

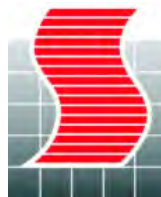
**OTTSWMM ANALYSIS REPORT**

**COUNTRYSIDE VILLAGES EMPLOYMENT  
BLOCK**

**CITY OF BRAMPTON**

**Project: 2011-3676**

**December 2011  
Revised October 2012**



**SCHAEFFERS**  
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- Appendix A: OTTSWMM Input Files and Output Summaries
- Appendix B: Storm Sewer Design Sheets
- Appendix C: Hydraulic Gradeline Analysis
- Appendix D: Inlet Capacity Calculations

# **1 INTRODUCTION**

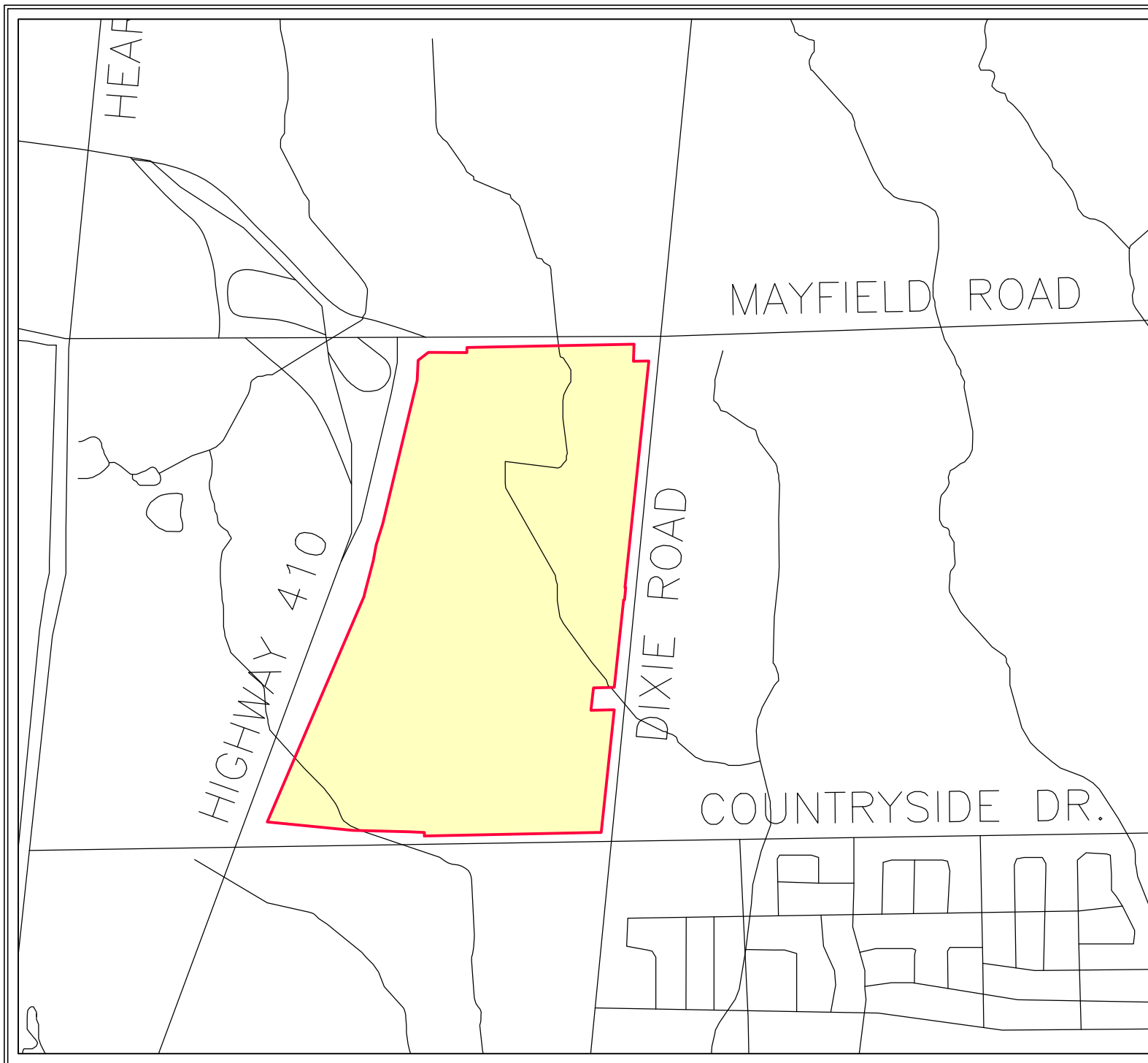
## **1.1 Study Objectives and Location**

This report is provided in support of the detailed design of the stormwater conveyance system within the Countryside Villages Employment Block (Figure 1.1) in the City of Brampton. The subject site is bounded by Mayfield Road to the north, Dixie Road to the east, Countryside Drive to the south, and Highway 410 extension to the west.

This report provides details of the proposed stormwater management conveyance system, including an OTTSWMM analysis for the stormwater conveyance system tributary to SWM Pond EC-4. Conformance with the City of Brampton design criteria is demonstrated throughout the report. As additional information, the engineering drawings for the subdivision should be referenced when reading this report.

## **1.2 Background**

The proposed stormwater conveyance system presented in this report discharges into SWM Pond EC-4 within the Countryside Villages Employment Block. For additional reference, please consult the “*Stormwater Management Pond EC-4 Design Report – Countryside Villages Employment Block, City of Brampton*” by Schaeffers Consulting Engineers.



COUNTRYSIDE VILLAGES  
EMPLOYMENT BLOCK

LEGEND

 COUNTRYSIDE VILLAGES  
EMPLOYMENT BLOCK

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FIGURE 1.1  
SUBJECT SITE LOCATION

## 2 OTTSWMM ANALYSIS

The drainage area (Figure 2.1) of the subject site will consist of a dual drainage system designed in accordance with City of Brampton standards. Runoff from the roads, for storms up to and including the 10-year event, will be captured and conveyed by the minor system, which will be comprised of storm sewers and catchbasins. Discharge from each employment block will be limited to the 2-year post-development flow rate, assuming a minimum 10-minute concentration. The major system will convey all runoff that is not captured by the minor system (up to and including the 100-year storm event) and will consist of roadways and overland flow paths.

To demonstrate that the proposed conveyance system meets the City of Brampton's standards, an OTTSWMM analysis was performed. It should be noted that the major system conveyance paths (i.e. roadways and overland flow paths) are demonstrated to meet the City of Brampton's storm design criteria (Depth of Flow < 0.3 m above gutter).

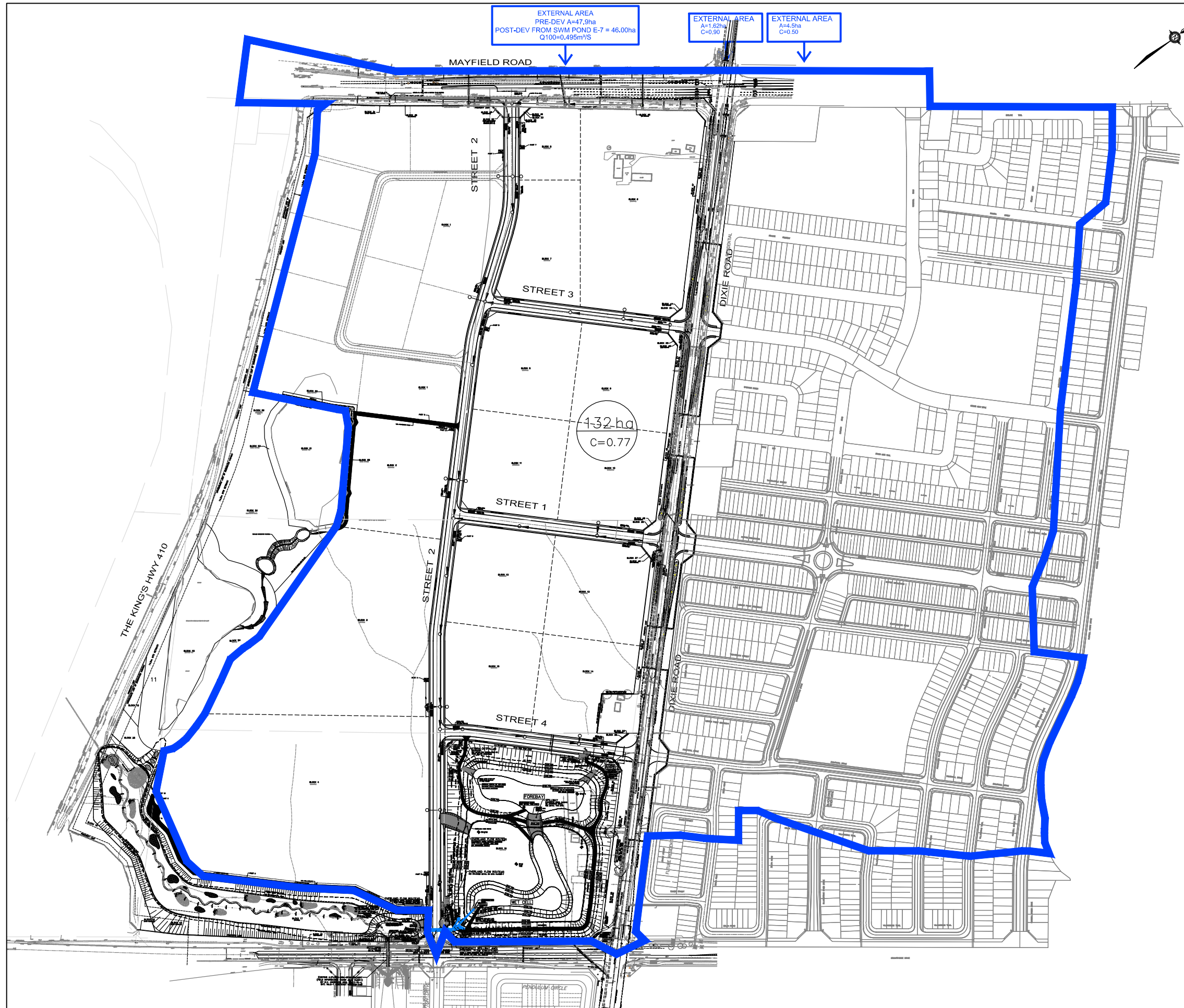
### 2.1 Modelling Assumptions and City Criteria

The proposed development was analyzed using the OTTSWMM (Ver. 1.1, July 1991) dual drainage computer model, and the City of Brampton's 10-year and 100-year 4-hour Chicago distribution storms with a 5 minute time step.

For more detail, please refer to the input files, and output summaries in Appendix A. Further, a digital copy of all files can be found in the pocket containing the OTTSWMM layout drawing.


The OTTSWMM analysis for the drainage area of the subject site was performed using the following general assumptions:

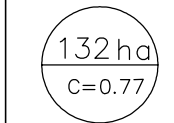
- Catch basins with OPSD 400.110 (grate design) standards are being used.
- Stormwater pipes were entered in the model using a roughness value of  $n=0.013$ .
- Levels of imperviousness for commercial/industrial blocks and roads were modeled as 100% ( $C=0.90$ ).
- Onsite quantity controls were assumed within commercial/industrial blocks to restrict runoff to the 2-year post-development flow under the 100-year storm event.



## COUNTRYSIDE VILLAGES

### LEGEND

 SWM POND EC-4 TRIBUTARY AREA

 AREA IN HECTARES  
RUNOFF COEFFICIENT

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FIGURE 2.1  
SWM POND EC-4  
TRIBUTARY AREA

## 2.2 Minor System

A 2400m x 1800m box culvert located off Street 2 (OTTSWMM pipe # 146) is proposed to convey stormwater flows from the Employment Block and north external area to the west forebay of Pond EC-4. These flows are a combination of the minor system flows from the whole watershed area, and the major system flows captured upstream of the outlet. Another 2400m x 1800m box culvert located off Street 4 (OTTSWMM pipe #137) is proposed to convey stormwater flows from the east external area to the east forebay of Pond EC-4.

## 2.3 Major System

The proposed major system consists of roadways and surface drainage that will convey runoff from storm events in excess of the 10-year storm event flows which are not captured by the minor system.

All overland flow is contained within road right-of-ways to a maximum depth of 0.3 m above the gutter as specified by the City of Brampton criteria. For details, please refer to the OTTSWMM results in Appendix A. Table 2.1 provides the point of maximum depth of flow on the roads.

**Table 2.1: Depth of Flow**

Location	OTTSWMM ID	Depth of flow above gutter (mm)
Mayfield Road	2062	117

## 2.4 Major System Capture

Within Countryside Villages Employment Block, there are three locations where total capture inlets have been proposed to capture major system flows. These locations are shown in Table 2.2, while inlet capacity calculations can be found in Appendix D.

**Table 2.2: Major System Inlet Design**

OTTSWMM Segment #	Street	Total # of Inlets	Size	Total Captured Flow (m <sup>3</sup> /s)	Inlet Type
216	Street 3	2	1.2 m x 0.6 m	0.124	OPSD 400.110
227	Street 1	2	1.2 m x 0.6 m	0.150	OPSD 400.110
237	Street 4	2	1.2 m x 0.6 m	0.155	OPSD 400.110
2431	Street 2	2	1.2 m x 0.6 m	0.135	OPSD 400.110



### 3 HYDRAULIC GRADELINE ANALYSIS

An HGL analysis was undertaken to determine the 100 year water level in the road relative to the basement elevation of the dwelling units, under conditions of the 100-year storm. An HGL spreadsheet with the proposed design and recommendations for minimum basement elevations to satisfy City criteria is provided in Appendix C.

The site is divided into individual sewer runs from the highpoints in the sewer to the outlet. Each sewer run consists of several lengths of sewer. Each length of sewer is between two nodes (manholes, outlets, connections). The HGL is estimated at the nodes from downstream to upstream, based on:

- the downstream HGL during 100 year storm;
- the slope, diameter and Manning's n of the pipe;
- losses due to bends  $H_{bends} = K \frac{V^2}{2g}$  with the coefficient K = 1.0 for 90 degree bends, 0.2 for 45 degree bends, and 0.1 for flow through a straight manhole;

The flow condition at the upstream end of the pipe is evaluated as being 1 for full pipe, 2 for gradually varied, or 3 for free flow. Full flow generally occurs when the flow exceeds the pipe capacity OR there is a downstream water level that is above the invert at the outlet. For full flow, the upstream HGL is estimated based on the flow velocity that occurs at the 100 year captured flow. HGL elevations from other studies were implemented at outfall locations.

1. Full flow  $H_{us \text{ full flow}} = H_{ds} + l \times S_{f \text{ full flow}} + H_{bends \text{ full flow}}$

For full flow the velocity  $V = \frac{Q_{100 \text{ yr cap}}}{\text{Full pipe Area}}$ , and the Hydraulic Radius  $R = \frac{D}{4}$

The Hydraulic Slope is estimated as  $S_f = \frac{n^2 V^2}{R^{\frac{4}{3}}}$  based on the Manning's equation.

2. For gradually varied flow the following is used

$$H_{usgv \text{ flow}} = H_{ds} + l \times S_{f \text{ free flow}} + H_{bends \text{ free flow}}$$

This formula conservatively estimates the upstream HGL as it assumes that the free flow head losses occur for the full length of the pipe. It also takes the higher velocity associated with the partial area of the pipe to estimate bend losses.

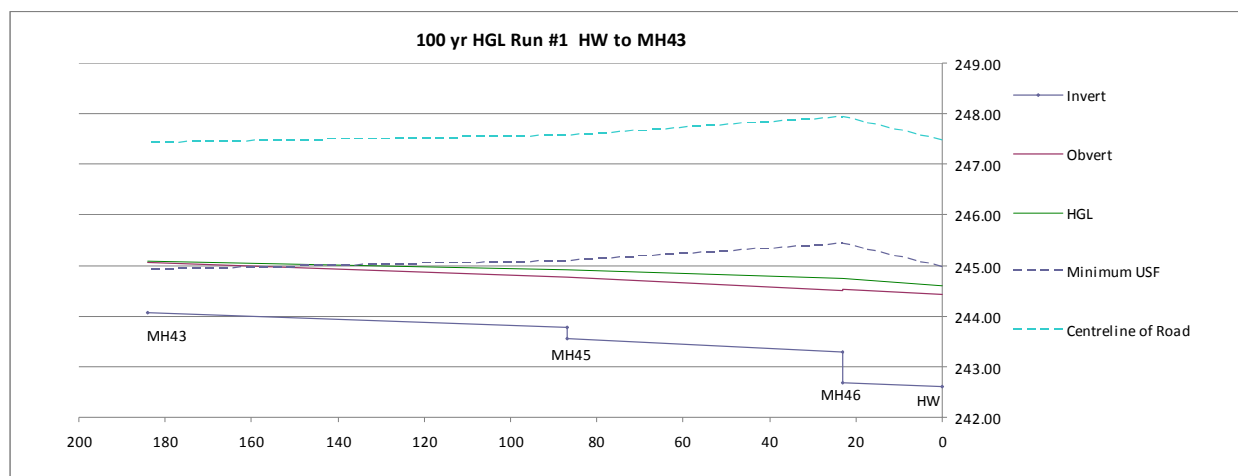
Free flow determines the area and hydraulic radius of pipe that occurs at a given slope for flows that are less than the capacity of the pipe. The free flow depth is determined by iterating the depth and solving for the flow in which the free flow hydraulic slope  $S_{f \text{ free flow}}$ , is equal to the slope of the pipe. The velocity estimated for head losses is greater than it is for a full pipe estimate as it utilizes the partial pipe area in determining velocity.

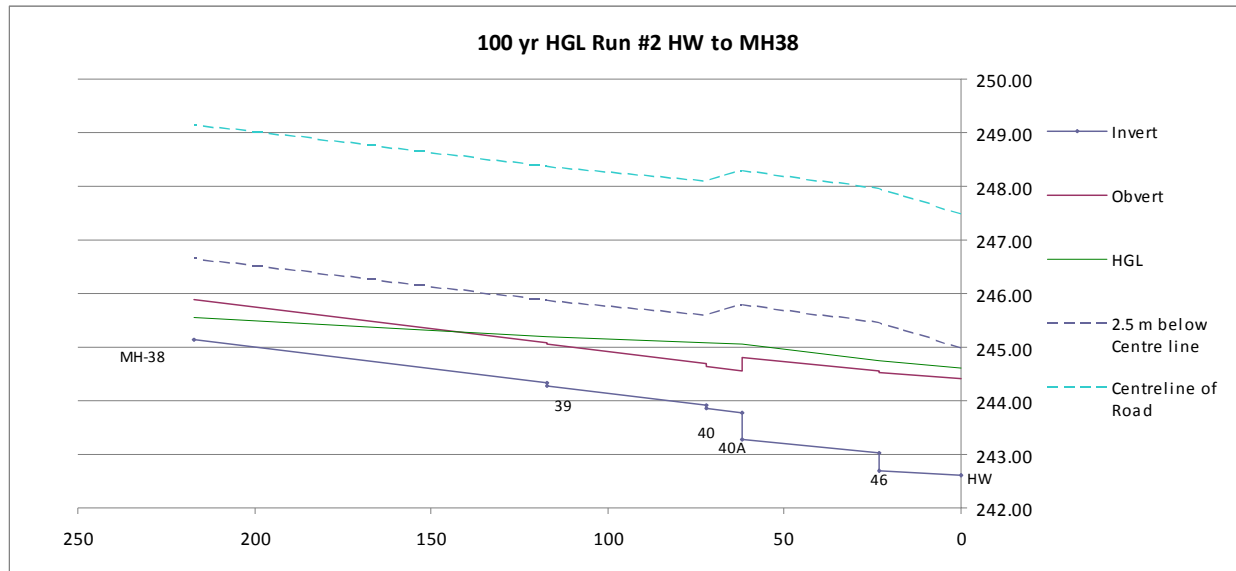
- For free flow, the upstream hydraulic grade is estimated as being:

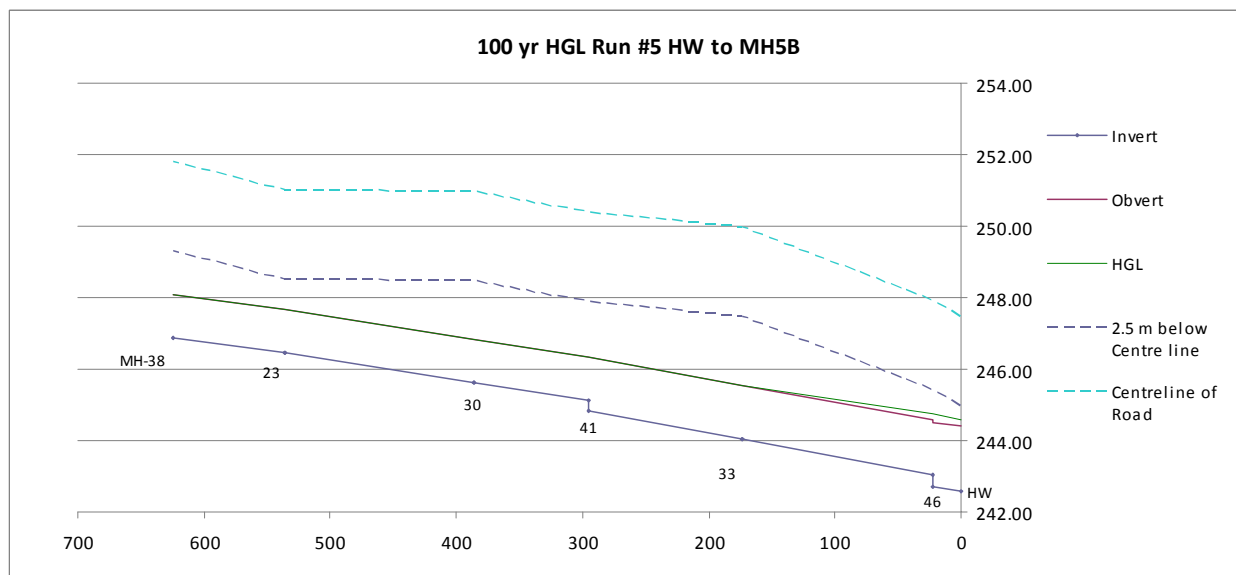
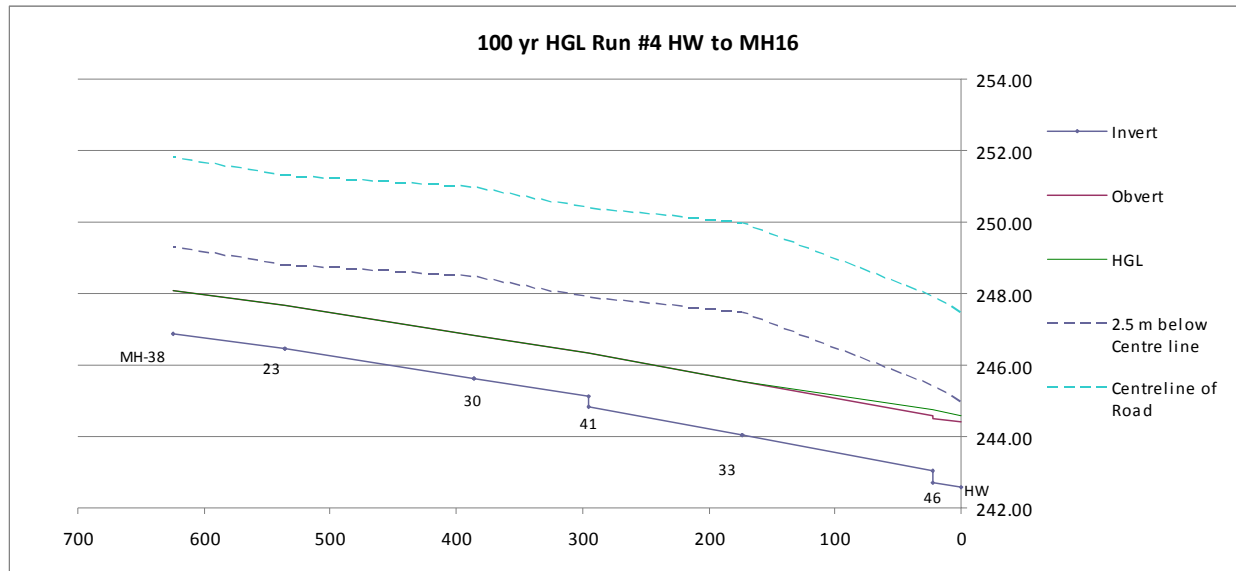
$$H_{us \text{ freeflow}} = US \text{ Invert} + \text{Free flow depth} + H_{bends \text{ free flow}}$$

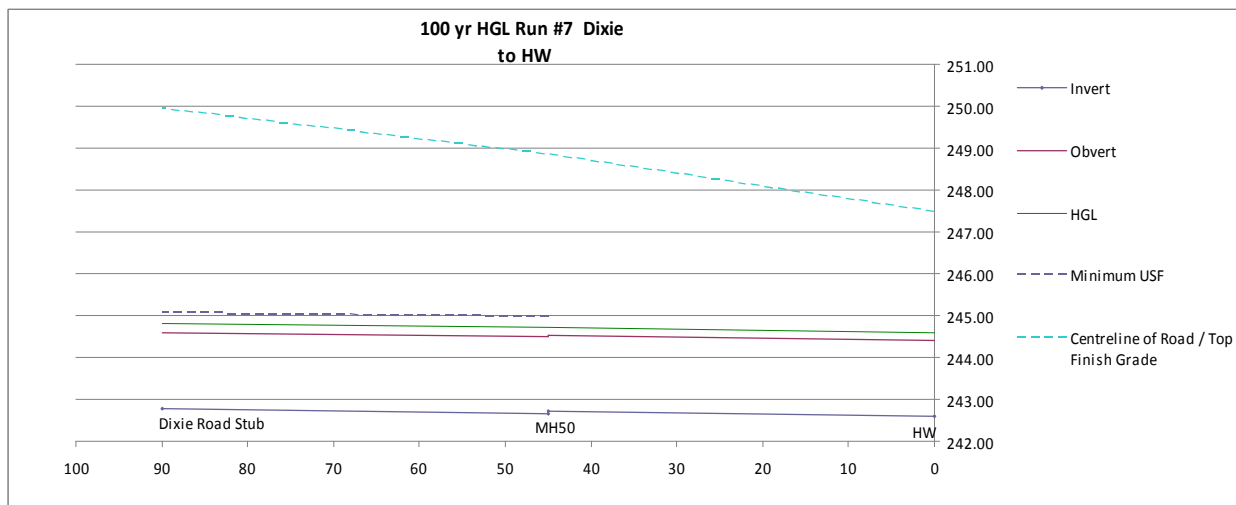
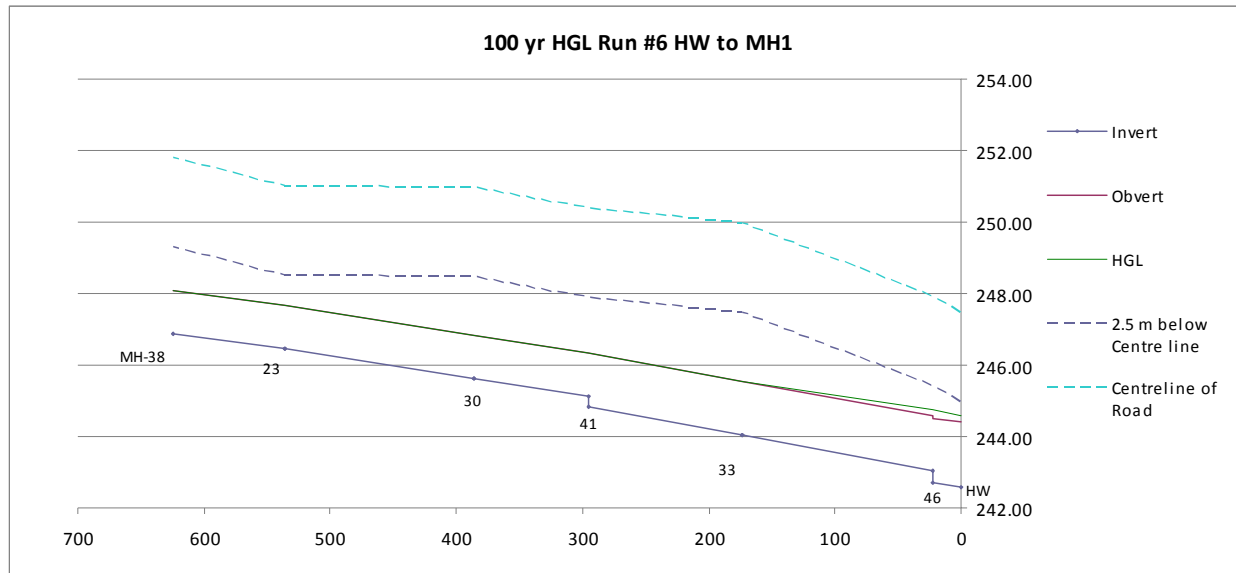
This method uses the higher velocity associated with the partial area of the pipe.

The results of the analysis are summarized in the charts below.









## 4 SUMMARY AND CLOSING REMARKS

This report provides an OTTSWMM analysis for the stormwater conveyance system of the Countryside Villages Employment Block in City of Brampton.

The following highlights the key aspects of this study.

- The minor system has been designed to convey flows from a 10-year storm event.
- On-site controls were assumed within commercial/industrial blocks to restrict runoff to the 2-year post-development flow under the 100-year storm event.
- The major system has been designed to convey all flows in excess of those captured by the minor system. During a 100-year storm event all flow depths on the roads will remain less than 0.3 m above the gutter.

Should you have any questions or comments please do not hesitate to contact the undersigned.

Respectfully Submitted,

**SCHAEFFER & ASSOCIATES LTD.**



Michael Paulo, P.Eng.  
Water Resources Engineer/Designer

## **APPENDIX A**

### **OTTSWMM Input Files and Output Summaries**

OTTSWMM INPUT: Countryside Villages Employment Block

Date: October 2012

FILE NAME: 10YR.DAT

OTTSWMM ANALYSIS FOR 3676 COUNTRYSIDE VILLAGES EMPLOYMENT LANDS OCTOBER 2012

10 YEAR 4 HOUR CHICAGO STORM - 5 MIN FILE: 10YR.DAT

1 5 48 1 0 0 9999  
5 48  
3.82 4.02 4.25 4.51 4.82 5.18 5.61 6.14 6.8 7.67 8.8510.5913.4319.1940.57179.9  
51.9929.6321.5317.2214.5112.6311.2410.16 9.3 5.59 8 7.5 7.07 6.69 6.35 6.06  
5.79 5.55 5.33 5.14 4.95 4.79 4.63 4.49 4.36 4.23 4.12 4.01 3.91 3.81 3.72 3.63

0 1051 105 54.0.00250.013 457  
0 105 106 110.00250.013 838  
0 106 108 79.0.00300.013 1372  
0 101 103 10.0.005 0.013 457  
0 103 108 64.5.00650.013 762  
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0 111 112 530.0120.013 1372  
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0 117 118 1000.0060.013 1067  
0 118 119 1000.0060.013 1067  
0 119 120 88.50.0050.013 1830  
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0 123 130 150.00550.013 1830  
0 127 128 76.5.00650.013 457  
0 128 129 990.0050.013 914  
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1 122 130 10.00700.013 914  
0 130 141 91.00550.013 1830  
0 141 133 122.00650.013 2063  
0 137 9999 45.00250.013 2270  
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1 140 133 100.0080.013 762  
0 133 146 150.00650.013 2063  
0 143 145 970.0030.013 991  
0 145 146 640.0040.013 1219  
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0 1431 9997 630.0100.013 305

13

1 5.5 0.02 1500.0130.005 0.020.025 0.45  
2 5.5 0.02 1500.013 0.01 0.020.025 0.45  
3 6 0.02 1500.0130.005 0.020.025 0.45  
4 6 0.02 1500.013 0.03 0.020.025 0.45  
5 6.2 0.02 1500.0130.005 0.020.025 0.45  
6 6.25 0.02 1500.0130.005 0.020.025 0.45  
7 6.25 0.02 1500.013 0.01 0.020.025 0.45  
8 9 0.02 1500.013 0.02 0.020.025 0.45  
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10 12 0.02 1500.013 0.01 0.020.025 0.45  
11 14 0.02 1500.0130.005 0.020.025 0.45  
12 16 0.02 1500.0130.005 0.020.025 0.45  
13 20 0.02 1500.013 0.01 0.020.025 0.45  
2  
1 12  
0 0 28.4 25.3 56.8 39.3 85.2 49.2113.6 58.7 142 66.3170.4 71.9198.7 75.7  
281.9 80567.8 80 3407 80 8518 80  
2 12  
0 0 40 40 80 80 120 120 160 160 200 200 240 240 280 280  
360 360 800 800 4000 4000 9999 9999  
0 201 203 325 10 1 1 101  
0 203 206 65 10 2 1 103  
0 206 205 76 9 1 1 106  
0 205 2051 80 11 3 1 105  
1 2062 206 460 10 2 2288.5 106  
0 2061 2062 230 11 5 1 106  
0 2051 8999 120 13 2 1 1051  
0 208 211 90 4 2 1 108  
0 211 212 50 1 2 1 111  
0 212 219 130 1 4 1 112  
0 216 8998 70 1 2 2 116  
0 217 218 100 2 2 1 117  
0 218 219 90 1 2 1 118  
0 219 220 89 1 2 1 119  
0 220 223 62 1 2 1 120  
0 223 230 150 1 4 1 123  
1 227 8997 100 5 2 2 127  
0 228 229 98 2 0 1 128  
0 229 230 95 1 4 1 129  
0 230 241 90 2 2 1 130  
0 241 233 125 2 4 1 141  
1 237 8996 100 7 2 2 137  
0 238 239 130 2 2 1 138  
0 239 233 45 2 2 1 139  
0 233 245 125 2 2 1 133  
0 245 243 60 2 2 1 145



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1	311	8989	170	13	2	2	453	117	
1	320	8988	300	13	2	2	854	120	
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1	322	8986	120	13	2	2	194	117	
1	324	8985	130	13	2	2	225	130	
1	325	8984	100	13	2	2	196	123	
1	326	8983	100	13	2	2	196	128	
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1	335	8981	150	13	2	2	195	141	
1	333	8980	150	13	2	2	194	128	
1	331	8979	200	13	2	2	331	133	
1	336	8978	100	13	2	2	194	138	
1	332	8977	100	13	2	2	185	133	
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0	212	212	0.31	1000.013	0.25	0.02	130	1.57	4.67
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5.	5705.	5705.	5705.	5705.	5705.	5705.	5705.	5705.	5705.

**OTTSWMM OUTPUT: Countryside Villages Employment Block**  
**FILE NAME: 10YR.OUT**

**DATE: October 2012**

PAUL WISNER & ASSOCIATES INC., OTTAWA

OTTSWMM ANALYSIS FOR 3676 COUNTRYSIDE VILLAGES EMPLOYMENT LANDS OCTOBER 2012  
10 YEAR 4 HOUR CHICAGO STORM - 5 MIN FILE: 10YR.DAT

MAJOR SYSTEM

SUMMARY OF SIMULATION RESULTS

	SEGMENT NO	MAX. FLOW (CMS)	MAX. DEPTH (MM)	MAX. CAPTURE (L/S)	INLET RESTRICTION	MAX. STORAGE (M3)
1	201	.3089	74.	68.6	NO	.000
2	203	.2965	73.	134.9	NO	.000
3	206	.2341	77.	59.3	NO	.000
4	205	.2764	82.	153.7	NO	.000
5	2062	.5735	96.	573.5	NO	.000
6	2061	.1980	72.	147.5	NO	.000
7	2051	.2126	65.	112.5	NO	.000
8	208	.0776	35.	60.8	NO	.000
9	211	.0627	44.	53.1	NO	.000
10	212	.1278	62.	105.7	NO	.000
11	216	.0807	50.	80.0	NO	.000
12	217	.0888	44.	65.8	NO	.000
13	218	.1059	57.	73.6	NO	.000
14	219	.1210	61.	80.6	NO	.000
15	220	.0962	54.	69.2	NO	.000
16	223	.1569	66.	117.9	NO	.000
17	227	.0985	55.	98.5	NO	.000
18	228	.0852	43.	.0	-	.000
19	229	.1696	68.	126.7	NO	.000
20	230	.1458	57.	89.3	NO	.000
21	241	.1635	60.	123.9	NO	.000
22	237	.1017	47.	101.7	NO	.000
23	238	.1190	51.	80.0	NO	.000
24	239	.0796	42.	61.7	NO	.000
25	233	.1781	62.	100.3	NO	.000
26	245	.1297	53.	84.0	NO	.000
27	243	.1301	53.	114.1	NO	.000
28	2431	.0888	44.	78.0	NO	.000
29	506	.2350	67.	235.0	NO	.000
30	309	1.2441	129.	830.0	YES	.000
31	310	.2977	73.	181.1	YES	.000
32	314	.5621	95.	356.3	YES	.000
33	311	1.2794	130.	901.7	YES	.000
34	320	2.3718	164.	1699.9	YES	.000
35	321	.6027	98.	386.2	YES	.000
36	322	.6027	98.	386.2	YES	.000
37	324	.6943	103.	447.9	YES	.000
38	325	.5906	97.	390.1	YES	.000
39	326	.5906	97.	390.1	YES	.000
40	334	.8969	113.	593.2	YES	.000
41	335	.6211	99.	388.1	YES	.000
42	333	.6182	98.	386.2	YES	.000
43	331	1.0257	120.	658.9	YES	.000
44	336	.5856	97.	386.2	YES	.000
45	332	.5632	95.	368.2	YES	.000
46	344	1.5188	138.	849.9	YES	.000
47	342	1.1511	125.	740.5	YES	.000
48	337	5.5700	227.	5570.0	NO	.000

PAUL WISNER & ASSOCIATES INC., OTTAWA

OTTSWMM ANALYSIS FOR 3676 COUNTRYSIDE VILLAGES EMPLOYMENT LANDS OCTOBER 2012  
 10 YEAR 4 HOUR CHICAGO STORM - 5 MIN FILE: 10YR.DAT

MINOR SYSTEM

SUMMARY OF SIMULATION RESULTS

	SEWER NO	SLOPE (M/M)	MANNING N	MAX. FLOW (CMS)	ORIGINAL SIZE (MM)	AVAILABLE CAPACITY (CMS)	Q/QFULL ORIGINAL SIZE	REQUIRED SIZE (MM)	CAPACITY (CMS)	Q/QFULL REQUIRED SIZE
1	1051	.00250	.01300	.1125	457.00	.1486	.76	460.00	.1512	.74
2	105	.00250	.01300	.2627	838.00	.7486	.35	610.00	.3210	.82
3	106	.00300	.01300	1.2127	1372.00	3.0536	.40	1000.00	1.3138	.92
4	101	.00500	.01300	.0686	457.00	.2102	.33	310.00	.0747	.92
5	103	.00650	.01300	.2031	762.00	.9368	.22	460.00	.2438	.83
6	108	.01800	.01300	1.4445	1372.00	7.4797	.19	760.00	1.5480	.93
7	111	.01200	.01300	2.4925	1372.00	6.1071	.41	1000.00	2.6276	.95
8	112	.00650	.01300	2.5811	1372.00	4.4947	.57	1220.00	3.2864	.79
9	116	.01000	.01300	.0800	457.00	.2972	.27	310.00	.1056	.76
10	117	.00600	.01300	1.4203	1067.00	2.2088	.64	920.00	1.4876	.95
11	118	.00600	.01300	1.8424	1067.00	2.2088	.83	1000.00	1.8580	.99
12	119	.00500	.01300	4.4470	1830.00	8.4981	.52	1525.00	5.2261	.85
13	120	.00550	.01300	6.5548	1830.00	8.9129	.74	1700.00	7.3229	.90
14	123	.00550	.01300	7.0236	1830.00	8.9129	.79	1700.00	7.3229	.96
15	127	.00650	.01300	.0985	457.00	.2396	.41	380.00	.1465	.67
16	128	.00500	.01300	.8730	914.00	1.3345	.65	840.00	1.0655	.82
17	129	.00700	.01300	.9936	914.00	1.5790	.63	840.00	1.2607	.79
18	122	.00700	.01300	.9888	914.00	1.5790	.63	840.00	1.2607	.78
19	130	.00550	.01300	8.4373	1830.00	8.9129	.95	1825.00	8.8482	.95
20	141	.00650	.01300	9.4646	2063.00	13.3380	.71	1825.00	9.6190	.98
21	137	.00250	.01300	5.6716	2270.00	10.6743	.53	1825.00	5.9654	.95
22	138	.00800	.01300	.4661	762.00	1.0393	.45	610.00	.5742	.81
23	139	.00800	.01300	.5263	762.00	1.0393	.51	610.00	.5742	.92
24	140	.00800	.01300	.5240	762.00	1.0393	.50	610.00	.5742	.91
25	133	.00650	.01300	10.9877	2063.00	13.3380	.82	1980.00	11.9546	.92
26	143	.00300	.01300	.8546	991.00	1.2825	.67	920.00	1.0519	.81
27	145	.00400	.01300	1.7792	1219.00	2.5724	.69	1070.00	1.8170	.98
28	146	.00400	.01300	12.6294	2270.00	13.5021	.94	2300.00	13.9833	.90
29	1431	.01000	.01300	.0780	305.00	.1011	.77	310.00	.1056	.74

\*\*\* SIMULATION ENDED NORMALLY \*\*\*

**OTTSWMM INPUT: Countryside Villages Employment Block**  
**FILE NAME: 100YR.DAT**

**Date: October 2012**

OTTSWMM ANALYSIS FOR 3676 COUNTRYSIDE VILLAGES EMPLOYMENT LANDS OCTOBER 2012

100 YEAR 4 HOUR CHICAGO STORM - 5 MIN FILE: 100YR.DAT

1 5 48 1 0 0 9999  
5 48  
5.76 6.06 6.41 6.8 7.26 7.8 8.45 9.2410.2311.5213.2915.8820.1128.6660.24263.7  
77.0744.1332.1425.7521.7218.9216.8515.2413.96 12.912.0211.2710.6210.06 9.56 9.11  
8.72 8.36 8.03 7.74 7.46 7.21 6.98 6.77 6.57 6.38 6.21 6.05 5.89 5.75 5.61 5.48

0 1051 105 54.0.00250.013 457  
0 105 106 110.00250.013 838  
0 106 108 79.0.00300.013 1372  
0 101 103 10.0.005 0.013 457  
0 103 108 64.5.00650.013 762  
0 108 111 90.50.0180.013 1372  
0 111 112 530.0120.013 1372  
0 112 119 136.00650.013 1372  
0 116 117 65.0 0.010.013 457  
0 117 118 1000.0060.013 1067  
0 118 119 1000.0060.013 1067  
0 119 120 88.50.0050.013 1830  
0 120 123 61.5.00550.013 1830  
0 123 130 150.00550.013 1830  
0 127 128 76.5.00650.013 457  
0 128 129 990.0050.013 914  
0 129 122 870.0070.013 914  
1 122 130 10.00700.013 914  
0 130 141 91.00550.013 1830  
0 141 133 122.00650.013 2063  
0 137 9999 45.00250.013 2270  
0 138 139 1000.0080.013 762  
0 139 140 450.0080.013 762  
1 140 133 100.0080.013 762  
0 133 146 150.00650.013 2063  
0 143 145 970.0030.013 991  
0 145 146 640.0040.013 1219  
1 146 9998 230.0040.013 2270  
0 1431 9997 630.0100.013 305

13

1 5.5 .02 150 .013 .005 .020 .025 .450  
2 5.5 .02 150 .013 .010 .020 .025 .450  
3 6 .02 150 .013 .005 .020 .025 .450  
4 6 .02 150 .013 .030 .020 .025 .450  
5 6.2 .02 150 .013 .005 .020 .025 .450  
6 6.25 .02 150 .013 .005 .020 .025 .450  
7 6.25 .02 150 .013 .010 .020 .025 .450  
8 9 .02 150 .013 .020 .020 .025 .450  
9 12 .02 150 .013 .005 .020 .025 .450  
10 12 .02 150 .013 .010 .020 .025 .450  
11 14 .02 150 .013 .005 .020 .025 .450  
12 16 .02 150 .013 .005 .020 .025 .450  
13 20 .02 150 .013 .010 .020 .025 .450  
2  
1 12  
0 0 28.4 25.3 56.8 39.3 85.2 49.2113.6 58.7 142 66.3170.4 71.9198.7 75.7  
281.9 80567.8 80 3407 80 8518 80  
2 12  
0 0 40 40 80 80 120 120 160 160 200 200 240 240 280 280  
360 360 800 800 4000 4000 9999 9999  
0 201 203 325 10 1 1 101  
0 203 206 65 10 2 1 103  
0 206 205 76 9 1 1 106  
0 205 2051 80 11 3 1 105  
1 2062 206 460 10 2 2288.5 106  
0 2061 2062 230 11 5 1 106  
0 2051 8999 120 13 2 1 1051  
0 208 211 90 4 2 1 108  
0 211 212 50 1 2 1 111  
0 212 219 130 1 4 1 112  
0 216 8998 70 1 2 2 116  
0 217 218 100 2 2 1 117  
0 218 219 90 1 2 1 118  
0 219 220 89 1 2 1 119  
0 220 223 62 1 2 1 120  
0 223 230 150 1 4 1 123  
1 227 8997 100 5 2 2 127  
0 228 229 98 2 0 1 128  
0 229 230 95 1 4 1 129  
0 230 241 90 2 2 1 130  
0 241 233 125 2 4 1 141  
1 237 8996 100 7 2 2 137  
0 238 239 130 2 2 1 138  
0 239 233 45 2 2 1 139  
0 233 245 125 2 2 1 133  
0 245 243 60 2 2 1 145

[illegible]

**OTTSWMM OUTPUT: Countryside Villages Employment Block**  
**FILE NAME: 100YR.OUT**

**DATE: October 2012**

PAUL WISNER & ASSOCIATES INC., OTTAWA

OTTSWMM ANALYSIS FOR 3676 COUNTRYSIDE VILLAGES EMPLOYMENT LANDS OCTOBER 2012  
100 YEAR 4 HOUR CHICAGO STORM - 5 MIN FILE: 100YR.DAT

MAJOR SYSTEM

SUMMARY OF SIMULATION RESULTS

	SEGMENT NO	MAX. FLOW (CMS)	MAX. DEPTH (MM)	MAX. CAPTURE (L/S)	INLET RESTRICTION	MAX. STORAGE (M3)
1	201	.4707	90.	77.2	NO	.000
2	203	.4611	89.	154.6	NO	.000
3	206	.6049	111.	80.0	NO	.000
4	205	.6733	116.	230.8	NO	.000
5	2062	.9550	117.	574.3	YES	.000
6	2061	.3010	85.	193.0	NO	.000
7	2051	.5677	96.	160.0	NO	.000
8	208	.1180	40.	80.0	NO	.000
9	211	.1078	58.	75.2	NO	.000
10	212	.2127	74.	148.4	NO	.000
11	216	.1237	62.	122.7	NO	.000
12	217	.1351	54.	85.6	NO	.000
13	218	.1763	69.	99.2	NO	.000
14	219	.2034	72.	108.5	NO	.000
15	220	.1550	66.	92.8	NO	.000
16	223	.2341	77.	157.9	NO	.000
17	227	.1502	65.	150.2	NO	.000
18	228	.1296	53.	.0	-	.000
19	229	.2576	80.	166.2	NO	.000
20	230	.2760	71.	130.1	NO	.000
21	241	.3097	75.	185.6	NO	.000
22	237	.1552	59.	155.2	NO	.000
23	238	.1812	62.	101.6	NO	.000
24	239	.1425	56.	88.5	NO	.000
25	233	.3668	80.	146.9	NO	.000
26	245	.2988	73.	135.3	NO	.000
27	243	.2918	73.	211.1	NO	.000
28	2431	.1351	54.	111.1	NO	.000
29	506	.4950	92.	495.0	NO	.000
30	309	1.9083	152.	830.0	YES	.000
31	310	.4379	87.	181.1	YES	.000
32	314	.8464	111.	356.3	YES	.000
33	311	1.9912	154.	901.7	YES	.000
34	320	3.7067	194.	1699.9	YES	.000
35	321	.9114	114.	386.2	YES	.000
36	322	.9114	114.	386.2	YES	.000
37	324	1.0540	122.	447.9	YES	.000
38	325	.9025	114.	390.1	YES	.000
39	326	.9025	114.	390.1	YES	.000
40	334	1.3719	133.	593.2	YES	.000
41	335	.9288	115.	388.1	YES	.000
42	333	.9243	115.	386.2	YES	.000
43	331	1.5530	140.	658.9	YES	.000
44	336	.8945	113.	386.2	YES	.000
45	332	.8579	111.	368.2	YES	.000
46	344	2.3477	164.	849.9	YES	.000
47	342	1.7452	147.	740.5	YES	.000
48	337	9.3200	276.	9320.0	NO	.000

PAUL WISNER & ASSOCIATES INC., OTTAWA

OTTSWMM ANALYSIS FOR 3676 COUNTRYSIDE VILLAGES EMPLOYMENT LANDS OCTOBER 2012  
 100 YEAR 4 HOUR CHICAGO STORM - 5 MIN FILE: 100YR.DAT

MINOR SYSTEM

SUMMARY OF SIMULATION RESULTS

	SEWER NO	SLOPE (M/M)	MANNING N	MAX. FLOW (CMS)	ORIGINAL SIZE (MM)	AVAILABLE CAPACITY (CMS)	Q/QFULL ORIGINAL SIZE	REQUIRED SIZE (MM)	CAPACITY (CMS)	Q/QFULL REQUIRED SIZE
1	1051	.00250	.01300	.1600	457.00	.1486	1.08	530.00	.2206	.73
2	105	.00250	.01300	.3889	838.00	.7486	.52	690.00	.4459	.87
3	106	.00300	.01300	1.7157	1372.00	3.0536	.56	1220.00	2.2327	.77
4	101	.00500	.01300	.0772	457.00	.2102	.37	380.00	.1285	.60
5	103	.00650	.01300	.2316	762.00	.9368	.25	460.00	.2438	.95
6	108	.01800	.01300	1.9996	1372.00	7.4797	.27	840.00	2.0216	.99
7	111	.01200	.01300	3.0598	1372.00	6.1071	.50	1070.00	3.1472	.97
8	112	.00650	.01300	3.1981	1372.00	4.4947	.71	1220.00	3.2864	.97
9	116	.01000	.01300	.1227	457.00	.2972	.41	380.00	.1817	.68
10	117	.00600	.01300	1.4950	1067.00	2.2088	.68	1000.00	1.8580	.80
11	118	.00600	.01300	1.9426	1067.00	2.2088	.88	1070.00	2.2254	.87
12	119	.00500	.01300	5.1855	1830.00	8.4981	.61	1525.00	5.2261	.99
13	120	.00550	.01300	7.3190	1830.00	8.9129	.82	1700.00	7.3229	1.00
14	123	.00550	.01300	7.7746	1830.00	8.9129	.87	1825.00	8.8482	.88
15	127	.00650	.01300	.1502	457.00	.2396	.63	460.00	.2438	.62
16	128	.00500	.01300	.9232	914.00	1.3345	.69	840.00	1.0655	.87
17	129	.00700	.01300	1.0799	914.00	1.5790	.68	840.00	1.2607	.86
18	122	.00700	.01300	1.0722	914.00	1.5790	.68	840.00	1.2607	.85
19	130	.00550	.01300	9.3443	1830.00	8.9129	1.05	1980.00	10.9966	.85
20	141	.00650	.01300	10.4590	2063.00	13.3380	.78	1980.00	11.9546	.87
21	137	.00250	.01300	9.4752	2270.00	10.6743	.89	2300.00	11.0547	.86
22	138	.00800	.01300	.4878	762.00	1.0393	.47	610.00	.5742	.85
23	139	.00800	.01300	.5739	762.00	1.0393	.55	610.00	.5742	1.00
24	140	.00800	.01300	.5672	762.00	1.0393	.55	610.00	.5742	.99
25	133	.00650	.01300	12.1294	2063.00	13.3380	.91	2150.00	14.8912	.81
26	143	.00300	.01300	.9516	991.00	1.2825	.74	920.00	1.0519	.90
27	145	.00400	.01300	1.9232	1219.00	2.5724	.75	1220.00	2.5781	.75
28	146	.00400	.01300	13.9588	2270.00	13.5021	1.03	2300.00	13.9833	1.00
29	1431	.01000	.01300	.1111	305.00	.1011	1.10	380.00	.1817	.61

\*\*\* SIMULATION ENDED NORMALLY \*\*\*





# LEGEND

— SEGMENT BOUNDARY

0.22ha  
C=0.90  
AREA IN HECTARES  
RUNOFF COEFFICIENT

243  
143  
0  
MAJOR SYSTEM SEGMENT ID  
MINOR SYSTEM SEGMENT ID  
NUMBER OF CATCHBASINS



DRAWING 1  
COUNTRYSIDE VILLAGES  
EMPLOYMENT BLOCK  
OTTSWMM LAYOUT

2011-3676    APRIL 2012    SCALE: N.T.S.



## **APPENDIX B**

### **Storm Sewer Design Sheets**



**SCHAEFFERS**  
Consulting Engineers  
6 Ronrose Drive, Concord,  
Ontario L4K 4R3  
Tel: (905) 738-6100  
Fax: (905) 738-6875  
SCHAEFFER & ASSOCIATES LTD design@schaeffers.com

**STORM SEWER DESIGN SHEET**

**CITY OF BRAMPTON**  
**COUNTRYSIDE VILLAGES EMPLOYMENT LANDS**

**PROJECT No.:** 2011-3676  
**DESIGNED BY:** M.P.  
**DATE:** October 23, 2012

F:\3676\3676-DESIGN SHEET\3676-STM.xls\STM10YR (Ctrl Blocks to 2YR)

STREET	UPSTREAM		DOWNSTREAM		NO. OF HECTARES			AREA x STORM C0-EFF.					TIME		I10 <sub>YR</sub>	Q=2.78 x CIA / 1000 (m³/s)	PIPE						
								0.25	0.50	0.75	0.90	TOTAL A x C					Length (m)	SIZE		GRADE	TYPE OF PIPE	CAPACITY (m³/s)	VELOCITY (m/s)
	MH	INV	MH	INV	IN AREA	CONTRI.	TOTAL						NOM (mm)	ACT (mm)									
MAYFIELD ROAD	5B		5		0.31		0.31				0.31	0.279	0.99	10.00	121.93	0.095	54.0	450	457	0.25	CONC.	0.149	0.91
	5		6		0.33		0.64				0.33	0.576	1.35	10.99	114.16	0.183	110.0	825	838	0.25	CONC.	0.749	1.36
							0.64					0.576		12.34									
External North Ex. CULV.)	External		CULVERT		47.90		47.90							18.00		0.650							
100YR full capture flow (carried to downstream pipes as constant flow)																							
From North (Ex. CULV.)			CULVERT				47.90							18.00		0.650							
NORTH SIDE OF MAYFIELD R	CULVERT		6		2.08		49.98				2.08	1.872	0.54	18.00	81.04	1.072	50.0	1000	1016	0.25	CONC.	1.251	1.54
							49.98					1.872		18.54									
From Mayfield Road			6				0.64					0.576		12.34									
From North Side of Road			6				49.98					1.872		18.54		0.650							
MAYFIELD ROAD	6		8		0.24		50.86				0.24	2.664	0.55	18.54	79.39	1.238	79.0	1350	1372	0.40	CONC.	3.522	2.38
							50.86					2.664		19.09									
MAYFIELD ROAD	DICB		4		0.81		0.81				0.81	0.729	0.07	10.00	121.93	0.247	6.0	525	533	0.50	CONC.	0.317	1.42
	4		8		0.19		1.00				0.19	0.900	0.52	10.07	121.34	0.304	64.5	750	762	0.65	CONC.	0.936	2.05
							1.00					0.900		10.59									
From Mayfield Road							50.86					2.664		19.09		0.650							
From Mayfield Road							1.00					0.900		10.59									
ACE DRIVE	8		11		0.20		52.06				0.20	3.744	0.30	19.09	77.79	1.460	90.5	1350	1372	1.80	CONC.	7.470	5.06
							52.06					3.744		19.39									
BLOCK 1*	PLUG		11		4.20		4.20				4.20	3.780	0.10	10.00	79.43	0.835	13.0	825	838	0.70	CONC.	1.253	2.27
(constant flow)							4.20							10.10		0.835							
BLOCK 5*	10		11		0.92		0.92				0.92	0.828	0.08	10.00	79.43	0.183	11.5	900	914	0.70	CONC.	1.580	2.41
(constant flow)							0.92							10.08		0.183							



**SCHAEFFERS**  
Consulting Engineers  
6 Ronrose Drive, Concord,  
Ontario L4K 4R3  
Tel: (905) 738-6100  
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SCHAEFFER & ASSOCIATES LTD design@schaeffers.com

**STORM SEWER DESIGN SHEET**

**CITY OF BRAMPTON**  
**COUNTRYSIDE VILLAGES EMPLOYMENT LANDS**

**PROJECT No.:** 2011-3676  
**DESIGNED BY:** M.P.  
**DATE:** October 23, 2012

F:\3676\3676-DESIGN SHEET\3676-STM.xls\STM10YR (Ctrl Blocks to 2YR)

STREET	UPSTREAM		DOWNSTREAM		NO. OF HECTARES			AREA x STORM CO-EFF.					TIME		I10 <sub>YR</sub>	Q=2.78 x CIA / 1000 (m³/s)	PIPE						
																	Length (m)	SIZE		GRADE	TYPE OF PIPE	CAPACITY (m³/s)	VELOCITY (m/s)
	MH	INV	MH	INV	IN AREA	CONTRI.	TOTAL	0.25	0.50	0.75	0.90	TOTAL A x C	IN AREA	TOT				NOM (mm)	ACT (mm)				
From Ace Drive			11				52.06					3.744		19.39		0.650							
From Block 1			11				4.20					0.000		10.10		0.835							
From Block 5			11				0.92					0.000		10.08		0.183							
ACE DRIVE	11		12		0.12		57.30				0.12	3.852	0.21	19.39	76.96	2.492	53.0	1350	1372	1.20	CONC.	6.100	4.13
	12		19		0.31		57.61				0.31	4.131	0.75	19.60	76.37	2.545	136.0	1350	1372	0.65	CONC.	4.489	3.04
							57.61					4.131		20.35									
CONSTANT FLOW	100YR-10YR = (0.124-0.067)															0.057							
DOCKSTEADER ROAD	16		17		0.22		0.22				0.22	0.198	0.68	10.00	121.93	0.124	65.0	375	381	1.00	UR-PVC	0.183	1.60
							0.22					0.198		10.68									
BLOCK 6* (constant flow)	14		17		4.56		4.56				4.56	4.104	0.10	10.00	79.43	0.906	14.0	900	914	0.65	CONC.	1.523	2.32
							4.56							10.10		0.906							
BLOCK 9* (constant flow)	15		17		1.95		1.95				1.95	1.755	0.10	10.00	79.43	0.388	14.0	900	914	0.65	CONC.	1.523	2.32
							1.95							10.10		0.388							
From Docksteader Rd			17				0.22					0.198		10.68		0.057							
From Block 6			17				4.56					0.000		10.10		0.906							
From Block 9			17				1.95					0.000		10.10		0.388							
DOCKSTEADER ROAD	17		18		0.23		6.74				0.23	0.207	0.68	10.68	116.52	1.418	100.0	1050	1067	0.60	CONC.	2.207	2.47
							6.74					0.207		11.35									
BLOCK 7* (constant flow)	13		18		1.80		1.80				1.80	1.620	0.14	10.00	79.43	0.358	14.0	525	533	0.65	CONC.	0.362	1.62
							1.80							10.14		0.358							
From Docksteader Rd			18				6.74					0.207		11.35		1.351							
From Block 7			18				1.80					0.000		10.14		0.358							
DOCKSTEADER ROAD	18		19		0.22		8.76				0.22	0.405	0.68	11.35	111.66	1.834	100.0	1050	1067	0.60	CONC.	2.207	2.47
							8.76					0.405		12.03									
From Ace Drive			19				57.61					4.131		20.35		1.668							
From Docksteader Rd			19				8.76					0.405		12.03		1.709							
ACE DRIVE	19		20		0.19		66.56				0.19	4.707	0.50	20.35	74.41	4.350	88.5	2400x1200		0.50	CONC.	8.504	2.95
							66.56					4.707		20.85									



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**STORM SEWER DESIGN SHEET**

**CITY OF BRAMPTON**  
**COUNTRYSIDE VILLAGES EMPLOYMENT LANDS**

**PROJECT No.:** 2011-3676  
**DESIGNED BY:** M.P.  
**DATE:** October 23, 2012

F:\3676\3676-DESIGN SHEET\3676-STM.xls\STM10YR (Ctrl Blocks to 2YR)

STREET	UPSTREAM		DOWNSTREAM		NO. OF HECTARES			AREA x STORM CO-EFF.					TIME		I10 <sub>YR</sub>	Q=2.78 x CIA / 1000 (m³/s)	PIPE						
																	Length (m)	SIZE		GRADE	TYPE OF PIPE	CAPACITY (m³/s)	VELOCITY (m/s)
	MH	INV	MH	INV	IN AREA	CONTRI.	TOTAL	0.25	0.50	0.75	0.90	TOTAL A x C	IN AREA	TOT				NOM (mm)	ACT (mm)				
BLOCK 1* (constant flow)	PLUG		20		8.60		8.60				8.60	7.740	0.09	10.00	79.43	1.709	14.0	1050	1067	0.70	CONC.	2.383	2.67
							8.60							10.09		1.709							
BLOCK 8* (constant flow)	21		20		1.95		1.95				1.95	1.755	0.08	10.00	79.43	0.388	11.0	900	914	0.65	CONC.	1.523	2.32
							1.95							10.08		0.388							
From Ace Drive			20				66.56					4.707		20.85		3.376							
From Block 1			20				8.60					0.000		10.09		1.709							
From Block 8			20				1.95					0.000		10.08		0.388							
ACE DRIVE	20		23		0.15		77.26				0.15	4.842	0.33	20.85	73.17	6.458	61.5	2400x1200		0.55	CONC.	8.919	3.10
							77.26					4.842		21.18									
BLOCK 11* (constant flow)	25		23		1.97		1.97				1.97	1.773	0.10	10.00	79.43	0.392	11.0	675	686	0.65	CONC.	0.707	1.91
							1.97							10.10		0.392							
From Ace Drive			23				77.26					4.842		21.18		5.473							
From Block 11			23				1.97					0.000		10.10		0.392							
ACE DRIVE	23		30		0.34		79.57				0.34	5.148	0.81	21.18	72.37	6.900	150.0	2400x1200		0.55	CONC.	8.919	3.10
							79.57					5.148		21.99									
BLOCK 2* (constant flow)	24		30		2.27		2.27				2.27	2.043	0.11	10.00	79.43	0.451	14.0	750	762	0.65	CONC.	0.936	2.05
							2.27							10.11		0.451							
CONSTANT FLOW	100YR-10YR = (0.175-0.079)															0.096							
INSPIRE BOULEVARD	27		28		0.26		0.26				0.26	0.234	0.87	10.00	121.93	0.175	76.5	450	457	0.65	UR-PVC	0.240	1.46
							0.26					0.234		10.87									
BLOCK 10* (constant flow)	26		28		1.97		1.97				1.97	1.773	0.12	10.00	79.43	0.392	14.0	675	686	0.65	CONC.	0.707	1.91
							1.97							10.12		0.392							
BLOCK 13* (constant flow)	27B		28		1.95		1.95				1.95	1.755	0.10	10.00	79.43	0.388	11.0	675	686	0.65	CONC.	0.707	1.91
							1.95							10.10		0.388							



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**STORM SEWER DESIGN SHEET**

**CITY OF BRAMPTON**  
**COUNTRYSIDE VILLAGES EMPLOYMENT LANDS**

**PROJECT No.:** 2011-3676  
**DESIGNED BY:** M.P.  
**DATE:** October 23, 2012

F:\3676\3676-DESIGN SHEET\3676-STM.xls\STM10YR (Ctrl Blocks to 2YR)

STREET	UPSTREAM		DOWNSTREAM		NO. OF HECTARES			AREA x STORM C0-EFF.					TIME		I10 <sub>YR</sub>	Q=2.78 x CIA / 1000 (m³/s)	PIPE						
								Length (m)	SIZE		GRADE	TYPE OF PIPE					CAPACITY (m³/s)	VELOCITY (m/s)					
	MH	INV	MH	INV	IN AREA	CONTRI.	TOTAL		0.25	0.50			0.75	0.90					TOTAL A x C	IN AREA	TOT	NOM (mm)	ACT (mm)
From Inspire Blvd			28				0.26					0.234		10.87		0.096							
From Block 10			28				1.97					0.000		10.12		0.392							
From Block 13			28				1.95					0.000		10.10		0.388							
INSPIRE BOULEVARD	28		29		0.23		4.15				0.23	0.441	0.81	10.87	115.04	1.016	99.0	900	914	0.50	CONC.	1.335	2.03
	29		22		0.23		4.38				0.23	0.648	0.60	11.68	109.43	1.072	87.0	900	914	0.70	CONC.	1.580	2.41
	22		30		0.00		4.38				0.00	0.648	0.07	12.29	105.67	1.065	10.0	900	914	0.70	CONC.	1.580	2.41
							4.38					0.648		12.36									
From Ace Drive			30				79.57					5.148		21.99		5.864							
From Block 2			30				2.27					0.000		10.11		0.451							
From Inspire Blvd			30				4.38					0.648		12.36		0.875							
ACE DRIVE	30		41		0.20		86.42				0.20	5.976	0.49	21.99	70.52	8.362	91.0	2400x1200		0.55	CONC.	8.919	3.10
							86.42					5.976		22.48									
BLOCK 3 (north)* (constant flow)	34		41		3.00		3.00				3.00	2.700	0.11	10.00	79.43	0.596	14.0	750	762	0.65	CONC.	0.936	2.05
							3.00							10.11		0.596							
BLOCK 12* (constant flow)	35		41		1.96		1.96				1.96	1.764	0.07	10.00	79.43	0.390	11.0	975	991	0.65	CONC.	1.885	2.45
							1.96							10.07		0.390							
From Ace Drive			41				86.42					5.976		22.48		7.190							
From Block 2 Central			41				3.00					0.000		10.11		0.596							
From Block 5 North			41				1.96					0.000		10.07		0.390							
ACE DRIVE	41		33		0.28		91.66				0.28	6.228	0.55	22.48	69.45	9.379	122.0	2400x1500		0.65	CONC.	13.334	3.70
							91.66					6.228		23.03									
BLOCK 3 SOUTH* (constant flow)	31		33		3.33		3.33				3.33	2.997	0.09	10.00	79.43	0.662	14.0	975	991	0.70	CONC.	1.956	2.54
							3.33							10.09		0.662							
BLOCK 15* (constant flow)	32		33		1.86		1.86				1.86	1.674	0.08	10.00	79.43	0.370	11.5	975	991	0.70	CONC.	1.956	2.54
							1.86							10.08		0.370							



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STREET	UPSTREAM		DOWNSTREAM		NO. OF HECTARES			AREA x STORM C0-EFF.					TIME		I10 <sub>YR</sub>	Q=2.78 x CIA / 1000 (m³/s)	PIPE						
								Length (m)	SIZE		GRADE	TYPE OF PIPE					CAPACITY (m³/s)	VELOCITY (m/s)					
	MH	INV	MH	INV	IN AREA	CONTRI.	TOTAL		0.25	0.50			0.75	0.90					TOTAL A x C	IN AREA	TOT	NOM (mm)	ACT (mm)
BLOCK 14* (constant flow)	36		38		1.95		1.95				1.95	1.755	0.12	10.00	79.43	0.388	14.0	675	686	0.70	CONC.	0.734	1.99
							1.95							10.12		0.388							
From Block 14			38				1.95					0.000		10.12		0.388							
TASKER ROAD	38		39		0.31		2.26				0.31	0.279	0.73	10.12	120.95	0.481	100.0	750	762	0.80	CONC.	1.039	2.28
	39		40		0.11		2.37				0.11	0.378	0.33	10.85	115.22	0.509	45.0	750	762	0.80	CONC.	1.039	2.28
	40		33		0.00		2.37				0.00	0.378	0.07	11.18	112.85	0.506	10.0	750	762	0.80	CONC.	1.039	2.28
							2.37					0.378		11.25									
From Tasker Rd			33				2.37					0.378		11.25		0.388							
From Ace Drive			33				91.66					6.228		23.03		8.176							
From Block 3 South			33				3.33					0.000		10.09		0.662							
From Block 15			33				1.86					0.000		10.08		0.370							
ACE DRIVE	33		46		0.33		99.55				0.33	6.903	0.67	23.03	68.29	10.906	150.0	2400x1500		0.65	CONC.	13.334	3.70
							99.55					6.903		23.70									
BLOCK 4 SOUTH* (constant flow)	42		43		3.75		3.75				3.75	3.375	0.11	10.00	79.43	0.745	14.0	825	838	0.60	CONC.	1.160	2.10
							3.75							10.11		0.745							
From Block 4 South							3.75					0.000		10.11		0.745							
ACE DRIVE	43		45		0.22		3.97				0.22	0.198	0.97	10.11	121.00	0.812	97.0	975	991	0.30	CONC.	1.281	1.66
							3.97					0.198		11.08									
BLOCK 4 NORTH* (constant flow)	44		45		5.27		5.27				5.27	4.743	0.10	13.30	64.80	0.854	14.0	900	914	0.60	CONC.	1.463	2.23
							5.27							13.40		0.854							
From Ace Drive			45				3.97					0.198		11.08		0.745							
From Block 4 North			45				5.27					0.000		13.40		0.854							
ACE DRIVE	45		46		0.14		9.38				0.14	0.324	0.48	13.40	99.47	1.689	64.0	1200	1219	0.40	CONC.	2.572	2.20
							9.38					0.324		13.89									
From Ace Drive			46				99.55					6.903		23.70		9.595							
From Ace Drive			46				9.38					0.324		13.89		1.600							
To Pond	46		HW		0.00		108.93				0.00	7.227	0.12	23.70	66.93	12.540	23.0	2400x1800		0.40	CONC.	13.491	3.12
							108.93					7.227		23.83									



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STREET	UPSTREAM		DOWNSTREAM		NO. OF HECTARES			AREA x STORM C0-EFF.					TIME		I10 <sub>YR</sub>	Q=2.78 x CIA / 1000 (m³/s)	PIPE						
								0.25	0.50	0.75	0.90	TOTAL A x C					Length (m)	SIZE		GRADE	TYPE OF PIPE	CAPACITY (m³/s)	VELOCITY (m/s)
	IN AREA	CONTRI.	TOTAL	NOM (mm)	ACT (mm)																		
External From East to Tasker Rd	Area 63ha, Peak Flow 9.184 cu.m/sec						63.00									9.184							
CONSTANT FLOW 100 yr capture	0.155 cu.m/sec															0.155							
	External		50		0.27		63.27				0.27		0.57	18.00	81.04	9.339	85.0	2400x1800		0.25	CONC.	10.665	2.47
	50		HW		0.00		63.27						0.18	18.57	79.29	9.339	26.0	2400x1800		0.25	CONC.	10.665	2.47
							63.27							18.75		9.339							
Ace Drive L.P to Box Cul.					0.23		0.23				0.23	0.207	0.10	10.00	121.93	0.070	8.5	300	305	1.00	UR-PVC	0.101	1.38
							0.23					0.207		10.10									

\* DENOTES A CONSTANT FLOW BASED ON THE ALLOWABLE RELEASE RATE PROVIDED IN THE SWM REPORT.

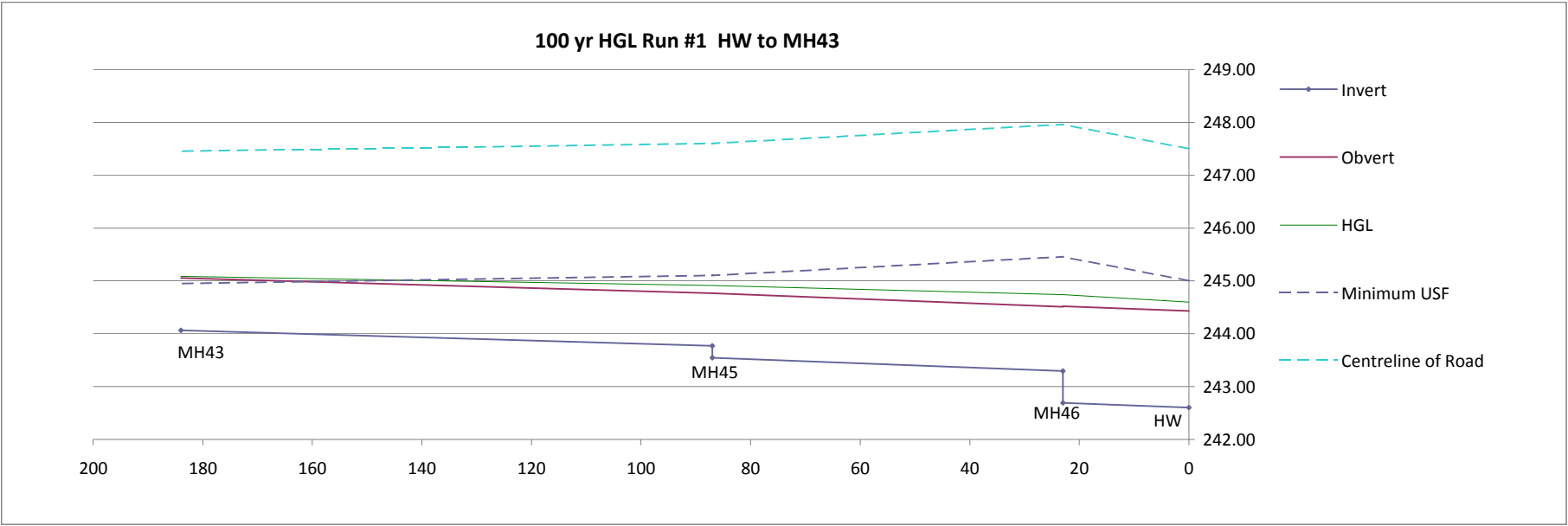
## **APPENDIX C**

### **Hydraulic Grade-line Analysis**

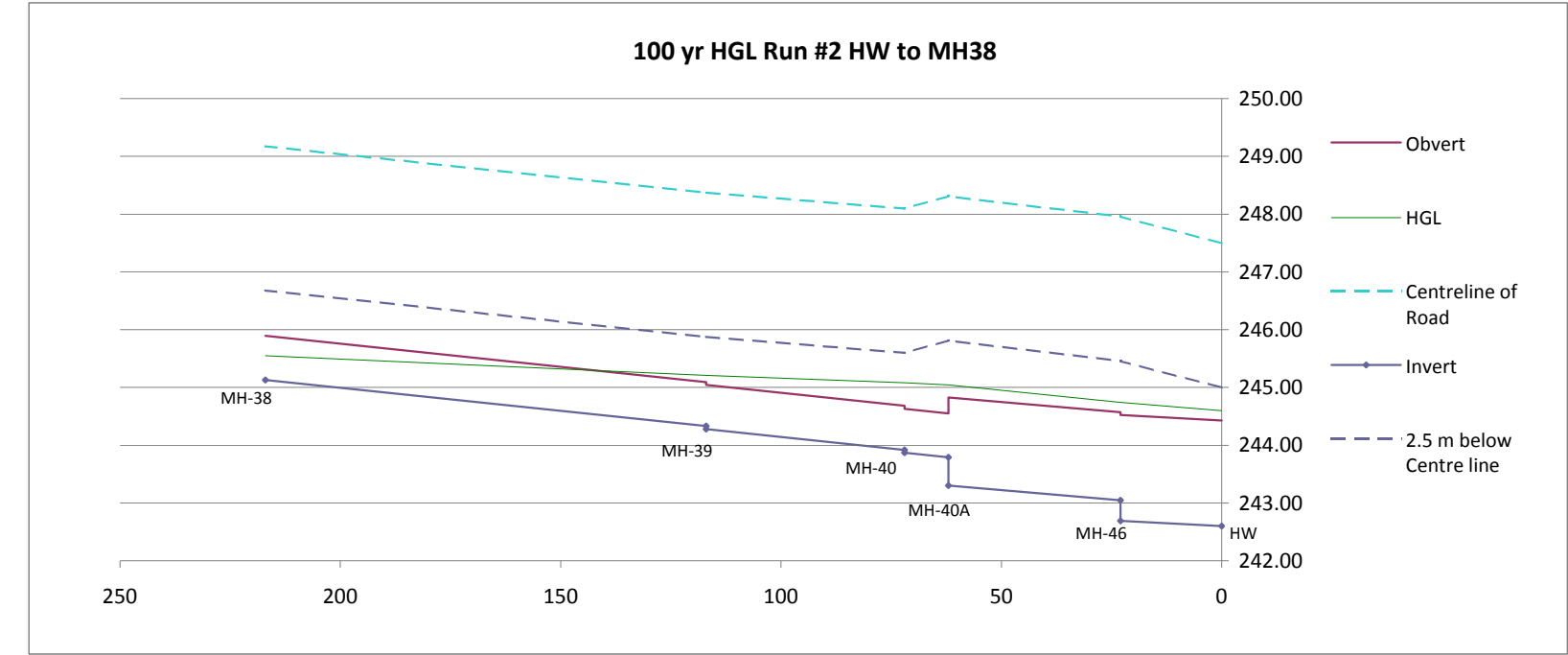


Run # 1 HW - to MH43

Full Flow																								Free Flow												Minimum USF	Centreline of Road																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
Pipe Number	US MH	DS MH	DS Invert	length	Slope	1 = Circular 2		Free Flow d/D	Free Flow Q	Flow Condition 1 = full pipe; 2= gradually varied; 3 =			US Free flow level	DS Surcharge	US Surcharge	US Invert	Loss Coeffici ents	Friction Losses	Additional Losses	A	R	V	Hydraulic		Friction Losses	Additional Losses	V2/2g	Chainage	Invert	Obvert	HGL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
						= Box	Diameter			Q	n	DS HGL											Slope	V2/2g																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		



														Full Flow				Free Flow														
Pipe Number	US MH	DS MH	DS Invert	length	Slope	1 = Circular 2 = Box	Rise	Height	Q	n	DS HGL	Free Flow d/D	Free Flow Q	Flow Condition 1 = full pipe; 2= gradually varied; 3 =	DS Obvert	US Obvert	US HGL	US Free flow level	US Surchage	US Invert	Loss Coefficients	Friction Losses	Additional Losses	Friction Losses	Additional Losses	V2/2g	Chainage	Invert	Obvert	HGL	2.5 m below Centre line	Centrel ine of Road
146	46	HW	242.600	23	0.40%	2	1829	2438	13.96	0.013	244.600	0.834	13.96	1	244.429	244.521	244.740	244.217	0.220	242.692	0.1	0.090	0.050	0.09	0.07	0.718	0	242.60	244.43	244.60	245.00	247.50
																											23	242.69	244.52	244.74	245.46	247.96
133	40A	46	243.046	39	0.65%	2	1524	2438	12.13	0.013	244.740	0.749	12.13	1	244.570	244.824	245.042	244.441	0.218	243.300	0.2	0.193	0.109	0.25	0.19	0.969	23	243.05	244.57	244.74	245.46	247.96
																											62	243.30	244.82	245.04	245.81	248.31
140	40	40A	243.790	10	0.80%	1	762		0.57	0.013	245.042	0.527	0.57	1	244.552	244.632	245.081	244.272	0.449	243.870	0.2	0.024	0.016	0.08	0.06	0.276	62	243.79	244.55	245.04	245.81	248.31
																											72	243.87	244.63	245.08	245.60	248.10
139	39	40	243.920	45	0.80%	1	762		0.57	0.013	245.081	0.531	0.57	1	244.682	245.042	245.207	244.684	0.165	244.280	0.2	0.110	0.016	0.36	0.06	0.278	72	243.92	244.68	245.08	245.60	248.10
																											117	244.28	245.04	245.21	245.88	248.38
138	38	39	244.330	100	0.80%	1	762		0.49	0.013	245.207	0.482	0.49	3	245.092	245.892	245.549	245.498	no	245.130	0.2	0.176	0.012	0.80	0.05	0.256	117	244.33	245.09	245.21	245.88	248.38
																											217	245.13	245.89	245.55	246.68	249.18



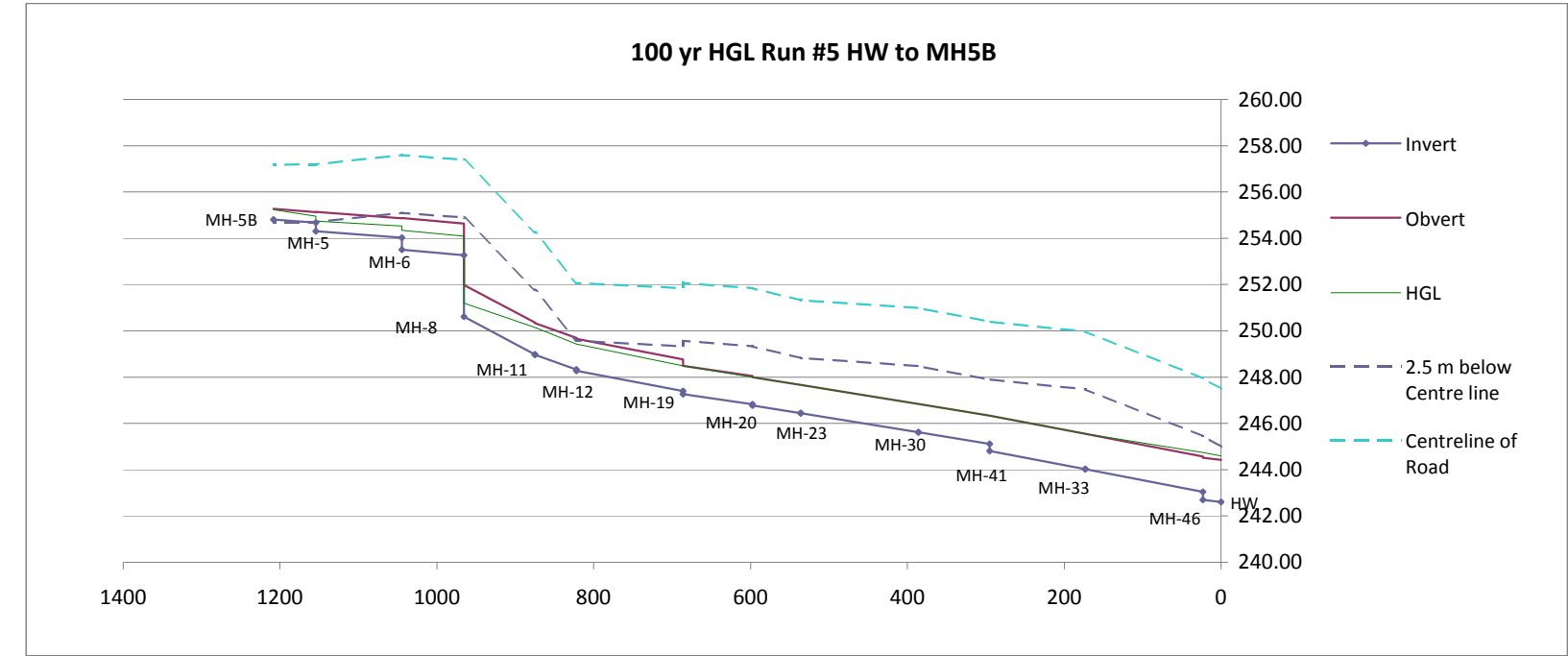
Pipe Number	US MH	DS MH	DS Invert	length	Slope	1 = Circular 2 = Box	Rise	Height	Q	n	DS HGL	Free Flow d/D	Free Flow Q	Flow Condition 1 = full pipe; 2= gradually varied; 3 =	Full Flow										Free Flow										2.5 m below Centreline	
															DS Obvert	US Obvert	US HGL	flow level	US Surchage	US Invert	Loss Coeffi ents	Friction Losses	Additional Losses	Friction Losses	Additional Losses	V2/2g	Chainage	Invert	Obvert	HGL	Centre line	Centreline of Road				
146	46	HW	242.600	23	0.40%	2	1829	2438	13.96	0.013	244.600	0.834	13.96	1	244.429	244.521	244.740	244.217	0.220	242.692	0.1	0.090	0.050	0.09	0.07	0.718	0	242.60	244.43	244.60	245.00	247.50				
133	33	46	243.046	150	0.65%	2	1524	2438	12.13	0.013	244.740	0.749	12.13	2	244.570	245.545	245.545	245.162	no	244.021	0.1	0.741	0.054	0.98	0.10	0.969	23	242.69	244.52	244.74	245.46	247.96				
																											173	244.02	245.55	245.55	247.48	249.98				
141	41	33	244.021	122	0.65%	2	1524	2438	10.46	0.013	245.545	0.671	10.46	2	245.545	246.338	246.338	245.837	no	244.814	0.0	0.448	0.000	0.79	0.00	0.897	173	244.02	245.55	245.55	247.48	249.98				
																											295	244.81	246.34	246.34	247.90	250.40				
130	22A	41	245.114	82	0.55%	2	1219	2438	9.34	0.013	246.338	0.821	9.34	1	246.333	246.784	246.793	246.566	0.009	245.565	0.0	0.455	0.000	0.45	0.00	0.747	295	245.11	246.33	246.34	247.90	250.40				
																											377	245.57	246.78	246.79	247.90	250.40				
122	22	22A	245.815	10	0.70%	1	914		1.07	0.013	246.793	0.604	1.07	1	246.729	246.799	246.852	246.437	0.053	245.885	0.2	0.032	0.027	0.07	0.07	0.341	377	245.82	246.73	246.79	247.90	250.40				
																											387	245.89	246.80	246.85	248.20	250.70				
129	29	22	245.967	87	0.70%	1	914		1.08	0.013	246.852	0.607	1.08	3	246.881	247.490	247.199	247.131	no	246.576	0.2	0.285	0.028	0.61	0.07	0.342	387	245.97	246.88	246.85	248.20	250.70				
																											474	246.58	247.49	247.20	248.20	250.70				
128	28	29	246.626	99	0.50%	1	914		0.92	0.013	247.199	0.612	0.92	3	247.540	248.035	247.729	247.680	no	247.121	0.2	0.237	0.020	0.50	0.05	0.245	474	246.63	247.54	247.20	248.20	250.70				
																											573	247.12	248.04	247.73	248.20	250.70				
127	27	28	247.571	76.5	0.65%	1	457		0.15	0.013	247.729	0.574	0.15	3	248.028	248.525	248.355	248.331	no	248.068	0.2	0.196	0.009	0.50	0.02	0.121	573	247.57	248.03	247.73	248.20	250.70				
																											650	248.07	248.53	248.35	248.20	250.70				



																									Full Flow					Free Flow									
Pipe Number	US MH	DS MH	DS Invert	length	Slope	1 = Circular 2 = Box		Rise	Height	Q	n	DS HGL	Free Flow d/D	Free Flow Q	Flow Condition 1 = full pipe; 2= gradually varied; 3 =					Loss Coefficients	Friction Losses	Additional Losses	A	R	V	Hydraulic		Friction Losses	Additional Losses	V2/2g	Chainage	Invert	Obvert	HGL	2.5 m below Centre line				
															free	DS Obvert	US Obvert	US HGL	US Free flow level							US Surcharge	US Invert								Slope	V2/2g	Centre line	Centreline of Road	
146	46	HW	242.600	23	0.40%	2	1829	2438	13.96	0.013	244.600	0.834	13.96	1	244.429	244.521	244.740	244.217	0.220	242.692	0.1	0.090	0.050	4.459	0.523	3.130	0.39%	0.499	0.09	0.07	0.718	0	242.60	244.43	244.60	245.00	247.50		
133	33	46	243.046	150	0.65%	2	1524	2438	12.13	0.013	244.740	0.749	12.13	2	244.570	245.545	245.545	245.162	no	244.021	0.1	0.741	0.054	3.716	0.469	3.264	0.49%	0.543	0.98	0.10	0.969	23	242.69	244.52	244.74	245.46	247.96		
141	41	33	244.021	122	0.65%	2	1524	2438	10.46	0.013	245.545	0.671	10.46	2	245.545	246.338	246.338	245.837	no	244.814	0.0	0.448	0.000	3.716	0.469	2.814	0.37%	0.404	0.79	0.00	0.897	173	244.02	245.55	245.55	247.48	249.98		
130	30	41	245.114	91	0.55%	2	1219	2438	9.34	0.013	246.338	0.821	9.34	1	246.333	246.834	246.843	246.616	0.009	245.615	0.0	0.505	0.000	2.973	0.406	3.143	0.55%	0.504	0.50	0.00	0.747	295	244.81	246.34	246.34	247.90	250.40		
123	23	30	245.615	150	0.55%	2	1219	2438	7.77	0.013	246.843	0.718	7.77	2	246.834	247.659	247.659	247.316	no	246.440	0.0	0.576	0.000	2.973	0.406	2.615	0.38%	0.349	0.83	0.00	0.675	386	245.61	246.83	246.84	248.49	250.99		
120	20	23	246.440	61.5	0.55%	2	1219	2438	7.32	0.013	247.659	0.688	7.32	2	247.659	247.997	247.997	247.617	no	246.778	0.0	0.209	0.000	2.973	0.406	2.462	0.34%	0.309	0.34	0.00	0.653	536	246.44	247.66	247.66	248.83	251.33		
119	19	20	246.828	88.5	0.50%	2	1219	2438	5.19	0.013	247.997	0.557	5.19	2	248.047	248.490	248.490	247.950	no	247.271	0.2	0.151	0.031	2.973	0.406	1.744	0.17%	0.155	0.44	0.10	0.499	598	246.83	248.05	248.00	249.34	251.84		
118	18	19	247.415	100	0.60%	1	1067		1.94	0.013	248.490	0.728	1.94	2	248.482	249.082	249.082	248.792	no	248.015	0.1	0.465	0.024	0.894	0.267	2.173	0.46%	0.241	0.60	0.04	0.396	686	247.27	248.49	248.49	249.58	252.08		
117	17	18	248.065	100	0.60%	1	1067		1.50	0.013	249.082	0.603	1.49	2	249.132	249.732	249.718	249.309	no	248.665	0.1	0.275	0.014	0.894	0.267	1.672	0.28%	0.142	0.60	0.04	0.359	786	248.02	249.08	249.08	250.08	252.58		
116	16	17	249.265	65	1.00%	1	457		0.12	0.013	249.718	0.447	0.12	3	249.722	250.372	250.134	250.119	no	249.915	0.1	0.111	0.003	0.164	0.114	0.748	0.17%	0.029	0.65	0.02	0.151	886	248.67	249.72	249.72	249.86	252.36		
																																951	249.92	250.37	250.13	249.86	252.36		



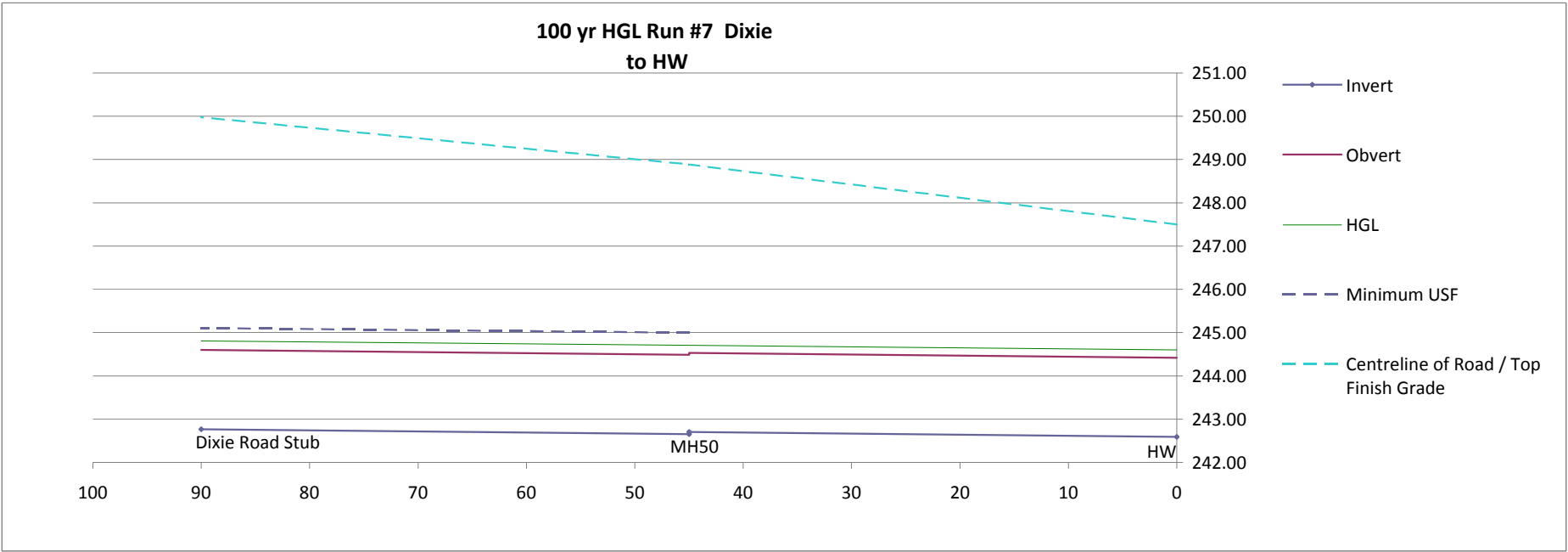
Pipe Number	US MH	DS MH	DS Invert	length	Slope	1 = Circular 2 = Box	Rise	Height	Q	n	DS HGL	Free Flow d/D	Free Flow Q	Flow Condition 1 = full pipe; 2= gradually varied; 3 =	DS Obvert	US Obvert	US HGL	US Free flow level	US Surchage	US Invert	Loss Coefficients	Full Flow					Free Flow					2.5 m below Centreline	
																						Friction Losses	Additional Losses	Friction Losses	Additional Losses	V2/2g	Chainage	Invert	Obvert	HGL	Centre line	of Road	
146	46	HW	242.600	23	0.40%	2	1829	2438	13.96	0.013	244.600	0.834	13.96	1	244.429	244.521	244.740	244.217	0.220	242.692	0.1	0.090	0.050	0.09	0.07	0.718	0	242.60	244.43	244.60	245.00	247.50	
133	33	46	243.046	150	0.65%	2	1524	2438	12.13	0.013	244.740	0.749	12.13	2	244.570	245.545	245.545	245.162	no	244.021	0.1	0.741	0.054	0.98	0.10	0.969	23	242.69	244.52	244.74	245.46	247.96	
																											173	244.02	245.55	245.55	247.48	249.98	
141	41	33	244.021	122	0.65%	2	1524	2438	10.46	0.013	245.545	0.671	10.46	2	245.545	246.338	246.338	245.837	no	244.814	0.0	0.448	0.000	0.79	0.00	0.897	173	244.02	245.55	245.55	247.48	249.98	
																											295	244.81	246.34	246.34	247.90	250.40	
130	30	41	245.114	91	0.55%	2	1219	2438	9.34	0.013	246.338	0.821	9.34	1	246.333	246.834	246.843	246.616	0.009	245.615	0.0	0.505	0.000	0.50	0.00	0.747	295	245.11	246.33	246.34	247.90	250.40	
																											386	245.61	246.83	246.84	248.49	250.99	
123	23	30	245.615	150	0.55%	2	1219	2438	7.77	0.013	246.843	0.718	7.77	2	246.834	247.659	247.659	247.316	no	246.440	0.0	0.576	0.000	0.83	0.00	0.675	386	245.62	246.83	246.84	248.49	250.99	
																											536	246.44	247.66	247.66	248.83	251.33	
120	20	23	246.440	61.5	0.55%	2	1219	2438	7.32	0.013	247.659	0.688	7.32	2	247.659	247.997	247.997	247.617	no	246.778	0.0	0.209	0.000	0.34	0.00	0.653	536	246.44	247.66	247.66	248.83	251.33	
																											598	246.78	248.00	248.00	249.34	251.84	
119	19	20	246.828	88.5	0.50%	2	1219	2438	5.19	0.013	247.997	0.557	5.19	2	248.047	248.490	248.490	247.950	no	247.271	0.2	0.151	0.031	0.44	0.10	0.499	598	246.83	248.05	248.00	249.34	251.84	
																											686	247.27	248.49	248.49	249.58	252.08	
112	12	19	247.394	136	0.65%	1	1372		3.20	0.013	248.490	0.623	3.20	2	248.766	249.650	249.429	249.133	no	248.278	0.1	0.448	0.024	0.88	0.06	0.555	686	247.39	248.77	248.49	249.34	251.84	
																											822	248.28	249.65	249.43	249.58	252.08	
111	11	12	248.328	53	1.20%	1	1372		3.06	0.013	249.429	0.501	3.06	2	249.700	250.336	250.152	249.651	no	248.964	0.1	0.160	0.022	0.64	0.09	0.870	822	248.33	249.70	249.43	249.58	252.08	
																											875	248.96	250.34	250.15	251.76	254.26	
108	8	11	248.984	90.5	1.80%	1	1372		2.00	0.013	250.152	0.353	2.00	3	250.356	251.985	251.191	251.098	no	250.613	0.1	0.117	0.009	1.63	0.09	0.935	875	248.98	250.36	250.15	251.76	254.26	
																											966	250.61	251.99	251.19	254.90	257.40	
106	6	8	253.263	79	0.30%	1	1372		1.72	0.013	254.086	0.536	1.72	2	254.635	254.872	254.346	254.236	no	253.500	0.1	0.075	0.007	0.24	0.02	0.230	966	253.26	254.64	254.09	254.90	257.40	
																											1045	253.50	254.87	254.35	255.10	257.60	
105	5	6	254.025	110	0.25%	1	838		0.39	0.013	254.528	0.512	0.39	3	254.863	255.138	254.738	254.729	no	254.300	0.1	0.074	0.003	0.28	0.01	0.096	1045	254.03	254.86	254.53	255.10	257.60	
																											1155	254.30	255.14	254.74	254.70	257.20	
1051	5B	5	254.675	54	0.25%	1	457		0.16	0.013	254.949	0.921	0.16	3	255.132	255.267	255.236	255.231	no	254.810	0.1	0.157	0.005	0.14	0.01	0.052	1155	254.68	255.13	254.95	254.70	257.20	
																											1209	254.81	255.27	255.24	254.68	257.18	





Run # 7 HW - to Dixie

Pipe Number	US MH	DS MH	DS Invert	length	Slope	1 =		Q	n	DS HGL	d/D	Free Flow Q	Flow Condition 1 = full pipe; 2= gradually varied; 3 =	DS Obvert	US Obvert	US HGL	US Free flow level	US Surcharge	US Invert	Loss Coefficients	Full Flow				Free Flow				Chainage	Invert	Obvert	HGL	Minimum USF	Centreline of Road / Top Finish Grade
						= Box	Diameter														Friction Losses	Additional Losses	Hydraulic Slope	V2/2g	Friction Losses	Additional Losses	V2/2g							
137	50	HW	242.591	45	0.25%	2	1829	2438	9.48	0.013	244.600	0.742	9.48	1	244.420	244.532	244.705	244.061	0.172	242.704	0.1	0.082	0.023	0.18%	0.230	0.11	0.04	0.418	0	242.59	244.42	244.60		247.50
																													45	242.70	244.53	244.70		248.89
137	stub	50	242.656	45	0.25%	2	1829	2438	9.48	0.013	244.705	0.742	9.48	1	244.485	244.597	244.809	244.126	0.212	242.769	0.1	0.082	0.023	0.18%	0.230	0.11	0.04	0.418	45	242.66	244.48	244.70	245.00	248.89
																													90	242.77	244.60	244.81	245.11	249.98



## **APPENDIX D**

### **Inlet Capacity Calculations**



## INLET CAPACITY AT ROAD SAG COUNTRYSIDE VILLAGES EMPLOYMENT BLOCK

Date: May 2012

Job: 3676

### Input:

ID Number / Location = OTTSWMM Segment # 216  
100-Year Overland Flow = 0.124 m<sup>3</sup>/s  
Catchbasin Type = 2 \*  
Number of Catchbasins = 2  
Depth of Ponding = 110 mm

### Output:

Flow Capacity per Inlet = 0.147 m<sup>3</sup>/s \*\*  
Flow Capacity per Inlet with 50% Blockage = 0.073 m<sup>3</sup>/s  
Number of Inlet = 2  
Total Flow Capacity with 50% Blockage = 0.147 m<sup>3</sup>/s

Total flow capacity with 50% blockage is greater than the incoming 100-Year overland flow, therefore the inlet structure is sized adequately.

### Notes:

\* Catchbasin Type (1 for single, 2 for twin)

\*\* Calculation based on MTO Design Chart 4.19: Inlet Capacity at Road Sag (Pro-rated to OPSD 400.11)

Depth of Ponding

= 252.24 - 252.13 = 110 mm

Road Center Line Elevation = 252.31 m  
Road Cross Slope = 0.03  
Road Width = 6 m  
Catchbasin Elevation = 252.13 m  
Maximum Ponding Elevation = 252.24 m

## INLET CAPACITY AT ROAD SAG COUNTRYSIDE VILLAGES EMPLOYMENT BLOCK

Date: May 2012

Job: 3676

### Input:

ID Number / Location = OTTSWMM Segment # 227  
100-Year Overland Flow = 0.150 m<sup>3</sup>/s  
Catchbasin Type = 2 \*  
Number of Catchbasins = 2  
Depth of Ponding = 124 mm

### Output:

Flow Capacity per Inlet = 0.167 m<sup>3</sup>/s \*\*  
Flow Capacity per Inlet with 50% Blockage = 0.083 m<sup>3</sup>/s  
Number of Inlet = 2  
Total Flow Capacity with 50% Blockage = 0.167 m<sup>3</sup>/s

Total flow capacity with 50% blockage is greater than the incoming 100-Year overland flow, therefore the inlet structure is sized adequately.

### Notes:

\* Catchbasin Type (1 for single, 2 for twin)

\*\* Calculation based on MTO Design Chart 4.19: Inlet Capacity at Road Sag (Pro-rated to OPSD 400.11)

Depth of Ponding

= 250.72 - 250.60 = 124 mm

Road Center Line Elevation = 250.776 m  
Road Cross Slope = 0.03  
Road Width = 6 m  
Catchbasin Elevation = 250.60 m  
Maximum Ponding Elevation = 250.72 m

**INLET CAPACITY AT ROAD SAG  
COUNTRYSIDE VILLAGES EMPLOYMENT BLOCK**

Date: May 2012

Job: 3676

**Input:**

ID Number / Location = OTTSWMM Segment # 237  
100-Year Overland Flow = 0.155 m<sup>3</sup>/s  
Catchbasin Type = 2 \*  
Number of Catchbasins = 2  
Depth of Ponding = 123 mm

**Output:**

Flow Capacity per Inlet = 0.167 m<sup>3</sup>/s \*\*  
Flow Capacity per Inlet with 50% Blockage = 0.083 m<sup>3</sup>/s  
Number of Inlet = 2  
Total Flow Capacity with 50% Blockage = 0.167 m<sup>3</sup>/s

Total flow capacity with 50% blockage is greater than the incoming 100-Year overland flow, therefore the inlet structure is sized adequately.

**Notes:**

\* Catchbasin Type (1 for single, 2 for twin)

\*\* Calculation based on MTO Design Chart 4.19: Inlet Capacity at Road Sag (Pro-rated to OPSD 400.11)

Depth of Ponding

= 248.65 - 248.53 = 123 mm

Road Center Line Elevation = 248.707 m

Road Cross Slope = 0.03

Road Width = 6 m

Catchbasin Elevation = 248.53 m

Maximum Ponding Elevation = 248.65 m

**INLET CAPACITY AT ROAD SAG  
COUNTRYSIDE VILLAGES EMPLOYMENT BLOCK**

Date: May 2012

Job: 3676

**Input:**

ID Number / Location = OTTSWMM Segment # 2431  
100-Year Overland Flow = 0.155 m<sup>3</sup>/s  
Catchbasin Type = 2 \*  
Number of Catchbasins = 2  
Depth of Ponding = 124 mm

**Output:**

Flow Capacity per Inlet = 0.167 m<sup>3</sup>/s \*\*  
Flow Capacity per Inlet with 50% Blockage = 0.083 m<sup>3</sup>/s  
Number of Inlet = 2  
Total Flow Capacity with 50% Blockage = 0.167 m<sup>3</sup>/s

Total flow capacity with 50% blockage is greater than the incoming 100-Year overland flow, therefore the inlet structure is sized adequately.

**Notes:**

\* Catchbasin Type (1 for single, 2 for twin)

\*\* Calculation based on MTO Design Chart 4.19: Inlet Capacity at Road Sag (Pro-rated to OPSD 400.11)

Depth of Ponding

= 245.38 - 245.26 = 124 mm

Road Center Line Elevation = 245.436 m

Road Cross Slope = 0.03

Road Width = 6 m

Catchbasin Elevation = 245.26 m

Maximum Ponding Elevation = 245.38 m