REPORT
Project: 116871-5.2.2

DESIGN BRIEF
COWAN'S GROVE PLAZA
4791 BANK STREET
LEITRIM DEVELOPMENT AREA

Development Application File No. **D07-12-18-0109**

Prepared for URBANDALE CORPORATION
by IBI GROUP
JULY 2018
REVISED FEBRUARY 2019

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1 INTRODUCTION

1.1 Scope

IBI Group has been retained by Urbandale Corporation to prepare the necessary engineering plans, specifications and documents to support the proposed Site Plan Application for the subject lands in accordance with the policies set out by the Planning and Development Branch of the City of Ottawa. This Brief will present a detailed servicing scheme to support development of the properties, and will include sections on water supply, wastewater management, minor and major stormwater management along with erosion and sediment control.

1.2 Subject Property

The subject property, known as Cowan's Grove Plaza, is located within Urbandale's Cowan's Grove subdivision lands. The location of the Cowan's Grove subdivision within the Leitrim Development Area is shown on Figure 1 and the location of the within the Cowan's Grove subdivision is shown on Figure 2.

The proposed area to be developed as the Cowan's Grove Plaza is approximately 1.4 Ha and is bisected by Shuttleworth Drive with .46 Ha of the development to the south of Shuttleworth and the remaining .94 Ha portion located north of Shuttleworth.

The current architectural site plan, upon which this report is based, contains five commercial retail buildings of various sizes along with associated landscaping, parking, vehicle access routes and pedestrian areas. The architectural site plan is shown on Figure 3.

1.3 Previous Studies

The subject site is located within the Cowan's Grove subdivision area and as such the design on which numerous planning and engineering studies have been completed. Besides the Official Plan and zoning, significant to the subject site are the following:

- **Design Brief, Cowan's Grove, 4791 Bank Street, prepared by IBI Group May 2018** This approved report (*City File No. D07-16-13-0035*) demonstrates that storm, sanitary and water service allocations for the subject lands were included in the design of the subdivision.

It is the intention of this report to demonstrate that the proposed servicing for the subject lands will be completed in accordance with the approved Cowan's Grove subdivision report.

1.4 Pre-Consultation

There was a formal pre-consultation meeting held with the City of Ottawa in March 2018, a memo subsequently issued by the City of Ottawa regarding the discussions held was issued and can be found in **Appendix E**. In summary, it was determined that the servicing for the Cowan's Grove Plaza shall be completed in accordance with the approved report identified in Section 1.3 of this brief. As all sewers are contained on site, and the site has 1 owner consultation and approval through the MOECC is not required for this site. The RVCA has been consulted through the City circulation process.

1.5 Geotechnical Considerations

One geotechnical report "Geotechnical Investigation, Proposed Residential Development, Kellam Lands, Ottawa, Ontario" dated December 2013, has been prepared by Golder Associates for the subject lands.

The objectives of the investigation were to prepare a report to:

- Determine the subsoil and groundwater conditions at the site by means of test pits and boreholes and;
- To provide geotechnical recommendations pertaining to design of the proposed development including construction considerations.

The report recommendations were based on the findings and observations from several boreholes and test pits. Among other items, the report recommendations deal with:

- Site grading;
- Foundation design;
- Pavement structure;
- Sewer and Watermain Construction;
- Groundwater Control;
- Grade Raises

The geotechnical investigation report confirmed that the site consists mostly of silt, sand, boulders and glacial till on top of limestone bedrock. These conditions will provide a suitable base for subdivision construction. No practical restrictions apply to grade raise thickness and service trench seepage barriers are recommended.

2 WATER SUPPLY

2.1 Existing Conditions

The primary source of water for the Leitrim Development Area (LDA) is the Ottawa South Pumping Station (OSPS) which is located approximately 1km north of Leitrim Road adjacent to the future rapid rail transit corridor. There is an existing 400mm diameter watermain on Bank Street west of the site which connects to the OSPS along Leitrim Road and through the existing Findlay Creek Village located west of the subject site.

As part of the Cowan's Grove subdivision works a 250mm dia watermain was installed within the Shuttleworth Drive ROW from the 400mm watermain within Bank Street. Watermain stubs were left to service the Cowan's Grove Plaza development, a 200mm stub to service the south portion and a 200mm stub to service the north portion.

2.2 2016 Updated Serviceability Report

The preferred water distribution plan for the Leitrim Development Area was included in the 2016 USR. A copy of the recommended plan Figure 2.2 from that report, is included in **Appendix A**. Cowan's Grove is included in the OPA 76 Area 9b as shown on Figure 2.2. The recommended water plan for Area 9b includes a connection to the watermain on Bank Street and several connections to the Claridge OPA 76 Area 9a development to the north. A 250 mm diameter watermain is recommended to connect to the 400 mm diameter watermain on Bank Street and extend north adjacent to the mixed use and school site. All other pipes in the site will be 150 and 200 mm diameter.

2.3 Design Criteria

2.3.1 Water Demands

The Cowan's Grove Plaza site consists of five single storey retail buildings. A water demand has been calculated using a shopping center rate of 2,500 liters of water per 1000 m^2 of floor space as per table 4.2 of the Ottawa Design Guidelines – Water Distribution.

A watermain demand calculation sheet is included in **Appendix A** and the total demands are summarized as follows;

- Average Day 0.10 l/s
- Maximum Day 0.14 l/s
- Peak Hour 0.26 l/s

Since the Leitrim Development Area has a population larger than 3,000 persons, the City of Ottawa has provided system level demands for large growth areas. The system level demands were used in the 2016 Updated Serviceability Report hydraulic analysis and is used in this analysis for all existing lands in the Leitrim Development Area. The system level demands are summarized in **Table 2.1**.

Table 2.1 LDA Unit Water Demands

	AVERAGE (l/Unit/Day)	OUTDOOR WATER DEMAND (l/Unit/Day)	MAX. DAY (l/Unit/Day)	PEAK DAY (l/Unit/Day)*
Single Family	567	1049	Average + OWD	2.1 x Max Day
Townhouse (Medium Density)	558	0	Average	1.6 x Max Day
Apartment (High Density)	400	0	Average	1.6 x Max Day
Employee* (ICI)	85	0	Average	1.5 x Max Day
Water Loss per Connection	80	N/A	Average	Average

** 100 employees/hectare assumed for ICI land use*

The City of Ottawa has also provided external water demand criteria for locations downstream of the LDA, summarized in **Table 2.2**.

Table 2.2 External Water Demand Criteria for Locations Downstream of the LDA

LOCATION	CRITERIA
Carlsbad Trickle Feed	829 Dwelling Units
Existing South of FCV	200 Dwelling Units
Russell	11.8 MLD pumped over 20 hours

The Russell demand will be added to the average and maximum day demand, but will not be included in the peak hour calculations because the pumping to Russell is stopped during the peak hour period. Correspondence from the City of Ottawa regarding the LDA water demands is included in **Appendix A**.

2.3.2 System Pressures

The 2010 City of Ottawa Water Distribution Guidelines states that the preferred practice for design of a new distribution system is to have normal operating pressures range between 345 kPa (50 psi) and 552 kPa (80 psi) under maximum daily flow conditions. Other pressure criteria identified in the guidelines are as follows:

Minimum Pressure: Minimum system pressure under peak hour demand conditions shall not be less than 276 kPa (40 psi).

Fire Flow: During the period of maximum day demand, the system pressure shall not be less than 140 kPa (20 psi) during a fire flow event.

Maximum Pressure: Maximum pressure at any point in the distribution system shall not exceed 689 kPa (100 psi). In accordance with the Ontario Building/Plumbing Code the maximum pressure should not exceed 552 kPa (80 psi). Pressure reduction controls may be required for buildings where it is not possible/feasible to maintain the system pressure below 552 kPa.

2.3.3 Fire Flow Rates

The Cowan's Grove Plaza site plan contains 5 commercial building pads. Calculations using the Fire Underwriting Survey (FUS) method were conducted to determine the fire flow requirement for the site. Results of the analysis provides a maximum fire flow rate of 5,700 l/min or 95 l/s is required which is used in the hydraulic analysis. A copy of the FUS calculations are included in **Appendix A**.

2.3.4 Boundary Conditions

The City of Ottawa has provided a hydraulic boundary condition at the intersection of Bank Street and Shuttleworth Driver. A copy of the boundary conditions is included in **Appendix A** and summarized as follows:

Table 2. 1 Hydraulic Boundary Conditions

	RIVERSIDE DRIVE.
Max HGL (Basic Day)	78.8 m
Min HGL (Peak Hour)	77.1 m
Max Day + Fire Flow (5,000 l/min Fire Flow)	75.0 m

2.3.5 Hydraulic Model

A computer model for the Leitrim development area water distribution system has been developed using the H_20 map version 6.0 program produced by MWH Soft. The source of water is the Ottawa South Pumping Station (OSPS) which is located approximately 1 km north of Leitrim Road adjacent to the future rapid rail transit corridor.

The City of Ottawa has been supplying potable water to the Leitrim area for decades. Over time the City has made modifications and improvements to the delivery network. The Gloucester South Pump Station was decommissioned in 2005 and the Ottawa South Pumping Station (OSPS) was brought into service in 2001. The latter facility is currently delivering water to the downstream customers at the hydraulic grade line of about 155 m.

In an effort to better integrate the downstream areas including Riverside South, Longfields/Davidson Heights in Barrhaven and Leitrim, the City is planning to lower the hydraulic grade line at the Ottawa South station to about 146 m. For the hydraulic analysis of the water distribution system, a hydraulic boundary condition has been provided by the City at Leitrim Road and the rail corridor at the northwest corner of the LDA. A hydraulic grade line elevation of 144 meters is to be used for peak hour and maximum day plus fire analysis which represents the 146 meter level at the OSPS and the demands from the Riverside South community. For average day analysis the current level of 155 meters at the OSPS will be applied at the boundary condition to determine the maximum pressure in the water system. Correspondence from the City of Ottawa concerning boundary conditions is included in **Appendix A.**

2.4 Proposed Water Plan

Drawing C-100 shows the watermain layout, two 200mm watermains are connected to the 250mm watermain which services phase 1 of the subdivision which is connected to the 400mm watermain at two locations. The buildings are serviced by 150mm watermains from the 200mm watermain. There are fire hydrants on Shuttleworth Drive in front of the commercial site and a hydrant in front of building A at node C-05.

Results of the hydraulic analysis for Cowan's Grove are included in **Appendix A** and are summarized as follows:

Table 2.3 Results of Water Distribution Hydraulic Analysis for Cowan's Grove Plaza

SCENARIO	PLAZA
Basic Day (Max HGL) Pressure (kPa)	562.0 – 565.4
Peak Hour Pressure (kPa)	457.5 – 460.9
Design Fire flow @ 140 kPa Residual Pressure (l/s)	203.3 – 332.1

A comparison of the results and design criteria is summarized as follows:

Maximum Pressure — Under Basic Day conditions with a hydraulic grade line elevation of 155 meters at the OSPS, all nodes in Cowan's Grove Plaza exceed 552 kPa (80 spi). Pressure reducing control, in the form of pressure reducing valves at the building, in accordance with Technical Bulletin ISDTB-2014-02, is therefore recommended for all buildidngs. There are no nodes where the pressure exceeds 689 kPa (100 psi).

Minimum Pressure — The lowest minimum pressure during peak hour conditions is 457.5 kPa which exceeds the minimum 276 kPa (40 psi) requirement.

Fire Flow — The minimum design fire flow under maximum day conditions with minimum system pressure of 140 kPa (20 psi) is 203.3 l/s which exceeds the requirement of 95 l/s (5,700 l/min.) as discussed in Section 2.3.3.

3 WASTEWATER DISPOSAL

3.1 Existing Conditions

The Leitrim Pump Station is the wastewater outlet for all developed lands within the LDA, including the subject property. As noted in section 1.3 and 1.4 above the sanitary sewer design for the subject lands are to be in accordance with the approved Cowan's Grove subdivision servicing report. The sanitary drainage area plan and sanitary sewer design sheet from the Cowan's Grove subdivision has been included in **Appendix B**. During construction of the Cowan's Grove subdivision two 200mm sanitary service stubs were left to service the subject lands, one stub to service the north section of the subject lands and 1 stub to service the south section.

3.2 Design Criteria

The sanitary sewers for the subject site will be based on the City of Ottawa design criteria. It should be noted that the sanitary sewer design for this study incorporates the latest City of Ottawa design parameters identified in Technical Bulletin ISTB-2018-01. Some of the key criteria will include the following:

- Commercial/Institutional flow — 28,000 l/ha/d
- Peaking factor — 1.5 if ICI in contributing area >20%
1.0 if ICI in contributing area <20%
- Infiltration allowance — 0.33 l/s/ha
- Velocities — 0.60 m/s min. to 3.0 m/s max.

3.3 Recommended Wastewater Plan

The on-site sanitary system will consist of a network of 200mm PVC sewers installed at normal depth and slope and will provide a single service connection to each commercial building pad. The sewers have been designed using the criteria noted above in section 3.2 and outlet via the connections to the sanitary sewer within the Shuttleworth Drive right of way. A copy of the sanitary drainage area plan 116871-C-400 and the sanitary sewer design sheet can be found in **Appendix B.** Please refer to the site servicing plan 116871-C-100 in **Appendix F** for further details.

4 SITE STORMWATER MANAGEMENT

4.1 Existing Conditions

The site was designed and included within the stormwater management strategy of the approved Cowan's Grove subdivision as noted in sections 1.3 and 1.4.

Included in the Cowan's Grove subdivision stormwater management strategy was an allocation for lands tributary to the subdivision sewers that will require separate site stormwater management design, these allocations were included in that report's Table 5.4, a copy of which can be found in **Appendix C**. The subject site fall within this category and have been included in the allocation. A copy of the Cowan's Grove storm drainage area plan 103557-500 has been included in **Appendix C** which identifies the subject lands as drainage areas MU02 & MU03. These drainage areas are shown on the table 5.4 which specify the release rates used in this design.

4.2 Design Criteria

The stormwater system was designed following the principles of dual drainage, making accommodations for both major and minor flow.

Some of the key criteria include the following:

- Design Storm — 1:5 year return (Ottawa)
- Rational Method Sewer Sizing
- Initial Time of Concentration — 10 minutes
- Runoff Coefficients
  - Landscaped Areas — C = 0.30
  - Asphalt/Concrete — C = 0.90
  - Roof — C = 0.90
- Pipe Velocities — 0.80 m/s to 6.0 m/s
- Minimum Pipe Size — 250 mm diameter (200 mm CB Leads)

4.3 Proposed Minor System

Using the criteria identified in Section 4.2, the proposed on-site storm sewers were sized accordingly. A detailed storm sewer design sheet and the associated storm sewer drainage area plan is included in **Appendix C**. The General Plan of Services 116871-100, depicting all on-site storm sewers can be found in **Appendix F**.

4.4 Stormwater Management

The subject site will be limited to a release rate established using the criteria described in section 4.2. This will be achieved through a combination of inlet control devices (ICD's) at inlet locations and surface storage.

Flows generated that are in excess of the site`s allowable release rate will be stored on site in strategic surface storage areas or by the use of roof top storage and gradually released into the minor system so as not to exceed the site's allocation.

The maximum surface retention depth located within the developed areas will be limited to 350mm during a 1:100 year event. A copy of the Site Ponding Plan 116871-C-600 can be found in **Appendix C.**

Overland flow routes will be provided in the grading to permit emergency overland flow, in excess of the 100 year event, from the site.

At certain locations within the site, the opportunity to store runoff is limited due to grading constraints and building geometry. These locations are generally located at the perimeter of the site where it is necessary to tie into public boulevards and adjacent properties or in areas where ponding stormwater is undesirable. These "uncontrolled" areas – 0.12 hectares in total, have an average C value of 0.43. Based on 1:100 year storm uncontrolled flows, the uncontrolled areas generate 26.16 l/s runoff (refer to Section 4.5 for calculation).

The site grading and ponding has been designed to control water generated during the 1:100-year event, with no overflow leaving the site. Please refer to the SWM calculations in **Appendix C**.

4.5 Inlet Controls

The allowable release rate for the 1.42 Ha site is taken from the Cowan's Grove subdivision table 5.4 (found in Appendix C) and is as follows:

$\mathbf{Q_{allowable}}$ = **191 L/s (drainage area MU02) + 96 L/s (drainage area MU03)**

= **287.00 L/s**

As noted in Section 4.4, a portion of the site will be left to discharge offsite at an uncontrolled rate.

Based on a 1:100 year event, the flow from the 0.41 Ha uncontrolled area can be determined as:

$\mathbf{Q_{uncontrolled}}$ = **2.78** x **C** x $\mathbf{i_{100yr}}$ x **A** where:

C = Average runoff coefficient of uncontrolled area = 0.43

$\mathbf{i_{100yr}}$ = Intensity of 100-year storm event (mm/hr)

= $1735.688 \times (T_c + 6.014)^{0.820}$ = 178.56 mm/hr; where T_c = 10 minutes

A = Uncontrolled Area = 0.12 Ha

Therefore, the uncontrolled release rate can be determined as:

$\mathbf{Q_{uncontrolled}}$ = **2.78** x **C** x $\mathbf{i_{100yr}}$ x **A**

= 2.78 x 0.43 x 178.56 x 0.12

= 26.16 L/s

The maximum allowable release rate from the remainder of the site can then be determined as:

$\mathbf{Q_{max\ allowable}}$ = $\mathbf{Q_{restricted} - Q_{uncontrolled}}$

= 287.00 L/s – 26.16 L/s

= **260.84 L/s**

Based on the flow allowance at the various inlet locations, a combination of various sizes of inlet control devices (ICDs) were chosen in the design. The design of the inlet control devices is unique to each drainage area and is determined based on a number of factors, including hydraulic head and allowable release rate. The inlet control devices were sized according to the manufacturer's design charts. The restrictions will cause the on-site catchbasins and manholes to surcharge, generating surface ponding in the parking and landscaped areas. Ponding locations and elevations are summarized on the Ponding Plan 116871-C-600, and included in **Appendix C**.

4.6 On-Site Detention

Any excess storm water up to the 100-year event is to be stored on-site in order to not surcharge the downstream municipal storm sewer system. Detention will be provided in parking and landscape areas and building rooftops, where feasible. As previously noted, the volume of storage is dependent on the characteristics of each individual drainage area and the ICD's were chosen accordingly. It should be noted that 0.30m of vertical separation has been provided from all maximum ponding elevations to lowest building openings.

4.6.1 Site Inlet Control

The following Table summarizes the on-site storage requirements during both the 1:5-year and 1:100-year events.

DRAINAGE AREA(s)	TRIBUTARY AREA	AVAILABLE STORAGE (M^3)	100-YEAR STORM		5-YEAR STORM	
			RESTRICTED FLOW (L/S)	REQUIRED STORAGE (M^3)	RESTRICTED FLOW (L/S)	REQUIRED STORAGE (M^3)
P113A	0.09	18.06	14	17.57	14	3.85
P113B	0.24	18.88	89	18.85	89	0.77
P103A/P103B/P103C	0.17	50.00	17	48.12	17	16.81
P8B	0.06	2.85	32	2.83	32	0
P8A	0.18	90.29	6	79.45	6	33.36
P101A	0.05	6.67	14	6.57	14	1.22
P101B	0.03	0.69	21	0.63	21	0.06
P106A/P106B	0.08	25.77	7	24.21	7	8.75
P105	0.06	0.79	36	0.79	36	0.42
TOTAL	**0.96**	**214.00**	**236**	**199.02**	**236**	**65.24**

In all instances the required storage is met with surface ponds which retain the stormwater and discharge at the restricted flow rate to the sewer system. Refer to the ponding plan in **Appendix C** for storage information.

4.6.2 Roof Inlet Controls

The proposed buildings will have roof inlet controls that help to control the amount of stormwater being released into the system. The restricted flow rate for the proposed building is shown below.

ICD AREA	TRIBUTARY AREA	100-YEAR STORM		5-YEAR STORM	
		RESTRICTED FLOW (L/S)	REQUIRED STORAGE (M^3)	RESTRICTED FLOW (L/S)	REQUIRED STORAGE (M^3)
R-A	0.09	6.0	30.80	6.0	11.78
R-B	0.10	7.0	33.51	7	12.71
R-C	0.03	3.0	8.49	3.0	2.97
R-D	0.07	5.0	23.25	5.0	8.78
R-E	0.02	3.0	4.46	3.0	1.35
TOTAL	**0.31**	**24.0**	**100.51**	**24.0**	**37.59**

4.6.3 Overall Release Rate

As demonstrated above, the site uses new inlet control devices to restrict the 100 year storm event to the criteria approved by the City of Ottawa. Restricted stormwater will be contained onsite by

utilizing surface ponding and rooftop storage. In the 100 year event, there will be no overflow off-site from restricted areas.

The sum of restrictions on the site, rooftops and uncontrolled flows is (236 l/s + 24.0 l/s + 26.16) 286.16 l/s, which is less than the allowable release of 287.00 l/s noted in section 4.5.

4.7 Quality Control

As noted in the Design Brief for the Cowan's Grove subdivision (City File. No. D07-16-13-0035) the subject lands are tributary to the Expansion of Findlay Creek Village Stormwater facility. This facility has been designed to provide quality control for the tributary lands as approved by the City of Ottawa, Ministry of Environment and Conservation Authority.

5 APPROVALS AND PERMIT REQUIREMENTS

5.1 City of Ottawa

The City of Ottawa reviews all development documents including this report and working drawings. Upon completion, the City will approve the local watermains, under Permit No. 008-202, and issue a Commence Work Notification.

5.2 Province of Ontario

It is not anticipated that an Environmental Compliance Approval from the Ministry of Environment (MOE) will be necessary for this site. The Ministry has already issued a Permit To Take Water that covered this block.

5.3 Federal Government

There are no required permits, authorizations or approvals needed expressly for this development from the federal government.

6 SEDIMENT AND EROSION CONTROL PLAN

6.1 General

During construction, existing stream and conveyance systems can be exposed to significant sediment loadings. Although construction is only a temporary situation, it is proposed to possibly introduce a number of mitigative construction techniques to reduce unnecessary construction sediment loadings. These may include:

- Until the local storm sewer and storm pond are constructed, groundwater in trenches will be pumped into a filter mechanism prior to release to the environment. bulkhead barriers will be installed at the nearest downstream manhole in each sewer which connects to an existing downstream sewer;
- sediment capture filter socks will remain on open surface structures such as maintenance holes and catchbasins until these structures are commissioned and put into use; and
- silt fence on the site perimeter will be installed.

6.2 Trench Dewatering

Any trench dewatering using pumps will be discharged into a filter trap made up of geotextile filters and straw bales similar in design to the OPSD 219.240 Dewatering Trap. These will be constructed in a bowl shape with the fabric forming the bottom and the straw bales forming the sides. Any pumped groundwater will be filtered prior to release to the existing surface runoff. The contractor will inspect and maintain the filters as needed, including sediment removal and disposal and material replacement as needed. It should be noted that that the contractor will be responsible for the design and management of the trap(s).

6.3 Bulkhead Barriers

To further reduce downstream sediment loading, a ½ diameter bulkhead will be constructed over the lower half of the outletting sewer during construction. These bulkheads will trap any sediment laden flows, thus preventing any construction-related contamination into existing sewers. The bulkheads will be inspected and maintained including periodic sediment removal as needed.

6.4 Seepage Barriers

In order to further reduce sediment loading to the stormwater management facility, seepage barriers will be installed on any surface water courses at appropriate locations that may become evident during construction. These barriers will be Light Duty Straw Bale Barriers per OPSD 219.100 and Heavy Duty Silt Fence Barriers per OPSD 219.130; locations are shown on the Sediment and Erosion Control Plan included in **Appendix D**. They are typically made of layers of straw bales or geotextile fabric staked in place. All seepage barriers will be inspected and maintained as needed.

6.5 Surface Structure Filters

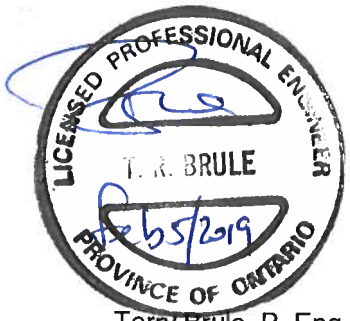
All catchbasins, and to a lesser degree, manholes, convey surface water to sewers. Until streets are asphalted and curbed, all catchbasins and manholes will be constructed with sediment capture inserts or equivalent located between the structure frame and cover. These will stay in place and be maintained during construction and build until it is appropriate to remove same.

7 CONCLUSION

This report has illustrated that the proposed Cowan's Grove Plaza can be serviced via existing municipal services (currently under construction). The water network will be extended to provide necessary service. All sanitary and storm sewer designs for this development will be completed in conformance with City of Ottawa standards while acknowledging downstream constraints.

By limiting flow into the minor storm sewer system as per the applicable local stormwater management criteria and allowing for excess surface storage on-site, all stormwater management requirements will be met. Adherence to the Sediment and Erosion Control Plan during construction will minimize harmful impacts on surface water.

Based on the information provided within this report, the plans prepared for the subject development can be serviced to meet City of Ottawa requirements.



Terry Brule, P. Eng.
Associate

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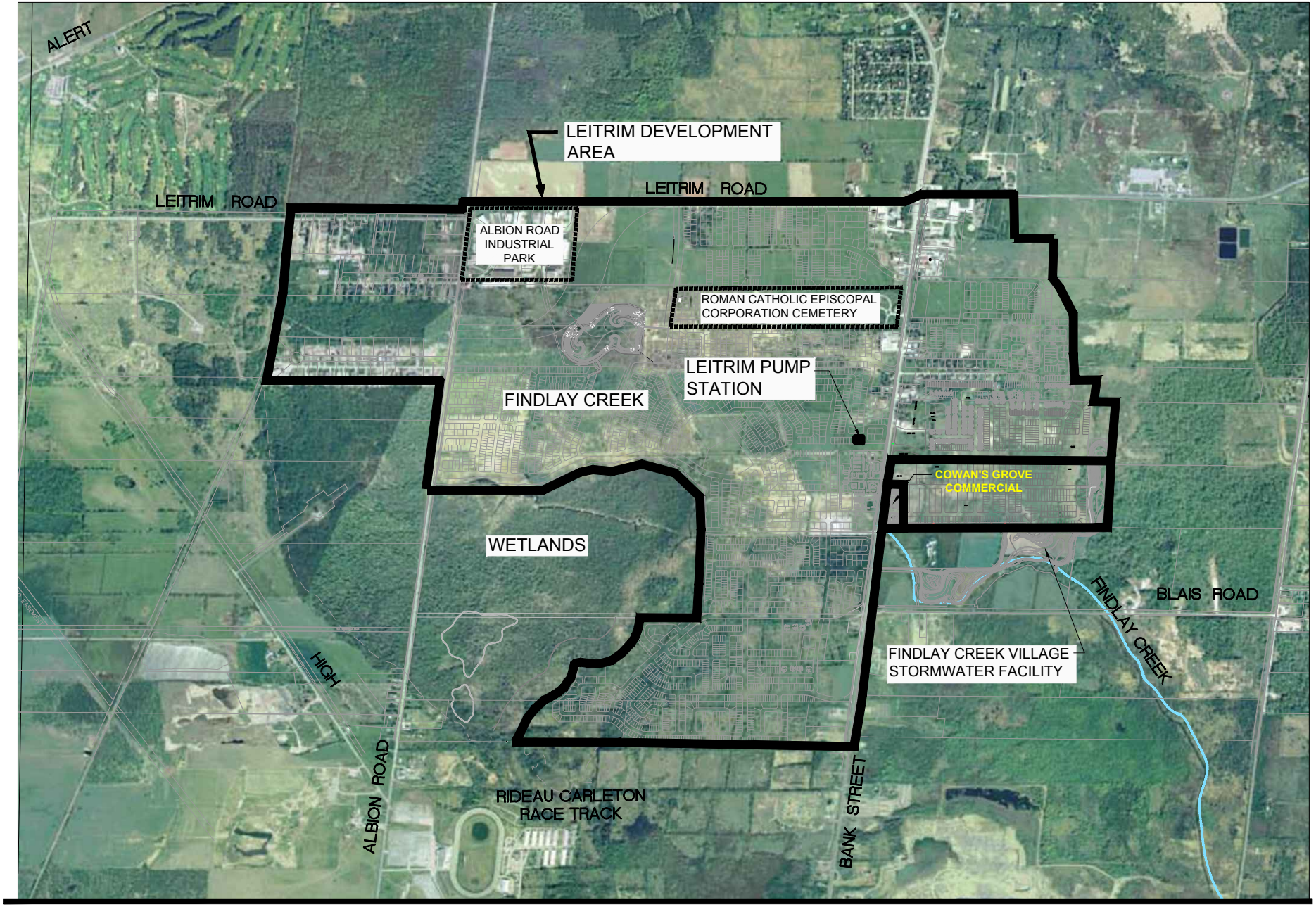

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4791 BANK STREET

Drawing Title: LOCATION WITHIN LEITRIM DEVELOPMENT AREA

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FIGURE 2

Drawing Title

LOCATION WITHIN
COWAN'S GROVE SUBDIVISION

Project Title

COWAN'S GROVE
PLAZA
4791 BANK STREET

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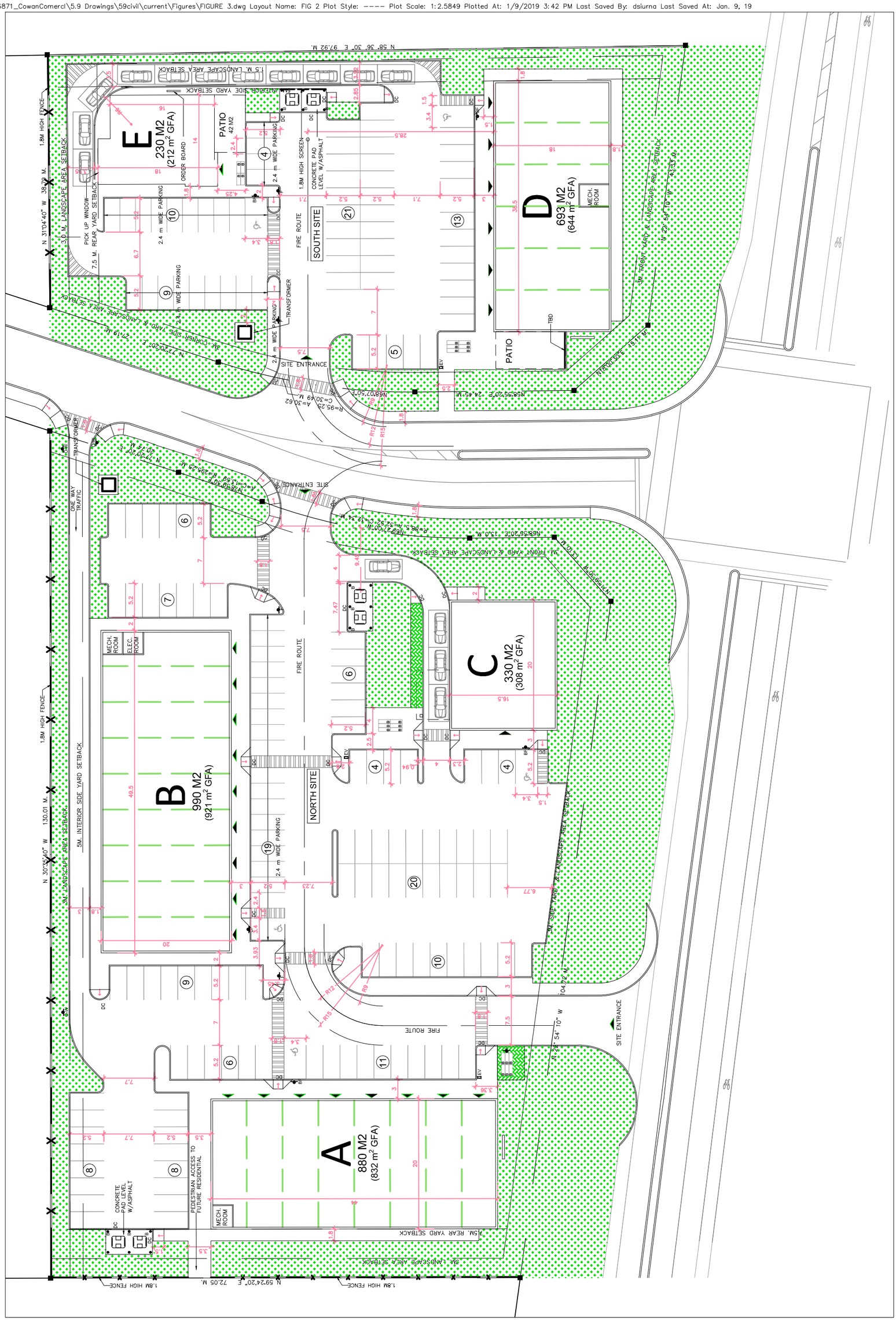

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FIGURE 3	ARCHITECTURAL SITE PLAN	COWAN'S GROVE PLAZA	N.T.S.

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APPENDIX A

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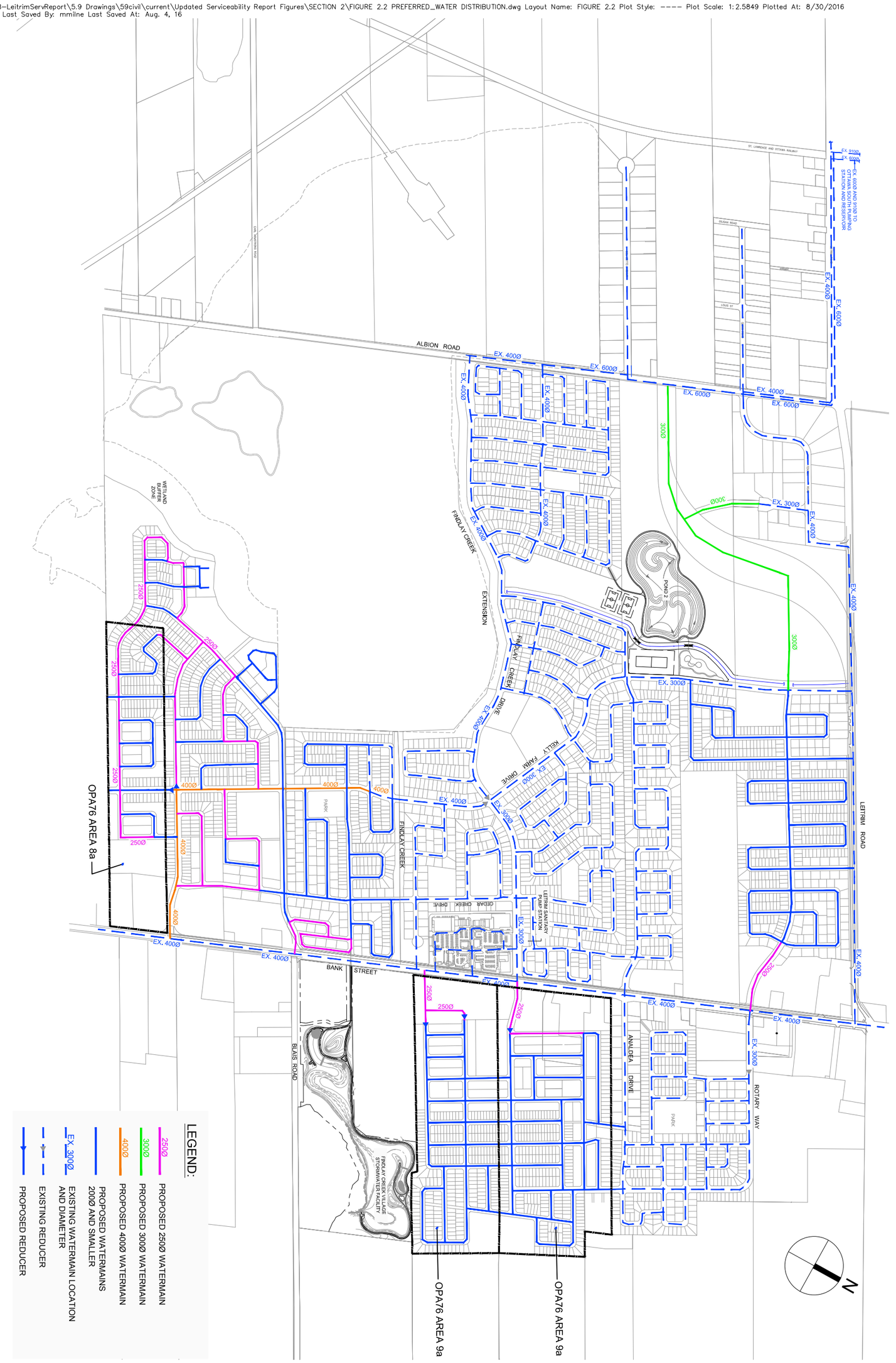

Sheet No.	Drawing Title	Project Title	Scale
FIGURE 2.2	PREFERRED WATER DISTRIBUTION PLAN	UPDATED SERVICEABILITY PLAN (CLASS EA OPA76 AREAS 8a, 9a and 9b) LEITRIM DEVELOPMENT AREA	N.T.S.

IBI

Lance Erion

Subject: FW: Leitrim Serviceability Update, September 2014

From: Rogers, Christopher [mailto:Christopher.Rogers@ottawa.ca]
Sent: Friday, October 24, 2014 11:10 AM
To: Bob Wingate
Cc: Zagorski, Joseph; Diduch, Roman
Subject: Leitrim Serviceability Update, September 2014

Bob,

Comments on the draft report are as follows:

- An introduction is needed to explain the purpose of the report, as this strongly influences the level of detail expected.
- Construction of the new 610mm main on Leitrim was completed in 2014. The project limits included Leitrim Road, from the CPR corridor to Albion, and on Albion from Leitrim to Fenton. This project provides a redundant supply to the majority of the existing Zone 3C, including LDA, via Albion and Findlay Creek.
- The information used for the analysis is dated. Please note the following:

- System-level demands for large growth areas are now estimated as given in the table below. The numbers used in your analysis are conservative, except for the unit demands for apartments. These numbers should only be used for establishing the backbone of the proposed distribution system. Design guideline demands should be used for local system designs.
- The post zone reconfiguration OSPS HGL is currently expected to be 146m. Note that the current Zone 3C remains at 155m. The plan should consider post-reconfiguration boundary conditions for pressure minima, and pre-reconfiguration conditions for pressure maxima.
- Zone 3C will be supplied by two pumping facilities, the OSPS and the Barrhaven PS. Rather that updating the Riverside South development numbers, we propose using our estimated future boundary conditions at Leitrim/CPR = 144m for peak hour and max day + fire (i.e. no need to consider RS development in your model). The development downstream of FCV can be represented as given in Table 2.2, but consider 829 units for Carlsbad.

- Provide figure clearly illustrating existing and proposed service areas, sub-areas identified in OPA 76, existing watermains (including new 610), proposed future watermains. Watermains should be colour-coded to emphasize mains larger than 200mm (nominal).
- Figure 2.2 as referenced in Section 2.4 was not provided in my copy of the report. Review of proposed network cannot be completed without figure as requested above. Focus should be on backbone of network and connection points to existing system.
- Review of alternatives would be better focussed on viable options, such as sizing and configuration of backbone distribution system. For example, if the second E-W main from the north (pipe 1557) were to be sized at 305mm, could this potentially allow for downsizing of downstream mains, to increase number of 6" mains? The City's interest here is to ensure design demands will be met with minimum network pipe sizing, so as to avoid high water age in the system.
- Provide figure illustrating distribution of residual pressure at model nodes under various design conditions, employing a suitable colour-coding scheme.
- Notwithstanding the above point, local sizing and fire demands will need to be reviewed for each plan of subdivision and site plan, and local system sizing will need to be finalized based on the City's design guideline demands, rather than the system-level demands considered in this report.

	Average (L/unit/day)	Outdoor Water Demand (L/unit/day)	Max Day (L/unit/day)	Peak Hour
SFH (OGB)	567	1049	Average + OWD	2.1 x Max Day
MLT (OGB)	558	0	Average	1.6 x Max Day
APT (OGB)	400	0	Average	1.6 x Max Day
EMP (OGB)	85	0	Average	1.5 x Max Day
Water Loss per connection	80	N/A	Average	Average
	Sum above for total Average Day		Sum above for total Max Day	Sum above for to Peak Hour

Regards,

Chris Rogers, M.A.Sc., P.Eng.
Senior Project Manager
Policy Development and Urban Design Branch
Gestionnaire principal de projet
Direction de l'élaboration des politiques et de l'esthétique urbaine

City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 27785
ottawa.ca/planning / ottawa.ca/urbanisme

IBI GROUP
333 PRESTON STREET
OTTAWA, ON
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WATERMAIN DEMAND CALCULATION SHEET

PROJECT : COWAN'S GROVE PLAZA
LOCATION : CITY OF OTTAWA
DEVELOPER : URBANDALE

FILE: 116871.5.7
DATE PRINTED: 11-Jul-18
DESIGN: JEB
PAGE : 1 OF 1

NODE	RESIDENTIAL				NON-RESIDENTIAL			AVERAGE DAILY DEMAND (l/s)			MAXIMUM DAILY DEMAND (l/s)			MAXIMUM HOURLY DEMAND (l/s)			FIRE DEMAND
	UNITS			POP'N	INDTRL	COMM.	RETAIL										
	SF	SD & TH	ST		(ha.)	(ha.)	(m^2)	Res.	Non-res.	Total	Res.	Non-res.	Total	Res.	Non-res.	Total	(l/min)
Cowan's Grove Plaza																	
Building A							880	0.00	0.03	0.03	0.00	0.04	0.04	0.00	0.07	0.07	5,700
Building B							990	0.00	0.03	0.03	0.00	0.04	0.04	0.00	0.08	0.08	5,700
Building C							330	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.03	0.03	5,700
Building D							693	0.00	0.02	0.02	0.00	0.03	0.03	0.00	0.05	0.05	5,700
Building E							418	0.00	0.01	0.01	0.00	0.02	0.02	0.00	0.03	0.03	5,700
TOTAL										0.10			0.14			0.26	

ASSUMPTIONS

RESIDENTIAL DENSITIES

- Single Family (SF) — 3.4 p / p / u
- Semi Detached (SD) & Townhouse (T — 2.7 p / p / u
- Stacked Townhouse (ST) — 2.3 p / p / u

AVG. DAILY DEMAND

- Residential — 350 l / cap / day
- Industrial (Business Park) — 35,000 l / ha / day
- Commercial (Employment A — 50,000 l / ha / day
- Retail (Shopping Centre) — 2,500 l / 1000m^2 / day

MAX. DAILY DEMAND

- Residential — 875 l / cap / day
- Industrial (Business Park) — 52,500 l / ha / day
- Commercial (Employment A — 75,000 l / ha / day
- Retail (Shopping Centre) — 3,750 l / 1000m^2 / day

MAX. HOURLY DEMAND

- Residential — 1,925 l / cap / day
- Industrial (Business Park) — 94,500 l / ha / day
- Commercial (Employment A — 135,000 l / ha / day
- Retail (Shopping Centre) — 6,750 l / 1000m^2 / day

FIRE FLOW

- SF, SD & TH — 10,000 l / min
- Retail — 5,700 l / min

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Fire Flow Design Sheet
Cowan's Grove Plaza
City of Ottawa
Project No. 116871
20-Jun-18

Cowan's Grove - Building A

1. An estimate of the Fire Flow required for a given fire area may be estimated by: $F = 220\ C\ \sqrt{A}$

F = required fire flow in litres per minute
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, masonry or metal walls)
- 0.6 for fire-resistive construction (fully protected frame, floors, roof)

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

A = 880 m^2
C = 0.8
F = 5221.0 L/min

rounded off to 6,000 L/min (min value of 2000 L/min)

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

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

Reduction due to low occupancy hazard 0% x 6,000 = 6,000 L/min

3. The value obtained in 2. may be reduced by as much as 75% for buildings equipped with automatic sprinkler protection.

Non-combustible c/w Automatic Sprinkler System	-75%
Combustible c/w Automatic Sprinkler System	-50%
Sprinkler System conforming to NFPA13	-30%
No Automatic Sprinkler System	0%

Reduction due to Sprinkler System -30% x 6,000 = 4,200 L/min

4. The value obtained in 3. may be increased for structures exposed within 45 metres by the fire area under consideration.

Separation	Charge
0 to 3 m	25%
3.1 to 10 m	20%
10.1 to 20 m	15%
20.1 to 30 m	10%
30.1 to 45 m	5%

Side 1	15	15%	north side
Side 2	29	10%	east side
Side 3	22	10%	south side
Side 4	55	0%	west side
		35%	(Total shall not exceed 75%)

Increase due to separation 35% x 4,200 = 5,670 L/min

The fire flow requirement is 5,700 L/min
or **95 L/sec**
or 1,506 gpm (us)
or 1,254 gpm (uk)

Based on method described in:
"Water Supply for Public Fire Protection - A Guide to Recommended Practice", 1991
by Fire Underwriters Survey

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Fire Flow Design Sheet
Cowan's Grove Plaza
City of Ottawa
Project No. 116871
20-Jun-18

Cowan's Grove - Building B

1. An estimate of the Fire Flow required for a given fire area may be estimated by: $F = 220\ C \sqrt{A}$

F = required fire flow in litres per minute
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, masonry or metal walls)
- 0.6 for fire-resistive construction (fully protected frame, floors, roof)

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

A = 990 m^2
C = 0.8
F = 5537.7 L/min

rounded off to 6,000 L/min (min value of 2000 L/min)

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

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

Reduction due to low occupancy hazard 0% x 6,000 = 6,000 L/min

3. The value obtained in 2. may be reduced by as much as 75% for buildings equipped with automatic sprinkler protection.

Non-combustible c/w Automatic Sprinkler System	-75%
Combustible c/w Automatic Sprinkler System	-50%
Sprinkler System conforming to NFPA13	-30%
No Automatic Sprinkler System	0%

Reduction due to Sprinkler System -30% x 6,000 = 4,200 L/min

4. The value obtained in 3. may be increased for structures exposed within 45 metres by the fire area under consideration.

Separation	Charge
0 to 3 m	25%
3.1 to 10 m	20%
10.1 to 20 m	15%
20.1 to 30 m	10%
30.1 to 45 m	5%

Side 1	22	10%	north side
Side 2	15	15%	east side
Side 3	50	0%	south side
Side 4	33	5%	west side
		30%	(Total shall not exceed 75%)

Increase due to separation 30% x 4,200 = 5,460 L/min

The fire flow requirement is 5,500 L/min
or **92 L/sec**
or 1,453 gpm (us)
or 1,210 gpm (uk)

Based on method described in:
"Water Supply for Public Fire Protection - A Guide to Recommended Practice", 1991
by Fire Underwriters Survey

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Fire Flow Design Sheet
Cowan's Grove Plaza
City of Ottawa
Project No. 116871
20-Jun-18

Cowan's Grove - Building D

1. An estimate of the Fire Flow required for a given fire area may be estimated by: $F = 220\ C\ \sqrt{A}$

F = required fire flow in litres per minute
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, masonry or metal walls)
- 0.6 for fire-resistive construction (fully protected frame, floors, roof)

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

A = 693 m^2
C = 0.8
F = 4633.2 L/min

rounded off to 5,000 L/min (min value of 2000 L/min)

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

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

Reduction due to low occupancy hazard 0% x 5,000 = 5,000 L/min

3. The value obtained in 2. may be reduced by as much as 75% for buildings equipped with automatic sprinkler protection.

Non-combustible c/w Automatic Sprinkler System	-75%
Combustible c/w Automatic Sprinkler System	-50%
Sprinkler System conforming to NFPA13	-30%
No Automatic Sprinkler System	0%

Reduction due to Sprinkler System -30% x 5,000 = 3,500 L/min

4. The value obtained in 3. may be increased for structures exposed within 45 metres by the fire area under consideration.

Separation	Charge
0 to 3 m	25%
3.1 to 10 m	20%
10.1 to 20 m	15%
20.1 to 30 m	10%
30.1 to 45 m	5%

Side 1	40	5%	north side
Side 2	42	5%	east side
Side 3	13	15%	south side
Side 4	55	0%	west side
		25%	(Total shall not exceed 75%)

Increase due to separation 25% x 3,500 = 4,375 L/min

The fire flow requirement is 4,400 L/min
or **73 L/sec**
or 1,162 gpm (us)
or 968 gpm (uk)

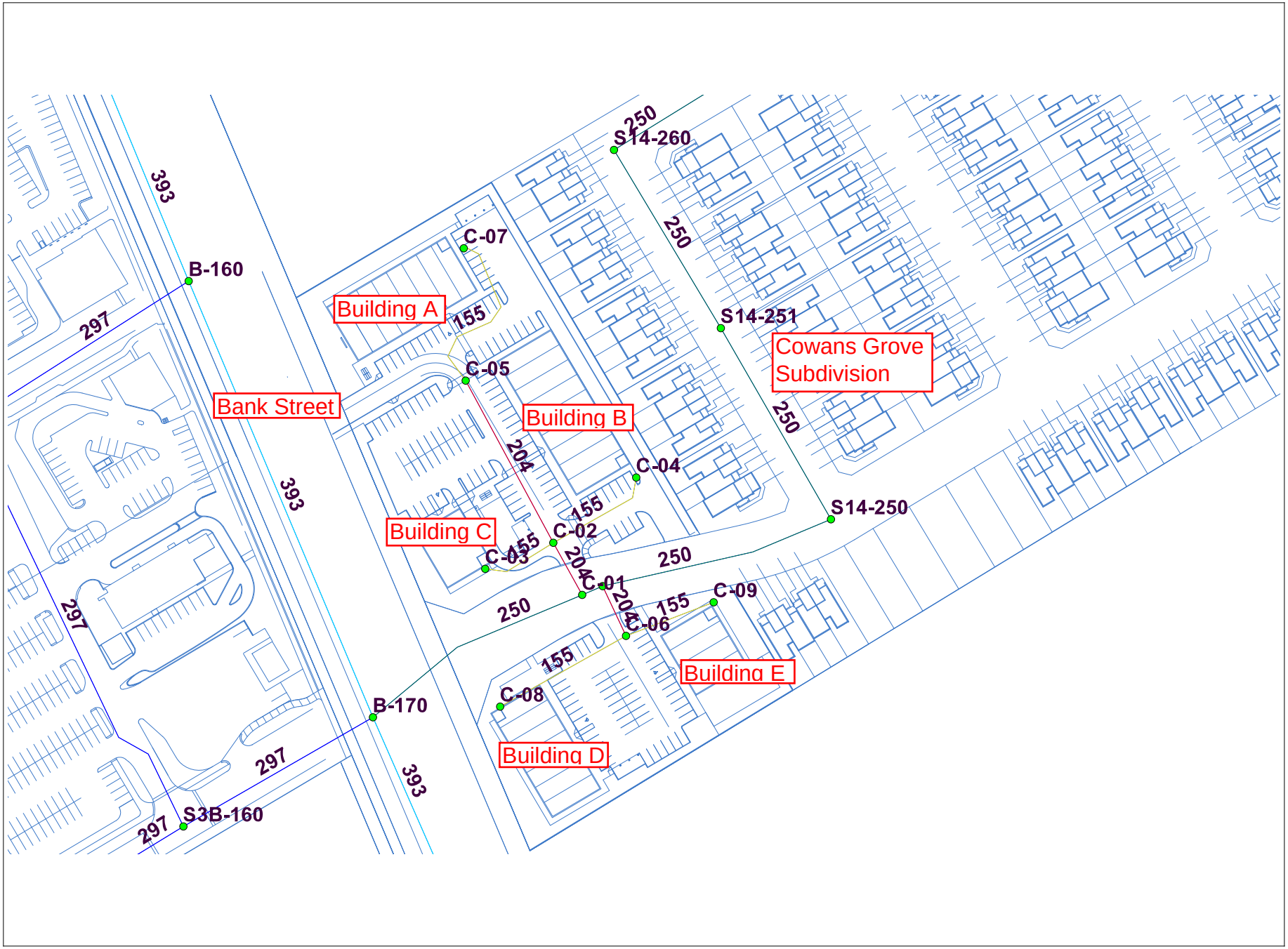
Based on method described in:
"Water Supply for Public Fire Protection - A Guide to Recommended Practice", 1991
by Fire Underwriters Survey

Cowans Grove Phase 1

E

Date: Wednesday, July 11, 2018

Cowans Grove Commercial Site



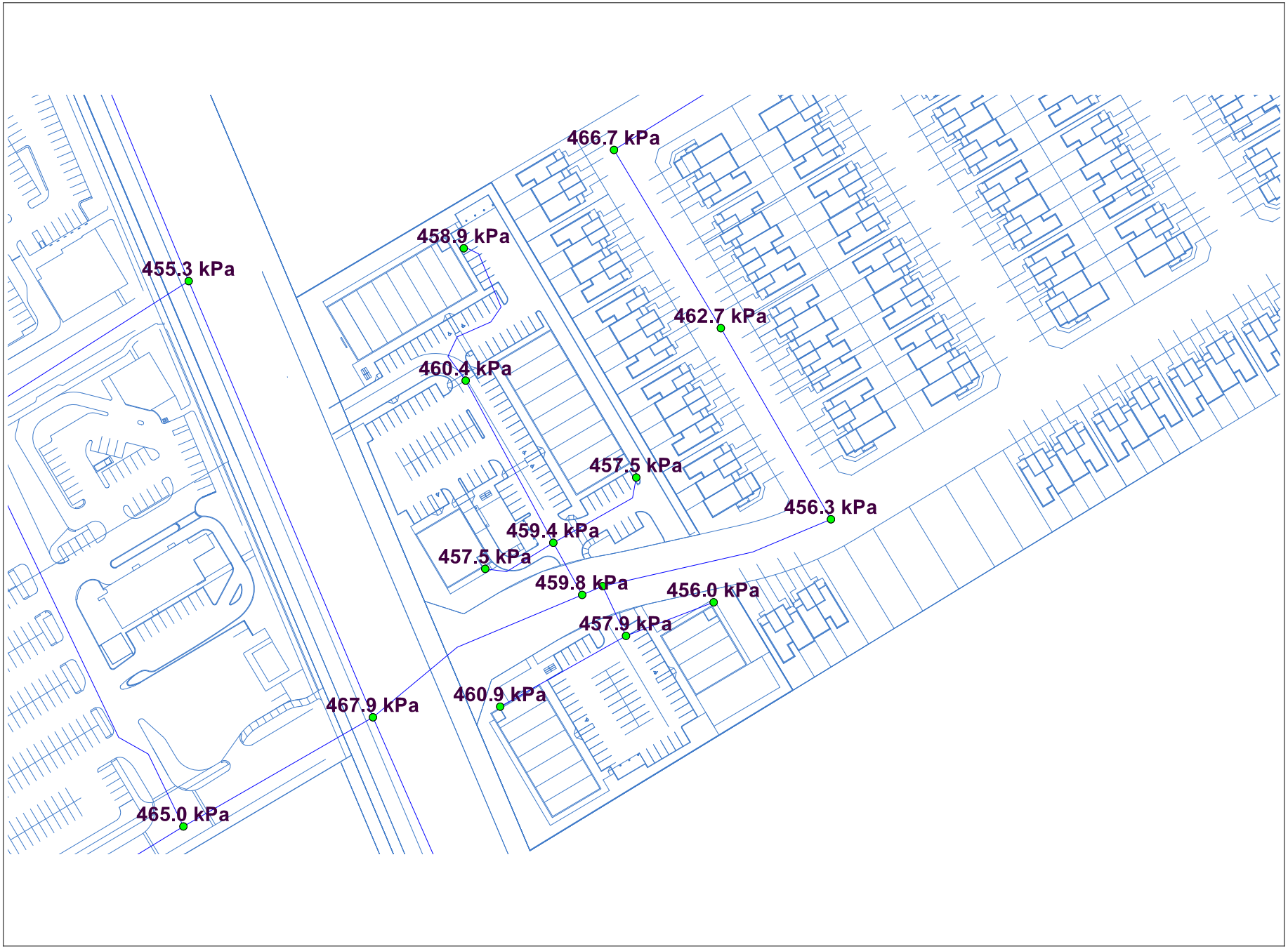
Date: Wednesday, July 11, 2018

Basic Day (Max HGL) Pressures - HGL 155 m

E

Date: Wednesday, July 11, 2018

Peak Hour Pressures - HGL 144 m



E

Date: Wednesday, July 11, 2018

Max Day + Fire Fireflows - HGL 144 m

E

Date: Wednesday, July 11, 2018

APPENDIX B

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SANITARY SEWER DESIGN SHEET

Cowan's Grove
CITY OF OTTAWA
Urbandale Corporation

LOCATION				RESIDENTIAL										ICI AREAS							INFILTRATION ALLOWANCE			FIXED FLOW (L/s)		TOTAL FLOW	PROPOSED SEWER DESIGN						
				AREA w/ Units (Ha)	UNIT TYPES				AREA w/o Units (Ha)	POPULATION		PEAK FACTOR	PEAK FLOW (L/s)	AREA (Ha)						PEAK FLOW (L/s)	AREA (Ha)		FLOW			CAPACITY	LENGTH	DIA	SLOPE	VELOCITY (full)	AVAILABLE CAPACITY	
														INSTITUTIONAL		COMMERCIAL		INDUSTRIAL													
STREET	AREA ID	FROM MH	TO MH		SF	SD	TH	APT		IND	CUM			IND	CUM	IND	CUM	IND	CUM		IND	CUM	(L/s)	IND	CUM		(L/s)	(m)	(mm)	(%)	(m/s)	L/s	(%)
Block 223	BLK13102AN	BLK13102AN	MH13102A	0.24						30.9	30.9	4.00	0.50	0.00	0.00	0.71	0.71	0.00	0.00	0.62	0.95	0.95	0.27			1.38	27.59	12.25	200	0.65	0.85	26.20	94.98%
Shuttleworth Drive	MH13102A	MH13102A	MH13103A	0.17			0			0.0	30.9	4.00	0.50	0.00	0.00	0.00	0.71	0.00	0.00	0.62	0.17	1.12	0.31			1.43	20.24	38.66	200	0.35	0.624	18.81	92.92%
Block 222	BLK13102AS	BLK13103AS	MH13103A	0.12						15.6	15.6	4.00	0.25	0.00	0.00	0.36	0.36	0.00	0.00	0.31	0.48	0.48	0.13			0.70	27.59	12.00	200	0.65	0.85	26.89	97.46%
Shuttleworth Drive	MH13103A	MH13103A	MH13104A	0.23	1		5			15.2	61.7	4.00	1.00	0.00	0.00	0.00	1.07	0.00	0.00	0.93	0.23	1.83	0.51			2.44	20.24	42.88	200	0.35	0.624	17.80	87.93%
Shuttleworth Drive	MH13105Aa	MH13105A	MH13104A	0.48	5		6			30.4	30.4	4.00	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.48	0.48	0.13			0.63	27.59	85.00	200	0.65	0.851	26.96	97.73%
Shuttleworth Drive	MH13105Ab	MH13105A	MH13106A	0.40			12			28.8	28.8	4.00	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.40	0.11			0.58	32.46	71.00	200	0.90	1.001	31.88	98.22%
Shuttleworth Drive	MH13106A	MH13106A	MH13107A	0.43		1	12			32.0	60.8	4.00	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.83	0.23			1.22	20.24	78.01	200	0.35	0.62	19.03	93.99%
Shuttleworth Drive	MH13107A	MH13107A	MH13108A	0.19			6			14.4	75.2	4.00	1.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	1.02	0.29			1.50	20.24	39.08	200	0.35	0.62	18.74	92.57%
Park - Block 243	BLK13108NA	BLK13108A	MH13108A						0.37	0.0	0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.37	0.10			0.10	27.59	15.00	200	0.65	0.85	27.48	99.62%
Shuttleworth Drive	MH13108A	MH13108A	MH13110A	0.58	4	8	2			43.2	118.4	4.00	1.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.58	1.97	0.55			2.47	20.24	116.93	200	0.35	0.62	17.77	87.80%
Shuttleworth Drive	MH13110A	MH13110A	MH13111A	0.37	6					19.2	137.6	4.00	2.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	2.34	0.66			2.88	20.24	78.00	200	0.35	0.62	17.36	85.75%
Shuttleworth Drive	MH13111A	MH13111A	MH13112A	0.49	6					19.2	156.8	4.00	2.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	2.83	0.79			3.33	20.24	77.40	200	0.35	0.62	16.91	83.53%
Shuttleworth Drive	MH13112A	MH13112A	MH13113A	0.10	1					3.2	160.0	4.00	2.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	2.93	0.82			3.41	20.24	7.72	200	0.35	0.62	16.83	83.14%
Shuttleworth Drive	MH13113A	MH13113A	MH13114A	0.37	7					22.4	182.4	4.00	2.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	3.30	0.92			3.88	20.24	48.19	200	0.35	0.62	16.36	80.83%
Longworth Avenue	MH13147A	MH13147A	MH13117A	0.80	13					41.6	41.6	4.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.80	0.22			0.90	20.24	101.00	200	0.35	0.62	19.34	95.56%
Longworth Avenue	MH13117A	MH13117A	MH13116A	0.19	2					6.4	48.0	4.00	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.99	0.28			1.05	20.24	11.48	200	0.35	0.62	19.19	94.79%
Longworth Avenue	MH13116A	MH13116A	MH13115A	0.35	5					16.0	64.0	4.00	1.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	1.34	0.38			1.41	20.24	69.89	200	0.35	0.62	18.83	93.02%
Islington Way	MH13142A	MH13142A	MH13115A	0.87	16					51.2	51.2	4.00	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.87	0.87	0.24			1.07	20.24	106.80	200	0.35	0.62	19.17	94.70%
Islington Way	MH13115A	MH13115A	MH13114A	0.33	5					16.0	131.2	4.00	2.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	2.54	0.71			2.84	26.50	83.76	200	0.60	0.82	23.67	89.30%
Shuttleworth Drive	MH13114A	MH13114A	MH13135A	0.32	5					16.0	329.6	4.00	5.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32	6.16	1.72			7.07	20.24	78.00	200	0.35	0.62	13.18	65.10%
Longworth Avenue	MH13104A	MH13104A	MH13120A	0.28			9			21.6	113.7	4.00	1.84	0.00	0.00	0.00	1.07	0.00	0.00	0.93	0.28	2.59	0.73			3.50	20.24	55.00	200	0.35	0.62	16.74	82.72%
Longworth Avenue	MH13122A	MH13120A	MH13122A	0.56			20			48.0	161.7	4.00	2.62	0.00	0.00	0.00	1.07	0.00	0.00	0.93	0.56	3.15	0.88			4.43	20.24	75.32	200	0.35	0.62	15.81	78.10%
Longworth Avenue	MH13122A	MH13122A	MH13123A	0.07			2			4.8	166.5	4.00	2.70	0.00	0.00	0.00	1.07	0.00	0.00	0.93	0.07	3.22	0.90			4.53	20.24	11.54	200	0.35	0.62	15.71	77.62%
Block 223	BLK13123A	BLK13123A	MH13123A	0.35						44.9	44.9	4.00	0.73	0.00	0.00	1.04	1.04	0.00	0.00	0.90	1.38	1.38	0.39			2.01	20.24	12.00	200	0.35	0.62	18.23	90.06%
Longworth Avenue	MH13123A	MH13123A	MH13124A	0.33			9			21.6	232.9	4.00	3.77	0.00	0.00	0.00	2.11	0.00	0.00	1.83	0.33	4.93	1.38			6.98	20.24	69.84	200	0.35	0.62	13.26	65.50%
Pisces Terrace	MH13150A	MH13150A	MH13124A	0.81			28			67.2	67.2	4.00	1.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.81	0.81	0.23			1.32	20.24	116.96	200	0.35	0.62	18.93	93.50%
Longworth Avenue	MH13124A	MH13124A	MH13125A	0.45			14			33.6	333.7	4.00	5.41	0.00	0.00	0.00	2.11	0.00	0.00	1.83	0.45	6.19	1.73			8.97	20.24	78.00	200	0.35	0.62	11.27	55.69%
Wabasso Lane	MH13153A	MH13153A	MH13125A	0.82			28			67.2	67.2	4.00	1.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.82	0.82	0.23			1.32	20.24	116.97	200	0.35	0.62	18.92	93.49%
Longworth Avenue	MH13125A	MH13125A	MH13126A	0.40			11			26.4	427.3	4.00	6.92	0.00	0.00	0.00	2.11	0.00	0.00	1.83	0.40	7.41	2.07			10.83	20.24	78.00	200	0.35	0.62	9.41	46.51%
Trident Mews	MH13156A	MH13156A	MH13126A	0.66		7	13			53.6	53.6	4.00	0.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.66	0.18			1.05	20.24	117.14	200	0.35	0.62	19.19	94.80%
Trident Mews	MH13158A	MH13158A	MH13159A	0.39			11			26.4	26.4	4.00	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.39	0.11			0.54	28.63	80.00	200	0.70	0.88	28.09	98.12%
Trident Mews	MH13159A	MH13159A	MH13126A	0.26			7			16.8	43.2	4.00	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26	0.65	0.18			0.88	28.63	68.26	200	0.70	0.88	27.75	96.92%
Longworth Avenue	MH13126A	MH13126A	MH13127A	0.25			4			9.6	533.7	3.96	8.56	0.00	0.00	0.00	2.11	0.00	0.00	1.83	0.25	8.97	2.51			12.90	20.24	78.00	200	0.35	0.62	7.34	36.27%
Rathburn Lane	MH13160A	MH13160A	MH13127A	0.65			21			50.4	50.4	4.00	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.65	0.18			1.00	20.24	119.98	200	0.35	0.62	19.24	95.07%
Rathburn Lane	MH13162A	MH13162A	MH13163A	0.64			22			52.8	52.8	4.00	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.64	0.64	0.18			1.03	20.24	80.00	200	0.35	0.62	19.21	94.89%
Rathburn Lane	MH13163A	MH13163A	MH13127A	0.41			14			33.6	86.4	4.00	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.41	1.05	0.29			1.69	40.20	69.26	200	1.38	1.24	38.50	95.79%
Longworth Avenue	MH13127A	MH13127A	MH13128A	0.22			3			7.2	677.7	3.90	10.71	0.00	0.00	0.00	2.11	0.00	0.00	1.83	0.22	10.89	3.05			15.59	20.24	78.00	200	0.35	0.62	4.65	22.97%
Odyssey Way	MH13165A	MH13165A	MH13128A	0.94	18					57.6	57.6	4.00	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.94	0.94	0.26			1.20	20.24	119.99	200	0.35	0.62	19.05	94.09%
Odyssey Way	MH13167A	MH13167A	MH13168A	0.66		7	15			58.4	58.4	4.00	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.66	0.18			1.13	20.24	80.00	200	0.35	0.62	19.11	94.41%
Odyssey Way	MH13168A	MH13168A	MH13128A	0.39		6	7			36.0	94.4	4.00	1.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	1.05	0.29			1.82	47.16	65.89	200	1.90	1.45	45.34	96.13%
Longworth Avenue	MH13128A	MH13128A	MH13129A	0.16		1				3.2	832.9	3.85	12.99	0.00	0.00	0.00	2.11	0.00	0.00	1.83	0.16	13.04	3.65			18.47	20.24	78.00	200	0.35	0.62	1.77	8.76%
Wooler Place	MH13170A	MH13170A	MH13129A	0.93	18					57.6	57.6	4.00	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.93	0.93	0.26			1.19	20.24	119.99	200	0.35	0.62	19.05	94.10%
Wooler Place	MH13172A	MH13172A	MH13173A	0.55	12					38.4	38.4	4.00	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	0.55	0.15			0.78	20.24	81.50	200	0.35	0.62	19.47	96.17%
Wooler Place	MH13173A	MH13173A	MH13129A	0.46	9					28.8	67.2	4.00	1.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.46	1.01	0.28			1.37	45.13	66.50	200	1.74	1.39	43.76	96.96%
Longworth Avenue	MH13129A	MH13129A	MH13135A						0.12	0.0	957.7	3.81	14.79	0.00	0.00	0.00	2.11	0.00	0.00	1.83	0.12	15.10	4.23			20.85	31.02	78.00	250	0.25	0.61	10.17	32.79%
Shuttleworth Drive	MH13175A	MH13175A	MH13176A	0.21	4					12.8	12.8	4.00	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.21	0.06			0.27	27.59	39.00	200	0.65	0.85	27.32	99.04%
Shuttleworth Drive	MH13176A	MH13176A	MH13135A	0.31	5					16.0	28.8	4.00	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.52	0.15			0.61	27.59	78.00	200	0.65	0.85	26.97	97.78%

Design Parameters:

Residential			ICI Areas			
SF/SD	3.2	p/p/u				Peak Factor
TH	2.4	p/p/u	INST	50,000	L/Ha/day	1.5
APT	1.9	p/p/u	COM	50,000	L/Ha/day	1.5
Other	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart
MU	130	p/p/Ha		17000	L/Ha/day	

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day 300 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
Harmon Formula = 1+(14/(4+P^0.5))
where P = population in thousands

Designed: M.M / K.H.
Checked: J.I.M.
Dwg. Reference: 103557-400

No.	Revision	Date
1	Submission No. 1 for City Review	2017-12-05
2	Submission No. 2 for City Review	2018-03-28
3	REVISED PER NEW TOWNHOUSE LAYOUT	2018-04-30
4	Submission No. 3 for City Review	2018-05-16

File Reference: 103557.5.7.1
Date: 2018-05-16
Sheet No: 1 of 2

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SANITARY SEWER DESIGN SHEET

Cowan's Grove
CITY OF OTTAWA
Urbandale Corporation

LOCATION				RESIDENTIAL										ICI AREAS							INFILTRATION ALLOWANCE			FIXED FLOW (L/s)		TOTAL FLOW	PROPOSED SEWER DESIGN						
				AREA w/ Units (Ha)	UNIT TYPES				AREA w/o Units (Ha)	POPULATION		PEAK FACTOR	PEAK FLOW (L/s)	AREA (Ha)						PEAK FLOW (L/s)	AREA (Ha)		FLOW			CAPACITY	LENGTH	DIA	SLOPE	VELOCITY (full)	AVAILABLE CAPACITY	
														INSTITUTIONAL		COMMERCIAL		INDUSTRIAL													
STREET	AREA ID	FROM MH	TO MH		SF	SD	TH	APT		IND	CUM			IND	CUM	IND	CUM	IND	CUM		IND	CUM	(L/s)	IND	CUM		(L/s)	(m)	(mm)	(%)	(m/s)	L/s	(%)
Longworth Avenue	MH13135A	MH13135A	MH13136A	0.51	10					32.0	1348.1	3.71	20.28	0.00	0.00	0.00	2.11	0.00	0.00	1.83	0.51	22.29	6.24			28.35	45.12	75.00	300	0.20	0.62	16.77	37.17%
Longworth Avenue	MH13136A	MH13136A	MH13137A	0.60	11					35.2	1383.3	3.70	20.76	0.00	0.00	0.00	2.11	0.00	0.00	1.83	0.60	22.89	6.41			29.00	45.12	74.15	300	0.20	0.62	16.12	35.72%
Longworth Avenue	MH13147B	MH13147A	MH13146A	0.56	10					32.0	32.0	4.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.56	0.56	0.16			0.68	20.24	73.05	200	0.35	0.62	19.57	96.66%
Longworth Avenue	MH13146A	MH13146A	MH13145A	0.19	2					6.4	38.4	4.00	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.75	0.21			0.83	20.24	11.32	200	0.35	0.62	19.41	95.89%
Longworth Avenue	MH13145A	MH13145A	MH13141A	0.35	5					16.0	54.4	4.00	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	1.10	0.31			1.19	20.24	70.10	200	0.35	0.62	19.05	94.12%
Islington Way	MH13142B	MH13142A	MH13141A	0.54	9					28.8	28.8	4.00	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.54	0.54	0.15			0.62	27.59	83.76	200	0.65	0.85	26.97	97.76%
Longworth Avenue	MH13141A	MH13141A	MH13140A	0.35	5					16.0	99.2	4.00	1.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	1.99	0.56			2.16	20.24	70.15	200	0.35	0.62	18.08	89.31%
Longworth Avenue	MH13140A	MH13140A	MH13139A	0.07	0					0.0	99.2	4.00	1.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	2.06	0.58			2.18	20.24	11.01	200	0.35	0.62	18.06	89.21%
Longworth Avenue	MH13139A	MH13139A	MH13138A	0.17	2					6.4	105.6	4.00	1.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	2.23	0.62			2.34	20.24	40.50	200	0.35	0.62	17.91	88.46%
Longworth Avenue	MH13138A	MH13138A	MH13137A	0.35	5					16.0	121.6	4.00	1.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	2.58	0.72			2.69	20.24	71.50	200	0.35	0.62	17.55	86.70%
Highgarden Terrace	MH13137A	MH13137A	MH13137B						0.13	0.0	1504.9	3.68	22.43	0.00	0.00	0.00	2.11	0.00	0.00	1.83	0.13	25.60	7.17			31.42	70.84	66.55	375	0.15	0.62	39.42	55.64%
Highgarden Terrace		MH13137B	MH13185A							0.0	1504.9	3.68	22.43	0.00	0.00	0.00	2.11	0.00	0.00	1.83	0.00	25.60	7.17			31.42	70.84	12.37	375	0.15	0.62	39.42	55.64%
Pergola Place	MH13180A	MH13180A	MH13181A	0.64	13					41.6	41.6	4.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.64	0.64	0.18			0.85	20.24	75.54	200	0.35	0.62	19.39	95.78%
Pergola Place	MH13181A	MH13181A	MH13185A	0.49	9					28.8	70.4	4.00	1.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.49	1.13	0.32			1.46	20.24	73.60	200	0.35	0.62	18.79	92.80%
Park - Block 260	MH13185AE	MH13185AE	MH13185A						3.11	0.0	0.0	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.11	3.11	0.87			0.87	27.59	13.13	200	0.65	0.85	26.72	96.84%
Highgarden Terrace	MH13185A	MH13185A	*EXMH141A*						0.14	0.0	1575.3	3.66	23.38	0.00	0.00	0.00	2.11	0.00	0.00	1.83	0.14	29.98	8.39			33.61	70.84	84.29	375	0.15	0.62	37.23	52.56%
					DRAFT 2016 UPDATED SERVICEABILITY REPORT																													
Zone 10 Future			*EXMH140A*	7.86	158		89	72	0.93	856.0	856.0	3.84	13.32	0.52	0.52	1.11	1.11	0.00	0.00	0.28	10.42	10.42	2.92			16.52							
Zone 10 Existing (Modified Peaking Factor)			*EXMH140A*	23.91	79		121		0.82	543.2	543.2	1.90	3.34	1.89	1.89	0.00	0.00	0.00	0.00	1.09	26.62	26.62	7.45			11.89							
					LILYTHORNE DESIGN SHEET DATED 2018-02-09																													
			EXMH140A	0.50	6					19.2	19.2	4.90	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50	0.14			0.44							
			EXMH140A	1.60	25					80.0	80.0	6.90	1.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.60	1.60	0.45			2.24							
			EXMH206A	33.51						0.0	2012.2	3.58	29.21	0.00	2.25	0.00	3.90	0.00	0.00	5.34	33.51	33.51	9.38			43.93							
Street No. 7	*EXMH141A*	*EXMH140A*	*EXMH141A*	0.16						0.0	1498.4	3.68	22.34	0.00	2.41	0.00	1.11	0.00	0.00	3.06	0.16	39.30	11.00			36.40	91.46	*88.63*	*375*	*0.25*	0.80	55.06	60.20%
Street No. 1		*EXMH141A*	*EXMH206A*							0.0	3073.7	3.43	42.75	0.00	2.41	0.00	3.22	0.00	0.00	4.89	0.00	69.28	19.40			67.04	91.46	*179.98*	*375*	*0.25*	0.80	24.42	26.70%
Street No. 1		*EXMH206A*	*EXMH200A*							0.0	5085.9	3.24	66.71	0.00	4.66	0.00	7.12	0.00	0.00	10.23	0.00	102.79	28.78			105.72	100.18	*500.10*	*375*	*0.30*	0.88	-5.54	-5.53%

Design Parameters:

Residential			ICI Areas			Peak Factor
SF/SD	3.2	p/p/u				
TH	2.4	p/p/u	INST	50,000	L/Ha/day	1.5
APT	1.9	p/p/u	COM	50,000	L/Ha/day	1.5
Other	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart
MU	130	p/p/Ha		17000	L/Ha/day	

Notes:

1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day 300 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5))
   where P = population in thousands

Designed: M.M / K.H

Checked: J.I.M.

Dwg. Reference: 103557-400

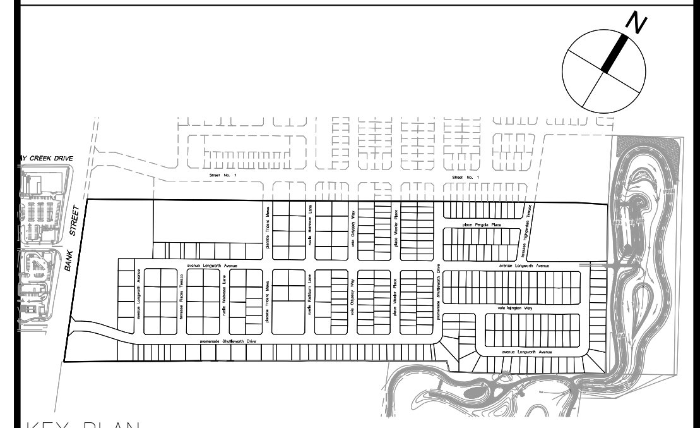
No.	Revision	Date
1	Submission No. 1 for City Review	2017-12-05
2	Submission No. 2 for City Review	2018-03-28
3	REVISED PER NEW TOWNHOUSE LAYOUT	2018-04-30
4	Submission No. 3 for City Review	2018-05-16

File Reference: 103557.5.7.1
Date: 2018-05-16
Sheet No: 2 of 2

LEGEND :

AREA NUMBER
POPULATION
AREA IN HECTARES
AREA BOUNDARY

SEE 010, 011, 012 FOR NOTES, LEGEND, CB TABLE, STREET SECTIONS AND DETAILS



KEY PLAN
NTS

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5	ISSUED FOR MOE	J.I.M.	2018:05:30
4	SUBMISSION NO. 3 FOR CITY REVIEW	J.I.M.	2018:05:16
3	REVISED PER NEW TOWNHOUSE LAYOUT	J.I.M.	2018:04:30
2	SUBMISSION NO. 2 FOR CITY REVIEW	J.I.M.	2018:03:28
1	SUBMISSION NO. 1 FOR CITY REVIEW	J.I.M.	2017:12:05

URBANDALE
CORPORATION

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title
Cowan's Grove

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2018/05/30
PROVINCE OF ONTARIO

N

Drawing Title

SANITARY DRAINAGE

AREA PLAN

Scale
1:1500

Design
K.H. / S.T. / M.M.

Date
NOVEMBER 2017

Drawn
D.D. / M.M.

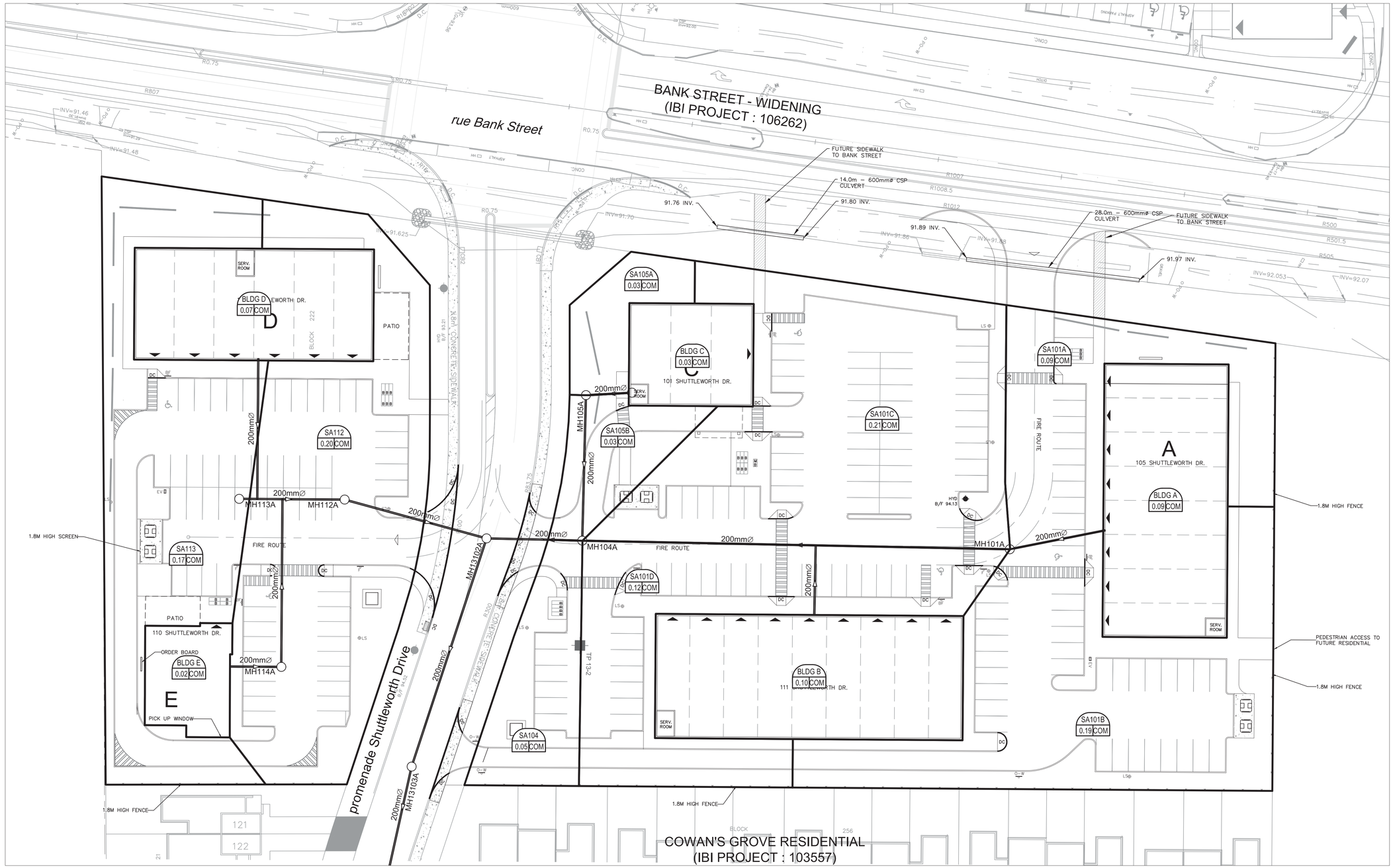
Checked
J.I.M.

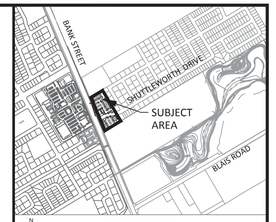
Project No.
103557

Drawing No.
400

D07-16-13-0035

#17553





KEY PLAN
(NTS)

NOTES:

1. SEE DRAWING C-010 FOR ADDITIONAL DETAILS AND NOTES.
2. SITE BENCHMARK TO BE OBTAINED FROM LEGAL SURVEYOR ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

LEGEND :

WH / 1.01 COM — AREA NUMBER; LAND USE / POPULATION
AREA IN HECTARES
5.14 / PBP — AREA IN HECTARES; LAND USE TYPE

PBP PRESTIGE BUSINESS PARK - 35 000 l/s/ha
IND LIGHT INDUSTRIAL - 35 000 l/s/ha
COM COMMERCIAL - 28 000 l/s/ha
ROW RIGHT OF WAY (INFILTRATION FLOW ONLY)

DRAINAGE AREA LIMITS
EXISTING DRAINAGE AREA LIMITS

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	T.R.B.	2019:01:22
3	RE-SUBMISSION FOR SITE PLAN APPROVAL	T.R.B.	2019:01:10
2	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	T.R.B.	2018:11:14
1	ISSUED FOR SPA	T.R.B.	2018:07:12

URBANDALE CORPORATION

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Project Title
Cowan's Grove
PLAZA
4791 BANK STREET

LICENSED PROFESSIONAL ENGINEER
T. R. BRULE
2019/01/22
PROVINCE OF ONTARIO

N

Drawing Title
SANITARY DRAINAGE AREA PLAN

Scale
1 : 300

Design	Date
J.B.	JUNE 2018
Drawn	Checked
D.P.S.	T.R.B.
Project No.	Drawing No.
116871	C-400

APPROVED ☐ REFUSED ☐

THIS____ DAY OF _____ , 20_____

DON HERWEYER, MCIP, RPP
MANAGER, DEVELOPMENT REVIEW - SOUTH
PLANNING, INFRASTRUCTURE & ECONOMIC
DEVELOPMENT DEPARTMENT, CITY OF OTTAWA

D07-12-18-0109

#17750

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SANITARY SEWER DESIGN SHEET

Cowan's Grove Plaza
CITY OF OTTAWA
Urbandale

LOCATION				RESIDENTIAL										ICI AREAS								INFILTRATION ALLOWANCE			FIXED FLOW (L/s)		TOTAL FLOW	PROPOSED SEWER DESIGN						
				AREA w/ Units (Ha)	UNIT TYPES				AREA w/o Units (Ha)	POPULATION		RES PEAK FACTOR	PEAK FLOW (L/s)	AREA (Ha)						ICI PEAK FACTOR	PEAK FLOW (L/s)	AREA (Ha)		FLOW				CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
														INSTITUTIONAL		COMMERCIAL		INDUSTRIAL																
STREET	AREA ID	FROM MH	TO MH		SF	SD	TH	APT		IND	CUM			IND	CUM	IND	CUM	IND	CUM			IND	CUM	(L/s)	IND	CUM	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (m/s)	L/s	(%)
Cowan's Grove Plaza - South	BLDG D	BLDG D	MH113-112							0.0	0.0	3.80	0.00			0.07	0.07			1.50	0.00	0.07	0.07	0.02	0.00	0.00	0.02	59.26	22.60	200	3.00	1.828	59.24	99.96%
Cowan's Grove Plaza - South	BLDG E	BLDG E	MH114A							0.0	0.0	3.80	0.00			0.02	0.02			1.50	0.00	0.02	0.02	0.01	0.00	0.00	0.01	34.22	8.24	200	1.00	1.055	34.21	99.98%
Cowan's Grove Plaza - South		MH114A	MH113-112							0.0	0.0	3.80	0.00				0.02			1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34.22	27.00	200	1.00	1.055	34.22	100.00%
Cowan's Grove Plaza - South	SA113	MH113A	MH112A							0.0	0.0	3.80	0.00			0.17	0.26			1.50	0.00	0.17	0.17	0.06	0.00	0.00	0.06	24.19	16.97	200	0.50	0.746	24.14	99.77%
Cowan's Grove Plaza - South	SA112	MH112A	*Stub*							0.0	0.0	3.80	0.00			0.20	0.46			1.50	0.00	0.20	0.46	0.15	0.00	0.00	0.15	27.59	14.62	200	0.65	0.851	27.43	99.45%
Cowan's Grove Plaza - South		*Stub*	*EXMH13102A*							0.0	0.0	3.80	0.00			0.00	0.46			1.50	0.00	0.00	0.46	0.15	0.00	0.00	0.15	27.59	9.05	200	0.65	0.851	27.43	99.45%
Cowan's Grove Plaza - North	BLDG A	BLDG A	MH101A							0.0	0.0	3.80	0.00			0.09	0.09			1.50	0.00	0.09	0.09	0.03	0.00	0.00	0.03	59.26	15.64	200	3.00	1.828	59.24	99.95%
Cowan's Grove Plaza - North	BLDG B	BLDG B	MH101A-104A							0.0	0.0	3.80	0.00			0.10	0.10			1.50	0.00	0.10	0.10	0.03	0.00	0.00	0.03	34.22	11.21	200	1.00	1.055	34.18	99.90%
Cowan's Grove Plaza - North	SA101A, 101B, 101C, 101D	MH101A	MH104A							0.0	0.0	3.80	0.00			0.61	0.80			1.50	0.00	0.61	0.80	0.26	0.00	0.00	0.26	24.19	68.81	200	0.50	0.746	23.93	98.91%
Cowan's Grove Plaza - North	BLDG C	BLDG C	MH105A							0.0	0.0	3.80	0.00			0.03	0.03			1.50	0.00	0.03	0.03	0.01	0.00	0.00	0.01	48.39	7.41	200	2.00	1.492	48.38	99.98%
Cowan's Grove Plaza - North	SA105A, SA105B	MH105A	MH104A							0.0	0.0	3.80	0.00			0.06	0.09			1.50	0.00	0.06	0.09	0.03	0.00	0.00	0.03	48.39	23.43	200	2.00	1.492	48.36	99.94%
Cowan's Grove Plaza - North	SA104	MH104A	*Stub*							0.0	0.0	3.80	0.00			0.05	0.94			1.50	0.00	0.05	0.94	0.31	0.00	0.00	0.31	27.59	6.21	200	0.65	0.851	27.28	98.88%
Cowan's Grove Plaza - North		*Stub*	*EXMH13102A*							0.0	0.0	3.80	0.00			0.00	0.94			1.50	0.00	0.00	0.94	0.31	0.00	0.00	0.31	27.59	9.19	200	0.65	0.851	27.28	98.88%

Design Parameters:

Residential			ICI Areas			
SF	3.4	p/p/u	INST	28,000	L/Ha/day	
TH/SD	2.7	p/p/u	COM	28,000	L/Ha/day	
APT	1.8	p/p/u	IND	35,000	L/Ha/day	MOE Chart
Other	60	p/p/Ha		17000	L/Ha/day	

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 280 L/day 200 L/day
3. Infiltration allowance: 0.33 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+(P/1000)^0.5))0.8
   where K = 0.8 Correction Factor
5. Commercial and Institutional Peak Factors based on total area, 1.5 if greater than 20%, otherwise 1.0

Designed: JEB

Checked: TRB

Dwg. Reference: 116871-400

No.	Revision	Date
1.	City Submission #1	2018-07-09
2.	City Submission #2	2018-11-14

File Reference: 116871.5.7.1 **Date:** 2018-07-06 **Sheet No:** 1 of 1

APPENDIX C

Drainage Area ID	Continuous/ Sag (1)(2)	Road Type	Minor System Design Target (Based On Road Type)		ICD (l/s)	Notes
			Minor System Design Storm	Generated Flow On Individual Segment Simulated (l/s)		
R13109B	Sag	Rear Yard	5	32	43	
R13110B	Sag	Rear Yard	5	30	31	
R13156	Sag	Rear Yard	5	26	28	

(1) Capture on continuous grade is limited to capacity of grate.

(2) The minor flow restriction has been increased in sags to allow full capture of overflow from upstream segments on continuous grade during the design storm event without ponding.

For those areas within Cowan's Grove which will require a separate site stormwater design and analysis, the following table summarizes the assumed inflow rate and minimum on-site storage required for their design.

Table 5.4 Summary of Minimum On-Site Storage and Minor System Inflow Rate for External Development Lands to Cowan's Grove

Drainage Area Id	Area (Ha)	Land Use	Imp Ratio	Minimum On-Site Storage Required (cu-m)*	Minor System Inflow Rate (l/s)
West Model (Street No 1 only from Lilythorne at Findlay Creek)					
MU04	1.32	Mixed Use/High Density	0.86	150.00	270
East Model (Street No 1 only from Lilythorne at Findlay Creek)					
PARK2	1.51	Park	0.14	353.00	146
FPARK2	1.60	Park	0.20	Total flow conveyed to PARK2 where it is stored and captured	
Centre Model					
INST	2.25	School	0.86	253.00	454
MU01	0.67	Mixed Use/High Density	0.86	80.00	135
MU05	1.39	Mixed Use/High Density	0.86	180.00	281
South Model					
MU02	0.95	Mixed Use/High Density	0.86	125.00	191
MU03	0.48	Mixed Use/High Density	0.86	60.00	96
PARK1	0.37	Park	0.14	60.00	16

** The on-site storage noted was used to evaluate Cowan's Grove. As a minimum this on-site storage should be provided.*

The storage available on-site and its maximum depth and the results of the DDSWMM evaluation for the subject site are presented in **Table 5.5**. The ponding plan for the subject site is presented on **Drawings 103557-600 and 103557-601**. The DDSWMM output files are presented in **Appendix E**.


2.78AC = 65.93
2.78AC = 4.14 (1:10yr)
Tc = 32.96 min
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Street 'W'
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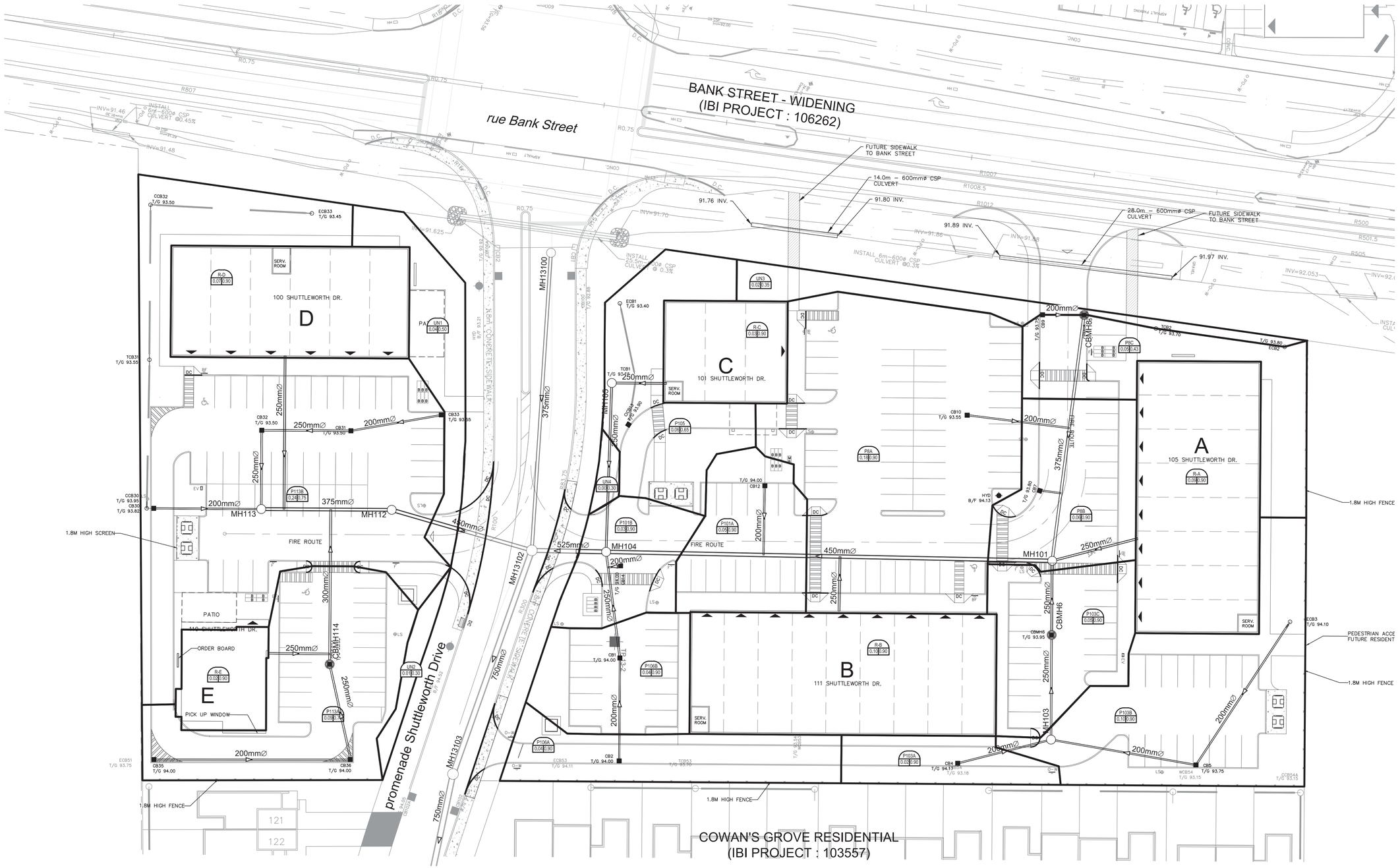
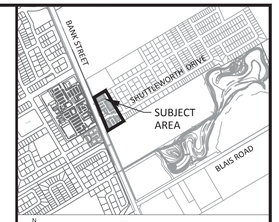




KEY PLAN
(NTS)

NOTES:
1. SEE DRAWING C-010 FOR ADDITIONAL DETAILS AND NOTES.
2. SITE BENCHMARK TO BE OBTAINED FROM LEGAL SURVEYOR ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

LEGEND:
- DRAINAGE AREA LIMITS
- XX (0.01) 0.90 — AREA ID / RUNOFF COEFFICIENT / AREA IN HECTARES

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	T.R.B.	2019/01/22
3	RE-SUBMISSION FOR SITE PLAN APPROVAL	T.R.B.	2019/01/10
2	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	T.R.B.	2018/11/14
1	ISSUED FOR SPA	T.R.B.	2018/07/12

URBANDALE CORPORATION

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title
Cowan's Grove
PLAZA
4791 BANK STREET

LICENCE PROFESSIONAL ENGINEER
T. R. BRULE
2019/01/22
PROVINCE OF ONTARIO

Drawing Title
STORM DRAINAGE AREA PLAN

Scale: 1 : 300

Design	Date
J.B.	JUNE 2018
Drawn	Checked
D.P.S.	T.R.B.
Project No.	Drawing No.
116871	C-500

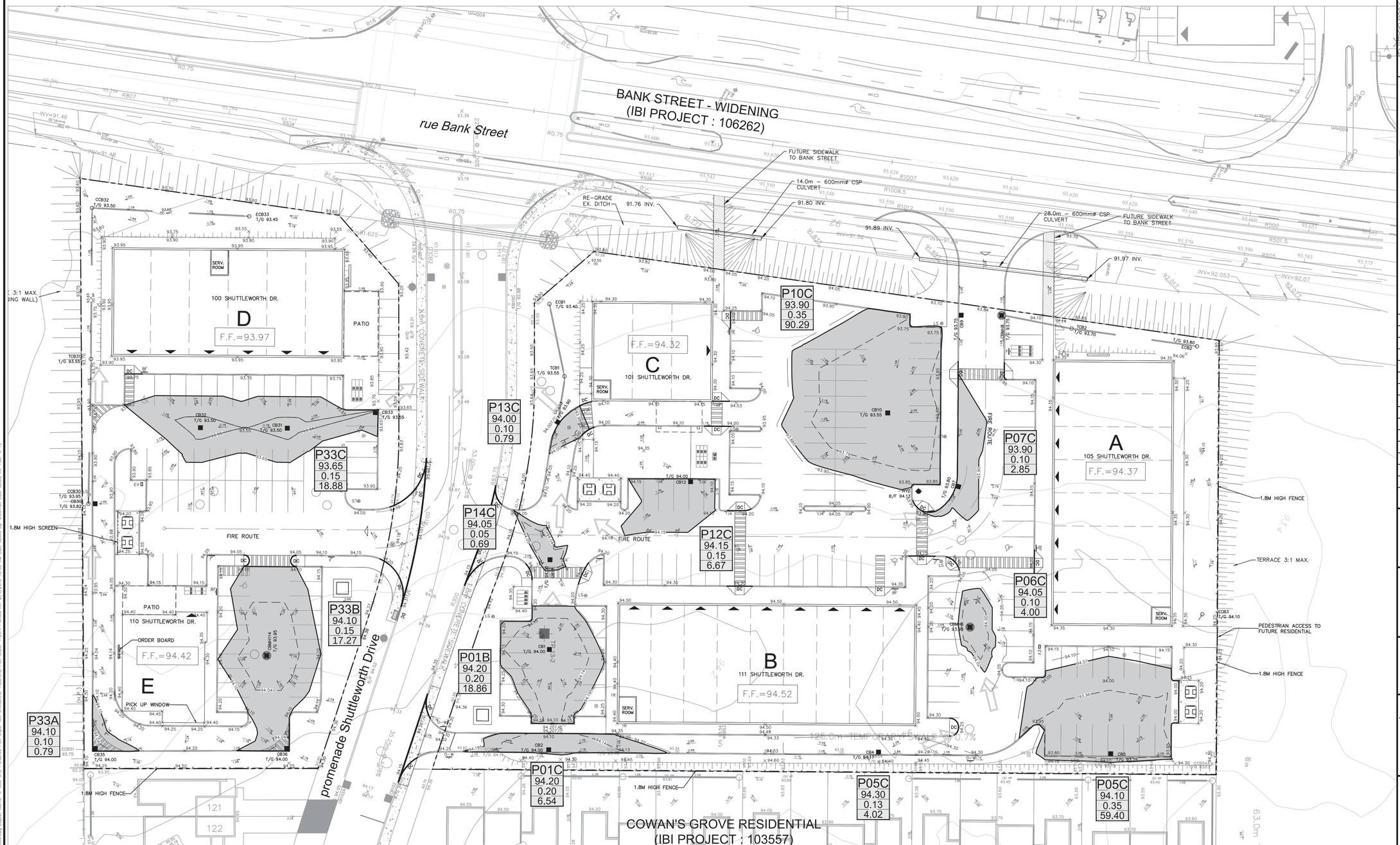
APPROVED ☐ REFUSED ☐

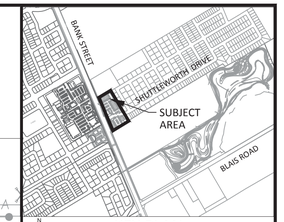
THIS ____ DAY OF _____ , 20_____

DON HERWEYER, MCIP, RPP
MANAGER, DEVELOPMENT REVIEW - SOUTH
PLANNING, INFRASTRUCTURE & ECONOMIC
DEVELOPMENT DEPARTMENT, CITY OF OTTAWA

D07-12-18-0109

#17750





KEY PLAN
(NTS)

NOTES:

1. SEE DRAWING C-010 FOR ADDITIONAL DETAILS AND NOTES.
2. SITE BENCHMARK TO BE OBTAINED FROM LEGAL SURVEYOR ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

LEGEND :

- 100 YEAR PONDING VOLUME LIMIT
- 5 YEAR PONDING ELEVATION
- SPILL OVER ELEVATION
- MAJOR OVERLAND FLOW ROUTE
- P11C / 98.40 / 0.25 / 26.45 — POND AREA # / POND ELEVATION (m) / POND DEPTH (m) / POND VOLUME (m³)

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	T.R.B.	2019/01/22
3	RE-SUBMISSION FOR SITE PLAN APPROVAL	T.R.B.	2019/01/10
2	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	T.R.B.	2018/11/14
1	ISSUED FOR SPA	T.R.B.	2018/07/12

URBANDALE CORPORATION

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title

Cowan's Grove
PLAZA
4791 BANK STREET

LICENCE — PROFESSIONAL ENGINEER — T. R. BRULE — 2019/01/22 — PROVINCE OF ONTARIO

Drawing Title

SITE PONDING

Scale: 1 : 300

Design	Date
J.B.	JUNE 2018
Drawn	Checked
D.P.S.	T.R.B.
Project No.	Drawing No.
116871	C-600

APPROVED ☐ REFUSED ☐

THIS ____ DAY OF _____ , 20_____

DON HERWEYER, MCIP, RPP
MANAGER, DEVELOPMENT REVIEW - SOUTH
PLANNING, INFRASTRUCTURE & ECONOMIC
DEVELOPMENT DEPARTMENT, CITY OF OTTAWA

D07-12-18-0109

#17750

J:\116871_CowanGrove\c10.9 Drawings\10plot\10plots\C-600.dwg Layout Name: C-600 SITE PONDING Plot Style: AIA STANDARD-FULL.CTB Plot Scale: 1:25.4 Plotted At: 2/4/2019 10:55 AM Last Saved By: DSOHNA Last Saved At: Feb. 4, 19

IBI GROUP
400-333 Preston Street
Ottawa, Ontario K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

STORM SEWER DESIGN SHEET

Cowan's Grove Plaza
City of Ottawa
Urbandale

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW													SEWER DATA								
STREET	AREA ID	FROM	TO	C= 0.20	C= 0.25	C= 0.40	C= 0.43	C= 0.57	C= 0.65	C= 0.69	C= 0.70	C= 0.75	C= 0.90	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (2) (mm/hr)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	2yr PEAK FLOW (L/s)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	W	H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (2yr) (L/s)	(%)
Cowan's Grove Plaza - South	R-D	BLDG D	MH113-112										0.07	0.18	0.18	10.00	0.34	10.34	76.81	104.19	122.14	178.56	13.45	18.25	21.39	31.27		18.25	62.04	24.79	250			1.00	1.224	43.79	70.59%
Cowan's Grove Plaza - South	P113A	CB36	CBMH114									0.09		0.19	0.19	10.00	0.26	10.26	76.81	104.19	122.14	178.56	14.41	19.55	22.92	33.51		19.55	51.91	15.78	250			0.70	1.024	32.35	62.33%
Cowan's Grove Plaza - South	R-E	BLDG E	Pipe										0.02	0.05	0.05	10.00	0.13	10.13	76.81	104.19	122.14	178.56	3.84	5.21	6.11	8.94		5.21	62.04	9.90	250			1.00	1.224	56.82	91.60%
Cowan's Grove Plaza - South		CBMH114	Pipe											0.00	0.24	10.26	0.30	10.56	75.83	102.86	120.57	176.25	18.02	24.45	28.66	41.89		24.45	100.88	25.00	300			1.00	1.383	76.43	75.77%
Cowan's Grove Plaza - South	P113B	MH113	MH112									0.24		0.50	0.91	10.34	0.31	10.65	75.53	102.44	120.08	175.53	68.98	93.55	109.66	160.30		93.55	129.34	21.08	375			0.50	1.134	35.78	27.67%
Cowan's Grove Plaza - South		MH112	Stub											0.00	0.91	10.65	0.25	10.90	74.41	100.89	118.26	172.85	67.95	92.14	108.00	157.85		92.14	133.02	12.28	450			0.20	0.810	40.88	30.73%
Cowan's Grove Plaza - South		Stub	EXMH13102											0.00	0.91	10.90	0.23	11.13	73.51	99.67	116.81	170.73	67.14	91.02	106.68	155.92		91.02	133.02	11.29	450			0.20	0.810	42.00	31.57%
Cowan's Grove Plaza - North	P103B	CB5	MH103										0.10	0.25	0.25	10.00	0.38	10.38	76.81	104.19	122.14	178.56	19.22	26.07	30.56	44.68		26.07	34.22	23.79	200			1.00	1.055	8.15	23.81%
Cowan's Grove Plaza - North	P103A	CB4	MH103										0.02	0.05	0.05	10.00	0.25	10.25	76.81	104.19	122.14	178.56	3.84	5.21	6.11	8.94		5.21	34.22	15.54	200			1.00	1.055	29.00	84.76%
Cowan's Grove Plaza - North		MH103	CBMH6											0.00	0.30	10.38	0.23	10.61	75.39	102.25	119.85	175.19	22.64	30.70	35.98	52.60		30.70	62.04	16.91	250			1.00	1.224	31.34	50.52%
Cowan's Grove Plaza - North	P103C	CBMH6	MH101										0.05	0.13	0.43	10.61	0.16	10.77	74.55	101.10	118.50	173.20	31.71	43.00	50.40	73.67		43.00	62.04	11.99	250			1.00	1.224	19.04	30.69%
Cowan's Grove Plaza - North	P8C	CBMH8	MH101				0.06							0.07	0.07	10.00	0.59	10.59	76.81	104.19	122.14	178.56	5.51	7.47	8.76	12.81		12.81	129.34	40.05	375			0.50	1.134	116.53	90.10%
Cowan's Grove Plaza - North	P8A, P8B	CBMH8	MH101										0.24	0.60	0.60	10.00	0.59	10.59	76.81	104.19	122.14	178.56	46.12	62.57	73.34	107.22		75.37	129.34	40.05	375			0.50	1.134	53.96	41.72%
Cowan's Grove Plaza - North	R-A	BLDG A	MH101										0.09	0.23	0.23	10.00	0.19	10.19	76.81	104.19	122.14	178.56	17.29	23.46	27.50	40.21		23.46	62.04	14.29	250			1.00	1.224	38.58	62.18%
Cowan's Grove Plaza - North	R-B	BLDG B	MH101-104										0.10	0.25	0.25	10.00	0.12	10.12	76.81	104.19	122.14	178.56	19.22	26.07	30.56	44.68		26.07	62.04	8.83	250			1.00	1.224	35.97	57.98%
Cowan's Grove Plaza - North	P101A	MH101	MH104										0.05	0.13	1.03	10.77	0.66	11.43	73.97	100.30	117.55	171.82	75.88	102.89	120.59	176.26		115.21	297.43	72.08	450			1.00	1.812	182.22	61.26%
														0.00	0.07	10.77	0.66	11.43	73.97	100.30	117.55	171.82	5.31	7.19	8.43	12.32										
Cowan's Grove Plaza - North	R-C	BLDG C	MH105										0.03	0.08	0.08	10.00	0.12	10.12	76.81	104.19	122.14	178.56	5.76	7.82	9.17	13.40		7.82	62.04	8.86	250			1.00	1.224	54.22	87.39%
Cowan's Grove Plaza - North	P105	MH105	MH104						0.06					0.11	0.18	10.12	0.37	10.49	76.34	103.56	121.40	177.46	14.01	19.00	22.27	32.56		19.00	62.04	27.31	250			1.00	1.224	43.04	69.37%
Cowan's Grove Plaza - North	P106A, P106B, P101B	CB1	MH104										0.11	0.28	0.28	10.00	0.24	10.24	76.81	104.19	122.14	178.56	21.14	28.68	33.62	49.14		28.68	62.04	17.29	250			1.00	1.224	33.36	53.78%
Cowan's Grove Plaza - North		MH104	Stub											0.00	1.48	11.43	0.07	11.51	71.71	97.19	113.90	166.45	106.46	144.28	169.08	247.09		156.22	247.37	4.84	525			0.30	1.107	91.15	36.85%
														0.00	0.07	11.43	0.07	11.51	71.71	97.19	113.90	166.45	5.14	6.97	8.17	11.94										
Cowan's Grove Plaza - North		Stub	EXMH13102											0.00	1.48	11.51	0.11	11.61	71.47	96.86	113.51	165.88	106.10	143.79	168.51	246.25		155.69	247.37	7.16	525			0.30	1.107	91.68	37.06%
														0.00	0.07	11.51	0.11	11.61	71.47	96.86	113.51	165.88	5.13	6.95	8.14	11.90										

Definitions:
Q = 2.78CiA, where:
Q = Peak Flow in Litres per Second (L/s)
A = Area in Hectares (Ha)
i = Rainfall intensity in millimeters per hour (mm/hr)
[i = 732.951 / (TC+6.199)^0.810] 2 YEAR
[i = 998.071 / (TC+6.053)^0.814] 5 YEAR
[i = 1174.184 / (TC+6.014)^0.816] 10 YEAR
[i = 1735.688 / (TC+6.014)^0.820] 100 YEAR

Notes:
1. Mannings coefficient (n) = 0.013

Designed: JEB
Checked: TRB
Dwg. Reference: 116871-500

No.	Revision	Date
1.	City Submission #1	2018-07-09
2.	City Submission #2	2018-11-14
3.	City Submission #3	2019-02-05

File Reference: 116871.5.7.1
Date: 2018-07-06
Sheet No: 1 of 1

IBI GROUP
333 PRESTON STREET
OTTAWA, ON
K1S 5N4

PROJECT: Cowan's Grove Plaza
DATE: 1/11/2019
FILE: 116871.5.7
REV #: 3
DESIGNED BY: JEB
CHECKED BY: TB

STORMWATER MANAGEMENT

Formulas and Descriptions

i_{2yr} = 1:2 year Intensity = 732.951 / $(T_c+6.199)^{0.810}$
i_{5yr} = 1:5 year Intensity = 998.071 / $(T_c+6.053)^{0.814}$
i_{100yr} = 1:100 year Intensity = 1735.688 / $(T_c+6.014)^{0.820}$
T_c = Time of Concentration (min)
C = Average Runoff Coefficient
A = Area (Ha)
Q = Flow = 2.78CiA (L/s)

Maximum Allowable Release Rate

Restricted Flowrate (based on Cowan's Grove Subdivision D07-16-13-0035 assigned release rate, report table 5.4)

Release rate North side (MU02)	191 L/s
Release Rate South side (MU03)	96 L/s

Q_{TOTAL} =	287.00 L/s

Uncontrolled Release ($Q_{uncontrolled} = 2.78*C*i_{100yr}*A_{uncontrolled}$)

C =	0.43
T_c =	10 min
i_{100yr} =	178.56 mm/hr
$A_{uncontrolled}$ =	0.12 Ha

$Q_{uncontrolled}$ =	26.16 L/s

Uncontrolled Areas	Area	C Value	Area Ave.	Weighted C
UN1	0.04	0.5	0.32	0.16
UN2	0.01	0.3	0.08	0.02
UN3	0.02	0.35	0.16	0.06
UN4	0.004	0.3	0.03	0.01
P8C	0.05	0.43	0.40	0.17
	0.124		1.00	0.43

Maximum Allowable Release Rate ($Q_{max\ allowable} = Q_{restricted} - Q_{uncontrolled}$)

$Q_{max\ allowable}$ =	260.84 L/s

MODIFIED RATIONAL METHOD (100-Year, 5-Year & 2-Year Ponding)

Drainage Area	*P113A*
Area (Ha)	0.090
C =	0.94
Restricted Flow Q_r (L/s)=	14.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
12	162.13	38.03	14.00	24.03	17.30
14	148.72	34.88	14.00	20.88	17.54
15	142.89	33.52	14.00	19.52	**17.57**
16	137.55	32.26	14.00	18.26	17.53
18	128.08	30.04	14.00	16.04	17.33

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	17.57	18.06	0.00	0.00

overflows to: P113B

Drainage Area	*P113A*
Area (Ha)	0.090
C =	0.75
Restricted Flow Q_r (L/s)=	14.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
3	166.09	31.17	14.00	17.17	3.09
5	141.18	26.49	14.00	12.49	3.75
6	131.57	24.69	14.00	10.69	**3.85**
7	123.30	23.14	14.00	9.14	3.84
9	109.79	20.60	14.00	6.60	3.57

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	3.85	18.06	0.00	0.00

overflows to: P113B

Drainage Area	*P113A*
Area (Ha)	0.090
C =	0.75
Restricted Flow Q_r (L/s)=	14.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
2	133.33	25.02	14.00	11.02	1.32
3	121.46	22.79	14.00	8.79	1.58
4	111.72	20.96	14.00	6.96	**1.67**
5	103.57	19.44	14.00	5.44	1.63
7	90.66	17.01	14.00	3.01	1.27

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	1.67	18.06	0	0.00

overflows to: P113B

Drainage Area	*P113B*
Area (Ha)	0.240
C =	0.94
Restricted Flow Q_r (L/s)=	89.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
3	286.05	178.92	89.00	89.92	16.19
5	242.70	151.81	89.00	62.81	18.84
6	226.01	141.37	89.00	52.37	**18.85**
7	211.67	132.40	89.00	43.40	18.23
9	188.25	117.75	89.00	28.75	15.53

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	18.85	18.88	0.00	0.00

overflows to: offsite

Drainage Area	*P113B*
Area (Ha)	0.240
C =	0.75
Restricted Flow Q_r (L/s)=	89.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
-2	319.47	159.86	89.00	70.86	-8.50
0	230.48	115.33	89.00	26.33	0.00
1	203.51	101.84	89.00	12.84	**0.77**
2	182.69	91.42	89.00	2.42	0.29
4	152.51	76.32	89.00	-12.68	-3.04

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.77	18.88	0.00	0.00

overflows to: offsite

Drainage Area	*P113B*
Area (Ha)	0.240
C =	0.75
Restricted Flow Q_r (L/s)=	89.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
-2	229.26	114.72	89.00	25.72	-3.09
-1	192.83	96.49	89.00	7.49	-0.45
0	167.22	83.68	89.00	-5.32	**0.00**
1	148.14	74.13	89.00	-14.87	-0.89
3	121.46	60.78	89.00	-28.22	-5.08

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.00	18.88	0	0.00

overflows to: offsite

Drainage Area	R-D				
Area (Ha)	0.070				
C =	1.00	Restricted Flow Q_r (L/s)=	5.00		

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
31	89.83	17.48	5.00	12.48	23.21
33	86.03	16.74	5.00	11.74	23.25
34	84.27	16.40	5.00	11.40	**23.25**
35	82.58	16.07	5.00	11.07	23.25
37	79.42	15.45	5.00	10.45	23.21

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	23.25	40.00	0.00	0.00

Drainage Area	R-D				
Area (Ha)	0.070				
C =	0.90	Restricted Flow Q_r (L/s)=	5.00		

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
16	80.46	14.09	5.00	9.09	8.73
18	74.97	13.13	5.00	8.13	8.78
19	72.53	12.70	5.00	7.70	**8.78**
20	70.25	12.30	5.00	7.30	8.76
22	66.15	11.58	5.00	6.58	8.69

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	8.78	40.00	0.00	0.00

Drainage Area	R-D				
Area (Ha)	0.070				
C =	0.90	Restricted Flow Q_r (L/s)=	5.00		

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
11	73.17	12.81	5.00	7.81	5.16
13	66.93	11.72	5.00	6.72	5.24
14	64.23	11.25	5.00	6.25	**5.25**
15	61.77	10.82	5.00	5.82	5.24
17	57.42	10.06	5.00	5.06	5.16

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	5.25	40.00	0	0.00

overflows to: 0.00

Drainage Area	R-E				
Area (Ha)	0.020				
C =	1.00	Restricted Flow Q_r (L/s)=	3.00		

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
14	148.72	8.27	3.00	5.27	4.43
16	137.55	7.65	3.00	4.65	4.46
17	132.63	7.37	3.00	4.37	**4.46**
18	128.08	7.12	3.00	4.12	4.45
20	119.95	6.67	3.00	3.67	4.40

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	4.46	30.00	0	0.00

Drainage Area	R-E				
Area (Ha)	0.020				
C =	0.90	Restricted Flow Q_r (L/s)=	3.00		

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
6	131.57	6.58	3.00	3.58	1.29
8	116.11	5.81	3.00	2.81	1.35
9	109.79	5.49	3.00	2.49	**1.35**
10	104.19	5.21	3.00	2.21	1.33
12	94.70	4.74	3.00	1.74	1.25

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	1.35	30.00	0	0.00

Drainage Area	R-E				
Area (Ha)	0.020				
C =	0.90	Restricted Flow Q_r (L/s)=	3.00		

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
3	121.46	6.08	3.00	3.08	0.55
5	103.57	5.18	3.00	2.18	0.65
6	96.64	4.84	3.00	1.84	**0.66**
7	90.66	4.54	3.00	1.54	0.65
9	80.87	4.05	3.00	1.05	0.57

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.66	30.00	0	0.00

overflows to: 0

Drainage Area	P103A/P103B/P103C				
Area (Ha)	0.170				
C =	1.00	Restricted Flow Q_r (L/s)=	17.00		

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
22	112.88	53.35	17.00	36.35	47.98
24	106.68	50.42	17.00	33.42	48.12
25	103.85	49.08	17.00	32.08	**48.12**
26	101.18	47.82	17.00	30.82	48.08
28	96.27	45.50	17.00	28.50	47.88

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	48.12	50.00	0	0.00

overflows to: P8B

Drainage Area	P103A/P103B/P103C				
Area (Ha)	0.170				
C =	0.90	Restricted Flow Q_r (L/s)=	17.00		

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
10	104.19	44.32	17.00	27.32	16.39
12	94.70	40.28	17.00	23.28	16.76
13	90.63	38.55	17.00	21.55	**16.81**
14	86.93	36.98	17.00	19.98	16.78
16	80.46	34.22	17.00	17.22	16.53

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	16.81	50.00	0	0.00

overflows to: P8B

Drainage Area	P103A/P103B/P103C				
Area (Ha)	0.170				
C =	0.90	Restricted Flow Q_r (L/s)=	17.00		

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
6	96.64	41.10	17.00	24.10	8.68
8	85.46	36.35	17.00	19.35	9.29
9	80.87	34.40	17.00	17.40	**9.40**
10	76.81	32.67	17.00	15.67	9.40
12	69.89	29.73	17.00	12.73	9.16

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	9.40	50.00	0	0.00

overflows to: P8B

Drainage Area	P8B				
Area (Ha)	0.060				
C =	1.00	Restricted Flow Q_r (L/s)=	32.00		

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
1	351.38	58.61	32.00	26.61	1.60
2	315.00	52.54	32.00	20.54	2.47
3	286.05	47.71	32.00	15.71	**2.83**
4	262.41	43.77	32.00	11.77	2.82
6	226.01	37.70	32.00	5.70	2.05

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	2.83	2.85	0.00	0.00

overflows to: offsite

Drainage Area	P8B				
Area (Ha)	0.060				
C =	0.90	Restricted Flow Q_r (L/s)=	32.00		

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
-3	402.34	60.40	32.00	28.40	-5.11
-1	266.98	40.08	32.00	8.08	-0.48
0	230.48	34.60	32.00	2.60	**0.00**
1	203.51	30.55	32.00	-1.45	-0.09
3	166.09	24.93	32.00	-7.07	-1.27

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.00	2.85	0	0.00

overflows to: offsite

Drainage Area	P8B				
Area (Ha)	0.060				
C =	0.90	Restricted Flow Q_r (L/s)=	32.00		

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
-4	387.14	58.12	32.00	26.12	-6.27
-2	229.26	34.42	32.00	2.42	-0.29
-1	192.83	28.95	32.00	-3.05	**0.18**
0	167.22	25.10	32.00	-6.90	0.00
2	133.33	20.02	32.00	-11.98	-1.44

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.18	2.85	0	0.00

overflows to: offsite

Drainage Area	P8A
Area (Ha)	0.180
C =	1.00
Restricted Flow Q_r (L/s)=	6.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
69	50.33	25.19	6.00	19.19	79.43
70	49.79	24.91	6.00	18.91	79.44
71	49.26	24.65	6.00	18.65	**79.45**
72	48.74	24.39	6.00	18.39	79.44
74	47.74	23.89	6.00	17.89	79.43

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	79.45	90.29	0.00	0.00

overflows to: offsite

Drainage Area	P8A
Area (Ha)	0.180
C =	0.90
Restricted Flow Q_r (L/s)=	6.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
35	48.52	21.85	6.00	15.85	33.29
37	46.67	21.02	6.00	15.02	33.35
38	45.81	20.63	6.00	14.63	**33.36**
39	44.98	20.26	6.00	14.26	33.36
41	43.42	19.55	6.00	13.55	33.34

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	33.36	90.29	0	0.00

overflows to: offsite

Drainage Area	P8A
Area (Ha)	0.180
C =	0.90
Restricted Flow Q_r (L/s)=	6.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
26	44.03	19.83	6.00	13.83	21.57
28	41.93	18.88	6.00	12.88	21.64
29	40.96	18.45	6.00	12.45	**21.66**
30	40.04	18.03	6.00	12.03	21.66
32	38.34	17.27	6.00	11.27	21.63

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	21.66	90.29	0	0.00

overflows to: offsite

Drainage Area	101A
Area (Ha)	0.050
C =	1.00
Restricted Flow Q_r (L/s)=	14.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
5	242.70	33.74	14.00	19.74	5.92
7	211.67	29.42	14.00	15.42	6.48
8	199.20	27.69	14.00	13.69	**6.57**
9	188.25	26.17	14.00	12.17	6.57
11	169.91	23.62	14.00	9.62	6.35

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	6.57	6.67	0.00	0.00

overflows to: Offsite

Drainage Area	P106A/P106/101B/101A
Area (Ha)	0.050
C =	0.90
Restricted Flow Q_r (L/s)=	14.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
0	230.48	28.83	14.00	14.83	0.00
2	182.69	22.85	14.00	8.85	1.06
3	166.09	20.78	14.00	6.78	**1.22**
4	152.51	19.08	14.00	5.08	1.22
6	131.57	16.46	14.00	2.46	0.89

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	1.22	6.67	0	0.00

overflows to: Offsite

Drainage Area	P106A/P106/101B/101A
Area (Ha)	0.050
C =	0.90
Restricted Flow Q_r (L/s)=	14.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
-1	192.83	24.12	14.00	10.12	-0.61
1	148.14	18.53	14.00	4.53	0.27
2	133.33	16.68	14.00	2.68	**0.32**
3	121.46	15.20	14.00	1.20	0.22
5	103.57	12.96	14.00	-1.04	-0.31

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.55	0.87	6.67	0	0.00

Drainage Area	101B
Area (Ha)	0.030
C =	1.00
Restricted Flow Q_r (L/s)=	21.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
-1	462.72	38.59	21.00	17.59	-1.06
1	351.38	29.31	21.00	8.31	0.50
2	315.00	26.27	21.00	5.27	**0.63**
3	286.05	23.86	21.00	2.86	0.51
5	242.70	20.24	21.00	-0.76	-0.23

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.63	0.69	0.00	0.00

overflows to: Offsite

Drainage Area	P106A/P106/101B/101A
Area (Ha)	0.030
C =	0.90
Restricted Flow Q_r (L/s)=	21.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
-4	555.75	41.71	21.00	20.71	-4.97
-2	319.47	23.98	21.00	2.98	-0.36
-1	266.98	20.04	21.00	-0.96	**0.06**
0	230.48	17.30	21.00	-3.70	0.00
2	182.69	13.71	21.00	-7.29	-0.87

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.06	0.69	0	0.00

Drainage Area	P106A/P106/101B/101A
Area (Ha)	0.030
C =	0.90
Restricted Flow Q_r (L/s)=	21.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
-5	632.75	47.49	21.00	26.49	-7.95
-3	285.77	21.45	21.00	0.45	-0.08
-2	229.26	17.21	21.00	-3.79	**0.46**
-1	192.83	14.47	21.00	-6.53	0.39
1	148.14	11.12	21.00	-9.88	-0.59

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.46	0.69	0	0.00

Drainage Area	P106A/P106B
Area (Ha)	0.080
C =	1.00
Restricted Flow Q_r (L/s)=	7.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
25	103.85	23.10	7.00	16.10	24.14
27	98.66	21.94	7.00	14.94	24.21
28	96.27	21.41	7.00	14.41	**24.21**
29	94.01	20.91	7.00	13.91	24.20
31	89.83	19.98	7.00	12.98	24.14

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	24.21	25.77	0.00	0.00

overflows to: Offsite

Drainage Area	P106A/P106/101B/101A
Area (Ha)	0.080
C =	0.90
Restricted Flow Q_r (L/s)=	7.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
12	94.70	18.95	7.00	11.95	8.61
14	86.93	17.40	7.00	10.40	8.74
15	83.56	16.72	7.00	9.72	**8.75**
16	80.46	16.10	7.00	9.10	8.74
18	74.97	15.01	7.00	8.01	8.65

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	8.75	25.77	0	0.00

Drainage Area	P106A/P106/101B/101A
Area (Ha)	0.080
C =	0.90
Restricted Flow Q_r (L/s)=	7.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
8	85.46	17.11	7.00	10.11	4.85
10	76.81	15.37	7.00	8.37	5.02
11	73.17	14.65	7.00	7.65	**5.05**
12	69.89	13.99	7.00	6.99	5.03
14	64.23	12.86	7.00	5.86	4.92

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	5.05	25.77	0	0.00

Drainage Area	P105
Area (Ha)	0.060
C =	0.81
Restricted Flow Q_r (L/s)=	36.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
0	398.62	53.86	36.00	17.86	0.00
1	351.38	47.47	36.00	11.47	0.69
2	315.00	42.56	36.00	6.56	**0.79**
3	286.05	38.65	36.00	2.65	0.48
4	262.41	35.45	36.00	-0.55	-0.13

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.79	0.79	0.00	0.00

Drainage Area	P105
Area (Ha)	0.060
C =	0.65
Restricted Flow Q_r (L/s)=	36.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
-3	402.34	43.62	36.00	7.62	-1.37
-2	319.47	34.64	36.00	-1.36	0.16
-1	266.98	28.95	36.00	-7.05	**0.42**
0	230.48	24.99	36.00	-11.01	0.00
1	203.51	22.06	36.00	-13.94	-0.84

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.42	0.79	0	0.00

Drainage Area	P105
Area (Ha)	0.060
C =	0.65
Restricted Flow Q_r (L/s)=	36.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
-5	632.75	68.60	36.00	32.60	-9.78
-3	285.77	30.98	36.00	-5.02	0.90
-2	229.26	24.86	36.00	-11.14	**1.34**
-1	192.83	20.91	36.00	-15.09	0.91
1	148.14	16.06	36.00	-19.94	-1.20

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	1.34	0.79	0	0.55

Drainage Area	R-A
Area (Ha)	0.090
C =	1.00
Restricted Flow Q_r (L/s)=	6.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
33	86.03	21.53	6.00	15.53	30.74
35	82.58	20.66	6.00	14.66	30.79
36	80.96	20.26	6.00	14.26	**30.80**
37	79.42	19.87	6.00	13.87	30.79
39	76.51	19.14	6.00	13.14	30.76

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	30.80	31.00	0.00	0.00

Drainage Area	R-A
Area (Ha)	0.090
C =	0.90
Restricted Flow Q_r (L/s)=	6.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
17	77.61	17.48	6.00	11.48	11.71
19	72.53	16.33	6.00	10.33	11.78
20	70.25	15.82	6.00	9.82	**11.78**
21	68.13	15.34	6.00	9.34	11.77
23	64.29	14.48	6.00	8.48	11.70

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	11.78	31.00	0	0.00

Drainage Area	R-A
Area (Ha)	0.090
C =	0.90
Restricted Flow Q_r (L/s)=	6.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
12	69.89	15.74	6.00	9.74	7.01
14	64.23	14.46	6.00	8.46	7.11
15	61.77	13.91	6.00	7.91	**7.12**
16	59.50	13.40	6.00	7.40	7.10
18	55.49	12.49	6.00	6.49	7.01

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	7.12	31.00	0	0.00

Drainage Area	R-B
Area (Ha)	0.100
C =	1.00
Restricted Flow Q_r (L/s)=	7.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
31	89.83	24.97	7.00	17.97	33.43
33	86.03	23.92	7.00	16.92	33.50
34	84.27	23.43	7.00	16.43	**33.51**
35	82.58	22.96	7.00	15.96	33.51
37	79.42	22.08	7.00	15.08	33.47

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	33.51	35.00	1.00	0.00

Drainage Area	R-B
Area (Ha)	0.100
C =	0.90
Restricted Flow Q_r (L/s)=	7.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
16	80.46	20.13	7.00	13.13	12.61
18	74.97	18.76	7.00	11.76	12.70
19	72.53	18.15	7.00	11.15	**12.71**
20	70.25	17.58	7.00	10.58	12.69
22	66.15	16.55	7.00	9.55	12.61

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	12.71	35.00	0	0.00

Drainage Area	R-B
Area (Ha)	0.100
C =	0.90
Restricted Flow Q_r (L/s)=	7.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
15	61.77	15.45	7.00	8.45	7.61
17	57.42	14.37	7.00	7.37	7.51
18	55.49	13.88	7.00	6.88	**7.43**
19	53.70	13.44	7.00	6.44	7.34
21	50.48	12.63	7.00	5.63	7.09

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	7.43	35.00	0	0.00

Drainage Area	R-C
Area (Ha)	0.030
C =	1.00
Restricted Flow Q_r (L/s)=	3.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
21	116.30	9.70	3.00	6.70	8.44
23	109.68	9.15	3.00	6.15	8.48
24	106.68	8.90	3.00	5.90	**8.49**
25	103.85	8.66	3.00	5.66	8.49
27	98.66	8.23	3.00	5.23	8.47

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	8.49	10.00	1.00	0.00

Drainage Area	R-C
Area (Ha)	0.030
C =	0.90
Restricted Flow Q_r (L/s)=	3.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
10	104.19	7.82	3.00	4.82	2.89
12	94.70	7.11	3.00	4.11	2.96
13	90.63	6.80	3.00	3.80	**2.97**
14	86.93	6.53	3.00	3.53	2.96
16	80.46	6.04	3.00	3.04	2.92

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	2.97	10.00	0	0.00

Drainage Area	R-C
Area (Ha)	0.030
C =	0.90
Restricted Flow Q_r (L/s)=	3.00

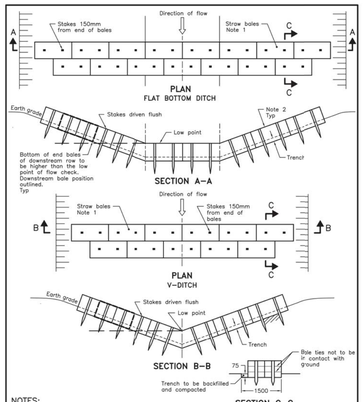
2-Year Ponding

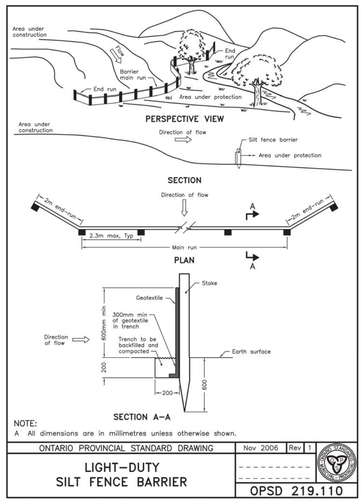
T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
15	61.77	4.64	3.00	1.64	1.47
17	57.42	4.31	3.00	1.31	1.34
18	55.49	4.16	3.00	1.16	**1.26**
19	53.70	4.03	3.00	1.03	1.17
21	50.48	3.79	3.00	0.79	0.99

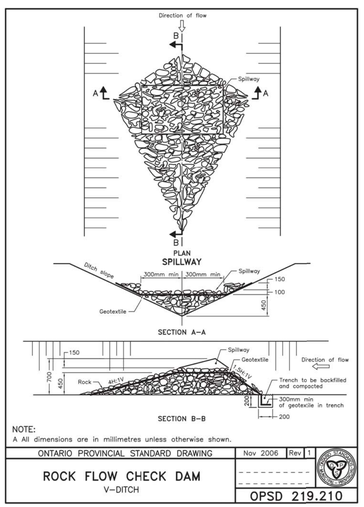
Storage (m^3)

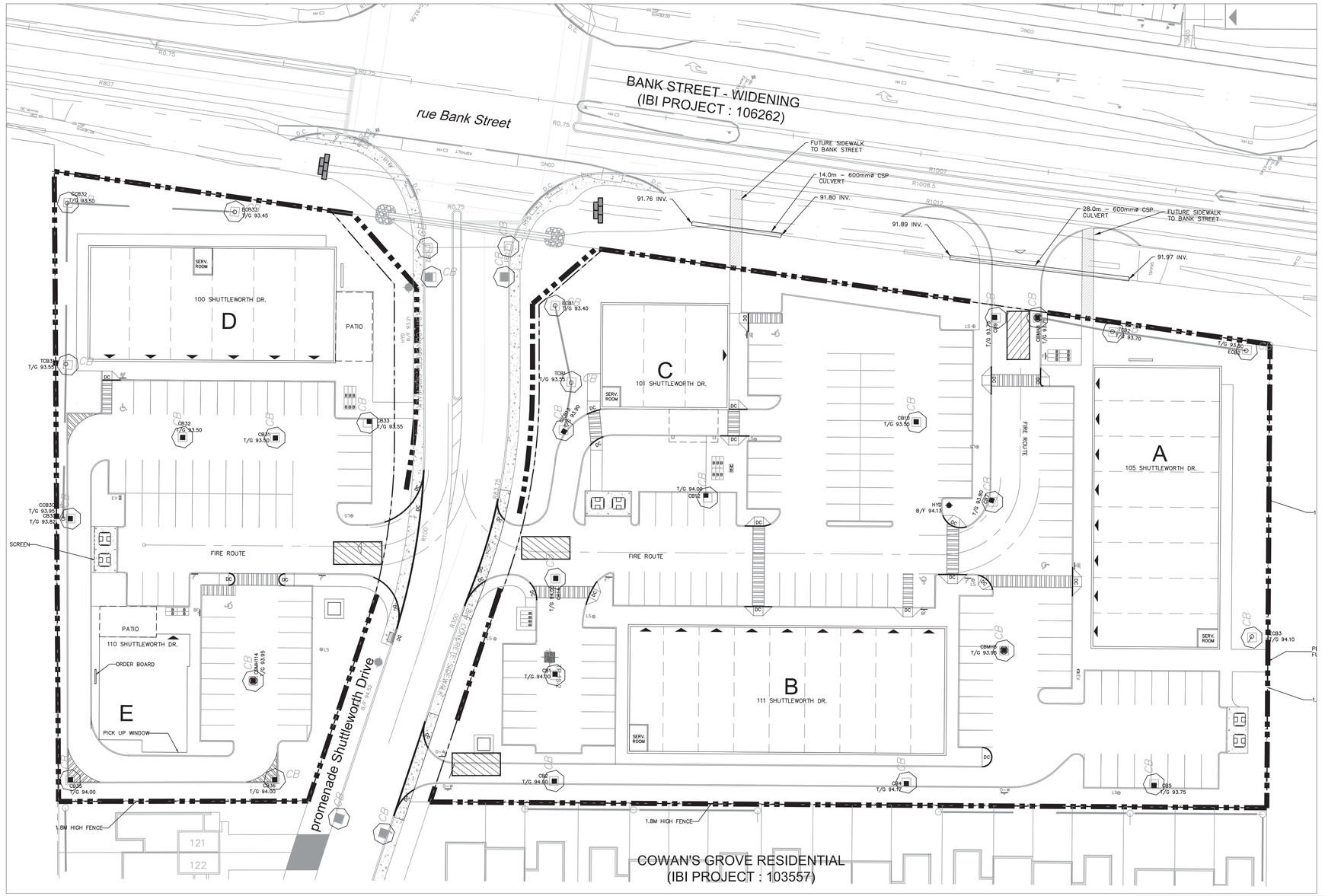
Overflow	Required	Surface	Sub-surface	Balance
0.00	1.26	10.00	0	0.00

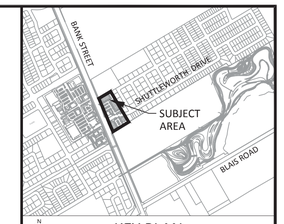
APPENDIX D











NOTES:
1. SEE DRAWING C-010 FOR ADDITIONAL DETAILS AND NOTES.
2. SITE BENCHMARK TO BE OBTAINED FROM LEGAL SURVEYOR ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

LEGEND :

- LIGHT DUTY SILT FENCE AS PER OPSD-219.110
- SNOW FENCE
- STRAW BALE CHECK DAM AS PER OPSD-219.180
- ROCK CHECK DAM AS PER OPSD-219.210
- SILT SACK PLACED UNDER EXISTING CB COVER
- TEMPORARY MUD MAT 0.15m THICK 50mm CLEAR STONE ON NON WOVEN FILTER CLOTH (15.0 × 7.0)

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	T.R.B.	2019/01/22
4	ISSUED FOR TENDER	T.R.B.	2019/01/17
3	RE-SUBMISSION FOR SITE PLAN APPROVAL	T.R.B.	2019/01/10
2	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	T.R.B.	2018/11/14
1	ISSUED FOR SPA	T.R.B.	2018/07/12

NOTES:

1. SILT FENCE TO BE ERECTED PRIOR TO EARTH WORKS BEING COMMENCED. SILT FENCE TO BE MAINTAINED UNTIL VEGETATION IS ESTABLISHED OR UNTIL START OF SUBSEQUENT PHASE.
2. STRAW BALE SEDIMENT TRAPS TO BE CONSTRUCTED IN EXISTING ROAD SIDE DITCHES. TRAPS TO REMAIN AND BE MAINTAINED UNTIL VEGETATION IS ESTABLISHED.
3. SILT SACK TO BE PLACED AND MAINTAINED UNDER COVER OF ALL CATCHBASINS. GEOTEXTILE SILT SACK IN STREET CBs TO REMAIN UNTIL ALL CURBS ARE CONSTRUCTED. GEOTEXTILE FABRIC IN RYCBs TO REMAIN UNTIL VEGETATION IS ESTABLISHED. ALL CATCHBASINS TO BE REGULARLY INSPECTED AND CLEANED, AS NECESSARY, UNTIL SOD AND CURBS ARE CONSTRUCTED.
4. WORKS NOTED ABOVE ARE TO BE INSTALLED, INSPECTED, MAINTAINED AND ULTIMATELY REMOVED BY SERVICING CONTRACTOR.
5. THIS IS A "LIVING DOCUMENT" AND MAY BE MODIFIED IN THE EVENT THE PROPOSED CONTROL MEASURES ARE INSUFFICIENT

APPROVED ☐ REFUSED ☐

THIS____ DAY OF _____ , 20_____

DON HERWEYER, MCIP, RPP
MANAGER, DEVELOPMENT REVIEW - SOUTH
PLANNING, INFRASTRUCTURE & ECONOMIC
DEVELOPMENT DEPARTMENT, CITY OF OTTAWA

URBANDALE CORPORATION

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title
Cowan's Grove
PLAZA
4791 BANK STREET

LICENSED PROFESSIONAL ENGINEER
T. R. BRULE
2019/01/22
PROVINCE OF ONTARIO

Drawing Title
EROSION AND SEDIMENTATION CONTROL PLAN

Scale
N.T.S.

Design	Date
J.B.	JUNE 2018
Drawn	Checked
D.P.S.	T.R.B.
Project No.	Drawing No.
116871	900

D07-12-18-0109

#17750

APPENDIX E

MEMO

Date: 07-03-2018

To / Destinataire	Max, Walker	
From / Expéditeur	Golam Sharif, Project Manager, Infrastructure Approvals	
Subject / Objet	**Pre-Application Consultation** **4791 Bank Street, Ward No 20,** *Commercial plaza (5 buildings) with a drive through.*	File No. PC2018-0007

Please note the following information regarding the engineering design submission for the above noted site:

1. The Servicing Study Guidelines for Development Applications are available at the following address: https://ottawa.ca/en/city-hall/planning-and-development/how-develop-property/development-application-review-process-2/guide-preparing-studies-and-plans

2. Servicing and site works shall be in accordance with the following documents:

   - ⇨ Ottawa Sewer Design Guidelines (October 2012) and Technical Bulletin PIEDTB-2016-01
   - ⇨ Ottawa Design Guidelines – Water Distribution (2010) and Technical Bulletins ISD-2010-2 and ISDTB-2014-02
   - ⇨ Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
   - ⇨ City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012)
   - ⇨ City of Ottawa Environmental Noise Control Guidelines (January, 2016)
   - ⇨ City of Ottawa Park and Pathway Development Manual (2012)
   - ⇨ City of Ottawa Accessibility Design Standards (2012)

- ⇨ Ottawa Standard Tender Documents (latest version)
- ⇨ Ontario Provincial Standards for Roads & Public Works (2013)

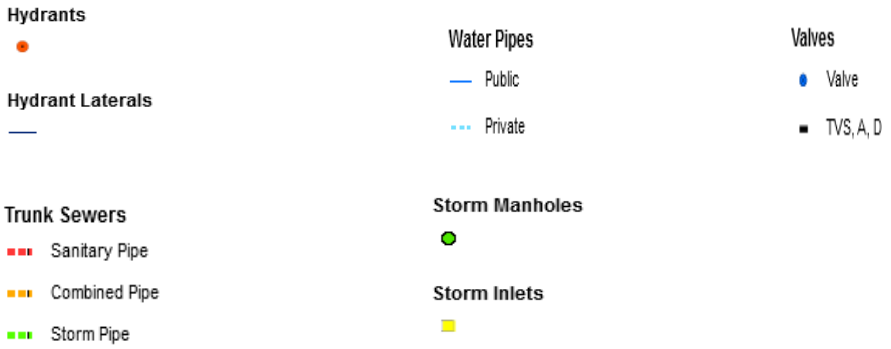
3. Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580-2424 x.44455).

4. The Stormwater Management Criteria, for the subject site, is to be based on the following:

   i. The approved "Cowan's Grove" subdivision report must follow to design stormwater management for this site.

   ii. Major and minor system as per approved "Cowan's Grove" subdivision criteria.

5. Deep Services (Storm, Sanitary & Water Supply)



i. A plan view of the approximate services may be seen above in red dash rectangle (Cowan's Grove). Services should ideally be grouped in a common trench to minimize the number of road cuts. The sizing of available future services is:

   a. Shuttleworth Drive - STUBs (to be confirmed from "Cowan's Grove"):

      i. Sanitary – 200 mm.

      ii. Storm – 525 mm/ 450 mm.

      iii. Water – 200 mm.

ii. All servicing as per approved "Cowan's Grove" subdivision criteria.

iii. As per City's Sewer Design guideline a monitoring manhole shall be required just inside the property line located in an accessible location (ie. Not in a parking area) for all non-residential and multi residential buildings connections from a private sewer to a public sewer.

iv. As per City's Sewer Design guideline it is expected that the alternative of a high level sewer in a public right-of-way and connected to the collector sewer is the preferred method of servicing properties.

v. New connections to sewer or watermain services within the City right of way is subject to City approval and are to be made above the springline of the sewermain as per:

   a. Std Dwg S11.1 for flexible main sewers – *connections made using approved tee or wye fittings.*

b. Std Dwg S11 (For rigid main sewers) – *lateral must be less that 50% the diameter of the sewermain,*

c. Std Dwg S11.2 (for rigid main sewers using bell end insert method) – *for larger diameter laterals where manufactured inserts are not available; lateral must be less that 50% the diameter of the sewermain,*

d. Connections to manholes permitted when the connection is to rigid main sewers where the lateral exceeds 50% the diameter of the sewermain. – Connect obvert to obvert with the outlet pipe unless pipes are a similar size.

e. No submerged outlet connections.

6. Water Boundary condition requests must include the location of the service and the expected loads required by the proposed development. Please provide the following information:

   i. Location of service

   ii. Type of development and the amount of fire flow required (as per FUS, 1999).

   iii. Average daily demand: ___ l/s.

   iv. Maximum daily demand: ___l/s.

   v. Maximum hourly daily demand: ___ l/s.

   vi. Hydrant location and spacing to meet City's Water Design guidelines.

7. General comments –

   i. Stormwater quality control criteria must consult with Rideau Valley Conservation Authority (RVCA).

   ii. Site-specific Geotechnical brief/ report is required apart from approved "Cowan's Grove" Subdivision.

   iii. Site-specific Noise study/ brief/ amendment is required apart from approved "Cowan's Grove" Subdivision.

   iv. The forecasted timeline of road resurfacing works on Bank Street is 3-5 years.

Should you have any questions or require additional information, please contact me directly at (613) 580-2424, x 20763 or by email at sharif.sharif@ottawa.ca.

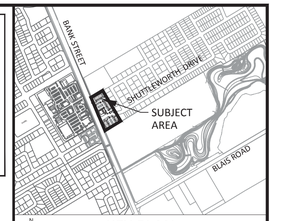
Golam Sharif
Project Manager – Infrastructure Approvals
Development Review, South Branch

APPENDIX F

APPROVED ☐ REFUSED ☐

THIS____ DAY OF _____ , 20_____

DON HERWEYER, MCIP, RPP
MANAGER, DEVELOPMENT REVIEW - SOUTH
PLANNING, INFRASTRUCTURE & ECONOMIC
DEVELOPMENT DEPARTMENT, CITY OF OTTAWA



KEY PLAN
(NTS)

FINDLAY CREEK COMMERCIAL DEVELOPMENT
(BY OTHERS)

BANK STREET - WIDENING
(IBI PROJECT : 106262)

rue Bank Street

Promenade Shuttleworth Drive

COWAN'S GROVE RESIDENTIAL
(IBI PROJECT : 103557)

100 SHUTTLEWORTH DR.
101 SHUTTLEWORTH DR.
105 SHUTTLEWORTH DR.
110 SHUTTLEWORTH DR.
111 SHUTTLEWORTH DR.

NOTES:

1. SEE DRAWING C-010 FOR ADDITIONAL DETAILS AND NOTES.
2. SITE BENCHMARK TO BE OBTAINED FROM LEGAL SURVEYOR ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	T.R.B.	2019:01:22
4	ISSUED FOR TENDER	T.R.B.	2019:01:17
3	RE-SUBMISSION FOR SITE PLAN APPROVAL	T.R.B.	2019:01:10
2	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	T.R.B.	2018:11:14
1	ISSUED FOR SPA	T.R.B.	2018:07:12

URBANDALE CORPORATION

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title
Cowan's Grove
PLAZA
4791 BANK STREET

L'ICENSED PROFESSIONAL ENGINEER
T. R. BRULE
2019/01/22
PROVINCE OF ONTARIO

Drawing Title
SITE SERVICING

Scale
1 : 300

Design	Date
J.B.	JUNE 2018
Drawn	Checked
D.P.S.	T.R.B.
Project No.	Drawing No.
116871	C-100

D07-12-18-0109

#17750

DRAWING NOTES

1.0 GENERAL

1.1 CONTRACTOR TO VERIFY ALL DIMENSIONS PRIOR TO CONSTRUCTION.

1.2 DO NOT SCALE DRAWINGS.

1.3 CONTRACTOR TO REPORT ALL DISCOVERIES OF ERRORS, OMISSIONS OR DISCREPANCIES TO THE ARCHITECT OR DESIGN ENGINEER AS APPLICABLE.

1.4 USE ONLY THE LATEST REVISED DRAWINGS OR THOSE THAT ARE MARKED "ISSUED FOR CONSTRUCTION".

1.5 ALL CONSTRUCTION SHALL COMPLY WITH CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.

1.6 THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT DRAWINGS AND SPECIFICATIONS.

1.7 FOR LEGAL SURVEY INFORMATION REFER TO REGISTERED PLAN.

1.8 REFER TO SITE PLAN BY DREDGE LEAHY ARCHITECTS INC.

1.09 CONTRACTOR TO IMPLEMENT EROSION AND SEDIMENT CONTROL MEASURES AS IDENTIFIED IN THE EROSION AND SEDIMENT CONTROL PLAN TO THE SATISFACTION OF THE CITY OF OTTAWA, PRIOR TO UNDERTAKING ANY SITE ALTERATIONS (FILLING, GRADING, REMOVAL OF VEGETATION, ETC.), DURING ALL PHASES OF THE SITE PREPARATION AND CONSTRUCTION THE MEASURES ARE TO BE MAINTAINED TO THE SATISFACTION OF THE ENGINEER AND CITY OF OTTAWA IN ACCORDANCE WITH THE BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL. SHOULD ANY ADDITIONAL MEASURES BE REQUIRED TO ADDRESS FIELD CONDITIONS THEY SHALL BE INSTALLED AS DIRECTED BY THE ENGINEER OR THE CITY OF OTTAWA. SUCH ADDITIONAL MEASURES MAY INCLUDE BUT NOT BE LIMITED TO INSTALLATION OF FILTER CLOTHS ACROSS MANHOLE AND CATCHBASIN LIDS TO PREVENT SEDIMENT FROM ENTERING THE STRUCTURE AND INSTALLATION AND MAINTENANCE OF A LIGHT DUTY SILT FENCE BARRIER AS REQUIRED.

1.10 ALL IRON WORK ELEVATIONS SHOWN ARE APPROXIMATE AND ARE SUBJECT TO MINOR ADJUSTMENTS AS DETERMINED BY THE ENGINEER.

1.11 ALL CONCRETE CURBS AND SIDEWALKS TO CONFORM TO O.P.S. AND CONSTRUCTED TO CITY STANDARDS. ALL ONSITE CURBS TO BE BARRIER TYPE, WITH DEPRESSIONS AS NOTED.

1.12 ALL CONCRETE SHALL BE "NORMAL PORTLAND CEMENT" IN ACCORDANCE WITH O.P.S.S. 1350 AND SHALL ACHIEVE A MINIMUM STRENGTH OF 30MPa AT 28 DAYS.

1.13 ALL CONSTRUCTION TRAFFIC TO ACCESS SITE FROM SHUTTLEWORTH DRIVE.

1.14 FOR GEOTECHNICAL REPORT SEE GEOTECHNICAL INVESTIGATION PROPOSED RESIDENTIAL DEVELOPMENT - KELLAM LANDS, OTTAWA, ON. REPORT No. 12-1121-0286 BY GOLDER ASSOCIATES.

1.15 CONTRACTOR TO PROTECT EXISTING INFRASTRUCTURE AND PROPERTY SUCH AS TREES, PARKING METERS, SIDEWALKS, CURBS, ASPHALT, AND STREET SIGNS FROM DAMAGE DURING CONSTRUCTION. CONTRACTOR TO PAY THE COST TO REINSTATE OR REPLACE ANY DAMAGED INFRASTRUCTURE OR PROPERTY TO THE SATISFACTION OF THE CITY.

1.16 THE POSITION OF POLE LINES, CONDUITS, WATERMAIN, SEWERS, AND OTHER UNDERGROUND AND ABOVEGROUND UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK THE CONTRACTOR SHALL INFORM ITSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, SHALL PROTECT ALL UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

1.17 CONTRACTOR TO SUPPLY SUITABLE FILL MATERIAL WHERE REQUIRED TO ROUGH GRADE THE SITE. ALL IMPORTED FILL MATERIAL TO BE CERTIFIED AS ACCEPTABLE BY THE GEOTECHNICAL ENGINEER.

1.18 CONTRACTOR TO HAUL EXCESS MATERIAL OFFSITE AS NECESSARY TO GRADE SITE TO MEET THE PROPOSED GRADES. ALL EXCESS MATERIAL TO BE HAULED OFFSITE AND DISPOSED OF AT AN APPROVED DUMP SITE. SHOULD THE CONTRACTOR DISCOVER ANY HAZARDOUS MATERIAL, CONTRACTOR IS TO NOTIFY ENGINEER. ENGINEER TO DETERMINE APPROPRIATE DISPOSAL METHOD/LOCATION.

1.19 FILL MATERIAL WITHIN THE PARKING LOT AND BUILDING PAD AREAS, AND SUPPORTING BUILDING FOUNDATIONS SHALL BE COMPACTED TO 98% STANDARD MODIFIED PROCTOR DENSITY AND TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER.

1.20 ALL COMPACTION METHODS TO BE PERFORMED TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER TO INCLUDE BUT NOT BE LIMITED TO THE THICKNESS OF LIFTS, AND COMPACTION EQUIPMENT USED.

1.21 ALL DISTURBED BOULEVARDS TO BE REINSTATED WITH SOD ON 100mm TOPSOIL.

1.22 UTILITY DUCTS TO BE INSTALLED PRIOR TO ROAD BASE CONSTRUCTION.

1.23 CLAY DIKES TO BE INSTALLED WHERE INDICATED ON THE DRAWINGS OR AS APPROVED AND DIRECTED BY THE GEOTECHNICAL ENGINEER ALL IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS AND SPECIFICATIONS.

2.0 SANITARY

2.1 ALL SANITARY SEWER MAINS TO BE CSA CERTIFIED, BELL AND SPIGOT TYPE, ONLY FACTORY FITTINGS TO BE USED. SEWER TO BE INSTALLED AS PER OSPD 1005.01. SANITARY SEWER MATERIALS TO BE:
250mmØ AND SMALLER - PVC DR 35

2.2 ALL SANITARY MAINTENANCE HOLES TO BE 1.2m DIAMETER AS PER CITY OF OTTAWA STANDARDS COMPLETE WITH BENCHING, RUNGS, FRAME AND COVER, DROP PIPES AND LANDINGS WHERE NEEDED.

2.3 SANITARY MANHOLE COVERS TO BE CITY OF OTTAWA STD. S25 (MOD. OPSD. 401.020). SANITARY MANHOLE COVER TO BE CLOSED COVER TYPE, AS PER CITY STANDARD S24.

2.4 SANITARY SEWER LEAKAGE TEST AND CCTV INSPECTION SHALL BE COMPLETED AS PER CITY SPECIFICATIONS PRIOR TO INSTALLATION OF BASE COURSE ASPHALT.

2.5 ANY SANITARY SEWER WITH LESS THAN 2.0m COVER REQUIRES THERMAL INSULATION AS PER CITY OF OTTAWA STANDARD W22, OR AS APPROVED BY THE ENGINEER.

2.6 CONNECTION TO THE EXISTING SANITARY SEWER TO BE INCLUDED IN THE COST FOR SANITARY SEWER INSTALLATION. THIS INCLUDES REINSTATEMENT OF ROAD CUTS TO CITY STANDARDS.

3.0 STORM

3.1 ALL STORM SEWERS TO BE CSA CERTIFIED, BELL AND SPIGOT TYPE. ALL STORM SEWERS TO BE INSTALLED PER MANUFACTURER'S INSTRUCTIONS. ONLY FACTORY FITTINGS TO BE USED. STORM SEWER MATERIALS TO BE : 375mmØ AND SMALLER - PVC DR 35
450mmØ AND LARGER - 100-D REINFORCED CONCRETE.

3.2 ALL STORM MAINTENANCE HOLES TO BE SIZED IN ACCORDANCE WITH THE PLANS AND AS PER CITY OF OTTAWA STANDARDS COMPLETE WITH BENCHING, RUNGS, AND FRAME AND COVER.

3.3 STORM MH COVERS TO BE OPEN TYPE, AS PER CITY STANDARD S24, FRAMES TO BE PER CITY OF OTTAWA STD. S25. CONTRACTOR TO INSTALL FILTER FABRIC UNDER STORM MH COVER UNTIL SODDING IS COMPLETE.

3.4 STORM MAINTENANCE HOLES TO BE OPSD, SIZE AS SPECIFIED, TAPER TOP.

3.5 ALL CATCH BASINS TO BE AS PER OPSD 705.010, FRAME & FISH TYPE GRATE AS PER CITY OF OTTAWA STD. S19.1.

3.6 150mm DIAMETER SOCK-WRAPPED PERFORATED PVC SUBDRAINS TO BE INSTALLED AT THE LIMIT OF THE HEAVY DUTY ROAD STRUCTURE WHERE IT MEETS THE LIGHT DUTY ROAD STRUCTURE AND AT ALL CB'S IN HEAVY DUTY ROADS AS IDENTIFIED ON PLAN. SUBDRAINS TO DISCHARGE TO CB'S AS SHOWN.

3.7 ANY STORM SEWER WITH LESS THAN 2.0m COVER REQUIRES THERMAL INSULATION AS PER CITY OF OTTAWA STANDARD W22, OR AS APPROVED BY THE ENGINEER.

3.8 CONNECTION TO THE EXISTING STORM SEWER TO BE INCLUDED IN THE COST FOR STORM SEWER INSTALLATION. THIS INCLUDES REINSTATEMENT OF ROAD CUT TO CITY STANDARDS.

3.9 CONTRACTOR TO PROVIDE IPEX-TEMPEST MHF ICD'S SHOP DRAWINGS, OR EQUIVALENT, FOR ENGINEERS REVIEW PRIOR TO ORDERING ICD'S.

4.0 WATER

4.1 ALL WATERMAINS TO BE PVC DR 18, WITH MINIMUM COVER OF 2.4m AND INSTALLED PER CITY OF OTTAWA STANDARDS. ALL DOMESTIC WATER SERVICES ARE TO BE 200mmØ.

4.2 THRUST BLOCKS TO BE INSTALLED AT ALL BENDS, TEES, AND CAPS ALL AS PER OPSD 1103.01 AND 1103.02.

4.3 CONTRACTOR TO CONDUCT PRESSURE AND LEAKAGE TESTING OF ALL WATERMAINS AND DISINFECT AND CHLORINATE ALL WATERMAINS TO THE SATISFACTION OF M.O.E. AND THE CITY OF OTTAWA.

4.4 TRACER WIRE TO BE INSTALLED ALONG THE FULL LENGTH OF WATERMAIN AND ATTACHED TO EACH MAIN STOP AS PER CITY OF OTTAWA STANDARDS.

4.5 ALL COMPONENTS OF THE WATER DISTRIBUTION SYSTEM SHALL BE CATHODICALLY PROTECTED AS PER CITY OF OTTAWA STANDARDS.

4.6 ALL VALVES & VALVE BOXES AND CHAMBERS, HYDRANTS, AND HYDRANT VALVES AND ASSEMBLIES SHALL BE INSTALLED AS PER CITY OF OTTAWA STANDARDS.

4.7 ANY WATERMAIN WITH LESS THAN 2.4m COVER REQUIRES THERMAL INSULATION AS PER CITY OF OTTAWA STANDARD W22, OR AS APPROVED BY THE ENGINEER.

4.8 CONTRACTOR IS RESPONSIBLE FOR ACQUIRING THE WATER PERMIT FROM THE CITY OF OTTAWA AND PAYMENT OF ANY FEES ASSOCIATED WITH SECURING THE WATER PERMIT. OWNER IS RESPONSIBLE FOR REIMBURSING THE CONTRACTOR FOR THE ACTUAL COST OF ACQUIRING THE WATER PERMIT.

4.9 CONNECTION TO EXISTING WATERMAIN TO BE INCLUDED IN THE COST FOR THE WATERMAIN INSTALLATION. THIS COST INCLUDES REINSTATEMENT OF ROAD CUTS TO CITY STANDARDS.

4.10 THESE CROSSINGS WERE PROVIDED FOR THE PREVIOUS SITE PLAN APPLICATION AND ARE NO LONGER NECESSARY BASED ON THE REVISED SANITARY SEWER WATERMAIN CONFIGURATION.

5.0 PARKING LOT AND WORK IN PUBLIC RIGHTS OF WAY

5.1 CONTRACTOR TO REINSTATE ROAD CUTS PER CITY OF OTTAWA STANDARD R-10.

5.2 THE CONTRACTOR SHALL PREPARE A TRAFFIC MANAGEMENT PLAN FOR REVIEW AND APPROVAL BY THE CITY OF OTTAWA. CONTRACTOR TO MAINTAIN TRAFFIC FLOW DURING THE ENTIRE CONSTRUCTION PERIOD. MAINTENANCE OF ROAD CUTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. PROVISION OF FLAGMEN, DETOURS AS NECESSARY, BARRICADES AND SIGNS TO THE FULL SATISFACTION OF THE ENGINEER AND ROAD AUTHORITY SHALL BE THE CONTRACTOR'S RESPONSIBILITY.

5.3 CONTRACTOR TO PREPARE SUBGRADE, INCLUDING PROOFROLLING, TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER PRIOR TO THE COMMENCEMENT OF PLACEMENT OF GRANULAR B MATERIAL.

5.4 FILL TO BE PLACED AND COMPACTED PER THE GEOTECHNICAL REPORT REQUIREMENTS.

5.5 CONTRACTOR TO SUPPLY, PLACE AND COMPACT GRANULAR B MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOETCHNICAL ENGINEER. CONTRACTOR TO PROVIDE ENGINEER WITH SAMPLES OF GRANULAR B MATERIAL FOR TESTING AND CERTIFICATION FROM THE GEOTECHNICAL ENGINEER THAT THE MATERIAL MEETS THE GRADATION REQUIREMENTS SPECIFIED IN THE GEOTECHNICAL REPORT.

5.6 GRANULAR A MATERIAL TO BE PLACED ONLY UPON APPROVAL BY THE GEOTECHNICAL ENGINEER OF GRANULAR B PLACEMENT.

5.7 CONTRACTOR TO SUPPLY, PLACE AND COMPACT GRANULAR A MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOTECHNICAL ENGINEER. CONTRACTOR TO PROVIDE ENGINEER WITH SAMPLES OF GRANULAR A MATERIAL FOR TESTING AND CERTIFICATION FROM THE GEOTECHNICAL ENGINEER THAT THE MATERIAL MEETS THE GRADATION REQUIREMENTS SPECIFIED IN THE GEOTECHNICAL REPORT.

5.8 ASPHALT MATERIAL TO BE PLACED ONLY UPON APPROVAL BY THE GEOTECHNICAL ENGINEER OF GRANULAR A PLACEMENT.

5.9 CONTRACTOR TO SUPPLY, PLACE AND COMPACT ASPHALT MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOTECHNICAL ENGINEER. CONTRACTOR TO PROVIDE ENGINEER WITH SAMPLES OF ASPHALT MATERIAL FOR TESTING AND CERTIFICATION FROM THE GEOTECHNICAL ENGINEER THAT THE MATERIAL MEETS THE REQUIREMENTS SPECIFIED IN THE GEOTECHNICAL REPORT.

5.10 CONTRACTOR IS RESPONSIBLE FOR ESTABLISHING LINE AND GRADE IN ACCORDANCE WITH THE PLANS, AND FOR PROVIDING THE ENGINEER WITH VERIFICATION PRIOR TO PLACEMENT.

5.11 DITCHES DISTURBED DURING CULVERT INSTALLATION AND GRADING OPERATIONS ARE TO BE REINSTATED TO THEIR ORIGINAL CONDITION AND FLOWLINE GRADES.

5.12 EXISTING EAST SIDE ROAD DITCH ALONG PALLADIUM DRIVE TO BE REALIGNED AS PER THE GRADING PLAN. ADJACENT AREAS BETWEEN ROAD SIDE DITCH AND PARKING LOT TO BE RE GRADED AS PER THE GRADING PLAN. ALL RE GRADED AREAS IN EXISTING PUBLIC RIGHTS OF WAY AND ANY OTHER DISTURBED AREAS IN EXISTING PUBLIC RIGHTS OF WAY ARE TO BE FINISHED WITH SOD ON 100mm TOPSOIL.

5.13 ALL EXCESS MATERIAL TO BE HAULED OFFSITE AND DISPOSED OF AT AN APPROVED DUMP SITE. SHOULD THE CONTRACTOR DISCOVER ANY HAZARDOUS MATERIAL, CONTRACTOR IS TO NOTIFY ENGINEER. ENGINEER TO DETERMINE APPROPRIATE DISPOSAL METHOD/LOCATION.

5.14 PAVEMENT STRUCTURE (MATERIAL TYPES AND THICKNESSES) FOR HEAVY DUTY AND LIGHT DUTY AREAS TO BE AS SPECIFIED IN THE GEOTECHNICAL REPORT AND SHOWN ON THE PLANS.

CATCH BASIN DATA TABLE

STRUCTURE ID	AREA ID	STRUCTURE	COVER	ELEVATION			OUTLET PIPE		HEAD	FLOW	ICD TYPE
				TOP OF GRATE	INVERT		DIAMETER	TYPE			
					INLET	OUTLET	(mm)				
ECB1	P105	CITY STD S29	S30/S31	93.40		92.400	250	HDPE PERF			
TCB1	P105	CITY STD S29	S30/S31	93.55	92.350	92.350	250	HDPE PERF			
CICB13	P105	OPSD 705.010	S22 & S23	93.90	92.300	92.200	200	PVC DR-35	1.700	36.00	Tempest HF - Type B
CB12	P101A	OPSD 705.010	S19	94.00		92.300	200	PVC DR-35	1.800	14.00	Tempest Vortex
CB14	P101B	OPSD 705.010	S19	94.00		92.300	200	PVC DR-35	1.800	21.00	Tempest HF - Type A
CB1	P106B	OPSD 705.010	S19	94.00	92.230	92.100	250	PVC DR-35	1.975	7.00	Tempest Vortex
CB2	P106A	OPSD 705.010	S19	94.00		92.400	200	PVC DR-35			
CB4	P103A	OPSD 705.010	S19	94.17		92.500	200	PVC DR-35			
CB5	P103B	OPSD 705.010	S19	93.75	92.228	92.050	200	PVC DR-35			
CB7	P8B	OPSD 705.010	S19	93.80		92.100	200	PVC DR-35	1.700	32.00	Tempest HF - Type B
CB9	P8C	OPSD 705.010	S19	93.75		92.050	200	PVC DR-35			
CB10	P8A	OPSD 705.010	S19	93.55		91.850	200	PVC DR-35	1.950	6.00	Tempest Vortex
CBMH8	P8C	OPSD 701.010	S25 & S28.1 Open	93.75	91.800	91.286	375	PVC DR-35			
CBMH14	P113A	OPSD 701.010	S25 & S28.1 Open	93.95	92.159	92.113	300	PVC DR-35	1.937	14.00	Tempest Vortex
CBMH6	P103C	OPSD 701.010	S25 & S28.1 Open	93.95	91.531	91.500	250	PVC DR-35	2.425	17.00	Tempest Vortex
TCB2	P8C	CITY STD S29	S30/S31	93.70	92.700	92.700	250	HDPE PERF			
ECB2	P8C	CITY STD S29	S30/S31	93.80		92.800	250	HDPE PERF			
ECB3	P103B	CITY STD S29	S30/S31	94.10		92.500	200	PVC DR-35			
ECB33	P113B	CITY STD S29	S30/S31	93.45		92.450	250	HDPE PERF			
CCB32	P113A	CITY STD S29	S30/S31	93.50	92.350	92.350	250	HDPE PERF			
CB30	P113B	OPSD 705.010	S19	93.82	92.150	92.150	200	PVC DR-35			
TCB31	P113B	CITY STD S29	S30/S31	93.55	92.250	92.250	250	HDPE PERF			
CCB30	P113B	CITY STD S29	S30/S31	93.95	92.150	92.150	250	PVC DR-35			
CB36	P113A	OPSD 705.010	S19	94.00	92.368	92.300	250	PVC DR-35			
CB35	P113A	OPSD 705.010	S19	94.00		92.500	200	PVC DR-35			
CB32	P113B	OPSD 705.010	S19	93.50	91.789	91.700	250	PVC DR-35			
CB31	P113B	OPSD 705.010	S19	93.50	91.940	91.890	250	PVC DR-35			
MH113	P113B	OPSD 701.010	OPSD 401.030	93.80		91.306	375	PVC DR-35	2.157	89.0	Tempest HF - Type E
CB33	P113B	OPSD 705.010	S19	93.55		92.050	200	PVC DR-35			

Bold font indicates CB's with ICD's

Revision: 2019-01-09

CROSSING SCHEDULE

①	250ø STM 0.25m CLEARANCE OVER 200ø SAN.
②	375ø STM 0.25m CLEARANCE UNDER 200ø SAN.
③	250ø STM 0.20m CLEARANCE OVER 200ø SAN.
④	150ø W/M 1.00m CLEARANCE OVER 200ø SAN.
⑤	150ø W/M 0.70m CLEARANCE OVER 450ø STM.
⑥	200ø W/M 1.10m CLEARANCE UNDER 250ø STM.
⑦	250ø STM 0.80m CLEARANCE OVER 200ø SAN.
⑧	150ø W/M 0.35m CLEARANCE OVER 200ø SAN.
⑨	200ø STM 1.15m CLEARANCE OVER 200ø SAN.
⑩	150ø W/M 0.85m CLEARANCE OVER 450ø STM.
⑪	200ø STM 0.90m CLEARANCE OVER 200ø WM.
⑫	200ø STM 1.0m CLEARANCE OVER 200ø SAN.
⑬	450ø STM 0.20m CLEARANCE UNDER 200ø SAN.
⑭	150ø W/M 0.50m(MIN) CLEARANCE UNDER 300ø STM.
⑮	200ø SAN 0.25m CLEARANCE OVER 300ø STM.
⑯	150ø W/M 0.8m CLEARANCE UNDER 200ø SAN.
⑰	150ø W/M .5m (MIN) CLEARANCE UNDER 250ø STM.
⑱	250ø STN 0.2m CLEARANCE OVER 250ø STM.

WATERMAIN SCHEDULE

	STATION	DESCRIPTION	FINISHED GRADE	TOP OF WATERMAIN	AS-BUILT WATERMAIN
A	0+000.00	CONNECT TO EXISTING 200ø CAP	94.14		*EX.±91.81*
	0+004.09	200x150REDUCER	94.08	91.68	
B	0+007.15	150x150TEE	94.02	91.62	
B	0+000.00	150x150TEE	94.02	91.62	
	0+002.36	22.5° BEND	93.98	91.58	
	0+014.22	45° BEND	93.95	91.55	
	0+018.76	45° BEND	94.03	91.63	
	0+040.17	V&VB	94.09	91.69	
	0+041.17	45° BEND	94.10	91.70	
	0+045.79	45° BEND	94.35	91.95	
C	0+046.63	BUILDING "E" CONNECTION	94.37	91.97	
B	0+000.00	150x150TEE	94.02	91.78	
	0+015.71	V&VB	93.69	91.29	
	0+017.57	22.5° BEND	93.62	91.22	
	0+042.51	45° BEND	93.70	91.30	
	0+045.01	45° BEND	93.66	91.26	
D	0+047.20	BUILDING "D" CONNECTION	93.90	91.50	
E	0+000.00	CONNECT TO EXISTING 200ø CAP	94.08		*EX.±91.73*
F	0+006.11	200x150CROSS	94.11	91.71	
	0+020.00	--	94.10	91.70	
	0+040.00	--	94.15	91.75	
	0+064.06	HYDRANT TEE	93.98	91.58	
	0+070.54	200x150 REDUCER	93.95	91.55	
	0+071.82	VERTICAL BEND	93.92	91.52	
	0+072.32	VERTICAL BEND	93.91	90.50	
	0+074.21	45BEND	93.93	90.50	
	0+077.97	45BEND	94.00	90.50	
	0+080.49	VERTICAL BEND	94.03	90.50	
	0+080.99	VERTICAL BEND	94.04	91.64	
	0+092.39	45BEND	94.02	91.62	
	0+098.65	45BEND	94.09	91.69	
	0+116.12	V&VB	94.09	91.69	
	0+118.58	45BEND	94.10	91.70	
	0+121.52	45BEND	94.29	91.89	
I	0+124.26	BUILDING "A" CONNECTION	94.33	91.93	
F	0+000.00	200x150CROSS	94.11	91.71	
	0+014.37	V&VB	93.95	91.55	
	0+017.18	45BEND	94.09	91.69	
	0+020.68	45BEND	94.27	91.87	
G	0+021.90	BUILDING "C" CONNECTION	94.30	91.90	
F	0+000.00	200x150CROSS	94.11	91.71	
	0+029.63	45BEND	94.14	91.74	
	0+032.63	45BEND	94.19	91.79	
	0+035.35	V&VB	94.21	91.81	
H	0+038.85	BUILDING "B" CONNECTION	94.50	92.10	

REVISED 2018-11-14

LEGEND:

- EXISTING SANITARY MANHOLE (MH3A)
- EXISTING STORM MANHOLE (MH3)
- EXISTING STREET CATCHBASIN (CB T/G 99.76)
- EXISTING CURB INLET CATCHBASIN (CICB T/G 99.76)
- EXISTING VALVE AND VALVE BOX (V&VB)
- EXISTING VALVE AND CHAMBER (V&VC)
- EXISTING HYDRANT (HYD B/F 100.56)
- EXISTING BARRIER CURB
- EXISTING DEPRESSED BARRIER CURB (D.C.)
- EXISTING CONCRETE SIDEWALK
- 250mmØ SUBDRAIN
- SIAMESE CONNECTION (IF REQUIRED)
- METER (M)
- REMOTE METER (RM)
- PRV PRESSURE REDUCING VALVE
- WATERMAIN IDENTIFICATION
- PIPE CROSSING IDENTIFICATION
- INLET CONTROL DEVICE LOCATION
- PROTECTIVE BOLLARD
- HEAVY DUTY ASPHALT / FIRE ROUTE

- SANITARY MANHOLE (MH3A)
- STORM MANHOLE (MH3)
- CATCHBASIN c/w TOP OF GRATE (CB T/G 99.76)
- REAR YARD CATCHBASIN c/w GUTTER GRADE (RYCB T/G 99.76)
- REAR YARD "END" CATCHBASIN C/W TOP OF GRATE 300ø (GRYCB T/G 100.25)
- CATCHBASIN MANHOLE c/w TOP OF GRATE (CBMH T/G 101.55)
- VALVE AND VALVE BOX (V&VB)
- VALVE AND CHAMBER (V&VC)
- HYDRANT c/w BOTTOM OF FLANGE ELEVATION (HYD B/F 100.56)
- DEPRESSED BARRIER CURB AS PER SC1.1 (D.C.)
- BARRIER CURB AND GUTTER AS PER SC1.2
- MOUNTABLE CURB AS PER SC1.3
- PROPOSED CONCRETE SIDEWALK
- 200mmø SAN — SANITARY SEWER & FLOW DIRECTION
- 825mmø STM — STORM SEWER & FLOW DIRECTION
- 200ø WATERMAIN — WATERMAIN
- 200ø RED WM 150ø WM — WATERMAIN REDUCER
- 2 VBENDS — VERTICAL BEND LOCATION
- PROPERTY LINE
- PROPOSED MAIL BOX (M)

- PROPOSED SWALE C/W FLOW DIRECTION
- 0.5% — PROPOSED DITCH C/W FLOW DIRECTION AND SLOPE
- 1.0% — SLOPE C/W FLOW DIRECTION
- MAJOR OVERLAND FLOW ROUTE
- 104.62 — PROPOSED SPOT GRADE
- x104.40 100 — PROPOSED SWALE GRADE
- x104.50 CI/HP — PROPOSED SWALE HIGH POINT
- 104.60 103.50 — LOT CORNER GRADE C/W EXISTING GROUND
- 86.45 EX — TIE INTO EXISTING GRADE
- 86.79 — FULL STATIC PONDING GRADE
- RETAINING WALL
- 105.30 T/W — TOP OF RETAINING WALL
- 103.50 B/W — PROPOSED BOTTOM OF RETAINING WALL
- TERRACING 3:1 MAXIMUM UNLESS NOTED OTHERWISE
- PRELIMINARY ROOF DRAIN LOCATION
- TP 13-301 — TEST PITS (SEE GEOTECHNICAL REPORT)
- CLAY DYKES PER S8
- F.F.E.=106.30 — PROPOSED BUILDING FINISHED FLOOR ELEVATION
- U.S.F.=104.30 — PROPOSED UNDERSIDE OF FOOTING ELEVATION
- PROPOSED TRANSFORMER
- PROPOSED BIKE RACK

PAVEMENT STRUCTURE **

CAR ONLY PARKING AREAS:

50mm WEAR COURSE – HL-3 OR SUPERPAVE 12.5 ASPHALTIC CONCRETE
150mm BASE – OPSS GRANULARGRANULAR "A" CRUSHED STONE
300mm SUBBASE – OPSS GRANULAR "B" TYPE II
SUBGRADE – IN SITU SOIL, OR OPSS GRANULAR "B" TYPE I OR II
MATERIAL PLACED OVER IN SITU SOIL

HEAVY TRUCK PARKING AREAS AND ACCESS LANES:

40mm WEAR COURSE – HL-3 OR SUPERPAVE 12.5 ASPHALTIC CONCRETE
50mm BINDER COURSE – HL-8 OR SUPERPAVE 19.0 ASPHALTIC CONCRETE
150mm BASE COURSE – OPSS GRANULAR "A" CRUSHED STONE
450mm SUBBASE – OPSS GRANULAR "B" TYPE II
SUBGRADE – IN SITU SOIL, OR OPSS GRANULAR "B" TYPE I OR II
MATERIAL PLACED OVER IN SITU SOIL

** REFER TO GEOTECHNICAL REPORT 12-1121-0286 BY GOLDER ASSOCIATES

Commercial Sanitary STRUCTURE TABLE

NAME	RIM ELEV.	INVERT IN	INVERT IN AS-BUILT	INVERT OUT	INVERT OUT AS-BUILT	DESCRIPTION
MH101A	94.00	NW91.680		SE91.240		1200mmø OPSD-701.010
MH104A *	94.04	NW90.896 SW90.895		SE90.297		1200mmø OPSD-701.010
MH105A	93.80	NW91.952		NE91.364		1200mmø OPSD-701.010
MH112A	93.84	SE90.949		N90.351		1200mmø OPSD-701.010
MH113A	93.79			NW91.034		1200mmø OPSD-701.010
MH114A *	93.99	SE92.218		SW91.800		1200mmø OPSD-701.010

* COVERS FOR SANITARY MAINTENANCE HOLES TO HAVE WATERTIGHT LIDS AS PER OPSD-401.030.

Commercial – Storm STRUCTURE TABLE

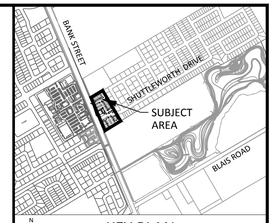
NAME	RIM ELEV.	INVERT IN	INVERT IN AS-BUILT	INVERT OUT	INVERT OUT AS-BUILT	DESCRIPTION
CBMH6	93.95	NE91.531		SW91.500		1200mmø OPSD-701.010
CBMH8	93.77	SE91.879		NE91.286		1200mmø OPSD-701.010
CBMH114	93.95	NE92.159		SW92.113		1200mmø OPSD-701.010
MH101	94.03	SW91.085 NE91.380 NW91.957		SE91.011		1200mmø OPSD-701.010
MH103	94.24	SE92.345 N91.812		SW91.700		1200mmø OPSD-701.010
MH104 *	94.03	NW90.290 SW91.240 NE91.927		SE90.215		1200mmø OPSD-701.010
MH105	93.72	NW91.962		NE91.513		1200mmø OPSD-701.010
MH112	93.92	SE91.201		N90.638		1200mmø OPSD-701.010
MH113	93.83	SW91.611 SE91.946		NW91.306		1200mmø OPSD-701.010

* COVERS FOR STORM MAINTENANCE HOLES TO HAVE WATERTIGHT LIDS AS PER OPSD-401.030.

APPROVED ☐ REFUSED ☐

THIS ____ DAY OF _____ , 20_____

DON HERWEYER, MCIP, RPP
MANAGER, DEVELOPMENT REVIEW - SOUTH
PLANNING, INFRASTRUCTURE & ECONOMIC
DEVELOPMENT DEPARTMENT, CITY OF OTTAWA



KEY PLAN
(NTS)

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	T.R.B.	2019/01/22
4	ISSUED FOR TENDER	T.R.B.	2019/01/17
3	RE-SUBMISSION FOR SITE PLAN APPROVAL	T.R.B.	2019/01/10
2	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	T.R.B.	2018/11/14
1	ISSUED FOR SPA	T.R.B.	2018/07/12

URBANDALE CORPORATION

IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title
Cowan's Grove
PLAZA
4791 BANK STREET

LICENSED PROFESSIONAL ENGINEER
T. R. BRULE
2019/01/22
PROVINCE OF ONTARIO

Drawing Title
DETAILS AND NOTES

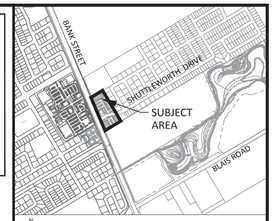
Scale
N.T.S.

| Design |

APPROVED ☐ REFUSED ☐

THIS____ DAY OF _____ , 20_____

DON HERWEYER, MCIP, RPP
MANAGER, DEVELOPMENT REVIEW - SOUTH
PLANNING, INFRASTRUCTURE & ECONOMIC
DEVELOPMENT DEPARTMENT, CITY OF OTTAWA



KEY PLAN
(NTS)

NOTES:
1. SEE DRAWING C-010 FOR ADDITIONAL DETAILS AND NOTES.
2. SITE BENCHMARK TO BE OBTAINED FROM LEGAL SURVEYOR ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

FINDLAY CREEK COMMERCIAL DEVELOPMENT
(BY OTHERS)

BANK STREET - WIDENING
(IBI PROJECT : 106262)

rue Bank Street

FUTURE SIDEWALK TO BANK STREET

14.0m – 600mmø CSP CULVERT

91.76 INV.

91.80 INV.

RE-GRADE EX. DITCH

28.0m – 600mmø CSP CULVERT

91.89 INV.

91.97 INV.

100 SHUTTLEWORTH DR.
D
F.F.=93.97

101 SHUTTLEWORTH DR.
C
F.F.=94.32

105 SHUTTLEWORTH DR.
A
F.F.=94.37

110 SHUTTLEWORTH DR.
E
F.F.=94.42

111 SHUTTLEWORTH DR.
B
F.F.=94.52

SERV. ROOM

PATIO

ORDER BOARD

PICK UP WINDOW

FIRE ROUTE

TERRACE 3:1 MAX. (OR RETAINING WALL)

1.8M HIGH SCREEN

1.8M HIGH FENCE

TERRACE 3:1 MAX.

PEDESTRIAN ACCESS TO FUTURE RESIDENTIAL

promenade Shuttleworth Drive

125.0m TEMPORARY TURNING CIRCLE @ 2.0%

63.0m TE

COWAN'S GROVE RESIDENTIAL
(IBI PROJECT : 103557)

No.	REVISIONS	By	Date
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PLAZA
4791 BANK STREET

PROFESSIONAL ENGINEER
T. R. BRULE
2019/01/22
PROVINCE OF ONTARIO

Drawing Title
SITE GRADING

Scale
1 : 300

Design	Date
J.B.	JUNE 2018
Drawn	Checked
D.P.S.	T.R.B.
Project No.	Drawing No.
116871	C-200

D07-12-18-0109

#17750