



MONARCH CORPORATION

**SITE SERVICING REPORT  
STORMWATER SITE MANAGEMENT PLAN AND EROSION  
AND SEDIMENT CONTROL PLAN  
STONEBRIDGE DEVELOPMENTS  
PHASE 11 - BLOCKS 331, 332 & 333**

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Project 25099-5.2.2

AUGUST 2010



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## 1. INTRODUCTION

Design of the site has been undertaken in accordance with the following reports:

- Barrhaven South Master Servicing Study prepared by Stantec Consulting, June 2007.
- Jockvale Servicing Study South Nepean Urban Area (Official Plan Area 12A) prepared by Cumming Cockburn, March 1999.
- Corrigan Stormwater Management Facility Stormwater Management Report and Design Brief prepared by IBI Group, July 2008.
- Site Servicing Study Stonebridge Development, Phase 10S Recreation Center/School/Park/Fire Station Complex prepared by IBI Group, August 2009.
- Site Servicing Report, Stormwater Site Management Plan and Erosion and Sediment Control Plan, Stonebridge Developments, Phase 11 & 12.

Phase 11 and 12 of the Stonebridge subdivision is located south of Cambrian Road and east of Greenbank Road as shown on the Key Plan. The site consists primarily of single family lots with street and private townhouse units which are the last remaining phases of the Stonebridge development south of Cambrian Road. Phase 11 covers approximately 17.2 hectares including the private sites while Phase 12 covers approximately 14.5 hectares. Block 331 is a 11 unit freehold townhouse site fronting onto Dundonald Drive. Block 332 and 333 is a 109 unit private townhouse site backed on the east and west sides of Blackleaf Drive. Sanitary, storm and water for the two phases will be connected to existing infrastructure constructed in previous phases.

This report deals with the townhouse blocks 331, 332 and 333 which are located in Phase 11. Design of these blocks have been incorporated into the design of Phase 11 and 12.

## 2. WATER DISTRIBUTION

The site is provided by existing watermains located on Blackleaf Drive, Cheyenne Way, Dundonald Drive, Kilbirnie Drive and Kilmarnock Way. Watermain pipe sizes have been determined through hydraulic analysis to ensure peak demand pressures and fire flow requirements are met. Results of the analysis are included in the Water Distribution Plan for Phases 11 and 12 which is a separate report.

Water service for Block 331 is provided by the proposed watermain on Dundonald Drive while water service for Blocks 332 and 333 is provided by the proposed watermain on Blackleaf Drive.

### 3. WASTEWATER SYSTEM (SANITARY SEWERS)

The sanitary sewer outlet for Phase 11 is through the existing 300 mm sanitary sewer located at Blackleaf Drive and Cheyenne Way while Phase 12 drains to the existing 300 mm sanitary sewer at Kilbirnie Drive and Kilmarnock Way. Phase 11 also includes the extension of Cheyenne Way and the extension of the existing sanitary sewer stub at Cheyenne Way adjacent to Decona Terrace. Block 331 is serviced from the proposed sanitary sewer on Dundonald Drive while Blocks 332 and 333 drain to the proposed sanitary sewer on Blackleaf Drive.

All sanitary sewers within the Stonebridge development are designed in accordance with current City of Ottawa criteria, including the following:

▪ Average Residential Rate	350 L/capita/day
▪ Population Density	Single Family – 3.4 ppu Townhouse – 2.7 ppu Stacked Townhouse – 2.3 ppu
▪ Residential Peaking Factor	Harmon Formula
▪ Infiltration Allowance	0.28 l/s/ha
▪ Average Non-Residential Rate* (Commercial, Industrial, School)	0.578 l/s/ha (50,000 l/day/ha)
▪ Non-Residential Peaking Factor	1.5
▪ Minimum Velocity	0.60 m/s

\* As noted in Appendix E of the Barrhaven South Master Servicing Study.

Sanitary drainage from Phases 11 and 12 have been incorporated in previous phases of the Stonebridge Subdivision which outlets directly into the South Nepean collector sewer on the east side of Jockvale Road and west of the Jock River Crossing. There are no external sanitary drainage areas draining through Phases 11 and 12 as these phases represent the limit of the Stonebridge development south of Cambrian Road.

Appendix A contains the sanitary drainage area plans and sanitary sewer design sheets. On the Sanitary Sewer Design Sheet, the actual depth of flow is indicated for all pipes larger than 200 mm to demonstrate that the flow depth is greater than 30% of the diameter.

### 4. STORMWATER SYSTEM

Storm drainage from Phase 12 is tributary to Phase 11 which outlets to the future trunk storm sewer on Greenbank Road as outlined in the Corrigan Stormwater Management Report. A temporary outlet is available through the adjacent Phase 10S lands to the north that will service Phase 11 and 12 on an interim basis should the construction of the Greenbank trunk sewer be delayed. The temporary storm sewer will eventually become the permanent storm sewer for the proposed recreation center/school/park/fire station complex planned for the Phase 10S lands, as described in the Site Servicing Study. The temporary sewer is sized to service all the tributary Phase 11 lands, including Blocks 331, 332 and 333, except for the south leg of Sunita Crescent, which is

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downstream of the temporary connection, and all of the Phase 12 lands. A section of the storm sewer linking Sunita Crescent and the park complex will be removed once the connection to the Greenbank trunk sewer is completed.

A section of Cheyenne Way from Decona Terrace to the bend drains back to Decona and is tributary to the Jockvale Stormwater Management Facility in accordance with the Phase 6 design. The areas tributary to the Jockvale Stormwater Management Facility are identified on the drainage area plan and design sheets.

There are no external storm drainage areas tributary to Phase 11 and 12. Drainage from an existing residence fronting onto Greenbank Road picked up on Blackleaf Drive south of Sunita in Phase 11. South of Phase 12 there is an area of existing drainage (Area B1 in the Corrigan Stormwater Management Report) that is tributary to Greenbank Road. In advance of the storm sewer construction on Greenbank Road, it is proposed to temporary intercept the flow in a temporary ditch inlet catchbasin in the Greenbank Road ditch south of Kilbirnie Drive. A total temporary external drainage area of 3.69 hectares is shown on the storm drainage area plan and the rational method flow has been added to the storm sewer design sheet.

At the outlet to the Greenbank trunk storm sewer, a hydraulic grade line elevation of 92.2 m is provided in the Corrigan Stormwater Management Report. The HGL has been extended back into the Phase 11 storm sewers until it meets to sewer obvert. Calculations are included in Appendix B and the HGL elevations are shown on the drawings where it is higher than the sewer obvert. In Block 333, the HGL of the storm sewers on Blackleaf Drive has been extended into the block. In Blocks 331 and 332, the HGL does not extend above pipe obvert. All underside of footing elevations have been set a minimum of 0.3 m above the higher of the HGL or sewer obvert. The minimum underside of footing elevations are shown on the Grading Plan. A check of the HGL for the temporary storm sewer was undertaken using the HGL elevation of 91.30 at Cambrian Road from the Corrigan Stormwater Management Report, as the temporary HGL at Sunita is lower than the permanent HGL from Greenbank, the permanent will be used.

Storm sewers are sized to convey a 5 year storm using City of Ottawa IDF curves and to convey the capture rate of 85 l/s/ha except for the portion of Cheyenne Way which is tributary to the Jockvale Stormwater Management Facility and has a capture rate of 70 l/s/ha. Due to the shape of the development, the capture rate produces a higher flow than the rationale method at the downstream end of the system and is used to size the pipe. To ensure that the design flows are not exceeded, inlet control devices (ICD's) are used in every inlet to the storm sewers and some pairs of street catchbasins are interconnected to reduce the total number of inlets. Standard IPEX/Pedro Plastic ICD's are used with the following release rates at the standard 1.22 m head.

Type A – 20.0 l/s  
Type B – 28.4 l/s  
Type C – 37.0 l/s  
Type X – 13.4 l/s

The Type X ICD's are used exclusively in rear yard catchbasins. The location of the ICD's and interconnected catchbasins are shown on the project drawings.

Major system overland flow routes are provided with a maximum level of ponding of 0.3 m for rear yards and local streets and 0.25 m on collector roads. High points between road sags are set to provide a minimum 0.1% longitudinal slope. The major system route for Phase 12 outlets to the Stonebridge golf course through a dedicated block on Centerra Court. Kinloch Court and Dundonald Drive in Phase 11 also outlets to the golf course on Dundonald. The remainder of Phase

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11 and portions of Phase 6 and 7B outlets through a dedicated block on Sunita Crescent to the Phase 10S park complex and into a future major system retention area as outlined in the Corrigan Stormwater Management Report.

Major system peak flows at the three major system outlets and for Block 321 have been determined by the SWMHYMO computer model. At these locations, the depth of flow and velocity has been calculated to ensure that the product of velocity and depth (VXD) do not exceed 0.6. Calculations and model output are included in Appendix B and summarized as follows:

Location	Major System Flow (m <sup>2</sup> /s)	VXD
Block 335 Sunita	3.2	0.47
Block 329 Centerra	1.4	0.28
Dundonald at golf course	0.5	0.11
Block 321 Chenoa	0.2	0.07

As demonstrated, the product of velocity and depth is less than 0.6 at all locations.

In the Corrigan Stormwater Management Report, a storage rate of 42 m<sup>3</sup>/ha is required for the lands which make up Phases 11 and 12. Storage is provided in the roadway sags which are indicated on the ponding plans. The total volume of street ponding available in the 26 ponding areas identified on the ponding plans, including 4 ponding areas on Block 332 and 333, are 1,282.4 m<sup>3</sup>. The total storm drainage area for Phase 11 and 12 including Blocks 331, 332 and 333 is 27.11 hectares giving a storage rate of 47.3 m<sup>3</sup>/ha which exceeds the required rate of 42 m<sup>3</sup>/ha.

Storm drainage area plans, ponding plans, storm sewer design sheets and the hydraulic grade line calculations are included in Appendix B.

## 5. SOURCE CONTROLS

### 5.1 General

Since an end of pipe treatment facility is provided for this development, stormwater management will focus on site level or source control management of runoff. Such controls or mitigative measures are proposed for the development not only for final development but also during construction and build out. Some of these measures are:

- flat lot grading;
- split lot drainage;
- pre-installation of roof leader splash pads; and
- vegetation planting.
- groundwater recharge

### 5.2 Lot Grading

All lots and townhouse blocks within the development will make use of the split drainage runoff concept. In accordance with local municipal standards, all lot grading will be between two and seven percent. All front yard drainage will be directed over landscaped front yards to the roadway system and all rearyard drainage will be directed to a swale drainage system. Typically swales will have slopes of 1.5%. These measures all serve to encourage individual lot infiltration.

### 5.3 Roof Leaders

The development will consist of single family lots and townhouse units. It is proposed that roof leaders from these units be constructed such that runoff is directed to grassed areas adjacent to the units. This will promote water quality treatment through settling, absorption, filtration and infiltration and a slow release rate to the conveyance network.

### 5.4 Vegetation

As with most subdivision agreements, the developer will be required to complete a vegetation and planting program. Vegetation throughout the development, including roadside planting, provide opportunities to re-create lost natural habitat.

### 5.5 Groundwater Recharge

With regard to the existing hydrologic regime in the Stonebridge Development, seepage barriers made of impervious clay dykes will be constructed in the municipal service trenches at regular intervals to reduce ground water lowering at the site. Appropriately placed, these seepage barriers help to re-establish and maintain the historic ground water regime after construction of the development. Detail drawing S8 is attached for reference in Appendix C.



## 6. CONVEYANCE CONTROLS

### 6.1 General

Besides source controls, the development also proposes to use several conveyance control measures to improve runoff quality. These will include:

- flat vegetated swales
- pervious rearyard drainage
- catchbasin sumps

### 6.2 Flat Vegetated Swales

All rearyards within the Stonebridge Development make use of relatively flat vegetated swales. These swales generally employ saw-toothing at regular intervals. These swales encourage infiltration and runoff treatment.

### 6.3 Catchbasin and Maintenance Hole Sumps

All catchbasins within the development, either rear yard or street, will be constructed with minimum 600 mm deep sumps. These sumps trap pollutants, sand, grit and debris which can be mechanically removed prior to being flushed into the minor pipe system. Both rear yard and street catchbasins will be to OPSD 705.02. All storm sewer maintenance holes serving local sewers less than 900 mm shall be constructed with a 300 mm sump per City of Ottawa Standards.

### 6.4 Pervious Rearyard Drainage

Some of the rearyard swales make use of a filter wrapper perforated drainage pipe constructed immediately below rearyard swales. This perforated pipe system is designed to provide some groundwater recharge and generally reduce both volumetric and pollutant loadings that enter the minor pipe system. Typically, a 250 mm Ø perforated pipe wrapped in a filter sock is constructed in a crushed stone surround at an invert elevation about 1.0 metre below grade. These pipes are in turn directly connected to rearyard catchbasins at regular intervals.

## 7. SEDIMENT AND EROSION CONTROL PLAN

### 7.1 General

During construction, existing stream and conveyance systems can be exposed to significant sediment loadings. Although construction is only a temporary situation, it is proposed to introduce a number of mitigative construction techniques to reduce unnecessary construction sediment loadings. These will include:

- groundwater in trench will be pumped into a filter mechanism prior to release to the environment;
- bulkhead barriers will be installed at the nearest downstream manhole in each sewer which connects to an existing downstream sewer;
- seepage barriers will be constructed in any temporary drainage ditches;
- filter cloths will remain on open surface structure such as manholes; catchbasins until these structures are commissioned and put into use; and
- silt fence on the site perimeter.

## 7.2 Trench Dewatering

Although little groundwater is expected during construction of municipal services, any trench dewatering using pumps will be discharged into a filter trap made up of geotextile filters and straw bales similar in design to the OPSD 219.240 Dewatering Trap. These will be constructed in a bowl shape with the fabric forming the bottom and the straw bales forming the sides. Any pumped groundwater will be filtered prior to release to the existing surface runoff. The contractor will inspect and maintain the filters as needed including sediment removal and disposal and material replacement as needed.

## 7.3 Bulkhead Barriers

Although the storm sewers eventually outlet into a sediment forebay, a ½ diameter bulkhead will be constructed over the lower half of the outletting sewer to reduce sediment loadings during construction. This bulkhead will trap any sediment carrying flows thus preventing any construction-related contamination of existing sewers. The bulkheads will be inspected and maintained including periodic sediment removal as needed.

## 7.4 Seepage Barriers

In order to further reduce sediment loading to the stormwater management facility, seepage barriers will be installed on any surface water courses at appropriate locations that may become evident during construction. These barriers will be similar to either the Light Duty Straw Bale Barrier as per OPSD 219.100 or the Light Duty Silt Fence Barrier as per OPSD 219.110. They are typically made of layers of straw bales or geotextile fabric staked in place. All seepage barriers will be inspected and maintained as needed.

## 7.5 Surface Structure Filters

All catchbasins, and to a lesser degree manholes, convey surface water to sewers. However, until the surrounding surface has been completed these structures should be covered in some fashion to prevent sediment from entering the minor storm sewer system. Until rearyards are sodded or until streets are asphalted and curbed, all catchbasins and manholes will be constructed with a geotextile filter fabric located between the structure frame and cover. These will stay in place and be maintained during construction and build until it is appropriate to remove same.

## 7.6 Stockpile Management

During construction of any development similar to the Stonebridge Development both imported and native soils are stockpiled. Mitigative measures and proper management to prevent these materials entering the sewer systems is needed.

During construction of the deeper municipal services, water, sewers and service connections, imported granular bedding materials are temporarily stockpiled on site. These materials are however quickly used up and generally before any catchbasins are installed. Street catchbasins are installed at the time of roadway construction and rearyard catchbasins are usually installed after base course asphalt is placed.

Contamination of the environment as a result of stockpiling of imported construction materials is generally not a concern. These materials are quickly used and the mitigative measures stated previously, especially the ½ diameter sewer bulkheads and filter fabric in catchbasins and manholes help to manage these concerns.

Roadway granular materials are not stockpiled on site. They are immediately placed in the roadway and have little opportunity of contamination. Lot grading sometimes generates stockpiles of native materials. However, this is only a temporary event since the materials are quickly moved off site.

## 8. CONCLUSIONS

As demonstrated in this report, the water, wastewater and stormwater systems are designed in conformance with the City of Ottawa standards.

The use of the lot level controls, conveyance controls and the end of pipe controls outlined in the report will result in effective treatment of surface stormwater runoff from the site. Adherence to the sediment and erosion control plan during construction will minimize harmful impacts on surface water.

Prepared by:



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# APPENDIX A



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SANITARY SEWER DESIGN SHEET

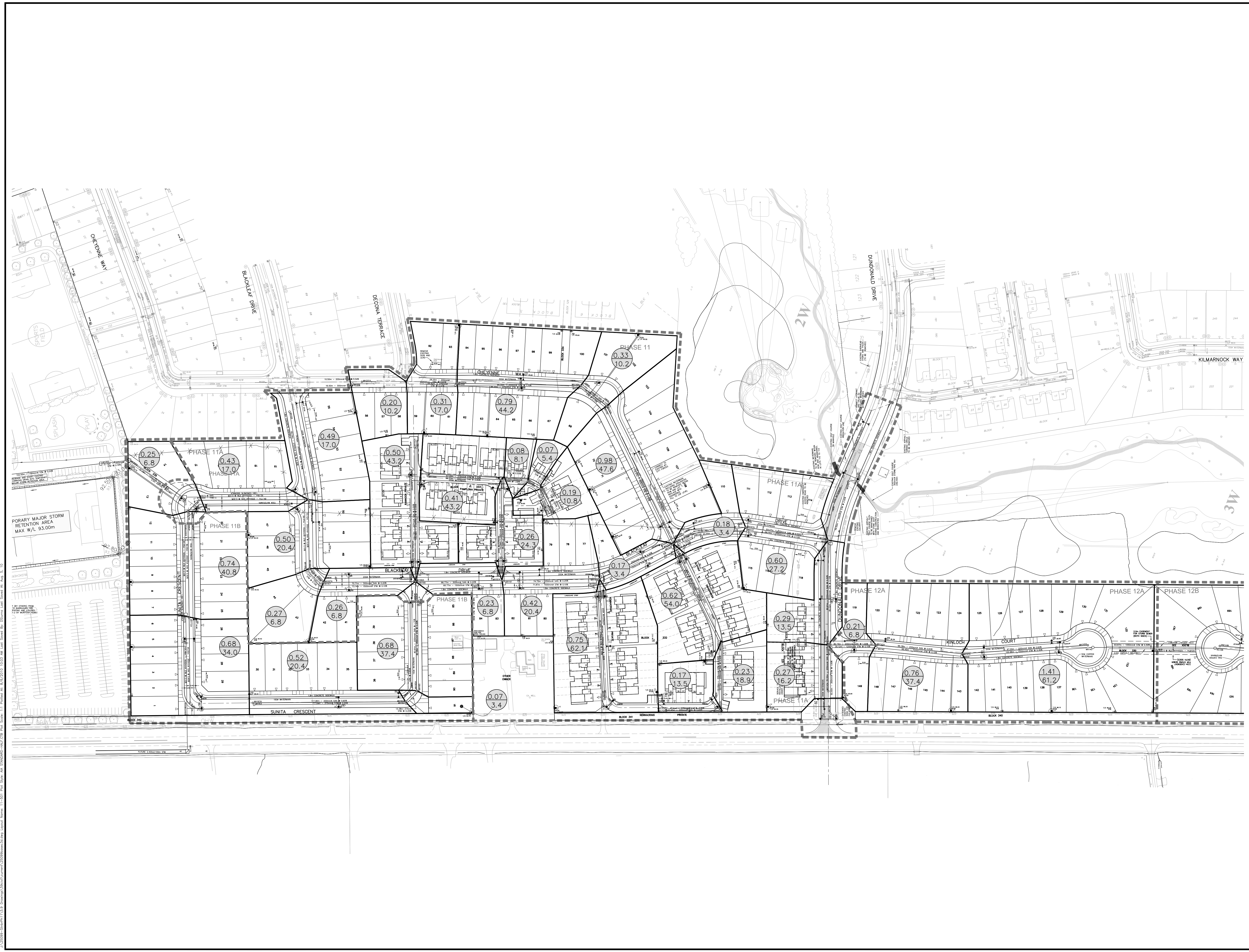
PROJECT: STONEBRIDGE PHASE 11  
DEVELOPER: MONARCH CORPORATION

JOB #: 25099-5.7  
DATE PRINTED: 05-Aug-10  
DESIGN: LE

LOCATION			INDIVIDUAL				CUM. RES. FLOW			INFILTRATION			TOTAL DESIGN FLOW (l/s)	PROPOSED SEWER						FLOW DEPTH			
STREET	FROM MH	TO MH	RESID. UNITS			RES. AREA (Ha)	POP.	POP.	PEAK FACT.	PEAK FLOW (l/s)	INCR. AREA (Ha)	CUM. AREA (Ha)		FLOW (l/s)	CAP. l/s	PIPE (mm)	LGTH. (m)	SLOPE %	VEL. (full) m/s	AVAIL. CAP. (l/s)	AVAIL. CAP. (%)	Flow qa/Qa (%)	Depth da/Df (%)
<b>Phase 11</b>																							
Kinlock Court	140 A	141 A	18			1.41	61.2	61	4.00	1.00	1.41	1.41	0.39	1.40	26.49	200	97.0	0.60	0.82	25.10	95%		
Kinlock Court	141 A	142 A	11			0.76	37.4	99	4.00	1.62	0.76	2.17	0.61	2.22	26.49	200	66.4	0.60	0.82	24.27	92%		
Kinlock Court	142 A	144 A	2			0.21	6.8	105	4.00	1.73	0.21	2.38	0.67	2.39	26.49	200	36.7	0.60	0.82	24.10	91%		
Dundonald Drive	143 A	144 A		6		0.27	16.2	16	4.00	0.27	0.27	0.27	0.08	0.34	48.38	200	35.5	2.00	1.49	48.04	99%		
Dundonald Drive	144 A	146 A		5		0.29	13.5	135	4.00	2.22	0.29	2.94	0.82	3.04	19.36	200	80.6	0.32	0.60	16.32	84%		
Blackleaf Drive	146 A	147 A	8			0.60	27.2	162	4.00	2.66	0.60	3.54	0.99	3.65	19.36	200	64.1	0.32	0.60	15.71	81%		
Blackleaf Drive	147 A	148 A	1			0.18	3.4	166	4.00	2.72	0.18	3.72	1.04	3.76	19.36	200	41.2	0.32	0.60	15.60	81%		
Blackleaf Drive	148 A	153 A						166	4.00	2.72	0.00	3.72	1.04	3.76	19.36	200	16.7	0.32	0.60	15.60	81%		
Cheyenne Way	149 A	150 A	3			0.33	10.2	10	4.00	0.17	0.33	0.33	0.09	0.26	44.62	200	25.5	1.70	1.38	44.36	99%		
Cheyenne Way	150 A	153 A	14			0.98	47.6	58	4.00	0.95	0.98	1.31	0.37	1.31	39.76	200	117.4	1.35	1.23	38.44	97%		
Block 332 Kennacraig Pr.	175 A	151 A		5		0.17	13.5	14	4.00	0.22	0.17	0.17	0.05	0.27	27.60	200	42.4	0.65	0.85	27.33	99%		
Block 332 Kennacraig Pr.	151 A	152 A		7		0.23	18.9	32	4.00	0.53	0.23	0.40	0.11	0.64	24.19	200	53.1	0.50	0.75	23.55	97%		
Block 332 Kennacraig Pr.	152 A	153 A		20		0.62	54.0	86	4.00	1.42	0.62	1.02	0.29	1.70	44.62	200	83.6	1.70	1.38	42.92	96%		
Blackleaf Drive	153 A	155 A	1			0.17	3.4	313	4.00	5.14	0.17	6.22	1.74	6.88	31.01	250	62.7	0.25	0.61	24.13	78%	22%	32%
Block 332 Kennacraig Pr.	154 A	155 A		24		0.75	64.8	65	4.00	1.06	0.75	0.75	0.21	1.27	45.92	200	92.5	1.80	1.42	44.65	97%		
Blackleaf Drive	155 A	161 A	6			0.42	20.4	399	4.00	6.54	0.42	7.39	2.07	8.60	31.01	250	75.0	0.25	0.61	22.41	72%	28%	36%
Block 333 Pamplona Pr.	156 A	157 A		4		0.19	10.8	11	4.00	0.18	0.19	0.19	0.05	0.23	36.68	200	21.0	1.15	1.13	36.45	99%		
Block 333 Pamplona Pr.	157 A	158 A		2		0.07	5.4	16	4.00	0.27	0.07	0.26	0.07	0.34	36.68	200	11.2	1.15	1.13	36.34	99%		
Block 333 Pamplona Pr.	158 A	160 A		3		0.08	8.1	24	4.00	0.40	0.08	0.34	0.10	0.49	36.68	200	20.5	1.15	1.13	36.18	99%		
Block 333 Pamplona Pr.	159 A	160 A		16		0.41	43.2	43	4.00	0.71	0.41	0.41	0.11	0.82	30.61	200	56.5	0.80	0.94	29.79	97%		
Block 333 Treadway Pr.	160 A	161 A		9		0.26	24.3	92	4.00	1.51	0.26	1.01	0.28	1.79	24.19	200	77.3	0.50	0.75	22.40	93%		
Blackleaf Drive	161 A	166 A	2			0.23	6.8	497	3.98	8.10	0.23	8.63	2.42	10.52	45.09	300	66.5	0.20	0.62	34.57	77%	23%	33%
Block 333 Rannoch Pr.	162 A	166 A		16		0.50	43.2	43	4.00	0.71	0.50	0.50	0.14	0.85	24.19	200	93.4	0.50	0.75	23.34	96%		
Sunita Crescent	163 A	164 A	6			0.52	20.4	20	4.00	0.33	0.52	0.52	0.15	0.48	27.60	200	117.5	0.65	0.85	27.12	98%		
Sunita Crescent	164 A	165 A	1			0.07	3.4	24	4.00	0.39	0.07	0.59	0.17	0.56	27.60	200	12.1	0.65	0.85	27.04	98%		
Sunita Crescent	165 A	166 A	11			0.68	37.4	61	4.00	1.00	0.68	1.27	0.36	1.36	44.62	200	83.9	1.70	1.38	43.26	97%		
Blackleaf Drive	166 A	167 A	2			0.26	6.8	608	3.93	9.80	0.26	10.66	2.98	12.78	45.09	300	70.7	0.20	0.62	32.31	72%	28%	38%
Blackleaf Drive	167 A	168 A	2			0.27	6.8	615	3.93	9.90	0.27	10.93	3.06	12.96	45.09	300	15.2	0.20	0.62	32.13	71%	29%	38%
Blackleaf Drive	168 A	170 A	6			0.50	20.4	636	3.92	10.21	0.50	11.43	3.20	13.41	45.09	300	53.1	0.20	0.62	31.68	70%	30%	38%
Sunita Crescent	173 A	172 A	10			0.68	34.0	34	4.00	0.56	0.68	0.68	0.19	0.75	27.60	200	65.0	0.65	0.85	26.85	97%		
Sunita Crescent	172 A	171 B	12			0.74	40.8	75	4.00	1.23	0.74	1.42	0.40	1.62	24.19	200	82.0	0.50	0.75	22.57	93%		
Sunita Crescent	171 B	171 A	2			0.25	6.8	82	4.00	1.34	0.25	1.67	0.47	1.81	19.36	200	12.0	0.32	0.60	17.55	91%		
Sunita Crescent	171 A	170 A	5			0.43	17.0	99	4.00	1.62	0.43	2.10	0.59	2.21	19.36	200	84.2	0.32	0.60	17.16	89%		
Blackleaf Drive	170 A	Ex Stub	5			0.49	17.0	751	3.88	11.94	0.49	14.02	3.93	15.86	55.24	300	74.5	0.30	0.76	39.37	71%	29%	38%

Where Q = average daily per capita flow (350 l/cap.d.) or (0.0041 l/sec./cap)  
 I = Unit of peak extraneous flow (0.28 l/sec/ha)  
 M = Residential Peaking factor = Harmon Peaking Factor,  $M = 1 + (14 / (4 + P^{0.5}))$ , where P = population in thousands  
 Population Density = 3.4 per single family, 2.7 per semi-detached and row townhouse units and 2.3 per stacked townhouse unit  
 Commercial, Office Space and School - Average flow 50,000 l/day/ha (0.578 l/s/ha) with Peaking Factor = 1.5  
 Undeveloped or Other Lands = 60 persons/gross hectare





**LEGEND:**

- SINGLE SERVICE LOCATION
- DRIVEWAY LOCATION
- STANDARD STREET CATCHBASIN
- REARYARD CB C/W TOP OF GRATE
- SINGLE CONNECTION BETWEEN PAIRS OF STREET CATCHBASINS
- CB WITH INLET CONTROL DEVICE

ICD TYPE      MAX. RELEASE RATE l/s

- TYPE A IPEX/PEDRO      20.0
- TYPE B IPEX/PEDRO      28.4
- TYPE C IPEX/PEDRO      37.0
- TYPE X PEDRO            13.4

- BARRIER CURB
- MOUNTABLE CURB
- DEPRESSED CURB
- PHASE LIMITS

**LEGEND:**

- AREA IN HECTARES
- POPULATION

14		
13		
12		
11		
10		
9		
8		
7	REVISED AS PER NEW LEGAL BLOCKS 331, 332, AND 333	LME 10:08:04
6	LOWER TEMPORARY MAJOR STORM RETENTION AREA BY 0.30m	LME 10:07:12
5	REVISED AS PER CITY COMMENTS	LME 10:07:08
4	REVISED AS PER CITY COMMENTS	LME 10:06:18
3	REVISED AS PER CITY COMMENTS	LME 10:05:19
2	REVISED AS PER CITY COMMENTS	LME 10:03:01
1	ISSUED FOR APPROVAL	LME 10:01:25
No.	REVISIONS	By Date

J:\2009-StonePh11\10 Drawing\11\10 SANITARY DRAINAGE AREA PLAN.dwg    11:50:17    Plot Size: A4    2009-01-14 11:50:17    Plot Scale: 1:1250    Plot Date: 2009-01-14 11:50:17    Plot Path: J:\2009-StonePh11\10 Drawing\11\10 SANITARY DRAINAGE AREA PLAN.dwg    Plot Name: 11:50:17



**IBI GROUP**      333 Preston Street  
 Tower 1, Suite 400  
 Ottawa, Ontario  
 Canada K1S 5N4  
 Tel (613)225-1311  
 FAX (613)225-9868

Project Title  
**STONEBRIDGE  
 PHASE 11**

LICENSED PROFESSIONAL ENGINEER  
 L. M. ERION  
 PROVINCE OF ONTARIO

Drawing Title  
**SANITARY DRAINAGE  
 AREA PLAN**

Scale  
 1:1250

Design	LME	Date	JANUARY 2010
Drawn	DPS	Checked	LME
Project No.	25099	Drawing No.	501

# **APPENDIX B**







IBI Group  
333 Preston Street - Suite 400  
Ottawa, Ontario  
K1S 5N4

### STORM SEWER DESIGN SHEET

PROJECT: Stonebridge Phase 11 & 12 Temporary Outlet  
LOCATION: City of Ottawa  
CLIENT: Monarch Corporation

LOCATION			AREA (Ha)								RATIONAL DESIGN FLOW						LEVEL OF SERVICE				SEWER DATA					AVAIL. CAP. (%)			
STREET	FROM MH	TO MH	C= 0.20	C= 0.30	C= 0.45	C= 0.70	C= 0.60	C= 0.80	INDIV. 2.78AC	ACCUM. 2.78AC	INLET (min.)	TIME IN PIPE	TOTAL (min.)	I (5 year) (mm/Hr)	I (10 year) (mm/Hr)	PEAK FLOW (L/s)	TOTAL PEAK FLOW (L/s)	AREA (ha) INDIV.	AREA (ha) ACCUM.	FLOW (L/s) INDIV.	FLOW (L/s) ACCUM.	CAP. (L/s)	LENGTH (M)	PIPE (mm)	SLOPE (%)	VEL. (M/s)	RATIONAL 5 YEAR	LEVEL OF SERVICE	
TEMPORARY OUTLET THROUGH PARK LANDS																													
Sunita Crescent (see Storm Sewer Design Sheet)																													
Stonebridge Phase 11 & 12	170	171								38.03	37.22	1.20	38.42	46.48			1,767.69	1,767.69	0.00	25.50	0.00	2,167.50	2,331.26	92.2	1500	0.10	1.278	24.17%	7.02%
Temporary Outlet Block 335	171	300A								0.00	38.03	0.57	38.99	45.46			1,728.71	1,728.71	0.00	25.50	0.00	2,167.50	2,226.68	51.3	1350	0.16	1.507	22.36%	2.66%
Park	300A	300								0.00	38.03	0.24	39.23	44.99			1,710.97	1,710.97	0.00	25.50	0.00	2,167.50	2,226.68	21.7	1350	0.16	1.507	23.16%	2.66%
Park	300	301	2.18					0.76	3.51	41.54	38.99	1.01	40.00	44.99			1,868.89	1,868.89	2.94	28.44	249.90	2,417.40	2,489.69	102.5	1350	0.20	1.685	24.93%	2.90%
Park	301	301A								0.00	41.54	0.33	40.33	44.18			1,985.32	1,985.32	0.00	28.44	0.00	2,567.40	2,783.72	37.0	1350	0.25	1.884	28.68%	7.77%
Park	301A	302								0.00	41.54	0.58	40.91	43.93			1,974.79	1,974.79	0.00	28.44	0.00	2,567.40	2,783.72	65.0	1350	0.25	1.884	29.06%	7.77%
Park	302	303					2.43	2.74	10.15	51.69	40.33	0.67	41.00	43.93			2,420.66	2,420.66	5.17	33.61	439.45	3,006.85	3,761.39	82.9	1500	0.26	2.062	35.64%	20.06%
Cambrian Road	303	304				0.73				1.42	1.42	41.00	1.27	42.27	50.70	71.99		0.73	0.73	175.20									
										51.69	41.00			43.42			2,394.31	2,466.30	0.73	34.34	62.05	3,244.10	3,793.06	110.0	1800	0.10	1.444	34.98%	14.47%
Cambrian Road	304	Ex. 177								1.42	42.27	1.19	43.46	49.60	70.43			0.00	0.73	0.00									
										51.69	42.27			42.49			2,346.17	2,416.61	0.00	34.34	0.00	3,244.10	3,793.06	103.2	1800	0.10	1.444	36.29%	14.47%
Designed:	LME																												
Checked:																													
Dwg. Reference:	File Ref:	Date:	Revision	Date	Sheet No:	Level of Service= 5 Year 85.00 L/s/Ha 10 Year 240.00 L/s/Ha  Mannings Coefficient (n) = 0.013  150 l/s added for major system retention area release flow																							
	25099- 5.7	04/08/2010			1 of 1	Q = 2.78AIC, where: Q = Peak Flow in Litres per Second (l/s) A = Area in Hectares (ha.) I = Rainfall Intensity in Millimeters per Hour (mm/hr) [I=998.071/((TC+6.053)^0.814)]																							





FRICITION LOSS BLACKLEAF DRIVE	FROM MH	TO MH	PIPE ID						
INVERT ELEVATION (m)	170	168							
	90.760	90.818							
DIAMETER (mm)	1500			DIA	AREA	PERIM.	HYD.R.	VEL.	Q
LENGHT (m)	56.6			(m)	(M2)	(m)	(m)	(m/s)	(l/s)
OBVERT ELEVATION (m)	92.284	92.342		1.524	1.82	4.79	0.38	1.29	2360.12
FLOW (l/s)	2,094.4								
HGL (m)	92.421	92.467							
MANHOLE LOSS (m)	0.010								
TOTAL HGL (m)		92.477							
MAX. SURCHARGE (mm)		135							

FRICITION LOSS BLACKLEAF DRIVE	FROM MH	TO MH	PIPE ID						
INVERT ELEVATION (m)	168	167							
	90.838	90.855							
DIAMETER (mm)	1500			DIA	AREA	PERIM.	HYD.R.	VEL.	Q
LENGHT (m)	17.1			(m)	(M2)	(m)	(m)	(m/s)	(l/s)
OBVERT ELEVATION (m)	92.362	92.379		1.524	1.82	4.79	0.38	1.28	2326.06
FLOW (l/s)	2,094.4								
HGL (m)	92.477	92.491							
MANHOLE LOSS (m)	0.010								
TOTAL HGL (m)		92.501							
MAX. SURCHARGE (mm)		122							

FRICITION LOSS BLACKLEAF DRIVE	FROM MH	TO MH	PIPE ID						
INVERT ELEVATION (m)	167	166							
	90.885	90.958							
DIAMETER (mm)	1500			DIA	AREA	PERIM.	HYD.R.	VEL.	Q
LENGHT (m)	73.1			(m)	(M2)	(m)	(m)	(m/s)	(l/s)
OBVERT ELEVATION (m)	92.409	92.482		1.524	1.82	4.79	0.38	1.28	2328.61
FLOW (l/s)	2,073.2								
HGL (m)	92.501	92.559							
MANHOLE LOSS (m)	0.009								
TOTAL HGL (m)		92.568							
MAX. SURCHARGE (mm)		86							

FRICITION LOSS BLACKLEAF DRIVE	FROM MH	TO MH	PIPE ID						
INVERT ELEVATION (m)	166	161							
	90.958	91.025							
DIAMETER (mm)	1500			DIA	AREA	PERIM.	HYD.R.	VEL.	Q
LENGHT (m)	66.5			(m)	(M2)	(m)	(m)	(m/s)	(l/s)
OBVERT ELEVATION (m)	92.482	92.549		1.524	1.82	4.79	0.38	1.28	2339.24
FLOW (l/s)	1,904.6								
HGL (m)	92.568	92.612							
MANHOLE LOSS (m)	0.008								
TOTAL HGL (m)		92.620							
MAX. SURCHARGE (mm)		71							

FRICITION LOSS BLACKLEAF DRIVE	FROM MH	TO MH	PIPE ID						
INVERT ELEVATION (m)	161	155							
	91.025	91.097							
DIAMETER (mm)	1500			DIA	AREA	PERIM.	HYD.R.	VEL.	Q
LENGHT (m)	72.1			(m)	(M2)	(m)	(m)	(m/s)	(l/s)
OBVERT ELEVATION (m)	92.549	92.621		1.524	1.82	4.79	0.38	1.28	2328.90
FLOW (l/s)	1,785.9								
HGL (m)	92.620	92.662							
MANHOLE LOSS (m)	0.007								
TOTAL HGL (m)		92.669							
MAX. SURCHARGE (mm)		48							

FRICITION LOSS BLACKLEAF DRIVE	FROM MH	TO MH	PIPE ID						
INVERT ELEVATION (m)	155	154							
	91.124	91.188							
DIAMETER (mm)	1500			DIA	AREA	PERIM.	HYD.R.	VEL.	Q
LENGHT (m)	63.8			(m)	(M2)	(m)	(m)	(m/s)	(l/s)
OBVERT ELEVATION (m)	92.648	92.712		1.524	1.82	4.79	0.38	1.28	2334.49
FLOW (l/s)	1,706.8								
HGL (m)	92.669	92.704							
MANHOLE LOSS (m)	0.000								
TOTAL HGL (m)		92.704							
MAX. SURCHARGE (mm)		-8							

STONEBRIDGE PHASE 11 - BLOCK 333

HGL CALCULATION - 100 YEAR

FRICTION LOSS		FROM MH	TO MH	PIPE ID	MANNING FORMULA - FLOWING FULL						
RANNOCK PRIVATE		166	162								
INVERT ELEVATION (m)		92.100	92.388								
DIAMETER (mm)					375	DIA	AREA	PERIM.	HYD.R.	VEL.	Q
LENGHT (m)					96.0	(m)	(M2)	(m)	(m)	(m/s)	(l/s)
OBVERT ELEVATION (m)		92.481	92.769		0.381	0.11	1.20	0.10	0.88	100.12	
FLOW (l/s)					72.9						
HGL (m)		92.570	92.723								
MANHOLE LOSS (m)											
TOTAL HGL (m)			92.723								
MAX. SURCHARGE (mm)			-46								
FRICTION LOSS		FROM MH	TO MH	PIPE ID							
PARK		161	160								
INVERT ELEVATION (m)		92.168	92.411								
DIAMETER (mm)					375	DIA	AREA	PERIM.	HYD.R.	VEL.	Q
LENGHT (m)					81.0	(m)	(M2)	(m)	(m)	(m/s)	(l/s)
OBVERT ELEVATION (m)		92.549	92.792		0.381	0.11	1.20	0.10	0.88	100.12	
FLOW (l/s)					57.0						
HGL (m)		92.620	92.699								
MANHOLE LOSS (m)											
TOTAL HGL (m)			92.699								
MAX. SURCHARGE (mm)			-93								

STONEBRIDGE PHASE 10S - TEMPORARY OUTLET

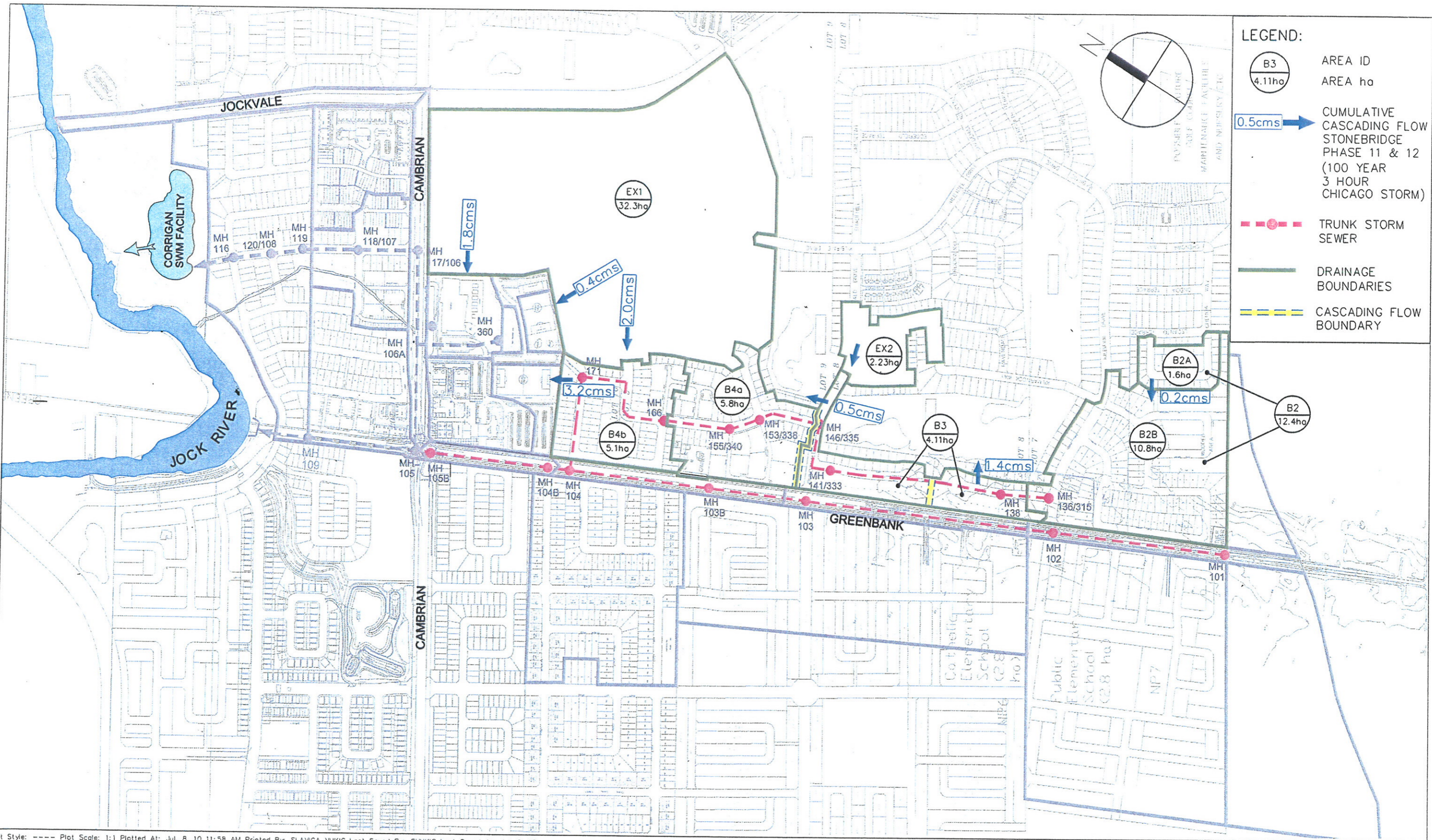
HGL CALCULATION - 100 YEAR

FRICION LOSS PARK	FROM MH	TO MH	PIPE ID	MANNING FORMULA - FLOWING FULL					
INVERT ELEVATION (m)	303	302							
	89.605	89.824							
DIAMETER (mm)	1500			DIA	AREA	PERIM.	HYD.R.	VEL.	Q
LENGHT (m)	82.9			(m)	(M2)	(m)	(m)	(m/s)	(l/s)
OBVERT ELEVATION (m)	91.129	91.348		1.524	1.82	4.79	0.38	2.08	3788.64
FLOW (l/s)	3,006.0								
HGL (m)	91.300	91.438							
MANHOLE LOSS (m)	0.022								
TOTAL HGL (m)		91.460							
MAX. SURCHARGE (mm)		112							
FRICION LOSS PARK	FROM MH	TO MH	PIPE ID						
INVERT ELEVATION (m)	302	301A							
	89.976	90.139							
DIAMETER (mm)	1350			DIA	AREA	PERIM.	HYD.R.	VEL.	Q
LENGHT (m)	65.0			(m)	(M2)	(m)	(m)	(m/s)	(l/s)
OBVERT ELEVATION (m)	91.348	91.511		1.372	1.48	4.31	0.34	1.89	2786.96
FLOW (l/s)	2,566.6								
HGL (m)	91.460	91.598							
MANHOLE LOSS (m)	0.023								
TOTAL HGL (m)		91.621							
MAX. SURCHARGE (mm)		111							
FRICION LOSS PARK	FROM MH	TO MH	PIPE ID						
INVERT ELEVATION (m)	301A	301							
	90.139	90.231							
DIAMETER (mm)	1350			DIA	AREA	PERIM.	HYD.R.	VEL.	Q
LENGHT (m)	37.0			(m)	(M2)	(m)	(m)	(m/s)	(l/s)
OBVERT ELEVATION (m)	91.511	91.603		1.372	1.48	4.31	0.34	1.88	2775.15
FLOW (l/s)	2,566.6								
HGL (m)	91.621	91.700							
MANHOLE LOSS (m)	0.022								
TOTAL HGL (m)		91.722							
MAX. SURCHARGE (mm)		119							
FRICION LOSS PARK	FROM MH	TO MH	PIPE ID						
INVERT ELEVATION (m)	301	300							
	90.231	90.436							
DIAMETER (mm)	1350			DIA	AREA	PERIM.	HYD.R.	VEL.	Q
LENGHT (m)	102.5			(m)	(M2)	(m)	(m)	(m/s)	(l/s)
OBVERT ELEVATION (m)	91.603	91.808		1.372	1.48	4.31	0.34	1.69	2488.90
FLOW (l/s)	2,416.6								
HGL (m)	91.722	91.915							
MANHOLE LOSS (m)	0.018								
TOTAL HGL (m)		91.933							
MAX. SURCHARGE (mm)		126							

FRICITION LOSS PARK	FROM MH	TO MH	PIPE ID						
INVERT ELEVATION (m)	300	171							
	90.436	90.551							
DIAMETER (mm)	1350			DIA	AREA	PERIM.	HYD.R.	VEL.	Q
LENGHT (m)	71.9			(m)	(M2)	(m)	(m)	(m/s)	(l/s)
OBVERT ELEVATION (m)	91.808	91.923		1.372	1.48	4.31	0.34	1.51	2225.29
FLOW (l/s)	2,166.7								
HGL (m)	91.933	92.042							
MANHOLE LOSS (m)	0.000								
TOTAL HGL (m)		92.042							
MAX. SURCHARGE (mm)		120							



j:\13931\_CorriganSWM\5.9 Drawings\59civil\current\Servicing Figures\25099-SK-1.dwg Layout Name: sk-1



**LEGEND:**

- B3  
4.11ho AREA ID
- EX1  
32.3ho AREA ho
- 0.5cms CUMULATIVE CASCADING FLOW STONEBRIDGE PHASE 11 & 12 (100 YEAR 3 HOUR CHICAGO STORM)
- - - TRUNK STORM SEWER
- DRAINAGE BOUNDARIES
- - - CASCADING FLOW BOUNDARY

Plot Style: ----- Plot Scale: 1:1 Plotted At: Jul. 8, 10 11:58 AM Printed By: SLAVICA VUKIC Last Saved By: SVUKIC Last Saved At: Jul. 8, 10

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00001> =====
00002>
00003> SSSSS W W M M H H Y Y M M OOO 999 999 =====
00004> S W W W MM MM H H Y Y MM MM O O 9 9 9 9
00005> SSSSS W W W M M M H H H H Y M M M O O ## 9 9 9 9 Ver. 4.02
00006> S W W M M H H Y M M O O 9999 9999 July 1999
00007> SSSSS W W M M H H Y M M OOO 9 9 =====
00008> 9 9 9 9 # 3699242
00009> StormWater Management HYdrologic Model 999 999 =====
00010>
00011> *****
00012> ***** SWMHYMO-99 Ver/4.02 *****
00013> ***** A single event and continuous hydrologic simulation model *****
00014> ***** based on the principles of HYMO and its successors *****
00015> ***** OTTHYMO-83 and OTTHYMO-89. *****
00016> *****
00017> ***** Distributed by: J.F. Sabourin and Associates Inc. *****
00018> ***** Ottawa, Ontario: (613) 727-5199 *****
00019> ***** Gatineau, Quebec: (819) 243-6858 *****
00020> ***** E-Mail: swmhymo@jfsa.Com *****
00021> *****
00022>
00023> ++++++
00024> ++++++ Licensed user: Cumming Cockburn Limited ++++++
00025> ++++++ Ottawa SERIAL#:3699242 ++++++
00026> ++++++
00027>
00028> *****
00029> ***** ++++++ PROGRAM ARRAY DIMENSIONS ++++++ *****
00030> ***** Maximum value for ID numbers : 10 *****
00031> ***** Max. number of rainfall points: 15000 *****
00032> ***** Max. number of flow points : 15000 *****
00033> *****
00034>
00035>
00036> ***** D E T A I L E D O U T P U T *****
00037> *****
00038> * DATE: 2010-06-15 TIME: 15:52:02 RUN COUNTER: 004270 *
00039> *****
00040> * Input filename: D:\MYDOCU~1\13931C~1\SWMHYMO\JUNE20~1\MRCsub01.dat *
00041> * Output filename: D:\MYDOCU~1\13931C~1\SWMHYMO\JUNE20~1\MRCsub01.out *
00042> * Summary filename: D:\MYDOCU~1\13931C~1\SWMHYMO\JUNE20~1\MRCsub01.sum *
00043> * User comments: *
00044> * 1: _____ *
00045> * 2: _____ *
00046> * 3: _____ *
00047> *****
00048>
00049> -----
00050> 001:0001-----
00051> *#*****
00052> *# Project Name: Corrigan SWM Facility
00053> *# Project Number: 13931
00054> *# Date :
00055> *# Modeller :
00056> *# Company : Cumming Cockburn Limited
00057> *# License # : 3699242
00058> *#*****
00059> *
00060> *
00061> -----
00062> | START | Project dir.: D:\MYDOCU~1\13931C~1\SWMHYMO\JUNE20~1\
00063> ----- Rainfall dir.: D:\MYDOCU~1\13931C~1\SWMHYMO\JUNE20~1\
00064> TZERO = .00 hrs on 0
00065> METOUT= 2 (output = METRIC)
00066> NRUN = 001

```

```

00067> NSTORM= 0
00068> -----
00069> 001:0002-----
00070> *
00071> *# 2010-06 MAJOR FLOW - STONEBRIDGE PHASES 11 AND 12
00072> *# PARAMETERS REVISED TO REFLECT DETAILED DESIGN
00073> *
00074> *
00075> *#=====
00076> *#=====
00077> *# 100 YEAR 3 HOUR CHICAGO STORM - 10 MIN TIME STEP
00078> *#=====
00079> *#=====
00080> *
00081> -----
00082> | READ STORM | Filename: D:\MYDOCU~1\13931C~1\SWMHYMO\JUNE20~1\CH
00083> | Ptotal= 71.68 mm| Comments: CHICAGO 3 HOUR 10 MIN 100 YEAR STORM
00084> -----
00085> TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
00086> hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
00087> .17 6.050 | 1.00 178.560 | 1.83 11.050 | 2.67 5.760
00088> .33 7.540 | 1.17 54.040 | 2.00 9.280 | 2.83 5.280
00089> .50 10.170 | 1.33 27.310 | 2.17 8.020 | 3.00 4.880
00090> .67 15.980 | 1.50 18.230 | 2.33 7.080 |
00091> .83 40.760 | 1.67 13.730 | 2.50 6.340 |
00092>
00093> -----
00094> 001:0003-----
00095> *
00096> *#=====
00097> *# AREA B2 (RESIDENTIAL)
00098> *# MH 136/315
00099> *# Note: Overflow to external drainage area
00100> *#=====
00101> *
00102> -----
00103> | CALIB STANDHYD | Area (ha)= 12.40
00104> | 01:000210 DT= 2.00 | Total Imp(%)= 40.00 Dir. Conn.(%)= 40.00
00105> -----
00106> IMPERVIOUS PERVIOUS (i)
00107> Surface Area (ha)= 4.96 7.44
00108> Dep. Storage (mm)= .80 1.50
00109> Average Slope (%)= .50 2.00
00110> Length (m)= 394.00 40.00
00111> Mannings n = .013 .250
00112>
00113> Max.eff.Inten.(mm/hr)= 178.56 65.59
00114> over (min) 6.00 14.00
00115> Storage Coeff. (min)= 5.68 (ii) 14.03 (ii)
00116> Unit Hyd. Tpeak (min)= 6.00 14.00
00117> Unit Hyd. peak (cms)= .19 .08
00118>
00119> PEAK FLOW (cms)= 1.96 .84 *TOTALS*
00120> TIME TO PEAK (hrs)= 1.03 1.20 2.446 (iii)
00121> RUNOFF VOLUME (mm)= 70.88 33.72 48.583
00122> TOTAL RAINFALL (mm)= 71.68 71.68 71.677
00123> RUNOFF COEFFICIENT = .99 .47 .678
00124>
00125> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00126> CN* = 77.0 Ia = Dep. Storage (Above)
00127> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00128> THAN THE STORAGE COEFFICIENT.
00129> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00130>
00131> -----
00132> 001:0004-----

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```

00133> *
00134> *
00135> -----
00136> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
00137> | IN>01:(000210) |
00138> | OUT<07:(000110) |
00139> -----
00140> OUTFLOW STORAGE | OUTFLOW STORAGE
00141> (cms) (ha.m.) | (cms) (ha.m.)
00142> .000 .0000E+00 | 1.064 .5400E-01
00143> 1.054 .1000E-03 | .000 .0000E+00
00144>
00145> ROUTING RESULTS AREA QPEAK TPEAK R.V.
00146> ----- (ha) (cms) (hrs) (mm)
00147> INFLOW >01: (000210) 12.40 2.446 1.033 48.583
00148> OUTFLOW<07: (000110) 10.85 1.064 1.067 48.583
00149> OVERFLOW<09: (000106) 1.55 1.358 1.067 48.583
00150>
00151> TOTAL NUMBER OF SIMULATED OVERFLOWS = 2
00152> CUMULATIVE TIME OF OVERFLOWS (hours)= .32
00153> PERCENTAGE OF TIME OVERFLOWING (%)= 5.49
00154>
00155> PEAK FLOW REDUCTION [Qout/Qin](%)= 43.514
00156> TIME SHIFT OF PEAK FLOW (min)= 2.00
00157> MAXIMUM STORAGE USED (ha.m.)=.5377E-01
00158>
00159> -----
00160> 001:0005-----
00161> *
00162> -----
00163> | DIVERT HYD |
00164> | INID=09 (000106)|
00165> -----
00166> Outflow / Inflow Relationships
00167> Flow 01 + Flow 04 = Total
00168> (cms) (cms) (cms)
00169> .000 .000 .000
00170> .197 1.161 1.358
00171>
00172> NHYD AREA QPEAK TpeakDate_hh:mm R.V. NFE WetHrs
00173> (ha) (cms) (mm) (hrs)
00174> IDin = 09:000106 1.55 1.358 No_date 1:04 48.583 2 0.
00175> -----
00176> IDout= 01:000101 .23 .197 No_date 1:04 48.583 2 0.
00177> IDout= 04:000102 1.33 1.161 No_date 1:04 48.583 2 0.
00178> -----
00179> 001:0006-----
00180> *
00181> *
00182> *
00183> *#=====
00184> *# AREA B3 (RESIDENTIAL)
00185> *# MH 141/333
00186> *# Note: Overflow to external drainage area
00187> *#=====
00188> *
00189> -----
00190> | CALIB STANDHYD | Area (ha)= 4.11
00191> | 01:000210 DT= 2.00 | Total Imp(%)= 40.00 Dir. Conn.(%)= 40.00
00192> -----
00193> IMPERVIOUS PERVIOUS (i)
00194> Surface Area (ha)= 1.64 2.47
00195> Dep. Storage (mm)= .80 1.50
00196> Average Slope (%)= .50 2.00
00197> Length (m)= 350.00 40.00
00198> Mannings n = .013 .250

```

```

00199>
00200> Max.eff.Inten.(mm/hr)= 178.56 65.59
00201> over (min) 6.00 14.00
00202> Storage Coeff. (min)= 5.29 (ii) 13.64 (ii)
00203> Unit Hyd. Tpeak (min)= 6.00 14.00
00204> Unit Hyd. peak (cms)= .20 .08
00205>
00206> PEAK FLOW (cms)= .66 .28 .826 (iii)
00207> TIME TO PEAK (hrs)= 1.03 1.20 1.033
00208> RUNOFF VOLUME (mm)= 70.88 33.72 48.583
00209> TOTAL RAINFALL (mm)= 71.68 71.68 71.677
00210> RUNOFF COEFFICIENT = .99 .47 .678

```

```

00211>
00212> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00213> CN* = 77.0 Ia = Dep. Storage (Above)
00214> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00215> THAN THE STORAGE COEFFICIENT.
00216> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00217>

```

```

00218> -----
00219> 001:0007-----

```

```

00220> *
00221> *
00222> -----
00223> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
00224> | IN>01:(000210) |
00225> | OUT<04:(000110) | ===== OUTFLOW STORAGE TABLE =====
00226> -----
00227> OUTFLOW STORAGE | OUTFLOW STORAGE
00228> (cms) (ha.m.) | (cms) (ha.m.)
00229> .000 .0000E+00 | .352 .2572E-01
00230> .349 .1000E-03 | .000 .0000E+00

```

```

00231> ROUTING RESULTS AREA QPEAK TPEAK R.V.
00232> ----- (ha) (cms) (hrs) (mm)
00233> INFLOW >01: (000210) 4.11 .826 1.033 48.583
00234> OUTFLOW<04: (000110) 3.74 .352 1.117 48.583
00235> OVERFLOW<08: (000106) .37 .366 1.117 48.583

```

```

00236>
00237> TOTAL NUMBER OF SIMULATED OVERFLOWS = 2
00238> CUMULATIVE TIME OF OVERFLOWS (hours)= .27
00239> PERCENTAGE OF TIME OVERFLOWING (%)= 4.91

```

```

00240>
00241>
00242> PEAK FLOW REDUCTION [Qout/Qin](%)= 42.630
00243> TIME SHIFT OF PEAK FLOW (min)= 5.00
00244> MAXIMUM STORAGE USED (ha.m.)=.2565E-01
00245>

```

```

00246> -----
00247> 001:0008-----

```

```

00248> *
00249> -----

```

```

00250> | DIVERT HYD |
00251> | INID=08 (000106)|
00252> -----
00253> Outflow / Inflow Relationships
00254> Flow 01 + Flow 10 = Total
00255> (cms) (cms) (cms)
00256> .000 .000 .000
00257> .142 .224 .366

```

```

00258>
00259> NHYD AREA QPEAK TpeakDate_hh:mm R.V. NFE WetHrs
00260> (ha) (cms) (mm) (hrs)
00261> IDin = 08:000106 .37 .366 No_date 1:07 48.583 2 0.
00262> =====
00263> IDout= 01:000101 .14 .142 No_date 1:07 48.583 2 0.
00264> IDout= 10:000102 .23 .224 No_date 1:07 48.583 2 0.

```

```

00265> -----
00266> 001:0009-----
00267> *
00268> *#=====
00269> *# ADDING OVERFLOW FROM B2
00270> *#=====
00271> *
00272> -----
00273> | ADD HYD (000107) | ID: NHYD      AREA      QPEAK      TPEAK      R.V.      DWF
00274> -----
00275>                ID1 01:000101      .14      .142      1.12      48.58      .000
00276>                +ID2 09:000106      1.55      1.358      1.07      48.58      .000
00277>                -----
00278>                SUM 08:000107      1.70      1.358      1.07      48.58      .000
00279>
00280> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00281>
00282> -----
00283> 001:0010-----
00284> *
00285> *
00286> *
00287> *#=====
00288> *# EXTERNAL LANDS (STONEBRIDGE)
00289> *# Note: Minor and overflow to external area
00290> *# (minor tributary to Jockvale SWM Facility)
00291> *#=====
00292> *
00293> -----
00294> | CALIB STANDHYD | Area (ha)= 2.23
00295> | 01:000210 DT= 2.00 | Total Imp(%)= 54.00 Dir. Conn.(%)= 41.00
00296> -----
00297>                IMPERVIOUS      PERVIOUS (i)
00298> Surface Area (ha)= 1.20 1.03
00299> Dep. Storage (mm)= .80 1.50
00300> Average Slope (%)= .50 2.00
00301> Length (m)= 223.00 40.00
00302> Mannings n = .013 .250
00303>
00304> Max.eff.Inten.(mm/hr)= 178.56 118.07
00305> over (min) 4.00 10.00
00306> Storage Coeff. (min)= 4.04 (ii) 10.64 (ii)
00307> Unit Hyd. Tpeak (min)= 4.00 10.00
00308> Unit Hyd. peak (cms)= .28 .11
00309>
00310> PEAK FLOW (cms)= .41 .20 *TOTALS*
00311> TIME TO PEAK (hrs)= 1.00 1.13 1.000
00312> RUNOFF VOLUME (mm)= 70.88 38.34 51.680
00313> TOTAL RAINFALL (mm)= 71.68 71.68 71.677
00314> RUNOFF COEFFICIENT = .99 .53 .721
00315>
00316> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00317> CN* = 77.0 Ia = Dep. Storage {Above}
00318> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00319> THAN THE STORAGE COEFFICIENT.
00320> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00321>
00322> -----
00323> 001:0011-----
00324> *
00325> *
00326> -----
00327> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
00328> | IN>01:(000210) |
00329> | OUT<02:(000110) | ===== OUTFLOW STORAGE TABLE =====
00330> ----- OUTFLOW STORAGE | OUTFLOW STORAGE

```

	(cms)	(ha.m.)		(cms)	(ha.m.)
00331>					
00332>	.000	.0000E+00		.180	.2480E-02
00333>	.178	.1000E-03		.000	.0000E+00

	ROUTING RESULTS	AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
00335>	INFLOW >01: (000210)	2.23	.546	1.000	51.680
00338>	OUTFLOW<02: (000110)	1.64	.180	.933	51.680
00339>	OVERFLOW<09: (000106)	.59	.365	1.017	51.680

00340>

00341>	TOTAL NUMBER OF SIMULATED OVERFLOWS =	2
00342>	CUMULATIVE TIME OF OVERFLOWS (hours)=	.45
00343>	PERCENTAGE OF TIME OVERFLOWING (%)=	9.41

00345>	PEAK FLOW REDUCTION [Qout/Qin](%)=	32.991
00346>	TIME SHIFT OF PEAK FLOW (min)=	-4.00
00347>	MAXIMUM STORAGE USED (ha.m.)=	.2460E-02

00350> -----

00351> 001:0012-----

00352> \*

00353> \*#=====

00354> \*# ADDING OVERFLOW FROM B3, EXTERNAL LANDS

00355> \*#=====

00356> \*

	ADD HYD (000107)   ID: NHYD	AREA	QPEAK	TPEAK	R.V.	DWF
		(ha)	(cms)	(hrs)	(mm)	(cms)
00357>						
00358>	ID1 10:000102	.23	.224	1.12	48.58	.000
00359>	+ID2 09:000106	.59	.365	1.02	51.68	.000
00360>						
00361>						
00362>						
00363>	SUM 01:000107	.82	.462	1.12	50.82	.000

00364>

00365> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

00366> -----

00367> 001:0013-----

00368> \*

00369> \*#=====

00370> \*# ADDING MINOR FLOW FROM B2, B3

00371> \*#=====

00372> \*

00373> \*

	ADD HYD (000107)   ID: NHYD	AREA	QPEAK	TPEAK	R.V.	DWF
		(ha)	(cms)	(hrs)	(mm)	(cms)
00374>						
00375>	ID1 04:000110	3.74	.352	1.12	48.58	.000
00376>	+ID2 07:000110	10.85	1.064	1.07	48.58	.000
00377>						
00378>						
00379>						
00380>	SUM 10:000107	14.59	1.416	1.12	48.58	.000

00381>

00382> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

00383> -----

00384> 001:0014-----

00385> \*

00386> \*#=====

00387> \*# AREA B4A (RESIDENTIAL)

00388> \*# MH 155/340

00389> \*# Note: Overflow routed to B6B

00390> \*#=====

00391> \*

00392> \*

00393>						
00394>	CALIB STANDHYD	Area (ha)=	5.80			
00395>	01:000210 DT= 2.00	Total Imp(%)=	49.00	Dir. Conn.(%)=	49.00	

```

00397>
00398> Surface Area (ha)= IMPERVIOUS 2.84 PERVIOUS (i) 2.96
00399> Dep. Storage (mm)= .80 1.50
00400> Average Slope (%)= .50 2.00
00401> Length (m)= 263.00 40.00
00402> Mannings n = .013 .250
00403>
00404> Max.eff.Inten.(mm/hr)= 178.56 71.11
00405> over (min) 4.00 12.00
00406> Storage Coeff. (min)= 4.46 (ii) 12.54 (ii)
00407> Unit Hyd. Tpeak (min)= 4.00 12.00
00408> Unit Hyd. peak (cms)= .26 .09
00409>
00410> PEAK FLOW (cms)= 1.25 .36 *TOTALS* 1.441 (iii)
00411> TIME TO PEAK (hrs)= 1.00 1.17 1.000
00412> RUNOFF VOLUME (mm)= 70.88 33.72 51.927
00413> TOTAL RAINFALL (mm)= 71.68 71.68 71.677
00414> RUNOFF COEFFICIENT = .99 .47 .724
00415>

```

```

00416> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00417> CN* = 77.0 Ia = Dep. Storage (Above)
00418> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00419> THAN THE STORAGE COEFFICIENT.
00420> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00421>

```

00422> -----

00423> 001:0015-----

```

00424> *
00425> *
00426> -----

```

00427> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.

00428> | IN>01:(000210) |

00429> | OUT<04:(000110) |

```

00430> -----
00431> | OUTFLOW STORAGE | OUTFLOW STORAGE |
00432> | (cms) (ha.m.) | (cms) (ha.m.) |
00433> | .000 .0000E+00 | .498 .1957E-01 |
00434> | .494 .1000E-03 | .000 .0000E+00 |

```

```

00435> ROUTING RESULTS AREA QPEAK TPEAK R.V.
00436> ----- (ha) (cms) (hrs) (mm)
00437> INFLOW >01: (000210) 5.80 1.441 1.000 51.927
00438> OUTFLOW<04: (000110) 4.66 .498 .983 51.927
00439> OVERFLOW<08: (000106) 1.14 .934 1.017 51.927

```

```

00441> TOTAL NUMBER OF SIMULATED OVERFLOWS = 2
00442> CUMULATIVE TIME OF OVERFLOWS (hours)= .37
00443> PERCENTAGE OF TIME OVERFLOWING (%)= 6.96
00444>

```

```

00445>
00446> PEAK FLOW REDUCTION [Qout/Qin] (%)= 34.570
00447> TIME SHIFT OF PEAK FLOW (min)= -1.00
00448> MAXIMUM STORAGE USED (ha.m.)=.1946E-01
00449>

```

00450> -----

00451> 001:0016-----

```

00452> *
00453> *
00454> *

```

```

00455> *#=====
00456> *# ADDING MINOR FLOW FROM B2, B3, B4A
00457> *#=====
00458> *

```

```

00459> -----
00460> | ADD HYD (000107) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00461> | (ha) (cms) (hrs) (mm) (cms)
00462> ID1 10:000107 14.59 1.416 1.12 48.58 .000

```



```

00463> +ID2 04:000110 4.66 .498 .98 51.93 .000
00464> =====
00465> SUM 01:000107 19.25 1.914 1.12 49.39 .000
00466>

```

00467> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

00468>
00469> -----
00470> 001:0017-----

```

```

00471> *
00472> *#=====
00473> *# AREA B4B (RESIDENTIAL)
00474> *# MH 171
00475> *# Note: Overflow routed to B6B
00476> *#=====
00477> *

```

```

00478> -----
00479> | CALIB STANDHYD | Area (ha)= 5.08
00480> | 04:000210 DT= 2.00 | Total Imp(%)= 39.00 Dir. Conn.(%)= 39.00
00481> -----

```

	IMPERVIOUS	PERVIOUS (i)	
00482> Surface Area (ha)=	1.98	3.10	
00483> Dep. Storage (mm)=	.80	1.50	
00484> Average Slope (%)=	.50	2.00	
00485> Length (m)=	307.00	40.00	
00486> Mannings n =	.013	.250	
00487> Max.eff.Inten.(mm/hr)=	178.56	65.59	
00488> over (min)	4.00	14.00	
00489> Storage Coeff. (min)=	4.89 (ii)	13.24 (ii)	
00490> Unit Hyd. Tpeak (min)=	4.00	14.00	
00491> Unit Hyd. peak (cms)=	.24	.08	
00492> PEAK FLOW (cms)=	.85	.36	1.014 (iii)
00493> TIME TO PEAK (hrs)=	1.00	1.20	1.000
00494> RUNOFF VOLUME (mm)=	70.88	33.72	48.211
00495> TOTAL RAINFALL (mm)=	71.68	71.68	71.677
00496> RUNOFF COEFFICIENT =	.99	.47	.673

\*TOTALS\*

```

00500>
00501> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00502> CN* = 77.0 Ia = Dep. Storage (Above)
00503> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00504> THAN THE STORAGE COEFFICIENT.
00505> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00506>

```

```

00507> -----
00508> 001:0018-----

```

```

00509> *
00510> *
00511> -----
00512> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
00513> | IN>04:(000210) |
00514> | OUT<10:(000110) |

```

```

00515> ===== OUTFLOW STORAGE TABLE =====
00516> OUTFLOW STORAGE | OUTFLOW STORAGE
00517> (cms) (ha.m.) | (cms) (ha.m.)
00518> .000 .0000E+00 | .436 .1848E-01
00519> .432 .1000E-03 | .000 .0000E+00

```

```

00520> ROUTING RESULTS AREA QPEAK TPEAK R.V.
00521> ----- (ha) (cms) (hrs) (mm)
00522> INFLOW >04: (000210) 5.08 1.014 1.000 48.211
00523> OUTFLOW<10: (000110) 4.39 .436 1.033 48.211
00524> OVERFLOW<07: (000106) .69 .574 1.033 48.211

```

```

00525>
00526> TOTAL NUMBER OF SIMULATED OVERFLOWS = 1
00527> CUMULATIVE TIME OF OVERFLOWS (hours)= .33
00528> PERCENTAGE OF TIME OVERFLOWING (%)= 6.15

```

```

00529>
00530>
00531>          PEAK FLOW REDUCTION [Qout/Qin] (%)= 43.016
00532>          TIME SHIFT OF PEAK FLOW (min)= 2.00
00533>          MAXIMUM STORAGE USED (ha.m.)=.1842E-01
00534>

```

```

-----
00536> 001:0019-----
00537> *
00538> *
00539> *
00540> *#=====
00541> *# ADDING MINOR FLOW FROM B2, B3, B4A, B4B
00542> *#=====
00543> *

```

```

-----
00544> | ADD HYD (000107) | ID: NHYD      AREA      QPEAK      TPEAK      R.V.      DWF
00546> -----
00547>          ID1 10:000110      4.39      .436      1.03      48.21      .000
00548>          +ID2 01:000107      19.25      1.914      1.12      49.39      .000
00549>          =====
00550>          SUM 04:000107      23.63      2.351      1.12      49.17      .000

```

```

00551>
00552> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00553>

```

```

-----
00555> 001:0020-----
00556> *
00557> *#=====
00558> *# ADDING FLOW FROM B1, A1-A7 TO FLOW FROM B2-B4
00559> *#=====
00560> *

```

```

-----
00561> | ADD HYD (000107) | ID: NHYD      AREA      QPEAK      TPEAK      R.V.      DWF
00563> -----
00564>          ID1 04:000107      23.63      2.351      1.12      49.17      .000
00565>          +ID2 02:000110      1.64      .180      .93      51.68      .000
00566>          =====
00567>          SUM 01:000107      25.27      2.530      1.12      49.34      .000

```

```

00568>
00569> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00570>

```

```

-----
00572> 001:0021-----
00573> *
00574> *#=====
00575> *# ADDING MAJOR FLOW FROM B4A, B4B
00576> *#=====
00577> *

```

```

-----
00578> | ADD HYD (000107) | ID: NHYD      AREA      QPEAK      TPEAK      R.V.      DWF
00580> -----
00581>          ID1 08:000106      1.14      .934      1.02      51.93      .000
00582>          +ID2 07:000106      .69      .574      1.03      48.21      .000
00583>          =====
00584>          SUM 05:000107      1.84      1.489      1.03      50.52      .000

```

```

00585>
00586> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00587>

```

```

-----
00589> 001:0022-----
00590> *
00591> *#=====
00592> *# EXTERNAL LANDS (STONEBRIDGE)
00593> *# Note: Overflow routed to B6B, minor flow to external
00594> *# (tributary to Jockvale SWM Facility)

```

```

00595> *#=====
00596> *
00597> -----
00598> | CALIB STANDHYD | Area (ha)= 32.30
00599> | 10:000210 DT= 2.00 | Total Imp(%)= 54.00 Dir. Conn.(%)= 41.00
00600> -----
00601> IMPERVIOUS PERVIOUS (i)
00602> Surface Area (ha)= 17.44 14.86
00603> Dep. Storage (mm)= .80 1.50
00604> Average Slope (%)= .50 2.00
00605> Length (m)= 607.00 40.00
00606> Mannings n = .013 .250
00607>
00608> Max.eff.Inten.(mm/hr)= 178.56 97.60
00609> over (min) 8.00 14.00
00610> Storage Coeff. (min)= 7.36 (ii) 14.49 (ii)
00611> Unit Hyd. Tpeak (min)= 8.00 14.00
00612> Unit Hyd. peak (cms)= .15 .08
00613> *TOTALS*
00614> PEAK FLOW (cms)= 4.64 2.45 6.444 (iii)
00615> TIME TO PEAK (hrs)= 1.07 1.20 1.100
00616> RUNOFF VOLUME (mm)= 70.88 38.34 51.680
00617> TOTAL RAINFALL (mm)= 71.68 71.68 71.677
00618> RUNOFF COEFFICIENT = .99 .53 .721
00619>
00620> (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00621> CN* = 77.0 Ia = Dep. Storage (Above)
00622> (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00623> THAN THE STORAGE COEFFICIENT.
00624> (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00625>

```

```

00626> -----
00627> 001:0023-----
00628> *
00629> *
00630> -----
00631> | ROUTE RESERVOIR | Requested routing time step = 1.0 min.
00632> | IN>10:(000210) |
00633> | OUT<02:(000110) |
00634> -----
00635> ===== OUTFLOW STORAGE TABLE =====
00636> OUTFLOW STORAGE | OUTFLOW STORAGE
00637> (cms) (ha.m.) | (cms) (ha.m.)
00638> .000 .0000E+00 | 2.284 .1357E+00
00639> 2.261 .1000E-03 | .000 .0000E+00
00640>
00641> ROUTING RESULTS AREA QPEAK TPEAK R.V.
00642> ----- (ha) (cms) (hrs) (mm)
00643> INFLOW >10: (000210) 32.30 6.444 1.100 51.680
00644> OUTFLOW<02: (000110) 25.40 2.284 1.067 51.441
00645> OVERFLOW<04: (000106) 6.90 4.160 1.100 51.680
00646>
00647> TOTAL NUMBER OF SIMULATED OVERFLOWS = 2
00648> CUMULATIVE TIME OF OVERFLOWS (hours)= .47
00649> PERCENTAGE OF TIME OVERFLOWING (%)= 13.66
00650>
00651> PEAK FLOW REDUCTION [Qout/Qin] (%)= 35.444
00652> TIME SHIFT OF PEAK FLOW (min)= -2.00
00653> MAXIMUM STORAGE USED (ha.m.)=.1354E+00
00654> -----

```

```

00655> 001:0024-----
00656> *
00657> *#=====
00658> *# MAJOR FLOW TO BLACKLEAF DITCH
00659> *#=====
00660> *

```

```

00661> -----
00662> | DIVERT HYD |
00663> | INID=04 (000106)|
00664> -----
00665> Outflow / Inflow Relationships
00666> Flow 08 + Flow 07 = Total
00667> (cms) (cms) (cms)
00668> .000 .000 .000
00669> 2.000 2.200 4.200
00670>
00671> NHYD AREA QPEAK TpeakDate_hh:mm R.V. NFE WetHrs
00672> (ha) (cms) (mm) (hrs)
00673> IDin = 04:000106 6.90 4.160 No_date 1:06 51.680 2 0.
00674> =====
00675> IDout= 08:000101 3.28 1.981 No_date 1:06 51.680 2 0.
00676> IDout= 07:000102 3.61 2.179 No_date 1:06 51.680 2 0.
00677> -----
00678> 001:0025-----
00679> *
00680> *#=====
00681> *# ADDING MAJOR FLOW ON BLACKLEAF TO B4A, B4B
00682> *#=====
00683> *
00684> -----
00685> | ADD HYD (000107) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
00686> (ha) (cms) (hrs) (mm) (cms)
00687> ID1 05:000107 1.84 1.489 1.03 50.52 .000
00688> +ID2 08:000101 3.28 1.981 1.10 51.68 .000
00689> =====
00690> SUM 04:000107 5.12 3.168 1.07 51.26 .000
00691>
00692> NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00693>
00694> -----
00695> 001:0026-----
00696> *
00697> FINISH
00698> -----
00699> *****
00700> WARNINGS / ERRORS / NOTES
00701> -----
00702> Simulation ended on 2010-06-15 at 15:52:02
00703> =====
00704>
00705>

```

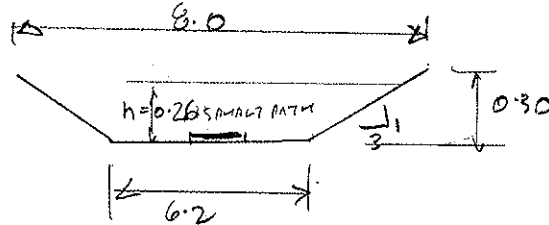
FLOW THROUGH MASON SYSTEM OUTLETS

$$Q = \frac{1}{n} A R^{2/3} S^{1/2}$$

BLOCK 335 SUNITA CROSSCUT

REQUIRED FLOW  $Q = 3.2 \text{ m}^3/\text{s}$

SECTION



longitudinal slope = 1.1%

FOR FLOW HEIGHT  $h = 0.26$  AREA =  $1.81 \text{ m}^2$

$$n = [2.0 \times 0.016 (\text{rough asphalt}) + 6.0 \times 0.024 (\text{grass})] / 6 = 0.022$$

$$\text{ACTUAL } Q = \frac{1}{0.022} (1.81) (0.23)^{2/3} \sqrt{0.011} = 3.26 \text{ m}^3/\text{s}$$

$$V = Q/A = 3.26 / 1.81 = 1.80 \text{ m/s}$$

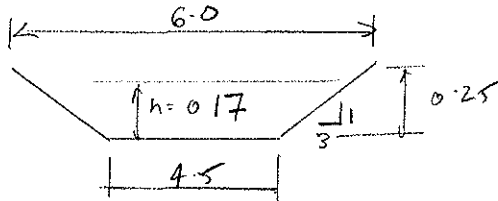
$$\text{DEPTH} \times \text{VELOCITY} = 1.80 \times 0.26 = 0.47 < 0.60$$

BLOCK 329 CENTERRA COURT

REQUIRED FLOW

$$Q = 1.4 \text{ m}^3/\text{s}$$

SECTION



longitudinal slope = 2.0%

FOR FLOW HEIGHT  $h = 0.17$  AREA =  $0.85 \text{ m}^2$

$$n = 0.024 (\text{grass})$$

$$\text{ACTUAL } Q = \frac{1}{0.024} (0.85) (0.15)^{2/3} \sqrt{0.02} = 1.40 \text{ m}^3/\text{s}$$

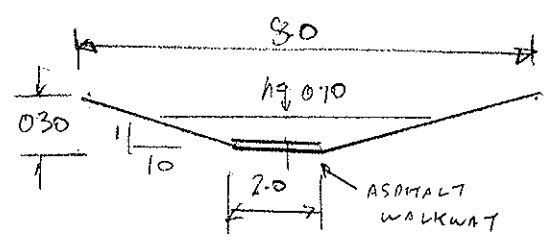
$$V = Q/A = 1.4 / 0.85 = 1.65 \text{ m/s}$$

$$\text{DEPTH} \times \text{VELOCITY} = 1.65 \times 0.17 = 0.28 < 0.60$$

BLOCH 321 CLENOA WAY TO HIRKCONNEL WAY

REQUIRED FLOW  $Q = 0.2 \text{ m}^3/\text{s}$

SECTION



longitudinal slope = 0.65%

FOR FLOW HEIGHT  $h = 0.10$       AREA =  $0.30 \text{ m}^2$   
 $n = 0.022$  (see Bloch 335)

ACTUAL  $Q = \frac{1}{0.022} (0.30)(0.07)^{2/3} \sqrt{0.0065} = 0.20 \text{ m}^3/\text{s}$   
 $V = Q/A = 0.20/0.30 = 0.65 \text{ m/s}$

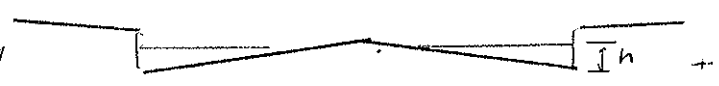
DEPTH X VELOCITY =  $0.10 \times 0.65 = 0.07 < 0.60$

DUNDONALD WAY

REQUIRED FLOW  $Q = 0.5 \text{ m}^3/\text{s}$

SECTION

11m ASPHALT WALKWAY



longitudinal slope = 0.60%

FOR FLOW HEIGHT  $h = 0.14$       AREA =  $0.65 \text{ m}^2$   
 $n = 0.016$

ACTUAL  $Q = \frac{1}{0.016} (0.65)(0.07)^{2/3} \sqrt{0.006} = 0.53 \text{ m}^3/\text{s}$   
 $V = Q/A = 0.53/0.65 = 0.81 \text{ m/s}$

DEPTH X VELOCITY =  $0.14 \times 0.81 = 0.11 < 0.60$

J:\25099-Stonebridge\113.9 Drawings\3.0 Drawings\BASE\25099-PONDING BASE.dwg Layout Name: 400 Phase 11 Pond Stair: Plot Scale: 1:2500 Printed At: 8/27/2010 10:35 AM Last Saved By: D:\vina Last Saved At: Aug. 4, 10



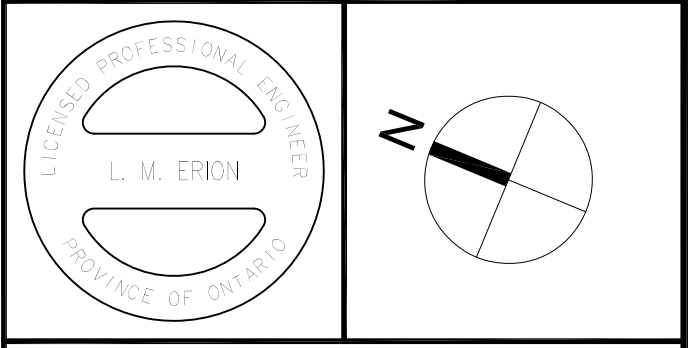
- LEGEND:**
- PONDING AREA  
(PONDING VOLUMES DETERMINED BY CIVIL 3D SOFTWARE)
  - 18 POND AREA NUMBER
  - 96.00 MAX. POND ELEVATION (m)
  - 0.24 MAX. POND DEPTH (m)
  - 163.5 POND VOLUME (m<sup>3</sup>)
  - MAJOR STORM FLOW DIRECTION

14			
13			
12			
11			
10			
9			
8			
7			
6	REVISED AS PER NEW LEGAL BLOCKS 331, 332, AND 333	LME	10:08:04
5	LOWER TEMPORARY MAJOR STORM RETENTION AREA BY 0.30m	LME	10:07:12
4	REVISED AS PER CITY COMMENTS	LME	10:06:18
3	REVISED AS PER CITY COMMENTS	LME	10:05:19
2	REVISED AS PER CITY COMMENTS	LME	10:03:01
1	ISSUED FOR APPROVAL	LME	10:01:25
No.	REVISIONS	By	Date



**IBI GROUP**  
 333 Preston Street  
 Tower 1, Suite 400  
 Ottawa, Ontario  
 Canada K1S 5N4  
 Tel (613)225-1311  
 FAX (613)225-9868

Project Title  
**STONEBRIDGE PHASE 11**

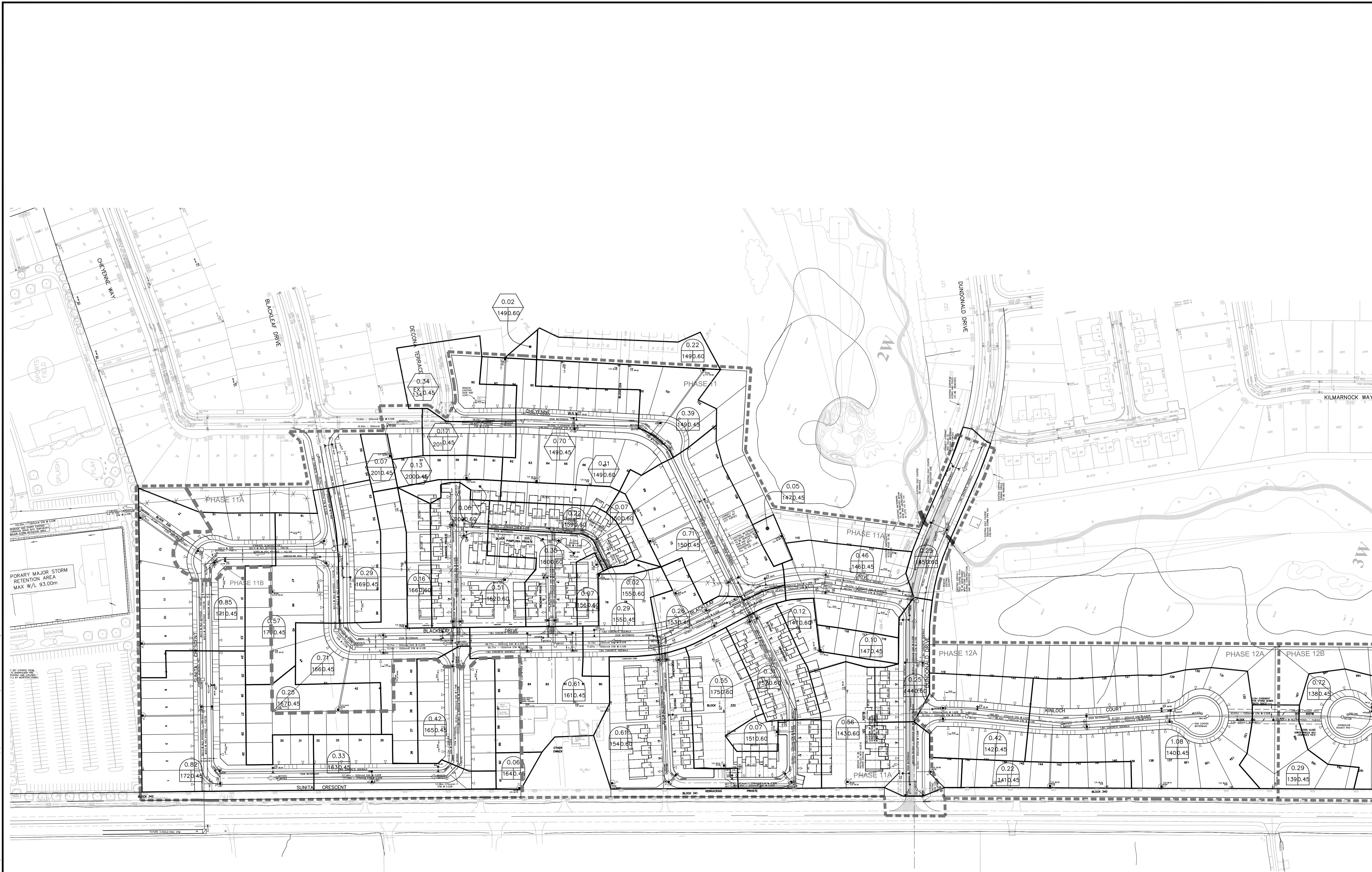


Drawing Title  
**PONDING PLAN**

Scale  
 1:1250

Design	LME	Date	JANUARY 2010
Drawn	DPS	Checked	LME

Project No.	25099	Drawing No.	400
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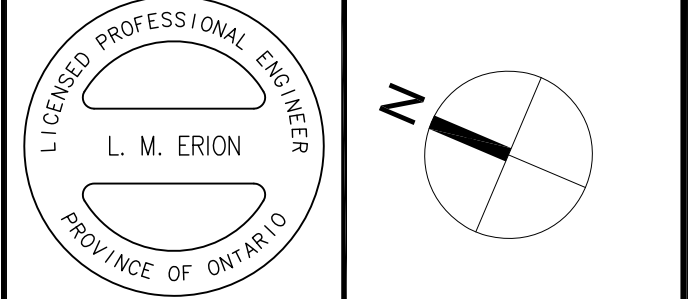
- LEGEND:**
- SINGLE SERVICE LOCATION
  - DRIVEWAY LOCATION
  - STANDARD STREET CATCHBASIN
  - REARYARD CB C/W TOP OF GRATE
  - SINGLE CONNECTION BETWEEN PAIRS OF STREET CATCHBASINS
  - CB WITH INLET CONTROL DEVICE
  - ICD TYPE      MAX. RELEASE RATE 1/s
    - TYPE A IPEX/PEDRO      20.0
    - TYPE B IPEX/PEDRO      28.4
    - TYPE C IPEX/PEDRO      37.0
    - TYPE X PEDRO            13.4
  - BARRIER CURB
  - MOUNTABLE CURB
  - DEPRESSED CURB
  - PHASE LIMITS
  - AREA CONNECTED TO JOCKVALE SWMF**
    - AREA IN HECTARES
    - RUNOFF COEFFICIENT
    - RECEIVING MH.
  - AREA CONNECTED TO CORRIGAN SWMF**
    - AREA IN HECTARES
    - RUNOFF COEFFICIENT
    - RECEIVING MH.
  - MAJOR STORM DIRECTION

14		
13		
12		
11		
10		
9		
8		
7	REVISED AS PER NEW LEGAL BLOCKS 331, 332, AND 333	LME 10:08:04
6	LOWER TEMPORARY MAJOR STORM RETENTION AREA BY 0.30m	LME 10:07:12
5	REVISED AS PER CITY COMMENTS	LME 10:07:08
4	REVISED AS PER CITY COMMENTS	LME 10:06:18
3	REVISED AS PER CITY COMMENTS	LME 10:05:19
2	REVISED AS PER CITY COMMENTS	LME 10:03:01
1	ISSUED FOR APPROVAL	LME 10:01:25
No.	REVISIONS	By Date



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 Fax (613)225-9868

Project Title  
**STONEBRIDGE  
 PHASE 11**



Drawing Title  
**STORM DRAINAGE  
 AREA PLAN**

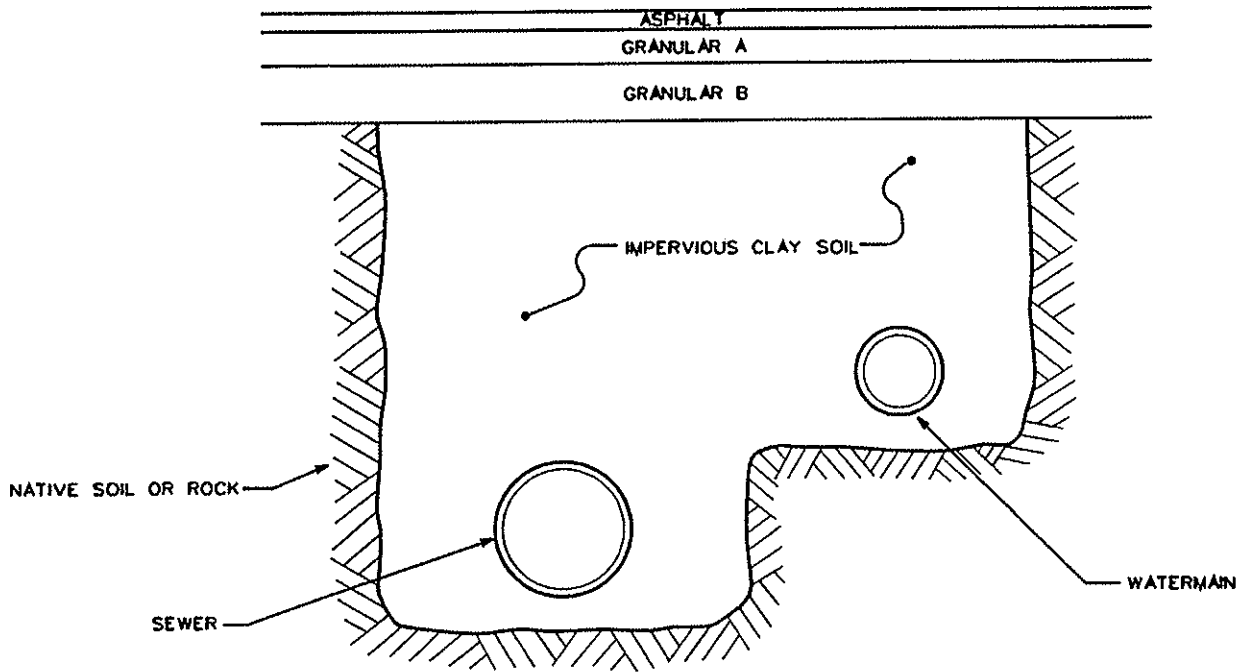
Scale  
 1:1250

Design	LME	Date	JANUARY 2010
Drawn	DPS	Checked	LME
Project No.	25099	Drawing No.	500

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 Plot Date: 01/15/2010 10:08 AM  
 Plot Scale: 1:1250  
 Plot Size: 36.00 x 24.00  
 Plot Title: STORM DRAINAGE AREA PLAN  
 Plot Path: J:\2009-StonePh11\10 Drawing\StonePh11\10 Storm Drainage Area Plan.dwg  
 Plot Name: 1:1250  
 Plot Size: 36.00 x 24.00  
 Plot Title: STORM DRAINAGE AREA PLAN  
 Plot Path: J:\2009-StonePh11\10 Drawing\StonePh11\10 Storm Drainage Area Plan.dwg  
 Plot Name: 1:1250



# APPENDIX C



**NOTES:**

1. CLAY SEAL TO EXTEND FROM BOTTOM OF TRENCH EXCAVATION TO UNDERSIDE OF ROAD STRUCTURE.
2. CLAY SEAL TO EXTEND FULL TRENCH WIDTH TO EXISTING NATIVE SOILS WITH A MINIMUM THICKNESS OF 1.0m ALONG PIPES.
3. CLAY SEAL TO BE LOCATED SO THAT NO PIPE JOINTS ARE WITHIN THE CLAY SEAL MATERIAL.

**NOTE:**  
 NO TRACKING OF MUD OR SEDIMENTS IS ALLOWED ONTO EXISTING ROADS. ANY MUD OR SEDIMENT OBSERVED ON EXISTING ROADS MUST BE REMOVED IMMEDIATELY.

- █ █ █ █ SILT FENCE AS PER OPSPD-219.110
- ▢ STRAW BALE FLOW CHECK AS PER OPSPD-219.180

14			
13			
12			
11			
10			
9			
8	REVISED AS PER NEW LEGAL BLOCKS 331, 332, AND 333	LME	10:08:04
7	LOWER TEMPORARY MAJOR STORM RETENTION AREA BY 0.30m	LME	10:07:12
6	REVISED AS PER CITY COMMENTS	LME	10:07:08
5	REVISED AS PER CITY COMMENTS	LME	10:06:18
4	REVISED AS PER CITY COMMENTS	LME	10:05:19
3	ISSUED FOR TENDER	LME	10:03:25
2	REVISED AS PER CITY COMMENTS	LME	10:03:01
1	ISSUED FOR APPROVAL	LME	10:01:25
No.	REVISIONS	By	Date



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 333 Preston Street  
 Tower 1, Suite 400  
 Ottawa, Ontario  
 Canada K1S 5N4  
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 FAX (613)225-9868

Project Title  
**STONEBRIDGE  
 PHASE 11**

LICENCED PROFESSIONAL ENGINEER  
 L. M. ERION  
 PROVINCE OF ONTARIO

Drawing Title  
**EROSION AND SEDIMENT  
 CONTROL PLAN**

Scale  
 1:1250

Design	LME	Date	JANUARY 2010
Drawn	DPS	Checked	LME
Project No.	25099	Drawing No.	900



J:\25099-StonePh11\10 Drawings\Stone\Current\25099stone11.dwg Layout Name: 900 Phase 11 Plot Style: IA STANDA... 8/2/2010 10:05:05 AM User: LME Last Saved By: LME Date Saved: Aug 2, 10