175 Richmond Road
& 350 Kirkwood Avenue
Ottawa, Ontario

Servicing Brief and

Stormwater Management Report

175 RICHMOND ROAD & 350 KIRKWOOD AVENUE
OTTAWA, ONTARIO

SERVICING BRIEF AND STORMWATER MANAGEMENT REPORT

Prepared by:

NOVATECH ENGINEERING CONSULTANTS LTD.
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario
K2M 1P6

File No.: 111130-0
Report Reference No.: R-2011-170
October 2011

NOVATECH
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CONSULTANTS LTD.

October 5, 2011

City of Ottawa
Planning and Growth Management Department
Development Review (Urban) Branch
Infrastructure Approvals Division
110 Laurier Avenue West, 4th Floor
Ottawa, Ontario
K1P 1J1

Attention: **Mr. Abdul Motalib**

Dear Sir:

Reference: **175 Richmond Road / 350 Kirkwood Avenue**
Servicing Design Brief
Our File No.: 111130

Enclosed herein is the Servicing Brief and Stormwater Management Report for the proposed development located at 175 Richmond Road / 350 Kirkwood Avenue. This report is submitted in support of the rezoning and site plan applications. It outlines how the site will be serviced with sanitary sewer, storm sewer and watermain.

Trusting this report is adequate for your purposes. Should you have any questions, or require addition information, please contact me.

Yours truly,

NOVATECH ENGINEERING CONSULTANTS LTD.

Greg MacDonald, P. Eng.
Senior Project Manager

GM/sb

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1.0 INTRODUCTION

The proposed Richmond Road-Kirkwood Avenue development (175 Richmond Road and 350 Kirkwood Avenue) is located on the north-west corner of Richmond Road and Kirkwood Avenue in the City of Ottawa, as shown in Figure 1 - Key Plan. The proposed development will consist of a 6-storey building and a 9-storey building with 239 condominium units. Also, a total of 310 underground parking spaces will be provided on 2 levels of underground parking.

As identified in the City of Ottawa's Zoning By-law (ZBL), this site is currently designated as IG1 – General Industrial zone; a mix of low to moderate impact, light industrial uses. The zoning amendment will revise the site's current designation for the proposed development. Specific details are provided in a Planning Rationale submitted as part of the ZBL Amendment application.

The subject site consists of approximately 0.64 ha in area. The development will replace a one to two storey building which contains specialty retail uses such as a travel agency, hair salon, dance academy, yoga studio, paint store, electrical equipment wholesaler, and sign shop as well as an engineering office at the north end of the site. The site currently has an access onto Richmond Road and has five loading bays on Wilber Street. Access on Wilber Street is poorly defined as there is no curb line and no differentiation between the asphalt loading area and the paved roadway. The existing conditions are shown in Figure 2 – Existing Conditions.

This servicing design brief will outline how the site will be serviced with sanitary sewer, storm sewer and watermain.

2.0 REFERENCES AND SUPPORTING DOCUMENTS

A geotechnical study has been completed by Paterson Consultants, which includes the proposed building and roadway modification. The report is submitted with the site plan application. It is not anticipated that there will be any geotechnical concerns with respect to site servicing.

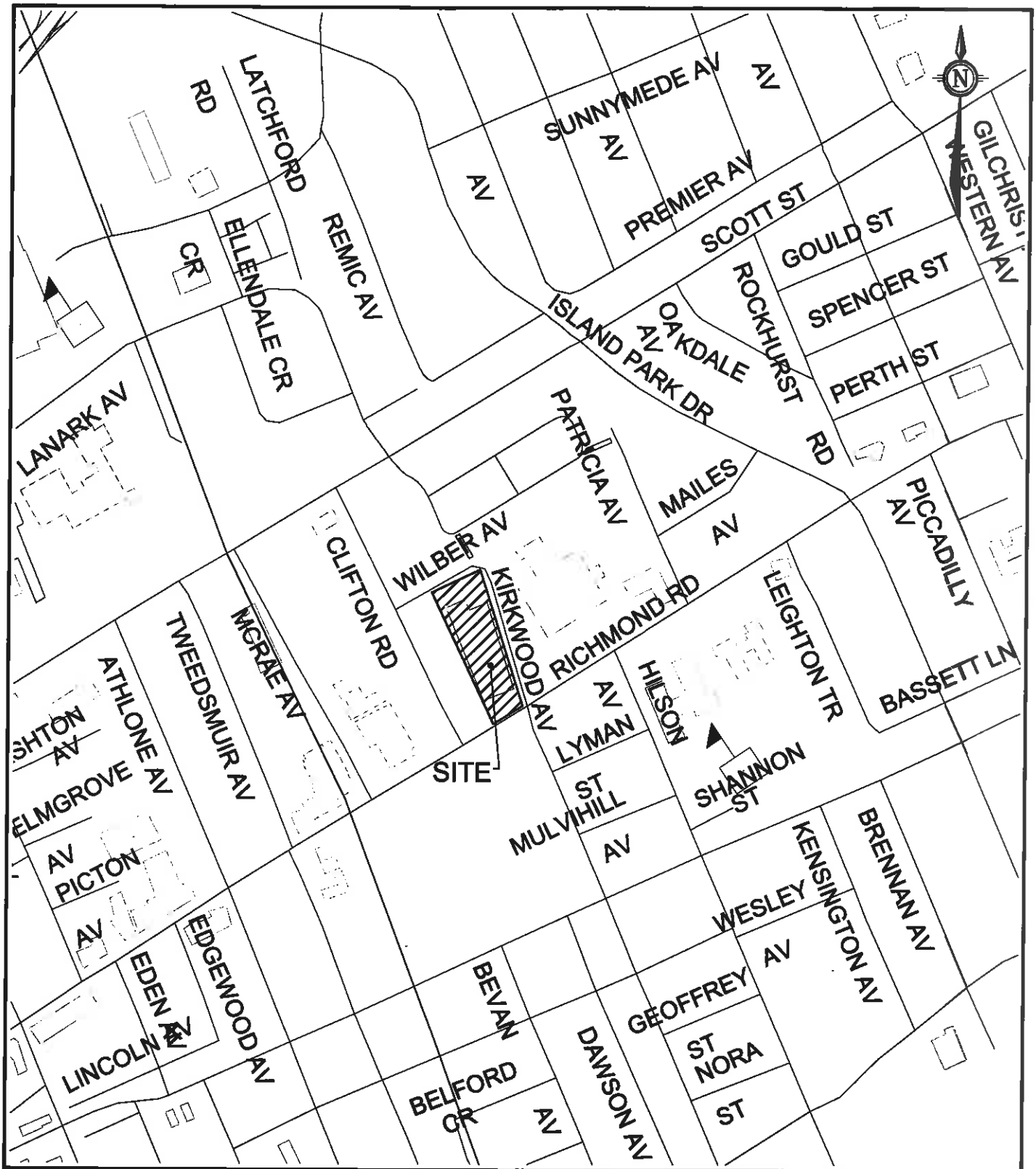
With regards to servicing, supporting documents include the City of Ottawa Sewer Design Guideline for wastewater flow evaluation and the City of Ottawa Design Guidelines for Water Distribution as will be discussed in Section 4.0 and 5.0.

The City of Ottawa Servicing Study Guidelines for Development Applications checklist has been completed and is attached in Appendix D.

3.0 STORM DRAINAGE AND STORMWATER MANAGEMENT

3.1 Study Objectives

The City will require that on-site stormwater management be implemented to control post-development stormwater discharge for both the 5 & 100 year storm events based on an allowable runoff coefficient (C) of 0.50, a time of concentration (t_c) of 20 minutes, and a 5-year storm control. Stormwater management will be achieved through the use of rooftop controls and surface ponding. Should surplus storage be required, stormwater management alternatives such as storage tanks or super-pipes will be implemented.



NOVATECH
ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

CITY OF OTTAWA
175 RICHMOND ROAD & 350 KIRKWOOD AVENUE

KEY PLAN

SEPT. 2011 111130 FIGURE1

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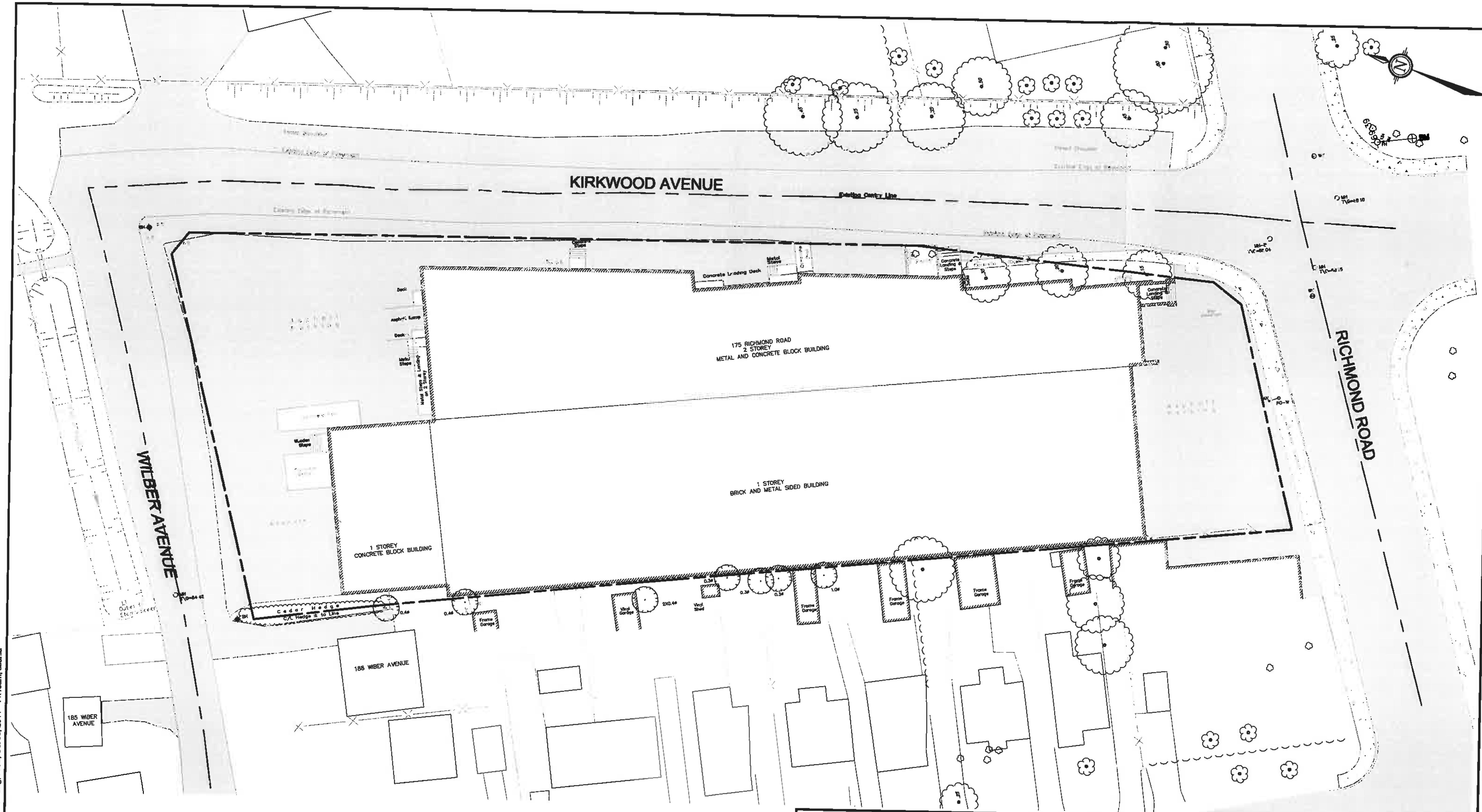

NOVATECH ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M IP6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

CITY OF OTTAWA
175 RICHMOND ROAD &
350 KIRKWOOD AVENUE

EXISTING CONDITION

SEPT. 2011 111130 FIGURE 2

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3.2 Pre-development Conditions

3.2.1 The Site

The site currently consists of a 2-storey mixed-use building. Existing conditions are shown – Figure 2.

3.2.2 Existing Drainage

Stormwater currently drains away from the site towards various roadway catch basins located on Richmond Road and Kirkwood Avenue, which outlet to the existing storm sewers within these streets.

3.2.3 Criteria and Allowable Release Rate

The approach to the stormwater management design, is to not exceed the allowable release rate as specified by the City of Ottawa for the newly developed areas. The allowable release rate will be calculated using a runoff coefficient of 0.50 and a time of concentration of 20 minutes. The allowable release rate for the proposed 0.64 ha site development is calculated to be 63.4 L/s using the Rational Method as follows:

Drainage Area (A) = 0.64 ha
Runoff Coefficient (C) = 0.50
Intensity (I5) = 70.25 mm/hr

Q= 2.78 CIA
Q= 2.78 x 0.50 x 70.25mm/hr x 0.64 ha
Q= 62.3 L/s

3.3 Post-Development Conditions

3.3.1 Development Proposal

Due to the extent of hard surfaced areas and limited allowable release rate from the site, any runoff in excess of the allowable quantity will be stored on the roof of the proposed building, up to and including the 1:100 year design event.

3.3.2 Post-Development Flow

The post-development flow from the building consists of controlled flow from the building roof and landscaped decks in the rear and uncontrolled overland flows at the front of the buildings. Refer to the attached plans for details and drainage areas.

3.3.2.2 Area A-1 And Area A-2: Uncontrolled Areas

Areas in the front of the buildings along Richmond Road and Kirkwood Avenue will flow overland uncontrolled to road catch basins on those streets. Runoff from the parking access ramp will flow internally and be directed to the existing 450mm diameter storm sewer on Wilber Avenue. The uncontrolled area for A-1 and A-2 is 0.110 ha and 0.016ha, respectively. Uncontrolled development flows for the 1:5 and 1:100 year design events have been calculated using the Rational Method as follows:

Area A-1

1:5 Year Event

Drainage Area (A) = 0.110 ha
Runoff Coefficient (C) = 0.90
Intensity (I5) = 70.25 mm/hr

Q= 2.78 CIA
Q= 2.78 x 0.90 x 70.25mm/hr x 0.110 ha
Q= 19.33 L/s

1:100 Year Event

Drainage Area (A) = 0.110 ha
Runoff Coefficient (C) = 1.00
Intensity (I5) = 119.95 mm/hr

Q= 2.78 CIA
Q= 2.78 x 1.00 x 119.95mm/hr x 0.110 ha
Q= 36.68 L/s

Area A-2

1:5 Year Event

Drainage Area (A) = 0.016 ha
Runoff Coefficient (C) = 0.90
Intensity (I5) = 70.25 mm/hr

Q= 2.78 CIA
Q= 2.78 x 0.90 x 70.25mm/hr x 0.016 ha
Q= 2.81 L/s

1:100 Year Event

Drainage Area (A) = 0.016 ha
Runoff Coefficient (C) = 1.00
Intensity (I5) = 119.95 mm/hr

Q= 2.78 CIA
Q= 2.78 x 1.00 x 119.95mm/hr x 0.016 ha
Q= 5.34 L/s

Refer to Figure 3 for storm drainage areas.

3.3.2.3 Remaining Allowable Release Rate

The maximum allowable storm flow for the remaining areas is the allowable release rate for the entire site less the uncontrolled flow. The following table indicates the allowable release rate for the entire site, the uncontrolled runoff and the remaining allowable release rate for the rest of the site areas for both the 5-year and 100-year storm events.

Table 3.3.1 Remaining Allowable Release Rate Summary

Area		Flow (L/s)	
		5-Year	100-Year
Entire Site (Legal Boundary)	Allowable	62.3	62.3
	Uncontrolled	22.15	42.02
Remaining Allowable Flow		40.15	20.28

3.3.2.4 Area R-1 to Area R-18: Controlled Development Roof Top Flows

The post-development flow from Areas R-1 to R-18 was calculated using the Rational Method to be 83.29 L/s for the 1:5 year design event and 158.60 L/s for the 1:100 year design event. Both events exceed the maximum allowable flow. Flow from the building roof will be controlled by Zurn rooftop drains. Flow through these drains is dependent on the height of water above the drain (H-Head) and the number of notches in the drain. Flow from the rooftop area has been summarized

in Table 3.3.2a. Refer to Figure 3 for roof drain locations. Detailed calculations are contained in Appendix A.

Table 3.3.2a Rooftop Drain Peak Flows

Area No.	Notches	ZURN ROOFDRAIN CONTROL PARAMETERS			
		1:5 YR EVENT		1:100 YR EVENT	
		Head (m)	Q (L/s)	Head (m)	Q (L/s)
R-1 to R-18	1	0.113	0.42	0.145	0.54
Total			7.56		9.72

The Modified Rational Method was used to determine the storage volume required for the various rooftop drainage areas. Based on a controlled flow provided via the Zurn rooftop drains, the ponding depth on the roof above the drains will be approximately 0.113m for the 1:5 year design event and approximately 0.145m for the 1:100 year design event, as determined through iteration calculations between the release rate, head and corresponding storage. Refer to Appendix A for detailed calculations and to the Roof Drain Table shown on 111130-GP and Figure 3.

2.3.2.5 Area A-3 And Area A-4: Controlled Development Surface Flows

The post-development flow from areas A-3 and A-4 was calculated using the Rational Method to be 50.05 L/s for the 1:5 year design event and 95.31 L/s for the 1:100 year design event. Both events exceed the maximum allowable flow. Flow from the upper and lower decks will be controlled by inlet control devices. Flow from each deck area has been summarized in Table 3.3.2b. Refer to Figure 3 for drain location. Detailed calculations are contained in Appendix A.

Table 3.3.2b Area Drain Inlet Control Flow Summary

Area No.	Area Drain Specification	Structure No.	INLET CONTROL PARAMETERS			
			5-Year Event		100-Year Event	
			Depth (m)	Total Flow (L/s)	Depth (m)	Total Flow (L/s)
A-03	ZN-221-2NH-G-P-X-VP-Y	AD 1 and AD 2	0.105	2.97 x 2	0.141	3.15 x 2
A-04	ZN-221-2NH-G-P-X-VP-Y	AD 3	0.092	2.90	0.127	3.08
			Total =	**8.84**	**Total =**	**9.15**

The Modified Rational Method was used to determine the storage volume required for each of the area drains. Based on a controlled flow provided via the Area Drain Restricted Inlet (2 inch dia.), the ponding depth on the lower deck area above the grate will vary between 0.105 and 0.141 m for the 5-year storm event and 100-year storm event, respectively. The ponding depth on the upper deck area above the grate will vary between 0.092 and 0.127 m for the 5-year storm event and 100-year storm event, respectively. This is determined through iterative calculations using the release rate, head, and corresponding storage. Refer to Appendix A for detailed calculations outlining the modified rational method used, the ponding depth, and stage-storage curves for each controlled drainage area.

3.3.2.6 Proposed Flow

The following table summarizes the direct runoff from the controlled flow areas for both the 1:5 year and 1:100 year design events.

Table 3.3.3 Proposed Post-Development Peak Flows

Area and Type of Control		Flow (L/s)	
		1:5 YR	1:100 YR
R-01 to R-18	Controlled	7.56	9.72
A-03 and A-04	Controlled	8.84	9.15
Total Controlled Flow		16.40	18.87
Total Uncontrolled Flow		22.15	42.02

The 1:5 year design event post-development flow from the site will be controlled to 38.55 L/s, and 60.89 L/s for the 5 year and 100 year design storms, respectively. Both flows are less than the allowable flow of 62.3 L/s.

3.3.3 Major Overland Flow Route

The site will be graded such that flows in excess of the 100-year storm event will be conveyed overland to Richmond Road, Kirkwood Avenue and Wilber Avenue.

3.4 Erosion and Sediment Control Measures

Temporary erosion and sediment control measures will be implemented during construction in accordance with the "Guidelines on Erosion and Sediment Control for Urban Construction Sites," (Government of Ontario, May 1987). These measures include:

- Placement of filter fabric under all catchbasins and maintenance hatches. The proposed erosion and sediment control measures will be implemented prior to construction and will remain in place during all phases of construction. Regular inspection and maintenance of the erosion control measures will be undertaken.

4.0 *SANITARY SEWER*

The 9-storey development at 175 Richmond Road will be serviced by a 150 mm dia. service that will connect to the existing 300 mm dia. sanitary sewer on Richmond Road. The 6-Storey development at 350 Kirkwood Avenue will be serviced by a 150mm dia. Service that will connect to the existing 229mm dia. sanitary sewer on Wilber Avenue. The proposed sanitary service connection to the building will be equipped with a full-port backwater valve.

The proposed development flows are based on the City of Ottawa Sewer Design Guidelines (refer to Appendix B). The flows are comprised of residential and retail space as presented below and are compared to the design flows based on current zoning.

175 Richmond Road Average Sanitary Flows Under Proposed Zoning A = 1800m^2

175 Richmond Road Residential Flow

Residential: Q_{SAN} = (66 units x 1.8 persons/unit + 30 units x 2.1 persons/unit) x 350 L/cap/day = 63,630 L/day

Average Sanitary Flow = 63,630 L/day = 0.74 L/sec

Peak Sanitary Flow = 2.94 L/sec (with PF = 4.0)

175 Richmond Road Commercial Flow

Comercial: Q_{SAN} = 615.2m^2 x 5 L/m^2/day = 3076.0 L/day

Average Sanitary Flow = 3076.0 L/day = 0.04 L/sec

Peak Sanitary Flow = 0.05 L/sec (with PF = 1.5)

Therefore,

Total Average Sanitary Flow = 0.78 L/sec
Total Peak Sanitary Flow = 2.99 L/sec (with PF)

350 Kirkwood Avenue Average Sanitary Flows Under Proposed Zoning A = 4580m^2

350 Kirkwood Avenue Residential Flow

Residential: Q_{SAN} = (116 units x 1.8 persons/unit + 32 units x 2.1 persons/unit) x 350 L/cap/day = 96,600 L/day

Average Sanitary Flow = 96,600 L/day = 1.12 L/sec

Peak Sanitary Flow = 4.47 L/sec (with PF = 4.0)

Therefore,

Total Average Sanitary Flow = 1.12 L/sec
Total Peak Sanitary Flow = 4.47 L/sec (with PF)

Average Sanitary Flows Under Current Zoning

Currently, the site is zoned IG1, a mix of low to moderate impact, light industrial uses. The site is currently occupied by a 1-storey building and a 2-storey building. Based on this, sanitary flows are calculated below.

1-Storey Building Floor Area = 0.483 ha (175 Richmond Road)

2-Storey Building Area = 0.155 ha x 2 = 0.310 ha (350 Kirkwood Avenue)

175 Richmond Road

Q_{ave} = 4,830 m2 * 5 L/m2 = 24,150 L/day = 0.28 L/sec
Q_{peak} = 0.39 L/sec * 1.5 = 0.42 L/sec

350 Kirkwood Avenue

Q_{ave} = 3,100 m2 * 5 L/m2 = 15,500 L/day = 0.18 L/sec
Q_{peak} = 0.18 L/sec * 1.5 = 0.27 L/sec

Therefore,

Total Average Sanitary Flow = 0.46 L/sec
Total Peak Sanitary Flow = 0.69 L/sec (with PF)

The development sanitary flows under the proposed zoning are higher than the flows under existing zoning. An assessment of the receiving sewers follows.

175 Richmond Road

Existing Peak Flow =	0.42 L/sec
Proposed Peak Flow =	2.99 L/sec
Difference =	2.57 L/sec

Receiving sewer on Richmond Road is a 300 mm diameter pipe at 0.40% slope with a capacity of 63.70 L/sec. The additional flow of 2.57 L/sec represents 4% of the pipe capacity which should not affect operation of the sewer.

350 Kirkwood Avenue

Existing Peak Flow =	0.27 L/sec
Proposed Peak Flow =	4.47 L/sec
Difference =	4.20 L/sec

Receiving sewer on Clifton Road is a 229mm diameter pipe at 0.76% with a capacity of 41.03 L/sec. The additional flow of 4.20 L/sec represents 10% of the pipe capacity. An assessment of the downstream sewer on Clifton Road and Scott Street to the West Nepean Collector revealed adequate capacity to accept this additional flow. Detailed calculations are provided in Appendix B.

5.0 WATER SUPPLY

The proposed 9-storey and 6-storey developments will be serviced separately, each by a 150mm dia. watermain service, which will connect to the existing 150mm dia. watermain located on Kirkwood Avenue. Estimated domestic water demands for the development have been calculated below as per Table 4.2 of the Ottawa Water Distribution Design Guidelines.

175 Richmond Road Residential Demand

Average Demand = (66 units x 1.8 persons/unit + 30 units x 2.1 persons/unit) x 350 L/cap/day = 63,630 L/day = 0.74 L/sec

Max Daily Demand = 63,630 x 2.5 = 159,075 L/day = 1.84 L/sec

Max Hourly Demand = 159,075 x 2.2 = 349,965 L/day = 4.05 L/sec

175 Richmond Road Commercial Demand

Average Demand = 615.2 m^2 x 2.5 L/m^2/day = 1,538 L/day = 0.02 L/sec

Max Daily Demand = 1,538 L/day x 1.5 = 2,307 L/day = 0.03 L/sec

Max Hourly Demand = 2,307 L/day x 1.8 = 4,153 L/day = 0.05 L/sec

Therefore,

Total Average Water Demand = 0.76 L/sec
Total Max Daily Water Demand = 1.86 L/sec
Total Max Hourly Demand = 4.10 L/sec

350 Kirkwood Avenue Residential Demand

Average Demand = (116 units x 1.8 persons/unit + 32 units x 2.1 persons/unit) x 350 L/cap/day = 96,600 L/day = 1.12 L/sec

Max Daily Demand = 96,600 x 2.5 = 241,500 L/day = 2.79 L/sec

Max Hourly Demand = 241,500 x 2.2 = 531,300 L/day = 6.15 L/sec

Therefore,

Total Average Water Demand = 1.12 L/sec
Total Max Daily Water Demand = 2.79 L/sec
Total Max Hourly Demand = 6.15 L/sec

Based on the data provided by the City, the existing watermains in the area are adequate to meet the domestic water demands. Refer to Appendix C for watermain data.

The building will be provided with standpipe and sprinkler system for fire protection. The fire demand for the proposed development is in the range of 1000 igpm. The available supply at 20 psi is in the neighbourhood of 2500 igpm around the site, based on the hydrant data supplied by the City, combined in Appendix C.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the foregoing, development of the site will be supported by the following:

- Stormwater discharge from the site will be controlled to less than the allowable 5-year pre-development storm event rate of 62.30 L/s by utilizing rooftop storage and deck storage for both the 5-year and 100-year post-development storm events.
- Stormwater from the ramp to the underground parking levels will be directed to the internal storm service.
- The site will be graded such that flows in excess of the 100-year storm event will be conveyed overland to Richmond Road, Kirkwood Avenue and Wilber Avenue.
- Temporary erosion and sediment control measures will be implemented during construction.
- Although there will be an increase in sanitary flow to the city sewers, the receiving sewers have sufficient capacity to handle these flows.
- The existing watermain on Richmond Road is sufficient to meet both the domestic and fire demands.

It is recommended that the proposed stormwater management system be approved for implementation. Adequate sanitary, storm and water capacity are available to service the site.

NOVATECH ENGINEERING CONSULTANTS LTD.

Prepared by:

Bassam Bahia, B.Eng.
Junior Engineer

David Smith, B.Eng.
Junior Engineer

Reviewed by:

Greg MacDonald, P.Eng.
Senior Project Manager

APPENDIX A

IDF CURVES, RATIONAL METHOD, RUNOFF

and SWM CALCULATIONS

RATIONAL METHOD

The Rational Method was used to determine both the allowable runoff as well as the post-development runoff for the proposed site. The equation is as follows:

$Q=2.78\ CIA$

Where:
Q is the runoff in L/s
C is the weighted runoff coefficient*
I is the rainfall intensity in mm/hr**
A is the area in hectares

*The weighted runoff coefficient is determined for each of the catchment areas as follows:

$$C = \frac{(A_{perv} \times C_{perv}) + (A_{imp} \times C_{imp})}{A_{tot}}$$

Where:
A_{perv} is the pervious area in hectares
C_{perv} is the pervious area runoff coefficient (C_{perv}=0.20)
A_{imp} is the impervious area in hectares
C_{imp} is the impervious area runoff coefficient (C_{imp}=0.90)
A_{tot} is the catchment area (A_{perv} + A_{imp}) in hectares

** The rainfall intensity is taken from the City of Ottawa IDF Curves with a time of concentration of 10 min (refer to attached IDF Curves) as specified by the City of Ottawa.

ALLOWABLE RELEASE RATE AS SPECIFIED BY THE CITY

The allowable release rate was calculated for the 0.638-hectare site, using a runoff coefficient of 0.50 and a time of concentration of 20 minutes, as specified by the City of Ottawa.

Drainage Area (A) = 0.638 ha
Runoff Coefficient (C) = 0.50
Intensity (I_5) = 70.25 mm/hr

Q_5= 2.78 CIA
Q_5= 2.78 x 0.50 x 70.25 x 0.638
Q_5= 62.30 L/s

POST-DEVELOPMENT FLOW

The post-development uncontrolled flows from the building roof. These sample calculation below shows a typical uncontrolled flow calculation for the roof top area. These area are to be controlled by the Zurn roof top drains.

SAMPLE CALCULATION:

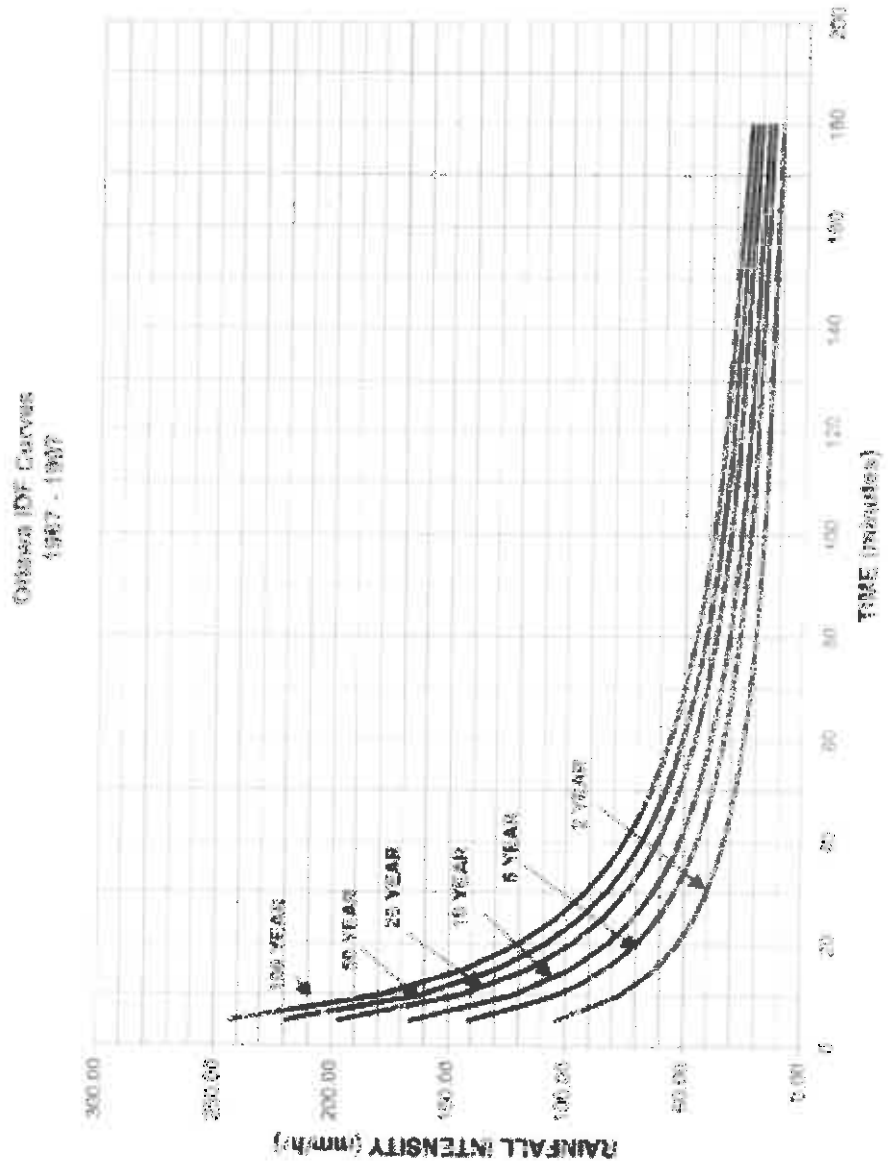
ROOF AREA

Drainage Area (A) = 0.3195 ha
Impervious Area = 0.3195 ha
Pervious Area = 0.0000 ha
Runoff Coefficient (C_5) = 0.90
Runoff Coefficient (C_{100}) = 1.00 (C_5 x 1.25 or a maximum of 1.00)
Tc = 10 minutes
Intensity (I_5) = 104.19 mm/hr
Intensity (I_{100}) = 178.60 mm/hr

Q_5= 2.78 CIA
Q_5= 2.78 x 0.90 x 104.19 x 0.3195
Q_5= 83.29 L/s

Q_{100}= 2.78 CIA
Q_{100}= 2.78 x 1.00 x 178.60 x 0.3195
Q_{100}= 158.60 L/s

APPENDIX 5-A OTTAWA INTENSITY DURATION FREQUENCY (IDF) CURVE



** IDF CURVE FROM OTTAWA SEWER DESIGN GUIDELINES – NOV 2004*

REQUIRED STORAGE - 1:5 YEAR EVENT
AREA R-01 to R-18 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.0178 ha	Qallow =	0.42
C =	0.90	Vol(max) =	3.76
		Nothches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	6.27	5.85	1.75
10	104.19	4.63	4.21	2.52
15	83.56	3.71	3.29	2.96
20	70.25	3.12	2.70	3.24
25	60.90	2.70	2.28	3.43
30	53.93	2.39	1.97	3.55
35	48.52	2.15	1.73	3.64
40	44.18	1.96	1.54	3.70
45	40.63	1.80	1.38	3.74
50	37.65	1.67	1.25	3.76
55	35.12	1.56	1.14	3.76
60	32.94	1.46	1.04	3.75
65	31.04	1.38	0.96	3.74
70	29.37	1.30	0.88	3.71
75	27.89	1.24	0.82	3.68
80	26.56	1.18	0.76	3.65
85	25.37	1.13	0.71	3.60
90	24.29	1.08	0.66	3.56

Qnet = Q - Qallow Vol = Qnet x time

Ponding depth (1:5yr storm)

B m^2	V (factor)	V m^3	H m
79	3.000	2.63	0.1
95	3.000	3.50	0.11
114	3.000	4.54	0.12
133	3.000	5.78	0.13
155	3.000	7.22	0.14
178	3.000	8.88	0.15

Linear interpolation

0.12	0.11	0.12	H =	0.113
4.54	3.50	4.54	3.76	

Qall 0.42

REQUIRED STORAGE - 1:100 YEAR EVENT
AREA R-01 to R-18 : BUILDING ROOF

OTTAWA IDF CURVE

Area =	0.01775 ha	Qallow =	0.54
C =	1.00	Vol(max) =	8.06
		Nothches =	1

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	11.98	11.44	3.43
10	178.56	8.81	8.27	4.96
15	142.89	7.05	6.51	5.86
20	119.95	5.92	5.38	6.45
25	103.85	5.12	4.58	6.88
30	91.87	4.53	3.99	7.19
35	82.58	4.07	3.53	7.42
40	75.15	3.71	3.17	7.60
45	69.05	3.41	2.87	7.74
50	63.95	3.16	2.62	7.85
55	59.62	2.94	2.40	7.93
60	55.89	2.76	2.22	7.99
65	52.65	2.60	2.06	8.03
70	49.79	2.46	1.92	8.05
75	47.26	2.33	1.79	8.06
80	44.99	2.22	1.68	8.06
85	42.95	2.12	1.58	8.06
90	41.11	2.03	1.49	8.04

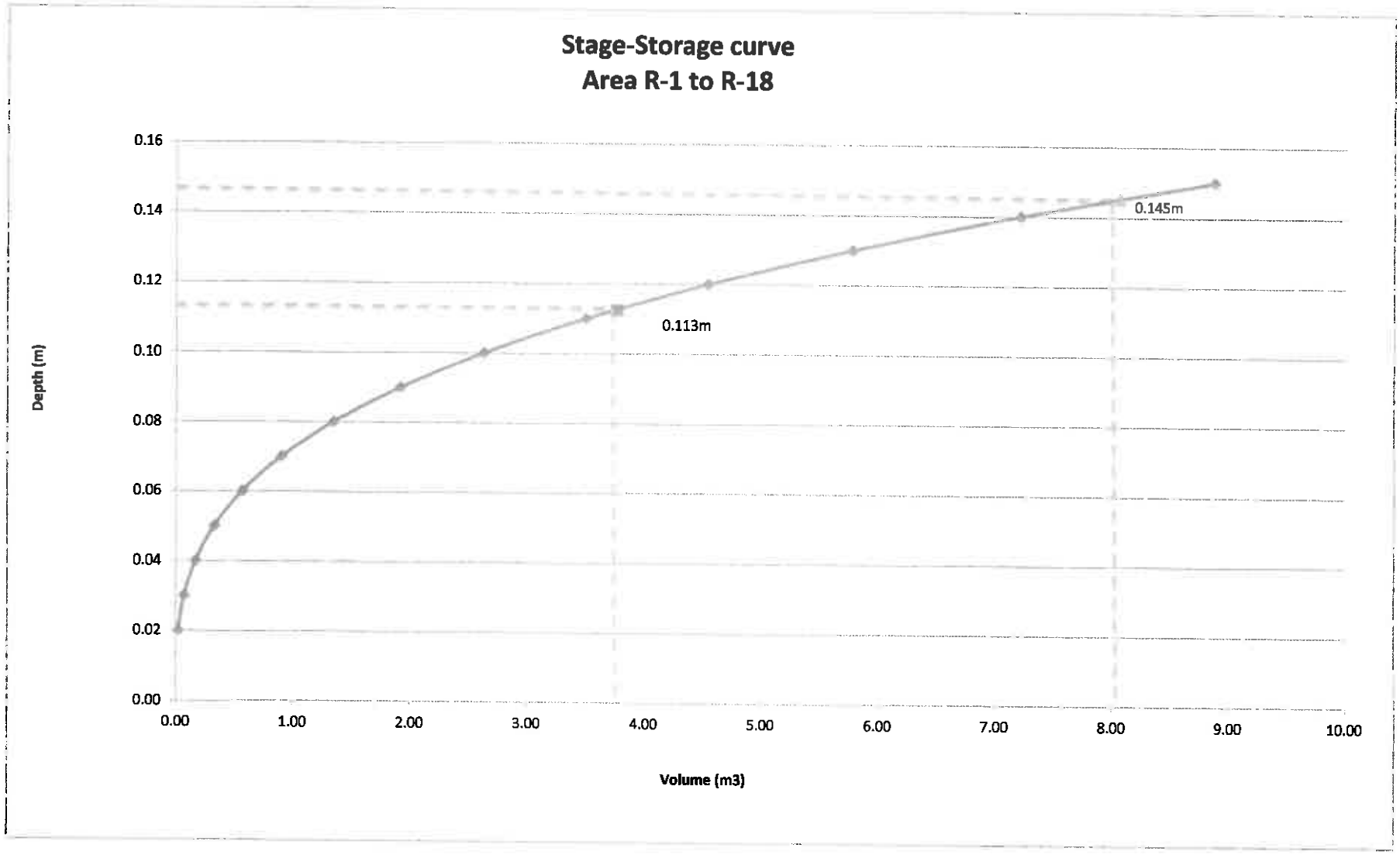
Ponding depth (1:100yr storm)

B m^2	V (factor)	V m^3	H m
79	3.000	2.63	0.1
95	3.000	3.50	0.11
114	3.000	4.54	0.12
133	3.000	5.78	0.13
155	3.000	7.22	0.14
178	3.000	8.88	0.15

Linear interpolation

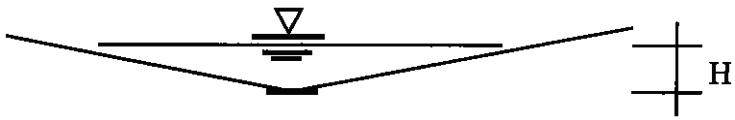
0.15	0.14	0.15	H =	0.145
8.88	7.22	8.88	8.06	

Qall 0.54


Stage-Storage curve
Area R-1 to R-18
Depth (m)
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.145m
0.113m
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
Volume (m3)

Zurn Roof Drains

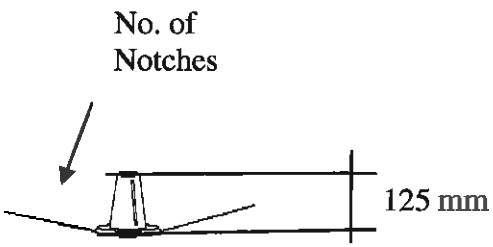
Opening	G.P.M. Per Inch of Head	L.P.M. Per Inch (25 mm) of Head	L/s Per Metre of Head	L/s Per 0.15 m of Head
Standard - X1	5.00	22.73	14.92	2.24
Reduced - X2	3.75	17.05	11.19	1.68
Reduced - X3	2.50	11.37	7.46	1.12
Max Reduced - X4	1.25	5.68	3.73	0.56



SAMPLE CALCULATION:

AREA R-01

Number of notches (N) = 1
Head (H) = 0.113 m for 5-year event
Head (H) = 0.145 m for 100-year event



$Q_{5\ all}$ = 11.19 L/s/m/notch x H x N
$Q_{5\ all}$ = 7.46 L/s/m/notch x .11 m x 1 notch
$Q_{5\ all}$ = 0.42 L/s

$Q_{100\ all}$ = 11.19 L/s/m/notch x H x N
$Q_{100\ all}$ = 7.46 L/s/m/notch x .14 m x 1 notch
$Q_{100\ all}$ = 0.54 L/s

175 Richmond Road
350 Kirkwood Avenue

Project:111130
9/29/2011

REQUIRED STORAGE - 1:5 YEAR EVENT
AREA AD-1 & AD-2 : LOWER DECK

OTTAWA IDF CURVE

Area =	0.1560	ha	Qallow =	5.94
C =	0.90		Vol(max) =	27.29
			Dia	51

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	55.10	49.16	14.75
10	104.19	40.67	34.73	20.84
15	83.56	32.61	26.67	24.01
20	70.25	27.42	21.48	25.78
25	60.90	23.77	17.83	26.74
30	53.93	21.05	15.11	27.20
35	48.52	18.94	13.00	27.29
40	44.18	17.25	11.31	27.13
45	40.63	15.86	9.92	26.78
50	37.65	14.70	8.76	26.27
55	35.12	13.71	7.77	25.64
60	32.94	12.86	6.92	24.91
65	31.04	12.12	6.18	24.09
70	29.37	11.46	5.52	23.20
75	27.89	10.89	4.95	22.25
80	26.56	10.37	4.43	21.25
85	25.37	9.90	3.96	20.20
90	24.29	9.48	3.54	19.12

Qnet = Q - Qallow Vol = Qnet x time

Ponding depth (1:5yr storm)

B m^2	V (factor)	V m^3	H m
693	3.000	23.11	0.1
839	3.000	30.76	0.11
998	3.000	39.94	0.12
1172	3.000	50.78	0.13
1359	3.000	63.42	0.14
1560	3.000	78.00	0.15

Linear interpolation

0.11	0.1	0.11	H =	0.105
30.76	23.11	30.76	27.29	

Qall 5.94

Grate
0.17

REQUIRED STORAGE - 1:100 YEAR EVENT
AREA AD-1 & AD-2 : LOWER DECK

OTTAWA IDF CURVE

Area =	0.156	ha	Qallow =	6.31
C =	1.00		Vol(max) =	64.57
			Dia	51

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	105.26	98.95	29.69
10	178.56	77.44	71.13	42.68
15	142.89	61.97	55.67	50.10
20	119.95	52.02	45.72	54.86
25	103.85	45.04	38.73	58.10
30	91.87	39.84	33.54	60.37
35	82.58	35.81	29.51	61.97
40	75.15	32.59	26.28	63.08
45	69.05	29.95	23.64	63.83
50	63.95	27.74	21.43	64.29
55	59.62	25.86	19.55	64.52
60	55.89	24.24	17.94	64.57
65	52.65	22.83	16.53	64.45
70	49.79	21.59	15.29	64.21
75	47.26	20.49	14.19	63.85
80	44.99	19.51	13.21	63.39
85	42.95	18.63	12.32	62.85
90	41.11	17.83	11.52	62.23

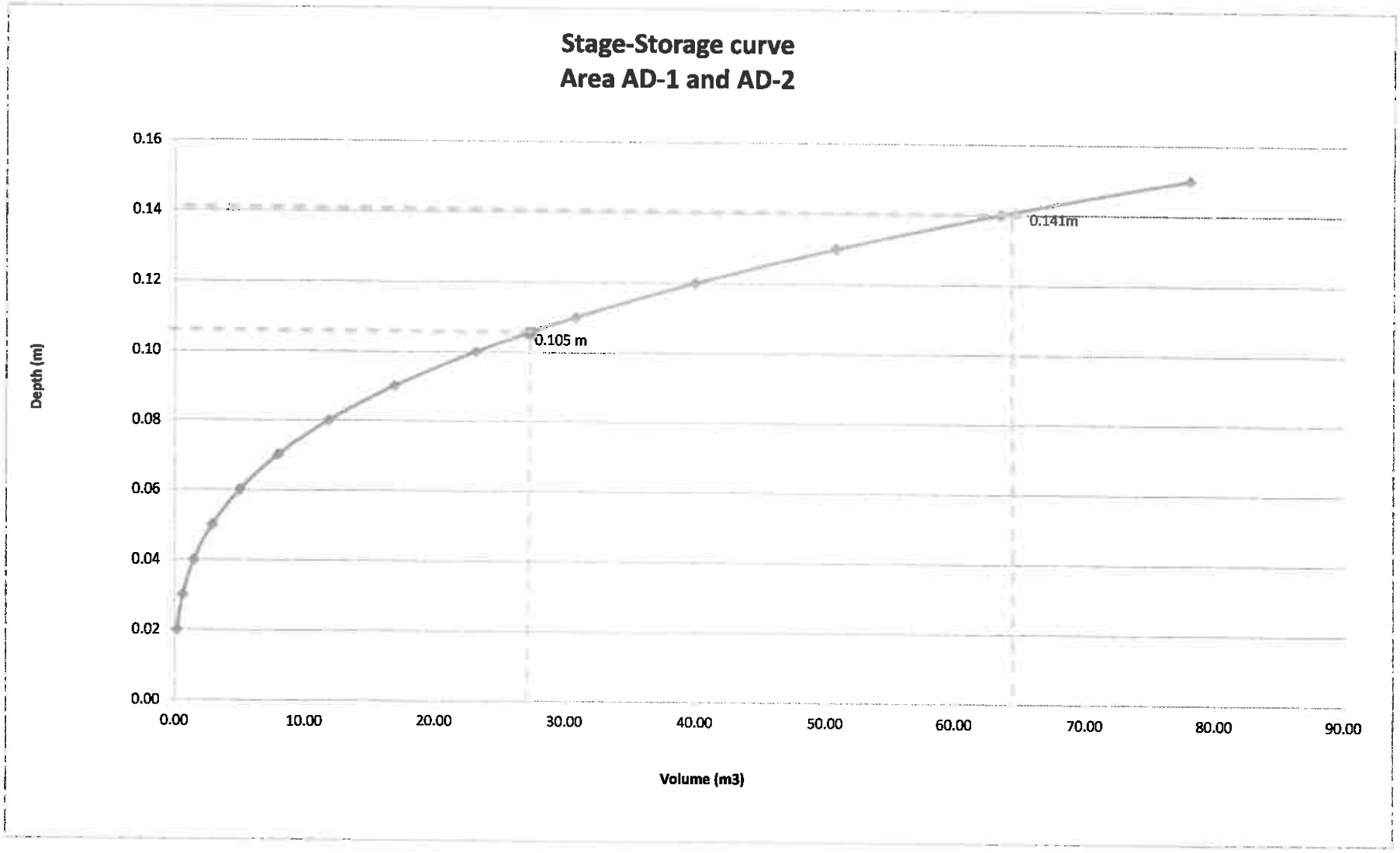
Ponding depth (1:100yr storm)

B m^2	V (factor)	V m^3	H m
693	3.000	23.11	0.1
839	3.000	30.76	0.11
998	3.000	39.94	0.12
1172	3.000	50.78	0.13
1359	3.000	63.42	0.14
1560	3.000	78.00	0.15

Linear interpolation

0.15	0.14	0.15	H =	0.141
78.00	63.42	78.00	64.57	

Qall 6.31


Stage-Storage curve
Area AD-1 and AD-2
Depth (m)
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.105 m
0.141m
0.00
10.00
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
Volume (m3)

REQUIRED STORAGE - 1:5 YEAR EVENT
AREA AD-3 : UPPER DECK

OTTAWA IDF CURVE

Area =	0.0360	ha	Qallow =	2.90
C =	0.90		Vol(max) =	4.16
			Dia	51

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	141.18	12.72	9.82	2.94
10	104.19	9.38	6.48	3.89
15	83.56	7.53	4.63	4.16
20	70.25	6.33	3.43	4.11
25	60.90	5.49	2.59	3.88
30	53.93	4.86	1.96	3.52
35	48.52	4.37	1.47	3.09
40	44.18	3.98	1.08	2.59
45	40.63	3.66	0.76	2.05
50	37.65	3.39	0.49	1.47
55	35.12	3.16	0.26	0.87
60	32.94	2.97	0.07	0.24
65	31.04	2.80	-0.10	-0.40
70	29.37	2.65	-0.25	-1.07
75	27.89	2.51	-0.39	-1.75
80	26.56	2.39	-0.51	-2.44
85	25.37	2.28	-0.62	-3.14
90	24.29	2.19	-0.71	-3.85

Qnet = Q - Qallow Vol = Qnet x time

Ponding depth (1:5yr storm)

B m^2	V (factor)	V m^3	H m
102	3.000	2.73	0.08
130	3.000	3.89	0.09
160	3.000	5.33	0.1
194	3.000	7.10	0.11
230	3.000	9.22	0.12
270	3.000	11.72	0.13
314	3.000	14.63	0.14
360	3.000	18.00	0.15

Linear interpolation

0.1	0.09	0.1	H =	0.092
5.33	3.89	5.33	4.16	

Qall 2.90

Grate
0.17

REQUIRED STORAGE - 1:100 YEAR EVENT
AREA AD-3 : UPPER DECK

OTTAWA IDF CURVE

Area =	0.036	ha	Qallow =	3.08
C =	1.00		Vol(max) =	11.01
			Dia	51

Time (min)	Intensity (mm/hr)	Q (L/s)	Qnet (L/s)	Vol (m3)
5	242.70	24.29	21.21	6.36
10	178.56	17.87	14.79	8.87
15	142.89	14.30	11.22	10.10
20	119.95	12.00	8.92	10.71
25	103.85	10.39	7.31	10.97
30	91.87	9.19	6.11	11.01
35	82.58	8.26	5.18	10.89
40	75.15	7.52	4.44	10.66
45	69.05	6.91	3.83	10.34
50	63.95	6.40	3.32	9.96
55	59.62	5.97	2.89	9.53
60	55.89	5.59	2.51	9.05
65	52.65	5.27	2.19	8.54
70	49.79	4.98	1.90	7.99
75	47.26	4.73	1.65	7.42
80	44.99	4.50	1.42	6.83
85	42.95	4.30	1.22	6.22
90	41.11	4.11	1.03	5.59

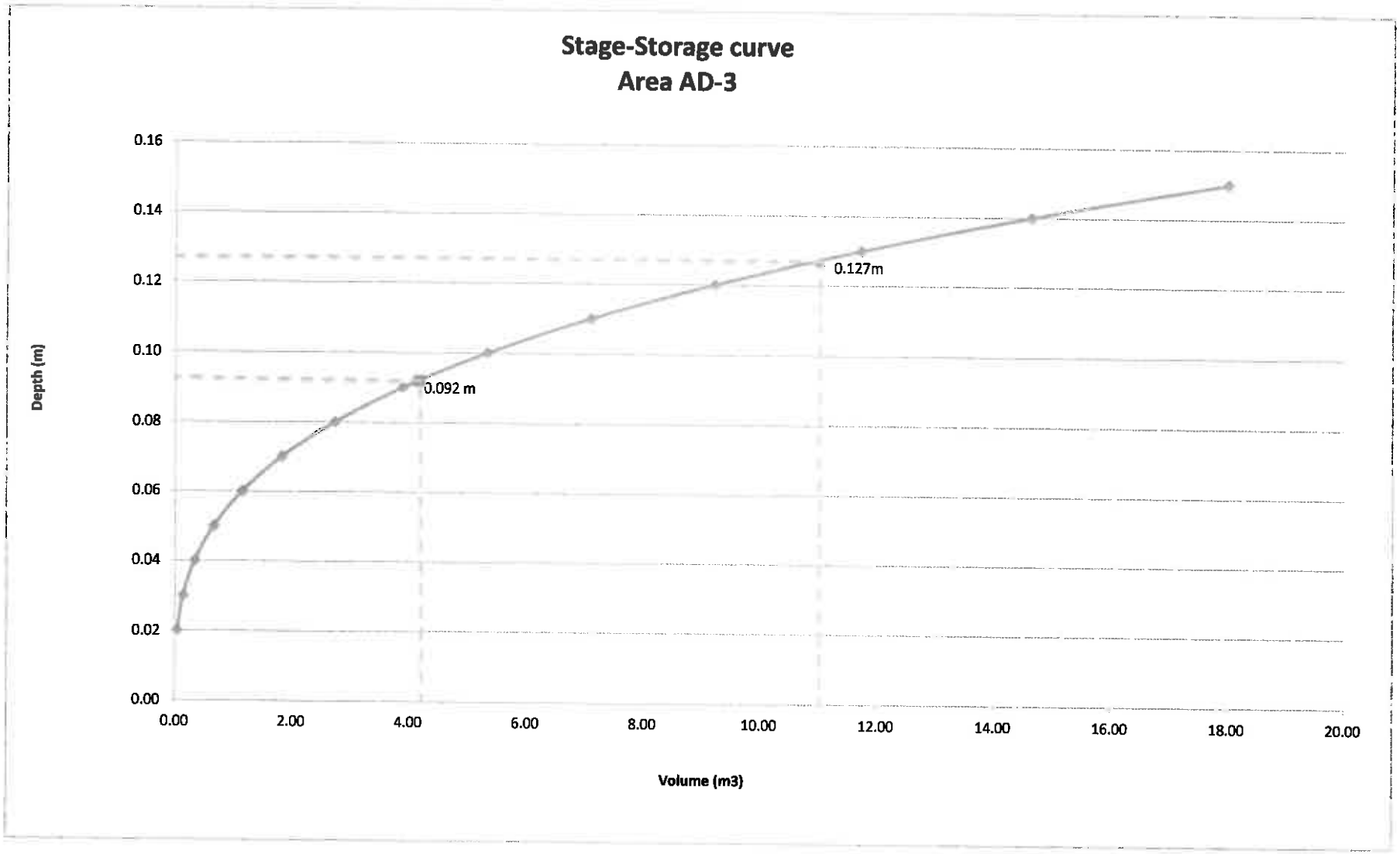
Ponding depth (1:100yr storm)

B m^2	V (factor)	V m^3	H m
102	3.000	2.73	0.08
130	3.000	3.89	0.09
160	3.000	5.33	0.1
194	3.000	7.10	0.11
230	3.000	9.22	0.12
270	3.000	11.72	0.13
314	3.000	14.63	0.14
360	3.000	18.00	0.15

Linear interpolation

0.13	0.12	0.13	H =	0.127
11.72	9.22	11.72	11.01	

Qall 3.08

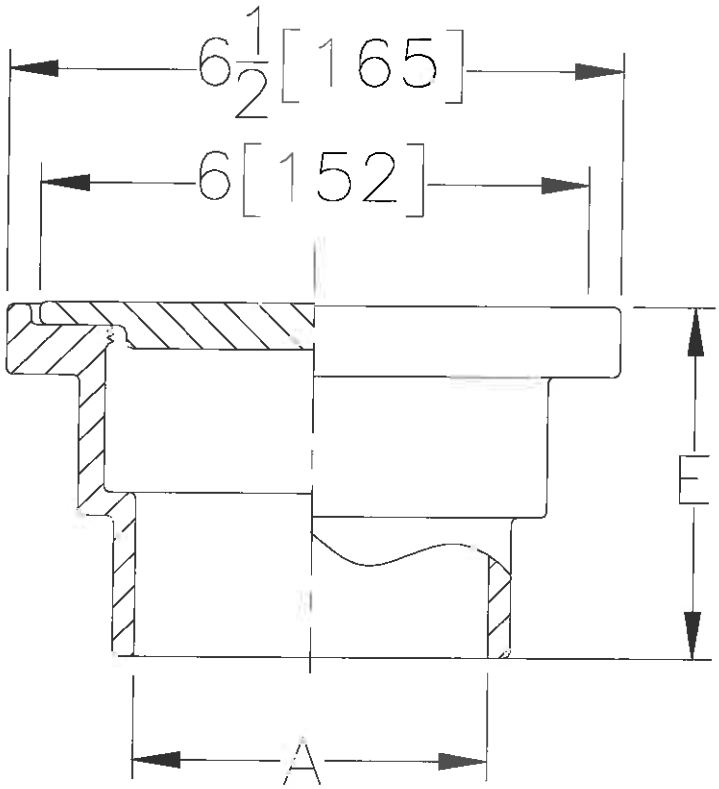

Stage-Storage curve
Area AD-3
Depth (m)
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.127m
0.092 m
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
20.00
Volume (m3)

Z-221
MEDIUM-DUTY FLOOR DRAIN

SPECIFICATION SHEET

TAG_____

Dimensional Data (inches and [mm]) are Subject to Manufacturing Tolerances and Change Without Notice



A Pipe Size Inches / [mm]	Approx. Wt. Lbs. / [kg]	Grate Open Area Sq. In. / [sq cm]
2 - 3 - 4 [51 - 76 - 102]	5 [2]	7 [45]

ENGINEERING SPECIFICATION: ZURN Z-221 Floor Drain, Dura-Coated cast iron body and grate.

OPTIONS (Check/specify appropriate options)

PIPE SIZE

2,3,4 [50,75,100]

(Specify size/type) **OUTLET**

____ NH No-Hub

E BODY HT. DIM.

3 3/4 [95]

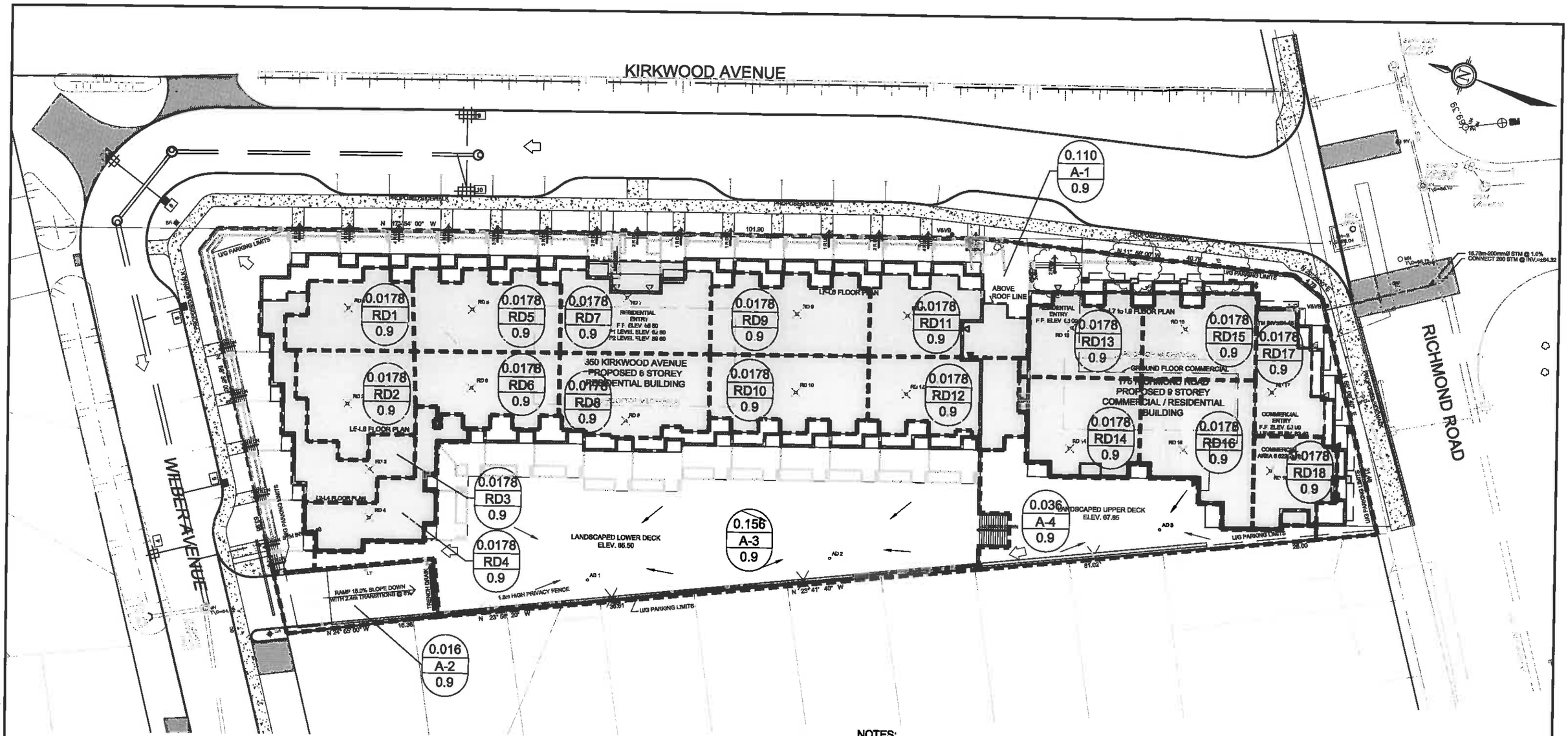
SUFFIXES

____ -G Galvanized Cast Iron
____ -P 1/2" [13] Trap Primer Connection
____ -VP Vandal-Proof Secured Top
____ -X Squeezin Backwater Valve
____ -Y Sediment Bucket

*REGULARLY FURNISHED UNLESS OTHERWISE SPECIFIED

REV.	DATE: 11/15/99	C.N. NO. 83329
DWG. NO. 63617	PRODUCT NO. Z-221	

ZURN INDUSTRIES LIMITED ♦ 3544 Nashua Drive ♦ Mississauga, Ontario L4V 1L2 ♦ Phone: 905/405-8272 Fax: 905/405-1292
In the U.S.: ZURN INDUSTRIES, INC. ♦ SPECIFICATION DRAINAGE OPERATION ♦ 1801 Pittsburgh Ave. ♦ Erie, PA 16514
Phone: 814/455-0921 ♦ Fax: 814/454-7929 ♦ World Wide Web: www.zurn.com



LEGEND

0.110 / A-1 / 0.9	DRAINAGE AREA(ha) / AREA NO. / RUN-OFF COEFFICENT
	STORM DRAINAGE AREA
RD 6	ROOF DRAIN
AD 1	AREA DRAIN
	MAJOR DRAINAGE

NOTES:

1) RD1 TO RD12 AND AD1 ARE TO BE DIRECTED TO THE 350 KIRKWOOD AVENUE STORM SERVICE.

2) RD13 TO RD18 AND AD2 ARE TO BE DIRECTED TO THE 175 RICHMOND ROAD STORM SERVICE.

PROPOSED BUILDINGS - ROOF & AREA DRAIN TABLE

ROOF DRAIN ID	ZURN SPECIFICATION	NOTCHES	POST-DEVELOPMENT CONDITIONS			
			1:5 YEAR EVENT		1:100 YEAR EVENT	
			FLOW (L/S)	DEPTH (m)	FLOW (L/S)	DEPTH (m)
RD 1 - 18	ZCF121-1W-X3-Z-105-10-77	1	0.42	0.113	0.54	0.145
AD 1 - 2	ZN-221-2NH-G-P-X-VP-Y		2.97	0.105	3.15	0.141
AD 3	ZN-221-2NH-G-P-X-VP-Y		2.90	0.092	3.08	0.122
TOTAL			16.40		19.10	

NOVATECH ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

1 : 500

CITY OF OTTAWA
175 RICHMOND ROAD & 350 KIRKWOOD AVENUE STORM WATER MANAGEMENT PLAN

SEPT. 2011 | 111130 | FIGURE 3

APPENDIX B

DETAILED SANITARY CALCULATIONS

SANITARY DESIGN SHEET
350 Kirkwood Avenue Development
WILBER AVENUE TO WEST NEPEAN COLLECTOR
JOB #111130

NOVATECH ENGINEERING CONSULTANTS LTD.

LOCATION			INDIVIDUAL AREA AND POPULATION				CUMULATIVE AREA & POPULATION			FLOWS INCLUDING OFFICE AREA						PROPOSED SEWER						
Street	From MH	To MH	Area (ha)	Occupancy Area: Residential Units	Occupancy Area: Population	Occupancy Area: Commercial	Area (ha)	Pop.	Office Area	Peak Factor (Res)	Peak Factor (Com)	Pop. Flow (L/s)	Infiltration Flow (L/s)	Commercial Flow * (L/s)	Total Flow (L/s)	Length (m)	Dia Act (mm)	Dia Nom (mm)	Slope (%)	Velocity (Full) (m/s)	Capacity (Full) (L/s)	Ratio Q/Qfull (%)
Wilber + 350 Kirkwood	107	103	1.01	149.00	279.4	0.00	1.00	279.4	0.00	4.00	1.50	4.53	0.28	0.00	4.81	95.0	228.6	225	0.40	0.72	29.6	16%
Clifton	105	103	1.05	14.00	47.6	0.00	1.05	47.6	0.00	4.00	1.50	0.77	0.29	0.00	1.07	77.8	228.6	225	0.55	0.85	34.7	3%
Clifton	103	101	0.73	10.00	34.0	0.00	2.78	361.0	0.00	4.00	1.50	5.85	0.78	0.00	6.63	80.0	228.6	225	0.76	0.99	40.8	16%
Clifton	101	28172	0.50	4.00	13.6	0.20	3.28	374.6	0.20	4.00	1.50	6.07	0.92	0.87	7.86	80.0	228.6	225	0.76	0.99	40.8	19%
Scott	28172	27607	0.89	0.00	0.0	0.57	4.17	374.6	0.77	4.00	1.50	6.07	1.17	3.34	10.58	132.0	228.6	225	0.40	0.72	29.6	36%
McRae	27604	27605	0.85	0.00	0.0	0.75	0.85	0.0	0.75	4.00	1.50	0.00	0.24	3.27	3.50	90.8	228.6	225	1.40	1.35	55.4	6%
McRae	27605	27606	1.18	0.00	0.0	1.07	2.03	0.0	1.82	4.00	1.50	0.00	0.57	7.92	8.49	82.9	228.6	225	1.60	1.44	59.2	14%
McRae	27606	27607	0.12	0.00	0.0	0.07	2.15	0.0	1.90	4.00	1.50	0.00	0.60	8.24	8.84	100.0	228.6	225	0.40	0.72	29.6	30%
Scott	27607	27602	0.27	0.00	0.0	0.13	6.59	374.6	2.80	4.00	1.50	6.07	1.85	12.13	20.05	60.0	228.6	225	0.40	0.72	29.6	68%

DESIGN PARAMETERS

Population Density =	3.4 person/unit	Infiltration Flow =	0.28 L/s/ha
Commercial Average Flow =	5 L/m^2/day		
Residential Average Flow =	350 L/person/day	Manning's n=	0.013

Peak factor based on Harmon Equation = 1+(14/4+Pop/1000)^1/2)*1 - (Maximum of 4.0)

Notes:

* Commercial flows calculated assuming 5 storey building (5 floors * 5L/m^2/day)

** Length taken as per mapping

Project: Richmond Road / Kirkwood Avenue Development
175 Richmond Road / 350 Kirkwood Avenue

Client: Claridge Homes

Date: October 5, 2011
All flows taken from the Ottawa Sewer Design Guide Figure 4.3

Designed: DAS

Checked: BHB

Dwg. Reference: 111130-SAN

TRANSIT WAY

TRANSIT WAY

WEST NEPEAN COLLECTOR
(1500mmX1500mm)

SAN 375mmØ

SAN
225mmØ

SAN
225mmØ

SCOTT STREET

SCOTT STREET

MHSA
27602

MHSA
27607

MHSA
28172

0.27
COMMERCIAL

0.89
COMMERCIAL

0.12
COMMERCIAL

MHSA
27606

SAN
225mmØ

SAN
225mmØ

0.50
4 | 10.8

MHSA
101

CLIFTON ROAD

TWEEDSMUIR ROAD

McRAE AVENUE

SAN
225mmØ

1.18
COMMERCIAL

0.73
8 | 21.2

SAN
225mmØ

MHSA
107

MHSA
103

SAN
225mmØ

WILBER STREET

1.00
14.9 | 27.4

MHSA
27605

0.85
COMMERCIAL

SAN
225mmØ

SAN
225mmØ

350
KIRKWOOD
AVENUE
(SITE
LOCATION)

CLIFTON ROAD

1.05
14 | 47.3

KIRKWOOD AVENUE

WINONA AVENUE

ATHLONE ROAD

SAN
225mmØ

McRAE AVENUE

MHSA
27604

MHSA
105

RICHMOND ROAD

RICHMOND ROAD

LEGEND

0.317 / 139-137 / 4 | 10.8	DRAINAGE AREA (hectares); DRAINAGE AREA NUMBER; MANHOLE TO MANHOLE; RUN–OFF COEFFICIENT
MH 100	SANITARY DRAINAGE AREA; EXISTING SANITARY SEWER AND MANHOLE; DIRECTION OF FLOW

NOVATECH
ENGINEERING CONSULTANTS LTD.
ENGINEERS & PLANNERS
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada
K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Email: novainfo@novatech-eng.com

1 : 2000

CITY OF OTTAWA
175 RICHMOND ROAD
EXISTING SANITARY DRAINAGE PLAN

SEPT. 2011 | 111130 | FIGURE 4

M:\2011\11\111130\CAD\Design\Figures\111130-FIG4a.dwg, FIG4, Oct 06, 2011 - 3:08pm, dsmith

APPENDIX C

HYDRANT FLOW DATA

Sam Bahia

From: Crowder, Murray [Murray.Crowder@ottawa.ca]
Sent: Wednesday, September 28, 2011 2:05 PM
To: s.bahia@novatech-eng.com
Subject: RE: 175 Richmond Rd
Attachments: Richmond & Clifton.pdf

Note: the computed flows are approximate and performed for hydrant colour coding purposes, thus these values are not intended for design purposes.

Ref# 6081

Sam Bahia
Company: Novatech Engineering Consultants Ltd.
Tel: 254-9643
Fax: 254-5867
Location: Richmond @ Clifton
Request_dt: 11-09-28-13:54:28
Email: s.bahia@novatech-eng.com

Inspection Date	Flow Hydrant	Residual Hydrant	Pressure (psi) Static	Dynamic	Pitot	Flow (igpm) actual	@ 20 psi
2011/06/15	6228085	6228084	68	>60	20	626	1648
2011/06/15	6228086	6228085	68	48	22	657	1054
2011/06/13	6228087	6228120	68	>60	44	929	2445
2011/06/13	6228120	6228093	66	>58	52	1010	2597
2011/06/13	6228093	6228124	62	>54	50	990	2425

Murray Crowder
Technical Support
Drinking Water Operations Branch
Environmental Services Department
City of Ottawa
951 Clyde Avenue, Ottawa, On K1Z 5A6
Mail Code 06-65
Tel: (613) 580-2424 x 22231
Fax: (613) 728-4183
e-mail: murray.crowder@ottawa.ca

From: Sam Bahia [mailto:s.bahia@novatech-eng.com]
Sent: September 28, 2011 10:31 AM
To: Crowder, Murray
Subject: 175 Richmond Rd

Hi Murray,

Could you please provide the hydrant flow data for hydrants shown at (Clifton Ave @ Wilber Ave),(Kirkwood Ave. @ Richmond Rd.) and (Clifton Ave @ Richmond Rd).
Located in map 362-028, H085, H093. Please note that the map reference I have is out of date, and there may be some new hydrant numbers.

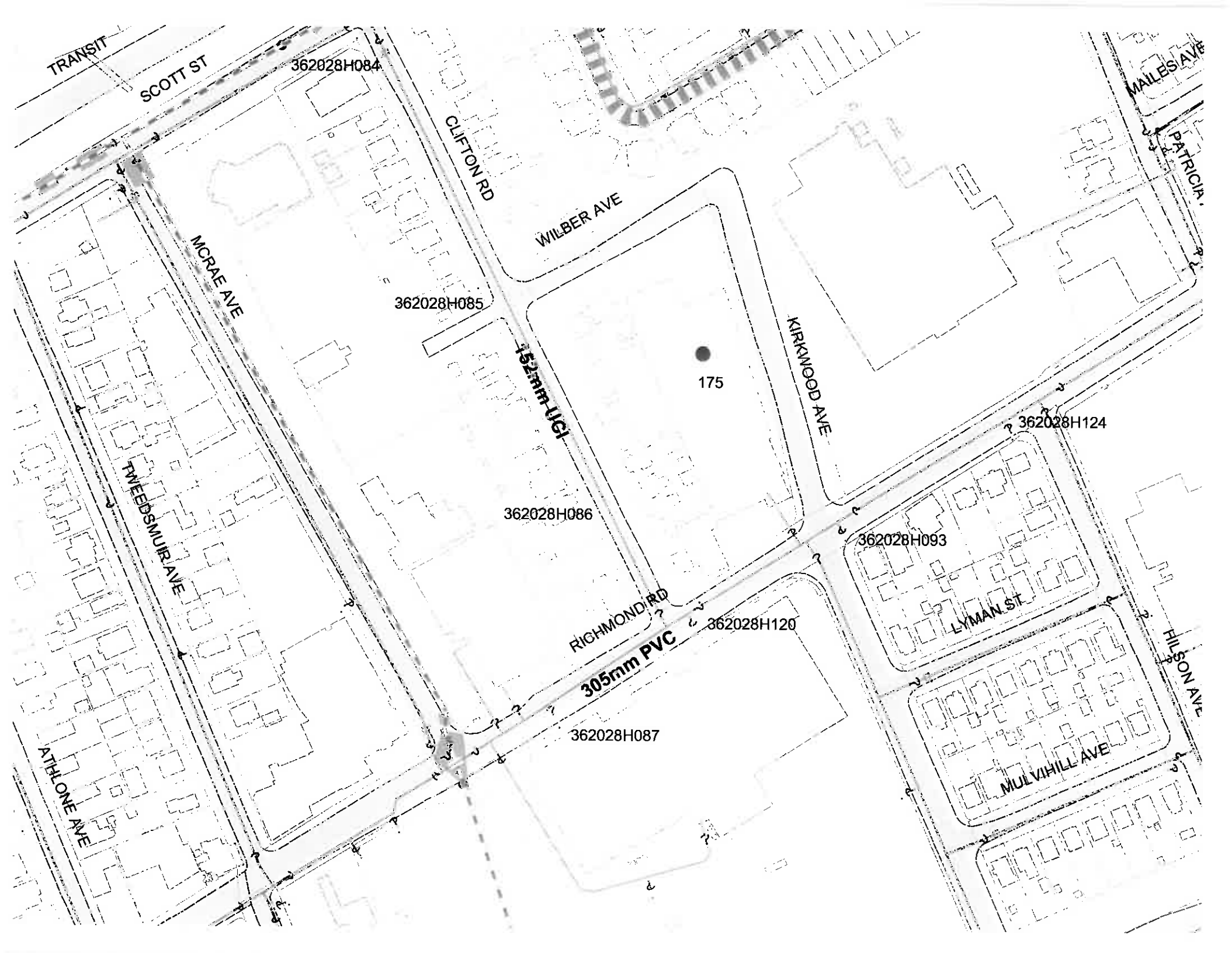
I am attaching a key plan showing hydrant locations in red and ex. watermain in purple.

This would be much appreciated

Thanks,

Sam Bahia
EIT

Novatech Engineering Consultants Ltd.
Suite 200 - 240 Michael Cowpland Drive
Ottawa, Ontario, K2M 1P6
Ph. (613)254-9643 ext. 285
Fax (613)254-5867


TRANSIT
SCOTT ST
362028H084
CLIFTON RD
WILBER AVE
MAILES AVE
PATRICIA
MCRAE AVE
362028H085
152mm UCI
175
KIRKWOOD AVE
362028H124
TWEEDSMUIR AVE
362028H086
362028H093
RICHMOND RD
362028H120
305mm PVC
LYMAN ST
HILSON AVE
362028H087
MULVIHILL AVE
ATHLONE AVE

APPENDIX D

DEVELOPMENT SERVICING STUDY CHECKLIST

NOVATECH
ENGINEERING
CONSULTANTS LTD.

Project Name: 175 Richmond Rd.
350 Kirkwood Ave.
Project Number:111130
Date: Oct. 13th 2011

Development Servicing Study Checklist

4.1 General Content	Addressed (Y/N/NA)	Section	Comments
Executive Summary (for larger reports only).	NA		
Date and revision number of the report.	Y	Cover	
Location map and plan showing municipal address, boundary, and layout of proposed development.	Y	Fig 1	
Plan showing the site and location of all existing services.	Y	Fig 2 / GP	
Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	NA		
Summary of Pre-consultation Meetings with City and other approval agencies.	NA		
Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	NA		
Statement of objectives and servicing criteria.	Y	1	
Identification of existing and proposed infrastructure available in the immediate area.	Y	3,4,5	
Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	NA		
Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighboring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	Y	GR	

Development Servicing Study Checklist

4.1 General Content	Addressed (Y/N/NA)	Section	Comments
Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	NA		
Proposed phasing of the development, if applicable.	NA		
Reference to geotechnical studies and recommendations concerning servicing.	Y	2	
All preliminary and formal site plan submissions should have the following information:			
Metric scale	Y		
North arrow (including construction North)	Y		
Key plan	Y		
Name and contact information of applicant and property owner	Y		
Property limits including bearings and	Y		
Existing and proposed structures and parking	Y		
Easements, road widening and rights-of-way	Y		
Adjacent street names	Y		

Development Servicing Study Checklist

4.2 Water	Addressed (Y/N/NA)	Section	Comments
Confirm consistency with Master Servicing Study, if available.	NA		
Availability of public infrastructure to service proposed development.	Y	5	
Identification of system constraints.			
Identify boundary conditions.			
Confirmation of adequate domestic supply and pressure.			
Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Y	5 /Appendix C	
Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.			
Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design.	NA		
Address reliability requirements such as appropriate location of shut-off valves.	Y	GP	
Check on the necessity of a pressure zone boundary modification.	NA		
Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range.	Y	5	
Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	Y	5/GP	
Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N		
Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Y	5	
Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.			

Development Servicing Study Checklist

4.3 Wastewater	Addressed (Y/N/NA)	Section	Comments
Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed	Y	4	
Confirm consistency with Master Servicing Study and/or justifications for deviations.	N		
Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N		
Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Y	4	
Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	Y	4, Appendix B	
Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	N		
Description of proposed sewer network including sewers, pumping stations, and forcemains.	Y	4	
Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	NA		
Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	NA		
Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N		
Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	NA		
Special considerations such as contamination, corrosive environment etc.	NA		

Development Servicing Study Checklist

4.4 Stormwater	Addressed (Y/N/NA)	Section	Comments
Description of drainage outlets and downstream constraints including legality of outlet (i.e. municipal drain, right-of-way, watercourse, or private property).	Y	3	
Analysis of the available capacity in existing public infrastructure.			
A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns and proposed drainage patterns.	Y	Fig. 3 / GR	
Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	N		
Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Y	3	
Description of stormwater management concept with facility locations and descriptions with references and supporting information.	Y	3	
Set-back from private sewage disposal systems.	NA		
Watercourse and hazard lands setbacks.	NA		
Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	NA		
Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	NA		
Storage requirements (complete with calcs) and conveyance capacity for 5 yr and 100 yr events.	Y	3 / Appendix A	
Identification of watercourse within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	NA		
Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Y	3	
Any proposed diversion of drainage catchment areas from one outlet to another.	NA		
Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and SWM	Y	3	
If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	NA		

Development Servicing Study Checklist

4.4 Stormwater	Addressed (Y/N/NA)	Section	Comments
Identification of municipal drains and related approval requirements.	Y	GP	
Description of how the conveyance and storage capacity will be achieved for the development.	Y	3	
100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	y	GR	
Inclusion of hydraulic analysis including HGL elevations.	NA		
Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Y	3 , 4	
Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	NA		
Identification of fill constrains related to floodplain and geotechnical investigation.	NA		

Development Servicing Study Checklist

4.5 Approval and Permit Requirements	Addressed (Y/N/NA)	Section	Comments
Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	NA		
Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	NA		
Changes to Municipal Drains.	NA		
Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	NA		

4.6 Conclusion	Addressed (Y/N/NA)	Section	Comments
Clearly stated conclusions and recommendations.	Y	6	
Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	NA		
All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario.	Y	6	

ATTACHED PLANS