APPENDICES

Appendix A POTABLE WATER SERVICING ANALYSIS

From: Oram, Cody
To: Rathnasooriya, Thakshika
Subject: RE: Boundary Conditions - 1357 Baseline Road
Date: Wednesday, September 11, 2019 10:29:56 AM
Attachments: 1357 Baseline Sept 2019.pdf

The following are boundary conditions, HGL, for hydraulic analysis at 1357 Clyde (zone ME) assumed to be connected to the 610mm on Clyde (see attached PDF for location).

Minimum HGL = 158.0m

Maximum HGL = 163.5m the maximum pressure is estimated to be above 80 psi. A pressure check at completion of construction is recommended to determine if pressure control is required.

MaxDay + FireFlow (150 L/s) = 155.0m

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

From: Rathnasooriya, Thakshika <Thakshika.Rathnasooriya@stantec.com>
Sent: August 29, 2019 3:59 PM
To: Oram, Cody <Cody.Oram@ottawa.ca>
Subject: RE: Boundary Conditions - 1357 Baseline Road

Hi Cody,

I apologize for the late response. The attached pdf shows the possible watermain connection points to the proposed building.

Thanks,

Shika Rathnasooriya P.Eng.

Direct: 613 724-4081

Thakshika.Rathnasooriya@stantec.com

Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

From: Oram, Cody <Cody.Oram@ottawa.ca>
Sent: Friday, August 23, 2019 3:17 PM
To: Rathnasooriya, Thakshika <Thakshika.Rathnasooriya@stantec.com>
Subject: RE: Boundary Conditions - 1357 Baseline Road

Hi Shika,
Could you provide a sketch showing the approx. connection locations?
Thank you,
Cody

From: Rathnasooriya, Thakshika <Thakshika.Rathnasooriya@stantec.com>
Sent: August 23, 2019 12:02 PM
To: Oram, Cody <Cody.Oram@ottawa.ca>
Subject: RE: Boundary Conditions - 1357 Baseline Road

Hi Cody,

We revised the OBC calculation for the worst case scenario, please disregard the previous OBC calculation sheet. The revised minimum required fire flow is 150 L/s (9,000 L/min).

Thank you,

Shika Rathnasooriya P.Eng.

Direct: 613 724-4081
Thakshika.Rathnasooriya@stantec.com

Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

From: Rathnasooriya, Thakshika
Sent: Thursday, August 22, 2019 9:15 AM
To: 'Cody.Oram@ottawa.ca' <Cody.Oram@ottawa.ca>
Cc: Smadella, Karin <Karin.Smadella@stantec.com>
Subject: Boundary Conditions - 1357 Baseline Road

Hi Cody,

I am looking for watermain hydraulic boundary conditions for the proposed site at 1357 Baseline Road. We anticipate connecting to the existing 200mm diameter watermains along the northern and eastern boundary of the proposed site.

The intended land use is two residential apartment buildings which share a common ground floor lobby and commercial areas.

Estimated domestic demands and fire flow requirements are as follows:
Average Day Demand - 2.93 L/s
Max Day Demand - 7.17 L/s
Peak Hour Demand - 15.67 L/s
Per OBC - 90L/s

Thank you,

Shika Rathnasooriya P.Eng.

Direct: 613 724-4081
Thakshika.Rathnasooriya@stantec.com

Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

The content of this email is the confidential property of Stantec and should not be copied, modified, retransmitted, or used for any purpose except with Stantec's written authorization. If you are not the intended recipient, please delete all copies and notify us immediately.

'

'
'

From: Smadella, Karin
To: Rathnasooriya, Thakshika
Subject: FW: 20191030 17-1444 Clyde Baseline site and parking plans in progress
Date: Tuesday, November 19, 2019 11:22:33 AM

These are the occupancy assumptions based on their other developments. Those units that don't have 2 occupants will have 1 occupant.

Let me know if you have any questions.

Karin

Karin Smadella, P.Eng.
Project Manager

Direct: 613 724-4371
Mobile: 613 698-8088
Karin.Smadella@stantec.com

Stantec
400 - 1331 Clyde Avenue
Ottawa ON K2C 3G4

From: Rudy Hanel <rhanel@groupeselection.com>
Sent: Thursday, October 31, 2019 3:57 PM
To: Smadella, Karin <Karin.Smadella@stantec.com>
Cc: Thomas Schweitzer <thomas.schweitzer@acdf.ca>; Simon Lussier <simon.lussier@acdf.ca>; O'Grady, Lauren <Lauren.OGrady@stantec.com>
Subject: Re: 20191030 17-1444 Clyde Baseline site and parking plans in progress

Hi Karin,

Total total peak number of residents is projected to be 523.

The underlying assumption is that x% of each size of unit across both retirement and apartment have 2 occupants, as follows: 0% of care units, 3% of studio units, 20% of 1 bedroom units, 65% of 2 bedroom units, and 100% of 3 bedroom units are projected to have 2 residents.

Regards,

Rudy Hanel
Consultant Project Director, Development, Ontario

1357 Baseline Road - Domestic Water Demand Estimates

	Senior Residance	Fridom Residence	Density
Studio	39.0	24.0	1.4
1 BR	101.0	89.0	1.4
2 BR	56.0	57.0	2.1
3 BR	4.0	4.0	3.1
Care	28.0	0.0	1.0

Building ID	Area (m^2)	Population	Daily Rate of Demand [1 2] (L/m^2/day)	Avg Day Demand		Max Day Demand [3,4]		Peak Hour Demand [3,4]	
				(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
Senior Residence									
Residential		354	350	86.0	1.43	215.1	3.59	473.2	7.89
Fridom Residence									
Residential		290	350	70.6	1.18	176.4	2.94	388.1	6.47
Commercial(retail, institutional)	548		28000	1.1	0.02	1.6	0.03	2.9	0.05
Total Site :				**157.7**	**2.63**	**393.1**	**6.55**	**864.2**	**14.40**

1 Average day water demand for residential areas are equal to 350 L/cap/d

2 28,000 L/gross ha/day is used to calculate water demand for retail, office and institutional facilities.

3 Water demand criteria used to estimate peak demand rates for residential areas are as follows:
maximum day demand rate = 2.5 x average day demand rate
peak hour demand rate = 2.2 x maximum day demand rate

4 Water demand criteria used to estimate peak demand rates for commercial and institutional areas are as follows:
maximum day demand rate = 1.5 x average day demand rate
peak hour demand rate = 1.8 x maximum day demand rate

Fire Flow Calculations as per Ontario Building Code (Appendix A)

Job#	1604-01510	Designed by:	TKR
Date	3-Jan-20	Checked by:	KLS
		Description:	2nd Floor

$Q = KVS_{tot}$

Q = Volume of water required (L)
V = Total building volume (m3)
K = Water supply coefficient from Table 1
S_{tot} = Sotal of spatial coefficeint values from property line exposures on all sides as obtained from the formula

$S_{tot} = 1.0 + [S_{side1} + S_{side2} + S_{side3} + S_{side4}]$

1	Type of construction	Building Classification		Water Supply Coefficient
	Non-Combustible without Fire-Resistance Ratings	A-2, B-1, B-2, B-3, C, D		16

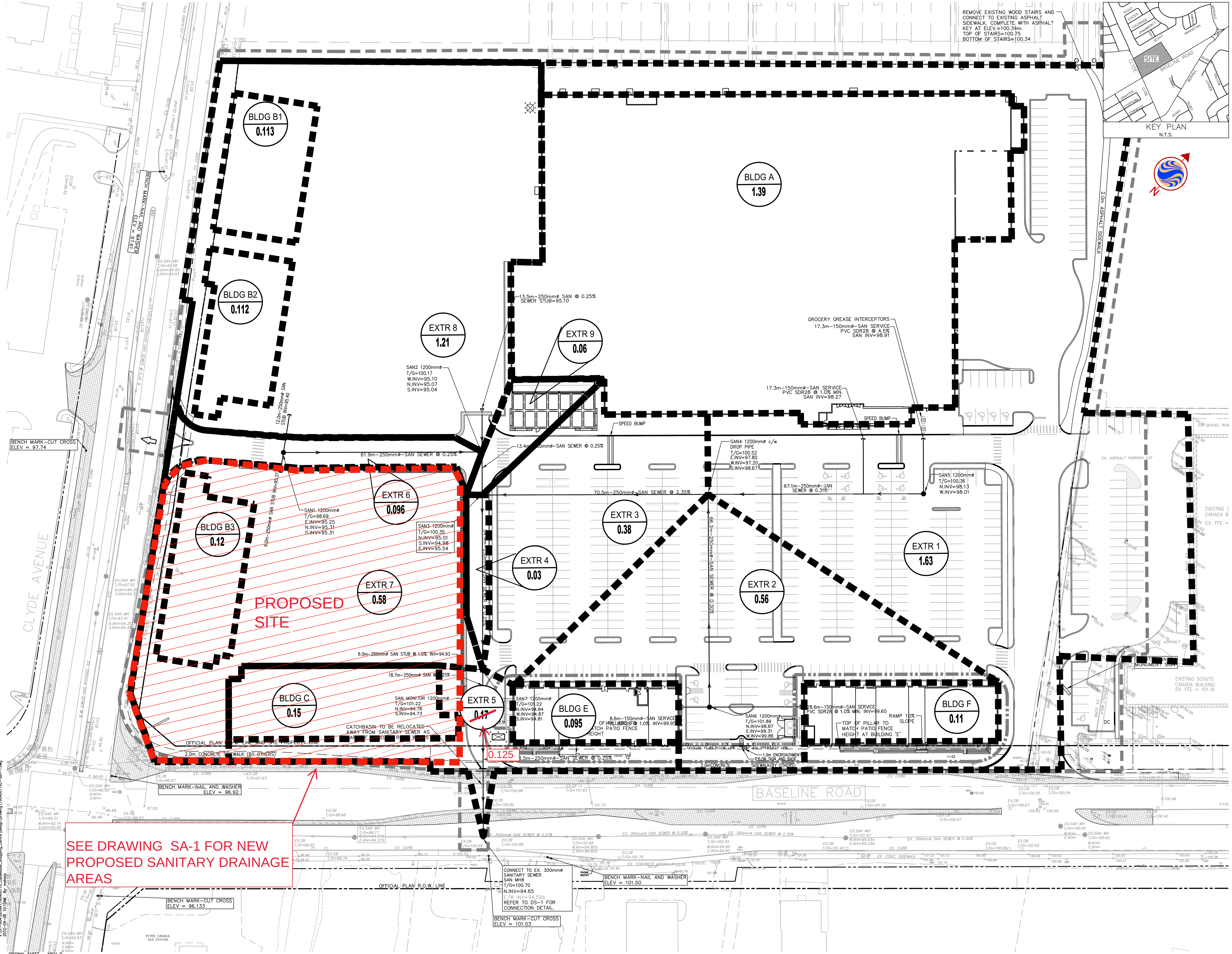
2	Area of one floor (m^2)	number of floors	height of ceiling (m)	Total Building Volume (m^3)
	2814.3	15	46.5	1,962,974

3	Side	Exposure Distance (m)	Spatial Coefficient	Total Spatial Coeffiecient
	North	12.8	0	1.49
	East	11.9	0	
	South	6.8	0	
	West	5.1	0.49	

4	Established Fire Safety Plan?	Reduction in Volume (%)		Total Volume Reduction
	no	0%		0%

5		**Total Volume 'Q' (L)**
		46,797,300
		Minimum Required Fire Flow (L/min)
		9,000

Appendix B SANITARY SEWER CALCULATIONS


REMOVE EXISTING WOOD STAIRS AND CONNECT TO EXISTING ASPHALT SIDEWALK. COMPLETE WITH ASPHALT KEY AT ELEV.=100.34m. TOP OF STAIRS=100.75 BOTTOM OF STAIRS=100.34
BLDG B1
0.113
BLDG B2
0.112
BLDG B3
0.12
BLDG A
1.39
EXTR 8
1.21
EXTR 9
0.06
EXTR 6
0.096
EXTR 7
0.58
EXTR 4
0.03
EXTR 3
0.38
EXTR 2
0.56
EXTR 1
1.63
EXTR 5
BLDG C
0.15
BLDG E
0.095
BLDG F
0.11
0.125
PROPOSED SITE
GROCERY GREASE INTERCEPTORS 17.3m-150mmø-SAN SERVICE PVC SDR28 @ 4.5% SAN INV=98.91
17.3m-150mmø-SAN SERVICE PVC SDR28 @ 1.0% MIN. SAN INV=98.27
13.5m-250mmø SAN @ 0.25% SEWER STUB=95.10
SAN2 1200mmø T/G=100.17 W.INV=95.10 N.INV=95.07 S.INV=95.04
SAN1 1200mmø T/G=98.69 E.INV=95.25 N.INV=95.31 S.INV=95.31
SAN3 1200mmø T/G=100.35 N.INV=95.01 S.INV=94.98 E.INV=95.54
SAN4 1200mmø c/w DROP PIPE T/G=100.52 E.INV=97.80 W.INV=97.20 S.INV=98.67
SAN5 1200mmø T/G=100.36 N.INV=98.13 W.INV=98.01
SAN6 1200mmø T/G=101.89 N.INV=98.87 E.INV=99.31 W.INV=99.86
SAN7 1200mmø T/G=101.22 N.INV=94.84 W.INV=94.87 S.INV=94.81
SAN MONITOR 1200mmø T/G=101.22 N.INV=94.76 S.INV=94.73
61.9m-250mmø-SAN SEWER @ 0.25%
70.5m-250mmø-SAN SEWER @ 2.35%
67.1m-150mmø-SAN SEWER @ 0.31%
6.0m-250mmø SAN STUB @ 1.0% INV=94.93
18.7m-250mmø SAN @ 0.25%
CATCHBASIN TO BE RELOCATED AWAY FROM SANITARY SEWER AS
28.6m-150mmø-SAN SERVICE PVC SDR28 @ 1.0% MIN. INV=99.60
8.6m-150mmø-SAN SERVICE @ 1.0% INV=99.95
TOP OF PILLAR TO MATCH PATIO FENCE HEIGHT AT BUILDING "E"
RAMP 10% SLOPE
1.0m ENCROACHMENT PYLON SIGN AND BASE
SPEED BUMP
2.0m ASPHALT SIDEWALK
2.0m CONCRETE SIDEWALK (BY OTHERS)
OFFICIAL PLAN R.O.W. LINE
CLYDE AVENUE
BASELINE ROAD
EXISTING SCOUTS CANADA BUILDING EX. FFE = 101.16
BENCH MARK-CUT CROSS ELEV = 97.74
BENCH MARK-NAIL AND WASHER ELEV = 96.92
BENCH MARK-CUT CROSS ELEV = 96.133
BENCH MARK-NAIL AND WASHER ELEV = 101.50
BENCH MARK-CUT CROSS ELEV = 101.03
CONNECT TO EX. 300mmø SANITARY SEWER. SAN MH8 T/G=100.70 N.INV=94.65 E/W INV=94.59± REFER TO DS-1 FOR CONNECTION DETAIL.
PETRO CANADA GAS STATION
SEE DRAWING SA-1 FOR NEW PROPOSED SANITARY DRAINAGE AREAS
ORIGINAL SHEET - ARCH D

KEY PLAN
N.T.S.

Stantec Consulting Ltd.
1505 Laperriere Avenue
Ottawa ON Canada
K1Z 7T1
Tel. 613.722.4420
Fax. 613.722.2799
www.stantec.com

Legend

- EXISTING SANITARY SEWER
- PROPOSED SANITARY SEWER
- 10 — DRAINAGE AREA ID
- 0.09 — SANITARY DRAINAGE AREA (ha)
- LIMIT OF SANITARY DRAINAGE AREA

Notes

GENERAL NOTES

1 ALL WORK SHALL BE CARRIED OUT IN COMPLIANCE WITH THE ONTARIO OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS.

2 ALL WORK AND MATERIALS TO CONFORM WITH CURRENT MINISTRY OF THE ENVIRONMENT & ENERGY OF ONTARIO, CITY OF OTTAWA AND ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS. LOCAL UTILITY STANDARDS AND MINISTRY OF TRANSPORTATION STANDARDS WILL APPLY WHERE REQUIRED.

3 THE CONTRACTOR IS ADVISED THAT WORKS BY OTHERS MAY BE ONGOING DURING THE PERIOD OF THIS CONTRACT. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES AND COORDINATION WITH ALL OTHER CONTRACTORS AND PREVENT CONSTRUCTION CONFLICTS.

4 THE INFORMATION SHOWN FOR EXISTING UTILITIES WAS PROVIDED BY OTHERS. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL UTILITIES DURING CONSTRUCTION. ALL EXISTING UTILITIES MUST BE LOCATED AND VERIFIED BY EACH UTILITY PRIOR TO COMMENCEMENT OF WORK. ANY VARIANCE IS TO BE IMMEDIATELY REPORTED TO THE ENGINEER. LOST TIME DUE TO FAILURE OF THE CONTRACTOR TO CONFIRM UTILITY LOCATIONS AND NOTIFY THE ENGINEER OF POSSIBLE CONFLICTS PRIOR TO CONSTRUCTION WILL BE AT THE CONTRACTORS EXPENSE.

5 ALL CONSTRUCTION SHALL BE CARRIED OUT IN ACCORDANCE WITH THE RECOMMENDATIONS MADE IN THE GEOTECHNICAL REPORT.

6 THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS REQUIRED AND TO BEAR THE COST OF SAME INCLUDING WATER PERMIT AND ASSOCIATED COSTS.

7 ALL DISTURBED AREAS SHALL BE REINSTATED TO EQUAL OR BETTER CONDITION TO THE SATISFACTION THE ENGINEER AND THE CITY. PAVEMENT REINSTATEMENT FOR SERVICE AND UTILITY CUTS SHALL BE IN ACCORDANCE WITH OPSD 509.010 AND OPSS 310.

8 FOR DETAILS RELATING TO STORMWATER MANAGEMENT AND ROOF DRAINAGE, SEE THE STORMWATER MANAGEMENT REPORT PREPARED BY STANTEC CONSULTING LTD. ROOF DRAINAGE TO BE PROVIDED VIA RESTRICTED RELEASE ROOF DRAINS AS DETAILED IN THE REPORT.

9 BENCHMARKS: IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THAT THE SITE BENCHMARK(S) HAS NOT BEEN ALTERED OR DISTURBED AND THAT ITS RELATIVE ELEVATION AND DESCRIPTION AGREES WITH THE INFORMATION SHOWN ON DRAWING GP-1.

10 THE CONTRACTOR SHALL PROVIDE TO THE ENGINEER 1 (ONE) SET OF AS CONSTRUCTED SITE SERVICING, GRADING, AND SITE ELECTRICAL DWGS.

Revision	By	Appd.	YY.MM.DD
1. ISSUED FOR REVIEW	MJS	PM	09.05.20

File Name: 160400770	Dwn.	Chkd.	Dsgn.	YY.MM.DD
	MJS	PM	MJS	09.05.20

Seal

Client/Project

CLYDESDALE SHOPPING CENTRE

1357 BASELINE ROAD

Ottawa ON Canada

Title

SANITARY DRAINAGE AREA PLAN

Project No.	Scale
160400770	1:500 (0 5 15 25m)

Drawing No.	Sheet	Revision
SAN-1	1 of 4	1

Stantec

SUBDIVISION:
1357 Baseline Road

DATE: 5/14/2020
REVISION: 2
DESIGNED BY: TR
CHECKED BY: KS

SANITARY SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401510

DESIGN PARAMETERS

MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	280 l/p/day	MINIMUM VELOCITY	0.60 m/s
MIN PEAK FACTOR (RES.)=	2.0	COMMERCIAL	28,000 l/ha/day	MAXIMUM VELOCITY	3.00 m/s
PEAKING FACTOR (INDUSTRIAL):	2.4	INDUSTRIAL (HEAVY)	55,000 l/ha/day	MANNINGS n	0.013
PEAKING FACTOR (COMM., INST.):	1.0	INDUSTRIAL (LIGHT)	35,000 l/ha/day	BEDDING CLASS	B
PERSONS / STUDIO (1 BED)	1.4	INSTITUTIONAL	50,000 l/ha/day	MINIMUM COVER	2.50 m
PERSONS / 2 BED APT	2.1	INFILTRATION	0.33 l/s/Ha		
PERSONS / 3 BED APT	3.1	HARMON CORRECTION FACTOR	0.8		

LOCATION			RESIDENTIAL AREA AND POPULATION									COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+I+I	INFILTRATION			TOTAL	PIPE							
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA	STUDIO 1 BED	UNITS 2 BED	3 BED	POP.	CUMULATIVE AREA	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	PEAK FLOW	TOTAL AREA	ACCU. AREA	INFILT. FLOW	FLOW	LENGTH	DIA	MATERIAL	CLASS	SLOPE	CAP. (FULL)	CAP. V PEAK FLOW	VEL. (FULL)	VEL. (ACT.)
			(ha)					(ha)			(l/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(l/s)	(ha)	(ha)	(l/s)	(l/s)	(m)	(mm)			(%)	(l/s)	(%)	(m/s)	(m/s)
FRIDOM	STUB	SAN1	0.354	113	57	4	290	0.35	290	3.47	3.26	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.354	0.35	0.12	3.38	11.7	250	PVC	SDR 35	1.00	60.6	**5.57%**	1.22	0.56
BLDG B	STUB	SAN1	0.000	0	0	0	0	0.00	0	3.80	0.00	0.188	0.188	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.06	0.188	0.19	0.06	0.12	15.5	250	PVC	SDR 35	1.00	60.6	**0.20%**	1.22	0.19
EXTR 6	SAN1	SAN2	0.000	0	0	0	0	0.35	290	3.47	3.26	0.000	0.188	0.00	0.00	0.00	0.00	0.00	0.00	0.096	0.10	0.06	0.096	0.64	0.21	3.53	33.6	250	PVC	SDR 35	0.31	33.8	**10.47%**	0.68	0.36
EXTR 8	SAN10	SAN2	0.000	0	0	0	0	0.00	0	3.80	0.00	0.000	0.000	0.00	0.00	0.00	0.00	0.00	0.00	1.247	1.25	0.00	1.247	1.25	0.41	0.41	47.0	250	PVC	SDR 35	0.25	30.3	**1.36%**	0.61	0.18
EXTR 9	SAN2	SAN3	0.000	0	0	0	0	0.35	290	3.47	3.26	0.000	0.188	0.00	0.00	0.00	0.00	0.00	0.00	0.060	1.40	0.06	0.060	1.95	0.64	3.97	13.4	250	PVC	SDR 35	0.25	30.3	**13.08%**	0.61	0.35
BLDG A	STUB	SAN5	0.000	0	0	0	0	0.00	0	3.80	0.00	1.390	1.390	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.45	1.390	1.39	0.46	0.91	17.3	150	PVC	DR 28	1.00	15.3	**5.93%**	0.86	0.39
EXTR 1	SAN5	SAN4	0.000	0	0	0	0	0.00	0	3.80	0.00	0.000	1.390	0.00	0.00	0.00	0.00	0.00	0.00	1.630	1.63	0.45	1.630	3.02	1.00	1.45	67.1	250	PVC	SDR 35	0.31	33.8	**4.29%**	0.68	0.28
BLDG E	STUB	SAN6	0.000	0	0	0	0	0.00	0	3.80	0.00	0.095	0.095	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.03	0.095	0.10	0.03	0.06	8.6	150	PVC	DR 28	1.00	15.3	**0.41%**	0.86	0.16
BLDG F	STUB	SAN6	0.000	0	0	0	0	0.00	0	3.80	0.00	0.110	0.110	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.04	0.110	0.11	0.04	0.07	28.6	150	PVC	DR 28	1.00	15.3	**0.47%**	0.86	0.19
EXTR 2	SAN6	SAN4	0.000	0	0	0	0	0.00	0	3.80	0.00	0.000	0.205	0.00	0.00	0.00	0.00	0.00	0.00	0.560	0.56	0.07	0.560	0.77	0.25	0.32	66.3	250	PVC	SDR 35	0.30	33.2	**0.96%**	0.67	0.18
EXTR 3	SAN4	SAN3	0.000	0	0	0	0	0.00	0	3.80	0.00	0.000	1.595	0.00	0.00	0.00	0.00	0.00	0.00	0.380	2.57	0.52	0.380	4.17	1.37	1.89	70.5	250	PVC	SDR 35	2.35	92.9	**2.03%**	1.87	0.61
EXTR 4	SAN3	SAN3A	0.000	0	0	0	0	0.35	290	3.47	3.26	0.000	1.783	0.00	0.00	0.00	0.00	0.00	0.00	0.030	4.00	0.58	0.030	6.14	2.03	5.87	23.5	250	PVC	SDR 35	0.18	25.7	**22.80%**	0.52	0.35
SENIORS	STUB	SAN3A	0.468	140	56	4	354	0.47	354	3.44	3.94	0.058	0.058	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.02	0.525	0.53	0.17	4.14	12.1	250	PVC	SDR 35	0.50	42.9	9.65%	0.86	0.45
	SAN3A	SAN7	0.000	0	0	0	0	0.82	644	3.33	6.96	0.000	1.841	0.00	0.00	0.00	0.00	0.00	0.00	0.000	4.00	0.60	0.000	6.67	2.20	9.75	29.2	250	PVC	SDR 35	0.50	42.9	22.75%	0.86	0.58
EXTR 5	SAN7	SAN8	0.000	0	0	0	0	0.82	644	3.33	6.96	0.000	1.841	0.00	0.00	0.00	0.00	0.00	0.00	0.125	4.13	0.60	0.125	6.79	2.24	9.79	33.6	250	PVC	SDR 35	0.31	33.8	29.01%	0.68	0.49

Appendix C STORMWATER MANAGEMENT CALCULATIONS

Stantec

1357 Baseline Road

DATE: 2020-05-15
REVISION: 2
DESIGNED BY: TR
CHECKED BY: DT

STORM SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401510

DESIGN PARAMETERS
$I = a / (t+b)^c$ (As per City of Ottawa Guidelines, 2012)

	1:2 yr	1:5 yr	1:10 yr	1:100 yr
a =	732.951	998.071	1174.184	1735.688
b =	6.199	6.053	6.014	6.014
c =	0.810	0.814	0.816	0.820

MANNING'S n = 0.013
MINIMUM COVER: 2.00 m
TIME OF ENTRY 10 min
BEDDING CLASS = B

LOCATION			DRAINAGE AREA																				PIPE SELECTION										
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (2-YEAR) (ha)	AREA (5-YEAR) (ha)	AREA (10-YEAR) (ha)	AREA (100-YEAR) (ha)	AREA (ROOF) (ha)	C (2-YEAR) (-)	C (5-YEAR) (-)	C (10-YEAR) (-)	C (100-YEAR) (-)	A x C (2-YEAR) (ha)	ACCUM AxC (2YR) (ha)	A x C (5-YEAR) (ha)	ACCUM. AxC (5YR) (ha)	A x C (10-YEAR) (ha)	ACCUM. AxC (10YR) (ha)	A x C (100-YEAR) (ha)	ACCUM. AxC (100YR) (ha)	T of C (min)	$I_{2\text{-YEAR}}$ (mm/h)	$I_{5\text{-YEAR}}$ (mm/h)	$I_{10\text{-YEAR}}$ (mm/h)	$I_{100\text{-YEAR}}$ (mm/h)	$Q_{CONTROL}$ (L/s)	ACCUM. $Q_{CONTROL}$ (L/s)	Q_{ACT} (CIA/360) (L/s)	LENGTH (m)	PIPE WIDTH OR DIAMETEI (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE %	Q_{CAP} (FULL) (L/s)	% FULL (-)	VEL. (FULL) (m/s)	VEL. (ACT) (m/s)	TIME OF FLOW (min)
500a, 500b, 500c, 500d	CBMH101	STM107	0.00	0.739	0.00	0.00	0.000	0.00	0.90	0.00	0.00	0.000	0.000	0.665	0.665	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	192.5	115.7	900	900	CIRCULAR	CONCRETE	-	0.10	597.2	**32.23%**	0.91	0.68	2.83
																				12.83																		
108, CB107, CB110	STM108	STM107	0.00	0.325	0.00	0.00	0.000	0.00	0.88	0.00	0.00	0.000	0.000	0.286	0.286	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	82.9	76.4	900	900	CIRCULAR	CONCRETE	-	0.10	597.2	**13.88%**	0.91	0.53	2.41
																				12.41																		
Roof A	STM107	STM106	0.00	0.000	0.00	0.00	1.346	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.951	0.000	0.000	0.000	0.000	12.83	67.42	91.30	106.96	156.26	27.0	27.0	268.3	56.4	900	900	CIRCULAR	CONCRETE	-	0.10	597.2	**44.92%**	0.91	0.76	1.24
CMH100	STM106	STM105	0.00	0.546	0.00	0.00	0.000	0.00	0.90	0.00	0.00	0.000	0.000	0.491	1.443	0.000	0.000	0.000	0.000	14.07	64.05	86.68	101.52	148.28	0.0	27.0	374.4	51.1	900	900	CIRCULAR	CONCRETE	-	0.10	597.2	**62.69%**	0.91	0.83	1.02
																				15.10																		
CB109, 105, Roof E, Roof F	STM109	STM105	0.00	0.631	0.00	0.00	0.206	0.00	0.90	0.00	0.00	0.000	0.000	0.568	0.568	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	7.0	7.0	171.4	63.3	900	900	CIRCULAR	CONCRETE	-	0.10	597.2	**28.69%**	0.91	0.66	1.61
																				11.61																		
104	STM105	STM104	0.00	0.168	0.00	0.00	0.000	0.00	0.90	0.00	0.00	0.000	0.000	0.151	2.162	0.000	0.000	0.000	0.000	15.10	61.54	83.25	97.49	142.36	0.0	34.0	533.9	67.4	900	900	CIRCULAR	CONCRETE	-	0.10	597.2	**89.40%**	0.91	0.92	1.22
																				16.31																		
F101	STM111	STM110	0.00	0.136	0.00	0.00	0.000	0.00	0.90	0.00	0.00	0.000	0.000	0.122	0.122	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	35.4	67.7	375	375	CIRCULAR	PVC	-	0.30	90.3	**39.24%**	0.86	0.68	1.66
	STM110	STM104	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.122	0.000	0.000	0.000	0.000	11.66	70.98	96.19	112.72	164.71	0.0	0.0	32.7	6.0	375	375	CIRCULAR	PVC	-	0.30	90.3	**36.22%**	0.86	0.67	0.15
																				11.81																		
	STM104	STM103	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.000	2.284	0.000	0.000	0.000	0.000	16.31	58.84	79.55	93.14	135.97	0.0	34.0	538.8	16.4	900	900	CIRCULAR	CONCRETE	-	2.32	2876.6	**18.73%**	4.38	2.79	0.10
																				16.41																		
902	CB	CBMH901	0.00	0.187	0.00	0.00	0.000	0.00	0.22	0.00	0.00	0.000	0.000	0.041	0.041	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	11.9	54.4	300	300	CIRCULAR	PVC	-	0.50	68.0	**17.51%**	0.97	0.61	1.50
	CBMH901	STM900	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.041	0.000	0.000	0.000	0.000	11.50	71.50	96.90	113.55	165.94	0.0	0.0	11.1	9.7	300	300	CIRCULAR	PVC	-	0.50	68.0	**16.29%**	0.97	0.59	0.27
																				11.77																		
900A, 900B, UNDR	STM900	STM103	0.00	0.595	0.00	0.00	0.000	0.00	0.90	0.00	0.00	0.000	0.000	0.536	0.577	0.000	0.000	0.000	0.000	11.77	70.62	95.69	112.13	163.86	0.0	0.0	153.3	61.0	900	900	CIRCULAR	CONCRETE	-	0.10	597.2	**25.67%**	0.91	0.64	1.60
																				13.36																		
F EX103A	STM103	STM102	0.00	0.143	0.00	0.00	0.000	0.00	0.90	0.00	0.00	0.000	0.000	0.129	2.990	0.000	0.000	0.000	0.000	16.41	58.63	79.26	92.80	135.49	0.0	34.0	692.3	62.8	900	900	CIRCULAR	CONCRETE	-	0.14	706.6	**97.97%**	1.08	1.12	0.93
																				17.34																		
Roof B1	BLDG B1	STM102	0.00	0.000	0.00	0.00	0.188	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	6.0	6.0	6.0	26.0	250	250	CIRCULAR	PVC	-	1.00	60.4	**9.93%**	1.22	0.65	0.67
																				10.67																		
F EX102A	STM102	STM101	0.00	0.034	0.00	0.00	0.000	0.00	0.90	0.00	0.00	0.000	0.000	0.031	3.020	0.000	0.000	0.000	0.000	17.34	56.74	76.68	89.77	131.04	0.0	40.0	683.4	20.0	1050	1050	CIRCULAR	CONCRETE	-	0.40	1801.7	**37.93%**	2.02	1.59	0.21
101A, R100-104, F505A-D,	STM101	STRMCPTR	0.00	0.238	0.00	0.00	0.709	0.00	0.90	0.00	0.00	0.000	0.000	0.214	3.234	0.000	0.000	0.000	0.000	17.55	56.34	76.13	89.12	130.08	74.5	114.5	798.5	2.5	675	675	CIRCULAR	CONCRETE	-	0.80	784.4	**101.80%**	2.12	2.24	0.02
F100, F EX102B	STRMCPTR	MONITOR	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.000	3.234	0.000	0.000	0.000	0.000	17.57	56.30	76.08	89.06	130.00	0.0	114.5	798.1	1.0	675	675	CIRCULAR	CONCRETE	-	1.00	876.9	**91.01%**	2.37	2.43	0.01
	MONITOR	OUTLET	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.00	0.00	0.000	0.000	0.000	3.234	0.000	0.000	0.000	0.000	17.58	56.29	76.06	89.04	129.96	0.0	114.5	797.9	15.1	675	675	CIRCULAR	CONCRETE	-	1.00	876.9	**90.99%**	2.37	2.43	0.10
																				17.68																		
																													900	900									

* NOTE: Areas tributary to storage tank & ICD discharging downstream of STM 101 controlled to a maximum of 74.5L/s (100yr event)
* NOTE: In-line inlet control device at STM101 limits outflow to downstream sewers / stormceptor

```
[TITLE]


[OPTIONS]
;;Options            Value
;;------------------ ------------
FLOW_UNITS           LPS
INFILTRATION         HORTON
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         ELEVATION
MIN_SLOPE            0
ALLOW_PONDING        YES
SKIP_STEADY_STATE    NO
START_DATE           01/01/1995
START_TIME           00:00:00
REPORT_START_DATE    01/01/1995
REPORT_START_TIME    00:00:00
END_DATE             01/01/1995
END_TIME             06:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:01:00
DRY_STEP             00:05:00
ROUTING_STEP         1
RULE_STEP            00:00:00
INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              4

[EVAPORATION]
;;Type           Parameters
;;-------------- ----------
MONTHLY      0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
DRY_ONLY     NO

[RAINGAGES]
;;               Rain      Time   Snow   Data
```



```
;;Name           Type       Intrvl Catch  Source
;;-------------- ---------- ------ ------ ----------
RG1              INTENSITY 0:10   1.0    TIMESERIES 100yrCHI

[SUBCATCHMENTS]
;;                                                    Total    Pcnt.            Pcnt.    Curb     Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- --------
101A             RG1              STM101           0.2305   100      43.2     1        0
104              RG1              STM104A-S        0.1774   100      37.8     1        0
105              RG1              CB105-S          0.537    100      120.8    1        0
108              RG1              STM108           0.064    100      14.4     1        0
500A             RG1              CMH101-S         0.151    100      34       1        0
500B             RG1              500B-S           0.239    100      53.8     1        0
500C             RG1              500C-S           0.272    100      61.2     1        0
500D             RG1              CMH101-S         0.077    100      17.3     1        0
900A             RG1              900A-S           0.386    100      86.9     1        0
900B             RG1              900B-S           0.187    100      42.1     1        0
902              RG1              STM902           0.187    2.86     42.1     1        0
CB107            RG1              CB107-S          0.22     100      49.5     1        0
CB109            RG1              CB109-S          0.094    85.71    21.2     1        0
CB110            RG1              CB110-S          0.041    78.57    9.2      1        0
CMH100           RG1              CMH100-S         0.546    100      122.9    1        0
F_EX102A         RG1              CB500-S          0.0344   100      26.85    2        0
F_EX102B         RG1              CB102B-S         0.0136   100      25.29    1.5      0
F_EX102B-1       RG1              CB102B-S         0.0136   100      25.3     2        0
F_EX103A         RG1              CB501-S          0.143    100      70.35    2        0
F100             RG1              TANK             0.2281   81.429   106      2        0
```

F101A	RG1	STM111	0.1358	100	77.146	2	0
F505A	RG1	TANK	0.0073	28.571	13.09	1.5	0
F505B	RG1	TANK	0.0074	28.571	13.146	1.5	0
F505C	RG1	TANK	0.0088	27.143	15.54	1.5	0
F505D	RG1	TANK	0.0046	0	13.325	1.5	0
R100	RG1	TANK	0.1028	100	50.14	1.5	0
R101	RG1	TANK	0.0486	100	22.23	1.5	0
R103	RG1	TANK	0.1134	100	57.13	1.5	0
R104	RG1	TANK	0.1869	100	84.44	2	0
ROOFA	RG1	RoofA-S	1.346	100	302.9	1	0
ROOFB1	RG1	RoofB1-S	0.188	100	42.3	1	0
ROOFE	RG1	RoofE-S	0.095	100	21.4	1	0
ROOFF	RG1	RoofF-S	0.111	100	25	1	0
UNC1	RG1	OF	0.208	24.29	46.8	1	0
UNC-1	RG1	OF	0.006	100	45	1.5	0
UNC2	RG1	OF	0.1886	64.29	42.435	1	0
UNC-2	RG1	OF	0.0011	100	2.72	1.5	0
UNC-3	RG1	OF	0.0017	100	2.72	1.5	0
UNC-4	RG1	OF	0.0041	100	7.187	1.5	0
UNDR	RG1	900A-S	0.022	100	5	1	0

[SUBAREAS]

;;Subcatchment	N-Imperv	N-Perv	S-Imperv	S-Perv	PctZero	RouteTo	PctRouted
101A	0.013	0.025	1.57	4.67	0	OUTLET	
104	0.013	0.025	1.57	4.67	0	OUTLET	
105	0.013	0.025	1.57	4.67	0	OUTLET	
108	0.013	0.025	1.57	4.67	0	OUTLET	

500A	0.013	0.025	1.57	4.67	0	OUTLET
500B	0.013	0.025	1.57	4.67	0	OUTLET
500C	0.013	0.025	1.57	4.67	0	OUTLET
500D	0.013	0.025	1.57	4.67	0	OUTLET
900A	0.013	0.025	1.57	4.67	0	OUTLET
900B	0.013	0.025	1.57	4.67	0	OUTLET
902	0.013	0.025	1.57	4.67	0	OUTLET
CB107	0.013	0.025	1.57	4.67	0	OUTLET
CB109	0.013	0.025	1.57	4.67	0	OUTLET
CB110	0.013	0.025	1.57	4.67	0	OUTLET
CMH100	0.013	0.025	1.57	4.67	0	OUTLET
F_EX102A	0.013	0.025	1.57	4.67	0	OUTLET
F_EX102B	0.013	0.025	1.57	4.67	0	OUTLET
F_EX102B-1	0.013	0.025	1.57	4.67	0	OUTLET
F_EX103A	0.013	0.025	1.57	4.67	0	OUTLET
F100	0.013	0.025	1.57	4.67	0	OUTLET
F101A	0.013	0.025	1.57	4.67	0	OUTLET
F505A	0.013	0.025	1.57	4.67	0	OUTLET
F505B	0.013	0.025	1.57	4.67	0	OUTLET
F505C	0.013	0.025	1.57	4.67	0	OUTLET
F505D	0.013	0.025	1.57	4.67	0	OUTLET
R100	0.013	0.025	1.57	4.67	0	OUTLET
R101	0.013	0.025	1.57	4.67	0	OUTLET
R103	0.013	0.025	1.57	4.67	0	OUTLET
R104	0.013	0.025	1.57	4.67	0	OUTLET
ROOFA	0.013	0.025	1.57	4.67	0	OUTLET
ROOFB1	0.013	0.025	1.57	4.67	0	OUTLET
ROOFE	0.013	0.025	1.57	4.67	0	OUTLET
ROOFF	0.013	0.025	1.57	4.67	0	OUTLET
UNC1	0.013	0.025	1.57	4.67	0	OUTLET
UNC-1	0.013	0.025	1.57	4.67	0	OUTLET
UNC2	0.013	0.025	1.57	4.67	0	OUTLET
UNC-2	0.013	0.025	1.57	4.67	0	OUTLET
UNC-3	0.013	0.025	1.57	4.67	0	OUTLET
UNC-4	0.013	0.025	1.57	4.67	0	OUTLET
UNDR	0.013	0.025	1.57	4.67	0	OUTLET

[INFILTRATION]

;;Subcatchment	MaxRate	MinRate	Decay	DryTime	MaxInfil
101A	76.2	13.2	4.14	7	0
104	76.2	13.2	4.14	7	0
105	76.2	13.2	4.14	7	0
108	76.2	13.2	4.14	7	0
500A	76.2	13.2	4.14	7	0
500B	76.2	13.2	4.14	7	0
500C	76.2	13.2	4.14	7	0
500D	76.2	13.2	4.14	7	0

900A	76.2	13.2	4.14	7	0
900B	76.2	13.2	4.14	7	0
902	76.2	13.2	4.14	7	0
CB107	76.2	13.2	4.14	7	0
CB109	76.2	13.2	4.14	7	0
CB110	76.2	13.2	4.14	7	0
CMH100	76.2	13.2	4.14	7	0
F_EX102A	76.2	13.2	4.14	7	0
F_EX102B	76.2	13.2	4.14	7	0
F_EX102B-1	76.2	13.2	4.14	7	0
F_EX103A	76.2	13.2	4.14	7	0
F100	76.2	13.2	4.14	7	0
F101A	76.2	13.2	4.14	7	0
F505A	76.2	13.2	4.14	7	0
F505B	76.2	13.2	4.14	7	0
F505C	76.2	13.2	4.14	7	0
F505D	76.2	13.2	4.14	7	0
R100	76.2	13.2	4.14	7	0
R101	76.2	13.2	4.14	7	0
R103	76.2	13.2	4.14	7	0
R104	76.2	13.2	4.14	7	0
ROOFA	76.2	13.2	4.14	7	0
ROOFB1	76.2	13.2	4.14	7	0
ROOFE	76.2	13.2	4.14	7	0
ROOFF	76.2	13.2	4.14	7	0
UNC1	76.2	13.2	4.14	7	0
UNC-1	76.2	13.2	4.14	7	0
UNC2	76.2	13.2	4.14	7	0
UNC-2	76.2	13.2	4.14	7	0
UNC-3	76.2	13.2	4.14	7	0
UNC-4	76.2	13.2	4.14	7	0
UNDR	76.2	13.2	4.14	7	0

[LID_CONTROLS]

;;	Type/Layer	Parameters						
LID1-R101	GR							
LID1-R101	SURFACE	150	0.05	0.13	0	5		
LID1-R101	SOIL	150	0.65	0.55	0.2	36	10.0	8.5
LID1-R101	DRAINMAT	3	0.5	0.1				

[LID_USAGE]

;;Subcatchment	LID Process	Number	Area	Width	InitSatur	FromImprv	ToPerv	Report File
	Drain to	FromPerv						
R101	LID1-R101	1	437.4	21.2	0	100	0	*
	*	100						

[JUNCTIONS]

;;	Invert	Max.	Init.	Surcharge	Ponded
;;Name	Elev.	Depth	Depth	Depth	Area
OF	93.73	4.27	0.68	0	0
ORF900B	96.77	2.07	0	0	0
STM101	93.98	4.09	0.43	0	0
STM104A	96.98	3.4	0	0	0
STM902	99.16	1.29	0	0	0
STRMCPTR	93.921	4.049	0.489	0	0

[OUTFALLS]

;;	Invert	Outfall	Stage/Table	Tide	
;;Name	Elev.	Type	Time Series	Gate	Route To
OF1	93.72	FIXED	94.41	NO	

[STORAGE]

;;	Invert	Max.	Init.	Storage	Curve			Evap.
;;Name	Elev.	Depth	Depth	Curve	Params			Frac.
Infiltration parameters								
500B-S	98.26	2.1	0	TABULAR	500b-IC		0	0
500C-S	98.4	2.14	0	TABULAR	500c-IC		0	0
900A-S	96.83	1.87	0	TABULAR	900A-IC		0	0
900B-S	96.77	2.07	0	TABULAR	900B-IC		0	0
CB102B-S	96.27	1.8	0	FUNCTIONAL	0	0	0	0
CB105-S	98.25	2.08	0	TABULAR	STM105-IC		0	0
CB107-S	98.56	2.09	0	TABULAR	CB107-IC		0	0
CB109-S	99.05	2.37	0	TABULAR	CB109-IC		0	0
CB110-S	98.6	2.06	0	TABULAR	CB110-IC		0	0
CB500-S	97.13	1.46	0	FUNCTIONAL	0	0	0	0
CB501-S	96.76	2.51	0	FUNCTIONAL	0	0	0	0
CB902A	97.07	1.43	0	FUNCTIONAL	0	0	0.36	0
CBMH901	96.76	3.77	0	FUNCTIONAL	0	0	1.13	0
CMH100-S	98.09	2.41	0	TABULAR	CMH100-IC		0	0
CMH101-S	97.74	2.62	0	TABULAR	CMH101-IC		0	0
MONITOR	93.881	4.049	0.529	FUNCTIONAL	0	0	1.13	0
ORF101	94.026	4.014	0.384	FUNCTIONAL	0	0	1.13	0
RoofA-S	110	0.15	0	TABULAR	ROOFA-S		0	0
RoofB1-S	110	0.15	0	TABULAR	ROOFB1-S		0	0
RoofE-S	110	0.15	0	TABULAR	ROOFE-S		0	0
RoofF-S	110	0.15	0	TABULAR	ROOFF-S		0	0
STM102	95.9	2.79	0	FUNCTIONAL	0	0	1.13	0
STM103	96.04	4.11	0	FUNCTIONAL	0	0	1.13	0
STM104A-S	98.25	2.08	0	TABULAR	STM104-IC		0	0

STM104B-S	96.98	3.4	0	FUNCTIONAL	0	0	1.13	0	0
STM105-S	97.39	3.12	0	FUNCTIONAL	0	0	1.13	0	0
STM106	97.47	3.11	0	FUNCTIONAL	0	0	1.13	0	0
STM107	97.56	3.33	0	FUNCTIONAL	0	0	1.13	0	0
STM108	98.1	2.7	0	FUNCTIONAL	0	0	1.13	0	0
STM109	97.61	4.18	0	FUNCTIONAL	0	0	1.13	0	0
STM110	97.76	2.39	0	FUNCTIONAL	0	0	1.49	0	0
STM111	98.03	2.84	0	FUNCTIONAL	0	0	1.85	0	0
STM900	96.15	3.62	0	FUNCTIONAL	0	0	1.13	0	0
TANK	94.41	2.71	0	FUNCTIONAL	0	0	83.8	0	0

[CONDUITS]

;;Name	Inlet Node	Outlet Node	Length	Manning N	Inlet Offset	Outlet Offset	Init. Flow	Max. Flow
C1	STM111	STM110	67.7	0.013	98.03	97.82	0	0
C3	OF	OF1	1	0.013	93.73	93.72	0	0
L1	CMH101-S	STM107	115.7	0.013	97.74	97.62	0	0
L11	STM107	STM106	56.4	0.013	97.56	97.5	0	0
L14	STM105-S	STM104A	64.078	0.013	97.39	97.32	0	0
L30	STM103	STM102	61.7	0.013	96.04	95.95	0	0
L32	ORF101	STRMCPTR	2.5	0.013	94.026	94.001	0	0
L34	STM108	STM107	76.4	0.013	98.1	98.02	0	0
L45	STM902	CB902A	179.1	0.013	99.16	97.1	0	0
L50	STM109	STM105-S	63.305	0.013	97.61	97.55	0	0
L51	STM106	STM105-S	51.1	0.013	97.47	97.42	0	0
L61	STM104B-S	STM103	16.447	0.013	96.98	96.63	0	0
L63	CB902A	CBMH901	54.4	0.013	97.07	96.79	0	0
L64	CBMH901	STM900	9.7	0.013	96.76	96.71	0	0
L65	STM900	STM103	49	0.013	96.15	96.09	0	0

L68	ORF900B	STM900	24.8	0.013	96.77	96.522	0	0
L70	STRMCPTR	MONITOR	1	0.013	93.921	93.911	0	0
L71	MONITOR	OF	18.845	0.013	93.881	93.73	0	0
L72	900A-S	STM900	3	0.013	96.83	96.8	0	0
L8	STM102	STM101	20.9	0.013	95.9	95.87	0	0

[ORIFICES]

;;Name	Inlet Node	Outlet Node	Orifice Type	Crest Height	Disch. Coeff.	Flap Gate	Open/Close Time
500B-IC	500B-S	STM107	SIDE	98.26	0.61	NO	0
500C-IC	500C-S	STM107	SIDE	98.4	0.61	NO	0
CB102B-IC1	CB102B-S	STM101	SIDE	96.27	0.61	NO	0
CB102B-IC2	CB102B-S	STM101	SIDE	96.27	0.61	NO	0
CB105-IC1	CB105-S	STM105-S	SIDE	98.25	0.61	NO	0
CB105-IC2	CB105-S	STM105-S	SIDE	98.25	0.61	NO	0
CB107-IC	CB107-S	STM107	SIDE	98.56	0.572	NO	0
CB109-IC	CB109-S	STM109	SIDE	99.05	0.61	NO	0
CB110-IC	CB110-S	STM108	SIDE	98.6	0.61	NO	0
CB500-IC	CB500-S	STM102	SIDE	97.06	0.61	NO	0
CB501-IC	CB501-S	STM103	SIDE	96.76	0.61	NO	0
CMH100-IC	CMH100-S	STM106	SIDE	98.09	0.61	NO	0
IC-TANK	TANK	ORF101	SIDE	94.41	0.61	NO	0
ORF_900B	900B-S	ORF900B	SIDE	96.77	0.572	NO	0
SMT101-IC	STM101	ORF101	SIDE	94.026	0.61	NO	0
STM104A-IC	STM104A-S	STM104A	SIDE	98.25	0.61	NO	0
STM104B-IC	STM104A	STM104B-S	SIDE	96.98	0.61	NO	0
STM110-IC	STM110	STM104B-S	SIDE	97.76	0.572	NO	0

[OUTLETS]

;;Name	Inlet Node	Outlet Node	Outflow Height	Outlet Type	Qcoeff/ QTable	Qexpon	Flap Gate
RA-O	RoofA-S	STM106	110	TABULAR/HEAD	BLDGA-O		NO
RB-O	RoofB1-S	STM101	110	TABULAR/HEAD	BLDGB-O		NO
RE-O	RoofE-S	STM109	110	TABULAR/HEAD	BLDGE-O		NO
RF-O	RoofF-S	STM109	110	TABULAR/HEAD	BLDGF-O		

NO

[XSECTIONS]

;;Link	Shape	Geom1	Geom2	Geom3	Geom4	Barrels
C1	CIRCULAR	0.375	0	0	0	1
C3	DUMMY	0	0	0	0	1
L1	CIRCULAR	0.9	1	1	1	1
L11	CIRCULAR	0.9	1	1	1	1
L14	CIRCULAR	0.9	1	1	1	1
L30	CIRCULAR	0.9	1	1	1	1
L32	CIRCULAR	0.675	1	1	1	1
L34	CIRCULAR	0.9	1	1	1	1
L45	CIRCULAR	0.3	1	1	1	1
L50	CIRCULAR	0.9	1	1	1	1
L51	CIRCULAR	0.9	1	1	1	1
L61	CIRCULAR	0.9	1	1	1	1
L63	CIRCULAR	0.3	1	1	1	1
L64	CIRCULAR	0.3	1	1	1	1
L65	CIRCULAR	0.9	1	1	1	1
L68	CIRCULAR	0.25	1	1	1	1
L70	CIRCULAR	0.675	1	1	1	1
L71	CIRCULAR	0.675	1	1	1	1
L72	CIRCULAR	0.2	1	1	1	1
L8	CIRCULAR	1.05	1	1	1	1
500B-IC	CIRCULAR	0.2	0	0	0	
500C-IC	CIRCULAR	0.3	0	0	0	
CB102B-IC1	CIRCULAR	0.2	0	0	0	
CB102B-IC2	CIRCULAR	0.2	0	0	0	
CB105-IC1	CIRCULAR	0.2	0	0	0	
CB105-IC2	CIRCULAR	0.2	0	0	0	
CB107-IC	CIRCULAR	0.127	0	0	0	
CB109-IC	CIRCULAR	0.09	0	0	0	
CB110-IC	CIRCULAR	0.075	0	0	0	
CB500-IC	CIRCULAR	0.2	0	0	0	
CB501-IC	CIRCULAR	0.2	0	0	0	
CMH100-IC	CIRCULAR	0.25	0	0	0	
IC-TANK	CIRCULAR	0.15	0	0	0	
ORF_900B	CIRCULAR	0.154	0	0	0	
SMT101-IC	CIRCULAR	0.38	0	0	0	
STM104A-IC	CIRCULAR	0.2	0	0	0	
STM104B-IC	CIRCULAR	0.25	0	0	0	
STM110-IC	CIRCULAR	0.108	0	0	0	

[TRANSECTS]

NC 0.013 0.013 0.013
X1 Roadway_Half 3 0.0 0.0 0.0 0.0 0.0 0.0 0.0

GR 0.15 0 0 0 0.12 4

[LOSSES]

;;Link	Inlet	Outlet	Average	Flap Gate	SeepageRate
L1	0	1.32	0	NO	0
L11	0	0.02	0	NO	0
L14	0	1.32	0	NO	0
L30	0	0.02	0	NO	0
L32	0	0.02	0	NO	0
L34	0	1.32	0	NO	0
L45	0	1.32	0	NO	0
L50	0	1.32	0	NO	0
L51	0	0.02	0	NO	0
L61	0	1.32	0	NO	0
L63	0	0.39	0	NO	0
L64	0	0.39	0	NO	0
L65	0	1.32	0	NO	0
L68	0	1.32	0	NO	0
L70	0	0.02	0	NO	0
L71	0	0.02	0	NO	0
L72	0	0.32	0	NO	0
L8	0	0.02	0	NO	0

[CURVES]

;;Name	Type	X-Value	Y-Value
TANK-PUMP	Pump1	0	70
TANK-PUMP		0.5	70
TANK-PUMP		1	70
TANK-PUMP		1.5	70
TANK-PUMP		2	70
BLDGA-O	Rating	0	0
BLDGA-O		0.025	17.6
BLDGA-O		0.05	35.7
BLDGA-O		0.075	52.9
BLDGA-O		0.1	70.6
BLDGA-O		0.2	139.3
BLDGB-O	Rating	0	0
BLDGB-O		0.025	2.5
BLDGB-O		0.05	5
BLDGB-O		0.075	7.4
BLDGB-O		0.1	9.9
BLDGB-O		0.2	19.5
BLDGE-O	Rating	0	0

```
BLDGE-O                    0.025      1.2
BLDGE-O                    0.05       2.5
BLDGE-O                    0.075      3.7
BLDGE-O                    0.1        5
BLDGE-O                    0.2        9.8

BLDGF-O          Rating    0          0
BLDGF-O                    0.025      0.4
BLDGF-O                    0.05       0.8
BLDGF-O                    0.075      1.1
BLDGF-O                    0.1        1.5
BLDGF-O                    0.2        3

500b-IC          Storage   0          0
500b-IC                    1.8        0
500b-IC                    2.1        522.67

500c-IC          Storage   0          0
500c-IC                    1.8        0
500c-IC                    2.14       132.5

900A-IC          Storage   0          0
900A-IC                    1.57       0
900A-IC                    1.87       1174

900B-IC          Storage   0          0
900B-IC                    1.77       0
900B-IC                    2.07       183.3

CB107-IC         Storage   0          0
CB107-IC                   1.8        0
CB107-IC                   2.09       389.66

CB109-IC         Storage   0          0
CB109-IC                   2.2        0
CB109-IC                   2.37       128

CB110-IC         Storage   0          0
CB110-IC                   1.8        0
CB110-IC                   2.06       116.15

CMH100-IC        Storage   0          0
CMH100-IC                  0.525      27.79
CMH100-IC                  0.5251     0
CMH100-IC                  2.11       0
CMH100-IC                  2.41       824

CMH101-IC        Storage   0          0
```



```
CMH101-IC                  2.32       0
CMH101-IC                  2.62       380

ROOFA-S          Storage   0          0
ROOFA-S                    0.025      10771
ROOFA-S                    0.05       10771
ROOFA-S                    0.075      10771
ROOFA-S                    0.1        10771
ROOFA-S                    0.2        10771

ROOFB1-S         Storage   0          0
ROOFB1-S                   0.025      1507
ROOFB1-S                   0.05       1507
ROOFB1-S                   0.075      1507
ROOFB1-S                   0.1        1507
ROOFB1-S                   0.2        1507

ROOFE-S          Storage   0          0
ROOFE-S                    0.025      760
ROOFE-S                    0.05       760
ROOFE-S                    0.075      760
ROOFE-S                    0.1        760
ROOFE-S                    0.2        760

ROOFF-S          Storage   0          0
ROOFF-S                    0.025      888
ROOFF-S                    0.05       888
ROOFF-S                    0.075      888
ROOFF-S                    0.1        888
ROOFF-S                    0.2        888

STM104-IC        Storage   0          0
STM104-IC                  1.8        0
STM104-IC                  2.08       447.85

STM105-IC        Storage   0          0
STM105-IC                  1.8        0
STM105-IC                  2.08       676.42

[TIMESERIES]
;;Name            Date      Time       Value
;;--------------- ---------- ---------- ----------
100yrCHI                   0:10       6.04573
100yrCHI                   0:20       7.54219
100yrCHI                   0:30       10.1588
100yrCHI                   0:40       15.96889
100yrCHI                   0:50       40.65497
100yrCHI                   1:00       178.559
```

```
100yrCHI                    1:10       54.04853
100yrCHI                    1:20       27.3187
100yrCHI                    1:30       18.24039
100yrCHI                    1:40       13.73692
100yrCHI                    1:50       11.05876
100yrCHI                    2:00       9.28521
100yrCHI                    2:10       8.02389
100yrCHI                    2:20       7.08022
100yrCHI                    2:30       6.34698
100yrCHI                    2:40       5.76029
100yrCHI                    2:50       5.27978
100yrCHI                    3:00       4.87871

5yrCHI                      0:10       3.68223
5yrCHI                      0:20       4.58232
5yrCHI                      0:30       6.15055
5yrCHI                      0:40       9.6141
5yrCHI                      0:50       24.17035
5yrCHI                      1:00       104.193
5yrCHI                      1:10       32.03692
5yrCHI                      1:20       16.3375
5yrCHI                      1:30       10.96479
5yrCHI                      1:40       8.28693
5yrCHI                      1:50       6.68897
5yrCHI                      2:00       5.6279
5yrCHI                      2:10       4.87167
5yrCHI                      2:20       4.30483
5yrCHI                      2:30       3.8637
5yrCHI                      2:40       3.51028
5yrCHI                      2:50       3.22046
5yrCHI                      3:00       2.97831

[REPORT]
INPUT      YES
CONTROLS   YES
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       364257.7732      5024908.9474     364649.4348      5025285.8866
UNITS            Meters

[COORDINATES]
;;Node           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
```



```
OF               364312.336       5025001.612
ORF900B          364374.812       5025090.618
STM101           364339.028       5025015.871
STM104A          364421.543       5025044.254
STM902           364508.242       5025253.984
STRMCPTR         364330.724       5025012.357
OF1              364301.746       5025018.852
500B-S           364539.868       5025169.412
500C-S           364541.573       5025150.916
900A-S           364353.592       5025101.592
900B-S           364369.167       5025084.799
CB102B-S         364340.665       5025009.567
CB105-S          364469.88        5025054.409
CB107-S          364583.471       5025143.393
CB109-S          364511.343       5025035.203
CB110-S          364612.328       5025089.374
CB500-S          364355.406       5025013.356
CB501-S          364383.528       5025030.044
CB902A           364354.83        5025161.938
CBMH901          364383.29        5025116.098
CMH100-S         364545.781       5025094.192
CMH101-S         364507.991       5025235.447
MONITOR          364328.55        5025011.214
ORF101           364334.834       5025014.135
RoofA-S          364508.902       5025121.665
RoofB1-S         364347.1         5025043.482
RoofE-S          364502.499       5025019.952
RoofF-S          364529.214       5025036.056
STM102           364357.664       5025023.736
STM103           364409.854       5025056.609
STM104A-S        364438.838       5025038.036
STM104B-S        364418.264       5025042.475
STM105-S         364475.679       5025078.529
STM106           364519.2         5025105.789
STM107           364566.601       5025138.782
STM108           364607.415       5025071.12
STM109           364509.622       5025025.098
STM110           364417.45        5025036.098
STM111           364448.738       5024981.523
STM900           364377.612       5025108.341
TANK             364340.946       5024997.56

[VERTICES]
;;Link           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
L45              364364.277       5025162.792
L72              364363.756       5025103.083
CB102B-IC1       364338.246       5025011.665
```

CB105-IC1	364471.022	5025060.946
CB105-IC2	364478.443	5025052.772

[POLYGONS]

;;Subcatchment	X-Coord	Y-Coord
101A	364394.672	5025051.112
101A	364389.933	5025042.349
101A	364351.748	5025018.159
101A	364350.793	5025017.554
101A	364337.431	5025011.52
101A	364335.521	5025016.024
101A	364336.718	5025018.805
101A	364333.993	5025023.086
101A	364332.844	5025022.393
101A	364329.061	5025028.402
101A	364330.077	5025029.041
101A	364330.218	5025029.662
101A	364326.435	5025035.67
101A	364367.015	5025061.214
101A	364372.534	5025058.76
101A	364376.781	5025058.264
101A	364383.031	5025064.845
101A	364387.238	5025068.025
101A	364392.533	5025071.359
101A	364384.518	5025084.091
101A	364396.777	5025091.808
101A	364405.11	5025078.57
101A	364405.347	5025078.718
101A	364411.276	5025069.204
101A	364405.825	5025065.874
101A	364405.362	5025065.051
101A	364399.482	5025060.006
101A	364394.672	5025051.112
104	364458.619	5024998.831
104	364455.931	5025003.1
104	364448.466	5025007.973
104	364443.981	5025007.183
104	364442.701	5025006.958
104	364441.66	5025007.55
104	364440.57	5025008.848
104	364418.28	5025044.258
104	364416.852	5025046.87
104	364417.758	5025048.792
104	364420.36	5025051.939
104	364421.715	5025053.579
104	364427.687	5025060.803
104	364433.234	5025064.29

104	364432.193	5025074.549
104	364473.83	5025008.406
104	364458.619	5024998.831
105	364490.726	5025100.434
105	364520.265	5025053.447
105	364520.265	5025053.447
105	364523.681	5025047.606
105	364523.681	5025047.606
105	364523.685	5025046.258
105	364523.685	5025046.258
105	364516.852	5025042.125
105	364516.852	5025042.125
105	364508.558	5025036.904
105	364508.558	5025036.904
105	364501.844	5025032.572
105	364501.844	5025032.572
105	364498.369	5025029.626
105	364498.369	5025029.626
105	364500.126	5025024.959
105	364500.126	5025024.959
105	364473.83	5025008.406
105	364473.83	5025008.406
105	364432.193	5025074.549
105	364432.193	5025074.549
105	364422.695	5025089.638
105	364422.695	5025089.638
105	364429.664	5025094.025
105	364429.664	5025094.025
105	364435.572	5025084.629
105	364435.572	5025084.629
105	364487.408	5025117.26
105	364487.408	5025117.26
105	364489.124	5025114.438
105	364489.124	5025114.438
105	364490.746	5025115.459
105	364490.746	5025115.459
105	364492.593	5025112.404
105	364492.593	5025112.404
105	364490.726	5025100.434
108	364608.587	5025080.569
108	364590.19	5025069.003
108	364590.19	5025069.003
108	364584.487	5025078.064
108	364584.487	5025078.064
108	364578.401	5025080.866
108	364578.401	5025080.866
108	364578.863	5025093.022
108	364578.863	5025093.022

108	364577.255	5025095.569
108	364577.255	5025095.569
108	364591.963	5025104.816
108	364591.963	5025104.816
108	364596.773	5025107.499
108	364596.773	5025107.499
108	364601.757	5025100.434
108	364601.757	5025100.434
108	364601.522	5025100.448
108	364601.522	5025100.448
108	364599.87	5025099.575
108	364599.87	5025099.575
108	364599.684	5025089.757
108	364599.684	5025089.757
108	364599.69	5025089.748
108	364599.69	5025089.748
108	364603.613	5025083.509
108	364603.613	5025083.509
108	364608.587	5025080.569
500A	364532.445	5025233.912
500A	364544.035	5025206.581
500A	364544.035	5025206.581
500A	364534.146	5025202.359
500A	364534.146	5025202.359
500A	364524.481	5025205.534
500A	364524.481	5025205.534
500A	364518.449	5025202.516
500A	364518.449	5025202.516
500A	364517.265	5025203.065
500A	364517.265	5025203.065
500A	364514.8	5025205.62
500A	364514.8	5025205.62
500A	364513.721	5025207.451
500A	364513.721	5025207.451
500A	364502.97	5025223.775
500A	364502.97	5025223.775
500A	364495.582	5025235.512
500A	364495.582	5025235.512
500A	364495.968	5025238.229
500A	364495.968	5025238.229
500A	364499.691	5025240.573
500A	364499.691	5025240.573
500A	364499.911	5025241.539
500A	364499.911	5025241.539
500A	364499.439	5025242.289
500A	364499.439	5025242.289
500A	364505.617	5025246.178
500A	364505.617	5025246.178

500A	364506.089	5025245.427
500A	364506.089	5025245.427
500A	364507.054	5025245.208
500A	364507.054	5025245.208
500A	364510.947	5025247.659
500A	364510.947	5025247.659
500A	364519.133	5025265.251
500A	364519.133	5025265.251
500A	364524.195	5025253.335
500A	364524.195	5025253.335
500A	364532.445	5025233.912
500B	364544.035	5025206.581
500B	364558.616	5025172.194
500B	364558.616	5025172.194
500B	364543.822	5025168.254
500B	364543.822	5025168.254
500B	364536.108	5025163.714
500B	364536.108	5025163.714
500B	364520.952	5025154.49
500B	364520.952	5025154.49
500B	364484.958	5025212.196
500B	364484.958	5025212.196
500B	364502.97	5025223.775
500B	364502.97	5025223.775
500B	364513.721	5025207.451
500B	364513.721	5025207.451
500B	364514.8	5025205.62
500B	364514.8	5025205.62
500B	364517.265	5025203.065
500B	364517.265	5025203.065
500B	364518.449	5025202.516
500B	364518.449	5025202.516
500B	364524.481	5025205.534
500B	364524.481	5025205.534
500B	364534.146	5025202.359
500B	364534.146	5025202.359
500B	364544.035	5025206.581
500C	364566.969	5025144.572
500C	364591.963	5025104.816
500C	364591.963	5025104.816
500C	364577.255	5025095.569
500C	364577.255	5025095.569
500C	364554.198	5025132.097
500C	364554.198	5025132.097
500C	364544.564	5025132.772
500C	364544.564	5025132.772
500C	364544.4	5025134.382
500C	364544.4	5025134.382

500C	364530.311	5025136.313
500C	364530.311	5025136.313
500C	364527.329	5025144.266
500C	364527.329	5025144.266
500C	364520.952	5025154.49
500C	364520.952	5025154.49
500C	364536.108	5025163.714
500C	364536.108	5025163.714
500C	364543.822	5025168.254
500C	364543.822	5025168.254
500C	364558.616	5025172.194
500C	364558.616	5025172.194
500C	364562.568	5025162.874
500C	364562.568	5025162.874
500C	364568.833	5025166.829
500C	364568.833	5025166.829
500C	364584.378	5025176.643
500C	364584.378	5025176.643
500C	364592.214	5025180.963
500C	364592.214	5025180.963
500C	364594.665	5025176.8
500C	364594.665	5025176.8
500C	364605.18	5025159.772
500C	364605.18	5025159.772
500C	364588.934	5025153.349
500C	364588.934	5025153.349
500C	364579.104	5025154.621
500C	364579.104	5025154.621
500C	364570.014	5025151.25
500C	364570.014	5025151.25
500C	364566.969	5025144.572
500D	364524.799	5025268.753
500D	364568.833	5025166.829
500D	364568.833	5025166.829
500D	364562.568	5025162.874
500D	364562.568	5025162.874
500D	364558.616	5025172.194
500D	364558.616	5025172.194
500D	364544.035	5025206.581
500D	364544.035	5025206.581
500D	364532.445	5025233.912
500D	364532.445	5025233.912
500D	364524.195	5025253.335
500D	364524.195	5025253.335
500D	364519.133	5025265.251
500D	364519.133	5025265.251
500D	364524.799	5025268.753
900A	364374.531	5025113.489

900A	364366.793	5025108.59
900A	364366.793	5025108.59
900A	364361.533	5025103.979
900A	364361.533	5025103.979
900A	364346.173	5025094.31
900A	364346.173	5025094.31
900A	364345.972	5025094.628
900A	364345.972	5025094.628
900A	364308.15	5025070.818
900A	364308.15	5025070.818
900A	364286.41	5025105.354
900A	364286.41	5025105.354
900A	364290.488	5025107.912
900A	364290.488	5025107.912
900A	364291.511	5025106.261
900A	364291.511	5025106.261
900A	364293.712	5025107.646
900A	364293.712	5025107.646
900A	364290.721	5025112.499
900A	364290.721	5025112.499
900A	364353.188	5025151.822
900A	364353.188	5025151.822
900A	364356.177	5025153.703
900A	364356.177	5025153.703
900A	364366.061	5025158.721
900A	364366.061	5025158.721
900A	364382.146	5025133.168
900A	364382.146	5025133.168
900A	364372.804	5025127.288
900A	364372.804	5025127.288
900A	364372.391	5025127.028
900A	364372.391	5025127.028
900A	364363.081	5025141.798
900A	364363.081	5025141.798
900A	364356.987	5025137.963
900A	364356.987	5025137.963
900A	364366.943	5025121.61
900A	364366.943	5025121.61
900A	364368.085	5025119.796
900A	364368.085	5025119.796
900A	364374.531	5025113.489
900B	364382.146	5025133.168
900B	364393.78	5025114.687
900B	364393.78	5025114.687
900B	364385.612	5025109.545
900B	364385.612	5025109.545
900B	364396.777	5025091.808
900B	364396.777	5025091.808

900B	364384.518	5025084.091
900B	364384.518	5025084.091
900B	364392.533	5025071.359
900B	364392.533	5025071.359
900B	364387.238	5025068.025
900B	364387.238	5025068.025
900B	364383.031	5025064.845
900B	364383.031	5025064.845
900B	364376.781	5025058.264
900B	364376.781	5025058.264
900B	364372.534	5025058.76
900B	364372.534	5025058.76
900B	364367.015	5025061.214
900B	364367.015	5025061.214
900B	364346.173	5025094.31
900B	364346.173	5025094.31
900B	364361.533	5025103.979
900B	364361.533	5025103.979
900B	364366.793	5025108.59
900B	364366.793	5025108.59
900B	364374.531	5025113.489
900B	364374.531	5025113.489
900B	364379.782	5025116.203
900B	364379.782	5025116.203
900B	364372.804	5025127.288
900B	364372.804	5025127.288
900B	364382.146	5025133.168
902	364353.188	5025151.822
902	364348.266	5025159.642
902	364348.266	5025159.642
902	364519.133	5025265.251
902	364519.133	5025265.251
902	364510.947	5025247.659
902	364510.947	5025247.659
902	364507.054	5025245.208
902	364507.054	5025245.208
902	364506.089	5025245.427
902	364506.089	5025245.427
902	364505.617	5025246.178
902	364505.617	5025246.178
902	364499.439	5025242.289
902	364499.439	5025242.289
902	364499.911	5025241.539
902	364499.911	5025241.539
902	364499.691	5025240.573
902	364499.691	5025240.573
902	364495.968	5025238.229
902	364495.968	5025238.229

902	364495.582	5025235.512
902	364495.582	5025235.512
902	364492.228	5025233.401
902	364492.228	5025233.401
902	364490.091	5025236.797
902	364490.091	5025236.797
902	364366.061	5025158.721
902	364366.061	5025158.721
902	364356.177	5025153.703
902	364356.177	5025153.703
902	364353.188	5025151.822
CB107	364605.18	5025159.772
CB107	364631.632	5025116.935
CB107	364631.632	5025116.935
CB107	364613.436	5025105.696
CB107	364613.436	5025105.696
CB107	364611.921	5025102.197
CB107	364611.921	5025102.197
CB107	364601.757	5025100.434
CB107	364601.757	5025100.434
CB107	364596.773	5025107.499
CB107	364596.773	5025107.499
CB107	364591.963	5025104.816
CB107	364591.963	5025104.816
CB107	364566.969	5025144.572
CB107	364566.969	5025144.572
CB107	364570.014	5025151.25
CB107	364570.014	5025151.25
CB107	364579.104	5025154.621
CB107	364579.104	5025154.621
CB107	364588.934	5025153.349
CB107	364588.934	5025153.349
CB107	364605.18	5025159.772
CB109	364541.666	5025029.033
CB109	364509.871	5025009.478
CB109	364509.871	5025009.478
CB109	364500.126	5025024.959
CB109	364500.126	5025024.959
CB109	364498.369	5025029.626
CB109	364498.369	5025029.626
CB109	364501.844	5025032.572
CB109	364501.844	5025032.572
CB109	364508.558	5025036.904
CB109	364508.558	5025036.904
CB109	364516.852	5025042.125
CB109	364516.852	5025042.125
CB109	364523.685	5025046.258
CB109	364523.685	5025046.258

CB109	364523.681	5025047.606
CB109	364523.681	5025047.606
CB109	364527.744	5025050.163
CB109	364527.744	5025050.163
CB109	364529.123	5025049.85
CB109	364529.123	5025049.85
CB109	364529.125	5025049.846
CB109	364529.125	5025049.846
CB109	364531.249	5025046.454
CB109	364531.249	5025046.454
CB109	364533.3	5025045.842
CB109	364533.3	5025045.842
CB109	364543.045	5025030.361
CB109	364543.045	5025030.361
CB109	364541.666	5025029.033
CB110	364613.605	5025104.242
CB110	364625.108	5025086.51
CB110	364625.108	5025086.51
CB110	364623.028	5025085.161
CB110	364623.028	5025085.161
CB110	364615.852	5025080.728
CB110	364615.852	5025080.728
CB110	364609.782	5025080.613
CB110	364609.782	5025080.613
CB110	364608.587	5025080.569
CB110	364608.587	5025080.569
CB110	364603.613	5025083.509
CB110	364603.613	5025083.509
CB110	364599.69	5025089.748
CB110	364599.69	5025089.748
CB110	364599.684	5025089.757
CB110	364599.684	5025089.757
CB110	364599.87	5025099.575
CB110	364599.87	5025099.575
CB110	364601.522	5025100.448
CB110	364601.522	5025100.448
CB110	364601.757	5025100.434
CB110	364601.757	5025100.434
CB110	364611.921	5025102.197
CB110	364611.921	5025102.197
CB110	364613.436	5025105.696
CB110	364613.436	5025105.696
CB110	364613.605	5025104.242
CMH100	364584.487	5025078.064
CMH100	364533.3	5025045.842
CMH100	364533.3	5025045.842
CMH100	364531.249	5025046.454
CMH100	364531.249	5025046.454

CMH100	364529.125	5025049.846
CMH100	364529.125	5025049.846
CMH100	364529.123	5025049.85
CMH100	364529.123	5025049.85
CMH100	364527.744	5025050.163
CMH100	364527.744	5025050.163
CMH100	364523.681	5025047.606
CMH100	364523.681	5025047.606
CMH100	364520.265	5025053.447
CMH100	364520.265	5025053.447
CMH100	364490.726	5025100.434
CMH100	364490.726	5025100.434
CMH100	364492.593	5025112.404
CMH100	364492.593	5025112.404
CMH100	364490.746	5025115.459
CMH100	364490.746	5025115.459
CMH100	364518.477	5025132.916
CMH100	364518.477	5025132.916
CMH100	364515.872	5025137.053
CMH100	364515.872	5025137.053
CMH100	364527.329	5025144.266
CMH100	364527.329	5025144.266
CMH100	364530.311	5025136.313
CMH100	364530.311	5025136.313
CMH100	364544.4	5025134.382
CMH100	364544.4	5025134.382
CMH100	364544.564	5025132.772
CMH100	364544.564	5025132.772
CMH100	364554.198	5025132.097
CMH100	364554.198	5025132.097
CMH100	364577.255	5025095.569
CMH100	364577.255	5025095.569
CMH100	364578.863	5025093.022
CMH100	364578.863	5025093.022
CMH100	364578.401	5025080.866
CMH100	364578.401	5025080.866
CMH100	364584.487	5025078.064
F_EX102A	364358.598	5025007.312
F_EX102A	364355.11	5025012.853
F_EX102A	364355.11	5025012.853
F_EX102A	364351.748	5025018.159
F_EX102A	364351.748	5025018.159
F_EX102A	364374.315	5025032.455
F_EX102A	364374.315	5025032.455
F_EX102A	364381.184	5025021.53
F_EX102A	364381.184	5025021.53
F_EX102A	364367.561	5025012.955
F_EX102A	364367.561	5025012.955

F_EX102A	364358.598	5025007.312
F_EX102B	364332.058	5025000.295
F_EX102B	364331.721	5025001.046
F_EX102B	364331.721	5025001.046
F_EX102B	364328.706	5025007.581
F_EX102B	364328.706	5025007.581
F_EX102B	364350.793	5025017.554
F_EX102B	364350.793	5025017.554
F_EX102B	364351.748	5025018.159
F_EX102B	364351.748	5025018.159
F_EX102B	364355.11	5025012.853
F_EX102B	364355.11	5025012.853
F_EX102B	364353.691	5025013.266
F_EX102B	364353.691	5025013.266
F_EX102B	364352.845	5025013.285
F_EX102B	364352.845	5025013.285
F_EX102B	364339.397	5025007.399
F_EX102B	364339.397	5025007.399
F_EX102B	364332.058	5025000.295
F_EX102B-1	364332.058	5025000.295
F_EX102B-1	364331.721	5025001.046
F_EX102B-1	364331.721	5025001.046
F_EX102B-1	364328.706	5025007.581
F_EX102B-1	364328.706	5025007.581
F_EX102B-1	364350.793	5025017.554
F_EX102B-1	364350.793	5025017.554
F_EX102B-1	364351.748	5025018.159
F_EX102B-1	364351.748	5025018.159
F_EX102B-1	364355.11	5025012.853
F_EX102B-1	364355.11	5025012.853
F_EX102B-1	364353.691	5025013.266
F_EX102B-1	364353.691	5025013.266
F_EX102B-1	364352.845	5025013.285
F_EX102B-1	364352.845	5025013.285
F_EX102B-1	364339.397	5025007.399
F_EX102B-1	364339.397	5025007.399
F_EX102B-1	364332.058	5025000.295
F_EX103A	364381.184	5025021.53
F_EX103A	364374.315	5025032.455
F_EX103A	364389.933	5025042.349
F_EX103A	364399.482	5025060.006
F_EX103A	364405.362	5025065.051
F_EX103A	364405.825	5025065.874
F_EX103A	364411.276	5025069.204
F_EX103A	364405.347	5025078.718
F_EX103A	364422.695	5025089.638
F_EX103A	364432.193	5025074.549
F_EX103A	364433.234	5025064.29

F_EX103A	364427.687	5025060.803
F_EX103A	364422.638	5025054.695
F_EX103A	364420.36	5025051.939
F_EX103A	364417.758	5025048.792
F_EX103A	364416.852	5025046.87
F_EX103A	364418.28	5025044.258
F_EX103A	364415.252	5025042.53
F_EX103A	364405.189	5025036.642
F_EX103A	364388.81	5025026.331
F_EX103A	364381.184	5025021.53
F100	364400.553	5024947.508
F100	364401.508	5024945.991
F100	364401.508	5024945.991
F100	364398.969	5024944.393
F100	364398.969	5024944.393
F100	364394.126	5024941.344
F100	364394.126	5024941.344
F100	364392.844	5024940.392
F100	364392.844	5024940.392
F100	364391.692	5024939.285
F100	364391.692	5024939.285
F100	364390.69	5024938.041
F100	364390.69	5024938.041
F100	364389.853	5024936.681
F100	364389.853	5024936.681
F100	364388.231	5024934.081
F100	364388.231	5024934.081
F100	364386.586	5024932.144
F100	364386.586	5024932.144
F100	364376.894	5024926.081
F100	364376.894	5024926.081
F100	364361.969	5024928.394
F100	364361.969	5024928.394
F100	364352.876	5024949.84
F100	364352.876	5024949.84
F100	364352.609	5024952.972
F100	364352.609	5024952.972
F100	364352.545	5024953.432
F100	364352.545	5024953.432
F100	364352.46	5024954.301
F100	364352.46	5024954.301
F100	364352.411	5024954.761
F100	364352.411	5024954.761
F100	364352.157	5024955.938
F100	364352.157	5024955.938
F100	364352.072	5024956.392
F100	364352.072	5024956.392
F100	364351.799	5024957.231

F100	364351.799	5024957.231
F100	364351.59	5024957.644
F100	364351.59	5024957.644
F100	364351.045	5024958.823
F100	364351.045	5024958.823
F100	364350.854	5024959.245
F100	364350.854	5024959.245
F100	364350.392	5024959.996
F100	364350.392	5024959.996
F100	364350.113	5024960.366
F100	364350.113	5024960.366
F100	364349.069	5024961.684
F100	364349.069	5024961.684
F100	364347.875	5024962.867
F100	364347.875	5024962.867
F100	364347.706	5024963.196
F100	364347.706	5024963.196
F100	364347.809	5024963.55
F100	364347.809	5024963.55
F100	364348.051	5024963.861
F100	364348.051	5024963.861
F100	364347.033	5024964.763
F100	364347.033	5024964.763
F100	364346.141	5024965.791
F100	364346.141	5024965.791
F100	364347.336	5024966.697
F100	364347.336	5024966.697
F100	364346.186	5024968.716
F100	364346.186	5024968.716
F100	364345.596	5024970.963
F100	364345.596	5024970.963
F100	364345.001	5024970.888
F100	364345.001	5024970.888
F100	364344.108	5024970.775
F100	364344.108	5024970.775
F100	364344.026	5024972.133
F100	364344.026	5024972.133
F100	364344.123	5024973.49
F100	364344.123	5024973.49
F100	364343.769	5024973.539
F100	364343.769	5024973.539
F100	364343.414	5024973.767
F100	364343.414	5024973.767
F100	364343.361	5024974.186
F100	364343.361	5024974.186
F100	364343.484	5024974.633
F100	364343.484	5024974.633
F100	364343.574	5024975.087

F100	364343.574	5024975.087
F100	364343.628	5024975.548
F100	364343.628	5024975.548
F100	364343.647	5024976.011
F100	364343.647	5024976.011
F100	364343.631	5024976.474
F100	364343.631	5024976.474
F100	364343.58	5024976.934
F100	364343.58	5024976.934
F100	364343.493	5024977.39
F100	364343.493	5024977.39
F100	364343.372	5024977.837
F100	364343.372	5024977.837
F100	364343.218	5024978.274
F100	364343.218	5024978.274
F100	364343.029	5024978.699
F100	364343.029	5024978.699
F100	364342.811	5024979.106
F100	364342.811	5024979.106
F100	364342.562	5024979.495
F100	364342.562	5024979.495
F100	364342.282	5024979.866
F100	364342.282	5024979.866
F100	364341.976	5024980.214
F100	364341.976	5024980.214
F100	364341.644	5024980.537
F100	364341.644	5024980.537
F100	364341.288	5024980.834
F100	364341.288	5024980.834
F100	364340.805	5024981.331
F100	364340.805	5024981.331
F100	364340.352	5024981.855
F100	364340.352	5024981.855
F100	364339.93	5024982.405
F100	364339.93	5024982.405
F100	364339.542	5024982.978
F100	364339.542	5024982.978
F100	364338.869	5024984.188
F100	364338.869	5024984.188
F100	364338.342	5024985.469
F100	364338.342	5024985.469
F100	364337.969	5024986.803
F100	364337.969	5024986.803
F100	364337.755	5024988.171
F100	364337.755	5024988.171
F100	364337.702	5024989.555
F100	364337.702	5024989.555
F100	364337.812	5024990.935

F100	364337.812	5024990.935
F100	364337.961	5024992.016
F100	364337.961	5024992.016
F100	364337.877	5024993.103
F100	364337.877	5024993.103
F100	364337.565	5024994.148
F100	364337.565	5024994.148
F100	364337.037	5024995.102
F100	364337.037	5024995.102
F100	364336.319	5024995.923
F100	364336.319	5024995.923
F100	364335.443	5024996.572
F100	364335.443	5024996.572
F100	364334.449	5024997.02
F100	364334.449	5024997.02
F100	364333.382	5024997.247
F100	364333.382	5024997.247
F100	364332.058	5025000.295
F100	364332.058	5025000.295
F100	364339.397	5025007.399
F100	364339.397	5025007.399
F100	364352.845	5025013.285
F100	364352.845	5025013.285
F100	364353.691	5025013.266
F100	364353.691	5025013.266
F100	364355.11	5025012.853
F100	364355.11	5025012.853
F100	364358.598	5025007.312
F100	364358.598	5025007.312
F100	364352.754	5025003.634
F100	364352.754	5025003.634
F100	364371.635	5024957.413
F100	364371.635	5024957.413
F100	364390.57	5024965.113
F100	364390.57	5024965.113
F100	364390.662	5024965.207
F100	364390.662	5024965.207
F100	364391.712	5024963.538
F100	364391.712	5024963.538
F100	364390.677	5024963.116
F100	364390.677	5024963.116
F100	364400.483	5024947.466
F100	364400.483	5024947.466
F100	364400.553	5024947.508
F101A	364444.097	5024974.917
F101A	364444.135	5024974.941
F101A	364444.135	5024974.941
F101A	364437.34	5024985.736

F101A	364437.34	5024985.736
F101A	364436.341	5024987.247
F101A	364436.341	5024987.247
F101A	364405.189	5025036.642
F101A	364405.189	5025036.642
F101A	364418.28	5025044.258
F101A	364418.28	5025044.258
F101A	364440.57	5025008.848
F101A	364440.57	5025008.848
F101A	364441.66	5025007.55
F101A	364441.66	5025007.55
F101A	364442.701	5025006.958
F101A	364442.701	5025006.958
F101A	364448.466	5025007.973
F101A	364448.466	5025007.973
F101A	364455.931	5025003.1
F101A	364455.931	5025003.1
F101A	364458.619	5024998.831
F101A	364458.619	5024998.831
F101A	364456.394	5024997.43
F101A	364456.394	5024997.43
F101A	364463.622	5024985.947
F101A	364463.622	5024985.947
F101A	364457.281	5024981.944
F101A	364457.281	5024981.944
F101A	364451.719	5024990.78
F101A	364451.719	5024990.78
F101A	364448.93	5024989.031
F101A	364448.93	5024989.031
F101A	364457.01	5024976.196
F101A	364457.01	5024976.196
F101A	364447.168	5024970.039
F101A	364447.168	5024970.039
F101A	364444.097	5024974.917
F505A	364400.553	5024947.508
F505A	364411.483	5024954.39
F505A	364411.483	5024954.39
F505A	364414.495	5024949.602
F505A	364414.495	5024949.602
F505A	364403.547	5024942.754
F505A	364403.547	5024942.754
F505A	364401.508	5024945.991
F505A	364401.508	5024945.991
F505A	364400.553	5024947.508
F505B	364414.022	5024955.986
F505B	364424.983	5024962.886
F505B	364424.983	5024962.886
F505B	364428.02	5024958.062

F505B	364428.02	5024958.062
F505B	364417.039	5024951.193
F505B	364417.039	5024951.193
F505B	364414.022	5024955.986
F505C	364431.077	5024966.722
F505C	364444.097	5024974.917
F505C	364444.097	5024974.917
F505C	364447.168	5024970.039
F505C	364447.168	5024970.039
F505C	364434.125	5024961.881
F505C	364434.125	5024961.881
F505C	364431.077	5024966.722
F505D	364398.969	5024944.393
F505D	364401.003	5024941.162
F505D	364401.003	5024941.162
F505D	364386.586	5024932.144
F505D	364386.586	5024932.144
F505D	364388.231	5024934.081
F505D	364388.231	5024934.081
F505D	364389.853	5024936.681
F505D	364389.853	5024936.681
F505D	364390.69	5024938.041
F505D	364390.69	5024938.041
F505D	364391.692	5024939.285
F505D	364391.692	5024939.285
F505D	364392.844	5024940.392
F505D	364392.844	5024940.392
F505D	364394.126	5024941.344
F505D	364394.126	5024941.344
F505D	364398.969	5024944.393
R100	364358.598	5025007.312
R100	364367.561	5025012.955
R100	364367.561	5025012.955
R100	364377.492	5024997.213
R100	364377.492	5024997.213
R100	364377.776	5024996.515
R100	364377.776	5024996.515
R100	364390.57	5024965.113
R100	364390.57	5024965.113
R100	364371.635	5024957.413
R100	364371.635	5024957.413
R100	364352.754	5025003.634
R100	364352.754	5025003.634
R100	364358.598	5025007.312
R101	364377.776	5024996.515
R101	364377.492	5024997.213
R101	364377.492	5024997.213
R101	364367.561	5025012.955

R101	364367.561	5025012.955
R101	364381.184	5025021.53
R101	364381.184	5025021.53
R101	364388.81	5025026.331
R101	364388.81	5025026.331
R101	364399.121	5025009.951
R101	364399.121	5025009.951
R101	364377.776	5024996.515
R103	364399.121	5025009.951
R103	364388.81	5025026.331
R103	364388.81	5025026.331
R103	364405.189	5025036.642
R103	364405.189	5025036.642
R103	364436.341	5024987.247
R103	364436.341	5024987.247
R103	364436.412	5024987.134
R103	364436.412	5024987.134
R103	364419.987	5024976.805
R103	364419.987	5024976.805
R103	364400.746	5025007.37
R103	364400.746	5025007.37
R103	364399.121	5025009.951
R104	364390.662	5024965.207
R104	364390.57	5024965.113
R104	364390.57	5024965.113
R104	364377.776	5024996.515
R104	364377.776	5024996.515
R104	364399.121	5025009.951
R104	364399.121	5025009.951
R104	364400.746	5025007.37
R104	364400.746	5025007.37
R104	364419.987	5024976.805
R104	364419.987	5024976.805
R104	364436.412	5024987.134
R104	364436.412	5024987.134
R104	364436.341	5024987.247
R104	364436.341	5024987.247
R104	364437.34	5024985.736
R104	364437.34	5024985.736
R104	364444.135	5024974.941
R104	364444.135	5024974.941
R104	364444.097	5024974.917
R104	364444.097	5024974.917
R104	364431.077	5024966.722
R104	364431.077	5024966.722
R104	364424.983	5024962.886
R104	364424.983	5024962.886
R104	364414.022	5024955.986

R104	364414.022	5024955.986
R104	364411.483	5024954.39
R104	364411.483	5024954.39
R104	364400.553	5024947.508
R104	364400.553	5024947.508
R104	364400.483	5024947.466
R104	364400.483	5024947.466
R104	364390.677	5024963.116
R104	364390.677	5024963.116
R104	364391.712	5024963.538
R104	364391.712	5024963.538
R104	364390.662	5024965.207
ROOFA	364366.061	5025158.721
ROOFA	364490.091	5025236.797
ROOFA	364490.091	5025236.797
ROOFA	364492.228	5025233.401
ROOFA	364492.228	5025233.401
ROOFA	364495.582	5025235.512
ROOFA	364495.582	5025235.512
ROOFA	364502.97	5025223.775
ROOFA	364502.97	5025223.775
ROOFA	364484.958	5025212.196
ROOFA	364484.958	5025212.196
ROOFA	364520.952	5025154.49
ROOFA	364520.952	5025154.49
ROOFA	364527.329	5025144.266
ROOFA	364527.329	5025144.266
ROOFA	364515.872	5025137.053
ROOFA	364515.872	5025137.053
ROOFA	364518.477	5025132.916
ROOFA	364518.477	5025132.916
ROOFA	364490.746	5025115.459
ROOFA	364490.746	5025115.459
ROOFA	364489.124	5025114.438
ROOFA	364489.124	5025114.438
ROOFA	364487.408	5025117.26
ROOFA	364487.408	5025117.26
ROOFA	364435.572	5025084.629
ROOFA	364435.572	5025084.629
ROOFA	364429.664	5025094.025
ROOFA	364429.664	5025094.025
ROOFA	364422.695	5025089.638
ROOFA	364422.695	5025089.638
ROOFA	364405.347	5025078.718
ROOFA	364405.347	5025078.718
ROOFA	364405.11	5025078.57
ROOFA	364405.11	5025078.57
ROOFA	364396.777	5025091.808

ROOFA	364396.777	5025091.808
ROOFA	364385.612	5025109.545
ROOFA	364385.612	5025109.545
ROOFA	364393.78	5025114.687
ROOFA	364393.78	5025114.687
ROOFA	364382.146	5025133.168
ROOFA	364382.146	5025133.168
ROOFA	364366.061	5025158.721
ROOFB1	364346.173	5025094.31
ROOFB1	364367.015	5025061.214
ROOFB1	364367.015	5025061.214
ROOFB1	364326.435	5025035.67
ROOFB1	364326.435	5025035.67
ROOFB1	364325.854	5025035.304
ROOFB1	364325.854	5025035.304
ROOFB1	364315.094	5025052.585
ROOFB1	364315.094	5025052.585
ROOFB1	364318.832	5025054.938
ROOFB1	364318.832	5025054.938
ROOFB1	364314.614	5025061.638
ROOFB1	364314.614	5025061.638
ROOFB1	364310.791	5025059.231
ROOFB1	364310.791	5025059.231
ROOFB1	364304.818	5025068.72
ROOFB1	364304.818	5025068.72
ROOFB1	364308.15	5025070.818
ROOFB1	364308.15	5025070.818
ROOFB1	364345.972	5025094.628
ROOFB1	364345.972	5025094.628
ROOFB1	364346.173	5025094.31
ROOFE	364463.622	5024985.947
ROOFE	364456.394	5024997.43
ROOFE	364456.394	5024997.43
ROOFE	364458.619	5024998.831
ROOFE	364458.619	5024998.831
ROOFE	364473.83	5025008.406
ROOFE	364473.83	5025008.406
ROOFE	364500.126	5025024.959
ROOFE	364500.126	5025024.959
ROOFE	364509.871	5025009.478
ROOFE	364509.871	5025009.478
ROOFE	364466.144	5024981.94
ROOFE	364466.144	5024981.94
ROOFE	364463.622	5024985.947
ROOFF	364594.232	5025062.583
ROOFF	364543.045	5025030.361
ROOFF	364543.045	5025030.361
ROOFF	364533.3	5025045.842

ROOFF	364533.3	5025045.842
ROOFF	364584.487	5025078.064
ROOFF	364584.487	5025078.064
ROOFF	364590.19	5025069.003
ROOFF	364590.19	5025069.003
ROOFF	364594.232	5025062.583
UNC1	364308.15	5025070.818
UNC1	364304.818	5025068.72
UNC1	364304.818	5025068.72
UNC1	364310.791	5025059.231
UNC1	364310.791	5025059.231
UNC1	364314.614	5025061.638
UNC1	364314.614	5025061.638
UNC1	364318.832	5025054.938
UNC1	364318.832	5025054.938
UNC1	364315.094	5025052.585
UNC1	364315.094	5025052.585
UNC1	364325.854	5025035.304
UNC1	364325.854	5025035.304
UNC1	364326.435	5025035.67
UNC1	364326.435	5025035.67
UNC1	364330.218	5025029.662
UNC1	364330.218	5025029.662
UNC1	364330.077	5025029.041
UNC1	364330.077	5025029.041
UNC1	364329.061	5025028.402
UNC1	364329.061	5025028.402
UNC1	364332.844	5025022.393
UNC1	364332.844	5025022.393
UNC1	364333.993	5025023.086
UNC1	364333.993	5025023.086
UNC1	364336.718	5025018.805
UNC1	364336.718	5025018.805
UNC1	364335.521	5025016.024
UNC1	364335.521	5025016.024
UNC1	364337.431	5025011.52
UNC1	364337.431	5025011.52
UNC1	364336.913	5025011.287
UNC1	364336.913	5025011.287
UNC1	364325.02	5025006.484
UNC1	364325.02	5025006.484
UNC1	364321.848	5025013.965
UNC1	364321.848	5025013.965
UNC1	364307.973	5025046.687
UNC1	364307.973	5025046.687
UNC1	364304.962	5025045.41
UNC1	364304.962	5025045.41
UNC1	364275.576	5025114.714

UNC1	364275.576	5025114.714
UNC1	364348.266	5025159.642
UNC1	364348.266	5025159.642
UNC1	364353.188	5025151.822
UNC1	364353.188	5025151.822
UNC1	364290.721	5025112.499
UNC1	364290.721	5025112.499
UNC1	364293.712	5025107.646
UNC1	364293.712	5025107.646
UNC1	364291.511	5025106.261
UNC1	364291.511	5025106.261
UNC1	364290.488	5025107.912
UNC1	364290.488	5025107.912
UNC1	364286.41	5025105.354
UNC1	364286.41	5025105.354
UNC1	364308.15	5025070.818
UNC-1	364352.876	5024949.84
UNC-1	364345.049	5024968.301
UNC-1	364345.049	5024968.301
UNC-1	364341.699	5024976.728
UNC-1	364341.699	5024976.728
UNC-1	364335.533	5024992.294
UNC-1	364335.533	5024992.294
UNC-1	364333.382	5024997.247
UNC-1	364333.382	5024997.247
UNC-1	364334.449	5024997.02
UNC-1	364334.449	5024997.02
UNC-1	364335.443	5024996.572
UNC-1	364335.443	5024996.572
UNC-1	364336.319	5024995.923
UNC-1	364336.319	5024995.923
UNC-1	364337.037	5024995.102
UNC-1	364337.037	5024995.102
UNC-1	364337.565	5024994.148
UNC-1	364337.565	5024994.148
UNC-1	364337.877	5024993.103
UNC-1	364337.877	5024993.103
UNC-1	364337.961	5024992.016
UNC-1	364337.961	5024992.016
UNC-1	364337.812	5024990.935
UNC-1	364337.812	5024990.935
UNC-1	364337.702	5024989.555
UNC-1	364337.702	5024989.555
UNC-1	364337.755	5024988.171
UNC-1	364337.755	5024988.171
UNC-1	364337.969	5024986.803
UNC-1	364337.969	5024986.803
UNC-1	364338.342	5024985.469

UNC-1	364338.342	5024985.469
UNC-1	364338.869	5024984.188
UNC-1	364338.869	5024984.188
UNC-1	364339.542	5024982.978
UNC-1	364339.542	5024982.978
UNC-1	364339.93	5024982.405
UNC-1	364339.93	5024982.405
UNC-1	364340.352	5024981.855
UNC-1	364340.352	5024981.855
UNC-1	364340.805	5024981.331
UNC-1	364340.805	5024981.331
UNC-1	364341.288	5024980.834
UNC-1	364341.288	5024980.834
UNC-1	364341.644	5024980.537
UNC-1	364341.644	5024980.537
UNC-1	364341.976	5024980.214
UNC-1	364341.976	5024980.214
UNC-1	364342.282	5024979.866
UNC-1	364342.282	5024979.866
UNC-1	364342.562	5024979.495
UNC-1	364342.562	5024979.495
UNC-1	364342.811	5024979.106
UNC-1	364342.811	5024979.106
UNC-1	364343.029	5024978.699
UNC-1	364343.029	5024978.699
UNC-1	364343.218	5024978.274
UNC-1	364343.218	5024978.274
UNC-1	364343.372	5024977.837
UNC-1	364343.372	5024977.837
UNC-1	364343.493	5024977.39
UNC-1	364343.493	5024977.39
UNC-1	364343.58	5024976.934
UNC-1	364343.58	5024976.934
UNC-1	364343.631	5024976.474
UNC-1	364343.631	5024976.474
UNC-1	364343.647	5024976.011
UNC-1	364343.647	5024976.011
UNC-1	364343.628	5024975.548
UNC-1	364343.628	5024975.548
UNC-1	364343.574	5024975.087
UNC-1	364343.574	5024975.087
UNC-1	364343.484	5024974.633
UNC-1	364343.484	5024974.633
UNC-1	364343.361	5024974.186
UNC-1	364343.361	5024974.186
UNC-1	364343.414	5024973.767
UNC-1	364343.414	5024973.767
UNC-1	364343.769	5024973.539

UNC-1	364343.769	5024973.539
UNC-1	364344.123	5024973.49
UNC-1	364344.123	5024973.49
UNC-1	364344.026	5024972.133
UNC-1	364344.026	5024972.133
UNC-1	364344.108	5024970.775
UNC-1	364344.108	5024970.775
UNC-1	364345.001	5024970.888
UNC-1	364345.001	5024970.888
UNC-1	364345.596	5024970.963
UNC-1	364345.596	5024970.963
UNC-1	364346.186	5024968.716
UNC-1	364346.186	5024968.716
UNC-1	364347.336	5024966.697
UNC-1	364347.336	5024966.697
UNC-1	364346.141	5024965.791
UNC-1	364346.141	5024965.791
UNC-1	364347.033	5024964.763
UNC-1	364347.033	5024964.763
UNC-1	364348.051	5024963.861
UNC-1	364348.051	5024963.861
UNC-1	364347.809	5024963.55
UNC-1	364347.809	5024963.55
UNC-1	364347.706	5024963.196
UNC-1	364347.706	5024963.196
UNC-1	364347.875	5024962.867
UNC-1	364347.875	5024962.867
UNC-1	364349.069	5024961.684
UNC-1	364349.069	5024961.684
UNC-1	364350.113	5024960.366
UNC-1	364350.113	5024960.366
UNC-1	364350.392	5024959.996
UNC-1	364350.392	5024959.996
UNC-1	364350.854	5024959.245
UNC-1	364350.854	5024959.245
UNC-1	364351.045	5024958.823
UNC-1	364351.045	5024958.823
UNC-1	364351.59	5024957.644
UNC-1	364351.59	5024957.644
UNC-1	364351.799	5024957.231
UNC-1	364351.799	5024957.231
UNC-1	364352.072	5024956.392
UNC-1	364352.072	5024956.392
UNC-1	364352.157	5024955.938
UNC-1	364352.157	5024955.938
UNC-1	364352.411	5024954.761
UNC-1	364352.411	5024954.761
UNC-1	364352.46	5024954.301

UNC-1	364352.46	5024954.301
UNC-1	364352.545	5024953.432
UNC-1	364352.545	5024953.432
UNC-1	364352.609	5024952.972
UNC-1	364352.609	5024952.972
UNC-1	364352.876	5024949.84
UNC2	364620.029	5025069.435
UNC2	364605.209	5025060.117
UNC2	364598.761	5025056.063
UNC2	364584.628	5025047.316
UNC2	364562.117	5025033.355
UNC2	364545.292	5025022.57
UNC2	364539.5	5025018.804
UNC2	364528.441	5025011.851
UNC2	364517.286	5025005.074
UNC2	364506.901	5024998.544
UNC2	364496.515	5024992.015
UNC2	364478.975	5024980.977
UNC2	364461.852	5024969.985
UNC2	364461.373	5024970.747
UNC2	364461.028	5024971.161
UNC2	364454.68	5024974.738
UNC2	364457.01	5024976.196
UNC2	364448.93	5024989.031
UNC2	364451.719	5024990.78
UNC2	364457.281	5024981.944
UNC2	364463.622	5024985.947
UNC2	364466.144	5024981.94
UNC2	364509.871	5025009.478
UNC2	364541.666	5025029.033
UNC2	364543.045	5025030.361
UNC2	364594.232	5025062.583
UNC2	364590.19	5025069.003
UNC2	364608.587	5025080.569
UNC2	364609.782	5025080.613
UNC2	364615.852	5025080.728
UNC2	364623.028	5025085.161
UNC2	364625.108	5025086.51
UNC2	364628.277	5025080.68
UNC2	364631.027	5025076.349
UNC2	364620.029	5025069.435
UNC-2	364398.969	5024944.393
UNC-2	364401.508	5024945.991
UNC-2	364401.508	5024945.991
UNC-2	364403.547	5024942.754
UNC-2	364403.547	5024942.754
UNC-2	364401.003	5024941.162
UNC-2	364401.003	5024941.162

UNC-2	364398.969	5024944.393
UNC-3	364411.483	5024954.39
UNC-3	364414.022	5024955.986
UNC-3	364414.022	5024955.986
UNC-3	364417.039	5024951.193
UNC-3	364417.039	5024951.193
UNC-3	364414.495	5024949.602
UNC-3	364414.495	5024949.602
UNC-3	364411.483	5024954.39
UNC-4	364424.983	5024962.886
UNC-4	364431.077	5024966.722
UNC-4	364431.077	5024966.722
UNC-4	364434.125	5024961.881
UNC-4	364434.125	5024961.881
UNC-4	364428.02	5024958.062
UNC-4	364428.02	5024958.062
UNC-4	364424.983	5024962.886
UNDR	364372.391	5025127.028
UNDR	364372.804	5025127.288
UNDR	364372.804	5025127.288
UNDR	364379.782	5025116.203
UNDR	364379.782	5025116.203
UNDR	364374.531	5025113.489
UNDR	364374.531	5025113.489
UNDR	364368.085	5025119.796
UNDR	364368.085	5025119.796
UNDR	364366.943	5025121.61
UNDR	364366.943	5025121.61
UNDR	364356.987	5025137.963
UNDR	364356.987	5025137.963
UNDR	364363.081	5025141.798
UNDR	364363.081	5025141.798
UNDR	364372.391	5025127.028

[SYMBOLS]

;;Gage	X-Coord	Y-Coord

[LABELS]

;;X-Coord	Y-Coord	Label
125.05	489.94	"Job#160400770: Clydesdale Shopping Centre" Arial "10" 0 0 0
114.05	485.92	"July 15, 2010" Arial "10" 0 0 0

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

WARNING 03: negative offset ignored for Link CB500-IC

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 40
Number of nodes 41
Number of links 42
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
RG1	100yrCHI	INTENSITY	10 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
101A	0.23	43.20	100.00	1.0000	RG1	STM101
104	0.18	37.80	100.00	1.0000	RG1	STM104A-S
105	0.54	120.80	100.00	1.0000	RG1	CB105-S
108	0.06	14.40	100.00	1.0000	RG1	STM108
500A	0.15	34.00	100.00	1.0000	RG1	CMH101-S
500B	0.24	53.80	100.00	1.0000	RG1	500B-S
500C	0.27	61.20	100.00	1.0000	RG1	500C-S
500D	0.08	17.30	100.00	1.0000	RG1	CMH101-S
900A	0.39	86.90	100.00	1.0000	RG1	900A-S
900B	0.19	42.10	100.00	1.0000	RG1	900B-S
902	0.19	42.10	2.86	1.0000	RG1	STM902
CB107	0.22	49.50	100.00	1.0000	RG1	CB107-S
CB109	0.09	21.20	85.71	1.0000	RG1	CB109-S
CB110	0.04	9.20	78.57	1.0000	RG1	CB110-S
CMH100	0.55	122.90	100.00	1.0000	RG1	CMH100-S
F_EX102A	0.03	26.85	100.00	2.0000	RG1	CB500-S

F_EX102B	0.01	25.29	100.00	1.5000	RG1	CB102B-S
F_EX102B-1	0.01	25.30	100.00	2.0000	RG1	CB102B-S
F_EX103A	0.14	70.35	100.00	2.0000	RG1	CB501-S
F100	0.23	106.00	81.43	2.0000	RG1	TANK
F101A	0.14	77.15	100.00	2.0000	RG1	STM111
F505A	0.01	13.09	28.57	1.5000	RG1	TANK
F505B	0.01	13.15	28.57	1.5000	RG1	TANK
F505C	0.01	15.54	27.14	1.5000	RG1	TANK
F505D	0.00	13.32	0.00	1.5000	RG1	TANK
R100	0.10	50.14	100.00	1.5000	RG1	TANK
R101	0.05	22.23	100.00	1.5000	RG1	TANK
R103	0.11	57.13	100.00	1.5000	RG1	TANK
R104	0.19	84.44	100.00	2.0000	RG1	TANK
ROOFA	1.35	302.90	100.00	1.0000	RG1	RoofA-S
ROOFB1	0.19	42.30	100.00	1.0000	RG1	RoofB1-S
ROOFE	0.10	21.40	100.00	1.0000	RG1	RoofE-S
ROOFF	0.11	25.00	100.00	1.0000	RG1	RoofF-S
UNC1	0.21	46.80	24.29	1.0000	RG1	OF
UNC-1	0.01	45.00	100.00	1.5000	RG1	OF
UNC2	0.19	42.44	64.29	1.0000	RG1	OF
UNC-2	0.00	2.72	100.00	1.5000	RG1	OF
UNC-3	0.00	2.72	100.00	1.5000	RG1	OF
UNC-4	0.00	7.19	100.00	1.5000	RG1	OF
UNDR	0.02	5.00	100.00	1.0000	RG1	900A-S

****
LID Control Summary
****

Subcatchment	LID Control	No. of Units	Unit Area	Unit Width	% Area Covered	% Imperv Treated	% Perv Treated
R101	LID1-R101	1	437.40	21.20	90.00	100.00	100.00

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OF	JUNCTION	93.73	4.27	0.0	
ORF900B	JUNCTION	96.77	2.07	0.0	
STM101	JUNCTION	93.98	4.09	0.0	
STM104A	JUNCTION	96.98	3.40	0.0	
STM902	JUNCTION	99.16	1.29	0.0	
STRMCPTR	JUNCTION	93.92	4.05	0.0	
OF1	OUTFALL	93.72	0.00	0.0	

500B-S	STORAGE	98.26	2.10	0.0
500C-S	STORAGE	98.40	2.14	0.0
900A-S	STORAGE	96.83	1.87	0.0
900B-S	STORAGE	96.77	2.07	0.0
CB102B-S	STORAGE	96.27	1.80	0.0
CB105-S	STORAGE	98.25	2.08	0.0
CB107-S	STORAGE	98.56	2.09	0.0
CB109-S	STORAGE	99.05	2.37	0.0
CB110-S	STORAGE	98.60	2.06	0.0
CB500-S	STORAGE	97.13	1.46	0.0
CB501-S	STORAGE	96.76	2.51	0.0
CB902A	STORAGE	97.07	1.43	0.0
CBMH901	STORAGE	96.76	3.77	0.0
CMH100-S	STORAGE	98.09	2.41	0.0
CMH101-S	STORAGE	97.74	2.62	0.0
MONITOR	STORAGE	93.88	4.05	0.0
ORF101	STORAGE	94.03	4.01	0.0
RoofA-S	STORAGE	110.00	0.15	0.0
RoofB1-S	STORAGE	110.00	0.15	0.0
RoofE-S	STORAGE	110.00	0.15	0.0
RoofF-S	STORAGE	110.00	0.15	0.0
STM102	STORAGE	95.90	2.79	0.0
STM103	STORAGE	96.04	4.11	0.0
STM104A-S	STORAGE	98.25	2.08	0.0
STM104B-S	STORAGE	96.98	3.40	0.0
STM105-S	STORAGE	97.39	3.12	0.0
STM106	STORAGE	97.47	3.11	0.0
STM107	STORAGE	97.56	3.33	0.0
STM108	STORAGE	98.10	2.70	0.0
STM109	STORAGE	97.61	4.18	0.0
STM110	STORAGE	97.76	2.39	0.0
STM111	STORAGE	98.03	2.84	0.0
STM900	STORAGE	96.15	3.62	0.0
TANK	STORAGE	94.41	2.71	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	STM111	STM110	CONDUIT	67.7	0.3102	0.0130
C3	OF	OF1	CONDUIT	1.0	1.0001	0.0130
L1	CMH101-S	STM107	CONDUIT	115.7	0.1037	0.0130
L11	STM107	STM106	CONDUIT	56.4	0.1064	0.0130
L14	STM105-S	STM104A	CONDUIT	64.1	0.1092	0.0130
L30	STM103	STM102	CONDUIT	61.7	0.1459	0.0130
L32	ORF101	STRMCPTR	CONDUIT	2.5	1.0001	0.0130

L34	STM108	STM107	CONDUIT	76.4	0.1047	0.0130
L45	STM902	CB902A	CONDUIT	179.1	1.1503	0.0130
L50	STM109	STM105-S	CONDUIT	63.3	0.0948	0.0130
L51	STM106	STM105-S	CONDUIT	51.1	0.0978	0.0130
L61	STM104B-S	STM103	CONDUIT	16.4	2.1285	0.0130
L63	CB902A	CBMH901	CONDUIT	54.4	0.5147	0.0130
L64	CBMH901	STM900	CONDUIT	9.7	0.5155	0.0130
L65	STM900	STM103	CONDUIT	49.0	0.1224	0.0130
L68	ORF900B	STM900	CONDUIT	24.8	1.0001	0.0130
L70	STRMCPTR	MONITOR	CONDUIT	1.0	1.0001	0.0130
L71	MONITOR	OF	CONDUIT	18.8	0.8013	0.0130
L72	900A-S	STM900	CONDUIT	3.0	1.0001	0.0130
L8	STM102	STM101	CONDUIT	20.9	0.1435	0.0130
500B-IC	500B-S	STM107	ORIFICE			
500C-IC	500C-S	STM107	ORIFICE			
CB102B-IC1	CB102B-S	STM101	ORIFICE			
CB102B-IC2	CB102B-S	STM101	ORIFICE			
CB105-IC1	CB105-S	STM105-S	ORIFICE			
CB105-IC2	CB105-S	STM105-S	ORIFICE			
CB107-IC	CB107-S	STM107	ORIFICE			
CB109-IC	CB109-S	STM109	ORIFICE			
CB110-IC	CB110-S	STM108	ORIFICE			
CB500-IC	CB500-S	STM102	ORIFICE			
CB501-IC	CB501-S	STM103	ORIFICE			
CMH100-IC	CMH100-S	STM106	ORIFICE			
IC-TANK	TANK	ORF101	ORIFICE			
ORF_900B	900B-S	ORF900B	ORIFICE			
SMT101-IC	STM101	ORF101	ORIFICE			
STM104A-IC	STM104A-S	STM104A	ORIFICE			
STM104B-IC	STM104A	STM104B-S	ORIFICE			
STM110-IC	STM110	STM104B-S	ORIFICE			
RA-O	RoofA-S	STM106	OUTLET			
RB-O	RoofB1-S	STM101	OUTLET			
RE-O	RoofE-S	STM109	OUTLET			
RF-O	RoofF-S	STM109	OUTLET			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	0.38	0.11	0.09	0.38	1	97.66
C3	DUMMY	0.00	0.00	0.00	0.00	1	0.00
L1	CIRCULAR	0.90	0.64	0.23	0.90	1	583.05
L11	CIRCULAR	0.90	0.64	0.23	0.90	1	590.49
L14	CIRCULAR	0.90	0.64	0.23	0.90	1	598.38

L30	CIRCULAR	0.90	0.64	0.23	0.90	1	691.45
L32	CIRCULAR	0.68	0.36	0.17	0.68	1	840.66
L34	CIRCULAR	0.90	0.64	0.23	0.90	1	585.84
L45	CIRCULAR	0.30	0.07	0.07	0.30	1	103.72
L50	CIRCULAR	0.90	0.64	0.23	0.90	1	557.36
L51	CIRCULAR	0.90	0.64	0.23	0.90	1	566.31
L61	CIRCULAR	0.90	0.64	0.23	0.90	1	2641.31
L63	CIRCULAR	0.30	0.07	0.07	0.30	1	69.38
L64	CIRCULAR	0.30	0.07	0.07	0.30	1	69.43
L65	CIRCULAR	0.90	0.64	0.23	0.90	1	633.52
L68	CIRCULAR	0.25	0.05	0.06	0.25	1	59.47
L70	CIRCULAR	0.68	0.36	0.17	0.68	1	840.66
L71	CIRCULAR	0.68	0.36	0.17	0.68	1	752.50
L72	CIRCULAR	0.20	0.03	0.05	0.20	1	32.80
L8	CIRCULAR	1.05	0.87	0.26	1.05	1	1034.65

```
****************
Transect Summary
****************

Transect Roadway_Half
Area:
            0.0004     0.0017     0.0038     0.0067     0.0104
            0.0150     0.0204     0.0267     0.0338     0.0417
            0.0504     0.0600     0.0704     0.0817     0.0938
            0.1067     0.1204     0.1350     0.1504     0.1667
            0.1838     0.2017     0.2204     0.2400     0.2604
            0.2817     0.3038     0.3267     0.3504     0.3750
            0.4004     0.4267     0.4538     0.4817     0.5104
            0.5400     0.5704     0.6017     0.6338     0.6667
            0.7000     0.7333     0.7667     0.8000     0.8333
            0.8667     0.9000     0.9333     0.9667     1.0000
Hrad:
            0.0168     0.0336     0.0504     0.0672     0.0839
            0.1007     0.1175     0.1343     0.1511     0.1679
            0.1847     0.2015     0.2182     0.2350     0.2518
            0.2686     0.2854     0.3022     0.3190     0.3358
            0.3525     0.3693     0.3861     0.4029     0.4197
            0.4365     0.4533     0.4701     0.4869     0.5036
            0.5204     0.5372     0.5540     0.5708     0.5876
            0.6044     0.6212     0.6379     0.6547     0.6715
            0.7046     0.7376     0.7706     0.8035     0.8364
            0.8692     0.9020     0.9347     0.9674     1.0000
Width:
            0.0250     0.0500     0.0750     0.1000     0.1250
            0.1500     0.1750     0.2000     0.2250     0.2500
```



```
            0.2750     0.3000     0.3250     0.3500     0.3750
            0.4000     0.4250     0.4500     0.4750     0.5000
            0.5250     0.5500     0.5750     0.6000     0.6250
            0.6500     0.6750     0.7000     0.7250     0.7500
            0.7750     0.8000     0.8250     0.8500     0.8750
            0.9000     0.9250     0.9500     0.9750     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000
            1.0000     1.0000     1.0000     1.0000     1.0000

************************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
************************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 01/01/1995 00:00:00
Ending Date .............. 01/01/1995 06:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... NO
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.001500 m

*********************
Control Actions Taken
*********************
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Initial LID Storage	0.001	0.198
Total Precipitation	0.475	71.665
Evaporation Loss	0.000	0.000
Infiltration Loss	0.022	3.277
Surface Runoff	0.441	66.470
LID Drainage	0.001	0.175
Final Storage	0.013	2.007
Continuity Error (%)	-0.092	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.442	4.418
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.408	4.081
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.001	0.008
Final Stored Volume	0.035	0.347
Continuity Error (%)	-0.032	

Highest Continuity Errors

Node CB902A (-4.72%)
Node STM108 (1.99%)

Highest Flow Instability Indexes

Link CB102B-IC1 (7)
Link CB102B-IC2 (7)
Link STM104A-IC (4)
Link 500B-IC (3)
Link SMT101-IC (3)

Routing Time Step Summary

Minimum Time Step	:	1.00 sec
Average Time Step	:	1.00 sec
Maximum Time Step	:	1.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.24
Percent Not Converging	:	0.10

Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
101A	71.66	0.00	0.00	0.00	70.12	0.00	70.12	0.16	113.95	0.978
104	71.66	0.00	0.00	0.00	70.13	0.00	70.13	0.12	87.81	0.979
105	71.66	0.00	0.00	0.00	70.13	0.00	70.13	0.38	265.92	0.979
108	71.66	0.00	0.00	0.00	70.13	0.00	70.13	0.04	31.69	0.979
500A	71.66	0.00	0.00	0.00	70.13	0.00	70.13	0.11	74.77	0.979
500B	71.66	0.00	0.00	0.00	70.13	0.00	70.13	0.17	118.35	0.979
500C	71.66	0.00	0.00	0.00	70.13	0.00	70.13	0.19	134.69	0.979
500D	71.66	0.00	0.00	0.00	70.13	0.00	70.13	0.05	38.13	0.979
900A	71.66	0.00	0.00	0.00	70.13	0.00	70.13	0.27	191.14	0.979
900B	71.66	0.00	0.00	0.00	70.13	0.00	70.13	0.13	92.60	0.979
902	71.66	0.00	0.00	43.02	2.01	26.66	28.67			

0.05	73.44	0.400							
	CB107		71.66	0.00	0.00	0.00	70.13	0.00	70.13
0.15	108.94	0.979							
	CB109		71.66	0.00	0.00	6.25	60.12	4.02	64.13
0.06	45.66	0.895							
	CB110		71.66	0.00	0.00	9.39	55.11	6.00	61.12
0.03	19.71	0.853							
	CMH100		71.66	0.00	0.00	0.00	70.13	0.00	70.13
0.38	270.37	0.979							
	F_EX102A		71.66	0.00	0.00	0.00	70.20	0.00	70.20
0.02	17.06	0.980							
	F_EX102B		71.66	0.00	0.00	0.00	70.21	0.00	70.21
0.01	6.75	0.980							
	F_EX102B-1		71.66	0.00	0.00	0.00	70.21	0.00	70.21
0.01	6.75	0.980							
	F_EX103A		71.66	0.00	0.00	0.00	70.19	0.00	70.19
0.10	70.93	0.979							
	F100		71.66	0.00	0.00	8.12	57.16	5.24	62.39
0.14	110.22	0.871							
	F101A		71.66	0.00	0.00	0.00	70.19	0.00	70.19
0.10	67.36	0.979							
	F505A		71.66	0.00	0.00	31.22	20.04	20.14	40.18
0.00	3.26	0.561							
	F505B		71.66	0.00	0.00	31.22	20.04	20.14	40.18
0.00	3.31	0.561							
	F505C		71.66	0.00	0.00	31.84	19.04	20.54	39.58
0.00	3.92	0.552							
	F505D		71.66	0.00	0.00	43.70	0.00	28.20	28.20
0.00	1.97	0.394							
	R100		71.66	0.00	0.00	0.00	70.18	0.00	70.18
0.07	50.99	0.979							
	R101		71.66	0.00	0.00	0.00	7.02	0.00	23.88
0.01	3.23	0.333							
	R103		71.66	0.00	0.00	0.00	70.18	0.00	70.18
0.08	56.25	0.979							
	R104		71.66	0.00	0.00	0.00	70.18	0.00	70.18
0.13	92.70	0.979							
	ROOFA		71.66	0.00	0.00	0.00	70.13	0.00	70.13
0.94	666.52	0.979							
	ROOFB1		71.66	0.00	0.00	0.00	70.13	0.00	70.13
0.13	93.10	0.979							
	ROOFE		71.66	0.00	0.00	0.00	70.13	0.00	70.13
0.07	47.04	0.979							
	ROOFF		71.66	0.00	0.00	0.00	70.13	0.00	70.13
0.08	54.97	0.979							
	UNC1		71.66	0.00	0.00	33.43	17.05	20.89	37.94
0.08	88.74	0.529							
	UNC-1		71.66	0.00	0.00	0.00	70.15	0.00	70.15

0.00	2.98	0.979							
	UNC2		71.66	0.00	0.00	15.68	45.10	9.96	55.06
0.10	88.65	0.768							
	UNC-2		71.66	0.00	0.00	0.00	70.21	0.00	70.21
0.00	0.55	0.980							
	UNC-3		71.66	0.00	0.00	0.00	70.21	0.00	70.21
0.00	0.84	0.980							
	UNC-4		71.66	0.00	0.00	0.00	70.21	0.00	70.21
0.00	2.03	0.980							
	UNDR		71.66	0.00	0.00	0.00	70.13	0.00	70.13
0.02	10.89	0.979							

****
LID Performance Summary
****

Subcatchment	LID Control	Total Inflow mm	Evap Loss mm	Infil Loss mm	Surface Outflow mm	Drain Outflow mm	Initial Storage mm	Final Storage mm	Continuity Error %
R101	LID1-R101	79.46	0.00	0.00	0.00	26.53	30.00	82.94	-0.02

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OF	JUNCTION	0.66	0.68	94.41	0 00:00	0.67
ORF900B	JUNCTION	0.07	1.04	97.81	0 01:14	1.03
STM101	JUNCTION	0.91	3.55	97.53	0 01:14	3.55
STM104A	JUNCTION	1.33	3.29	100.27	0 01:25	3.28
STM902	JUNCTION	0.01	0.18	99.34	0 01:10	0.18
STRMCPTR	JUNCTION	0.48	0.55	94.47	0 01:14	0.55
OF1	OUTFALL	0.69	0.69	94.41	0 00:00	0.69

500B-S	STORAGE	0.64	2.03	100.29	0	01:40	2.03
500C-S	STORAGE	0.56	1.90	100.30	0	01:20	1.90
900A-S	STORAGE	0.12	1.64	98.47	0	01:10	1.64
900B-S	STORAGE	0.18	2.00	98.77	0	01:12	2.00
CB102B-S	STORAGE	0.07	1.26	97.53	0	01:14	1.26
CB105-S	STORAGE	0.65	2.06	100.31	0	01:32	2.06
CB107-S	STORAGE	0.63	2.07	100.63	0	01:25	2.07
CB109-S	STORAGE	0.45	2.36	101.41	0	01:12	2.36
CB110-S	STORAGE	0.51	1.90	100.50	0	01:13	1.90
CB500-S	STORAGE	0.02	0.41	97.54	0	01:14	0.41
CB501-S	STORAGE	0.08	1.27	98.03	0	01:10	1.26
CB902A	STORAGE	0.03	0.61	97.68	0	01:14	0.61
CBMH901	STORAGE	0.04	0.85	97.61	0	01:14	0.85
CMH100-S	STORAGE	0.74	2.35	100.44	0	01:22	2.35
CMH101-S	STORAGE	0.84	2.54	100.28	0	01:33	2.54
MONITOR	STORAGE	0.52	0.58	94.46	0	01:14	0.58
ORF101	STORAGE	0.38	0.47	94.49	0	01:14	0.47
RoofA-S	STORAGE	0.05	0.07	110.07	0	01:50	0.07
RoofB1-S	STORAGE	0.05	0.07	110.07	0	01:50	0.07
RoofE-S	STORAGE	0.05	0.07	110.07	0	01:50	0.07
RoofF-S	STORAGE	0.07	0.09	110.09	0	03:11	0.09
STM102	STORAGE	0.28	1.64	97.54	0	01:14	1.64
STM103	STORAGE	0.29	1.54	97.58	0	01:14	1.54
STM104A-S	STORAGE	0.62	2.01	100.26	0	01:38	2.01
STM104B-S	STORAGE	0.16	0.61	97.59	0	01:14	0.61
STM105-S	STORAGE	1.08	2.89	100.28	0	01:32	2.89
STM106	STORAGE	1.03	2.81	100.28	0	01:32	2.81
STM107	STORAGE	0.95	2.72	100.28	0	01:32	2.72
STM108	STORAGE	0.67	2.18	100.28	0	01:32	2.18
STM109	STORAGE	0.92	2.67	100.28	0	01:32	2.67
STM110	STORAGE	0.18	2.05	99.81	0	01:11	2.05
STM111	STORAGE	0.13	1.79	99.82	0	01:11	1.78
STM900	STORAGE	0.20	1.45	97.60	0	01:14	1.44
TANK	STORAGE	0.52	2.51	96.92	0	01:20	2.51

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
OF	JUNCTION	183.79	768.08	0	01:10	0.192	4.08	-0.001
ORF900B	JUNCTION	0.00	59.77	0	01:06	0	0.131	0.402

STM101	JUNCTION	113.95	536.12	0	01:12	0.162	3.44	-0.038
STM104A	JUNCTION	0.00	235.75	0	01:25	0	2.47	-0.066
STM902	JUNCTION	73.44	73.44	0	01:10	0.0536	0.0536	4.586
STRMCPTR	JUNCTION	0.00	607.63	0	01:14	0	3.89	0.001
OF1	OUTFALL	0.00	768.07	0	01:10	0	4.08	0.000
500B-S	STORAGE	118.35	118.35	0	01:10	0.168	0.168	0.039
500C-S	STORAGE	134.69	134.69	0	01:10	0.191	0.191	0.030
900A-S	STORAGE	202.04	202.04	0	01:10	0.286	0.286	0.014
900B-S	STORAGE	92.60	92.60	0	01:10	0.131	0.131	0.033
CB102B-S	STORAGE	13.49	30.96	0	01:07	0.0191	0.0191	3.366
CB105-S	STORAGE	265.92	265.92	0	01:10	0.377	0.377	0.029
CB107-S	STORAGE	108.94	108.94	0	01:10	0.154	0.154	0.019
CB109-S	STORAGE	45.66	45.66	0	01:10	0.0603	0.0603	0.035
CB110-S	STORAGE	19.71	19.71	0	01:10	0.0251	0.0251	0.027
CB500-S	STORAGE	17.06	17.06	0	01:10	0.0242	0.0242	-0.001
CB501-S	STORAGE	70.93	70.93	0	01:10	0.1	0.1	-0.000
CB902A	STORAGE	0.00	71.50	0	01:10	0	0.0513	-4.509
CBMH901	STORAGE	0.00	66.17	0	01:08	0	0.054	-0.868
CMH100-S	STORAGE	270.37	270.37	0	01:10	0.383	0.383	0.005
CMH101-S	STORAGE	112.90	238.44	0	01:06	0.16	0.187	-0.209
MONITOR	STORAGE	0.00	607.63	0	01:14	0	3.89	-0.007
ORF101	STORAGE	0.00	607.63	0	01:14	0	3.89	-0.002
RoofA-S	STORAGE	666.52	666.52	0	01:10	0.944	0.944	0.003
RoofB1-S	STORAGE	93.10	93.10	0	01:10	0.132	0.132	0.003
RoofE-S	STORAGE	47.04	47.04	0	01:10	0.0666	0.0666	0.003
RoofF-S	STORAGE	54.97	54.97	0	01:10	0.0778	0.0778	0.008
STM102	STORAGE	0.00	482.50	0	01:14	0	3.16	0.026
STM103	STORAGE	0.00	547.68	0	01:08	0	3.14	0.124
STM104A-S	STORAGE	87.81	87.81	0	01:10	0.124	0.128	0.248
STM104B-S	STORAGE	0.00	259.90	0	01:23	0	2.57	0.008
STM105-S	STORAGE	0.00	431.15	0	01:06	0	2.38	0.220
STM106	STORAGE	0.00	329.62	0	01:06	0	1.88	0.147
STM107	STORAGE	0.00	544.38	0	01:05	0	0.82	-0.248
STM108	STORAGE	31.69	299.71	0	01:05	0.0449	0.0984	2.030
STM109	STORAGE	0.00	121.03	0	01:03	0	0.154	0.573
STM110	STORAGE	0.00	49.09	0	01:10	0	0.0953	-0.144
STM111	STORAGE	67.36	67.36	0	01:10	0.0953	0.0953	0.054
STM900	STORAGE	0.00	270.41	0	01:07	0	0.471	-0.059
TANK	STORAGE	322.62	322.62	0	01:10	0.448	0.448	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

	Max. Height	Min. Depth

Node	Type	Hours Surcharged	Above Crown Meters	Below Rim Meters
OF	JUNCTION	0.01	0.006	3.589
ORF900B	JUNCTION	0.40	0.785	1.035
STM101	JUNCTION	0.32	0.614	0.536
STM104A	JUNCTION	2.49	2.045	0.115

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
500B-S	0.008	10	0	0	0.048	61	0 01:40	104.31
500C-S	0.000	1	0	0	0.002	9	0 01:20	131.46
900A-S	0.000	0	0	0	0.009	5	0 01:10	180.35
900B-S	0.001	2	0	0	0.016	59	0 01:12	59.77
CB102B-S	0.000	0	0	0	0.000	0	0 00:00	23.23
CB105-S	0.014	15	0	0	0.084	89	0 01:32	222.00
CB107-S	0.008	14	0	0	0.049	87	0 01:25	43.75
CB109-S	0.000	4	0	0	0.009	84	0 01:12	25.77
CB110-S	0.000	1	0	0	0.002	15	0 01:13	14.20
CB500-S	0.000	0	0	0	0.000	0	0 00:00	17.06
CB501-S	0.000	0	0	0	0.000	0	0 00:00	70.91
CB902A	0.000	2	0	0	0.000	43	0 01:14	47.90
CBMH901	0.000	1	0	0	0.001	23	0 01:14	46.43
CMH100-S	0.013	10	0	0	0.089	68	0 01:22	188.13
CMH101-S	0.004	7	0	0	0.031	54	0 01:33	171.91
MONITOR	0.001	13	0	0	0.001	14	0 01:14	607.65
ORF101	0.000	9	0	0	0.001	12	0 01:14	607.63
RoofA-S	0.388	26	0	0	0.647	44	0 01:50	51.26
RoofB1-S	0.054	26	0	0	0.090	44	0 01:50	7.16
RoofE-S	0.028	26	0	0	0.046	44	0 01:50	3.59
RoofF-S	0.051	42	0	0	0.067	55	0 03:11	1.31
STM102	0.000	10	0	0	0.002	59	0 01:14	481.51
STM103	0.000	7	0	0	0.002	38	0 01:14	477.52

STM104A-S	0.006	9	0	0	0.037	59	0 01:38	80.39
STM104B-S	0.000	5	0	0	0.001	18	0 01:14	271.23
STM105-S	0.001	35	0	0	0.003	92	0 01:32	234.93
STM106	0.001	33	0	0	0.003	90	0 01:32	248.30
STM107	0.001	29	0	0	0.003	82	0 01:32	301.91
STM108	0.001	25	0	0	0.002	81	0 01:32	98.20
STM109	0.001	22	0	0	0.003	64	0 01:32	40.57
STM110	0.000	8	0	0	0.003	86	0 01:11	32.80
STM111	0.000	5	0	0	0.003	63	0 01:11	49.09
STM900	0.000	5	0	0	0.002	40	0 01:14	244.45
TANK	0.043	19	0	0	0.210	93	0 01:20	74.51

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF1	97.98	192.81	768.07	4.081
System	97.98	192.81	768.07	4.081

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	49.09	0 01:10	0.59	0.50	1.00
C3	DUMMY	768.07	0 01:10			
L1	CONDUIT	171.91	0 01:08	0.29	0.29	1.00
L11	CONDUIT	248.05	0 01:04	0.49	0.42	1.00
L14	CONDUIT	234.93	0 01:23	0.73	0.39	1.00
L30	CONDUIT	477.52	0 01:14	1.36	0.69	1.00
L32	CONDUIT	607.63	0 01:14	2.31	0.72	0.69
L34	CONDUIT	255.87	0 01:05	0.64	0.44	1.00
L45	CONDUIT	71.50	0 01:10	1.47	0.69	0.81
L50	CONDUIT	96.10	0 01:03	0.27	0.17	1.00
L51	CONDUIT	248.30	0 01:06	0.58	0.44	1.00
L61	CONDUIT	271.23	0 01:22	2.06	0.10	0.84

L63	CONDUIT	47.90	0	01:08	0.99	0.69	1.00
L64	CONDUIT	46.43	0	01:25	0.88	0.67	1.00
L65	CONDUIT	244.45	0	01:08	0.74	0.39	1.00
L68	CONDUIT	59.81	0	01:06	1.28	1.01	1.00
L70	CONDUIT	607.63	0	01:14	1.96	0.72	0.81
L71	CONDUIT	607.65	0	01:14	1.77	0.81	0.92
L72	CONDUIT	180.35	0	01:07	5.74	5.50	1.00
L8	CONDUIT	481.51	0	01:14	1.41	0.47	1.00
500B-IC	ORIFICE	104.31	0	01:04			1.00
500C-IC	ORIFICE	131.46	0	01:08			1.00
CB102B-IC1	ORIFICE	11.62	0	01:07			1.00
CB102B-IC2	ORIFICE	11.62	0	01:07			1.00
CB105-IC1	ORIFICE	111.00	0	01:03			1.00
CB105-IC2	ORIFICE	111.00	0	01:03			1.00
CB107-IC	ORIFICE	43.75	0	01:04			1.00
CB109-IC	ORIFICE	25.77	0	01:06			1.00
CB110-IC	ORIFICE	14.20	0	01:06			1.00
CB500-IC	ORIFICE	17.06	0	01:08			1.00
CB501-IC	ORIFICE	70.91	0	01:07			1.00
CMH100-IC	ORIFICE	188.13	0	01:02			1.00
IC-TANK	ORIFICE	74.51	0	01:20			1.00
ORF_900B	ORIFICE	59.77	0	01:06			1.00
SMT101-IC	ORIFICE	534.59	0	01:14			1.00
STM104A-IC	ORIFICE	80.39	0	01:05			1.00
STM104B-IC	ORIFICE	232.93	0	01:25			1.00
STM110-IC	ORIFICE	32.80	0	01:11			1.00
RA-O	DUMMY	51.26	0	01:50			
RB-O	DUMMY	7.16	0	01:50			
RE-O	DUMMY	3.59	0	01:50			
RF-O	DUMMY	1.31	0	03:11			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		Fraction of Time in Flow Class								
C1	1.00	0.07	0.00	0.00	0.21	0.00	0.00	0.73	0.06	0.00
L1	1.00	0.07	0.00	0.00	0.66	0.00	0.00	0.27	0.08	0.00
L11	1.00	0.07	0.00	0.00	0.92	0.00	0.00	0.01	0.02	0.00
L14	1.00	0.07	0.00	0.00	0.57	0.00	0.00	0.36	0.00	0.00
L30	1.00	0.07	0.00	0.00	0.09	0.00	0.00	0.84	0.00	0.00
L32	1.00	0.00	0.00	0.00	0.90	0.10	0.00	0.00	0.00	0.00
L34	1.00	0.07	0.00	0.00	0.45	0.00	0.00	0.48	0.02	0.00

L45	1.00	0.07	0.00	0.00	0.05	0.01	0.00	0.88	0.05	0.00
L50	1.00	0.07	0.00	0.00	0.61	0.00	0.00	0.32	0.03	0.00
L51	1.00	0.07	0.00	0.00	0.91	0.00	0.00	0.02	0.00	0.00
L61	1.00	0.07	0.00	0.00	0.05	0.01	0.00	0.87	0.01	0.00
L63	1.00	0.07	0.00	0.00	0.06	0.00	0.00	0.87	0.01	0.00
L64	1.00	0.08	0.00	0.00	0.06	0.00	0.00	0.86	0.00	0.00
L65	1.00	0.07	0.00	0.00	0.91	0.00	0.00	0.02	0.00	0.00
L68	1.00	0.07	0.00	0.00	0.07	0.00	0.00	0.86	0.01	0.00
L70	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
L71	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
L72	1.00	0.07	0.00	0.00	0.05	0.00	0.00	0.88	0.00	0.00
L8	1.00	0.07	0.00	0.00	0.10	0.00	0.00	0.84	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.56	0.56	0.70	0.01	0.01
L1	2.13	2.13	2.22	0.01	0.02
L11	2.26	2.26	2.31	0.01	0.01
L14	2.42	2.42	2.49	0.01	0.01
L30	0.33	0.33	0.35	0.01	0.01
L34	1.90	1.90	1.95	0.01	0.01
L45	0.01	0.01	0.20	0.01	0.01
L50	2.23	2.23	2.28	0.01	0.01
L51	2.34	2.34	2.39	0.01	0.01
L61	0.01	0.01	0.07	0.01	0.01
L63	0.21	0.21	0.30	0.01	0.01
L64	0.30	0.30	0.31	0.01	0.01
L65	0.30	0.30	0.31	0.01	0.01
L68	0.34	0.40	0.39	0.01	0.12
L71	0.01	0.01	0.01	0.01	0.01
L72	0.44	0.56	0.44	0.59	0.44
L8	0.32	0.32	0.32	0.01	0.01

Analysis begun on: Thu May 14 11:24:09 2020
Analysis ended on: Thu May 14 11:24:10 2020
Total elapsed time: 00:00:01

Appendix D GEOTECHNICAL INVESTIGATION

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

patersongroup

Supplemental Geotechnical Investigation

Proposed Hi-Rise Development
Clyde Avenue at Baseline Road
Ottawa, Ontario

Prepared For

Groupe Sélection

April 3, 2019

Report: PG4871-1

Paterson Group Inc.
Consulting Engineers
28 Concourse Gate - Unit 1
Ottawa (Nepean), Ontario
Canada K2E 7T7

Tel: (613) 226-7381
Fax: (613) 226-6344
www.patersongroup.ca

Table of Contents

Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by Groupe Sélection to conduct a supplemental geotechnical investigation for the proposed high rise development to be located at Clyde Avenue and Baseline Road in the City of Ottawa (refer to Figure 1 - Key Plan in Appendix 2 of this report).

The objective of the current investigation was to:

- ❑ Determine the subsoil and groundwater conditions at this site by means of boreholes.

- ❑ Provide geotechnical recommendations pertaining to design of the proposed development including construction considerations which may affect the design.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. It contains our findings and includes geotechnical recommendations pertaining to the design and construction of the subject development as they are understood at the time of writing this report.

Investigating the presence or potential presence of contamination on the subject property was not part of the scope of work of the current investigation.

2.0 Proposed Development

The proposed development is understood to consist of a 13 storey building with 2 levels of underground parking. The underground parking levels are anticipated to extend beyond the proposed building footprint and occupy the majority of the subject site. At-grade paved access lanes, parking areas and landscaped areas are also anticipated.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The field program for the current investigation was completed on March 25, 2019. At that time, 4 boreholes were advanced to a maximum depth of 7.6 m below existing grade. Previous investigations were carried out on June 11 to 13, 2008 and August 17, 2009. The borehole locations were distributed in a manner to provide general coverage of the proposed development. The locations were determined in the field by Paterson personnel taking into consideration site features and underground services. The locations of the test holes are shown in Drawing PG4871-1 - Test Hole Location Plan included in Appendix 2.

The boreholes were advanced using a truck-mounted auger drill rig operated by a two person crew. All fieldwork was conducted under the full-time supervision of our personnel under the direction of a senior engineer from the geotechnical department. The drilling procedure consisted of augering to the required depths at the selected locations and sampling the overburden.

Sampling and In Situ Testing

Soil samples from the boreholes were recovered from the auger flights or using a 50 mm diameter split-spoon sampler. All soil samples were initially classified on site, placed in sealed plastic bags and transported to our laboratory for further examination. The depths at which the auger and split spoon samples were recovered from the test holes are shown as AU and SS, respectively, on the Soil Profile and Test Data sheets presented in Appendix 1.

The Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split spoon samples. The SPT results are recorded as "N" values on the Soil Profile and Test Data sheets. The "N" value is the number of blows required to drive the split spoon sampler 300 mm into the soil after a 150 mm initial penetration using a 63.5 kg hammer falling from a height of 760 mm.

Coring of the bedrock using diamond drilling was carried out at two borehole locations to assess the bedrock quality. A recovery value and a Rock Quality Designation (RQD) value were calculated for each drilled section of bedrock and are shown on the Soil Profile and Test Data sheets in Appendix 1. The recovery value is the ratio, in percentage, of the length of the bedrock sample recovered over the length of the drilled section. The RQD value is the ratio, in percentage, of the total length of intact rock pieces longer than 100 mm in one drilled section over the length of the drilled section. These values are indicative of the quality of the bedrock.

The subsurface conditions observed in the boreholes were recorded in detail in the field. The soil profiles are logged on the Soil Profile and Test Data sheets presented in Appendix 1 of this report.

Groundwater

Flexible standpipes were installed in all boreholes to permit monitoring of the groundwater levels subsequent to the completion of the sampling program.

Sample Storage

All samples will be stored in the laboratory for a period of one month after issuance of this report. They will then be discarded unless we are otherwise directed.

3.2 Field Survey

The test hole locations were selected in the field by Paterson personnel in a manner to provide general coverage of the subject site, taking into consideration site features. The ground surface elevations at the borehole locations were provided by Stantec Geomatics. The test hole locations and ground surface elevations at the test hole locations are presented in Drawing PG4871-1 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Testing

All soil samples were recovered from the subject site and visually examined in our laboratory to review the results of the field logging.

3.4 Analytical Testing

One soil sample was submitted for analytical testing to assess the corrosion potential for exposed ferrous metals and the potential of sulphate attacks against subsurface concrete structures. The sample was analysed to determine the concentrations of sulphate and chloride, the resistivity and the pH of the sample. The analytical test results are presented in Appendix 1 and discussed in Subsection 6.7 of this report.

4.0 Observations

4.1 Surface Conditions

The subject site is currently unoccupied vacant land with a grass surface. During winter months the subject site is used as overflow parking for the neighbouring commercial properties and businesses. The site is relatively flat and approximately at grade with neighbouring properties and nearby roadways. The site is bordered to the north and east by commercial properties, to the south by Baseline Road and to the west by Clyde Avenue.

4.2 Subsurface Profile

Generally, the soil profile at the borehole locations consisted of a thin layer of topsoil and/or gravel fill followed by a layer of silty sand. A glacial till deposit was encountered below the fill/silty sand layer. The fine matrix of the glacial till was observed to consist of silty sand with gravel, cobbles and trace clay. Practical auger refusal was encountered at depths ranging from 2.6 to 3.5 m below ground surface. Specific details of the soil profile at each borehole location are provided on the Soil Profile and Test Data sheets in Appendix 1.

Bedrock

Grey limestone bedrock was cored at BHs 2 and 3 to a maximum depth of 7.7 m. The recovery values and RQD values for the bedrock cores were calculated. The recorded recovery values were 100% for all samples, while the RQD values vary between 82 and 100%. Based on these results the quality of the bedrock ranges from good to excellent.

Based on available geological mapping, the local bedrock consists of interbedded limestone and dolostone of the Gull River formation with an anticipated overburden thickness of 0 to 1 m.

4.3 Groundwater

Groundwater levels (GWL) were measured on April 1, 2019 in the standpipes installed at the borehole locations. The GWL readings and open hole groundwater observations are presented in Table 1 below. It is important to note that groundwater level readings could be influenced by surface water infiltrating the backfilled borehole. The groundwater table level can also be estimated based on moisture levels and colour of the recovered soil samples. Based on these observations at the borehole locations, the permanent groundwater table is expected below a 3 m depth. As groundwater levels are subject to seasonal fluctuations, it should be noted that groundwater may vary at the time of construction.

Table 1 - Summary of Groundwater Levels

Borehole Number	Ground Surface Elevation (m)	Measured Groundwater Level (m)		Recording Date
		Depth	Groundwater Elevation (m)	
BH 1	98.37	Blocked	-	April 1, 2019
BH 2	98.92	3.67	95.25	April 1, 2019
BH 3	98.37	2.11	96.26	April 1, 2019
BH 4	98.54	2.22	96.32	April 1, 2019

Note: The ground surface elevations at the borehole locations were provided by Stantec Geomatics.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is suitable for the proposed residential hi-rise development. It is anticipated that bedrock removal will be required to accommodate the proposed underground parking levels.

The above and other considerations are discussed in the following paragraphs.

5.2 Site Grading and Preparation

Stripping Depth

Topsoil and deleterious fill, such as those containing organic materials, should be stripped from under any buildings and other settlement sensitive structures. Existing foundation walls and other construction debris should be entirely removed from within the building perimeter. Under paved areas, existing construction remnants such as foundation walls should be excavated to a minimum of 1 m below final grade.

Bedrock Removal

Bedrock removal can be accomplished by hoe ramming where only a small quantity of the bedrock needs to be removed. Sound bedrock may be removed by line drilling and controlled blasting and/or hoe ramming.

Prior to considering blasting operations, the blasting effects on the existing services, buildings and other structures should be addressed. A pre-blast or pre-construction survey of the existing structures located in proximity of the blasting operations should be carried out prior to commencing site activities. The extent of the survey should be determined by the blasting consultant and should be sufficient to respond to any inquiries/claims related to the blasting operations.

As a general guideline, peak particle velocities (measured at the structures) should not exceed 25 mm per second during the blasting program to reduce the risks of damage to the existing structures.

The blasting operations should be planned and conducted under the supervision of a licensed professional engineer who is also an experienced blasting consultant.

Excavation side slopes in sound bedrock can be carried out using almost vertical side walls. A minimum 1 m horizontal ledge should be left between the bottom of the overburden excavation and the top of the bedrock surface to provide an area to allow for potential sloughing.

Fill Placement

Fill used for grading purposes beneath the proposed building, unless otherwise specified, should consist of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. An OPSS Granular B Type I (pit run) material or existing granular material approved by the geotechnical consultant can also be used below the proposed building footprint. The fill should be tested and approved prior to delivery to the site. It should be placed in lifts no greater than 300 mm in thickness and compacted using suitable compaction equipment for the specified lift thickness. Fill placed beneath the building areas should be compacted to at least 98% of its standard Proctor maximum dry density (SPMDD).

Non-specified existing fill along with site-excavated soil can be used as general landscaping fill where settlement of the ground surface is of minor concern. These materials should be spread in thin lifts and be compacted at minimum by the tracks of the spreading equipment to minimize voids. If these materials are to be used to build up the subgrade level for areas to be paved, they should be compacted in thin lifts to a minimum density of 95% of their respective SPMDD. Non-specified existing fill and site-excavated soils are not suitable for use as backfill against foundation walls, unless deemed acceptable by the geotechnical consultant.

5.3 Foundation Design

Shallow footings placed on a clean, surface sounded bedrock bearing surface can be designed using a factored bearing resistance value at ultimate limit states (ULS) of **1,500 kPa**, incorporating a geotechnical resistance factor of 0.5. Footings placed on a clean, surface-sounded bedrock bearing surface will be subjected to negligible post-construction total and differential settlements.

A clean, surface-sounded bedrock bearing surface should be free of loose materials, and have no near surface seams, voids, fissures or open joints which can be detected from surface sounding with a rock hammer.

For the footings at depth for the parking garage and building foundation, a factored bearing resistance value at ULS of **4,500 kPa**, incorporating a geotechnical resistance factor of 0.5 could be used if founded on limestone bedrock provided the bedrock is free of seams, fractures and voids within 1.5 m below the founding level.

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support. Near vertical (1H:6V) slopes can be used for unfractured bedrock bearing media; a 1H:1V slope can be used for fractured or weathered bedrock.

5.4 Design for Earthquakes

Shear wave velocity testing was completed for the subject site to accurately determine the applicable seismic site classification for the proposed buildings from Table 4.1.8.4.A of the Ontario Building Code 2012. The shear wave velocity testing was completed by Paterson personnel and the interpretation was completed by Dr. Dariush Motazedian, an expert seismologist with Carleton University. The results of the shear wave interpretation are presented in Appendix 2.

Field Program

The shear wave testing was located adjacent to the subject site, as presented in Drawing PG4871-2 - Seismic Survey Location Plan presented in Appendix 2. Paterson field personnel placed 24 horizontal geophones in a straight line in roughly a north-south orientation. The 4.5 Hz horizontal geophones were mounted to the surface by means of a 75 mm ground spike attached to the geophone land case. The geophones were spaced at 3 m intervals and were connected by a geophone spread cable to a Geode 24 Channel seismograph.

The seismograph was also connected to a computer laptop and a hammer trigger switch attached to a 12 pound dead blow hammer. The hammer trigger switch sends a start signal to the seismograph. The hammer is used to strike an I-beam seated into the ground surface, which creates a polarized shear wave. The hammer shots are repeated between 4 to 8 times at each shot location to improve signal to noise ratio. The shot locations are also completed in forward and reverse directions (i.e.-striking both sides of the I-beam seated parallel to the geophone array). The shot locations are located at the centre of the geophone array and 3, 4.5 and 30 m away from the first and last geophone.

The methods of testing completed by Paterson are guided by the standard testing procedures used by the expert seismologists at Carleton University and Geological Survey of Canada (GSC).

Data Processing and Interpretation

Interpretation for the shear wave velocity results were completed by Dr. Dariush Motazedian, an expert seismologist with Carleton University. The shear wave velocity measurement was made using reflection/refraction methods. The interpretation is performed by recovering arrival times from direct and refracted waves. The interpretation is repeated at each shot location to provide an average shear wave velocity, Vs_{30}, of the upper 30 m profile. The layer intercept times, velocities from different layers and critical distances are interpreted from the shear wave records to compute the bedrock depth at each location. The bedrock velocity was interpreted using the main refractor wave velocity, this is considered a conservative estimate of the bedrock velocity due to the increasing quality of the bedrock with depth. It should be noted that as bedrock quality increases, the bedrock shear wave velocity also increases.

Based on the available concept drawings and plans, the building footings will be placed directly on the bedrock.

The Vs_{30} was calculated using the standard equation for average shear wave velocity calculation from the Ontario Building Code (OBC) 2012.

$$V_{s30} = \frac{Depth_{OfInterest}(m)}{\sum\left(\frac{(Depth_{Layer1}(m)}{Vs_{Layer1}(m/s)} + \frac{Depth_{Layer2}(m)}{Vs_{Layer2}(m/s)}\right)}$$

$$V_{s30} = \frac{30m}{\sum\left(\frac{30m}{2{,}907m/s}\right)}$$

$$V_{s30} = 2{,}907m/s$$

Based on the results of the seismic testing , the average shear wave velocity of the upper 30 m profile below the proposed underside of foundation, Vs_{30}, was calculated to be **2,907 m/s**. Therefore, a **Site Class A** is applicable for the proposed buildings founded directly on bedrock as per Table 4.1.8.4.A of the OBC 2012. The soils underlying the site are not susceptible to liquefaction.

5.5 Basement Slab

All overburden soil will be removed for the proposed building and underground parking levels and the basement floor slab will be placed over a bedrock medium. OPSS Granular A or Granular B Type II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab. It is recommended that the upper 200 mm of sub-slab fill consist of a 19 mm clear crushed stone.

In consideration of the groundwater conditions encountered during the investigation, a subfloor drainage system, consisting of lines of perforated drainage pipe subdrains connected to a positive outlet, should be provided in the clear stone backfill under the lower basement floor.

5.6 Basement Wall

Where soil is to be retained, the conditions can be well-represented by assuming the retained soil consists of a material with an angle of internal friction of 30 degrees and a dry unit weight of 20 kN/m^3. Undrained conditions are anticipated (i.e. below the groundwater level). Therefore, the applicable effective unit weight of the retained soil can be taken as 13 kN/m^3, where applicable. A hydrostatic pressure should be added to the total static earth pressure when using the effective unit weight.

Two distinct conditions, static and seismic should be reviewed for design calculations. The parameters for design calculations for the two conditions are presented below.

Lateral Earth Pressures

The static horizontal earth pressure (P_o) can be calculated using a triangular earth pressure distribution equal to $K_o \cdot \gamma \cdot H$ where:

K_o = at-rest earth pressure coefficient of the applicable retained soil, 0.5
γ = unit weight of the applicable retained soil (kN/m^3)
H = height of the wall (m)

An additional pressure having a magnitude equal to $K_o \cdot q$ and acting on the entire height of the wall should be added to the above diagram for any surcharge loading, q (kPa), that may be placed at ground surface adjacent to the wall. The surcharge pressure will only be applicable for static analyses and should not be used in conjunction with the seismic loading case.

Actual earth pressures could be higher than the "at-rest" case if care is not exercised during the compaction of the backfill materials to maintain a minimum separation of 0.3 m from the walls with the compaction equipment.

Seismic Earth Pressures

The total seismic force (P_{AE}) includes both the earth force component (P_o) and the seismic component (ΔP_{AE}). The seismic earth force (ΔP_{AE}) can be calculated using $0.375 \cdot a_c \cdot \gamma \cdot H^2/g$ where:

a_c = $(1.45-a_{max}/g)a_{max}$
γ = unit weight of fill of the applicable retained soil (kN/m^3)
H = height of the wall (m)
g = gravity, 9.81 m/s^2

The peak ground acceleration, (a_{max}), for the Ottawa area is 0.32g according to OBC 2012. Note that the vertical seismic coefficient is assumed to be zero.

The earth force component (P_o) under seismic conditions can be calculated using $P_o = 0.5 \cdot K_o \cdot \gamma \cdot H^2$, where $K_o = 0.5$ for the soil conditions noted above.

The total earth force (P_{AE}) is considered to act at a height, h (m), from the base of the wall, where:

$h = \{P_o \cdot (H/3) + \Delta P_{AE} \cdot (0.6 \cdot H)\}/P_{AE}$

The earth forces calculated are unfactored. For the ULS case, the earth loads should be factored as live loads, as per OBC 2012.

5.7 Rock Anchor Design

The geotechnical design of grouted rock anchors in sedimentary bedrock is based upon two possible failure modes. The anchor can fail either by shear failure along the grout/rock interface or by pullout from a 60 to 90 degree cone with the apex near the middle of the anchor bonded length. Interaction may develop between the failure cones of adjacent anchors resulting in a total group capacity less than the sum of the individual anchor load capacity. A third failure mode of shear failure along the grout/steel interface should also be reviewed by a qualified structural engineer to ensure all typical failure modes have been reviewed. Typical rock anchor suppliers, such as Dywidag Systems International (DSI Canada), have qualified personnel on staff to recommend appropriate rock anchor size and materials.

Centre-to-centre spacing between anchors should be at least four times the anchor hole diameter and greater than 1/5 of the total anchor length (minimum of 1.2 m) to lower the group influence effects. Anchors in close proximity to each other are recommended to be grouted at the same time to ensure any fractures or voids are completely in-filled and grout does not flow from one hole to an adjacent empty one.

Regardless of whether an anchor is of the passive or post tensioned type, the anchor is recommended to be provided with a fixed length at the anchor base, which will provide the anchor capacity, and a free length between the rock surface and the bonded length. As the depth at which the apex of the shear failure cone develops midway along the bonded length, a fully bonded anchor has a much shallower cone, and therefore less geotechnical resistance, than one where the bonded length is at the bottom portion of the anchor.

Permanent anchors should be provided with corrosion protection. As a minimum, this requires that the entire drill hole be filled with cementitious grout. The free anchor length is provided by installing a sleeve to act as a bond break, with the sleeve filled with grout. Double corrosion protection can be provided with factory assembled systems, such as those available from Dywidag Systems International or Williams Form Engineering Corp. Recognizing the importance of the anchors for the long term performance of the foundation of the proposed buildings, the rock anchors for this project are recommended to be provided with double corrosion protection.

Grout to Rock Bond

Generally, the unconfined compressive strength of limestone and dolostone bedrock exceeds 80 MPa, which is stronger than most routine grouts. A factored tensile grout to rock bond resistance value at ULS of 1,000 kPa, incorporating a resistance factor of 0.3, can be used. A minimum grout strength of 40 MPa is recommended.

Rock Cone Uplift

As discussed previously, the geotechnical capacity of the rock anchors depends on the dimensions of the rock anchors and the configuration of the anchorage system. A **Rock Mass Rating (RMR) of 65** was assigned to the bedrock, and Hoek and Brown parameters (**m and s**) were taken as **0.575 and 0.00293**, respectively. For design purposes, all rock anchors were assumed to be placed at least 1.2 m apart to reduce group anchor effects.

Recommended Rock Anchor Lengths

Rock anchor lengths can be designed based on the required loads. Rock anchor lengths for some typical loads have been calculated and are presented on the following page. Load specified rock anchor lengths can be provided, if required. For calculations the parameters given in Table 2 were used.

Table 2 - Parameters Used in Rock Anchor Review

Grout to Rock Bond Strength - Factored at ULS	1.0 MPa
Compressive Strength - Grout	40 MPa
Rock Mass Rating (RMR) - Good Quality Limestone Hoek and Brown parameters	65 m=0.575 and s=0.00293
Unconfined compressive strength - Limestone bedrock	80 MPa
Unit weight - Submerged Bedrock	15 kN/m^3
Apex angle of failure cone	60^o
Apex of failure cone	mid-point of fixed anchor length

From a geotechnical perspective, the fixed anchor length will depend on the diameter of the drill holes. Recommended anchor lengths for a 75 and 125 mm diameter hole are provided in Table 3.

Table 3 - Recommended Rock Anchor Lengths - Grouted Rock Anchor

Diameter of Drill Hole (mm)	Anchor Lengths (m)			Factored Tensile Resistance (kN)
	Bonded Length	Unbonded Length	Total Length	
75	3.0	1.5	4.5	250
	4.2	2.2	6.4	500
	6.5	2.6	9.1	1000
	10	3.5	13.5	2000
125	2.8	1.5	4.3	250
	3.5	2.4	5.9	500
	5.5	2.8	8.3	1000
	8	3.8	11.8	2000

The anchor drill holes should be within 1.5 to 2 times the rock anchor tendon diameter, inspected by geotechnical personnel and flushed clean with water prior to grouting. A tremie tube is recommended to place grout from the bottom of the anchor holes. Compressive strength testing is recommended to be completed for the rock anchor grout. A set of grout cubes should be tested for each day that grout is prepared.

The geotechnical capacity of each rock anchor should be proof tested at the time of construction. More information on testing can be provided upon request. Compressive strength testing is recommended to be completed for the rock anchor grout. A set of grout cubes should be tested for each day grout is prepared.

5.8 Pavement Design

Car only parking and heavy traffic areas are anticipated at this site. The subgrade material will consist of glacial till. The proposed pavement structures are shown in Tables 4 and 5.

Table 4 - Recommended Pavement Structure - Car Only Parking Areas

Thickness (mm)	Material Description
50	**Wear Course -** HL-3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type II
	SUBGRADE - Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill

Table 5 - Recommended Pavement Structure - Access Lanes and Heavy Truck Parking Areas

Thickness (mm)	Material Description
40	**Wear Course -** HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Binder Course -** HL-8 or Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
400	**SUBBASE** - OPSS Granular B Type II
	SUBGRADE - Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project.

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type I or Type II material.

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 98% of the material's SPMDD using suitable compaction equipment.

Pavement Structure Drainage

Satisfactory performance of the pavement structure is largely dependent on keeping the contact zone between the subgrade material and the base stone in a dry condition. Failure to provide adequate drainage under conditions of heavy wheel loading can result in the fine subgrade soil being pumped into the voids in the stone subbase, thereby reducing its load carrying capacity.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

It is recommended that a perimeter foundation drainage system be provided for the proposed structure. The system should consist of a 150 mm diameter perforated corrugated plastic pipe, surrounded on all sides by 150 mm of 10 mm clear crushed stone, placed at the footing level around the exterior perimeter of the structure. The pipe should have a positive outlet, such as a gravity connection to the storm sewer.

Backfill against the exterior sides of the foundation walls should consist of free-draining non frost susceptible granular materials. It is anticipated that imported granular materials, such as clean sand or OPSS Granular B Type I granular material, should be used for this purpose. It should also be noted that existing granular material approved by the geotechnical consultant is also acceptable for backfill against the foundation walls.

6.2 Protection of Footings Against Frost Action

Perimeter footings of heated structures are required to be insulated against the deleterious effect of frost action. A minimum of 1.5 m thick soil cover (or equivalent) should be provided in this regard.

A minimum of 2.1 m thick soil cover (or equivalent) should be provided for other exterior unheated footings.

For footings founded directly on sound bedrock where insufficient soil cover is available, insulation can be used to make up the shortfall. Also, if the bedrock is considered to be non-frost susceptible, the suggested insulation can be omitted. Non-frost susceptible bedrock requires confirmation of no significant soil bearing seams within the potential frost penetration depth. This confirmation is carried out using probeholes which are verified by geotechnical personnel.

6.3 Excavation Side Slopes

The side slopes of excavations in the soil and fill overburden materials should either be cut back at acceptable slopes or should be retained by shoring systems from the start of the excavation until the structure is backfilled. It is assumed that sufficient room will be available for the greater part of the excavation to be undertaken by open-cut methods (i.e. unsupported excavations).

The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or flatter. The flatter slope is required for excavation below groundwater level. The subsoil at this site is considered to be mainly a Type 2 and 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides.

It is recommended that a trench box be used at all times to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by "cut and cover" methods and excavations will not be left open for extended periods of time.

6.4 Pipe Bedding and Backfill

At least 150 mm of OPSS Granular A should be used for pipe bedding for sewer and water pipes. The bedding should extend to the spring line of the pipe. Cover material, from the spring line to at least 300 mm above the obvert of the pipe should consist of OPSS Granular A. The bedding and cover materials should be placed in maximum 225 mm thick lifts compacted to a minimum of 95% of the material's SPMDD.

Generally, it should be possible to re-use the moist, not wet, glacial till above the cover material if the excavation and filling operations are carried out in dry weather conditions. The wet glacial till should be given a sufficient drying period to decrease its moisture content to an acceptable level to make compaction possible prior to being re-used.

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.8 m below finished grade) should match the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the material's SPMDD.

6.5 Groundwater Control

The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

It is anticipated that pumping from open sumps will be sufficient to control the groundwater influx through the sides of the excavations.

A temporary Ministry of the Environment, Conservation and Parks (MECP) permit to take water (PTTW) may be required for this project if more than 400,000 L/day of ground and/or surface water is to be pumped during the construction phase. A minimum of 4 to 5 months should be allowed for completion of the PTTW application package and issuance of the permit by the MECP.

For typical ground or surface water volumes being pumped during the construction phase, between 50,000 to 400,000 L/day, it is required to register in the Environmental Activity and Sector Registry (EASR). A minimum of two to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan to be prepared by a Qualified Person as stipulated under O.Reg. 63/16. If a project qualifies for a PTTW based upon anticipated conditions, an EASR will not be allowed as a temporary dewatering measure while awaiting the MECP review of the PTTW application.

6.6 Winter Construction

Precautions must be taken if winter construction is considered for this project.

The subsoil conditions at this site consist of frost susceptible materials. In the presence of water and freezing conditions, ice could form within the soil mass. Heaving and settlement upon thawing could occur.

In the event of construction during below zero temperatures, the founding stratum should be protected from freezing temperatures by the use of straw, propane heaters and tarpaulins or other suitable means. In this regard, the base of the excavations should be insulated from sub-zero temperatures immediately upon exposure and until such time as heat is adequately supplied to the building and the footings are protected with sufficient soil cover to prevent freezing at founding level.

Trench excavations and pavement construction are also difficult activities to complete during freezing conditions without introducing frost in the subgrade or in the excavation walls and bottoms. Precautions should be taken if such activities are to be carried out during freezing conditions. Additional information could be provided, if required.

6.7 Corrosion Potential and Sulphate

The results of analytical testing show that the sulphate content is less than 0.1%. This result is indicative that Type 10 Portland cement (normal cement) would be appropriate for this site. The chloride content and the pH of the sample indicate that they are not significant factors in creating a corrosive environment for exposed ferrous metals at this site, whereas the resistivity is indicative of an aggressive to very aggressive corrosive environment.

7.0 Recommendations

It is a requirement for the foundation design data provided herein to be applicable that the following material testing and observation program be performed by the geotechnical consultant.

- ❏ Review of the geotechnical aspects of the excavation contractor's shoring design, prior to construction.
- ❏ Review the bedrock stabilization and excavation requirements.
- ❏ Review proposed foundation drainage design and requirements.
- ❏ Observation of all bearing surfaces prior to the placement of concrete.
- ❏ Sampling and testing of the concrete and fill materials used.
- ❏ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ❏ Observation of all subgrades prior to backfilling and follow-up field density tests to determine the level of compaction achieved.
- ❏ Sampling and testing of the bituminous concrete including mix design reviews.

A report confirming that these works have been conducted in general accordance with our recommendations could be issued upon the completion of a satisfactory inspection program by the geotechnical consultant.

8.0 Statement of Limitations

The recommendations made in this report are in accordance with our present understanding of the project. We request that we be permitted to review the grading plan once available. Also, our recommendations should be reviewed when the project drawings and specifications are complete.

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, we request that we be notified immediately in order to permit reassessment of our recommendations.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Groupe Sélection or their agent(s) is not authorized without review by this firm for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

Nathan F. S. Christie, P.Eng.

Carlos P. Da Silva, P.Eng., ing, QP_{ESA}

Report Distribution:

- ❑ Groupe Sélection (3 copies)
- ❑ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

ANALYTICAL TESTING RESULTS

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Clyde Avenue and Baseline Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4871

REMARKS

HOLE NO. BH 1

BORINGS BY CME 55 Power Auger **DATE** March 25, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.37
FILL: Gravel		AU	1				
0.08							
Compact, brown **SILTY SAND**		SS	2	75	14	1	97.37
1.52							
GLACIAL TILL: Compact to dense, brown silty sand with gravel, some cobbles, trace clay		SS	3	83	14	2	96.37
		SS	4	92	50+		
2.59							
End of Borehole							
Practical refusal to augering at 2.59m depth							
(Piezometer blocked at 1.3m depth - April 1, 2019)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Clyde Avenue and Baseline Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4871

REMARKS

HOLE NO. BH 2

BORINGS BY CME 55 Power Auger **DATE** March 25, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.92
FILL: Brown silty sand with gravel		AU	1				
0.53							
Loose, brown **SILTY SAND**		SS	2	54	9	1	97.92
1.37							
GLACIAL TILL: Compact to dense, brown silty sand with gravel, some cobbles		SS	3	83	12	2	96.92
		SS	4	88	33		
3.02						3	95.92
		RC	1	100	95		
						4	94.92
BEDROCK: Good to excellent quality, grey limestone		RC	2	100	90	5	93.92
						6	92.92
		RC	3	100	82		
7.11						7	91.92
End of Borehole							
(GWL @ 3.67m - April 1, 2019)							

Pen. Resist. Blows/0.3m
● **50 mm Dia. Cone**
○ **Water Content %**

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Clyde Avenue and Baseline Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. PG4871

REMARKS

HOLE NO. BH 3

BORINGS BY CME 55 Power Auger **DATE** March 25, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.37
TOPSOIL 0.10		AU	1				
Very loose to loose, brown **SILTY SAND**		SS	2	75	1	1	97.37
1.60		SS	3	54	9	2	96.37
GLACIAL TILL: Compact to dense, brown silty sand with gravel, some cobbles, trace clay		SS	4	71	26	3	95.37
3.30		SS	5	75	50+		
		RC	1	100	91	4	94.37
BEDROCK: Good to excellent quality, grey limestone		RC	2	100	98	5	93.37
		RC	3	100	83	6	92.37
		RC	4	100	100	7	91.37
7.67 End of Borehole							
(GWL @ 2.11m - April 1, 2019)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Clyde Avenue and Baseline Road
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

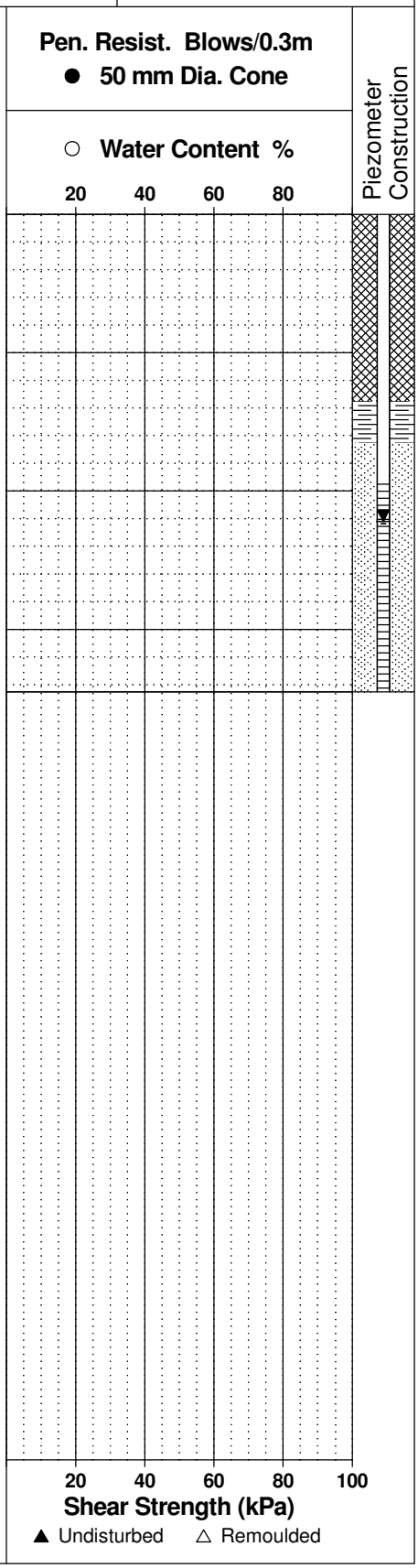
FILE NO. PG4871

REMARKS

HOLE NO. BH 4

BORINGS BY CME 55 Power Auger **DATE** March 25, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.54
TOPSOIL 0.30		AU	1				
Very loose, brown **SILTY SAND**		SS	2	58	3	1	97.54
1.30 Brown **SILTY CLAY** 1.37		SS	3	33	6	2	96.54
GLACIAL TILL: Compact to dense, brown silty sand with gravel, trace clay		SS	4	67	16	3	95.54
3.45		SS	5	100	50+		
End of Borehole							
Practical refusal to augering at 3.45m depth							
(GWL @ 2.22m - April 1, 2019)							



SYMBOLS AND TERMS

SOIL DESCRIPTION

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

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

The standard terminology to describe the relative strength of cohesionless soils is the compactness condition, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm. An SPT N value of "P" denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

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

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

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

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their "sensitivity". The sensitivity, S_t, is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

Low Sensitivity:	$S_t < 2$
Medium Sensitivity:	$2 < S_t < 4$
Sensitive:	$4 < S_t < 8$
Extra Sensitive:	$8 < S_t < 16$
Quick Clay:	$S_t > 16$

ROCK DESCRIPTION

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

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

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

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube, generally recovered using a piston sampler
G	-	"Grab" sample from test pit or surface materials
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

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

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

CONSOLIDATION TEST

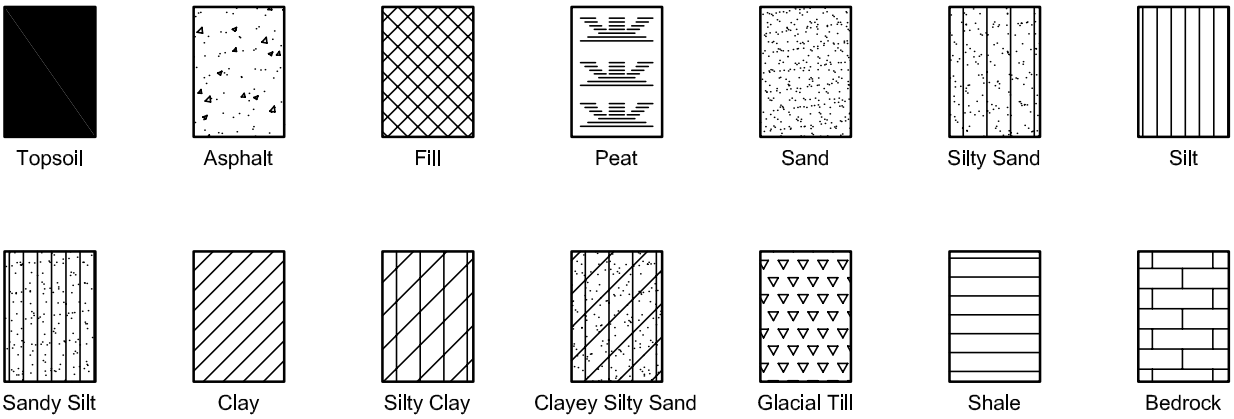
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void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

PERMEABILITY TEST

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

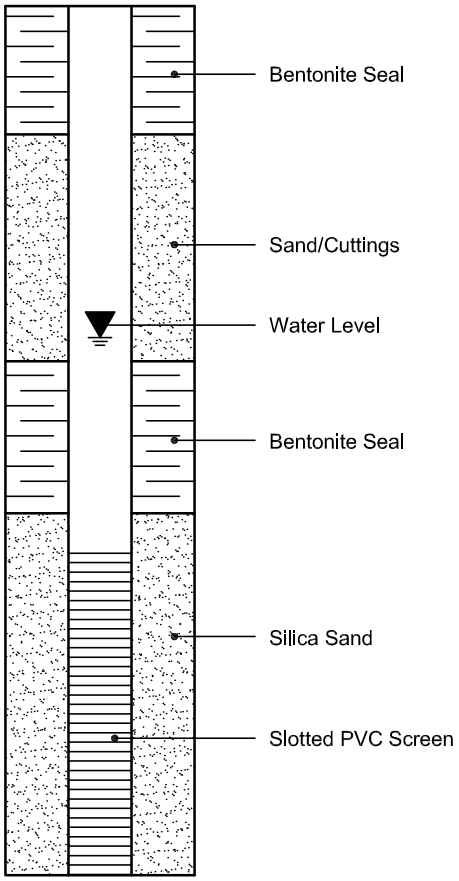
SYMBOLS AND TERMS (continued)

STRATA PLOT

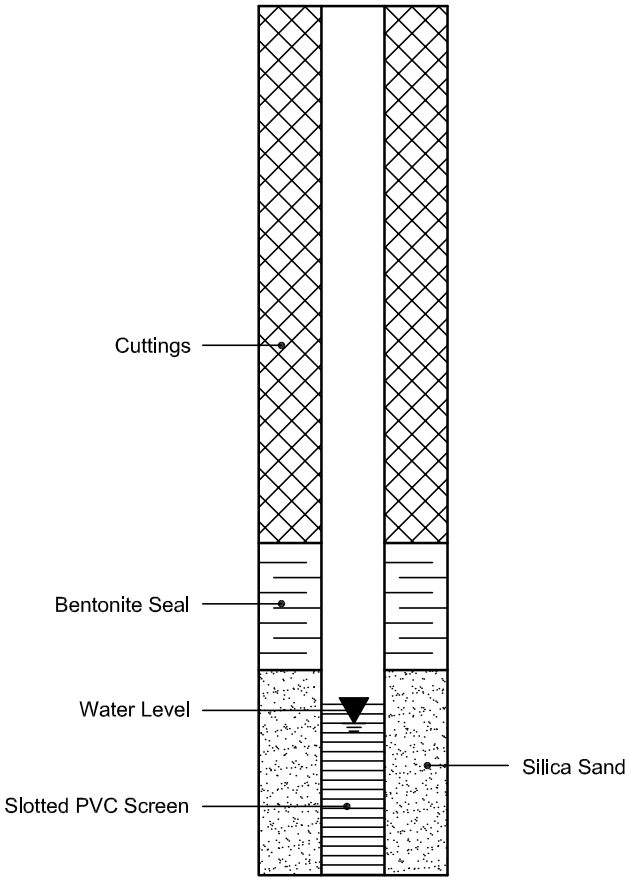


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 26252

Report Date: 29-Mar-2019

Order Date: 25-Mar-2019

Project Description: PG4871

	Client ID:	BH3-SS2	-	-	-
	Sample Date:	03/25/2019 12:00	-	-	-
	Sample ID:	1913155-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	81.5	-	-	-
General Inorganics					
pH	0.05 pH Units	7.38	-	-	-
Resistivity	0.10 Ohm.m	18.2	-	-	-
Anions					
Chloride	5 ug/g dry	274	-	-	-
Sulphate	5 ug/g dry	26	-	-	-

APPENDIX 2

FIGURE 1 - KEY PLAN

SHEAR WAVE VELOCITY MEASUREMENT REPORT

DRAWING PG4871-1 - TEST HOLE LOCATION PLAN

DRAWING PG4871-2 - SEISMIC SURVEY LOCATION

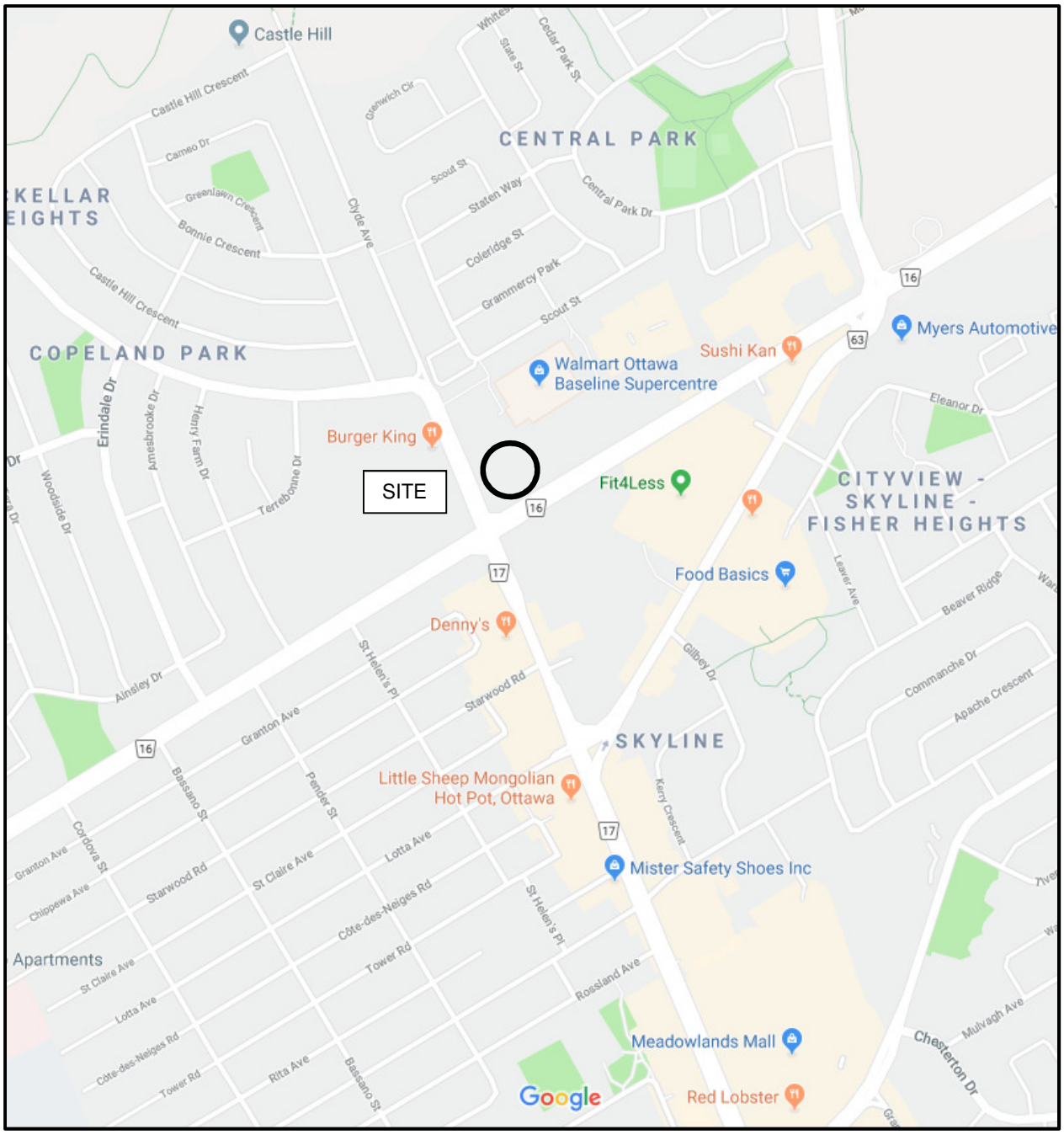
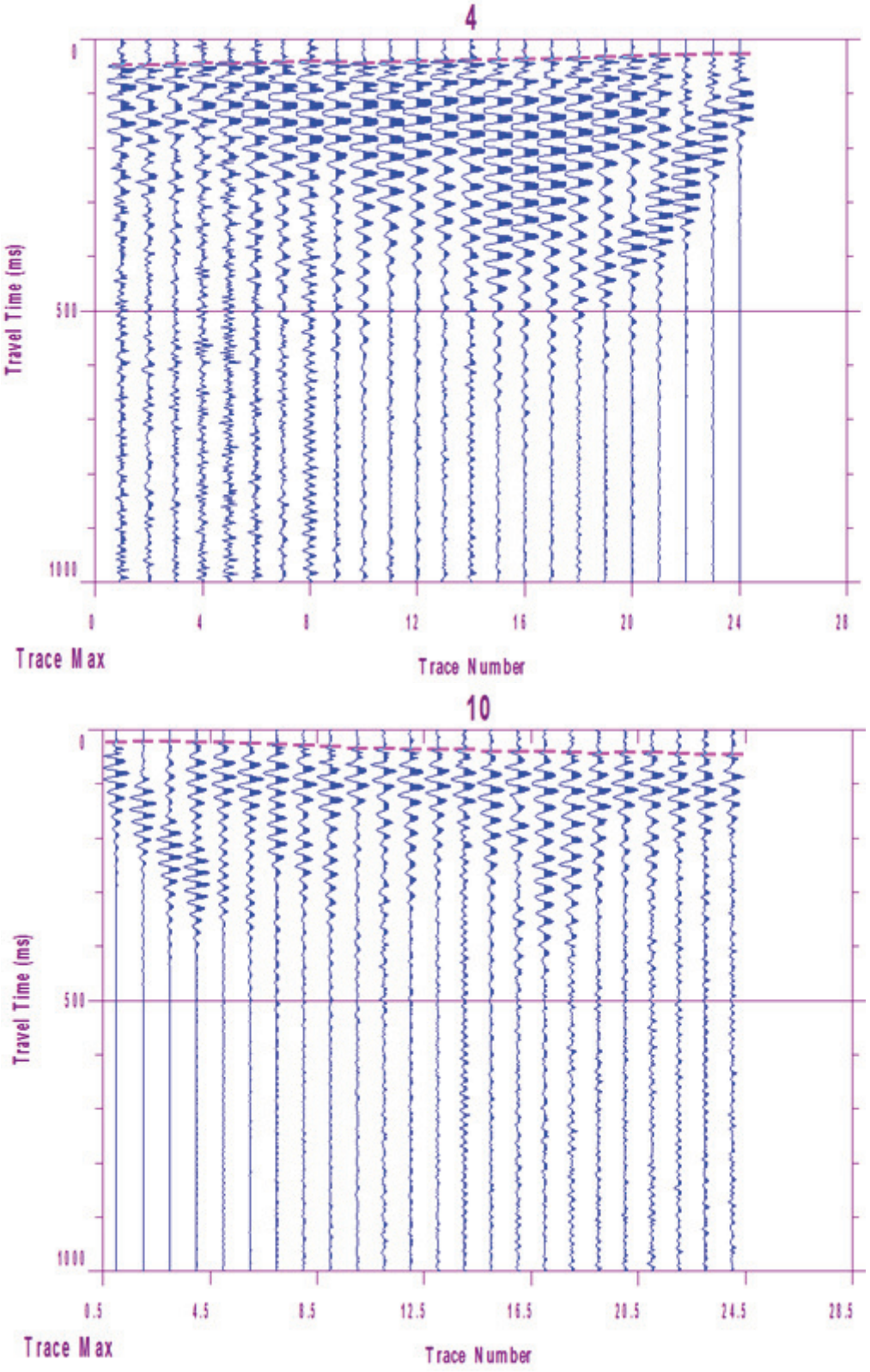
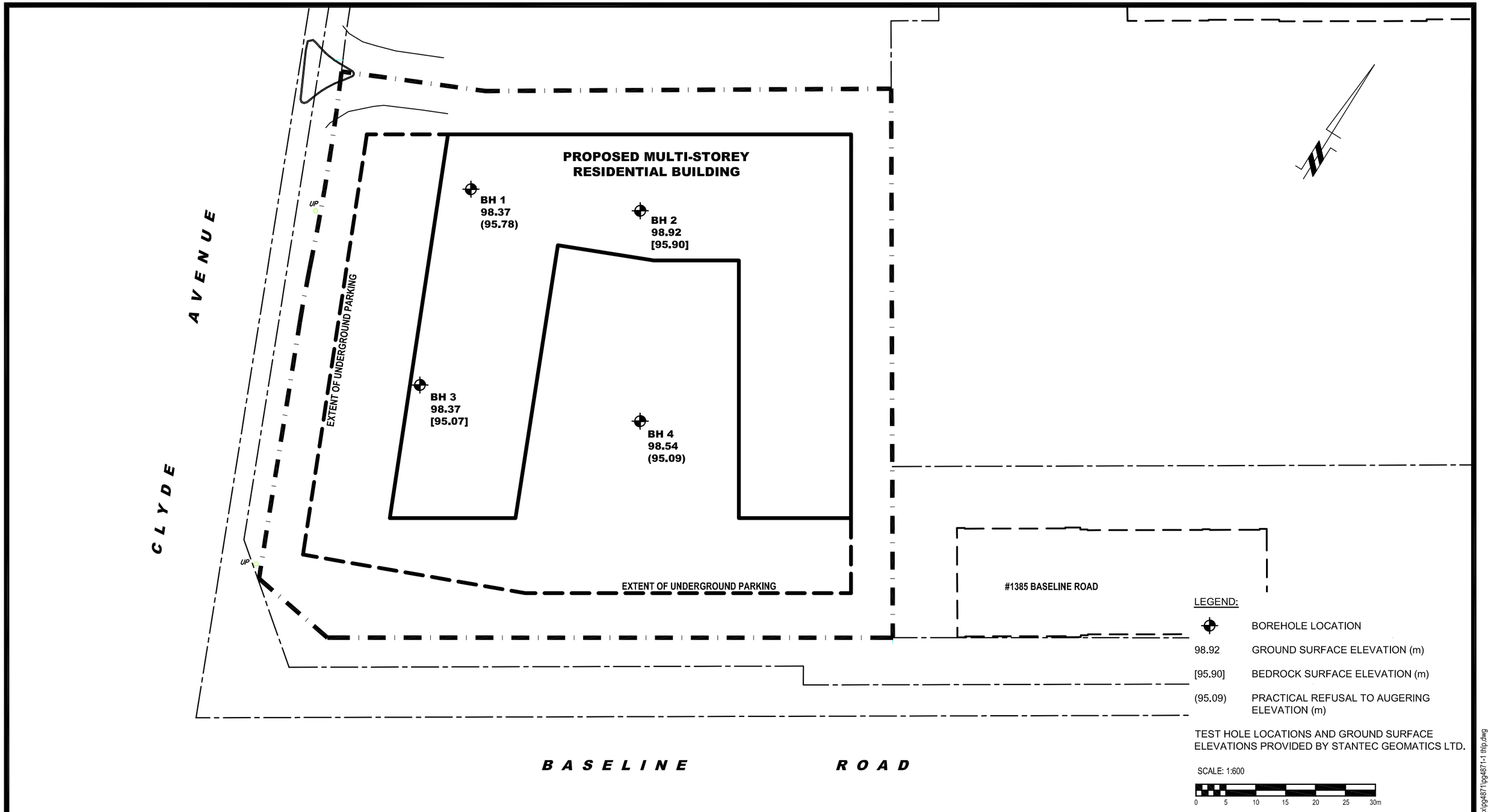


FIGURE 1

KEY PLAN

Figure 1. A few raw records, as examples, at -4.5m (graph #4) and +3m (graph #10).





patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL

GROUPE SELECTION

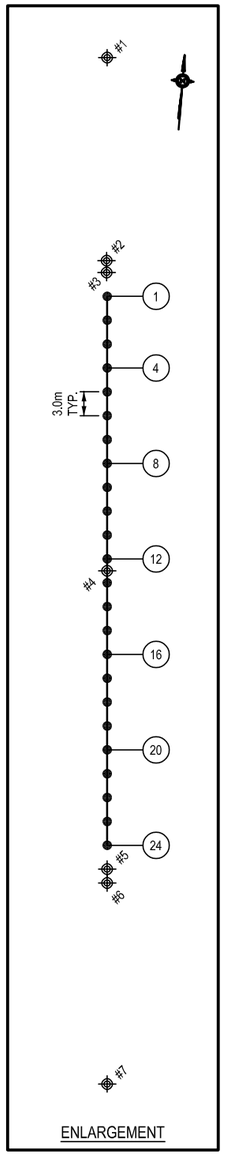
GEOTECHNICAL INVESTIGATION
PROP. MULTI-STOREY BUILDING - CLYDE AVE. AT BASELINE ROAD
OTTAWA, ONTARIO

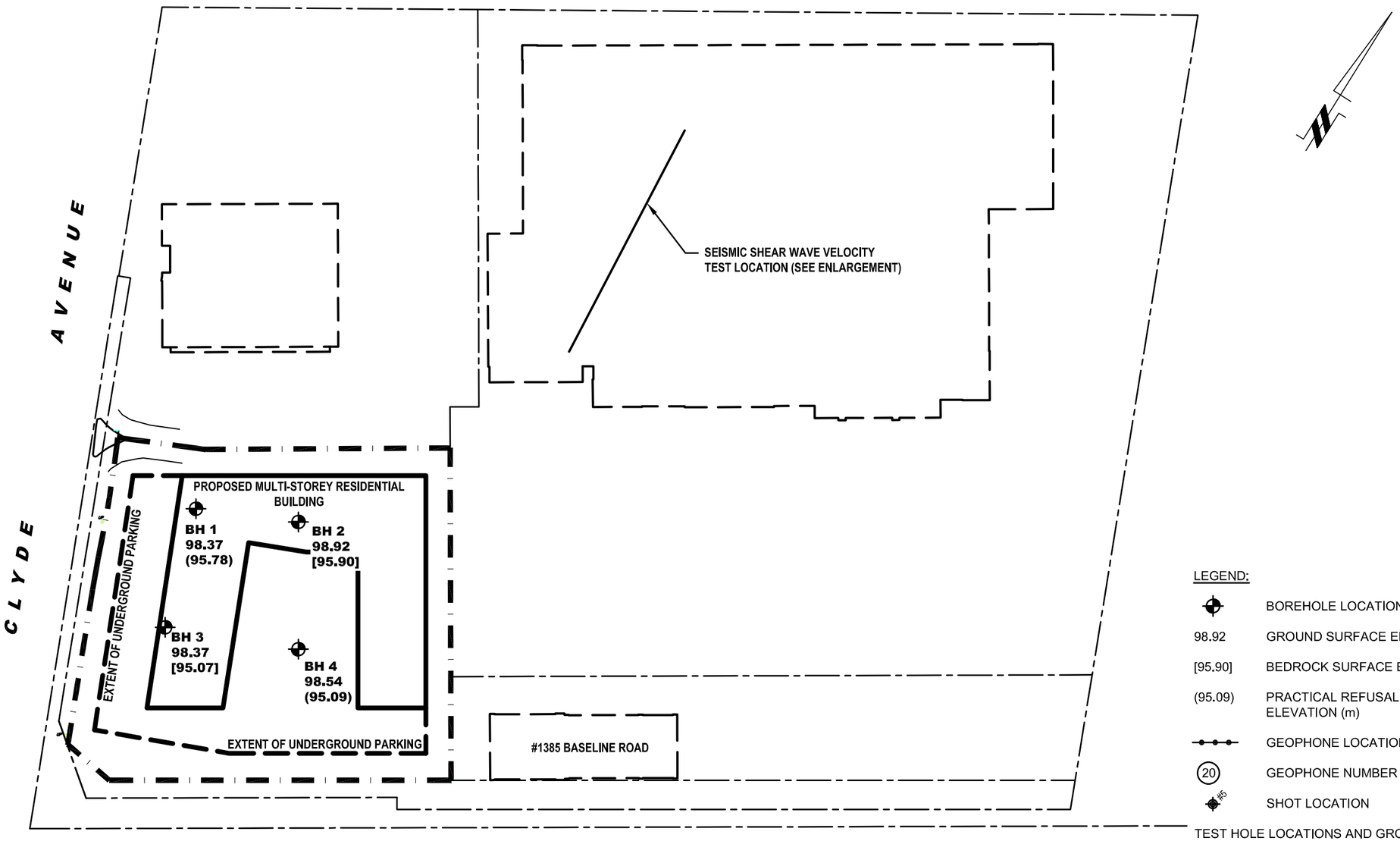
Title:

TEST HOLE LOCATION PLAN

Scale: 1:600	Date: 03/2019
Drawn by: MPG	Report No.: PG4871-1
Checked by: NC	**PG4871-1**
Approved by: DJG	Revision No.:

p:\autocad drawings\geotechnical\pg48xx\pg4871\pg4871-1 thlp.dwg





LEGEND:

- BOREHOLE LOCATION
- 98.92 GROUND SURFACE ELEVATION (m)
- [95.90] BEDROCK SURFACE ELEVATION (m)
- (95.09) PRACTICAL REFUSAL TO AUGERING ELEVATION (m)
- GEOPHONE LOCATIONS
- (20) GEOPHONE NUMBER
- #5 SHOT LOCATION

TEST HOLE LOCATIONS AND GROUND SURFACE ELEVATIONS PROVIDED BY STANTEC GEOMATICS LTD.

SCALE: 1:600

0 5 10 15 20 25 30m

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL

GROUPE SELECTION

GEOTECHNICAL INVESTIGATION
PROP. MULTI-STOREY BUILDING - CLYDE AVE. AT BASELINE ROAD
OTTAWA, ONTARIO

Title:
SEISMIC SURVEY LOCATION

Scale: 1:1250	Date: 03/2019
Drawn by: MPG	Report No.: PG4871-1
Checked by: NC	PG4871-2
Approved by: DJG	Revision No.:

p:\autocad drawings\geotechnical\pg48xx\pg4871\pg4871-2 thtp.dwg

Appendix E BACKGROUND REPORTS EXCERPTS

Stantec Consulting Ltd.
1505 Laperriere Avenue
Ottawa ON K1Z 7T1
Tel: (613) 722-4420
Fax: (613) 722-2799

July 16, 2010
File: 160400770/83

City of Ottawa
110 Laurier Avenue West
Ottawa, Ontario
K1P 1J1

Dear Sir or Madam:

Reference: 1357 Baseline Road SWM Update, City of Ottawa File No. D07-12-09-0193

This letter details the update of the stormwater management (SWM) design of the proposed commercial development at 1357 Baseline Road. The update has been prompted by the revised design of Phase 2 of the development. This report ensures that the proposed design meets all SWM criteria used during the original design. This report should be read in conjunction with the original City-approved report by Stantec Consulting Ltd. entitled "*Clydesdale Shopping Centres, 1357 Baseline Road, Ottawa, ON Stormwater Management Report*" dated April 26, 2010.

Phase 2 of the Clydesdale project is located in the northwest corner of the site, bounded by property lines to the north and west, by Building A to the east, and by the main access laneway to the south. Phase 3 of the site is located in the southwest portion of the site, bounded by property lines to the west and south, by Phase 1 to the east, and by the main access laneway to the north. See attached **Drawing SP-1** for more detail. Phase 2 is the area being proposed to be developed in this update.

Phase 2 was considered in the original report to be part of the "ultimate" design of the site. The SWM design for Phase 2 was based on a preliminary site plan which has subsequently changed. As of the writing of this letter, construction is underway for all parts of the original plan which were listed as part of the "interim" development. This letter examines the continued phasing of the project and how stormwater flows will be impacted by the revised site plan. A new "interim" scenario is considered where Phases 1 & 2 are built-out but Phase 3 is not. The "ultimate" scenario is considered to be when all phases are built-out.

Based on the revised site plan for Phase 2 from the client, Stantec delineated new SWM catchments and ponding limits. The existing SWMHYMO hydrologic model was updated and re-run incorporating these new catchments. The storm sewer design sheet and XP-SWMM hydraulic model were updated as well according to storm sewer changes. Hydrographs from SWMHYMO were input to the XP-SWMM hydraulic model to obtain ponding depths, hydraulic grade lines, and outflow hydrographs for the site.

One inlet control device size was revised (at manhole STM101) in order to continue to meet the required SWM criteria.

Reference: 1357 Baseline Road SWM Update, City of Ottawa File No. D07-12-09-0193

The following tables should be used to replace those in the original report:

Table 3.1: Interim ICD Schedule

INTERIM ICD SCHEDULE			
Structure ID	**ICD Type**	**Frame & Plate vs. Plug**	**Mount ICD on [Invert Direction]**
CB110	75 mm Circular Orifice	Plug	In CB
CB107C	75 mm Circular Orifice	Plug	In CB
CB109A	75 mm Circular Orifice	Plug	In CB
STM104	240 mm Circular Orifice	Frame & Plate	North Inv.
CB900B1	75 mm Circular Orifice	Plug	In CB
STM101	475 mm Circular Orifice	Frame & Plate	West Inv.

Table 3.2: Ultimate ICD Schedule

ULTIMATE ICD SCHEDULE			
Structure ID	**ICD Type**	**Frame & Plate vs. Plug**	**Mount ICD on [Invert Direction]**
CB110	75 mm Circular Orifice	Plug	In CB
CB107C	75 mm Circular Orifice	Plug	In CB
CB109A	75 mm Circular Orifice	Plug	In CB
STM104	240 mm Circular Orifice	Frame & Plate	North Inv.
CB900B1	75 mm Circular Orifice	Plug	In CB
STM101	475 mm Circular Orifice	Frame & Plate	West Inv.
STM901	127 mm Circular Orifice	Plug	In CB

Table 3.3: Summary of Roof Ponding Release Characteristics

Roof	Roof Area (m^2)	Available Ponding Depth (mm)	Available Storage Volume (m^3)	100 Year Storage Volume (m^3)	100 Year Ponding Depth (mm)	100 Year Inflow Rate (L/s)	100 Year Outflow Rate (L/s)[1]	Drawdown (hours)
Building A	13,463	75	808	692	64	657	45	7.1
Building B1	1,884	75	113	97	64	92	6	7.1
Building B2	1,220	75	73	63	64	60	4	7.1

Roof	Roof Area (m^2)	Available Ponding Depth (mm)	Available Storage Volume (m^3)	100 Year Storage Volume (m^3)	100 Year Ponding Depth (mm)	100 Year Inflow Rate (L/s)	100 Year Outflow Rate (L/s)[1]	Drawdown (hours)
Building C	1,530	75	92	79	64	75	5	7.1
Building E	950	75	57	49	64	47	3	7.1
Building F	1,110	75	67	57	64	55	4	7.1

Table 3.4: Summary of Ponding Depths and Volumes, 5 Year Event

Catchment	5 YEAR, 3 HOUR CHICAGO STORM							
	HGL (m)		T/G[1] (m)	Depth (m)			Volume (m^3)	
	Interim	Ultimate		Available	Interim	Ultimate	Interim	Ultimate
104	99.53	99.52	100.05	0.28	0.00	0.00	0.2	0.2
CMH100	99.65	99.65	100.20	0.30	0.00	0.00	7.5	7.5
105	99.54	99.53	100.05	0.28	0.00	0.00	0.2	0.2
500a	99.56	99.54	100.06	0.30	0.00	0.00	0.2	0.2
500b	99.56	99.54	100.06	0.30	0.00	0.00	0.2	0.2
500c	99.56	99.55	100.20	0.24	0.00	0.00	0.2	0.2
CB107	100.46	100.46	100.36	0.29	0.09	0.09	18.6	18.6
CB110	99.59	99.57	100.40	0.26	0.00	0.00	0.2	0.2
CB109	101.28	101.28	101.25	0.17	0.03	0.03	1.8	1.8
900A	98.43	98.43	98.40	0.30	0.03	0.03	16.0	16.0
900B	98.29	98.29	98.54	0.30	0.00	0.00	0.2	0.2
901	N/A	98.80	98.70	0.30	N/A	0.10	N/A	25.4

Table 3.5: Summary of Ponding Depths and Volumes, 100 Year Event, with Boundary Condition = 96.57m

Catchment	100 YEAR WITH BC, 3 HOUR CHICAGO STORM							
	HGL (m)		T/G[1] (m)	Depth (m)			Volume (m^3)	
	Interim	Ultimate		Available	Interim	Ultimate	Interim	Ultimate
104	100.19	100.18	100.05	0.28	0.14	0.13	32.1	30.1
CMH100	100.33	100.32	100.20	0.30	0.13	0.12	60.1	56.4
105	100.20	100.20	100.05	0.28	0.15	0.15	51.5	49.8
500a	100.21	100.20	100.06	0.30	0.14	0.14	27.6	26.1
500b	100.21	100.20	100.06	0.30	0.14	0.14	65.6	62.0
500c	100.34	100.32	100.20	0.24	0.13	0.12	9.1	8.3
CB107	100.61	100.61	100.36	0.29	0.25	0.25	48.7	48.7
CB110	100.43	100.43	100.40	0.26	0.03	0.03	2.0	2.0

Reference: 1357 Baseline Road SWM Update, City of Ottawa File No. D07-12-09-0193

Catchment	100 YEAR WITH BC, 3 HOUR CHICAGO STORM							
	HGL (m)		T/G[1] (m)	Depth (m)			Volume (m^3)	
	Interim	Ultimate		Available	Interim	Ultimate	Interim	Ultimate
CB109	101.39	101.39	101.25	0.17	0.14	0.14	9.1	9.1
900A	98.44	98.47	98.40	0.30	0.04	0.07	25.4	39.5
900B	98.70	98.68	98.54	0.30	0.16	0.14	14.9	12.8
901	N/A	98.96	98.70	0.30	N/A	0.25	N/A	62.6

Table 3.6: Summary of Ponding Depths and Volumes, 100 Year Event, with no Boundary Condition

Catchment	100 YEAR WITHOUT BC, 3 HOUR CHICAGO STORM							
	HGL (m)		T/G[1] (m)	Depth (m)			Volume (m^3)	
	Interim	Ultimate		Available	Interim	Ultimate	Interim	Ultimate
104	100.18	100.18	100.05	0.28	0.13	0.13	29.2	28.5
CMH100	100.33	100.33	100.20	0.30	0.13	0.13	60.1	61.8
105	100.19	100.19	100.05	0.28	0.14	0.14	48.8	48.1
500a	100.20	100.19	100.06	0.30	0.13	0.13	25.7	25.1
500b	100.20	100.19	100.06	0.30	0.13	0.13	61.1	59.7
500c	100.31	100.31	100.20	0.24	0.11	0.11	7.7	7.3
CB107	100.61	100.60	100.36	0.29	0.25	0.24	48.3	47.4
CB110	100.43	100.43	100.40	0.26	0.03	0.03	2.0	1.9
CB109	101.40	101.40	101.25	0.17	0.15	0.15	9.6	9.5
900A	98.51	98.49	98.40	0.30	0.11	0.09	64.7	52.4
900B	98.65	98.65	98.54	0.30	0.11	0.11	10.0	9.9
901	N/A	98.96	98.70	0.30	N/A	0.26	N/A	63.6

Table 3.7: Summary of Peak Outflows

	Peak Outflows (cms)				
	5 Year from Site	100 Year w BC		100 Year w/o BC	
		From Site	Site Plus Uncontrolled Flows	From Site	Site Plus Uncontrolled Flows
Interim Condition	0.380	0.527	0.712	0.558	0.743
Ultimate Condition	0.420	0.521	0.636	0.602	0.717

As mentioned in the original report, the allowable peak outflow from the site was calculated as 770 L/s using a 3 hour Chicago storm distribution based on City of Ottawa IDF parameters and an overall site C-value of 0.50. It can be seen from the revised **Table 3.7** that outflows from all of the modeled scenarios result in peak flows less than 770 L/s. Results from **tables 3.4 – 3.6** also show that available ponding is not exceeded in

in any of the modeled events – i.e. there is no spilling of major flows from the site during the 100 year storm (other than the uncontrolled areas which have already been accounted for in **Table 3.7**).

Unlike the other commercial buildings on the site, Building B1 contains a basement with a finished floor elevation of 96.05 m. The underground parking structure including basement will drain to the sanitary sewer. The storm service invert to the building is 96.22 m and cannot be lowered due to tie-in restrictions with the trunk sewer. The perimeter drains for the building foundation will therefore be pumped to the storm service. The storm service will also be protected with a backwater valve due to high hydraulic grade line in the storm sewer (worst-case 100 year HGL at the storm service invert is 97.95 m).

Stormwater quality control will continue to be provided by An STC9000 Stormceptor® unit to 90 % TSS removal, as per the original report's specification.

In conclusion, this letter updates the previously submitted report according to a revised site plan for Phase 2. The analysis of the revised Phase 2 design confirms that all original SWM criteria continue to be satisfied.

Sincerely,

STANTEC CONSULTING LTD.

Neal Cody, EIT
Water Resources Engineer-in-Training
Ph: (613) 724-4380
Fx: (613) 722-2799
Neal.Cody@stantec.com

Peter Moroz, P.Eng, MBA
Managing Principal, Urban Land Engineering
Ph: (613) 724-4082
Fx: (613) 722-2799
peter.moroz@stantec.com

Attachment:

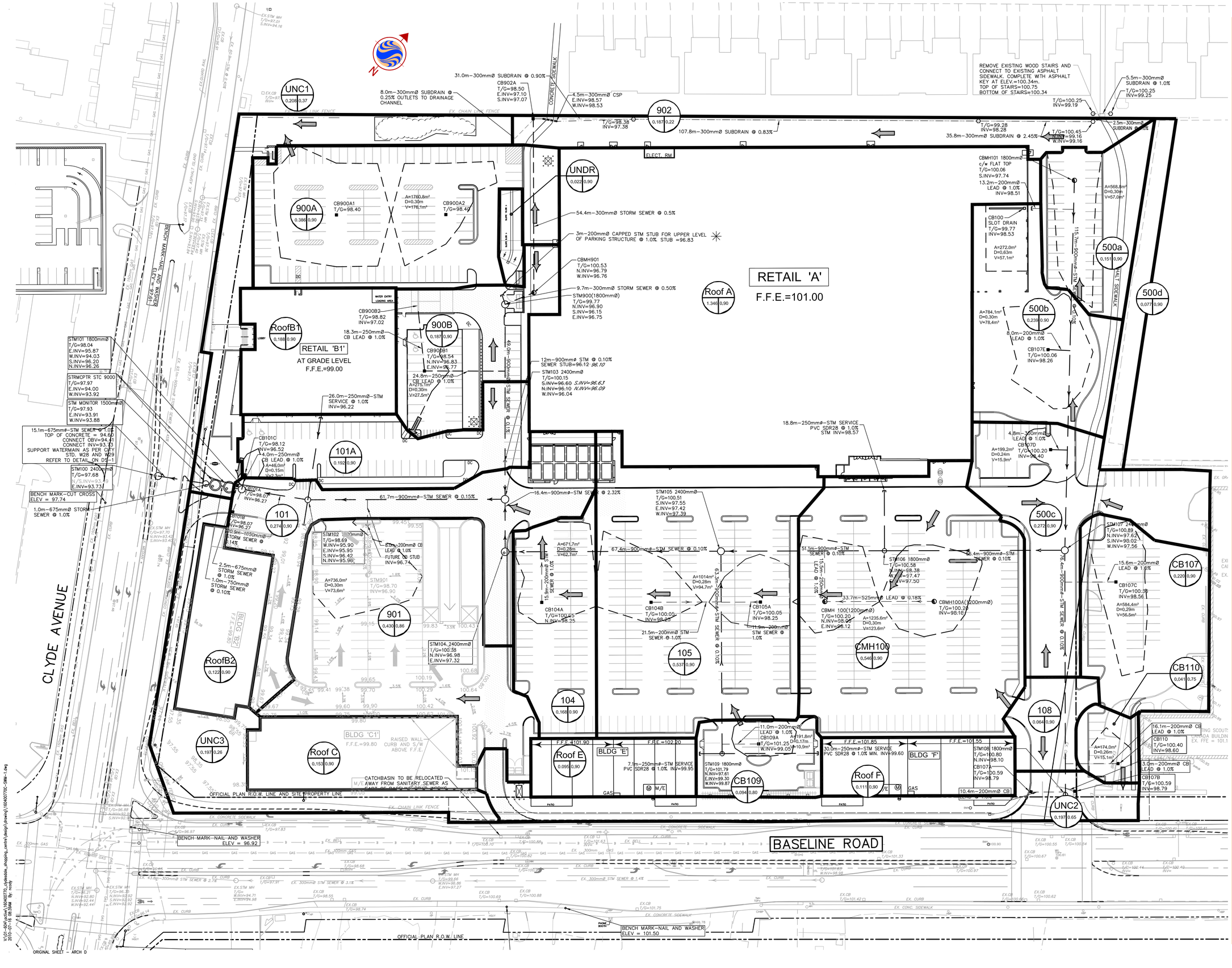
- Drawing SWM-1	INTERIM STORM DRAINAGE PLAN
- Drawing SWM-2	ULTIMATE STORM DRAINAGE PLAN
- Drawing SP-1	SERVICING PLAN
- Drawing GP-1	GRADING PLAN
- APPENDIX A	STORM SEWER DESIGN SHEET
- APPENDIX B	AREA CALCULATIONS AND CATCHMENT SUMMARIES
- APPENDIX C	SWMHYMO HYDROLOGIC MODELLING
- APPENDIX D	XPSWMM HYDRAULIC MODELLING
Appendix D.1	5 Year Interim Conditions
Appendix D.2	100 Year Interim Conditions, With Boundary Condition
Appendix D.3	100 Year Interim Conditions, Without Boundary Condition
Appendix D.4	5 Year Ultimate Conditions
Appendix D.5	100 Year Ultimate Conditions, With Boundary Condition

Reference: 1357 Baseline Road SWM Update, City of Ottawa File No. D07-12-09-0193

Appendix D.6 100 Year Ultimate Conditions, Without Boundary Condition - CD containing stormwater management modeling files

c.

npc v:\01-604\active\160400770_clydesdale_shopping_centre\design\report\swm\2010-07-16_subm4\let_2010-07-16_swm_update_ph2.docx



Stantec Consulting Ltd.
1505 Laperriere Avenue
Ottawa ON Canada
K1Z 7T1
Tel. 613.722.4420
Fax. 613.722.2799
www.stantec.com

Legend

- 85.59 — PROPOSED ELEVATION
- 85.64t/c — PROPOSED TOP OF CURB
- 1.0% — PROPOSED GRADE
- MAXIMUM PONDING LIMITS
- 500d / 0.077 / 0.90 — AREA ID / AREA (HA) / RUNOFF COEFF.
- DRAINAGE DIVIDE BOUNDARY
- 100–YEAR PONDING LIMITS
- EMERGENCY OVERLAND FLOW DIRECTION
- PROPOSED STORM SEWER
- PROPOSED CATCHBASIN MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED CATCHBASIN TEE
- EXISTING STORM SEWER
- EXISTING CATCHBASIN

Notes

ULTIMATE ICD SCHEDULE

Structure ID	ICD Type	Frame & Plate vs. Plug	Mount ICD on [Invert Direction]
CB110	75 mm Circular Orifice	Plug	In CB
CB107C	75 mm Circular Orifice	Plug	In CB
CB109A	75 mm Circular Orifice	Plug	In CB
STM104	240 mm Circular Orifice	Frame & Plate	North Inv.
CB900B1	75 mm Circular Orifice	Plug	In CB
STM101	475 mm Circular Orifice	Frame & Plate	West Inv.
STM901	127 mm Circular Orifice	Plug	In CB

4.	REVISED FOR PHASE 2 SP	NPC	PM	10.07.15
3.	REVISED AS PER CITY COMMENTS & SP	AML	MAF	10.04.23
2.	ISSUED TO CITY FOR SPA	NPC	PM	10.03.19
1.	ISSUED FOR REVIEW	NPC	PM	09.10.19
Revision		By	Appd.	YY.MM.DD
File Name: 160400770		MJS	PM	MJS 09.05.20
		Dwn.	Chkd.	Dsgn. YY.MM.DD

Seal

Client/Project

CLYDESDALE SHOPPING CENTRE

1357 BASELINE ROAD

Ottawa ON Canada

Title

ULTIMATE STORM DRAINAGE PLAN

Project No. 160400770

Scale 1:500 (0, 5, 15, 25m)

Drawing No. SWM-2

Sheet 2 of 2

Revision 4

Stantec

Development: **Clydesdale Shopping Centre**

DATE: September 10, 2009
REVISION: July 14, 2010
DESIGNED BY: npc
CHECKED BY:

STORM SEWER DESIGN SHEET

SmartCentres

Proposed Storm Sewer System

FILE NUMBER: 1604-00770

DESIGN PARAMETERS

1 in 5 years

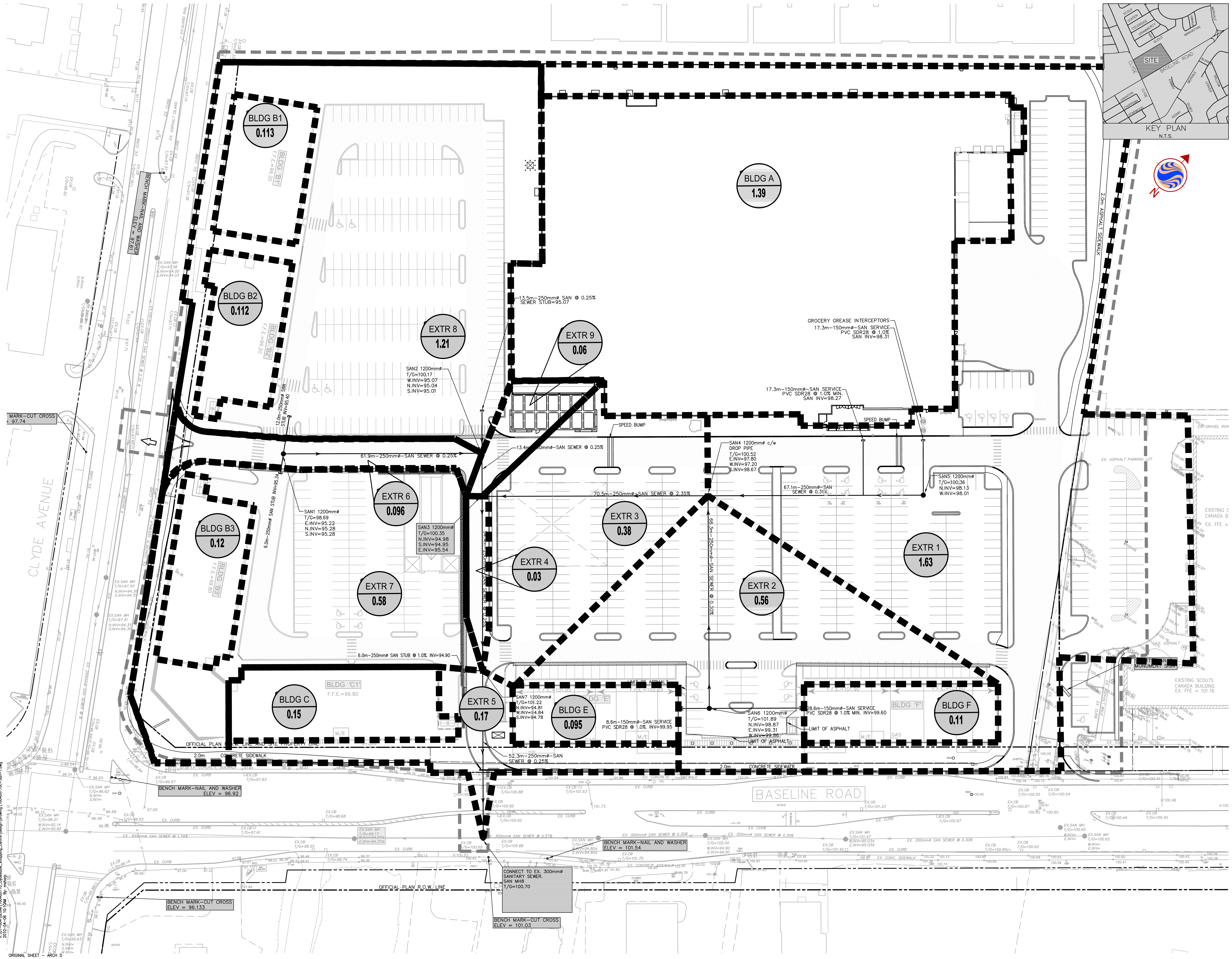
$I = a/(t+b)^c$ Ottawa Sewer Guideline IDF Parameters

a =	998.071	MANNING'S n =	0.013	
b =	6.053	MINIMUM COVER:	1.50	m
c =	0.814	TIME OF ENTRY	10	min

LOCATION	FROM M.H.	TO M.H.	DRAINAGE AREA AREA (ha)	C	ACCUM. AREA (ha)	A x C (ha)	ACCUM. AxC (ha)	T of C (min)	I (mm/h)	Q_{5yr} Roof (L/s)	Q_{total} (L/s)	PIPE SELECTION LENGTH (m)	PIPE SIZE (mm)	SLOPE %	CAP. (FULL) (L/s)	Qtotal Qcapacity	VEL. (FULL) (m/s)	VEL. (ACT) (m/s)	TIME OF FLOW (min)
500a, 500b, 500c, 500d	CBMH101	STM107	0.739	0.90	0.74	0.67	0.67	10.00	104.19	0.0	192.5	115.7	900	0.10	597.2	0.32	0.91	0.80	2.40
								12.40											
108, CB107, CB110	STM108	STM107	0.325	0.90	0.33	0.29	0.29	10.00	104.19	0.0	84.7	70.2	900	0.11	626.4	0.14	0.95	0.63	1.86
								11.86											
	STM107	STM106			1.06	0.00	0.96	12.40	93.04	0.0	247.5	56.4	900	0.11	634.9	0.39	0.97	0.89	1.05
CMH100, Roof A	STM106	STM105	0.546	0.90	1.61	0.49	1.45	13.45	88.94	27.0	385.0	51.1	900	0.10	597.2	0.64	0.91	0.97	0.88
								14.32											
CB109, 105, Roof E, Roof F	STM109	STM105	0.631	0.90	0.63	0.57	0.57	10.00	104.19	3+4	164.4	63.3	900	0.10	597.2	0.28	0.91	0.75	1.41
								11.41											
104	STM105	STM104	0.168	0.90	2.41	0.15	2.17	14.32	85.81	27.0	543.8	68.7	900	0.10	597.2	0.91	0.91	1.04	1.10
	STM104	STM103			2.41	0.00	2.17	15.42	82.22	27.0	522.2	16.4	900	2.11	2,744.8	0.19	4.18	3.09	0.09
								15.51											
902	CB	CBMH901	0.187	0.22	0.19	0.04	0.04	10.00	104.19	0.0	11.9	54.4	300	0.50	71.3	0.17	0.98	0.70	1.29
	CBMH901	STM900			0.19	0.00	0.04	11.29	97.85	0.0	11.2	9.7	300	0.50	71.3	0.16	0.98	0.67	0.24
								11.53											
900A	STUB	STM900	0.386	0.90	0.39	0.35	0.35	10.00	104.19	0.0	100.5	3.0	300	1.00	100.9	1.00	1.38	1.60	0.03
								10.03											
900B	STM900	STUB	0.187	0.90	0.76	0.17	0.56	11.53	96.76	0.0	149.7	49.0	900	0.10	597.2	0.25	0.91	0.73	1.12
	STUB	STM103			0.76	0.00	0.56	12.65	92.01	0.0	142.4	12.0	900	0.10	597.2	0.24	0.91	0.71	0.28
								12.93											
901	STM103	STM102	0.430	0.90	3.60	0.39	3.11	15.51	81.94	27.0	735.4	60.5	900	0.15	792.4	0.93	1.21	1.39	0.73
								16.24											
Roof B1	N.STUB	STM102			0.00	0.00	0.00	10.00	104.19	6.0	6.0	26.0	250	1.00	62.0	0.10	1.22	0.71	0.61
								10.61											
Roof B2, Roof C	S.STUB	STM102			0.00	0.00	0.00	10.00	104.19	9.0	9.0	84.5	900	0.11	616.4	0.01	0.94	0.38	3.75
								13.75											
	STM102	STM101			3.60	0.00	3.11	16.24	79.76	42.0	731.6	20.9	1050	0.14	1,066.0	0.69	1.19	1.29	0.27
101, 101A	STM101	STRMCPTR	0.466	0.90	4.07	0.42	3.53	16.51	78.99	42.0	816.8	2.5	675	1.00	877.0	0.93	2.37	2.73	0.02
	STRMCPTR	MONITOR			4.07	0.00	3.53	16.52	78.94	42.0	816.4	1.0	675	1.00	877.0	0.93	2.37	2.73	0.01
	MONITOR	OUTLET			4.07	0.00	3.53	16.53	78.93	42.0	816.2	15.1	675	1.00	877.0	0.93	2.37	2.73	0.09
								16.62											

Area to Sewer	4.07	ha
Roofs	2.02	ha
Total Area	6.08	ha

[#] - Indicates individual building roof release rate, otherwise value is accumulated roof release



Stantec

Stantec Consulting Ltd.
1505 Laperriere Avenue
Ottawa ON Canada
K1Z 7T1
Tel. 613.722.4420
Fax. 613.722.2799
www.stantec.com

Legend

- EXISTING SANITARY SEWER
- PROPOSED SANITARY SEWER
- DRAINAGE AREA ID (10)
- SANITARY DRAINAGE AREA (ha) (0.09)
- LIMIT OF SANITARY DRAINAGE AREA

Notes

GENERAL NOTES

1 ALL WORK SHALL BE CARRIED OUT IN COMPLIANCE WITH THE ONTARIO OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS.

2 ALL WORK AND MATERIALS TO CONFORM WITH CURRENT MINISTRY OF THE ENVIRONMENT & ENERGY OF ONTARIO, CITY OF OTTAWA AND ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS. LOCAL UTILITY STANDARDS AND MINISTRY OF TRANSPORTATION STANDARDS WILL APPLY WHERE REQUIRED.

3 THE CONTRACTOR IS ADVISED THAT WORKS BY OTHERS MAY BE ONGOING DURING THE PERIOD OF THIS CONTRACT. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES AND COORDINATION WITH ALL OTHER CONTRACTORS AND PREVENT CONSTRUCTION CONFLICTS.

4 THE INFORMATION SHOWN FOR EXISTING UTILITIES WAS PROVIDED BY OTHERS. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL UTILITIES DURING CONSTRUCTION. ALL EXISTING UTILITIES MUST BE LOCATED AND VERIFIED BY EACH UTILITY PRIOR TO COMMENCEMENT OF WORK. ANY VARIANCE IS TO BE IMMEDIATELY REPORTED TO THE ENGINEER. LOST TIME DUE TO FAILURE OF THE CONTRACTOR TO CONFIRM UTILITY LOCATIONS AND NOTIFY THE ENGINEER OF POSSIBLE CONFLICTS PRIOR TO CONSTRUCTION WILL BE AT THE CONTRACTORS EXPENSE.

5 ALL CONSTRUCTION SHALL BE CARRIED OUT IN ACCORDANCE WITH THE RECOMMENDATIONS MADE IN THE GEOTECHNICAL REPORT.

6 THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS REQUIRED AND TO BEAR THE COST OF SAME INCLUDING WATER PERMIT AND ASSOCIATED COSTS.

7 ALL DISTURBED AREAS SHALL BE REINSTATED TO EQUAL OR BETTER CONDITION TO THE SATISFACTION THE ENGINEER AND THE CITY. PAVEMENT REINSTATEMENT FOR SERVICE AND UTILITY CUTS SHALL BE IN ACCORDANCE WITH OPSD 509.010 AND OPSS 310.

8 FOR DETAILS RELATING TO STORMWATER MANAGEMENT AND ROOF DRAINAGE, SEE THE STORMWATER MANAGEMENT REPORT PREPARED BY STANTEC CONSULTING LTD. ROOF DRAINAGE TO BE PROVIDED VIA RESTRICTED RELEASE ROOF DRAINS AS DETAILED IN THE REPORT.

9 BENCHMARKS: IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THAT THE SITE BENCHMARK(S) HAS NOT BEEN ALTERED OR DISTURBED AND THAT ITS RELATIVE ELEVATION AND DESCRIPTION AGREES WITH THE INFORMATION SHOWN ON DRAWING GP–1.

10 THE CONTRACTOR SHALL PROVIDE TO THE ENGINEER 1 (ONE) SET OF AS CONSTRUCTED SITE SERVICING, GRADING, AND SITE ELECTRICAL DWGS.

Revision	By	Appd.	YY.MM.DD
1. ISSUED FOR REVIEW	MJS	PM	09.05.20

File Name: 160400770	Dwn.	Chkd.	Dsgn.	YY.MM.DD
	MJS	PM	MJS	09.05.20

Seal

Client/Project

CLYDESDALE SHOPPING CENTRE

1357 BASELINE ROAD
Ottawa ON Canada

Title

SANITARY DRAINAGE AREA PLAN

Project No. 160400770

Scale 1:500

Drawing No. SAN-1

Sheet 1 of 4

Revision 1

Stantec

Clydesdale Shopping Centre

DATE: March 30, 2010
REVISION:
DESIGNED MJS
CHECKED PM

SANITARY SEWER DESIGN SHEET

(City of Ottawa)

FILE NUMBERS: **Clydesdale 1604-00770**

DESIGN PARAMETERS

AVG. DAILY FLOW / PERSON =	350.000	l/p/day	COMMERCIAL	0.60	l/s/Ha
MINIMUM VELOCITY =	0.600	m/s	INDUSTRIAL	0.40	l/s/Ha
n =	0.013		INSTITUTIONAL	0.60	l/s/Ha
MAX PEAK FACTOR =	4.000		INFILTRATION	0.28	l/s/Ha
MIN PEAK FACTOR =	2.400		RESIDENTIAL PERSONS/TOWNS.UNIT =	2.7	
Peacking Factor Industrial:	2.400		RESIDENTIAL PERSONS/APT.UNIT =	2.4	
Peacking Factor Comm. / Inst.:	1.500				

LOCATION			PARKING LOT AND ROAD				COMM		INDUST		INSTIT		C+I+I	INFILTRATION				PIPE					
STREET	FROM M.H.	TO M.H.	AREA (ha)	CUMULATIVE AREA (ha)	PEAK FACT.	**PEAK FLOW (l/s)**	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	**TOTAL FLOW (l/s)**	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
BLDG B1, BLDG B2	STUB	MH1	0.000	0.000			0.23	0.23					0.21	0.230	0.230	0.064	**0.27**	12.0	250	1.00	62.73	1.23	0.00
BLDG B3, EXTR 7	STUB	MH1	0.580	0.580			0.12	0.12					0.11	0.700	0.700	0.196	**0.31**	6.0	250	1.00	62.73	1.23	0.00
EXTR 6	MH1	MH2	0.096	0.676			0.00	0.35					0.32	0.096	1.026	0.287	**0.61**	61.9	250	0.25	31.11	0.61	0.00
EXTR 8	STUB	MH2	1.210	1.210			0.00	0.00					0.00	1.210	1.210	0.339	**0.34**	13.5	250	0.25	31.11	0.61	0.00
EXTR 9	MH2	MH3	0.060	1.946			0.00	0.35					0.32	0.060	2.296	0.643	**0.96**	13.4	250	0.25	31.11	0.61	0.24
BLDG A	STUB	MH5	0.000	0.000			1.39	1.39					1.25	1.390	1.390	0.389	**1.64**	17.3	150	1.00	15.48	0.86	0.53
EXTR 1	MH5	MH4	1.630	1.630			0.00	1.39					1.25	1.630	3.020	0.846	**2.10**	67.1	250	0.31	34.68	0.68	0.35
BLDG F	STUB	MH6	0.000	0.000			0.11	0.11					0.10	0.110	0.110	0.031	**0.13**	28.6	150	1.00	15.48	0.86	0.00
BLDG E	STUB	MH6	0.000	0.000			0.10	0.10					0.09	0.100	0.100	0.028	**0.12**	8.6	150	1.00	15.48	0.86	0.00
EXTR 2	MH6	MH4	0.560	0.560			0.00	0.21					0.19	0.560	0.770	0.216	**0.41**	66.3	250	0.30	34.17	0.67	0.00
EXTR 3	MH4	MH3	0.380	2.570			0.00	1.60					1.44	0.380	4.170	1.168	**2.61**	70.5	250	2.35	95.88	1.88	0.75
EXTR 4	MH3	MH7	0.030	4.546			0.00	1.95					1.76	0.030	6.496	1.819	**3.58**	54.4	250	0.25	31.11	0.61	0.38
BLDG C1	STUB	MH7	0.000	0.000			0.15	0.15					0.14	0.150	0.150	0.042	**0.18**	6.0	250	1.00	62.73	1.23	0.00
EXTR 5	MH7	MH8	0.170	4.716			0.00	2.10					1.89	0.170	6.816	1.908	**3.80**	52.3	250	0.25	31.11	0.61	0.40

Appendix FDRAWINGS