24.20]
00078> *                          [120]       [14.30]
00079> *                          [360]       [6.20]
00080> *                          [720]       [3.60]
00081> *                         [1440]      [2.00]
00082> *                           -1              -1
00083> *# 5-YEAR IDF CHICAGO STORM
00084> --------------------
00085> | CHICAGO STORM    |     IDF curve parameters: A= 998.071
00086> | Ptotal= 42.51 mm |                           B=   6.053
00087> --------------------                           C=    .814
00088>                          used in:   INTENSITY =  A / (t + B)^C
00089>
00090>                          Duration of storm  =  3.00 hrs
00091>                          Storm time step    = 10.00 min
00092>                          Time to peak ratio =   .33
00093>
00094>                      The CORRELATION coefficient is = .9998645
00095>
00096>                       TIME        ENTERED            COMPUTED
00097>                      (min)        (mm/hr)             (mm/hr)
00098>                         5.         140.20              141.18
00099>                        10.         104.40              104.19
00100>                        15.          85.60               83.56
00101>                        30.          53.90               53.93
00102>                        60.          32.00               32.94
00103>                       120.          18.90               19.47
00104>                       360.           8.40                8.17
00105>                       720.           4.80                4.68
00106>                      1440.           2.60                2.67
00107>
00108>              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00109>               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00110>               .17   3.682 |   1.00 104.193 |   1.83   6.689 |   2.67   3.510
00111>               .33   4.582 |   1.17  32.037 |   2.00   5.628 |   2.83   3.220
00112>               .50   6.151 |   1.33  16.337 |   2.17   4.872 |   3.00   2.978
00113>               .67   9.614 |   1.50  10.965 |   2.33   4.305 |
00114>               .83  24.170 |   1.67   8.287 |   2.50   3.864 |
00115>
00116> ----------------------------------------------------------------------------
00117> 001:0003----------------------------------------------------------------------
00118> * 10-YEAR IDF CHICAGO STORM
00119> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00120> *                    ICASEcs=[2],
00121> *                   Enter ordinates of IDF curve below, at least seven points
00122> *                       TIME (min)    Intensity(mm/hr)
00123> *                          [5]         [165.00]
00124> *                          [10]        [122.50]
00125> *                          [15]        [100.40]
00126> *                          [30]        [63.10]
00127> *                         [60]        [37.10]
00128> *                         [120]       [22.00]
00129> *                          [360]       [9.90]
00130> *                          [720]       [5.60]
```

```
00131> *                          [1440]      [3.00]
  132> *                            -1              -1
  133> * 25-YEAR IDF CHICAGO STORM
00134> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min)
00135> *                    ICASEcs=[2],
  136> *                    Enter ordinates of IDF curve below, at least seven points
  137> *                        TIME (min)    Intensity(mm/hr)
00138> *                          [5]         [196.00]
00139> *                          [10]        [145.30]
  140> *                          [15]        [119.10]
  141> *                          [30]        [74.70]
00142> *                          [60]        [43.60]
00143> *                          [120]       [25.80]
  144> *                          [360]       [11.70]
  145> *                          [720]       [6.60]
00146> *                          [1440]      [3.50]
00147> *                            -1              -1
  148> * 100-YEAR IDF CHICAGO STORM
  149> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00150> *                   ICASEcs=[2],
00151> *                  Enter ordinates of IDF curve below, at least seven points
  152> *                      TIME (min)    Intensity(mm/hr)
  153> *                          [5]         [242.60]
00154> *                          [10]        [179.00]
00155> *                          [15]        [146.80]
  156> *                          [30]        [91.90]
  157> *                          [60]        [53.20]
00158> *                          [120]       [31.50]
00159> *                          [360]       [14.50]
  160> *                          [720]       [8.00]
  161> *                          [1440]      [4.30]
00162> *                            -1              -1
00163> ----------------------
  164> | DEFAULT VALUES     |  Filename: W:\active\60400144\design\analysis\SWMAPR~1\SH
  165> ----------------------  ICASEdv = 1 (read and print data)
00166>       FileTitle= File comment: [                ]
00167>                  THE FOLLOWING PARAMETERS ARE USED IN THE DESIGN STANDHYD COM
  168>       Horton's infiltration equation parameters:
  169>       [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
00170>       Parameters for PERVIOUS surfaces in STANDHYD:
00171>       [IAper=   6.20 mm] [LGP=70.00 m] [MNP= .250]
  172>       Parameters for IMPERVIOUS surfaces in STANDHYD:
  173>       [IAimp=   1.57 mm] [CLI=  .31]   [MNI= .013]
00174>       Parameters used in NASHYD:
00175>       [Ia=   4.67 mm] [N= 3.00]
  176> --------------------------------------------------------------------------------
  177> 001:0004-------------------------------------------------------------------------
00178> *# Area A1 (see DWG SD2)
00179> ----------------------
  180> | DESIGN NASHYD      |   Area     (ha)=   73.90   Curve Number    (CN)=60.00
  181> | 01:A1     DT= 5.00 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00182> ----------------------   U.H. Tp(hrs)=   1.440
00183>
  184>       Unit Hyd Qpeak   (cms)=    1.960
  185>
00186>       PEAK FLOW        (cms)=     .449 (i)
00187>       TIME TO PEAK     (hrs)=    2.917
  188>       RUNOFF VOLUME     (mm)=    6.913
  189>       TOTAL RAINFALL    (mm)=   42.514
00190>       RUNOFF COEFFICIENT   =     .163
00191>
  192>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
  193>
00194> --------------------------------------------------------------------------------
00195> 001:0005-------------------------------------------------------------------------
```

```
00196> *# Area A2
00197> ----------------------
00198> | DESIGN NASHYD       |   Area     (ha)=  120.00   Curve Number    (CN)=60.00
00199> | 02:A2     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00200> ----------------------   U.H. Tp(hrs)=   1.540
00201>
00202>      Unit Hyd Qpeak  (cms)=    2.976
00203>
00204>      PEAK FLOW       (cms)=     .694 (i)
00205>      TIME TO PEAK    (hrs)=    3.000
00206>      RUNOFF VOLUME    (mm)=    6.913
00207>      TOTAL RAINFALL   (mm)=   42.514
00208>      RUNOFF COEFFICIENT   =     .163
00209>
00210>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00211>
00212> ---------------------------------------------------------------------------
00213> 001:0006-----------------------------------------------------------------------
00214> *# Area A3
00215> ----------------------
00216> | DESIGN NASHYD       |   Area     (ha)=    5.60   Curve Number    (CN)=60.00
00217> | 03:A3     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00218> ----------------------   U.H. Tp(hrs)=   1.050
00219>
00220>      Unit Hyd Qpeak  (cms)=     .204
00221>
00222>      PEAK FLOW       (cms)=     .042 (i)
00223>      TIME TO PEAK    (hrs)=    2.333
00224>      RUNOFF VOLUME    (mm)=    6.913
00225>      TOTAL RAINFALL   (mm)=   42.514
00226>      RUNOFF COEFFICIENT   =     .163
00227>
00228>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00229>
00230> ---------------------------------------------------------------------------
00231> 001:0007-----------------------------------------------------------------------
00232> *# Area A4
00233> ----------------------
00234> | DESIGN NASHYD       |   Area     (ha)=   14.70   Curve Number    (CN)=60.00
00235> | 04:A4     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00236> ----------------------   U.H. Tp(hrs)=   1.040
00237>
00238>      Unit Hyd Qpeak  (cms)=     .540
00239>
00240>      PEAK FLOW       (cms)=     .112 (i)
00241>      TIME TO PEAK    (hrs)=    2.333
00242>      RUNOFF VOLUME    (mm)=    6.913
00243>      TOTAL RAINFALL   (mm)=   42.514
00244>      RUNOFF COEFFICIENT   =     .163
00245>
00246>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00247>
00248> ---------------------------------------------------------------------------
00249> 001:0008-----------------------------------------------------------------------
00250> *# Area A5
00251> ----------------------
00252> | DESIGN NASHYD       |   Area     (ha)=    3.50   Curve Number    (CN)=60.00
00253> | 05:A5     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00254> ----------------------   U.H. Tp(hrs)=    .630
00255>
00256>      Unit Hyd Qpeak  (cms)=     .212
00257>
00258>      PEAK FLOW       (cms)=     .037 (i)
00259>      TIME TO PEAK    (hrs)=    1.833
00260>      RUNOFF VOLUME    (mm)=    6.913
```

```
 0261>       TOTAL RAINFALL    (mm)=    42.514
  262>       RUNOFF COEFFICIENT    =      .163
  263>
 0264>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
 0265>
  266> ---------------------------------------------------------------------------
  267> 001:0009-----------------------------------------------------------------------
 0268> *# Area A6
 0269> ----------------------
  270> | DESIGN NASHYD        |   Area     (ha)=     4.10   Curve Number    (CN)=60.00
  271> | 06:001006 DT= 5.00   |   Ia       (mm)=    4.670   # of Linear Res.(N)= 3.00
 0272> ----------------------   U.H. Tp(hrs)=      .630
 0273>
  274>       Unit Hyd Qpeak  (cms)=      .249
  275>
 0276>       PEAK FLOW         (cms)=      .044 (i)
 0277>       TIME TO PEAK      (hrs)=     1.833
  278>       RUNOFF VOLUME      (mm)=     6.913
  279>       TOTAL RAINFALL    (mm)=    42.514
 0280>       RUNOFF COEFFICIENT    =      .163
 0281>
  282>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
  283>
 0284> ---------------------------------------------------------------------------
 0285> 001:0010-----------------------------------------------------------------------
  286> *# External Flows Pre-Development
  287> ---------------------
 0288> | ADD HYD (extpre) | ID: NHYD      AREA      QPEAK    TPEAK    R.V.     DWF
 0289> ---------------------                (ha)      (cms)    (hrs)    (mm)    (cms)
  290>                      ID1 01:A1       73.90      .448     2.92    6.91     .000
  291>                     +ID2 02:A2      120.00      .694     3.00    6.91     .000
 0292>                     +ID3 03:A3        5.60      .042     2.33    6.91     .000
 0293>                     +ID4 04:A4       14.70      .112     2.33    6.91     .000
  294>                     +ID5 05:A5        3.50      .037     1.83    6.91     .000
  295>                     +ID6 06:001006    4.10      .044     1.83    6.91     .000
 0296>                      ==========================================================
 0297>                      SUM 09:extpre   221.80     1.321     2.83    6.91     .000
  298>
  299>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
 0300>
 0301> ---------------------------------------------------------------------------
  302> 001:0011-----------------------------------------------------------------------
  303> ---------------------
 0304> | SAVE HYD           |   AREA       (ha)=  221.800
 0305> | ID=09 (extpre)     |   QPEAK     (cms)=    1.321 (i)
 0306> | DT= 5.00 PCYC= 1   |   TPEAK     (hrs)=    2.833
 0307> ---------------------   VOLUME      (mm)=    6.913
 0308>   Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-extpre.001
 0309>   Comments: Pre External Flows
  310>
  311>      (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
 0312>   TIME     FLOW |  TIME     FLOW |  TIME     FLOW |  TIME     FLOW |  TIME     FLOW
 0313>    hrs      cms |   hrs      cms |   hrs      cms |   hrs      cms |   hrs      cms
  314>     .00     .000|   2.33    1.221|   4.67     .651|   7.00     .092|   9.33     .008
  315>     .08     .000|   2.42    1.253|   4.75     .615|   7.08     .085|   9.42     .007
 0316>     .17     .000|   2.50    1.278|   4.83     .580|   7.17     .079|   9.50     .006
 0317>     .25     .000|   2.58    1.297|   4.92     .546|   7.25     .073|   9.58     .005
  318>     .33     .000|   2.67    1.310|   5.00     .514|   7.33     .067|   9.67     .005
  319>     .42     .000|   2.75    1.319|   5.08     .483|   7.42     .062|   9.75     .004
 0320>     .50     .000|   2.83    1.321|   5.17     .454|   7.50     .057|   9.83     .003
 0321>     .58     .000|   2.92    1.320|   5.25     .426|   7.58     .052|   9.92     .003
 0322>     .67     .000|   3.00    1.314|   5.33     .399|   7.67     .048|  10.00     .003
  323>     .75     .000|   3.08    1.304|   5.42     .373|   7.75     .045|  10.08     .002
 0324>     .83     .001|   3.17    1.290|   5.50     .349|   7.83     .041|  10.17     .002
 0325>     .92     .007|   3.25    1.272|   5.58     .326|   7.92     .038|  10.25     .002
```

1.00	.031	3.33	1.249	5.67	.305	8.00	.035	10.33	.001
1.08	.077	3.42	1.223	5.75	.284	8.08	.032	10.42	.001
1.17	.143	3.50	1.193	5.83	.265	8.17	.029	10.50	.001
1.25	.225	3.58	1.160	5.92	.247	8.25	.027	10.58	.001
1.33	.316	3.67	1.125	6.00	.230	8.33	.025	10.67	.001
1.42	.413	3.75	1.088	6.08	.214	8.42	.023	10.75	.001
1.50	.511	3.83	1.049	6.17	.199	8.50	.021	10.83	.001
1.58	.609	3.92	1.009	6.25	.184	8.58	.019	10.92	.000
1.67	.703	4.00	.968	6.33	.171	8.67	.018	11.00	.000
1.75	.793	4.08	.927	6.42	.159	8.75	.016	11.08	.000
1.83	.876	4.17	.886	6.50	.147	8.83	.015	11.17	.000
1.92	.953	4.25	.846	6.58	.136	8.92	.014	11.25	.000
2.00	1.021	4.33	.805	6.67	.126	9.00	.012	11.33	.000
2.08	1.083	4.42	.765	6.75	.117	9.08	.011	11.42	.000
2.17	1.136	4.50	.726	6.83	.108	9.17	.010	11.50	.000
2.25	1.183	4.58	.688	6.92	.100	9.25	.009		

001:0012

*# Site Area

DESIGN NASHYD	Area (ha)= 68.00	Curve Number (CN)=60.00
07:site DT= 5.00	Ia (mm)= 4.670	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 1.070	

Unit Hyd Qpeak (cms)= 2.427

PEAK FLOW (cms)= .508 (i)
TIME TO PEAK (hrs)= 2.417
RUNOFF VOLUME (mm)= 6.913
TOTAL RAINFALL (mm)= 42.514
RUNOFF COEFFICIENT = .163

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

001:0013

SAVE HYD	AREA (ha)= 68.000
ID=07 (site)	QPEAK (cms)= .508 (i)
DT= 5.00 PCYC= 1	TPEAK (hrs)= 2.417
	VOLUME (mm)= 6.913

Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-site.001
Comments: Pre Site Flows

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

TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms
.00	.000	1.83	.415	3.67	.315	5.50	.045	7.33	.003
.08	.000	1.92	.442	3.75	.296	5.58	.040	7.42	.002
.17	.000	2.00	.464	3.83	.277	5.67	.036	7.50	.002
.25	.000	2.08	.481	3.92	.259	5.75	.032	7.58	.002
.33	.000	2.17	.494	4.00	.241	5.83	.029	7.67	.001
.42	.000	2.25	.502	4.08	.223	5.92	.026	7.75	.001
.50	.000	2.33	.507	4.17	.206	6.00	.023	7.83	.001
.58	.000	2.42	.508	4.25	.190	6.08	.021	7.92	.001
.67	.000	2.50	.506	4.33	.175	6.17	.018	8.00	.001
.75	.000	2.58	.501	4.42	.161	6.25	.016	8.08	.001
.83	.000	2.67	.494	4.50	.147	6.33	.015	8.17	.001
.92	.004	2.75	.485	4.58	.135	6.42	.013	8.25	.000
1.00	.016	2.83	.475	4.67	.123	6.50	.012	8.33	.000
1.08	.041	2.92	.463	4.75	.112	6.58	.010	8.42	.000
1.17	.075	3.00	.450	4.83	.102	6.67	.009	8.50	.000
1.25	.117	3.08	.437	4.92	.092	6.75	.008	8.58	.000
1.33	.163	3.17	.422	5.00	.084	6.83	.007	8.67	.000
1.42	.211	3.25	.406	5.08	.076	6.92	.006	8.75	.000

0391>	1.50	.259	3.33	.389	5.17	.068	7.00	.005	8.83	.000
392>	1.58	.304	3.42	.372	5.25	.062	7.08	.004	8.92	.000
393>	1.67	.345	3.50	.353	5.33	.056	7.17	.004		
0394>	1.75	.382	3.58	.334	5.42	.050	7.25	.003		

0395> ----------
396> 001:0014----------
397> ----------

	ADD HYD (sumpre)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
0398>							
0399>	----------						
400>		ID1 09:extpre	221.80	1.321	2.83	6.91	.000
401>		+ID2 07:site	68.00	.508	2.42	6.91	.000
0402>			==========	==========	==========	==========	==========
0403>		SUM 08:sumpre	289.80	1.804	2.67	6.91	.000

404>
405> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
0406>
0407> ----------
408> 001:0015----------
409> ----------

0410>	SAVE HYD	AREA (ha)=	289.800
0411>	ID=08 (sumpre)	QPEAK (cms)=	1.804 (i)
412>	DT= 5.00 PCYC= 1	TPEAK (hrs)=	2.667
413>	----------	VOLUME (mm)=	6.913

0414> Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-sumpre.001
0415> Comments: Overall Predev Hydrograph
416>
417> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

0418> TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW
0419> hrs	cms	hrs	cms	hrs	cms	hrs	cms	hrs	cms
420> .00	.000	2.33	1.728	4.67	.774	7.00	.097	9.33	.008
421> .08	.000	2.42	1.761	4.75	.727	7.08	.090	9.42	.007
0422> .17	.000	2.50	1.784	4.83	.682	7.17	.082	9.50	.006
0423> .25	.000	2.58	1.798	4.92	.639	7.25	.076	9.58	.005
424> .33	.000	2.67	1.804	5.00	.598	7.33	.070	9.67	.005
425> .42	.000	2.75	1.803	5.08	.559	7.42	.064	9.75	.004
0426> .50	.000	2.83	1.796	5.17	.522	7.50	.059	9.83	.003
0427> .58	.000	2.92	1.782	5.25	.487	7.58	.054	9.92	.003
428> .67	.000	3.00	1.764	5.33	.455	7.67	.050	10.00	.003
429> .75	.000	3.08	1.741	5.42	.424	7.75	.046	10.08	.002
0430> .83	.001	3.17	1.713	5.50	.394	7.83	.042	10.17	.002
0431> .92	.011	3.25	1.678	5.58	.367	7.92	.039	10.25	.002
432> 1.00	.047	3.33	1.639	5.67	.341	8.00	.035	10.33	.001
433> 1.08	.118	3.42	1.594	5.75	.317	8.08	.032	10.42	.001
0434> 1.17	.219	3.50	1.546	5.83	.294	8.17	.030	10.50	.001
0435> 1.25	.342	3.58	1.494	5.92	.273	8.25	.027	10.58	.001
436> 1.33	.479	3.67	1.440	6.00	.253	8.33	.025	10.67	.001
437> 1.42	.624	3.75	1.384	6.08	.234	8.42	.023	10.75	.001
0438> 1.50	.770	3.83	1.326	6.17	.217	8.50	.021	10.83	.001
0439> 1.58	.913	3.92	1.268	6.25	.201	8.58	.019	10.92	.000
440> 1.67	1.049	4.00	1.209	6.33	.186	8.67	.018	11.00	.000
441> 1.75	1.175	4.08	1.151	6.42	.172	8.75	.016	11.08	.000
0442> 1.83	1.291	4.17	1.093	6.50	.159	8.83	.015	11.17	.000
0443> 1.92	1.395	4.25	1.036	6.58	.147	8.92	.014	11.25	.000
444> 2.00	1.486	4.33	.980	6.67	.136	9.00	.012	11.33	.000
445> 2.08	1.564	4.42	.926	6.75	.125	9.08	.011	11.42	.000
0446> 2.17	1.631	4.50	.873	6.83	.115	9.17	.010	11.50	.000
0447> 2.25	1.688	4.58	.822	6.92	.106	9.25	.009		

448> ----------
449> 001:0016----------
0450> FINISH
0451> ----------
452> **********
453> WARNINGS / ERRORS / NOTES
0454> ----------
0455> Simulation ended on 2005-05-04 at 10:08:08

```
00456> ================================================================================
00457>
00458>
```

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1: 10 yr SWMHYMO

```
00001> ================================================================================
 0002>
 0003>  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO         999    999  =========
00004>  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9 Ver. 4.02
 0006>      S  W W   M   M  H   H    Y    M   M  O   O       9999   9999 July 1999
 0007>  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9 =========
00008>                                                      9   9  9   9 # 3824306
00009>       StormWater Management HYdrologic Model          999    999  =========
 0010>
 0011>  ********************************************************************************
00012>  ************************** SWMHYMO-99 Ver/4.02 ***************************
00013>  *******  A single event and continuous hydrologic simulation model  *******
 0014>  *******     based on the principles of HYMO and its successors       *******
 0015>  *******                 OTTHYMO-83 and OTTHYMO-89.                   *******
00016>  ********************************************************************************
00017>  ******* Distributed by:  J.F. Sabourin and Associates Inc.           *******
 0018>  *******                  Ottawa,  Ontario: (613) 727-5199           *******
 0019>  *******                  Gatineau, Quebec: (819) 243-6858           *******
00020>  *******                  E-Mail: swmhymo@jfsa.Com                   *******
00021>  ********************************************************************************
 0022>
 0023>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++ Licensed user: Stantec Consulting Ltd. 604                    +++++++
00025>  +++++++                  Ottawa                 SERIAL#:3824306      +++++++
 0026>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 0027>
00028>  ********************************************************************************
00029>  *******           ++++++ PROGRAM ARRAY DIMENSIONS ++++++              *******
 0030>  *******           Maximum value for ID numbers  :     10              *******
 0031>  *******           Max. number of rainfall points:  15000              *******
00032>  *******           Max. number of flow points    :  15000              *******
00033>  ********************************************************************************
 0034>
 0035>
00036>  ********************   D E T A I L E D   O U T P U T   ********************
00037>  ********************************************************************************
 0038>  *       DATE: 2005-05-04     TIME: 10:09:18     RUN COUNTER: 000189       *
 0039>  ********************************************************************************
00040>  * Input   filename: W:\active\60400144\design\analysis\SWMAPR~1\144pre0.da*
00041>  * Output  filename: W:\active\60400144\design\analysis\SWMAPR~1\144pre0.ou*
 0042>  * Summary filename: W:\active\60400144\design\analysis\SWMAPR~1\144pre0.su*
 0043>  * User comments:                                                          *
00044>  * 1:_____________________________________________________________________*
00045>  * 2:_____________________________________________________________________*
 0046>  * 3:_____________________________________________________________________*
 0047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
 0050> 001:0001-----------------------------------------------------------------------
 0051> *#*****************************************************************************
00052> *#  Project Name: [Emerald Creek]    Project Number: [604-00144]
00053> *#  Date         : 06-18-2004
 0054> *#  Modeller     : [MAF]
 0055> *#  Company      : McNeely Engineering Consultants Limited
00056> *#  License #    :  5695479
00057> *#*****************************************************************************
 0058> --------------------
 0059> | START            |  Project dir.: W:\active\60400144\design\analysis\SWMAPR~1
00060> --------------------  Rainfall dir.: W:\active\60400144\design\analysis\SWMAPR~1
00061>     TZERO =   .00 hrs on        0
 0062>     METOUT=   2 (output = METRIC)
 0063>     NRUN  = 001
 0064>     NSTORM=   0
00065> --------------------------------------------------------------------------------
```

```
00066> 001:0002--------------------------------------------------------------------------
00067> *# EXISTING CONDITIONS
00068> * 2-YEAR IDF CHICAGO STORM
00069> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00070> *                    ICASEcs=[2],
00071> *                    Enter ordinates of IDF curve below, at least seven ponts
00072> *                       TIME (min)    Intensity(mm/hr)
00073> *                          [5]         [102.80]
00074> *                          [10]        [77.10]
00075> *                         [15]        [63.30]
00076> *                          [30]        [39.90]
00077> *                          [60]        [24.20]
00078> *                          [120]       [14.30]
00079> *                          [360]       [6.20]
00080> *                          [720]       [3.60]
00081> *                         [1440]      [2.00]
00082> *                           -1             -1
00083> * 5-YEAR IDF CHICAGO STORM
00084> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00085> *                  ICASEcs=[2],
00086> *                    Enter ordinates of IDF curve below, at least seven points
00087> *                       TIME (min)    Intensity(mm/hr)
00088> *                          [5]         [140.20]
00089> *                          [10]        [104.40]
00090> *                          [15]        [85.60]
00091> *                          [30]        [53.90]
00092> *                          [60]        [32.00]
00093> *                          [120]       [18.90]
00094> *                          [360]       [8.40]
00095> *                          [720]       [4.80]
00096> *                          [1440]      [2.60]
00097> *                            -1             -1
00098> *# 10-YEAR IDF CHICAGO STORM
00099> ---------------------
00100> | CHICAGO STORM     |     IDF curve parameters: A=1174.184
00101> | Ptotal= 49.50 mm  |                           B=   6.014
00102> ---------------------                           C=    .816
00103>                           used in:  INTENSITY =  A / (t + B)^C
00104>
00105>                           Duration of storm  =  3.00 hrs
00106>                           Storm time step    = 10.00 min
00107>                           Time to peak ratio =   .33
00108>
00109>                      The CORRELATION coefficient is = .9998038
00110>
00111>                       TIME        ENTERED             COMPUTED
00112>                      (min)        (mm/hr)              (mm/hr)
00113>                         5.         165.00               165.77
00114>                        10.         122.50               122.14
00115>                        15.         100.40                97.85
00116>                        30.          63.10                63.05
00117>                        60.          37.10                38.45
00118>                       120.          22.00                22.69
00119>                       360.           9.90                 9.50
00120>                       720.           5.60                 5.44
00121>                      1440.           3.00                 3.10
00122>
00123>            TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00124>            hrs     mm/hr|   hrs     mm/hr|   hrs     mm/hr|   hrs     mm/hr
00125>            .17     4.248|  1.00   122.142|  1.83     7.733|  2.67     4.049
00126>            .33     5.290|  1.17    37.285|  2.00     6.502|  2.83     3.714
00127>            .50     7.108|  1.33    18.954|  2.17     5.625|  3.00     3.434
00128>            .67    11.130|  1.50    12.700|  2.33     4.969|
00129>            .83    28.100|  1.67     9.588|  2.50     4.458|
00130>
```

```
00131> ------------------------------------------------------------------------------
 0132> 001:0003--------------------------------------------------------------------
 0133> * 25-YEAR IDF CHICAGO STORM
00134> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min)
00135> *                    ICASEcs=[2],
 0136> *                    Enter ordinates of IDF curve below, at least seven points
 0137> *                        TIME (min)    Intensity(mm/hr)
00138> *                          [5]         [196.00]
00139> *                          [10]        [145.30]
 0140> *                          [15]        [119.10]
 0141> *                          [30]        [74.70]
00142> *                          [60]        [43.60]
00143> *                          [120]       [25.80]
 0144> *                          [360]       [11.70]
 0145> *                          [720]       [6.60]
00146> *                          [1440]      [3.50]
00147> *                            -1              -1
 0148> * 100-YEAR IDF CHICAGO STORM
 0149> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00150> *                   ICASEcs=[2],
00151> *                   Enter ordinates of IDF curve below, at least seven points
 0152> *                       TIME (min)    Intensity(mm/hr)
 0153> *                          [5]         [242.60]
00154> *                          [10]        [179.00]
00155> *                          [15]        [146.80]
 0156> *                          [30]        [91.90]
 0157> *                          [60]        [53.20]
00158> *                          [120]       [31.50]
00159> *                          [360]       [14.50]
 0160> *                          [720]       [8.00]
 0161> *                          [1440]      [4.30]
00162> *                            -1              -1
00163> ----------------------
 0164> | DEFAULT VALUES      |  Filename: W:\active\60400144\design\analysis\SWMAPR~1\SH
 0165> ----------------------  ICASEdv = 1 (read and print data)
00166>       FileTitle= File comment: [                ]
00167>                  THE FOLLOWING PARAMETERS ARE USED IN THE DESIGN STANDHYD COM
 0168>       Horton's infiltration equation parameters:
 0169>       [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
00170>       Parameters for PERVIOUS surfaces in STANDHYD:
00171>       [IAper=   6.20 mm] [LGP=70.00 m] [MNP= .250]
 0172>       Parameters for IMPERVIOUS surfaces in STANDHYD:
 0173>       [IAimp=   1.57 mm] [CLI=  .31]   [MNI= .013]
00174>       Parameters used in NASHYD:
00175>       [Ia=   4.67 mm] [N= 3.00]
 0176> ------------------------------------------------------------------------------
 0177> 001:0004--------------------------------------------------------------------
00178> *# Area A1 (see DWG SD2)
00179> ----------------------
 0180> | DESIGN NASHYD       |   Area     (ha)=   73.90   Curve Number    (CN)=60.00
 0181> | 01:A1    DT= 5.00   |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00182> ----------------------   U.H. Tp(hrs)=   1.440
00183>
 0184>      Unit Hyd Qpeak  (cms)=    1.960
 0185>
00186>      PEAK FLOW       (cms)=     .610 (i)
00187>      TIME TO PEAK    (hrs)=    2.833
 0188>      RUNOFF VOLUME    (mm)=    9.386
 0189>      TOTAL RAINFALL   (mm)=   49.505
00190>      RUNOFF COEFFICIENT   =     .190
00191>
 0192>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
 0193>
00194> ------------------------------------------------------------------------------
00195> 001:0005--------------------------------------------------------------------
```

```
00196> *# Area A2
00197> ----------------------
00198> | DESIGN NASHYD       |   Area     (ha)=  120.00   Curve Number    (CN)=60.00
00199> | 02:A2     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00200> ----------------------   U.H. Tp(hrs)=   1.540
00201>
00202>      Unit Hyd Qpeak  (cms)=    2.976
00203>
00204>      PEAK FLOW       (cms)=     .944 (i)
00205>      TIME TO PEAK    (hrs)=    3.000
00206>      RUNOFF VOLUME    (mm)=    9.386
00207>      TOTAL RAINFALL   (mm)=   49.505
00208>      RUNOFF COEFFICIENT   =     .190
00209>
00210>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00211>
00212> ---------------------------------------------------------------------------
00213> 001:0006-----------------------------------------------------------------
00214> *# Area A3
00215> ----------------------
00216> | DESIGN NASHYD       |   Area     (ha)=    5.60   Curve Number    (CN)=60.00
00217> | 03:A3     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00218> ----------------------   U.H. Tp(hrs)=   1.050
00219>
00220>      Unit Hyd Qpeak  (cms)=     .204
00221>
00222>      PEAK FLOW       (cms)=     .058 (i)
00223>      TIME TO PEAK    (hrs)=    2.333
00224>      RUNOFF VOLUME    (mm)=    9.386
00225>      TOTAL RAINFALL   (mm)=   49.505
00226>      RUNOFF COEFFICIENT   =     .190
00227>
00228>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00229>
00230> ---------------------------------------------------------------------------
00231> 001:0007-----------------------------------------------------------------
00232> *# Area A4
00233> ----------------------
00234> | DESIGN NASHYD       |   Area     (ha)=   14.70   Curve Number    (CN)=60.00
00235> | 04:A4     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00236> ----------------------   U.H. Tp(hrs)=   1.040
00237>
00238>      Unit Hyd Qpeak  (cms)=     .540
00239>
00240>      PEAK FLOW       (cms)=     .153 (i)
00241>      TIME TO PEAK    (hrs)=    2.333
00242>      RUNOFF VOLUME    (mm)=    9.386
00243>      TOTAL RAINFALL   (mm)=   49.505
00244>      RUNOFF COEFFICIENT   =     .190
00245>
00246>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00247>
00248> ---------------------------------------------------------------------------
00249> 001:0008-----------------------------------------------------------------
00250> *# Area A5
00251> ----------------------
00252> | DESIGN NASHYD       |   Area     (ha)=    3.50   Curve Number    (CN)=60.00
00253> | 05:A5     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00254> ----------------------   U.H. Tp(hrs)=    .630
00255>
00256>      Unit Hyd Qpeak  (cms)=     .212
00257>
00258>      PEAK FLOW       (cms)=     .051 (i)
00259>      TIME TO PEAK    (hrs)=    1.750
00260>      RUNOFF VOLUME    (mm)=    9.386
```

```
00261>      TOTAL RAINFALL    (mm)=   49.505
 0262>      RUNOFF COEFFICIENT    =     .190
 0263>
00264>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00265>
 0266> ---------------------------------------------------------------------------
 0267> 001:0009-----------------------------------------------------------------------
00268> *# Area A6
00269> ---------------------
 0270> | DESIGN NASHYD       |   Area     (ha)=    4.10   Curve Number    (CN)=60.00
 0271> | 06:001006 DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00272> ---------------------   U.H. Tp(hrs)=    .630
00273>
 0274>      Unit Hyd Qpeak  (cms)=     .249
 0275>
00276>      PEAK FLOW       (cms)=     .060 (i)
00277>      TIME TO PEAK    (hrs)=    1.750
 0278>      RUNOFF VOLUME    (mm)=    9.386
 0279>      TOTAL RAINFALL   (mm)=   49.505
00280>      RUNOFF COEFFICIENT    =     .190
00281>
 0282>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
 0283>
00284> ---------------------------------------------------------------------------
00285> 001:0010-----------------------------------------------------------------------
 0286> *# External Flows Pre-Development
 0287> --------------------
00288> | ADD HYD (extpre) | ID: NHYD     AREA      QPEAK    TPEAK    R.V.     DWF
00289> --------------------              (ha)      (cms)    (hrs)    (mm)    (cms)
 0290>                    ID1 01:A1      73.90      .610     2.83    9.39     .000
 0291>                   +ID2 02:A2     120.00      .944     3.00    9.39     .000
00292>                   +ID3 03:A3       5.60      .058     2.33    9.39     .000
00293>                   +ID4 04:A4      14.70      .153     2.33    9.39     .000
 0294>                   +ID5 05:A5       3.50      .051     1.75    9.39     .000
 0295>                   +ID6 06:001006   4.10      .060     1.75    9.39     .000
00296>                    ================================================
00297>                    SUM 09:extpre  221.80     1.798     2.83    9.39     .000
 0298>
 0299>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00300>
00301> ---------------------------------------------------------------------------
 0302> 001:0011-----------------------------------------------------------------------
 0303> --------------------
00304> | SAVE HYD           |   AREA       (ha)=  221.800
00305> | ID=09 (extpre)     |   QPEAK     (cms)=    1.798 (i)
 0306> | DT= 5.00 PCYC= 1   |   TPEAK     (hrs)=    2.833
 0307> --------------------   VOLUME       (mm)=    9.386
00308>   Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-extpre.001
00309>   Comments: Pre External Flows
 0310>
 0311>     (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00312>   TIME     FLOW |  TIME     FLOW |  TIME     FLOW |  TIME     FLOW |  TIME     FLOW
00313>    hrs      cms |   hrs      cms |   hrs      cms |   hrs      cms |   hrs      cms
 0314>     .00     .000|    2.33   1.675|    4.67    .873|    7.00    .123|    9.33    .011
 0315>     .08     .000|    2.42   1.716|    4.75    .824|    7.08    .114|    9.42    .010
00316>     .17     .000|    2.50   1.749|    4.83    .779|    7.17    .105|    9.50    .008
00317>     .25     .000|    2.58   1.772|    4.92    .732|    7.25    .097|    9.58    .007
 0318>     .33     .000|    2.67   1.788|    5.00    .689|    7.33    .089|    9.67    .006
 0319>     .42     .000|    2.75   1.796|    5.08    .648|    7.42    .082|    9.75    .005
00320>     .50     .000|    2.83   1.798|    5.17    .608|    7.50    .076|    9.83    .004
00321>     .58     .000|    2.92   1.794|    5.25    .570|    7.58    .070|    9.92    .004
 0322>     .67     .000|    3.00   1.784|    5.33    .534|    7.67    .064|   10.00    .003
 0323>     .75     .000|    3.08   1.770|    5.42    .500|    7.75    .059|   10.08    .003
00324>     .83     .001|    3.17   1.749|    5.50    .468|    7.83    .055|   10.17    .003
00325>     .92     .011|    3.25   1.722|    5.58    .437|    7.92    .050|   10.25    .002
```

1.00	.046	3.33	1.690	5.67	.408	8.00	.046	10.33	.002
1.08	.112	3.42	1.653	5.75	.380	8.08	.043	10.42	.002
1.17	.205	3.50	1.611	5.83	.354	8.17	.039	10.50	.001
1.25	.319	3.58	1.566	5.92	.330	8.25	.036	10.58	.001
1.33	.445	3.67	1.517	6.00	.307	8.33	.033	10.67	.001
1.42	.579	3.75	1.466	6.08	.286	8.42	.030	10.75	.001
1.50	.715	3.83	1.413	6.17	.265	8.50	.028	10.83	.001
1.58	.849	3.92	1.358	6.25	.247	8.58	.025	10.92	.001
1.67	.979	4.00	1.303	6.33	.229	8.67	.023	11.00	.000
1.75	1.100	4.08	1.247	6.42	.212	8.75	.021	11.08	.000
1.83	1.213	4.17	1.192	6.50	.197	8.83	.020	11.17	.000
1.92	1.317	4.25	1.136	6.58	.182	8.92	.018	11.25	.000
2.00	1.409	4.33	1.081	6.67	.169	9.00	.016	11.33	.000
2.08	1.492	4.42	1.027	6.75	.156	9.08	.014	11.42	.000
2.17	1.563	4.50	.975	6.83	.144	9.17	.013	11.50	.000
2.25	1.624	4.58	.923	6.92	.133	9.25	.012		

001:0012----------

*# Site Area

DESIGN NASHYD	Area (ha)= 68.00	Curve Number (CN)=60.00
07:site DT= 5.00	Ia (mm)= 4.670	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 1.070	

Unit Hyd Qpeak (cms)= 2.427

PEAK FLOW (cms)= .693 (i)
TIME TO PEAK (hrs)= 2.417
RUNOFF VOLUME (mm)= 9.386
TOTAL RAINFALL (mm)= 49.505
RUNOFF COEFFICIENT = .190

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

001:0013----------

SAVE HYD	AREA (ha)= 68.000
ID=07 (site)	QPEAK (cms)= .693 (i)
DT= 5.00 PCYC= 1	TPEAK (hrs)= 2.417
	VOLUME (mm)= 9.386

Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-site.001
Comments: Pre Site Flows

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

TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms
.00	.000	1.83	.573	3.67	.422	5.50	.060	7.33	.004
.08	.000	1.92	.610	3.75	.396	5.58	.054	7.42	.003
.17	.000	2.00	.639	3.83	.370	5.67	.048	7.50	.003
.25	.000	2.08	.662	3.92	.345	5.75	.043	7.58	.002
.33	.000	2.17	.678	4.00	.321	5.83	.038	7.67	.002
.42	.000	2.25	.688	4.08	.298	5.92	.034	7.75	.002
.50	.000	2.33	.693	4.17	.275	6.00	.031	7.83	.001
.58	.000	2.42	.693	4.25	.254	6.08	.027	7.92	.001
.67	.000	2.50	.689	4.33	.233	6.17	.024	8.00	.001
.75	.000	2.58	.682	4.42	.214	6.25	.022	8.08	.001
.83	.001	2.67	.671	4.50	.196	6.33	.019	8.17	.001
.92	.006	2.75	.658	4.58	.179	6.42	.017	8.25	.001
1.00	.024	2.83	.643	4.67	.163	6.50	.015	8.33	.000
1.08	.059	2.92	.626	4.75	.149	6.58	.014	8.42	.000
1.17	.108	3.00	.608	4.83	.135	6.67	.012	8.50	.000
1.25	.166	3.08	.589	4.92	.123	6.75	.011	8.58	.000
1.33	.230	3.17	.569	5.00	.111	6.83	.009	8.67	.000
1.42	.297	3.25	.546	5.08	.101	6.92	.008	8.75	.000

00391>	1.50	.362	3.33	.523	5.17	.091	7.00	.007	8.83	.000
00392>	1.58	.423	3.42	.499	5.25	.082	7.08	.006	8.92	.000
00393>	1.67	.480	3.50	.473	5.33	.074	7.17	.005		
00394>	1.75	.530	3.58	.448	5.42	.066	7.25	.004		

00395> ----------
00396> 001:0014----------
00397> ----------

	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
00398> | ADD HYD (sumpre) |						
00399> ----------						
00400>	ID1 09:extpre	221.80	1.798	2.83	9.39	.000
00401>	+ID2 07:site	68.00	.693	2.42	9.39	.000
00402>		==========	==========	==========	==========	==========
00403>	SUM 08:sumpre	289.80	2.459	2.67	9.39	.000

00404>
00405> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00406>
00407> ----------
00408> 001:0015----------
00409> ----------

00410> | SAVE HYD	AREA	(ha)=	289.800
00411> | ID=08 (sumpre)	QPEAK	(cms)=	2.459 (i)
00412> | DT= 5.00 PCYC= 1 |	TPEAK	(hrs)=	2.667
00413> ----------	VOLUME	(mm)=	9.386

00414> Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-sumpre.001
00415> Comments: Overall Predev Hydrograph
00416>
00417> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

	TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW
00418>	hrs	cms	hrs	cms	hrs	cms	hrs	cms	hrs	cms
00419>	.00	.000	2.33	2.368	4.67	1.036	7.00	.130	9.33	.011
00420>	.08	.000	2.42	2.409	4.75	.973	7.08	.120	9.42	.010
00421>	.17	.000	2.50	2.437	4.83	.913	7.17	.110	9.50	.008
00422>	.25	.000	2.58	2.453	4.92	.855	7.25	.101	9.58	.007
00423>	.33	.000	2.67	2.459	5.00	.800	7.33	.093	9.67	.006
00424>	.42	.000	2.75	2.454	5.08	.748	7.42	.086	9.75	.005
00425>	.50	.000	2.83	2.441	5.17	.699	7.50	.079	9.83	.004
00426>	.58	.000	2.92	2.420	5.25	.652	7.58	.072	9.92	.004
00427>	.67	.000	3.00	2.393	5.33	.608	7.67	.066	10.00	.003
00428>	.75	.000	3.08	2.359	5.42	.566	7.75	.061	10.08	.003
00429>	.83	.002	3.17	2.317	5.50	.527	7.83	.056	10.17	.003
00430>	.92	.017	3.25	2.269	5.58	.490	7.92	.051	10.25	.002
00431>	1.00	.070	3.33	2.213	5.67	.456	8.00	.047	10.33	.002
00432>	1.08	.171	3.42	2.151	5.75	.423	8.08	.043	10.42	.002
00433>	1.17	.313	3.50	2.084	5.83	.393	8.17	.040	10.50	.001
00434>	1.25	.485	3.58	2.013	5.92	.364	8.25	.036	10.58	.001
00435>	1.33	.676	3.67	1.939	6.00	.338	8.33	.033	10.67	.001
00436>	1.42	.876	3.75	1.862	6.08	.313	8.42	.031	10.75	.001
00437>	1.50	1.077	3.83	1.783	6.17	.290	8.50	.028	10.83	.001
00438>	1.58	1.273	3.92	1.704	6.25	.268	8.58	.026	10.92	.001
00439>	1.67	1.458	4.00	1.624	6.33	.248	8.67	.024	11.00	.000
00440>	1.75	1.630	4.08	1.545	6.42	.230	8.75	.022	11.08	.000
00441>	1.83	1.787	4.17	1.467	6.50	.212	8.83	.020	11.17	.000
00442>	1.92	1.926	4.25	1.390	6.58	.196	8.92	.018	11.25	.000
00443>	2.00	2.049	4.33	1.315	6.67	.181	9.00	.016	11.33	.000
00444>	2.08	2.153	4.42	1.242	6.75	.167	9.08	.014	11.42	.000
00445>	2.17	2.241	4.50	1.171	6.83	.154	9.17	.013	11.50	.000
00446>	2.25	2.312	4.58	1.102	6.92	.142	9.25	.012		

00447> ----------
00448> 001:0016----------
00449> FINISH
00450> ----------
00451> **********
00452> WARNINGS / ERRORS / NOTES
00453> ----------
00454> Simulation ended on 2005-04-04 at 10:09:19

```
00456> ==========================================================================
00457>
00458>
```

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1: 25 yr SWMHYMO

```
0001> ================================================================================
 002>
 003>  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO         999     999  =========
0004>  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9   9   9
0005>  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9   9   9 Ver. 4.02
 006>      S  W W   M   M  H   H    Y    M   M  O   O       9999    9999 July 1999
 007>  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9       9 =========
0008>                                                      9   9   9   9 # 3824306
0009>       StormWater Management HYdrologic Model          999     999  =========
 010>
 011>  ********************************************************************************
0012>  ************************** SWMHYMO-99 Ver/4.02 ***************************
0013>  *******  A single event and continuous hydrologic simulation model  *******
 014>  *******     based on the principles of HYMO and its successors       *******
 015>  *******                  OTTHYMO-83 and OTTHYMO-89.                  *******
0016>  ********************************************************************************
0017>  ******* Distributed by:  J.F. Sabourin and Associates Inc.           *******
 018>  *******                  Ottawa,  Ontario: (613) 727-5199            *******
 019>  *******                  Gatineau, Quebec: (819) 243-6858            *******
0020>  *******                  E-Mail: swmhymo@jfsa.Com                    *******
0021>  ********************************************************************************
 022>
 023>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
0024>  +++++++ Licensed user: Stantec Consulting Ltd. 604                    +++++++
0025>  +++++++                 Ottawa                SERIAL#:3824306        +++++++
 026>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 027>
0028>  ********************************************************************************
0029>  *******           ++++++ PROGRAM ARRAY DIMENSIONS ++++++              *******
 030>  *******           Maximum value for ID numbers  :     10              *******
 031>  *******           Max. number of rainfall points:  15000              *******
0032>  *******           Max. number of flow points    :  15000              *******
0033>  ********************************************************************************
 034>
 035>
0036>  ********************   D E T A I L E D   O U T P U T   ********************
0037>  ********************************************************************************
 038>  *       DATE: 2005-05-04      TIME: 10:10:29      RUN COUNTER: 000190       *
 039>  ********************************************************************************
0040>  * Input   filename: W:\active\60400144\design\analysis\SWMAPR~1\144pre0.da*
0041>  * Output  filename: W:\active\60400144\design\analysis\SWMAPR~1\144pre0.ou*
 042>  * Summary filename: W:\active\60400144\design\analysis\SWMAPR~1\144pre0.su*
 043>  * User comments:                                                          *
0044>  * 1: _____________________________________________________________________*
0045>  * 2: _____________________________________________________________________*
 046>  * 3: _____________________________________________________________________*
 047>  ********************************************************************************
0048>
0049> --------------------------------------------------------------------------------
 050> 001:0001-------------------------------------------------------------------------
 051> *#*****************************************************************************
0052> *#  Project Name: [Emerald Creek]    Project Number: [604-00144]
0053> *#  Date         : 06-18-2004
 054> *#  Modeller     : [MAF]
 055> *#  Company      : McNeely Engineering Consultants Limited
0056> *#  License #    :  5695479
0057> *#*****************************************************************************
 058> --------------------
 059> | START            |  Project  dir.: W:\active\60400144\design\analysis\SWMAPR~1
0060> --------------------  Rainfall dir.: W:\active\60400144\design\analysis\SWMAPR~1
0061>     TZERO =    .00 hrs on        0
 062>     METOUT=    2 (output = METRIC)
 063>     NRUN  = 001
 064>     NSTORM=    0
0065> --------------------------------------------------------------------------------
```

```
00066> 001:0002--------------------------------------------------------------------------------
00067> *# EXISTING CONDITIONS
00068> * 2-YEAR IDF CHICAGO STORM
00069> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00070> *                    ICASEcs=[2],
00071> *                    Enter ordinates of IDF curve below, at least seven ponts
00072> *                       TIME (min)    Intensity(mm/hr)
00073> *                          [5]         [102.80]
00074> *                          [10]        [77.10]
00075> *                         [15]        [63.30]
00076> *                          [30]        [39.90]
00077> *                          [60]        [24.20]
00078> *                          [120]       [14.30]
00079> *                          [360]       [6.20]
00080> *                          [720]       [3.60]
00081> *                         [1440]      [2.00]
00082> *                            -1              -1
00083> * 5-YEAR IDF CHICAGO STORM
00084> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00085> *                   ICASEcs=[2],
00086> *                    Enter ordinates of IDF curve below, at least seven points
00087> *                       TIME (min)    Intensity(mm/hr)
00088> *                          [5]         [140.20]
00089> *                          [10]        [104.40]
00090> *                          [15]        [85.60]
00091> *                          [30]        [53.90]
00092> *                          [60]        [32.00]
00093> *                          [120]       [18.90]
00094> *                          [360]       [8.40]
00095> *                          [720]       [4.80]
00096> *                          [1440]      [2.60]
00097> *                            -1              -1
00098> * 10-YEAR IDF CHICAGO STORM
00099> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00100> *                    ICASEcs=[2],
00101> *                   Enter ordinates of IDF curve below, at least seven points
00102> *                       TIME (min)    Intensity(mm/hr)
00103> *                          [5]         [165.00]
00104> *                          [10]        [122.50]
00105> *                          [15]        [100.40]
00106> *                          [30]        [63.10]
00107> *                         [60]        [37.10]
00108> *                         [120]       [22.00]
00109> *                          [360]       [9.90]
00110> *                          [720]       [5.60]
00111> *                          [1440]      [3.00]
00112> *                            -1              -1
00113> *# 25-YEAR IDF CHICAGO STORM
00114> --------------------
00115> | CHICAGO STORM    |     IDF curve parameters: A=1402.884
00116> | Ptotal= 58.23 mm |                           B=   6.018
00117> --------------------                           C=    .819
00118>                          used in:   INTENSITY =  A / (t + B)^C
00119>
00120>                          Duration of storm   =  3.00 hrs
00121>                          Storm time step     = 10.00 min
00122>                          Time to peak ratio =   .33
00123>
00124>                       The CORRELATION coefficient is = .9997492
00125>
00126>                        TIME        ENTERED              COMPUTED
00127>                       (min)        (mm/hr)               (mm/hr)
00128>                          5.         196.00                196.58
00129>                         10.         145.30                144.69
00130>                         15.         119.10                115.83
```

```
00131>                      30.         74.70                74.51
 0132>                      60.         43.60                45.36
 0133>                     120.         25.80                26.72
00134>                     360.         11.70                11.16
00135>                     720.          6.60                 6.37
 0136>                    1440.          3.50                 3.62
 0137>
00138>          TIME    RAIN  |   TIME    RAIN  |   TIME    RAIN  |   TIME    RAIN
00139>          hrs    mm/hr  |   hrs    mm/hr  |   hrs    mm/hr  |   hrs    mm/hr
 0140>          .17    4.934  |  1.00  144.693  |  1.83    9.014  |  2.67    4.701
 0141>          .33    6.152  |  1.17   43.904  |  2.00    7.571  |  2.83    4.310
00142>          .50    8.282  |  1.33   22.224  |  2.17    6.544  |  3.00    3.983
00143>          .67   13.006  |  1.50   14.852  |  2.33    5.776  |
 0144>          .83   33.041  |  1.67   11.192  |  2.50    5.179  |
 0145>
00146> ----------------------------------------------------------------------------
00147> 001:0003-------------------------------------------------------------------
 0148> * 100-YEAR IDF CHICAGO STORM
 0149> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00150> *                   ICASEcs=[2],
00151> *                  Enter ordinates of IDF curve below, at least seven points
 0152> *                      TIME (min)     Intensity(mm/hr)
 0153> *                          [5]          [242.60]
00154> *                          [10]         [179.00]
00155> *                          [15]         [146.80]
 0156> *                          [30]         [91.90]
 0157> *                          [60]         [53.20]
00158> *                          [120]        [31.50]
00159> *                          [360]        [14.50]
 0160> *                          [720]        [8.00]
 0161> *                          [1440]       [4.30]
00162> *                            -1             -1
00163> ----------------------
 0164> | DEFAULT VALUES      |  Filename: W:\active\60400144\design\analysis\SWMAPR~1\SH
 0165> ----------------------  ICASEdv = 1 (read and print data)
00166>       FileTitle= File comment: [                ]
00167>                  THE FOLLOWING PARAMETERS ARE USED IN THE DESIGN STANDHYD COM
 0168>       Horton's infiltration equation parameters:
 0169>       [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
00170>       Parameters for PERVIOUS surfaces in STANDHYD:
00171>       [IAper=   6.20 mm] [LGP=70.00 m] [MNP= .250]
 0172>       Parameters for IMPERVIOUS surfaces in STANDHYD:
 0173>       [IAimp=   1.57 mm] [CLI=  .31]    [MNI= .013]
 0174>       Parameters used in NASHYD:
00175>       [Ia=   4.67 mm] [N= 3.00]
 0176> ----------------------------------------------------------------------------
 0177> 001:0004-------------------------------------------------------------------
 0178> *# Area A1 (see DWG SD2)
00179> ----------------------
 0180> | DESIGN NASHYD       |   Area     (ha)=   73.90   Curve Number    (CN)=60.00
 0181> | 01:A1     DT= 5.00  |   Ia       (mm)=    4.670   # of Linear Res.(N)= 3.00
 0182> ----------------------   U.H. Tp(hrs)=    1.440
00183>
 0184>       Unit Hyd Qpeak  (cms)=     1.960
 0185>
 0186>       PEAK FLOW       (cms)=      .839 (i)
0187>       TIME TO PEAK    (hrs)=     3.833
 0188>       RUNOFF VOLUME    (mm)=    12.868
 0189>       TOTAL RAINFALL   (mm)=    58.226
 0190>       RUNOFF COEFFICIENT   =      .221
00191>
 0192>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
 0193>
 0194> ----------------------------------------------------------------------------
00195> 001:0005-------------------------------------------------------------------
```

```
00196> *# Area A2
00197> ----------------------
00198> | DESIGN NASHYD       |   Area     (ha)=  120.00   Curve Number    (CN)=60.00
00199> | 02:A2     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00200> ----------------------   U.H. Tp(hrs)=   1.540
00201>
00202>      Unit Hyd Qpeak  (cms)=    2.976
00203>
00204>      PEAK FLOW       (cms)=    1.297 (i)
00205>      TIME TO PEAK    (hrs)=    3.000
00206>      RUNOFF VOLUME    (mm)=   12.868
00207>      TOTAL RAINFALL   (mm)=   58.226
00208>      RUNOFF COEFFICIENT   =     .221
00209>
00210>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00211>
00212> ---------------------------------------------------------------------------
00213> 001:0006-----------------------------------------------------------------------
00214> *# Area A3
00215> ----------------------
00216> | DESIGN NASHYD       |   Area     (ha)=    5.60   Curve Number    (CN)=60.00
00217> | 03:A3     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00218> ----------------------   U.H. Tp(hrs)=   1.050
00219>
00220>      Unit Hyd Qpeak  (cms)=     .204
00221>
00222>      PEAK FLOW       (cms)=     .080 (i)
00223>      TIME TO PEAK    (hrs)=    2.333
00224>      RUNOFF VOLUME    (mm)=   12.868
00225>      TOTAL RAINFALL   (mm)=   58.226
00226>      RUNOFF COEFFICIENT   =     .221
00227>
00228>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00229>
00230> ---------------------------------------------------------------------------
00231> 001:0007-----------------------------------------------------------------------
00232> *# Area A4
00233> ----------------------
00234> | DESIGN NASHYD       |   Area     (ha)=   14.70   Curve Number    (CN)=60.00
00235> | 04:A4     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00236> ----------------------   U.H. Tp(hrs)=   1.040
00237>
00238>      Unit Hyd Qpeak  (cms)=     .540
00239>
00240>      PEAK FLOW       (cms)=     .211 (i)
00241>      TIME TO PEAK    (hrs)=    2.333
00242>      RUNOFF VOLUME    (mm)=   12.868
00243>      TOTAL RAINFALL   (mm)=   58.226
00244>      RUNOFF COEFFICIENT   =     .221
00245>
00246>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00247>
00248> ---------------------------------------------------------------------------
00249> 001:0008-----------------------------------------------------------------------
00250> *# Area A5
00251> ----------------------
00252> | DESIGN NASHYD       |   Area     (ha)=    3.50   Curve Number    (CN)=60.00
00253> | 05:A5     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00254> ----------------------   U.H. Tp(hrs)=    .630
00255>
00256>      Unit Hyd Qpeak  (cms)=     .212
00257>
00258>      PEAK FLOW       (cms)=     .072 (i)
00259>      TIME TO PEAK    (hrs)=    1.750
00260>      RUNOFF VOLUME    (mm)=   12.868
```

```
      TOTAL RAINFALL   (mm)=   58.226
      RUNOFF COEFFICIENT   =     .221

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

---------- 001:0009 ----------
*# Area A6
----------------------
| DESIGN NASHYD      |   Area     (ha)=    4.10   Curve Number    (CN)=60.00
| 06:001006 DT= 5.00 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .630

      Unit Hyd Qpeak   (cms)=     .249

      PEAK FLOW        (cms)=     .084 (i)
      TIME TO PEAK     (hrs)=    1.750
      RUNOFF VOLUME     (mm)=   12.868
      TOTAL RAINFALL    (mm)=   58.226
      RUNOFF COEFFICIENT   =     .221

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

---------- 001:0010 ----------
*# External Flows Pre-Development
--------------------
| ADD HYD (extpre) | ID: NHYD      AREA      QPEAK    TPEAK    R.V.     DWF
--------------------                (ha)      (cms)    (hrs)    (mm)     (cms)
                  ID1 01:A1        73.90      .839     2.83   12.87     .000
                 +ID2 02:A2       120.00     1.297     3.00   12.87     .000
                 +ID3 03:A3         5.60      .080     2.33   12.87     .000
                 +ID4 04:A4        14.70      .211     2.33   12.87     .000
                 +ID5 05:A5         3.50      .072     1.75   12.87     .000
                 +ID6 06:001006     4.10      .084     1.75   12.87     .000
                  ==========================================================
                  SUM 09:extpre   221.80     2.472     2.75   12.87     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---------- 001:0011 ----------
--------------------
| SAVE HYD         |   AREA      (ha)=  221.800
| ID=09 (extpre)   |   QPEAK     (cms)=    2.472 (i)
| DT= 5.00 PCYC= 1 |   TPEAK     (hrs)=    2.750
--------------------   VOLUME      (mm)=   12.868
  Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-extpre.001
  Comments: Pre External Flows

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

TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms
.00	.000	2.33	2.320	4.67	1.182	7.00	.166	9.33	.014
.08	.000	2.42	2.374	4.75	1.116	7.08	.153	9.42	.013
.17	.000	2.50	2.415	4.83	1.052	7.17	.141	9.50	.011
.25	.000	2.58	2.445	4.92	.991	7.25	.131	9.58	.009
.33	.000	2.67	2.464	5.00	.932	7.33	.120	9.67	.008
.42	.000	2.75	2.472	5.08	.875	7.42	.111	9.75	.007
.50	.000	2.83	2.472	5.17	.822	7.50	.102	9.83	.006
.58	.000	2.92	2.463	5.25	.770	7.58	.094	9.92	.005
.67	.000	3.00	2.447	5.33	.722	7.67	.087	10.00	.004
.75	.001	3.08	2.424	5.42	.675	7.75	.080	10.08	.004
.83	.003	3.17	2.393	5.50	.631	7.83	.074	10.17	.003
.92	.018	3.25	2.354	5.58	.590	7.92	.068	10.25	.003

00326>	1.00	.069	3.33	2.308	5.67	.550	8.00	.062	10.33	.003
00327>	1.08	.164	3.42	2.255	5.75	.513	8.08	.057	10.42	.002
00328>	1.17	.296	3.50	2.196	5.83	.478	8.17	.053	10.50	.002
00329>	1.25	.456	3.58	2.133	5.92	.445	8.25	.048	10.58	.002
00330>	1.33	.634	3.67	2.065	6.00	.414	8.33	.044	10.67	.001
00331>	1.42	.822	3.75	1.994	6.08	.385	8.42	.041	10.75	.001
00332>	1.50	1.011	3.83	1.921	6.17	.358	8.50	.037	10.83	.001
00333>	1.58	1.197	3.92	1.846	6.25	.332	8.58	.034	10.92	.001
00334>	1.67	1.375	4.00	1.770	6.33	.308	8.67	.031	11.00	.001
00335>	1.75	1.543	4.08	1.693	6.42	.286	8.75	.029	11.08	.000
00336>	1.83	1.698	4.17	1.617	6.50	.265	8.83	.026	11.17	.000
00337>	1.92	1.838	4.25	1.541	6.58	.246	8.92	.024	11.25	.000
00338>	2.00	1.965	4.33	1.466	6.67	.227	9.00	.022	11.33	.000
00339>	2.08	2.076	4.42	1.392	6.75	.210	9.08	.019	11.42	.000
00340>	2.17	2.172	4.50	1.320	6.83	.194	9.17	.018	11.50	.000
00341>	2.25	2.253	4.58	1.250	6.92	.180	9.25	.016		

00342> ----------
00343> 001:0012----------
00344> *# Site Area
00345> ----------
00346> | DESIGN NASHYD | Area (ha)= 68.00 Curve Number (CN)=60.00
00347> | 07:site DT= 5.00 | Ia (mm)= 4.670 # of Linear Res.(N)= 3.00
00348> ---------- U.H. Tp(hrs)= 1.070
00349>
00350> Unit Hyd Qpeak (cms)= 2.427
00351>
00352> PEAK FLOW (cms)= .957 (i)
00353> TIME TO PEAK (hrs)= 2.333
00354> RUNOFF VOLUME (mm)= 12.868
00355> TOTAL RAINFALL (mm)= 58.226
00356> RUNOFF COEFFICIENT = .221
00357>
00358> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00359>
00360> ----------
00361> 001:0013----------
00362> ----------
00363> | SAVE HYD | AREA (ha)= 68.000
00364> | ID=07 (site) | QPEAK (cms)= .957 (i)
00365> | DT= 5.00 PCYC= 1 | TPEAK (hrs)= 2.333
00366> ---------- VOLUME (mm)= 12.868
00367> Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-site.001
00368> Comments: Pre Site Flows
00369>
00370> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

	TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW
00371>	hrs	cms	hrs	cms	hrs	cms	hrs	cms	hrs	cms
00372>	.00	.000	1.83	.801	3.67	.570	5.50	.080	7.33	.005
00373>	.08	.000	1.92	.850	3.75	.534	5.58	.072	7.42	.004
00374>	.17	.000	2.00	.889	3.83	.499	5.67	.064	7.50	.003
00375>	.25	.000	2.08	.919	3.92	.465	5.75	.057	7.58	.003
00376>	.33	.000	2.17	.939	4.00	.432	5.83	.051	7.67	.003
00377>	.42	.000	2.25	.952	4.08	.400	5.92	.046	7.75	.002
00378>	.50	.000	2.33	.957	4.17	.370	6.00	.041	7.83	.002
00379>	.58	.000	2.42	.955	4.25	.341	6.08	.037	7.92	.002
00380>	.67	.000	2.50	.948	4.33	.313	6.17	.033	8.00	.001
00381>	.75	.000	2.58	.937	4.42	.288	6.25	.029	8.08	.001
00382>	.83	.001	2.67	.921	4.50	.263	6.33	.026	8.17	.001
00383>	.92	.009	2.75	.901	4.58	.240	6.42	.023	8.25	.001
00384>	1.00	.036	2.83	.879	4.67	.219	6.50	.020	8.33	.001
00385>	1.08	.086	2.92	.855	4.75	.199	6.58	.018	8.42	.000
00386>	1.17	.155	3.00	.829	4.83	.181	6.67	.016	8.50	.000
00387>	1.25	.238	3.08	.802	4.92	.164	6.75	.014	8.58	.000
00388>	1.33	.328	3.17	.773	5.00	.149	6.83	.013	8.67	.000
00389>	1.42	.420	3.25	.742	5.08	.135	6.92	.011	8.75	.000

1.50	.511	3.33	.709	5.17	.122	7.00	.009	8.83	.000
1.58	.596	3.42	.675	5.25	.110	7.08	.008	8.92	.000
1.67	.673	3.50	.641	5.33	.099	7.17	.006		
1.75	.742	3.58	.605	5.42	.089	7.25	.005		

001:0014

ADD HYD (sumpre)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 09:extpre	221.80	2.472	2.75	12.87	.000
	+ID2 07:site	68.00	.957	2.33	12.87	.000
	SUM 08:sumpre	289.80	3.384	2.67	12.87	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

001:0015

SAVE HYD	AREA (ha)= 289.800
ID=08 (sumpre)	QPEAK (cms)= 3.384 (i)
DT= 5.00 PCYC= 1	TPEAK (hrs)= 2.667
	VOLUME (mm)= 12.868

Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-sumpre.001
Comments: Overall Predev Hydrograph

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

TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms
.00	.000	2.33	3.277	4.67	1.401	7.00	.175	9.33	.014
.08	.000	2.42	3.330	4.75	1.315	7.08	.161	9.42	.013
.17	.000	2.50	3.364	4.83	1.233	7.17	.148	9.50	.011
.25	.000	2.58	3.381	4.92	1.155	7.25	.136	9.58	.009
.33	.000	2.67	3.384	5.00	1.081	7.33	.125	9.67	.008
.42	.000	2.75	3.373	5.08	1.010	7.42	.115	9.75	.007
.50	.000	2.83	3.351	5.17	.943	7.50	.106	9.83	.006
.58	.000	2.92	3.318	5.25	.880	7.58	.097	9.92	.005
.67	.000	3.00	3.277	5.33	.820	7.67	.089	10.00	.004
.75	.001	3.08	3.226	5.42	.764	7.75	.082	10.08	.004
.83	.004	3.17	3.166	5.50	.711	7.83	.075	10.17	.003
.92	.027	3.25	3.096	5.58	.661	7.92	.069	10.25	.003
1.00	.105	3.33	3.017	5.67	.614	8.00	.063	10.33	.003
1.08	.250	3.42	2.930	5.75	.571	8.08	.058	10.42	.002
1.17	.451	3.50	2.837	5.83	.530	8.17	.053	10.50	.002
1.25	.694	3.58	2.738	5.92	.491	8.25	.049	10.58	.002
1.33	.962	3.67	2.635	6.00	.455	8.33	.045	10.67	.001
1.42	1.242	3.75	2.528	6.08	.422	8.42	.041	10.75	.001
1.50	1.521	3.83	2.420	6.17	.391	8.50	.038	10.83	.001
1.58	1.792	3.92	2.311	6.25	.362	8.58	.035	10.92	.001
1.67	2.048	4.00	2.202	6.33	.334	8.67	.032	11.00	.001
1.75	2.285	4.08	2.094	6.42	.309	8.75	.029	11.08	.000
1.83	2.499	4.17	1.987	6.50	.286	8.83	.027	11.17	.000
1.92	2.688	4.25	1.882	6.58	.264	8.92	.024	11.25	.000
2.00	2.854	4.33	1.779	6.67	.244	9.00	.022	11.33	.000
2.08	2.994	4.42	1.680	6.75	.225	9.08	.019	11.42	.000
2.17	3.111	4.50	1.583	6.83	.207	9.17	.018	11.50	.000
2.25	3.205	4.58	1.490	6.92	.190	9.25	.016		

001:0016

FINISH

****

WARNINGS / ERRORS / NOTES

Simulation ended on 2005-05-04 at 10:10:29

```
00456> ==========================================================================
00457>
00458>
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stantec.com

Stantec

1: 100 yr SWMHYMO

```
00001> ================================================================================
 )002>
 )003>  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO         999     999  =========
00004>  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9   9   9
00005>  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9   9   9 Ver. 4.02
 )006>      S  W W   M   M  H   H    Y    M   M  O   O       9999    9999 July 1999
 )007>  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9       9 =========
00008>                                                      9   9   9   9 # 3824306
00009>       StormWater Management HYdrologic Model          999     999  =========
 )010>
 )011>  ********************************************************************************
)0012>  ************************** SWMHYMO-99 Ver/4.02 ***************************
)0013>  *******  A single event and continuous hydrologic simulation model  *******
 0014>  *******     based on the principles of HYMO and its successors       *******
 0015>  *******                 OTTHYMO-83 and OTTHYMO-89.                   *******
)0016>  ********************************************************************************
)0017>  ******* Distributed by:  J.F. Sabourin and Associates Inc.           *******
 0018>  *******                  Ottawa,  Ontario: (613) 727-5199            *******
 0019>  *******                  Gatineau, Quebec: (819) 243-6858            *******
)0020>  *******                  E-Mail: swmhymo@jfsa.Com                    *******
)0021>  ********************************************************************************
 022>
 023>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
)0024>  +++++++ Licensed user: Stantec Consulting Ltd. 604                      +++++++
)0025>  +++++++                  Ottawa                SERIAL#:3824306        +++++++
 026>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 027>
)0028>  ********************************************************************************
)0029>  *******            ++++++ PROGRAM ARRAY DIMENSIONS ++++++              *******
 030>  *******            Maximum value for ID numbers  :     10              *******
 031>  *******            Max. number of rainfall points:  15000              *******
)0032>  *******            Max. number of flow points    :  15000              *******
)0033>  ********************************************************************************
 034>
 035>
)0036>  ********************   D E T A I L E D   O U T P U T   ********************
)0037>  ********************************************************************************
 038>  *       DATE: 2005-05-04      TIME: 10:11:43      RUN COUNTER: 000191       *
 039>  ********************************************************************************
)0040>  * Input   filename: W:\active\60400144\design\analysis\SWMAPR~1\144pre0.da*
0041>  * Output  filename: W:\active\60400144\design\analysis\SWMAPR~1\144pre0.ou*
 042>  * Summary filename: W:\active\60400144\design\analysis\SWMAPR~1\144pre0.su*
 043>  * User comments:                                                          *
)0044>  * 1:_____________________________________________________________________*
0045>  * 2:_____________________________________________________________________*
 046>  * 3:_____________________________________________________________________*
 047>  ********************************************************************************
)0048>
0049> --------------------------------------------------------------------------------
 050> 001:0001-------------------------------------------------------------------------
 051> *#*****************************************************************************
)0052> *#  Project Name: [Emerald Creek]     Project Number: [604-00144]
0053> *#  Date         : 06-18-2004
 054> *#  Modeller     : [MAF]
 055> *#  Company      : McNeely Engineering Consultants Limited
)0056> *#  License #    :  5695479
005  > *#*****************************************************************************
 058> --------------------
 059> | START            |  Project dir.: W:\active\60400144\design\analysis\SWMAPR~1
)060> --------------------  Rainfall dir.: W:\active\60400144\design\analysis\SWMAPR~1
0061>     TZERO =    .00 hrs on       0
 062>     METOUT=    2 (output = METRIC)
 063>     NRUN  = 001
 064>     NSTORM=    0
0065> --------------------------------------------------------------------------------
```

```
00066> 001:0002--------------------------------------------------------------------------
00067> *# EXISTING CONDITIONS
00068> * 2-YEAR IDF CHICAGO STORM
00069> *CHICAGO STORM        IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00070> *                     ICASEcs=[2],
00071> *                     Enter ordinates of IDF curve below, at least seven ponts
00072> *                        TIME (min)    Intensity(mm/hr)
00073> *                           [5]         [102.80]
00074> *                           [10]        [77.10]
00075> *                          [15]        [63.30]
00076> *                           [30]        [39.90]
00077> *                           [60]        [24.20]
00078> *                           [120]       [14.30]
00079> *                           [360]       [6.20]
00080> *                           [720]       [3.60]
00081> *                          [1440]      [2.00]
00082> *                            -1             -1
00083> * 5-YEAR IDF CHICAGO STORM
00084> *CHICAGO STORM        IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00085> *                    ICASEcs=[2],
00086> *                     Enter ordinates of IDF curve below, at least seven points
00087> *                        TIME (min)    Intensity(mm/hr)
00088> *                           [5]         [140.20]
00089> *                           [10]        [104.40]
00090> *                           [15]        [85.60]
00091> *                           [30]        [53.90]
00092> *                           [60]        [32.00]
00093> *                           [120]       [18.90]
00094> *                           [360]       [8.40]
00095> *                           [720]       [4.80]
00096> *                           [1440]      [2.60]
00097> *                             -1             -1
00098> * 10-YEAR IDF CHICAGO STORM
00099> *CHICAGO STORM        IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00100> *                     ICASEcs=[2],
00101> *                    Enter ordinates of IDF curve below, at least seven points
00102> *                        TIME (min)    Intensity(mm/hr)
00103> *                           [5]         [165.00]
00104> *                           [10]        [122.50]
00105> *                           [15]        [100.40]
00106> *                           [30]        [63.10]
00107> *                          [60]        [37.10]
00108> *                          [120]       [22.00]
00109> *                           [360]       [9.90]
00110> *                           [720]       [5.60]
00111> *                           [1440]      [3.00]
00112> *                             -1             -1
00113> * 25-YEAR IDF CHICAGO STORM
00114> *CHICAGO STORM        IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min)
00115> *                     ICASEcs=[2],
00116> *                     Enter ordinates of IDF curve below, at least seven points
00117> *                         TIME (min)    Intensity(mm/hr)
00118> *                           [5]         [196.00]
00119> *                           [10]        [145.30]
00120> *                           [15]        [119.10]
00121> *                           [30]        [74.70]
00122> *                           [60]        [43.60]
00123> *                           [120]       [25.80]
00124> *                           [360]       [11.70]
00125> *                           [720]       [6.60]
00126> *                           [1440]      [3.50]
00127> *                             -1             -1
00128> *# 100-YEAR IDF CHICAGO STORM
00129> --------------------
00130> | 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

The CORRELATION coefficient is = .9997117

TIME (min)	ENTERED (mm/hr)	COMPUTED (mm/hr)
5.	242.60	242.70
10.	179.00	178.56
15.	146.80	142.89
30.	91.90	91.87
60.	53.20	55.89
120.	31.50	32.89
360.	14.50	13.72
720.	8.00	7.83
1440.	4.30	4.45

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN 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: W:\active\60400144\design\analysis\SWMAPR~1\SH
ICASEdv = 1 (read and print data)

FileTitle= File comment: [ ]
THE FOLLOWING PARAMETERS ARE USED IN THE DESIGN STANDHYD COM
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= 6.20 mm] [LGP=70.00 m] [MNP= .250]
Parameters for IMPERVIOUS surfaces in STANDHYD:
[IAimp= 1.57 mm] [CLI= .31] [MNI= .013]
Parameters used in NASHYD:
[Ia= 4.67 mm] [N= 3.00]

001:0004

---

*# Area A1 (see DWG SD2)

DESIGN NASHYD 01:A1 DT= 5.00	Area (ha)= 73.90	Curve Number (CN)=60.00
	Ia (mm)= 4.670	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 1.440	

Unit Hyd Qpeak (cms)= 1.960

PEAK FLOW (cms)= 1.242 (i)
TIME TO PEAK (hrs)= 2.330
RUNOFF VOLUME (mm)= 18.992
TOTAL RAINFALL (mm)= 71.665
RUNOFF COEFFICIENT = .265

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

001:0005

```
00196> *# Area A2
00197> ----------------------
00198> | DESIGN NASHYD       |   Area     (ha)=  120.00   Curve Number    (CN)=60.00
00199> | 02:A2     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00200> ----------------------   U.H. Tp(hrs)=   1.540
00201>
00202>      Unit Hyd Qpeak  (cms)=    2.976
00203>
00204>      PEAK FLOW       (cms)=    1.919 (i)
00205>      TIME TO PEAK    (hrs)=    2.917
00206>      RUNOFF VOLUME    (mm)=   18.992
00207>      TOTAL RAINFALL   (mm)=   71.665
00208>      RUNOFF COEFFICIENT   =     .265
00209>
00210>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00211>
00212> ---------------------------------------------------------------------------
00213> 001:0006-----------------------------------------------------------------------
00214> *# Area A3
00215> ----------------------
00216> | DESIGN NASHYD       |   Area     (ha)=    5.60   Curve Number    (CN)=60.00
00217> | 03:A3     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00218> ----------------------   U.H. Tp(hrs)=   1.050
00219>
00220>      Unit Hyd Qpeak  (cms)=     .204
00221>
00222>      PEAK FLOW       (cms)=     .119 (i)
00223>      TIME TO PEAK    (hrs)=    2.333
00224>      RUNOFF VOLUME    (mm)=   18.992
00225>      TOTAL RAINFALL   (mm)=   71.665
00226>      RUNOFF COEFFICIENT   =     .265
00227>
00228>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00229>
00230> ---------------------------------------------------------------------------
00231> 001:0007-----------------------------------------------------------------------
00232> *# Area A4
00233> ----------------------
00234> | DESIGN NASHYD       |   Area     (ha)=   14.70   Curve Number    (CN)=60.00
00235> | 04:A4     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00236> ----------------------   U.H. Tp(hrs)=   1.040
00237>
00238>      Unit Hyd Qpeak  (cms)=     .540
00239>
00240>      PEAK FLOW       (cms)=     .313 (i)
00241>      TIME TO PEAK    (hrs)=    2.333
00242>      RUNOFF VOLUME    (mm)=   18.992
00243>      TOTAL RAINFALL   (mm)=   71.665
00244>      RUNOFF COEFFICIENT   =     .265
00245>
00246>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00247>
00248> ---------------------------------------------------------------------------
00249> 001:0008-----------------------------------------------------------------------
00250> *# Area A5
00251> ----------------------
00252> | DESIGN NASHYD       |   Area     (ha)=    3.50   Curve Number    (CN)=60.00
00253> | 05:A5     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00254> ----------------------   U.H. Tp(hrs)=    .630
00255>
00256>      Unit Hyd Qpeak  (cms)=     .212
00257>
00258>      PEAK FLOW       (cms)=     .107 (i)
00259>      TIME TO PEAK    (hrs)=    1.750
00260>      RUNOFF VOLUME    (mm)=   18.992
```

```
00261>      TOTAL RAINFALL   (mm)=   71.665
 262>      RUNOFF COEFFICIENT   =     .265
 263>
00264>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00265>
 266> ---------------------------------------------------------------------------
 267> 001:0009-----------------------------------------------------------------
00268> *# Area A6
00269> ----------------------
 270> | DESIGN NASHYD       |   Area    (ha)=    4.10   Curve Number    (CN)=60.00
 271> | 06:001006 DT= 5.00  |   Ia      (mm)=   4.670   # of Linear Res.(N)= 3.00
00272> ----------------------   U.H. Tp(hrs)=    .630
00273>
 274>      Unit Hyd Qpeak  (cms)=     .249
 275>
00276>      PEAK FLOW       (cms)=     .125 (i)
00277>      TIME TO PEAK    (hrs)=    1.750
 278>      RUNOFF VOLUME    (mm)=   18.992
 279>      TOTAL RAINFALL   (mm)=   71.665
00280>      RUNOFF COEFFICIENT   =     .265
00281>
 282>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
 283>
00284> ---------------------------------------------------------------------------
00285> 001:0010-----------------------------------------------------------------
 286> *# External Flows Pre-Development
 287> --------------------
00288> | ADD HYD (extpre) | ID: NHYD     AREA      QPEAK    TPEAK    R.V.     DWF
00289> --------------------                (ha)      (cms)    (hrs)    (mm)    (cms)
 290>                    ID1 01:A1        73.90     1.242    2.83   18.99     .000
 291>                   +ID2 02:A2       120.00     1.919    2.92   18.99     .000
00292>                   +ID3 03:A3         5.60      .119    2.33   18.99     .000
00293>                   +ID4 04:A4        14.70      .313    2.33   18.99     .000
 294>                   +ID5 05:A5         3.50      .107    1.75   18.99     .000
 295>                   +ID6 06:001006     4.10      .125    1.75   18.99     .000
00296>                    ==========================================================
00297>                    SUM 09:extpre   221.80     3.661    2.75   18.99     .000
 298>
 299>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00300>
00301> ---------------------------------------------------------------------------
 302> 001:0011-----------------------------------------------------------------
 303> --------------------
00304> | SAVE HYD          |   AREA      (ha)=  221.800
00305> | ID=09 (extpre)    |   QPEAK    (cms)=    3.661 (i)
 306> | DT= 5.00 PCYC= 1  |   TPEAK    (hrs)=    2.750
 307> --------------------   VOLUME      (mm)=   18.992
00308>   Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-extpre.001
00309>   Comments: Pre External Flows
 310>
 311>      (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00312>   TIME     FLOW |  TIME     FLOW |  TIME     FLOW |  TIME     FLOW |  TIME     FLOW
00313>    hrs      cms |   hrs      cms |   hrs      cms |   hrs      cms |   hrs      cms
 314>     .00     .000|   2.33    3.458|   4.67    1.721|   7.00     .241|   9.33     .021
 315>     .08     .000|   2.42    3.534|   4.75    1.625|   7.08     .222|   9.42     .019
00316>    .17     .000|   2.50    3.590|   4.83    1.531|   7.17     .205|   9.50     .016
00317>    .25     .000|   2.58    3.629|   4.92    1.442|   7.25     .189|   9.58     .013
 318>     .33     .000|   2.67    3.652|   5.00    1.356|   7.33     .174|   9.67     .011
 319>     .42     .000|   2.75    3.661|   5.08    1.274|   7.42     .161|   9.75     .010
00320>    .50     .000|   2.83    3.656|   5.17    1.195|   7.50     .148|   9.83     .008
00321>    .58     .000|   2.92    3.639|   5.25    1.120|   7.58     .136|   9.92     .007
 322>     .67     .000|   3.00    3.611|   5.33    1.049|   7.67     .126|  10.00     .006
 323>     .75     .002|   3.08    3.573|   5.42     .981|   7.75     .116|  10.08     .006
00324>    .83     .006|   3.17    3.524|   5.50     .917|   7.83     .106|  10.17     .005
00325>    .92     .032|   3.25    3.463|   5.58     .857|   7.92     .098|  10.25     .004
```

1.00	.112	3.33	3.392	5:67	.799	8.00	.090	10.33	.004
1.08	.259	3.42	3.311	5.75	.745	8.08	.083	10.42	.003
1.17	.462	3.50	3.222	5.83	.694	8.17	.076	10.50	.003
1.25	.705	3.58	3.127	5.92	.647	8.25	.070	10.58	.002
1.33	.974	3.67	3.025	6.00	.601	8.33	.064	10.67	.002
1.42	1.255	3.75	2.920	6.08	.559	8.42	.059	10.75	.002
1.50	1.538	3.83	2.811	6.17	.520	8.50	.054	10.83	.001
1.58	1.815	3.92	2.699	6.25	.482	8.58	.050	10.92	.001
1.67	2.080	4.00	2.587	6.33	.448	8.67	.046	11.00	.001
1.75	2.328	4.08	2.474	6.42	.415	8.75	.042	11.08	.001
1.83	2.556	4.17	2.361	6.50	.385	8.83	.038	11.17	.000
1.92	2.762	4.25	2.249	6.58	.356	8.92	.035	11.25	.000
2.00	2.947	4.33	2.139	6.67	.330	9.00	.032	11.33	.000
2.08	3.108	4.42	2.030	6.75	.305	9.08	.028	11.42	.000
2.17	3.246	4.50	1.925	6.83	.282	9.17	.025	11.50	.000
2.25	3.363	4.58	1.821	6.92	.260	9.25	.023		

001:0012

*# Site Area

DESIGN NASHYD	Area (ha)= 68.00	Curve Number (CN)=60.00
07:site DT= 5.00	Ia (mm)= 4.670	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 1.070	

Unit Hyd Qpeak (cms)= 2.427

PEAK FLOW (cms)= 1.421 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 18.992
TOTAL RAINFALL (mm)= 71.665
RUNOFF COEFFICIENT = .265

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

001:0013

SAVE HYD	AREA (ha)= 68.000	
ID=07 (site)	QPEAK (cms)= 1.421 (i)	
DT= 5.00 PCYC= 1	TPEAK (hrs)= 2.333	
	VOLUME (mm)= 18.992	

Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-site.001
Comments: Pre Site Flows

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

TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms
.00	.000	1.83	1.204	3.67	.828	5.50	.115	7.33	.007
.08	.000	1.92	1.274	3.75	.776	5.58	.103	7.42	.006
.17	.000	2.00	1.330	3.83	.725	5.67	.092	7.50	.005
.25	.000	2.08	1.372	3.92	.675	5.75	.083	7.58	.004
.33	.000	2.17	1.400	4.00	.626	5.83	.074	7.67	.004
.42	.000	2.25	1.416	4.08	.580	5.92	.066	7.75	.003
.50	.000	2.33	1.421	4.17	.536	6.00	.059	7.83	.003
.58	.000	2.42	1.417	4.25	.493	6.08	.053	7.92	.002
.67	.000	2.50	1.404	4.33	.453	6.17	.047	8.00	.002
.75	.001	2.58	1.384	4.42	.416	6.25	.042	8.08	.002
.83	.003	2.67	1.359	4.50	.380	6.33	.037	8.17	.001
.92	.017	2.75	1.328	4.58	.347	6.42	.033	8.25	.001
1.00	.059	2.83	1.294	4.67	.316	6.50	.029	8.33	.001
1.08	.137	2.92	1.256	4.75	.288	6.58	.026	8.42	.001
1.17	.242	3.00	1.217	4.83	.261	6.67	.023	8.50	.001
1.25	.367	3.08	1.175	4.92	.237	6.75	.021	8.58	.000
1.33	.503	3.17	1.131	5.00	.215	6.83	.018	8.67	.000
1.42	.642	3.25	1.084	5.08	.194	6.92	.015	8.75	.000

0391>	1.50	.776	3.33	1.035	5.17	.175	7.00	.013	8.83	.000
392>	1.58	.902	3.42	.984	5.25	.158	7.08	.011	8.92	.000
393>	1.67	1.017	3.50	.933	5.33	.142	7.17	.009		
0394>	1.75	1.118	3.58	.880	5.42	.128	7.25	.008		

0395> ----------
396> 001:0014----------
397> ----------

0398>	ADD HYD (sumpre)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
0399>	----------						
400>		ID1 09:extpre	221.80	3.661	2.75	18.99	.000
401>		+ID2 07:site	68.00	1.421	2.33	18.99	.000
0402>		==========	==========	==========	==========	==========	==========
0403>		SUM 08:sumpre	289.80	5.014	2.58	18.99	.000

404>
405> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
0406>
0407> ----------
408> 001:0015----------
409> ----------

0410>	SAVE HYD	AREA (ha)= 289.800
0411>	ID=08 (sumpre)	QPEAK (cms)= 5.014 (i)
412>	DT= 5.00 PCYC= 1	TPEAK (hrs)= 2.583
413>	----------	VOLUME (mm)= 18.992

0414> Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-sumpre.001
0415> Comments: Overall Predev Hydrograph
416>
417> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

0418> TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW
0419> hrs	cms	hrs	cms	hrs	cms	hrs	cms	hrs	cms
420> .00	.000	2.33	4.879	4.67	2.038	7.00	.253	9.33	.021
421> .08	.000	2.42	4.950	4.75	1.913	7.08	.233	9.42	.019
0422> .17	.000	2.50	4.994	4.83	1.793	7.17	.214	9.50	.016
0423> .25	.000	2.58	5.014	4.92	1.679	7.25	.197	9.58	.013
424> .33	.000	2.67	5.011	5.00	1.570	7.33	.181	9.67	.011
425> .42	.000	2.75	4.989	5.08	1.468	7.42	.166	9.75	.010
0426> .50	.000	2.83	4.949	5.17	1.370	7.50	.153	9.83	.008
0427> .58	.000	2.92	4.895	5.25	1.278	7.58	.141	9.92	.007
428> .67	.000	3.00	4.828	5.33	1.191	7.67	.129	10.00	.006
429> .75	.002	3.08	4.748	5.42	1.109	7.75	.119	10.08	.006
0430> .83	.010	3.17	4.654	5.50	1.032	7.83	.109	10.17	.005
0431> .92	.048	3.25	4.547	5.58	.960	7.92	.100	10.25	.004
432> 1.00	.171	3.33	4.427	5.67	.892	8.00	.092	10.33	.004
433> 1.08	.396	3.42	4.296	5.75	.828	8.08	.084	10.42	.003
0434> 1.17	.704	3.50	4.155	5.83	.768	8.17	.077	10.50	.003
0435> 1.25	1.073	3.58	4.007	5.92	.713	8.25	.071	10.58	.002
436> 1.33	1.477	3.67	3.853	6.00	.661	8.33	.065	10.67	.002
437> 1.42	1.897	3.75	3.696	6.08	.612	8.42	.060	10.75	.002
0438> 1.50	2.315	3.83	3.535	6.17	.566	8.50	.055	10.83	.001
0439> 1.58	2.718	3.92	3.374	6.25	.524	8.58	.050	10.92	.001
0440> 1.67	3.097	4.00	3.213	6.33	.485	8.67	.046	11.00	.001
441> 1.75	3.445	4.08	3.054	6.42	.448	8.75	.042	11.08	.001
0442> 1.83	3.759	4.17	2.896	6.50	.414	8.83	.038	11.17	.000
0443> 1.92	4.037	4.25	2.742	6.58	.382	8.92	.035	11.25	.000
0444> 2.00	4.277	4.33	2.592	6.67	.353	9.00	.032	11.33	.000
445> 2.08	4.479	4.42	2.446	6.75	.326	9.08	.028	11.42	.000
0446> 2.17	4.646	4.50	2.305	6.83	.300	9.17	.025	11.50	.000
0447> 2.25	4.779	4.58	2.169	6.92	.276	9.25	.023		

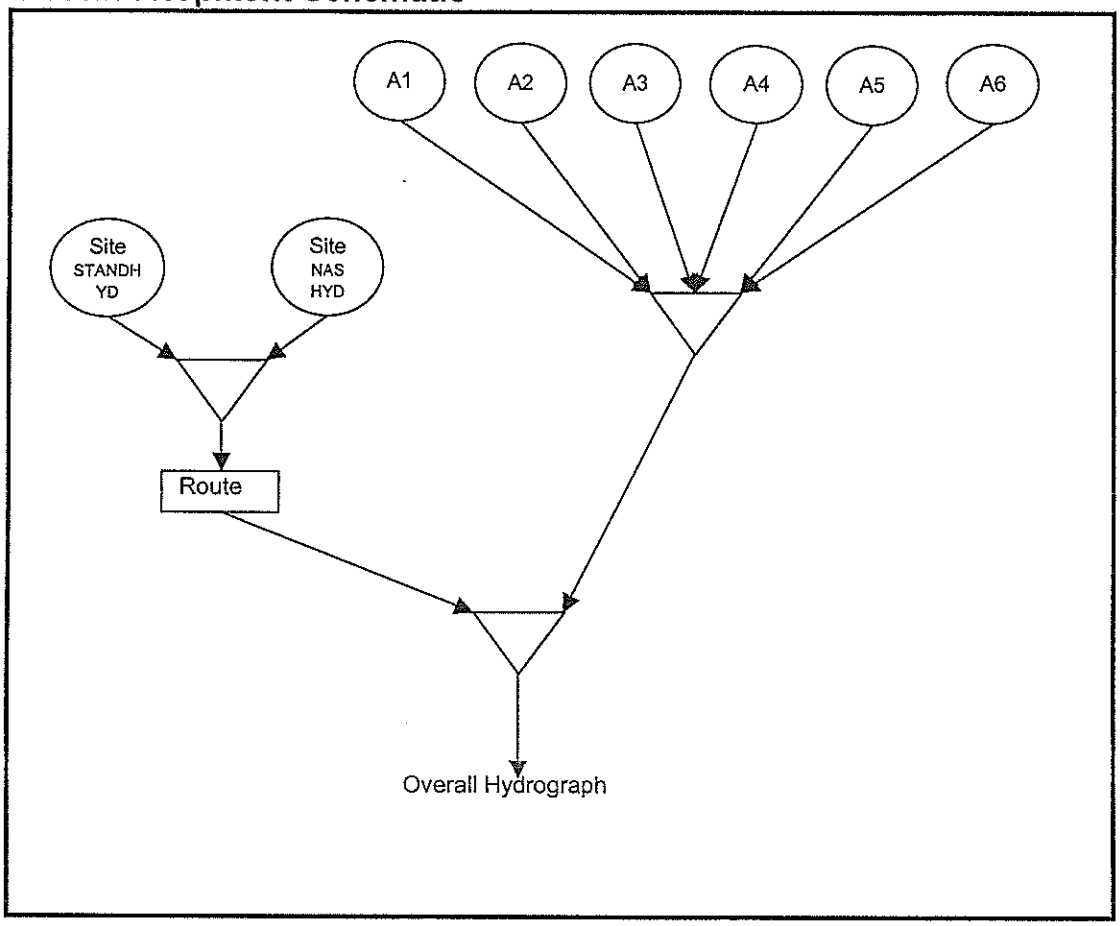
0448> ----------
449> 001:0016----------
0450> FINISH
0451> ----------
0452> **********
1453> WARNINGS / ERRORS / NOTES
0454> ----------
0455> Simulation ended on 2005-05-04 at 10:11:43

```
00456> ================================================================================
00457>
00458>
```

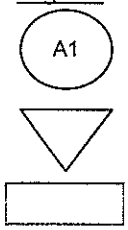
Appendix D
Postdevelopment Calculations

Job # 1604-00144
Project Emerald Creek Estates SWM Schematic
Date 23-Jun-05

Postdevelopment Schematic



Legend:



Generate Hydrograph for Area A1

Add Hydrographs

Route Hydrograph (open channel)

```
00001> 2     Metric units
 0002> *#*************************************************************************
 0003> *#  Project Name: [Emerald Creek]    Project Number: [604-00144]
00004> *#  Date         : 06-18-2004
00005> *#  Modeller     : [MAF]
 0006> *#  Company      : McNeely Engineering Consultants Limited
 0007> *#  License #    :  5695479
00008> *#*************************************************************************
00009> START                TZERO=[0.0],  METOUT=[2],  NSTORM=[0],  NRUN=[0]
 0010> *%                    [] <--storm filename, one per line for NSTORM time
 0011> *%-----------------|-------------------------------------------------------|
00012> *# 2-YEAR IDF CHICAGO STORM
00013> CHICAGO STORM        IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
  014>                      ICASEcs=[2],
  015>                      Enter ordinates of IDF curve below, at least seven points
 0016>                         TIME (min)     Intensity(mm/hr)
 0017>                            [5]         [102.80]
  018>                            [10]        [77.10]
  019>                            [15]        [63.30]
 0020>                            [30]        [39.90]
 0021>                            [60]        [24.20]
  022>                            [120]       [14.30]
  023>                            [360]       [6.20]
 0024>                            [720]       [3.60]
 0025>                            [1440]      [2.00]
  026>                             -1              -1
  027> *%-----------------|-------------------------------------------------------|
 0028> * 5-YEAR IDF CHICAGO STORM
 0029> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
  030> *                    ICASEcs=[2],
  031> *                    Enter ordinates of IDF curve below, at least seven points
 0032> *                       TIME (min)     Intensity(mm/hr)
 0033> *                          [5]         [140.20]
  034> *                          [10]        [104.40]
  035> *                          [15]        [85.60]
 0036> *                          [30]        [53.90]
 0037> *                          [60]        [32.00]
  038> *                          [120]       [18.90]
  039> *                          [360]       [8.40]
 0040> *                          [720]       [4.80]
 0041> *                          [1440]      [2.60]
  042> *                           -1              -1
  043> *%-----------------|-------------------------------------------------------|
 0044> * 10-YEAR IDF CHICAGO STORM
 0045> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
  046> *                    ICASEcs=[2],
  047> *                    Enter ordinates of IDF curve below, at least seven points
 0048> *                       TIME (min)     Intensity(mm/hr)
 0049> *                          [5]         [165.00]
  050> *                          [10]        [122.50]
  051> *                          [15]        [100.40]
 0052> *                          [30]        [63.10]
 0053> *                          [60]        [37.10]
  054> *                          [120]       [22.00]
  055> *                          [360]       [9.90]
 0056> *                          [720]       [5.60]
 0057> *                          [1440]      [3.00]
  058> *                           -1              -1
  059> *%-----------------|-------------------------------------------------------|
 0060> * 25-YEAR IDF CHICAGO STORM
 0061> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min)
  062> *                    ICASEcs=[2],
  063> *                    Enter ordinates of IDF curve below, at least seven points
  064> *                       TIME (min)     Intensity(mm/hr)
 0065> *                          [5]         [196.00]
```

```
00066> *                          [10]        [145.30]
00067> *                          [15]        [119.10]
00068> *                          [30]        [74.70]
00069> *                          [60]        [43.60]
00070> *                          [120]       [25.80]
00071> *                          [360]       [11.70]
00072> *                          [720]       [6.60]
00073> *                          [1440]      [3.50]
00074> *                            -1            -1
00075> *%-----------------|-------------------------------------------------------|
00076> * 100-YEAR IDF CHICAGO STORM
00077> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00078> *                   ICASEcs=[2],
00079> *                  Enter ordinates of IDF curve below, at least seven points
00080> *                    TIME (min)    Intensity(mm/hr)
00081> *                        [5]         [242.60]
00082> *                        [10]        [179.00]
00083> *                        [15]        [146.80]
00084> *                        [30]        [91.90]
00085> *                        [60]        [53.20]
00086> *                        [120]       [31.50]
00087> *                        [360]       [14.50]
00088> *                        [720]       [8.00]
00089> *                        [1440]      [4.30]
00090> *                          -1            -1
00091> *%-----------------|-------------------------------------------------------|
00092> DEFAULT VALUES      ICASEdef=[1],  read and print values
00093>                     DEFVAL_FILENAME=["SHIELDS2.VAL"]
00094> *%-----------------|-------------------------------------------------------|
00095> *# Area A1 (see DWG SD2)
00096> DESIGN NASHYD       ID=[1], NHYD=["A1"], DT=[5]min, AREA=[73.9](ha),
00097>                     DWF=[0](cms), CN/C=[60], TP=[1.44]hrs,
00098>                     RAINFALL=[ ,  ,  ,  ,  ](mm/hr), END=-1
00099> *%-----------------|-------------------------------------------------------|
00100> *# Area A2
00101> DESIGN NASHYD       ID=[2], NHYD=["A2"], DT=[5]min, AREA=[120](ha),
00102>                     DWF=[0](cms), CN/C=[60], TP=[1.54]hrs,
00103>                     RAINFALL=[ ,  ,  ,  ,  ](mm/hr), END=-1
00104> *%-----------------|-------------------------------------------------------|
00105> *# Area A3
00106> DESIGN NASHYD       ID=[3], NHYD=["A3"], DT=[5]min, AREA=[5.6](ha),
00107>                     DWF=[0](cms), CN/C=[60], TP=[1.05]hrs,
00108>                     RAINFALL=[ ,  ,  ,  ,  ](mm/hr), END=-1
00109> *%-----------------|-------------------------------------------------------|
00110> *# Area A4
00111> DESIGN NASHYD       ID=[4], NHYD=["A4"], DT=[5]min, AREA=[14.7](ha),
00112>                     DWF=[0](cms), CN/C=[60], TP=[1.04]hrs,
00113>                     RAINFALL=[ ,  ,  ,  ,  ](mm/hr), END=-1
00114> *%-----------------|-------------------------------------------------------|
00115> *# Area A5
00116> DESIGN NASHYD       ID=[5], NHYD=["A5"], DT=[5]min, AREA=[3.5](ha),
00117>                     DWF=[0](cms), CN/C=[60], TP=[0.63]hrs,
00118>                     RAINFALL=[ ,  ,  ,  ,  ](mm/hr), END=-1
00119> *%-----------------|-------------------------------------------------------|
00120> *# Area A6
00121> DESIGN NASHYD       ID=[6], NHYD=["A6"], DT=[5.0]min, AREA=[4.1](ha),
00122>                     DWF=[0](cms), CN/C=[60], TP=[0.63]hrs,
00123>                     RAINFALL=[ ,  ,  ,  ,  ](mm/hr), END=-1
00124> *%-----------------|-------------------------------------------------------|
00125> *# External Flows Pre-Development
00126> ADD HYD             IDsum=[9], NHYD=["extpre"], IDs to add=[1 2 3 4 5 6]
00127> *%-----------------|-------------------------------------------------------|
00128> SAVE HYD            ID=[9],   # OF PCYCLES=[1],  ICASEsh=[1]
00129>                     HYD_COMMENT=["Post External Flows"]
00130> *%-----------------|-------------------------------------------------------|
```

```
00131> *# Site Area
 0132> DESIGN NASHYD        ID=[1], NHYD=["siteR"], DT=[5]min, AREA=[48.1](ha),
 0133>                      DWF=[0](cms), CN/C=[60], TP=[1.07]hrs,
00134>                      RAINFALL=[ ,  ,  ,  , ](mm/hr), END=-1
00135> *%-----------------|-------------------------------------------------------|
 0136> DESIGN STANDHYD     ID=[2], NHYD=["siteU"], DT=[2]min, AREA=[19.9](ha),
 0137>                      XIMP=[0.08], TIMP=[0.25], DWF=[0](cms),  LOSS=[2], CN =[60]
00138>                      SLOPE=[0.5](%), RAINFALL=[ , , , , ](mm/hr), END=-1
00139> *%-----------------|-------------------------------------------------------|
 0140> ADD HYD             IDsum=[3], NHYD=["site"], IDs to add=[1 2]
 0141> *%-----------------|-------------------------------------------------------|
00142> ROUTE CHANNEL       IDout=[4], NHYD=["rtsit1"], IDin=[3],
00143>                      RDT=[2](min),
  144>                      CHLGTH=[1400](m),  CHSLOPE=[0.5](%),
  145>                                          FPSLOPE=[0.5](%),
00146>                    SECNUM=[1],       NSEG=[1]
00147>                    ( SEGROUGH, SEGDIST (m))=[-0.035, 12] NSEG times
  148>                    ( DISTANCE (m), ELEVATION (m))=[0, 2]
  149>                                                   [6, 0]
00150>                                                    [12, 2]
00151> *%-----------------|-------------------------------------------------------|
  152> ROUTE CHANNEL       IDout=[5], NHYD=["rtsit2"], IDin=[4],
  153>                      RDT=[2](min),
00154>                      CHLGTH=[475](m),  CHSLOPE=[0.36](%),
00155>                                          FPSLOPE=[0.36](%),
 0156>                      SECNUM=[1],       NSEG=[1]
 0157>                      ( SEGROUGH, SEGDIST (m))=[-0.035, 15] NSEG times
00158>                      ( DISTANCE (m), ELEVATION (m))=[0, 2]
00159>                                                     [6, 0]
  160>                                                     [9, 0]
  161>                                                     [15,2]
00162> *%-----------------|-------------------------------------------------------|
00163> SAVE HYD            ID=[5],   # OF PCYCLES=[1],  ICASEsh=[1]
  164>                      HYD_COMMENT=["Post Site Flows"]
  165> *%-----------------|-------------------------------------------------------|
00166> ADD HYD             IDsum=[8], NHYD=["sumpst"], IDs to add=[9 5]
00167> *%-----------------|-------------------------------------------------------|
  168> SAVE HYD            ID=[8],   # OF PCYCLES=[1],  ICASEsh=[1]
  169>                      HYD_COMMENT=["Overall Postdev Hydrograph"]
00170> *%-----------------|-------------------------------------------------------|
00171>
  172> FINISH
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1: 2 yr SWMHYMO

```
 ==========================================================================
 
 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 # 3824306
      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: Stantec Consulting Ltd. 604                   +++++++
 +++++++                Ottawa              SERIAL#:3824306          +++++++
 +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ***************************************************************************
 *******          ++++++ 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: 2005-05-04     TIME: 10:20:58     RUN COUNTER: 000192       *
 ***************************************************************************
 * Input   filename: W:\active\60400144\design\analysis\SWMAPR~1\144post2.d*
 * Output  filename: W:\active\60400144\design\analysis\SWMAPR~1\144post2.o*
 * Summary filename: W:\active\60400144\design\analysis\SWMAPR~1\144post2.s*
 * User comments:                                                          *
 * 1: _____________________________________________________________________*
 * 2: _____________________________________________________________________*
 * 3: _____________________________________________________________________*
 ***************************************************************************

 ---------------------------------------------------------------------------
 001:0001---------------------------------------------------------------------
 *#*************************************************************************
 *#  Project Name: [Emerald Creek]    Project Number: [604-00144]
 *#  Date         : 06-18-2004
 *#  Modeller     : [MAF]
 *#  Company      : McNeely Engineering Consultants Limited
 *#  License #    :  5695479
 *#*************************************************************************
 --------------------
 | START            |  Project dir.: W:\active\60400144\design\analysis\SWMAPR~1
 -------------------- Rainfall dir.: W:\active\60400144\design\analysis\SWMAPR~1
     TZERO =   .00 hrs on        0
     METOUT=   2 (output = METRIC)
     NRUN  = 001
     NSTORM=   0
 ---------------------------------------------------------------------------
```

```
00066> 001:0002--------------------------------------------------------------------------------
00067> *# 2-YEAR IDF CHICAGO STORM
00068> ---------------------
00069> | CHICAGO STORM     |     IDF curve parameters: A= 732.951
00070> | Ptotal= 31.86 mm  |                           B=   6.199
00071> ---------------------                          C=    .810
00072>                           used in:   INTENSITY =  A / (t + B)^C
00073>
00074>                           Duration of storm   =  3.00 hrs
00075>                           Storm time step     = 10.00 min
00076>                           Time to peak ratio  =   .33
00077>
00078>                       The CORRELATION coefficient is = .9999453
00079>
00080>                        TIME        ENTERED              COMPUTED
00081>                       (min)        (mm/hr)              (mm/hr)
00082>                          5.         102.80               103.57
00083>                         10.          77.10                76.81
00084>                         15.          63.30                61.77
00085>                         30.          39.90                40.04
00086>                         60.          24.20                24.56
00087>                        120.          14.30                14.56
00088>                        360.           6.20                 6.14
00089>                        720.           3.60                 3.53
00090>                       1440.           2.00                 2.02
00091>
00092>                TIME    RAIN  |   TIME    RAIN  |   TIME    RAIN  |   TIME    RAIN
00093>                 hrs   mm/hr  |    hrs   mm/hr  |    hrs   mm/hr  |    hrs   mm/hr
00094>                 .17   2.815  |   1.00  76.805  |   1.83   5.095  |   2.67   2.684
00095>                 .33   3.498  |   1.17  24.079  |   2.00   4.291  |   2.83   2.463
00096>                 .50   4.687  |   1.33  12.364  |   2.17   3.718  |   3.00   2.279
00097>                 .67   7.305  |   1.50   8.324  |   2.33   3.288  |
00098>                 .83  18.209  |   1.67   6.303  |   2.50   2.953  |
00099>
00100> --------------------------------------------------------------------------------
00101> 001:0003--------------------------------------------------------------------------------
00102> * 5-YEAR IDF CHICAGO STORM
00103> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00104> *                   ICASEcs=[2],
00105> *                   Enter ordinates of IDF curve below, at least seven points
00106> *                       TIME (min)    Intensity(mm/hr)
00107> *                          [5]         [140.20]
00108> *                          [10]        [104.40]
00109> *                          [15]        [85.60]
00110> *                          [30]        [53.90]
00111> *                          [60]        [32.00]
00112> *                          [120]       [18.90]
00113> *                          [360]       [8.40]
00114> *                          [720]       [4.80]
00115> *                          [1440]      [2.60]
00116> *                            -1           -1
00117> * 10-YEAR IDF CHICAGO STORM
00118> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00119> *                   ICASEcs=[2],
00120> *                   Enter ordinates of IDF curve below, at least seven points
00121> *                       TIME (min)    Intensity(mm/hr)
00122> *                          [5]         [165.00]
00123> *                          [10]        [122.50]
00124> *                          [15]        [100.40]
00125> *                          [30]        [63.10]
00126> *                          [60]        [37.10]
00127> *                          [120]       [22.00]
00128> *                          [360]       [9.90]
00129> *                          [720]       [5.60]
00130> *                          [1440]      [3.00]
```

```
0131> *                                -1              -1
 132> * 25-YEAR IDF CHICAGO STORM
 133> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min)
0134> *                    ICASEcs=[2],
0135> *                    Enter ordinates of IDF curve below, at least seven points
 136> *                        TIME (min)    Intensity(mm/hr)
 137> *                          [5]         [196.00]
0138> *                          [10]        [145.30]
0139> *                          [15]        [119.10]
 140> *                          [30]        [74.70]
 141> *                          [60]        [43.60]
0142> *                          [120]       [25.80]
0143> *                          [360]       [11.70]
 144> *                          [720]       [6.60]
 145> *                          [1440]      [3.50]
0146> *                            -1              -1
0147> * 100-YEAR IDF CHICAGO STORM
 148> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
 149> *                   ICASEcs=[2],
0150> *                   Enter ordinates of IDF curve below, at least seven points
0151> *                     TIME (min)    Intensity(mm/hr)
 152> *                         [5]         [242.60]
 153> *                          [10]        [179.00]
0154> *                          [15]        [146.80]
0155> *                          [30]        [91.90]
 156> *                          [60]        [53.20]
 157> *                          [120]       [31.50]
0158> *                          [360]       [14.50]
0159> *                          [720]       [8.00]
 160> *                          [1440]      [4.30]
 161> *                            -1              -1
0162> ----------------------
0163> | DEFAULT VALUES     |  Filename: W:\active\60400144\design\analysis\SWMAPR~1\SH
 164> ----------------------  ICASEdv = 1 (read and print data)
 165>       FileTitle= File comment: [                ]
0166>                  THE FOLLOWING PARAMETERS ARE USED IN THE DESIGN STANDHYD COM
0167>       Horton's infiltration equation parameters:
 168>       [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
 169>       Parameters for PERVIOUS surfaces in STANDHYD:
0170>       [IAper=   6.20 mm] [LGP=70.00 m] [MNP= .250]
0171>       Parameters for IMPERVIOUS surfaces in STANDHYD:
 172>       [IAimp=   1.57 mm] [CLI=  .31]    [MNI= .013]
 173>       Parameters used in NASHYD:
0174>       [Ia=   4.67 mm] [N= 3.00]
0175> ------------------------------------------------------------------------------
 176> 001:0004-------------------------------------------------------------------------
 177> *# Area A1 (see DWG SD2)
0178> ----------------------
0179> | DESIGN NASHYD       |   Area     (ha)=   73.90   Curve Number    (CN)=60.00
 180> | 01:A1     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
 181> ----------------------   U.H. Tp(hrs)=   1.440
0182>
0183>      Unit Hyd Qpeak  (cms)=    1.960
 184>
 185>      PEAK FLOW       (cms)=     .243 (i)
0186>      TIME TO PEAK    (hrs)=    3.000
0187>      RUNOFF VOLUME    (mm)=    3.762
 188>      TOTAL RAINFALL   (mm)=   31.860
 189>      RUNOFF COEFFICIENT   =     .118
0190>
0191>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
 192>
 193> ------------------------------------------------------------------------------
0194> 001:0005-------------------------------------------------------------------------
0195> *# Area A2
```

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00196> ----------------------
00197> | DESIGN NASHYD       |   Area     (ha)=  120.00   Curve Number    (CN)=60.00
00198> | 02:A2     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00199> ----------------------   U.H. Tp(hrs)=   1.540
00200>
00201>      Unit Hyd Qpeak  (cms)=    2.976
00202>
00203>      PEAK FLOW       (cms)=     .376 (i)
00204>      TIME TO PEAK    (hrs)=    3.083
00205>      RUNOFF VOLUME    (mm)=    3.762
00206>      TOTAL RAINFALL   (mm)=   31.860
00207>      RUNOFF COEFFICIENT   =     .118
00208>
00209>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00210>
00211> ---------------------------------------------------------------------------
00212> 001:0006-----------------------------------------------------------------
00213> *# Area A3
00214> ----------------------
00215> | DESIGN NASHYD       |   Area     (ha)=    5.60   Curve Number    (CN)=60.00
00216> | 03:A3     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00217> ----------------------   U.H. Tp(hrs)=   1.050
00218>
00219>      Unit Hyd Qpeak  (cms)=     .204
00220>
00221>      PEAK FLOW       (cms)=     .023 (i)
00222>      TIME TO PEAK    (hrs)=    2.417
00223>      RUNOFF VOLUME    (mm)=    3.762
00224>      TOTAL RAINFALL   (mm)=   31.860
00225>      RUNOFF COEFFICIENT   =     .118
00226>
00227>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00228>
00229> ---------------------------------------------------------------------------
00230> 001:0007-----------------------------------------------------------------
00231> *# Area A4
00232> ----------------------
00233> | DESIGN NASHYD       |   Area     (ha)=   14.70   Curve Number    (CN)=60.00
00234> | 04:A4     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00235> ----------------------   U.H. Tp(hrs)=   1.040
00236>
00237>      Unit Hyd Qpeak  (cms)=     .540
00238>
00239>      PEAK FLOW       (cms)=     .060 (i)
00240>      TIME TO PEAK    (hrs)=    2.417
00241>      RUNOFF VOLUME    (mm)=    3.762
00242>      TOTAL RAINFALL   (mm)=   31.860
00243>      RUNOFF COEFFICIENT   =     .118
00244>
00245>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00246>
00247> ---------------------------------------------------------------------------
00248> 001:0008-----------------------------------------------------------------
00249> *# Area A5
00250> ----------------------
00251> | DESIGN NASHYD       |   Area     (ha)=    3.50   Curve Number    (CN)=60.00
00252> | 05:A5     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00253> ----------------------   U.H. Tp(hrs)=    .630
00254>
00255>      Unit Hyd Qpeak  (cms)=     .212
00256>
00257>      PEAK FLOW       (cms)=     .020 (i)
00258>      TIME TO PEAK    (hrs)=    1.833
00259>      RUNOFF VOLUME    (mm)=    3.762
00260>      TOTAL RAINFALL   (mm)=   31.860
```

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00261>      RUNOFF COEFFICIENT    =      .118
  262>
  263>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00264>
00265> ---------------------------------------------------------------------------
  266> 001:0009-----------------------------------------------------------------
  267> *# Area A6
00268> ----------------------
00269> | DESIGN NASHYD       |   Area     (ha)=    4.10   Curve Number    (CN)=60.00
  270> | 06:A6     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
  271> ----------------------   U.H. Tp(hrs)=     .630
00272>
00273>      Unit Hyd Qpeak  (cms)=     .249
  274>
  275>      PEAK FLOW       (cms)=     .023 (i)
00276>      TIME TO PEAK    (hrs)=    1.833
00277>      RUNOFF VOLUME    (mm)=    3.762
  278>      TOTAL RAINFALL   (mm)=   31.860
  279>      RUNOFF COEFFICIENT   =     .118
00280>
00281>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
  282>
  283> ---------------------------------------------------------------------------
00284> 001:0010-----------------------------------------------------------------
00285> *# External Flows Pre-Development
  286> --------------------
  287> | ADD HYD (extpre) | ID: NHYD     AREA     QPEAK   TPEAK   R.V.     DWF
00288> --------------------              (ha)     (cms)   (hrs)   (mm)    (cms)
00289>                    ID1 01:A1      73.90     .243    3.00   3.76    .000
  290>                   +ID2 02:A2     120.00     .376    3.08   3.76    .000
  291>                   +ID3 03:A3       5.60     .023    2.42   3.76    .000
00292>                   +ID4 04:A4      14.70     .060    2.42   3.76    .000
00293>                   +ID5 05:A5       3.50     .020    1.83   3.76    .000
  294>                   +ID6 06:A6       4.10     .023    1.83   3.76    .000
  295>                    ================================================
00296>                    SUM 09:extpre  221.80     .716    2.92   3.76    .000
00297>
  298>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
  299>
00300> ---------------------------------------------------------------------------
00301> 001:0011-----------------------------------------------------------------
  302> --------------------
  303> | SAVE HYD          |   AREA      (ha)=  221.800
00304> | ID=09 (extpre)    |   QPEAK     (cms)=     .716 (i)
00305> | DT= 5.00 PCYC= 1  |   TPEAK     (hrs)=    2.917
  306> --------------------   VOLUME      (mm)=    3.762
  307>   Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-extpre.001
00308>   Comments: Post External Flows
00309>
  310>      (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
  311>   TIME    FLOW |  TIME    FLOW |  TIME    FLOW |  TIME    FLOW |  TIME    FLOW
00312>    hrs     cms |   hrs     cms |   hrs     cms |   hrs     cms |   hrs     cms
00313>     .00    .000|    2.33   .650|    4.67   .363|    7.00   .052|    9.33   .005
  314>     .08    .000|    2.42   .669|    4.75   .344|    7.08   .048|    9.42   .004
  315>     .17    .000|    2.50   .684|    4.83   .324|    7.17   .044|    9.50   .004
00316>     .25    .000|    2.58   .696|    4.92   .306|    7.25   .041|    9.58   .003
00317>     .33    .000|    2.67   .705|    5.00   .288|    7.33   .038|    9.67   .003
  318>     .42    .000|    2.75   .711|    5.08   .271|    7.42   .035|    9.75   .002
  319>     .50    .000|    2.83   .715|    5.17   .254|    7.50   .032|    9.83   .002
00320>     .58    .000|    2.92   .716|    5.25   .239|    7.58   .030|    9.92   .002
00321>     .67    .000|    3.00   .715|    5.33   .224|    7.67   .027|   10.00   .002
  322>     .75    .000|    3.08   .711|    5.42   .210|    7.75   .025|   10.08   .001
  323>     .83    .000|    3.17   .705|    5.50   .196|    7.83   .023|   10.17   .001
00324>     .92    .003|    3.25   .696|    5.58   .183|    7.92   .021|   10.25   .001
00325>    1.00    .014|    3.33   .685|    5.67   .171|    8.00   .020|   10.33   .001
```

1.08	.036	3.42	.672	5.75	.160	8.08	.018	10.42	.001
1.17	.069	3.50	.657	5.83	.149	8.17	.017	10.50	.001
1.25	.111	3.58	.640	5.92	.139	8.25	.015	10.58	.001
1.33	.157	3.67	.621	6.00	.129	8.33	.014	10.67	.000
1.42	.208	3.75	.601	6.08	.120	8.42	.013	10.75	.000
1.50	.260	3.83	.581	6.17	.112	8.50	.012	10.83	.000
1.58	.312	3.92	.559	6.25	.104	8.58	.011	10.92	.000
1.67	.362	4.00	.537	6.33	.096	8.67	.010	11.00	.000
1.75	.410	4.08	.515	6.42	.089	8.75	.009	11.08	.000
1.83	.456	4.17	.493	6.50	.083	8.83	.008	11.17	.000
1.92	.498	4.25	.470	6.58	.077	8.92	.008	11.25	.000
2.00	.536	4.33	.448	6.67	.071	9.00	.007	11.33	.000
2.08	.570	4.42	.426	6.75	.066	9.08	.006	11.42	.000
2.17	.601	4.50	.405	6.83	.061	9.17	.006	11.50	.000
2.25	.627	4.58	.384	6.92	.056	9.25	.005		

001:0012

*# Site Area

DESIGN NASHYD	Area (ha)= 48.10	Curve Number (CN)=60.00
01:siteR DT= 5.00	Ia (mm)= 4.670	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 1.070	

Unit Hyd Qpeak (cms)= 1.717

PEAK FLOW (cms)= .193 (i)
TIME TO PEAK (hrs)= 2.417
RUNOFF VOLUME (mm)= 3.762
TOTAL RAINFALL (mm)= 31.860
RUNOFF COEFFICIENT = .118

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

001:0013

DESIGN STANDHYD	Area (ha)= 19.90	
02:siteU DT= 2.00	Total Imp(%)= 25.00	Dir. Conn.(%)= 8.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	4.97	14.92	
Dep. Storage	(mm)=	1.57	6.20	
Average Slope	(%)=	.50	.50	
Length	(m)=	801.21	70.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	61.74	3.70	
over	(min)	14.00	70.00	
Storage Coeff.	(min)=	13.29 (ii)	69.23 (ii)	
Unit Hyd. Tpeak	(min)=	14.00	70.00	
Unit Hyd. peak	(cms)=	.08	.02	
				TOTALS
PEAK FLOW	(cms)=	.18	.03	.189 (iii)
TIME TO PEAK	(hrs)=	1.17	2.33	1.167
RUNOFF VOLUME	(mm)=	30.29	4.36	6.433
TOTAL RAINFALL	(mm)=	31.86	31.86	31.860
RUNOFF COEFFICIENT	=	.95	.14	.202

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 60.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0014----------

ADD HYD (site)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 01:siteR	48.10	.193	2.42	3.76	.000
	+ID2 02:siteU	19.90	.189	1.17	6.43	.000
	SUM 03:site	68.00	.296	2.33	4.54	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

001:0015----------

ROUTE CHANNEL
IN> 03:site
OUT< 04:rtsit1

Routing time step (min) = 2.00
Number of SEGMENTS = 1
Slopes (%), CHANNEL= .50 FLOODPLAIN= .50
LENGTH = 1400.00 (m)

<------ DATA FOR SECTION (1.0) ------>

Distance	Elevation	Manning	
.00	2.00	.0350	Main Channel
6.00	.00	.0350	Main Channel
12.00	2.00	.0350	Main Channel

<---------- TRAVEL TIME TABLE ---------->

DEPTH (m)	ELEV (m)	X-VOLUME (cu.m.)	S-VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)	D x V (m2/s)
.105	.105	.465E+02	.350E+00	.009	.274	85.17	.029
.211	.211	.186E+03	.280E+01	.058	.435	53.65	.092
.316	.316	.419E+03	.945E+01	.170	.570	40.95	.180
.421	.421	.745E+03	.224E+02	.367	.690	33.80	.291
.526	.526	.116E+04	.437E+02	.666	.801	29.13	.422
.632	.632	.168E+04	.756E+02	1.083	.905	25.79	.571
.737	.737	.228E+04	.120E+03	1.633	1.003	23.28	.739
.842	.842	.298E+04	.179E+03	2.331	1.096	21.29	.923
.947	.947	.377E+04	.255E+03	3.192	1.185	19.68	1.123
1.053	1.053	.465E+04	.350E+03	4.227	1.272	18.35	1.339
1.158	1.158	.563E+04	.466E+03	5.450	1.355	17.22	1.569
1.263	1.263	.670E+04	.605E+03	6.874	1.436	16.25	1.814
1.368	1.368	.786E+04	.769E+03	8.509	1.515	15.40	2.073
1.474	1.474	.912E+04	.960E+03	10.368	1.591	14.66	2.345
1.579	1.579	.105E+05	.118E+04	12.463	1.666	14.00	2.631
1.684	1.684	.119E+05	.143E+04	14.803	1.740	13.41	2.930
1.789	1.789	.134E+05	.172E+04	17.400	1.811	12.88	3.241
1.895	1.895	.151E+05	.204E+04	20.265	1.882	12.40	3.565
2.000	2.000	.168E+05	.240E+04	23.408	1.951	11.96	3.901

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

	<---- hydrograph ---->				<-pipe / channel->	
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 3:site	68.00	.296	2.33	4.544	.383	.641
OUTFLOW: ID= 4:rtsit1	68.00	.264	2.87	4.544	.366	.621

001:0016----------

ROUTE CHANNEL
IN> 04:rtsit1
OUT< 05:rtsit2

Routing time step (min) = 2.00
Number of SEGMENTS = 1
Slopes (%), CHANNEL= .36 FLOODPLAIN= .36
LENGTH = 475.00 (m)

<------ DATA FOR SECTION (1.0) ------>

Distance	Elevation	Manning	
.00	2.00	.0350	Main Channel
6.00	.00	.0350	Main Channel
9.00	.00	.0350	Main Channel
15.00	2.00	.0350	Main Channel

<---------- TRAVEL TIME TABLE ---------->

DEPTH (m)	ELEV (m)	X-VOLUME (cu.m.)	S-VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)	D x V (m2/s)
.105	.105	.166E+03	.510E+01	.125	.357	22.15	.038
.211	.211	.363E+03	.224E+02	.412	.539	14.68	.114
.316	.316	.592E+03	.547E+02	.847	.679	11.65	.215
.421	.421	.853E+03	.105E+03	1.431	.797	9.93	.336
.526	.526	.114E+04	.176E+03	2.171	.901	8.79	.474
.632	.632	.147E+04	.271E+03	3.075	.995	7.96	.628
.737	.737	.182E+04	.393E+03	4.153	1.082	7.32	.797
.842	.842	.221E+04	.544E+03	5.414	1.163	6.81	.980
.947	.947	.263E+04	.728E+03	6.866	1.241	6.38	1.175
1.053	1.053	.308E+04	.948E+03	8.519	1.314	6.02	1.383
1.158	1.158	.356E+04	.121E+04	10.382	1.385	5.72	1.604
1.263	1.263	.407E+04	.150E+04	12.463	1.453	5.45	1.836
1.368	1.368	.462E+04	.185E+04	14.772	1.519	5.21	2.079
1.474	1.474	.519E+04	.224E+04	17.317	1.583	5.00	2.334
1.579	1.579	.580E+04	.268E+04	20.107	1.646	4.81	2.599
1.684	1.684	.644E+04	.317E+04	23.149	1.707	4.64	2.875
1.789	1.789	.711E+04	.372E+04*	26.453	1.766	4.48	3.161
1.895	1.895	.782E+04	.433E+04*	30.026	1.825	4.34	3.458
2.000	2.000	.855E+04	.500E+04*	33.877	1.882	4.21	3.764

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

		<---- hydrograph ---->			<-pipe / channel->	
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 4:rtsit1	68.00	.264	2.87	4.544	.156	.428
OUTFLOW: ID= 5:rtsit2	68.00	.258	3.10	4.544	.154	.424

001:0017----------

SAVE HYD	AREA (ha)= 68.000
ID=05 (rtsit2)	QPEAK (cms)= .258 (i)
DT= 2.00 PCYC= 1	TPEAK (hrs)= 3.100
	VOLUME (mm)= 4.544

Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-rtsit2.001
Comments: Post Site Flows

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

TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms
.00	.000	3.80	.227	7.60	.020	11.40	.002	15.20	.000
.03	.000	3.83	.224	7.63	.020	11.43	.002	15.23	.000
.07	.000	3.87	.221	7.67	.019	11.47	.002	15.27	.000
.10	.000	3.90	.218	7.70	.019	11.50	.002	15.30	.000
.13	.000	3.93	.215	7.73	.018	11.53	.002	15.33	.000
.17	.000	3.97	.212	7.77	.018	11.57	.002	15.37	.000
.20	.000	4.00	.209	7.80	.018	11.60	.002	15.40	.000
.23	.000	4.03	.206	7.83	.017	11.63	.001	15.43	.000
.27	.000	4.07	.203	7.87	.017	11.67	.001	15.47	.000
.30	.000	4.10	.200	7.90	.017	11.70	.001	15.50	.000

00521>	.33	.000	4.13	.197	7.93	.016	11.73	.001	15.53	.000
522>	.37	.000	4.17	.194	7.97	.016	11.77	.001	15.57	.000
523>	.40	.000	4.20	.191	8.00	.016	11.80	.001	15.60	.000
00524>	.43	.000	4.23	.188	8.03	.015	11.83	.001	15.63	.000
00525>	.47	.000	4.27	.185	8.07	.015	11.87	.001	15.67	.000
526>	.50	.000	4.30	.181	8.10	.015	11.90	.001	15.70	.000
527>	.53	.000	4.33	.178	8.13	.014	11.93	.001	15.73	.000
00528>	.57	.000	4.37	.175	8.17	.014	11.97	.001	15.77	.000
00529>	.60	.000	4.40	.172	8.20	.014	12.00	.001	15.80	.000
530>	.63	.000	4.43	.169	8.23	.013	12.03	.001	15.83	.000
531>	.67	.000	4.47	.166	8.27	.013	12.07	.001	15.87	.000
00532>	.70	.000	4.50	.163	8.30	.013	12.10	.001	15.90	.000
00533>	.73	.000	4.53	.159	8.33	.013	12.13	.001	15.93	.000
534>	.77	.000	4.57	.157	8.37	.012	12.17	.001	15.97	.000
535>	.80	.000	4.60	.154	8.40	.012	12.20	.001	16.00	.000
00536>	.83	.001	4.63	.151	8.43	.012	12.23	.001	16.03	.000
00537>	.87	.001	4.67	.148	8.47	.012	12.27	.001	16.07	.000
538>	.90	.001	4.70	.145	8.50	.011	12.30	.001	16.10	.000
539>	.93	.002	4.73	.143	8.53	.011	12.33	.001	16.13	.000
00540>	.97	.002	4.77	.140	8.57	.011	12.37	.001	16.17	.000
00541>	1.00	.003	4.80	.137	8.60	.011	12.40	.001	16.20	.000
542>	1.03	.004	4.83	.135	8.63	.010	12.43	.001	16.23	.000
543>	1.07	.005	4.87	.132	8.67	.010	12.47	.001	16.27	.000
00544>	1.10	.007	4.90	.130	8.70	.010	12.50	.001	16.30	.000
00545>	1.13	.009	4.93	.127	8.73	.010	12.53	.001	16.33	.000
546>	1.17	.012	4.97	.125	8.77	.010	12.57	.001	16.37	.000
547>	1.20	.016	5.00	.122	8.80	.009	12.60	.001	16.40	.000
00548>	1.23	.019	5.03	.120	8.83	.009	12.63	.001	16.43	.000
00549>	1.27	.024	5.07	.117	8.87	.009	12.67	.001	16.47	.000
550>	1.30	.028	5.10	.115	8.90	.009	12.70	.001	16.50	.000
551>	1.33	.033	5.13	.112	8.93	.009	12.73	.001	16.53	.000
00552>	1.37	.038	5.17	.110	8.97	.008	12.77	.001	16.57	.000
00553>	1.40	.043	5.20	.107	9.00	.008	12.80	.001	16.60	.000
554>	1.43	.048	5.23	.105	9.03	.008	12.83	.001	16.63	.000
555>	1.47	.053	5.27	.102	9.07	.008	12.87	.001	16.67	.000
00556>	1.50	.058	5.30	.100	9.10	.008	12.90	.001	16.70	.000
00557>	1.53	.063	5.33	.098	9.13	.008	12.93	.001	16.73	.000
558>	1.57	.068	5.37	.095	9.17	.007	12.97	.001	16.77	.000
559>	1.60	.073	5.40	.093	9.20	.007	13.00	.001	16.80	.000
00560>	1.63	.078	5.43	.091	9.23	.007	13.03	.001	16.83	.000
00561>	1.67	.084	5.47	.089	9.27	.007	13.07	.001	16.87	.000
562>	1.70	.089	5.50	.087	9.30	.007	13.10	.001	16.90	.000
563>	1.73	.095	5.53	.085	9.33	.007	13.13	.001	16.93	.000
00564>	1.77	.100	5.57	.083	9.37	.007	13.17	.001	16.97	.000
00565>	1.80	.106	5.60	.081	9.40	.006	13.20	.001	17.00	.000
566>	1.83	.111	5.63	.079	9.43	.006	13.23	.001	17.03	.000
567>	1.87	.117	5.67	.077	9.47	.006	13.27	.001	17.07	.000
00568>	1.90	.123	5.70	.075	9.50	.006	13.30	.000	17.10	.000
00569>	1.93	.129	5.73	.073	9.53	.006	13.33	.000	17.13	.000
570>	1.97	.135	5.77	.071	9.57	.006	13.37	.000	17.17	.000
571>	2.00	.141	5.80	.070	9.60	.006	13.40	.000	17.20	.000
00572>	2.03	.147	5.83	.068	9.63	.006	13.43	.000	17.23	.000
00573>	2.07	.153	5.87	.066	9.67	.005	13.47	.000	17.27	.000
574>	2.10	.159	5.90	.064	9.70	.005	13.50	.000	17.30	.000
575>	2.13	.165	5.93	.063	9.73	.005	13.53	.000	17.33	.000
00576>	2.17	.171	5.97	.061	9.77	.005	13.57	.000	17.37	.000
00577>	2.20	.177	6.00	.060	9.80	.005	13.60	.000	17.40	.000
578>	2.23	.182	6.03	.058	9.83	.005	13.63	.000	17.43	.000
579>	2.27	.188	6.07	.057	9.87	.005	13.67	.000	17.47	.000
00580>	2.30	.193	6.10	.055	9.90	.005	13.70	.000	17.50	.000
00581>	2.33	.199	6.13	.054	9.93	.005	13.73	.000	17.53	.000
582>	2.37	.204	6.17	.053	9.97	.004	13.77	.000	17.57	.000
583>	2.40	.209	6.20	.051	10.00	.004	13.80	.000	17.60	.000
00584>	2.43	.213	6.23	.050	10.03	.004	13.83	.000	17.63	.000
00585>	2.47	.218	6.27	.049	10.07	.004	13.87	.000	17.67	.000

2.50	.222	6.30	.048	10.10	.004	13.90	.000	17.70	.000
2.53	.226	6.33	.047	10.13	.004	13.93	.000	17.73	.000
2.57	.230	6.37	.045	10.17	.004	13.97	.000	17.77	.000
2.60	.234	6.40	.044	10.20	.004	14.00	.000	17.80	.000
2.63	.237	6.43	.043	10.23	.004	14.03	.000	17.83	.000
2.67	.240	6.47	.042	10.27	.004	14.07	.000	17.87	.000
2.70	.243	6.50	.041	10.30	.004	14.10	.000	17.90	.000
2.73	.245	6.53	.040	10.33	.004	14.13	.000	17.93	.000
2.77	.247	6.57	.039	10.37	.003	14.17	.000	17.97	.000
2.80	.249	6.60	.038	10.40	.003	14.20	.000	18.00	.000
2.83	.251	6.63	.038	10.43	.003	14.23	.000	18.03	.000
2.87	.253	6.67	.037	10.47	.003	14.27	.000	18.07	.000
2.90	.254	6.70	.036	10.50	.003	14.30	.000	18.10	.000
2.93	.255	6.73	.035	10.53	.003	14.33	.000	18.13	.000
2.97	.256	6.77	.034	10.57	.003	14.37	.000	18.17	.000
3.00	.257	6.80	.034	10.60	.003	14.40	.000	18.20	.000
3.03	.258	6.83	.033	10.63	.003	14.43	.000	18.23	.000
3.07	.258	6.87	.032	10.67	.003	14.47	.000	18.27	.000
3.10	.258	6.90	.031	10.70	.003	14.50	.000	18.30	.000
3.13	.258	6.93	.031	10.73	.003	14.53	.000	18.33	.000
3.17	.258	6.97	.030	10.77	.003	14.57	.000	18.37	.000
3.20	.258	7.00	.029	10.80	.003	14.60	.000	18.40	.000
3.23	.257	7.03	.029	10.83	.003	14.63	.000	18.43	.000
3.27	.256	7.07	.028	10.87	.002	14.67	.000	18.47	.000
3.30	.256	7.10	.028	10.90	.002	14.70	.000	18.50	.000
3.33	.254	7.13	.027	10.93	.002	14.73	.000	18.53	.000
3.37	.253	7.17	.026	10.97	.002	14.77	.000	18.57	.000
3.40	.252	7.20	.026	11.00	.002	14.80	.000	18.60	.000
3.43	.250	7.23	.025	11.03	.002	14.83	.000	18.63	.000
3.47	.248	7.27	.025	11.07	.002	14.87	.000	18.67	.000
3.50	.247	7.30	.024	11.10	.002	14.90	.000	18.70	.000
3.53	.245	7.33	.024	11.13	.002	14.93	.000	18.73	.000
3.57	.243	7.37	.023	11.17	.002	14.97	.000	18.77	.000
3.60	.241	7.40	.023	11.20	.002	15.00	.000	18.80	.000
3.63	.239	7.43	.022	11.23	.002	15.03	.000	18.83	.000
3.67	.237	7.47	.022	11.27	.002	15.07	.000	18.87	.000
3.70	.234	7.50	.021	11.30	.002	15.10	.000	18.90	.000
3.73	.232	7.53	.021	11.33	.002	15.13	.000		
3.77	.229	7.57	.020	11.37	.002	15.17	.000		

001:0018

ADD HYD (sumpst)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 09:extpre	221.80	.716	2.92	3.76	.000
	+ID2 05:rtsit2	68.00	.258	3.10	4.54	.000
	SUM 08:sumpst	289.80	.972	3.00	3.95	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

001:0019

SAVE HYD	AREA (ha)= 289.800
ID=08 (sumpst)	QPEAK (cms)= .972 (i)
DT= 2.00 PCYC= 1	TPEAK (hrs)= 3.000
	VOLUME (mm)= 3.943

Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-sumpst.001
Comments: Overall Postdev Hydrograph

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

TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms
.00	.000	3.80	.816	7.60	.049	11.40	.002	15.20	.000

00651>	.03	.000	3.83	.805	7.63	.048	11.43	.002	15.23	.000
652>	.07	.000	3.87	.793	7.67	.046	11.47	.002	15.27	.000
653>	.10	.000	3.90	.782	7.70	.045	11.50	.002	15.30	.000
00654>	.13	.000	3.93	.770	7.73	.044	11.53	.002	15.33	.000
00655>	.17	.000	3.97	.759	7.77	.043	11.57	.002	15.37	.000
656>	.20	.000	4.00	.747	7.80	.042	11.60	.002	15.40	.000
657>	.23	.000	4.03	.735	7.83	.040	11.63	.001	15.43	.000
00658>	.27	.000	4.07	.723	7.87	.039	11.67	.001	15.47	.000
00659>	.30	.000	4.10	.711	7.90	.038	11.70	.001	15.50	.000
660>	.33	.000	4.13	.699	7.93	.037	11.73	.001	15.53	.000
661>	.37	.000	4.17	.687	7.97	.036	11.77	.001	15.57	.000
00662>	.40	.000	4.20	.675	8.00	.035	11.80	.001	15.60	.000
00663>	.43	.000	4.23	.663	8.03	.034	11.83	.001	15.63	.000
664>	.47	.000	4.27	.651	8.07	.033	11.87	.001	15.67	.000
665>	.50	.000	4.30	.639	8.10	.032	11.90	.001	15.70	.000
00666>	.53	.000	4.33	.626	8.13	.031	11.93	.001	15.73	.000
00667>	.57	.000	4.37	.615	8.17	.031	11.97	.001	15.77	.000
668>	.60	.000	4.40	.603	8.20	.030	12.00	.001	15.80	.000
669>	.63	.000	4.43	.591	8.23	.029	12.03	.001	15.83	.000
00670>	.67	.000	4.47	.579	8.27	.028	12.07	.001	15.87	.000
00671>	.70	.000	4.50	.567	8.30	.027	12.10	.001	15.90	.000
672>	.73	.000	4.53	.556	8.33	.027	12.13	.001	15.93	.000
673>	.77	.000	4.57	.545	8.37	.026	12.17	.001	15.97	.000
00674>	.80	.000	4.60	.533	8.40	.025	12.20	.001	16.00	.000
00675>	.83	.001	4.63	.522	8.43	.024	12.23	.001	16.03	.000
676>	.87	.002	4.67	.511	8.47	.024	12.27	.001	16.07	.000
677>	.90	.003	4.70	.501	8.50	.023	12.30	.001	16.10	.000
00678>	.93	.006	4.73	.490	8.53	.022	12.33	.001	16.13	.000
00679>	.97	.012	4.77	.480	8.57	.022	12.37	.001	16.17	.000
680>	1.00	.017	4.80	.469	8.60	.021	12.40	.001	16.20	.000
681>	1.03	.027	4.83	.459	8.63	.021	12.43	.001	16.23	.000
00682>	1.07	.037	4.87	.449	8.67	.020	12.47	.001	16.27	.000
00683>	1.10	.050	4.90	.439	8.70	.020	12.50	.001	16.30	.000
684>	1.13	.066	4.93	.429	8.73	.019	12.53	.001	16.33	.000
685>	1.17	.082	4.97	.420	8.77	.018	12.57	.001	16.37	.000
00686>	1.20	.101	5.00	.410	8.80	.018	12.60	.001	16.40	.000
00687>	1.23	.122	5.03	.401	8.83	.017	12.63	.001	16.43	.000
688>	1.27	.144	5.07	.391	8.87	.017	12.67	.001	16.47	.000
689>	1.30	.167	5.10	.382	8.90	.017	12.70	.001	16.50	.000
00690>	1.33	.190	5.13	.373	8.93	.016	12.73	.001	16.53	.000
00691>	1.37	.215	5.17	.364	8.97	.016	12.77	.001	16.57	.000
692>	1.40	.240	5.20	.355	9.00	.015	12.80	.001	16.60	.000
693>	1.43	.266	5.23	.347	9.03	.015	12.83	.001	16.63	.000
00694>	1.47	.292	5.27	.338	9.07	.014	12.87	.001	16.67	.000
00695>	1.50	.318	5.30	.330	9.10	.014	12.90	.001	16.70	.000
696>	1.53	.343	5.33	.321	9.13	.013	12.93	.001	16.73	.000
697>	1.57	.369	5.37	.313	9.17	.013	12.97	.001	16.77	.000
00698>	1.60	.395	5.40	.305	9.20	.013	13.00	.001	16.80	.000
00699>	1.63	.420	5.43	.298	9.23	.012	13.03	.001	16.83	.000
00700>	1.67	.446	5.47	.290	9.27	.012	13.07	.001	16.87	.000
701>	1.70	.471	5.50	.283	9.30	.012	13.10	.001	16.90	.000
00702>	1.73	.496	5.53	.275	9.33	.011	13.13	.001	16.93	.000
00703>	1.77	.520	5.57	.268	9.37	.011	13.17	.001	16.97	.000
00704>	1.80	.544	5.60	.261	9.40	.011	13.20	.001	17.00	.000
705>	1.83	.567	5.63	.255	9.43	.010	13.23	.001	17.03	.000
00706>	1.87	.590	5.67	.248	9.47	.010	13.27	.001	17.07	.000
070	1.90	.612	5.70	.242	9.50	.010	13.30	.000	17.10	.000
00708>	1.93	.634	5.73	.235	9.53	.009	13.33	.000	17.13	.000
709>	1.97	.655	5.77	.229	9.57	.009	13.37	.000	17.17	.000
00710>	2.00	.677	5.80	.223	9.60	.009	13.40	.000	17.20	.000
00711>	2.03	.696	5.83	.217	9.63	.008	13.43	.000	17.23	.000
00712>	2.07	.716	5.87	.211	9.67	.008	13.47	.000	17.27	.000
713>	2.10	.735	5.90	.205	9.70	.008	13.50	.000	17.30	.000
00714>	2.13	.753	5.93	.200	9.73	.008	13.53	.000	17.33	.000
00715>	2.17	.771	5.97	.194	9.77	.007	13.57	.000	17.37	.000

00716>	2.20	.788	6.00	.189	9.80	.007	13.60	.000	17.40	.000
00717>	2.23	.804	6.03	.184	9.83	.007	13.63	.000	17.43	.000
00718>	2.27	.820	6.07	.179	9.87	.007	13.67	.000	17.47	.000
00719>	2.30	.834	6.10	.174	9.90	.006	13.70	.000	17.50	.000
00720>	2.33	.849	6.13	.169	9.93	.006	13.73	.000	17.53	.000
00721>	2.37	.861	6.17	.164	9.97	.006	13.77	.000	17.57	.000
00722>	2.40	.874	6.20	.160	10.00	.006	13.80	.000	17.60	.000
00723>	2.43	.885	6.23	.155	10.03	.006	13.83	.000	17.63	.000
00724>	2.47	.896	6.27	.151	10.07	.006	13.87	.000	17.67	.000
00725>	2.50	.906	6.30	.147	10.10	.005	13.90	.000	17.70	.000
00726>	2.53	.915	6.33	.143	10.13	.005	13.93	.000	17.73	.000
00727>	2.57	.924	6.37	.139	10.17	.005	13.97	.000	17.77	.000
00728>	2.60	.932	6.40	.135	10.20	.005	14.00	.000	17.80	.000
00729>	2.63	.939	6.43	.131	10.23	.005	14.03	.000	17.83	.000
00730>	2.67	.945	6.47	.128	10.27	.005	14.07	.000	17.87	.000
00731>	2.70	.950	6.50	.124	10.30	.005	14.10	.000	17.90	.000
00732>	2.73	.955	6.53	.121	10.33	.004	14.13	.000	17.93	.000
00733>	2.77	.959	6.57	.117	10.37	.004	14.17	.000	17.97	.000
00734>	2.80	.963	6.60	.114	10.40	.004	14.20	.000	18.00	.000
00735>	2.83	.966	6.63	.111	10.43	.004	14.23	.000	18.03	.000
00736>	2.87	.968	6.67	.108	10.47	.004	14.27	.000	18.07	.000
00737>	2.90	.970	6.70	.105	10.50	.004	14.30	.000	18.10	.000
00738>	2.93	.971	6.73	.102	10.53	.004	14.33	.000	18.13	.000
00739>	2.97	.972	6.77	.099	10.57	.004	14.37	.000	18.17	.000
00740>	3.00	.972	6.80	.097	10.60	.003	14.40	.000	18.20	.000
00741>	3.03	.971	6.83	.094	10.63	.003	14.43	.000	18.23	.000
00742>	3.07	.970	6.87	.091	10.67	.003	14.47	.000	18.27	.000
00743>	3.10	.968	6.90	.089	10.70	.003	14.50	.000	18.30	.000
00744>	3.13	.966	6.93	.086	10.73	.003	14.53	.000	18.33	.000
00745>	3.17	.963	6.97	.084	10.77	.003	14.57	.000	18.37	.000
00746>	3.20	.959	7.00	.081	10.80	.003	14.60	.000	18.40	.000
00747>	3.23	.955	7.03	.079	10.83	.003	14.63	.000	18.43	.000
00748>	3.27	.951	7.07	.077	10.87	.003	14.67	.000	18.47	.000
00749>	3.30	.945	7.10	.075	10.90	.003	14.70	.000	18.50	.000
00750>	3.33	.940	7.13	.073	10.93	.003	14.73	.000	18.53	.000
00751>	3.37	.933	7.17	.071	10.97	.003	14.77	.000	18.57	.000
00752>	3.40	.926	7.20	.069	11.00	.002	14.80	.000	18.60	.000
00753>	3.43	.919	7.23	.067	11.03	.002	14.83	.000	18.63	.000
00754>	3.47	.911	7.27	.065	11.07	.002	14.87	.000	18.67	.000
00755>	3.50	.903	7.30	.063	11.10	.002	14.90	.000	18.70	.000
00756>	3.53	.895	7.33	.062	11.13	.002	14.93	.000	18.73	.000
00757>	3.57	.886	7.37	.060	11.17	.002	14.97	.000	18.77	.000
00758>	3.60	.877	7.40	.058	11.20	.002	15.00	.000	18.80	.000
00759>	3.63	.867	7.43	.057	11.23	.002	15.03	.000	18.83	.000
00760>	3.67	.858	7.47	.055	11.27	.002	15.07	.000	18.87	.000
00761>	3.70	.847	7.50	.053	11.30	.002	15.10	.000	18.90	.000
00762>	3.73	.837	7.53	.052	11.33	.002	15.13	.000		
00763>	3.77	.827	7.57	.051	11.37	.002	15.17	.000		

00764> ----------
00765> 001:0020----------
00766> FINISH
00767> ----------
00768> **********
00769> WARNINGS / ERRORS / NOTES
00770> ------------------------
00771> Simulation ended on 2005-05-04 at 10:20:58
00772> ==========
00773>
00774>

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Stantec

1: 5 yr SWMHYMO

```
 00001> ================================================================================
  002>
  003>  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999  =========
 00004>  S      W W W  MM MM  H   H   Y Y   MM MM  O   O     9   9  9   9
 00005>  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9 Ver. 4.02
  006>      S   W W   M   M  H   H    Y    M   M  O   O       9999   9999 July 1999
  007>  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9  =========
 00008>                                                      9   9  9   9 # 3824306
 00009>       StormWater Management HYdrologic Model          999    999  =========
  010>
  011>  ********************************************************************************
 00012>  ************************** SWMHYMO-99 Ver/4.02 ***************************
 00013>  *******  A single event and continuous hydrologic simulation model  *******
  014>  *******     based on the principles of HYMO and its successors       *******
  015>  *******                  OTTHYMO-83 and OTTHYMO-89.                  *******
 00016>  ********************************************************************************
 00017>  ******* Distributed by:  J.F. Sabourin and Associates Inc.          *******
  018>  *******                  Ottawa,  Ontario: (613) 727-5199           *******
  019>  *******                  Gatineau, Quebec: (819) 243-6858           *******
 00020>  *******                  E-Mail: swmhymo@jfsa.Com                   *******
 00021>  ********************************************************************************
  022>
  023>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 00024>  +++++++ Licensed user: Stantec Consulting Ltd. 604                      +++++++
 00025>  +++++++                 Ottawa                SERIAL#:3824306         +++++++
  026>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
  027>
 00028>  ********************************************************************************
 00029>  *******          ++++++ PROGRAM ARRAY DIMENSIONS ++++++              *******
  030>  *******          Maximum value for ID numbers  :     10              *******
  031>  *******          Max. number of rainfall points:  15000              *******
 00032>  *******          Max. number of flow points    :  15000              *******
 00033>  ********************************************************************************
  034>
  035>
 00036>  ********************   D E T A I L E D   O U T P U T   ********************
 00037>  ********************************************************************************
  038>  *       DATE: 2005-05-04      TIME: 10:22:27      RUN COUNTER: 000193       *
  039>  ********************************************************************************
 00040>  * Input   filename: W:\active\60400144\design\analysis\SWMAPR~1\144post2.d*
 00041>  * Output  filename: W:\active\60400144\design\analysis\SWMAPR~1\144post2.o*
 00042>  * Summary filename: W:\active\60400144\design\analysis\SWMAPR~1\144post2.s*
  043>  * User comments:                                                          *
  044>  * 1: _____________________________________________________________________*
 00045>  * 2: _____________________________________________________________________*
 00046>  * 3: _____________________________________________________________________*
  047>  ********************************************************************************
  048>
 00049>  --------------------------------------------------------------------------------
 00050>  001:0001-----------------------------------------------------------------------
  051>  *#*****************************************************************************
  052>  *#  Project Name: [Emerald Creek]    Project Number: [604-00144]
 00053>  *#  Date         : 06-18-2004
 00054>  *#  Modeller     : [MAF]
  055>  *#  Company      : McNeely Engineering Consultants Limited
  056>  *#  License #    :  5695479
 00057>  *#*****************************************************************************
 00058>  --------------------
  059>  | START            |  Project  dir.: W:\active\60400144\design\analysis\SWMAPR~1
  060>  --------------------  Rainfall dir.: W:\active\60400144\design\analysis\SWMAPR~1
 00061>       TZERO =    .00 hrs on        0
 00062>       METOUT=    2 (output = METRIC)
  063>       NRUN  = 001
  064>       NSTORM=    0
 00065>  --------------------------------------------------------------------------------
```

```
00066> 001:0002--------------------------------------------------------------------------
00067> * 2-YEAR IDF CHICAGO STORM
00068> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00069> *                    ICASEcs=[2],
00070> *                    Enter ordinates of IDF curve below, at least seven points
00071> *                       TIME (min)     Intensity(mm/hr)
00072> *                          [5]          [102.80]
00073> *                          [10]         [77.10]
00074> *                          [15]         [63.30]
00075> *                          [30]         [39.90]
00076> *                          [60]         [24.20]
00077> *                          [120]        [14.30]
00078> *                          [360]        [6.20]
00079> *                          [720]        [3.60]
00080> *                          [1440]       [2.00]
00081> *                           -1             -1
00082> *# 5-YEAR IDF CHICAGO STORM
00083> ---------------------
00084> | CHICAGO STORM     |    IDF curve parameters: A= 998.071
00085> | Ptotal= 42.51 mm  |                          B=   6.053
00086> ---------------------                         C=    .814
00087>                          used in:   INTENSITY =  A / (t + B)^C
00088>
00089>                          Duration of storm  =  3.00 hrs
00090>                          Storm time step    = 10.00 min
00091>                          Time to peak ratio =   .33
00092>
00093>                      The CORRELATION coefficient is = .9998645
00094>
00095>                       TIME        ENTERED              COMPUTED
00096>                      (min)        (mm/hr)              (mm/hr)
00097>                         5.         140.20               141.18
00098>                        10.         104.40               104.19
00099>                        15.          85.60                83.56
00100>                        30.          53.90                53.93
00101>                        60.          32.00                32.94
00102>                       120.          18.90                19.47
00103>                       360.           8.40                 8.17
00104>                       720.           4.80                 4.68
00105>                      1440.           2.60                 2.67
00106>
00107>              TIME    RAIN  |   TIME    RAIN  |   TIME    RAIN  |   TIME    RAIN
00108>               hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr |    hrs    mm/hr
00109>               .17    3.682 |   1.00  104.193 |   1.83    6.689 |   2.67    3.510
00110>               .33    4.582 |   1.17   32.037 |   2.00    5.628 |   2.83    3.220
00111>               .50    6.151 |   1.33   16.337 |   2.17    4.872 |   3.00    2.978
00112>               .67    9.614 |   1.50   10.965 |   2.33    4.305 |
00113>               .83   24.170 |   1.67    8.287 |   2.50    3.864 |
00114>
00115> --------------------------------------------------------------------------------
00116> 001:0003--------------------------------------------------------------------------
00117> * 10-YEAR IDF CHICAGO STORM
00118> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00119> *                    ICASEcs=[2],
00120> *                    Enter ordinates of IDF curve below, at least seven points
00121> *                         TIME (min)     Intensity(mm/hr)
00122> *                            [5]          [165.00]
00123> *                            [10]         [122.50]
00124> *                            [15]         [100.40]
00125> *                            [30]         [63.10]
00126> *                            [60]         [37.10]
00127> *                            [120]        [22.00]
00128> *                            [360]        [9.90]
00129> *                            [720]        [5.60]
00130> *                            [1440]       [3.00]
```

```
0131> *                                  -1              -1
 132> * 25-YEAR IDF CHICAGO STORM
 133> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min)
0134> *                    ICASEcs=[2],
0135> *                    Enter ordinates of IDF curve below, at least seven points
 136> *                        TIME (min)    Intensity(mm/hr)
 137> *                          [5]         [196.00]
0138> *                          [10]        [145.30]
0139> *                          [15]        [119.10]
 140> *                          [30]        [74.70]
 141> *                          [60]        [43.60]
0142> *                          [120]       [25.80]
0143> *                          [360]       [11.70]
 144> *                          [720]       [6.60]
 145> *                          [1440]      [3.50]
0146> *                            -1              -1
0147> * 100-YEAR IDF CHICAGO STORM
 148> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
 149> *                   ICASEcs=[2],
0150> *                   Enter ordinates of IDF curve below, at least seven points
0151> *                      TIME (min)    Intensity(mm/hr)
 152> *                         [5]         [242.60]
 153> *                          [10]        [179.00]
0154> *                          [15]        [146.80]
0155> *                          [30]        [91.90]
 156> *                          [60]        [53.20]
 157> *                          [120]       [31.50]
0158> *                          [360]       [14.50]
0159> *                          [720]       [8.00]
 160> *                          [1440]      [4.30]
 161> *                            -1              -1
0162> ----------------------
0163> | DEFAULT VALUES      |  Filename: W:\active\60400144\design\analysis\SWMAPR~1\SH
0164> ----------------------  ICASEdv = 1 (read and print data)
 165>       FileTitle= File comment: [                ]
0166>                  THE FOLLOWING PARAMETERS ARE USED IN THE DESIGN STANDHYD COM
0167>       Horton's infiltration equation parameters:
 168>       [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
 169>       Parameters for PERVIOUS surfaces in STANDHYD:
0170>       [IAper=   6.20 mm] [LGP=70.00 m] [MNP= .250]
0171>       Parameters for IMPERVIOUS surfaces in STANDHYD:
 172>       [IAimp=   1.57 mm] [CLI=  .31]   [MNI= .013]
 173>       Parameters used in NASHYD:
 174>       [Ia=   4.67 mm] [N= 3.00]
0175> ------------------------------------------------------------------------------
0176> 001:0004-------------------------------------------------------------------------
 177> *# Area A1 (see DWG SD2)
 178> ----------------------
0179> | DESIGN NASHYD       |   Area     (ha)=   73.90   Curve Number    (CN)=60.00
0180> | 01:A1     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
 181> ----------------------   U.H. Tp(hrs)=   1.440
 182>
0183>       Unit Hyd Qpeak   (cms)=    1.960
0184>
 185>       PEAK FLOW        (cms)=     .448 (i)
 186>       TIME TO PEAK     (hrs)=    2.917
0187>       RUNOFF VOLUME    (mm)=    6.113
0188>       TOTAL RAINFALL   (mm)=   42.514
 189>       RUNOFF COEFFICIENT   =     .143
 190>
0191>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
0192>
 193> ------------------------------------------------------------------------------
 194> 001:0005-------------------------------------------------------------------------
0195> *# Area A2
```

```
00196> ----------------------
00197> | DESIGN NASHYD       |   Area     (ha)=  120.00   Curve Number    (CN)=60.00
00198> | 02:A2     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00199> ----------------------   U.H. Tp(hrs)=   1.540
00200>
00201>      Unit Hyd Qpeak  (cms)=    2.976
00202>
00203>      PEAK FLOW       (cms)=     .694 (i)
00204>      TIME TO PEAK    (hrs)=    3.000
00205>      RUNOFF VOLUME    (mm)=    6.913
00206>      TOTAL RAINFALL   (mm)=   42.514
00207>      RUNOFF COEFFICIENT   =     .163
00208>
00209>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00210>
00211> ---------------------------------------------------------------------------
00212> 001:0006-----------------------------------------------------------------------
00213> *# Area A3
00214> ----------------------
00215> | DESIGN NASHYD       |   Area     (ha)=    5.60   Curve Number    (CN)=60.00
00216> | 03:A3     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00217> ----------------------   U.H. Tp(hrs)=   1.050
00218>
00219>      Unit Hyd Qpeak  (cms)=     .204
00220>
00221>      PEAK FLOW       (cms)=     .042 (i)
00222>      TIME TO PEAK    (hrs)=    2.333
00223>      RUNOFF VOLUME    (mm)=    6.913
00224>      TOTAL RAINFALL   (mm)=   42.514
00225>      RUNOFF COEFFICIENT   =     .163
00226>
00227>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00228>
00229> ---------------------------------------------------------------------------
00230> 001:0007-----------------------------------------------------------------------
00231> *# Area A4
00232> ----------------------
00233> | DESIGN NASHYD       |   Area     (ha)=   14.70   Curve Number    (CN)=60.00
00234> | 04:A4     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00235> ----------------------   U.H. Tp(hrs)=   1.040
00236>
00237>      Unit Hyd Qpeak  (cms)=     .540
00238>
00239>      PEAK FLOW       (cms)=     .112 (i)
00240>      TIME TO PEAK    (hrs)=    2.333
00241>      RUNOFF VOLUME    (mm)=    6.913
00242>      TOTAL RAINFALL   (mm)=   42.514
00243>      RUNOFF COEFFICIENT   =     .163
00244>
00245>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00246>
00247> ---------------------------------------------------------------------------
00248> 001:0008-----------------------------------------------------------------------
00249> *# Area A5
00250> ----------------------
00251> | DESIGN NASHYD       |   Area     (ha)=    3.50   Curve Number    (CN)=60.00
00252> | 05:A5     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00253> ----------------------   U.H. Tp(hrs)=    .630
00254>
00255>      Unit Hyd Qpeak  (cms)=     .212
00256>
00257>      PEAK FLOW       (cms)=     .037 (i)
00258>      TIME TO PEAK    (hrs)=    1.833
00259>      RUNOFF VOLUME    (mm)=    6.913
00260>      TOTAL RAINFALL   (mm)=   42.514
```

```
00261>      RUNOFF COEFFICIENT    =      .163
 0262>
 0263>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00264>
00265> ------------------------------------------------------------------------------
 0266> 001:0009--------------------------------------------------------------------
 0267> *# Area A6
00268> ----------------------
00269> | DESIGN NASHYD       |   Area     (ha)=    4.10   Curve Number    (CN)=60.00
 0270> | 06:A6     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
 0271> ----------------------   U.H. Tp(hrs)=    .630
00272>
00273>      Unit Hyd Qpeak  (cms)=     .249
 0274>
 0275>      PEAK FLOW       (cms)=     .044 (i)
00276>      TIME TO PEAK    (hrs)=   1.833
00277>      RUNOFF VOLUME    (mm)=   6.913
 0278>      TOTAL RAINFALL   (mm)=  42.514
 0279>      RUNOFF COEFFICIENT    =     .163
00280>
00281>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
 0282>
 0283> ------------------------------------------------------------------------------
00284> 001:0010--------------------------------------------------------------------
00285> *# External Flows Pre-Development
 0286> --------------------
 0287> | ADD HYD (extpre) | ID: NHYD     AREA      QPEAK   TPEAK   R.V.    DWF
00288> ---------------------              (ha)      (cms)   (hrs)   (mm)   (cms)
00289>                    ID1 01:A1      73.90      .448    2.92   6.91    .000
 0290>                   +ID2 02:A2     120.00      .694    3.00   6.91    .000
 0291>                   +ID3 03:A3       5.60      .042    2.33   6.91    .000
 0292>                   +ID4 04:A4      14.70      .112    2.33   6.91    .000
 0293>                   +ID5 05:A5       3.50      .037    1.83   6.91    .000
 0294>                   +ID6 06:A6       4.10      .044    1.83   6.91    .000
 0295>                    ==========================================================
 0296>                    SUM 09:extpre  221.80     1.321    2.83   6.91    .000
 0297>
 0298>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
 0299>
 0300> ------------------------------------------------------------------------------
 0301> 001:0011--------------------------------------------------------------------
 0302> ---------------------
  303> | SAVE HYD            |   AREA       (ha)=  221.800
 0304> | ID=09 (extpre)      |   QPEAK      (cms)=    1.321 (i)
 0305> | DT= 5.00 PCYC= 1    |   TPEAK      (hrs)=    2.833
 0306> ---------------------   VOLUME       (mm)=    6.913
  307>   Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-extpre.001
 0308>   Comments: Post External Flows
 0309>
 0310>      (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
  311>   TIME     FLOW |  TIME     FLOW |  TIME     FLOW |  TIME     FLOW |  TIME     FLOW
 0312>    hrs      cms |   hrs      cms |   hrs      cms |   hrs      cms |   hrs      cms
 0313>     .00     .000|    2.33   1.221|    4.67   .651|    7.00   .092|    9.33   .008
 0314>     .08     .000|    2.42   1.253|    4.75   .615|    7.08   .085|    9.42   .007
  315>     .17     .000|    2.50   1.278|    4.83   .580|    7.17   .079|    9.50   .006
 0316>     .25     .000|    2.58   1.297|    4.92   .546|    7.25   .073|    9.58   .005
 0317>     .33     .000|    2.67   1.310|    5.00   .514|    7.33   .067|    9.67   .005
 0318>     .42     .000|    2.75   1.318|    5.08   .483|    7.42   .062|    9.75   .004
  319>     .50     .000|    2.83   1.321|    5.17   .454|    7.50   .057|    9.83   .003
  320>     .58     .000|    2.92   1.320|    5.25   .426|    7.58   .052|    9.92   .003
 0321>     .67     .000|    3.00   1.314|    5.33   .399|    7.67   .048|   10.00   .003
 0322>     .75     .000|    3.08   1.304|    5.42   .373|    7.75   .045|   10.08   .002
  323>     .83     .001|    3.17   1.290|    5.50   .349|    7.83   .041|   10.17   .002
  324>     .92     .007|    3.25   1.272|    5.58   .326|    7.92   .038|   10.25   .002
 0325>    1.00     .031|    3.33   1.249|    5.67   .305|    8.00   .035|   10.33   .001
```

1.08	.077	3.42	1.223	5.75	.284	8.08	.032	10.42	.001
1.17	.143	3.50	1.193	5.83	.265	8.17	.029	10.50	.001
1.25	.225	3.58	1.160	5.92	.247	8.25	.027	10.58	.001
1.33	.316	3.67	1.125	6.00	.230	8.33	.025	10.67	.001
1.42	.413	3.75	1.088	6.08	.214	8.42	.023	10.75	.001
1.50	.511	3.83	1.049	6.17	.199	8.50	.021	10.83	.001
1.58	.609	3.92	1.009	6.25	.184	8.58	.019	10.92	.000
1.67	.703	4.00	.968	6.33	.171	8.67	.018	11.00	.000
1.75	.793	4.08	.927	6.42	.159	8.75	.016	11.08	.000
1.83	.876	4.17	.886	6.50	.147	8.83	.015	11.17	.000
1.92	.953	4.25	.846	6.58	.136	8.92	.014	11.25	.000
2.00	1.021	4.33	.805	6.67	.126	9.00	.012	11.33	.000
2.08	1.083	4.42	.765	6.75	.117	9.08	.011	11.42	.000
2.17	1.136	4.50	.726	6.83	.108	9.17	.010	11.50	.000
2.25	1.183	4.58	.688	6.92	.100	9.25	.009		

001:0012

*# Site Area

DESIGN NASHYD	Area (ha)= 48.10	Curve Number (CN)=60.00
01:siteR DT= 5.00	Ia (mm)= 4.670	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 1.070	

Unit Hyd Qpeak (cms)= 1.717

PEAK FLOW (cms)= .359 (i)
TIME TO PEAK (hrs)= 2.417
RUNOFF VOLUME (mm)= 6.913
TOTAL RAINFALL (mm)= 42.514
RUNOFF COEFFICIENT = .163

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

001:0013

DESIGN STANDHYD	Area (ha)= 19.90	
02:siteU DT= 2.00	Total Imp(%)= 25.00	Dir. Conn.(%)= 8.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	4.97	14.92	
Dep. Storage	(mm)=	1.57	6.20	
Average Slope	(%)=	.50	.50	
Length	(m)=	801.21	70.00	
Mannings n	=	.013	.250	
Max.eff.Inten.	(mm/hr)=	92.17	8.36	
over	(min)	12.00	52.00	
Storage Coeff.	(min)=	11.33 (ii)	51.72 (ii)	
Unit Hyd. Tpeak	(min)=	12.00	52.00	
Unit Hyd. peak	(cms)=	.10	.02	
				TOTALS
PEAK FLOW	(cms)=	.26	.19	.294 (iii)
TIME TO PEAK	(hrs)=	1.13	1.97	1.133
RUNOFF VOLUME	(mm)=	40.94	8.00	10.631
TOTAL RAINFALL	(mm)=	42.51	42.51	42.514
RUNOFF COEFFICIENT	=	.96	.19	.250

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 60.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

00391> 001:0014----------
 0392> --------------------
 0393> | ADD HYD (site) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00394> -------------------- (ha) (cms) (hrs) (mm) (cms)
00395> ID1 01:siteR 48.10 .359 2.42 6.91 .000
 0396> +ID2 02:siteU 19.90 .294 1.13 10.63 .000
 0397> ==========
00398> SUM 03:site 68.00 .562 2.17 8.00 .000
00399>

 0400> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
 0401>

00402> ----------
00403> 001:0015----------
 0404> --------------------
 0405> | ROUTE CHANNEL | Routing time step (min) = 2.00
00406> | IN> 03:site | Number of SEGMENTS = 1
00407> | OUT< 04:rtsit1 | Slopes (%), CHANNEL= .50 FLOODPLAIN= .50
 0408> -------------------- LENGTH = 1400.00 (m)
 0409>

00410> <------- DATA FOR SECTION (1.0) ------>
00411> Distance Elevation Manning
 0412> .00 2.00 .0350 Main Channel
 0413> 6.00 .00 .0350 Main Channel
00414> 12.00 2.00 .0350 Main Channel
00415>

 0416> <---------- TRAVEL TIME TABLE ---------->
 0417> DEPTH ELEV X-VOLUME S-VOLUME FLOW RATE VELOCITY TRAV.TIME D x V
 0418> (m) (m) (cu.m.) (cu.m.) (cms) (m/s) (min) (m2/s)
 0419> .105 .105 .465E+02 .350E+00 .009 .274 85.17 .029
 0420> .211 .211 .186E+03 .280E+01 .058 .435 53.65 .092
 0421> .316 .316 .419E+03 .945E+01 .170 .570 40.95 .180
 0422> .421 .421 .745E+03 .224E+02 .367 .690 33.80 .291
 0423> .526 .526 .116E+04 .437E+02 .666 .801 29.13 .422
 0424> .632 .632 .168E+04 .756E+02 1.083 .905 25.79 .571
 0425> .737 .737 .228E+04 .120E+03 1.633 1.003 23.28 .739
 0426> .842 .842 .298E+04 .179E+03 2.331 1.096 21.29 .923
 0427> .947 .947 .377E+04 .255E+03 3.192 1.185 19.68 1.123
 0428> 1.053 1.053 .465E+04 .350E+03 4.227 1.272 18.35 1.339
 0429> 1.158 1.158 .563E+04 .466E+03 5.450 1.355 17.22 1.569
 0430> 1.263 1.263 .670E+04 .605E+03 6.874 1.436 16.25 1.814
 0431> 1.368 1.368 .786E+04 .769E+03 8.509 1.515 15.40 2.073
 0432> 1.474 1.474 .912E+04 .960E+03 10.368 1.591 14.66 2.345
 0433> 1.579 1.579 .105E+05 .118E+04 12.463 1.666 14.00 2.631
 0434> 1.684 1.684 .119E+05 .143E+04 14.803 1.740 13.41 2.930
 0435> 1.789 1.789 .134E+05 .172E+04 17.400 1.811 12.88 3.241
 0436> 1.895 1.895 .151E+05 .204E+04 20.265 1.882 12.40 3.565
 0437> 2.000 2.000 .168E+05 .240E+04 23.408 1.951 11.96 3.901
 0438>

 0439> X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 0440> S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
 0441>

 0442> <---- hydrograph ----> <-pipe / channel->
 0443> AREA QPEAK TPEAK R.V. MAX DEPTH MAX VEL
 0444> (ha) (cms) (hrs) (mm) (m) (m/s)
 0445> INFLOW : ID= 3:site 68.00 .562 2.17 8.001 .490 .759
 0446> OUTFLOW: ID= 4:rtsit1 68.00 .507 2.67 8.001 .470 .737
 0447>
 0448>

 0449> ----------
 0450> 001:0016----------
 0451> --------------------
 0452> | ROUTE CHANNEL | Routing time step (min) = 2.00
 0453> | IN> 04:rtsit1 | Number of SEGMENTS = 1
 0454> | OUT< 05:rtsit2 | Slopes (%), CHANNEL= .36 FLOODPLAIN= .36
 0455> -------------------- LENGTH = 475.00 (m)

<------ DATA FOR SECTION (1.0) ------>

Distance	Elevation	Manning	
.00	2.00	.0350	Main Channel
6.00	.00	.0350	Main Channel
9.00	.00	.0350	Main Channel
15.00	2.00	.0350	Main Channel

<---------- TRAVEL TIME TABLE ---------->

DEPTH (m)	ELEV (m)	X-VOLUME (cu.m.)	S-VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)	D x V (m2/s)
.105	.105	.166E+03	.510E+01	.125	.357	22.15	.038
.211	.211	.363E+03	.224E+02	.412	.539	14.68	.114
.316	.316	.592E+03	.547E+02	.847	.679	11.65	.215
.421	.421	.853E+03	.105E+03	1.431	.797	9.93	.336
.526	.526	.114E+04	.176E+03	2.171	.901	8.79	.474
.632	.632	.147E+04	.271E+03	3.075	.995	7.96	.628
.737	.737	.182E+04	.393E+03	4.153	1.082	7.32	.797
.842	.842	.221E+04	.544E+03	5.414	1.163	6.81	.980
.947	.947	.263E+04	.728E+03	6.866	1.241	6.38	1.175
1.053	1.053	.308E+04	.948E+03	8.519	1.314	6.02	1.383
1.158	1.158	.356E+04	.121E+04	10.382	1.385	5.72	1.604
1.263	1.263	.407E+04	.150E+04	12.463	1.453	5.45	1.836
1.368	1.368	.462E+04	.185E+04	14.772	1.519	5.21	2.079
1.474	1.474	.519E+04	.224E+04	17.317	1.583	5.00	2.334
1.579	1.579	.580E+04	.268E+04	20.107	1.646	4.81	2.599
1.684	1.684	.644E+04	.317E+04	23.149	1.707	4.64	2.875
1.789	1.789	.711E+04	.372E+04*	26.453	1.766	4.48	3.161
1.895	1.895	.782E+04	.433E+04*	30.026	1.825	4.34	3.458
2.000	2.000	.855E+04	.500E+04*	33.877	1.882	4.21	3.764

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

	AREA (ha)	<---- hydrograph ----> QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	<-pipe / channel-> MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 4:rtsit1	68.00	.507	2.67	8.001	.233	.565
OUTFLOW: ID= 5:rtsit2	68.00	.499	2.87	8.001	.231	.562

001:0017

SAVE HYD	AREA (ha)=	68.000
ID=05 (rtsit2)	QPEAK (cms)=	.499 (i)
DT= 2.00 PCYC= 1	TPEAK (hrs)=	2.867
	VOLUME (mm)=	8.001

Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-rtsit2.001
Comments: Post Site Flows

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

TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms
.00	.000	3.77	.385	7.53	.025	11.30	.002	15.07	.000
.03	.000	3.80	.377	7.57	.025	11.33	.002	15.10	.000
.07	.000	3.83	.370	7.60	.024	11.37	.002	15.13	.000
.10	.000	3.87	.362	7.63	.024	11.40	.002	15.17	.000
.13	.000	3.90	.355	7.67	.023	11.43	.002	15.20	.000
.17	.000	3.93	.348	7.70	.023	11.47	.002	15.23	.000
.20	.000	3.97	.342	7.73	.022	11.50	.002	15.27	.000
.23	.000	4.00	.335	7.77	.022	11.53	.002	15.30	.000
.27	.000	4.03	.329	7.80	.021	11.57	.002	15.33	.000
.30	.000	4.07	.323	7.83	.021	11.60	.002	15.37	.000

)0521>	.33	.000	4.10	.317	7.87	.020	11.63	.001	15.40	.000
522>	.37	.000	4.13	.311	7.90	.020	11.67	.001	15.43	.000
523>	.40	.000	4.17	.305	7.93	.019	11.70	.001	15.47	.000
)0524>	.43	.000	4.20	.300	7.97	.019	11.73	.001	15.50	.000
)0525>	.47	.000	4.23	.294	8.00	.018	11.77	.001	15.53	.000
526>	.50	.000	4.27	.289	8.03	.018	11.80	.001	15.57	.000
527>	.53	.000	4.30	.283	8.07	.017	11.83	.001	15.60	.000
)0528>	.57	.000	4.33	.277	8.10	.017	11.87	.001	15.63	.000
)0529>	.60	.000	4.37	.272	8.13	.017	11.90	.001	15.67	.000
530>	.63	.000	4.40	.266	8.17	.016	11.93	.001	15.70	.000
531>	.67	.000	4.43	.260	8.20	.016	11.97	.001	15.73	.000
)0532>	.70	.000	4.47	.254	8.23	.016	12.00	.001	15.77	.000
)0533>	.73	.001	4.50	.249	8.27	.015	12.03	.001	15.80	.000
534>	.77	.001	4.53	.244	8.30	.015	12.07	.001	15.83	.000
535>	.80	.001	4.57	.238	8.33	.015	12.10	.001	15.87	.000
)0536>	.83	.002	4.60	.233	8.37	.014	12.13	.001	15.90	.000
)0537>	.87	.002	4.63	.228	8.40	.014	12.17	.001	15.93	.000
538>	.90	.003	4.67	.223	8.43	.014	12.20	.001	15.97	.000
539>	.93	.004	4.70	.218	8.47	.013	12.23	.001	16.00	.000
)0540>	.97	.005	4.73	.213	8.50	.013	12.27	.001	16.03	.000
)0541>	1.00	.006	4.77	.209	8.53	.013	12.30	.001	16.07	.000
542>	1.03	.008	4.80	.204	8.57	.012	12.33	.001	16.10	.000
543>	1.07	.011	4.83	.200	8.60	.012	12.37	.001	16.13	.000
)0544>	1.10	.015	4.87	.195	8.63	.012	12.40	.001	16.17	.000
)0545>	1.13	.020	4.90	.191	8.67	.011	12.43	.001	16.20	.000
546>	1.17	.026	4.93	.186	8.70	.011	12.47	.001	16.23	.000
547>	1.20	.032	4.97	.182	8.73	.011	12.50	.001	16.27	.000
)0548>	1.23	.039	5.00	.178	8.77	.011	12.53	.001	16.30	.000
)0549>	1.27	.047	5.03	.174	8.80	.010	12.57	.001	16.33	.000
550>	1.30	.055	5.07	.170	8.83	.010	12.60	.001	16.37	.000
551>	1.33	.064	5.10	.166	8.87	.010	12.63	.001	16.40	.000
)0552>	1.37	.074	5.13	.162	8.90	.010	12.67	.001	16.43	.000
)0553>	1.40	.084	5.17	.158	8.93	.010	12.70	.001	16.47	.000
554>	1.43	.094	5.20	.154	8.97	.009	12.73	.001	16.50	.000
555>	1.47	.105	5.23	.151	9.00	.009	12.77	.001	16.53	.000
)0556>	1.50	.115	5.27	.148	9.03	.009	12.80	.001	16.57	.000
)0557>	1.53	.126	5.30	.144	9.07	.009	12.83	.001	16.60	.000
558>	1.57	.138	5.33	.141	9.10	.009	12.87	.001	16.63	.000
559>	1.60	.150	5.37	.137	9.13	.008	12.90	.001	16.67	.000
)0560>	1.63	.164	5.40	.134	9.17	.008	12.93	.001	16.70	.000
)0561>	1.67	.177	5.43	.130	9.20	.008	12.97	.001	16.73	.000
562>	1.70	.191	5.47	.127	9.23	.008	13.00	.001	16.77	.000
563>	1.73	.206	5.50	.123	9.27	.008	13.03	.001	16.80	.000
)0564>	1.77	.221	5.53	.120	9.30	.007	13.07	.001	16.83	.000
)0565>	1.80	.237	5.57	.117	9.33	.007	13.10	.001	16.87	.000
566>	1.83	.254	5.60	.114	9.37	.007	13.13	.001	16.90	.000
567>	1.87	.271	5.63	.111	9.40	.007	13.17	.001	16.93	.000
)0568>	1.90	.288	5.67	.108	9.43	.007	13.20	.000	16.97	.000
)0569>	1.93	.305	5.70	.106	9.47	.007	13.23	.000	17.00	.000
570>	1.97	.322	5.73	.103	9.50	.006	13.27	.000	17.03	.000
571>	2.00	.339	5.77	.100	9.53	.006	13.30	.000	17.07	.000
)0572>	2.03	.354	5.80	.098	9.57	.006	13.33	.000	17.10	.000
)0573>	2.07	.368	5.83	.095	9.60	.006	13.37	.000	17.13	.000
574>	2.10	.381	5.87	.093	9.63	.006	13.40	.000	17.17	.000
575>	2.13	.393	5.90	.090	9.67	.006	13.43	.000	17.20	.000
)0576>	2.17	.405	5.93	.088	9.70	.006	13.47	.000	17.23	.000
)0577>	2.20	.416	5.97	.086	9.73	.006	13.50	.000	17.27	.000
578>	2.23	.425	6.00	.083	9.77	.005	13.53	.000	17.30	.000
579>	2.27	.433	6.03	.081	9.80	.005	13.57	.000	17.33	.000
)0580>	2.30	.440	6.07	.079	9.83	.005	13.60	.000	17.37	.000
)0581>	2.33	.447	6.10	.077	9.87	.005	13.63	.000	17.40	.000
582>	2.37	.454	6.13	.075	9.90	.005	13.67	.000	17.43	.000
583>	2.40	.460	6.17	.073	9.93	.005	13.70	.000	17.47	.000
)0584>	2.43	.465	6.20	.071	9.97	.005	13.73	.000	17.50	.000
)0585>	2.47	.471	6.23	.069	10.00	.005	13.77	.000	17.53	.000

00586>	2.50	.475	6.27	.067	10.03	.005	13.80	.000	17.57	.000
00587>	2.53	.480	6.30	.065	10.07	.004	13.83	.000	17.60	.000
00588>	2.57	.483	6.33	.063	10.10	.004	13.87	.000	17.63	.000
00589>	2.60	.487	6.37	.062	10.13	.004	13.90	.000	17.67	.000
00590>	2.63	.490	6.40	.060	10.17	.004	13.93	.000	17.70	.000
00591>	2.67	.492	6.43	.058	10.20	.004	13.97	.000	17.73	.000
00592>	2.70	.494	6.47	.057	10.23	.004	14.00	.000	17.77	.000
00593>	2.73	.496	6.50	.055	10.27	.004	14.03	.000	17.80	.000
00594>	2.77	.497	6.53	.054	10.30	.004	14.07	.000	17.83	.000
00595>	2.80	.498	6.57	.052	10.33	.004	14.10	.000	17.87	.000
00596>	2.83	.499	6.60	.051	10.37	.004	14.13	.000	17.90	.000
00597>	2.87	.499	6.63	.050	10.40	.004	14.17	.000	17.93	.000
00598>	2.90	.498	6.67	.048	10.43	.003	14.20	.000	17.97	.000
00599>	2.93	.498	6.70	.047	10.47	.003	14.23	.000	18.00	.000
00600>	2.97	.497	6.73	.046	10.50	.003	14.27	.000	18.03	.000
00601>	3.00	.496	6.77	.045	10.53	.003	14.30	.000	18.07	.000
00602>	3.03	.494	6.80	.044	10.57	.003	14.33	.000	18.10	.000
00603>	3.07	.492	6.83	.042	10.60	.003	14.37	.000	18.13	.000
00604>	3.10	.490	6.87	.041	10.63	.003	14.40	.000	18.17	.000
00605>	3.13	.488	6.90	.040	10.67	.003	14.43	.000	18.20	.000
00606>	3.17	.485	6.93	.039	10.70	.003	14.47	.000	18.23	.000
00607>	3.20	.482	6.97	.038	10.73	.003	14.50	.000	18.27	.000
00608>	3.23	.478	7.00	.037	10.77	.003	14.53	.000	18.30	.000
00609>	3.27	.475	7.03	.037	10.80	.003	14.57	.000	18.33	.000
00610>	3.30	.471	7.07	.036	10.83	.003	14.60	.000	18.37	.000
00611>	3.33	.467	7.10	.035	10.87	.003	14.63	.000	18.40	.000
00612>	3.37	.463	7.13	.034	10.90	.002	14.67	.000	18.43	.000
00613>	3.40	.459	7.17	.033	10.93	.002	14.70	.000	18.47	.000
00614>	3.43	.454	7.20	.032	10.97	.002	14.73	.000	18.50	.000
00615>	3.47	.449	7.23	.032	11.00	.002	14.77	.000	18.53	.000
00616>	3.50	.444	7.27	.031	11.03	.002	14.80	.000	18.57	.000
00617>	3.53	.438	7.30	.030	11.07	.002	14.83	.000	18.60	.000
00618>	3.57	.431	7.33	.029	11.10	.002	14.87	.000	18.63	.000
00619>	3.60	.424	7.37	.029	11.13	.002	14.90	.000	18.67	.000
00620>	3.63	.416	7.40	.028	11.17	.002	14.93	.000	18.70	.000
00621>	3.67	.409	7.43	.027	11.20	.002	14.97	.000	18.73	.000
00622>	3.70	.401	7.47	.027	11.23	.002	15.00	.000		
00623>	3.73	.393	7.50	.026	11.27	.002	15.03	.000		

00624> ----------
00625> 001:0018----------
00626> ----------

	ADD HYD (sumpst)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
00627>							
00628>	----------						
00629>		ID1 09:extpre	221.80	1.321	2.83	6.91	.000
00630>		+ID2 05:rtsit2	68.00	.499	2.87	8.00	.000
00631>		==========	==========	==========	==========	==========	==========
00632>		SUM 08:sumpst	289.80	1.820	2.83	7.17	.000

00633>
00634> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00635>
00636> ----------
00637> 001:0019----------
00638> ----------

00639>	SAVE HYD	AREA	(ha)=	289.800
00640>	ID=08 (sumpst)	QPEAK	(cms)=	1.820 (i)
00641>	DT= 2.00 PCYC= 1	TPEAK	(hrs)=	2.833
00642>	----------	VOLUME	(mm)=	7.168

00643> Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-sumpst.001
00644> Comments: Overall Postdev Hydrograph
00645>
00646> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

	TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW
00647>	hrs	cms	hrs	cms	hrs	cms	hrs	cms	hrs	cms
00649>	.00	.000	3.77	1.465	7.53	.081	11.30	.002	15.07	.000
00650>	.03	.000	3.80	1.441	7.57	.078	11.33	.002	15.10	.000

)0651>	.07	.000	3.83	1.418	7.60	.076	11.37	.002	15.13	.000
652>	.10	.000	3.87	1.395	7.63	.074	11.40	.002	15.17	.000
653>	.13	.000	3.90	1.372	7.67	.071	11.43	.002	15.20	.000
)0654>	.17	.000	3.93	1.349	7.70	.069	11.47	.002	15.23	.000
)0655>	.20	.000	3.97	1.327	7.73	.067	11.50	.002	15.27	.000
656>	.23	.000	4.00	1.304	7.77	.065	11.53	.002	15.30	.000
657>	.27	.000	4.03	1.281	7.80	.063	11.57	.002	15.33	.000
)0658>	.30	.000	4.07	1.259	7.83	.062	11.60	.002	15.37	.000
)0659>	.33	.000	4.10	1.236	7.87	.060	11.63	.001	15.40	.000
660>	.37	.000	4.13	1.214	7.90	.058	11.67	.001	15.43	.000
661>	.40	.000	4.17	1.192	7.93	.056	11.70	.001	15.47	.000
)0662>	.43	.000	4.20	1.170	7.97	.055	11.73	.001	15.50	.000
)0663>	.47	.000	4.23	1.148	8.00	.053	11.77	.001	15.53	.000
664>	.50	.000	4.27	1.126	8.03	.051	11.80	.001	15.57	.000
665>	.53	.000	4.30	1.104	8.07	.050	11.83	.001	15.60	.000
)0666>	.57	.000	4.33	1.082	8.10	.048	11.87	.001	15.63	.000
)0667>	.60	.000	4.37	1.061	8.13	.047	11.90	.001	15.67	.000
668>	.63	.000	4.40	1.039	8.17	.046	11.93	.001	15.70	.000
669>	.67	.000	4.43	1.017	8.20	.044	11.97	.001	15.73	.000
)0670>	.70	.001	4.47	.996	8.23	.043	12.00	.001	15.77	.000
)0671>	.73	.001	4.50	.975	8.27	.042	12.03	.001	15.80	.000
672>	.77	.001	4.53	.954	8.30	.040	12.07	.001	15.83	.000
673>	.80	.002	4.57	.934	8.33	.039	12.10	.001	15.87	.000
)0674>	.83	.002	4.60	.913	8.37	.038	12.13	.001	15.90	.000
)0675>	.87	.005	4.63	.894	8.40	.037	12.17	.001	15.93	.000
676>	.90	.008	4.67	.874	8.43	.036	12.20	.001	15.97	.000
677>	.93	.015	4.70	.854	8.47	.035	12.23	.001	16.00	.000
)0678>	.97	.026	4.73	.835	8.50	.034	12.27	.001	16.03	.000
)0679>	1.00	.037	4.77	.816	8.53	.033	12.30	.001	16.07	.000
680>	1.03	.058	4.80	.798	8.57	.032	12.33	.001	16.10	.000
681>	1.07	.079	4.83	.780	8.60	.031	12.37	.001	16.13	.000
)0682>	1.10	.106	4.87	.762	8.63	.030	12.40	.001	16.17	.000
)0683>	1.13	.137	4.90	.744	8.67	.029	12.43	.001	16.20	.000
684>	1.17	.169	4.93	.726	8.70	.028	12.47	.001	16.23	.000
685>	1.20	.208	4.97	.709	8.73	.027	12.50	.001	16.27	.000
)0686>	1.23	.248	5.00	.692	8.77	.027	12.53	.001	16.30	.000
)0687>	1.27	.290	5.03	.676	8.80	.026	12.57	.001	16.33	.000
688>	1.30	.335	5.07	.659	8.83	.025	12.60	.001	16.37	.000
689>	1.33	.380	5.10	.643	8.87	.024	12.63	.001	16.40	.000
)0690>	1.37	.429	5.13	.627	8.90	.024	12.67	.001	16.43	.000
)0691>	1.40	.477	5.17	.612	8.93	.023	12.70	.001	16.47	.000
692>	1.43	.527	5.20	.597	8.97	.022	12.73	.001	16.50	.000
693>	1.47	.576	5.23	.582	9.00	.021	12.77	.001	16.53	.000
)0694>	1.50	.627	5.27	.568	9.03	.021	12.80	.001	16.57	.000
)0695>	1.53	.676	5.30	.554	9.07	.020	12.83	.001	16.60	.000
696>	1.57	.727	5.33	.540	9.10	.019	12.87	.001	16.63	.000
697>	1.60	.778	5.37	.526	9.13	.019	12.90	.001	16.67	.000
)0698>	1.63	.829	5.40	.512	9.17	.018	12.93	.001	16.70	.000
)0699>	1.67	.881	5.43	.499	9.20	.017	12.97	.001	16.73	.000
700>	1.70	.930	5.47	.486	9.23	.017	13.00	.001	16.77	.000
701>	1.73	.981	5.50	.473	9.27	.016	13.03	.001	16.80	.000
)0702>	1.77	1.031	5.53	.460	9.30	.016	13.07	.001	16.83	.000
)0703>	1.80	1.080	5.57	.448	9.33	.015	13.10	.001	16.87	.000
704>	1.83	1.130	5.60	.436	9.37	.015	13.13	.001	16.90	.000
705>	1.87	1.178	5.63	.425	9.40	.014	13.17	.001	16.93	.000
)0706>	1.90	1.225	5.67	.413	9.43	.014	13.20	.000	16.97	.000
)0707>	1.93	1.272	5.70	.402	9.47	.013	13.23	.000	17.00	.000
708>	1.97	1.316	5.73	.391	9.50	.013	13.27	.000	17.03	.000
709>	2.00	1.361	5.77	.381	9.53	.012	13.30	.000	17.07	.000
)0710>	2.03	1.400	5.80	.370	9.57	.012	13.33	.000	17.10	.000
)0711>	2.07	1.438	5.83	.360	9.60	.011	13.37	.000	17.13	.000
712>	2.10	1.474	5.87	.350	9.63	.011	13.40	.000	17.17	.000
713>	2.13	1.508	5.90	.341	9.67	.010	13.43	.000	17.20	.000
)0714>	2.17	1.542	5.93	.331	9.70	.010	13.47	.000	17.23	.000
)0715>	2.20	1.571	5.97	.322	9.73	.010	13.50	.000	17.27	.000

00716>	2.23	1.599	6.00	.313	9.77	.009	13.53	.000	17.30	.000
00717>	2.27	1.623	6.03	.304	9.80	.009	13.57	.000	17.33	.000
00718>	2.30	1.646	6.07	.296	9.83	.009	13.60	.000	17.37	.000
00719>	2.33	1.668	6.10	.288	9.87	.008	13.63	.000	17.40	.000
00720>	2.37	1.688	6.13	.280	9.90	.008	13.67	.000	17.43	.000
00721>	2.40	1.706	6.17	.271	9.93	.008	13.70	.000	17.47	.000
00722>	2.43	1.724	6.20	.264	9.97	.007	13.73	.000	17.50	.000
00723>	2.47	1.739	6.23	.256	10.00	.007	13.77	.000	17.53	.000
00724>	2.50	1.754	6.27	.249	10.03	.007	13.80	.000	17.57	.000
00725>	2.53	1.765	6.30	.242	10.07	.007	13.83	.000	17.60	.000
00726>	2.57	1.777	6.33	.235	10.10	.007	13.87	.000	17.63	.000
00727>	2.60	1.787	6.37	.228	10.13	.006	13.90	.000	17.67	.000
00728>	2.63	1.795	6.40	.221	10.17	.006	13.93	.000	17.70	.000
00729>	2.67	1.803	6.43	.215	10.20	.006	13.97	.000	17.73	.000
00730>	2.70	1.808	6.47	.209	10.23	.006	14.00	.000	17.77	.000
00731>	2.73	1.813	6.50	.203	10.27	.006	14.03	.000	17.80	.000
00732>	2.77	1.816	6.53	.197	10.30	.005	14.07	.000	17.83	.000
00733>	2.80	1.818	6.57	.191	10.33	.005	14.10	.000	17.87	.000
00734>	2.83	1.820	6.60	.185	10.37	.005	14.13	.000	17.90	.000
00735>	2.87	1.819	6.63	.180	10.40	.005	14.17	.000	17.93	.000
00736>	2.90	1.818	6.67	.175	10.43	.005	14.20	.000	17.97	.000
00737>	2.93	1.816	6.70	.170	10.47	.005	14.23	.000	18.00	.000
00738>	2.97	1.813	6.73	.165	10.50	.004	14.27	.000	18.03	.000
00739>	3.00	1.810	6.77	.160	10.53	.004	14.30	.000	18.07	.000
00740>	3.03	1.804	6.80	.155	10.57	.004	14.33	.000	18.10	.000
00741>	3.07	1.799	6.83	.151	10.60	.004	14.37	.000	18.13	.000
00742>	3.10	1.792	6.87	.146	10.63	.004	14.40	.000	18.17	.000
00743>	3.13	1.784	6.90	.142	10.67	.004	14.43	.000	18.20	.000
00744>	3.17	1.775	6.93	.138	10.70	.004	14.47	.000	18.23	.000
00745>	3.20	1.765	6.97	.134	10.73	.003	14.50	.000	18.27	.000
00746>	3.23	1.754	7.00	.130	10.77	.003	14.53	.000	18.30	.000
00747>	3.27	1.742	7.03	.126	10.80	.003	14.57	.000	18.33	.000
00748>	3.30	1.730	7.07	.122	10.83	.003	14.60	.000	18.37	.000
00749>	3.33	1.717	7.10	.119	10.87	.003	14.63	.000	18.40	.000
00750>	3.37	1.702	7.13	.115	10.90	.003	14.67	.000	18.43	.000
00751>	3.40	1.687	7.17	.112	10.93	.003	14.70	.000	18.47	.000
00752>	3.43	1.671	7.20	.109	10.97	.003	14.73	.000	18.50	.000
00753>	3.47	1.654	7.23	.105	11.00	.003	14.77	.000	18.53	.000
00754>	3.50	1.637	7.27	.102	11.03	.003	14.80	.000	18.57	.000
00755>	3.53	1.618	7.30	.099	11.07	.002	14.83	.000	18.60	.000
00756>	3.57	1.597	7.33	.096	11.10	.002	14.87	.000	18.63	.000
00757>	3.60	1.577	7.37	.094	11.13	.002	14.90	.000	18.67	.000
00758>	3.63	1.555	7.40	.091	11.17	.002	14.93	.000	18.70	.000
00759>	3.67	1.534	7.43	.088	11.20	.002	14.97	.000		
00760>	3.70	1.511	7.47	.086	11.23	.002	15.00	.000		
00761>	3.73	1.488	7.50	.083	11.27	.002	15.03	.000		

00762> ----------
00763> 001:0020----------
00764> FINISH
00765> ----------
00766> **********
00767> WARNINGS / ERRORS / NOTES
00768> ----------
00769> Simulation ended on 2005-05-04 at 10:22:28
00770> ==========
00771>
00772>

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1: 10 yr SWMHYMO

```
00001> ================================================================================
 )002>
 )003>  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999  =========
00004>  S      W W W  MM MM  H   H   Y Y   MM MM  O   O     9   9  9   9
00005>  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9 Ver. 4.02
 )006>      S  W W   M   M  H   H    Y    M   M  O   O       9999   9999 July 1999
 )007>  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9 =========
00008>                                                       9   9  9   9 # 3824306
00009>       StormWater Management HYdrologic Model           999    999  =========
 )010>
 )011>  ********************************************************************************
00012>  ************************** SWMHYMO-99 Ver/4.02 ***************************
00013>  *******  A single event and continuous hydrologic simulation model  *******
 )014>  *******     based on the principles of HYMO and its successors       *******
 )015>  *******                 OTTHYMO-83 and OTTHYMO-89.                   *******
)0016>  ********************************************************************************
)0017>  ******* Distributed by:  J.F. Sabourin and Associates Inc.           *******
 )018>  *******                  Ottawa,  Ontario: (613) 727-5199            *******
 )019>  *******                  Gatineau, Quebec: (819) 243-6858            *******
)0020>  *******                  E-Mail: swmhymo@jfsa.Com                    *******
)0021>  ********************************************************************************
 )022>
 )023>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
)0024>  +++++++ Licensed user: Stantec Consulting Ltd. 604                    +++++++
)0025>  +++++++                  Ottawa              SERIAL#:3824306         +++++++
 )026>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 )027>
)0028>  ********************************************************************************
)0029>  *******           ++++++ PROGRAM ARRAY DIMENSIONS ++++++              *******
 )030>  *******           Maximum value for ID numbers  :     10              *******
 )031>  *******           Max. number of rainfall points:  15000              *******
)0032>  *******           Max. number of flow points    :  15000              *******
)0033>  ********************************************************************************
 )034>
 )035>
)0036>  ********************   D E T A I L E D   O U T P U T   ********************
)0037>  ********************************************************************************
 )038>  *       DATE: 2005-05-04      TIME: 10:23:38      RUN COUNTER: 000194       *
 )039>  ********************************************************************************
)0040>  * Input   filename: W:\active\60400144\design\analysis\SWMAPR~1\144post2.d*
)0041>  * Output  filename: W:\active\60400144\design\analysis\SWMAPR~1\144post2.o*
)0042>  * Summary filename: W:\active\60400144\design\analysis\SWMAPR~1\144post2.s*
 )043>  * User comments:                                                          *
)0044>  * 1: _____________________________________________________________________*
)0045>  * 2: _____________________________________________________________________*
)0046>  * 3: _____________________________________________________________________*
 )047>  ********************************************************************************
)0048>
0049> --------------------------------------------------------------------------------
)0050> 001:0001-----------------------------------------------------------------------
 )051> *#*************************************************************************
)0052> *#  Project Name: [Emerald Creek]    Project Number: [604-00144]
0053> *#  Date         : 06-18-2004
)0054> *#  Modeller     : [MAF]
 )055> *#  Company      : McNeely Engineering Consultants Limited
)0056> *#  License #    :  5695479
)0057> *#*************************************************************************
)0058> --------------------
 )059> | START            |  Project  dir.: W:\active\60400144\design\analysis\SWMAPR~1
)0060> --------------------  Rainfall dir.: W:\active\60400144\design\analysis\SWMAPR~1
0061>      TZERO =    .00 hrs on        0
)0062>     METOUT=    2 (output = METRIC)
 )063>     NRUN  = 001
)0064>     NSTORM=    0
0065> --------------------------------------------------------------------------------
```

```
00066> 001:0002--------------------------------------------------------------------------
00067> * 2-YEAR IDF CHICAGO STORM
00068> *CHICAGO STORM        IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00069> *                     ICASEcs=[2],
00070> *                     Enter ordinates of IDF curve below, at least seven points
00071> *                        TIME (min)    Intensity(mm/hr)
00072> *                            [5]         [102.80]
00073> *                            [10]        [77.10]
00074> *                            [15]        [63.30]
00075> *                            [30]        [39.90]
00076> *                            [60]        [24.20]
00077> *                            [120]       [14.30]
00078> *                            [360]       [6.20]
00079> *                            [720]       [3.60]
00080> *                            [1440]      [2.00]
00081> *                             -1             -1
00082> * 5-YEAR IDF CHICAGO STORM
00083> *CHICAGO STORM        IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00084> *                    ICASEcs=[2],
00085> *                    Enter ordinates of IDF curve below, at least seven points
00086> *                        TIME (min)    Intensity(mm/hr)
00087> *                            [5]         [140.20]
00088> *                            [10]        [104.40]
00089> *                            [15]        [85.60]
00090> *                            [30]        [53.90]
00091> *                            [60]        [32.00]
00092> *                            [120]       [18.90]
00093> *                            [360]       [8.40]
00094> *                            [720]       [4.80]
00095> *                            [1440]      [2.60]
00096> *                              -1             -1
00097> *# 10-YEAR IDF CHICAGO STORM
00098> --------------------
00099> | CHICAGO STORM    |     IDF curve parameters: A=1174.184
00100> | Ptotal= 49.50 mm |                           B=   6.014
00101> --------------------                           C=    .816
00102>                          used in:   INTENSITY =  A / (t + B)^C
00103>
00104>                          Duration of storm   =  3.00 hrs
00105>                          Storm time step     = 10.00 min
00106>                          Time to peak ratio =   .33
00107>
00108>                      The CORRELATION coefficient is = .9998038
00109>
00110>                       TIME        ENTERED              COMPUTED
00111>                      (min)        (mm/hr)               (mm/hr)
00112>                         5.         165.00                165.77
00113>                        10.         122.50                122.14
00114>                        15.         100.40                 97.85
00115>                        30.          63.10                 63.05
00116>                        60.          37.10                 38.45
00117>                       120.          22.00                 22.69
00118>                       360.           9.90                  9.50
00119>                       720.           5.60                  5.44
00120>                      1440.           3.00                  3.10
00121>
00122>              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00123>               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00124>               .17   4.248 |   1.00 122.142 |   1.83   7.733 |   2.67   4.049
00125>               .33   5.290 |   1.17  37.285 |   2.00   6.502 |   2.83   3.714
00126>               .50   7.108 |   1.33  18.954 |   2.17   5.625 |   3.00   3.434
00127>               .67  11.130 |   1.50  12.700 |   2.33   4.969 |
00128>               .83  28.100 |   1.67   9.588 |   2.50   4.458 |
00129>
00130> --------------------------------------------------------------------------
```

```
00131> 001:0003--------------------------------------------------------------------------------
 0132> * 25-YEAR IDF CHICAGO STORM
 0133> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min)
00134> *                    ICASEcs=[2],
00135> *                    Enter ordinates of IDF curve below, at least seven points
 0136> *                        TIME (min)    Intensity(mm/hr)
 0137> *                          [5]         [196.00]
00138> *                          [10]        [145.30]
00139> *                          [15]        [119.10]
 0140> *                          [30]        [74.70]
 0141> *                          [60]        [43.60]
00142> *                          [120]       [25.80]
00143> *                          [360]       [11.70]
 0144> *                          [720]       [6.60]
 0145> *                          [1440]      [3.50]
00146> *                            -1           -1
00147> * 100-YEAR IDF CHICAGO STORM
 0148> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
 0149> *                   ICASEcs=[2],
00150> *                   Enter ordinates of IDF curve below, at least seven points
00151> *                     TIME (min)    Intensity(mm/hr)
 0152> *                        [5]         [242.60]
 0153> *                          [10]        [179.00]
00154> *                          [15]        [146.80]
00155> *                          [30]        [91.90]
 0156> *                          [60]        [53.20]
 0157> *                          [120]       [31.50]
00158> *                          [360]       [14.50]
00159> *                          [720]       [8.00]
 0160> *                          [1440]      [4.30]
 0161> *                            -1           -1
00162> ----------------------
00163> | DEFAULT VALUES     |  Filename: W:\active\60400144\design\analysis\SWMAPR~1\SH
 0164> ----------------------  ICASEdv = 1 (read and print data)
 0165>       FileTitle= File comment: [                ]
00166>                  THE FOLLOWING PARAMETERS ARE USED IN THE DESIGN STANDHYD COM
00167>       Horton's infiltration equation parameters:
 0168>       [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
 0169>       Parameters for PERVIOUS surfaces in STANDHYD:
00170>       [IAper=   6.20 mm] [LGP=70.00 m] [MNP= .250]
00171>       Parameters for IMPERVIOUS surfaces in STANDHYD:
 0172>       [IAimp=   1.57 mm] [CLI=  .31]   [MNI= .013]
 0173>       Parameters used in NASHYD:
00174>       [Ia=   4.67 mm] [N= 3.00]
00175> --------------------------------------------------------------------------------
 0176> 001:0004--------------------------------------------------------------------------------
 0177> *# Area A1 (see DWG SD2)
00178> ----------------------
00179> | DESIGN NASHYD      |   Area     (ha)=   73.90   Curve Number    (CN)=60.00
 0180> | 01:A1     DT= 5.00 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
 0181> ----------------------   U.H. Tp(hrs)=   1.440
00182>
00183>       Unit Hyd Qpeak  (cms)=    1.960
 0184>
 0185>       PEAK FLOW       (cms)=     .610 (i)
 0186>       TIME TO PEAK    (hrs)=    2.833
00187>       RUNOFF VOLUME    (mm)=    9.336
 0188>       TOTAL RAINFALL   (mm)=   49.505
 0189>       RUNOFF COEFFICIENT   =     .190
 0190>
00191>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
 0192>
 0193> --------------------------------------------------------------------------------
 0194> 001:0005--------------------------------------------------------------------------------
00195> *# Area A2
```

```
00196> ----------------------
00197> | DESIGN NASHYD       |   Area     (ha)=  120.00   Curve Number    (CN)=60.00
00198> | 02:A2     DT= 5.00  |   Ia       (mm)=    4.670  # of Linear Res.(N)= 3.00
00199> ----------------------   U.H. Tp(hrs)=    1.540
00200>
00201>      Unit Hyd Qpeak  (cms)=     2.976
00202>
00203>      PEAK FLOW       (cms)=      .944 (i)
00204>      TIME TO PEAK    (hrs)=     3.000
00205>      RUNOFF VOLUME    (mm)=     9.386
00206>      TOTAL RAINFALL   (mm)=    49.505
00207>      RUNOFF COEFFICIENT   =      .190
00208>
00209>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00210>
00211> ---------------------------------------------------------------------------
00212> 001:0006-----------------------------------------------------------------------
00213> *# Area A3
00214> ----------------------
00215> | DESIGN NASHYD       |   Area     (ha)=    5.60   Curve Number    (CN)=60.00
00216> | 03:A3     DT= 5.00  |   Ia       (mm)=    4.670  # of Linear Res.(N)= 3.00
00217> ----------------------   U.H. Tp(hrs)=    1.050
00218>
00219>      Unit Hyd Qpeak  (cms)=      .204
00220>
00221>      PEAK FLOW       (cms)=      .058 (i)
00222>      TIME TO PEAK    (hrs)=     2.333
00223>      RUNOFF VOLUME    (mm)=     9.386
00224>      TOTAL RAINFALL   (mm)=    49.505
00225>      RUNOFF COEFFICIENT   =      .190
00226>
00227>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00228>
00229> ---------------------------------------------------------------------------
00230> 001:0007-----------------------------------------------------------------------
00231> *# Area A4
00232> ----------------------
00233> | DESIGN NASHYD       |   Area     (ha)=   14.70   Curve Number    (CN)=60.00
00234> | 04:A4     DT= 5.00  |   Ia       (mm)=    4.670  # of Linear Res.(N)= 3.00
00235> ----------------------   U.H. Tp(hrs)=    1.040
00236>
00237>      Unit Hyd Qpeak  (cms)=      .540
00238>
00239>      PEAK FLOW       (cms)=      .153 (i)
00240>      TIME TO PEAK    (hrs)=     2.333
00241>      RUNOFF VOLUME    (mm)=     9.386
00242>      TOTAL RAINFALL   (mm)=    49.505
00243>      RUNOFF COEFFICIENT   =      .190
00244>
00245>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00246>
00247> ---------------------------------------------------------------------------
00248> 001:0008-----------------------------------------------------------------------
00249> *# Area A5
00250> ----------------------
00251> | DESIGN NASHYD       |   Area     (ha)=    3.50   Curve Number    (CN)=60.00
00252> | 05:A5     DT= 5.00  |   Ia       (mm)=    4.670  # of Linear Res.(N)= 3.00
00253> ----------------------   U.H. Tp(hrs)=     .630
00254>
00255>      Unit Hyd Qpeak  (cms)=      .212
00256>
00257>      PEAK FLOW       (cms)=      .051 (i)
00258>      TIME TO PEAK    (hrs)=     1.750
00259>      RUNOFF VOLUME    (mm)=     9.386
00260>      TOTAL RAINFALL   (mm)=    49.505
```

```
00261>      RUNOFF COEFFICIENT    =      .190
 0262>
 0263>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00264>
00265> ------------------------------------------------------------------------------
 0266> 001:0009-------------------------------------------------------------------------
 0267> *# Area A6
00268> ----------------------
00269> | DESIGN NASHYD       |   Area     (ha)=    4.10   Curve Number    (CN)=60.00
 0270> | 06:A6     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
 0271> ----------------------   U.H. Tp(hrs)=     .630
00272>
00273>      Unit Hyd Qpeak  (cms)=     .249
 0274>
 0275>      PEAK FLOW       (cms)=     .060 (i)
00276>      TIME TO PEAK    (hrs)=    1.750
00277>      RUNOFF VOLUME    (mm)=    9.386
 0278>      TOTAL RAINFALL   (mm)=   49.505
 0279>      RUNOFF COEFFICIENT    =     .190
00280>
00281>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
 0282>
 0283> ------------------------------------------------------------------------------
00284> 001:0010-------------------------------------------------------------------------
00285> *# External Flows Pre-Development
 0286> --------------------
 0287> | ADD HYD (extpre) | ID: NHYD     AREA      QPEAK    TPEAK    R.V.     DWF
00288> --------------------                (ha)      (cms)    (hrs)    (mm)    (cms)
00289>                    ID1 01:A1       73.90      .610     2.83     9.39     .000
 0290>                   +ID2 02:A2      120.00      .944     3.00     9.39     .000
 0291>                   +ID3 03:A3        5.60      .058     2.33     9.39     .000
 0292>                   +ID4 04:A4       14.70      .153     2.33     9.39     .000
 0293>                   +ID5 05:A5        3.50      .051     1.75     9.39     .000
 0294>                   +ID6 06:A6        4.10      .060     1.75     9.39     .000
 0295>                    ==========================================================
 0296>                    SUM 09:extpre   221.80     1.798     2.83     9.39     .000
 0297>
 0298>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
 0299>
 0300> ------------------------------------------------------------------------------
 0301> 001:0011-------------------------------------------------------------------------
 0302> --------------------
 0303> | SAVE HYD           |   AREA       (ha)=  221.800
 0304> | ID=09 (extpre)     |   QPEAK     (cms)=    1.798 (i)
 0305> | DT= 5.00 PCYC= 1   |   TPEAK     (hrs)=    2.833
 0306> --------------------   VOLUME      (mm)=    9.386
 0307>   Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-extpre.001
 0308>   Comments: Post External Flows
 0309>
 0310>      (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
 0311>   TIME     FLOW |  TIME     FLOW |  TIME     FLOW |  TIME     FLOW |  TIME     FLOW
 0312>    hrs      cms |   hrs      cms |   hrs      cms |   hrs      cms |   hrs      cms
 0313>    .00     .000 |  2.33    1.675 |  4.67     .873 |  7.00     .123 |  9.33     .011
 0314>    .08     .000 |  2.42    1.716 |  4.75     .824 |  7.08     .114 |  9.42     .010
 0315>    .17     .000 |  2.50    1.748 |  4.83     .778 |  7.17     .105 |  9.50     .008
 0316>    .25     .000 |  2.58    1.772 |  4.92     .732 |  7.25     .097 |  9.58     .007
 0317>    .33     .000 |  2.67    1.786 |  5.00     .689 |  7.33     .089 |  9.67     .006
 0318>    .42     .000 |  2.75    1.796 |  5.08     .648 |  7.42     .082 |  9.75     .005
 0319>    .50     .000 |  2.83    1.798 |  5.17     .608 |  7.50     .076 |  9.83     .004
 0320>    .58     .000 |  2.92    1.794 |  5.25     .570 |  7.58     .070 |  9.92     .004
 0321>    .67     .000 |  3.00    1.784 |  5.33     .534 |  7.67     .064 | 10.00     .003
 0322>    .75     .000 |  3.08    1.770 |  5.42     .500 |  7.75     .059 | 10.08     .003
 0323>    .83     .001 |  3.17    1.749 |  5.50     .468 |  7.83     .055 | 10.17     .003
 0324>    .92     .011 |  3.25    1.722 |  5.58     .437 |  7.92     .050 | 10.25     .002
 0325>   1.00     .046 |  3.33    1.690 |  5.67     .408 |  8.00     .046 | 10.33     .002
```

00326>	1.08	.112	3.42	1.653	5.75	.380	8.08	.043	10.42	.002
00327>	1.17	.205	3.50	1.611	5.83	.354	8.17	.039	10.50	.001
00328>	1.25	.319	3.58	1.566	5.92	.330	8.25	.036	10.58	.001
00329>	1.33	.445	3.67	1.517	6.00	.307	8.33	.033	10.67	.001
00330>	1.42	.579	3.75	1.466	6.08	.286	8.42	.030	10.75	.001
00331>	1.50	.715	3.83	1.413	6.17	.265	8.50	.028	10.83	.001
00332>	1.58	.849	3.92	1.358	6.25	.247	8.58	.025	10.92	.001
00333>	1.67	.979	4.00	1.303	6.33	.229	8.67	.023	11.00	.000
00334>	1.75	1.100	4.08	1.247	6.42	.212	8.75	.021	11.08	.000
00335>	1.83	1.213	4.17	1.192	6.50	.197	8.83	.020	11.17	.000
00336>	1.92	1.317	4.25	1.136	6.58	.182	8.92	.018	11.25	.000
00337>	2.00	1.409	4.33	1.081	6.67	.169	9.00	.016	11.33	.000
00338>	2.08	1.492	4.42	1.027	6.75	.156	9.08	.014	11.42	.000
00339>	2.17	1.563	4.50	.975	6.83	.144	9.17	.013	11.50	.000
00340>	2.25	1.624	4.58	.923	6.92	.133	9.25	.012		

00341> ----------
00342> 001:0012----------
00343> *# Site Area
00344> ----------
00345> | DESIGN NASHYD | Area (ha)= 48.10 Curve Number (CN)=60.00
00346> | 01:siteR DT= 5.00 | Ia (mm)= 4.670 # of Linear Res.(N)= 3.00
00347> ---------- U.H. Tp(hrs)= 1.070
00348>
00349> Unit Hyd Qpeak (cms)= 1.717
00350>
00351> PEAK FLOW (cms)= .490 (i)
00352> TIME TO PEAK (hrs)= 2.417
00353> RUNOFF VOLUME (mm)= 9.386
00354> TOTAL RAINFALL (mm)= 49.505
00355> RUNOFF COEFFICIENT = .190
00356>
00357> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00358>
00359> ----------
00360> 001:0013----------
00361> ----------
00362> | DESIGN STANDHYD | Area (ha)= 19.90
00363> | 02:siteU DT= 2.00 | Total Imp(%)= 25.00 Dir. Conn.(%)= 8.00
00364> ----------
00365>

		IMPERVIOUS	PERVIOUS (i)	
00366> Surface Area	(ha)=	4.97	14.92	
00367> Dep. Storage	(mm)=	1.57	6.20	
00368> Average Slope	(%)=	.50	.50	
00369> Length	(m)=	801.21	70.00	
00370> Mannings n	=	.013	.250	
00371>				
00372> Max.eff.Inten.	(mm/hr)=	122.14	12.71	
00373> over	(min)	10.00	44.00	
00374> Storage Coeff.	(min)=	10.12 (ii)	44.28 (ii)	
00375> Unit Hyd. Tpeak	(min)=	10.00	44.00	
00376> Unit Hyd. peak	(cms)=	.11	.03	
00377>				*TOTALS*
00378> PEAK FLOW	(cms)=	.33	.29	.380 (iii)
00379> TIME TO PEAK	(hrs)=	1.10	1.80	1.100
00380> RUNOFF VOLUME	(mm)=	47.93	10.83	13.795
00381> TOTAL RAINFALL	(mm)=	49.50	49.50	49.505
00382> RUNOFF COEFFICIENT	=	.97	.22	.279

00383>
00384> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00385> CN* = 60.0 Ia = Dep. Storage (Above)
00386> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00387> THAN THE STORAGE COEFFICIENT.
00388> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00389>
00390> ----------

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00391> 001:0014----------------------------------------------------------------------------
 0392> --------------------
 0393> | ADD HYD (site  ) | ID: NHYD      AREA      QPEAK    TPEAK    R.V.     DWF
00394> --------------------                (ha)      (cms)    (hrs)    (mm)     (cms)
00395>                   ID1 01:siteR      48.10      .490     2.42    9.39      .000
 0396>                  +ID2 02:siteU      19.90      .380     1.10   13.80      .000
 0397>                   ==========================================================
00398>                   SUM 03:site       68.00      .768     2.07   10.68      .000
00399>
  400>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
  401>
00402> ----------------------------------------------------------------------------
00403> 001:0015----------------------------------------------------------------------------
  404> --------------------
  405> | ROUTE CHANNEL    |      Routing time step (min) =  2.00
00406> |  IN> 03:site     |      Number of SEGMENTS =  1
00407> | OUT< 04:rtsit1   |      Slopes (%), CHANNEL= .50   FLOODPLAIN= .50
  408> --------------------                  LENGTH = 1400.00     (m)
  409>
00410>               <------ DATA FOR SECTION (   1.0) ------>
00411>               Distance      Elevation       Manning
  412>                   .00          2.00          .0350      Main Channel
  413>                 6.00           .00          .0350      Main Channel
00414>                12.00          2.00          .0350      Main Channel
00415>
  416>    <----------------------------- TRAVEL TIME TABLE ----------------------------->
  417>     DEPTH     ELEV    X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
00418>       (m)      (m)    (cu.m.)   (cu.m.)      (cms)     (m/s)      (min)   (m2/s)
00419>      .105     .105   .465E+02  .350E+00       .009      .274      85.17    .029
  420>      .211     .211   .186E+03  .280E+01       .058      .435      53.65    .092
  421>      .316     .316   .419E+03  .945E+01       .170      .570      40.95    .180
00422>      .421     .421   .745E+03  .224E+02       .367      .690      33.80    .291
00423>      .526     .526   .116E+04  .437E+02       .666      .801      29.13    .422
  424>      .632     .632   .168E+04  .756E+02      1.083      .905      25.79    .571
  425>      .737     .737   .228E+04  .120E+03      1.633     1.003      23.28    .739
00426>      .842     .842   .298E+04  .179E+03      2.331     1.096      21.29    .923
00427>      .947     .947   .377E+04  .255E+03      3.192     1.185      19.68   1.123
  428>     1.053    1.053   .465E+04  .350E+03      4.227     1.272      18.35   1.339
  429>     1.158    1.158   .563E+04  .466E+03      5.450     1.355      17.22   1.569
00430>     1.263    1.263   .670E+04  .605E+03      6.874     1.436      16.25   1.814
00431>     1.368    1.368   .786E+04  .769E+03      8.509     1.515      15.40   2.073
  432>     1.474    1.474   .912E+04  .960E+03     10.368     1.591      14.66   2.345
  433>     1.579    1.579   .105E+05  .118E+04     12.463     1.666      14.00   2.631
00434>     1.684    1.684   .119E+05  .143E+04     14.803     1.740      13.41   2.930
00435>     1.789    1.789   .134E+05  .172E+04     17.400     1.811      12.88   3.241
  436>     1.895    1.895   .151E+05  .204E+04     20.265     1.882      12.40   3.565
  437>     2.000    2.000   .168E+05  .240E+04     23.408     1.951      11.96   3.901
00438>
00439>  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
  440>  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
  441>
00442>                                        <---- hydrograph ---->   <-pipe / channel->
00443>                                AREA     QPEAK    TPEAK    R.V.   MAX DEPTH  MAX VEL
  444>                                (ha)     (cms)    (hrs)    (mm)       (m)      (m/s)
  445>    INFLOW : ID= 3:site        68.00      .768     2.07  10.676       .552      .824
  446>    OUTFLOW: ID= 4:rtsit1      68.00      .701     2.53  10.676       .535      .808
00447>
00448>
  449> ----------------------------------------------------------------------------
00450> 001:0016----------------------------------------------------------------------------
00451> --------------------
00452> | ROUTE CHANNEL    |      Routing time step (min) =  2.00
  453> |  IN> 04:rtsit1   |      Number of SEGMENTS =  1
  454> | OUT< 05:rtsit2   |      Slopes (%), CHANNEL= .36   FLOODPLAIN= .36
00455> --------------------                  LENGTH =  475.00     (m)
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00456>
00457>                <------ DATA FOR SECTION (   1.0) ------>
00458>                Distance      Elevation       Manning
00459>                    .00          2.00          .0350      Main Channel
00460>                   6.00           .00          .0350      Main Channel
00461>                   9.00           .00          .0350      Main Channel
00462>                  15.00          2.00          .0350      Main Channel
00463>
00464>    <----------------------------- TRAVEL TIME TABLE ---------------------------->
00465>     DEPTH     ELEV   X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
00466>       (m)      (m)   (cu.m.)   (cu.m.)       (cms)     (m/s)      (min)  (m2/s)
00467>      .105     .105  .166E+03  .510E+01        .125      .357      22.15    .038
00468>      .211     .211  .363E+03  .224E+02        .412      .539      14.68    .114
00469>      .316     .316  .592E+03  .547E+02        .847      .679      11.65    .215
00470>      .421     .421  .853E+03  .105E+03       1.431      .797       9.93    .336
00471>      .526     .526  .114E+04  .176E+03       2.171      .901       8.79    .474
00472>      .632     .632  .147E+04  .271E+03       3.075      .995       7.96    .628
00473>      .737     .737  .182E+04  .393E+03       4.153     1.082       7.32    .797
00474>      .842     .842  .221E+04  .544E+03       5.414     1.163       6.81    .980
00475>      .947     .947  .263E+04  .728E+03       6.866     1.241       6.38   1.175
00476>     1.053    1.053  .308E+04  .948E+03       8.519     1.314       6.02   1.383
00477>     1.158    1.158  .356E+04  .121E+04      10.382     1.385       5.72   1.604
00478>     1.263    1.263  .407E+04  .150E+04      12.463     1.453       5.45   1.836
00479>     1.368    1.368  .462E+04  .185E+04      14.772     1.519       5.21   2.079
00480>     1.474    1.474  .519E+04  .224E+04      17.317     1.583       5.00   2.334
00481>     1.579    1.579  .580E+04  .268E+04      20.107     1.646       4.81   2.599
00482>     1.684    1.684  .644E+04  .317E+04      23.149     1.707       4.64   2.875
00483>     1.789    1.789  .711E+04  .372E+04*     26.453     1.766       4.48   3.161
00484>     1.895    1.895  .782E+04  .433E+04*     30.026     1.825       4.34   3.458
00485>     2.000    2.000  .855E+04  .500E+04*     33.877     1.882       4.21   3.764
00486>
00487>  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
00488>  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
00489>  (*) Actual value may be less due to limited CHANNEL LENGTH for given SLOPE.
00490>
00491>                                        <---- hydrograph ---->   <-pipe / channel->
00492>                                  AREA    QPEAK    TPEAK   R.V.   MAX DEPTH  MAX VEL
00493>                                  (ha)    (cms)    (hrs)   (mm)       (m)      (m/s)
00494>    INFLOW : ID= 4:rtsit1        68.00     .701     2.53 10.676       .280       .625
00495>    OUTFLOW: ID= 5:rtsit2        68.00     .692     2.70 10.676       .278       .621
00496>
00497>
00498> ------------------------------------------------------------------------------
00499> 001:0017---------------------------------------------------------------------
00500> --------------------
00501> | SAVE HYD          |   AREA       (ha)=   68.000
00502> | ID=05 (rtsit2)    |   QPEAK      (cms)=     .692 (i)
00503> | DT= 2.00 PCYC= 1  |   TPEAK      (hrs)=    2.700
00504> --------------------   VOLUME      (mm)=   10.676
00505>   Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-rtsit2.001
00506>   Comments: Post Site Flows
00507>
00508>      (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00509>   TIME    FLOW |  TIME    FLOW |  TIME    FLOW |  TIME    FLOW |  TIME    FLOW
00510>    hrs     cms |   hrs     cms |   hrs     cms |   hrs     cms |   hrs     cms
00511>    .00    .000|   3.80    .501|   7.60    .027|  11.40    .002|  15.20    .000
00512>    .03    .000|   3.83    .492|   7.63    .026|  11.43    .002|  15.23    .000
00513>    .07    .000|   3.87    .483|   7.67    .026|  11.47    .002|  15.27    .000
00514>    .10    .000|   3.90    .474|   7.70    .025|  11.50    .002|  15.30    .000
00515>    .13    .000|   3.93    .465|   7.73    .025|  11.53    .002|  15.33    .000
00516>    .17    .000|   3.97    .455|   7.77    .024|  11.57    .002|  15.37    .000
00517>    .20    .000|   4.00    .443|   7.80    .023|  11.60    .002|  15.40    .000
00518>    .23    .000|   4.03    .432|   7.83    .023|  11.63    .002|  15.43    .000
00519>    .27    .000|   4.07    .422|   7.87    .022|  11.67    .002|  15.47    .000
00520>    .30    .000|   4.10    .412|   7.90    .022|  11.70    .002|  15.50    .000
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0521>	.33	.000	4.13	.401	7.93	.021	11.73	.001	15.53	.000
522>	.37	.000	4.17	.389	7.97	.021	11.77	.001	15.57	.000
523>	.40	.000	4.20	.378	8.00	.020	11.80	.001	15.60	.000
0524>	.43	.000	4.23	.368	8.03	.020	11.83	.001	15.63	.000
0525>	.47	.000	4.27	.358	8.07	.019	11.87	.001	15.67	.000
526>	.50	.000	4.30	.349	8.10	.019	11.90	.001	15.70	.000
527>	.53	.000	4.33	.341	8.13	.018	11.93	.001	15.73	.000
0528>	.57	.000	4.37	.333	8.17	.018	11.97	.001	15.77	.000
0529>	.60	.000	4.40	.325	8.20	.017	12.00	.001	15.80	.000
530>	.63	.000	4.43	.318	8.23	.017	12.03	.001	15.83	.000
531>	.67	.001	4.47	.311	8.27	.017	12.07	.001	15.87	.000
0532>	.70	.001	4.50	.304	8.30	.016	12.10	.001	15.90	.000
0533>	.73	.001	4.53	.297	8.33	.016	12.13	.001	15.93	.000
534>	.77	.002	4.57	.290	8.37	.016	12.17	.001	15.97	.000
535>	.80	.002	4.60	.283	8.40	.015	12.20	.001	16.00	.000
0536>	.83	.003	4.63	.276	8.43	.015	12.23	.001	16.03	.000
0537>	.87	.003	4.67	.269	8.47	.014	12.27	.001	16.07	.000
538>	.90	.004	4.70	.263	8.50	.014	12.30	.001	16.10	.000
539>	.93	.006	4.73	.256	8.53	.014	12.33	.001	16.13	.000
0540>	.97	.007	4.77	.250	8.57	.013	12.37	.001	16.17	.000
0541>	1.00	.010	4.80	.244	8.60	.013	12.40	.001	16.20	.000
542>	1.03	.013	4.83	.239	8.63	.013	12.43	.001	16.23	.000
543>	1.07	.018	4.87	.233	8.67	.013	12.47	.001	16.27	.000
0544>	1.10	.024	4.90	.227	8.70	.012	12.50	.001	16.30	.000
0545>	1.13	.032	4.93	.222	8.73	.012	12.53	.001	16.33	.000
546>	1.17	.040	4.97	.217	8.77	.012	12.57	.001	16.37	.000
547>	1.20	.050	5.00	.212	8.80	.011	12.60	.001	16.40	.000
0548>	1.23	.061	5.03	.207	8.83	.011	12.63	.001	16.43	.000
0549>	1.27	.073	5.07	.202	8.87	.011	12.67	.001	16.47	.000
550>	1.30	.085	5.10	.197	8.90	.011	12.70	.001	16.50	.000
551>	1.33	.098	5.13	.192	8.93	.010	12.73	.001	16.53	.000
0552>	1.37	.112	5.17	.188	8.97	.010	12.77	.001	16.57	.000
0553>	1.40	.126	5.20	.183	9.00	.010	12.80	.001	16.60	.000
554>	1.43	.142	5.23	.178	9.03	.010	12.83	.001	16.63	.000
555>	1.47	.159	5.27	.174	9.07	.009	12.87	.001	16.67	.000
0556>	1.50	.178	5.30	.170	9.10	.009	12.90	.001	16.70	.000
0557>	1.53	.198	5.33	.166	9.13	.009	12.93	.001	16.73	.000
558>	1.57	.220	5.37	.162	9.17	.009	12.97	.001	16.77	.000
559>	1.60	.244	5.40	.158	9.20	.009	13.00	.001	16.80	.000
0560>	1.63	.269	5.43	.154	9.23	.008	13.03	.001	16.83	.000
0561>	1.67	.294	5.47	.150	9.27	.008	13.07	.001	16.87	.000
562>	1.70	.318	5.50	.146	9.30	.008	13.10	.001	16.90	.000
563>	1.73	.342	5.53	.142	9.33	.008	13.13	.001	16.93	.000
0564>	1.77	.366	5.57	.138	9.37	.008	13.17	.001	16.97	.000
0565>	1.80	.391	5.60	.135	9.40	.007	13.20	.001	17.00	.000
566>	1.83	.416	5.63	.131	9.43	.007	13.23	.001	17.03	.000
567>	1.87	.438	5.67	.127	9.47	.007	13.27	.000	17.07	.000
0568>	1.90	.457	5.70	.124	9.50	.007	13.30	.000	17.10	.000
0569>	1.93	.475	5.73	.120	9.53	.007	13.33	.000	17.13	.000
570>	1.97	.493	5.77	.117	9.57	.007	13.37	.000	17.17	.000
571>	2.00	.510	5.80	.114	9.60	.007	13.40	.000	17.20	.000
0572>	2.03	.527	5.83	.111	9.63	.006	13.43	.000	17.23	.000
0573>	2.07	.544	5.87	.108	9.67	.006	13.47	.000	17.27	.000
574>	2.10	.559	5.90	.105	9.70	.006	13.50	.000	17.30	.000
575>	2.13	.575	5.93	.103	9.73	.006	13.53	.000	17.33	.000
576>	2.17	.589	5.97	.100	9.77	.006	13.57	.000	17.37	.000
577>	2.20	.602	6.00	.097	9.80	.006	13.60	.000	17.40	.000
578>	2.23	.615	6.03	.095	9.83	.006	13.63	.000	17.43	.000
579>	2.27	.626	6.07	.092	9.87	.005	13.67	.000	17.47	.000
580>	2.30	.636	6.10	.090	9.90	.005	13.70	.000	17.50	.000
0581>	2.33	.646	6.13	.087	9.93	.005	13.73	.000	17.53	.000
582>	2.37	.654	6.17	.085	9.97	.005	13.77	.000	17.57	.000
583>	2.40	.661	6.20	.083	10.00	.005	13.80	.000	17.60	.000
584>	2.43	.667	6.23	.080	10.03	.005	13.83	.000	17.63	.000
0585>	2.47	.673	6.27	.078	10.07	.005	13.87	.000	17.67	.000

2.50	.678	6.30	.076	10.10	.005	13.90	.000	17.70	.000
2.53	.682	6.33	.074	10.13	.004	13.93	.000	17.73	.000
2.57	.686	6.37	.072	10.17	.004	13.97	.000	17.77	.000
2.60	.688	6.40	.070	10.20	.004	14.00	.000	17.80	.000
2.63	.690	6.43	.068	10.23	.004	14.03	.000	17.83	.000
2.67	.691	6.47	.066	10.27	.004	14.07	.000	17.87	.000
2.70	.692	6.50	.064	10.30	.004	14.10	.000	17.90	.000
2.73	.692	6.53	.062	10.33	.004	14.13	.000	17.93	.000
2.77	.691	6.57	.061	10.37	.004	14.17	.000	17.97	.000
2.80	.690	6.60	.059	10.40	.004	14.20	.000	18.00	.000
2.83	.688	6.63	.057	10.43	.004	14.23	.000	18.03	.000
2.87	.686	6.67	.056	10.47	.004	14.27	.000	18.07	.000
2.90	.683	6.70	.054	10.50	.003	14.30	.000	18.10	.000
2.93	.680	6.73	.053	10.53	.003	14.33	.000	18.13	.000
2.97	.676	6.77	.051	10.57	.003	14.37	.000	18.17	.000
3.00	.671	6.80	.050	10.60	.003	14.40	.000	18.20	.000
3.03	.667	6.83	.049	10.63	.003	14.43	.000	18.23	.000
3.07	.662	6.87	.047	10.67	.003	14.47	.000	18.27	.000
3.10	.657	6.90	.046	10.70	.003	14.50	.000	18.30	.000
3.13	.651	6.93	.045	10.73	.003	14.53	.000	18.33	.000
3.17	.645	6.97	.044	10.77	.003	14.57	.000	18.37	.000
3.20	.639	7.00	.043	10.80	.003	14.60	.000	18.40	.000
3.23	.632	7.03	.042	10.83	.003	14.63	.000	18.43	.000
3.27	.625	7.07	.040	10.87	.003	14.67	.000	18.47	.000
3.30	.618	7.10	.039	10.90	.003	14.70	.000	18.50	.000
3.33	.611	7.13	.038	10.93	.003	14.73	.000	18.53	.000
3.37	.604	7.17	.037	10.97	.003	14.77	.000	18.57	.000
3.40	.597	7.20	.037	11.00	.002	14.80	.000	18.60	.000
3.43	.590	7.23	.036	11.03	.002	14.83	.000	18.63	.000
3.47	.582	7.27	.035	11.07	.002	14.87	.000	18.67	.000
3.50	.574	7.30	.034	11.10	.002	14.90	.000	18.70	.000
3.53	.567	7.33	.033	11.13	.002	14.93	.000	18.73	.000
3.57	.559	7.37	.032	11.17	.002	14.97	.000	18.77	.000
3.60	.551	7.40	.031	11.20	.002	15.00	.000	18.80	.000
3.63	.543	7.43	.031	11.23	.002	15.03	.000		
3.67	.535	7.47	.030	11.27	.002	15.07	.000		
3.70	.526	7.50	.029	11.30	.002	15.10	.000		
3.73	.518	7.53	.028	11.33	.002	15.13	.000		
3.77	.510	7.57	.028	11.37	.002	15.17	.000		

001:0018

ADD HYD (sumpst)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 09:extpre	221.80	1.798	2.83	9.39	.000
	+ID2 05:rtsit2	68.00	.692	2.70	10.68	.000
	SUM 08:sumpst	289.80	2.488	2.77	9.69	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

001:0019

SAVE HYD	AREA (ha)= 289.800
ID=08 (sumpst)	QPEAK (cms)= 2.488 (i)
DT= 2.00 PCYC= 1	TPEAK (hrs)= 2.767
	VOLUME (mm)= 9.689

Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-sumpst.001
Comments: Overall Postdev Hydrograph

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

TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms
.00	.000	3.80	1.935	7.60	.096	11.40	.002	15.20	.000

)0651>	.03	.000	3.83	1.905	7.63	.093	11.43	.002	15.23	.000
652>	.07	.000	3.87	1.874	7.67	.090	11.47	.002	15.27	.000
653>	.10	.000	3.90	1.843	7.70	.088	11.50	.002	15.30	.000
)0654>	.13	.000	3.93	1.812	7.73	.085	11.53	.002	15.33	.000
)0655>	.17	.000	3.97	1.780	7.77	.082	11.57	.002	15.37	.000
656>	.20	.000	4.00	1.746	7.80	.080	11.60	.002	15.40	.000
657>	.23	.000	4.03	1.713	7.83	.077	11.63	.002	15.43	.000
)0658>	.27	.000	4.07	1.680	7.87	.075	11.67	.002	15.47	.000
)0659>	.30	.000	4.10	1.648	7.90	.073	11.70	.002	15.50	.000
660>	.33	.000	4.13	1.615	7.93	.071	11.73	.001	15.53	.000
661>	.37	.000	4.17	1.581	7.97	.069	11.77	.001	15.57	.000
0662>	.40	.000	4.20	1.548	8.00	.066	11.80	.001	15.60	.000
0663>	.43	.000	4.23	1.515	8.03	.064	11.83	.001	15.63	.000
664>	.47	.000	4.27	1.483	8.07	.062	11.87	.001	15.67	.000
665>	.50	.000	4.30	1.453	8.10	.061	11.90	.001	15.70	.000
0666>	.53	.000	4.33	1.422	8.13	.059	11.93	.001	15.73	.000
0667>	.57	.000	4.37	1.393	8.17	.057	11.97	.001	15.77	.000
668>	.60	.000	4.40	1.363	8.20	.055	12.00	.001	15.80	.000
669>	.63	.000	4.43	1.335	8.23	.054	12.03	.001	15.83	.000
0670>	.67	.001	4.47	1.306	8.27	.052	12.07	.001	15.87	.000
0671>	.70	.001	4.50	1.278	8.30	.050	12.10	.001	15.90	.000
672>	.73	.001	4.53	1.251	8.33	.049	12.13	.001	15.93	.000
673>	.77	.002	4.57	1.223	8.37	.047	12.17	.001	15.97	.000
0674>	.80	.003	4.60	1.195	8.40	.046	12.20	.001	16.00	.000
0675>	.83	.004	4.63	1.169	8.43	.045	12.23	.001	16.03	.000
676>	.87	.009	4.67	1.142	8.47	.043	12.27	.001	16.07	.000
677>	.90	.014	4.70	1.116	8.50	.042	12.30	.001	16.10	.000
0678>	.93	.024	4.73	1.090	8.53	.041	12.33	.001	16.13	.000
0679>	.97	.039	4.77	1.065	8.57	.039	12.37	.001	16.17	.000
680>	1.00	.056	4.80	1.041	8.60	.038	12.40	.001	16.20	.000
681>	1.03	.086	4.83	1.016	8.63	.037	12.43	.001	16.23	.000
0682>	1.07	.117	4.87	.992	8.67	.036	12.47	.001	16.27	.000
0683>	1.10	.155	4.90	.969	8.70	.035	12.50	.001	16.30	.000
684>	1.13	.200	4.93	.946	8.73	.034	12.53	.001	16.33	.000
685>	1.17	.245	4.97	.923	8.77	.033	12.57	.001	16.37	.000
0686>	1.20	.300	5.00	.901	8.80	.032	12.60	.001	16.40	.000
0687>	1.23	.357	5.03	.879	8.83	.031	12.63	.001	16.43	.000
688>	1.27	.417	5.07	.858	8.87	.030	12.67	.001	16.47	.000
689>	1.30	.480	5.10	.837	8.90	.029	12.70	.001	16.50	.000
0690>	1.33	.544	5.13	.816	8.93	.028	12.73	.001	16.53	.000
0691>	1.37	.611	5.17	.796	8.97	.027	12.77	.001	16.57	.000
692>	1.40	.679	5.20	.776	9.00	.026	12.80	.001	16.60	.000
693>	1.43	.748	5.23	.756	9.03	.025	12.83	.001	16.63	.000
0694>	1.47	.820	5.27	.737	9.07	.024	12.87	.001	16.67	.000
0695>	1.50	.893	5.30	.718	9.10	.023	12.90	.001	16.70	.000
696>	1.53	.967	5.33	.700	9.13	.023	12.93	.001	16.73	.000
697>	1.57	1.043	5.37	.682	9.17	.022	12.97	.001	16.77	.000
0698>	1.60	1.119	5.40	.664	9.20	.021	13.00	.001	16.80	.000
0699>	1.63	1.196	5.43	.647	9.23	.020	13.03	.001	16.83	.000
700>	1.67	1.273	5.47	.630	9.27	.020	13.07	.001	16.87	.000
701>	1.70	1.345	5.50	.614	9.30	.019	13.10	.001	16.90	.000
0702>	1.73	1.418	5.53	.597	9.33	.019	13.13	.001	16.93	.000
0703>	1.77	1.489	5.57	.581	9.37	.018	13.17	.001	16.97	.000
704>	1.80	1.559	5.60	.566	9.40	.017	13.20	.001	17.00	.000
705>	1.83	1.629	5.63	.550	9.43	.017	13.23	.001	17.03	.000
0706>	1.87	1.693	5.67	.535	9.47	.016	13.27	.000	17.07	.000
0707>	1.90	1.753	5.70	.521	9.50	.015	13.30	.000	17.10	.000
708>	1.93	1.810	5.73	.506	9.53	.015	13.33	.000	17.13	.000
709>	1.97	1.865	5.77	.492	9.57	.014	13.37	.000	17.17	.000
710>	2.00	1.920	5.80	.479	9.60	.013	13.40	.000	17.20	.000
0711>	2.03	1.969	5.83	.466	9.63	.013	13.43	.000	17.23	.000
712>	2.07	2.019	5.87	.453	9.67	.012	13.47	.000	17.27	.000
713>	2.10	2.065	5.90	.440	9.70	.012	13.50	.000	17.30	.000
714>	2.13	2.109	5.93	.428	9.73	.011	13.53	.000	17.33	.000
0715>	2.17	2.152	5.97	.416	9.77	.011	13.57	.000	17.37	.000

00716>	2.20	2.190	6.00	.404	9.80	.010	13.60	.000	17.40	.000
00717>	2.23	2.226	6.03	.393	9.83	.010	13.63	.000	17.43	.000
00718>	2.27	2.260	6.07	.382	9.87	.010	13.67	.000	17.47	.000
00719>	2.30	2.291	6.10	.371	9.90	.009	13.70	.000	17.50	.000
00720>	2.33	2.320	6.13	.361	9.93	.009	13.73	.000	17.53	.000
00721>	2.37	2.345	6.17	.350	9.97	.009	13.77	.000	17.57	.000
00722>	2.40	2.369	6.20	.341	10.00	.008	13.80	.000	17.60	.000
00723>	2.43	2.390	6.23	.331	10.03	.008	13.83	.000	17.63	.000
00724>	2.47	2.409	6.27	.321	10.07	.008	13.87	.000	17.67	.000
00725>	2.50	2.426	6.30	.312	10.10	.007	13.90	.000	17.70	.000
00726>	2.53	2.440	6.33	.303	10.13	.007	13.93	.000	17.73	.000
00727>	2.57	2.453	6.37	.294	10.17	.007	13.97	.000	17.77	.000
00728>	2.60	2.463	6.40	.286	10.20	.007	14.00	.000	17.80	.000
00729>	2.63	2.471	6.43	.277	10.23	.006	14.03	.000	17.83	.000
00730>	2.67	2.479	6.47	.269	10.27	.006	14.07	.000	17.87	.000
00731>	2.70	2.483	6.50	.261	10.30	.006	14.10	.000	17.90	.000
00732>	2.73	2.486	6.53	.254	10.33	.006	14.13	.000	17.93	.000
00733>	2.77	2.488	6.57	.246	10.37	.006	14.17	.000	17.97	.000
00734>	2.80	2.487	6.60	.239	10.40	.005	14.20	.000	18.00	.000
00735>	2.83	2.486	6.63	.232	10.43	.005	14.23	.000	18.03	.000
00736>	2.87	2.482	6.67	.225	10.47	.005	14.27	.000	18.07	.000
00737>	2.90	2.478	6.70	.218	10.50	.005	14.30	.000	18.10	.000
00738>	2.93	2.472	6.73	.212	10.53	.005	14.33	.000	18.13	.000
00739>	2.97	2.464	6.77	.205	10.57	.005	14.37	.000	18.17	.000
00740>	3.00	2.456	6.80	.199	10.60	.004	14.40	.000	18.20	.000
00741>	3.03	2.445	6.83	.193	10.63	.004	14.43	.000	18.23	.000
00742>	3.07	2.434	6.87	.187	10.67	.004	14.47	.000	18.27	.000
00743>	3.10	2.422	6.90	.182	10.70	.004	14.50	.000	18.30	.000
00744>	3.13	2.408	6.93	.176	10.73	.004	14.53	.000	18.33	.000
00745>	3.17	2.393	6.97	.171	10.77	.004	14.57	.000	18.37	.000
00746>	3.20	2.377	7.00	.166	10.80	.004	14.60	.000	18.40	.000
00747>	3.23	2.360	7.03	.161	10.83	.003	14.63	.000	18.43	.000
00748>	3.27	2.341	7.07	.156	10.87	.003	14.67	.000	18.47	.000
00749>	3.30	2.321	7.10	.151	10.90	.003	14.70	.000	18.50	.000
00750>	3.33	2.301	7.13	.147	10.93	.003	14.73	.000	18.53	.000
00751>	3.37	2.279	7.17	.143	10.97	.003	14.77	.000	18.57	.000
00752>	3.40	2.257	7.20	.138	11.00	.003	14.80	.000	18.60	.000
00753>	3.43	2.234	7.23	.134	11.03	.003	14.83	.000	18.63	.000
00754>	3.47	2.210	7.27	.130	11.07	.003	14.87	.000	18.67	.000
00755>	3.50	2.185	7.30	.126	11.10	.003	14.90	.000	18.70	.000
00756>	3.53	2.159	7.33	.122	11.13	.003	14.93	.000	18.73	.000
00757>	3.57	2.133	7.37	.119	11.17	.002	14.97	.000	18.77	.000
00758>	3.60	2.107	7.40	.115	11.20	.002	15.00	.000	18.80	.000
00759>	3.63	2.079	7.43	.112	11.23	.002	15.03	.000		
00760>	3.67	2.052	7.47	.108	11.27	.002	15.07	.000		
00761>	3.70	2.023	7.50	.105	11.30	.002	15.10	.000		
00762>	3.73	1.994	7.53	.102	11.33	.002	15.13	.000		
00763>	3.77	1.965	7.57	.099	11.37	.002	15.17	.000		

00764> ----------
00765> 001:0020----------
00766> FINISH
00767> ----------
00768> **********
00769> WARNINGS / ERRORS / NOTES
00770> ------------------------
00771> Simulation ended on 2005-05-04 at 10:23:39
00772> ==========
00773>
00774>

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Stantec

1: 25 yr SWMHYMO

```
00001> ================================================================================
 002>
 003>  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999  =========
00004>  S      W W W  MM MM  H   H   Y Y   MM MM  O   O    9   9  9   9
00005>  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O ##  9   9  9   9 Ver. 4.02
 006>      S   W W   M   M  H   H    Y    M   M  O   O      9999   9999 July 1999
 007>  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9 =========
00008>                                                      9   9  9   9 # 3824306
00009>       StormWater Management HYdrologic Model          999    999  =========
 010>
 011>  ********************************************************************************
00012>  ************************** SWMHYMO-99 Ver/4.02 ***************************
00013>  *******  A single event and continuous hydrologic simulation model  *******
 014>  *******     based on the principles of HYMO and its successors       *******
 015>  *******                  OTTHYMO-83 and OTTHYMO-89.                  *******
00016>  ********************************************************************************
00017>  ******* Distributed by:  J.F. Sabourin and Associates Inc.          *******
 018>  *******                   Ottawa,  Ontario: (613) 727-5199          *******
 019>  *******                   Gatineau, Quebec: (819) 243-6858          *******
00020>  *******                   E-Mail: swmhymo@jfsa.Com                  *******
00021>  ********************************************************************************
 022>
 023>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++ Licensed user: Stantec Consulting Ltd. 604                      +++++++
00025>  +++++++                 Ottawa                SERIAL#:3824306         +++++++
 026>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 027>
00028>  ********************************************************************************
00029>  *******          ++++++ PROGRAM ARRAY DIMENSIONS ++++++                *******
 030>  *******          Maximum value for ID numbers  :     10                *******
 031>  *******          Max. number of rainfall points:  15000                *******
00032>  *******          Max. number of flow points    :  15000                *******
00033>  ********************************************************************************
 034>
 035>
00036>  ********************   D E T A I L E D   O U T P U T   ********************
00037>  ********************************************************************************
 038>  *       DATE: 2005-05-04      TIME: 10:24:42      RUN COUNTER: 000195       *
 039>  ********************************************************************************
00040>  * Input   filename: W:\active\60400144\design\analysis\SWMAPR~1\144post2.d*
00041>  * Output  filename: W:\active\60400144\design\analysis\SWMAPR~1\144post2.o*
 042>  * Summary filename: W:\active\60400144\design\analysis\SWMAPR~1\144post2.s*
 043>  * User comments:                                                          *
00044>  * 1:_____________________________________________________________________*
00045>  * 2:_____________________________________________________________________*
 046>  * 3:_____________________________________________________________________*
 047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
 050> 001:0001-------------------------------------------------------------------------
 051> *#*****************************************************************************
00052> *#  Project Name: [Emerald Creek]     Project Number: [604-00144]
00053> *#  Date         : 06-18-2004
 054> *#  Modeller     : [MAF]
 055> *#  Company      : McNeely Engineering Consultants Limited
00056> *#  License #    :  5695479
00057> *#*****************************************************************************
 058> --------------------
 059> | START            |  Project dir.: W:\active\60400144\design\analysis\SWMAPR~1
00060> --------------------  Rainfall dir.: W:\active\60400144\design\analysis\SWMAPR~1
00061>      TZERO =    .00 hrs on        0
 062>      METOUT=    2 (output = METRIC)
 063>      NRUN  = 001
 064>      NSTORM=    0
00065> --------------------------------------------------------------------------------
```

```
00066> 001:0002--------------------------------------------------------------------------
00067> * 2-YEAR IDF CHICAGO STORM
00068> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00069> *                    ICASEcs=[2],
00070> *                   Enter ordinates of IDF curve below, at least seven points
00071> *                      TIME (min)    Intensity(mm/hr)
00072> *                         [5]         [102.80]
00073> *                         [10]        [77.10]
00074> *                         [15]        [63.30]
00075> *                         [30]        [39.90]
00076> *                         [60]        [24.20]
00077> *                         [120]       [14.30]
00078> *                         [360]       [6.20]
00079> *                         [720]       [3.60]
00080> *                         [1440]      [2.00]
00081> *                          -1             -1
00082> * 5-YEAR IDF CHICAGO STORM
00083> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00084> *                    ICASEcs=[2],
00085> *                    Enter ordinates of IDF curve below, at least seven points
00086> *                       TIME (min)    Intensity(mm/hr)
00087> *                         [5]         [140.20]
00088> *                         [10]        [104.40]
00089> *                         [15]        [85.60]
00090> *                         [30]        [53.90]
00091> *                         [60]        [32.00]
00092> *                         [120]       [18.90]
00093> *                         [360]       [8.40]
00094> *                         [720]       [4.80]
00095> *                         [1440]      [2.60]
00096> *                           -1             -1
00097> * 10-YEAR IDF CHICAGO STORM
00098> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00099> *                    ICASEcs=[2],
00100> *                    Enter ordinates of IDF curve below, at least seven points
00101> *                         TIME (min)    Intensity(mm/hr)
00102> *                         [5]         [165.00]
00103> *                         [10]        [122.50]
00104> *                         [15]        [100.40]
00105> *                         [30]        [63.10]
00106> *                         [60]        [37.10]
00107> *                         [120]       [22.00]
00108> *                         [360]       [9.90]
00109> *                         [720]       [5.60]
00110> *                         [1440]      [3.00]
00111> *                           -1             -1
00112> *# 25-YEAR IDF CHICAGO STORM
00113> --------------------
00114> | CHICAGO STORM    |     IDF curve parameters: A=1402.884
00115> | Ptotal= 58.23 mm |                           B=   6.018
00116> --------------------                           C=    .819
00117>                          used in:   INTENSITY =  A / (t + B)^C
00118>
00119>                          Duration of storm  =  3.00 hrs
00120>                          Storm time step    = 10.00 min
00121>                          Time to peak ratio =   .33
00122>
00123>                       The CORRELATION coefficient is = .9997492
00124>
00125>                        TIME        ENTERED              COMPUTED
00126>                       (min)        (mm/hr)               (mm/hr)
00127>                          5.         196.00                196.58
00128>                         10.         145.30                144.69
00129>                         15.         119.10                115.83
00130>                         30.          74.70                 74.51
```

```
00131>                      60.          43.60                45.36
  132>                     120.          25.80                26.72
  133>                     360.          11.70                11.16
00134>                     720.           6.60                 6.37
00135>                    1440.           3.50                 3.62
  136>
  137>              TIME    RAIN |    TIME    RAIN |    TIME    RAIN |    TIME    RAIN
00138>               hrs   mm/hr |     hrs   mm/hr |     hrs   mm/hr |     hrs   mm/hr
00139>               .17   4.934 |    1.00 144.693 |    1.83   9.014 |    2.67   4.701
  140>               .33   6.152 |    1.17  43.904 |    2.00   7.571 |    2.83   4.310
  141>               .50   8.282 |    1.33  22.224 |    2.17   6.544 |    3.00   3.983
00142>               .67  13.006 |    1.50  14.852 |    2.33   5.776 |
00143>               .83  33.041 |    1.67  11.192 |    2.50   5.179 |
  144>
  145> ---------------------------------------------------------------------------
00146> 001:0003-----------------------------------------------------------------------
00147> * 100-YEAR IDF CHICAGO STORM
  148> *CHICAGO STORM       IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
  149> *                   ICASEcs=[2],
00150> *                  Enter ordinates of IDF curve below, at least seven points
00151> *                     TIME (min)     Intensity(mm/hr)
  152> *                         [5]          [242.60]
  153> *                        [10]          [179.00]
00154> *                        [15]          [146.80]
00155> *                        [30]          [91.90]
  156> *                        [60]          [53.20]
  157> *                       [120]          [31.50]
00158> *                       [360]          [14.50]
00159> *                       [720]          [8.00]
  160> *                      [1440]          [4.30]
  161> *                        -1               -1
00162> ----------------------
00163> | DEFAULT VALUES     |  Filename: W:\active\60400144\design\analysis\SWMAPR~1\SH
  164> ----------------------  ICASEdv = 1 (read and print data)
  165>       FileTitle= File comment: [                ]
00166>                  THE FOLLOWING PARAMETERS ARE USED IN THE DESIGN STANDHYD COM
00167>       Horton's infiltration equation parameters:
  168>       [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
  169>       Parameters for PERVIOUS surfaces in STANDHYD:
00170>       [IAper=   6.20 mm] [LGP=70.00 m] [MNP= .250]
00171>       Parameters for IMPERVIOUS surfaces in STANDHYD:
  172>       [IAimp=   1.57 mm] [CLI=  .31]   [MNI= .013]
  173>       Parameters used in NASHYD:
00174>       [Ia=   4.67 mm] [N= 3.00]
00175> ---------------------------------------------------------------------------
  176> 001:0004-----------------------------------------------------------------------
  177> *# Area A1 (see DWG SD2)
00178> ----------------------
00179> | DESIGN NASHYD      |   Area     (ha)=   73.90   Curve Number    (CN)=60.00
00180> | 01:A1     DT= 5.00 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
  181> ----------------------   U.H. Tp(hrs)=   1.440
00182>
00183>      Unit Hyd Qpeak  (cms)=    1.960
00184>
  185>      PEAK FLOW       (cms)=     .839 (i)
00186>      TIME TO PEAK    (hrs)=    2.833
00187>      RUNOFF VOLUME    (mm)=   12.868
00188>      TOTAL RAINFALL   (mm)=   58.226
  189>      RUNOFF COEFFICIENT   =     .221
00190>
00191>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00192>
  193> ---------------------------------------------------------------------------
00194> 001:0005-----------------------------------------------------------------------
00195> *# Area A2
```

```
00196> ----------------------
00197> | DESIGN NASHYD       |   Area     (ha)=  120.00   Curve Number    (CN)=60.00
00198> | 02:A2     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00199> ----------------------   U.H. Tp(hrs)=   1.540
00200>
00201>      Unit Hyd Qpeak  (cms)=    2.976
00202>
00203>      PEAK FLOW       (cms)=    1.297 (i)
00204>      TIME TO PEAK    (hrs)=    3.000
00205>      RUNOFF VOLUME    (mm)=   12.868
00206>      TOTAL RAINFALL   (mm)=   58.226
00207>      RUNOFF COEFFICIENT   =     .221
00208>
00209>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00210>
00211> ---------------------------------------------------------------------------
00212> 001:0006-----------------------------------------------------------------------
00213> *# Area A3
00214> ----------------------
00215> | DESIGN NASHYD       |   Area     (ha)=    5.60   Curve Number    (CN)=60.00
00216> | 03:A3     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00217> ----------------------   U.H. Tp(hrs)=   1.050
00218>
00219>      Unit Hyd Qpeak  (cms)=     .204
00220>
00221>      PEAK FLOW       (cms)=     .080 (i)
00222>      TIME TO PEAK    (hrs)=    2.333
00223>      RUNOFF VOLUME    (mm)=   12.868
00224>      TOTAL RAINFALL   (mm)=   58.226
00225>      RUNOFF COEFFICIENT   =     .221
00226>
00227>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00228>
00229> ---------------------------------------------------------------------------
00230> 001:0007-----------------------------------------------------------------------
00231> *# Area A4
00232> ----------------------
00233> | DESIGN NASHYD       |   Area     (ha)=   14.70   Curve Number    (CN)=60.00
00234> | 04:A4     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00235> ----------------------   U.H. Tp(hrs)=   1.040
00236>
00237>      Unit Hyd Qpeak  (cms)=     .540
00238>
00239>      PEAK FLOW       (cms)=     .211 (i)
00240>      TIME TO PEAK    (hrs)=    2.333
00241>      RUNOFF VOLUME    (mm)=   12.868
00242>      TOTAL RAINFALL   (mm)=   58.226
00243>      RUNOFF COEFFICIENT   =     .221
00244>
00245>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00246>
00247> ---------------------------------------------------------------------------
00248> 001:0008-----------------------------------------------------------------------
00249> *# Area A5
00250> ----------------------
00251> | DESIGN NASHYD       |   Area     (ha)=    3.50   Curve Number    (CN)=60.00
00252> | 05:A5     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00253> ----------------------   U.H. Tp(hrs)=    .630
00254>
00255>      Unit Hyd Qpeak  (cms)=     .212
00256>
00257>      PEAK FLOW       (cms)=     .072 (i)
00258>      TIME TO PEAK    (hrs)=    1.750
00259>      RUNOFF VOLUME    (mm)=   12.868
00260>      TOTAL RAINFALL   (mm)=   58.226
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00261>      RUNOFF COEFFICIENT    =      .221
 262>
 263>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00264>
00265> ------------------------------------------------------------------------------
 266> 001:0009----------------------------------------------------------------------
 267> *# Area A6
00268> ----------------------
00269> | DESIGN NASHYD       |   Area     (ha)=    4.10   Curve Number    (CN)=60.00
 270> | 06:A6     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
 271> ----------------------   U.H. Tp(hrs)=    .630
00272>
00273>      Unit Hyd Qpeak  (cms)=     .249
 274>
 275>      PEAK FLOW       (cms)=     .084 (i)
00276>      TIME TO PEAK    (hrs)=    1.750
00277>      RUNOFF VOLUME    (mm)=   12.868
 278>      TOTAL RAINFALL   (mm)=   58.226
 279>      RUNOFF COEFFICIENT    =      .221
00280>
00281>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
 282>
 283> ------------------------------------------------------------------------------
00284> 001:0010----------------------------------------------------------------------
00285> *# External Flows Pre-Development
 286> --------------------
 287> | ADD HYD (extpre) | ID: NHYD      AREA      QPEAK    TPEAK    R.V.     DWF
00288> --------------------              (ha)      (cms)    (hrs)    (mm)    (cms)
00289>                    ID1 01:A1      73.90      .839     2.83   12.87     .000
 290>                   +ID2 02:A2     120.00     1.297     3.00   12.87     .000
 291>                   +ID3 03:A3       5.60      .080     2.33   12.87     .000
00292>                   +ID4 04:A4      14.70      .211     2.33   12.87     .000
00293>                   +ID5 05:A5       3.50      .072     1.75   12.87     .000
 294>                   +ID6 06:A6       4.10      .084     1.75   12.87     .000
 295>                    ================================================
00296>                    SUM 09:extpre  221.80     2.472     2.75   12.87     .000
00297>
 298>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
 299>
00300> ------------------------------------------------------------------------------
00301> 001:0011----------------------------------------------------------------------
 302> --------------------
 303> | SAVE HYD           |   AREA      (ha)=  221.800
00304> | ID=09 (extpre)     |   QPEAK     (cms)=   2.472 (i)
00305> | DT= 5.00 PCYC= 1   |   TPEAK     (hrs)=   2.750
 306> --------------------   VOLUME      (mm)=  12.868
 307>   Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-extpre.001
00308>   Comments: Post External Flows
00309>
 310>      (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
 311>   TIME   FLOW |  TIME   FLOW |  TIME   FLOW |  TIME   FLOW |  TIME   FLOW
00312>    hrs    cms |   hrs    cms |   hrs    cms |   hrs    cms |   hrs    cms
00313>     .00   .000|  2.33  2.320|  4.67  1.182|  7.00   .166|  9.33   .014
 314>     .08   .000|  2.42  2.374|  4.75  1.116|  7.08   .153|  9.42   .013
 315>     .17   .000|  2.50  2.415|  4.83  1.052|  7.17   .141|  9.50   .011
00316>     .25   .000|  2.58  2.445|  4.92   .991|  7.25   .131|  9.58   .009
00317>     .33   .000|  2.67  2.466|  5.00   .932|  7.33   .120|  9.67   .008
 318>     .42   .000|  2.75  2.472|  5.08   .875|  7.42   .111|  9.75   .007
 319>     .50   .000|  2.83  2.472|  5.17   .822|  7.50   .102|  9.83   .006
00320>     .58   .000|  2.92  2.463|  5.25   .770|  7.58   .094|  9.92   .005
00321>     .67   .000|  3.00  2.447|  5.33   .722|  7.67   .087| 10.00   .004
 322>     .75   .001|  3.08  2.424|  5.42   .675|  7.75   .080| 10.08   .004
 323>     .83   .003|  3.17  2.393|  5.50   .631|  7.83   .074| 10.17   .003
00324>     .92   .018|  3.25  2.354|  5.58   .590|  7.92   .068| 10.25   .003
00325>    1.00   .069|  3.33  2.308|  5.67   .550|  8.00   .062| 10.33   .003
```

00326>	1.08	.164	3.42	2.255	5.75	.513	8.08	.057	10.42	.002
00327>	1.17	.296	3.50	2.196	5.83	.478	8.17	.053	10.50	.002
00328>	1.25	.456	3.58	2.133	5.92	.445	8.25	.048	10.58	.002
00329>	1.33	.634	3.67	2.065	6.00	.414	8.33	.044	10.67	.001
00330>	1.42	.822	3.75	1.994	6.08	.385	8.42	.041	10.75	.001
00331>	1.50	1.011	3.83	1.921	6.17	.358	8.50	.037	10.83	.001
00332>	1.58	1.197	3.92	1.846	6.25	.332	8.58	.034	10.92	.001
00333>	1.67	1.375	4.00	1.770	6.33	.308	8.67	.031	11.00	.001
00334>	1.75	1.543	4.08	1.693	6.42	.286	8.75	.029	11.08	.000
00335>	1.83	1.698	4.17	1.617	6.50	.265	8.83	.026	11.17	.000
00336>	1.92	1.838	4.25	1.541	6.58	.246	8.92	.024	11.25	.000
00337>	2.00	1.965	4.33	1.466	6.67	.227	9.00	.022	11.33	.000
00338>	2.08	2.076	4.42	1.392	6.75	.210	9.08	.019	11.42	.000
00339>	2.17	2.172	4.50	1.320	6.83	.194	9.17	.018	11.50	.000
00340>	2.25	2.253	4.58	1.250	6.92	.180	9.25	.016		

00341> ----------
00342> 001:0012----------
00343> *# Site Area
00344> ----------
00345> | DESIGN NASHYD | Area (ha)= 48.10 Curve Number (CN)=60.00
00346> | 01:siteR DT= 5.00 | Ia (mm)= 4.670 # of Linear Res.(N)= 3.00
00347> ---------- U.H. Tp(hrs)= 1.070
00348>
00349> Unit Hyd Qpeak (cms)= 1.717
00350>
00351> PEAK FLOW (cms)= .677 (i)
00352> TIME TO PEAK (hrs)= 2.333
00353> RUNOFF VOLUME (mm)= 12.868
00354> TOTAL RAINFALL (mm)= 58.226
00355> RUNOFF COEFFICIENT = .221
00356>
00357> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00358>
00359> ----------
00360> 001:0013----------
00361> ----------
00362> | DESIGN STANDHYD | Area (ha)= 19.90
00363> | 02:siteU DT= 2.00 | Total Imp(%)= 25.00 Dir. Conn.(%)= 8.00
00364> ----------
00365>

00366>		IMPERVIOUS	PERVIOUS (i)	
00367>	Surface Area (ha)=	4.97	14.92	
00368>	Dep. Storage (mm)=	1.57	6.20	
00369>	Average Slope (%)=	.50	.50	
00370>	Length (m)=	801.21	70.00	
00371>	Mannings n =	.013	.250	
00372>	Max.eff.Inten.(mm/hr)=	144.69	19.29	
00373>	over (min)	10.00	38.00	
00374>	Storage Coeff. (min)=	9.46 (ii)	38.36 (ii)	
00375>	Unit Hyd. Tpeak (min)=	10.00	38.00	
00376>	Unit Hyd. peak (cms)=	.12	.03	
00377>				*TOTALS*
00378>	PEAK FLOW (cms)=	.40	.44	.533 (iii)
00379>	TIME TO PEAK (hrs)=	1.10	1.67	1.600
00380>	RUNOFF VOLUME (mm)=	56.66	14.79	18.135
00381>	TOTAL RAINFALL (mm)=	58.23	58.23	58.226
00382>	RUNOFF COEFFICIENT =	.97	.25	.311

00383>
00384> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00385> CN* = 60.0 Ia = Dep. Storage (Above)
00386> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00387> THAN THE STORAGE COEFFICIENT.
00388> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00389>
00390> ----------

001:0014

ADD HYD (site)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 01:siteR	48.10	.677	2.33	12.87	.000
	+ID2 02:siteU	19.90	.533	1.60	18.14	.000
	SUM 03:site	68.00	1.059	2.00	14.41	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

001:0015

ROUTE CHANNEL
IN> 03:site
OUT< 04:rtsit1

Routing time step (min) = 2.00
Number of SEGMENTS = 1
Slopes (%), CHANNEL= .50 FLOODPLAIN= .50
LENGTH = 1400.00 (m)

<------- DATA FOR SECTION (1.0) ------>

Distance	Elevation	Manning	
.00	2.00	.0350	Main Channel
6.00	.00	.0350	Main Channel
12.00	2.00	.0350	Main Channel

<---------- TRAVEL TIME TABLE ---------->

DEPTH (m)	ELEV (m)	X-VOLUME (cu.m.)	S-VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)	D x V (m2/s)
.105	.105	.465E+02	.350E+00	.009	.274	85.17	.029
.211	.211	.186E+03	.280E+01	.058	.435	53.65	.092
.316	.316	.419E+03	.945E+01	.170	.570	40.95	.180
.421	.421	.745E+03	.224E+02	.367	.690	33.80	.291
.526	.526	.116E+04	.437E+02	.666	.801	29.13	.422
.632	.632	.168E+04	.756E+02	1.083	.905	25.79	.571
.737	.737	.228E+04	.120E+03	1.633	1.003	23.28	.739
.842	.842	.298E+04	.179E+03	2.331	1.096	21.29	.923
.947	.947	.377E+04	.255E+03	3.192	1.185	19.68	1.123
1.053	1.053	.465E+04	.350E+03	4.227	1.272	18.35	1.339
1.158	1.158	.563E+04	.466E+03	5.450	1.355	17.22	1.569
1.263	1.263	.670E+04	.605E+03	6.874	1.436	16.25	1.814
1.368	1.368	.786E+04	.769E+03	8.509	1.515	15.40	2.073
1.474	1.474	.912E+04	.960E+03	10.368	1.591	14.66	2.345
1.579	1.579	.105E+05	.118E+04	12.463	1.666	14.00	2.631
1.684	1.684	.119E+05	.143E+04	14.803	1.740	13.41	2.930
1.789	1.789	.134E+05	.172E+04	17.400	1.811	12.88	3.241
1.895	1.895	.151E+05	.204E+04	20.265	1.882	12.40	3.565
2.000	2.000	.168E+05	.240E+04	23.408	1.951	11.96	3.901

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

	AREA (ha)	<---- hydrograph ----> QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	<-pipe / channel-> MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 3:site	68.00	1.059	2.00	14.410	.626	.898
OUTFLOW: ID= 4:rtsit1	68.00	.970	2.43	14.410	.601	.872

001:0016

ROUTE CHANNEL
IN> 04:rtsit1
OUT< 05:rtsit2

Routing time step (min) = 2.00
Number of SEGMENTS = 1
Slopes (%), CHANNEL= .36 FLOODPLAIN= .36
LENGTH = 475.00 (m)

```
00456>
00457>                <------ DATA FOR SECTION (   1.0) ------>
00458>                Distance      Elevation       Manning
00459>                    .00          2.00          .0350      Main Channel
00460>                   6.00           .00          .0350      Main Channel
00461>                   9.00           .00          .0350      Main Channel
00462>                  15.00          2.00          .0350      Main Channel
00463>
00464>    <---------------------------- TRAVEL TIME TABLE ---------------------------->
00465>     DEPTH     ELEV    X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
00466>       (m)      (m)    (cu.m.)   (cu.m.)       (cms)     (m/s)      (min)  (m2/s)
00467>      .105     .105   .166E+03  .510E+01        .125      .357      22.15    .038
00468>      .211     .211   .363E+03  .224E+02        .412      .539      14.68    .114
00469>      .316     .316   .592E+03  .547E+02        .847      .679      11.65    .215
00470>      .421     .421   .853E+03  .105E+03       1.431      .797       9.93    .336
00471>      .526     .526   .114E+04  .176E+03       2.171      .901       8.79    .474
00472>      .632     .632   .147E+04  .271E+03       3.075      .995       7.96    .628
00473>      .737     .737   .182E+04  .393E+03       4.153     1.082       7.32    .797
00474>      .842     .842   .221E+04  .544E+03       5.414     1.163       6.81    .980
00475>      .947     .947   .263E+04  .728E+03       6.866     1.241       6.38   1.175
00476>     1.053    1.053   .308E+04  .948E+03       8.519     1.314       6.02   1.383
00477>     1.158    1.158   .356E+04  .121E+04      10.382     1.385       5.72   1.604
00478>     1.263    1.263   .407E+04  .150E+04      12.463     1.453       5.45   1.836
00479>     1.368    1.368   .462E+04  .185E+04      14.772     1.519       5.21   2.079
00480>     1.474    1.474   .519E+04  .224E+04      17.317     1.583       5.00   2.334
00481>     1.579    1.579   .580E+04  .268E+04      20.107     1.646       4.81   2.599
00482>     1.684    1.684   .644E+04  .317E+04      23.149     1.707       4.64   2.875
00483>     1.789    1.789   .711E+04  .372E+04*     26.453     1.766       4.48   3.161
00484>     1.895    1.895   .782E+04  .433E+04*     30.026     1.825       4.34   3.458
00485>     2.000    2.000   .855E+04  .500E+04*     33.877     1.882       4.21   3.764
00486>
00487>  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
00488>  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
00489>  (*) Actual value may be less due to limited CHANNEL LENGTH for given SLOPE.
00490>
00491>                                      <---- hydrograph ---->   <-pipe / channel->
00492>                                AREA    QPEAK    TPEAK   R.V.  MAX DEPTH  MAX VEL
00493>                                (ha)     (cms)    (hrs)   (mm)      (m)      (m/s)
00494>    INFLOW : ID= 4:rtsit1      68.00      .970     2.43 14.410      .338      .701
00495>    OUTFLOW: ID= 5:rtsit2      68.00      .958     2.60 14.410      .336      .699
00496>
00497>
00498> --------------------------------------------------------------------------------
00499> 001:0017---------------------------------------------------------------------------
00500> --------------------
00501> | SAVE HYD          |   AREA       (ha)=   68.000
00502> | ID=05 (rtsit2)    |   QPEAK     (cms)=     .958 (i)
00503> | DT= 2.00 PCYC= 1  |   TPEAK     (hrs)=    2.600
00504> --------------------   VOLUME      (mm)=   14.410
00505>   Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-rtsit2.001
00506>   Comments: Post Site Flows
00507>
00508>      (i)  PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00509>   TIME    FLOW |  TIME    FLOW |  TIME    FLOW |  TIME    FLOW |  TIME    FLOW
00510>    hrs     cms |   hrs     cms |   hrs     cms |   hrs     cms |   hrs     cms
00511>    .00    .000|   3.80    .640|   7.60    .031|  11.40    .002|  15.20    .000
00512>    .03    .000|   3.83    .627|   7.63    .030|  11.43    .002|  15.23    .000
00513>    .07    .000|   3.87    .615|   7.67    .029|  11.47    .002|  15.27    .000
00514>    .10    .000|   3.90    .603|   7.70    .029|  11.50    .002|  15.30    .000
00515>    .13    .000|   3.93    .591|   7.73    .028|  11.53    .002|  15.33    .000
00516>    .17    .000|   3.97    .579|   7.77    .027|  11.57    .002|  15.37    .000
00517>    .20    .000|   4.00    .567|   7.80    .027|  11.60    .002|  15.40    .000
00518>    .23    .000|   4.03    .555|   7.83    .026|  11.63    .002|  15.43    .000
00519>    .27    .000|   4.07    .543|   7.87    .025|  11.67    .002|  15.47    .000
00520>    .30    .000|   4.10    .531|   7.90    .025|  11.70    .002|  15.50    .000
```

)0521>	.33	.000	4.13	.519	7.93	.024	11.73	.002	15.53	.000
522>	.37	.000	4.17	.507	7.97	.023	11.77	.002	15.57	.000
523>	.40	.000	4.20	.496	8.00	.023	11.80	.002	15.60	.000
)0524>	.43	.000	4.23	.484	8.03	.022	11.83	.002	15.63	.000
)0525>	.47	.000	4.27	.473	8.07	.022	11.87	.001	15.67	.000
526>	.50	.000	4.30	.460	8.10	.021	11.90	.001	15.70	.000
527>	.53	.000	4.33	.446	8.13	.021	11.93	.001	15.73	.000
)0528>	.57	.000	4.37	.433	8.17	.020	11.97	.001	15.77	.000
)0529>	.60	.001	4.40	.421	8.20	.020	12.00	.001	15.80	.000
530>	.63	.001	4.43	.409	8.23	.019	12.03	.001	15.83	.000
531>	.67	.001	4.47	.397	8.27	.019	12.07	.001	15.87	.000
)0532>	.70	.001	4.50	.384	8.30	.018	12.10	.001	15.90	.000
)0533>	.73	.002	4.53	.372	8.33	.018	12.13	.001	15.93	.000
534>	.77	.002	4.57	.360	8.37	.017	12.17	.001	15.97	.000
535>	.80	.003	4.60	.350	8.40	.017	12.20	.001	16.00	.000
)0536>	.83	.004	4.63	.340	8.43	.017	12.23	.001	16.03	.000
)0537>	.87	.005	4.67	.331	8.47	.016	12.27	.001	16.07	.000
538>	.90	.006	4.70	.323	8.50	.016	12.30	.001	16.10	.000
539>	.93	.008	4.73	.314	8.53	.015	12.33	.001	16.13	.000
)0540>	.97	.010	4.77	.306	8.57	.015	12.37	.001	16.17	.000
)0541>	1.00	.013	4.80	.298	8.60	.015	12.40	.001	16.20	.000
542>	1.03	.018	4.83	.290	8.63	.014	12.43	.001	16.23	.000
543>	1.07	.025	4.87	.282	8.67	.014	12.47	.001	16.27	.000
)0544>	1.10	.034	4.90	.275	8.70	.014	12.50	.001	16.30	.000
)0545>	1.13	.044	4.93	.268	8.73	.013	12.53	.001	16.33	.000
546>	1.17	.057	4.97	.261	8.77	.013	12.57	.001	16.37	.000
547>	1.20	.072	5.00	.254	8.80	.013	12.60	.001	16.40	.000
)0548>	1.23	.088	5.03	.248	8.83	.012	12.63	.001	16.43	.000
0549>	1.27	.106	5.07	.242	8.87	.012	12.67	.001	16.47	.000
550>	1.30	.125	5.10	.236	8.90	.012	12.70	.001	16.50	.000
551>	1.33	.147	5.13	.230	8.93	.012	12.73	.001	16.53	.000
)0552>	1.37	.173	5.17	.224	8.97	.011	12.77	.001	16.57	.000
0553>	1.40	.201	5.20	.219	9.00	.011	12.80	.001	16.60	.000
554>	1.43	.232	5.23	.213	9.03	.011	12.83	.001	16.63	.000
555>	1.47	.263	5.27	.208	9.07	.011	12.87	.001	16.67	.000
)0556>	1.50	.295	5.30	.203	9.10	.010	12.90	.001	16.70	.000
0557>	1.53	.330	5.33	.198	9.13	.010	12.93	.001	16.73	.000
558>	1.57	.367	5.37	.193	9.17	.010	12.97	.001	16.77	.000
559>	1.60	.408	5.40	.188	9.20	.010	13.00	.001	16.80	.000
)0560>	1.63	.446	5.43	.183	9.23	.009	13.03	.001	16.83	.000
0561>	1.67	.480	5.47	.179	9.27	.009	13.07	.001	16.87	.000
562>	1.70	.514	5.50	.174	9.30	.009	13.10	.001	16.90	.000
563>	1.73	.547	5.53	.170	9.33	.009	13.13	.001	16.93	.000
)564>	1.77	.580	5.57	.165	9.37	.008	13.17	.001	16.97	.000
0565>	1.80	.613	5.60	.161	9.40	.008	13.20	.001	17.00	.000
^566>	1.83	.645	5.63	.157	9.43	.008	13.23	.001	17.03	.000
567>	1.87	.676	5.67	.153	9.47	.008	13.27	.001	17.07	.000
)568>	1.90	.706	5.70	.148	9.50	.008	13.30	.001	17.10	.000
0569>	1.93	.735	5.73	.144	9.53	.008	13.33	.001	17.13	.000
^570>	1.97	.761	5.77	.140	9.57	.007	13.37	.001	17.17	.000
571>	2.00	.784	5.80	.136	9.60	.007	13.40	.001	17.20	.000
)572>	2.03	.806	5.83	.132	9.63	.007	13.43	.000	17.23	.000
0573>	2.07	.826	5.87	.129	9.67	.007	13.47	.000	17.27	.000
^574>	2.10	.845	5.90	.125	9.70	.007	13.50	.000	17.30	.000
575>	2.13	.862	5.93	.122	9.73	.007	13.53	.000	17.33	.000
)576>	2.17	.876	5.97	.118	9.77	.006	13.57	.000	17.37	.000
0577>	2.20	.889	6.00	.115	9.80	.006	13.60	.000	17.40	.000
^578>	2.23	.900	6.03	.112	9.83	.006	13.63	.000	17.43	.000
579>	2.27	.911	6.07	.109	9.87	.006	13.67	.000	17.47	.000
)580>	2.30	.920	6.10	.106	9.90	.006	13.70	.000	17.50	.000
0581>	2.33	.928	6.13	.103	9.93	.006	13.73	.000	17.53	.000
^582>	2.37	.936	6.17	.100	9.97	.006	13.77	.000	17.57	.000
583>	2.40	.942	6.20	.098	10.00	.005	13.80	.000	17.60	.000
584>	2.43	.947	6.23	.095	10.03	.005	13.83	.000	17.63	.000
0585>	2.47	.951	6.27	.092	10.07	.005	13.87	.000	17.67	.000

00586>	2.50	.954	6.30	.090	10.10	.005	13.90	.000	17.70	.000
00587>	2.53	.956	6.33	.087	10.13	.005	13.93	.000	17.73	.000
00588>	2.57	.957	6.37	.085	10.17	.005	13.97	.000	17.77	.000
00589>	2.60	.958	6.40	.083	10.20	.005	14.00	.000	17.80	.000
00590>	2.63	.957	6.43	.081	10.23	.005	14.03	.000	17.83	.000
00591>	2.67	.956	6.47	.078	10.27	.005	14.07	.000	17.87	.000
00592>	2.70	.954	6.50	.076	10.30	.004	14.10	.000	17.90	.000
00593>	2.73	.952	6.53	.074	10.33	.004	14.13	.000	17.93	.000
00594>	2.77	.949	6.57	.072	10.37	.004	14.17	.000	17.97	.000
00595>	2.80	.944	6.60	.070	10.40	.004	14.20	.000	18.00	.000
00596>	2.83	.940	6.63	.068	10.43	.004	14.23	.000	18.03	.000
00597>	2.87	.935	6.67	.066	10.47	.004	14.27	.000	18.07	.000
00598>	2.90	.929	6.70	.064	10.50	.004	14.30	.000	18.10	.000
00599>	2.93	.923	6.73	.062	10.53	.004	14.33	.000	18.13	.000
00600>	2.97	.917	6.77	.061	10.57	.004	14.37	.000	18.17	.000
00601>	3.00	.910	6.80	.059	10.60	.004	14.40	.000	18.20	.000
00602>	3.03	.903	6.83	.057	10.63	.003	14.43	.000	18.23	.000
00603>	3.07	.895	6.87	.056	10.67	.003	14.47	.000	18.27	.000
00604>	3.10	.887	6.90	.054	10.70	.003	14.50	.000	18.30	.000
00605>	3.13	.879	6.93	.053	10.73	.003	14.53	.000	18.33	.000
00606>	3.17	.869	6.97	.051	10.77	.003	14.57	.000	18.37	.000
00607>	3.20	.858	7.00	.050	10.80	.003	14.60	.000	18.40	.000
00608>	3.23	.848	7.03	.048	10.83	.003	14.63	.000	18.43	.000
00609>	3.27	.837	7.07	.047	10.87	.003	14.67	.000	18.47	.000
00610>	3.30	.825	7.10	.046	10.90	.003	14.70	.000	18.50	.000
00611>	3.33	.813	7.13	.045	10.93	.003	14.73	.000	18.53	.000
00612>	3.37	.801	7.17	.043	10.97	.003	14.77	.000	18.57	.000
00613>	3.40	.789	7.20	.042	11.00	.003	14.80	.000	18.60	.000
00614>	3.43	.776	7.23	.041	11.03	.003	14.83	.000	18.63	.000
00615>	3.47	.764	7.27	.040	11.07	.003	14.87	.000	18.67	.000
00616>	3.50	.751	7.30	.039	11.10	.003	14.90	.000	18.70	.000
00617>	3.53	.739	7.33	.038	11.13	.002	14.93	.000	18.73	.000
00618>	3.57	.727	7.37	.037	11.17	.002	14.97	.000	18.77	.000
00619>	3.60	.715	7.40	.036	11.20	.002	15.00	.000	18.80	.000
00620>	3.63	.702	7.43	.035	11.23	.002	15.03	.000	18.83	.000
00621>	3.67	.690	7.47	.034	11.27	.002	15.07	.000	18.87	.000
00622>	3.70	.677	7.50	.033	11.30	.002	15.10	.000	18.90	.000
00623>	3.73	.665	7.53	.033	11.33	.002	15.13	.000	18.93	.000
00624>	3.77	.652	7.57	.032	11.37	.002	15.17	.000		

00625> ----------
00626> 001:0018----------
00627> ----------

00628> | ADD HYD (sumpst) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00629> ---------- (ha) (cms) (hrs) (mm) (cms)
00630> ID1 09:extpre 221.80 2.472 2.75 12.87 .000
00631> +ID2 05:rtsit2 68.00 .958 2.60 14.41 .000
00632> ==========
00633> SUM 08:sumpst 289.80 3.422 2.73 13.23 .000
00634>
00635> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00636>
00637> ----------
00638> 001:0019----------
00639> ----------

00640> | SAVE HYD | AREA (ha)= 289.800
00641> | ID=08 (sumpst) | QPEAK (cms)= 3.422 (i)
00642> | DT= 2.00 PCYC= 1 | TPEAK (hrs)= 2.733
00643> ---------- VOLUME (mm)= 13.230
00644> Filename: W:\active\60400144\design\analysis\SWMAPR-1\H-sumpst.001
00645> Comments: Overall Postdev Hydrograph
00646>
00647> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

00648>	TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW
00649>	hrs	cms	hrs	cms	hrs	cms	hrs	cms	hrs	cms
00650>	.00	.000	3.80	2.590	7.60	.124	11.40	.002	15.20	.000

)0651>	.03	.000	3.83	2.548	7.63	.120	11.43	.002	15.23	.000
652>	.07	.000	3.87	2.506	7.67	.116	11.47	.002	15.27	.000
653>	.10	.000	3.90	2.464	7.70	.113	11.50	.002	15.30	.000
)0654>	.13	.000	3.93	2.421	7.73	.109	11.53	.002	15.33	.000
)0655>	.17	.000	3.97	2.379	7.77	.106	11.57	.002	15.37	.000
656>	.20	.000	4.00	2.337	7.80	.103	11.60	.002	15.40	.000
657>	.23	.000	4.03	2.294	7.83	.099	11.63	.002	15.43	.000
)0658>	.27	.000	4.07	2.252	7.87	.096	11.67	.002	15.47	.000
)0659>	.30	.000	4.10	2.209	7.90	.093	11.70	.002	15.50	.000
660>	.33	.000	4.13	2.166	7.93	.091	11.73	.002	15.53	.000
661>	.37	.000	4.17	2.124	7.97	.088	11.77	.002	15.57	.000
)0662>	.40	.000	4.20	2.082	8.00	.085	11.80	.002	15.60	.000
)0663>	.43	.000	4.23	2.040	8.03	.083	11.83	.002	15.63	.000
664>	.47	.000	4.27	1.998	8.07	.080	11.87	.001	15.67	.000
665>	.50	.000	4.30	1.956	8.10	.078	11.90	.001	15.70	.000
)0666>	.53	.000	4.33	1.912	8.13	.075	11.93	.001	15.73	.000
)0667>	.57	.000	4.37	1.870	8.17	.073	11.97	.001	15.77	.000
668>	.60	.001	4.40	1.828	8.20	.071	12.00	.001	15.80	.000
669>	.63	.001	4.43	1.787	8.23	.068	12.03	.001	15.83	.000
)0670>	.67	.001	4.47	1.746	8.27	.066	12.07	.001	15.87	.000
)0671>	.70	.002	4.50	1.704	8.30	.064	12.10	.001	15.90	.000
672>	.73	.002	4.53	1.664	8.33	.062	12.13	.001	15.93	.000
673>	.77	.003	4.57	1.624	8.37	.060	12.17	.001	15.97	.000
)0674>	.80	.005	4.60	1.586	8.40	.058	12.20	.001	16.00	.000
0675>	.83	.007	4.63	1.549	8.43	.057	12.23	.001	16.03	.000
676>	.87	.014	4.67	1.513	8.47	.055	12.27	.001	16.07	.000
677>	.90	.021	4.70	1.478	8.50	.053	12.30	.001	16.10	.000
)0678>	.93	.036	4.73	1.443	8.53	.052	12.33	.001	16.13	.000
0679>	.97	.058	4.77	1.409	8.57	.050	12.37	.001	16.17	.000
680>	1.00	.082	4.80	1.375	8.60	.048	12.40	.001	16.20	.000
681>	1.03	.125	4.83	1.342	8.63	.047	12.43	.001	16.23	.000
)0682>	1.07	.170	4.87	1.310	8.67	.045	12.47	.001	16.27	.000
0683>	1.10	.224	4.90	1.278	8.70	.044	12.50	.001	16.30	.000
684>	1.13	.287	4.93	1.247	8.73	.043	12.53	.001	16.33	.000
685>	1.17	.353	4.97	1.216	8.77	.041	12.57	.001	16.37	.000
)0686>	1.20	.432	5.00	1.186	8.80	.040	12.60	.001	16.40	.000
0687>	1.23	.512	5.03	1.157	8.83	.039	12.63	.001	16.43	.000
688>	1.27	.598	5.07	1.128	8.87	.038	12.67	.001	16.47	.000
689>	1.30	.688	5.10	1.100	8.90	.036	12.70	.001	16.50	.000
)0690>	1.33	.782	5.13	1.073	8.93	.035	12.73	.001	16.53	.000
0691>	1.37	.882	5.17	1.046	8.97	.034	12.77	.001	16.57	.000
692>	1.40	.985	5.20	1.020	9.00	.033	12.80	.001	16.60	.000
693>	1.43	1.091	5.23	.994	9.03	.032	12.83	.001	16.63	.000
)0694>	1.47	1.198	5.27	.969	9.07	.030	12.87	.001	16.67	.000
0695>	1.50	1.306	5.30	.944	9.10	.029	12.90	.001	16.70	.000
696>	1.53	1.415	5.33	.919	9.13	.028	12.93	.001	16.73	.000
697>	1.57	1.527	5.37	.896	9.17	.027	12.97	.001	16.77	.000
)0698>	1.60	1.640	5.40	.872	9.20	.026	13.00	.001	16.80	.000
0699>	1.63	1.750	5.43	.850	9.23	.026	13.03	.001	16.83	.000
0700>	1.67	1.855	5.47	.827	9.27	.025	13.07	.001	16.87	.000
701>	1.70	1.956	5.50	.805	9.30	.024	13.10	.001	16.90	.000
702>	1.73	2.056	5.53	.784	9.33	.023	13.13	.001	16.93	.000
0703>	1.77	2.154	5.57	.763	9.37	.022	13.17	.001	16.97	.000
0704>	1.80	2.249	5.60	.743	9.40	.022	13.20	.001	17.00	.000
705>	1.83	2.343	5.63	.723	9.43	.021	13.23	.001	17.03	.000
706>	1.87	2.430	5.67	.703	9.47	.020	13.27	.001	17.07	.000
0707>	1.90	2.515	5.70	.684	9.50	.019	13.30	.001	17.10	.000
0708>	1.93	2.599	5.73	.665	9.53	.018	13.33	.001	17.13	.000
709>	1.97	2.675	5.77	.646	9.57	.017	13.37	.001	17.17	.000
710>	2.00	2.749	5.80	.629	9.60	.016	13.40	.001	17.20	.000
0711>	2.03	2.815	5.83	.611	9.63	.015	13.43	.000	17.23	.000
0712>	2.07	2.880	5.87	.594	9.67	.015	13.47	.000	17.27	.000
713>	2.10	2.940	5.90	.577	9.70	.014	13.50	.000	17.30	.000
714>	2.13	2.995	5.93	.561	9.73	.014	13.53	.000	17.33	.000
0715>	2.17	3.048	5.97	.545	9.77	.013	13.57	.000	17.37	.000

00716>	2.20	3.093	6.00	.529	9.80	.013	13.60	.000	17.40	.000
00717>	2.23	3.137	6.03	.515	9.83	.012	13.63	.000	17.43	.000
00718>	2.27	3.177	6.07	.500	9.87	.012	13.67	.000	17.47	.000
00719>	2.30	3.214	6.10	.486	9.90	.011	13.70	.000	17.50	.000
00720>	2.33	3.249	6.13	.472	9.93	.011	13.73	.000	17.53	.000
00721>	2.37	3.278	6.17	.458	9.97	.010	13.77	.000	17.57	.000
00722>	2.40	3.305	6.20	.445	10.00	.010	13.80	.000	17.60	.000
00723>	2.43	3.329	6.23	.433	10.03	.010	13.83	.000	17.63	.000
00724>	2.47	3.350	6.27	.420	10.07	.009	13.87	.000	17.67	.000
00725>	2.50	3.369	6.30	.408	10.10	.009	13.90	.000	17.70	.000
00726>	2.53	3.383	6.33	.396	10.13	.009	13.93	.000	17.73	.000
00727>	2.57	3.396	6.37	.385	10.17	.008	13.97	.000	17.77	.000
00728>	2.60	3.406	6.40	.373	10.20	.008	14.00	.000	17.80	.000
00729>	2.63	3.414	6.43	.362	10.23	.008	14.03	.000	17.83	.000
00730>	2.67	3.420	6.47	.352	10.27	.007	14.07	.000	17.87	.000
00731>	2.70	3.421	6.50	.341	10.30	.007	14.10	.000	17.90	.000
00732>	2.73	3.422	6.53	.331	10.33	.007	14.13	.000	17.93	.000
00733>	2.77	3.421	6.57	.322	10.37	.007	14.17	.000	17.97	.000
00734>	2.80	3.416	6.60	.312	10.40	.006	14.20	.000	18.00	.000
00735>	2.83	3.411	6.63	.303	10.43	.006	14.23	.000	18.03	.000
00736>	2.87	3.403	6.67	.294	10.47	.006	14.27	.000	18.07	.000
00737>	2.90	3.394	6.70	.285	10.50	.006	14.30	.000	18.10	.000
00738>	2.93	3.383	6.73	.276	10.53	.006	14.33	.000	18.13	.000
00739>	2.97	3.370	6.77	.268	10.57	.005	14.37	.000	18.17	.000
00740>	3.00	3.357	6.80	.260	10.60	.005	14.40	.000	18.20	.000
00741>	3.03	3.341	6.83	.252	10.63	.005	14.43	.000	18.23	.000
00742>	3.07	3.324	6.87	.244	10.67	.005	14.47	.000	18.27	.000
00743>	3.10	3.305	6.90	.237	10.70	.005	14.50	.000	18.30	.000
00744>	3.13	3.284	6.93	.230	10.73	.004	14.53	.000	18.33	.000
00745>	3.17	3.262	6.97	.223	10.77	.004	14.57	.000	18.37	.000
00746>	3.20	3.236	7.00	.216	10.80	.004	14.60	.000	18.40	.000
00747>	3.23	3.210	7.03	.209	10.83	.004	14.63	.000	18.43	.000
00748>	3.27	3.182	7.07	.203	10.87	.004	14.67	.000	18.47	.000
00749>	3.30	3.151	7.10	.197	10.90	.004	14.70	.000	18.50	.000
00750>	3.33	3.121	7.13	.191	10.93	.004	14.73	.000	18.53	.000
00751>	3.37	3.088	7.17	.185	10.97	.003	14.77	.000	18.57	.000
00752>	3.40	3.054	7.20	.179	11.00	.003	14.80	.000	18.60	.000
00753>	3.43	3.019	7.23	.174	11.03	.003	14.83	.000	18.63	.000
00754>	3.47	2.984	7.27	.169	11.07	.003	14.87	.000	18.67	.000
00755>	3.50	2.948	7.30	.164	11.10	.003	14.90	.000	18.70	.000
00756>	3.53	2.910	7.33	.158	11.13	.003	14.93	.000	18.73	.000
00757>	3.57	2.872	7.37	.154	11.17	.003	14.97	.000	18.77	.000
00758>	3.60	2.834	7.40	.149	11.20	.003	15.00	.000	18.80	.000
00759>	3.63	2.795	7.43	.144	11.23	.003	15.03	.000	18.83	.000
00760>	3.67	2.755	7.47	.140	11.27	.002	15.07	.000	18.87	.000
00761>	3.70	2.714	7.50	.136	11.30	.002	15.10	.000	18.90	.000
00762>	3.73	2.673	7.53	.132	11.33	.002	15.13	.000	18.93	.000
00763>	3.77	2.632	7.57	.128	11.37	.002	15.17	.000		

00764> ----------
00765> 001:0020----------
00766> FINISH
00767> ----------
00768> **********
00769> WARNINGS / ERRORS / NOTES
00770> ----------
00771> Simulation ended on 2005-05-04 at 10:24:42
00772> ==========
00773>
00774>

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1: 100 yr SWMHYMO

```
00001> ================================================================================
 0002>
 0003>  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999     999  =========
00004>  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9   9   9
00005>  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9   9   9 Ver. 4.02
 0006>      S   W W   M   M  H   H    Y    M   M  O   O       9999    9999 July 1999
 0007>  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9       9 =========
00008>                                                       9   9   9   9 # 3824306
00009>       StormWater Management HYdrologic Model           999     999  =========
 0010>
 0011>  ********************************************************************************
00012>  ************************** SWMHYMO-99 Ver/4.02 ***************************
00013>  *******  A single event and continuous hydrologic simulation model  *******
 0014>  *******     based on the principles of HYMO and its successors       *******
 0015>  *******                 OTTHYMO-83 and OTTHYMO-89.                   *******
00016>  ********************************************************************************
00017>  ******* Distributed by:  J.F. Sabourin and Associates Inc.           *******
 0018>  *******                  Ottawa,  Ontario: (613) 727-5199           *******
 0019>  *******                  Gatineau, Quebec: (819) 243-6858           *******
00020>  *******                  E-Mail: swmhymo@jfsa.Com                   *******
00021>  ********************************************************************************
 0022>
 0023>  +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024>  +++++++ Licensed user: Stantec Consulting Ltd. 604                    +++++++++
00025>  +++++++                  Ottawa                 SERIAL#:3824306      +++++++++
 0026>  ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 0027>
00028>  ********************************************************************************
00029>  *******          ++++++ PROGRAM ARRAY DIMENSIONS ++++++              *******
 0030>  *******          Maximum value for ID numbers  :     10              *******
 0031>  *******          Max. number of rainfall points:  15000              *******
00032>  *******          Max. number of flow points    :  15000              *******
00033>  ********************************************************************************
 0034>
 0035>
00036>  ********************   D E T A I L E D   O U T P U T   ********************
00037>  ********************************************************************************
 0038>  *       DATE: 2005-05-04      TIME: 10:25:38      RUN COUNTER: 000196       *
 0039>  ********************************************************************************
00040>  * Input   filename: W:\active\60400144\design\analysis\SWMAPR~1\144post2.d*
00041>  * Output  filename: W:\active\60400144\design\analysis\SWMAPR~1\144post2.o*
 0042>  * Summary filename: W:\active\60400144\design\analysis\SWMAPR~1\144post2.s*
 0043>  * User comments:                                                          *
00044>  * 1:_____________________________________________________________________*
00045>  * 2:_____________________________________________________________________*
 0046>  * 3:_____________________________________________________________________*
 0047>  ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
 0050> 001:0001-----------------------------------------------------------------------
 0051> *#*************************************************************************
00052> *#  Project Name: [Emerald Creek]    Project Number: [6004-00144]
00053> *#  Date         : 06-18-2004
 0054> *#  Modeller     : [MAF]
 0055> *#  Company      : McNeely Engineering Consultants Limited
00056> *#  License #    :  5695479
00057> *#*************************************************************************
 0058> --------------------
 0059> | START            |  Project  dir.: W:\active\6040014:\design\analysis\SWMAPR~1
 0060> --------------------  Rainfall dir.: W:\active\60400144\design\analysis\SWMAPR~1
00061>     TZERO =    .00 hrs on        0
 0062>     METOUT=    2 (output = METRIC)
 0063>     NRUN  = 001
 0064>     NSTORM=    0
00065> --------------------------------------------------------------------------------
```

```
00066> 001:0002--------------------------------------------------------------------------
00067> * 2-YEAR IDF CHICAGO STORM
00068> *CHICAGO STORM        IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00069> *                     ICASEcs=[2],
00070> *                     Enter ordinates of IDF curve below, at least seven points
00071> *                        TIME (min)    Intensity(mm/hr)
00072> *                           [5]         [102.80]
00073> *                           [10]        [77.10]
00074> *                           [15]        [63.30]
00075> *                           [30]        [39.90]
00076> *                           [60]        [24.20]
00077> *                           [120]       [14.30]
00078> *                           [360]       [6.20]
00079> *                           [720]       [3.60]
00080> *                           [1440]      [2.00]
00081> *                            -1             -1
00082> * 5-YEAR IDF CHICAGO STORM
00083> *CHICAGO STORM        IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00084> *                    ICASEcs=[2],
00085> *                    Enter ordinates of IDF curve below, at least seven points
00086> *                       TIME (min)    Intensity(mm/hr)
00087> *                          [5]         [140.20]
00088> *                          [10]        [104.40]
00089> *                          [15]        [85.60]
00090> *                          [30]        [53.90]
00091> *                          [60]        [32.00]
00092> *                          [120]       [18.90]
00093> *                          [360]       [8.40]
00094> *                          [720]       [4.80]
00095> *                          [1440]      [2.60]
00096> *                            -1             -1
00097> * 10-YEAR IDF CHICAGO STORM
00098> *CHICAGO STORM        IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min),
00099> *                     ICASEcs=[2],
00100> *                    Enter ordinates of IDF curve below, at least seven points
00101> *                       TIME (min)    Intensity(mm/hr)
00102> *                          [5]         [165.00]
00103> *                          [10]        [122.50]
00104> *                          [15]        [100.40]
00105> *                          [30]        [63.10]
00106> *                          [60]        [37.10]
00107> *                          [120]       [22.00]
00108> *                          [360]       [9.90]
00109> *                          [720]       [5.60]
00110> *                          [1440]      [3.00]
00111> *                            -1             -1
00112> * 25-YEAR IDF CHICAGO STORM
00113> *CHICAGO STORM        IUNITS=[2],  TD=[3](hrs), RTP=[0.333],  CSDT=[10](min)
00114> *                     ICASEcs=[2],
00115> *                     Enter ordinates of IDF curve below, at least seven points
00116> *                        TIME (min)    Intensity(mm/hr)
00117> *                           [5]         [196.00]
00118> *                           [10]        [145.30]
00119> *                           [15]        [119.10]
00120> *                           [30]        [74.70]
00121> *                           [60]        [43.60]
00122> *                           [120]       [25.80]
00123> *                           [360]       [11.70]
00124> *                           [720]       [6.60]
00125> *                           [1440]      [3.50]
00126> *                             -1             -1
00127> *# 100-YEAR IDF CHICAGO STORM
00128> --------------------
00129> | CHICAGO STORM     |     IDF curve parameters: A=1735.688
00130> | Ptotal= 71.66 mm  |                           B=    6.014
```

```
00131> --------------------
 0132>                                          C=     .820
 0133>                      used in:   INTENSITY =  A / (t + B)^C
00134>
00135>                      Duration of storm   =  3.00 hrs
00136>                      Storm time step     = 10.00 min
 0137>                      Time to peak ratio =    .33
00138>
00139>                   The CORRELATION coefficient is = .9997117
 0140>
 0141>                    TIME        ENTERED              COMPUTED
00142>                   (min)        (mm/hr)              (mm/hr)
00143>                     5.          242.60               242.70
 0144>                    10.          179.00               178.56
 0145>                    15.          146.80               142.89
00146>                    30.           91.90                91.87
00147>                    60.           53.20                55.89
 0148>                   120.           31.50                32.89
 0149>                   360.           14.50                13.72
00150>                   720.            8.00                 7.83
00151>                  1440.            4.30                 4.45
 0152>
 0153>          TIME    RAIN  |  TIME    RAIN  |  TIME    RAIN  |  TIME    RAIN
00154>          hrs    mm/hr  |   hrs   mm/hr  |   hrs   mm/hr  |   hrs   mm/hr
00155>          .17    6.046  |  1.00  178.559 |  1.83   11.059 |  2.67    5.760
 0156>          .33    7.542  |  1.17   54.049 |  2.00    9.285 |  2.83    5.280
 0157>          .50   10.159  |  1.33   27.319 |  2.17    8.024 |  3.00    4.879
00158>          .67   15.969  |  1.50   18.240 |  2.33    7.080 |
00159>          .83   40.655  |  1.67   13.737 |  2.50    6.347 |
 0160> ------------------------------------------------------------------------------
 0161> 001:0003----------------------------------------------------------------------
00162> ----------------------
00163> | DEFAULT VALUES     |  Filename: W:\active\60400144\design\analysis\SWMAPR~1\SH
 0164> ----------------------  ICASEdv = 1 (read and print data)
 0165>       FileTitle= File comment: [                ]
00166>                  THE FOLLOWING PARAMETERS ARE USED IN THE DESIGN STANDHYD COM
00167>       Horton's infiltration equation parameters:
 0168>       [Fo= 50.00 mm/hr] [Fc= 7.50 mm/hr] [DCAY= 2.00 /hr] [F=  .00 mm]
 0169>       Parameters for PERVIOUS surfaces in STANDHYD:
00170>       [IAper=   6.20 mm] [LGP=70.00 m] [MNP= .250]
00171>       Parameters for IMPERVIOUS surfaces in STANDHYD:
 0172>       [IAimp=   1.57 mm] [CLI=  .31]    [MNI= .013]
 0173>       Parameters used in NASHYD:
00174>       [Ia=   4.67 mm] [N= 3.00]
00175> ------------------------------------------------------------------------------
 0176> 001:0004----------------------------------------------------------------------
 0177> *# Area A1 (see DWG SD2)
00178> ----------------------
00179> | DESIGN NASHYD       |   Area     (ha)=   73.90   Curve Number    (CN)=60.00
 0180> | 01:A1     DT= 5.00 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
 0181> ----------------------   U.H. Tp(hrs)=   1.440
 0182>
00183>       Unit Hyd Qpeak  (cms)=    1.960
 0184>
 0185>       PEAK FLOW       (cms)=    1.242 (i)
 0186>       TIME TO PEAK    (hrs)=    2.833
00187>       RUNOFF VOLUME    (mm)=   18.932
 0188>       TOTAL RAINFALL   (mm)=   71.665
 0189>       RUNOFF COEFFICIENT   =     .265
 0190>
00191>       (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
 0192>
 0193> ------------------------------------------------------------------------------
 0194> 001:0005----------------------------------------------------------------------
00195> *# Area A2
```

```
00196> ----------------------
00197> | DESIGN NASHYD       |   Area     (ha)=  120.00   Curve Number    (CN)=60.00
00198> | 02:A2     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00199> ----------------------   U.H. Tp(hrs)=   1.540
00200>
00201>      Unit Hyd Qpeak  (cms)=    2.976
00202>
00203>      PEAK FLOW       (cms)=    1.919 (i)
00204>      TIME TO PEAK    (hrs)=    2.917
00205>      RUNOFF VOLUME    (mm)=   18.992
00206>      TOTAL RAINFALL   (mm)=   71.665
00207>      RUNOFF COEFFICIENT   =     .265
00208>
00209>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00210>
00211> ---------------------------------------------------------------------------
00212> 001:0006-----------------------------------------------------------------
00213> *# Area A3
00214> ----------------------
00215> | DESIGN NASHYD       |   Area     (ha)=    5.60   Curve Number    (CN)=60.00
00216> | 03:A3     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00217> ----------------------   U.H. Tp(hrs)=   1.050
00218>
00219>      Unit Hyd Qpeak  (cms)=     .204
00220>
00221>      PEAK FLOW       (cms)=     .119 (i)
00222>      TIME TO PEAK    (hrs)=    2.333
00223>      RUNOFF VOLUME    (mm)=   18.992
00224>      TOTAL RAINFALL   (mm)=   71.665
00225>      RUNOFF COEFFICIENT   =     .265
00226>
00227>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00228>
00229> ---------------------------------------------------------------------------
00230> 001:0007-----------------------------------------------------------------
00231> *# Area A4
00232> ----------------------
00233> | DESIGN NASHYD       |   Area     (ha)=   14.70   Curve Number    (CN)=60.00
00234> | 04:A4     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00235> ----------------------   U.H. Tp(hrs)=   1.040
00236>
00237>      Unit Hyd Qpeak  (cms)=     .540
00238>
00239>      PEAK FLOW       (cms)=     .313 (i)
00240>      TIME TO PEAK    (hrs)=    2.333
00241>      RUNOFF VOLUME    (mm)=   18.992
00242>      TOTAL RAINFALL   (mm)=   71.665
00243>      RUNOFF COEFFICIENT   =     .265
00244>
00245>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00246>
00247> ---------------------------------------------------------------------------
00248> 001:0008-----------------------------------------------------------------
00249> *# Area A5
00250> ----------------------
00251> | DESIGN NASHYD       |   Area     (ha)=    3.50   Curve Number    (CN)=60.00
00252> | 05:A5     DT= 5.00  |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
00253> ----------------------   U.H. Tp(hrs)=    .630
00254>
00255>      Unit Hyd Qpeak  (cms)=     .212
00256>
00257>      PEAK FLOW       (cms)=     .107 (i)
00258>      TIME TO PEAK    (hrs)=    1.750
00259>      RUNOFF VOLUME    (mm)=   18.992
00260>      TOTAL RAINFALL   (mm)=   71.665
```

```
      RUNOFF COEFFICIENT    =      .265

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

---------------------------------------------------------------------------
001:0009---------------------------------------------------------------------
*# Area A6
----------------------
| DESIGN NASHYD      |   Area     (ha)=    4.10   Curve Number    (CN)=60.00
| 06:A6     DT= 5.00 |   Ia       (mm)=   4.670   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=     .630

      Unit Hyd Qpeak  (cms)=      .249

      PEAK FLOW       (cms)=      .125 (i)
      TIME TO PEAK    (hrs)=    1.750
      RUNOFF VOLUME    (mm)=   18.992
      TOTAL RAINFALL   (mm)=   71.665
      RUNOFF COEFFICIENT    =      .265

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

---------------------------------------------------------------------------
001:0010---------------------------------------------------------------------
*# External Flows Pre-Development
--------------------
| ADD HYD (extpre) | ID: NHYD      AREA      QPEAK    TPEAK    R.V.     DWF
--------------------                (ha)      (cms)    (hrs)    (mm)    (cms)
                  ID1 01:A1        73.90     1.242     2.83   18.99     .000
                 +ID2 02:A2       120.00     1.919     2.92   18.99     .000
                 +ID3 03:A3         5.60      .119     2.33   18.99     .000
                 +ID4 04:A4        14.70      .313     2.33   18.99     .000
                 +ID5 05:A5         3.50      .107     1.75   18.99     .000
                 +ID6 06:A6         4.10      .125     1.75   18.99     .000
                  ==========================================================
                  SUM 09:extpre   221.80     3.661     2.75   18.99     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

---------------------------------------------------------------------------
001:0011---------------------------------------------------------------------
--------------------
| SAVE HYD         |   AREA      (ha)=  221.800
| ID=09 (extpre)   |   QPEAK    (cms)=    3.661 (i)
| DT= 5.00 PCYC= 1 |   TPEAK    (hrs)=    2.750
--------------------   VOLUME     (mm)=   18.992
  Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-extpre.001
  Comments: Post External Flows

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

TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms
.00	.000	2.33	3.458	4.67	1.721	7.00	.241	9.33	.021
.08	.000	2.42	3.534	4.75	1.625	7.08	.222	9.42	.019
.17	.000	2.50	3.590	4.83	1.531	7.17	.205	9.50	.016
.25	.000	2.58	3.629	4.92	1.442	7.25	.189	9.58	.013
.33	.000	2.67	3.652	5.00	1.356	7.33	.174	9.67	.011
.42	.000	2.75	3.661	5.08	1.274	7.42	.161	9.75	.010
.50	.000	2.83	3.656	5.17	1.195	7.50	.148	9.83	.008
.58	.000	2.92	3.639	5.25	1.120	7.58	.136	9.92	.007
.67	.000	3.00	3.611	5.33	1.049	7.67	.126	10.00	.006
.75	.002	3.08	3.573	5.42	.981	7.75	.116	10.08	.006
.83	.006	3.17	3.524	5.50	.917	7.83	.106	10.17	.005
.92	.032	3.25	3.463	5.58	.857	7.92	.098	10.25	.004
1.00	.112	3.33	3.392	5.67	.799	8.00	.090	10.33	.004

00326>	1.08	.259	3.42	3.311	5.75	.745	8.08	.083	10.42	.003
00327>	1.17	.462	3.50	3.222	5.83	.694	8.17	.076	10.50	.003
00328>	1.25	.705	3.58	3.127	5.92	.647	8.25	.070	10.58	.002
00329>	1.33	.974	3.67	3.025	6.00	.601	8.33	.064	10.67	.002
00330>	1.42	1.255	3.75	2.920	6.08	.559	8.42	.059	10.75	.002
00331>	1.50	1.538	3.83	2.811	6.17	.520	8.50	.054	10.83	.001
00332>	1.58	1.815	3.92	2.699	6.25	.482	8.58	.050	10.92	.001
00333>	1.67	2.080	4.00	2.587	6.33	.448	8.67	.046	11.00	.001
00334>	1.75	2.328	4.08	2.474	6.42	.415	8.75	.042	11.08	.001
00335>	1.83	2.556	4.17	2.361	6.50	.385	8.83	.038	11.17	.000
00336>	1.92	2.762	4.25	2.249	6.58	.356	8.92	.035	11.25	.000
00337>	2.00	2.947	4.33	2.139	6.67	.330	9.00	.032	11.33	.000
00338>	2.08	3.108	4.42	2.030	6.75	.305	9.08	.028	11.42	.000
00339>	2.17	3.246	4.50	1.925	6.83	.282	9.17	.025	11.50	.000
00340>	2.25	3.363	4.58	1.821	6.92	.260	9.25	.023		

00341> ----------
00342> 001:0012----------
00343> *# Site Area
00344> ----------
00345> | DESIGN NASHYD | Area (ha)= 48.10 Curve Number (CN)=60.00
00346> | 01:siteR DT= 5.00 | Ia (mm)= 4.670 # of Linear Res.(N)= 3.00
00347> ---------- U.H. Tp(hrs)= 1.070
00348>
00349> Unit Hyd Qpeak (cms)= 1.717
00350>
00351> PEAK FLOW (cms)= 1.005 (i)
00352> TIME TO PEAK (hrs)= 2.333
00353> RUNOFF VOLUME (mm)= 18.992
00354> TOTAL RAINFALL (mm)= 71.665
00355> RUNOFF COEFFICIENT = .265
00356>
00357> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00358>
00359> ----------
00360> 001:0013----------
00361> ----------
00362> | DESIGN STANDHYD | Area (ha)= 19.90
00363> | 02:siteU DT= 2.00 | Total Imp(%)= 25.00 Dir. Conn.(%)= 8.00
00364> ----------
00365>

		IMPERVIOUS	PERVIOUS (i)	
00366> Surface Area	(ha)=	4.97	14.92	
00367> Dep. Storage	(mm)=	1.57	6.20	
00368> Average Slope	(%)=	.50	.50	
00369> Length	(m)=	801.21	70.00	
00370> Mannings n	=	.013	.250	
00371>				
00372> Max.eff.Inten.	(mm/hr)=	178.56	31.93	
00373> over	(min)	8.00	32.00	
00374> Storage Coeff.	(min)=	8.69 (ii)	32.32 (ii)	
00375> Unit Hyd. Tpeak	(min)=	8.00	32.00	
00376> Unit Hyd. peak	(cms)=	.13	.04	
00377>				*TOTALS*
00378> PEAK FLOW	(cms)=	.53	.74	.875 (iii)
00379> TIME TO PEAK	(hrs)=	1.07	1.53	1.500
00380> RUNOFF VOLUME	(mm)=	70.09	21.68	25.553
00381> TOTAL RAINFALL	(mm)=	71.66	71.66	71.665
00382> RUNOFF COEFFICIENT	=	.98	.30	.357

00383>
00384> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00385> CN* = 60.0 Ia = Dep. Storage (Above)
00386> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00387> THAN THE STORAGE COEFFICIENT.
00388> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00389>
00390> ----------

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00391> 001:0014----------------------------------------------------------------------
  392> --------------------
  393> | ADD HYD (site  ) | ID: NHYD      AREA      QPEAK    TPEAK    R.V.     DWF
00394> --------------------                (ha)      (cms)    (hrs)    (mm)     (cms)
00395>                    ID1 01:siteR     48.10     1.005     2.33   18.99     .000
  396>                   +ID2 02:siteU     19.90      .875     1.50   25.55     .000
  397>                    ================================================================
00398>                    SUM 03:site       68.00     1.558     1.90   20.91     .000
00399>
  400>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
  401>
00402> ----------------------------------------------------------------------
00403> 001:0015----------------------------------------------------------------------
  404> --------------------
  405> | ROUTE CHANNEL    |      Routing time step (min) =  2.00
00406> |  IN> 03:site     |      Number of SEGMENTS =  1
00407> | OUT< 04:rtsit1   |      Slopes (%), CHANNEL= .50   FLOODPLAIN= .50
  408> --------------------                  LENGTH = 1400.00     (m)
  409>
00410>                <------- DATA FOR SECTION (   1.0) ------>
00411>               Distance      Elevation       Manning
  412>                   .00          2.00          .0350      Main Channel
  413>                 6.00           .00          .0350      Main Channel
00414>                12.00          2.00          .0350      Main Channel
00415>
  416>    <----------------------------- TRAVEL TIME TABLE ----------------------------->
  417>     DEPTH     ELEV    X-VOLUME   S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME   D x V
00418>       (m)      (m)     (cu.m.)    (cu.m.)      (cms)     (m/s)      (min)   (m2/s)
00419>      .105     .105   .465E+02   .350E+00       .009      .274      85.17     .029
  420>      .211     .211   .186E+03   .280E+01       .058      .435      53.65     .092
  421>      .316     .316   .419E+03   .945E+01       .170      .570      40.95     .180
00422>      .421     .421   .745E+03   .224E+02       .367      .690      33.80     .291
00423>      .526     .526   .116E+04   .437E+02       .666      .801      29.13     .422
  424>      .632     .632   .168E+04   .756E+02      1.083      .905      25.79     .571
  425>      .737     .737   .228E+04   .120E+03      1.633     1.003      23.28     .739
00426>      .842     .842   .298E+04   .179E+03      2.331     1.096      21.29     .923
00427>      .947     .947   .377E+04   .255E+03      3.192     1.185      19.68    1.123
  428>     1.053    1.053   .465E+04   .350E+03      4.227     1.272      18.35    1.339
  429>     1.158    1.158   .563E+04   .466E+03      5.450     1.355      17.22    1.569
00430>     1.263    1.263   .670E+04   .605E+03      6.874     1.436      16.25    1.814
00431>     1.368    1.368   .786E+04   .769E+03      8.509     1.515      15.40    2.073
  432>     1.474    1.474   .912E+04   .960E+03     10.368     1.591      14.66    2.345
  433>     1.579    1.579   .105E+05   .118E+04     12.463     1.666      14.00    2.631
00434>     1.684    1.684   .119E+05   .143E+04     14.803     1.740      13.41    2.930
00435>     1.789    1.789   .134E+05   .172E+04     17.400     1.811      12.88    3.241
  436>     1.895    1.895   .151E+05   .204E+04     20.265     1.882      12.40    3.565
  437>     2.000    2.000   .168E+05   .240E+04     23.408     1.951      11.96    3.901
00438>
00439>  X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
  440>  S-VOLUME= Volume that can be stored in channel at specified ELEVATION.
  441>
00442>                                        <---- hydrograph ---->   <-pipe / channel->
00443>                                 AREA     QPEAK    TPEAK    R.V.   MAX DEPTH  MAX VEL
  444>                                 (ha)     (cms)    (hrs)    (mm)       (m)      (m/s)
  445>    INFLOW : ID= 3:site         68.00     1.558     1.90   20.912      .723      .988
00446>    OUTFLOW: ID= 4:rtsit1       68.00     1.442     2.33   20.912      .709      .966
00447>
  448>
  449> ----------------------------------------------------------------------
00450> 001:0016----------------------------------------------------------------------
00451> --------------------
  452> | ROUTE CHANNEL    |      Routing time step (min) =  2.00
  453> |  IN> 04:rtsit1   |      Number of SEGMENTS =  1
00454> | OUT< 05:rtsit2   |      Slopes (%), CHANNEL= .36   FLOODPLAIN= .36
00455> --------------------                  LENGTH =  475.00     (m)
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<------ DATA FOR SECTION (1.0) ------>

Distance	Elevation	Manning	
.00	2.00	.0350	Main Channel
6.00	.00	.0350	Main Channel
9.00	.00	.0350	Main Channel
15.00	2.00	.0350	Main Channel

<---------- TRAVEL TIME TABLE ---------->

DEPTH (m)	ELEV (m)	X-VOLUME (cu.m.)	S-VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)	D x V (m2/s)
.105	.105	.166E+03	.510E+01	.125	.357	22.15	.038
.211	.211	.363E+03	.224E+02	.412	.539	14.68	.114
.316	.316	.592E+03	.547E+02	.847	.679	11.65	.215
.421	.421	.853E+03	.105E+03	1.431	.797	9.93	.336
.526	.526	.114E+04	.176E+03	2.171	.901	8.79	.474
.632	.632	.147E+04	.271E+03	3.075	.995	7.96	.628
.737	.737	.182E+04	.393E+03	4.153	1.082	7.32	.797
.842	.842	.221E+04	.544E+03	5.414	1.163	6.81	.980
.947	.947	.263E+04	.728E+03	6.866	1.241	6.38	1.175
1.053	1.053	.308E+04	.948E+03	8.519	1.314	6.02	1.383
1.158	1.158	.356E+04	.121E+04	10.382	1.385	5.72	1.604
1.263	1.263	.407E+04	.150E+04	12.463	1.453	5.45	1.836
1.368	1.368	.462E+04	.185E+04	14.772	1.519	5.21	2.079
1.474	1.474	.519E+04	.224E+04	17.317	1.583	5.00	2.334
1.579	1.579	.580E+04	.268E+04	20.107	1.646	4.81	2.599
1.684	1.684	.644E+04	.317E+04	23.149	1.707	4.64	2.875
1.789	1.789	.711E+04	.372E+04*	26.453	1.766	4.48	3.161
1.895	1.895	.782E+04	.433E+04*	30.026	1.825	4.34	3.458
2.000	2.000	.855E+04	.500E+04*	33.877	1.882	4.21	3.764

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

		<---- hydrograph ---->			<-pipe / channel->	
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 4:rtsit1	68.00	1.442	2.33	20.912	.423	.798
OUTFLOW: ID= 5:rtsit2	68.00	1.428	2.47	20.912	.419	.794

001:0017----------

SAVE HYD	AREA (ha)= 68.000
ID=05 (rtsit2)	QPEAK (cms)= 1.428 (i)
DT= 2.00 PCYC= 1	TPEAK (hrs)= 2.467
	VOLUME (mm)= 20.912

Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-rtsit2.001
Comments: Post Site Flows

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

TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms	TIME hrs	FLOW cms
.00	.000	3.87	.843	7.73	.034	11.60	.002	15.47	.000
.03	.000	3.90	.822	7.77	.033	11.63	.002	15.50	.000
.07	.000	3.93	.801	7.80	.032	11.67	.002	15.53	.000
.10	.000	3.97	.780	7.83	.031	11.70	.002	15.57	.000
.13	.000	4.00	.761	7.87	.030	11.73	.002	15.60	.000
.17	.000	4.03	.743	7.90	.030	11.77	.002	15.63	.000
.20	.000	4.07	.725	7.93	.029	11.80	.002	15.67	.000
.23	.000	4.10	.707	7.97	.028	11.83	.002	15.70	.000
.27	.000	4.13	.690	8.00	.027	11.87	.002	15.73	.000
.30	.000	4.17	.674	8.03	.027	11.90	.002	15.77	.000

00521>	.33	.000	4.20	.657	8.07	.026	11.93	.002	15.80	.000
)522>	.37	.000	4.23	.642	8.10	.025	11.97	.002	15.83	.000
)523>	.40	.000	4.27	.626	8.13	.025	12.00	.002	15.87	.000
00524>	.43	.000	4.30	.611	8.17	.024	12.03	.002	15.90	.000
00525>	.47	.000	4.33	.596	8.20	.023	12.07	.001	15.93	.000
)526>	.50	.000	4.37	.581	8.23	.023	12.10	.001	15.97	.000
)527>	.53	.001	4.40	.566	8.27	.022	12.13	.001	16.00	.000
00528>	.57	.001	4.43	.552	8.30	.022	12.17	.001	16.03	.000
00529>	.60	.001	4.47	.538	8.33	.021	12.20	.001	16.07	.000
)530>	.63	.002	4.50	.524	8.37	.021	12.23	.001	16.10	.000
)531>	.67	.002	4.53	.510	8.40	.020	12.27	.001	16.13	.000
00532>	.70	.003	4.57	.497	8.43	.020	12.30	.001	16.17	.000
00533>	.73	.003	4.60	.484	8.47	.019	12.33	.001	16.20	.000
)534>	.77	.004	4.63	.470	8.50	.019	12.37	.001	16.23	.000
)535>	.80	.005	4.67	.455	8.53	.018	12.40	.001	16.27	.000
00536>	.83	.006	4.70	.440	8.57	.018	12.43	.001	16.30	.000
00537>	.87	.008	4.73	.427	8.60	.017	12.47	.001	16.33	.000
)538>	.90	.010	4.77	.414	8.63	.017	12.50	.001	16.37	.000
539>	.93	.013	4.80	.401	8.67	.017	12.53	.001	16.40	.000
00540>	.97	.017	4.83	.386	8.70	.016	12.57	.001	16.43	.000
00541>	1.00	.023	4.87	.373	8.73	.016	12.60	.001	16.47	.000
542>	1.03	.032	4.90	.361	8.77	.015	12.63	.001	16.50	.000
543>	1.07	.044	4.93	.350	8.80	.015	12.67	.001	16.53	.000
00544>	1.10	.060	4.97	.339	8.83	.015	12.70	.001	16.57	.000
00545>	1.13	.079	5.00	.329	8.87	.014	12.73	.001	16.60	.000
546>	1.17	.102	5.03	.319	8.90	.014	12.77	.001	16.63	.000
547>	1.20	.128	5.07	.310	8.93	.014	12.80	.001	16.67	.000
00548>	1.23	.160	5.10	.301	8.97	.013	12.83	.001	16.70	.000
00549>	1.27	.196	5.13	.292	9.00	.013	12.87	.001	16.73	.000
550>	1.30	.236	5.17	.284	9.03	.013	12.90	.001	16.77	.000
551>	1.33	.280	5.20	.276	9.07	.012	12.93	.001	16.80	.000
00552>	1.37	.330	5.23	.269	9.10	.012	12.97	.001	16.83	.000
00553>	1.40	.388	5.27	.262	9.13	.012	13.00	.001	16.87	.000
554>	1.43	.450	5.30	.255	9.17	.011	13.03	.001	16.90	.000
555>	1.47	.509	5.33	.248	9.20	.011	13.07	.001	16.93	.000
00556>	1.50	.567	5.37	.242	9.23	.011	13.10	.001	16.97	.000
00557>	1.53	.625	5.40	.235	9.27	.011	13.13	.001	17.00	.000
558>	1.57	.683	5.43	.229	9.30	.010	13.17	.001	17.03	.000
559>	1.60	.740	5.47	.223	9.33	.010	13.20	.001	17.07	.000
00560>	1.63	.798	5.50	.218	9.37	.010	13.23	.001	17.10	.000
00561>	1.67	.857	5.53	.212	9.40	.010	13.27	.001	17.13	.000
562>	1.70	.911	5.57	.207	9.43	.009	13.30	.001	17.17	.000
563>	1.73	.959	5.60	.201	9.47	.009	13.33	.001	17.20	.000
00564>	1.77	1.005	5.63	.196	9.50	.009	13.37	.001	17.23	.000
00565>	1.80	1.050	5.67	.191	9.53	.009	13.40	.001	17.27	.000
566>	1.83	1.092	5.70	.186	9.57	.009	13.43	.001	17.30	.000
567>	1.87	1.132	5.73	.181	9.60	.008	13.47	.001	17.33	.000
00568>	1.90	1.169	5.77	.176	9.63	.008	13.50	.001	17.37	.000
00569>	1.93	1.203	5.80	.172	9.67	.008	13.53	.001	17.40	.000
570>	1.97	1.235	5.83	.167	9.70	.008	13.57	.001	17.43	.000
571>	2.00	1.265	5.87	.162	9.73	.008	13.60	.001	17.47	.000
00572>	2.03	1.291	5.90	.158	9.77	.007	13.63	.000	17.50	.000
00573>	2.07	1.315	5.93	.154	9.80	.007	13.67	.000	17.53	.000
574>	2.10	1.336	5.97	.149	9.83	.007	13.70	.000	17.57	.000
575>	2.13	1.355	6.00	.145	9.87	.007	13.73	.000	17.60	.000
00576>	2.17	1.371	6.03	.141	9.90	.007	13.77	.000	17.63	.000
00577>	2.20	1.385	6.07	.137	9.93	.007	13.80	.000	17.67	.000
578>	2.23	1.396	6.10	.133	9.97	.006	13.83	.000	17.70	.000
579>	2.27	1.405	6.13	.129	10.00	.006	13.87	.000	17.73	.000
00580>	2.30	1.413	6.17	.125	10.03	.006	13.90	.000	17.77	.000
00581>	2.33	1.419	6.20	.122	10.07	.006	13.93	.000	17.80	.000
582>	2.37	1.424	6.23	.118	10.10	.006	13.97	.000	17.83	.000
583>	2.40	1.427	6.27	.115	10.13	.006	14.00	.000	17.87	.000
00584>	2.43	1.428	6.30	.112	10.17	.006	14.03	.000	17.90	.000
00585>	2.47	1.428	6.33	.109	10.20	.005	14.07	.000	17.93	.000

00586>	2.50	1.427	6.37	.106	10.23	.005	14.10	.000	17.97	.000
00587>	2.53	1.424	6.40	.103	10.27	.005	14.13	.000	18.00	.000
00588>	2.57	1.421	6.43	.100	10.30	.005	14.17	.000	18.03	.000
00589>	2.60	1.416	6.47	.097	10.33	.005	14.20	.000	18.07	.000
00590>	2.63	1.410	6.50	.095	10.37	.005	14.23	.000	18.10	.000
00591>	2.67	1.403	6.53	.092	10.40	.005	14.27	.000	18.13	.000
00592>	2.70	1.395	6.57	.090	10.43	.005	14.30	.000	18.17	.000
00593>	2.73	1.386	6.60	.087	10.47	.005	14.33	.000	18.20	.000
00594>	2.77	1.377	6.63	.085	10.50	.004	14.37	.000	18.23	.000
00595>	2.80	1.367	6.67	.082	10.53	.004	14.40	.000	18.27	.000
00596>	2.83	1.357	6.70	.080	10.57	.004	14.43	.000	18.30	.000
00597>	2.87	1.346	6.73	.078	10.60	.004	14.47	.000	18.33	.000
00598>	2.90	1.334	6.77	.076	10.63	.004	14.50	.000	18.37	.000
00599>	2.93	1.323	6.80	.074	10.67	.004	14.53	.000	18.40	.000
00600>	2.97	1.310	6.83	.072	10.70	.004	14.57	.000	18.43	.000
00601>	3.00	1.298	6.87	.070	10.73	.004	14.60	.000	18.47	.000
00602>	3.03	1.285	6.90	.068	10.77	.004	14.63	.000	18.50	.000
00603>	3.07	1.271	6.93	.066	10.80	.004	14.67	.000	18.53	.000
00604>	3.10	1.258	6.97	.064	10.83	.004	14.70	.000	18.57	.000
00605>	3.13	1.243	7.00	.062	10.87	.003	14.73	.000	18.60	.000
00606>	3.17	1.228	7.03	.060	10.90	.003	14.77	.000	18.63	.000
00607>	3.20	1.213	7.07	.058	10.93	.003	14.80	.000	18.67	.000
00608>	3.23	1.197	7.10	.057	10.97	.003	14.83	.000	18.70	.000
00609>	3.27	1.180	7.13	.055	11.00	.003	14.87	.000	18.73	.000
00610>	3.30	1.164	7.17	.054	11.03	.003	14.90	.000	18.77	.000
00611>	3.33	1.147	7.20	.052	11.07	.003	14.93	.000	18.80	.000
00612>	3.37	1.130	7.23	.051	11.10	.003	14.97	.000	18.83	.000
00613>	3.40	1.112	7.27	.049	11.13	.003	15.00	.000	18.87	.000
00614>	3.43	1.094	7.30	.048	11.17	.003	15.03	.000	18.90	.000
00615>	3.47	1.076	7.33	.047	11.20	.003	15.07	.000	18.93	.000
00616>	3.50	1.058	7.37	.045	11.23	.003	15.10	.000	18.97	.000
00617>	3.53	1.039	7.40	.044	11.27	.003	15.13	.000	19.00	.000
00618>	3.57	1.021	7.43	.043	11.30	.003	15.17	.000	19.03	.000
00619>	3.60	1.002	7.47	.042	11.33	.002	15.20	.000	19.07	.000
00620>	3.63	.984	7.50	.041	11.37	.002	15.23	.000	19.10	.000
00621>	3.67	.965	7.53	.039	11.40	.002	15.27	.000	19.13	.000
00622>	3.70	.947	7.57	.038	11.43	.002	15.30	.000	19.17	.000
00623>	3.73	.928	7.60	.037	11.47	.002	15.33	.000		
00624>	3.77	.908	7.63	.036	11.50	.002	15.37	.000		
00625>	3.80	.886	7.67	.035	11.53	.002	15.40	.000		
00626>	3.83	.864	7.70	.035	11.57	.002	15.43	.000		

00627> ----------

00628> 001:0018----------

00629> ----------

00630> | ADD HYD (sumpst) | ID: NHYD

00631>			AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
00632>		ID1 09:extpre	221.80	3.661	2.75	18.99	.000
00633>		+ID2 05:rtsit2	68.00	1.428	2.47	20.91	.000
00634>			==========	==========	==========	==========	==========
00635>		SUM 08:sumpst	289.80	5.055	2.67	19.44	.000

00636>

00637> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

00638>

00639> ----------

00640> 001:0019----------

00641> ----------

00642> | SAVE HYD | AREA (ha)= 289.800

00643> | ID=08 (sumpst) | QPEAK (cms)= 5.055 (i)

00644> | DT= 2.00 PCYC= 1 | TPEAK (hrs)= 2.667

00645> ---------- VOLUME (mm)= 19.442

00646> Filename: W:\active\60400144\design\analysis\SWMAPR~1\H-sumpst.001

00647> Comments: Overall Postdev Hydrograph

00648>

00649> (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

00650>	TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW	TIME	FLOW

00651>	hrs	cms	hrs	cms	hrs	cms	hrs	cms	hrs	cms
652>	.00	.000	3.87	3.609	7.73	.151	11.60	.002	15.47	.000
653>	.03	.000	3.90	3.544	7.77	.147	11.63	.002	15.50	.000
00654>	.07	.000	3.93	3.478	7.80	.142	11.67	.002	15.53	.000
00655>	.10	.000	3.97	3.412	7.83	.138	11.70	.002	15.57	.000
656>	.13	.000	4.00	3.348	7.87	.133	11.73	.002	15.60	.000
657>	.17	.000	4.03	3.284	7.90	.129	11.77	.002	15.63	.000
00658>	.20	.000	4.07	3.221	7.93	.125	11.80	.002	15.67	.000
00659>	.23	.000	4.10	3.158	7.97	.121	11.83	.002	15.70	.000
660>	.27	.000	4.13	3.096	8.00	.117	11.87	.002	15.73	.000
661>	.30	.000	4.17	3.035	8.03	.114	11.90	.002	15.77	.000
00662>	.33	.000	4.20	2.974	8.07	.110	11.93	.002	15.80	.000
00663>	.37	.000	4.23	2.913	8.10	.107	11.97	.002	15.83	.000
664>	.40	.000	4.27	2.853	8.13	.103	12.00	.002	15.87	.000
665>	.43	.000	4.30	2.794	8.17	.100	12.03	.002	15.90	.000
00666>	.47	.000	4.33	2.735	8.20	.097	12.07	.001	15.93	.000
00667>	.50	.000	4.37	2.677	8.23	.094	12.10	.001	15.97	.000
668>	.53	.001	4.40	2.618	8.27	.091	12.13	.001	16.00	.000
669>	.57	.001	4.43	2.561	8.30	.088	12.17	.001	16.03	.000
00670>	.60	.001	4.47	2.504	8.33	.085	12.20	.001	16.07	.000
00671>	.63	.002	4.50	2.448	8.37	.083	12.23	.001	16.10	.000
672>	.67	.002	4.53	2.393	8.40	.080	12.27	.001	16.13	.000
673>	.70	.003	4.57	2.339	8.43	.078	12.30	.001	16.17	.000
00674>	.73	.005	4.60	2.285	8.47	.075	12.33	.001	16.20	.000
00675>	.77	.007	4.63	2.231	8.50	.073	12.37	.001	16.23	.000
676>	.80	.010	4.67	2.176	8.53	.071	12.40	.001	16.27	.000
677>	.83	.013	4.70	2.123	8.57	.068	12.43	.001	16.30	.000
00678>	.87	.024	4.73	2.071	8.60	.066	12.47	.001	16.33	.000
00679>	.90	.036	4.77	2.020	8.63	.064	12.50	.001	16.37	.000
680>	.93	.060	4.80	1.969	8.67	.062	12.53	.001	16.40	.000
681>	.97	.097	4.83	1.918	8.70	.060	12.57	.001	16.43	.000
00682>	1.00	.135	4.87	1.869	8.73	.058	12.60	.001	16.47	.000
00683>	1.03	.203	4.90	1.821	8.77	.056	12.63	.001	16.50	.000
684>	1.07	.274	4.93	1.774	8.80	.055	12.67	.001	16.53	.000
685>	1.10	.360	4.97	1.729	8.83	.053	12.70	.001	16.57	.000
00686>	1.13	.460	5.00	1.685	8.87	.051	12.73	.001	16.60	.000
00687>	1.17	.563	5.03	1.642	8.90	.050	12.77	.001	16.63	.000
688>	1.20	.687	5.07	1.600	8.93	.048	12.80	.001	16.67	.000
689>	1.23	.816	5.10	1.559	8.97	.046	12.83	.001	16.70	.000
00690>	1.27	.955	5.13	1.519	9.00	.044	12.87	.001	16.73	.000
00691>	1.30	1.102	5.17	1.479	9.03	.043	12.90	.001	16.77	.000
692>	1.33	1.254	5.20	1.441	9.07	.041	12.93	.001	16.80	.000
693>	1.37	1.416	5.23	1.404	9.10	.039	12.97	.001	16.83	.000
00694>	1.40	1.587	5.27	1.368	9.13	.038	13.00	.001	16.87	.000
00695>	1.43	1.762	5.30	1.332	9.17	.037	13.03	.001	16.90	.000
696>	1.47	1.934	5.33	1.297	9.20	.035	13.07	.001	16.93	.000
697>	1.50	2.105	5.37	1.263	9.23	.034	13.10	.001	16.97	.000
00698>	1.53	2.275	5.40	1.230	9.27	.033	13.13	.001	17.00	.000
00699>	1.57	2.442	5.43	1.198	9.30	.032	13.17	.001	17.03	.000
700>	1.60	2.608	5.47	1.166	9.33	.031	13.20	.001	17.07	.000
701>	1.63	2.773	5.50	1.135	9.37	.030	13.23	.001	17.10	.000
00702>	1.67	2.937	5.53	1.105	9.40	.029	13.27	.001	17.13	.000
00703>	1.70	3.090	5.57	1.076	9.43	.028	13.30	.001	17.17	.000
704>	1.73	3.237	5.60	1.047	9.47	.026	13.33	.001	17.20	.000
705>	1.77	3.379	5.63	1.019	9.50	.025	13.37	.001	17.23	.000
00706>	1.80	3.514	5.67	.990	9.53	.024	13.40	.001	17.27	.000
00707>	1.83	3.646	5.70	.964	9.57	.022	13.43	.001	17.30	.000
708>	1.87	3.770	5.73	.937	9.60	.021	13.47	.001	17.33	.000
709>	1.90	3.890	5.77	.912	9.63	.020	13.50	.001	17.37	.000
00710>	1.93	4.003	5.80	.887	9.67	.019	13.53	.001	17.40	.000
00711>	1.97	4.108	5.83	.862	9.70	.018	13.57	.001	17.43	.000
712>	2.00	4.211	5.87	.838	9.73	.018	13.60	.001	17.47	.000
713>	2.03	4.302	5.90	.814	9.77	.017	13.63	.000	17.50	.000
714>	2.07	4.391	5.93	.791	9.80	.016	13.67	.000	17.53	.000
00715>	2.10	4.472	5.97	.769	9.83	.016	13.70	.000	17.57	.000

00716>	2.13	4.546	6.00	.747	9.87	.015	13.73	.000	17.60	.000
00717>	2.17	4.618	6.03	.725	9.90	.014	13.77	.000	17.63	.000
00718>	2.20	4.678	6.07	.704	9.93	.014	13.80	.000	17.67	.000
00719>	2.23	4.736	6.10	.684	9.97	.013	13.83	.000	17.70	.000
00720>	2.27	4.787	6.13	.664	10.00	.013	13.87	.000	17.73	.000
00721>	2.30	4.833	6.17	.645	10.03	.012	13.90	.000	17.77	.000
00722>	2.33	4.878	6.20	.626	10.07	.012	13.93	.000	17.80	.000
00723>	2.37	4.913	6.23	.608	10.10	.011	13.97	.000	17.83	.000
00724>	2.40	4.945	6.27	.591	10.13	.011	14.00	.000	17.87	.000
00725>	2.43	4.973	6.30	.574	10.17	.010	14.03	.000	17.90	.000
00726>	2.47	4.996	6.33	.557	10.20	.010	14.07	.000	17.93	.000
00727>	2.50	5.017	6.37	.541	10.23	.010	14.10	.000	17.97	.000
00728>	2.53	5.030	6.40	.525	10.27	.009	14.13	.000	18.00	.000
00729>	2.57	5.042	6.43	.509	10.30	.009	14.17	.000	18.03	.000
00730>	2.60	5.050	6.47	.494	10.33	.009	14.20	.000	18.07	.000
00731>	2.63	5.054	6.50	.479	10.37	.008	14.23	.000	18.10	.000
00732>	2.67	5.055	6.53	.465	10.40	.008	14.27	.000	18.13	.000
00733>	2.70	5.051	6.57	.452	10.43	.008	14.30	.000	18.17	.000
00734>	2.73	5.046	6.60	.438	10.47	.007	14.33	.000	18.20	.000
00735>	2.77	5.037	6.63	.425	10.50	.007	14.37	.000	18.23	.000
00736>	2.80	5.025	6.67	.412	10.53	.007	14.40	.000	18.27	.000
00737>	2.83	5.013	6.70	.400	10.57	.007	14.43	.000	18.30	.000
00738>	2.87	4.995	6.73	.388	10.60	.006	14.47	.000	18.33	.000
00739>	2.90	4.977	6.77	.376	10.63	.006	14.50	.000	18.37	.000
00740>	2.93	4.956	6.80	.365	10.67	.006	14.53	.000	18.40	.000
00741>	2.97	4.932	6.83	.353	10.70	.006	14.57	.000	18.43	.000
00742>	3.00	4.909	6.87	.343	10.73	.005	14.60	.000	18.47	.000
00743>	3.03	4.881	6.90	.332	10.77	.005	14.63	.000	18.50	.000
00744>	3.07	4.852	6.93	.322	10.80	.005	14.67	.000	18.53	.000
00745>	3.10	4.821	6.97	.312	10.83	.005	14.70	.000	18.57	.000
00746>	3.13	4.787	7.00	.302	10.87	.005	14.73	.000	18.60	.000
00747>	3.17	4.752	7.03	.293	10.90	.004	14.77	.000	18.63	.000
00748>	3.20	4.712	7.07	.284	10.93	.004	14.80	.000	18.67	.000
00749>	3.23	4.671	7.10	.275	10.97	.004	14.83	.000	18.70	.000
00750>	3.27	4.629	7.13	.267	11.00	.004	14.87	.000	18.73	.000
00751>	3.30	4.584	7.17	.259	11.03	.004	14.90	.000	18.77	.000
00752>	3.33	4.538	7.20	.251	11.07	.004	14.93	.000	18.80	.000
00753>	3.37	4.489	7.23	.243	11.10	.004	14.97	.000	18.83	.000
00754>	3.40	4.439	7.27	.235	11.13	.003	15.00	.000	18.87	.000
00755>	3.43	4.388	7.30	.228	11.17	.003	15.03	.000	18.90	.000
00756>	3.47	4.334	7.33	.221	11.20	.003	15.07	.000	18.93	.000
00757>	3.50	4.280	7.37	.214	11.23	.003	15.10	.000	18.97	.000
00758>	3.53	4.224	7.40	.208	11.27	.003	15.13	.000	19.00	.000
00759>	3.57	4.167	7.43	.201	11.30	.003	15.17	.000	19.03	.000
00760>	3.60	4.109	7.47	.195	11.33	.003	15.20	.000	19.07	.000
00761>	3.63	4.050	7.50	.189	11.37	.003	15.23	.000	19.10	.000
00762>	3.67	3.991	7.53	.183	11.40	.003	15.27	.000	19.13	.000
00763>	3.70	3.930	7.57	.177	11.43	.002	15.30	.000	19.17	.000
00764>	3.73	3.869	7.60	.172	11.47	.002	15.33	.000		
00765>	3.77	3.806	7.63	.166	11.50	.002	15.37	.000		
00766>	3.80	3.740	7.67	.161	11.53	.002	15.40	.000		
00767>	3.83	3.675	7.70	.156	11.57	.002	15.43	.000		

00768> ----------
00769> 001:0020----------
00770> FINISH
00771> ----------
00772> **********
00773> WARNINGS / ERRORS / NOTES
00774> ----------
00775> Simulation ended on 2005-05-04 at 10:25:38
00776> ==========
00777>
00778>

Appendix E
Rational Method Ditch and Culvert Design Sheets

Stantec

SUBDIVISION: Emerald Links

REVISION DATE: March 19,2005
DATE: February 6, 2003
DESIGNED BY: MAF
CHECKED BY:

STORM DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 604-00144

DESIGN PARAMETERS

DESIGN STORM 1 in 5 Years(Ditches)
$I = a / (tc + b)^c$
a= 1279.9 MANNING'S n = 0.035
b= 7.38 TIME OF ENTRY varies min 20
c= 0.860

LOCATION STREET	FROM	TO (Areas)	DRAINAGE AREA AREA (ha)	C	ACCUM AREA (ha)	A x C	ACCUM A x C	Tc of C (min)	I (mm/h)	Q (L/s)	DITCH PROPERTIES LENGTH (m)	WIDTH (m)	SIDE SLOPE RATIO	SLOPE %	AVAILABLE DEPTH (m)	VELOCITY FULL (m/s)	DITCH CAPACITY (L/s)	DEPTH OF FLOW (m)	VELOCITY ACTUAL (m/s)	TIME OF FLOW (min)
Street 1																				
	To	A(1)	73.90	0.21	73.90	15.52	15.52	144.54												
Sreet No. 1	A	B(7,6)	5.40	0.29	79.30	1.561	17.080	145.91	16.90	801.73	70.0	0.3	3	0.50	1.00	1.27	3190	0.530	0.85	1.37
Easement(Lots 35,36)	C	D(8,9,10)	2.90	0.36	82.20	1.035	18.115	152.17	16.33	821.54	230.0	0.3	3	0.20	1.20	0.90	4222	0.650	0.61	6.26
Street No. 1/2	G2	G(12,15)	2.10	0.33	2.10	0.68	0.68	20.00	74.32	141.33	250.0	0.3	3	0.50	0.60	0.92	1160	0.35	0.66	6.34
	To	E(2)	120.00	0.22	120.00	26.40	26.40	154.19												
Sreet No. 3/2	F2	G(3,14,16)	8.400	0.26	130.50	2.150	29.235	157.19	15.90	129.04	170.0	0.9	3	0.50	0.60	0.99	1610	0.555	0.95	3.00
Easement(Lots 45,46)	H	D(13,17,18,19,20,21)	9.070	0.31	139.57	2.812	32.047	164.04	15.35	1366.44	282.0	0.3	3	0.20	1.50	1.04	7497	0.780	0.69	6.85
Easement(Lots 55,54)	D	K2(22,23,24,25,26)	2.960	0.34	224.73	1.006	51.168	166.68	15.15	2153.18	190.0	0.3	3	0.50	2.00	1.98	24996	0.910	1.20	2.65
Easement(Off-Site)	K2	V(27)	1.490	0.24	226.22	0.358	51.526	169.97	14.91	2133.65	180.0	3.0	3	0.36	2.00	1.88	33875	0.540	0.91	3.28
Easement(Off-Site)	V	W(43)	2.590	0.20	265.19	0.518	61.490	173.43	14.66	2504.79	155.0	4.0	3	0.20	1.62	1.28	18432	0.600	0.75	3.46
	To	L(4)	14.700	0.21	14.700	3.09	3.09	104.26												
Easement(Lot 25)	M	T(28,29)	1.000	0.62	15.70	0.620	3.707	111.80	20.98	216.05	210.0	0.3	3	0.20	0.78	0.69	1413	0.414	0.46	7.54
Easement(Off-Site)	T	U(34)	1.430	0.22	21.63	0.315	5.269	115.36	20.46	299.38	100.0	0.3	3	0.20	1.70	1.13	10365	0.420	0.47	3.56
Easement(Off-Site)	U	V(41,42)	3.500	0.22	36.38	0.770	9.446	130.37	18.53	486.09	400.0	4.0	3	0.20	1.47	1.17	13010	0.240	0.44	15.00
	To	N(5,30)	4.000	0.25	4.000	0.99	0.99	63.04												
Easement(Lots27,28)	O	T (31, 32, 33)	0.500	0.51	4.50	0.255	1.247	65.48	32.03	10.96	80.0	0.3	3	0.50	0.78	1.08	2234	0.252	0.55	2.44
	To	P(35,36)	2.500	0.30	2.500	0.75	0.75	20.00												
Street No. 1	Q	R(38,37)	2.000	0.35	4.50	0.700	1.450	24.04	66.03	265.96	155.0	0.3	3	0.50	0.30	0.60	218	0.330	0.64	4.04
Street No. 2	S	U(11,39,40)	6.750	0.29	11.25	1.958	3.408	26.20	62.36	590.28	100.0	0.3	3	0.50	0.65	0.97	1415	0.450	0.77	2.16

Stantec

SUBDIVISION: Emerald Links

REVISION DATE: March 19,2005
DATE: February 6, 2003
DESIGNED BY: MAF
CHECKED BY:

STORM DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 604-00144

DESIGN PARAMETERS

DESIGN STORM 1 in 10 Years(Ditches)
I = a / (tc + b)^c
a= 1469.3 MANNING'S n = 0.035
b= 7.29 TIME OF ENTRY varies min 20
c= 0.859

LOCATION			DRAINAGE AREA								DITCH PROPERTIES							
STREET	FROM	TO (Area#)	AREA (ha)	C	ACCUM AREA (ha)	ACCUM A x C	ACCUM A x C x T	T (min)	I (mm/h)	Q (l/s)	LENGTH (m)	WIDTH (m)	SIDE SLOPE RATIO	SLOPE %	AVAILABLE DEPTH (m)	VELOCITY (m/s)	DITCH CAPACITY (l/s)	DEPTH OF FLOW (m)	VELOCITY (ACTUAL) (m/s)	TIME OF FLOW (min)
	To	A(1)	73.90	0.21	73.90	15.52	15.52	144.54												
Sreet No. 1	A	B(7,6)	5.40	0.29	79.30	1.561	17.080	145.86	19.52	926.22	70.0	0.3	3.0	0.50	1.00	1.27	4190	0.562	0.88	1.32
Easement(Lots 35,36)	C	D(8,9,10)	2.90	0.36	82.20	1.035	18.115	152.14	18.86	949.02	230.0	0.3	3.0	0.20	1.20	0.90	4222	0.730	0.61	6.28
Street No. 1/2	G2	G(12,15)	2.10	0.33	2.10	0.68	0.68	20.00	85.88	163.32	250.0	0.3	3.0	0.50	0.60	0.92	1160	0.3	0.68	6.11
	To	E(2)	120.00	0.22	120.00	26.40	26.40	154.19												
Sreet No. 3/2	F2	G(3,14,16)	8.40	0.26	130.50	2.150	29.235	157.07	18.37	492.09	170.0	0.9	3.0	0.50	0.60	0.99	1610	0.590	0.98	2.88
Easement(Lots 45,46)	H	D(13,17,18,19,20,21)	9.07	0.31	139.57	2.812	32.047	163.71	17.76	1580.92	282.0	0.3	3.0	0.20	1.50	1.04	7497	0.820	0.71	6.64
Easement(Lots 55,54)	D	K2(22,23,24,25,26)	2.96	0.34	224.73	1.006	51.168	166.51	17.51	2489.15	190.0	0.3	3.0	0.50	2.00	1.98	24996	0.830	1.13	2.81
Easement(Off-Site)	K2	V(27)	1.49	0.24	226.22	0.358	51.526	169.67	17.24	2468.07	180.0	3.0	3.0	0.36	1.00	1.88	33875	0.580	0.95	3.16
Easement(Off-Site)	V	W(43)	2.59	0.20	260.69	0.518	61.490	172.98	16.97	2898.81	155.0	4.0	3.0	0.20	1.62	1.28	18432	0.650	0.78	3.31
	To	L(4)	14.70	0.21	14.700	3.09	3.09	104.26												
Easement(Lot 25)	M	T(28,29)	1.00	0.62	15.70	0.620	3.707	112.08	24.18	249.00	210.0	0.3	3.0	0.20	0.75	0.69	1413	0.350	0.45	7.82
Easement(Off-Site)	T	U(34)	1.43	0.22	21.63	0.315	5.269	115.50	23.60	345.42	100.0	0.3	3.0	0.20	1.70	1.13	10365	0.450	0.49	3.42
Easement(Off-Site)	U	V(41,42)	3.50	0.22	31.88	0.770	9.446	129.76	21.48	563.51	400.0	4.0	3.0	0.20	1.37	1.17	13010	0.261	0.47	14.27
	To	N(5,30)	4.00	0.25	4.000	0.99	0.99	63.04												
Easement(Lots27,28)	O	T (31, 32, 33)	0.50	0.51	4.50	0.255	1.247	65.55	36.96	128.02	80.0	0.3	3.0	0.50	0.75	1.08	2234	0.240	0.53	2.51
	To	P(35,36)	2.50	0.30	7.000	0.75	0.75	20.00												
Street No. 1	Q	R(38,37)	2.00	0.35	9.00	0.700	1.450	23.90	76.58	308.45	155.0	0.3	3.0	0.50	0.30	0.60	216	0.350	0.66	3.90
Street No. 2	S	U(11,39,40)	6.75	0.29	6.75	1.958	3.408	25.97	72.46	686.82	100.0	0.3	3.0	0.50	0.65	0.97	1415	0.480	0.80	2.08

Stantec

SUBDIVISION: **Emerald Links**

REVISION DATE: March 19,2005
DATE: October 25, 2004
DESIGNED BY: MAF
CHECKED BY:

STORM DESIGN SHEET
(City of Ottawa)

FILE: 604-00144

DESIGN PARAMETERS

DESIGN STORM $I = a / (t+b)^c$

a= 1469.3
b= 7.2872
c= 0.8588

1 in 10 Years(Culverts)

Manning's n = 0.035 Ditch
Manning's n = 0.024 Culvert
TIME OF ENTF 20 min

Outlet Control Calculations:

HW = Ht + TW - LaS
TW = Tailwater elevation
S = Slope of Culvert
$H_T = [1 + Ke + (19.6\, n^2\, La / R^{1.333})\, V^2/2g]$
See details at bottom of sheet

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23a	23b	24
LOCATION						DRAINAGE AREA							DITCH PROPERTIES												CULVERT PROPERTIES			
STREET	FROM	TO	AREA (ha)	C	Σ AREA (ha)	A x C	Σ A x C (ha)	T of C (min)	I (mm/h)	Q (l/s)	LENGTH (m)	BOTTOM WIDTH (m)	SIDE SLOPE RATIO	SLOPE	DEPTH (m)	VELOCITY Manning (m/s)	Capacity Q (l/s)	TIME OF FLOW (min)	Full AREA (m²)	Full WETTED PERIMETER (m)	Full HYDRAULIC RADIUS (m)	VELOCITY Q/Area (m/s)	Actual Length (m)	Slope (%)	SIZE (mm)	Slope %	CULVERT CAPACITY (l/s)
Street No 1(1,6,7)	B	C	79.300	0.22	79.300	17.446	17.45	144.540	19.67	953.15	40.0	0.3	3	0.50	1.000	1.27	4189.566	0.53	3.80	6.62	0.58	0.79	1.20	16.5	1.03x0.74(2)	0.50%	2031.16
Street No 2 (8,9,10,13,19,20,21,22,23)	K	K1	12.430	0.26	223.830	3.19	51.20	157.16 157.44	18.34	2608.05	17.0	0.3	2	0.20	1.500	1.01	5016.311	0.28	1.95	7.01	0.71	0.85	3.08	24.0	1400(2)	0.50%	9681.99
Albion Road(3)	F	F1	5.600	0.23	5.600	1.29	1.29	105.10 105.30	25.43	90.47	15.0	0.3	3	0.50	1.000	1.27	4189.566	0.20	3.30	6.62	0.50	0.32	0.28	20.0	600	0.50%	498.64
Street No 1(12)	G1	G2	1.400	0.31	1.400	0.43	0.43	20.00 21.65	81.65	99.43	60.0	0.3	3	0.50	0.300	0.60	217.764	1.65	0.36	2.20	0.16	0.35	0.28	17.5	600	0.50%	309.02
Street No 2(2,3,12,14,15,16)	G	H	130.500	0.23	130.500	30.02	30.02	157.16 157.41	18.34	1529.20	15.0	0.3	2	0.20	1.500	1.01	5016.311	0.25	1.95	7.01	0.71	0.72	2.12	19.0	1.39x0.94(2)	0.50%	3371.61
Street No 1(4)	L	M	14.700	0.21	14.700	3.09	3.09	104.26 104.73	25.54	218.99	19.0	0.3	2	0.20	0.750	0.67	977.611	0.47	1.45	3.79	0.38	0.77	0.28	19.0	600	0.50%	394.33
Street No 1(5,30)	N	O	4.000	0.25	4.000	1.00	1.00	63.04 63.45	37.90	105.27	15.0	0.3	3	0.50	0.300	0.60	217.764	0.41	0.36	2.20	0.16	0.37	0.28	15.0	600	0.50%	486.05
Street No 1(35,36)	P	Q	2.500	0.31	2.500	0.78	0.78	20.00 20.41	84.78	182.52	15.0	0.3	3	0.50	0.300	0.60	217.764	0.41	0.36	2.20	0.16	0.65	0.28	17.5	600	0.50%	395.94
Street No 2(11,37,38)	R	S	7.550	0.28	10.050	2.11	2.89	28.46 28.71	67.70	543.31	15.0	0.3	3	0.50	0.650	0.97	1415.429	0.26	1.46	4.41	0.33	1.08	0.50	16.5	800	0.50%	869.47
Street No 2(17,18)	I	J	1.600	0.34	1.600	0.54	0.54	20.00 24.64	75.05	113.40	200.0	0.3	3	0.50	0.400	0.72	431.019	4.64	0.60	2.83	0.21	0.40	0.28	17.0	600	0.50%	221.74

Outlet Control

HW = Ht + TW - LaS
TW = Tailwater elevation or $(d_c + D)/2$, whichever is greater
S = Slope of Culvert
$H_T = [1 + Ke + (19.6\, n^2\, La / R^{1.333})\, V^2/2g]$

Where:

V = Velocity (m/s) : Q/A
n = Manning's : (0.024)CSP
R = Hydraulic Radius : A/Pw
Ht = Head Loss (m)
Pw = Weted Perimeter

Ke = Entrance Loss coefficient : 0.9
La = Length of Culvert (m)
g = Gravity : 9.81 (m/sec)
A = Area of Culvert (m2)

Stantec	SUBDIVISION: Emerald Links	STORM DESIGN SHEET (City of Ottawa)	DESIGN PARAMETERS
	REVISION DATE: March 19,2005		DESIGN STORM 1 in 25 Years(Ditches)
	DATE: February 6, 2003		$I = a / (tc + b)^c$
	DESIGNED BY: MAF	FILE NUMBER: 604-00144	a= 1412.62 MANNING'S n = 0.035
	CHECKED BY:		b= 7.2145 TIME OF ENTRY varies min 20
			c= 0.8585

LOCATION			DRAINAGE AREA									DITCH PROPERTIES									
STREET	FROM	TO (Areas)	AREA (ha)	C	ACCUM. AREA	A x C (ha)	ACCUM. A.C (ha)	T of C (min)	I (mm/h)	Q (l/s)	LENGTH (m)	WIDTH (m)	SIDE SLOPE RATIO	SLOPE %	AVAILABLE DEPTH (m)	VELOCITY (FULL) (m/s)	DITCH CAPACITY (l/s)	DEPTH OF FLOW (m)	VELOCITY (ACTUAL) (m/s)	TIME OF FLOW (min)
	To	*A(1)*	*73.90*	*0.23*	*73.90*	*17.07*	*17.07*	*144.54*												
Sreet No. 1	A	B(7,6)	5.40	*0.32*	79.30	1.717	18.788	145.83	18.81	981.56	70.0	0.3	3.0	0.50	1.00	1.27	4190	0.580	0.90	1.29
Easement(Lots 35,36)	C	D(8,9,10)	2.90	*0.39*	82.20	1.139	19.926	151.81	18.20	1007.37	230.0	0.3	3.0	0.20	1.20	0.90	4222	0.700	0.64	5.98
Street No. 1/2	G2	G(12,15)	*2.10*	*0.36*	2.10	0.75	0.75	20.00	82.84	173.29	250.0	0.3	3.0	0.50	0.60	0.92	1160	[illegible]	0.70	5.92
	To	E(2)	*120.00*	*0.24*	*120.00*	*29.04*	*29.04*	*154.19*												
Sreet No. 3/2	F2	G(3,14,16)	8.40	*0.28*	130.50	2.365	32.159	157.04	17.70	1581.23	170.0	0.90	3.0	0.50	0.60	0.99	1610	0.600	0.99	2.85
Easement(Lots 45,46)	H	D(13,17,18,19,20,	9.07	*0.34*	139.57	3.093	35.251	163.53	17.12	1676.60	282.0	0.3	3.0	0.20	1.50	1.04	7497	0.850	0.72	6.49
Easement(Lots 55,54)	D	K2(22,23,24,25,2	2.96	*0.37*	224.73	1.107	56.285	166.29	16.89	2640.32	190.0	0.3	3.0	0.50	2.00	1.98	24996	0.850	1.15	2.77
Easement(Off-Site)	K2	V(27)	1.49	*0.26*	226.22	0.393	56.678	169.40	16.63	2618.64	180.0	3.0	3.0	0.36	2.00	1.88	33875	0.600	0.97	3.10
Easement(Off-Site)	V	W(43)	2.59	*0.22*	260.69	0.570	67.639	172.65	16.37	3076.37	155.0	4.0	3.0	0.20	1.62	1.28	18432	0.670	0.79	3.26
	To	L(4)	*14.70*	*0.23*	*14.700*	*3.40*	*3.40*	*104.26*												
Easement(Lot 25)	M	T(28,29)	1.00	*0.68*	15.70	0.682	4.078	111.96	23.31	264.07	210.0	0.3	3.0	0.20	0.78	0.69	1413	0.400	0.45	7.70
Easement(Off-Site)	T	U(34)	1.43	*0.24*	21.63	0.346	5.795	115.33	22.76	366.44	100.0	0.3	3.0	0.20	1.70	1.13	10365	0.460	0.49	3.37
Easement(Off-Site)	U	V(41,42)	3.50	*0.24*	31.88	0.847	10.391	128.85	20.81	600.53	400.0	4.0	3.0	0.20	1.37	1.17	13010	0.287	0.49	13.52
	To	N(5,30)	*4.00*	*0.27*	*4.000*	*1.09*	*1.09*	*63.04*												
Easement(Lots27,28)	O	T (31, 32, 33)	0.50	*0.56*	4.50	0.281	1.372	65.49	35.63	135.77	80.0	0.3	3.0	0.50	0.78	1.08	2234	0.250	0.54	2.45
	To	P(35,36)	*2.50*	*0.33*	*7.000*	*0.83*	*0.83*	*20.00*												
Street No. 1	Q	R(38,37)	2.00	*0.39*	9.00	0.770	1.595	23.83	73.98	327.79	155.0	0.3	3.0	0.50	0.30	0.60	218	0.360	0.67	3.83
Street No. 2	S	U(11,39,40)	6.75	*0.32*	6.75	2.153	3.748	25.88	70.03	729.15	100.0	0.3	3.0	0.50	0.65	0.97	1415	0.490	0.81	2.05

Stantec

SUBDIVISION: **Emerald Links**

REVISION DATE: March 19,2005
DATE: October 25, 2004
DESIGNED BY: MAF
CHECKED BY:

FILE: 604-00144

STORM DESIGN SHEET
(City of Ottawa)

DESIGN PARAMETERS

DESIGN STORM
$I = a / (t+b)^c$
a= 1412.62
b= 7.2145
c= 0.8585

1 in 25 Years(Culverts)

Manning's n =	0.035	Ditch
Manning's n =	0.024	Culvert

TIME OF ENTF 20 min

Outlet Control Calculations:

HW = Ht + TW - LaS
TW = Tailwater elevation
S = Slope of Culvert
$H_T = [\,1 + Ke + (\,19.6\,n^2\,La\,/\,R^{1.333}\,)\,V^2/2g\,]$
See details at bottom of sheet

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23a	23b	24
LOCATION			DRAINAGE AREA					DITCH PROPERTIES								CULVERT PROPERTIES								
STREET	FROM	TO	AREA (ha)	C	ACCUM AREA (ha)	AREA (ha)	ACCUM AVG (ha)	T of C (min)	I (mm/hr)	Q (cfs)	LENGTH (m)	BOTTOM WIDTH (m)	SIDE SLOPE RATIO	SLOPE (%)	DEPTH (m)	VELOCITY @ Manning (m/s)	Capacity Q = AV (l/s)	TIME OF FLOW (min)	Full AREA ((m²)	Full WETED PERIMETER (m)	Full HYDRAULIC RADIUS (m)	Full VELOCITY Q/A (m/s)	Angle (°)	Length (m)	Size (mm)	Slope (%)	Full CULVERT CAPACITY (l/s)
Street No 1(1,6,7)	B	C	79.300	0.24	79.300	19.032	19.03	144.540	18.95	1001.61	40.0	0.3	3	0.50	1.000	1.27	4189.565	0.53	3.30	6.62	0.50	0.83	1.20	16.5	1.03x0.74(2)	0.50%	2216.54
Street No 2 (8,9,10,13,19,20,21,22,23)	K	K1	12.430	0.29	223.830	3.60	55.85	157.16 157.44	17.66	2740.61	17.0	0.3	2	0.20	1.500	1.01	5016.311	0.28	4.95	7.01	0.71	0.89	3.08	24.0	1400(2)	0.50%	7474.76
Albion Road(3)	F	F1	5.600	0.25	5.600	1.40	1.40	105.10 105.30	24.49	95.21	15.0	0.3	3	0.50	1.000	1.27	4189.566	0.20	3.30	6.62	0.50	0.34	0.28	20.0	600	0.50%	498.64
Street No 1(12)	G1	G2	1.400	0.34	1.400	0.48	0.48	20.00 21.65	78.75	104.13	60.0	0.3	3	0.50	0.300	0.60	217.764	1.65	0.36	2.29	0.16	0.37	0.28	17.5	600	0.50%	422.21
Street No 2(2,3,12,14,15,16)	G	H	130.500	0.25	130.500	32.63	32.63	157.16 157.41	17.67	1599.11	15.0	0.3	2	0.20	1.500	1.01	5016.311	0.25	4.95	7.01	0.71	0.76	2.12	19.0	1.39x0.94(2)	0.50%	2813.23
Street No 1(4)	L	M	14.700	0.25	14.700	3.68	3.68	104.26 104.73	24.60	251.14	19.0	0.3	2	0.20	0.780	0.67	977.611	0.47	1.45	3.74	0.38	0.89	0.28	19.0	600	0.50%	381.10
Street No 1(5,30)	N	O	4.000	0.28	4.000	1.12	1.12	63.04 63.45	36.51	113.60	15.0	0.3	3	0.50	0.300	0.60	217.764	0.41	0.36	2.29	0.16	0.40	0.28	15.0	600	0.50%	479.18
Street No 1(35,36)	P	Q	2.500	0.34	2.500	0.85	0.85	20.00 20.41	81.78	193.08	15.0	0.3	3	0.50	0.300	0.60	217.764	0.41	0.36	2.29	0.16	0.68	0.28	17.5	600	0.50%	385.39
Street No 2(11,37,38)	R	S	7.550	0.31	10.050	2.34	3.19	28.45 28.71	65.27	578.49	15.0	0.3	3	0.50	0.650	0.97	1415.429	0.26	1.46	4.41	0.33	1.15	0.50	16.5	800	0.50%	839.56
Street No 2(17,18)	I	J	1.600	0.37	1.600	0.59	0.59	20.00 24.64	72.37	119.01	200.0	0.3	3	0.50	0.400	0.72	431.019	4.64	0.60	2.93	0.21	0.42	0.28	17.0	600	0.50%	221.74

Outlet Control

HW = Ht + TW - LaS
TW = Tailwater elevation or $(d_c + D)/2$, whichever is greater
S = Slope of Culvert
$H_T = [\,1 + Ke + (\,19.6\,n^2\,La\,/\,R^{1.333}\,)\,V^2/2g\,]$

Where:

V = Velocity (m/s) : Q/A
n = Manning's : (0.024)CSP
R = Hydraulic Radius : A/Pw
Ht = Head Loss (m)
Pw = Weted Perimeter

Ke = Entrance Loss coefficient : 0.9
La = Length of Culvert (m)
g = Gravity : 9.81 (m/sec)
A = Area of Culvert (m2)

Stantec

SUBDIVISION: Emerald Links

REVISION DATE: March 19,2005
DATE: February 6, 2003
DESIGNED BY: MAF
CHECKED BY:

FILE NUMBER: 604-00144

STORM DESIGN SHEET
(City of Ottawa)

DESIGN PARAMETERS

DESIGN STORM 1 in 100 Years(Ditches)
I = a / (tc + b)^c
a= 2066.7 MANNING'S n = 0.035
b= 7.13 TIME OF ENTRY varies min 20
c= 0.857

LOCATION			DRAINAGE AREA								DITCH PROPERTIES							
STREET	FROM	TO (Area)	AREA (ha)	C 100 YEAR	ACCUM AREA (ha)	2.78 AC (ha)	ACCUM 2.78 AC (ha)	tc (min)	T (min)	Q (l/s)	LENGTH (m)	WIDTH (m)	SIDE SLOPE RATIO	SLOPE	AVAILABLE DEPTH (m)	VELOCITY (FULL) (m/s)	DITCH CAPACITY (l/s)	DEPTH OF FLOW (m)	VELOCITY (ACTUAL) (m/s)	TIME OF FLOW (min)
	To	*A(1)*	*73.90*	*0.26*	*73.90*	*19.40*	*19.40*	*144.54*												
Sreet No. 1	A	B(7,6)	5.40	0.36	79.30	1.951	21.350	145.68	27.73	1642.71	70.0	0.3	3.0	0.50	1.00	1.27	4190	0.708	1.02	1.14
Easement(Lots 35,36)	C	D(8,9,10)	2.90	0.45	82.20	1.294	22.644	150.90	26.95	1693.94	230.0	0.3	3.0	0.20	1.20	0.90	4222	0.870	0.74	5.22
Street No. 1/2	G2	G(12,15)	*2.10*	0.33	2.10	0.68	0.68	20.00	122.03	232.07	250.0	0.3	3.0	0.50	0.60	0.92	1160	0.410	0.72	5.80
	To	E(2)	*120.00*	*0.28*	*120.00*	*33.00*	*33.00*	*154.19*												
Sreet No. 3/2	F2	G(3,14,16)	8.40	0.32	130.50	2.688	36.373	156.69	26.13	2639.63	170.0	0.9	3.0	0.50	0.60	0.99	1610	0.752	1.13	2.50
Easement(Lots 45,46)	H	D(13,17,18,19,20,	9.07	0.39	139.57	3.515	39.887	162.44	25.37	2810.64	282.0	0.3	3.0	0.20	1.50	1.04	7497	1.030	0.82	5.74
Easement(Lots 55,54)	D	K2(22,23,24,25,2	2.96	0.43	224.73	1.258	63.789	164.87	25.06	4440.32	190.0	0.3	3.0	0.50	2.00	1.98	24996	1.040	1.30	2.43
Easement(Off-Site)	K2	V(27)	1.49	0.30	226.22	0.447	64.236	167.57	24.73	4412.16	180.0	3.0	3.0	0.36	2.00	1.88	33875	0.775	1.11	2.70
Easement(Off-Site)	V	W(43)	2.59	0.25	260.69	0.648	76.691	170.38	24.39	5196.15	155.0	4.0	3.0	0.20	1.62	1.28	18432	0.880	0.92	2.81
	To	L(4)	*14.70*	*0.26*	*14.700*	*3.86*	*3.86*	*104.26*												
Easement(Lot 25)	M	T(28,29)	1.00	0.78	15.70	0.775	4.634	111.07	34.56	444.89	210.0	0.3	3.0	0.20	0.78	0.69	1413	0.490	0.51	6.81
Easement(Off-Site)	T	U(34)	1.43	0.28	21.63	0.393	6.586	114.06	33.83	618.92	100.0	0.3	3.0	0.20	1.70	1.13	10365	0.560	0.56	2.99
Easement(Off-Site)	U	V(41,42)	3.50	0.28	31.88	0.963	11.808	125.93	31.23	1024.23	400.0	4.0	3.0	0.20	1.37	1.17	13010	0.360	0.56	11.87
	To	N(5,30)	*4.00*	*0.31*	*4.000*	*1.24*	*1.24*	*63.04*												
Easement(Lots27,28)	O	T (31, 32, 33)	0.50	0.64	4.50	0.319	1.559	65.20	52.65	227.99	80.0	0.3	3.0	0.50	0.78	1.08	2234	0.310	0.62	2.16
	To	P(35,36)	*2.50*	*0.38*	*7.000*	*0.94*	*0.94*	*20.00*												
Street No. 1	Q	R(38,37)	2.00	0.44	9.00	0.875	1.813	23.35	110.45	556.08	155.0	0.3	3.0	0.50	0.30	0.60	218	0.150	0.77	3.35
Street No. 2	S	U(11,39,40)	6.75	0.36	6.75	2.447	4.259	25.14	105.17	1244.85	100.0	0.3	3.0	0.50	0.65	0.97	1415	0.610	0.93	1.79

Stantec

SUBDIVISION: **Emerald Links**

REVISION DATE: March 19,2005
DATE: October 25, 2004
DESIGNED BY: MAF
CHECKED BY:

STORM DESIGN SHEET
(City of Ottawa)

FILE: 604-00144

DESIGN PARAMETERS

DESIGN STORM $I = a / (t+b)^c$ — 1 in 100 Years (Culverts)

a=	2066.67	Manning's n =	0.035	Ditch
b=	7.1328	Manning's n =	0.024	Culvert
c=	0.8572	TIME OF ENTF	20	min

Outlet Control Calculations:

$HW = Ht + TW - LaS$
TW = Tailwater elevation
S = Slope of Culvert
$H_T = [\,1 + Ke + (\,19.6\,n^2\,La\,/\,R^{1.333}\,)\,V^2/2g\,]$
See details at bottom of sheet

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23a	23b	24	32
LOCATION			DRAINAGE AREA					DITCH PROPERTIES								CULVERT PROPERTIES									
STREET	FROM MH	TO MH	I AREA (ha)	C	ACCUM AREA (ha)	A x C	ACCUM A x C (ha)	T of C (min)	I (mm/h)	Q (L/s)	LENGTH (m)	BOTTOM WIDTH (m)	SIDE SLOPE RATIO	SLOPE (%)	DEPTH (m)	VELOCITY Manning (m/s)	FLOW (L/s)	TIME OF FLOW (min)	Full AREA (m²)	Full WETTED PERIMETER (m)	Full HYDRAULIC RADIUS (m)	VELOCITY Q/A (m/s)	Actual Length (m)	Dia (mm)	Slope (%)	CULVERT CAPACITY (l/s)	100Yr HW ELEV
Street No 1(1,6,7)	B	C	79.3	0.28	79.300	21.808	21.81	144.54	27.91	1690.83	40.0	0.3	3.0	0.5	1.00	1.27	1189.6	0.53	0.30	5.62	0.05	1.41	1.20	16.5	1.03x0.74(2)	0.50%	2031.16	
t No 2 (8,9,10,13,19,20,21,2	K	K1	12.43	0.32	223.830	3.99	64.00	157.16 157.44	26.03	1676.8	17.0	0.3	2.0	0.2	1.50	1.01	5016.3	0.28	1.95	7.01	0.28	1.50	3.08	24.0	1400(2)	0.50%	9681.99	
Albion Road(3)	F	F1	5.6	0.29	5.600	1.61	1.61	105.10 105.30	36.08	161.4	15.0	0.3	3.0	0.5	1.00	1.27	4189.6	0.20	0.30	5.62	0.05	0.57	0.28	20.0	600.0	0.50%	498.64	
Street No 1(12)	G1	G2	1.4	0.39	1.400	0.54	0.54	20.00 21.65	116.00	174.8	60.0	0.3	3.0	0.5	0.30	0.60	217.8	1.65	0.36	2.20	0.16	0.62	0.28	17.5	600.0	0.50%	309.02	
Street No 2(2,3,12,14,15,16	G	H	130.5	0.29	130.500	37.52	37.52	157.16 157.41	26.03	2711.23	15.0	0.3	2.0	0.2	1.50	1.01	5016.3	0.25	1.95	7.01	0.28	1.28	2.12	19.0	1.39x0.94(2)	0.50%	3371.61	
Street No 1(4)	L	M	14.7	0.26	14.700	3.86	3.86	104.26 104.73	36.24	386.1	19.0	0.3	2.0	0.2	0.75	0.67	977.6	0.47	0.45	3.79	0.12	1.37	0.28	19.0	600.0	0.50%	394.33	
Street No 1(5,30)	N	O	4	0.31	4.000	1.25	1.25	63.04 63.45	53.77	185.7	15.0	0.3	3.0	0.5	0.30	0.60	217.8	0.41	0.36	2.20	0.16	0.66	0.28	15.0	600.0	0.50%	486.05	
Street No 1(35,36)	P	Q	2.5	0.39	2.500	0.97	0.97	20.00 20.41	120.46	324.2	15.0	0.3	3.0	0.5	0.30	0.60	217.8	0.41	0.36	2.20	0.16	1.15	0.28	17.5	600.0	0.50%	395.94	
Street No 2(11,37,38)	R	S	7.55	0.35	10.050	2.64	3.61	28.45 28.71	96.13	964.3	15.0	0.3	3.0	0.5	0.65	0.97	1415.4	0.26	1.46	4.41	0.33	1.92	0.50	16.5	800.0	0.50%	869.47	
Street No 2(17,18)	I	J	1.6	0.43	1.600	0.68	0.68	20.00 24.64	105.59	200.3	200.0	0.3	3.0	0.5	0.40	0.72	431.0	4.64	0.60	2.83	0.21	0.71	0.28	17.0	600.0	0.50%	221.74	

Outlet Control

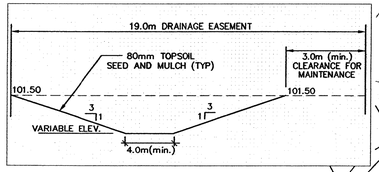
$HW = Ht + TW - LaS$
TW = Tailwater elevation or $(d_c + D)/2$, whichever is greater
S = Slope of Culvert
$H_T = [\,1 + Ke + (\,19.6\,n^2\,La\,/\,R^{1.333}\,)\,V^2/2g\,]$

Where:

V = Velocity (m/s) : Q/A
n = Manning's : (0.024)CSP
R = Hydraulic Radius : A/Pw
Ht = Head Loss (m)
Pw = Weted Perimeter

Ke = Entrance Loss coefficient : 0.9
La = Length of Culvert (m)
g = Gravity : 9.81 (m/sec)
A = Area of Culvert (m2)

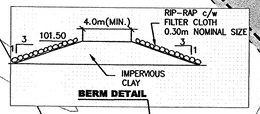
Appendix F
Excerpts from Draft Plan Conditions



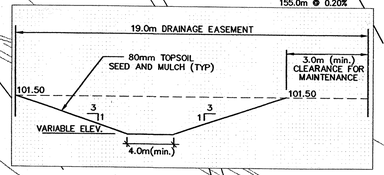
CULVERT SCHEDULE

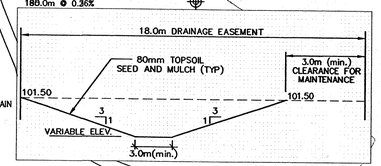
I.D. NUMBER	CULVERT PIPE SIZE	REMARKS
B,C	(2) 1.03mx0.72m	CSPA, 2.01h
F,F1	600mmø	CSP, 2.01h
G1,G2	600mmø	CSP, 2.01h
G,H	(2) 1.39mx0.97m	CSPA, 2.01h
I,J	600mmø	CSP, 2.01h
K,K1	(2) 1400mmø	CSP, 2.01h
L,M	600mmø	CSP, 2.01h
P,Q	600mmø	CSP, 2.01h
R,S	800mmø	CSP, 2.01h

* ALL DRIVEWAY AND TRANSFORMER CULVERTS SHALL BE 9.0m - 500mm SIZE, 1.6th WITH THE EXCEPTION OF LOTS 82 WHICH WILL BE (2) 1.39mx0.97m, 2.01h.



BERM DETAIL





CONT'D ON GP1

CONT'D ON GP4

PROP. CULVERT 9.0m-2x14 CSP 1 W.INV=10 E.INV=10

PROP. CULVERT 9.0m 600ø CSP 1.6th (99.56)

REGRADE EXISTING DITCH 400.0m @ 0.20%

19.0m DRAINAGE EASEMENT

(99.46)

(99.25)

(99.15)

PROP. CULVERT 9.0m 900ø CSP 1.6th

(2) PROP. CULVERT 9.0m 1400ø CSP 1.6th

(99.19)

(99.25)

(99.39)

(99.62)

HA 1

HA 2

EXISTING OVERFLOW CHANNEL

SPRATT MULTICIPAL DRAIN

100.5

99.73 100 YR HGL

(101.50)

PROPOSED BERM

NO WORK ALLOWED WITHIN 15.0m OF MUNICIPAL DRAIN

INV. 98.09

EXISTING 750ø PVC PIPE

INV. 98.20

(98.68)

(98.74)

(98.80)

(98.98) 100 YR HGL

(98.95)

DRAINAGE EASEMENT 19.0m

REGRADE EXISTING DITCH 180.0m @ 0.36%

HA 18

ABANDON MUNICIPAL DRAIN (99.30)

PROPOSED DITCH 155.0m @ 0.20%

TW 2

TW 1

HA 9

HA 10

PROPOSED BERM ELEV.101.50

EXISTING RE-ALIGNED DITCH

NO WORK ALLOWED WITHIN 15.0m OF MUNICIPAL DRAIN

TRANSNORTHERN PIPELINE EASEMENT

INSTITUTIONAL

EASEMENT

ROAD WIDENING

SHAPE TO 3:1 SIDE SLOPE

BALLYCASTLE CRESCENT

15.0m EASEMENT

GW=2.10m

GW=0.90m

LOT

LOT

LOT

04327

LOT	USF(MIN)	HOUSE	A	B
65	101.25	103.50	102.20	102.20
66	101.10	103.35	102.05	102.05
67	101.30	103.55	102.25	102.25
68	101.50	103.75	102.45	102.45
69	101.65	103.90	102.60	102.60
70	101.95	104.20	102.90	102.90
71	102.00	104.25	102.96	102.96
58	101.40	103.95	102.65	102.65
57	101.30	104.25	102.95	102.95
56	101.30	104.35	103.05	103.05
55	101.30	104.55	103.25	103.25

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2005-04-08 12:17PM By: monrob

ORIGINAL SHEET - ISO A1

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K1Z 7T1
Tel. 613.722.4420
Fax. 613.722.2799
www.stantec.com

Stantec

Legend

- PROPOSED CULVERT
- PROPOSED DITCH
- PROPOSED HOUSE ENVELOPE AND LOT NUMBER (LOTS INDICATED IN BRACKETS REFER TO REGISTERED LOTS FOR PHASE 1)
- PARTIALLY-RAISED LEACHING BED WITH NATIVE MANTLE (8 RUNS OF 15m) MIN. 8m FROM ANY STRUCTURES MIN. 6m FROM ANY PROPERTY LINES. (REFER: J.D. PATTERSON AND ASSOC. REPORT GB329-03 DATED MAY 12, 2003, REVISED APRIL 04, 2005.
- SPARE AREA FOR PARTIALLY-RAISED LEACHING BED (8 RUNS OF 15m) AND BED ELEVATIONS
- PROPOSED DRILLED WELL
- HAND AUGER HOLE LOCATION
- TEST WELL LOCATION
- DRAINAGE EASEMENT
- PROPOSED LOT CORNER ELEVATION / EXISTING LOT CORNER ELEVATION
- PROPOSED ℄ DITCH ELEVATION
- 100 YEAR FLOOD ELEVATION
- FILL TO PROVIDE DITCH BACK SLOPE
- CULVERT IDENTIFICATION
- GROUND WATER DEPTH IN METRES (MARCH 17, 2005)
- LOWEST UCF BASED ON GROUND WATER ELEVATIONS. SEE NOTES 4 & 5
- 100yr FLOODLINE

Notes

1. ELEVATIONS AT HOUSES ARE BASED ON PARTIALLY RAISED TILE BEDS ON GRAVITY SYSTEM. IF PUMPING IS USED HOUSE ELEVATIONS CAN BE LOWERED.
   CAUTION: LOWERING OF FOUNDATIONS BELOW GROUND WATER TABLE WILL RESULT IN EXCESSIVE OPERATION OF SUMP PUMPS.
2. REFER TO GP-4 FOR GRADING DETAILS
3. ALL DITCHES SHALL BE c/w 80mm TOPSOIL SEED AND MULCH.
4. GWL - RECORDED GROUND WATER ELEVATION. UNDERSIDE OF FOOTING (USF) ELEVATIONS SHALL BE 0.15M (MIN) ABOVE THIS ELEVATION. AS PER THE GEOTECHINCAL REPORT THE FOLLOWING OPTIONS ARE TO BE CONSIDERED FOR DRAINAGE AT THE RESIDENTIAL STRUCTURES:
   - DAMP PROOF THE EXTERIOR OF THE FOUNDATION WALLS AND BACKFILL THE WALLS WITH FREE DRAINING, NON-FROST SUSCEPTIBLE SAND OR SAND AND GRAVEL, SUCH AS THAT MEETING ONTARIO PROVINCIAL STANDARD SPECIFICATIONS (OPSS) REQUIREMENTS FOR GRANULAR B TYPE I, OR
   - INSTALL AND APPROVED PROPRIETARY DRAINAGE MATERIAL (SUCH AS SYSTEM PLATON) ON THE EXTERIOR OF THE FOUNDATION WALLS AND BACKFILL THE WALLS WITH NATIVE MATERIAL OR IMPORTED SOIL.

   A PERFORATED DRAIN SHOULD BE INSTALLED AROUND THE BASEMENT AREA AT THE LEVEL OF THE BOTTOM OF THE FOOTINGS. THE DRAIN SHOULD OUTLET TO A SUMP FROM WHICH THE WATER IS PUMPED OR SHOULD DRAIN BY GRAVITY TO A SUITABLE OUTLET.
5. USF IS TYPICALLY BASED ON THE FINISHED HOUSE ELEVATIONS (LESS 2.25m) HOWEVER THE (MINIMUM) USF IS THE LOWEST ELEVATION THE USF CAN BE BASED EITHER THE GWL OR 100 YEAR FLOOD ELEVATION WHICH EVER IS GREATER.

Revision	By	Appd.	Date
8 100yr FLOODLINE	GBU	TJW	JUNE23/05
5 REVISED AS PER CITY COMMENTS AND STREET NAMES, NEW LOT #'S	GBU	TJW	MAY25/05
4 REVISED AS PER CITY COMMENTS. REVISED CULVERT SIZING. SWM	NI	TJW	MARC.28/05
3 REVISED SITE PLAN DATED SEPT27/04	SK	TJW	OCT18/04
2 REVISED AS PER NEW TOPO AND CITY COMMENTS	GBU	TJW	SEPT21/04
1 REVISED LOT & ROAD LAYOUT	GBU	TJW	DEC.8/03

File Name: 60400144U-BASE

Dwn. Chkd. Dsgn. Date

Seals

LICENSED PROFESSIONAL ENGINEER P. MOROZ June 23, 2005 PROVINCE OF ONTARIO

Client/Project

CAVANAGH CONSTRUCTION

EMERALD LINKS SUBDIVISION

Ottawa, Ontario

Title

GRADING PLAN

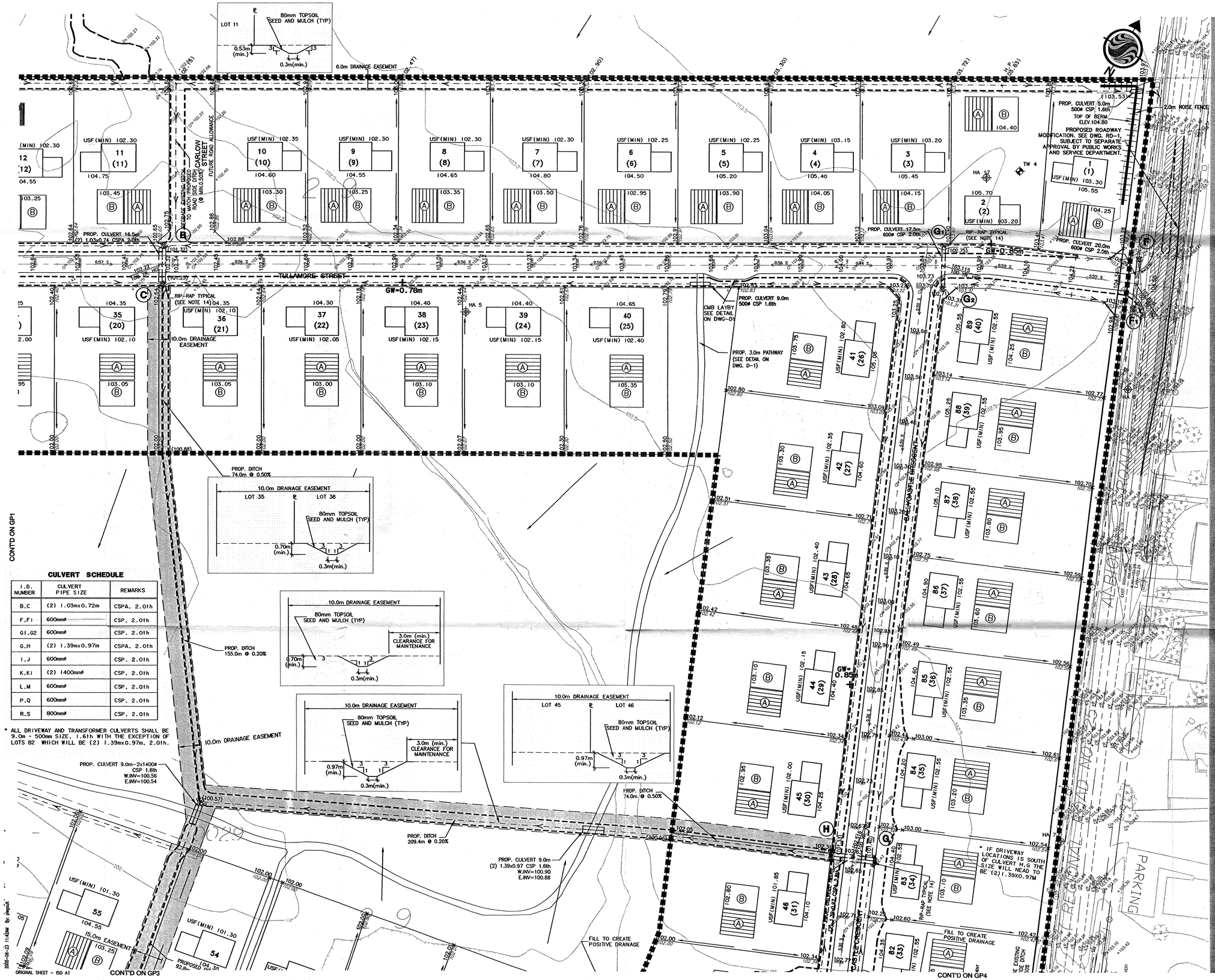
Project No. 60400144

Scale 1:750 (0 7.5 22.5 37.5m)

Drawing No. GP-3

Sheet 16 of 24

Revision 6



CULVERT SCHEDULE

I.D. NUMBER	CULVERT PIPE SIZE	REMARKS
B,C	(2) 1.03mx0.72m	CSPA. 2.0th
F,F1	600mmø	CSP. 2.0th
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K,K1	(2) 1400mmø	CSP. 2.0th
L,M	600mmø	CSP. 2.0th
P,Q	600mmø	CSP. 2.0th
R,S	800mmø	CSP. 2.0th

* ALL DRIVEWAY AND TRANSFORMER CULVERTS SHALL BE 9.0m - 500mm SIZE, 1.6th WITH THE EXCEPTION OF LOTS 82 WHICH WILL BE (2) 1.39mx0.97m, 2.0th.

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Stantec

Legend

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- PROPOSED DITCH
- PROPOSED HOUSE ENVELOPE AND LOT NUMBER (LOTS INDICATED IN BRACKETS REFER TO REGISTERED LOTS FOR PHASE 1)
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- 100 YEAR FLOOD ELEVATION
- FILL TO PROVIDE DITCH BACK SLOPE
- CULVERT IDENTIFICATION
- GW=0.90m GROUND WATER DEPTH IN METRES (MARCH 17, 2005)
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- 100yr FLOODLINE

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	Revision	By	Appd.	Date
6	100yr FLOODLINE	GBU	TJW	JUNE23/05
5	REVISED AS PER CITY COMMENTS – ADD STREET NAME – R-PLAN LOT #'S	GBU	TJW	MAY25/05
4	REVISED AS PER CITY COMMENTS – REVISED CULVERT SIZING - SWM	NI	TJW	MARC.28/05
3	REVISED SITE PLAN DATED SEP127/04	SK	TJW	OCT18/04
2	REVISED AS PER NEW TOPO AND CITY COMMENTS	GBU	TJW	SEPT21/04
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File Name: 60400144U-BASE

Dwn.	Chkd.	Dsgn.	Date

Seals

LICENSED PROFESSIONAL ENGINEER
P. MOROZ
June 23, 2005
PROVINCE OF ONTARIO

Client/Project
CAVANAGH CONSTRUCTION

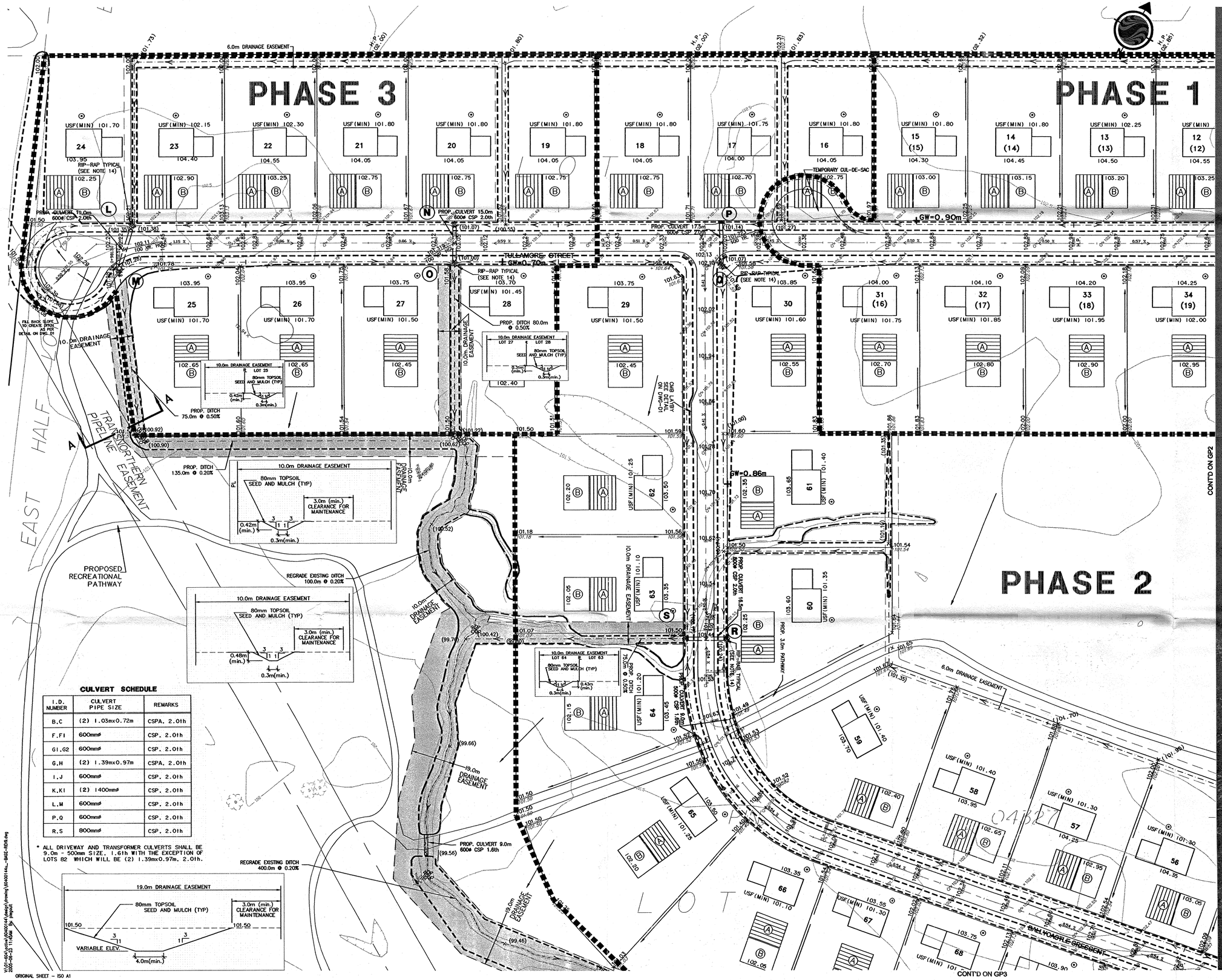
EMERALD LINKS SUBDIVISION

Ottawa, Ontario

Title
GRADING PLAN

Project No.	Scale	Sheet	Revision
60400144	1:750 (0 7.5 22.5 37.5m)	15 of 24	6

Drawing No. GP-2



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- HAND AUGER HOLE LOCATION
- TEST WELL LOCATION
- DRAINAGE EASEMENT
- PROPOSED LOT CORNER ELEVATION / EXISTING LOT CORNER ELEVATION
- PROPOSED ℄ DITCH ELEVATION
- 100 YEAR FLOOD ELEVATION
- FILL TO PROVIDE DITCH BACK SLOPE
- CULVERT IDENTIFICATION
- GW=0.90m GROUND WATER DEPTH IN METRES (MARCH 17, 2005)
- USF(MIN) 101.80 LOWEST UCF BASED ON GROUND WATER ELEVATIONS. SEE NOTES 4 & 5
- 100yr FLOODLINE

Notes

1. ELEVATIONS AT HOUSES ARE BASED ON PARTIALLY RAISED TILE BEDS ON GRAVITY SYSTEM. IF PUMPING IS USED HOUSE ELEVATIONS CAN BE LOWERED.
   CAUTION: LOWERING OF FOUNDATIONS BELOW GROUND WATER TABLE WILL RESULT IN EXCESSIVE OPERATION OF SUMP PUMPS.
2. REFER TO GP-4 FOR GRADING DETAILS
3. ALL DITCHES SHALL BE c/w 80mm TOPSOIL SEED AND MULCH.
4. GWL – RECORDED GROUND WATER ELEVATION. UNDERSIDE OF FOOTING (USF) ELEVATIONS SHALL BE 0.15M (MIM) ABOVE THIS ELEVATION. AS PER THE GEOTECHNICAL REPORT THE FOLLOWING OPTIONS ARE TO BE CONSIDERED FOR DRAINAGE AT THE RESIDENTIAL STRUCTURES:
   – DAMP PROOF THE EXTERIOR OF THE FOUNDATION WALLS AND BACKFILL THE WALLS WITH FREE DRAINING, NON-FROST SUSCEPTIBLE SAND OR SAND AND GRAVEL, SUCH AS THAT MEETING ONTARIO PROVINCIAL STANDARD SPECIFICATIONS (OPSS) REQUIREMENTS FOR GRANULAR B TYPE I. OR
   – INSTALL AND APPROVED PROPRIETARY DRAINAGE MATERIAL (SUCH AS SYSTEM PLATON) ON THE EXTERIOR OF THE FOUNDATION WALLS AND BACKFILL THE WALLS WITH NATIVE MATERIAL OR IMPORTED SOIL.
   A PERFORATED DRAIN SHOULD BE INSTALLED AROUND THE BASEMENT AREA AT THE LEVEL OF THE BOTTOM OF THE FOOTINGS. THE DRAIN SHOULD OUTLET TO A SUMP FROM WHICH THE WATER IS PUMPED OR SHOULD DRAIN BY GRAVITY TO A SUITABLE OUTLET.
5. USF IS TYPICALLY BASED ON THE FINISHED HOUSE ELEVATIONS (LESS 2.25m) HOWEVER THE (MINIMUM) USF IS THE LOWEST ELEVATION THE USF CAN BE BASED ON EITHER THE GWL OR 100 YEAR FLOOD ELEVATION WHICH EVER IS GREATER.

No.	Revision	By	Appd.	Date
6	100yr FLOODLINE	GBU	TJW	JUNE23/05
5	REVISED AS PER CITY COMMENTS – ADD STREET NAME – REVISED LOT #'s	GBU	TJW	MAY25/05
4	REVISED AS PER CITY COMMENTS – REVISED CULVERT SIZING. SWM	NI	TJW	MARC28/05
3	REVISED SITE PLAN DATED SEPT27/04	SK	TJW	OCT18/04
2	REVISED AS PER NEW TOPO AND CITY COMMENTS	GBU	TJW	SEP121/04
1	REVISED LOT & ROAD LAYOUT	GBU	TJW	DEC.8/03

File Name: 60400144U-BASE

Dwn. | Chkd. | Dsgn. | Date

Seals

LICENSED PROFESSIONAL ENGINEER P. MOROZ June 28,'05 PROVINCE OF ONTARIO

Client/Project

CAVANAGH CONSTRUCTION

EMERALD LINKS SUBDIVISION

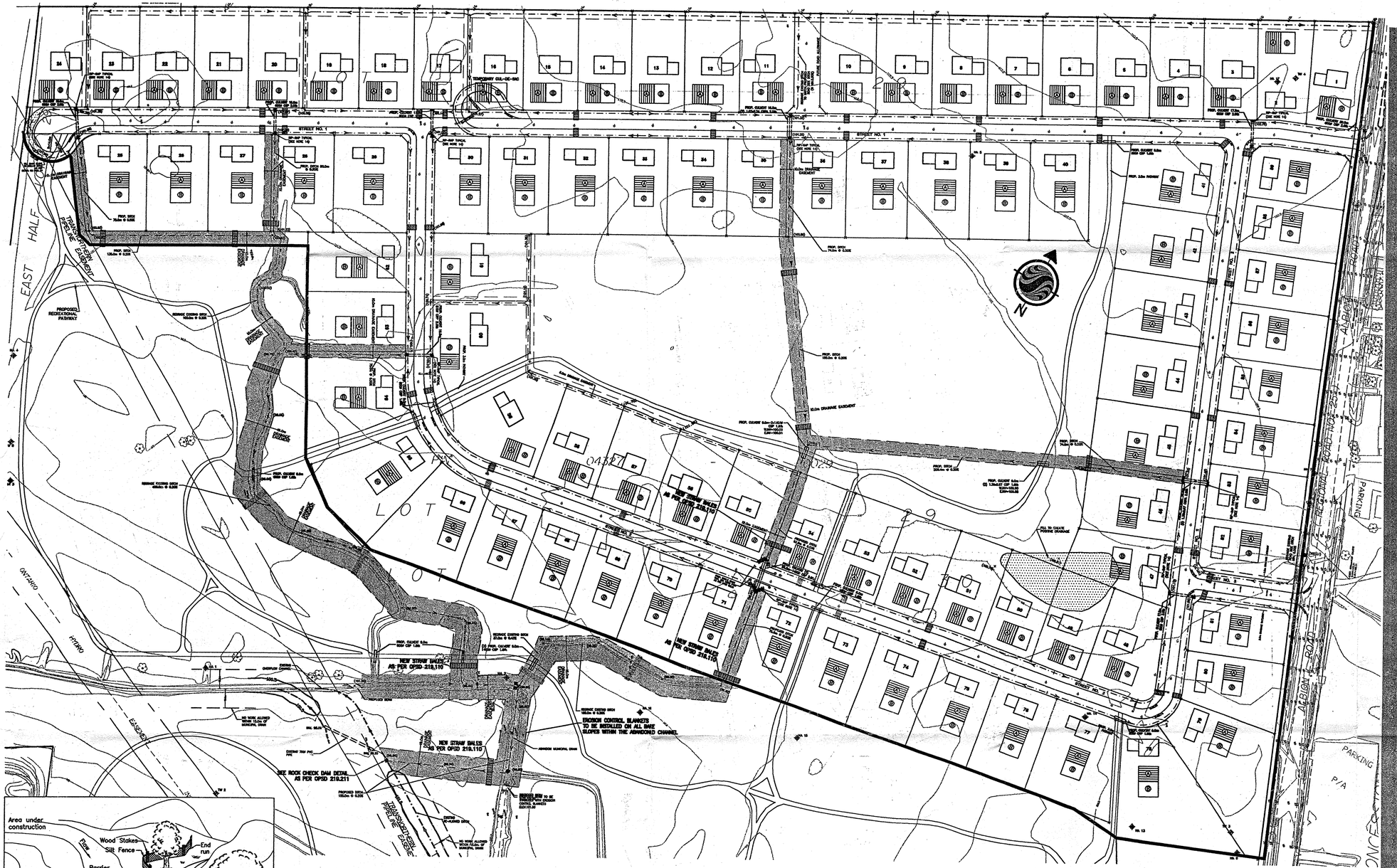
Ottawa, Ontario

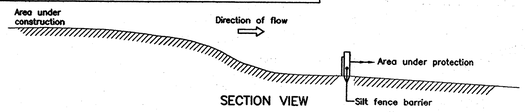
Title

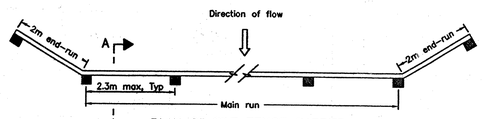
GRADING PLAN

Project No.	Scale	Sheet	Revision
60400144	1:750 (0 7.5 22.5 37.5m)	14 of 24	6

Drawing No. GP-1



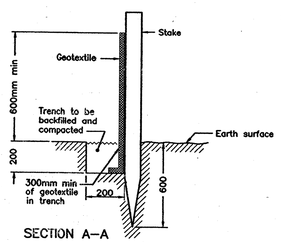


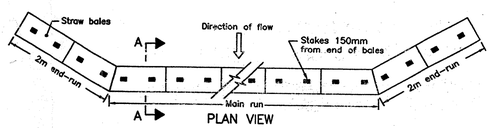


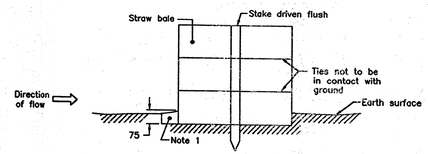
NOTES:

1) WOVEN GEOTEXTILE TO HAVE A MINIMUM EQUIVALENT OPENING SIZE OF 0.15mm AND A MAXIMUM EQUIVALENT OPENING SIZE OF 0.25mm.
2) WOVEN GEOTEXTILE TO HAVE A HORIZONTAL OVERLAP OF 1000mm AT JOINTS.
3) ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.

LIGHT DUTY SILT FENCE BARRIER
AS PER OPSD 219.110
N.T.S.







1 BALANCE OF EXCAVATED TRENCH TO BE BACKFILLED FOLLOWING BALE PLACEMENT.
2 ALL DIMENSIONS ARE IN MILLIMETRES OR METRES UNLESS OTHERWISE SHOWN.

LIGHT DUTY STRAW BALE BARRIER
AS PER OPSD 219.100
N.T.S.

BEST MANAGEMENT PRACTICES

EROSION AND SEDIMENT CONTROLS (BEST MANAGEMENT PRACTICES) SHALL BE PROVIDED DURING CONSTRUCTION OF THIS PROJECT.

EROSION MUST BE MINIMIZED AND SEDIMENTS MUST BE REMOVED FROM CONSTRUCTION SITE RUN-OFF IN ORDER TO PROTECT DOWNSTREAM AREAS. DURING ALL CONSTRUCTION, EROSION AND SEDIMENTATION SHOULD BE CONTROLLED BY THE FOLLOWING TECHNIQUES:

1. MINIMIZE THE EXTENT OF EXPOSED SOILS.
2. REVEGETATE EXPOSED AREAS AS SOON AS POSSIBLE.
3. MINIMIZE THE AREA TO BE CLEARED AND GRUBBED.
4. PROTECT EXPOSED SLOPES WITH PLASTIC OR SYNTHETIC MULCHES.
5. INSTALL FILTER CLOTH BETWEEN FRAME AND COVER ON ALL PROPOSED CATCH BASINS AND CATCH BASIN MANHOLES AND ON ALL EXISTING CATCH BASINS THAT WILL RECEIVE RUN-OFF FROM THE SITE.
6. INSTALL SILT FENCES AROUND THE PERIMETER OF STOCKPILES OF TOPSOIL TO BE USED OR REMOVED FROM SITE. (LOCATION TO BE DETERMINED)
7. SEDIMENT CONTROL DEVICES SHALL BE INSPECTED DAILY AND CLEANED OF ANY ACCUMULATED SILT AS REQUIRED. THE DEPOSITS WILL BE DISPOSED OF AS PER THE REQUIREMENTS OF THE CONTRACT.
8. IN SOME CASES SOME FILTER BARRIERS MAY BE REMOVED TEMPORARILY TO ACCOMODATE CONSTRUCTION OPERATIONS. THE AFFECTED BARRIERS WILL BE REINSTATED AT NIGHT WHEN CONSTRUCTION IS COMPLETED. REMOVAL SHALL NOT OCCUR IF RUN OFF OR RAIN FALL IS PREDICTED UNLESS A NEW DEVICE HAS BEEN INSTALLED TO PROTECT THE EXISTING STORM AND SANITARY SEWER SYSTEMS.
9. NO REFUELING OR CLEANING OF EQUIPMENT IS PERMITTED NEAR ANY EXISTING WATERWAYS.

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Legend

- PROPOSED SANITARY SEWER & MANHOLE
- PROPOSED STORM SEWER & MANHOLE
- PROPOSED CATCH BASIN
- PROPOSED WATERMAIN
- PROPOSED VALVE BOX
- PROPOSED FIRE HYDRANT
- SILT FENCE BOUNDARY
- STRAW BALE BARRIER WITHIN ROAD SIDE DITCHES @ 100m INTERVALS

Notes

Revision	By	Appd.	Date
4 – REVISED AS PER CITY COMMENTS – REVISED CLIENT SIZING, SWM	NI	TJW	MARC.28/05
3 REVISED SITE PLAN DATED SEPT27/04			OCT18/04
2 REVISED SITE PLAN	SK	TJW	SEPT27/04
1 REVISED AS PER NEW TOPO AND CITY COMMENTS	GBU	TJW	SEPT21/04

File Name:

Dwn. Chkd. Dsgn. Date

Seals

LICENSED PROFESSIONAL ENGINEER S. J. PIGEON PROVINCE OF ONTARIO

Client/Project

CAVANAGH CONSTRUCTION

EMERALD LINKS SUBDIVISION

Ottawa, Ontario

Title

EROSION CONTROL

Project No. 60400144

Scale 0 15 45 75m 1:1500

Drawing No. EC-1

Sheet 19 of 24

Revision 4

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Legend

Notes

Revision	By	Appd.	Date
4 REVISED SWM INFO	NI	MAF	APR.21/05
3 REVISED SWM PARAMETERS	SK	MAF	OCT.29/04
2 REVISED SWM AREAS	NI	TJW	JUNE22/04
1 REVISED LOT & ROAD LAYOUT	GBU	TJW	DEC.8/03

File Name: 60400144U-BASE

Dwn.	Chkd.	Dsgn.	Date

Seals

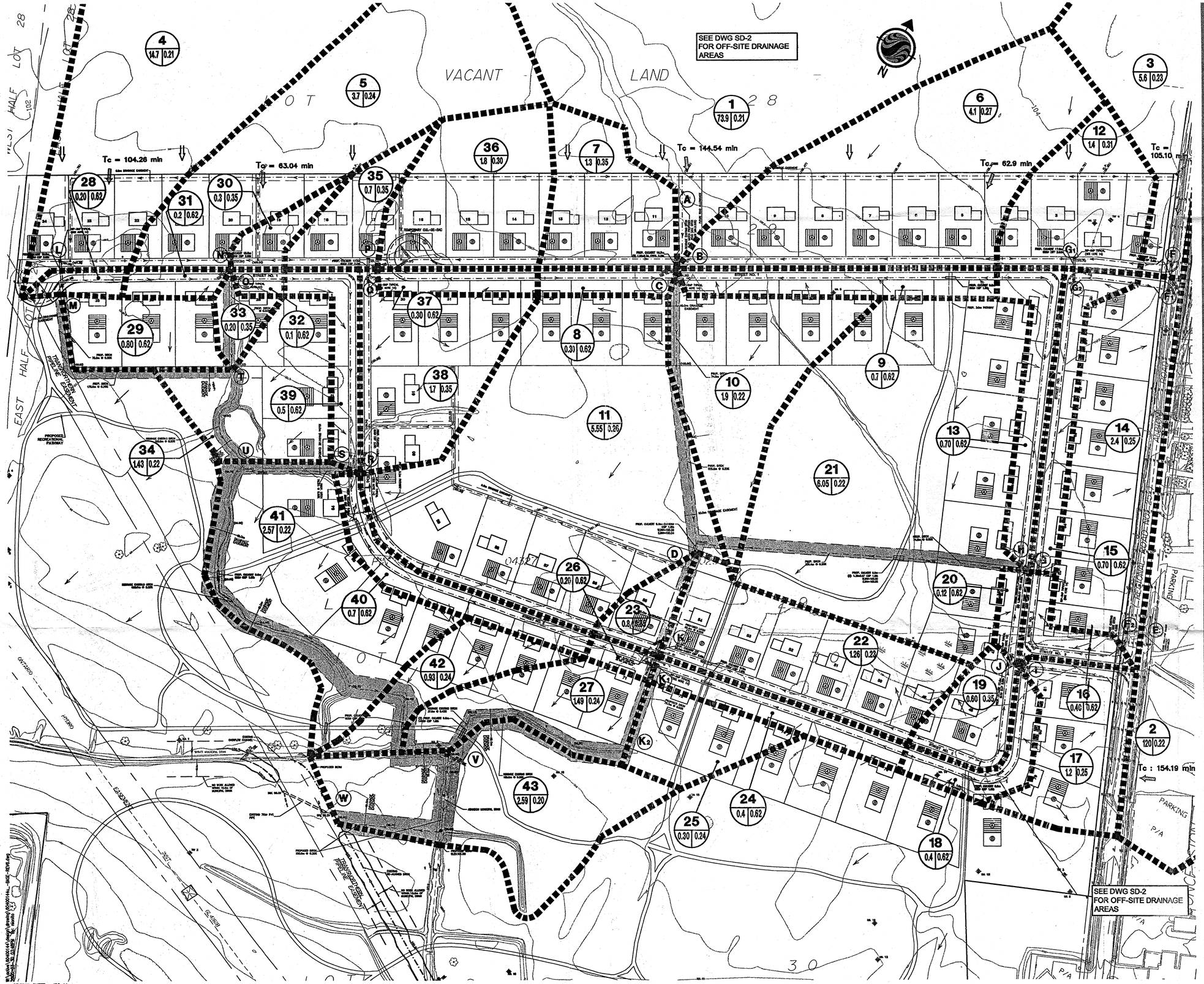
Client/Project
MR. BRIAN WILSON

EMERALD LINKS SUBDIVISION

Ottawa, Ontario

Title
OFF-SITE STORM DRAINAGE PLAN

Project No.	Scale	Revision
60400144	1:5000 (0 50 150 250m)	
Drawing No.	Sheet	
SD2	1 of 1	4



ORIGINAL SHEET - ISO A1

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Legend

C
0.43 0.90

DRAINAGE AREA NO.
RUNOFF CO-EFFICIENT
STORM DRAINAGE AREA ha.

LIMIT OF STORM DRAINAGE AREA

DRAINAGE CALCULATION POINT

Notes

CULVERT SCHEDULE

I.D. NUMBER	CULVERT PIPE SIZE	REMARKS
B,C	(2) 1.03mx0.72m	CSPA, 2.0th
F,F1	600mmø	CSP, 2.0th
G1,G2	600mmø	CSP, 2.0th
G,H	(2) 1.39mx0.97m	CSPA, 2.0th
I,J	600mmø	CSP, 2.0th
K,K1	(2) 1400mmø	CSP, 2.0th
L,M	600mmø	CSP, 2.0th
P,Q	600mmø	CSP, 2.0th
R,S	800mmø	CSP, 2.0th

* ALL DRIVEWAY AND TRANSFORMER CULVERTS SHALL BE 9.0m - 500mm SIZE, 1.6th WITH THE EXCEPTION OF LOTS 82 AND 83 WHICH WILL BE (2) 1.39mx0.97m, 2.0th.

Revision	By	Appd.	Date
4 REVISED AS PER CITY COMMENTS - REVISED CULVERT SIZING .SWM	NI	TJW	MARC.28/05
3 REVISED SITE PLAN DATED SEPT27/04	SK	TJW	OCT18/04
2 REVISED AS PER NEW TOPO AND CITY COMMENTS	GBU	TJW	SEPT21/04
1 REVISED LOT & ROAD LAYOUT	GBU	TJW	DEC.8/03

File Name: 60400144U-BASE

Dwn.	Chkd.	Dsgn.	Date

Seals

LICENSED PROFESSIONAL ENGINEER
S. J. PICHETTE
PROVINCE OF ONTARIO

Client/Project

CAVANAGH CONSTRUCTION

EMERALD LINKS SUBDIVISION

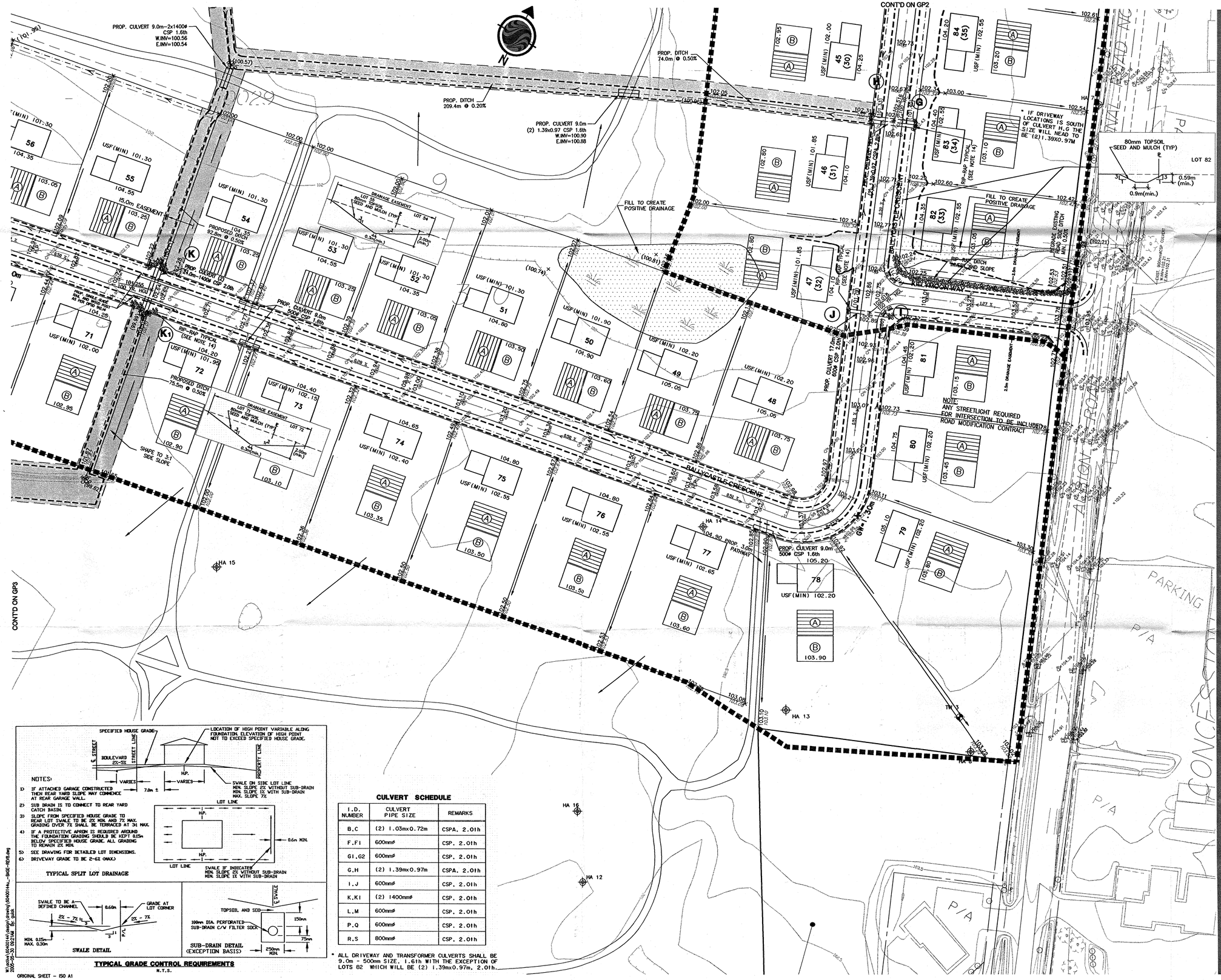
Ottawa, Ontario

Title

STORM DRAINAGE PLAN

Project No.	Scale				
60400144	1:1500	0	15	45	75m

Drawing No.	Sheet	Revision
SD1	20 of 24	4



CULVERT SCHEDULE

I.D. NUMBER	CULVERT PIPE SIZE	REMARKS
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I,J	600mmø	CSP. 2.0th
K,K1	(2) 1400mmø	CSP. 2.0th
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P,Q	600mmø	CSP. 2.0th
R,S	800mmø	CSP. 2.0th

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2005-05-30 08:21AM By: gbell

ORIGINAL SHEET - ISO A1

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Legend

- PROPOSED CULVERT
- PROPOSED DITCH
- PROPOSED HOUSE ENVELOPE AND LOT NUMBER (LOTS INDICATED IN BRACKETS REFER TO REGISTERED LOTS FOR PHASE 1)
- PARTIALLY-RAISED LEACHING BED WITH NATIVE MANTLE (8 RUNS OF 15m) MIN. 8m FROM ANY STRUCTURES MIN. 6m FROM ANY PROPERTY LINES. (REFER: J.D. PATTERSON AND ASSOC. REPORT 08529-05 DATED MAY 12, 2003. REVISED APRIL 04, 2005.
- SPARE AREA FOR PARTIALLY-RAISED LEACHING BED (8 RUNS OF 15m) AND BED ELEVATIONS
- PROPOSED DRILLED WELL
- HAND AUGER HOLE LOCATION
- TEST WELL LOCATION
- DRAINAGE EASEMENT
- PROPOSED LOT CORNER ELEVATION / EXISTING LOT CORNER ELEVATION
- PROPOSED ℄ DITCH ELEVATION
- 100 YEAR FLOOD ELEVATION
- FILL TO PROVIDE DITCH BACK SLOPE
- CULVERT IDENTIFICATION
- GW=0.90m GROUND WATER DEPTH IN METRES (MARCH 17, 2005)
- USF(MIN) 101.80 LOWEST UCF BASED ON GROUND WATER ELEVATIONS. SEE NOTES 4 & 5
- 100yr FLOODLINE

Notes

1. ELEVATIONS AT HOUSES ARE BASED ON PARTIALLY RAISED TILE BEDS ON GRAVITY SYSTEM. IF PUMPING IS USED HOUSE ELEVATIONS CAN BE LOWERED.
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2. REFER TO GP-4 FOR GRADING DETAILS
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   – DAMP PROOF THE EXTERIOR OF THE FOUNDATION WALLS AND BACKFILL THE WALLS WITH FREE DRAINING, NON-FROST SUSCEPTIBLE SAND OR SAND AND GRAVEL, SUCH AS THAT MEETING ONTARIO PROVINCIAL STANDARD SPECIFICATIONS (OPSS) REQUIREMENTS FOR GRANULAR B TYPE I, OR
   – INSTALL AND APPROVED PROPRIETARY DRAINAGE MATERIAL (SUCH AS SYSTEM PLATON) ON THE EXTERIOR OF THE FOUNDATION WALLS AND BACKFILL THE WALLS WITH NATIVE MATERIAL OR IMPORTED SOIL.
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Revision	By	Appd.	Date
6 100yr FLOODLINE	GBU	TJW	JUNE23/05
5 REVISED AS PER CITY COMMENTS – ADD STREET NAMES – M-PLAN LOT #'s	GBU	TJW	MAY25/05
4 REVISED AS PER CITY COMMENTS – REVISED CULVERT SIZING, SWM	NI	TJW	MARC.28/05
3 REVISED SITE PLAN DATED SEPT27/04	SK	TJW	OCT18/04
2 REVISED AS PER NEW TOPO AND CITY COMMENTS	GBU	TJW	SEPT21/04
1 REVISED LOT & ROAD LAYOUT	GBU	TJW	DEC.8/03

File Name: 60400144U-BASE

Dwn.	Chkd.	Dsgn.	Date

Seals

LICENSED PROFESSIONAL ENGINEER P. MAROZ June 23, 2005 PROVINCE OF ONTARIO

Client/Project

CAVANAGH CONSTRUCTION

EMERALD LINKS SUBDIVISION

Ottawa, Ontario

Title

GRADING PLAN

Project No.	Scale	Sheet	Revision
60400144	1:750 (0, 7.5, 22.5, 37.5m)	17 of 24	6

Drawing No. GP-4