REPORT
Project: 121753-7.3

DESIGN BRIEF
COWAN'S GROVE MID-DENSITY
4791 BANK STREET
LEITRIM DEVELOPMENT AREA

Development Application File No. **D07-12-20-0015**

Prepared for URBANDALE CORPORATION
by IBI GROUP
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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 Mid-Density, 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 Mid Density is approximately 1.39 Ha and is bound by Bank Street to the West, the Cowan's Grove commercial plaza and Longworth Avenue to the South, the Cowan's Grove subdivision to the east and development lands to the north.

The current architectural site plan, upon which this report is based, contains seven residential stacked townhouse blocks of various sizes for a total of 102 units along with associated landscaping, parking, vehicle access routes and pedestrian areas. The architectural site plan is shown on Figure 3.

1.3 Previous Studies

As noted above, 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 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 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.

Two watermains are located adjacent to the site, 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. Additionally, as part of the Cowan's Grove subdivision works a 250mm dia watermain was installed within the Longworth Avenue ROW.

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.

2.3 Design Criteria

2.3.1 Water Demands

The Cowan's Grove Mid-Density site consists of seven residential stacked townhouse blocks of various sizes for a total of 102 units. A water demand has been calculated using the following data as per table 4.2 of the Ottawa Design Guidelines – Water Distribution.

- Townhouse and Semi-Detached 2.7 person per unit
- Residential Average Day Demand 350 l/cap/day

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

- Average Day 1.12 l/s
- Maximum Day 2.79 l/s
- Peak Hour 6.14 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 Rate

The Cowan's Grove Mid-Density site plan contains seven residential stacked townhouse blocks. Fire flow is determined by the Fire Underwriters Survey (FUS) method in which the building construction type, occupancy and separation from adjacent buildings is considered. A calculation has been conducted for Block 6 which is the biggest building with the most exposures, resulting in a fire flow rate of 17,000 litres per minute. A copy of the FUS calculation is included in *Appendix A*.

A fire route is shown on the site plan, and to ensure adequate hydrant coverage, 2 hydrants are proposed on the site which provide coverage to all buildings)within 90m of each hydrant), as well as both site entrances. Fire department connections are not proposed for the building on-site.

2.3.4 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 121753-C-100, located in **Appendix E**, shows the watermain layout. A 200mm watermain is connected to the 250mm in Longworth Avenue and crosses the site to connect to the 400mm watermain within Bank Street. This private watermain provides connections to the 2 on-site hydrants as well as providing a service to the single central water meter located in a heated enclosure within the garbage corral. From the water meter location a water service distribution network, varying in size from 150mm to 50mm, provides water services throughout the site to the

various residential blocks. There is no connection between the 200mm watermain connected to the hydrants and the watermain servicing the buildings.

Results of the hydraulic analysis for Cowan's Grove Mid-Density 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)	559.2 – 573.7
Peak Hour Pressure (kPa)	448.7 – 462.9
Design Fire flow @ 140 kPa Residual Pressure (l/s)	293.9 – 294.6

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 442.7 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) at the two hydrant locations are 293.9 and 294.6 L/s which exceeds the requirement of 283.3 l/s (17,000 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 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**. The subject lands are identified as BLK13123A on the aforementioned subdivision documents. During construction of the Cowan's Grove subdivision a 200mm sanitary service stub from the sewer located within Longworth Avenue was left to service the subject lands.

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:

- Demand per capital — 280 litres/person/day
- Peaking factor — Harmon formula where K=0.8
- 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 service connections to each vertical stack of 3 units. The sewers have been designed using the criteria noted above in section 3.2 and outlet via the connection to the sanitary sewer within the Longworth Avenue 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 121753-C-100 in **Appendix E** for further details.

4 SITE STORMWATER MANAGEMENT

4.1 Objective

The purpose of this evaluation is to prepare the dual drainage design, including the minor and major system, for the proposed site. The design includes the assignment of inlet control devices, on-site storage, and maximum depth of surface ponding. The evaluation takes into consideration the City of Ottawa Sewer Design Guidelines (OSDG) (October 2012), the February 2014 Technical Bulletin ISDTB-2014-01, the September 2016 Technical Bulletin PIEDTB-2016-01 and the June 2018 Technical Bulletin ISTB-2018-04.

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 — 1:2 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 System Concept

The site was included with the stormwater management strategy of the approved Cowan's Grove subdivision as noted in section 1.3. As outlined within the Cowan's Grove Design Brief, the existing downstream storm infrastructure in the adjacent Longworth Ave. was design and constructed with capacity for the minor system flows from the subject lands. 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 area MU05. That report provided summary of the flow allocation for the subject lands, a copy of the summary Table 5.4 is provided within **Appendix C** for reference. The minor system flow allocation for the subject lands is 281l/s per the approved Cowan's Grove Design Brief.

4.3.1 Dual Drainage Design

The dual drainage system proposed for the subject lands will accommodate both major and minor stormwater runoff. Minor flow from the subject site will be conveyed through the storm sewer network and discharge into the existing 975 mmØ trunk storm sewer in Longworth Avenue.

The balance of the surface flow not captured by the minor system will be conveyed via the major system. Where possible, storage will be provided in surface sags or low points within the roadway. Once the maximum storage is utilized, the excess flow will cascade to the next downstream street

sag. Major flow up to 100-year storm event will be restricted and detained on-site. Emergency overflow will be directed towards Longworth Avenue.

4.3.2 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 121753-C-100, depicting all on-site storm sewers can be found in **Appendix E**.

4.4 Stormwater Management

4.4.1 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, Conservation and Parks.

4.4.2 Water Quantity Control

The subject site will be limited to the minor system release rate of 281l/s as per the Cowan's Grove Design Brief. This will be achieved through a combination of inlet control devices (ICD's) at inlet locations and surface storage.

Surface flows in excess of the site`s allowable release rate will be stored on site in strategic surface storage areas 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 121753-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 the west edge and the southeast corner of the site the opportunity to capture and store runoff is limited due to grading constraints and building geometry. These areas will discharge to Bank St. road side ditch or Longworth Avenue uncontrolled. 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.

4.5 Hydrological Evaluation

The hydrological analysis of the proposed dual drainage system was conducted using DDSWMM. This technique offers a single storm event flow generation and routing. Land use, selected modeling routines, and input parameters are discussed in the following sections. Model files are included on the CD enclosed in **Appendix C**. The main hydrological parameters for the subject site are summarized below.

Storms and Drainage Area Parameters

The main hydrology parameters are summarized below and in **Table 4.1**.

- **Design storms:** The site was evaluated using the following storms:
    - 2 year, 3 hour Chicago storm events with a 10 minute time step (for dual drainage evaluation, specifically to confirm no ponding after the storm event);

- 100 year 3 hour Chicago storm event with a 10 minute time step (to confirm on-site storage requirements); and
- 100 year 3 hour Chicago storm event + 20% increase in intensity with a 10 minute time step (for a stress test on major flow conveyance as per the City of Ottawa Sewer Design Guidelines).

- **Infiltration:** The selected infiltration losses are consistent with the City of Ottawa Sewer Design Guidelines. The Horton values are as follows: f_o = 76.2 mm/h, f_c = 13.2 mm/h, k = 0.00115 s^{-1}.

- **Area:** Catchment areas are based on the rational method drainage areas with some minor modifications for modelling purposes.

- **Imperviousness:** Imperviousness for the subject site is based on the rational method runoff coefficients as indicated within Drawing 500.

- **Width:** The catchment width was based on the conveyance route length of the drainage area and multiplied by two. The multiplier of two was only used if the drainage area had runoff contribution from both sides of the drainage area.

- **Slope:** The ground slope was based upon the average slope for both impervious and pervious area. Generally, the slope is approximately 2% (0.02 m/m). This assumes a slope of approximately 1% for impervious or road surfaces and 3% for pervious surfaces (lot grading).

- **Detention storage depth:** Detention storage depths of 1.57 mm and 4.67 mm were used for impervious and pervious areas, respectively.
- **Manning's roughness:** Manning's roughness coefficients of 0.013 and 0.25 were used for impervious and pervious areas, respectively.

- **Baseflow:** No baseflow components were assumed for any of the areas contributing runoff to the minor system.

- **Minor system capture:** The minor system capture is based on the ICD design. ICDs are incorporated into the design to maintain the allowable release rate into the existing downstream storm sewer system to protect the minor system from surcharge during infrequent storm events and to utilize the available on-site storage.

  The main hydrological parameters used in the DDSWWM model are summarized in **Table 4.1**. A CD of the model files is provided in **Appendix C**.

- **Major system storage and routing:** The subject site is comprised of parking areas and drive aisles. Flow is attenuated within low points with potential overflow cascading to the next segment downstream. The total volume at each low point, up to the overflow depth, is the maximum static storage.

  For areas with ponding, cascading overflow from a low point to a downstream segment utilizes the static storage available plus an additional amount of storage equivalent to the depth required for the flow to cascade over the downstream high point. The attenuation in street sags was evaluated to account for static storage and, if overflow occurs, dynamic storage. Within this report it is referred to as double routing.

  DDSWMM does not have a direct way of coding double routing since it does not allow the user to code dynamic storage over the high point. For this analysis, the method employed is

that recommended in the February 2014 City of Ottawa Technical Bulletin (PIEDTB-2016-01). It accounts for overflow from a street segment (regular static storage at a sag) being conveyed to a downstream dummy segment. In other words, a regular low point segment is provided with a downstream dummy segment for further flow attenuation to account for the dynamic ponding during overflow.

There are no drainage area attributes associated with the dummy segment since it is a segment solely for routing. In addition, there is no inflow to the minor system from these dummy segments. The overflow hydrograph from the upstream catchment is routed in the dummy segment to the next "real" downstream segment. The dummy segments have the following specific characteristics:

- Segment Length: Equivalent to the length of the maximum static storage from the street segment contributing to it.

- Road Type: Equivalent to the right-of-way characteristics from the segment contributing to it, but with a longitudinal slope of 0.01% (0.0001 m/m).

The dummy segments for major system routing have been applied to the analysis of the subject site. The segments are referenced as D1, D2, D3, etc. within the DDSWMM modelling file. The drainage area plan presented in **Drawing 500** does not show the dummy segments, but the DDSWMM output file shows the dummy segments immediately following the corresponding major segment which cascades into that dummy segment.

Rear yards were considered independently of street segments and rear yard catch basins were incorporated in the DDSWMM model. Simulations were based on the total interception of runoff by the storm inlets. This was done by specifying a one-to-one relationship between approach flow and capture flow. For this particular case, underground storage volumes in rear yards was accounted for as available on-site storage. As per the Technical Bulletin (PIEDTB-2016-01), the effect of flow attenuation due to surface ponding in rear yards has been accounted for by utilizing a constant slope ditch/swale draining to the street. The ditch/swale has a minimum longitudinal slope of 1.5%, a maximum depth of 600mm, and side slopes of 3 horizontal to 1 vertical.

Table 4.1 DDSWMM Hydrological Parameters

DRAINAGE AREA ID	AREA (HA)	D/S SEGMENT ID	IMP RATIO [Tp (h)]	Segment Length (m)	Subcatchment WIDTH (M)	MINOR SYSTEM RESTRICTION (l/s)	AVAILABLE STATIC PONDING (M^3)
P1	0.07	P3	0.99	36	72	13	2.4
P5	0.11	P4	0.71	40	80	15	15.2
P4	0.09	P3	0.99	27	54	16	10.4
P2	0.26	P3	0.79	59	118	38	91.5
P3	0.08	P6A	0.99	28	56	27	10.9
P7	0.11	P8	0.93	47	47	18	14.7
P8	0.05	P9	0.93	26	26	9	28.6
P9	0.12	P10	0.71	51	102	24	13.4
P6A	0.07	R1	0.99	23	23	21	2.9
P6B	0.06	P10	0.99	19	19	18	0.9
P10	0.05	P12	0.99	29	58	18	2.1
P12	0.10	UN3	0.93	28	28	35	1.3
R1	0.09	OUT1	0.57	56	112	29	0.0

DRAINAGE AREA ID	AREA (HA)	D/S SEGMENT ID	IMP RATIO [Tp (h)]	Segment Length (m)	Subcatchment WIDTH (M)	MINOR SYSTEM RESTRICTION (l/s)	AVAILABLE STATIC PONDING (M^3)
UN3	0.005	OUT1	0.99	6	12	N/A	N/A
UN1	0.07	OUT3	0.99	50	50	N/A	N/A
UN2	0.06	OUT3	0.99	45	45	N/A	N/A

4.6 Results of the Hydrological Evaluation

The allowable minor system release rate for the 1.39 Ha site is 281 L/s according to the previous Cowan's Grove Design Brief, See Table 4.5 in **Appendix C**. As noted in Section 4.5.1, a portion of the site will be left to discharge to Bank St. roadside ditch and Longworth Avenue uncontrolled. As per the detailed DDSWMM model, these uncontrolled areas will contribute approximately 58 L/s to Bank St. and 2 L/s to Longworth Avenue during the 100 year Chicago design storm. The flows to Bank St. will be accommodated within the existing roadside ditch drainage system, and in the future will be accommodated within the future urbanization and widening of Bank St.

Based on the flow allowance for the site, inlet control devices are proposed for the surface drainage. For the 100 year Chicago Storm, the sum of all the minor flow rates is controlled to the maximum allowable flowrate of 281 l/s. Table 4.2 summarizes the ICDs characteristics, refer to **Drawing C-010** for detailed calculations and orifice sizing.

Table 4.2 Summary of ICD

LOCATION	AREA (HA)	RELEASE RATE (L/S)	Head (M)	ICD
P1	0.07	13	1.65	IPEX MHF 69 mm Diameter
P5	0.11	15	1.65	IPEX MHF 74 mm Diameter
P4	0.09	16	1.65	IPEX MHF 76 mm Diameter
P2	0.26	38	1.65	IPEX MHF 83 mm Diameter
P3	0.08	27	1.65	IPEX MHF 100 mm Diameter
P7	0.11	18	1.65	IPEX MHF 81 mm Diameter
P8	0.05	9	1.65	IPEX MHF 57 mm Diameter
P9	0.12	24	1.65	IPEX MHF 94 mm Diameter
P6A	0.07	21	1.65	IPEX MHF 87 mm Diameter
P6B	0.06	18	1.65	IPEX MHF 81 mm Diameter
P10	0.05	18	1.65	IPEX MHF 81 mm Diameter
P12	0.10	35	1.65	IPEX MHF 113 mm Diameter
R1	0.09	29	1.4	IPEX MHF 104 mm Diameter
TOTAL	**1.39**	**281**		

The below **Table 4.1** and summarizes the minor system capture for each subcatchment on the subject site for the 2 year, 3 hour Chicago storm events. The results demonstrate that there is no ponding on the block where the flow is controlled following the 2 year storm event.

Table 4.1 DDSWMM Hydrological Model Results for 2 Year 3 Hour Chicago

DRAINAGE AREA ID	MINOR SYSTEM RESTRICTION (l/s)	AVAILABLE STATIC STORAGE (m3)	MINOR SYSTEM CAPTURE	TOTAL STORAGE USED (m3)	OVERFLOW (l/s)
P1	13	2.43	13	0.02	0
P5	15	15.17	15	0.01	0
P4	16	10.43	16	0.02	0
P2	38	91.49	38	0.01	0
P3	27	10.88	15	0.01	0
P7	18	14.66	18	0.02	0
P8	9	28.59	9	0.01	0
P9	24	13.41	17	0.01	0
P6A	21	2.94	12	0.01	0
P6B	18	0.93	10	0.01	0
P10	18	2.07	10	0.01	0
P12	35	1.30	16	0	0
R1	29	0	10.33	0	0
UN3	N/A	N/A	N/A	N/A	1
UN1	N/A	N/A	N/A	N/A	13
UN2	N/A	N/A	N/A	N/A	11
OUT1*	N/A	N/A	N/A	N/A	1
OUT3**	N/A	N/A	N/A	N/A	24

Notes: * Sum of flows to Longworth Ave. (R1, P12, UN3)

** Sum of uncontrolled sheet flows to Bank St. (UN1, UN2)

The **Table 4.2** and **Table 4.3** below, summarize the cascading overflows for each subcatchment on the subject site for the 100 year 3 hour Chicago storm event and the 100 year Chicago storm increased by 20%, respectively. The cascading overflow is the flow exiting a drainage area when maximum minor system inflow and maximum available ponding has been utilized. The overflow is obtained from the respective DDSWMM output file provided in **Appendix C**, CD model files.

Table 4.2 DDSWMM Hydrological Model Results for 100 Year 3 Hour Chicago

DRAINAGE AREA ID	MINOR SYSTEM RESTRICTION (l/s)	AVAILABLE STATIC STORAGE (m3)	MINOR SYSTEM CAPTURE	TOTAL STORAGE USED (m3)	OVERFLOW (l/s)
P1	13	2.43	13	2.43	19
P5	15	15.17	15	15.17	12
P4	16	10.43	16	10.43	13
P2	38	91.49	38	45.62	0
P3	27	10.88	27	10.88	4
P7	18	14.66	18	14.66	11
P8	9	28.59	9	11.52	0
P9	24	13.41	24	13.26	0
P6A	21	2.94	21	2.94	1
P6B	18	0.93	18	0.93	6
P10	18	2.07	18	2.07	8
P12	35	1.30	35	1.30	8

R1	29	0	29	0	0
UN3	N/A	N/A	N/A	N/A	8
UN1	N/A	N/A	N/A	N/A	31
UN2	N/A	N/A	N/A	N/A	27
OUT1*	N/A	N/A	N/A	N/A	8
OUT3**	N/A	N/A	N/A	N/A	58

Notes: * Sum of flows to Longworth Ave. (R1, P12, UN3)
** Sum of uncontrolled sheet flows to Bank St. (UN1, UN2)

The above results indicate that the major system flow from the site is 8L/s to Longworth Avenue during the 100 year 3 hour Chicago design storm. This major system cascading flow will have negligible impact on the downstream system. Review of the downstream dual drainage system on Longworth Avenue indicates that this major system cascading flow will be accommodated within the downstream sag with an increase in water level of approximately less than 1cm. Supporting information from the Cowan's Grove Design Brief including the Ponding Plan (103557-600) indicating ponding ID 123B on Longworth Avenue as well as the Velocity x Depth Calculation – Cowan's Grove Design Brief sheet are included within Appendix C for reference.

Table 4.3 DDSWMM Hydrological Model Results for 100 Year 3 Hour Chicago +20%

DRAINAGE AREA ID	MINOR SYSTEM RESTRICTION (l/s)	AVAILABLE STATIC STORAGE (m3)	MINOR SYSTEM CAPTURE	TOTAL STORAGE USED (m3)	OVERFLOW (l/s)
P1	13	2.43	13	2.43	26
P5	15	15.17	15	15.17	18
P4	16	10.43	16	10.43	21
P2	38	91.49	38	68.92	0
P3	27	10.88	27	10.88	40
P7	18	14.66	18	14.66	16
P8	9	28.59	9	18.38	0
P9	24	13.41	24	13.41	12
P6A	21	2.94	21	2.94	37
P6B	18	0.93	18	0.93	11
P10	18	2.07	18	2.07	17
P12	35	1.30	35	1.30	29
R1	29	0	29	0	34
UN3	N/A	N/A	N/A	N/A	28
UN1	N/A	N/A	N/A	N/A	38
UN2	N/A	N/A	N/A	N/A	33
OUT1*	N/A	N/A	N/A	N/A	51
OUT3**	N/A	N/A	N/A	N/A	70

Notes: * Sum of flows to Longworth Ave. (R1, P12, UN3)
** Sum of uncontrolled sheet flows to Bank St. (UN1, UN2)

The above results indicate that the major system flow from the site is 51L/s during the 100 year 3 hour Chicago + 20% sensitivity analysis. This is less than the previous analysis within the Cowan's Grove Design Brief, which included an overflow of 308 L/s generated from the site. Therefore, the proposed design will not have a negative impact on the existing downstream system.

The following table summarizes the elevation of dynamic ponding, property line elevation and the garage elevations for the street segments during the 100 year storm event increased by 20%.

Table 4.4 Critical Ponding Locations during the Stress Test and Adjacent Property Elevations

DRAINAGE AREA ID	STATIC PONDING DEPTH (M)	MAX. DEPTH (STATIC + DYNAMIC, WHERE APPLICABLE) (M)	(1) CORRESPONDING ELEVATION (M)	(2) ADJACENT PROPERTY LINE ELEVATION (M)	DIFFERENCE (2) – (1)	(3) ADJACENT CRITICAL ELEVATION		DIFFERENCE (3) – (1)
						LOCATION	(3) ELEVATION (M)	
P1	0.05	0.12	94.02	93.95	-0.07	Building envelope	94.40	0.38
P2	0.30	0.30	93.95	93.95	0.00	Building envelope	94.30	0.35
P3	0.15	0.22	94.02	93.95	-0.07	Building envelope	94.20	0.18
P4	0.15	0.21	94.01	93.95	-0.06	Building envelope	94.20	0.19
P5	0.15	0.20	94.00	93.95	-0.05	Building envelope	94.25	0.25
P6A	0.15	0.22	93.87	93.80	-0.07	building envelope	94.15	0.28
P6B	0.10	0.14	93.74	93.70	-0.04	building envelope	94.15	0.41
P7	0.20	0.25	94.00	93.95	-0.05	building envelope	94.20	0.20
P8	0.25	0.25	93.95	93.95	0.00	Building envelope	94.25	0.30
P9	0.20	0.25	93.95	93.90	-0.05	Building envelope	94.25	0.30
P10	0.15	0.21	93.76	93.70	-0.06	Building envelope	93.80	0.04
P12	0.15	0.22	93.32	93.32	0.00	Building envelope	93.65	0.33
R1	0.00	0.02	93.33	93.31	-0.02	Building envelope	93.61	0.28
UN1	0.00	0.01	94.29	n/a	n/a	Building envelope	94.30	0.01
UN2	0.00	0.01	94.26	n/a	n/a	Building envelope	94.30	0.04
UN3	0.00	0.07	93.23	n/a	n/a	n/a	n/a	n/a

From the comparison in **Table 4.4**, during the 100 year storm event increased by 20%, the major system encroaches the adjacent property line, but remains below the garage opening at all locations.

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, Conservation and Parks (MECP) 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 is constructed, groundwater in trenches will be pumped into a filter mechanism prior to release to the environment;
- 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 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.

6.4 Surface Structure Filters

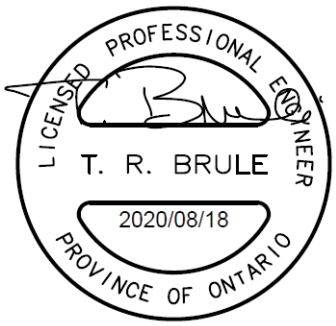
All catchbasins, and to a lesser degree, manholes, convey surface water to sewers. Until streets are asphalted and curbed, all catchbasins and manholes will be constructed with sediment capture inserts or equivalent located between the structure frame and cover. These will stay in place and be maintained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

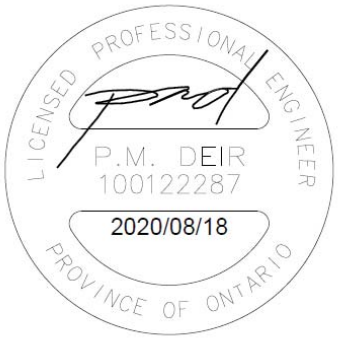
7 CONCLUSION

This report has illustrated that the proposed Cowan's Grove Mid-Density block can be serviced via existing municipal services. 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

Peter Deir P. Eng.
Section 4 Only

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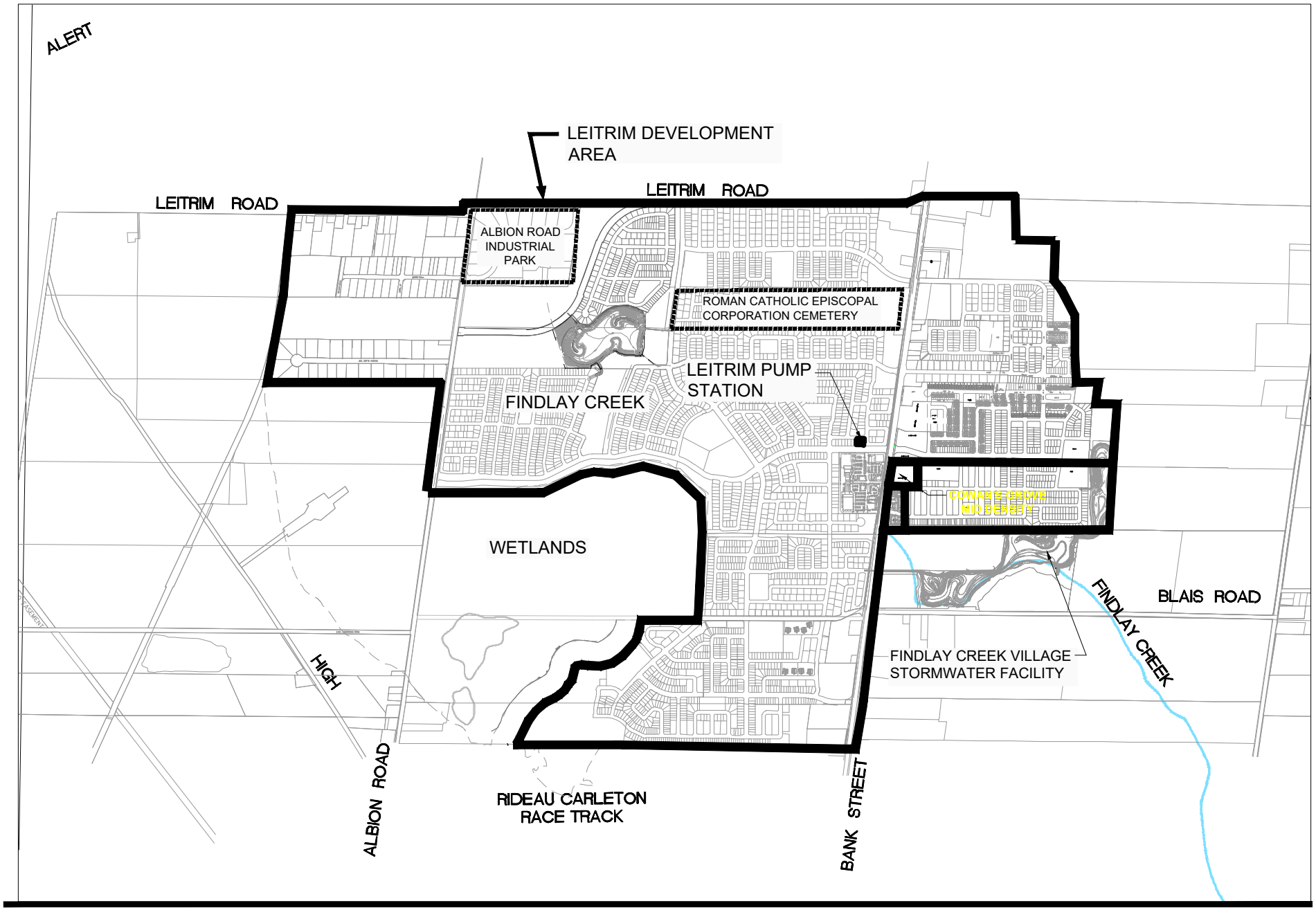

J:\121753_CowansGrove\7.0_Production\7.3_Design\04_Civil_LAND\Figure\FIGURE 1.dwg Layout Name: FIGURE 1

Scale

NTS

Project Title

COWAN'S GROVE MID DENSITY

4791 BANK STREET

Drawing Title

LOCATION WITHIN LEITRIM DEVELOPMENT AREA

Sheet No.

FIGURE 1

Sheet No.

FIGURE 2

Drawing Title

LOCATION WITHIN
COWAN'S GROVE SUBDIVISION

Project Title

COWAN'S GROVE
MID DENSITY
4791 BANK STREET

Scale

N.T.S.

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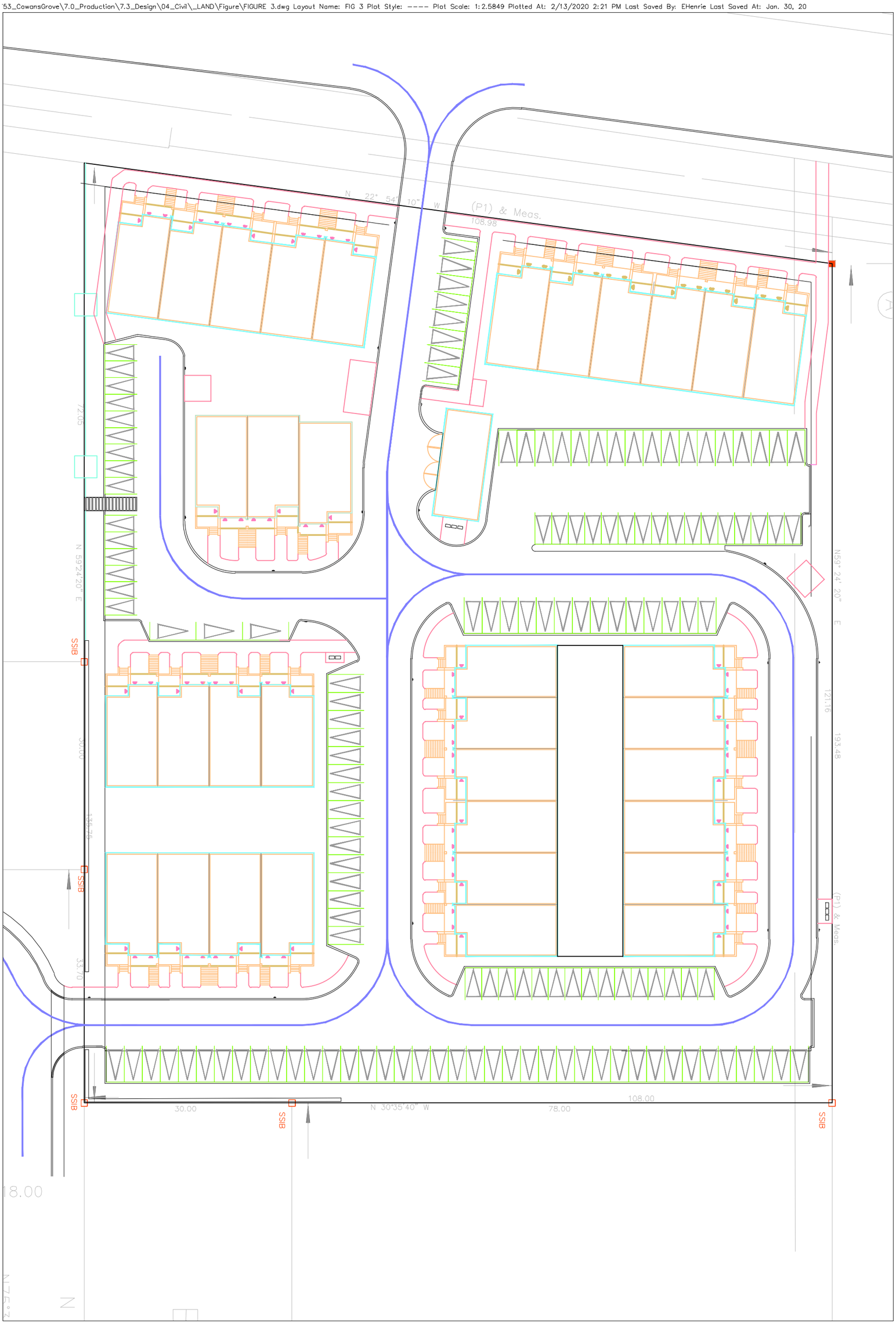
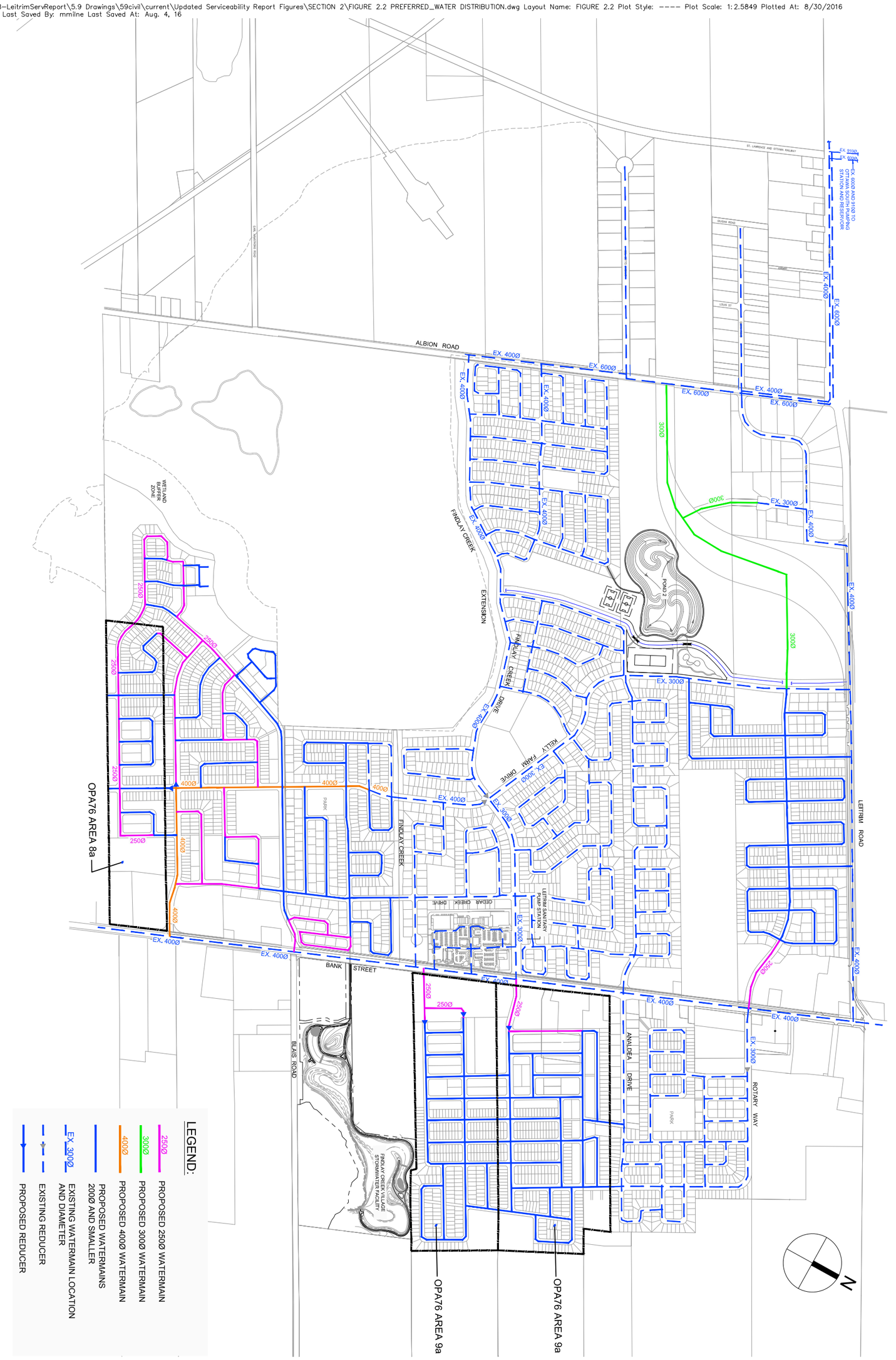


Sheet No.	Drawing Title	Project Title	Scale
FIGURE 3	ARCHITECTURAL SITE PLAN	COWAN'S GROVE MID DENSITY	N.T.S.

IBI

APPENDIX A

J:\34738-LeitrimServReport\5.9 Drawings\59civil\current\Updated Serviceability Report Figures\SECTION 2\FIGURE 2.2 PREFERRED_WATER DISTRIBUTION.dwg Layout Name: FIGURE 2.2 Plot Style: ---- Plot Scale: 1:2.5849 Plotted At: 8/30/2016 9:49 AM Last Saved By: mmilne Last Saved At: Aug. 4, 16



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
[redacted] 613.580.2424 ext./poste 27785
ottawa.ca/planning / ottawa.ca/urbanisme

WATERMAIN DEMAND CALCULATION SHEET

IBI GROUP
333 PRESTON STREET
OTTAWA, ONTARIO
K1S 5N4

PROJECT : **Cowan's Grove Mid Density Block**
CLIENT : **Urbandale**

FILE: 121753
DATE PRINTED: 30-Jan-20
DESIGN: JB
PAGE: 1 OF 1

NODE	RESIDENTIAL				NON-RESIDENTIAL (ICI)			AVERAGE DAILY DEMAND (l/s)			MAXIMUM DAILY DEMAND (l/s)			MAXIMUM HOURLY DEMAND (l/s)			FIRE DEMAND (l/min)
	SINGLE FAMILY UNITS	TOWN HOUSE UNITS	MEDIUM DENSITY (ha)	POPULATION	INDUST. (ha)	COMM. (ha)	INSTIT. (ha)	RESIDENTIAL	ICI	TOTAL	RESIDENTIAL	ICI	TOTAL	RESIDENTIAL	ICI	TOTAL	
T14 (Block 1)		18		49				0.20		0.20	0.49		0.49	1.08		1.08	
T20 (Blocks 2 and 3)		24		65				0.26		0.26	0.66		0.66	1.44		1.44	
T22 (Blocks 4 and 5)		24		65				0.26		0.26	0.66		0.66	1.44		1.44	
T16 (Blocks 6 and 7)		36		97				0.39		0.39	0.98		0.98	2.17		2.17	
T-3																	17,000
T-4																	17,000
Totals		102		275						1.12			2.79			6.14	

POPULATION DENSITY

Single Family	3.4 persons/unit
Semi Detached & Townhouse	2.7 persons/unit
Medium Density	1.8 persons/unit

WATER DEMAND RATES

Residential	350 l/cap/day
Commercial Shopping Center	2,500 $L/(1000m2)/day$

PEAKING FACTORS

Maximum Daily	
Residential	2.5 x avg. day
Commercial	1.5 x avg. day
Maximum Hourly	
Residential	2.2 x avg. day
Commercial	1.8 x avg. day

FIRE DEMANDS

Single Family	10,000 l/min (166.7 l/s)
Semi Detached & Townhouse	10,000 l/min (166.7 l/s)
Stacked towns	17,000 l/min (283.3 l/s)

Fire Flow Requirement from Fire Underwriters Survey

Block 6 - 3 Storey Stacked Townhouse Block

Floor Area	650	m^2
Total Floor Area	1,950	m^2

$F = 220C\sqrt{A}$

C	1.5		C =	1.5 wood frame
A	1,950	m^2		1.0 ordinary
				0.8 non-combustible
F	14,572	l/min		0.6 fire-resistive
use	15,000	l/min		

Occupancy Adjustment

		-25%	non-combustible
		-15%	limited combustible
Use	-15%	0%	combustible
		+15%	free burning
Adjustment	-2250 l/min	+25%	rapid burning
Fire flow	12,750 l/min		

Sprinkler Adjustment

		-30%	system conforming to NFPA 13
		-50%	complete automatic system
Use	0%		
Adjustment	0 l/min		

Building Face	Separation (m)	Adjacent Exposed Wall			Exposure Charge *
		Length	Stories	L*H Factor	
north	9.5	45.0	3	135	20%
east	> 45				
south	20.5	26.0	3	78	9%
west	35.0				5%
Total					34%

* Exposure charges from Techinical Bulletin ISTB 2018-02 Appendix H (ISO Method)

Adjustment	4,335	l/min
Fire flow	17,085	l/min
Use	**17,000**	**l/min**
	283.3	**l/s**

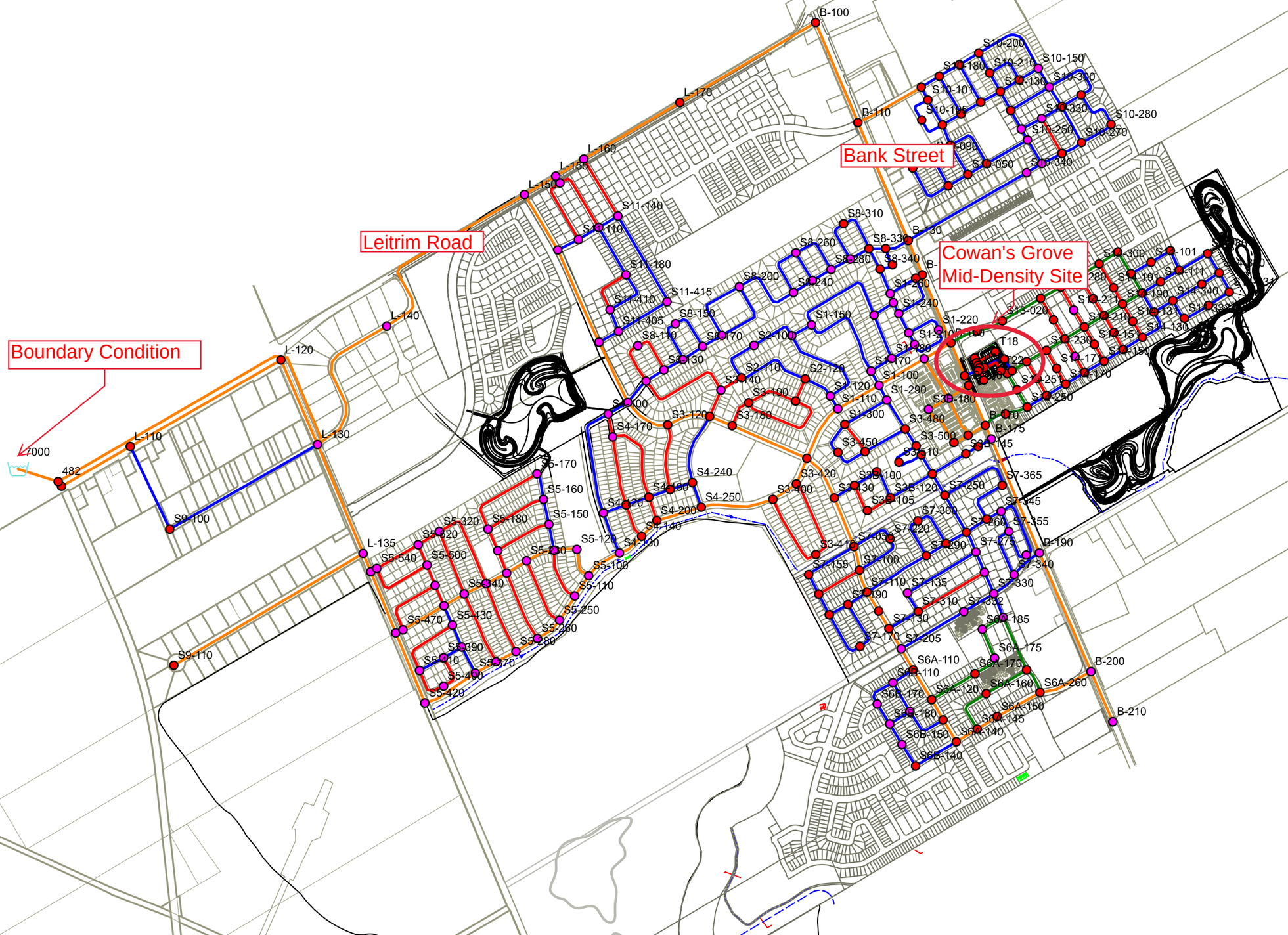
OVERALL WATER MODEL

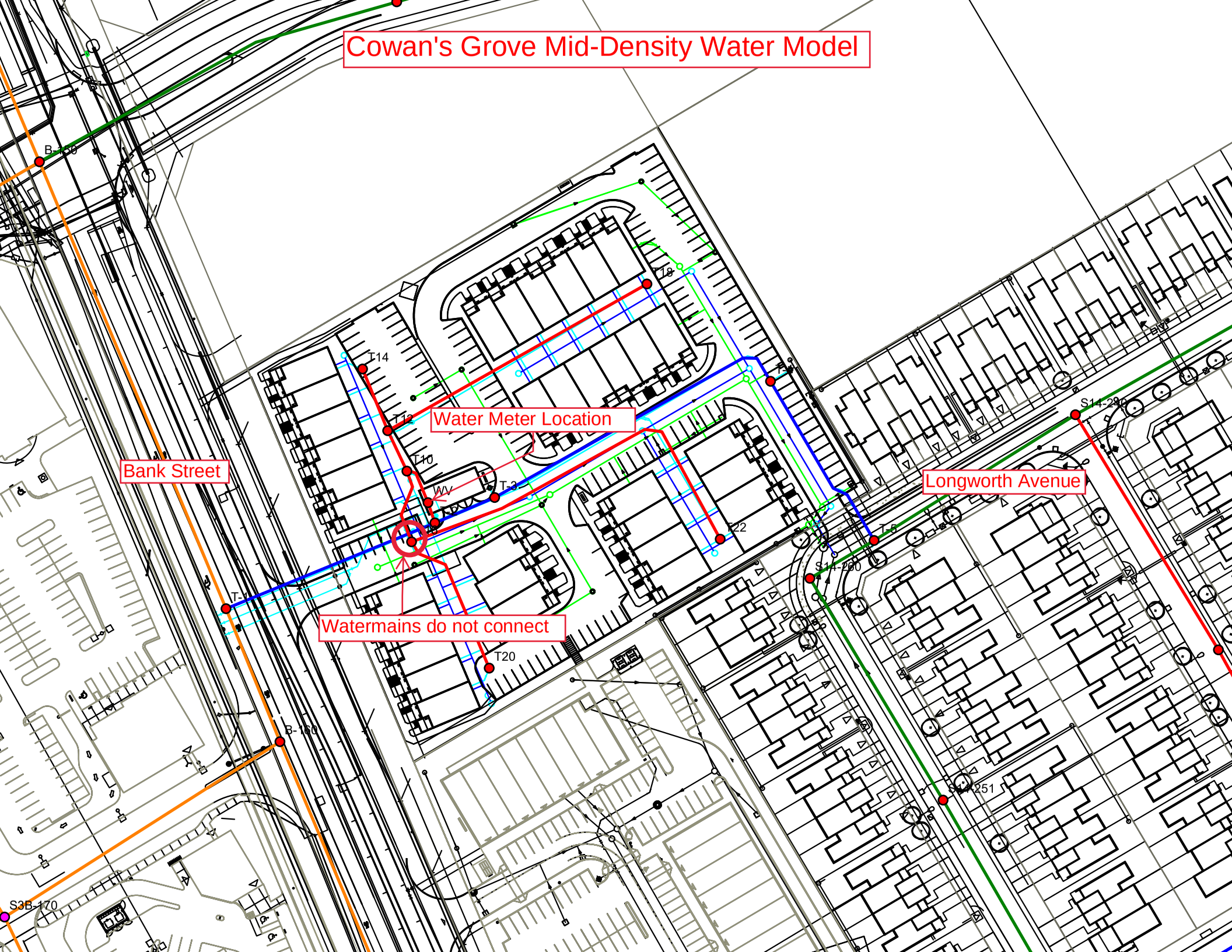
Boundary Condition

Leitrim Road

Bank Street

Cowan's Grove
Mid-Density Site




Cowan's Grove Mid-Density Water Model
Water Meter Location
Bank Street
Longworth Avenue
Watermains do not connect
B-160
T14
T12
T10
T-3
WV
T18
T22
T-5
T-1
T20
S14-250
S14-251
S3B-170

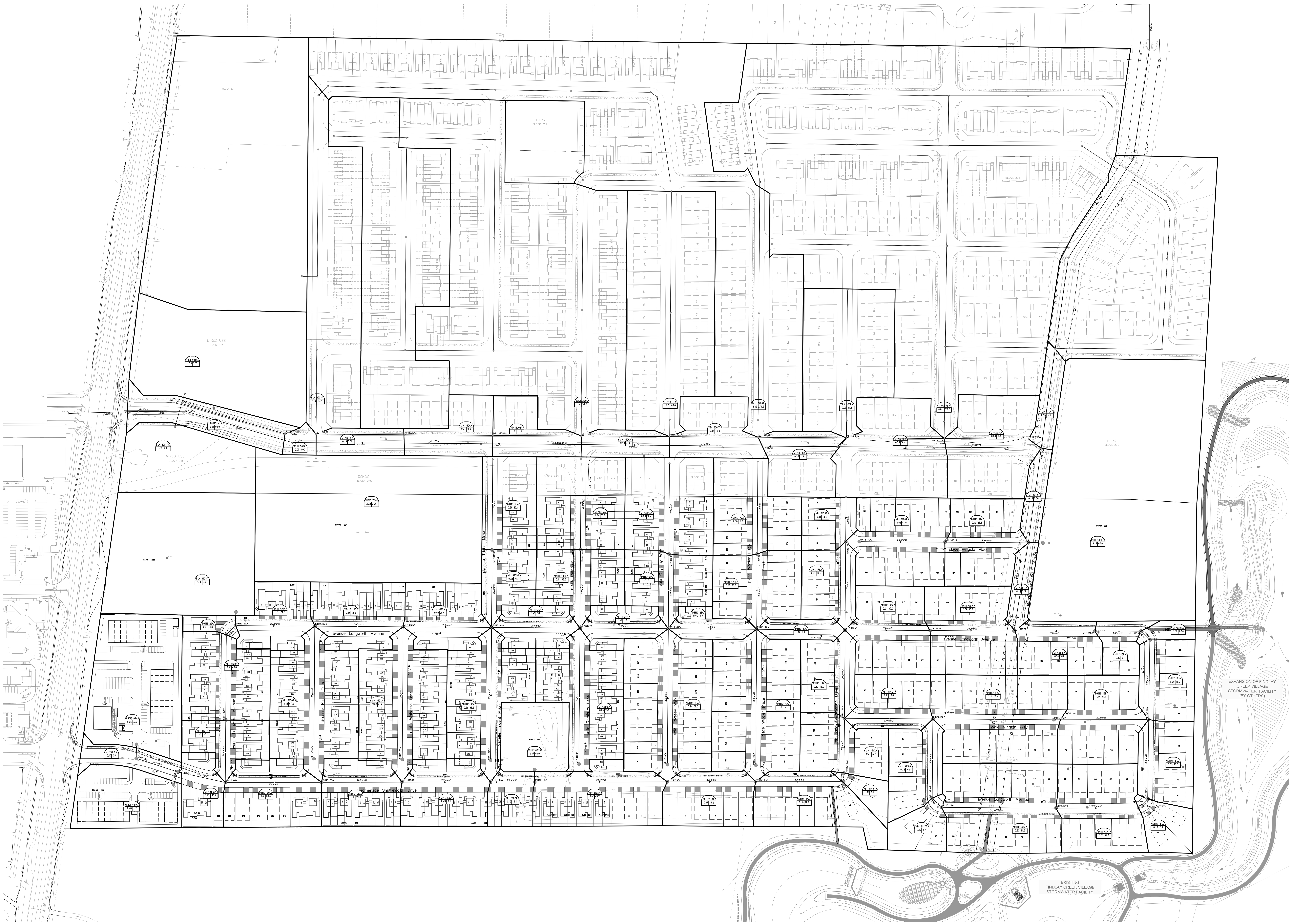
		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
251	☐	S7-360	0.16	94.65	151.30	555.13
252	☐	S7-365	0.24	94.60	151.34	555.98
253	☐	S8-100	0.09	94.90	152.36	563.09
254	☐	S8-110	0.13	95.50	152.34	556.97
255	☐	S8-130	0.10	95.30	152.32	558.72
256	☐	S8-140	0.13	95.38	152.25	557.30
257	☐	S8-150	0.22	95.70	152.23	553.99
258	☐	S8-170	0.15	95.50	152.22	555.80
259	☐	S8-180	0.33	95.50	152.16	555.20
260	☐	S8-200	0.43	95.69	152.11	552.83
261	☐	S8-240	0.49	96.28	151.93	545.36
262	☐	S8-260	0.47	96.70	151.91	541.06
263	☐	S8-270	0.16	96.19	151.91	546.05
264	☐	S8-280	0.16	96.58	151.90	542.07
265	☐	S8-300	0.16	98.40	151.86	523.85
266	☐	S8-310	0.31	99.80	151.85	510.03
267	☐	S8-330	0.13	100.83	151.84	499.86
268	☐	S8-340	0.18	99.05	151.83	517.19
269	☐	S8-350	0.28	99.70	151.83	510.84
270	☐	S8-360	0.00	101.30	151.83	495.20
271	☐	S9-100	1.46	101.00	154.63	525.53
272	☐	S9-110	0.83	101.50	154.26	516.97
273	☐	T-1	0.00	93.45	151.58	569.68
274	☐	T-2	0.00	94.35	151.57	560.69
275	☐	T-3	0.00	94.15	151.56	562.61
276	☐	T-4	0.00	93.00	151.55	573.72
277	☐	T-5	0.00	93.10	151.54	572.64
278	☐	T10	0.00	94.50	151.57	559.21
279	☐	T12	0.00	94.20	151.57	562.15
280	☐	T14	0.20	94.00	151.57	564.11
281	☐	T16	0.39	94.05	151.57	563.61
282	☐	T18	0.00	93.90	151.57	565.09
283	☐	T20	0.26	94.10	151.57	563.12
284	☐	T22	0.26	93.35	151.57	570.46
285	☐	WV	0.00	94.35	151.57	560.68

		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
251	☐	S7-360	0.25	94.65	140.46	448.93
252	☐	S7-365	0.36	94.60	140.47	449.47
253	☐	S8-100	0.48	94.90	141.06	452.29
254	☐	S8-110	0.72	95.50	141.02	446.04
255	☐	S8-130	0.52	95.30	141.00	447.81
256	☐	S8-140	0.43	95.38	140.93	446.33
257	☐	S8-150	0.45	95.70	140.91	443.01
258	☐	S8-170	0.34	95.50	140.89	444.83
259	☐	S8-180	0.51	95.50	140.84	444.26
260	☐	S8-200	0.65	95.69	140.79	441.93
261	☐	S8-240	0.75	96.28	140.64	434.67
262	☐	S8-260	0.72	96.70	140.62	430.39
263	☐	S8-270	0.25	96.19	140.62	435.39
264	☐	S8-280	0.25	96.58	140.61	431.45
265	☐	S8-300	0.25	98.40	140.58	413.34
266	☐	S8-310	0.47	99.80	140.57	399.55
267	☐	S8-330	0.20	100.83	140.57	389.42
268	☐	S8-340	0.27	99.05	140.56	406.79
269	☐	S8-350	0.45	99.70	140.56	400.43
270	☐	S8-360	0.00	101.30	140.57	384.77
271	☐	S9-100	3.03	101.00	143.51	416.60
272	☐	S9-110	1.24	101.50	143.10	407.67
273	☐	T-1	0.00	93.45	140.41	460.22
274	☐	T-2	0.00	94.35	140.31	450.38
275	☐	T-3	0.00	94.15	140.30	452.23
276	☐	T-4	0.00	93.00	140.24	462.93
277	☐	T-5	0.00	93.10	140.21	461.61
278	☐	T10	0.00	94.50	140.29	448.68
279	☐	T12	0.00	94.20	140.29	451.62
280	☐	T14	1.08	94.00	140.29	453.57
281	☐	T16	2.17	94.05	140.27	452.90
282	☐	T18	0.00	93.90	140.29	454.56
283	☐	T20	1.44	94.10	140.26	452.37
284	☐	T22	1.44	93.35	140.26	459.66
285	☐	WV	0.00	94.35	140.30	450.31

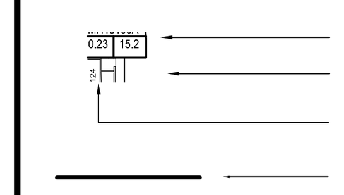
		ID	Total Demand (L/s)	Available Flow at Hydrant (L/s)	Critical Node ID	Critical Node Pressure (kPa)	Critical Node Head (m)	Design Flow (L/s)	Design Pressure (kPa)	Design Fire Node Pressure (kPa)
259	☐	S8-270	166.83	207.00	S8-270	139.96	110.47	207.00	139.96	139.96
260	☐	S8-280	166.83	217.35	S8-280	139.96	110.86	217.35	139.96	139.96
261	☐	S8-300	166.83	244.76	S8-300	139.96	112.68	244.76	139.96	139.97
262	☐	S8-310	166.98	203.55	S8-310	139.96	114.08	203.55	139.96	139.96
263	☐	S8-330	166.80	264.30	S8-330	139.96	115.11	264.30	139.96	139.97
264	☐	S8-340	166.85	288.70	S8-340	139.96	113.33	288.70	139.96	139.98
265	☐	S8-350	166.95	261.88	S8-350	139.96	113.98	261.88	139.96	139.97
266	☐	S8-360	166.67	279.08	S8-360	139.96	115.58	279.08	139.96	139.98
267	☐	S9-100	251.46	212.31	S9-100	139.96	115.28	212.31	139.96	139.96
268	☐	S9-110	250.83	215.29	S9-110	139.96	115.78	215.29	139.96	139.97
269	☐	T-3	283.30	294.64	T-3	139.96	108.43	294.64	139.96	139.97
270	☐	T-4	283.30	293.94	T-4	139.96	107.28	293.94	139.96	139.97

		ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/k-m)	Status	Flow Reversal Count
386	☐	1069	S8-340	S8-350	47.07	204.00	110.00	-1.11	0.03	0.00	0.01	Open	0
387	☐	1073	S8-360	S8-330	58.07	204.00	110.00	-2.74	0.08	0.00	0.07	Open	0
388	☐	1075	S8-360	S8-350	61.66	204.00	110.00	1.56	0.05	0.00	0.03	Open	0
389	☐	1167	S9-100	L-110	318.80	204.00	110.00	-9.89	0.30	0.25	0.79	Open	0
390	☐	P15	T-1	T-2	57.54	204.00	110.00	15.44	0.47	0.10	1.80	Open	0
391	☐	P11	T-1	B-150	123.59	393.00	120.00	-27.77	0.23	0.02	0.19	Open	0
392	☐	P27	T10	T12	11.41	155.00	100.00	1.08	0.06	0.00	0.06	Open	0
393	☐	P39	T12	T18	75.94	155.00	100.00	0.00	0.00	0.00	0.00	Open	0
394	☐	P25	T14	T12	17.01	155.00	100.00	-1.08	0.06	0.00	0.06	Open	0
395	☐	P37	T16	T22	101.71	155.00	100.00	1.44	0.08	0.01	0.10	Open	0
396	☐	P33	T16	T10	19.38	155.00	100.00	-5.05	0.27	0.02	1.03	Open	0
397	☐	P17	T-2	T-3	16.55	204.00	110.00	9.31	0.28	0.01	0.71	Open	0
398	☐	P29	T-2	WV	5.46	155.00	100.00	6.13	0.32	0.01	1.48	Open	0
399	☐	P35	T20	T16	39.56	155.00	100.00	-1.44	0.08	0.00	0.10	Open	0
400	☐	P19	T-3	T-4	82.98	204.00	110.00	9.31	0.28	0.06	0.71	Open	0
401	☐	P21	T-4	T-5	49.08	204.00	110.00	9.31	0.28	0.03	0.71	Open	0
402	☐	P13	T-5	S14-260	19.00	250.00	110.00	-3.75	0.08	0.00	0.05	Open	0
403	☐	P31	WV	T10	10.47	155.00	100.00	6.13	0.32	0.02	1.48	Open	0

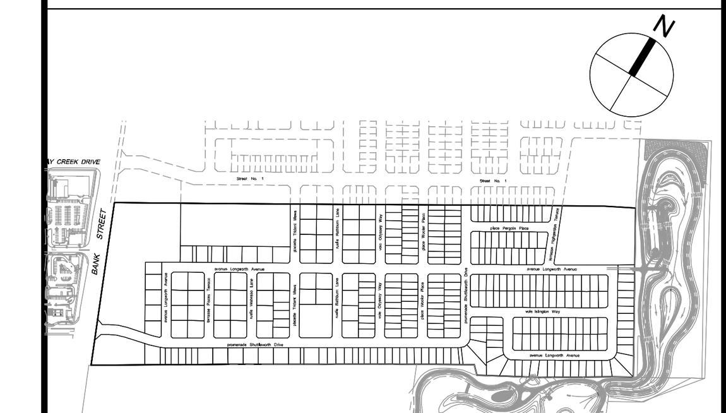
APPENDIX B



LEGEND :



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

Drawing Title
SANITARY DRAINAGE AREA PLAN

Scale 1:1500

Design	Date
K.H. / S.T. / M.M.	NOVEMBER 2017
Drawn	**Checked**
D.D. / M.M.	J.I.M.
Project No.	**Drawing No.**
103557	400

D07-16-13-0035

#17553

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

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										
														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)	CAPACITY (L/s)	LENGTH (m)	DIA (mm)	SLOPE (%)	VELOCITY (full) (m/s)	AVAILABLE CAPACITY L/s	AVAILABLE CAPACITY (%)
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	46.5	4.00	0.75	0.00	0.00	0.00	1.07	0.00	0.00	0.93	0.17	1.60	0.45			2.13	20.24	38.66	200	0.35	0.624	18.11	89.47%
Block 222	BLK13102AS	BLK13102AS	MH13102A	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				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				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				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				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				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				0.90	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	1.38						190.0	190.0	4.00	3.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.38	1.38	0.39			3.47	20.24	12.00	200	0.35	0.62	16.78	82.88%
Longworth Avenue	MH13123A	MH13123A	MH13124A	0.33			9			21.6	378.1	4.00	6.13	0.00	0.00	0.00	1.07	0.00	0.00	0.93	0.33	4.93	1.38			8.44	20.24	69.84	200	0.35	0.62	11.81	58.32%
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	478.9	3.98	7.73	0.00	0.00	0.00	1.07	0.00	0.00	0.93	0.45	6.19	1.73			10.39	20.24	78.00	200	0.35	0.62	9.85	48.66%
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	572.5	3.94	9.14	0.00	0.00	0.00	1.07	0.00	0.00	0.93	0.40	7.41	2.07			12.15	20.24	78.00	200	0.35	0.62	8.09	39.98%
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	678.9	3.90	10.73	0.00	0.00	0.00	1.07	0.00	0.00	0.93	0.25	8.97	2.51			14.17	20.24	78.00	200	0.35	0.62	6.07	29.98%
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	822.9	3.85	12.84	0.00	0.00	0.00	1.07	0.00	0.00	0.93	0.22	10.89	3.05			16.82	20.24	78.00	200	0.35	0.62	3.42	16.89%
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	978.1	3.81	15.08	0.00	0.00	0.00	1.07	0.00	0.00	0.93	0.16	13.04	3.65			19.66	20.24	78.00	200	0.35	0.62	0.58	2.87%
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	1102.9	3.77	16.85	0.00	0.00	0.00	1.07	0.00	0.00	0.93	0.12	15.10	4.23			22.01	31.02	78.00	250	0.25	0.61	9.01	29.04%
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%

FLOW MATCHES DESIGN SHEET FOR SUBJECT SITE

Design Parameters:

Residential

SF/SD	3.2	p/p/u
TH	2.4	p/p/u
APT	1.9	p/p/u
Other	60	p/p/Ha
MU	130	p/p/Ha

ICI Areas

			Peak Factor
INST	50,000	L/Ha/day	1.5
COM	50,000	L/Ha/day	1.5
IND	35,000	L/Ha/day	MOE Chart
	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
5	Revised Block 223	2020-08-18

File Reference: 103557.5.7.1

Date: 2018-05-16

Sheet No: 1 of 2

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

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	UNIT TYPES				AREA	POPULATION		PEAK	PEAK	AREA (Ha)						PEAK	AREA (Ha)		FLOW								AVAILABLE	
STREET	AREA ID	FROM MH	TO MH	w/ Units (Ha)	SF	SD	TH	APT	w/o Units (Ha)	IND	CUM	FACTOR	FLOW (L/s)	INSTITUTIONAL		COMMERCIAL		INDUSTRIAL		FLOW (L/s)	IND	CUM	(L/s)	IND	CUM	(L/s)	CAPACITY (L/s)	LENGTH (m)	DIA (mm)	SLOPE (%)	VELOCITY (full) (m/s)	CAPACITY L/s	(%)
														IND	CUM	IND	CUM	IND	CUM													
Longworth Avenue	MH13135A	MH13135A	MH13136A	0.51	10					32.0	1493.3	3.68	22.27	0.00	0.00	0.00	1.07	0.00	0.00	0.93	0.51	22.29	6.24			29.44	45.12	75.00	300	0.20	0.62	15.68	34.75%
Longworth Avenue	MH13136A	MH13136A	MH13137A	0.60	11					35.2	1528.5	3.67	22.75	0.00	0.00	0.00	1.07	0.00	0.00	0.93	0.60	22.89	6.41			30.09	45.12	74.15	300	0.20	0.62	15.03	33.31%
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	1650.1	3.65	24.39	0.00	0.00	0.00	1.07	0.00	0.00	0.93	0.13	25.60	7.17			32.49	70.84	12.37	375	0.15	0.62	38.35	54.13%
Highgarden Terrace		MH13137B	MH13185A							0.0	1650.1	3.65	24.39	0.00	0.00	0.00	1.07	0.00	0.00	0.93	0.00	25.60	7.17			32.49	70.84	66.55	375	0.15	0.62	38.35	54.13%
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	1720.5	3.64	25.34	0.00	0.00	0.00	1.07	0.00	0.00	0.93	0.14	29.98	8.39			34.66	70.84	84.29	375	0.15	0.62	36.18	51.07%
					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	3218.9	3.42	44.55	0.00	2.41	0.00	3.22	0.00	0.00	4.89	0.00	69.28	19.40			68.83	91.46	*179.98*	*375*	*0.25*	0.80	22.62	24.74%
Street No. 1		*EXMH206A*	*EXMH200A*							0.0	5231.1	3.23	68.38	0.00	4.66	0.00	7.12	0.00	0.00	10.23	0.00	102.79	28.78			107.38	100.18	*500.10*	*375*	*0.30*	0.88	-7.20	-7.19%

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

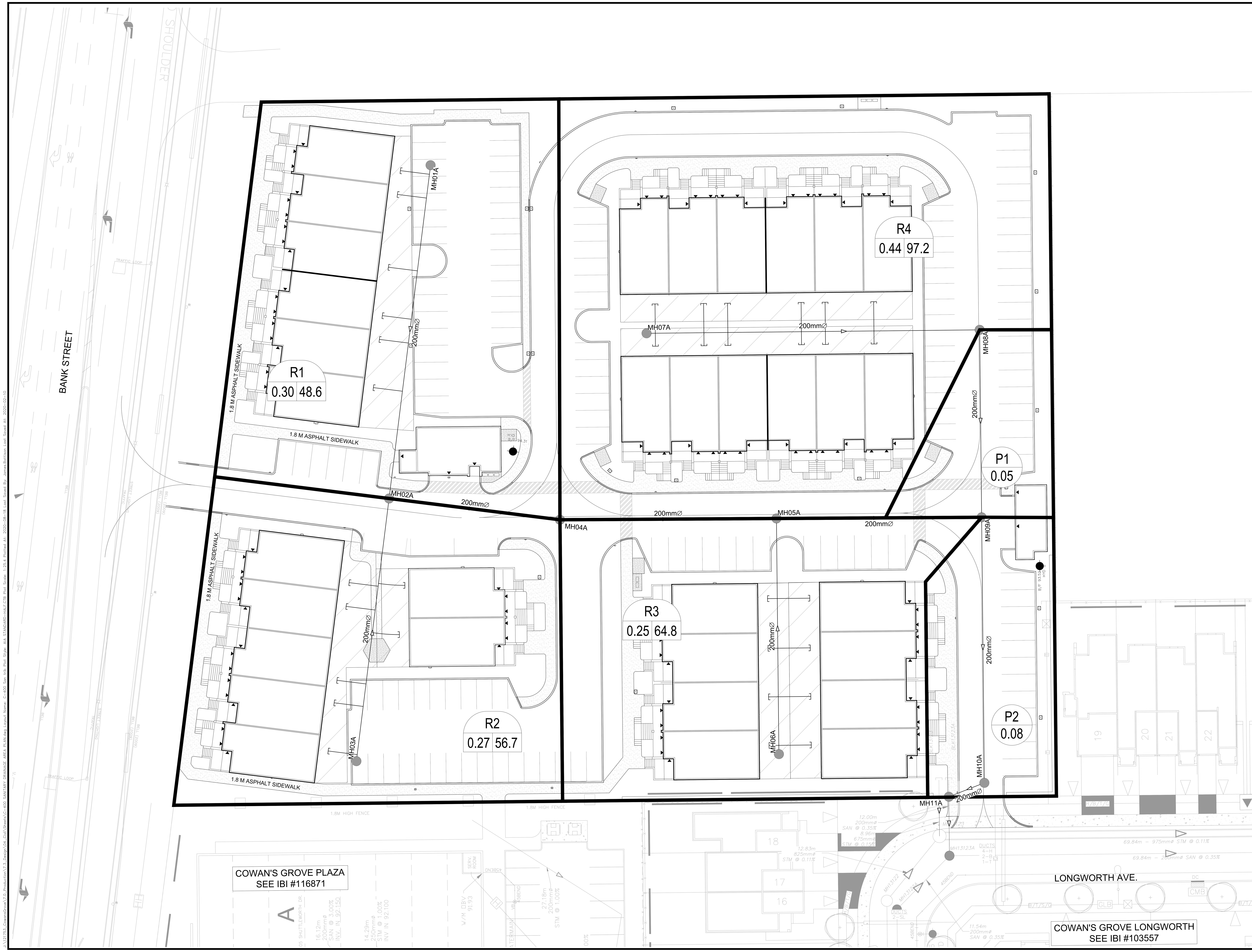
Designed: M.M / K.H

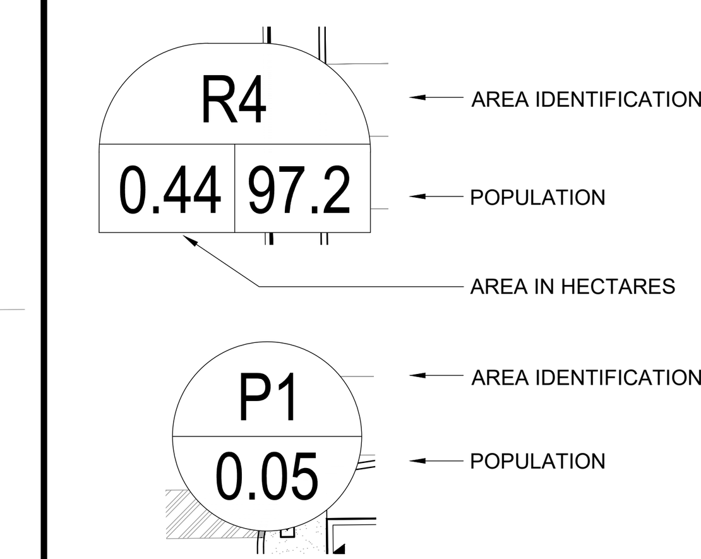
Checked: J.I.M.

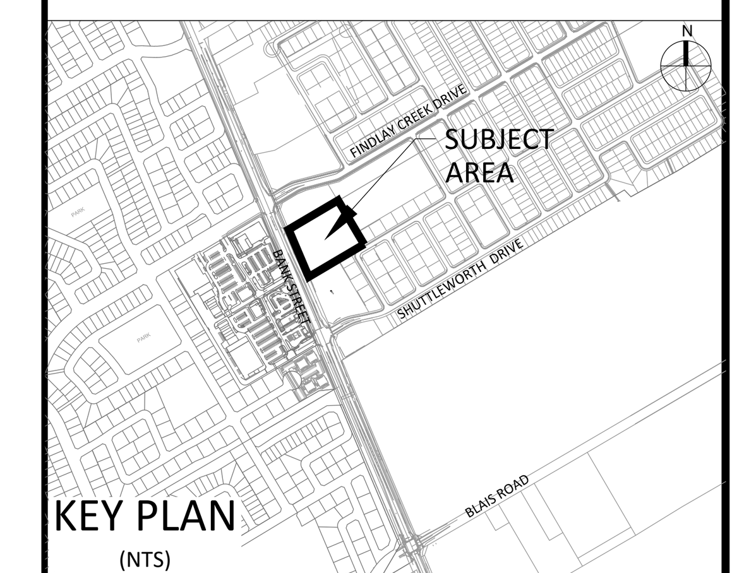
Dwg. Reference: 103557-400

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
5	Revised Block 223	2020-08-18

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







KEY PLAN
(NTS)

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3	REVISED AS PER COMMENTS	TRB	2020:08:18
2	ISSUED FOR SPA	TRB	2020:02:13
1	ISSUED TO CITY FOR REVIEW	TRB	2020:02:01

Cowan's Grove

IBI GROUP
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ibigroup.com

Project Title
COWAN'S GROVE
MID-DENSITY
4791 BANK STREET

LICENSED PROFESSIONAL ENGINEER
T. R. BRULE
2020/08/18
PROVINCE OF ONTARIO

N

Drawing Title
SANITARY DRAINAGE
AREA PLAN

Scale 1 : 250

Design JB	Date JANUARY 2020
Drawn EH	Checked TRB
Project No. 121753	Drawing No. C-400

CITY PLAN No. ####
CITY FILE No. ####

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ibigroup.com

SANITARY SEWER DESIGN SHEET

Cowan's Grove Mid Density
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 (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)	(L/s)	(m)	(mm)	(%)	(m/s)	L/s	(%)
Cowan's Mid Density	R1	MH01A	MH02A				18		0.30	48.6	48.6	3.65	0.58	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.30	0.30	0.10	0.00	0.00	0.67	20.24	51.65	200	0.35	0.624	19.57	96.67%
Cowan's Mid Density	R2	MH03A	MH02A				21		0.27	56.7	56.7	3.64	0.67	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.27	0.27	0.09	0.00	0.00	0.76	20.24	42.56	200	0.35	0.624	19.48	96.25%
Cowan's Mid Density		MH02A	MH04A							0.0	105.3	3.59	1.23	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.57	0.19	0.00	0.00	1.41	20.24	29.48	200	0.35	0.624	18.83	93.02%
Cowan's Mid Density		MH04A	MH05A							0.0	105.3	3.59	1.23	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.57	0.19	0.00	0.00	1.41	20.24	33.30	200	0.35	0.624	18.83	93.02%
Cowan's Mid Density	R3	MH06A	MH05A				24		0.25	64.8	64.8	3.63	0.76	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.25	0.25	0.08	0.00	0.00	0.85	20.24	36.24	200	0.35	0.624	19.40	95.82%
Cowan's Mid Density		MH05A	MH09A							0.0	170.1	3.54	1.95	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.82	0.27	0.00	0.00	2.22	20.24	31.56	200	0.35	0.624	18.02	89.03%
Cowan's Mid Density	R4	MH07A	MH08A				36		0.44	97.2	97.2	3.60	1.13	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.44	0.44	0.15	0.00	0.00	1.28	20.24	51.24	200	0.35	0.624	18.96	93.68%
Cowan's Mid Density	P1	MH08A	MH09A						0.05	0.0	97.2	3.60	1.13	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.05	0.49	0.16	0.00	0.00	1.29	20.24	28.83	200	0.35	0.624	18.95	93.60%
Cowan's Mid Density	P2	MH09A	MH10A						0.08	0.0	267.3	3.48	3.01	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.08	1.39	0.46	0.00	0.00	3.47	20.24	40.84	200	0.35	0.624	16.77	82.84%
Cowan's Mid Density		MH10A	MH11A							0.0	267.3	3.48	3.01	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.39	0.46	0.00	0.00	3.47	20.24	5.87	200	0.35	0.624	16.77	82.84%
Cowan's Mid Density		MH11A	MH13123A							0.0	267.3	3.48	3.01	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.39	0.46	0.00	0.00	3.47	20.24	9.07	200	0.35	0.624	16.77	82.84%

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	

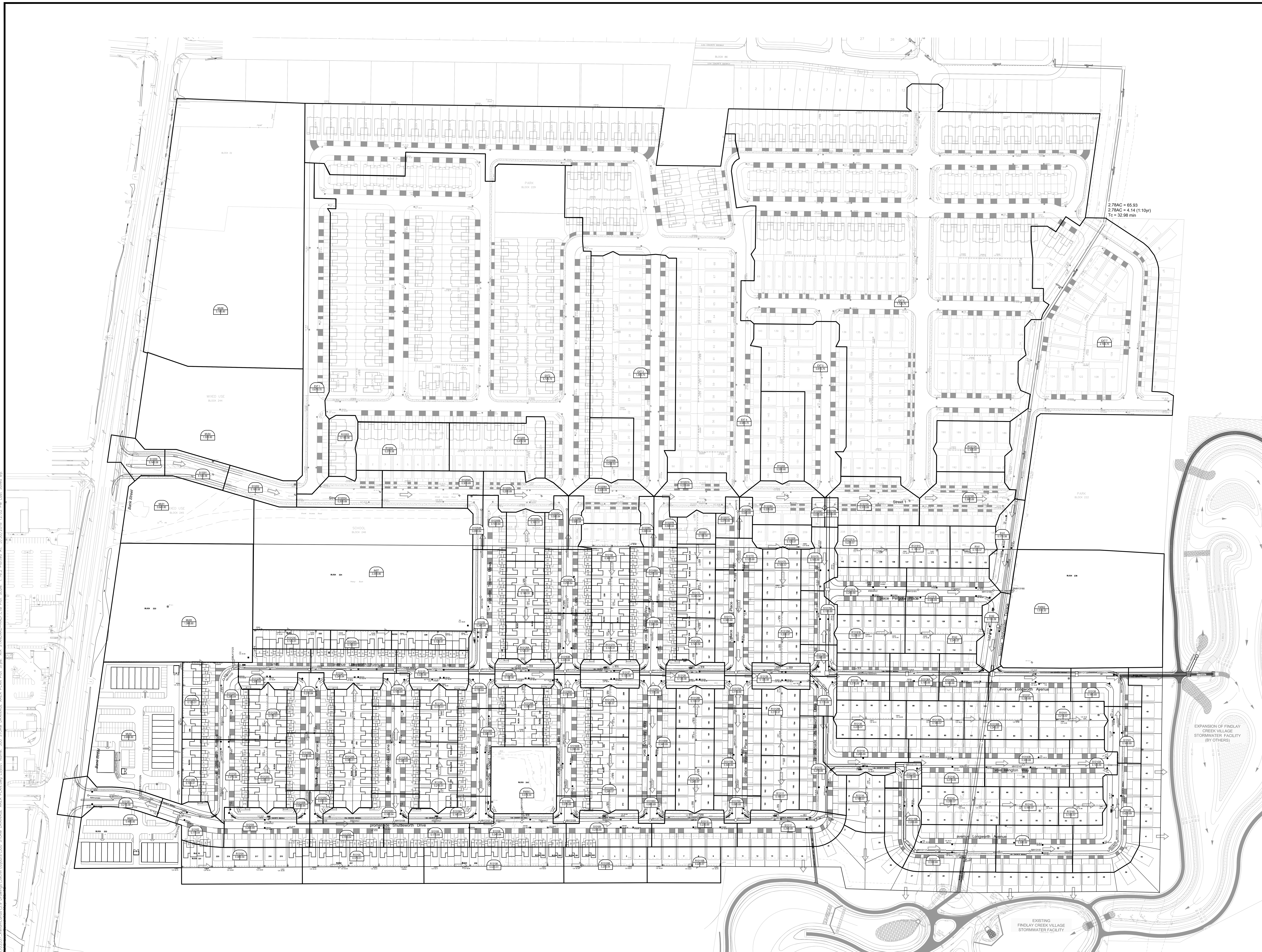
Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 280 L/day 200 L/day
3. Infiltration allowance: 0.33 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+(P/1000)^0.5))0.8
   where K = 0.8 Correction Factor
5. Commercial and Institutional Peak Factors based on total area,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

Designed: JEB
Checked: TRB
Dwg. Reference: 121753-C-400

No.	Revision	Date
1.	1st City Submission	2020-01-30
2.	2nd City Submission	2020-08-18

File Reference: 121753.7.3 **Date:** 2020-01-30 **Sheet No:** 1 of 1

APPENDIX C



LEGEND :

AREA NUMBER
RUN OFF COEFFICIENT
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

Drawing Title

STORM DRAINAGE AREA PLAN

Scale

1:1500

Design	Date
K.H. / S.T. / M.M.	NOVEMBER 2017
Drawn	Checked
D.D. / M.M.	J.I.M.
Project No.	Drawing No.
103557	500

D07-16-13-0035

#17553

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.

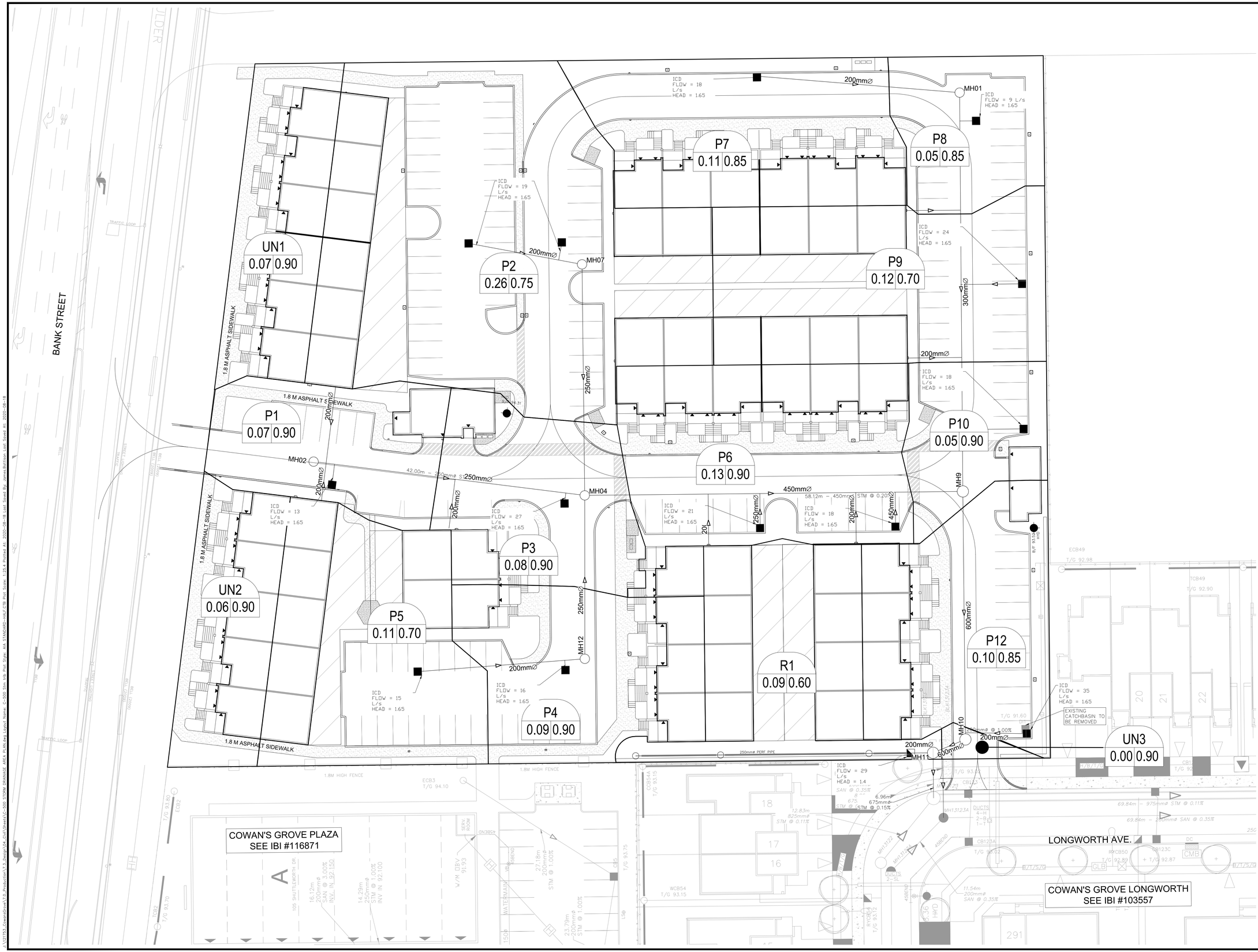
For those areas within Cowan's Grove which will require a separate site stormwater design and analysis, the following table summarizes the assumed inflow rate and minimum on-site storage required for their design.

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

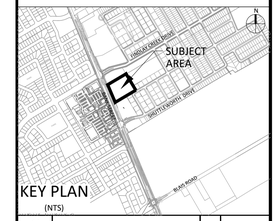
Drainage Area Id	Area (Ha)	Land Use	Imp Ratio	Minimum On-Site Storage Required (cu-m)*	Minor System Inflow Rate (l/s)
West Model (Street No 1 only from Lilythorne at Findlay Creek)					
MU04	1.32	Mixed Use/High Density	0.86	150.00	270
East Model (Street No 1 only from Lilythorne at Findlay Creek)					
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**.



P7
0.11 0.85
AREA NUMBER
COEFFICIENT
AREA (ha)



KEY PLAN
(NTS)

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3	REVISED AS PER COMMENTS	TRB	2020:08:18
2	ISSUED FOR SPA	TRB	2020:02:13
1	ISSUED TO CITY FOR REVIEW	TRB	2020:02:01

Cowan's Grove

IBI GROUP
400 – 333 Preston Street
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Project Title
COWAN'S GROVE
MID-DENSITY
4791 BANK STREET

LICENCE PROFESSIONAL ENGINEER
T. R. BRULE
2020/08/18
PROVINCE OF ONTARIO

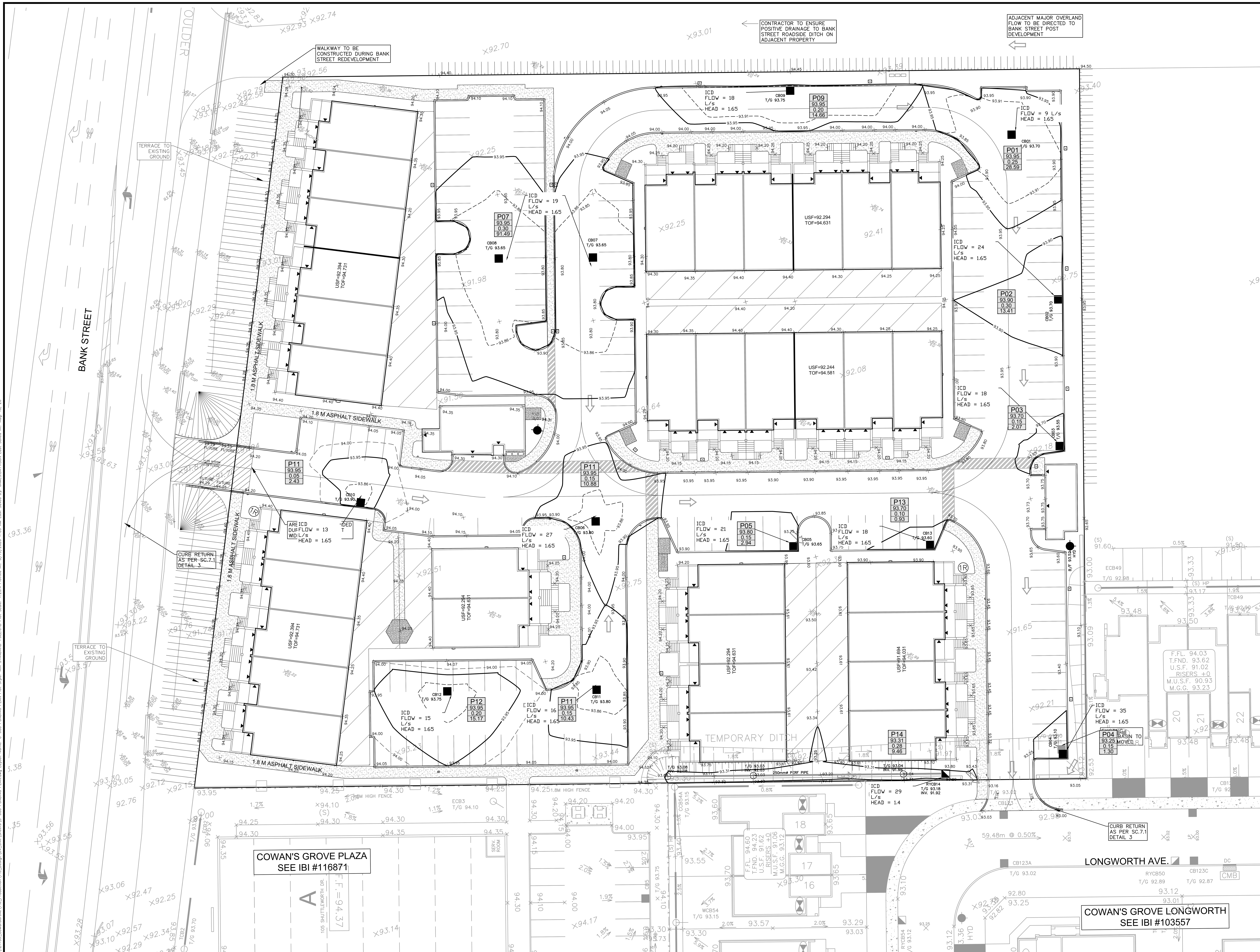
N

Drawing Title
STORM DRAINAGE
AREA PLAN

Scale
1:250

Design	Date
JB	JANUARY 2020
Drawn	Checked
EH	TRB
Project No.	Drawing No.
121753	C-500

CITY PLAN No.####
CITY FILE No. ####


BANK STREET
WALKWAY TO BE CONSTRUCTED DURING BANK STREET REDEVELOPMENT
CONTRACTOR TO ENSURE POSITIVE DRAINAGE TO BANK STREET ROADSIDE DITCH ON ADJACENT PROPERTY
ADJACENT MAJOR OVERLAND FLOW TO BE DIRECTED TO BANK STREET POST DEVELOPMENT
TERRACE TO EXISTING GROUND
CURB RETURN AS PER SC.7.1 DETAIL 3
1.8 M ASPHALT SIDEWALK
TEMPORARY DITCH
250mm Ø PERF PIPE
LONGWORTH AVE.
COWAN'S GROVE PLAZA SEE IBI #116871
COWAN'S GROVE LONGWORTH SEE IBI #103557
P01 93.95 0.25 28.59
P02 93.90 0.30 13.41
P03 93.70 0.15 2.07
P04 93.25 0.15 1.30
P05 93.80 0.15 2.94
P07 93.95 0.30 91.49
P09 93.95 0.20 14.66
P11 93.95 0.05 2.43
P11 93.95 0.15 10.88
P11 93.95 0.15 10.43
P12 93.95 0.20 15.17
P13 93.70 0.10 0.93
P14 93.31 0.28 9.46
ICD FLOW = 18 L/s HEAD = 1.65
ICD FLOW = 9 L/s HEAD = 1.65
ICD FLOW = 19 L/s HEAD = 1.65
ICD FLOW = 24 L/s HEAD = 1.65
ICD FLOW = 18 L/s HEAD = 1.65
ICD FLOW = 13 L/s HEAD = 1.65
ICD FLOW = 27 L/s HEAD = 1.65
ICD FLOW = 21 L/s HEAD = 1.65
ICD FLOW = 18 L/s HEAD = 1.65
ICD FLOW = 15 L/s HEAD = 1.65
ICD FLOW = 16 L/s HEAD = 1.65
ICD FLOW = 29 L/s HEAD = 1.4
ICD FLOW = 35 L/s HEAD = 1.65
USF=92.294 TOF=94.631
USF=92.244 TOF=94.581
USF=92.394 TOF=94.731
59.48m @ 0.50%
KEY PLAN (NTS)
SUBJECT AREA

LEGEND:

- 100 YEAR PONDING VOLUME LIMIT
- 5 YEAR PONDING ELEVATION
- SPILL OVER ELEVATION
- EMERGENCY OVERLAND FLOW ROUTE

P11C — POND AREA #
98.40 — POND ELEVATION (m)
0.25 — POND DEPTH (m)
26.45 — POND VOLUME (m^3)

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3	REVISED AS PER COMMENTS	TRB	2020:08:18
2	ISSUED FOR SPA	TRB	2020:02:13
1	ISSUED TO CITY FOR REVIEW	TRB	2020:02:01

Cowan's Grove

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4791 BANK STREET

LICENSED PROFESSIONAL ENGINEER
T. R. BRULE
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Drawing Title
PONDING PLAN

Scale
1 : 250
####

Design	Date
JB	JANUARY 2020
Drawn	Checked
EH	TRB
Project No.	Drawing No.
121753	C-600

CITY PLAN No. ####

CITY FILE No. ####

IBI GROUP
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STORM SEWER DESIGN SHEET

Cowan's Grove Mid Density
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= 0.50	C= 0.60	C= 0.70	C= 0.75	C= 0.80	C= 0.85	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 Mid Density	P1, P3	MH02	MH04										0.15	0.38	0.38	10.00	0.81	10.81	76.81	104.19	122.14	178.56	28.82	39.10	45.84	67.01		28.82	43.87	42.00	250			0.50	0.866	15.04	34.29%
Cowan's Mid Density	P2	MH12	MH04							0.26				0.54	0.54	10.00	0.48	10.48	76.81	104.19	122.14	178.56	41.64	56.48	66.21	96.80		41.64	43.87	25.13	250			0.50	0.866	2.23	5.09%
Cowan's Mid Density	P5, P4	MH07	MH04						0.11				0.09	0.44	0.44	10.00	0.68	10.68	76.81	104.19	122.14	178.56	33.74	45.77	53.65	78.43		33.74	43.87	35.52	250			0.50	0.866	10.13	23.10%
Cowan's Mid Density	P6	MH04	MH9										0.13	0.33	1.68	10.81	1.20	12.00	73.83	100.11	117.33	171.49	124.18	168.37	197.34	288.43		124.18	133.02	58.12	450			0.20	0.810	8.84	6.64%
Cowan's Mid Density	P7, P8, P9, P10	MH01	MH9						0.12			0.16	0.05	0.74	0.74	10.00	1.25	11.25	76.81	104.19	122.14	178.56	56.58	76.76	89.98	131.54		56.58	59.68	61.32	300			0.35	0.818	3.10	5.19%
Cowan's Mid Density	P12	MH9	MH10									0.10		0.24	2.65	12.00	0.75	12.75	69.88	94.68	110.94	162.10	185.53	251.36	294.53	430.37		185.53	248.09	38.13	600			0.15	0.850	62.56	25.22%
Cowan's Mid Density		MH10	MH11											0.00	2.65	12.75	0.11	12.86	67.64	91.60	107.32	156.79	179.57	243.20	284.92	416.26		179.57	248.09	5.63	600			0.15	0.850	68.51	27.62%
Cowan's Mid Density	R1	MH11	MH13123					0.09						0.15	2.81	12.86	0.13	12.99	67.32	91.17	106.80	156.04	188.84	255.73	299.59	437.68		188.84	339.63	6.96	675			0.15	0.919	150.80	44.40%
																															675						

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: 121753-C-500

No.	Revision	Date
1.	1st City Submission	2020-01-30
2.	2nd City Submission	2020-08-18

File Reference: 121753.7.3
Date: 2020-01-30
Sheet No: 1 of 1

Velocity x Depth Calculation - Cowan's Grove Design Brief

Excerpt from Cowan's Grove Design Brief (VxD Calculation)

Iteration equation:

Velocity:

$$v_x = v_{min} + \frac{Q_x - Q_{min}}{Q_{max} - Q_{min}}(v_{max} - v_{min})$$

Depth:

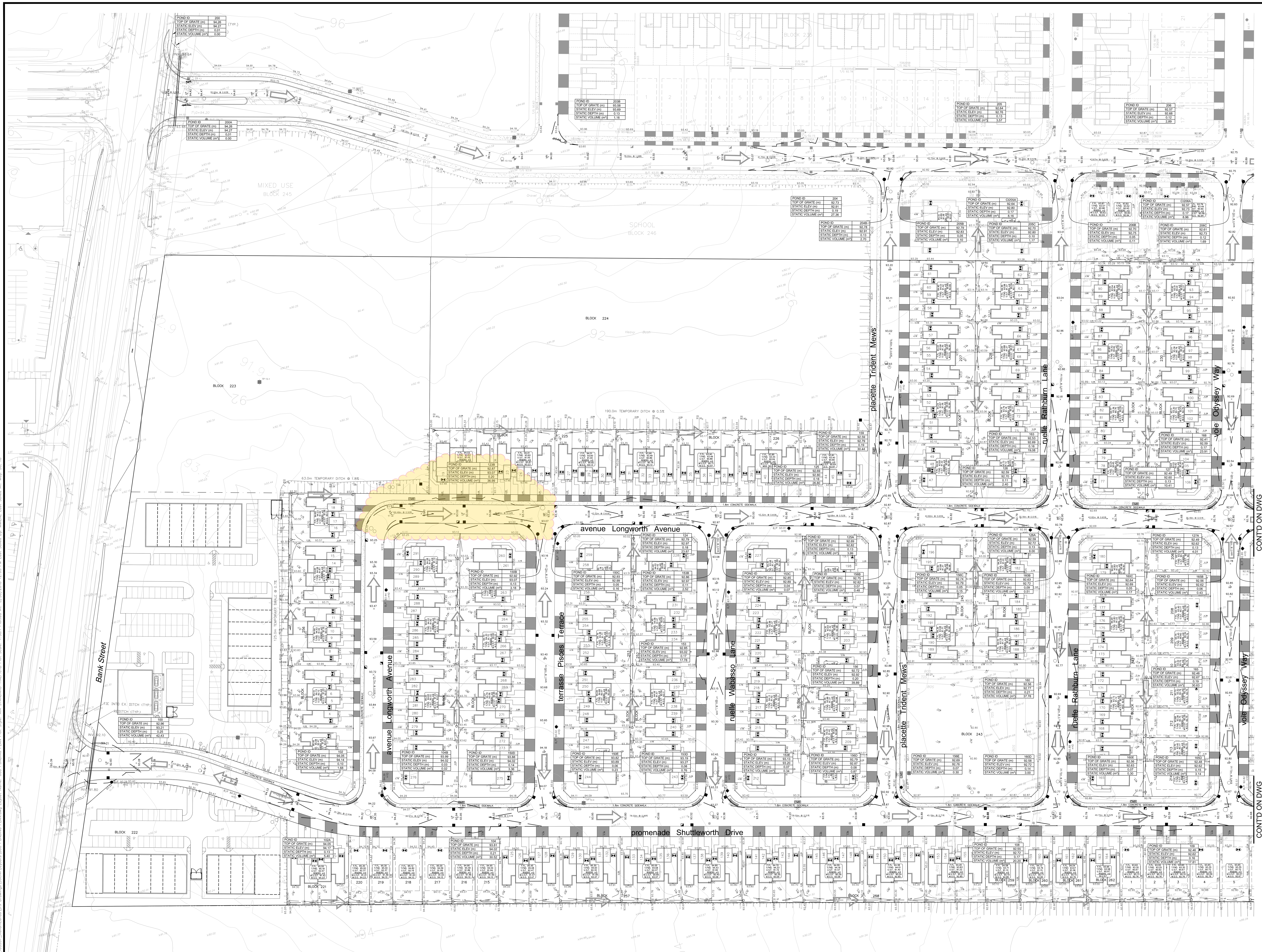
$$d_x = d_{min} + \frac{Q_x - Q_{min}}{Q_{max} - Q_{min}}(d_{max} - d_{min})$$

Major system cascading flow of 8L/s would increase Overflow Flowrate to 0.152cms

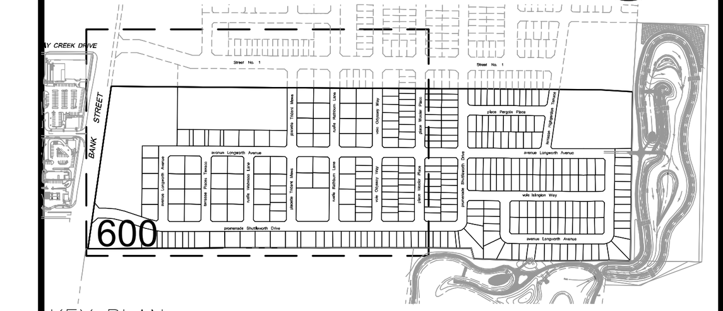
Depth would increase by approximately less than 1cm

100 Year 3 Hour Chicago Storm

Area ID (Dummy Segment, if applicable)	Road ROW Section	Longitudinal Slope (%)	Overflow Flowrate		SWMHYMO (34731vxd.out)					Calculation Sheet: Overflow for Typical Road Ponding Area					SWMHYMO (34731vxd.out)			Velocity x Depth	Maximum Static Ponding Depth	Total Dynamic Depth
					Flowrate (cms)		Velocity (m/s)			Flowrate (cms)		Depth (m)			Depth (m)					
			Qx (l/s)	Qx (cms)	Qmin	Qmax	vmin	vmax	vx	Qmin	Qmax	dmin	dmax	dx	dmin	dmax	dx	(m^2/s)	(m)	(m)
S13120	18	0.83	**79**	0.079	0.054	0.098	0.612	0.708	**0.667**	0.0753	0.08846	0.08	0.085	N/A	0.052	0.064	**0.059**	**0.039**	0.00	0.059
S13123A	18	0.50	**141**	0.141	0.124	0.187	0.621	0.688	**0.639**	0.1321	0.15047	0.1	0.105	N/A	0.077	0.09	**0.081**	**0.051**	0.00	0.081
S13123B	18	0.69	**144**	0.144	0.09	0.146	0.646	0.729	**0.726**	0.1321	0.15047	0.1	0.105	0.103	N/A	N/A	N/A	**0.075**	0.20	0.303
S13150B	18	0.54	**60**	0.06	0.044	0.079	0.493	0.571	**0.529**	0.051	0.06134	0.07	0.075	N/A	0.052	0.064	**0.057**	**0.030**	0.00	0.057
S13150A	18	0.69	**188**	0.188	0.146	0.22	0.729	0.808	**0.774**	0.1703	0.19178	0.11	0.115	**0.114**	N/A	N/A	N/A	**0.088**	0.13	0.244
S13124	18	0.65	**216**	0.216	0.213	0.305	0.785	0.858	**0.787**	0.2148	0.23954	0.12	0.125	**0.120**	N/A	N/A	N/A	**0.095**	0.19	0.310
S13153B	18	0.69	**46**	0.046	0.023	0.049	0.46	0.558	**0.547**	0.0419	0.05104	0.065	0.07	**0.067**	N/A	N/A	N/A	**0.037**	0.17	0.237
S13153A	18	0.65	**252**	0.252	0.213	0.305	0.785	0.858	**0.816**	0.2395	0.26914	0.125	0.13	**0.127**	N/A	N/A	N/A	**0.104**	0.12	0.247
S13125	18	0.65	**267**	0.267	0.213	0.305	0.785	0.858	**0.828**	0.2395	0.26914	0.125	0.13	**0.130**	N/A	N/A	N/A	**0.107**	0.13	0.260
S13159	18	0.65	**279**	0.279	0.213	0.305	0.785	0.858	**0.837**	0.2691	0.30361	0.13	0.135	**0.131**	N/A	N/A	N/A	**0.110**	0.15	0.281
S13156A	18	0.65	**10**	0.01	0.008	0.022	0.341	0.447	**0.356**	0.008	0.01148	0.035	0.04	**0.038**	N/A	N/A	N/A	**0.013**	0.07	0.108
S13126	18	0.65	**289**	0.289	0.213	0.305	0.785	0.858	**0.845**	0.2691	0.30361	0.13	0.135	**0.133**	N/A	N/A	N/A	**0.112**	0.13	0.263
S13163A	18	0.50	**68**	0.068	0.042	0.076	0.475	0.55	**0.532**	0.0613	0.07286	0.075	0.08	N/A	0.052	0.064	**0.061**	**0.033**	0.00	0.061
S13163B	18	0.65	**296**	0.296	0.213	0.305	0.785	0.858	**0.851**	0.2691	0.30361	0.13	0.135	**0.134**	N/A	N/A	N/A	**0.114**	0.15	0.284
S13160A	18	0.65	**12**	0.012	0.008	0.022	0.341	0.447	**0.371**	0.0115	0.01571	0.04	0.045	**0.041**	N/A	N/A	N/A	**0.015**	0.06	0.101
S13127	18	0.65	**312**	0.312	0.305	0.417	0.858	0.928	**0.862**	0.3036	0.33969	0.135	0.14	**0.136**	N/A	N/A	N/A	**0.117**	0.13	0.266
S13168A	18	0.50	**56**	0.056	0.042	0.076	0.475	0.55	**0.506**	0.051	0.06134	0.07	0.075	N/A	0.052	0.064	**0.057**	**0.029**	0.00	0.057
S13168B	18	0.65	**314**	0.314	0.305	0.417	0.858	0.928	**0.864**	0.3036	0.33969	0.135	0.14	**0.136**	N/A	N/A	N/A	**0.118**	0.16	0.296
S13165A	18	0.65	**11**	0.011	0.008	0.022	0.341	0.447	**0.364**	0.008	0.01148	0.035	0.04	**0.039**	N/A	N/A	N/A	**0.014**	0.06	0.099
S13128	18	0.69	**313**	0.313	0.22	0.314	0.808	0.884	**0.883**	0.3036	0.33969	0.135	0.14	**0.136**	N/A	N/A	N/A	**0.120**	0.13	0.266
S13172	18	0.51	**41**	0.041	0.02	0.043	0.396	0.479	**0.472**	0.034	0.042	0.06	0.065	N/A	0.039	0.052	**0.051**	**0.024**	0.00	0.051
S13173	18	0.69	**282**	0.282	0.22	0.314	0.808	0.884	**0.858**	0.2691	0.30361	0.13	0.135	**0.132**	N/A	N/A	N/A	**0.113**	0.18	0.312
S13170A	18	0.69	**11**	0.011	0.008	0.023	0.351	0.46	**0.373**	0.008	0.01148	0.035	0.04	**0.039**	N/A	N/A	N/A	**0.015**	0.06	0.099
S13129	18	0.57	**284**	0.284	0.2	0.285	0.735	0.803	**0.802**	0.2691	0.30361	0.13	0.135	**0.132**	N/A	N/A	N/A	**0.106**	0.18	0.312
S13176B	18	0.57	**271**	0.271	0.2	0.285	0.735	0.803	**0.792**	0.2691	0.30361	0.13	0.135	**0.130**	N/A	N/A	N/A	**0.103**	0.14	0.270
S13130	18	0.57	**12**	0.012	0.007	0.021	0.319	0.418	**0.354**	0.0115	0.01571	0.04	0.045	**0.041**	N/A	N/A	N/A	**0.014**	0.12	0.161
S13135	18	1.25	**234**	0.234	0.196	0.296	0.982	1.088	**1.022**	0.2287	0.255	0.12	0.125	**0.121**	N/A	N/A	N/A	**0.124**	0.10	0.221
S13136A	18	1.04	**199**	0.199	0.179	0.27	0.895	0.992	**0.916**	0.1981	0.22187	0.115	0.12	**0.115**	N/A	N/A	N/A	**0.106**	0.20	0.315
S13136B	18	0.58	**134**	0.134	0.134	0.202	0.669	0.741	**0.669**	0.1321	0.15047	0.1	0.105	**0.101**	N/A	N/A	N/A	**0.067**	0.12	0.221
S13137	18	0.57	**278**	0.278	0.2	0.285	0.735	0.803	**0.797**	0.2691	0.30361	0.13	0.135	**0.131**	N/A	N/A	N/A	**0.105**	0.16	0.291
S13138	18	0.50	**426**	0.426	0.33	0.544	1.646	1.926	**1.772**	0.4165	0.45754	0.15	0.155	**0.151**	N/A	N/A	N/A	**0.268**	0.14	0.291
S13113	18	0.50	**47**	0.047	0.042	0.076	0.475	0.55	**0.486**	0.0419	0.05104	0.065	0.07	**0.068**	N/A	N/A	N/A	**0.033**	0.13	0.198
S13114	18	0.50	**50**	0.05	0.042	0.076	0.475	0.55	**0.493**	0.0419	0.05104	0.065	0.07	**0.069**	N/A	N/A	N/A	**0.034**	0.21	0.279
S13115B	18	0.57	**33**	0.033	0.021	0.045	0.418	0.507	**0.463**	0.0268	0.03383	0.055	0.06	**0.059**	N/A	N/A	N/A	**0.027**	0.11	0.169
S13115A	18	0.82	**40**	0.04	0.025	0.054	0.502	0.608	**0.557**	0.0349	0.04326	0.06	0.065	**0.063**	N/A	N/A	N/A	**0.035**	0.11	0.173
S13142	18	0.58	**93**	0.093	0.082	0.134	0.592	0.669	**0.608**	0.0856	0.09975	0.085	0.09	**0.088**	N/A	N/A	N/A	**0.053**	0.11	0.198
S13143B	18	0.70	**90**	0.09	0.09	0.147	0.651	0.735	**0.651**	0.0856	0.09975	0.085	0.09	**0.087**	N/A	N/A	N/A	**0.056**	0.18	0.267
S13143A	18	0.51	**223**	0.223	0.189	0.27	0.695	0.76	**0.722**	0.2148	0.23954	0.12	0.125	**0.122**	N/A	N/A	N/A	**0.088**	0.14	0.262
S13117	18	0.52	**36**	0.036	0.02	0.043	0.4	0.484	**0.458**	0.0338	0.04188	0.06	0.065	**0.061**	N/A	N/A	N/A	**0.028**	0.16	0.221
S13146	18	0.55	**62**	0.062	0.044	0.08	0.498	0.577	**0.538**	0.0613	0.07286	0.075	0.08	**0.075**	N/A	N/A	N/A	**0.040**	0.14	0.215
S13145	18	0.55	**162**	0.162	0.13	0.196	0.651	0.722	**0.685**	0.1505	0.17034	0.105	0.11	**0.108**	N/A	N/A	N/A	**0.074**	0.11	0.218
S13141	18	0.57	**254**	0.254	0.2	0.285	0.735	0.803	**0.778**	0.2395	0.26914	0.125	0.13	**0.127**	N/A	N/A	N/A	**0.099**	0.10	0.227
R13120A	3.6	1.50	**20**	0.02	0.017	0.036	0.619	0.75	**0.640**	0.0167	0.02215	0.045	0.05	**0.048**	0.095	0.126	N/A	**0.031**	0.07	0.118
R13123B	3.6	1.50	**46**	0.046	0.036	0.065	0.75	0.87	**0.791**	0.0446	0.05433	0.065	0.07	**0.066**	0.126	0.158	N/A	**0.052**	0.24	0.306
R13159	3.6	1.50	**37**	0.037	0.036	0.065	0.75	0.87	**0.754**	0.036	0.04459	0.06	0.065	**0.061**	0.126	0.158	N/A	**0.046**	0.20	0.261
R13124B	3.6	1.50	**43**	0.043	0.036	0.065	0.75	0.87	**0.779**	0.036	0.04459	0.06	0.065	**0.064**	0.126	0.158	N/A	**0.050**	0.17	0.234
R13125	3.6	1.50	**43**	0.043	0.036	0.065	0.75	0.87	**0.779**	0.036	0.04459	0.06	0.065	**0.064**	0.126	0.158	N/A	**0.050**	0.16	0.224
R13126B	3.6	1.50	**24**	0.024	0.017	0.036	0.619	0.75	**0.667**	0.0222	0.02856	0.05	0.055	**0.051**	0.095	0.126	N/A	**0.034**	0.08	0.131
R13126A	3.6	1.50	**38**	0.038	0.036	0.065	0.75	0.87	**0.758**	0.036	0.04459	0.06	0.065	**0.061**	0.126	0.158	N/A	**0.046**	0.16	0.221
R13127B	3.6	1.50	**22**	0.022	0.017	0.036	0.619	0.75	**0.653**	0.0167	0.02215	0.045	0.05	**0.050**	0.095	0.126	N/A	**0.033**	0.21	0.260
R13127A	3.6	1.50	**53**	0.053	0.036	0.065	0.75	0.87	**0.820**	0.0446	0.05433	0.065	0.07	**0.069**	0.126	0.158	N/A	**0.057**	0.16	0.229
R13128B	3.6	1.50	**19**	0.019	0.017	0.036	0.619	0.75	**0.633**	0.0167	0.02215	0.045	0.05	**0.047**	0.095	0.126	N/A	**0.030**	0.18	0.227
R13128A	3.6	1.50	**47**	0.047	0.036	0.065	0.75	0.87	**0.796**	0.0446	0.05433	0.065	0.07	**0.066**	0.126	0.158	N/A	**0.053**	0.18	0.246
R13129B	3.6	1.50	**31**	0.031	0.017	0.036	0.619	0.75	**0.716**	0.0286	0.03602	0.055	0.06	**0.057**	0.095	0.126	N/A	**0.041**	0.14	0.197
R13129A	3.6	1.50	**62**	0.062	0.036	0.065	0.75	0.87	**0.858**	0.0543	0.06531	0.07	0.075	**0.073**	0.126	0.158	N/A	**0.063**	0.15	0.223
R13114	3.6	1.50	**25**	0.025	0.017	0.036	0.619	0.75	**0.674**	0.0222	0.02856	0.05	0.055	N/A	0.095	0.126	**0.108**	**0.073**	0.00	0.108
R13141	3.6	1.50	**98**	0.098	0.065	0.106	0.87	0.983	**0.961**	0.0928	0.11104	0.085	0.09	**0.086**	0.158	0.189	N/A	**0.083**	0.29	0.376
R13145	3.6	1.50	**72**	0.072	0.065	0.106	0.87	0.983	**0.889**	0.0653	0.07757	0.075	0.08	**0.078**	0.158	0.189	N/A	**0.069**	0.30	0.378
S142	18	0.58	**219**	0.219	0.205	0.293	0.754	0.824	**0.765**	0.2148	0.23954	0.12	0.125	**0.121**	0.09	0.103	N/A	**0.092**	0.17	0.291
S13156A+S13159	18	0.65	**289**	0.289	0.213	0.305	0.785	0.858	**0.845**	0.269	0.304	0.130	0.135	**0.133**	N/A	N/A	N/A	**0.112**	0.15	0.283
S13160A+S13163B	18	0.65	**308**	0.308	0.305	0.417	0.858	0.928	**0.860**	0.304	0.340	0.135	0.140	**0.136**	N/A	N/A	N/A	**0.117**	0.15	0.286
S13165A+S13168B	18	0.65	**325**	0.325	0.305	0.417	0.858	0.928	**0.871**	0.304	0.340	0.135	0.140	**0.138**	N/A	N/A	N/A	**0.120**	0.16	0.298
S13170A+S13173	18	0.69	**293**	0.293	0.220	0.314	0.808	0.884	**0.867**	0.304	0.340	0.135	0.140	**0.133**	N/A	N/A	N/A	**0.116**	0.18	0.313
S13130+S13176B	18	0.57	**283**	0.283	0.200	0.285	0.735	0.803	**0.801**	0.304	0.340	0.135	0.140	**0.132**	N/A	N/A	N/A	**0.106**	0.14	0.272
S13114+S13115A	18	0.57	**90**	0.09	0.082	0.133	0.587	0.663	**0.599**	0.085	0.100	0.085	0.090	**0.087**	N/A	N/A	N/A	**0.052**	0.21	0.297
S142+S13136B	18	0.58	**353**	0.353	0.293	0.401	0.824	0.891	**0.861**	0.340	0.377	0.140	0.145	**0.142**	N/A	N/A	N/A	**0.122**	0.17	0.312



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



KEY PLAN
NTS

No.	REVISIONS	By	Date
14			
13			
12			
11			
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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

Drawing Title

PONDING PLAN

Scale

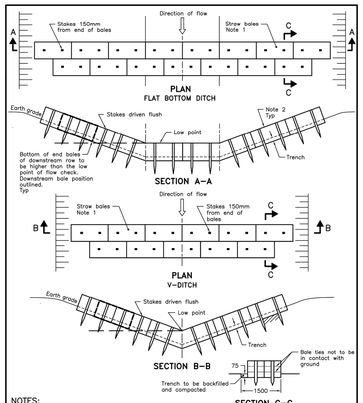
1 : 750

Design K.H. / S.T. / M.M.	Date NOVEMBER 2017
Drawn D.D. / M.M.	Checked J.I.M.
Project No. 103557	Drawing No. 600

D07-16-13-0035

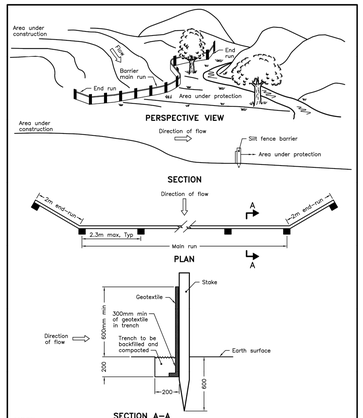
#17553

APPENDIX D



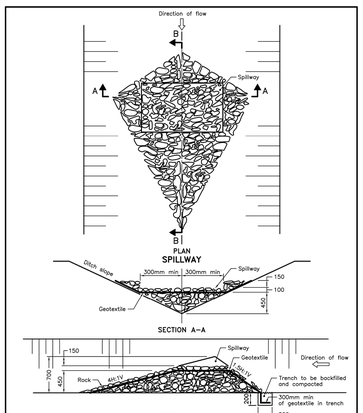
NOTES:
1 Number of bales varies to suit ditch.
2 Straw bales to be butted tightly against adjoining bales and shaped to conform to the sides of the ditch to prevent water flow through barrier.
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2006	Rev. 1
STRAW BALE FLOW CHECK DAM		OPSD 219.180



NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2006	Rev. 1
LIGHT–DUTY SILT FENCE BARRIER		OPSD 219.110



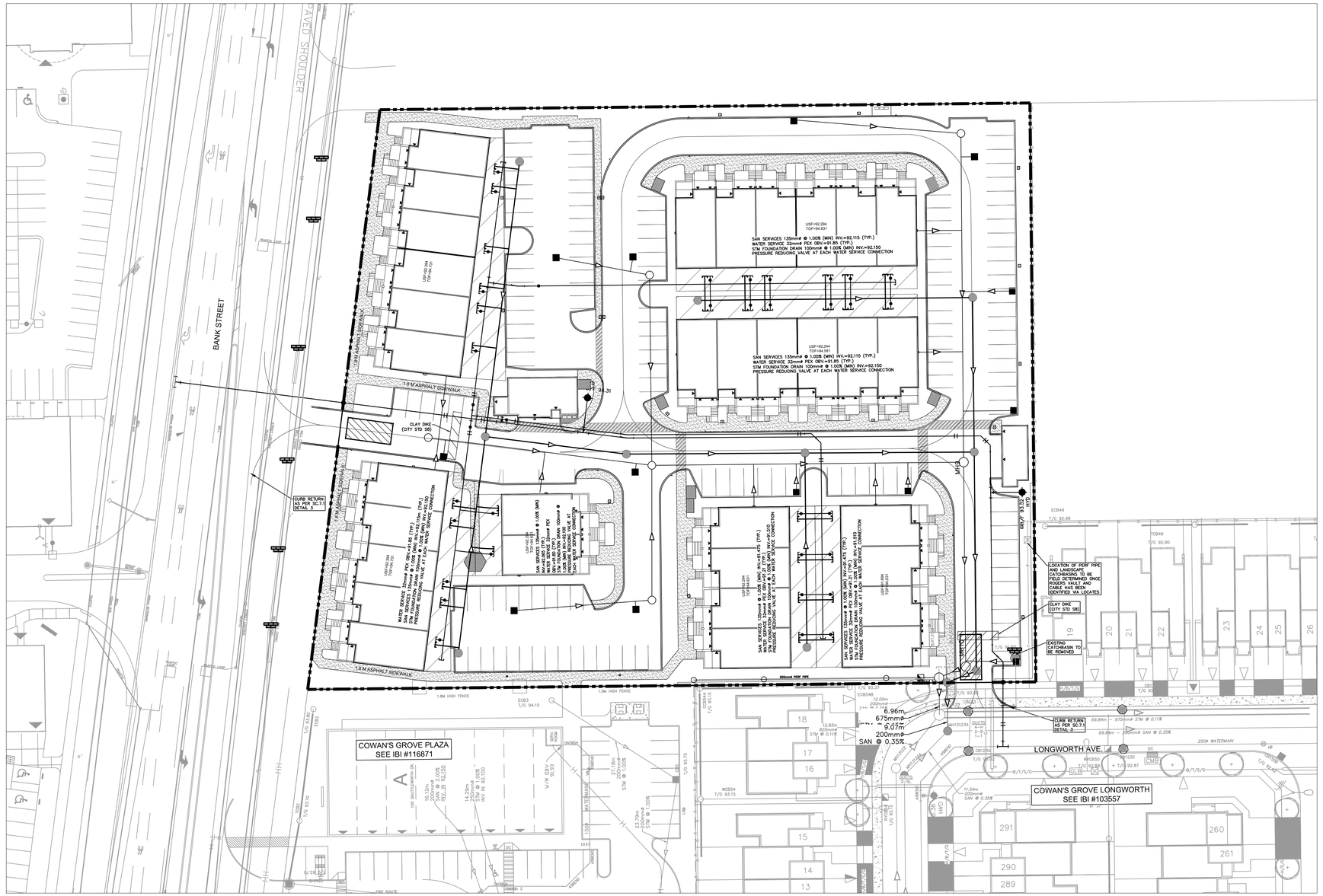
NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2006	Rev. 1
ROCK FLOW CHECK DAM V–DITCH		OPSD 219.210

NOTES:

THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY,

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

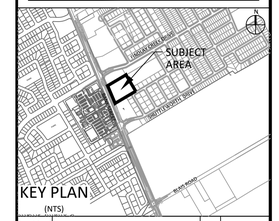


NOTES:
1. SEE DRAWING C-010 FOR ADDITIONAL DETAILS AND NOTES.
2. SITE BENCHMARK TO BE OBTAINED FROM LEGAL SURVEYOR ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

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 (7.0 x 15.0)

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



No.	REVISIONS	By	Date
14			
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3	REVISED AS PER COMMENTS	TRB	2020:08:18
2	ISSUED FOR SPA	TRB	2020:02:13
1	ISSUED TO CITY FOR REVIEW	TRB	2020:02:01

Cowan's Grove

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400 – 333 Preston Street
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ibigroup.com

Project Title
COWAN'S GROVE MID-DENSITY
4791 BANK STREET

LICENSED PROFESSIONAL ENGINEER
T. R. BRULE
2020/08/18
PROVINCE OF ONTARIO

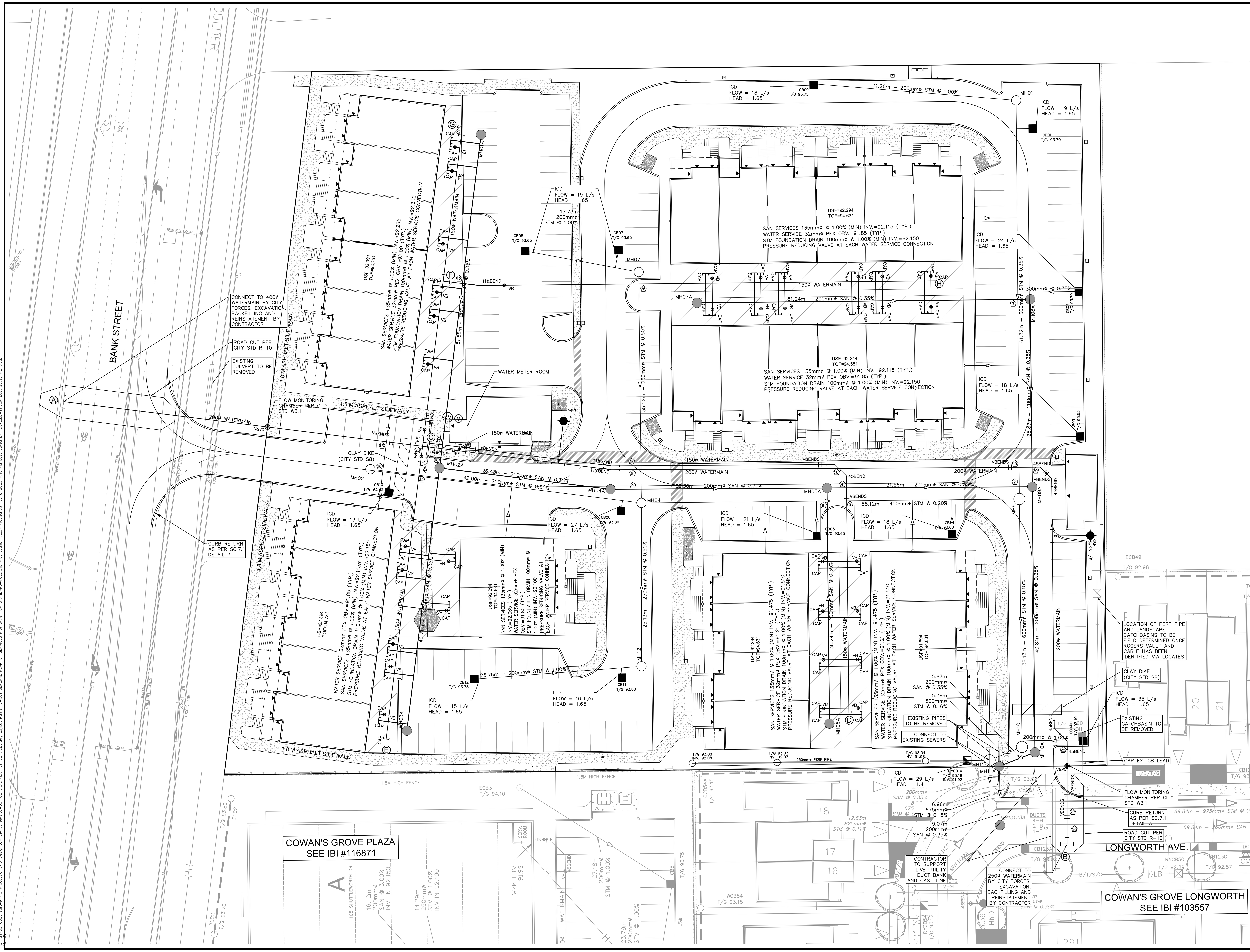
Drawing Title
EROSION AND SEDIMENTATION PLAN

Scale
1 : 400

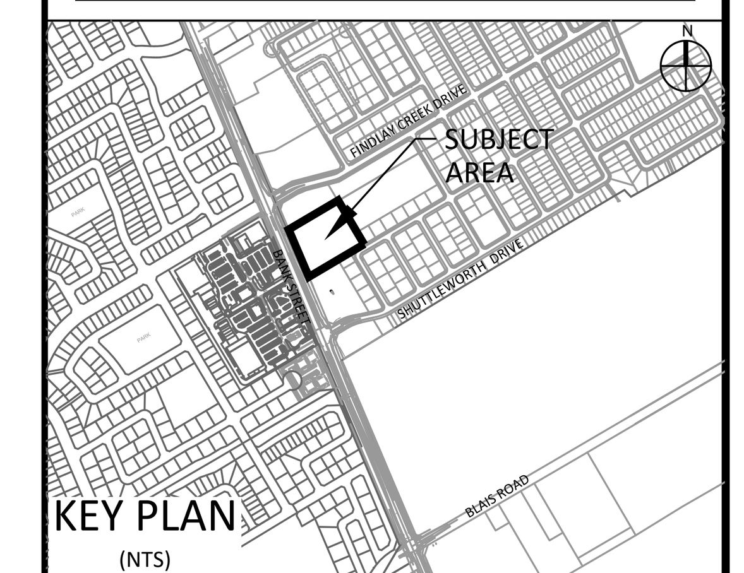
Design	Date
JB	JANUARY 2020
Drawn	Checked
EH	TRB
Project No.	Drawing No.
121753	C-900

CITY PLAN No.#### CITY FILE No. ####

APPENDIX E



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



KEY PLAN (NTS)

No.	REVISIONS	By	Date
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3	REVISED AS PER COMMENTS	TRB	2020:08:18
2	ISSUED FOR SPA	TRB	2020:02:13
1	ISSUED TO CITY FOR REVIEW	TRB	2020:02:01

Cowan's Grove

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 MID-DENSITY

4791 BANK STREET

LICENSED PROFESSIONAL ENGINEER T. R. BRULE 2020/08/18 PROVINCE OF ONTARIO

Drawing Title

GENERAL PLAN OF SERVICES

Scale	1 : 250
Design: JB	Date: JANUARY 2020
Drawn: EH	Checked: TRB
Project No.: 121753	Drawing No.: C-001

CITY PLAN No. ####

CITY FILE No. ####

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 IBI GROUP ARCHITECTS INC.

1.9 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 SEDIMENT CAPTURE FILTER SOCKS WITHIN MANHOLES AND CATCHBASINS 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 BANK STREET.

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.

1.24 BACKWATER VALES, PER CITY STANDARDS S14, S14.1 AND S14.2 RE TO BE INSTALLED FOR ALL STORM AND SANITARY SERVICE CONNECTIONS.

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. UNLESS NOTED OTHERWISE

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 3m 150mm DIAMETER SOCK-WRAPPED PERFORATED PVC SUBDRAINS TO BE INSTALLED ALL CB'S. TO EXTEND PARALLEL TO CURB IN CBS ADJACENT TO CURB AND IN 4 DIRECTIONS FOR CBS IN CENTER OF PARKING LOT. SUBDRAINS TO DISCHARGE TO CB'S.

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 ALL WATERMAIN CROSSINGS TO BE COMPLETED AS PER CITY OF OTTAWA STANDARDS W25 AND W25.2

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

5.8 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.

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

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

5.11 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.

5.12 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.

SAN STRUCTURE TABLE

NAME	RIM ELEV.	INVERT IN	INVERT IN AS-BUILT	INVERT OUT	INVERT OUT AS-BUILT	DESCRIPTION
EXMH13123	91.51	NW90.700				1200mmø OPSD-701.010
MH01A	94.01			SE91.796		1200mmø OPSD-701.010
MH02A	94.03	NW91.615 SE91.915		NE91.315		1200mmø OPSD-701.010
MH03A	94.00			NW92.057		1200mmø OPSD-701.010
MH04A	93.85	SW91.222		NE91.202		1200mmø OPSD-701.010
MH05A	93.96	SW91.086 SE91.126		NE91.066		1200mmø OPSD-701.010
MH06A	93.37			NW91.253		1200mmø OPSD-701.010
MH07A	94.21			NE91.255		1200mmø OPSD-701.010
MH08A	93.81	SW91.076		SE91.016		1200mmø OPSD-701.010
MH09A	93.74	SW90.955 NW90.915		SE90.895		1200mmø OPSD-701.010
MH10A	93.22	NW90.752		SW90.752		1200mmø OPSD-701.010
MH11A	93.31	NE90.732		SE90.732		1200mmø OPSD-701.010

STM STRUCTURE TABLE

NAME	RIM ELEV.	INVERT IN	INVERT IN AS-BUILT	INVERT OUT	INVERT OUT AS-BUILT	DESCRIPTION
EXMH13123	94.14	NW89.694				1200mmø OPSD-701.010
MH01	93.85	SW91.787		SE90.390		1200mmø OPSD-701.010
MH02	93.89			NE91.110		1200mmø OPSD-701.010
MH04	93.85	SW90.900 SE91.041 NW90.700		NE90.141		1200mmø OPSD-701.010
MH07	93.79	W91.823		SE90.878		1200mmø OPSD-701.010
MH9	93.71	NW90.175 SW90.025		SE89.875		1500mmø OPSD-701.011
MH10	93.25	NW89.818		SW89.788		1500mmø OPSD-701.011
MH11	93.24	NE89.779 SW91.890		SE89.704		1500mmø OPSD-701.011
MH12	93.86	SW91.842		NW91.167		1200mmø OPSD-701.010

CROSSING SCHEDULE

2	200ø SAN 0.50m CLEARANCE OVER 300ø STM.
3	200ø SAN 0.45m CLEARANCE OVER 300ø STM.
4	150ø W/M 0.30m CLEARANCE OVER 200ø SAN.
5	150ø W/M 0.50m CLEARANCE OVER 450ø STM.
6	450ø STM 0.50m CLEARANCE UNDER 200ø SAN.
8	200ø W/M 0.45m CLEARANCE OVER 250ø STM.
9	200ø SAN 0.50m CLEARANCE OVER 250ø STM.
11	150ø W/M 0.50m CLEARANCE UNDER 200ø WM.
12	150ø W/M 0.30m CLEARANCE OVER 200ø SAN.
13	150ø W/M 0.50m CLEARANCE UNDER 200ø WM.
15	200ø SAN 0.50m CLEARANCE OVER 250ø STM.
16	150ø W/M 0.50m CLEARANCE OVER 250ø STM.
17	150ø W/M 1.00m CLEARANCE UNDER 200ø SAN.
18	200ø W/M 0.15m CLEARANCE UNDER 150ø W/M.
19	200ø W/M 0.80m CLEARANCE OVER 300ø STM.
20	200ø W/M 0.30m CLEARANCE OVER 200ø SAN.
22	200ø W/M 0.80m CLEARANCE UNDER 200ø STM.
23	200ø W/M 0.50m CLEARANCE UNDER 200ø SAN.
26	150ø W/M 0.50m CLEARANCE UNDER 250ø STM.
27	200ø W/M 0.50m CLEARANCE OVER 975ø STM.
28	200ø W/M 1.50m CLEARANCE OVER 200ø SAN.

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 BY GOLDER ASSOCIATES 12-1121-0286

WATERAIN SCHEDULE

	Station	Description	Finished Grade	Top of Waterain	As Built Waterain
A	0+000.00	TVS	93.457m	91.057m	
	0+031.60	V&VC	94.393m	91.993m	
	0+050.54	V BEND	93.941m	91.541m	
	0+051.04	V BEND	93.935m	91.535m	
	0+057.54	V BEND	94.186m	91.786m	
	0+058.04	V BEND	94.204m	91.804m	
	0+061.31	SERVICE TEE	94.172m	91.772m	
	0+076.65	HYDRANT	94.062m	91.662m	
	0+084.86	11.25° BEND	93.901m	91.501m	
	0+145.92	V BEND	93.730m	91.330m	
	0+146.42	V BEND	93.722m	91.415m	
	0+150.81	45° BEND	93.658m	91.415m	
	0+151.81	V BEND	93.641m	91.415m	
	0+152.31	V BEND	93.633m	91.233m	
	0+153.30	45° BEND	93.616m	91.216m	
	0+162.14	HYDRANT	93.554m	91.154m	
	0+191.77	45° BEND	93.294m	90.894m	
	0+194.55	45° BEND	93.242m	90.842m	
	0+198.35	V&VC	93.248m	90.848m	
	0+202.20	V BEND	93.820m	91.420m	
	0+202.70	V BEND	93.903m	91.503m	
	0+205.93	V BEND	93.130m	90.730m	
	0+206.43	V BEND	93.130m	90.730m	
B	0+210.35	TVS	93.000m	90.600m	
C	0+000.00	TEE	93.988m	91.588m	
	0+004.92	SERVICE TEE	94.304m	91.904m	
	0+006.42	SERVICE TEE	94.206m	91.806m	
	0+008.13	V BEND	94.247m	91.847m	
	0+008.63	V BEND	94.255m	91.855m	
	0+029.19	11.25° BEND	93.910m	91.510m	
	0+061.04	V BEND	93.891m	91.491m	
	0+061.54	V BEND	93.891m	91.566m	
	0+063.54	45° BEND	93.891m	91.566m	
	0+066.03	45° BEND	93.859m	91.566m	
	0+068.99	V BEND	93.785m	91.566m	
	0+069.49	V BEND	93.773m	91.373m	
	0+079.18	SERVICE CROSS	93.656m	91.256m	
	0+086.82	SERVICE CROSS	93.531m	91.131m	
	0+094.29	SERVICE CROSS	93.469m	91.069m	
	0+101.76	SERVICE CROSS	93.408m	91.008m	
D	0+102.50	SERVICE TEE	93.406m	91.006m	
C	0+000.00	TEE	93.988m	91.588m	
	0+002.17	VB	93.965m	91.565m	
	0+003.03	V BEND	93.955m	91.555m	
	0+003.53	V BEND	93.947m	91.547m	
	0+016.19	SERVICE TEE	94.307m	91.907m	
	0+017.76	SERVICE TEE	94.349m	91.949m	
	0+019.87	SERVICE TEE	94.361m	91.961m	
	0+025.38	SERVICE TEE	94.295m	91.895m	
	0+031.33	SERVICE TEE	94.212m	91.812m	
	0+032.81	SERVICE TEE	94.191m	91.791m	
	0+034.81	SERVICE TEE	94.165m	91.765m	
	0+042.28	SERVICE TEE	94.080m	91.680m	
E	0+045.98	CAP	94.231m	91.831m	
C	0+000.00	TEE	93.985m	91.585m	
	0+002.02	VB	94.020m	91.620m	
	0+012.03	SERVICE TEE	94.030m	91.630m	
	0+019.50	SERVICE TEE	94.259m	91.859m	
	0+023.19	SERVICE TEE	94.322m	91.922m	
F	0+025.00	TEE	94.232m	91.832m	
	0+030.69	SERVICE TEE	94.226m	91.826m	
	0+041.97	SERVICE TEE	94.220m	91.820m	
	0+045.66	SERVICE TEE	94.215m	91.815m	
G	0+047.65	CAP	94.213m	91.813m	
F	0+000.00	TEE	94.200m	91.800m	
	0+002.00	VB	94.000m	91.410m	
	0+005.54	11.25° BEND	93.900m	91.410m	
	0+009.42	VB	93.813m	91.413m	
	0+041.41	SERVICE CROSS	94.299m	91.899m	
	0+048.88	SERVICE CROSS	94.391m	91.991m	
	0+052.56	SERVICE CROSS	94.369m	91.969m	
	0+063.88	SERVICE CROSS	94.275m	91.875m	
	0+067.56	SERVICE CROSS	94.234m	91.834m	
	0+075.03	SERVICE CROSS	94.153m	91.753m	
H	0+075.97	CAP	94.143m	91.743m	

LEGEND:

EXISTING SANITARY MANHOLE	SANITARY MANHOLE	H/B/T/G	EXISTING UTILITIES
EXISTING STORM MANHOLE	STORM MANHOLE		EXISTING DUCT BANK
EXISTING STREET CATCHBASIN	CATCHBASIN c/w TOP OF GRATE		SLOPE C/W FLOW DIRECTION
EXISTING CURB INLET CATCHBASIN	REAR YARD CATCHBASIN c/w GUTTER GRADE		MAJOR OVERLAND FLOW ROUTE
EXISTING VALVE AND VALVE BOX	REAR YARD "END" CATCHBASIN C/W TOP OF GRATE 300ø)		PROPOSED SPOT GRADE
EXISTING VALVE AND CHAMBER	CATCHBASIN MANHOLE c/w TOP OF GRATE		PROPOSED SWALE GRADE
EXISTING HYDRANT	VALVE AND VALVE BOX		PROPOSED SWALE HIGH POINT
EXISTING BARRIER CURB	VALVE AND CHAMBER		LOT CORNER GRADE C/W EXISTING GROUND
EXISTING DEPRESSED BARRIER CURB	HYDRANT c/w BOTTOM OF FLANGE ELEVATION		TIE INTO EXISTING GRADE
EXISTING CONCRETE SIDEWALK	DEPRESSED BARRIER CURB AS PER SC1.1		EXISTING AOV SURVEY GRADE
250mmØ SUBDRAIN	BARRIER CURB AS PER SC1.1		EXISTING IBI SURVEY GRADE
SIAMESE CONNECTION (IF REQUIRED)	MOUNTABLE CURB AS PER SC1.3		FULL STATIC PONDING GRADE
METER	PROPOSED CONCRETE SIDEWALK		RETAINING WALL
REMOTE METER	SANITARY SEWER & FLOW DIRECTION		TOP OF RETAINING WALL
PRV PRESSURE REDUCING VALVE	STORM SEWER & FLOW DIRECTION		PROPOSED BOTTOM OF RETAINING WALL
WATERMAIN IDENTIFICATION	WATERMAIN		TERRACING 3:1 MAXIMUM UNLESS NOTED OTHERWISE
PIPE CROSSING IDENTIFICATION	WATERMAIN REDUCER		PRELIMINARY ROOF DRAIN LOCATION
INLET CONTROL DEVICE LOCATION	VERTICAL BEND LOCATION		TEST PITS (SEE GEOTECHNICAL REPORT)
PROTECTIVE BOLLARD	PROPERTY LINE		CLAY DYKES PER S8
HEAVY DUTY ASPHALT / FIRE ROUTE	PROPOSED MAIL BOX	USF=92.394	PROPOSED UNDERSIDE OF FOOTING ELEVATION
		TOF=94.731	PROPOSED TOP OF FOUNDATION ELEVATION

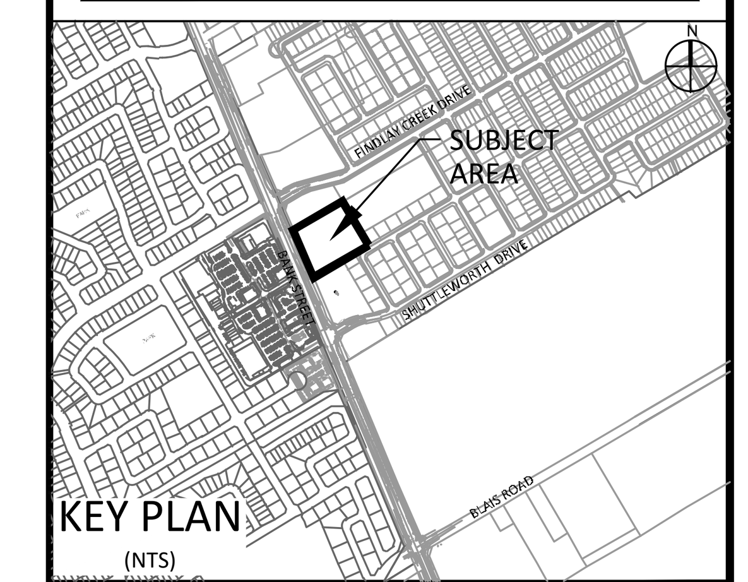
CATCH BASIN DATA TABLE

STRUCTURE ID	AREA ID	STRUCTURE	COVER	ELEVATION: TOP OF GRATE	ELEVATION: INVERT INLET	ELEVATION: INVERT OUTLET	OUTLET PIPE: DIAMETER (mm)	OUTLET PIPE: TYPE	HEAD	FLOW	ICD TYPE
CB10	P1	OPSD 705.010	S19	93.900	92.350		200	PVC DR-35	1.65	13.00	IPEX MHF
CB06	P3	OPSD 705.010	S19	93.800	92.250		200	PVC DR-35	1.65	27.00	IPEX MHF
CB12	P5	OPSD 705.010	S19	93.750	92.200		200	PVC DR-35	1.65	15.00	IPEX MHF
CB11	P4	OPSD 705.010	S19	93.800	92.250		200	PVC DR-35	1.65	16.00	IPEX MHF
CB08	P2	OPSD 705.010	S19	93.650	92.100		200	PVC DR-35	1.65	19.00	IPEX MHF
CB07	P2	OPSD 705.010	S19	93.650	92.100		200	PVC DR-35	1.65	19.00	IPEX MHF
CB05	P6	OPSD 705.010	S19	93.650	92.100		200	PVC DR-35	1.65	21.00	IPEX MHF
CB13	P6	OPSD 705.010	S19	93.600	92.050		200	PVC DR-35	1.65	18.00	IPEX MHF
CB09	P7	OPSD 705.010	S19	93.750	92.200		200	PVC DR-35	1.65	18.00	IPEX MHF
CB01	P8	OPSD 705.010	S19	93.700	92.150		200	PVC DR-35	1.65	9.00	IPEX MHF
CB02	P9	OPSD 705.010	S19	93.700	92.150		200	PVC DR-35	1.65	24.00	IPEX MHF
CB03	P10	OPSD 705.010	S19	93.550	92.000		200	PVC DR-35	1.65	18.00	IPEX MHF
CB04	P12	OPSD 705.010	S19	93.100	91.550		200	PVC DR-35	1.65	35.00	IPEX MHF
RYCB14	R1	OPSD 705.010	S19	93.180	91.880		200	PVC DR-35	1.400	29.00	IPEX MHF

Bold font indicates CB's with ICD's

Revision: 2020-08-18

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



KEY PLAN
(NTS)

No.	REVISIONS	By	Date
14			
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3	REVISED AS PER COMMENTS	TRB	2020:08:18
2	ISSUED FOR SPA	TRB	2020:02:13
1	ISSUED TO CITY FOR REVIEW	TRB	2020:02:01

Cowan's Grove

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 MID-DENSITY
4791 BANK STREET

LICENSED PROFESSIONAL ENGINEER
T. R. BRULE
2020/08/18
PROVINCE OF ONTARIO

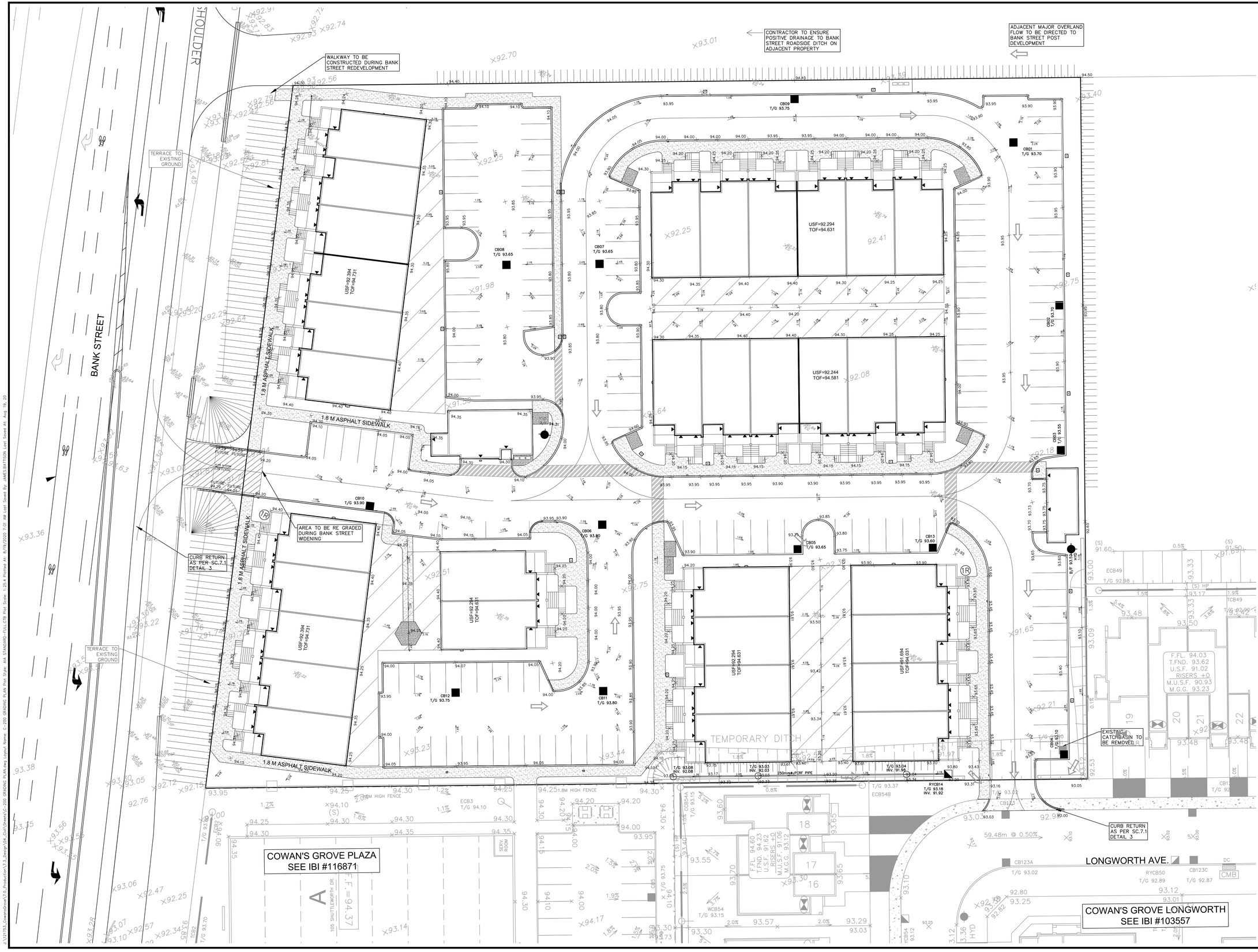
Drawing Title
DETAILS AND NOTES

Scale: N.T.S.

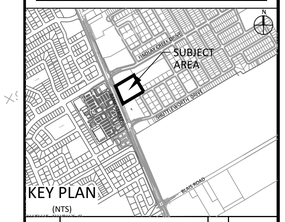
Design: JB | Date: JANUARY 2020
Drawn: EH | Checked: TRB

Project No.: 121753 | Drawing No.: C-010

CITY PLAN No. ####
CITY FILE No. ####



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



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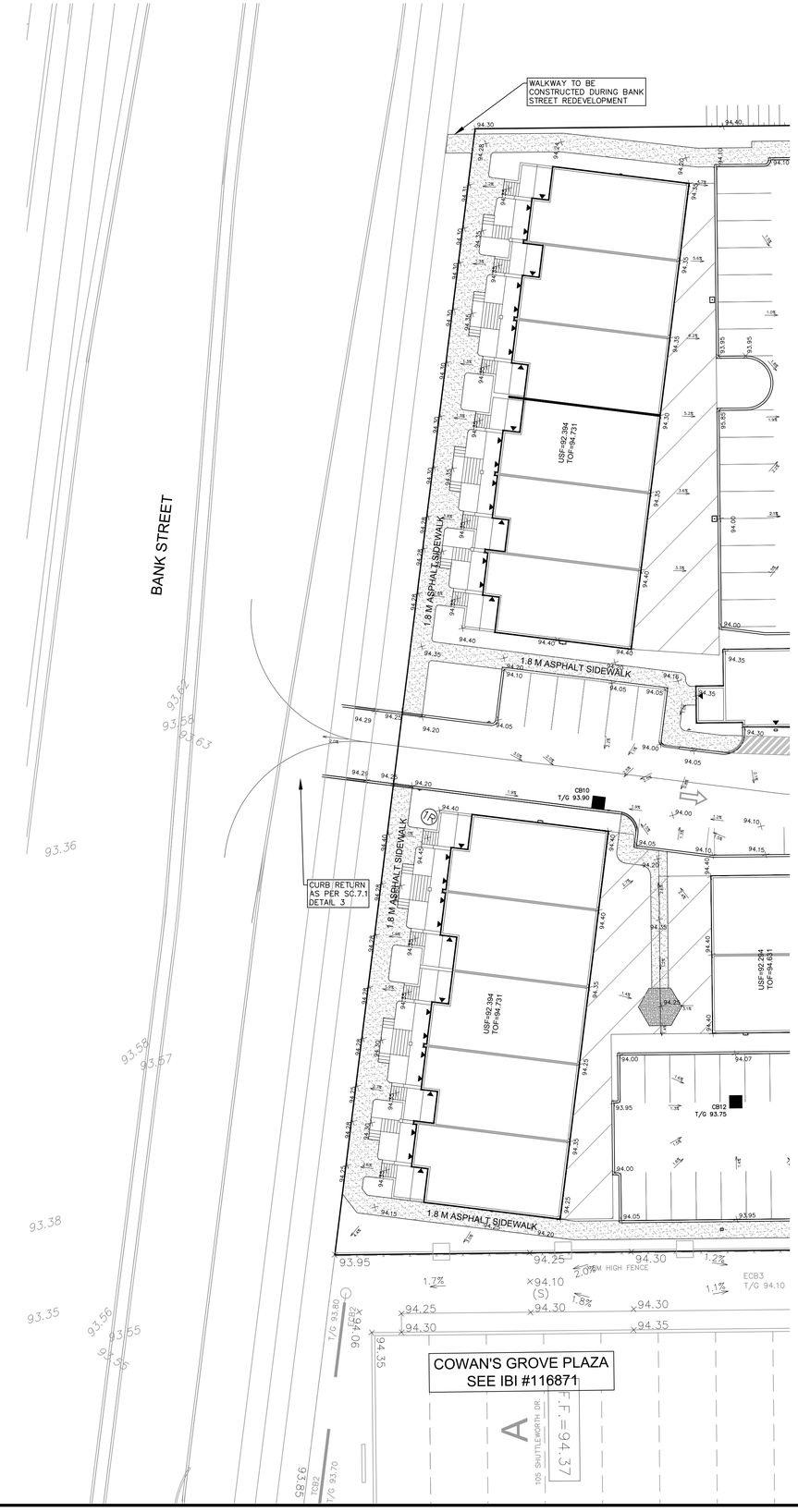
LICENSED PROFESSIONAL ENGINEER
T. R. BRULE
2020/08/18
PROVINCE OF ONTARIO

Drawing Title

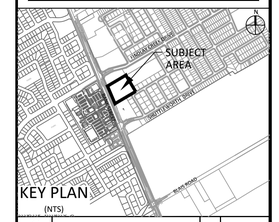
GRADING PLAN

Scale	1 : 250
Design: JB	Date: JANUARY 2020
Drawn: EH	Checked: TRB
Project No.: 121753	Drawing No.: C-200

CITY PLAN No.#### CITY FILE No. ####



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



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MID-DENSITY
4791 BANK STREET

LICENSED PROFESSIONAL ENGINEER
T. R. BRULE
2020/08/18
PROVINCE OF ONTARIO

Drawing Title
GRADING PLAN
ULTIMATE BANK ST

Scale
1 : 250

Design	Date
JB	JANUARY 2020
Drawn	Checked
EH	TRB
Project No.	Drawing No.
121753	C-201

CITY FILE No. ##### CITY PLAN No.#####