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SERVICING DESIGN AND STORMWATER MANAGEMENT BRIEF
Senhor Santo Cristo Parish
1100 Kenaston Street
Ottawa, Ontario

Prepared For:

Senhor Santo Cristo Parish
(Mr. Jose Vaz)
1100 Kenaston Street
Ottawa, Ontario

PROJECT #: 160749

DISTRIBUTION
6 copies – City of Ottawa
2 copies – Senhor Santo Cristo Parish
1 copy – Kollaard Associates Inc.

Rev 0 – Issued for Zoning By-law Amendment Application November 8, 2016

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1 INTRODUCTION

Kollaard Associates was retained by Senhor Santo Cristo Parish (Mr. Jose Vaz) to complete a Site Servicing and Stormwater Management Report for the proposed residential addition to the existing Senhor Santo Cristo Parish church at 1100 Kenaston Street, Ottawa, Ontario.

This report will address the serviceability of the proposed addition, specifically relating to the adequacy of the existing municipal storm infrastructure, sanitary sewer, and watermains to hydraulically convey the necessary storm runoff, sanitary sewage and water demands that will be placed on the existing system as a result of the proposed addition. The report shall also summarize the stormwater management (SWM) design requirements and proposed works that will address stormwater flows arising from the site under post-development conditions and will identify any stormwater servicing concerns and also describe any measures to be taken during construction to minimize erosion and sedimentation.

The development being proposed Senhor Santo Cristo Parish will consist of the construction of a two storey residential addition to the existing church. The site is located on the south side of Kenaston Street between Michael Street and Algoma Road within the City of Ottawa.

The site has a total area of 2 hectares that is currently occupied by an existing church serviced by an asphalt park lot surrounding the church within the north side of the property. There is an existing driveway on the west side of the property to an existing building on the south side. All remaining areas are grass, landscaped area. The proposed two storey residential addition is to be constructed on the southwest side of the existing church. The addition is also to include a garage that will be accessed from the existing parking lot.

In general, the stormwater management works for the portion of the proposed addition consist of controlled parking lot drainage towards an existing catch basin that outlets to the existing 300mm diameter storm sewer on Kenaston Street.

2 STORMWATER MANAGEMENT CONSIDERATION

2.1 Stormwater Management Design Criteria

Design of the proposed stormwater management works was completed in conformance with the City of Ottawa Design Guidelines (October 2012) and the Ministry of Environment Stormwater Management Planning and Design Manual (MOE Manual).

Stormwater management for the site was considered with respect to the following SWM design criteria:

- Post-development peak runoff rates will be restricted to less than or equal to the pre-development peak runoff rate for all storms up to and including the 100 year storm event

- The proposed development should not negatively impact the quality of the runoff exiting the site and entering the existing 300mm diameter storm sewer.

2.2 Stormwater Quantity Control

Peak Flow for runoff quantities for the Pre-Development and Post-Development stages of the project were calculated using the rational method. The rational method is a common and straightforward calculation, which assumes that the entire drainage area is subject to uniformly distributed rainfall. The formula is:

$$Q = \frac{CiA}{360}$$

Where
Q is the Peak runoff measured in ***m^3/s***
C is the Runoff Coefficient, **Dimensionless**
A is the runoff area in ***hectares***
i is the storm intensity measure in ***mm/hr***

All values for intensity, i, for this project were derived from IDF curves provided by the City of Ottawa for data collected at the Ottawa International airport. For this project two return periods were considered, 5 and 100-year events. The formulae for each are:

5-Year Event

$$i = \frac{998.071}{(t_c + 6.053)^{0.814}}$$

100-Year Event

$$i = \frac{1735.071}{(t_c + 6.014)^{0.82}}$$

where t_c is time of concentration

2.2.1 Pre-Development Site Conditions

As previously stated, the proposed development location is south at the southwest side of the existing church at 1100 Kenaston Street in the City of Ottawa, Ontario. The development area has a total area of about of 340 square metres all of which is to be located within the asphalt surfaced parking area of the existing development. As such the existing predevelopment area is completely impervious resulting in a runoff coefficient of 0.9 for a 5 year storm event and 1.0 for a 100 year storm event.

2.2.2 Runoff Coefficients

Runoff coefficients for impervious surfaces (roofs, asphalt, and concrete) were taken as 0.90, whereas pervious surfaces (grass) were taken as 0.30.

A 25% increase for the post development 100-year runoff coefficients was used as per City of Ottawa guidelines. Refer to Appendix A1 for pre-development and post development runoff coefficients.

2.2.3 Controlled and Uncontrolled Areas

For the purposes of this storm water management design, the site is considered to be entirely within the controlled area of the existing development. No additional controls are proposed as part of the proposed development at the site. The proposed development will not result in the redirection of the runoff from any surface to an area outside of the controlled area of the existing development.

2.2.4 Impervious Ratio

The impervious ratio for the developed portion of the site is equal the total impervious area divided by the total developed area. As previously indicated, the existing development area is almost completely impervious resulting in an impervious ratio of 0.99.

The proposed development will consist of an about 190 square metre addition, with 150 square metres of asphaltic parking and sidewalk area.

2.2.5 Allowable Release Rate

Based on the stormwater management criteria, the allowable release rate for each storm event is equal to the pre-development release rate for that storm event.

The pre-development flow rates were calculated assuming a time of concentration of 10 minutes based on the existing development conditions. A time of concentration of 10 minutes yields an intensity of 104.19 mm/hr, and 178.56 mm/hr for the 5 year, and 100 year return periods, respectively.

Using the Rational Method the pre-development flow rates are as follows:

5 year = 0.9 x 104.19 x 0.034 / 360 = 0.0089 m^3/s

100 year = 1.0 x 178.56 x 0.034 / 360 = 0.0169 m^3/s

Since the entire site is within the controlled area of the existing development, there is no uncontrolled area. As such, the allowable release rate from the site is equal to the pre-development flow rate.

Calculations are provided in Appendix A.

2.2.6 Post Development Flow Rate

The post-development flow rates were calculated assuming a time of concentration of 10 minutes based on the proposed development conditions. A time of concentration of 10 minutes yields an intensity of 104.19 mm/hr, and 178.56 mm/hr for the 5 year, and 100 year return periods, respectively.

Run-off from the roof areas will be directed via down spouts onto a stone splash pad beside the sidewalk area. The gravel pad will disperse the concentrated flow from the roof drain over the ground surface and direct the roof runoff onto the existing parking area.

Using the Rational Method the post-development flow rates are as follows:

5 year = 0.9 x 104.19 x 0.034 / 360 = 0.0089 m^3/s

100 year = 1.0 x 178.56 x 0.034 / 360 = 0.0169 m^3/s

Since the calculated post-development flow rates are equal to the pre-development flow rates the proposed development will not result in an increase in the quantity of the stormwater runoff from the site when compared to the existing development.

3 SANITARY SEWER DESIGN

The 150mm diameter sanitary service lateral for the existing development is connected to the 250 mm diameter sewer on Kenaston Street. Proposed sewage discharges will be domestic in type and in compliance with the City of Ottawa Sewer Use By-law. The anticipated peak sanitary flow from the proposed addition will be 0.055 L/s. This represents about 0.16 percent of the capacity of the sanitary sewer along Kenaston Street. As such there is sufficient capacity for the proposed addition.

3.1 Existing Sanitary Flow Demand

The sanitary sewage flow for the existing building was calculated based on the Ontario Building Code.

Commercial Sewage Design Flow Calculation (As per O.B.C. 8.2.1.3)

Use: Church (with Kitchen)

# of Seats	Volume/per Seat	Flow (Litres / day)
260	36	9360

= 0.108 Litres/second

Peaking Factor = (commercial/institutional) = 1.5

Q_{Peak} = 0.108 L/sec x 1.5 = 0.163 L/sec

3.2 Proposed Addition Sanitary Flow Demand

The sanitary sewage flow for the proposed addition was calculated based on the Ontario Building Code.

Residential Sewage Design Flow Calculation

Total domestic pop:
Single Family Dwelling : 3.4ppu

$Q_{Domestic}$ = 3.4 x 350 L/person/day x (1/86,400 sec/day) = 0.014 L/sec

$$\text{Peaking Factor} = 1 + \frac{14}{4 + (4/1000)^{0.5}} = 4.45 \text{ *use 4 maximum}$$

$Q_{Peak\ Domestic}$ = 0.014 L/sec x 4.0 = **0.055 L/sec**

3.3 Infiltration and Total Flow from Site

Q Infiltration = 0. 28 L/ha/sec x 2.0ha = 0.56 L/sec

Total Peak Sanitary Flow = 0.163 + 0.055 + 0.560 = 0.778 L/sec

3.4 Sanitary Service Laterals

The Ontario Building Code specifies minimum pipe size and maximum hydraulic loading for sanitary sewer pipe. OBC 7.4.10.8 (2) states "Horizontal sanitary drainage pipe shall be designed to carry no more than 65% of its full capacity." The maximum peak sanitary flows for the site are 0.778 L/sec. The capacity of the existing 150 mm diameter PVC Sanitary Service at a slope of 1 percent is 15.24 L/sec. Since 0.778 L/sec is much less than 9.91 (0.65 x 15.24), the sanitary service is properly sized.

Table 3.4.1 Fixture Unit Consideration

Floor Level	Fixture Type	Number of Fixtures	Hydraulic Load	Total Hydraulic Load
Basement – Church	Water Closet	8	4	32
	Bathroom Sink	8	1.5	12
	Urinal	2	2	4
	Kitchen Sink	1	1.5	1.5
	Dishwasher	1	3	3
	Bar Sink	1	1.5	1.5
Main Floor – Church	Water Closet	2	4	8
	Bathroom Sink	2	1.5	3
	Bar Sink	1	1.5	1.5
Main Floor – Residence	Kitchen Sink	1	1.5	1.5
	Dishwasher	1	1.5	1.5
	Water Closet	1	4	4
	Bathroom Sink	1	1.5	1.5
2nd Floor – Residence	Bathroom Group	1	6	6
	Clothes Washer	1	1.5	1.5
			Total Hydraulic Load:	82.5

In addition, from Table 7.4.10.8, the allowable number of fixture units for a 150 mm diameter sanitary service pipe is 600. There are approximately 83 fixtures in the building. As such the existing 150 mm diameter sanitary service is adequate for the proposed sanitary flow.

4 WATERMAIN DESIGN

4.1 Water Demand

The existing building is serviced by a 50 mm diameter water service. The service connects to the existing water main along Kenaston Street.

The water demand for the proposed addition is anticipated to be equal to the sanitary flow.

From above, the average daily water demand would be 0.108 L/sec + 0.014 L/sec= 0.122 L/sec.

Maximum daily demand is 2.5 x 0.122 l/sec = 0.305 l/sec.

Maximum Hourly demand is = 2.2 x 0.305l/sec = 0.672 l/sec.

The above calculated water demand and Fire Fighting Requirement (attached in Appendix B) were provided to the City of Ottawa for boundary conditions.

4.2 Available Pressure

The following boundary conditions were provided by the City of Ottawa:

The following are boundary conditions, HGL, for hydraulic analysis at 1100 Kenaston (zone 1E) assumed to be connected to the 203mm on Kenaston (see attached PDF for location).

Minimum HGL = 109.5m

Maximum HGL = 118.3m

MaxDay (0.31L/s) + FireFlow (233 L/s) = 86.5m

The service being proposed for the development is 50mm in diameter. Using the above minimum HGL, a 50 mm service diameter would result in a residual pressure of about 323 kPa (47 psi) on the second floor of the proposed residential addition.

The residual pressure during fire fighting at the street is 184 kPa (27psi) which is above the minimum 150 kPa (20 psi) that is required for fire fighting.

Boundary conditions are provided in Appendix B.

5 EROSION AND SEDIMENT CONTROL

The owner (and/or contractor) agrees to prepare and implement an erosion and sediment control plan at least equal to the stated minimum requirements and to the satisfaction of the City of Ottawa, appropriate to the site conditions, prior to undertaking any site alterations (filling, grading, removal of vegetation, etc.) and during all phases of site preparation and

construction in accordance with the current best management practices for erosion and sediment control. It is considered to be the owners and/or contractors responsibility to ensure that the erosion control measures are implemented and maintained.

In order to limit the amount of sediment carried in stormwater runoff from the site during construction, it is recommended to install a silt fence along the property, as shown in Kollaard Associates Inc. Drawing #140749 - 1 Proposed Site Grading Plan. The silt fence may be polypropylene, nylon, and polyester or ethylene yarn.

If a standard filter fabric is used, it must be backed by a wire fence supported on posts not greater than 2.0 m apart. Extra strength filter fabric may be used without a wire fence backing if posts are not greater than 1.0 m apart. Fabric joints should be lapped at least 150 mm (6") and stapled. The bottom edge of the filter fabric should be anchored in a 300 mm (1 ft) deep trench, to prevent flow under the fence. Sections of fence should be cleaned, if blocked with sediment and replaced if torn.

Filter cloths should be installed across existing storm manhole and catch basin lids. As well, filter cloths should be installed across the proposed catch basin and manhole lids immediately after the catch basins and manholes are placed. The filter cloths should only be removed once the asphaltic concrete is installed and the site is cleaned.

The exposed landscaped areas of the site should be mulched and seeded with a rapid growing grass mixture or sodded as soon as possible. The proposed asphaltic concrete surfaced areas should be surfaced as soon as possible.

The silt fences should only be removed once the site is stabilized and vegetation is established.

These measures will reduce the amount of sediment carried from the site during storm events that may occur during construction.

6 CONCLUSIONS

This report addresses the adequacy of the existing municipal storm and sanitary sewer system and watermains to service the proposed residential addition on Kenaston Street. Based on the analysis provided in this report, the conclusions are as follows:

The proposed development will result in no change in stormwater runoff from the existing conditions. The quality of the runoff will not be affected.

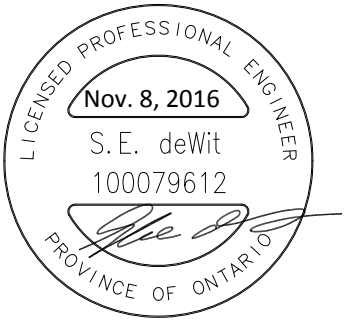
The peak sewage flow rate from the proposed addition will be 0.055 L/sec. The existing municipal sanitary sewer and service lateral should have adequate capacity to accommodate the minimal increase in peak flow.

The existing municipal watermain along Kenaston Street will have adequate capacity to service the proposed development.

During all construction activities, erosion and sedimentation shall be controlled.

We trust that this report provides sufficient information for your present purposes. If you have any questions concerning this report or if we can be of any further assistance to you on this project, please do not hesitate to contact our office.

Sincerely,
Kollaard Associates, Inc.



Steven deWit, P.Eng.

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Appendix A - Storm Design Information

- Allowable Controlled Area Release Rate

APPENDIX A1: STORMWATER MANAGEMENT MODEL

RATIONAL METHOD CALCULATION SHEET - ALLOWABLE CONTROLLED AREA RELEASE RATE

Client: Senhor Santo Cristo Parish
Job No.: 160749
Location: 1100 Kenaston Street
Ottawa, Ontario
Date: November 8, 2016

Design Criteria:

Pre-Development

Site Area	Total	0.0340	hectares
	Controlled	0.034	hectares
	Uncontrolled	0.000	hectares
Time of Concentration, (Pre) Tc 5,2 year =		10	minutes
Time of Concentration, (Pre) Tc 100 year =		10	minutes
Pre-Development C - 5,2 year =		0.90	
Pre-Development C - 100 year =		1.000	

Post-Development

Site Area	Total	0.000	hectares
	Controlled	0.034	hectares
	Uncontrolled	0.000	hectares
Post-Development C (Controlled) 5, 2 - year =		0.81	
Post-Development C (Uncontrolled) 5, 2 - year =		n/a	
Post-Development C (Controlled) 100-year =		0.91	
Post-Development C (Uncontrolled) 100-year =		n/a	
Time of Concentration, (Post) Tc 5, 25 year =		10	minutes
Time of Concentration, (Post) Tc 100 year =		10	minutes

5 YEAR STORM	I =	104.19	mm/hr	
CALCULATED OUTFLOW RESTRICTION =		0.0089	m^3/s	(note 1)
2 YEAR STORM	I =	76.81	mm/hr	
CALCULATED OUTFLOW RESTRICTION =		0.0065	m^3/s	(note 1)
100 YEAR STORM	I =	178.56	mm/hr	
CALCULATED OUTFLOW RESTRICTION =		0.0169	m^3/s	(note 1)

5 YEAR STORM RUNOFF EVENT ALLOWABLE CONTROLLED AREA RELEASE RATE CALCULATION

		PRE-DEVELOPMENT	POST-DEVELOPMENT			ALLOWABLE
RAINFALL	RAINFALL	PEAK	CONTROLLED	UNCONTROLLED	TOTAL	RELEASE RATE
DURATION	INTENSITY	RUNOFF	PEAK RUNOFF	PEAK RUNOFF	PEAK FLOW	
(min.)	(mm/hr)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	m^3/s
5	141.2	0.0120	0.0108	0.000	0.0108	0.0089
10	104.2	0.0089	0.0080	0.000	0.0080	0.0089
15	83.6	0.0071	0.0064	0.000	0.0064	0.0089
20	70.3	0.0060	0.0054	0.000	0.0054	0.0089
30	53.9	0.0046	0.0041	0.000	0.0041	0.0089
40	44.2	0.0038	0.0034	0.000	0.0034	0.0089
60	32.9	0.0028	0.0025	0.000	0.0025	0.0089

Allowable release rate from the controlled area of the site for a 5 year storm event based on a post-development Time of concentration of 10 minutes is **0.0089 m^3/s** (note 2)

2 YEAR STORM RUNOFF EVENT ALLOWABLE CONTROLLED AREA RELEASE RATE CALCULATION

		PRE-DEVELOPMENT	POST-DEVELOPMENT			ALLOWABLE
RAINFALL	RAINFALL	PEAK	CONTROLLED	UNCONTROLLED	TOTAL	RELEASE RATE
DURATION	INTENSITY	RUNOFF	PEAK RUNOFF	PEAK RUNOFF	PEAK FLOW	
(min.)	(mm/hr)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	m^3/s
5	103.6	0.0088	0.008	0.000	0.0079	0.0065
10	76.8	0.0065	0.006	0.000	0.0059	0.0065
15	61.8	0.0053	0.005	0.000	0.0047	0.0065
20	52.0	0.0044	0.004	0.000	0.0040	0.0065
30	40.0	0.0034	0.003	0.000	0.0031	0.0065
40	32.9	0.0028	0.003	0.000	0.0025	0.0065
60	24.6	0.0021	0.002	0.000	0.0019	0.0065

Allowable release rate from the controlled area of the site for a 5 year storm event based on a post-development Time of concentration of 10 minutes is **0.0065 m^3/s** (note 2)

100 YEAR STORM RUNOFF EVENT ALLOWABLE CONTROLLED AREA RELEASE RATE CALCULATION

		PRE-DEVELOPMENT	POST-DEVELOPMENT			ALLOWABLE
RAINFALL	RAINFALL	PEAK	CONTROLLED	UNCONTROLLED	TOTAL	RELEASE RATE
DURATION	INTENSITY	RUNOFF	PEAK RUNOFF	PEAK RUNOFF	PEAK FLOW	
(min.)	(mm/hr)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	m^3/s
5	242.7	0.023	0.0208	0.000	0.0208	0.0169
10	178.6	0.017	0.0153	0.000	0.0153	0.0169
15	142.9	0.013	0.0122	0.000	0.0122	0.0169
20	120.0	0.011	0.0103	0.000	0.0103	0.0169
30	91.9	0.009	0.0079	0.000	0.0079	0.0169
40	75.2	0.007	0.0064	0.000	0.0064	0.0169
60	55.9	0.005	0.0048	0.000	0.0048	0.0169

Allowable release rate from the controlled area of the site for a 100 year storm event based on a post-development Time of concentration of 10 minutes is **0.0169 m^3/s** (note 2)

Note 1 Calculated outflow restriction is equal to the pre-development runoff rate at the designated time of concentration for the catchment
Note 2 Allowable release rate is obtained from column 8 for the indicated time of concentration for post development conditions.

Appendix B – Watermain Servicing

- Fire Flow Requirements
- Boundary Conditions

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CALCULATION OF FIRE FLOW REQURIEMENTS

Calculation Based on Fire Underwriters Survey, 1999

1) An estimate of the Fire Flow required for a given fire area may be estimated by:

$$F = 220 \times C \times \sqrt{A}$$

where F = required fire flow in litres per minute

A = total floor area in m^2 (including all storeys, but excluding basements at least 50% below grade)

C = coefficient related to the type of construction:

1.5	for wood construction (structure essentially combustible)
1.0	for ordinary construction (brick or other masonry walls, combustible floor and interior)
0.8	for noncombustible construction (unprotected metal structural components, masonary or metal walls)
0.6	for fire-resistive construction (fully protected frame, floors, roof)

No. of Floor = 3

Area / Floor = 1200 m^2

A = 3600 m^2

C = 1.0

F = 13,200 L/min ----------> Rounded to nearest 1000 = **13,000** L/min

2) The value obtained in 1. may be reduced by as much as 25% for occupancies having a low

Non-combustible =	-25%
Limited Combustible =	-15%
Combustible =	0%
Free Burning =	15%
Rapid Burning =	25%

Reduction due to low occupancy hazard = -15% x 13,000 = = **11,050** L/min

3) The value above my be reduced by up to 50% for automatic sprinlker system

Reduction due to automatic sprinker system = 0% x 11,050 = **11,050**

4) The value obtained in 2. may be increased for structures exposed within 45 metres by the fire

Separation (metres)	Condtion	Charge
0m to 3.0m	1	25%
3.1m to 10.0m	2	20%
10.1m to 20.0m	3	15%
20.1m to 30.0m	4	10%
30.1m to 45.0m	5	5%
45.1m to	6	0%

	Exposures	Distance(m)	Condtion		Charge
e	Side 1	21.6	4	-------->	10%
w	Side 2	34.6	5	-------->	5%
n	Front	16.1	3	-------->	15%
s	Back	173.9	6	-------->	0%
					30%

Increase due to separation = 30% x 11,050 = **3,315** L/min

The fire flow requirement is = **11,050**

Increase due to Separation = 3,315

14,365 Rounded: 14,000

or **239.4** **L/sec** **233.3**

Nicole Rajnovich

From: Rostami, Babak [Babak.Rostami@ottawa.ca]
Sent: November-02-16 1:46 PM
To: 'Nicole Rajnovich'
Subject: FW: 1100 Kenaston Street- Boundary Conditions
Attachments: 1100 Kenaston Oct 2016.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Nicole,

Please see response from our water modeling department.

The following are boundary conditions, HGL, for hydraulic analysis at 1100 Kenaston (zone 1E) assumed to be connected to the 203mm on Kenaston (see attached PDF for location).

Minimum HGL = 109.5m

Maximum HGL = 118.3m

MaxDay (0.31L/s) + FireFlow (233 L/s) = 86.5m

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.

Let us know if you have any question.

Regards,

Babak Rostami
Development Review, Urban Services Branch
Planning, Infrastructure and Economic Development
110 Laurier Ave. West, 4th Floor East,
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City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 27807
ottawa.ca/planning / ottawa.ca/urbanisme

From: Nicole Rajnovich [mailto:nicole@kollaard.ca]
Sent: October 25, 2016 1:11 PM
To: Rostami, Babak
Subject: RE: 1100 Kenaston Street - Boundary Conditions

Hello Babak,

We were retained to prepare a Servicing Brief for the proposed residential addition to the existing church at 1100 Kenaston Street. Could you kindly provide us with the Boundary conditions with the following information?

- Type of Development: Residential/commercial
- Location of service: 1100 Kenaston Street – see attached Key Plan
- Amount of fire flow required: See attached Fire Flow Requirements
- Average daily water demand = 0.122 l/sec
- Maximum daily demand = 0.305 l/sec.
- Maximum Hourly demand is = 0.672 l/sec.

Thank you and Best Regards,

Nicole Rajnovich

Nicole Rajnovich

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Boundary Condition for 1100 Kenaston