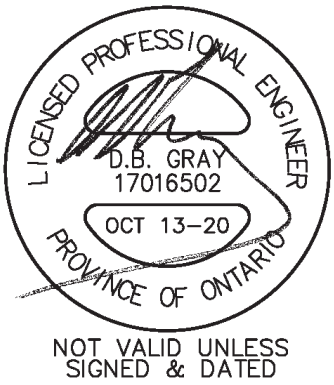
SERVICING BRIEF &
STORMWATER MANAGEMENT REPORT

Dunbar Court
Ottawa, Ontario

Report No. 19062

October 13, 2020



D.B. Gray Engineering Inc.

Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

700 Long Point Circle
Ottawa, Ontario K1T 4E9

613-425-8044
d.gray@dbgrayengineering.com

SERVICING FEASIBILITY REPORT
Dunbar Court
Ottawa, Ontario

This report describes the services and addresses the stormwater management requirements for the re-development Nepean Housing Corporation's existing community located at Dunbar Court which currently consists of 46 townhouse units. It is proposed that 4 townhouse units be demolished, and a 31-unit 3-storey apartment building be constructed.

This report forms part of the stormwater management design for the proposed development. Refer to drawings C-1 to C-9, also prepared by D. B. Gray Engineering Inc.

WATER SUPPLY FOR FIREFIGHTING:

There is a 150mm private watermain extending the full length of Dunbar Court, connecting to a 200mm municipal watermain in Bateman Drive and a 300mm watermain in an easement at the south end of the property adjacent to Gibbard Avenue. There are three existing private fire hydrants on the property. Two of the existing private fire hydrants are close to the proposed apartment building; about 23 m and 29 m unobstructed distances from the main entrance to the apartment building. Two new fire hydrants are proposed at the south end of the property connecting to Gibbard Avenue watermain and they will be about 47 m and 50 m unobstructed distances from the apartment building

The building will be wood-framed construction; a sprinkler system is not proposed. Based on this construction, a fire flow of 283.3 L/s (17,000 L/min) is required, as calculated as per the Fire Underwriter Survey "Water Supply For Fire Protection". The calculations were submitted to the City and boundary conditions were requested.

As per City of Ottawa Tech Bulletin ISTB-2018-02, the aggregate fire flow of all contributing fire hydrants within 150 m of the building can used to supply the required fire flow. The two new on-site hydrants will be a Class AA are within 75 m and can contribute 5,700 L/min (95 L/s) (as per Table 1 of ISTB-2018-02). That leaves 5,600 L/min, 2,800 L/min (46.7 L/s) each, to be supplied by the two closest existing private fire hydrants.

The boundary conditions received from the City (based on the City's computer model of the municipal water distribution system) includes the HGL (hydraulic grade line) of 119.0 m during a flow rate of 300 L/s at the Gibbard Avenue watermain and 124.0 m during a flow rate of 150 L/s at Bateman Drive watermain. This calculates to be 233 kPa (34 psi) at the two new hydrants. A model was created using EPANET software to analyze the

hydraulics of the existing 150mm private watermain serving the existing on-site fire hydrants. Using 46.7 L/s flowrate at each of the existing on-site fire hydrant, the pressure at the hydrants were calculated to be 197 kPa (28.6 psi) and 198 kPa (28.7 psi). Since the pressures at all new and existing hydrants will be above 138 kPa (20 psi) there is an adequate water supply for firefighting.

WATER SERVICE:

After the redevelopment 42 townhouse units will remain. The 31 apartment units will be comprised of 23 one-bedroom and 8 two-bedroom units. Based on the City of Ottawa Water Distribution Design Guidelines for residential properties (1.4 person per bachelor/one-bedroom unit; 2.1 persons per two-bedroom unit and 2.7 persons per townhouse unit; and 350 L/person/day) and Ministry of the Environment Design Guidelines for peaking factors the daily average flow is 0.7 L/s with a maximum daily and maximum hourly demand of 3.2 and 4.8 L/s, respectively.

To determine water pressure under these demands, boundary conditions, based on the City of Ottawa computer simulation of the water distribution system, at the subject location, are required. In summary, the requested the boundary conditions for the subject area were based on the following:

Average Daily Demand: 0.7 L/s.
Maximum Daily Demand: 3.2 L/s.
Maximum Hourly Demand: 4.8 L/s

Based on the boundary conditions received from the City, the minimum HGL (hydraulic grade line) is 127.0m and maximum is 134.2m. With these HGLs the static water pressure at the first floor of the proposed apartment building is calculated to vary from 302 kPa to 392 kPa (44 to 54 psi) which is on the low side of an acceptable range; a booster pump may be required for the domestic water supply.

Based on the AWWA water flow demand curve, and a water pressure at the meter of 338 kPa (49 psi), the peak demand for the building is expected to be 2.3 L/s (138 L/min / 36 USgpm). The AWWA method calculates the instantaneous demand and is used to size the water service. This peak demand will produce an acceptable velocity of 1.2 m/s in the proposed 50mm water service connection (up to 2.4 m/s is acceptable). The water service will connect to the existing 150 mm private watermain.

SANITARY SERVICE:

Dunbar Court is served by a private sanitary sewer system consisting of 250mm diameter sewer pipes, connecting to a 250mm municipal sanitary sewer in Bateman Drive.

Gabrielle Schaeffer (City of Ottawa Infrastructure Approvals) has stated there are no known issues with sanitary sewers in the area. However, she advised us to analyze the sewage load and capacity of the first sewer pipe segment downstream of Dunbar Court. This 250mm pipe segment, having a pipe slope of 0.50%, has a capacity of capacity of 43.9 L/s. The private sewer system is also analyzed and the last pipe segment has a capacity of 39.2 L/s (250mm at 0.40% slope).

With the existing conditions, in addition to the 46 townhouse units in Dunbar Court, upstream of the point of connection, there are 18 single family houses and a 60-unit apartment building. Based on the City of Ottawa Sewer Design Guidelines for residential properties these numbers of residential units represents a population of 124 in Dunbar Court and a total upstream population of 297 (3.4 persons per single family unit; 2.7 persons per townhouse unit and 1.4 persons per average apartment unit). Also based on the City's guidelines (280 L/person/day and a 3.2 peaking factor) the existing flows are calculated to be 1.69 L/s in the last private sewer pipe segment and 5.36 L/s in the first pipe segment downstream of Dunbar Court which means the existing sewage load is only 4% and 12% of the sewer capacities respectively.

With the proposed development (4 townhouse units demolished and a 31-unit 3-storey apartment building constructed) the population of Dunbar Court increases to 181 and the total upstream population increases to 354 (based on the City's guidelines) and the proposed flows are calculated to be 2.28 L/s in the last private sewer pipe segment and 5.95 L/s in the first pipe segment downstream of Dunbar Court. The proposed sewage load will be only 6% and 14% of the sewer capacities respectively and therefore the increase in sanitary flows is expected to have a negligible impact.

A 150mm sanitary sewer service connection will be required. Based on the City's guidelines the peak flow generated by the proposed apartment building is calculated to be 0.83 l/s. This flow will be adequately handled by the proposed sanitary sewer service (having a 15.9 L/s capacity).

STORMWATER MANAGEMENT:

Water Quality:

Comments from the Rideau Valley Conservation Authority (RVCA) are required but it is expected that since the majority of runoff will be from rooftop and landscaped areas, which is considered clean, it is expected that onsite water quality controls will be not be required. No permanent quality control measures are proposed.

An erosion and sediment control plan has been developed to be implemented during construction, (see drawing C-4 and notes 2.1 to 2.6 on drawing C-6). In summary: to filter out construction sediment capture filter sock inserts will be installed in all existing catch basins adjacent to the site; a silt fence barrier will be installed; and any material deposited on a public road shall be removed.

Water Quantity:

The stormwater management criteria for quantity control are, in the area being re-developed, to control the post development peak flows for the 5-year and 100-year storm events to peak flows during the 5-year storm event using a pre-development runoff coefficient or runoff coefficient of 0.50, whichever is less; and a calculated time of concentration (not less than 10 minutes). It is calculated that the pre-development conditions reflect a 5-year runoff coefficient of 0.42 and a time of concentration of 1.2 minutes. Therefore, based on runoff coefficient of 0.50, a 10 minute time of concentration; and using the Rational Method; the maximum allowable release rate is 17.61 L/s for all storm events. The runoff coefficients for the 100 year event are increased by 25% to maximum 1.00.

Stormwater will be stored within the development on the roof of the proposed building.

Drainage Area I
(Uncontrolled Flow Off Site – 668 sq.m.):
It would be difficult to control the runoff from the perimeter of the site so it will be allowed to flow uncontrolled off the site.

	100-year	5-year
Maximum flow rate:	25.60 L/s	13.30 L/s

Drainage Area II (Roof – 317 sq.m.):
Each of the three roof drains will be a flow control type which will restrict the flow and cause the storm water to pond on the roof. The flow control type roof drain shall be installed with a parabolic shaped slotted weir (1 slot per weir drain at 0.0124 l/s per mm per slot - 5 USgpm per inch per slot); the opening at top of flow control weir shall be a minimum 50 mm in diameter: Watts roof drain with a Watts Accutrol Weir RD-100-A1 or equal. The roof drain will be installed at the low point of the roof which will be 150mm lower than the perimeter of the roof. Six scuppers, each 385 mm wide and installed 150 mm above the roof drains, are required (refer to architectural for exact locations and details). The roof shall be designed to carry the load of water having a 50 mm depth at scupper and 200 mm depth at roof drain (refer to structural).

	100-year	5-year
The maximum release rate:	5.03 L/s	3.85 L/s
The maximum ponding depth:	135 mm	103 mm
The maximum stored volume:	27.88 cu.m.	12.44 cu.m.

The Entire Site:

	100-year	5-year
Pre-development flow rate:	34.93 L/s	17.61 L/s
Maximum allowable release rate:	17.61 L/s	17.61 L/s
Maximum release rate:	30.64 L/s	17.15 L/s

The uncontrolled flow is greater than the maximum allowable release rate; therefore, the criteria cannot be achieved during the 100-year event; however, it is about 12% less than pre-development conditions. For the 5-year storm event the maximum post-development release rate is calculated to be less than the maximum allowable

The unrestricted flowrate resulting from one in five-year storm event will produce a peak flow of 19.8 L/s which will be adequately served by the proposed storm sewer connection (150mm at 2% - 22.5 L/s capacity) being at 88% of its capacity. The restricted flowrate (due to the flow control roof drain) during a five-year storm event will produce a peak flow off the site of 3.85 L/s during the 5-year event.

The post development stormwater flows contributing to the municipal storm sewer system is expected to have a positive impact given that it is less than pre--development flows.

CONCLUSIONS:

1. There is an adequate water supply for firefighting from the municipal watermain.

2. The range of water pressures in the municipal watermain is on the low side of an acceptable range; a booster pump may be required for the domestic water supply.

3. The proposed water service connection is adequately sized to serve the development.

4. The expected sanitary sewage flow rate will be adequately handled by the proposed sanitary sewer service connection and private sanitary sewer.

5. The sanitary flow contributing to the existing municipal sanitary sewer is expected to have an acceptable impact.

6. The RVCA is not expected to require any quality protection and no permanent quality control measures are proposed.

7. An erosion and sediment control plan has been developed to be implemented during construction.

8. The stormwater management criteria for quantity control are, in the area being re-developed, to control the post development peak flows for the 5-year and 100-year storm events to peak flows during the 5-year storm event. It would be difficult to control the runoff from the perimeter of the site so it will be allowed to flow uncontrolled off the site. The uncontrolled flow is greater than the maximum allowable release rate; therefore, the criteria cannot be achieved during the 100-yeara event. However, it is about 12% less than pre-development conditions. For

the 5-year storm event the maximum post-development release rate is calculated to be less than the maximum allowable

9. The unrestricted flowrate resulting from one in five-year storm event will produce a peak flow of 19.8 L/s which will be adequately by the proposed storm sewer connection (150mm at 2% - 22.5 L/s capacity) being at 88% of its capacity. The restricted flowrate (due to the flow control roof drain) during a five-year storm event will produce a peak flow off the site of 3.85 L/s during the 5-year event.

10. The post development stormwater flows contributing to the municipal storm sewer system is expected to have a positive impact given that it is less than pre--development flows.

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700 Long Point Circle
Ottawa, Ontario K1T 4E9

613-425-8044
d.gray@dbgrayengieering.com

24-Jan-20
REVISED 08-Oct-20

Dunbar Court
Ottawa, Ontario

Fire Flow Requirements

Proposed 31-Unit 3-Storey Apartment Building (East of Firewall)

Fire flow requirement as calculated as per Fire Underwriter Survey "Water Supply For Fire Protection".

F = 220 C $A^{0.5}$ = the required fire flow in litres per minute

C = coefficient related to the type of construction
= 1.5 Wood Frame Construction

A = total floor area (all storeys excluding basements at least 50% below grade)

Proposed Building South	3rd Floor	519	sq.m.
	2nd Floor	519	sq.m.
	Ground Floor	519	sq.m.
	TOTAL FIRE AREA:	1557	sq.m.

F = 13,021 L/min
= 13,000 L/min (rounded off to the nearest 1,000 L/min)

-15% Charge for Combustible Occupancy

= 11,050 L/min

0% Reduction: No Sprinkler System

= - L/min

Increase for Separation Exposed Buildings

			Adjacent Building			Length-Height
			Constuction	Length m	Storeys	Factor
18%	North	3.1 to 10m	W-F	17	2	34
10%	East	20.1 to 30m	W-F	29	4	116
17%	South	3.1 to 10m	W-F	10	2	20
10%	West	FIREWALL				0
55%	Total Increase for Exposure (maximum 75%)					

= 6,078 L/min Increase

= 17,128 L/min
F = 17,000 L/min (rounded off to the nearest 1,000 L/min)
= 283.3 L/s

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25-Jan-20
REVISED 08-Oct-20

Dunbar Court
Ottawa, Ontario

Fire Flow Requirements

Proposed 31-Unit 3-Storey Apartment Building (West of Firewall)

Fire flow requirement as calculated as per Fire Underwriter Survey "Water Supply For Fire Protection".

$F = 220\ C\ A^{0.5}$ = the required fire flow in litres per minute

C = coefficient related to the type of construction
= 1.5 Wood Frame Construction

A = total floor area (all storeys excluding basements at least 50% below grade)

Proposed Building South	3rd Floor	278	sq.m.
	2nd Floor	278	sq.m.
	Ground Floor	278	sq.m.
	TOTAL FIRE AREA:	834	sq.m.

F = 9,530 L/min
= 10,000 L/min (rounded off to the nearest 1,000 L/min)

-15% Charge for Combustible Occupancy

= 8,500 L/min

0% Reduction: No Sprinkler System

= - L/min

Increase for Separation Exposed Buildings

			Adjacent Building			Length-Height
			Constuction	Length m	Storeys	Factor
12%	North	10.1 to 20m	W-F	13	2	26
10%	East	FIREWALL				0
12%	South	10.1 to 20m	W-F	10	2	20
12%	West	10.1 to 20m	W-F	14	2	28
46%	Total Increase for Exposure (maximum 75%)					

= 3,910 L/min Increase

= 12,410 L/min
F = 12,000 L/min (rounded off to the nearest 1,000 L/min)
= 200.0 l/s

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13-Apr-20
REVISED 08-Oct-20

Dunbar Court
Ottawa, Ontario

Water Demand

PROPOSED DEVELOPMENT
42 EXISTING TOWNHOUSE UNITS
+ 31-UNIT 3-STOREY APARTMENT BUILDING

	Number of Units	Persons Per Unit	Population
UNIT TYPE:			
Single Family:	0	3.4	0
Semi- detached:	0	2.7	0
Duplex:	0	2.3	0
Townhouse:	42	2.7	113
APARTMENTS:			
1 Bedroom:	23	1.4	32
2 Bedroom:	8	2.1	17
Average Apartment:	0	1.8	0
TOTAL:	73		162

DAILY AVERAGE

350 litres / person / day
39.5 l/min 0.7 l/s 10 USgpm

MAXIMUM DAILY DEMAND 4.8 (Peaking Factor for a population of 162: Table 3-3 MOE Design Guidelines for Drinking-Water Systems)
189.2 l/min 3.2 l/s 50 USgpm

MAXIMUM HOURLY DEMAND 7.2 (Peaking Factor for a population of 162 Table 3-3 MOE Design Guidelines for Drinking-Water Systems)
285.6 l/min 4.8 l/s 75 USgpm

Elevation of Water Meter: 96.04 m ASL
Finish Floor Elevation: 95.14 m ASL

			Static Pressure at Water Meter		
MINIMUM HGL:	127.0	m ASL	44	psi	304 kPa
MAXIMUM HGL:	134.2	m ASL	54	psi	374 kPa

D.B. Gray Engineering Inc.

Douglas Gray <d.gray@dbgrayengineering.com>

RE: Dunbar Court

1 message

Schaeffer, Gabrielle <gabrielle.schaeffer@ottawa.ca> Fri, May 1, 2020 at 9:16 AM
To: Douglas Gray <d.gray@dbgrayengineering.com>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>

Hi Doug,

I see your interpretation. I am fine with proceeding with your assessment.

Thanks,

Gabrielle

From: Douglas Gray <d.gray@dbgrayengineering.com>
Sent: May 01, 2020 7:59 AM
To: Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>
Subject: Re: Dunbar Court

Hi Gabrielle

Thank you for the boundary conditions.

With respect to peaking factors: You are correct if you are using Table 4.2 in the Ottawa Design Guidelines as modified by Technical Bulletin ISD-2010-2 (i.e The maximum hour daily demand is calculated using the peaking factor multiplied by the max. day demand, not the average day demand.)

However, Table 4.2 is for 501 to 3,000 persons and, as per the Ottawa Guidelines, Table 3-3 in the MOE Design Guidelines is to be used for peaking factors for 0 to 500 persons. The MOE Guidelines states that *"Table 3.1 provides peaking factors for use with average day demand …"*

Therefore our calculations are correct.

Regards, Doug

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Ottawa, Ontario K1T 4E9 d.gray@dbgrayengineering.com

On Tue, Apr 28, 2020 at 8:26 AM Schaeffer, Gabrielle <gabrielle.schaeffer@ottawa.ca> wrote:

> Hi Doug,
>
> I reviewed your calculations and noticed a small error: The maximum hour daily demand is calculated using the peaking factor multiplied by the max. day demand, not the average day demand. This change to the guidelines were made in the Technical Bulletin 2010-02.
>
> The following are boundary conditions, HGL, for hydraulic analysis at 1 Dunbar Crt (zone 2W) assumed to be connected to the 305mm on Gibbard and 203mm on Bateman (see attached PDF for location).
>
> Minimum HGL = 127.0m, same at both connections
>
> Maximum HGL = 134.2m, same at both connections
>
> Gibbard Connection:
>
> MaxDay + FireFlow (300L/s) = 119.0m
>
> MaxDay + FireFlow (150 L/s) = 126.0m
>
> Bateman Connection:

MaxDay + FireFlow (150 L/s) = 124.0m

Available Flow @ 20psi = 240L/s assuming a ground elevation of 93.6m

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.

Regards,

Gabrielle Schaeffer, P.Eng

Senior Engineer - Infrastructure Applications

City of Ottawa

Development Review - West Branch

Planning, Infrastructure and Economic Development Department

110 Laurier Ave., 4th Floor East;

Ottawa ON K1P 1J1

Mail Code 01-14

Tel: 613-580-2424 x 22517

Fax: 613-560-6006

****During this period of uncertainty surrounding COVID-19, we are following recommended best practices to minimize the risk of exposure, while ensuring service to our clients remains as uninterrupted as possible. I am working from home, and my work hours may be affected, but I will respond to emails at my earliest opportunity. Should there be delays, I thank for your understanding and patience.****

From: Douglas Gray <d.gray@dbgrayengineering.com>
Sent: April 14, 2020 7:14 AM
To: Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>
Subject: Re: Dunbar Court

Hi Gabrielle

(Please forward this email to the correct person if it is not you.)

Dunbar Court currently consists of 46 townhouse units. It is proposed that 4 townhouse units be demolished and a 28-unit apartment building constructed.

The private watermina in Dunbar Court connects to the 305mm on Gibbard and 203mm on Bateman (see attached PDF for location).

Please provide the boundary conditions at Dunbar Court.

Average daily demand: 0.7 l/s.

Maximum daily demand: 3.2 l/s.

Maximum hourly daily demand: ~~4.8 l/s~~ **23L/s**

Fire Flow demand: 300.0 l/s

Fire Flow + Max Day: 303.2 l/s

We are considering alternative designs so please also provide the boundary conditions for a fire flow demand of 150.0 l/s.

Average daily demand: 0.7 l/s.

Maximum daily demand: 3.2 l/s.

Maximum hourly daily demand: ~~4.8 l/s~~ **23L/s**

Fire Flow demand: 150.0 l/s

Fire Flow + Max Day: 153.2 l/s

Our calculations are attached.

Regards, Doug

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Ottawa, Ontario K1T 4E9 d.gray@dbgrayengineering.com

On Wed, Aug 1, 2018 at 10:12 AM Schaeffer, Gabrielle <gabrielle.schaeffer@ottawa.ca> wrote:

> Hi Doug,
>
> The following are boundary conditions, HGL, for hydraulic analysis at 1 Dunbar Crt (zone 2W) assumed to be connected to the 305mm on Gibbard and 203mm on Bateman (see attached PDF for location).
>
> Minimum HGL = 127.0m, same at both connections
>
> Maximum HGL = 134.2m, same at both connections
>
> Gibbard Connection:
>
> MaxDay + FireFlow (300L/s) = 119.0m
>
> MaxDay + FireFlow (417 L/s) = 112.0m
>
> Bateman Connection:
>
> Available Flow @ 20psi = 240L/s assuming a ground elevation of 93.6m
>
> 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.*
>
> Regards,
>
> Gabrielle
>
> **From:** Douglas Gray <d.gray@dbgrayengineering.com>
> **Sent:** Friday, July 27, 2018 1:13 PM
> **To:** Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
> **Cc:** Lucio Renna <l.renna@dbgrayengineering.com>
> **Subject:** Re: Dunbar Court
>
> Hi Gabrielle

Dunbar Court currently consists of 46 townhouse units. It is proposed that 4 townhouse units be demolished and a 28-unit apartment building constructed.

Please provide the boundary conditions at Dunbar Court.

Average daily demand: 0.7 l/s.

Maximum daily demand: 3.3 l/s.

Maximum hourly daily demand: 5.0 l/s

Fire Flow demand: 416.7 l/s

Fire Flow + Max Day: 420.0 l/s

There may be a sprinkler system in the apartment building so please also provide the boundary conditions for a fire flow demand of 300.0 l/s.

Average daily demand: 0.7 l/s.

Maximum daily demand: 3.3 l/s.

Maximum hourly daily demand: 5.0 l/s

Fire Flow demand: 300.0 l/s

Fire Flow + Max Day: 303.3 l/s

Our calculations are attached.

Attached is geoOttawa map showing the location of the watermain in Dunbar Court. This watermain has two connection points. It connects to the City watermain in Bateman Dr and and to a City watermain in the former Knowdale Rd ROW now adjacent to Gibbard Ave.

Regards, Doug

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Ottawa, Ontario K1T 4E9 d.gray@dbgrayengineering.com

On Tue, Jul 24, 2018 at 1:08 PM, Schaeffer, Gabrielle <gabrielle.schaeffer@ottawa.ca> wrote:

> Hi Doug,

Concerning the downstream sanitary capacity, it is up to the proponent to assess if sufficient capacity is available downstream and should be included in the servicing report. Review of the report will be completed once a formal application has been submitted.

Thank you for the boundary conditions requests. One edit is required in the Sprinkler system FUS calculations. As per the FUS Guide for Determination of Required Fire Flow, the Exposure increase is to be based on the calculated fire flow determined at step 2 (Occupancy). Therefore the calculation should be as follows: RFF = 13600 – (13600 x 50%) + (13600 x 65%) = 15,640 L/min. Please revise your calculations a request accordingly.

Additionally, if a full 50% reduction for sprinklers is being sought-after, please provide a letter from the mechanical engineer indicating how the system will meet all FUS requirements for a fully supervised sprinkler system. Please ensure a fully supervised system is proposed as per page G-100 of Appendix H of the Ottawa Design Guidelines – Water Distribution, which is provided in Technical Bulletin ISTB-2018-02 dated March 21, 2018 (attached for your convenience).

Regards,

Gabrielle

From: Douglas Gray <d.gray@dbgrayengineering.com>
Sent: Wednesday, July 11, 2018 1:31 PM
To: Schaeffer, Gabrielle <gabrielle.schaeffer@Ottawa.ca>
Cc: Lucio Renna <l.renna@dbgrayengineering.com>
Subject: Dunbar Court

Hi Gabrielle

A couple of months ago we discussed the servicing of two existing affordable housing projects that are being proposed to be re-developed. This email concerns Dunbar Court. (I will send another email concerning Hammill Court in a few days.)

Dunbar Court currently consists of 46 townhouse units. It is proposed that 4 townhouse units be demolished and a 28-unit apartment building constructed.

We have calculated that the current sanitary sewage flow to be 2.36 l/s. With the proposed re-development we have calculated that the sanitary flows will be 3.13 l/s. (See attached Sanitary Sewer Design Form.) As we previously discussed please inquire if the increase (0.77 l/s) will cause any downstream capacity issues.

Also please provide the boundary conditions at Dunbar Court.

Average daily demand: 0.7 l/s.

Maximum daily demand: 3.3 l/s.

Maximum hourly daily demand: 5.0 l/s

Fire Flow demand: 366.7 l/s

Fire Flow + Max Day: 370.0 l/s

There may be a sprinkler system in the apartment building so please also provide the boundary conditions for a fire flow demand of 133.3 l/s.

Average daily demand: 0.7 l/s.

Maximum daily demand: 3.3 l/s.

Maximum hourly daily demand: 5.0 l/s

Fire Flow demand: 183.3 l/s

Fire Flow + Max Day: 186.6 l/s

Our calculations are attached.

Also attached is geoOttawa map showing the location of the watermain in Dunbar Court. This watermain has two connection points. It connects to the City watermain in Bateman Dr and and to a City watermain in the former Knowdale Rd ROW. now adjacent to Gibbard Ave.

Thanks, Doug

D. B. GRAY ENGINEERING INC.

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Ottawa, Ontario K1T 4E9 d.gray@dbgrayengineering.com

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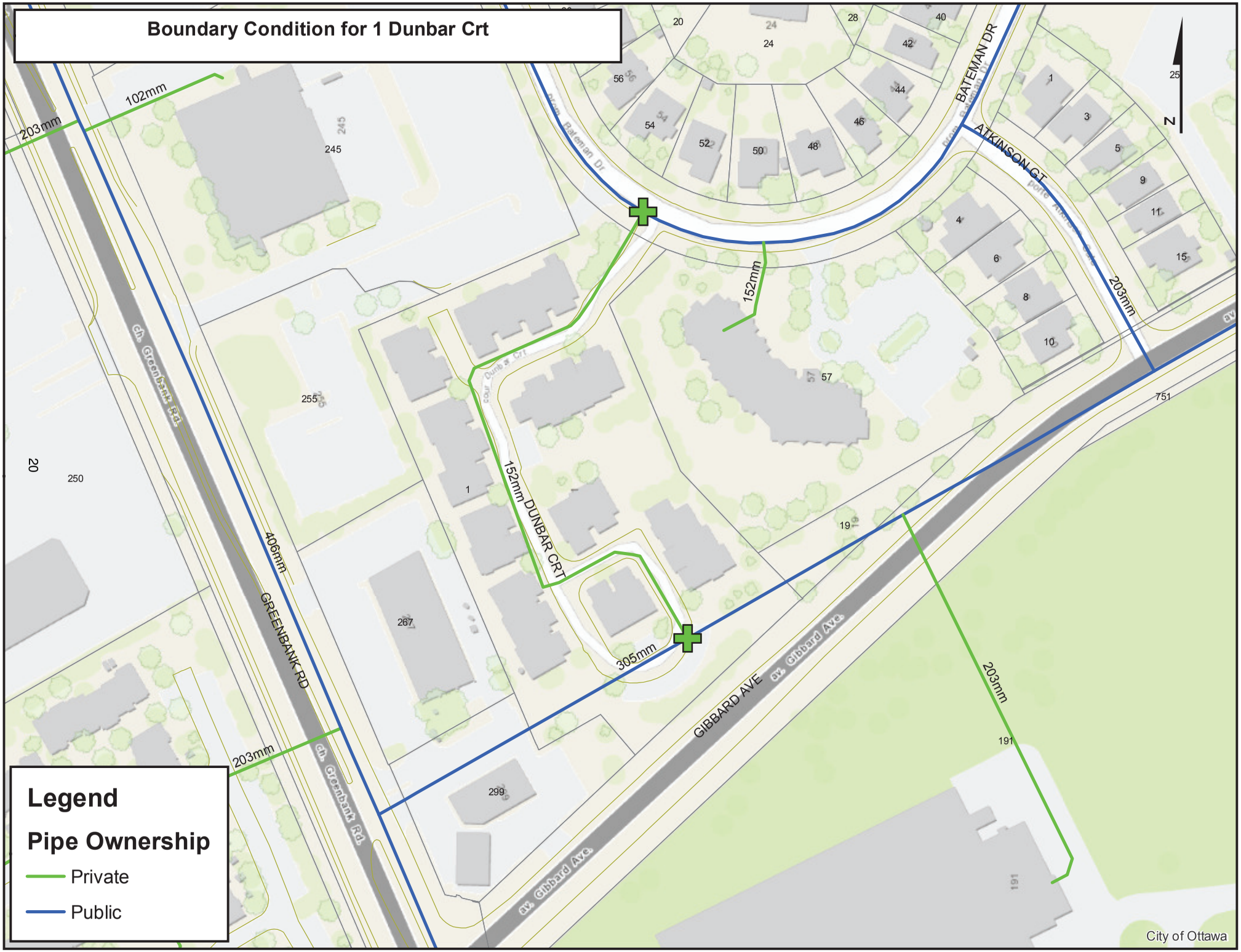

Boundary Condition for 1 Dunbar Crt
102mm
203mm
406mm
GREENBANK RD
Ch. Greenbank Rd.
152mm DUNBAR CRT
305mm
152mm
203mm
GIBBARD AVE
Gv. Gibbard Ave.
BATEMAN DR
ATKINSON GT
203mm
203mm
751
245
250
255
267
299
191
N
Legend
Pipe Ownership
Private
Public
City of Ottawa

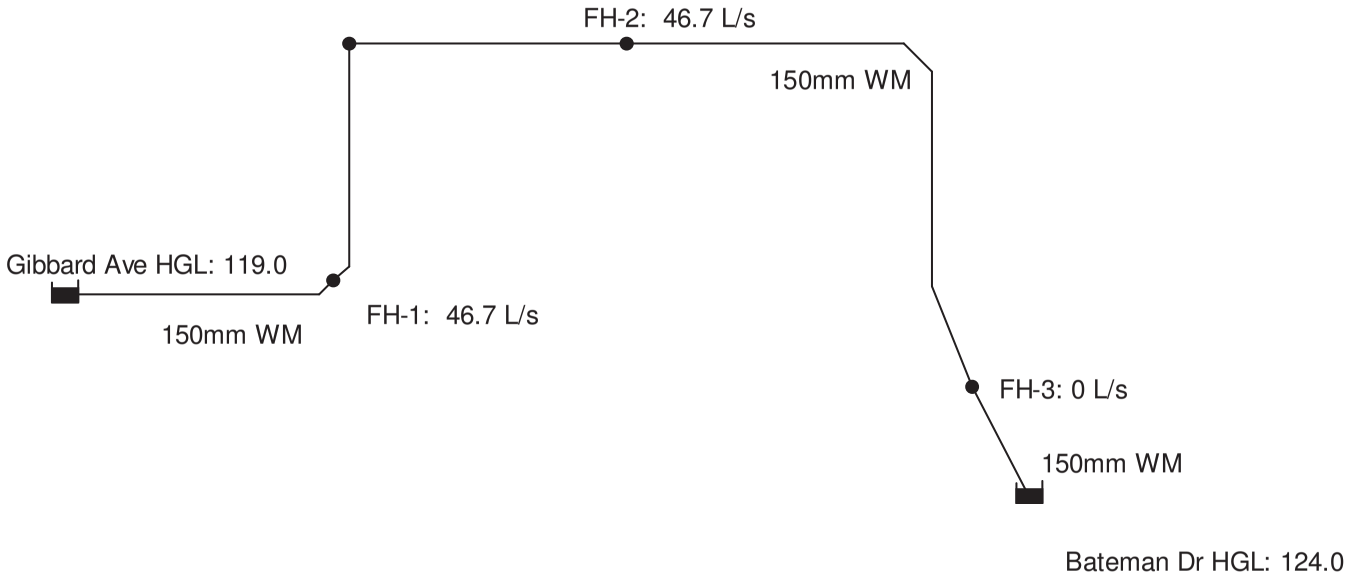
Dunbar Court
Ottawa, Ontario

EPANET HYDRAULIC MODELLING RESULTS

Gibbard Ave MAX DAY + FIRE FLOW: 300 L/s - HGL = 119.0
Bateman Dr MAX DAY + FIRE FLOW: 150 L/s - HGL = 124.0

Node ID	Demand	Head	Elevation	Pressure		
	L/s	m	m	m	psi	kPa
1 Reservoir 1	-50.54	119.00	95.26	23.74	33.8	233
2 FH-1 (46.7 L/s +1.1 L/s Domestic)	47.80	115.11	94.95	20.16	28.7	198
3 Node 3	0.00	115.10	95.05	20.05	28.5	197
4 FH-2 (46.7 L/s +1.1 L/s Domestic)	47.80	115.09	95.00	20.09	28.6	197
5 FH-3 (0 L/s +1.1 L/s Domestic)	1.10	121.29	93.95	27.34	38.9	268
6 Reservoir 2	-46.16	124.00	93.65	30.35	43.2	298

Link ID	Diameter	Length	Roughness	Loss Coeff.	Flow	Velocity
	mm	m			L/s	m/s
Pipe 1	150	33,4	100	2.40	50.54	2.86
Pipe 2	150	27.2	100	3.00	2.74	0.16
Pipe 3	150	33.4	100	0.80	2.74	0.16
Pipe 4	150	80.1	100	1.85	45.06	2.55
Pipe 5	150	24.7	100	2.60	46.16	2.61


FH-2: 46.7 L/s
150mm WM
Gibbard Ave HGL: 119.0
FH-1: 46.7 L/s
150mm WM
FH-3: 0 L/s
150mm WM
Bateman Dr HGL: 124.0

Network Table - Nodes

Node ID	Elevation m	Demand LPS	Head m	Pressure m
Junc 2	94.95	47.80	115.11	20.16
Junc 3	95.05	0.00	115.10	20.05
Junc 4	95.00	47.80	115.09	20.09
Junc 5	93.95	1.10	121.29	27.34
Resvr 1	119	-50.54	119.00	0.00
Resvr 6	124.0	-46.16	124.00	0.00

Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s
Pipe 1	33.4	150	100	50.54	2.86
Pipe 2	27.2	150	100	2.74	0.16
Pipe 3	33.4	150	100	2.74	0.16
Pipe 4	80.1	150	100	-45.06	2.55
Pipe 5	24.7	150	100	-46.16	2.61

29-Sep-20

Dunbar Court
PROPOSED 31-Unit 3-Storey Apartment Builidng
Ottawa, Ontario

Peak Water Demand

WATER FIXTURE VALUE
(AWWA Manual M22 - Sizing Water Service Lines and Meters)

	No.	F.V.	Total
Bathtub		8	0
Tiolet - tank	32	6	192
Tiolet - flush valve		24	0
Lavs.	32	1.5	48
Bidet		2	0
Urinal - wall flush valve		10	0
Shower	31	2.5	77.5
K. Sink	32	1.8	57.6
Dishwasher		1.3	0
Clothes Washer	6	3	18
Commercial Sink		4	0
J. Sink	1	4	4
Commercial Dishwasher		4	0
Commercial Washer		4	0
Hose 1/2 in		5	0
Hose 3/4 in		12	0
			397.1

Peak Demand (fig 4-2 or 4-3 AWWA M22)			41	USgpm		
Pressure @ Meter	338	kPa	49	psi		
Pressure Factor (table 4-1 AWWA M22)			0.89			
Peak Demand			36	USgpm		
Irrigation - hose 1/2 in	0		0	USgpm (includes pressure factor)		
TOTAL PEAK DEMAND	138	l/min	36	USgpm	2.3	l/s
		Nominal Size	2.0	in	50	mm
			3.9	ft/s	1.2	m/s

D.B. GRAY ENGINEERING INC.

Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

700 Long Point Circle
Ottawa, Ontario K1T 4E9
613-425-8044
d.gray@dbgrayengineering.com

SANITARY SEWER DESIGN FORM

Average Daily Flows:
Residential: 280 l / capita / day
Commercial: 28,000 l / ha / day
Instituational: 28,000 l / ha / day
Light Industrial: 35,000 l / ha / day
Heavy Industrial: 55,000 l / ha / day

Peaking Factor:
Residential (Harmon Equation): $P.F. = 1 + \frac{14}{4 + P^{0.5}} \times 0.8$
P = Population / 1000
Commercial & Institutional: 1.5 if contribution >20%, otherwise use 1.0
Industrial: As per Ottawa Guidelines Appendix 4-B

Infiltration Allowance: 0.33 l / s / ha

PROJECT: DUNBAR COURT
Designed By: DBG
8-Oct-18

LOCATION			Section								Cumulative Residential		Section Non-Residential			Cumulative					SEWER DATA								COMMENTS
			Single Family	Semi / Townhouse	Duplex / Triplex	Apartments (average)	Apartments (1 Bed.)	Apartments (2 Bed.)	Apartments (3 Bed.)	Resid-ential Area	Pop.	Peaking Factor	Area	Flow	Peaking Factor	Flow	Area	Sewage Flow	Infil-tration Flow	Total Flow				n = 0.013					
STREET	FROM	TO	ppu = 3.4	ppu = 2.7	ppu = 2.3	ppu = 1.8	ppu = 1.4	ppu = 2.1	ppu = 3.1												Type of Pipe	Dia. Actual (mm)	Dia. Nom. (mm)	Slope (%)	Length (m)	Capacity (l/s)	Velocity (m/s)	Ratio Q/Qfull	
			No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	ha			ha	l/ha/day		l/s	ha	l/s	l/s	l/s								
			UPSTREAM OF EXISTING DUNBAR COURT DEVELOPMENT																									
Bateman Dr	Upstream of MH5 in Bateman	MH 5 in Bateman	18			60				5.6	169	3.2	0.000			0.0	5.6	1.75	1.85	3.60		254.0	250	0.50	33.4	43.9	0.87	0.08	
			EXISTING DUNBAR COURT DEVELOPMENT 46 TOWNHOUSE UNITS																									
Dunbar Court	MH7	MH6		4						0.18	11	3.2	0.000			0.0	0.18	0.11	0.06	0.17		254.0	250	0.30	18.4	34.0	0.67	0.01	
Dunbar Court	MH6	MH4		7						0.151	30	3.2	0.000			0.0	0.33	0.31	0.11	0.42		254.0	250	0.30	28.0	34.0	0.67	0.01	
Dunbar Court	MH-5	MH4		5						0.140	14	3.2	0.000			0.0	0.14	0.14	0.05	0.19		254.0	250	0.30	23.0	34.0	0.67	0.01	
Dunbar Court	MH4	MH3		13						0.276	78	3.2	0.000			0.0	0.75	0.81	0.25	1.06		254.0	250	0.30	68.5	34.0	0.67	0.03	
Dunbar Court	MH3	MH2		15						0.318	119	3.2	0.000			0.0	1.07	1.23	0.35	1.58		254.0	250	0.30	32.0	34.0	0.67	0.05	
Dunbar Court	MH2	MH1		2						0.160	124	3.2	0.000			0.0	1.23	1.29	0.40	1.69		254.0	250	0.30	32.0	34.0	0.67	0.05	
Dunbar Court	MH1	MH 5 in Bateman								0.000	124	3.2	0.000			0.0	1.23	1.29	0.40	1.69		254.0	250	0.40	9.0	39.2	0.77	0.04	
			DOWNSTREAM OF EXISTING DUNBAR COURT DEVELOPMENT																									
Bateman Dr	MH 5 in Bateman	MH 4 in Bateman	1							0.100	297	3.2	0.000			0.0	6.93	3.08	2.29	5.36		254.0	250	0.50	34.0	43.9	0.87	0.12	
			UPSTREAM OF PROPOSED DUNBAR COURT DEVELOPMENT																									
Bateman Dr	Upstream of MH5 in Bateman	MH 5 in Bateman	18			60				5.6	169	3.2	0.000			0.0	5.6	1.75	1.85	3.60		254.0	250	0.50	33.4	43.9	0.87	0.08	
			PROPOSED DEVELOPMENT 42 EXISTING TOWNHOUSE UNITS + 28 UNIT APARTMENT BUILDING																									
Dunbar Court	MH7	MH6		4						0.18	11	3.2	0.000			0.0	0.18	0.11	0.06	0.17		254.0	250	0.30	18.4	34.0	0.67	0.01	
Dunbar Court	MH6	MH4		4				31		0.151	87	3.2	0.000			0.0	0.33	0.90	0.11	1.01		254.0	250	0.30	28.0	34.0	0.67	0.03	
Dunbar Court	MH-5	MH4		5						0.140	14	3.2	0.000			0.0	0.14	0.14	0.05	0.19		254.0	250	0.30	23.0	34.0	0.67	0.01	
Dunbar Court	MH4	MH3		13						0.276	135	3.2	0.000			0.0	0.75	1.40	0.25	1.65		254.0	250	0.30	68.5	34.0	0.67	0.05	
Dunbar Court	MH3	MH2		15						0.318	176	3.2	0.000			0.0	1.07	1.82	0.35	2.17		254.0	250	0.30	32.0	34.0	0.67	0.06	
Dunbar Court	MH2	MH1		2						0.160	181	3.2	0.000			0.0	1.23	1.88	0.40	2.28		254.0	250	0.30	32.0	34.0	0.67	0.07	
Dunbar Court	MH1	MH 5 in Bateman								0.000	181	3.2	0.000			0.0	1.23	1.88	0.40	2.28		254.0	250	0.40	9.0	39.2	0.77	0.06	
			DOWNSTREAM OF EXISTING DUNBAR COURT DEVELOPMENT																									
Bateman Dr	MH 5 in Bateman	MH 4 in Bateman	1							0.100	354	3.2	0.000			0.0	6.93	3.67	2.29	5.95		254.0	250	0.50	34.0	43.9	0.87	0.14	

STORMWATER MANAGEMENT CALCULATIONS

The orifice calculations are based on the following formula:

$$Q = C_d \times A_o \sqrt{2gh} \times 1000$$

where:

- Q = flowrate in litres per second
- C_d = coefficient of discharge
- A_o = orifice area in sq.m.
- g = 9.81 m/s2
- h = head above orifice in meters

Flow control roof drain calculations are based on the following formula:

$$Q = N \times S \times d \times F$$

where:

- Q = flowrate in litres per second
- N = number of roof drains
- S = slots per weir
- d = pond depth at roof drain in mm
- F = flowrate through each slot
  - 0.0124 litres per second per mm pond depth (5 USgpm per inch)

Storage calculations on the roof area are based on the following formula for volume of a cone:

$$V = (A \times d)/3$$

where:

- V = volume in cu.m.
- A = ponding area in sq.m.
- d = ponding depth in meters

Summary Tables

ONE HUNDRED YEAR EVENT					
Drainage Area	Pre-Development		Maximum Release Rate (L/s)	Maximum Volume Required (cu.m)	Maximum Volume Stored (cu.m)
	100 Year Flow Rate (L/s)	5 Year Flow Rate (Maximum Allowable) (L/s)			
AREA I (Uncontrolled Flow Off Site)	-	-	25.60	-	-
AREA II (Roof)	-	-	5.03	27.88	27.88
TOTAL	34.93	17.61	30.64	27.88	27.88

FIVE YEAR EVENT				
Drainage Area	Maximum Allowable Release Rate (L/s)	Maximum Release Rate (L/s)	Maximum Volume Required (cu.m)	Maximum Volume Stored (cu.m)
AREA I (Uncontrolled Flow Off Site)	-	13.30	-	-
AREA II (Roof)	-	3.85	12.44	12.44
TOTAL	17.61	17.15	12.44	12.44

Dunbar Court

Ottawa, Ontario

STORMWATER MANAGEMENT CALCULATIONS
Rational Method

PRE-DEVELOPMENT CONDITIONS

100-Year Release Rate

			C
Roof Area:	255	sq.m	1.00
Asphalt/Concrete Area:	195	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	1015	sq.m	0.25
Total Catchment Area:	1465	sq.m	0.48

Bransby William Formula (Used when C > 0.40)

$$Tc = \frac{0.057 \cdot L}{Sw^{0.2} \cdot A^{0.1}} \text{ min}$$

Sheet Flow Distance (L):	22	m
Slope of Land (Sw):	4	%
Area (A):	0.1465	ha
Time of Concentration (Sheet Flow):	1.2	min
Area (A):	1465	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	179	mm/hr
Runoff Coeficient (C):	0.48	
100-Year Pre-Development Flow Rate (2.78AiC):	34.93	L/s

5-Year Release Rate

			C
Roof Area:	255	sq.m	0.90
Asphalt/Concrete Area:	195	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	1015	sq.m	0.20
Total Catchment Area:	1465	sq.m	0.42

Bransby William Formula (Used when C > 0.40)

$$Tc = \frac{0.057 \cdot L}{Sw^{0.2} \cdot A^{0.1}} \text{ min}$$

Sheet Flow Distance (L):	22	m
Slope of Land (Sw):	4	%
Area (A):	0.1465	ha
Time of Concentration (Sheet Flow):	1.2	min
Area (A):	1465	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	104	mm/hr
Runoff Coeficient (C):	0.42	
5 Year Pre-Development Release Rate (2.78AiC):	17.61	L/s
)Maximum Allowable Release Rate)		

ONE HUNDRED-YEAR EVENT

DRAINAGE AREA I (Uncontrolled Flow Off Site)

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	0	sq.m	1.00
Asphalt/Concrete Area:	465	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	203	sq.m	0.25
Total Catchment Area:	668	sq.m	0.77
Area (A):	668	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	179	mm/hr	
Runoff Coeficient (C):	0.77		
Release Rate (2.78AiC):	25.60	L/s	

DRAINAGE AREA II (Roof)

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	797	sq.m	1.00
Asphalt/Concrete Area:	0	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	0	sq.m	0.25
Total Catchment Area:	797	sq.m	1.00

No. of Roof Drains: 3

Slots per Wier: 1 0.0124 L/s/mm/slot (5 USGPM/in/slot)

Depth at Roof Drain: 135 mm

Maximum Release Rate: 5.03 L/s

Pond Area: 618 sq.m

Achieved Volume: 27.88 cu.m

Maximum Volume Required: 27.88 cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
5	243	53.77	5.03	48.74	14.62
10	179	39.56	5.03	34.53	20.72
15	143	31.66	5.03	26.63	23.96
20	120	26.58	5.03	21.54	25.85
25	104	23.01	5.03	17.97	26.96
30	92	20.35	5.03	15.32	27.58
35	83	18.30	5.03	13.26	27.85
40	75	16.65	5.03	11.62	27.88
45	69	15.30	5.03	10.26	27.71
50	64	14.17	5.03	9.14	27.41
55	60	13.21	5.03	8.18	26.98
60	56	12.38	5.03	7.35	26.46
65	53	11.66	5.03	6.63	25.86
70	50	11.03	5.03	6.00	25.19
75	47	10.47	5.03	5.44	24.46
80	45	9.97	5.03	4.93	23.68
85	43	9.52	5.03	4.48	22.86
90	41	9.11	5.03	4.07	22.00
95	39	8.74	5.03	3.70	21.11
100	38	8.40	5.03	3.36	20.18
105	36	8.09	5.03	3.05	19.23
110	35	7.80	5.03	2.77	18.25
115	34	7.53	5.03	2.50	17.25
120	33	7.29	5.03	2.25	16.23
125	32	7.06	5.03	2.02	15.19
130	31	6.85	5.03	1.81	14.13
135	30	6.65	5.03	1.61	13.05
140	29	6.46	5.03	1.42	11.97
145	28	6.28	5.03	1.25	10.86
150	28	6.12	5.03	1.08	9.75
180	24	5.30	5.03	0.26	2.82
210	21	4.68	4.68	0.00	0.00
240	19	4.21	4.21	0.00	0.00
270	17	3.83	3.83	0.00	0.00
300	16	3.52	3.52	0.00	0.00

FIVE-YEAR EVENT

DRAINAGE AREA I (Uncontrolled Flow Off Site)

(FIVE-YEAR EVENT)

			C
Roof Area:	0	sq.m	0.90
Asphalt/Concrete Area:	465	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	203	sq.m	0.20
Total Catchment Area:	668	sq.m	0.69

Area (A):	668	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	104	mm/hr
Runoff Coeficient (C):	0.69	
Release Rate (2.78AiC):	13.30	L/s

DRAINAGE AREA II (Roof)

(FIVE-YEAR EVENT)

			C
Roof Area:	797	sq.m	0.90
Asphalt/Concrete Area:	0	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	0	sq.m	0.20
Total Catchment Area:	797	sq.m	0.90

No. of Roof Drains: 3

Slots per Wier: 1 0.0124 L/s/mm/slot (5 USGPM/in/slot)

Depth at Roof Drain: 103 mm

Maximum Release Rate: 3.85 L/s

Pond Area: 361 sq.m

Achieved Volume: 12.44 cu.m

Maximum Volume Required: 12.44 cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
5	141	28.15	3.85	24.30	7.29
10	104	20.78	3.85	16.93	10.16
15	84	16.66	3.85	12.81	11.53
20	70	14.01	3.85	10.16	12.19
25	61	12.14	3.85	8.30	12.44
30	54	10.75	3.85	6.91	12.43
35	49	9.67	3.85	5.83	12.24
40	44	8.81	3.85	4.96	11.91
45	41	8.10	3.85	4.25	11.49
50	38	7.51	3.85	3.66	10.98
55	35	7.00	3.85	3.16	10.42
60	33	6.57	3.85	2.72	9.80
65	31	6.19	3.85	2.34	9.14
70	29	5.86	3.85	2.01	8.44
75	28	5.56	3.85	1.71	7.71
80	27	5.30	3.85	1.45	6.96
85	25	5.06	3.85	1.21	6.18
90	24	4.84	3.85	1.00	5.38
95	23	4.65	3.85	0.80	4.56
100	22	4.47	3.85	0.62	3.72
105	22	4.30	3.85	0.46	2.87
110	21	4.15	3.85	0.30	2.01
115	20	4.01	3.85	0.16	1.13
120	19	3.88	3.85	0.03	0.25
125	19	3.76	3.76	0.00	0.00
130	18	3.65	3.65	0.00	0.00
135	18	3.54	3.54	0.00	0.00
140	17	3.44	3.44	0.00	0.00
145	17	3.35	3.35	0.00	0.00
150	16	3.26	3.26	0.00	0.00
180	14	2.83	2.83	0.00	0.00
210	13	2.50	2.50	0.00	0.00
240	11	2.25	2.25	0.00	0.00
270	10	2.05	2.05	0.00	0.00
300	9	1.89	1.89	0.00	0.00

City of Ottawa Servicing Study Checklist

General Content

Executive Summary (for large reports only): not applicable

Date and revision number of the report: see page 1 of Servicing Brief and Stormwater Management Report

Location map and plan showing municipal address, boundary, and layout of proposed development: see drawings C-1 to C-9

Plan showing the site and location of all existing services: see drawings C-1 to C-9

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: not applicable

Summary of Pre-consultation Meetings with City and other approval agencies: not available

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: not applicable

Statement of objectives and servicing criteria: see page 2 of Servicing Brief and Stormwater Management Report

Identification of existing and proposed infrastructure available in the immediate area: see drawings C-1 to C-9

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). see drawings C-1 to C-9

Concept level master grading plan to confirm existing and proposed grades in the development and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths: not applicable

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: not applicable

Proposed phasing of the development, if applicable: not applicable

Reference to geotechnical studies and recommendations concerning servicing: see note 1.5 on drawing C-6

All preliminary and formal site plan submissions should have the following information:

- **Metric scale:** included
- **North arrow:** included
    - **(including construction North):** not included
- **Key Plan:** included

- **Name and contact information of applicant and property owner:** not available
- **Property limits**: included
    - **including bearings and dimensions:** not included
- **Existing and proposed structures and parking areas:** included
- **Easements, road widening and rights-of-way:** included
- **Adjacent street names:** included

Development Servicing Report: Water

Confirm consistency with Master Servicing Study, if available: not applicable

Availability of public infrastructure to service proposed development: see page 2 of Servicing Brief

Identification of system constraints: see page 2 of Servicing Brief

Confirmation of adequate domestic supply and pressure: see page 2 of Servicing Brief

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 locations throughout the development: see page 2 & 9 to 14 of Servicing Brief

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: see page 2 of Servicing Brief

Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design: not applicable

Address reliability requirements such as appropriate location of shut-off valves: not applicable

Check on the necessity of a pressure zone boundary modification:. not applicable

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: not applicable

Description of the proposed water distribution network, including locations of proposed connections to the existing systems, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions: not applicable

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: not applicable

Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines: see page 3 of Servicing Brief

Provision of a model schematic showing the boundary conditions locations, streets , parcels, and building locations for reference: not applicable

Development Servicing Report: Wastewater

Summary of proposed design criteria: see page 3 of Servicing Brief

(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 infrastructure): not applicable

Confirm consistency with Master Servicing Study and /or justification for deviations: not applicable

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 conditions of sewers: not applicable

Descriptions of existing sanitary sewer available for discharge of wastewater from proposed development: see page 3 of Servicing Brief

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): not applicable

Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix C) format. see page 16 of Servicing Brief

Description of proposed sewer network including sewers, pumping stations, and forcemains: see page 4 of Servicing Brief

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): not applicable

Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development: not applicable

Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity: not applicable

Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding: not applicable

Special considerations such as contamination, corrosive environment etc: not applicable

Development Servicing Report: Stormwater Checklist

Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property): see page 4 of Servicing Brief and Stormwater Management Report

Analysis of available capacity in existing public infrastructure. not applicable

A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern: see drawing C-4

Water quality 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: see Stormwater Management Report Servicing Brief and Stormwater Management Report

Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements: Servicing Brief and Stormwater Management Report

Descriptions of the references and supporting information.
Set-back from private sewage disposal systems. not applicable

Watercourse and hazard lands setbacks: not applicable

Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed: the pre-application consultation record is not yet been issued

Confirm consistency with sub-waterched and Master Servicing Study, if applicable study exists: not applicable

Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period). see drawings C-1 to C-7 and Servicing Brief and Stormwater Management Report

Identification of watercourses within the proposed development and how watercourses will be protected, or , if necessary, altered by the proposed development with applicable approvals. see drawings C-1 to C-7 and Servicing Brief and Stormwater Management Report

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: see Servicing Brief and Stormwater Management Report

Any proposed diversion of drainage catchment areas from one outlet to another. : not applicable

Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities. : not applicable

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: not applicable

Identification of potential impacts to receiving watercourses: Servicing Brief and Stormwater Management Report

Identification of municipal drains and related approval requirements. : not applicable

Descriptions of how the conveyance and storage capacity will be achieved for the development: see page 3 of Servicing Brief and Stormwater Management Report

100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading:

Inclusion of hydraulic analysis including hydraulic grade line elevations. : not applicable

Description of approach to erosion and sediment control during construction for the protection of receiving watercourses of drainage corridors: see notes 2.1 to 2.5 on drawing C-6

Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplains elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current: not applicable

Identification of fill constraints related to floodplain and geotechnical investigation. : not applicable

Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

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 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: see page 19 of Servicing Brief and Stormwater Management Report

Application for Certificate of Approval (CofA) under the Ontario Water Resources Act:

Changes to Municipal Drains. : not applicable

Other permits (National Capital commission, Parks Canada, public Works and Government Services Canada, Ministry of transportation etc.) : not applicable

Conclusion Checklist

Clearly stated conclusions and recommendations: see page 7 of Servicing Brief

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.

All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario: included