AME-TECH Developments Limited
Urban Engineering & Project Management Services

STORMWATER MANAGEMENT DESIGN BRIEF
Lot 30 and Part of Lot 31, Registered Plan 230
6460 Main Street, Residential Development
TOWN OF WHITCHURCH STOUFFVILLE
Revised NOVEMBER 2023

1.0 INTRODUCTION

The subject property is located on the north side of Main Street west of Baker Street, descrobed as Lot 30 and Part of Lot 31, Registered Plan 230 in the Town Whitchurch. Stouffville, Municipal address 6460 Main Street as depicted in Figure 1.

The existing topography of the land is gently sloping in a southerly direction towards Main Street as identified in Figure 2. Storm drainage from the site is presently conveyed to Main Street via sheet flow drainage. An existing 600mm diameter storm sewer on Main Street and 300mm diameter service connection are available to service the subject lands.

The minor storm system shall be sized in order to accomodate the 5 year storm per Town specifications. The 100 year post-development flows shall be captured on-site and controlled to their pre-development levels where possible in order to maintain the present water balance site characteristics. Best management practices shall be implimented including sedimentation control, infiltration, evapotranspiration, enhanced landscaping, and other low impact developmet (LIDs) storm drainage practices for water management.

2.0 POST-DEVELOPMENT STORM DRAINAGE AREAS

Total Site Area =	2468.1 sq.m.	
Hard Surface Area =	1556.8 sq.m.	C=0.90
Landscaped Area =	911.3 sq.m.	C=0.30

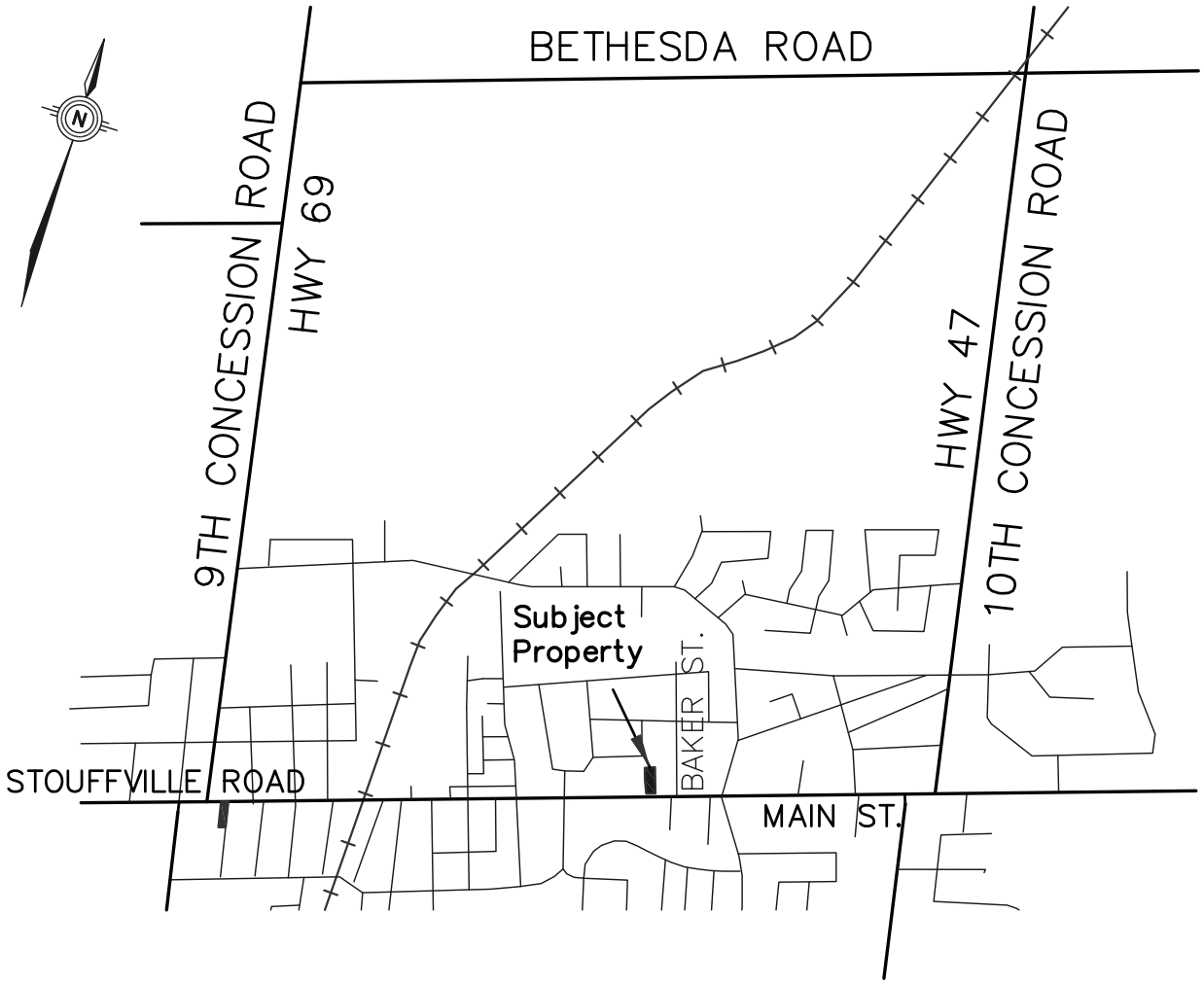
Composite Run-off Coefficient 0.68
(refer to Figure 3. for further details)

346 Newkirk Road, Unit 9, Richmond Hill, Ontario L4C 0A9 Tel: (905) 884-4336 Email: ame-tech@on.aibn.com

2426009 ONTARIO LTD.

PROPOSED RESIDENTIAL DEVELOPMENT

6460 MAIN STREET, TOWN OF WHITCHURCH–STOUFFVILLE



KEY PLAN
N.T.S.

FIGURE 1 – LOCATION PLAN

2426009 ONTARIO LTD.

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6460 MAIN STREET, TOWN OF WHITCHURCH–STOUFFVILLE

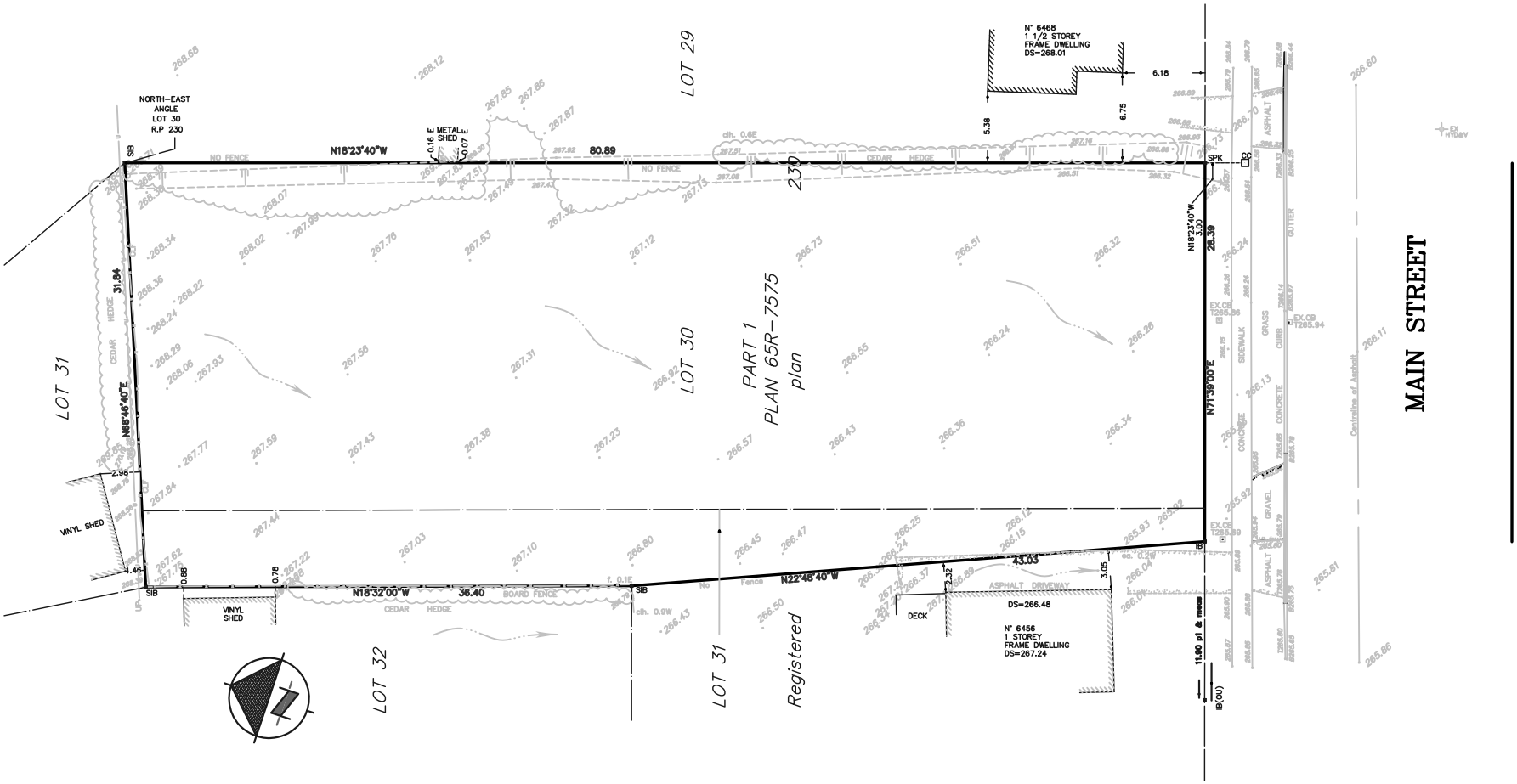
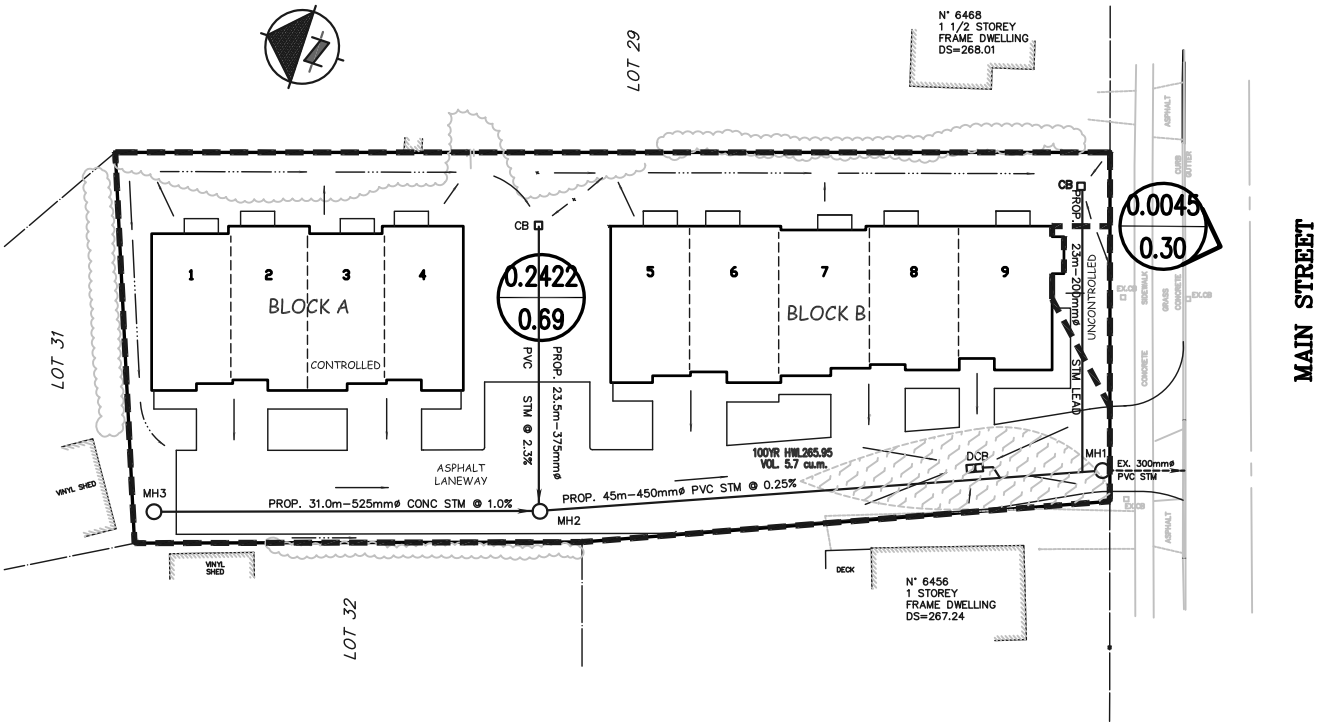


FIGURE 2 – EXISTING TOPOGRAPHY

2426009 ONTARIO LTD.

PROPOSED RESIDENTIAL DEVELOPMENT

6460 MAIN STREET, TOWN OF WHITCHURCH–STOUFFVILLE



POST–DEVELOPMENT STORM DRAINAGE	
TOTAL SITE AREA	2468.1 SQ.M.
LANDSCAPED AREAS	911.3 SQ.M.
HARD SURFACE AREA	1556.8 SQ.M.
COMPOSITE RUN–OFF COEFFICIENT	Rc=0.68
CONTROLLED AREAS	
LANDSCAPED	866 SQ.M.
HARD	1556.8 SQ.M.
COMPOSITE RUN–OFF COEFFICIENT	Rc=0.69
UNCONTROLLED	
LANDSCAPED	45.3 SQ.M.
RUN–OFF COEFFICIENT	R=0.30

FIGURE 3 – POST–DEVELOPMENT DRAINAGE

3.0 DESIGN CRITERIA

Proposed 5-year Minor System

The proposed internal minor storm sewer system shall be designed to accomodate the 5-year storm in accordance with the Town's standards using the following formula:

Q5= 2.78xRIA l/s
R - Runoff coeficient
I - Intensity mm/hr, Tc (10min.)
A - Drainage Area (ha)

I5 = 1015.93 x (T+5.255)^-0.82
R = 0.75 (Towns)
I = 107.00 mm/hr
A = 0.2468 ha
Q5post = 55.06 l/s
Q5pre = 22.02 l/s R=0.30

Note: The existing 300mm dia. service lateral @ 0.5% has a capacity of 71 L/s which is satisfactory.
Flow capacity of the internal 450mm dia storm @ 0.25% = 149 l/s

Proposed Major System

On-site detention shall be provided in order to control the 100 year post-development flows to the pre-development level (R=0.30).

The 100-year pre-development flow is calculated as follows:

Q100pre = 2.78xRIA l/s
R - Runoff coeficient
I - Intensity mm/hr, Tc (10min.)
A - Drainage Area (ha)
= 2.78 x 0.30 x 186.74 x .2468
38.4 l/s

I100 = 2051.707 x (T+6.23)^-0.86
R = 0.30
I = 186.74
A = 0.2468 ha

4.0 UNCONTROLLED RUNOFF

A small landscaped portion of the site on the south side of Block B shall discharge to the Main Street existing BCB without stormwater controls as follows:

Landscaped Area = 0.00453 ha

R= 0.300
Tc(min.) = 10.0
I100 = 186.74

Q100u = 2.78 x 0.30 x 186.74 x 0.00453
= 0.71 l/s

(refer to previous Figure 3)

5.0 DETENTION VOLUME CALCULATIONS

RUNOFF / STORAGE COMPUTATIONS (100 Year Storm Event)

The allowable flow adjusted for uncontrolled areas is :

Qall = 38.4 - 0.71 l/s
= 37.7 l/s

Total Controlled areas: 0.24228
Landscaped = 0.0866
Hard Surface 0.15568
Post Rc = 0.69
All- Dist(cms) 0.03773

100 Year Storm Storage Requirements
I for Tc 10 min. 186.74

Max. Stor. (m3)= 29.11

TIME (min.)	INTENSITY (mm/hr)	Q PEAK (m3/s)	RUN-VOL (m3)	DIS-VOL (m3)	STO-VOL (m3)
1	374.33	0.173	10.36	2.264	8.10
2	334.87	0.154	18.54	4.528	14.01
3	303.42	0.140	25.20	6.792	18.41
4	277.73	0.128	30.75	9.056	21.70
9	197.24	0.091	49.14	20.376	28.76
10	186.74	0.086	51.69	22.640	29.05
11	177.38	0.082	54.01	24.904	**29.11**
12	168.98	0.078	56.13	27.168	28.96
20	123.58	0.057	68.42	45.281	23.14
25	106.36	0.049	73.61	56.601	17.01
30	93.61	0.043	77.74	67.921	9.82

AVAILABLE DETENTION VOLUME CALCULATIONS

Required Storage Volume : **29.1** cu.m.

Available Storage Volume :
Pipe : 23 m - 200mm dia. STM 0.7 cu.m.
Pipe : 45 m - 450mm dia. STM 7.2 cu.m.
Pipe : 23.5 m - 450mm dia. STM 3.7 cu.m.
Pipe : 31 m - 525mm dia. STM 6.7 cu.m.

Ponding Areas 5.7 cu.m.
Catchbasins & Manholes 5.0 cu.m.

Provided Storage Volume : **Total** **29.1** cu.m.

6.0 INLET CAPACITY / OUTLET CONTROLS

The inlet capacity at the sag can be verified using the attached MTO Design Chart 4.19. Based on a ponding depth of 150mm the capacity of the double catchbasin is 0.17 cu.m/s.

Post Dev. flow to the DCB: Q100 = 2.78 x 0.69 x 186.74 x 0.1965
= 86.2 l/s

Assuming 50% blockage at DCB or reduced capacity of 85 l/s, sufficient capacity within acceptable tolerances (<2%) has been provided to accomodate the anticipated 100 year flow.

Limit discharge to Qa = 37.7 l/s

Q = CA(2gh)^.5		C =	0.82
A = Q/(C(2gh)^.5)		Q =	0.0377 cms
D = (4A/PI)^.5		g =	9.8 m/s^2
		h(max) =	1.035 m
A =	0.0102 m^2		
D =	0.114 m		
Use a	115 mm orifice pipe		

7.0 WATER BALANCE MANAGEMENT

The primary objective of Water Balance Management is to capture and manage rainfall on the development site itself where possible to preserve the pre-development hydrology or "Water Balance". The pre-development hydrology / water balance typically consists of three components: runoff, infiltration and evapotranspiration.

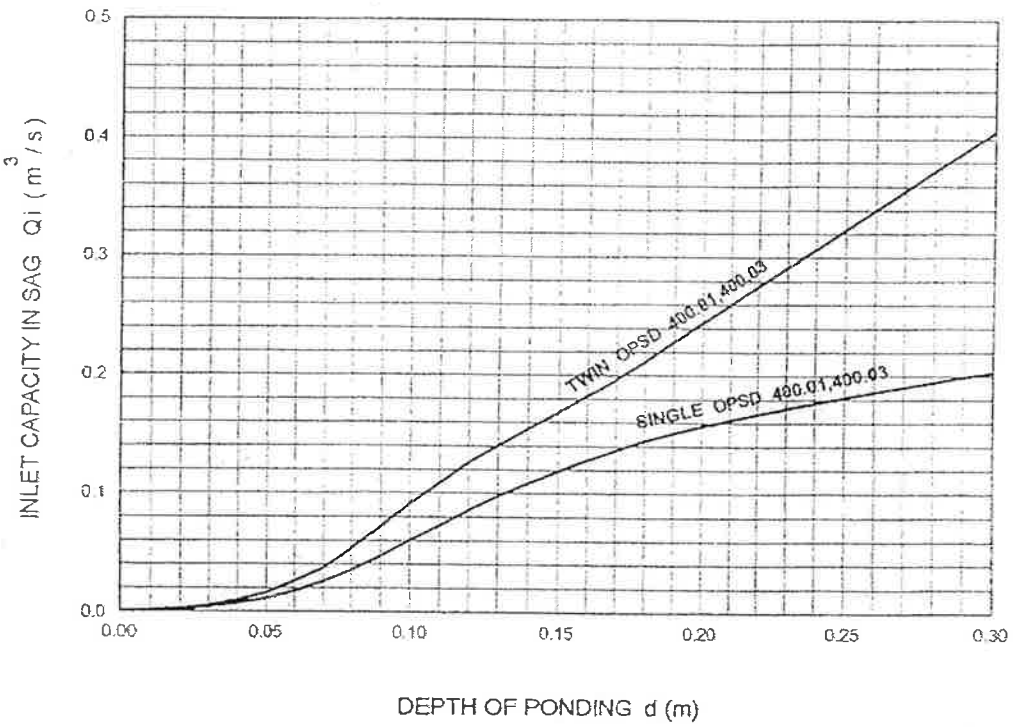
Water balance targets / criteria on a development site can be achieved through the implimentation of a combination of the following:
1. Infiltration
2. Evapotransportation
3. Landscaping
4. Rainwater re-use and/or other Low Impact Development (LID) practices.

Targets and Design criteria:

Within the Toronto area, storms with 24-hour volumes of 5mm or less contribute 50% of the total average annual rainfall volume. Therefore, the first flush or 5mm shall be retained on-site through infiltration, evapotranspiration and/or rainwater re-use.
The techniques used in order to facilitate a water balance for the subject development are identified and summarized below:

1. Use of absorbent landscaping materials.
2. Extended swale lengths, reduced swale gradients with french drains (where possible).
3. Porous / Eco Pavers on driveways.
4. Roof-top drainage or portion thereof connected to infiltration galleries / french-drains.

Design Chart 4.19: Inlet Capacity at Road Sag



Water Balance Measures Summary:

Target - Retain runoff from a 5mm, 24hr rainfall event

Site Area	% of Total Area	Abstraction for Area	Abstraction for Total Area
Absorbent Landscaping	36.9%	5 mm	1.85 mm
Porous / Eco Pavers	6.2%	5 mm	0.31 mm
Roof-top to Infiltr. Galleries	6.5%	5 mm	0.33 mm
Total Roof-top & Hard Surfaces	63.1%	0.6 mm	3.15 mm
			5.63 mm Total

* Although the roof-top and asphalt surfaces are impermeable some minor evaporation / infiltration will occur during and after a rainfall event (0.6mm).

Smaller developments present a challenge with respect to achieving Water Balance targets however, we believe the proposed LID measures and assumptions have achieved / exceeded the required target level and are in general conformity with Water Balance Management best management practices.

8.0 STORMWATER QUALITY CONTROL

Water quality controls can be enhanced by installing an oil and grit separator. The proposed STC 300i by Stormceptor specifies Level 1 (Enhanced) water quality control for the subject area by removing 85% annual TSS. The Stormceptor sizing table and detailes have been provided herewith in Appendix A.

The TRCA rate the Stormceptor OGS products as being only 50% effective in TSS removal and as such a pro-rated water quality assesment (worst case) for the subject site can be summarized as follows:

Target: Level 1 (Enhanced) - 80% TSS Removal for the site.

Total Site Area:	2468 sq.m.
Treated areas: Pavement / Driveways / Walkways	846 sq.m.

Based on the treated drainage areas of 850 sq.m. the STC 300i specifies a TSS removal of 85%.

Water Quality Summary:	**(sq.m.)**	**% TSS Removal**	
Roof plus Landscape Areas -	1622	100	
Treated Pavement Areas -	846	42.5	(50% of 85% TSS)
Un-treated Pavement Areas -	0	0	
Pro-rated TSS removal:		**80.3**	
Plus: Catchbasin with sumps:		10	
Total TSS Removal		**90.3**	

Notes:
1. Suspended solid transfer from roof-tops and absorbant landscaped areas are negligible
2. Properly maintained catchbasins equipped with sumps and / or goss traps will enhance the overall water quality and TSS removal within the site.

The Water Quality Level 1 Enhanced target has been achieved for the subject property by utilizing the STC300i Stormcetor.

9.0 EROSION AND SEDIMENTATION COTROL

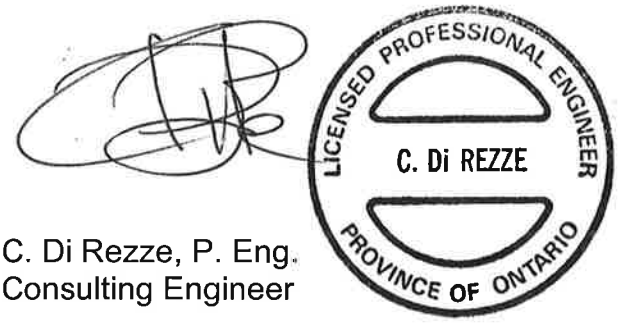
Prior to and during the construction phase of the project the erosion and sedimentation control strategy as outlined on Dwg. ESC1 shall be implimented.

In order to prevent erosion and the transport of sediments off-site and / or from migrating into the storm sewer system, the following temporary measures should be considered and implimented as required:

- install 'heavy duty' sediment fencing around the perimeter of the construction area
- install sediment controls at catchbasins and catchbasin maintenance chambers
- install rock-check dams and provide mud-mat tracking area at entrance / exit to the site
- immediate seeding and mulching of any disturbed and permanent landscaped areas

Sincerely,

AME-TECH Developments Limited



C. Di Rezze, P. Eng.
Consulting Engineer

APPENDIX A

Stormcetor Sizing Table and Detail

Ontario Stormceptor Sizing Table

Estimates obtained from simulations using the Expert System Version sizing program
Toronto Central Rain Gauge, 1986 to 1996
All drainage areas are 100% impervious
No flow control has been assumed

Legend

- 80% or greater
- 70% to 79%
- 60% to 69%
- Less than 60%

Hanson Stormceptor®

Hanson Pipe & Products Canada, Inc.
p. 1.888.888.3222 f. 519.621.8233

Drainage Area (ha)	ESTIMATED ANNUAL % RUNOFF TREATED												ESTIMATED ANNUAL % TSS REMOVED												Drainage Area (ha)
	Stormceptor Model												Stormceptor Model												
	300	750	1000	1500	2000	3000	4000	5000	6000	9000	10000	14000	300	750	1000	1500	2000	3000	4000	5000	6000	9000	10000	14000	
0.1	95	99	99	99	100	100	100	100	100	100	100	100	85	91	91	92	94	95	96	96	97	98	98	98	0.1
0.2	88	98	98	98	99	99	100	100	100	100	100	100	78	86	87	88	90	91	93	94	95	96	96	97	0.2
0.3	83	97	97	97	99	99	99	99	100	100	100	100	73	83	84	84	87	88	91	91	93	94	95	96	0.3
0.4	78	95	95	95	98	98	99	99	99	100	100	100	70	80	81	82	85	86	89	90	91	93	94	95	0.4
0.5	74	93	93	93	97	97	99	99	99	99	99	100	67	78	79	80	83	84	87	88	90	92	93	94	0.5
0.6	70	91	91	91	96	96	98	98	99	99	99	100	64	76	77	78	81	83	86	87	89	91	91	93	0.6
0.7	66	89	89	89	94	94	98	98	99	99	99	99	62	74	75	76	80	81	85	86	88	90	91	92	0.7
0.8	63	88	88	88	93	93	97	97	98	99	99	99	60	73	74	74	78	80	84	84	87	89	90	91	0.8
0.9	60	87	87	87	92	92	96	96	98	99	99	99	58	71	73	73	77	79	83	83	86	88	89	91	0.9
1.0	57	85	85	85	91	91	96	96	98	99	99	99	56	70	71	72	76	78	82	82	85	87	88	90	1.0
1.1	55	84	84	84	91	91	95	95	97	98	98	99	55	69	70	71	75	77	81	82	84	97	98	89	1.1
1.2	53	83	83	83	90	90	95	95	97	98	98	99	53	68	69	70	74	76	80	81	83	86	87	89	1.2
1.3	51	81	81	81	89	89	94	94	96	98	98	99	52	67	68	69	73	75	79	80	82	95	96	88	1.3
1.4	49	80	80	80	88	88	93	93	96	98	98	99	51	66	67	68	72	74	78	79	82	85	86	88	1.4
1.5	47	79	79	79	87	87	93	93	95	97	97	99	50	65	67	67	72	73	78	78	81	84	85	87	1.5
1.6	46	78	78	78	86	86	92	92	95	97	97	98	49	65	66	66	71	72	77	78	81	84	84	87	1.6
1.7	44	76	76	76	85	85	92	92	95	97	97	98	48	64	65	65	70	72	76	77	80	83	84	86	1.7
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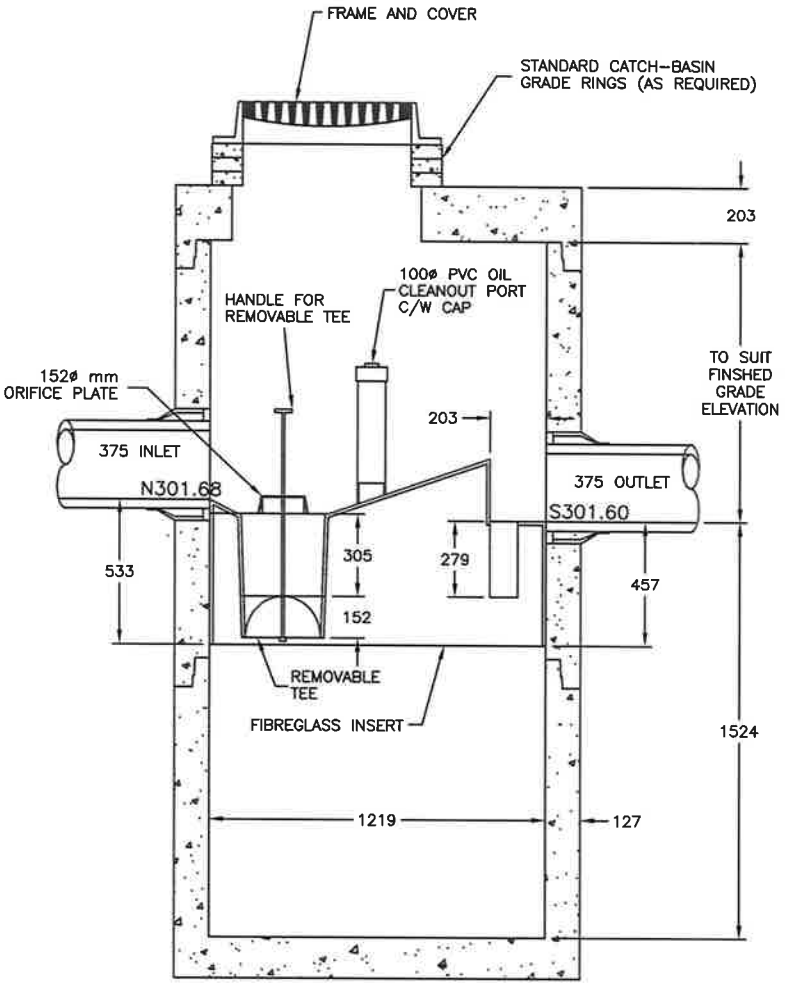
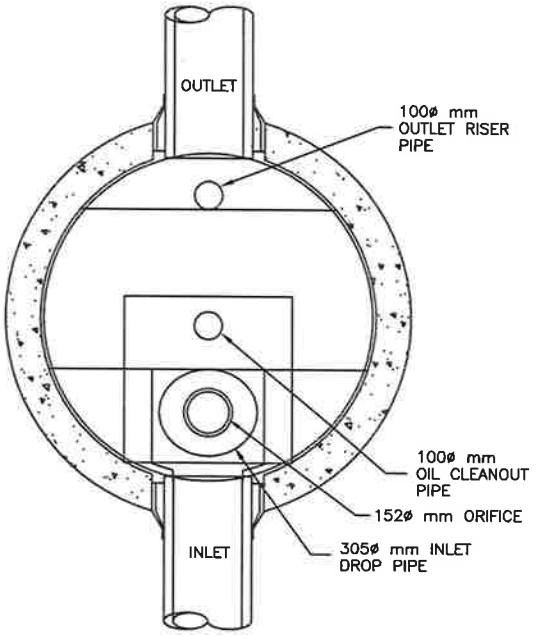
1.9	41	74	74	74	84	84	91	91	94	96	96	98	46	62	63	64	69	70	75	76	79	82	83	85	1.9
2.0	40	73	73	73	83	83	90	90	93	96	96	98	45	62	63	63	68	70	75	75	78	82	82	85	2.0
2.1	39	72	72	72	82	82	90	90	93	95	95	97	44	61	62	62	68	69	74	75	78	81	82	84	2.1
2.2	38	71	71	71	82	82	89	89	93	95	95	97	43	60	61	62	67	68	74	74	77	81	82	84	2.2
2.3	37	70	70	70	81	81	89	89	92	95	95	97	43	60	61	61	66	68	73	74	77	80	81	84	2.3
2.4	36	69	69	69	80	80	88	88	92	95	95	97	42	59	60	61	65	67	73	73	76	80	81	83	2.4
2.5	35	68	68	68	79	79	88	88	91	94	94	97	41	59	60	60	65	67	72	73	76	79	80	83	2.5
2.6	34	67	67	67	79	79	87	87	91	94	94	96	41	58	59	59	65	66	72	72	76	79	80	82	2.6
2.7	33	66	66	66	78	78	87	87	91	94	94	96	40	57	59	59	64	66	71	72	75	79	79	82	2.7
2.8	32	66	66	66	77	77	86	86	90	93	93	95	40	57	58	58	64	65	71	72	75	78	79	82	2.8
2.9	32	65	65	65	77	77	86	86	90	93	93	96	39	56	58	58	64	65	70	71	74	78	79	82	2.9
3.0	31	64	64	64	76	76	85	85	90	93	93	95	39	56	57	57	63	65	70	71	74	78	78	81	3.0
3.1	30	63	63	63	75	75	85	85	89	92	92	95	38	55	57	57	63	64	70	70	74	77	78	81	3.1
3.2	30	62	62	62	75	75	84	84	89	92	92	95	38	55	56	56	62	64	69	70	73	77	78	81	3.2
3.3	29	62	62	62	74	74	84	84	89	92	92	95	37	55	56	56	62	63	69	70	73	77	77	80	3.3
3.4	28	61	61	61	74	74	83	83	88	92	92	95	37	54	55	55	61	63	68	69	73	76	77	80	3.4
3.5	28	60	60	60	73	73	83	83	88	91	91	94	36	54	55	55	61	62	68	69	72	76	77	80	3.5
3.6	27	59	59	59	72	72	83	83	88	91	91	94	36	53	54	55	61	62	68	69	72	76	77	79	3.6
3.7	27	59	59	59	72	72	82	82	87	91	91	94	36	53	54	54	60	62	67	68	72	75	76	79	3.7
3.8	26	58	58	58	71	71	82	82	87	91	91	94	35	52	53	54	60	61	67	68	71	75	76	79	3.8
3.9	26	57	57	57	71	71	81	81	87	90	90	94	35	52	53	53	60	61	67	68	71	75	76	79	3.9
4.0	25	57	57	57	70	70	81	81	86	90	90	93	35	52	53	53	59	61	66	67	71	75	75	78	4.0
4.1	25	56	56	56	69	69	80	80	86	90	90	93	34	51	52	53	59	60	66	67	71	74	75	78	4.1
4.2	25	56	56	56	69	69	80	80	86	90	90	93	34	51	52	52	59	60	66	67	70	74	75	78	4.2
4.3	24	55	55	55	68	68	80	80	85	89	89	93	34	51	52	52	58	60	66	66	70	74	75	78	4.3
4.4	24	54	54	54	68	68	79	79	85	89	89	93	33	50	51	52	58	59	65	66	70	74	74	77	4.4
4.5	24	54	54	54	67	67	79	79	85	89	89	92	33	50	51	51	58	59	65	66	69	73	74	77	4.5
4.6	23	53	53	53	67	67	78	78	84	89	89	92	33	50	51	51	57	59	65	66	69	73	74	77	4.6
4.7	23	53	53	53	66	66	78	78	84	88	88	92	32	49	50	50	57	58	65	65	69	73	74	77	4.7
4.8	23	52	52	52	66	66	78	78	84	88	88	92	32	49	50	50	57	58	64	65	69	73	73	76	4.8
4.9	22	52	52	52	65	65	77	77	83	88	88	92	32	49	50	50	56	58	64	65	68	72	73	76	4.9
5.0	22	51	51	51	65	65	77	77	83	88	88	91	32	48	49	50	56	57	64	64	68	72	73	76	5.0
Drainage Area (ha)	300	750	1000	1500	2000	3000	4000	5000	6000	9000	10000	14000	300	750	1000	1500	2000	3000	4000	5000	6000	9000	10000	14000	Drainage Area (ha)
	Stormceptor Model												Stormceptor Model												
	ESTIMATED ANNUAL % RUNOFF TREATED												ESTIMATED ANNUAL % TSS REMOVED												



SECTION VIEW



PLAN VIEW

STORMCEPTOR MODEL STC 300i CAPACITIES				
MAXIMUM TREATMENT FLOWRATE (L/s)	DOWN PIPE DIAMETER/ ORIFICE (mm)	SEDIMENT CAPACITY (L)	OIL CAPACITY (L)	TOTAL HOLDING CAPACITY (L)
5	100	950	350	1425

NOTES:
1. ACCESS OPENING SHOULD BE LOCATED OVER THE OIL CLEANOUT PORT TO ALLOW FOR INSPECTION AND MAINTENANCE FROM THE SURFACE.
2. PIPE INSTALLATION BY NON-SHRINK GROUT OR FLEXIBLE BOOTS.

DESIGN SPECIFICATIONS:
1. MANUFACTURED TO CSA A257.4
2. CONCRETE STRENGTH: 30 MPa
3. REINFORCING STEEL: 448 MPa
4. WELDED WIRE FABRIC TO CSA G30.5
5. CONCRETE COVER TO STEEL: 25 mm MIN.
6. DESIGNED TO OHBDC '91 3rd EDITION LOADING

THE STORMCEPTOR SYSTEM IS PROTECTED BY ONE OR MORE OF THE FOLLOWING PATENTS:

CANADIAN PATENT NO. 2,009,208
CANADIAN PATENT NO. 2,137,942
CANADIAN PATENT NO. 2,175,277
CANADIAN PATENT NO. 2,180,305

Centennial
Concrete Pipe & Products Inc.

Stormceptor®

STC-300i
INLET STORMCEPTOR
300 GALLON CAPACITY

DATE: 10 MAY 00

D.B.	UNITS:	SCALE:
B.L.	METRIC	1:25