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Design Brief
Bank Street Development
4836 Bank Street

Prepared for Leitrim Home Hardware
by IBI Group
APRIL 2019
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1 INTRODUCTION

1.1 Scope

IBI Group has been retained by Leitrim Home Hardware to prepare the necessary engineering plans, specifications and documents to support a 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 property, and will include sections that will review water supply, wastewater disposal, minor and major stormwater management along with erosion and sediment control.

1.2 Subject Site

The Leitrim Home Hardware site is located at the southwest corner of the Bank Street and Dun Skipper Drive intersection. The proposed development is approximately 2.5 hectares in size and is also bounded by the Idone subdivision to the south and east. Please refer to **Figure 1.1** for more information regarding the site location.

The subject property is presently improved with a Home Hardware retail outlet and associated out buildings. The proposed re-development of the site will include a new Home Hardware building; three other buildings; two vehicular accesses; dedicated parking spaces and landscaping areas. A current concept of the envisioned development is shown on **Figure 1.2**.

1.3 Previous Studies

Design of this project has been undertaken in accordance with the following reports:

- **2016 Updated Serviceability Report (Class EA OPA 76 Areas 8a, 9a & 9b) Leitrim Development Area (IBI Group, September 2016)** – The report is an update to an earlier servicing report completed in 2007. The updated report was needed to review the impacts on existing major infrastructure by developing an additional 87 ha in the LDA. IN 2012, under OPA 76, the City of Ottawa increased its urban envelope by over 900 ha including expansion areas 8a, 9a, and 9b in the LDA. The subject site is included in the OPA 76 Expansion Area. The report included a high level review of the development requirements of the subject site. The design of the subject site is based on the report recommendations.
- **Design Brief Pathways at Findlay Creek 4800 Bank Street (Remer Lands) Phase 1 (IBI Group July 2017)** – The report provides detail design criteria for adjacent developments including the subject site and identifies capacity for a water supply and both storm and sanitary sewers for the subject site.

1.4 Pre-Consultation

A pre-consultation meeting with the Owner and City Staff was held on October 18, 2018. Attached in **Appendix A** is an October 24, 2018 e-mail which includes some meeting notes from that meeting. Some of the items discussed during the meeting dealt with the following subjects:

- Policies
- Engineering
- Planning
- Transportation
- Forestry
- SNCA
- Required Plans and Studies

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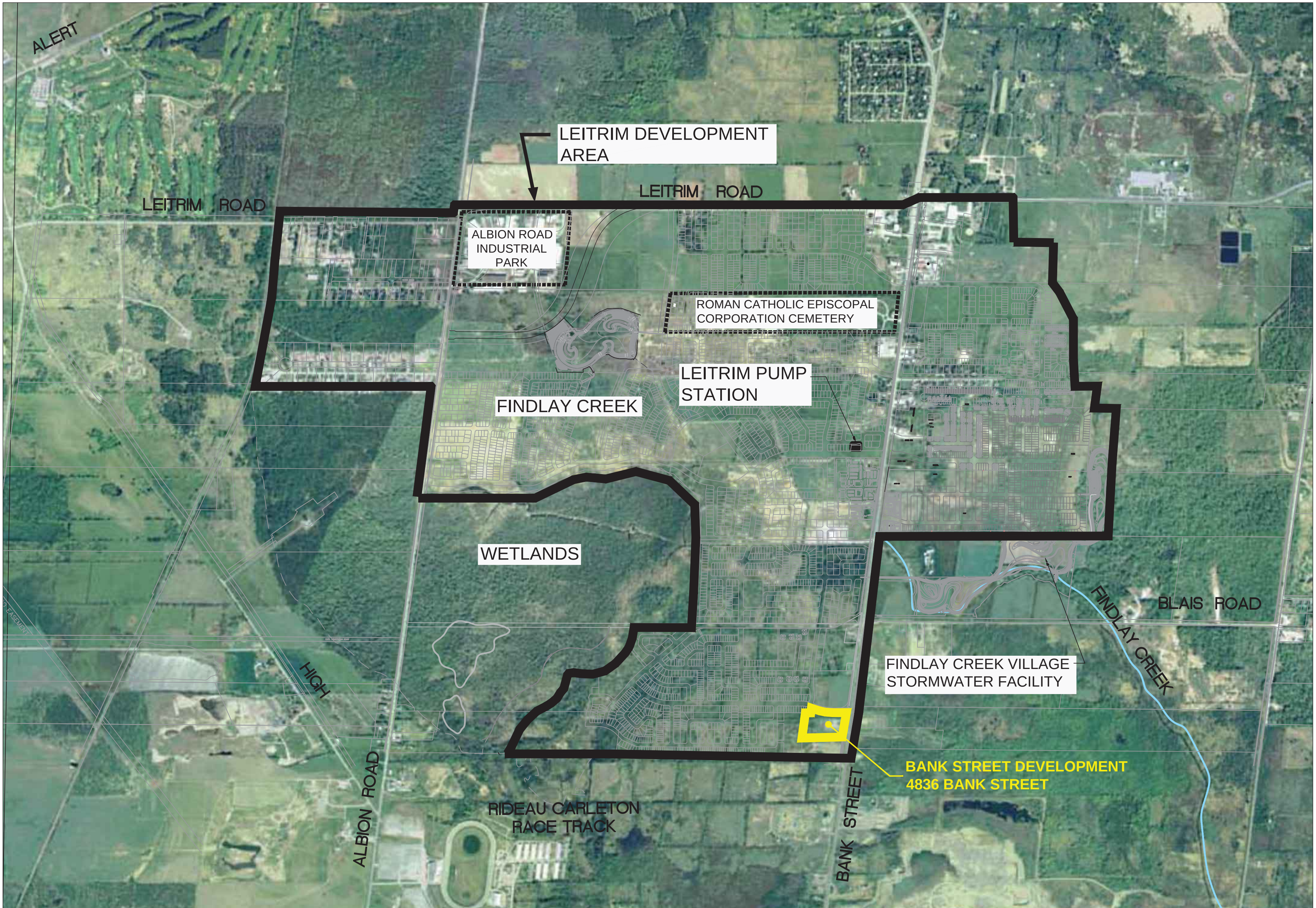
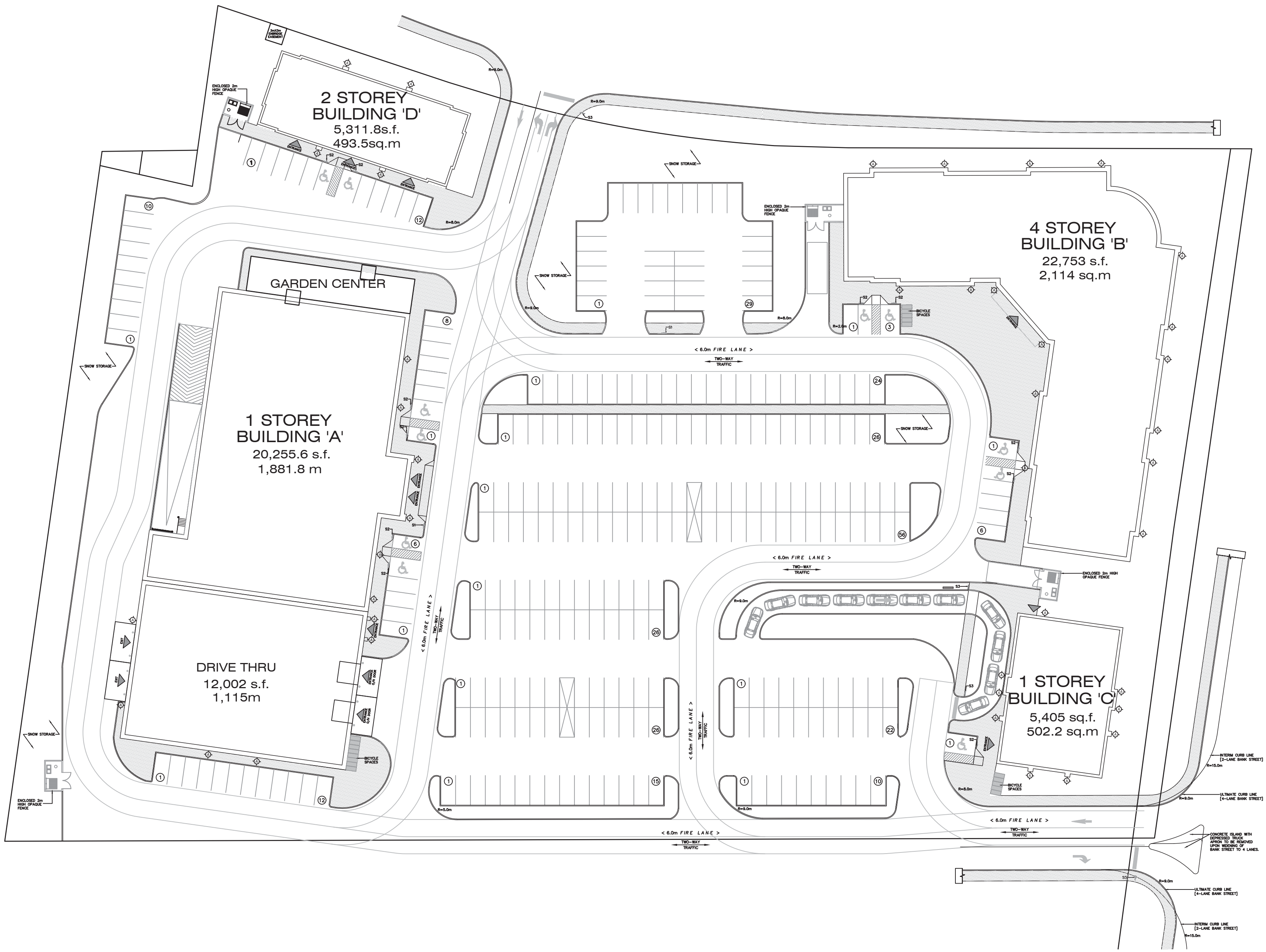


Scale	Project Title	Drawing Title	Sheet No.
NTS	BANK STREET DEVELOPMENT 4836 BANK STREET	SITE LOCATION	FIGURE 1.1



J:\119351_4836BankSt\5.9 Drawings\59civil\current\Figures\FIGURE 1.2.dwg Layout Name: FIGURE 1.2

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Scale	Project Title	Drawing Title	Sheet No.
N.T.S.	BANK STREET DEVELOPMENT 4836 BANK STREET	SITE PLAN	FIGURE 1.2

There is a small drainage ditch on the subject property which outlets to the Bank Street side road ditch. That ditch will need to be filled to support the proposed development. The South Nation Conservation (SNC) was contacted to confirm if a permit was needed to fill the ditch. In an April 15, 2019 e-mail, the SNC confirmed that a permit from that agency would not be required to fill the on-site ditch. A copy of that e-mail is included in **Appendix A**.

1.5 Geotechnical Investigation

A geotechnical report entitled “Geotechnical Investigation, Proposed Commercial Development, 4836 Bank Street, Ottawa, Ontario” by Paterson Group has been prepared for the subject site.

The objective of the investigation report include:

- Determination of the subsoil and groundwater conditions;
- Provision of geotechnical recommendations pertaining to the design and development of the subject site including construction considerations.

Among other items, the report comments on the following:

- Site grading and grade raises;
- Foundation design;
- Pavement structure;
- Infrastructure construction;
- Groundwater control;
- Contamination/corrosive environment.

2 WATER SUPPLY

2.1 Existing Conditions

As previously noted, the 2.5 hectare Home Hardware site is located west of Bank Street and south of Dun Skipper Drive. The subject site is flanked on both the north and east sides by existing watermains. Existing 400 diameter watermains are included in both Bank Street and Dun Skipper Drive. Both watermains fall within the City of Ottawa's pressure district Zone 4C which will provide the water supply to the site.

2.2 Design Criteria

2.2.1 Water Demands

Water demands have been calculated for the development using consumption rates from Table 4.2 of the Ottawa Design Guidelines – Water Distribution. Buildings A, C and D are one or two storey retail buildings while Building B is a 4 storey hotel with an estimated 500 beds. A summary of the water consumption rates is as follows:

Basic Demand:

- Shopping Centre (Retail) 2500 l/1000m^2/day
- Hotels 225 l/bed/day

Maximum Daily Demand: 1.5 x Basic Day

Maximum Hourly Demand: 1.8 x Maximum Day

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

- Average Day 1.41 l/s
- Maximum Day 2.12 l/s
- Peak Hour 3.83 l/s

2.2.2 System Pressure

The Ottawa Design Guidelines – Water Distribution (WDG001), July 2010, City of Ottawa, Clause 4.2.2 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 480 kPa (80 psi) under maximum daily flow conditions. Other pressure criteria identified in Clause 4.2.2 of 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	In accordance with the Ontario Building/Plumbing Code, the maximum pressure should not exceed 552 kPa (80 psi). Pressure reduction controls will be required for buildings where it is not possible/feasible to maintain the system pressure below 552 kPa.

2.2.3 Fire Flow Rates

The subject site plan will contain 4 commercial building pads. Calculations using the Fire Underwritera Survey (FUS) method were conducted to determine the fire flow requirement for the site for the two largest Buildings ‘A’ and ‘B’. The FUS method considers building floor area, type of building construction, type of occupancy, availability of sprinkler systems and separations from adjacent buidings. Without detailed architectural drawings for the buildings, the building construction is assumed to be non-combustible as defined by the FUS. As we do not have details of the sprinkler systems at this time, a reduction of 30% has been assumed in accordance with the FUS. No reduction or increase has been required for the occupancy as is common with commercial buildings. Results of the calculations show a fire demand of 11,000 l/min (183.3 l/s) for Building ‘A’ and 13,000 l/min for Building ‘B’. A copy of the FUS calculations is included in **Appendix B**.

2.2.4 Boundary Conditions

The City of Ottawa has provided hydraulic boundary conditions at two locations, one at the existing main on Dun Skipper Drive at the entrance to the site and the other is on the existing Bank Street main at the Bank Street entrance. Boundary conditions have been supplied for the 2019 existing conditions and for the future SUC zone reconfiguration in which the HGL will be reduced. Therefore the existing condition Max HGL is used for the basic day analysis to determine the maximum pressure as it represents the highest HGL elevation. For the peak hour and max day plus fire analysis the SUC zone reconfiguration is used in the analysis as these represent the lowest HGL elevations. The boundary conditions are included in Appendix B and are summarized as follows;

SCENARIO	CONDITION 1 DUN SKIPPER DRIVE	CONDITION 2 BANK STREET
Max HGL (Basic Day)	155.6m	155.6m
Peak Hour	145.1m	145.1m
Max Day + Fire (11,000 l/min)	139.6m	139.6m
Max Day + Fire (13,000 l/min)	137.8m	137.9m

2.2.5 Hydraulic Model

A computer model for the site has been developed using the Infowater 12.4 program by Innovyze. The model includes the propsed and existing watermains on Bank Street and Dun Skipper Drive and the boundary conditions provided by thr City.

2.3 Proposed Water Plan

2.3.1 Modelling Results

The site will be serviced by two connections to the existing 400 mm watermains on Dun Skipper Drive and Bank Street. All watermains are 200 mm diameter except for a 150 mm diameter stub which services Buildings ‘A’ and ‘D’. There are four fire hydrants proposed, nodes TH-010 to TH-040 in the model. Nodes TH-010 and TH-030 are adjacent to Buildings ‘A’ and ‘D’ with a fire demand of 11,000 l/min per Section 2.3.3. Nodes TH-020 and TH-040 are adjacent to Buildings ‘B’ and ‘C’ with a fire demand of 13,000 l/min. An existing hydrant on Dun Skipper Drive also provides fire protection to Building 'B' and is represented by Node S15-300 in the water model.Results of the hydraulic analysis for the Site is included in **Appendix B** and is summarized as follows:

SCENARIO	
Basic Day (Max HGL) Pressure (kPa)	530.3 – 539.0
Basic Day Water Age (hrs.)	1.0 – 7.5
Peak Hour Pressure (kPa)	417.4 – 436.0
Design Fire flow @ 140 kPa Residual Pressure (l/s) - Retail (183.3 l/s) - Hotel (216.7 l/s)	434.0 & 686.0 425.4 – 486.4

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

Maximum Pressure	Under Basic Day there are no nodes in which the pressure exceeds 552 kPa (80 psi), thus no pressure reducing control is required. There is also no area where the pressure exceeds the maximum level of 689 kPa (100 psi) in unoccupied areas.
Water Age	The water age under basic day conditions has been calculated for the site. The water age is calculated from the boundary. The highest water age is 7.5 hours from the boundary conditions. While the water age is adequate under basic day conditions, the age may be a concern during the early stage of construction due to low demand. Should water quality become a concern an automatic flushing unit in accordance with City Detail W3.2 can be installed on the water system in order to increase circulation.
Minimum Pressure	The lowest minimum pressure during peak hour conditions is 417.4 kPa which exceeds the minimum 276 kPa (40 psi) requirement.
Fire Flow	The minimum design fire flow under maximum day conditions with minimum system pressure of 140 kPa (20 psi) is 434.0 l/s for retail which exceeds the requirement of 183.3 l/s (11,000 l/min) from Section 2.3.3. For the hotel, the minimum fire flow is 425.4 l/s which practically meets the 216.7 l/s (13,000 l/min) requirement.

2.3.2 Watermain Layout

In order to provide additional reliability to the system in case of a watermain break, two connections to the City's watermain system are proposed. One proposed connection is to the existing 400 mm watermain within the Dun Skipper Drive right of way and the other proposed connection is to the 400 mm watermain in Bank Street. The proposed water plan is shown on Drawing 119351-001, the Site Servicing Plan, a copy of which is included in **Appendix F**. An accompanying Drawing 010, Details and Notes is also included in **Appendix F**. The proposed fire hydrant layout also includes an unobstructed path of no more than 45m between the hydrant and Siamese connections as required by the Ontario Building Code.

3 WASTEWATER DISPOSAL

3.1 Existing Conditions

The Leitrim Home Hardware site at 4836 Bank Street is located within the Leitrim Development Area where sanitary flows ultimately outlet to the Leitrim Sanitary Pumping Station. As part of the adjacent downstream developments, the outlet sanitary sewer system for the subject site was completed. Those sewers were installed as per the recommendations of the 2016 Updated Serviceability Report. In particular, a 200 mm diameter sanitary sewer in Dun Skipper Drive was constructed as part of the Pathways Phase 1 project. That sewer (at MH1A) was also sized for the upstream Idone commercial lands. A highlighted copy of the sanitary sewer design sheet from the Pathways Phase 1 design, together with the related Sanitary Drainage Area Plan (drawing 33956-501A) are included in **Appendix C**.

3.2 Design Criteria

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

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

3.3 Recommended Wastewater Plan

The on-site sanitary system will consist of a network of 200mm PVC sewers installed at normal depth and slope and will provide a single service connection to each commercial building. The sewers have been designed using the criteria noted above in Section 3.2 and outlet via a connection to the sanitary sewer within the Dun Skipper Drive right of way. A copy of the sanitary drainage area plan 119351-400 and the sanitary sewer design sheet can be found in **Appendix C.** Please refer to the site servicing plan 119351-001 for further details. No off site construction or sewer improvements are needed for the subject site. As noted previously, the proposed wastewater plan includes capacity at MH 1A for the upstream Idone commercial property.

4 SITE STORMWATER MANAGEMENT

4.1 Existing Conditions

The 2016 Updated Serviceability Report recommended that the subject site and the upstream Idone commercial site be serviced with a 1350 mm diameter minor storm sewer. That sewer was constructed in 2017 as part of the downstream Pathway Phase 1 development and is presently terminated near the north-east corner on the subject site. It is noted that the 1350 mm diameter storm sewer was also sized to provide a minor storm outlet for a portion of the future Earl Armstrong Road. The City of Ottawa requested the latter capacity in the event that the future road was located adjacent to the Idone commercial property. For reference, a highlighted copy of the Pathways Phase 1 storm sewer design sheet together with a copy of Drawing 33956-500A, Pathways Phase 1 Storm Drainage Area Plan are included in **Appendix D**.

The City of Ottawa is presently undertaking the Earl Armstrong Road Environmental Assessment and the preferred location of the road at Bank Street is not adjacent to the Idone property but about 200 m south of that location. Therefore the development of the subject site, as well as the adjacent Idone commercial property, will no longer need to provide a minor storm outlet for the future Earl Armstrong Road.

4.2 Phasing

Although the subject site will eventually include four buildings, the property owner plans to phase the site development. The first phase will include only Building A, associated parking, and vehicular connection to both Bank Street and Dun Skipper Drive. **Figure 4.1** shows the approximate limits for Phase 1. The existing Home Hardware retail outlet will remain open while the new store is under construction. As a consequence of this development plan, the existing 1350 mm diameter storm sewer, which is presently terminated behind Building B near Dun Skipper Drive, can no longer be the minor storm outlet for the commercial site. Instead, it is now proposed to service the site with a new 750 mm diameter storm sewer under the Don Skipper Drive driveway access location.

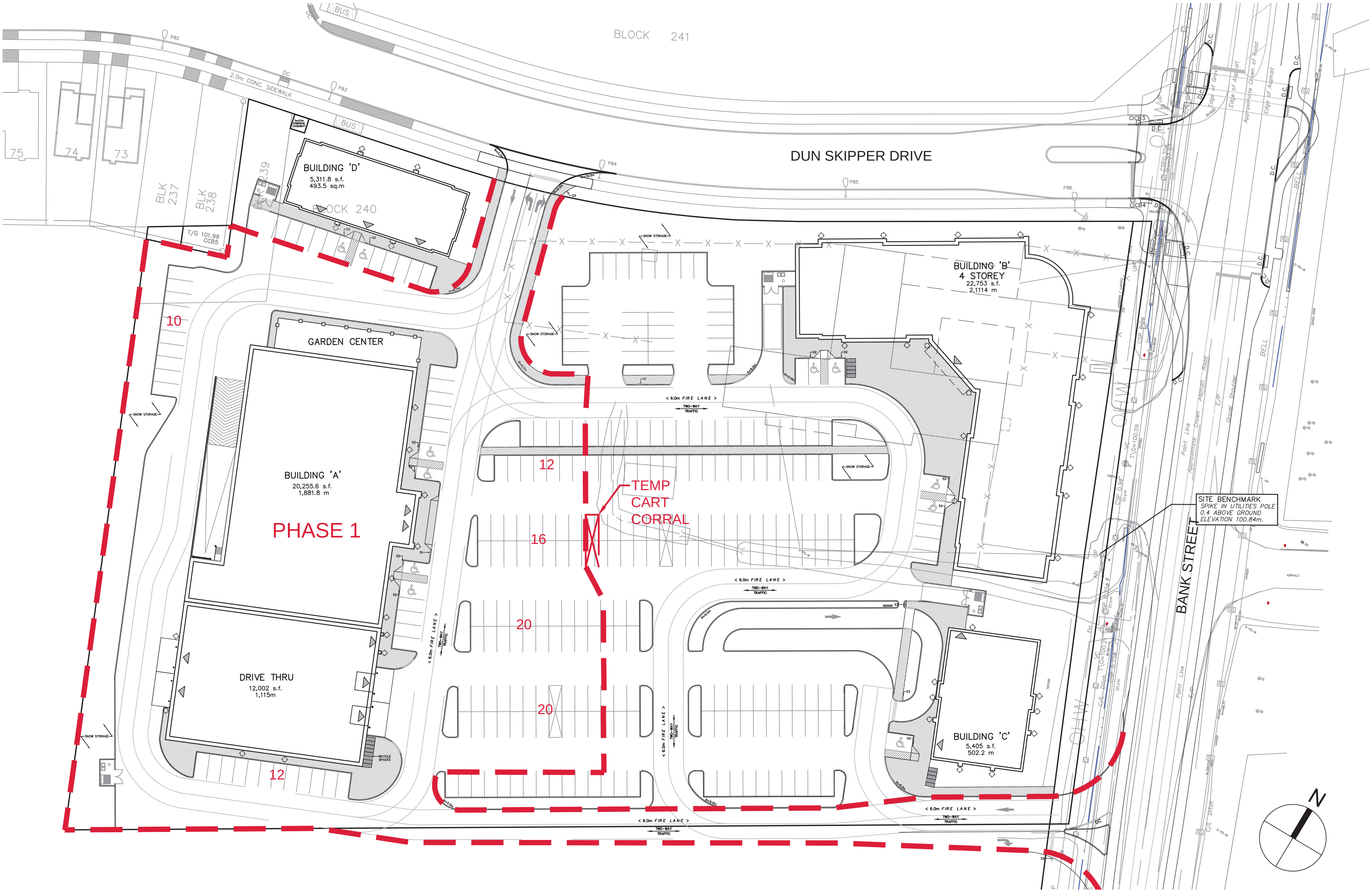
4.3 Design Criteria

IBI Group recently completed the municipal infrastructure design for the Pathways Phase 1 development. That design included a review of the allowable flow from the subject site including the adjacent Idone commercial property. The "Pathways" design assumed that the allowable minor storm release rate for the two commercial sites was 760 l/s and that the 1:100 year storm event would be self-contained with no overflow to adjacent properties. The emergency overflow for events greater than the 1:100 year event (stress test) would be to Bank Street. A copy of drawing 33956-700 DDSWMM Schematic from the former report along with an excerpt from the report identifying the previously mentioned release rate are included in **Appendix D**. The subject site and adjacent commercial property are outlined in the red and identified as area EXT4.

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	1:2 year return (Ottawa)
• Initial Time of Concentration	10 minutes
• Runoff Coefficients	
• Pipe Velocities	0.80 m/s to 6.0 m/s



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N.T.S.	BANK STREET DEVELOPMENT 4836 BANK STREET	PHASING PLAN	FIGURE 4.1

4.4 Proposed Minor System

Using the criteria identified in Section 4.3, the proposed on-site storm sewers were sized accordingly. A detailed storm sewer design sheet and the associated Storm Sewer Drainage Area plan (drawing 119351-500) are both included in **Appendix D**. The Site Servicing Plan, depicting all on-site storm sewers can be found in **Appendix G**.

The proposed minor storm sewer will range in size between 200 mm diameter and 750 mm diameter. Catchbasin lead pipes will mostly be 200 mm diameter with some 250 mm diameter exceptions. The minor storm sewer outlet will be via the 750 mm diameter pipe which is proposed to connect to the existing 1350 mm diameter storm sewer in Dun Skipper Drive. The existing 1350 mm diameter storm sewer behind building B will be terminated with a manhole and will receive some minor storm flow from the landscaped areas behind Building B. The proposed design has also provided minor storm sewer capacity for the future Idone commercial site near MH1.

The 1350 mm diameter storm sewer in Dun Skipper Drive ultimatly outlets to the Findlay Creek Village SWMF. This facility provides 80% TSS removal, as such no additional on-site stormwater quality control is required withn the subject lands.

4.5 Stormwater Management

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

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

The maximum surface retention depth located within the developed areas will be limited to 300mm during a 1:100 year event as shown on the ponding and grading plans located in **Appendix G.**

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 a single location within the site, west of building D, the opportunity to store runoff is limited due to grading constraints and building geometry, this area will flow uncontrolled to the Dun Skipper right-of-way. This uncontrolled areas – 0.01 hectares in total, have an average C value of 0.6250. Based on 1:100 year storm uncontrolled flows, the uncontrolled areas generate 3.10 l/s runoff (refer to Section 4.6 for the calculation).

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

4.6 Inlet Controls

The allowable release rate for the 2.49 Ha site can be calculated as follows:

$Q_{allowable}$	= 760 L/s as per IBI Pathways Phase 1 Report – EXT 4 drainage area
Area Total EXT4	= 4.04 Ha
Subject lands share	= 62% of EXT4 release rate (2.5 Ha / 4.04 Ha = 0.62)
$Q_{Subject\ Lands}$	= 468.42 L/s

As noted in Section 4.5, a small portion of the site just west of Building D will be left to discharge to the Dun Skipper Drive boulevard at an uncontrolled rate.

Based on a 1:100 year event, the flow from the 0.01 Ha uncontrolled areas can be determined as:

$\mathbf{Q_{uncontrolled}}$	$= \mathbf{2.78} \times \mathbf{C} \times \mathbf{i_{100yr}} \times \mathbf{A}$ where:
C	= Average runoff coefficient of uncontrolled area = 0.625
$\mathbf{i_{100yr}}$	= Intensity of 100-year storm event (mm/hr)
	$= 1735.688 \times (T_c + 6.014)^{0.820}$ = 178.56 mm/hr; where T_c = 10 minutes
A	= Uncontrolled Area = 0.01 Ha

Therefore, the uncontrolled release rate can be determined as:

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

$$= 2.78 \times 0.625 \times 178.56 \times 0.01$$

$$= \mathbf{3.10\ L/s}$$

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

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

$$= 468.42\ L/s - 3.10\ L/s$$

$$= \mathbf{465.31\ L/s}$$

Based on the flow allowance at the various inlet locations, a combination of various sizes of inlet control devices (ICDs) were chosen for the design. The design of the inlet control devices is unique to each drainage area and is determined based on a number of factors, including hydraulic head and allowable release rate. The inlet control devices were sized according to the manufacturer's design charts. The restrictions will cause the on-site catchbasins and manholes to surcharge, generating surface ponding in the parking and landscaped areas. Ponding locations and elevations are summarized on drawing 119351-600, Ponding Plan 119351-600 which is included in **Appendix G**.

4.7 On-Site Detention

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

4.7.1 Site Inlet Control

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

DRAINAGE AREA(s)	TRIBUTARY AREA	AVAILABLE STORAGE (M^3)	100-YEAR STORM		5-YEAR STORM	
			RESTRICTED FLOW (L/S)	REQUIRED STORAGE (M^3)	RESTRICTED FLOW (L/S)	REQUIRED STORAGE (M^3)
MH9/MH9B	0.14	20.64	10	44.84	10	13.85
CB1	0.17	50.59	16	38.68	16	10.47
CB16	0.01	0.31	6	1.56	6	0.48
CB17	0.09	0.84	9	25.47	9	8.90
CB15	0.09	66.27	6	28.06	6	8.73
CBMH3	0.02	4.17	6	1.52	6	0.42
CB11	0.03	0.93	15	1.65	15	0.02
CB12/13/14	0.33	54.36	73	54.70	73	13.07
CB10	0.13	6.81	45	13.23	45	1.73
CBMH2	0.08	6.21	20	11.83	20	2.53
CB7	0.08	6.97	30	7.30	30	0.79
CB6	0.07	13.66	20	9.01	20	2.53
CB5	0.06	3.41	15	8.87	15	1.89
CB8	0.17	24.90	47	22.66	47	4.29
CB4	0.03	10.62	6	5.42	6	1.40
CBMH1	0.08	0.00	20	11.83	20	2.53
CB9	0.15	10.83	43	19.23	43	0.00
CB18	0.16	13.76	15	3.65	15	0.19
TOTAL	**1.89**	**295.28**	**402**	**309.51**	**402**	**73.82**

In all instances within the parking lot areas the required storage is met with surface ponds and underground in structure/pipe storage which retain the stormwater and discharge at the restricted flow rate to the sewer system. Additionally, available storage in the landscaped area at CB18 has been calculated including the volume capacity of the perforated pipe subdrain as well as the City standard S29 clear stone trench. Refer to the SWM calculations in **Appendix E** for storage information and Drawing 119351-600, Ponding Plan located in **Appendix G**.

4.7.2 Roof Inlet Controls

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

ICD AREA	TRIBUTARY AREA	100-YEAR STORM		5-YEAR STORM	
		RESTRICTED FLOW (L/S)	REQUIRED STORAGE (M^3)	RESTRICTED FLOW (L/S)	REQUIRED STORAGE (M^3)
Bldg A	0.30	27.0	89.56	27.0	32.15
Bldg B	0.22	20.0	65.35	20.0	23.40
Bldg C	0.05	8.0	10.68	8.0	3.13
Bldg D	0.05	8.0	10.68	8.0	3.13
TOTAL	**0.62**	**63.0**	**176.27**	**63.0**	**61.81**

4.7.3 Overall Release Rate

As noted above, the site uses ICDs to restrict the 100 year storm event to the criteria approved by the City of Ottawa. Restricted stormwater will be contained onsite by utilizing surface ponding, in structure/pipe and rooftop storage. In the 100 year event, there will be no off-site overflow.

The sum of restrictions on the site, rooftops and uncontrolled flows is 468.10 l/s (402 l/s + 63.00 l/s + 3.10 L/S), which is less than the allowable release of 468.42 l/s noted in section 4.6.

5 SEDIMENT AND EROSION CONTROL PLAN

5.1 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. One half diameter bulkhead barriers will be installed at the nearest downstream manhole in each sewer which connects to an existing downstream sewers.
- Seepage barriers will be constructed in any temporary drainage ditches (where applicable);
- 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.
- Silt fence on the site perimeter will be installed.

5.2 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).

5.3 Bulkhead Barriers

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

5.4 Seepage Barriers

In order to further reduce sediment loading to the surrounding area such as the Bank Street roadside ditch, 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 Erosion and Sedimentation Control Plan included in **Appendix G**. 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.

5.5 Surface Structure Filters

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

6 APROVALS AND CITY REQUIREMENTS

6.1 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, submit the sewer ECA application to the province, and eventually issue a Commence Work Notification.

6.2 Province of Ontario

The Ministry of Environment, Conservation and Parks (MECP) will approve the local sewers under Section 53 of the Ontario Water Resources Act and issue an Environmental Compliance Approval. The Ministry will also issue a Permit to Take Water.

6.3 Conservation Authority

The South Nation Conservation has confirmed no permits are required from the agency. Email correspondence with SNC is included in **Appendix A**.

6.4 Federal Government

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

7 CONCLUSIONS & RECOMMENDATIONS

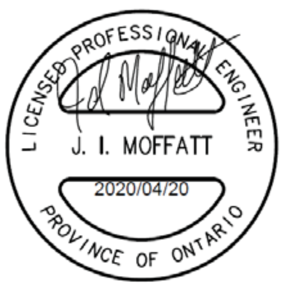
7.1 Conclusions

This report and the accompanying working drawings clearly indicate that the proposed development meets the requirements of the stakeholder regulators, including the City of Ottawa, provincial MECP and SNC. The proposed development is in general conformance with the recommendations of both the 2016 Updated Serviceability Report and the Pathways Phase 1 design.

There is a reliable water supply available adjacent to the proposed development; a wastewater outlet is available adjacent to the site, local storm sewers have been installed adjacent to the site and an expansion to the existing Findlay Creek Village Stormwater Facility has been constructed to collect and treat runoff from the subject site.

7.2 Recommendations

It is recommended that the regulators review this submission with an aim of providing the requisite approvals to permit the owners to proceed to the construction stage of the subject site.



"J:\119351_4836BankSt\5.2 Reports\5.2.2 Civil\3rd Submission\CTR-Design Brief-2020-04-20.docx"

APPENDIX A

- **City Pre-Consultation Meeting Notes (October 24, 2018 e-mail)**
- **April 15, 2019 e-mail from the South Nation Conservation**

From:	Walker, Max
To:	Nico Church
Cc:	Brian Casagrande
Subject:	4836 Bank Street - Comments
Date:	October-24-18 3:07:35 PM
Attachments:	Pre-application Consultation Servicing Memo (2).pdf 4836_Plans and Study list.pdf

Nico,

-

As a follow-up to our meeting on October 18, 2018, please find below information regarding the development of the noted site. I have identified the plans and studies required for an application for a Site Plan Control (Manager Approval, Public Consultation) and a Zoning By-law amendment. Should the proposed development/use change, another pre-consultation should be scheduled to discuss.

-

Policies/designations of the site:

- Official Plan – designated Developing Community (Expansion Area) and General Urban Area
  - Official Plan Amendment 150 was adopted by Council in December 2013. The application will be reviewed under the Official Plan with regard for the Council approved amendments contained within Official Plan Amendment (OPA) 150. An annotated version of the Official Plan, showing the proposed changes within the context of existing policies, can be found here.
- Please consider section 4.8.6 - Land-Use Constraints Due to Airport and Aircraft Operations
- Leitrim Community Design Plan
- Building Better and Smarter Suburbs
- Urban Design Guidelines for Large-Format Retail

Engineering Comments:

-

As per the pre-application memo, attached.

-

Planning Comments:

Buildings should be oriented to front, face, and feature public streets, especially with buildings at corners, as shown on the concept plan.

Building façades along the public streets should be articulated with colour, material variations, windows, and other treatments of the wall plane to provide a high quality of design, detail, and variety. The design treatment of flanking façades visible from the street should be similar to that of the front facade.

Building fronts should be treated as pedestrian areas and public spaces.

The side and rear of buildings abutting low to medium density residential properties should be of similar height as the residential dwellings or should be stepped above 4 storeys to maintain an appropriate scale in relation to adjacent residential uses.

- E.g., where the building height is greater than 4 storeys the second, third or fourth storey could be stepped back a further 2.5 metres from the front wall of the storey below.

- Locate loading areas away from adjacent sensitive uses, such as residential and outdoor amenity areas, to reduce the impacts of noise and pollution that could be caused by such uses. Use landscaping and fencing to help buffer potential impacts.

Orient the front façade to face the public street and locate front doors to be visible, and directly accessible, from the public street.

- Please consider adjustments to the building center building with a view on orienting it towards the streets to re-inforce the street edge with active frontages and entrances directly from ROW and parking located behind the building.

Base new development on an internal circulation pattern that allows logical movement throughout the site that will accommodate, and not preclude, intensification over time. Design the internal circulation pattern with direct connections to the surrounding streets.

- The subject property does not have access to Dunskipper Dr. Please outline the framework that will facilitate the proposed access, e.g. easement.

    - Consider locating the access over the future services for the most efficient and effective use of space.

- The proposed access to Bank Street overlaps with the lands to the south. Please clarify how this access will be built, e.g., agreements, if any, between the Owner of the subject site and of the abutting lands.

Design the site circulation to minimize the conflicts between pedestrians and vehicles. This can be achieved by orienting car parking spaces to minimize the number of traffic aisles that pedestrians must cross. Overall, the development should be designed for pedestrians and the public realm first, vehicles second.

Divide large parking areas into smaller and well-defined sections using soft and hard landscaping in order to minimize the amount of paved areas

Enclose all utility equipment within buildings or screen it from both the public street and private properties to the rear and ensure that noise is attenuated. This includes utility boxes, garbage and recycling container storage, loading docks and ramps and air conditioner compressors

Outdoor loading and refuse collection - incorporating all building services, including disposal bins, into the architectural fabric of the building

- Ensure that the wall height is sufficient to completely conceal garbage dumpsters in order to avoid conflict of uses. We find that the Ecoloxia refuse bins meets this objective.

- Consider Molak and/or Earthbins.

The site has approximately 300 parking spaces, whereas the By-law requires only 176 parking space @ a rate of 3.4 per 100 m2 of GFA for retail. Shopping Centre is 3.6 per 100 m2 of GFA. Please provide a strong rational for the excessive parking spaces.

Provide opportunities for pedestrian connections between the subject site and remainder of the Idone lands. Section 4.11 (c) of the Official Plan states that we should pursue opportunities to reduce parking requirements and promote increased usage of walking, cycling and transit, where appropriate. We are creating a connected development which works in favor of permeability and improved opportunities for active transportation. Disconnected neighborhoods with isolated land uses result in longer trip distances, which favor vehicular mode choices.

With respect to the turning movements, the applicant should demonstrate that all operational characteristics of the site could be self-contained.

The site is outside of the area envisioned for the mixed-use centre designation per the Leitrim Community Design Plan. It is suggested to make a case for why the expansion of the mixed-use area further south is reasonable and why this property should be analogous to the other mixed use areas.

Section 3.13 -Developing Community Expansions Area- of the Official Plan requires a Plan of Subdivision to determine how the land will be serviced and developed. Because the Owner is not party to the plan of subdivision for the surrounding lands, a site plan application, together with a zoning amendment application, is required to the identify distribution of land uses, how the site is to be serviced and how traffic will be addressed.

The site is located within the Ottawa Airport Operating Influence Zone. The landscape plan should not include plants known to be attractive to birds. The landscape plan should conform to Transport Canada's TP 11500 table c4 'Ornamental Trees and Shrubs Attractive to Birds'.

Transportation Comments:

A Transportation Impact Assessment (TIA) would be required in support of the Zoning By-law application. The TIA should be in accordance to the City's TIA Guidelines.

Bank Street is an urban arterial road in this section with a ROW protection of 44.5m per the City OP. Road widening will be required to achieve the ROW width, i.e. 22.25m from the existing centreline of the road to the property line.

There is a plan to improve the Intersection of Bank Street and Dunskipper Drive. This will include turning lanes and traffic signals. The intersection is currently in the 2014 DC By-law, subject to approval by Council.

Note that per the transportation impact study completed for the subdivision to the north, the traffic signals are not warranted for the intersection until 2025.

Ensure that Dunskipper access on Bank Street is reviewed for safety if road modifications are not in place or keep this access closed until intersection modifications and signalization can be completed.

A 5X5 sight triangle will be required at the Dunskipper Drive access

New TIA guidelines:

The TIA (Transportation Impact Assessment) Guidelines (2017) were approved by Transportation Committee and City Council on June 14, 2017. The new version of the TIA Guidelines (2017) that are posted on the web are now to be used for the TIA Submission for development applications.

The following list highlights the significant changes to the 2006 TIA Guidelines

- A recent revisit of all steps in the TIA Guidelines has retained the first three steps as required for our review and or sign off. Only step 4, which is the strategy report, is optional. You may or may not forward the strategy report to staff for review and can move on to assemble all documentation (including strategy report) into step 5 for submission of the application.

  Please provide 3 copies of the Traffic Impact Assessment, if required.

-

Forestry Comments:

- A Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City; an approved TCR is a requirement of Site Plan approval.

- Any removal of privately-owned trees 10cm or larger in diameter requires a tree permit issued under the Urban Tree Conservation Bylaw; the permit is based on the approved TCR.

- The removal of City-owned trees will require the permission of Forestry Services who will also review the submitted TCR.

- In this case, the TCR may be combined with the Environmental Impact Statement.

    - TCR shall addresses butternut trees.

- The TCR must list all trees on site by species, diameter and health condition – separate stands of trees may be combined using averages.

- The TCR must address all trees with a critical root zone that extends into the developable area – all trees that could be impacted by the construction that are outside the developable area need to be addressed.

- Trees with a trunk that crosses/touches a property line are considered co-owned by both property owners; permission from the adjoining property owner must be obtained prior to the removal of co-owned trees.

If trees are to be removed, the TCR must clearly show where they are, and document the reason they can not be retained – please provide a plan showing retained and removed treed areas.

- All retained trees must be shown and all retained trees within the area impacted by the development process must be protected as per City guidelines listed on Ottawa.ca.

- The City encourages the retention of healthy trees; if possible, please seek opportunities for retention of trees that will contribute to the design/function of the site.

- Please ensure all planted trees have a sufficient soil volume to support them at maturity. Please ensure salt tolerant trees are planted in high salt areas.

- For more information on the process or help with tree retention options, contact Mark Richardson mark.richardson@ottawa.ca.

-

SNCA Comments:

-

SNC recommends a storm water report, or an update to an existing report. It should demonstrate that storm water runoff post development will equal pre development for the 2 or 5 and the 100 year storm event. Treatment should achieve a 80% TSS removal. The following plans should also be provided: storm water, drainage and grading, sediment and erosion control.

GeoOttawa shows roadside ditches and a watercourse that starts on the property flowing east into the ditch. These features should be been confirmed.

Note that any interference with a watercourse may require a permit under Ontario Regulation 170/06 and restrictions may apply. The applicant should contact South Nation Conservation before commencing any work that may interfere with a watercourse.

-

Required plans and studies:

As per the Study and Plan identification List

For information and guidance on preparing required studies and plans refer to http://ottawa.ca/en/city-hall/planning-and-development/how-develop-property/development-application-review-process-2/guide-preparing-studies-and-plans

Fees

The fees are detailed in Table 1 and 2, below. Please note that where two or more planning applications are submitted at the same time for the same property, the planning fee imposed for such applications shall be reduced by 10%.

Table 1: Site Plan Fees

Manager Approval, Public Consultation Fee:	**$ 21,508.66**
Includes:	Planning Fee: $ 18,478
	On-Site Sign Fee: $576.30
	Legal Fee: $2,454.36 ($2,172 + $282.36 HST)
Plus	
Initial Engineering Design Review	**$10,000 (includes HST) (value of Hard**

and Inspection Fee:	**and Soft Servicing >$300,000)**
Plus	
Conservation Authority Fee:	**$975**

Table 2: Zoning Amendment Fees

Zoning By-Law Amendments	
Major Zoning Amendment:	**$16,545.30**
Includes:	Planning Fee: $15,969
	On-Site Sign Fee: $576.30 (*incl. HST)*

Prior to making a complete submission, I also encourage you to discuss the proposal with the area Councillor and local community associations. Please note that these pre-consultation comments are valid for one year. If you submit a development application after this time, you may be required to meet for another pre-consultation meeting and/or the submission requirements may change.

If you have any questions regarding the foregoing, please do not hesitate to contact me.

Regards,

-Max

Max Walker, RPP
Planner I | Urbaniste I
Development Review (South Services) | Examen des projets d'aménagement (services sud)
Planning, Infrastructure and Economic Development | Services de planification, d'infrastructure et de développement économique
City of Ottawa | Ville d'Ottawa
☎ 613.580.2424 ext./poste 23947
ottawa.ca/planning / ottawa.ca/urbanisme

Ottawa

PLANNING AND GROWTH MANAGEMENT
URBANISME ET GESTION DE LA CROISSANCE

APPLICANT'S STUDY AND PLAN IDENTIFICATION LIST

Legend: **S** indicates that the study or plan is required with application submission.
A indicates that the study or plan may be required to satisfy a condition of approval/draft approval.

For information and guidance on preparing required studies and plans refer to:

http://ottawa.ca/en/development-application-review-process-0/guide-preparing-studies-and-plans

S/A	Number of copies	ENGINEERING		S/A	Number of copies
S	5	1. Site Servicing Plan	2. Assessment of Adequacy of Public Services / Site Servicing Study / Brief	S	3
S	5	3. Grade Control and Drainage Plan	4. Geotechnical Study	S	3
		5. Composite Utility Plan	6. Groundwater Impact Study		
		7. Servicing Options Report	8. Wellhead Protection Study		
S	9	9. Transportation Impact Brief	10.Erosion and Sediment Control Plan / Brief	S	3
S	3	11.Storm water Management Report / Brief	12.Hydro geological and Terrain Analysis		
S	3	13.Hydraulic Water main Analysis	14.Noise / Vibration Study	S	3
		15.Roadway Modification Design Plan	16.Confederation Line Proximity Study		

S/A	Number of copies	PLANNING / DESIGN / SURVEY		S/A	Number of copies
		17.Draft Plan of Subdivision	18.Plan Showing Layout of Parking Garage		
		19.Draft Plan of Condominium	20.Planning Rationale/ Design Brief	S	2
S	10	21.Site Plan	22.Minimum Distance Separation (MDS)		
	10	23.Concept Plan Showing Proposed Land Uses and Landscaping	24.Agrology and Soil Capability Study		
		25.Concept Plan Showing Ultimate Use of Land	26.Cultural Heritage Impact Statement		
S	10	27.Landscape Plan	28.Archaeological Resource Assessment Requirements: **S** (site plan) **A** (subdivision, condo)	S	2
S	1	29.Survey Plan	30.Shadow Analysis		
S	3	31.Architectural Building Elevation Drawings (dimensioned)	32.Design Brief		
		33.Wind Analysis			

S/A	Number of copies	ENVIRONMENTAL		S/A	Number of copies
S	3	34.Phase 1 Environmental Site Assessment	35.Impact Assessment of Adjacent Waste Disposal/Former Landfill Site		
A	3	36.Phase 2 Environmental Site Assessment (depends on the outcome of Phase 1)	37.Assessment of Landform Features		
		38.Record of Site Condition	39.Mineral Resource Impact Assessment		
S	3	40.Tree Conservation Report	41.Environmental Impact Statement / Impact Assessment of Endangered Species		
		42.Mine Hazard Study / Abandoned Pit or Quarry Study			

S/A	Number of copies	ADDITIONAL REQUIREMENTS		S/A	Number of copies
S	1	43. Electronic Copy of All reports/drawings	44.		

Meeting Date: October 18, 2018

File Lead (Assigned Planner): Max Walker
City Architect:

Site Address 4836 Bank Street

Application Type: Site Plan Control / Zoning Amendment

Infrastructure Approvals Project Manager: Natasha Baird
Transportation Project Manager: Amira Shehata

*Preliminary Assessment: 1✓ 2☐ 3☐ 4☐ 5☐

*One (1) indicates that considerable major revisions are required before a planning application is submitted, while five (5) suggests that proposal appears to meet the City's key land use policies and guidelines. **This assessment is purely advisory and does not consider technical aspects of the proposal or in any way guarantee application approval.**

It is important to note that the need for additional studies and plans may result during application review. If following the submission of your application, it is determined that material that is not identified in this checklist is required to achieve complete application status, in accordance with the Planning Act and Official Plan requirements, the Planning and Growth Management Department will notify you of outstanding material required within the required 30 day period. Mandatory pre-application consultation will not shorten the City's standard processing timelines, or guarantee that an application will be approved. It is intended to help educate and inform the applicant about submission requirements as well as municipal processes, policies, and key issues in advance of submitting a formal development application. This list is valid for one year following the meeting date. If the application is not submitted within this timeframe the applicant must again pre-consult with the Planning and Growth Management Department.

MEMO

Date:

To / Destinataire	Max Walker, Planner
From / Expéditeur	Natasha Baird, Project Manager, Infrastructure Approvals
Subject / Objet	**Pre-Application Consultation 4836 Bank and Ward No. 22,** File No. PC2018-0257

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

1. The Servicing Study Guidelines for Development Applications are available at the following address: http://ottawa.ca/en/development-application-review-process-0/servicing-study-guidelines-development-applications

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

   ⇨ Ottawa Sewer Design Guidelines (October 2012)

   ⇨ Ottawa Design Guidelines – Water Distribution (2010)

   ⇨ Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)

   ⇨ City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012)

   ⇨ City of Ottawa Environmental Noise Control Guidelines (January, 2016)

   ⇨ City of Ottawa Park and Pathway Development Manual (2012)

   ⇨ City of Ottawa Accessibility Design Standards (2012)

   ⇨ Ottawa Standard Tender Documents (latest version)

   ⇨ Ontario Provincial Standards for Roads & Public Works (2013)

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

4. The Stormwater Management Criteria, for the subject site, is based on the total allowable minor system outflow of 760L/s for 1:100 year storm. For further information please refer to the approved Design Brief, Pathways at Findlay Creek, 4800 Bank Street, Phase 1, prepared by IBI, revised August 2017.

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

    i. The monitoring manhole should be located in an accessible location on private property near the property line (ie. Not in a parking area).

    Sewer connections to be made above the springline of the sewermain as per:

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

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

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

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

    e. No submerged outlet connections.

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

    i. Location of service

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

iii. Average daily demand: ___ l/s.

iv. Maximum daily demand: ___l/s.

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

7. Provide a geotechnical report for the proposed development.

8. MOECC ECA Requirements

An MOECC Environmental Compliance Approval might be required for the proposed development. Please contact Ontario Ministry of the Environment and Climate Change, Ottawa District Office to arrange a pre-submission consultation:

For I/C/I applications: Emily Diamond

(613) 521-3450, ext. 238

Emily.Diamond@ontario.ca

9. Phase 1 ESAs and Phase 2 ESAs must conform to clause 4.8.4 of the Official Plan that requires that development applications conform to Ontario Regulation 153/04.

10. Location of Fire Hydrant:

If the proposed buildings will be sprinkled, an unobstructed path of 45 meters between the hydrant and siamese connection as required by the Ontario Building Code.

11. Noise Study Requirements:

Since the proposed site is within 100m from an arterial road, a noise study will be required.

12. Exterior Site Lighting:

If the exterior Site Lighting is used, provide a certification and plan by a qualified engineer confirming the design complies with the following criteria needs to be provided:

i. It must be designed using only fixtures that meet the criteria for Full Cut-Off (Sharp cut-off) Classification, as recognized by the Illuminating Engineering Society of North America (IESNA or IES), and;

ii. It must result in minimal light spillage onto adjacent properties. As a guideline, 0.5 foot-candle is normally the maximum allowable spillage.

iii. The location of the fixtures, fixture types as in make, model and part number and the mounting heights must be shown on one of the approved plans.

Should you have any questions or require additional information, please contact me directly at (613) 580-2424, x 27995 or by email at natasha.baird@ottawa.ca.

Jim Moffatt

From:	Samantha Labadie
Sent:	Monday, April 15, 2019 9:45 AM
To:	Jim Moffatt
Subject:	FW: 4836 Bank Street - Ditch

From: Geoff Owens [mailto:GOwens@nation.on.ca]
Sent: Monday, April 15, 2019 8:28 AM
To: Samantha Labadie <Samantha.Labadie@ibigroup.com>
Subject: RE: 4836 Bank Street - Ditch

Good morning Samantha,

It does not appear to be something SNC's Regulations would consider requires a permit. However, it should be understood that drainage is a big issue in the area and current drainage patterns/flows should be maintained and no changes that impact any surrounding properties including the City of Ottawa should be made as this may constitute an issue under common law drainage.

Regards,
Geoff

From: Samantha Labadie <Samantha.Labadie@ibigroup.com>
Sent: April 2, 2019 10:12 AM
To: Geoff Owens <GOwens@nation.on.ca>
Subject: 4836 Bank Street - Ditch

Hi Geoff,

The Home Hardware property at 4836 Bank Street is proposed to be redeveloped and there is an existing ditch that would need to be filled in (sketch attached).

The existing ditch starts on the property and drains to a roadside ditch along Bank Street.

Would you be able to let us know if we need a permit to fill this ditch in?

Thank you,

Samantha Labadie

IBI GROUP
Suite 400, 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel +1 613 225 1311 ext 64062 fax +1 613 225 9868

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Geoff Owens | Regulations Officer
38 Victoria Street, P. O. Box 29, Finch, ON K0C 1K0
Tel: 613-984-2948 or 1-877-984-2948 ext. 613) 984-2948 x.240 | Fax: 613-984- 2872
www.nation.on.ca

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APPENDIX B

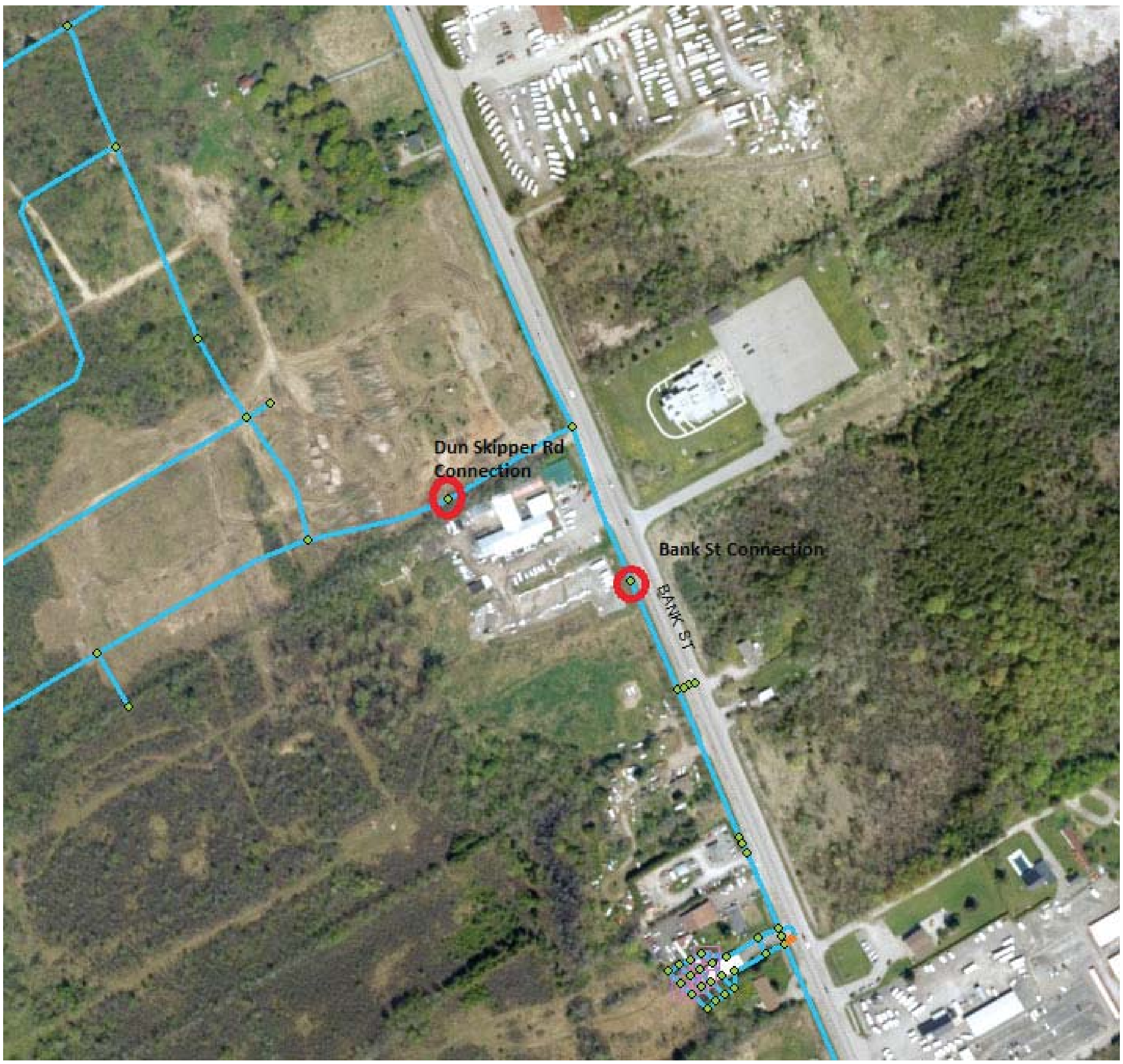
- Boundary Conditions from the City of Ottawa
- Watermain Demand Calculation Sheets
- FUS Calculation
- Water model schematic and results

Boundary Conditions for 4836 Bank St

Information Provided:
Date provided: December 2019

Scenario	Demand	
	L/min	L/s
Average Daily Demand	84.6	1.41
Maximum Daily Demand	127.2	2.12
Peak Hour	229.8	3.83
Fire Flow Demand #1	11000	183.3
Fire Flow Demand #2	13000	216.67

Location:



Results: 2019 Existing Conditions

Connection 1 - Dun Skipper Dr.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	155.6	79.7
Peak Hour	145.9	65.9
Max Day plus Fire (11,000 l/min)	146.0	66.0
Max Day plus Fire (13,000 L/min)	143.1	61.9

[1] Ground Elevation = 99.53m

Connection 2 - Bank St.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	155.6	80.2
Peak Hour	145.9	66.4
Max Day plus Fire (11,000 l/min)	144.7	66.5
Max Day plus Fire (13,000 L/min)	143.1	62.4

[1] Ground Elevation = 99.19m

Results: SUC Zone Reconfiguration

Connection 1 - Dun Skipper Dr.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	146.9	67.3
Peak Hour	145.1	64.8
Max Day plus Fire (11,000 l/min)	139.6	56.9
Max Day plus Fire (13,000 L/min)	137.8	54.5

[1] Ground Elevation = 99.53m

Connection 2 - Bank St.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	146.8	67.7
Peak Hour	145.1	65.3
Max Day plus Fire (11,000 l/min)	139.6	57.4
Max Day plus Fire (13,000 L/min)	137.9	55.0

[1] Ground Elevation = 99.19m

Notes:

1) As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:

a) If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
b) Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

IBI GROUP
333 PRESTON STREET
OTTAWA, ON
K1S 5N4

WATERMAIN DEMAND CALCULATION SHEET

PROJECT : 4836 Bank Street
LOCATION : Leitrim Development Area - City of Ottawa
DEVELOPER : Leitrim Home Hardware

FILE: 119351.5.7.3
DATE PRINTED: 16-Apr-19
DESIGN: LME

NODE	RESIDENTIAL UNITS				NON-RESIDENTIAL			AVERAGE DAILY DEMAND (l/s)			MAXIMUM DAILY DEMAND (l/s)			MAXIMUM HOURLY `			FIRE DEMAND
	SF	APT	ST	HOTEL BEDS	INDTRL (ha.)	INST. (ha.)	RETAIL (m^2)	Res.	Non-res.	Total	Res.	Non-res.	Total	Res.	Non-res.	Total	(l/min)
T-120																	
(Building A and D)							3,490	0.00	0.10	0.10	0.00	0.15	0.15	0.00	0.27	0.27	
T-150																	
(Building B)				500				1.30	0.00	1.30	1.95	0.00	1.95	3.52	0.00	3.52	
T-160																	
(Building C)							502	0.00	0.01	0.01	0.00	0.02	0.02	0.00	0.04	0.04	
Fire Nodes																	
TH-110, TH-030																	11,000
TH-020, TH-040																	13,000

ASSUMPTIONS

RESIDENTIAL DENSITIES
- Single Family (SF) 3.4 p / p / u
- Hotel Beds average 1.8 p / p / u
- Stacked Townhouse (ST) 2.3 p / p / u

AVG. DAILY DEMAND
- Hotel (Table 4.2) 225 l / cap / day
- Retail (Shopping Centre) 2,500 l / 1000m^2 / day

MAX. DAILY DEMAND
- Hotel (Table 4.2) 338 l / cap / day
- Retail (Shopping Centre) 3,750 l / 1000m^2 / day

MAX. HOURLY DEMAND
- Hotel (Table 4.2) 608 l / cap / day
- Retail (Shopping Centre) 6,750 l / 1000m^2 / day

FIRE FLOW
- Hotel 13,000 l / min
- Retail 11,000 l / min

Fire Flow Requirement from Fire Underwriters Survey

Building 'A' & Drive Thru- 1 Storey Retail

Building Floor Area 2,997 m^2

Fire Flow

F = 220C√A

C	0.8		C =	1.5 wood frame
A	2,997	m^2		1.0 ordinary
				0.8 non-combustile
F	9,635	l/min		0.6 fire-resistive
Use	10,000	l/min		

Occupancy Adjustment

			-25%	non-combustile
			-15%	limited combustile
Use	0%		0%	combustile
			+15%	free burning
Adjustment	0	l/min	+25%	rapid burning
Fire flow	10,000	l/min		

Sprinkler Adjustment

			-30%	system conforming to NFPA 13
			-50%	complete automatic system
Use	-30%			
Adjustment	-3000	l/min		

Exposure Adjustment

Building Face	Separation	Charge
north	23	10%
east	> 45	0%
south	20	15%
west	20	15%
Total		40%

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

Adjustment 4,000 l/min

Required Fire Flow

Total adjustments	1,000	l/min
Fire flow	11,000	l/min
Use	**11,000**	**l/min**
	183.3	**l/s**

Fire Flow Requirement from Fire Underwriters Survey

Building 'B' - 5 Storey Hotel Building

Building Floor Area (2 largest adjoining floors plus 50% of floors above up to eight)

Floor 1 & 2	4,318	m^2
50% Floors 3 to 5	3,238	m^2
Total	7,556	m^2

Fire Flow

$F = 220C\sqrt{A}$

C	0.8		C =	1.5	wood frame
A	7,556	m^2		1.0	ordinary
				0.8	non-combustile
F	15,299	l/min		0.6	fire-resistive
Use	15,000	l/min			

Occupancy Adjustment

			-25%	non-combustile
			-15%	limited combustile
Use	0%		0%	combustile
			+15%	free burning
Adjustment	0	l/min	+25%	rapid burning
Fire flow	15,000	l/min		

Sprinkler Adjustment

			-30%	system conforming to NFPA 13
			-50%	complete automatic system
Use	-30%			
Adjustment	-4500	l/min		

Exposure Adjustment

Building Face	Separation	Charge
north	> 45	0%
east	> 45	0%
south	12	15%
west	> 45	0%
Total		15%

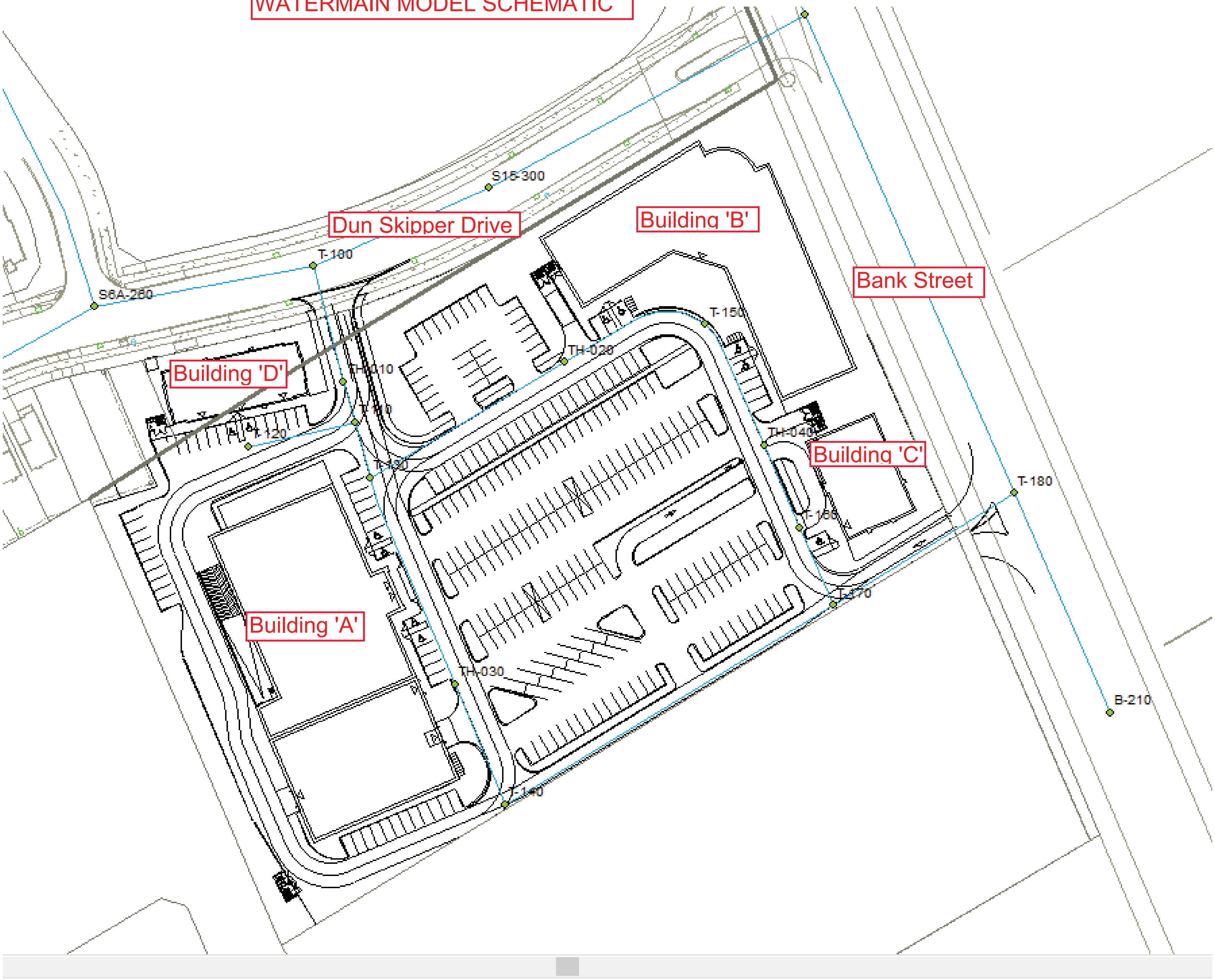
Separation	Charge
0 to 3m	+25%
3.1 to 10m	+20%
10.1 to 20m	+15%
20.1 to 30m	+10%
30.1 to 45m	+5%

Adjustment 2,250 l/min

Required Fire Flow

Total adjustments	(2,250)	l/min
Fire flow	12,750	l/min
Use	**13,000**	**l/min**
	216.7	**l/s**

WATERMAIN MODEL SCHEMATIC



Basic Day (Max HGL) - Junction Report

		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)	Water Age (hrs)
1		B-200	0.68	99.25	155.60	552.18	4.69
2		S15-300	2.34	100.00	155.60	544.84	3.78
3		T-100	0.00	101.50	155.60	530.14	1.00
4		T-110	0.00	102.10	155.60	524.26	3.00
5		T-120	0.10	102.25	155.60	522.79	4.43
6		T-130	0.00	102.50	155.60	520.34	6.21
7		T-140	0.00	102.50	155.60	520.34	6.13
8		T-150	1.30	100.60	155.60	538.95	6.40
9		T-160	0.01	101.00	155.60	535.04	3.00
10		T-170	0.00	100.80	155.60	537.00	2.00
11		T-180	0.00	101.10	155.60	534.06	1.00
12		TH-010	0.00	101.90	155.60	526.22	2.00
13		TH-020	0.00	100.70	155.60	537.97	7.21
14		TH-030	0.00	100.90	155.60	536.02	7.54
15		TH-040	0.00	100.70	155.60	537.97	4.00

		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)	Water Age (hrs)
1	☐	B-200	1.02	99.25	145.10	449.29	0.00
2	☐	S15-300	6.31	100.00	145.10	441.94	0.00
3	☐	T-100	0.00	101.50	145.10	427.24	0.00
4	☐	T-110	0.00	102.10	145.10	421.36	0.00
5	☐	T-120	0.27	102.25	145.10	419.89	0.00
6	☐	T-130	0.00	102.50	145.10	417.44	0.00
7	☐	T-140	0.00	102.50	145.10	417.44	0.00
8	☐	T-150	3.52	100.60	145.10	436.03	0.00
9	☐	T-160	0.04	101.00	145.10	432.13	0.00
10	☐	T-170	0.00	100.80	145.10	434.10	0.00
11	☐	T-180	0.00	101.10	145.10	431.16	0.00
12	☐	TH-010	0.00	101.90	145.10	423.32	0.00
13	☐	TH-020	0.00	100.70	145.10	435.06	0.00
14	☐	TH-030	0.00	100.90	145.10	433.12	0.00
15	☐	TH-040	0.00	100.70	145.10	435.06	0.00

Peak Hour - Pipe Report

		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
1	☐	2107	S15-300	B-200	84.75	393.00	120.00	-1.70	0.01	0.00	0.00	Open	0
2	☐	791	B-200	T-180	127.53	393.00	120.00	-2.72	0.02	0.00	0.00	Open	0
3	☐	P13	T-100	TH-010	25.45	204.00	110.00	1.24	0.04	0.00	0.02	Open	0
4	☐	P15	TH-010	T-110	10.56	204.00	110.00	1.24	0.04	0.00	0.02	Open	0
5	☐	P17	T-110	T-120	27.22	155.00	100.00	0.27	0.01	0.00	0.00	Open	0
6	☐	P19	T-130	T-110	14.44	204.00	110.00	-0.97	0.03	0.00	0.01	Open	0
7	☐	P21	T-130	TH-020	56.42	204.00	110.00	1.54	0.05	0.00	0.03	Open	0
8	☐	P23	T-130	TH-030	55.80	204.00	110.00	-0.57	0.02	0.00	0.00	Open	0
9	☐	P25	TH-030	T-140	32.64	204.00	110.00	-0.57	0.02	0.00	0.00	Open	0
10	☐	P27	TH-020	T-150	39.62	204.00	110.00	1.54	0.05	0.00	0.03	Open	0
11	☐	P29	TH-040	T-150	33.83	204.00	110.00	1.98	0.06	0.00	0.04	Open	0
12	☐	P31	TH-040	T-160	22.30	204.00	110.00	-1.98	0.06	0.00	0.04	Open	0
13	☐	P33	T-160	T-170	21.12	204.00	110.00	-2.02	0.06	0.00	0.04	Open	0
14	☐	P35	T-140	T-170	95.88	204.00	110.00	-0.57	0.02	0.00	0.00	Open	0
15	☐	P39	T-170	T-180	1.00	204.00	110.00	-2.59	0.08	0.00	0.07	Open	0
16	☐	P41	T-100	S15-300	54.54	393.00	120.00	4.61	0.04	0.00	0.01	Open	0
17	☐	P43	C2	T-180	1.00	204.00	110.00	5.32	0.16	0.00	0.25	Open	0
18	☐	P45	C1	T-100	1.00	204.00	110.00	5.84	0.18	0.00	0.30	Open	0

Max Day + Fire (11,000 l/min) - Fireflow Design Report

		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)
1	☐	TH-010	183.33	686.03	TH-010	139.96	116.18	686.04	139.96	139.96
2	☐	TH-030	183.33	434.04	TH-030	139.96	115.18	434.04	139.96	139.96

Max Day + Fire (13,000 l/min) - Fireflow Design Report

		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)
1	☐	S15-300	220.18	2,284.11	S15-300	139.98	114.28	2,284.21	139.96	139.96
2	☐	TH-020	216.67	425.54	TH-020	139.96	114.98	425.54	139.96	139.96
3	☐	TH-040	216.67	486.43	TH-040	139.96	114.98	486.43	139.96	139.96

APPENDIX C

- **Pathways Phase 1 Sanitary Sewer Design Sheet**
- **Drawing 33956-501A – Pathways Phase 1 External Sanitary Drainage Area Plan**
- **Sanitary Sewer Design Sheet**
- **Drawing 119351-400 – Sanitary Drainage Area Plan**

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LEGEND
Red text High level sanitary sewer

SANITARY SEWER DESIGN SHEET

Remer Lands Phase 1
City of ottawa
Leitrim South Holdings Inc. (Regional Group)

LOCATION				RESIDENTIAL										ICI AREAS							INFILTRATION ALLOWANCE			FIXED FLOW (L/s)		TOTAL FLOW	PROPOSED SEWER DESIGN						
STREET	AREA ID	FROM MH	TO MH	AREA w/ Units (Ha)	UNIT TYPES SF	SD	TH	APT	AREA w/o Units (Ha)	POPULATION IND	CUM	PEAK FACTOR	PEAK FLOW (L/s)	AREA (Ha) INSTITUTIONAL IND	CUM	COMMERCIAL IND	CUM	INDUSTRIAL IND	CUM	PEAK FLOW (L/s)	AREA (Ha) IND	CUM	FLOW (L/s)	IND	CUM	(L/s)	CAPACITY (L/s)	LENGTH (m)	DIA (mm)	SLOPE (%)	VELOCITY (full) (m/s)	AVAILABLE CAPACITY L/s	(%)
Dun Skipper Road	6132Aa	MH6132A	MH6133A	0.64	10					32.0	32.0	4.00	0.52		0.00		0.00		0.00	0.00	0.64	0.64	0.18		0.00	0.70	43.28	82.00	200	1.60	1.335	42.58	98.39%
					DRAFT 2016 UPDATED SERVICEABILITY REPORT																												
Street No. 7	EXT2		BLK6133AS						2.88	172.8	172.8	4.00	2.80		0.00		0.00		0.00	0.00	2.88	2.88	0.81										
Street No. 7	6133Ab	BLK6133AS	MH6133A	0.07						0.0	172.8	4.00	2.80		0.00		0.00		0.00	0.00	0.07	2.95	0.83		0.00	3.63	24.19	44.00	200	0.50	0.746	20.57	85.01%
Dun Skipper Road	6133Aa	MH6133A	MH6134A	0.58	10					32.0	236.8	4.00	3.84		0.00		0.00		0.00	0.00	0.58	4.17	1.17		0.00	5.00	37.48	72.14	200	1.20	1.156	32.48	86.65%
Dun Skipper Road	6134A	MH6134A	MH6135A	0.66	12					38.4	275.2	4.00	4.46		0.00		0.00		0.00	0.00	0.66	4.83	1.35		0.00	5.81	28.63	72.09	200	0.70	0.883	22.82	79.70%
Dun Skipper Road	6135A	MH6135A	MH6136A	0.19	3					9.6	284.8	4.00	4.61		0.00		0.00		0.00	0.00	0.19	5.02	1.41		0.00	6.02	28.63	24.81	200	0.70	0.883	22.61	78.97%
					DRAFT 2016 UPDATED SERVICEABILITY REPORT																												
Easement	EXT3	BLK6145A	MH6146A	2.50						250.8	250.8	4.00	4.06		0.00		0.00		0.00	0.00	2.50	2.50	0.70		0.00	4.76	21.64	22.70	200	0.40	0.667	16.88	77.99%
Easement		MH6146A	MH6136A							0.0	250.8	4.00	4.06		0.00		0.00		0.00	0.00	0.00	2.50	0.70		0.00	4.76	21.64	46.46	200	0.40	0.667	16.88	77.99%
					DRAFT 2016 UPDATED SERVICEABILITY REPORT																												
	EXT4	BLK6138A	MH6138A							0.0	0.0	4.00	0.00		0.00	4.07	4.07		0.00	3.53	4.07	4.07	1.14		0.00	4.67	20.24	20.00	200	0.35	0.624	15.57	76.92%
Dun Skipper Road	6138A	MH6138A	MH6137A	0.08						0.0	0.0	4.00	0.00		0.00		4.07		0.00	3.53	0.08	4.15	1.16		0.00	4.69	20.24	32.25	200	0.35	0.624	15.55	76.81%
Dun Skipper Road	6137A	MH6137A	MH6136A	0.10						0.0	0.0	4.00	0.00		0.00		4.07		0.00	3.53	0.10	4.25	1.19		0.00	4.72	20.24	44.44	200	0.35	0.624	15.52	76.67%
Cedar Creek Drive	6136A	MH6136A	MH6121A	0.04						0.0	535.6	3.96	8.59		0.00		4.07		0.00	3.53	0.04	11.81	3.31		0.00	15.43	20.24	28.03	200	0.35	0.624	4.81	23.78%
Cedar Creek Drive	6121A	MH6121A	MH6120A	0.03						0.0	535.6	3.96	8.59		0.00		4.07		0.00	3.53	0.03	11.84	3.32		0.00	15.44	20.24	12.97	200	0.35	0.624	4.81	23.74%
Cedar Creek Drive	6120A	MH6120A	MH6119A	0.10						0.0	535.6	3.96	8.59		0.00		4.07		0.00	3.53	0.10	11.94	3.34		0.00	15.47	20.24	53.29	200	0.35	0.624	4.78	23.60%
Pingwi Place	6132Ab	MH6132A	MH6161A	0.25	3					9.6	9.6	4.00	0.16		0.00		0.00		0.00	0.00	0.25	0.25	0.07		0.00	0.23	56.22	77.03	200	2.70	1.734	56.00	99.60%
Pingwi Place	6161A	MH6161A	MH6162A	0.22	3					9.6	19.2	4.00	0.31		0.00		0.00		0.00	0.00	0.22	0.47	0.13		0.00	0.44	24.19	11.41	200	0.50	0.746	23.75	98.17%
Pingwi Place	6162A	MH6162A	MH6163A	0.62	14					44.8	64.0	4.00	1.04		0.00		0.00		0.00	0.00	0.62	1.09	0.31		0.00	1.34	20.24	74.88	200	0.35	0.624	18.90	93.37%
Pingwi Place	6163A	MH6163A	MH6164A	0.44			12			28.8	92.8	4.00	1.50		0.00		0.00		0.00	0.00	0.44	1.53	0.43		0.00	1.93	20.24	86.35	200	0.35	0.624	18.31	90.46%
Pingwi Place	6164A	MH6164A	MH6119A	0.40			11			26.4	119.2	4.00	1.93		0.00		0.00		0.00	0.00	0.40	1.93	0.54		0.00	2.47	29.63	86.29	200	0.75	0.914	27.16	91.66%
Block 429	COM	BLK6119AE	MH6119A							0.0	0.0	4.00	0.00		0.00	3.01	3.01		0.00	2.61	3.01	3.01	0.84		0.00	3.46	45.12	20.00	300	0.20	0.618	41.66	92.34%
Cedar Creek Drive	6119A	MH6119A	MH6118A	0.05						0.0	654.8	3.91	10.37		0.00		7.08		0.00	6.15	0.05	16.93	4.74		0.00	21.26	45.12	28.01	300	0.20	0.618	23.86	52.88%
Cedar Creek Drive	6118A	MH6118A	MH6117A	0.07						0.0	654.8	3.91	10.37		0.00		7.08		0.00	6.15	0.07	17.00	4.76		0.00	21.28	45.12	33.76	300	0.20	0.618	23.84	52.83%
Block 443	HD1	BLK6117AW	MH6117A	1.03						129.6	129.6	4.00	2.10		0.00		0.00		0.00	0.00	1.03	1.03	0.29		0.00	2.39	20.24	20.00	200	0.35	0.624	17.85	88.20%
Cedar Creek Drive	6117A	MH6117A	MH6116A	0.55			17			40.8	825.2	3.85	12.88		0.00		7.08		0.00	6.15	0.55	18.58	5.20		0.00	24.23	45.12	75.05	300	0.20	0.618	20.89	46.30%
Cedar Creek Drive	6116A	MH6116A	MH6115A	0.52			17			40.8	866.0	3.84	13.47		0.00		7.08		0.00	6.15	0.52	19.10	5.35		0.00	24.96	59.68	67.16	300	0.35	0.818	34.72	58.17%
Salamander Way	6156Aa	MH6156A	MH6157A	0.29	3					9.6	9.6	4.00	0.16		0.00		0.00		0.00	0.00	0.29	0.29	0.08		0.00	0.24	31.55	74.63	200	0.85	0.973	31.31	99.25%
Salamander Way	6157A	MH6157A	MH6158A	0.07			1			2.4	12.0	4.00	0.19		0.00		0.00		0.00	0.00	0.07	0.36	0.10		0.00	0.30	34.22	12.28	200	1.00	1.055	33.92	99.14%
Salamander Way	6158A	MH6158A	MH6153A	0.54			14			33.6	45.6	4.00	0.74		0.00		0.00		0.00	0.00	0.54	0.90	0.25		0.00	0.99	56.22	106.46	200	2.70	1.734	55.23	98.24%
Block 436	PARK	BLK6153C	MH6153A						0.83	0.0	0.0	4.00	0.00		0.00		0.00		0.00	0.00	0.83	0.83	0.23		0.00	0.23	24.19	13.25	200	0.50	0.746	23.96	99.04%
Salamander Way	6153A	MH6153A	MH6154A	0.03						0.0	45.6	4.00	0.74		0.00		0.00		0.00	0.00	0.03	1.76	0.49		0.00	1.23	28.63	10.53	200	0.70	0.883	27.40	95.70%
Salamander Way	6154A	MH6154A	MH6115A	0.13						0.0	45.6	4.00	0.74		0.00		0.00		0.00	0.00	0.13	1.89	0.53		0.00	1.27	24.19	76.18	200	0.50	0.746	22.93	94.76%
Cedar Creek Drive	6115A	MH6115A	MH6101A	0.61			18			43.2	954.8	3.81	14.75		0.00		7.08		0.00	6.15	0.61	21.60	6.05		0.00	26.94	59.68	87.15	300	0.35	0.818	32.74	54.86%
Miikana Road	6101A	MH6101A	MH6102A	0.45			11			26.4	981.2	3.81	15.13		0.00		7.08		0.00	6.15	0.45	22.05	6.17		0.00	27.45	59.68	91.17	300	0.35	0.818	32.24	54.01%
Block 436	HD2	BLK6102AS	MH6102A	0.94						115.2	115.2	4.00	1.87		0.00		0.00		0.00	0.00	0.94	0.94	0.26		0.00	2.13	20.24	20.00	200	0.35	0.624	18.11	89.48%
Miikana Road	6102A	MH6102A	MH6103A	0.23			6			14.4	1110.8	3.77	16.96		0.00		7.08		0.00	6.15	0.23	23.22	6.50		0.00	29.61	59.68	41.44	300	0.35	0.818	30.07	50.38%
Miikana Road	6103A	MH6103A	MH6104A	0.66			18			43.2	1154.0	3.76	17.57		0.00		7.08		0.00	6.15	0.66	23.88	6.69		0.00	30.40	59.68	120.00	300	0.35	0.818	29.28	49.06%
Block 450	INST	BLK6104AS	MH6104A							0.0	0.0	4.00	0.00	2.55	2.55		0.00		0.00	2.21	2.55	2.55	0.71		0.00	2.93	20.24	20.00	200	0.35	0.624	17.32	85.54%
Miikana Road	6104A	MH6104A	MH6105B	0.60			15			36.0	1190.0	3.75	18.08		2.55		7.08		0.00	8.36	0.60	27.03	7.57		0.00	34.01	59.68	114.40	300	0.35	0.818	25.68	43.02%
Miikana Road		MH6105B	*EX. MH647A*							0.0	1190.0	3.75	18.08		2.55		7.08		0.00	8.36	0.00	27.03	7.57		0.00	34.01	45.12	8.00	300	0.20	0.618	11.11	24.63%
Kelly Farm Drive		*EX. MH647A*	*EX. MH742A*	*0.28*			*5*			*12.0*	3587.6	3.38	49.05		2.55		7.08		0.00	8.36	0.28	75.56	21.16		0.00	78.57	101.84	*80.31*	*375*	*0.31*	0.893	23.27	22.85%

Design Parameters:

Residential			ICI Areas			Peak Factor
SF	3.2	p/p/u	INST	50,000	L/Ha/day	1.5
TH/SD	2.4	p/p/u	COM	50,000	L/Ha/day	1.5
APT	1.9	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): 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

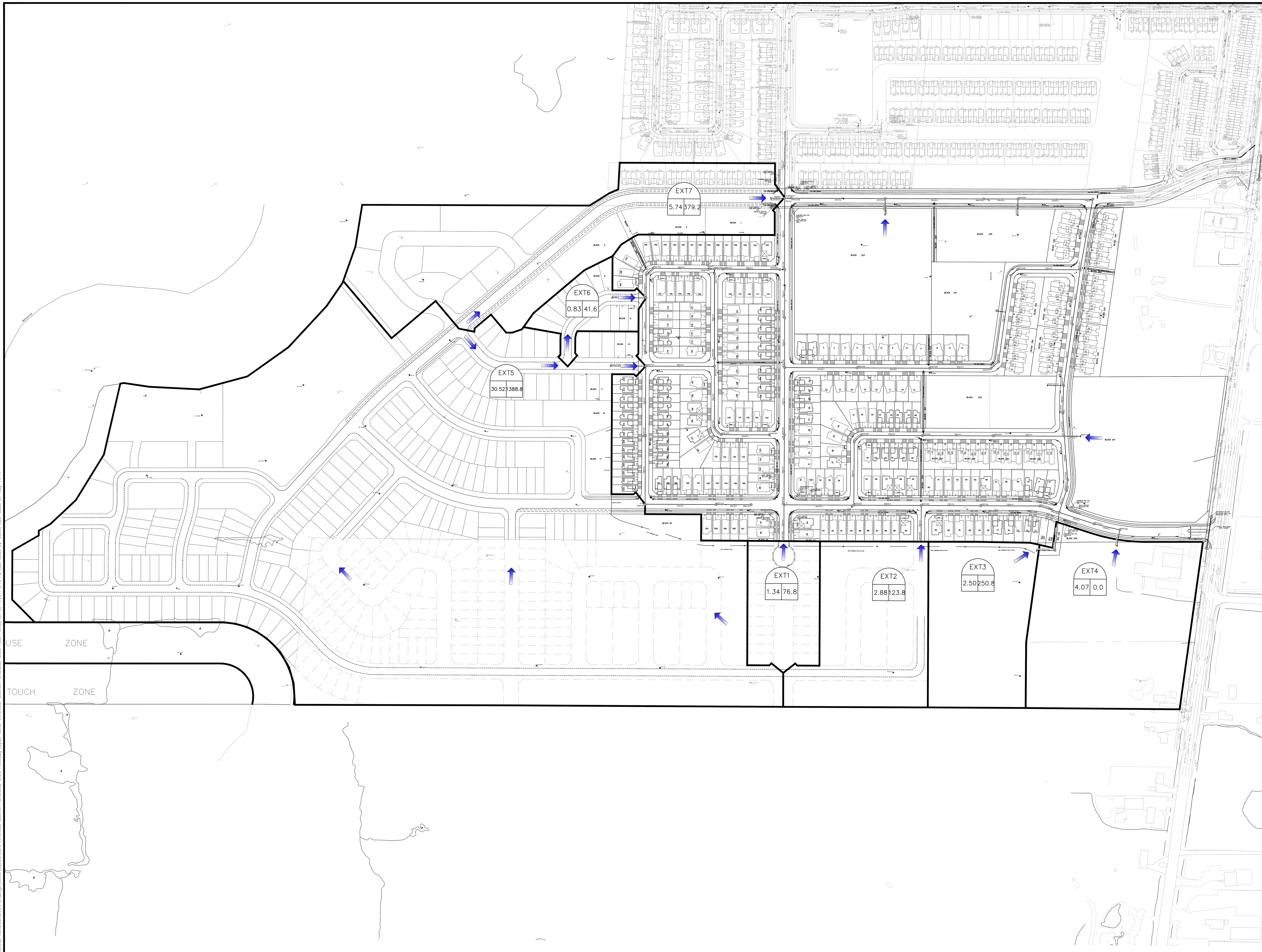
Designed: WY

Checked: JM

Dwg. Reference: 501, 501A

No.	Revision	Date
1.	City Submission No. 1	2016-11-23
2.	City Submission No. 2	2017-05-12
3.	City Submission No. 3	2017-07-05
4.	Updated Street Name for MOE Submission	2017-08-03

File Reference: 33956.5.7.1 | Date: 2017-05-10 | Sheet No: 2 of 2



REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ____________________

Date ____________________ 2017

Plan Number ____________________

LEGEND :

EXT3	AREA NUMBER
2.50	AREA IN HECTARES
250.8	RUNOFF COEFFICIENT
➡	FUTURE FLOW DIRECTION

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5	REVISED BLOCK NUMBERS	J.I.M.	2017:08:11
4	RE-SUBMISSION FOR MOECC APPROVAL & REVISED STREET NAMES	J.I.M.	2017:08:02
3	SUBMISSION FOR MOECC APPROVAL	J.I.M.	2017:07:07
2	SUBMISSION No.2 FOR CITY REVIEW	J.I.M.	2017:05:12
1	SUBMISSION No.1 FOR CITY REVIEW	J.I.M.	2016:11:23

LEITRIM SOUTH
HOLDINGS INC.

IBI GROUP
400 – 333 Preston Street
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tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title

pathways
at FINDLAY CREEK

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2017/08/02
PROVINCE OF ONTARIO

N

Drawing Title

EXTERNAL SANITARY
DRAINAGE AREA PLAN

Scale 1 : 1000

Design	Date
J.I.M.	NOV 2016
Drawn	**Checked**
D.D.	----
Project No.	**Drawing No.**
33956	501A

D07-16-13-0023

#17367

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SANITARY SEWER DESIGN SHEET

4836 Bank Street
CITY OF OTTAWA
Home Hardware

LOCATION: STREET	LOCATION: AREA ID	LOCATION: FROM MH	LOCATION: TO MH	RESIDENTIAL: AREA w/ Units (Ha)	UNIT TYPES: SF	UNIT TYPES: SD	UNIT TYPES: TH	UNIT TYPES: APT	AREA w/o Units (Ha)	POPULATION: IND	POPULATION: CUM	RES PEAK FACTOR	PEAK FLOW (L/s)	ICI AREAS: AREA (Ha) INSTITUTIONAL: IND	INSTITUTIONAL: CUM	COMMERCIAL: IND	COMMERCIAL: CUM	INDUSTRIAL: IND	INDUSTRIAL: CUM	ICI PEAK FACTOR	PEAK FLOW (L/s)	INFILTRATION ALLOWANCE: AREA (Ha) IND	AREA (Ha) CUM	FLOW (L/s)	FIXED FLOW (L/s): IND	FIXED FLOW (L/s): CUM	TOTAL FLOW (L/s)	PROPOSED SEWER DESIGN: CAPACITY (L/s)	LENGTH (m)	DIA (mm)	SLOPE (%)	VELOCITY (full) (m/s)	AVAILABLE CAPACITY L/s	AVAILABLE CAPACITY (%)
		BLDG D	MH7A-MH5A							0.0	0.0	3.80	0.00			0.05	0.05			1.50	0.02	0.05	0.05	0.02	0.00	0.00	0.04	34.22	11.10	200	1.00	1.055	34.18	99.88%
		BLDG A	MH7A-MH5A							0.0	0.0	3.80	0.00			0.30	0.30			1.50	0.15	0.30	0.30	0.10	0.00	0.00	0.24	34.22	14.61	200	1.00	1.055	33.97	99.28%
		MH7A	MH5A							0.0	0.0	3.80	0.00			1.01	1.01			1.50	0.49	1.01	1.01	0.33	0.00	0.00	0.82	27.59	32.62	200	0.65	0.851	26.76	97.01%
		BLDG C	MH1A-MH2A							0.0	0.0	3.80	0.00			0.06	0.06			1.50	0.03	0.06	0.06	0.02	0.00	0.00	0.05	34.22	12.70	200	1.00	1.055	34.17	99.86%
Idone Commercial		MH1A	MH2A							0.0	0.0	3.80	0.00			2.35	2.35			1.50	1.14	2.35	2.35	0.78	0.00	0.00	1.92	20.24	83.16	200	0.35	0.624	18.32	90.53%
		BLDG B	MH2A-MH3A							0.0	0.0	3.80	0.00			0.22	0.22			1.50	0.11	0.22	0.22	0.07	0.00	0.00	0.18	34.22	17.46	200	1.00	1.055	34.04	99.48%
		MH2A	MH3A							0.0	0.0	3.80	0.00			0.37	2.72			1.50	1.32	0.37	2.72	0.90	0.00	0.00	2.22	20.24	12.25	200	0.35	0.624	18.02	89.03%
		MH3A	MH4A							0.0	0.0	3.80	0.00			0.15	2.87			1.50	1.40	0.15	2.87	0.95	0.00	0.00	2.34	20.24	68.50	200	0.35	0.624	17.90	88.43%
		MH4A	MH5A							0.0	0.0	3.80	0.00			0.02	2.89			1.50	1.40	0.02	2.89	0.95	0.00	0.00	2.36	20.24	14.90	200	0.35	0.624	17.88	88.35%
		MH5A	MH6A							0.0	0.0	3.80	0.00			0.17	4.07			1.50	1.98	0.17	4.07	1.34	0.00	0.00	3.32	20.24	33.69	200	0.35	0.624	16.92	83.59%

Design Parameters:

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

MOE Chart

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

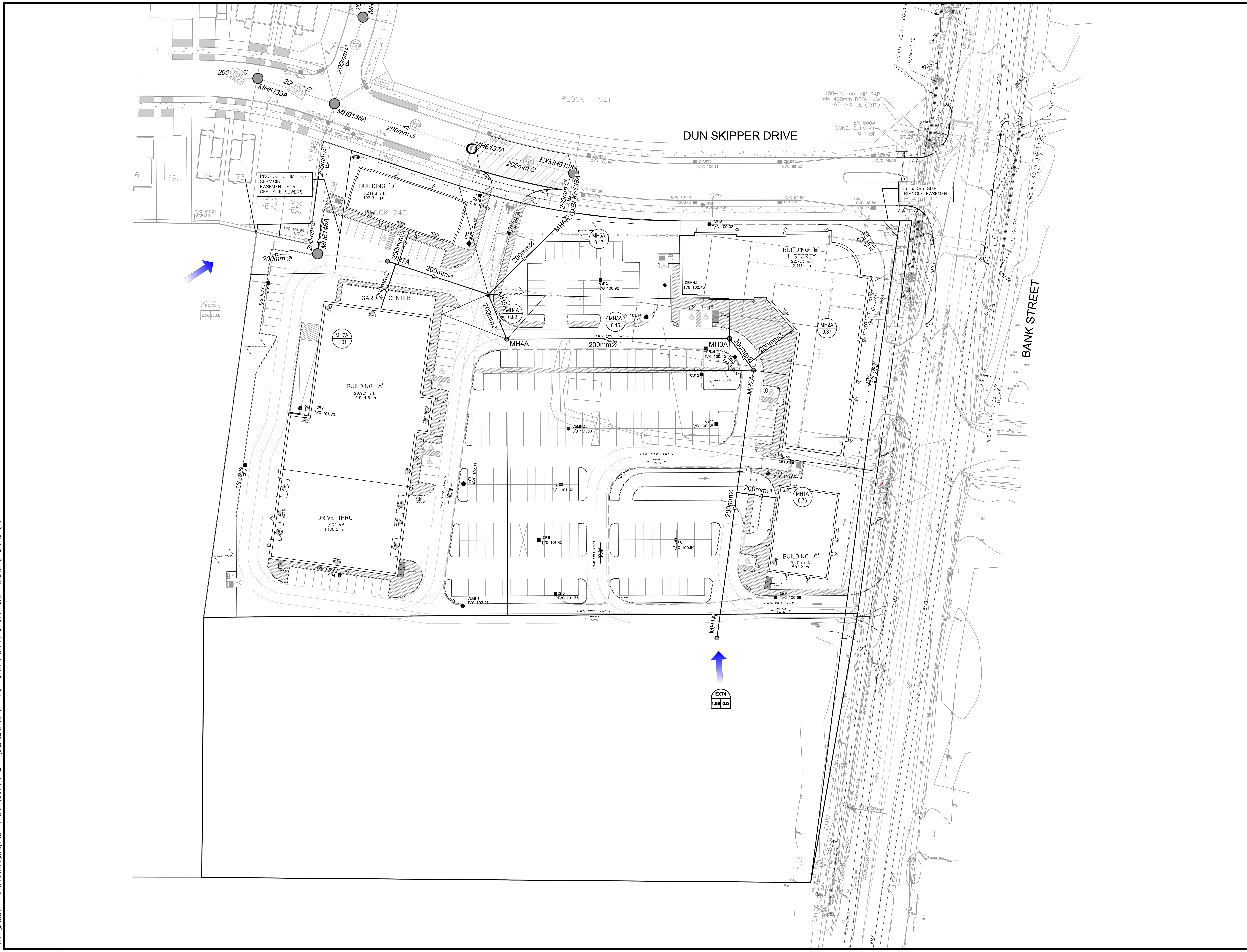
Designed: SEL

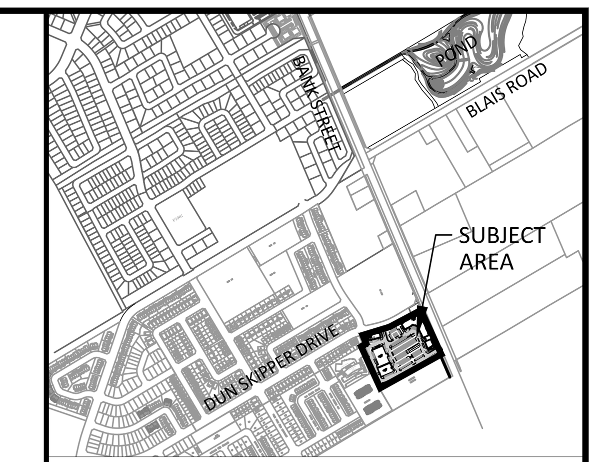
Checked: JIM

Dwg. Reference: 119351-501

No.	Revision	Date
1.	Report Name (Master Servicing Study, Adequacy of Public Services, Servicing Brief, ect) - Submission No. 1	2019-03-30

File Reference:	Date:	Sheet No:
119351.5.7.1	2019-03-30	1 of 1





N
KEY PLAN
(NTS)

NOTES:
1. SEE DRAWING C-010 FOR ADDITIONAL DETAILS AND NOTES.

2. SITE BENCHMARK TO BE OBTAINED FROM LEGAL SURVEYOR H.A. KEN SHIPMAN SURVEYING LTD.

LEGEND :
6115A — EXISTING AREA NUMBER
0.81 | 43.2 — EXISTING POPULATION
EXISTING AREA IN HECTARES
FUTURE FLOW DIRECTION
MH2A — EXISTING AREA NUMBER
0.37 — EXISTING AREA IN HECTARES
MH2A — AREA NUMBER
0.37 — AREA IN HECTARES

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4	REVISED AS PER CITY COMMENTS	JIM	2020:04:20
3	REVISED AS PER CITY COMMENTS	JIM	2019:12:09
2	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	JIM	2019:10:11
1	ISSUED FOR SPA	JIM	2019:04:15

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Project Title
BANK STREET DEVELOPMENT
4836 BANK STREET

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2020/04/20
PROVINCE OF ONTARIO

N

Drawing Title
SANITARY DRAINAGE AREA PLAN

Scale
1 : 500

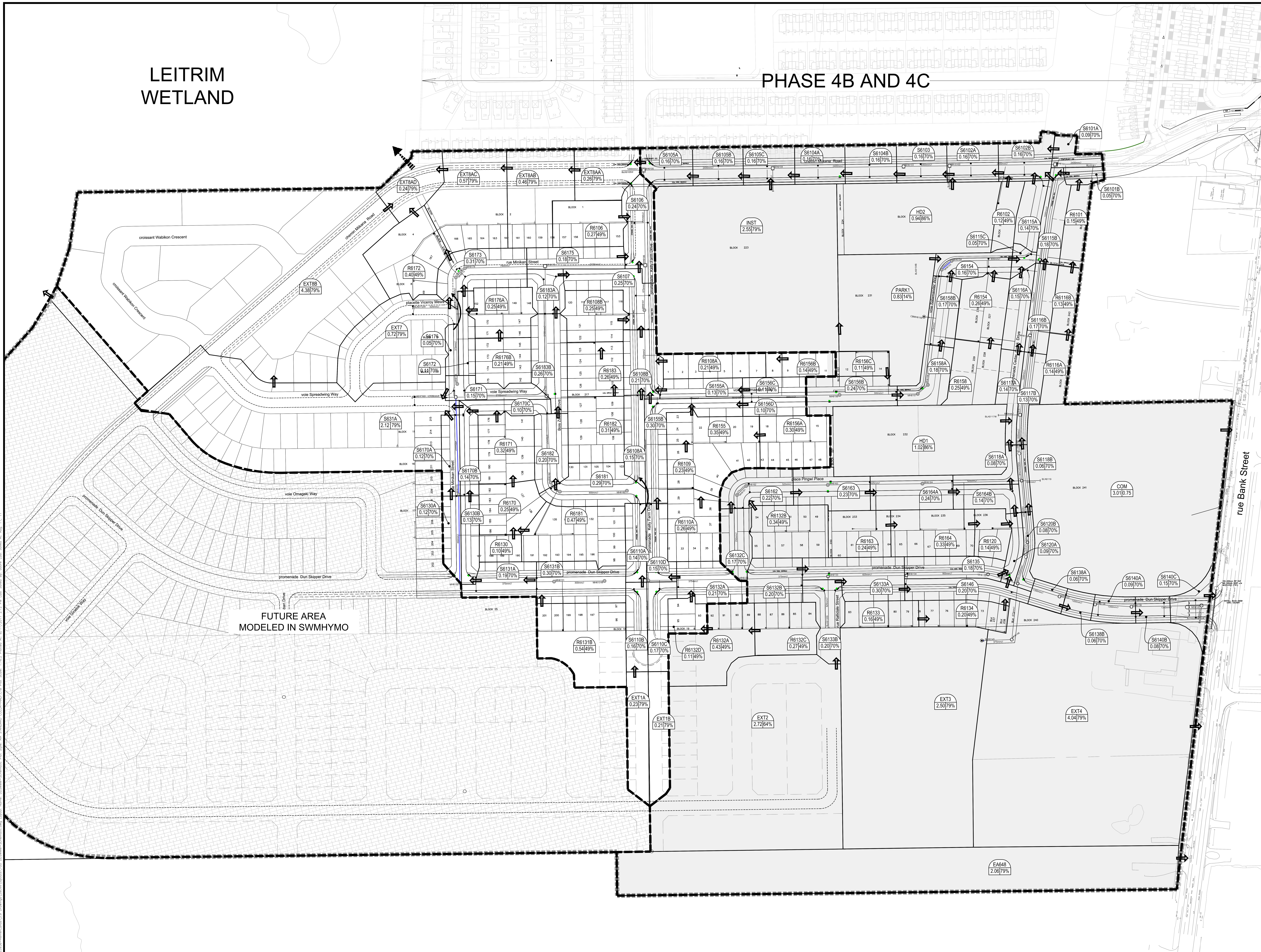
Design	SEL	Date	FEB. 2019
Drawn	DPS	Checked	JIM
Project No.	119351	Drawing No.	400

D07-12-19-0092

#17977

APPENDIX D

- **Pathways Phase 1 Storm Sewer Design Sheet**
- **Drawing 33956-500A – Pathways Phase 1 External Storm Drainage Area Plan**
- **Drawing 33956-700 – DDSWMM Schematic from Pathways Phase 1**
- **Excerpts from Design Brief Pathways at Findlay Creek 4800 Bank Street (Remer Lands) Phase 1 Leitrim Development Area (IBI Group, August 2017)**
- **Storm Sewer Design Sheet**
- **Drawing 119351-500 – Storm Drainage Area Plan**



LEGEND:

- PHASE 1 EAST DRAINAGE AREA MODELED IN DDSWMM
- PHASE 1 WEST DRAINAGE AREA MODELED IN DDSWMM
- FUTURE DRAINAGE AREA MODELED IN DDSWMM
- PHASE 1 DRAINAGE BOUNDARY
- DDSWMM MODELS DRAINAGE BOUNDARIES
- SUBCATCHMENT DRAINAGE BOUNDARY

S208 — AREA ID
0.19 | 71 — Imp.(%)/Tp.(hr)
AREA (ha)

- MAJOR FLOW
- MAJOR FLOW TO WETLAND

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5	REVISED BLOCK NUMBERS	D.D.	2017:08:11
4	RE-SUBMISSION FOR MOECC APPROVAL & REVISED STREET NAMES	R.B.	2017:08:02
3	SUBMISSION FOR MOECC APPROVAL	R.B.	2017:07:07
2	SUBMISSION NO.2 FOR CITY REVIEW	R.B.	2017:05:12
1	SUBMISSION NO.1 FOR CITY REVIEW	R.B.	2016:11:23

LEITRIM SOUTH HOLDINGS INC.

IBI

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Project Title

pathways at FINDLAY CREEK

LICENSED PROFESSIONAL ENGINEER
R.F.D. BROWN
100078940
2017/08/02
PROVINCE OF ONTARIO

N

Drawing Title

DDSWMM SCHEMATIC

Scale
1:1500

Design	Date
R.B.	NOV 2016
Drawn	**Checked**
J.F.	R.B.
Project No.	**Drawing No.**
33956	700

D07-XX-XX-XXXX

#17367

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STORM SEWER DESIGN SHEET

Pathways at FINDLAY CREEK
City of Ottawa
Leitrim South Holdings Inc. (Regional Group)

LEGEND
Black text 5 year event curve design
Red text 10 year event curve design (Earl Armstrong Road)

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW													SEWER DATA								
STREET	AREA ID	FROM	TO	C= 0.15	C= 0.30	C= 0.40	C= 0.54	C= 0.61	C= 0.65	C= 0.69	C= 0.71	C= 0.75	C= 0.80	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	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 (5yr) (L/s)	(%)
	EXT 2			DRAFT 2016 UPDATED SERVICEABILITY REPORT											4.92			12.88																	
Street No. 7	S6133B	BLK6133S	MH6133					0.20						0.34	5.25	12.88	0.33	13.21	91.10	106.72	155.91	478.64				478.64	1,296.87	47.00	825			0.75	2.350	818.23	63.09%
Dun Skipper Road	S6132B, R6132A, R6132C	MH6132	MH6133				0.70	0.20						1.39	1.39	10.00	1.04	11.04	104.19	122.14	178.56	144.83				144.83	149.72	82.07	375			0.67	1.313	4.89	3.27%
Dun Skipper Road	S6133A, R6133	MH6133	MH6134				0.16	0.30						0.75	7.39	13.21	0.40	13.61	89.81	105.21	153.69	663.99				663.99	1,640.43	71.48	825			1.20	2.973	976.44	59.52%
Dun Skipper Road	R6134	MH6134	MH6135				0.20							0.30	7.69	13.61	0.52	14.13	88.32	103.45	151.12	679.48				679.48	1,580.10	74.61	900			0.70	2.406	900.63	57.00%
Dun Skipper Road	S6135	MH6135	MH6136					0.18						0.31	8.00	14.13	0.20	14.33	86.47	101.28	147.93	691.68				691.68	1,580.10	28.36	900			0.70	2.406	888.43	56.23%
				DRAFT 2016 UPDATED SERVICEABILITY REPORT																															
				DRAFT 2016 UPDATED SERVICEABILITY REPORT																															
	EXT 4	BLK900	MH6140									4.04		8.42	16.42	15.74	0.16	15.90	81.24	95.13	138.90	1,334.13				1,742.71	2,490.17	16.00	1350			0.20	1.685	747.46	30.02%
	EXT 5	BLK900	MH6140									2.06		4.30	4.30	15.74	0.16	15.90	81.24	95.13	138.90		408.58			1,742.71	2,490.17	16.00	1350			0.20	1.685	747.46	30.02%
Dun Skipper Road	S6140A-C	MH6140	MH6139							0.22				0.42	16.84	15.90	0.73	16.63	80.76	94.57	138.07	1,360.38				1,766.55	2,156.55	64.00	1350			0.15	1.460	390.00	18.08%
		MH6140	MH6139											0.00	4.30	15.90	0.73	16.63	80.76	94.57	138.07		406.17			1,766.55	2,156.55	64.00	1350			0.15	1.460	390.00	18.08%
Dun Skipper Road	S6139	MH6139	MH6138							0.08				0.15	17.00	16.63	0.38	17.01	78.64	92.07	134.41	1,336.66				1,732.10	2,156.55	33.27	1350			0.15	1.460	424.45	19.68%
		MH6139	MH6138											0.00	4.30	16.63	0.38	17.01	78.64	92.07	134.41		395.44			1,732.10	2,156.55	33.27	1350			0.15	1.460	424.45	19.68%
Dun Skipper Road	S6138	MH6138	MH6137							0.08				0.15	17.15	17.01	0.38	17.39	77.58	90.83	132.59	1,330.61				1,720.72	2,156.55	33.26	1350			0.15	1.460	435.83	20.21%
		MH6138	MH6137											0.00	4.30	17.01	0.38	17.39	77.58	90.83	132.59		390.11			1,720.72	2,156.55	33.26	1350			0.15	1.460	435.83	20.21%
Dun Skipper Road		MH6137	MH6136											0.00	17.15	17.39	0.46	17.84	76.56	89.62	130.82	1,313.04				1,697.97	2,156.55	39.90	1350			0.15	1.460	458.57	21.26%
		MH6137	MH6136											0.00	4.30	17.39	0.46	17.84	76.56	89.62	130.82		384.93			1,697.97	2,156.55	39.90	1350			0.15	1.460	458.57	21.26%
Temp Ditch		DI 1	BLK6145		6.71									5.60	5.60	49.35	0.01	49.36	38.01	44.39	64.57	212.72				212.72	448.66	1.00	525			1.00	2.008	235.93	52.59%
				DRAFT 2016 UPDATED SERVICEABILITY REPORT																															
Easement	EXT 3	BLK6145	MH6146									2.50		5.21	9.51	12.00	0.26	12.26	94.70	110.96	162.13	900.33				900.33	1,280.55	25.77	975			0.30	1.662	380.22	29.69%
Easement	S6146	MH6146	MH6136					0.21						0.36	9.86	12.26	0.52	12.77	93.61	109.68	160.25	923.30				923.30	1,280.55	51.42	975			0.30	1.662	357.24	27.90%
Cedar Creek Drive		MH6136	BEND6121											0.00	35.01	17.84	0.23	18.08	75.37	88.22	128.77	2,638.86				3,017.79	3,297.98	25.33	1500			0.20	1.808	280.19	8.50%
		BEND6121	MH6120											0.00	35.01	18.08	0.12	18.20	74.77	87.52	127.74	2,618.06				2,993.99	3,297.98	13.56	1500			0.20	1.808	303.99	9.22%
		MH6136	BEND6121											0.00	4.30	17.84	0.23	18.08	75.37	88.22	128.77		378.93			3,017.79	3,297.98	25.33	1500			0.20	1.808	280.19	8.50%
		BEND6121	MH6120											0.00	4.30	18.08	0.12	18.20	74.77	87.52	127.74		375.93			2,993.99	3,297.98	13.56	1500			0.20	1.808	303.99	9.22%
Cedar Creek Drive	S6120, R6120	MH6120	MH6119				0.14			0.17				0.54	35.55	18.08	0.52	18.60	74.77	87.52	127.74	2,658.16				3,034.08	3,297.98	56.40	1500			0.20	1.808	263.90	8.00%
		MH6120	MH6119											0.00	4.30	18.08	0.52	18.60	74.77	87.52	127.74		375.93			3,034.08	3,297.98	56.40	1500			0.20	1.808	263.90	8.00%
Pingwi Place	S6132C, R6132B	MH6132	MH6161				0.34	0.17						0.80	0.80	10.00	0.64	10.64	104.19	122.14	178.56	83.22				83.22	101.94	76.86	250			2.70	2.012	18.72	18.37%
Pingwi Place		MH6161	MH6162											0.00	0.80	10.64	0.12	10.76	100.95	118.32	172.94	80.62				80.62	182.91	11.65	375			1.00	1.604	102.29	55.92%
Pingwi Place	S6162	MH6162	MH6163					0.21						0.36	1.15	10.76	1.39	12.14	100.35	117.62	171.92	115.89				115.89	200.65	74.71	525			0.20	0.898	84.76	42.24%
Pingwi Place	S6163, R6163	MH6163	MH6164				0.24			0.23				0.80	1.96	12.14	1.21	13.36	94.08	110.24	161.07	184.05				184.05	265.43	86.36	525			0.35	1.188	81.37	30.66%
Pingwi Place	S6164A-B, R6164	MH6164	MH6119				0.33			0.38				1.22	3.18	13.36	0.87	14.22	89.27	104.58	152.76	283.94				283.94	388.55	90.57	525			0.75	1.739	104.60	26.92%
Block 429	COM	BLK6119	MH6119									3.01		6.28	6.28	12.00	0.22	12.22	94.70	110.96	162.13	594.30				594.30	844.60	17.00	900			0.20	1.286	250.30	29.64%
Cedar Creek Drive	S6118	MH6119	BEND6118							0.14				0.27	45.27	18.60	0.19	18.79	73.49	86.01	125.53	3,327.09				3,696.53	4,039.18	25.02	1500			0.30	2.214	342.66	8.48%
		BEND6118	MH6117											0.00	45.27	18.79	0.26	19.05	73.03	85.48	124.74	3,306.54				3,673.69	4,039.18	35.20	1500			0.30	2.214	365.50	9.05%
		MH6119	BEND6118											0.00	4.30	18.60	0.19	18.79	73.49	86.01	125.53		369.43			3,696.53	4,039.18	25.02	1500			0.30	2.214	342.66	8.48%
		BEND6118	MH6117											0.00	4.30	18.79	0.26	19.05	73.03	85.48	124.74		367.14			3,673.69	4,039.18	35.20	1500			0.30	2.214	365.50	9.05%
Block 443	HD1	BLK6117W	MH6117										1.02	2.27	2.27	12.00	0.30	12.30	94.70	110.96	162.13	214.82				214.82	320.28	20.00	600			0.25	1.097	105.46	32.93%
Cedar Creek Drive	S6117	MH6117	MH6116							0.27				0.52	48.06	19.05	0.51	19.56	72.41	84.74	123.66	3,479.86				3,843.83	4,362.82	73.12	1500			0.35	2.392	518.99	11.90%
		MH6117	MH6116											0.00	4.30	19.05	0.50	19.56	72.41	84.74	123.66		363.97			3,843.83	4,362.82	72.31	1500			0.35	2.392	518.99	11.90%
Cedar Creek Drive	S6116, R6116A-B	MH6116	MH6115				0.27			0.34				1.06	49.12	19.56	0.41	19.97	71.23	83.36	121.64	3,498.73				3,856.77	5,214.57	69.61	1500			0.50	2.859	1357.80	26.04%
Cedar Creek Drive		MH6116	MH6115											0.00	4.30	19.56	0.40	19.96	71.23	83.36	121.64		358.04			3,856.77	5,214.57	69.28	1500			0.50	2.859	1357.80	26.04%
Salamander Way	S6156B, R6156C	MH6156	MH6157				0.11	0.24						0.57	0.57	10.00	0.93	10.93	104.19	122.14	178.56	59.61				59.61	93.01	71.45	300			0.85	1.275	33.40	35.91%
Salamander Way		MH6157	MH6158											0.00	0.57	10.93	0.15	11.08	99.50	116.62	170.45	56.93				56.93	100.88	12.31	300			1.00	1.383	43.95	43.57%
Salamander Way	S6158A-B, R6158	MH6158	MH6153				0.25			0.35				1.05	1.62	11.08	0.67	11.75	98.80	115.79	169.23	159.94				159.94	300.55	105.99	375			2.70	2.636	140.61	46.78%
Block 438 (Park)	PARK1	BLK6153B	MH6153		0.83									0.69	0.69	11.00	0.16	11.16	99.19	116.25	169.91	68.66				68.66	100.88	13.00	300			1.00	1.383	32.22	31.94%
Salamander Way		MH6153	MH6154											0.00	2.31	11.75	0.13	11.88	95.76	112.22	163.98	221.31				221.31	248.85	11.90	450			0.70	1.516	27.54	11.07%
Salamander Way	S6154, R6154	MH6154	MH6115				0.26			0.16				0.70	3.01	11.88	0.86	12.75	95.20	111.55	163.00	286.37				286.37	452.94	80.33	600			0.50	1.552	166.57	36.78%
Cedar Creek Drive	S6115	MH6115	MH6101							0.33				0.63	52.76	19.97	0.51	20.48	70.32	82.30	120.08	3,710.31				4,063.81	5,214.57	88.17	1500			0.50	2.859	1150.76	22.07%
Cedar Creek Drive		MH6115	MH6101											0.00	4.30	19.96	0.52	20.48	70.33	82.30	120.08		353.50			4,063.81	5,214.57	88.50	1500			0.50	2.859	1150.76	22.07%
Miikana Road	S6101A-B,R6101	MH6101	BLK6101				0.15			0.14				0.49	151.62	30.13	0.23	30.36	53.77	62.86	91.59	8,151.91				8,421.89	12,912.88	38.34	2400			0.25	2.765	4490.99	34.78%
Miikana Road		MH6101	BLK6101											0.00	4.30	30.13	0.23	30.36	53.77	62.86	91.59		269.98			8,421.89	12,912.88	38.34	2400			0.25	2.765	4490.99	34.78%
Dun Skipper culvert				31.15										12.99	12.99	92.20	0.39	92.59	23.84	27.80	40.35	309.73				309.73	452.94	36.00	600			0.50	1.552	143.21	31.62%

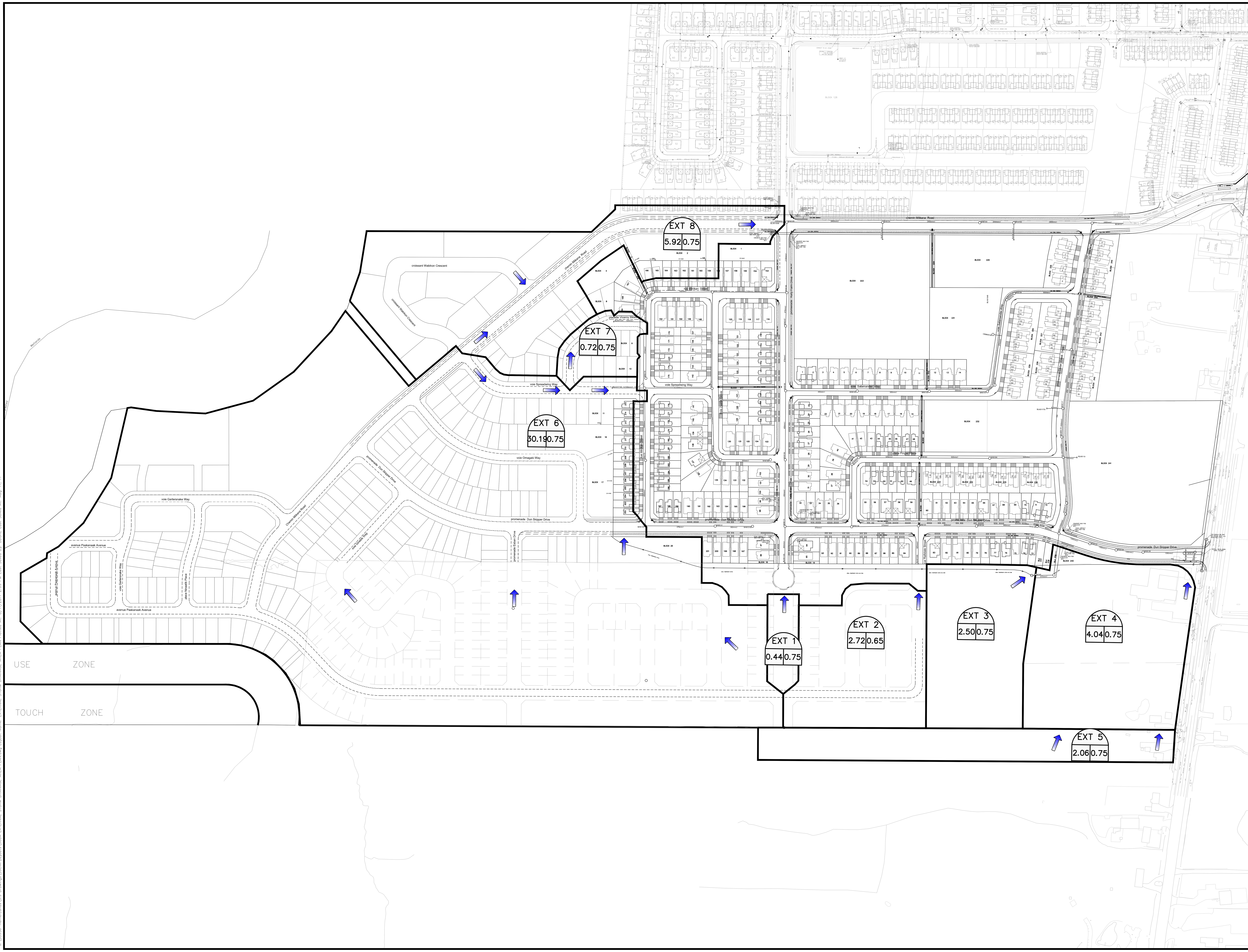
Definitions:
Q = 2.78CiA, where:
Q = Peak Flow in Litres per Second (L/s)
A = Area in Hectares (Ha)
i = Rainfall intensity in millimeters per hour (mm/hr)
[i = 998.071 / (TC+6.053)^0.814] 5 YEAR
[i = 1174.184 / (TC+6.014)^0.816] 10 YEAR
[i = 1735.688 / (TC+6.014)^0.820] 100 YEAR

Notes:
1. Mannings coefficient (n) = 0.013

Designed: W.Y.
Checked: J.M.
Dwg. Reference: 500, 500A

No.	Revision	Date
1.	City submission No. 1	2016-11-23
2.	City Submission No. 2	2017-05-12
3.	City Submission No. 3	2017-07-06
4.	Updated Street Name for MOE Submission	2017-08-03

File Reference: 33956.5.7.1
Date: 2017-05-10
Sheet No: 2 of 2



REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ____________________

Date ____________________ 2017

Plan Number ____________________

LEGEND :

EXT 1 — AREA NUMBER

0.44 0.75 — RUNOFF COEFFICIENT

AREA IN HECTARES

FUTURE MINOR FLOW DIRECTION

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5	REVISED BLOCK NUMBERS	J.I.M.	2017:08:11
4	RE-SUBMISSION FOR MOECC APPROVAL & REVISED STREET NAMES	J.I.M.	2017:08:02
3	SUBMISSION FOR MOECC APPROVAL	J.I.M.	2017:07:07
2	SUBMISSION No.2 FOR CITY REVIEW	J.I.M.	2017:05:12
1	SUBMISSION No.1 FOR CITY REVIEW	J.I.M.	2016:11:23

LEITRIM SOUTH HOLDINGS INC.

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Project Title

pathways at FINDLAY CREEK

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2017/08/02
PROVINCE OF ONTARIO

N

Drawing Title

EXTERNAL STORM DRAINAGE AREA PLAN

Scale 1 : 2000

Design	Date
J.I.M.	NOV 2016
Drawn	**Checked**
D.D.	----
Project No.	**Drawing No.**
33956	500A

D07-16-13-0023

#17367

REPORT
Project: 33956-5.2.2

DESIGN BRIEF
PATHWAYS AT FINDLAY CREEK
4800 BANK STREET
(REMER LANDS)
PHASE 1
LEITRIM DEVELOPMENT AREA

Prepared for LEITRIM SOUTH HOLDINGS INC.
by IBI GROUP

REVISED: AUGUST, 2017

was not accounted for as available on-site storage. Inlet restriction was also proposed for rear yards and overflow from the rear yards cascades to a major system street segment via swales.

Major System Storage Attenuation and Routing (Double Routing)

For street segments, the cascading overflow to the next segment or low point, utilizes the static storage available plus an additional amount of storage equivalent to the depth required for the flow to carry over the 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.

The DDSWMM model 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, an alternative method was employed where the overflow from a street segment (regular static storage at a sag) is conveyed to a dummy segment. In other words, a regular low point segment was provided with a downstream dummy segment for further flow attenuation to account for the dynamic ponding during overflow.

The dummy segment does not have any drainage area attributes associated with it since it is a segment 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 specific characteristics which are noted below:

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

- Road Type – equivalent to appropriate right-of-way characteristics from the segment contributing to it, and with a minimum longitudinal slope of 0.01% (0.0001 m/m).

The double routing method noted above applied to DDSWMM, is a feasible method outlined in the February 2014 Technical Bulletin ISDTB 2014-01.

The dummy segments for major system routing were applied to the analysis of the subject site. The segments are referenced as D1, D2, D3, etc. within the DDSWMM modelling file. The DDSWMM schematic presented in **Drawing 700** does not show the dummy segments, but DDSWMM computer output file shows the dummy segments immediately following the corresponding major segment which cascades into that dummy segment.

Future Lands

In addition to the above noted assumptions with respect to Phase 1 Pathways at Findlay Creek, the following assumptions were used to model the minor and major system flow from the future areas which are tributary to and contribute flow (minor and major) to the subject site. A summary of the areas, storages, inflows and parameter assumptions are provided in **Table 4.4**.

- Commercial Sites (DDSWMM ID: COM and EXT4)

  These commercial areas were assumed to be restricted to the 5 year modeled flow. It was also assumed that full on-site storage will be provided in both sites (all major flow contained on-site up to and including the 100 year event). Emergency overflow for both sites will be routed to Bank Street (DDSWMM ID BANK).

† Pathways at Findlay Creek Phase 1 West modeled flow is from the DDSWMM output file 33956-PH1W-3CHI2.out, 33956-PH1W-3CHI5.out and 33956-PH1W-3CHI100.out which are all presented on the CD in **Appendix E**.

The assigned size of the inlet control devices (ICDs) for the subject site was optimized using DDSWMM. ICDs are incorporated into the stormwater management design to protect the minor system from surcharge during major storm events. The ICDs used for Phase 1 are provided on **Drawing 010**. It should be noted that due to the increased minor system capture at low points flow, there were a few instances where the flow restriction into the minor system was the capacity of the CB inlet. These include one CB on S6115B, one CB on S6183A, one CB on S6107 (indicated in bold in **Table 4.4**). Calculations demonstrating the capacity of the CBs within a road sag is presented in **Appendix E**. In addition, there are two instances where the CB lead is the restriction for the inflow to the minor system. These include S6115B and S6155B. Calculations supporting the lead size for the inflow restriction are provided in **Appendix E**.

For those areas within Phase 1 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 4.5 Summary of Minimum On-Site Storage and Minor System Inflow Rate for External Development Lands to Phase 1

Drainage Area		Land Use	IMP Ratio (%)	Minimum On-Site Storage Required (m^3)*	Minor System Inflow Rate (l/s)
Segment ID	Area (ha)				
EXT3	2.50	High Density	79	125.00	469
HD1	1.02	High Density	86	100.00	206
PARK1	0.83	Park	14	150.00	38
HD2	0.94	High Density	86	115.00	190
INST	2.55	School	79	290.00	476
EXT4	4.06	Commercial	79	462.00	760
COM	3.01	Commercial	79	345.00	562

** The on-site storage noted was used to evaluate Phase 1. As a minimum this on-site storage should be provided.*

4.9.3 Simulation Results

Minor system hydrographs generated in DDSWMM were downloaded to the XPSWMM model for hydraulic grade line analysis (refer to **Section 4.10**).

The storage available on-site and its maximum depth and the results of the DDSWMM evaluation for the subject site are presented in **Table 4.6**. Also included in **Table 4.6**, is the duration of ponding and depth of ponding for the 2 year, 5 year, 100 year and July 1, 1979 historical storm events. The ponding plan for the subject site is presented on **Drawing 751**. The DDSWMM output files are presented in **Appendix E**.

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STORM SEWER DESIGN SHEET

4836 Bank Street
City of Ottawa
Home Hardware

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW															SEWER DATA								
STREET	AREA ID	FROM	TO	C= 0.20	C= 0.30	C= 0.40	C= 0.50	C= 0.55	C= 0.65	C= 0.70	C= 0.75	C= 0.90	C= 1.00	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)	(%)
		CB3	MH9-MH8								0.12			0.25	0.25	10.00	0.11	10.11	76.81	104.19	122.14	178.56	19.22	26.07	30.56	44.68		19.22	34.22	6.73	200			1.00	1.055	15.00	43.84%
		CB2	MH9-MH8									0.02		0.05	0.05	10.00	0.12	10.12	76.81	104.19	122.14	178.56	3.84	5.21	6.11	8.94		3.84	34.22	7.69	200			1.00	1.055	30.37	88.77%
		MH9	MH8											0.00	0.30	10.12	0.64	10.76	76.34	103.56	121.39	177.46	22.92	31.09	36.45	53.28		22.92	158.41	53.17	375			0.75	1.389	135.48	85.53%
		CB1	MH8-MH7								0.17			0.35	0.35	10.00	0.17	10.17	76.81	104.19	122.14	178.56	27.22	36.93	43.29	63.29		27.22	34.22	10.80	200			1.00	1.055	6.99	20.44%
		MH8	MH7											0.00	0.65	10.76	0.41	11.17	74.01	100.35	117.61	171.90	48.45	65.70	77.00	112.54		48.45	53.73	26.20	250			0.75	1.060	5.28	9.82%
		BLDG D	MH7-MH5									0.05		0.13	0.13	10.00	0.20	10.20	76.81	104.19	122.14	178.56	9.61	13.03	15.28	22.34		9.61	34.22	12.60	200			1.00	1.055	24.61	71.92%
		BLDG A	MH7-MH5									0.30		0.75	0.75	10.00	0.18	10.18	76.81	104.19	122.14	178.56	57.65	78.21	91.68	134.03		57.65	62.04	12.97	250			1.00	1.224	4.39	7.07%
		MH7	MH5											0.00	1.53	11.17	0.46	11.63	72.58	98.39	115.31	168.52	111.08	150.57	176.46	257.90		111.08	230.39	38.63	450			0.60	1.403	119.31	51.79%
		CB4	MH10-CBMH1									0.03		0.08	0.08	10.00	0.12	10.12	76.81	104.19	122.14	178.56	5.76	7.82	9.17	13.40		5.76	34.22	7.78	200			1.00	1.055	28.45	83.15%
		MH10	CBMH1											0.00	0.08	10.12	0.73	10.85	76.34	103.55	121.38	177.44	5.73	7.77	9.11	13.32		5.73	48.06	41.57	250			0.60	0.948	42.33	88.08%
		CB5	CBMH1-CBMH2									0.06		0.15	0.15	10.00	0.36	10.36	76.81	104.19	122.14	178.56	11.53	15.64	18.34	26.81		11.53	34.22	22.72	200			1.00	1.055	22.69	66.30%
		CB6	CBMH1-CBMH2									0.07		0.18	0.18	10.00	0.15	10.15	76.81	104.19	122.14	178.56	13.45	18.25	21.39	31.27		13.45	34.22	9.78	200			1.00	1.055	20.76	60.69%
		CB7	CBMH1-CBMH2									0.08		0.20	0.20	10.00	0.15	10.15	76.81	104.19	122.14	178.56	15.37	20.86	24.45	35.74		15.37	34.22	9.59	200			1.00	1.055	18.84	55.07%
		CBMH1	CBMH2									0.08		0.20	0.80	10.85	0.80	11.66	73.68	99.89	117.07	171.12	58.99	79.98	93.73	137.00		58.99	66.53	63.40	250			1.15	1.313	7.54	11.33%
		CBMH2	MH4											0.00	0.80	11.66	0.68	12.33	70.98	96.18	112.71	164.70	56.83	77.01	90.24	131.87		56.83	59.68	33.14	300			0.35	0.818	2.86	4.79%
		CB9	MH1-MH2									0.15		0.38	0.38	10.00	0.28	10.28	76.81	104.19	122.14	178.56	28.82	39.10	45.84	67.01		28.82	34.22	17.68	200			1.00	1.055	5.39	15.76%
		CB8	MH1-MH2									0.17		0.43	0.43	10.00	0.24	10.24	76.81	104.19	122.14	178.56	32.67	44.32	51.95	75.95		32.67	34.22	14.99	200			1.00	1.055	1.55	4.53%
		BLDG C	MH1-MH2									0.05		0.13	0.13	10.00	0.22	10.22	76.81	104.19	122.14	178.56	9.61	13.03	15.28	22.34		9.61	34.22	14.20	200			1.00	1.055	24.61	71.92%
		CB10	MH1-MH2									0.13		0.33	0.33	10.00	0.27	10.27	76.81	104.19	122.14	178.56	24.98	33.89	39.73	58.08		24.98	34.22	17.04	200			1.00	1.055	9.23	26.99%
		CB11	MH1-MH2									0.03		0.08	0.08	10.00	0.11	10.11	76.81	104.19	122.14	178.56	5.76	7.82	9.17	13.40		5.76	34.22	6.75	200			1.00	1.055	28.45	83.15%
		CB12	CB13									0.06		0.15	0.15	10.00	0.18	10.18	76.81	104.19	122.14	178.56	11.53	15.64	18.34	26.81		11.53	34.22	11.50	200			1.00	1.055	22.69	66.30%
Idone Commercial		MH1	MH2								1.58			3.29	4.77	10.28	0.87	11.15	75.75	102.74	120.43	176.05	361.36	490.12	574.51	839.82		361.36	452.94	81.04	600			0.50	1.552	91.59	20.22%
		CB13	MH2-MH3									0.18		0.45	0.45	10.00	0.01	10.01	76.81	104.19	122.14	178.56	34.59	46.92	55.01	80.42		34.59	40.49	1.00	200			1.40	1.248	5.90	14.56%
		BLDG B	MH2-MH3									0.22		0.55	0.55	10.00	0.26	10.26	76.81	104.19	122.14	178.56	42.28	57.35	67.23	98.29		42.28	62.04	19.00	250			1.00	1.224	19.76	31.85%
		MH2	MH3											0.00	5.77	11.15	0.14	11.29	72.66	98.49	115.42	168.69	419.32	568.41	666.14	973.56		419.32	480.32	10.88	675			0.30	1.300	61.00	12.70%
		CB14	MH3-MH4									0.15		0.38	0.38	10.00	0.03	10.03	76.81	104.19	122.14	178.56	28.82	39.10	45.84	67.01		28.82	34.22	1.63	200			1.00	1.055	5.39	15.76%
		CB15	CBMH3								0.09			0.19	0.19	10.00	0.31	10.31	76.81	104.19	122.14	178.56	14.41	19.55	22.92	33.51		14.41	34.22	19.85	200			1.00	1.055	19.80	57.88%
		CB18	MH11		0.16									0.13	0.13	10.00	0.27	10.27	76.81	104.19	122.14	178.56	10.25	13.90	16.30	23.83		10.25	27.59	13.80	200			0.65	0.851	17.34	62.85%
		MH11	CBMH3											0.00	0.13	10.27	0.34	10.61	75.78	102.79	120.48	176.12	10.11	13.72	16.08	23.50		10.11	27.59	17.50	200			0.65	0.851	17.47	63.34%
		CBMH3	MH3-MH4						0.02					0.04	0.36	10.31	0.35	10.67	75.62	102.57	120.22	175.74	27.01	36.64	42.95	62.78		27.01	27.59	17.94	200			0.65	0.851	0.57	2.07%
		MH3	MH4											0.00	6.50	11.29	1.01	12.30	72.19	97.84	114.66	167.58	469.49	636.36	745.75	1,089.88		469.49	519.40	69.31	750			0.20	1.139	49.91	9.61%
		MH4	MH5											0.00	7.30	12.30	0.20	12.51	68.96	93.42	109.46	159.93	503.74	682.38	799.52	1,168.19		503.74	580.71	15.46	750			0.25	1.273	76.96	13.25%
		CB17	MH5-MH12									0.09		0.23	0.23	10.00	0.04	10.04	76.81	104.19	122.14	178.56	17.29	23.46	27.50	40.21		17.29	34.22	2.55	200			1.00	1.055	16.92	49.45%
		CB16	MH5-MH12		0.01									0.01	0.01	10.00	0.14	10.14	76.81	104.19	122.14	178.56	0.64	0.87	1.02	1.49		0.64	34.22	9.09	200			1.00	1.055	33.58	98.13%
		MH5	MH12											0.00	9.07	12.51	0.34	12.85	68.36	92.59	108.48	158.49	619.90	839.64	983.73	1,437.28		619.90	687.10	31.13	750			0.35	1.507	67.20	9.78%
		MH12	EX 1350 SEWER											0.00	9.07	12.85	0.17	13.02	67.36	91.21	106.86	156.12	610.81	827.17	969.05	1,415.73		610.81	687.10	15.71	750			0.35	1.507	76.29	11.10%

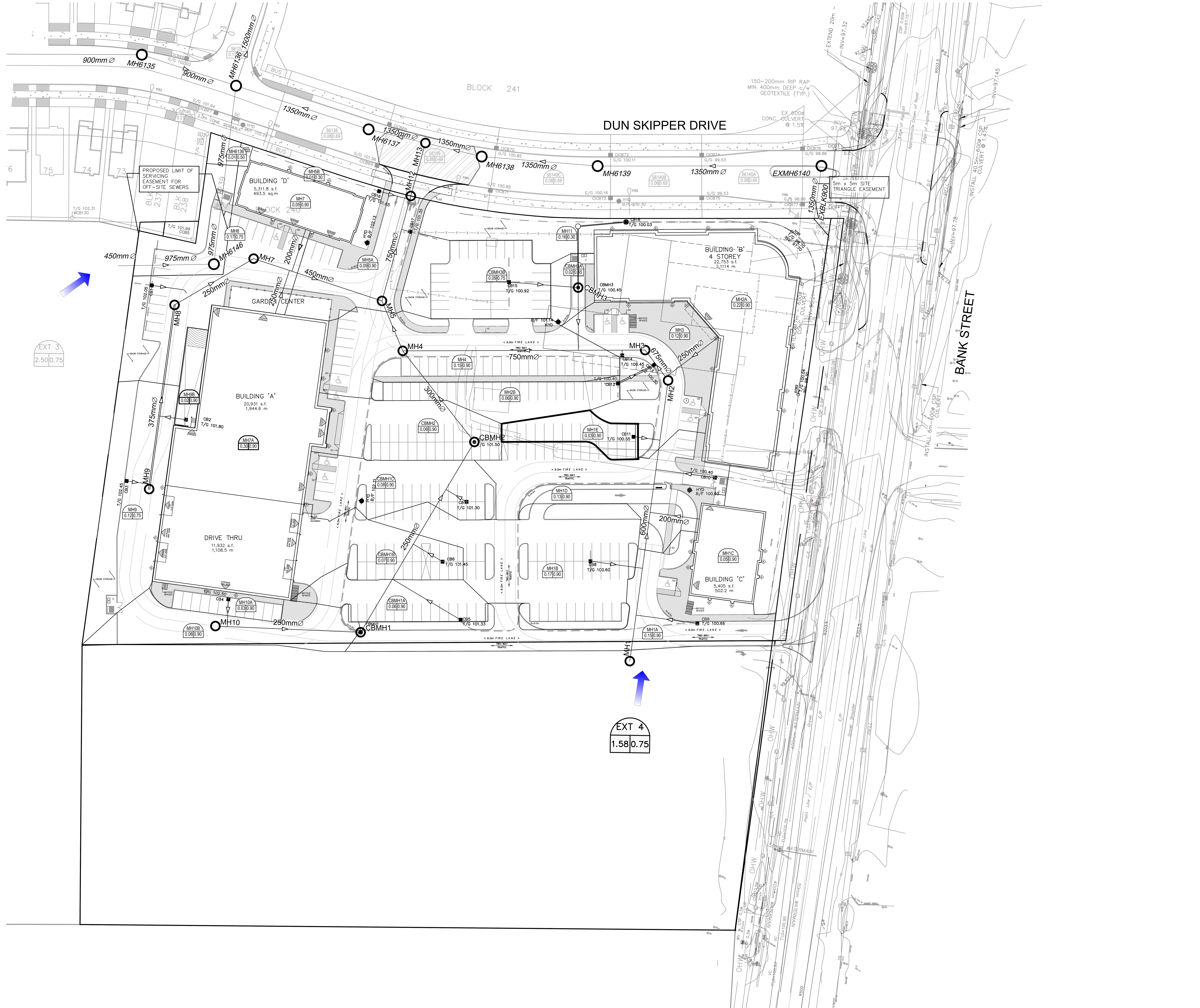
Definitions:
Q = 2.78CiA, where:
Q = Peak Flow in Litres per Second (L/s)
A = Area in Hectares (Ha)
i = Rainfall intensity in millimeters per hour (mm/hr)
[i = 732.951 / (TC+6.199)^0.810] 2 YEAR
[i = 998.071 / (TC+6.053)^0.814] 5 YEAR
[i = 1174.184 / (TC+6.014)^0.816] 10 YEAR
[i = 1735.688 / (TC+6.014)^0.820]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

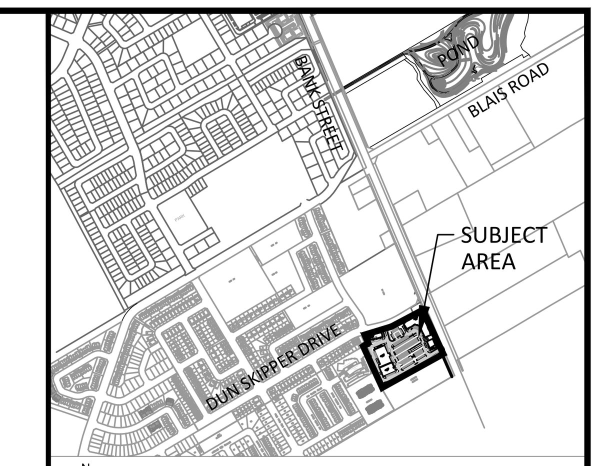
Notes:
1. Mannings coefficient (n) = 0.013

Designed: JEB
Checked: JIM
Dwg. Reference: 119351-500

No.	Revision	Date
1.	- Submission No. 1	2019-03-30
2.	Revised per City Comments	2020-04-20

File Reference:	Date:	Sheet No:
119351.5.7.1	2019-03-30	1 of 1





KEY PLAN
(NTS)

NOTES:

1. SEE DRAWING C-010 FOR ADDITIONAL DETAILS AND NOTES.
2. SITE BENCHMARK TO BE OBTAINED FROM LEGAL SURVEYOR H.A. KEN SHIPMAN SURVEYING LTD.

LEGEND:

- DRAINAGE AREA LIMITS
- XX / 0.01 / 0.30: AREA ID; RUNOFF COEFFICIENT; AREA IN HECTARES
- XX / 0.01 / 0.30: EXISTING AREA ID; EXISTING RUNOFF COEFFICIENT; EXISTING AREA IN HECTARES

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5	REVISED AS PER CITY COMMENTS	JIM	2020:04:20
4	REVISED AS PER CITY COMMENTS	JIM	2020:04:03
3	REVISED AS PER CITY COMMENTS	JIM	2019:12:09
2	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	JIM	2019:10:11
1	ISSUED FOR SPA	JIM	2019:04:15

IBI GROUP
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tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title

BANK STREET DEVELOPMENT

4836 BANK STREET

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2020/04/20
PROVINCE OF ONTARIO

Drawing Title

STORM DRAINAGE AREA PLAN

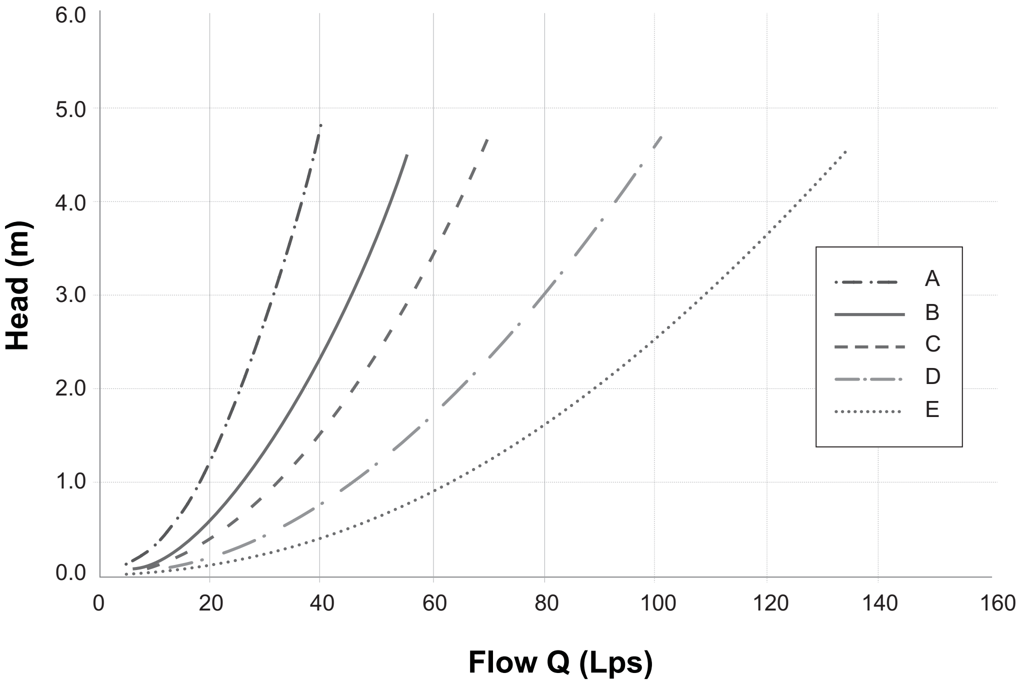
Scale
1 : 500

Design	Date
SEL	FEB. 2019
Drawn	**Checked**
DPS	JIM
Project No.	**Drawing No.**
119351	500

D07-12-19-0092

#17977

Chart 3: HF & MHF Preset Flow Curves



APPENDIX E

- **Stormwater Management Calculations**

IBI GROUP
333 PRESTON STREET
OTTAWA, ON
K1S 5N4

PROJECT: 4836 Bank St
DATE: 2019-10-08
FILE: 119351.5.7
REV #:
DESIGNED BY: JEB
CHECKED BY: JM

STORMWATER MANAGEMENT

Formulas and Descriptions

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

Maximum Allowable Release Rate

Restricted Flowrate
Taken from City of Ottawa approved Design Brief "Pathways at Findlay Creek" (D07-16-13-0023) drainage area EXT 4

EXT 4 Release Rate	760.00	L/s
Area EXT 4 $_{TOTAL}$ =	4.04	Ha
Area Subject Lands	2.49	
Perscentage Share of release rate	62%	

Q_{TOTAL} = 468.42 L/s

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

C =	0.625	
T_c =	10	min
i_{100yr} =	178.56	mm/hr
$A_{uncontrolled}$ =	0.01	Ha

$Q_{uncontrolled}$ = 3.10 L/s

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

$Q_{max\ allowable}$ = 465.31 L/s

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

Drainage Area	***MH9/MH9B***				
Area (Ha)	0.14				
C =	0.98	Restricted Flow Q_r (L/s)=		10.00	
100-Year Ponding					
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi$_{100yr}$A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***
30	91.87	34.86	10.00	24.86	44.75
32	87.89	33.35	10.00	23.35	44.83
33	86.03	32.65	10.00	22.65	**44.84**
34	84.27	31.98	10.00	21.98	44.83
36	80.96	30.72	10.00	20.72	44.76

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	44.84	20.64	10.07	14.13

Length (m)	Dia (m)	Area (m^2)	Volume (m^3)
54.91	0.375	0.110	6.06
6.73	0.200	0.031	0.21
7.69	0.200	0.031	0.24
			6.51

overflows to: CB1

Drainage Area	***MH9/MH9B***				
Area (Ha)	0.14				
C =	0.78	Restricted Flow Q_r (L/s)=		10.00	
5-Year Ponding					
T_c Variable (min)	***i_{5yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi$_{5yr}$A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 5yr (m^3)***
13	90.63	27.51	10.00	17.51	13.66
15	83.56	25.37	10.00	15.37	13.83
16	80.46	24.43	10.00	14.43	**13.85**
17	77.61	23.56	10.00	13.56	13.83
19	72.53	22.02	10.00	12.02	13.70

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	13.85	20.64	10.07	0.00

Structure	Depth	Area (m^2)	Volume (m^3)
CB3 (600mm x 600mm)	1.80	0.36	0.65
CB2 (600mm x 600mm)	1.80	0.36	0.65
CBMH10 (1200mm round)	2.00	1.13	2.26
			3.56

overflows to: CB1

Drainage Area	***MH9/MH9B***				
Area (Ha)	0.140				
C =	0.78	Restricted Flow Q_r (L/s)=		10.00	
2-Year Ponding					
T_c Variable (min)	***i_{2yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi$_{2yr}$A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 2yr (m^3)***
10	76.81	23.32	10.00	13.32	7.99
11	73.17	22.21	10.00	12.21	8.06
12	69.89	21.22	10.00	11.22	**8.08**
13	66.93	20.32	10.00	10.32	8.05
15	61.77	18.75	10.00	8.75	7.88

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	8.08	20.64	10.07	0.00

overflows to: CB1

Drainage Area	CB1				
Area (Ha)	0.17				
C =	0.88	Restricted Flow Q_r (L/s)=		16.00	

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
19	123.87	49.72	16.00	33.72	38.44
21	116.30	46.68	16.00	30.68	38.65
22	112.88	45.31	16.00	29.31	**38.68**
23	109.68	44.02	16.00	28.02	38.67
25	103.85	41.68	16.00	25.68	38.52

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
14.13	52.82	50.59	5.58	0.00

Length (m)	Dia (m)	Area (m^2)	Volume (m^3)
31.00	0.450	0.159	4.93
			4.93

overflows to: CB17

Drainage Area	CB1				
Area (Ha)	0.17				
C =	0.70	Restricted Flow Q_r (L/s)=		16.00	

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
7	123.30	39.59	16.00	23.59	9.91
9	109.79	35.25	16.00	19.25	10.40
10	104.19	33.46	16.00	17.46	**10.47**
11	99.19	31.85	16.00	15.85	10.46
13	90.63	29.10	16.00	13.10	10.22

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	10.47	50.59	5.58	0.00

Structure	Depth	Area (m^2)	Volume (m^3)
CB3 (600mm x 600mm)	1.80	0.36	0.65
			0.65

overflows to: CB17

Drainage Area	CB1				
Area (Ha)	0.165				
C =	0.70	Restricted Flow Q_r (L/s)=		16.00	

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
4	111.72	35.87	16.00	19.87	4.77
6	96.64	31.03	16.00	15.03	5.41
7	90.66	29.11	16.00	13.11	**5.51**
8	85.46	27.44	16.00	11.44	5.49
10	76.81	24.66	16.00	8.66	5.20

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	5.51	50.59	5.58	0.00

overflows to: CB17

Drainage Area	CB16				
Area (Ha)	0.010				
C =	0.38	Restricted Flow Q_r (L/s)=		6.00	

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
-6	57497.20	599.41	16.00	583.41	-210.03
-4	977.56	10.19	16.00	-5.81	1.39
-3	702.38	7.32	16.00	-8.68	**1.56**
-2	555.31	5.79	16.00	-10.21	1.23
0	398.62	4.16	16.00	-11.84	0.00

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	1.56	0.31	0.00	1.25

overflows to: CB17

Drainage Area	CB16				
Area (Ha)	0.010				
C =	0.30	Restricted Flow Q_r (L/s)=		6.00	

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
-6	10904.38	90.94	6.00	84.94	-30.58
-4	555.75	4.63	6.00	-1.37	0.33
-3	402.34	3.36	6.00	-2.64	**0.48**
-2	319.47	2.66	6.00	-3.34	0.40
0	230.48	1.92	6.00	-4.08	0.00

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.48	0.31	0.00	0.17

overflows to: CB17

Drainage Area	CB16				
Area (Ha)	0.010				
C =	0.30	Restricted Flow Q_r (L/s)=		6.00	

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
-7	#NUM!	#NUM!	6.00	#NUM!	#NUM!
-5	632.75	5.28	6.00	-0.72	0.22
-4	387.14	3.23	6.00	-2.77	**0.67**
-3	285.77	2.38	6.00	-3.62	0.65
-1	192.83	1.61	6.00	-4.39	0.26

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.67	0.31	0.00	0.36

overflows to: CB17

Drainage Area	CB17				
Area (Ha)	0.090				
C =	1.00	Restricted Flow Q_r (L/s)=		9.00	

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
22	112.88	28.24	9.00	19.24	25.40
24	106.68	26.69	9.00	17.69	25.47
25	103.85	25.98	9.00	16.98	**25.47**
26	101.18	25.32	9.00	16.32	25.45
28	96.27	24.09	9.00	15.09	25.35

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
1.25	26.73	0.84	5.10	20.79

Length (m)	Dia (m)	Area (m^2)	Volume (m^3)
28.00	0.450	0.159	4.45
			4.45

overflows to: CB15

Drainage Area	CB17				
Area (Ha)	0.090				
C =	0.90	Restricted Flow Q_r (L/s)=		9.00	

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
10	104.19	23.46	9.00	14.46	8.68
12	94.70	21.32	9.00	12.32	8.87
13	90.63	20.41	9.00	11.41	**8.90**
14	86.93	19.58	9.00	10.58	8.88
16	80.46	18.12	9.00	9.12	8.75

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.17	9.06	0.84	5.10	3.13

Structure	Depth	Area (m^2)	Volume (m^3)
CB3 (600mm x 600mm)	1.80	0.36	0.65
			0.65

overflows to: CB15

Drainage Area	CB17				
Area (Ha)	0.090				
C =	0.90	Restricted Flow Q_r (L/s)=		9.00	

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p=2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
7	90.66	20.42	9.00	11.42	4.79
9	80.87	18.21	9.00	9.21	4.97
10	76.81	17.29	9.00	8.29	**4.98**
11	73.17	16.48	9.00	7.48	4.93
13	66.93	15.07	9.00	6.07	4.74

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	4.98	0.84	5.10	0.00

overflows to: CB15

Drainage Area	CB15
Area (Ha)	0.090
C =	0.94

Restricted Flow Q_r (L/s)= 6.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{100yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
33	86.03	20.18	6.00	14.18	28.08
35	82.58	19.37	6.00	13.37	28.08
36	80.96	18.99	6.00	12.99	**28.06**
37	79.42	18.63	6.00	12.63	28.03
39	76.51	17.95	6.00	11.95	27.96

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
20.79	48.85	66.27	5.10	0.00

Length (m)	Dia (m)	Area (m^2)	Volume (m^3)
28.00	0.450	0.159	4.45
			4.45

overflows to: out

Drainage Area	CB15
Area (Ha)	0.090
C =	0.75

Restricted Flow Q_r (L/s)= 6.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{5yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
13	90.63	17.01	6.00	11.01	8.59
15	83.56	15.68	6.00	9.68	8.71
16	80.46	15.10	6.00	9.10	**8.73**
17	77.61	14.56	6.00	8.56	8.73
19	72.53	13.61	6.00	7.61	8.67

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
3.13	11.86	66.27	5.10	0.00

Structure	Depth	Area (m^2)	Volume (m^3)
CB3 (600mm x 600mm)	1.80	0.36	0.65
			0.65

overflows to: out

Drainage Area	CB15
Area (Ha)	0.090
C =	0.75

Restricted Flow Q_r (L/s)= 6.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{2yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
9	80.87	15.18	6.00	9.18	4.95
11	73.17	13.73	6.00	7.73	5.10
12	69.89	13.12	6.00	7.12	**5.12**
13	66.93	12.56	6.00	6.56	5.12
15	61.77	11.59	6.00	5.59	5.03

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	5.12	66.27	5.10	0.00

overflows to: out

Drainage Area	CBMH3
Area (Ha)	0.020
C =	0.81

Restricted Flow Q_r (L/s)= 6.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{100yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
3	286.05	12.92	6.00	6.92	1.25
5	242.70	10.96	6.00	4.96	1.49
6	226.01	10.21	6.00	4.21	**1.52**
7	211.67	9.56	6.00	3.56	1.50
9	188.25	8.50	6.00	2.50	1.35

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	1.52	4.17	0	0.00

overflows to: CB12/13/14

Drainage Area	CBMH3
Area (Ha)	0.020
C =	0.90

Restricted Flow Q_r (L/s)= 6.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{5yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
0	230.48	11.53	6.00	5.53	0.00
2	182.69	9.14	6.00	3.14	0.38
3	166.09	8.31	6.00	2.31	**0.42**
4	152.51	7.63	6.00	1.63	0.39
6	131.57	6.58	6.00	0.58	0.21

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.42	4.17	0.00	0.00

overflows to: CB12/13/14

Drainage Area	CBMH3
Area (Ha)	0.020
C =	0.90

Restricted Flow Q_r (L/s)= 6.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{2yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
-2	229.26	11.47	6.00	5.47	-0.66
0	167.22	8.37	6.00	2.37	0.00
1	148.14	7.41	6.00	1.41	**0.08**
2	133.33	6.67	6.00	0.67	0.08
4	111.72	5.59	6.00	-0.41	-0.10

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.08	4.17	0.00	0.00

overflows to: CB12/13/14

Drainage Area	CB11
Area (Ha)	0.030
C =	1.00

Restricted Flow Q_r (L/s)= 15.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{100yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
1	351.38	29.31	15.00	14.31	0.86
3	286.05	23.86	15.00	8.86	1.59
4	262.41	21.88	15.00	6.88	**1.65**
5	242.70	20.24	15.00	5.24	1.57
7	211.67	17.65	15.00	2.65	1.11

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
5.62	7.27	0.93	0	6.34

overflows to: CB12/CB13/CB14

Drainage Area	CB11
Area (Ha)	0.030
C =	0.90

Restricted Flow Q_r (L/s)= 15.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{5yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
-2	319.47	23.98	15.00	8.98	-1.08
0	230.48	17.30	15.00	2.30	0.00
1	203.51	15.28	15.00	0.28	**0.02**
2	182.69	13.71	15.00	-1.29	-0.15
4	152.51	11.45	15.00	-3.55	-0.85

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.02	0.93	0.00	0.00

overflows to: CB12/CB13/CB14

Drainage Area	CB11
Area (Ha)	0.030
C =	0.90

Restricted Flow Q_r (L/s)= 15.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{2yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
-4	387.14	29.06	15.00	14.06	-3.37
-2	229.26	17.21	15.00	2.21	-0.26
-1	192.83	14.47	15.00	-0.53	**0.03**
0	167.22	12.55	15.00	-2.45	0.00
2	133.33	10.01	15.00	-4.99	-0.60

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.03	0.93	0.00	0.00

overflows to: CB12/CB13/CB14

Drainage Area	CB12/CB13/CB14				
Area (Ha)	0.330				
C =	1.00	Restricted Flow Q_r (L/s)=		73.00	
100-Year Ponding					
T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{100yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
9	188.25	172.70	73.00	99.70	53.84
10	178.56	163.81	73.00	90.81	54.49
11	169.91	155.87	73.00	82.87	**54.70**
12	162.13	148.74	73.00	75.74	54.53
14	148.72	136.44	73.00	63.44	53.29

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
6.34	61.03	54.36	5.07	1.60

Length (m)	Dia (m)	Area (m^2)	Volume (m^3)
11.07	0.375	0.110	1.22
12.00	0.450	0.159	1.91
			3.13

overflows to: CB10

Drainage Area	CB12/CB13/CB14				
Area (Ha)	0.330				
C =	0.90	Restricted Flow Q_r (L/s)=		73.00	
5-Year Ponding					
T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{5yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
2	182.69	150.84	73.00	77.84	9.34
4	152.51	125.92	73.00	52.92	12.70
5	141.18	116.57	73.00	43.57	**13.07**
6	131.57	108.63	73.00	35.63	12.83
8	116.11	95.87	73.00	22.87	10.98

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	13.07	54.36	5.07	0.00

Structure	Depth	Area (m^2)	Volume (m^3)
CB12 (600mm x 600mm)	1.80	0.36	0.65
CB13 (600mm x 600mm)	1.80	0.36	0.65
CB14 (600mm x 600mm)	1.80	0.36	0.65
			1.94

overflows to: CB10

Drainage Area	2/CB13/CB14				
Area (Ha)	0.330				
C =	0.90	Restricted Flow Q_r (L/s)=		73.00	
2-Year Ponding					
T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{2yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
0	167.22	138.07	73.00	65.07	0.00
2	133.33	110.09	73.00	37.09	4.45
3	121.46	100.29	73.00	27.29	**4.91**
4	111.72	92.25	73.00	19.25	4.62
6	96.64	79.79	73.00	6.79	2.44

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	4.91	54.36	5.07	0.00

overflows to: CB10

Drainage Area	CB10				
Area (Ha)	0.130				
C =	1.00	Restricted Flow Q_r (L/s)=		45.00	
100-Year Ponding					
T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{100yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
5	242.70	87.71	45.00	42.71	12.81
6	226.01	81.68	45.00	36.68	13.20
7	211.67	76.50	45.00	31.50	**13.23**
8	199.20	71.99	45.00	26.99	12.96
10	178.56	64.53	45.00	19.53	11.72

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
5.62	18.85	6.81	0.00	12.04

overflows to: CB18

Drainage Area	CB10				
Area (Ha)	0.130				
C =	0.90	Restricted Flow Q_r (L/s)=		45.00	
5-Year Ponding					
T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{5yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
-1	266.98	86.84	45.00	41.84	-2.51
1	203.51	66.19	45.00	21.19	1.27
2	182.69	59.42	45.00	14.42	**1.73**
3	166.09	54.02	45.00	9.02	1.62
5	141.18	45.92	45.00	0.92	0.28

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	1.73	6.81	0.00	0.00

overflows to: CB18

Drainage Area	CB10				
Area (Ha)	0.130				
C =	0.90	Restricted Flow Q_r (L/s)=		45.00	
2-Year Ponding					
T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{2yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
-2	229.26	74.57	45.00	29.57	-3.55
0	167.22	54.39	45.00	9.39	0.00
1	148.14	48.19	45.00	3.19	**0.19**
2	133.33	43.37	45.00	-1.63	-0.20
4	111.72	36.34	45.00	-8.66	-2.08

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
Balance	#VALUE!	6.81	0.00	#VALUE!

overflows to: CB18

Drainage Area: CBMH2

Area (Ha): 0.080

C = 1.00 | Restricted Flow Q_r (L/s)= 20.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{100yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
7	211.67	47.07	20.00	27.07	11.37
9	188.25	41.87	20.00	21.87	11.81
10	178.56	39.71	20.00	19.71	**11.83**
11	169.91	37.79	20.00	17.79	11.74
13	155.11	34.50	20.00	14.50	11.31

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	11.83	6.21	0.00	5.62

overflows to: CB11

Drainage Area: CBMH2

Area (Ha): 0.080

C = 0.90 | Restricted Flow Q_r (L/s)= 20.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{5yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
1	203.51	40.73	20.00	20.73	1.24
3	166.09	33.24	20.00	13.24	2.38
4	152.51	30.53	20.00	10.53	**2.53**
5	141.18	28.26	20.00	8.26	2.48
7	123.30	24.68	20.00	4.68	1.97

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	2.53	6.21	0.00	0.00

Drainage Area: CBMH2

Area (Ha): 0.080

C = 0.90 | Restricted Flow Q_r (L/s)= 20.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{2yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
-1	192.83	38.60	20.00	18.60	-1.12
1	148.14	29.65	20.00	9.65	0.58
2	133.33	26.69	20.00	6.69	**0.80**
3	121.46	24.31	20.00	4.31	0.78
5	103.57	20.73	20.00	0.73	0.22

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.80	6.21	0.00	0.00

Drainage Area: CB7

Area (Ha): 0.080

C = 1.00 | Restricted Flow Q_r (L/s)= 30.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{100yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
3	286.05	63.62	30.00	33.62	6.05
5	242.70	53.98	30.00	23.98	7.19
6	226.01	50.26	30.00	20.26	**7.30**
7	211.67	47.07	30.00	17.07	7.17
9	188.25	41.87	30.00	11.87	6.41

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
5.62	12.91	6.97	0.00	5.94

overflows to: CB8

Drainage Area: CB7

Area (Ha): 0.080

C = 0.90 | Restricted Flow Q_r (L/s)= 30.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{5yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
-1	266.98	53.44	30.00	23.44	-1.41
1	203.51	40.73	30.00	10.73	0.64
2	182.69	36.57	30.00	6.57	**0.79**
3	166.09	33.24	30.00	3.24	0.58
5	141.18	28.26	30.00	-1.74	-0.52

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.79	6.97	0.00	0.00

overflows to: CB8

Drainage Area: CB7

Area (Ha): 0.080

C = 0.90 | Restricted Flow Q_r (L/s)= 30.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{2yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
-3	285.77	57.20	30.00	27.20	-4.90
-1	192.83	38.60	30.00	8.60	-0.52
0	167.22	33.47	30.00	3.47	**0.00**
1	148.14	29.65	30.00	-0.35	-0.02
3	121.46	24.31	30.00	-5.69	-1.02

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.00	6.97	0.00	0.00

overflows to: CB8

Drainage Area: CB6

Area (Ha): 0.070

C = 1.00 | Restricted Flow Q_r (L/s)= 20.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{100yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
5	242.70	47.23	20.00	27.23	8.17
7	211.67	41.19	20.00	21.19	8.90
8	199.20	38.76	20.00	18.76	**9.01**
9	188.25	36.63	20.00	16.63	8.98
11	169.91	33.06	20.00	13.06	8.62

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	9.01	13.66	0.00	0.00

overflows to: CB8

Drainage Area: P3/L3

Area (Ha): 0.160

C = 0.45 | Restricted Flow Q_r (L/s)= 20.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{5yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
1	203.51	40.73	20.00	20.73	1.24
3	166.09	33.24	20.00	13.24	2.38
4	152.51	30.53	20.00	10.53	**2.53**
5	141.18	28.26	20.00	8.26	2.48
7	123.30	24.68	20.00	4.68	1.97

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	2.53	13.66	0.00	0.00

overflows to: CB8

Drainage Area: CB6

Area (Ha): 0.070

C = 0.45 | Restricted Flow Q_r (L/s)= 20.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{2yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
-4	387.14	33.90	20.00	13.90	-3.34
-2	229.26	20.08	20.00	0.08	-0.01
-1	192.83	16.89	20.00	-3.11	**0.19**
0	167.22	14.64	20.00	-5.36	0.00
2	133.33	11.68	20.00	-8.32	-1.00

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.19	13.66	0.00	0.00

overflows to: CB8

Drainage Area: CB5

Area (Ha): 0.060

C = 1.00 | Restricted Flow Q_r (L/s)= 15.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{100yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
7	211.67	35.31	15.00	20.31	8.53
9	188.25	31.40	15.00	16.40	8.86
10	178.56	29.78	15.00	14.78	**8.87**
11	169.91	28.34	15.00	13.34	8.80
13	155.11	25.87	15.00	10.87	8.48

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	8.87	3.41	0.00	5.46

overflows to: CB8

Drainage Area: CB5

Area (Ha): 0.060

C = 0.90 | Restricted Flow Q_r (L/s)= 15.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{5yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
1	203.51	30.55	15.00	15.55	0.93
3	166.09	24.93	15.00	9.93	1.79
4	152.51	22.89	15.00	7.89	**1.89**
5	141.18	21.19	15.00	6.19	1.86
7	123.30	18.51	15.00	3.51	1.47

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	1.89	3.41	0.00	0.00

overflows to: CB8

Drainage Area: CB5

Area (Ha): 0.060

C = 0.90 | Restricted Flow Q_r (L/s)= 15.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{2yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
-1	192.83	28.95	15.00	13.95	-0.84
1	148.14	22.24	15.00	7.24	0.43
2	133.33	20.02	15.00	5.02	**0.60**
3	121.46	18.23	15.00	3.23	0.58
5	103.57	15.55	15.00	0.55	0.16

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
#VALUE!	#VALUE!	3.41	0.00	#VALUE!

overflows to: CB8

Drainage Area	**CB8**		
Area (Ha)	0.170		
C =	1.00	Restricted Flow Q_r (L/s)=	47.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{100yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
6	226.01	106.81	47.00	59.81	21.53
8	199.20	94.14	47.00	47.14	22.63
9	188.25	88.97	47.00	41.97	**22.66**
10	178.56	84.39	47.00	37.39	22.43
12	162.13	76.62	47.00	29.62	21.33

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
11.40	34.07	24.90	1.60	7.57

Length (m)	Dia (m)	Area (m^2)	Volume (m^3)
6.00	0.450	0.159	0.95
			0.95

overflows to: CB9

Drainage Area	**CB8**		
Area (Ha)	0.170		
C =	0.90	Restricted Flow Q_r (L/s)=	47.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{5yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
1	203.51	86.56	47.00	39.56	2.37
3	166.09	70.64	47.00	23.64	4.26
4	152.51	64.87	47.00	17.87	**4.29**
5	141.18	60.05	47.00	13.05	3.91
7	123.30	52.45	47.00	5.45	2.29

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	4.29	24.90	1.60	0.00

Structure	Depth	Area (m^2)	Volume (m^3)
CB8 (600mm x 600mm)	1.80	0.36	0.65
			0.65

Drainage Area	**CB8**		
Area (Ha)	0.170		
C =	0.90	Restricted Flow Q_r (L/s)=	47.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{2yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
-1	192.83	82.02	47.00	35.02	-2.10
1	148.14	63.01	47.00	16.01	0.96
2	133.33	56.71	47.00	9.71	**1.17**
3	121.46	51.66	47.00	4.66	0.84
5	103.57	44.05	47.00	-2.95	-0.88

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	1.17	24.90	1.60	0.00

Drainage Area	**CB4**		
Area (Ha)	0.030		
C =	1.00	Restricted Flow Q_r (L/s)=	6.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{100yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
9	188.25	15.70	6.00	9.70	5.24
11	169.91	14.17	6.00	8.17	5.39
12	162.13	13.52	6.00	7.52	**5.42**
13	155.11	12.94	6.00	6.94	5.41
15	142.89	11.92	6.00	5.92	5.33

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
7.57	12.98	10.62	0.00	2.36

overflows to: CBMH1

Drainage Area	**CB4**		
Area (Ha)	0.030		
C =	0.90	Restricted Flow Q_r (L/s)=	6.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{5yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
3	166.09	12.47	6.00	6.47	1.16
5	141.18	10.60	6.00	4.60	1.38
6	131.57	9.88	6.00	3.88	**1.40**
7	123.30	9.26	6.00	3.26	1.37
9	109.79	8.24	6.00	2.24	1.21

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	1.40	10.62	0.00	0.00

overflows to: CBMH1

Drainage Area	**CB4**		
Area (Ha)	0.030		
C =	0.90	Restricted Flow Q_r (L/s)=	6.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{2yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
1	148.14	11.12	6.00	5.12	0.31
3	121.46	9.12	6.00	3.12	0.56
4	111.72	8.39	6.00	2.39	**0.57**
5	103.57	7.77	6.00	1.77	0.53
7	90.66	6.81	6.00	0.81	0.34

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.57	10.62	0.00	0.00

overflows to: CBMH1

Drainage Area	**CBMH1**		
Area (Ha)	0.080		
C =	1.00	Restricted Flow Q_r (L/s)=	20.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{100yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
7	211.67	47.07	20.00	27.07	11.37
9	188.25	41.87	20.00	21.87	11.81
10	178.56	39.71	20.00	19.71	**11.83**
11	169.91	37.79	20.00	17.79	11.74
13	155.11	34.50	20.00	14.50	11.31

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
2.36	14.19	0.00	0.00	14.19

overflows to: CB9

Drainage Area	**CBMH1**		
Area (Ha)	0.080		
C =	0.90	Restricted Flow Q_r (L/s)=	20.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{5yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
1	203.51	40.73	20.00	20.73	1.24
3	166.09	33.24	20.00	13.24	2.38
4	152.51	30.53	20.00	10.53	**2.53**
5	141.18	28.26	20.00	8.26	2.48
7	123.30	24.68	20.00	4.68	1.97

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	2.53	0.00	0.00	2.53

overflows to: CB9

Drainage Area	**CBMH1**		
Area (Ha)	0.080		
C =	0.90	Restricted Flow Q_r (L/s)=	20.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{2yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
-1	192.83	38.60	20.00	18.60	-1.12
1	148.14	29.65	20.00	9.65	0.58
2	133.33	26.69	20.00	6.69	**0.80**
3	121.46	24.31	20.00	4.31	0.78
5	103.57	20.73	20.00	0.73	0.22

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.80	0.00	0.00	0.80

overflows to: CB9

Drainage Area	**CB9**		
Area (Ha)	0.150		
C =	1.00	Restricted Flow Q_r (L/s)=	43.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{100yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
5	242.70	101.21	43.00	58.21	17.46
7	211.67	88.27	43.00	45.27	19.01
8	199.20	83.07	43.00	40.07	**19.23**
9	188.25	78.50	43.00	35.50	19.17
11	169.91	70.85	43.00	27.85	18.38

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
21.75	40.99	10.83	0.00	30.16

overflows to: CB18

Drainage Area	**CB9**		
Area (Ha)	0.160		
C =	0.45	Restricted Flow Q_r (L/s)=	43.00

5-Year Ponding

T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{5yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
-3	402.34	80.53	43.00	37.53	-6.76
-1	266.98	53.44	43.00	10.44	-0.63
0	230.48	46.13	43.00	3.13	**0.00**
1	203.51	40.73	43.00	-2.27	-0.14
3	166.09	33.24	43.00	-9.76	-1.76

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
2.53	2.53	10.83	0.00	0.00

overflows to: CB18

Drainage Area	**CB9**		
Area (Ha)	0.150		
C =	0.45	Restricted Flow Q_r (L/s)=	43.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow Q_p=2.78xCi_{2yr}A (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
-3	285.77	53.62	43.00	10.62	-1.91
-1	192.83	36.18	43.00	-6.82	0.41
0	167.22	31.38	43.00	-11.62	**0.00**
1	148.14	27.80	43.00	-15.20	-0.91
3	121.46	22.79	43.00	-20.21	-3.64

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.00	10.83	0.00	0.00

overflows to: CB18

Drainage Area	CB18				
Area (Ha)	0.160				
C =	0.25	Restricted Flow Q_r (L/s)=		15.00	
100-Year Ponding					
T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
3	286.05	31.81	15.00	16.81	3.03
5	242.70	26.99	15.00	11.99	3.60
6	226.01	25.13	15.00	10.13	**3.65**
7	211.67	23.54	15.00	8.54	3.59
9	188.25	20.93	15.00	5.93	3.20

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
42.19	45.84	13.76	46.33	0.00

Drainage Area	CB18				
Area (Ha)	0.160				
C =	0.20	Restricted Flow Q_r (L/s)=		15.00	
5-Year Ponding					
T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
-2	319.47	28.42	15.00	13.42	-1.61
0	230.48	20.50	15.00	5.50	0.00
1	203.51	18.10	15.00	3.10	**0.19**
2	182.69	16.25	15.00	1.25	0.15
4	152.51	13.57	15.00	-1.43	-0.34

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.19	13.76	46.33	0.00

Drainage Area	CB18				
Area (Ha)	0.160				
C =	0.20	Restricted Flow Q_r (L/s)=		15.00	
2-Year Ponding					
T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
-3	285.77	25.42	15.00	10.42	-1.88
-1	192.83	17.15	15.00	2.15	-0.13
0	167.22	14.88	15.00	-0.12	**0.00**
1	148.14	13.18	15.00	-1.82	-0.11
3	121.46	10.81	15.00	-4.19	-0.76

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	0.00	13.76	46.33	0.00

Subsurface storage calculation

450mm subdrain @ 96m	15.30	m^3
Bottom of storage medium ave. grade	98.00	m
width of S29 trench	1.00	m
depth of S29 trench (below spill elev.)	1.01	m
Volume of S29 trench	96.96	m^3
Volume of clear stone	81.66	m^3
25mm clear stone per S29	0.38	void ratio
Stoage within clear stone	31.03	m^3

C

overflows to: offsite

overflows to: offsite

overflows to: offsite

Drainage Area	RA				
Area (Ha)	0.300				
C =	1.00	Restricted Flow Q_r (L/s)=		27.00	
100-Year Ponding					
T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 100yr (m^3)
25	103.85	86.61	27.00	59.61	89.41
26	101.18	84.38	27.00	57.38	89.52
27	98.66	82.28	27.00	55.28	**89.56**
28	96.27	80.29	27.00	53.29	89.53
29	94.01	78.41	27.00	51.41	89.45

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	89.56	90.00	0.00	0.00

Drainage Area	RA				
Area (Ha)	0.300				
C =	0.90	Restricted Flow Q_r (L/s)=		27.00	
5-Year Ponding					
T_c Variable (min)	i_{5yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{5yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 5yr (m^3)
13	90.63	68.03	27.00	41.03	32.00
14	86.93	65.25	27.00	38.25	32.13
15	83.56	62.72	27.00	35.72	**32.15**
16	80.46	60.39	27.00	33.39	32.06
17	77.61	58.25	27.00	31.25	31.88

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	32.15	90.00	0.00	0.00

Drainage Area	RA				
Area (Ha)	0.300				
C =	0.90	Restricted Flow Q_r (L/s)=		27.00	
2-Year Ponding					
T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	Q_p-Q_r (L/s)	Volume 2yr (m^3)
8	85.46	64.14	27.00	37.14	17.83
10	76.81	57.65	27.00	30.65	18.39
11	73.17	54.92	27.00	27.92	**18.43**
12	69.89	52.46	27.00	25.46	18.33
14	64.23	48.21	27.00	21.21	17.82

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	18.43	90.00	0.00	0.00

Drainage Area RB

Drainage Area	RB				
Area (Ha)	0.220				
C =	1.00	Restricted Flow Q_r (L/s)=		20.00	
100-Year Ponding					
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi$_{100yr}$A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***
24	106.68	65.24	20.00	45.24	65.15
26	101.18	61.88	20.00	41.88	65.34
27	98.66	60.34	20.00	40.34	**65.35**
28	96.27	58.88	20.00	38.88	65.32
30	91.87	56.19	20.00	36.19	65.14

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	65.35	66.00	0.00	0.00

Drainage Area	RB				
Area (Ha)	0.220				
C =	0.90	Restricted Flow Q_r (L/s)=		20.00	
5-Year Ponding					
T_c Variable (min)	***i_{5yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi$_{5yr}$A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 5yr (m^3)***
11	99.19	54.60	20.00	34.60	22.84
13	90.63	49.89	20.00	29.89	23.31
14	86.93	47.85	20.00	27.85	**23.40**
15	83.56	45.99	20.00	25.99	23.39
17	77.61	42.72	20.00	22.72	23.17

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	23.40	66.00	0.00	0.00

Drainage Area	RB				
Area (Ha)	0.220				
C =	0.90	Restricted Flow Q_r (L/s)=		20.00	
2-Year Ponding					
T_c Variable (min)	***i_{2yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi$_{2yr}$A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 2yr (m^3)***
8	85.46	47.04	20.00	27.04	12.98
10	76.81	42.28	20.00	22.28	13.37
11	73.17	40.27	20.00	20.27	**13.38**
12	69.89	38.47	20.00	18.47	13.30
14	64.23	35.36	20.00	15.36	12.90

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	13.38	66.00	0.00	0.00

Drainage Area RC

Drainage Area	RC				
Area (Ha)	0.050				
C =	1.00	Restricted Flow Q_r (L/s)=		8.00	
100-Year Ponding					
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi$_{100yr}$A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***
12	162.13	22.54	8.00	14.54	10.47
14	148.72	20.67	8.00	12.67	10.64
15	142.89	19.86	8.00	11.86	**10.68**
16	137.55	19.12	8.00	11.12	10.67
18	128.08	17.80	8.00	9.80	10.59

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	10.68	13.50	1.00	0.00

Drainage Area	RC				
Area (Ha)	0.050				
C =	0.90	Restricted Flow Q_r (L/s)=		8.00	
5-Year Ponding					
T_c Variable (min)	***i_{5yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi$_{5yr}$A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 5yr (m^3)***
5	141.18	17.66	8.00	9.66	2.90
7	123.30	15.43	8.00	7.43	3.12
8	116.11	14.53	8.00	6.53	**3.13**
9	109.79	13.74	8.00	5.74	3.10
11	99.19	12.41	8.00	4.41	2.91

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	3.13	13.50	0.00	0.00

Drainage Area	RC				
Area (Ha)	0.050				
C =	0.90	Restricted Flow Q_r (L/s)=		8.00	
2-Year Ponding					
T_c Variable (min)	***i_{2yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi$_{2yr}$A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 2yr (m^3)***
2	133.33	16.68	8.00	8.68	1.04
4	111.72	13.98	8.00	5.98	1.43
5	103.57	12.96	8.00	4.96	**1.49**
6	96.64	12.09	8.00	4.09	1.47
8	85.46	10.69	8.00	2.69	1.29

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	1.49	13.50	0.00	0.00

Drainage Area RD

Drainage Area	RD				
Area (Ha)	0.050				
C =	1.00	Restricted Flow Q_r (L/s)=		8.00	
100-Year Ponding					
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi$_{100yr}$A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***
12	162.13	22.54	8.00	14.54	10.47
14	148.72	20.67	8.00	12.67	10.64
15	142.89	19.86	8.00	11.86	**10.68**
16	137.55	19.12	8.00	11.12	10.67
18	128.08	17.80	8.00	9.80	10.59

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	10.68	11.25	1.00	0.00

Drainage Area	RD				
Area (Ha)	0.050				
C =	0.90	Restricted Flow Q_r (L/s)=		8.00	
5-Year Ponding					
T_c Variable (min)	***i_{5yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi$_{5yr}$A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 5yr (m^3)***
5	141.18	17.66	8.00	9.66	2.90
7	123.30	15.43	8.00	7.43	3.12
8	116.11	14.53	8.00	6.53	**3.13**
9	109.79	13.74	8.00	5.74	3.10
11	99.19	12.41	8.00	4.41	2.91

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	3.13	11.25	0.00	0.00

Drainage Area	RD				
Area (Ha)	0.050				
C =	0.90	Restricted Flow Q_r (L/s)=		8.00	
2-Year Ponding					
T_c Variable (min)	***i_{2yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi$_{2yr}$A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 2yr (m^3)***
2	133.33	16.68	8.00	8.68	1.04
4	111.72	13.98	8.00	5.98	1.43
5	103.57	12.96	8.00	4.96	**1.49**
6	96.64	12.09	8.00	4.09	1.47
8	85.46	10.69	8.00	2.69	1.29

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	1.49	11.25	0.00	0.00

Drainage Area EXTERNAL

Drainage Area	EXTERNAL				
Area (Ha)	1.550				
C =	1.00	Restricted Flow Q_r (L/s)=		291.58	
100-Year Ponding					
T_c Variable (min)	***i_{100yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi$_{100yr}$A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 100yr (m^3)***
9	188.25	811.19	291.58	519.61	280.59
11	169.91	732.13	291.58	440.55	290.76
12	162.13	698.63	291.58	407.05	**293.08**
13	155.11	668.36	291.58	376.78	293.89
15	142.89	615.73	291.58	324.15	291.74

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	293.08	270.00	0.00	23.08

Drainage Area	EXTERNAL				
Area (Ha)	1.550				
C =	0.80	Restricted Flow Q_r (L/s)=		291.58	
5-Year Ponding					
T_c Variable (min)	***i_{5yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi$_{5yr}$A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 5yr (m^3)***
2	182.69	629.76	291.58	338.18	40.58
4	152.51	525.73	291.58	234.15	56.19
5	141.18	486.67	291.58	195.09	**58.53**
6	131.57	453.54	291.58	161.96	58.31
8	116.11	400.26	291.58	108.68	52.17

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	58.53	270.00	0.00	0.00

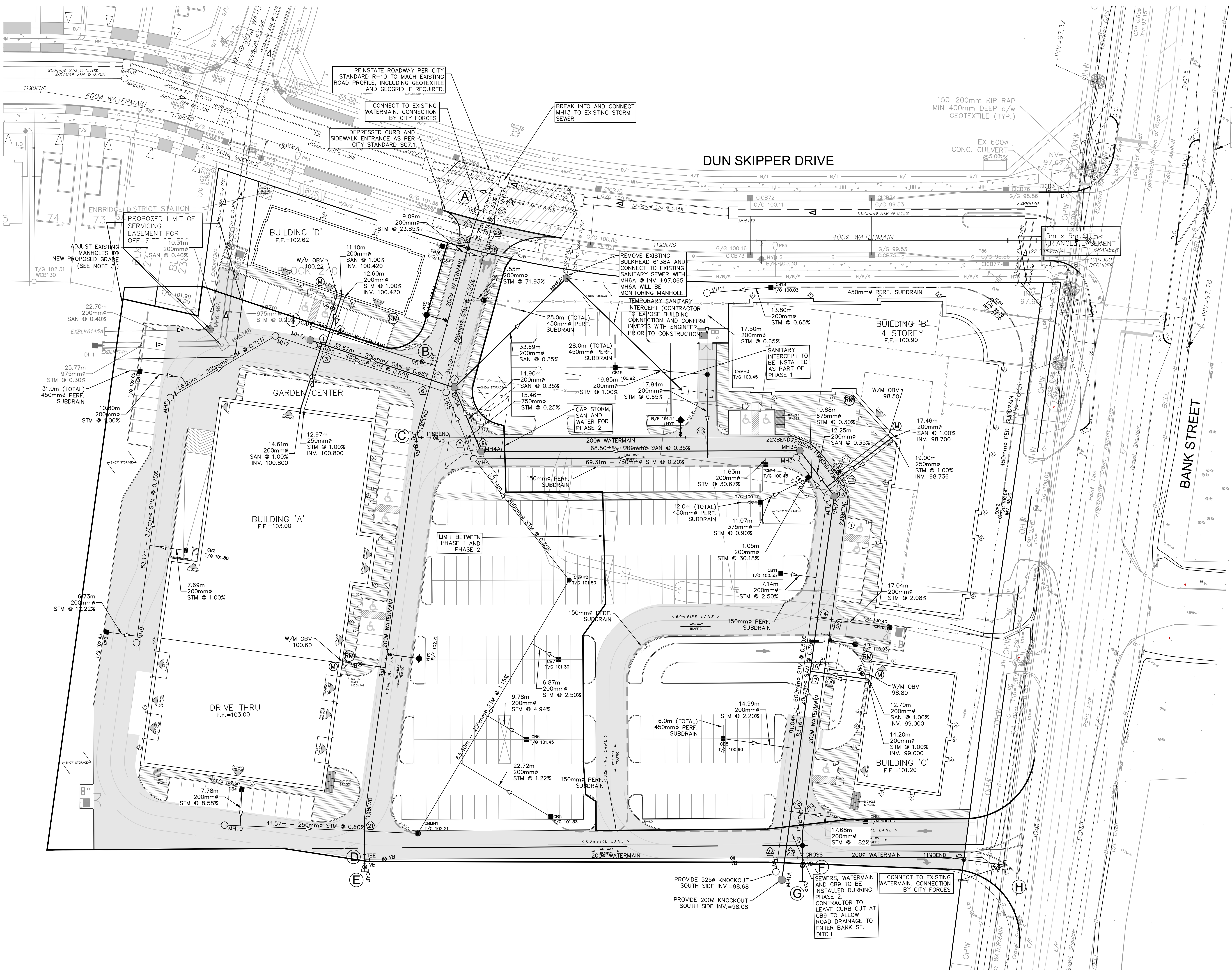
Drainage Area	EXTERNAL				
Area (Ha)	1.550				
C =	0.80	Restricted Flow Q_r (L/s)=		291.58	
2-Year Ponding					
T_c Variable (min)	***i_{2yr} (mm/hour)***	***Peak Flow Q_p=2.78xCi$_{2yr}$A (L/s)***	***Q_r (L/s)***	***Q_p-Q_r (L/s)***	***Volume 2yr (m^3)***
0	167.22	576.45	291.58	284.87	0.00
2	133.33	459.62	291.58	168.04	20.16
3	121.46	418.71	291.58	127.13	**22.88**
4	111.72	385.13	291.58	93.55	22.45
6	96.64	333.13	291.58	41.55	14.96

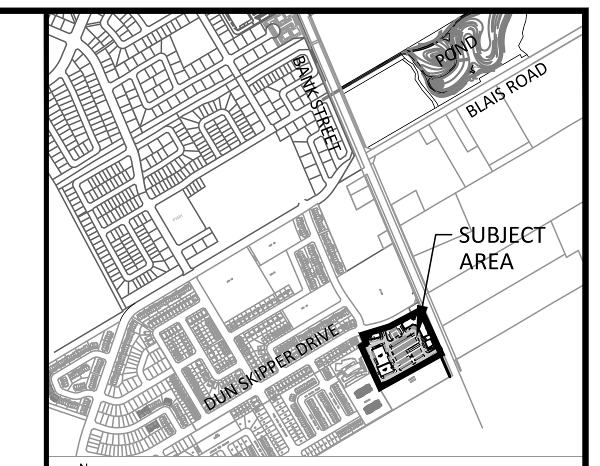
Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	22.88	270.00	0.00	0.00

APPENDIX F

- **Drawing 119351-001 – Site Servicing Plan**
- **Drawing 119351-010 – Details and Notes**
- **Drawing 119351-200 – Site Grading Plan**
- **Drawing 119351-600 – Ponding Plan**
- **Drawing 119351-900 – Erosion and Sedimentation Control Plan**





KEY PLAN
(NTS)

NOTES:

1. SEE DRAWING C-010 FOR ADDITIONAL DETAILS AND NOTES.
2. SITE BENCHMARK TO BE OBTAINED FROM LEGAL SURVEYOR H.A. KEN SHIPMAN SURVEYING LTD.
3.0 EXISTING SANITARY MANHOLE - MH6146A AS-BUILT F/C = 102.019 TO BE ADJUSTED TO ±102.160 EXISTING STORM MANHOLE - MH61646 AS-BUILT F/C = 102.018 TO BE ADJUSTED TO ±102.24.

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7	REVISED AS PER CITY COMMENTS	JIM	2020:04:20
6	REVISED AS PER CITY COMMENTS	JIM	2020:04:02
5	ISSUED FOR TENDER	JIM	2020:03:18
4	REVISED AS PER CITY COMMENTS	JIM	2020:03:13
3	REVISED AS PER CITY COMMENTS	JIM	2019:12:09
2	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	JIM	2019:10:11
1	ISSUED FOR SPA	JIM	2019:04:15

IBI

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Project Title

BANK STREET DEVELOPMENT
4836 BANK STREET

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2020/04/20
PROVINCE OF ONTARIO

N

Drawing Title

SITE SERVICING PLAN

Scale
1 : 400

Design	Date
SEL	FEB. 2019
Drawn	Checked
DPS	JIM
Project No.	Drawing No.
119351	001

D07-12-19-0092

#17977

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 S. J. LAWRENCE ARCHITECT INCORPORATED.

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

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

1.11 ALL CONCRETE CURBS AND SIDEWALKS TO CONFORM TO CITY STANDARDS SC1.1 AND SC1.4. 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 COMMERCIAL DEVELOPMENT - 4836 BANK STREET, OTTAWA, ON. REPORT No. PG2934-LET.01 REVISON 1 BY PATERSON GROUP DATED NOV. 19 2019. FOR GEOTECHNICAL REPORT ON DUN SKIPPER DRIVE SEE GEOTECHNICAL INVESTIGATION PROPOSED RESIDENTIAL DEVELOPMENT REMER LANDS OTTAWA, ONTARIO REPORT #13-1121-0083 (1042/2042) PREPARED 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 ALL UTILITY BOXES (i.e. PEDESTALS, TRANSFORMERS, ETC) ARE TO BE INSTALLED IN ACCORDANCE WITH THE LATEST EDITION OF THE CITY OF OTTAWA'S "GUIDELINES FOR UTILITY PEDESTALS WITHIN THE ROAD RIGHT OF WAY"

1.25 FOR SITE BENCH MARK SEE SURVEY BY H. A. KEN SHIPMAN SURVEYING LTD. REF. NO. GL-495.

2.0 SANITARY

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

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

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

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

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

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

3.0 STORM

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

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

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

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

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

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

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

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

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

4.0 WATER

4.1 ALL WATERMAINS TO BE PVC DR 18, WITH MINIMUM COVER OF 2.4m AND INSTALLED PER CITY OF OTTAWA STANDARDS W17. ALL DOMESTIC WATER SERVICES ARE TO BE 200mmØ.

4.2 THRUST BLOCKS TO BE INSTALLED AT ALL BENDS, TEES, AND CAPS ALL TO CITY STANDARDS W25.3 AND W25.4.

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 STANDARD W36.

4.5 ALL COMPONENTS OF THE WATER DISTRIBUTION SYSTEM SHALL BE CATHODICALLY PROTECTED AS PER CITY OF OTTAWA STANDARD W40.

4.6 ALL VALVES & VALVE BOXES AND CHAMBERS, HYDRANTS, AND HYDRANT VALVES AND ASSEMBLIES SHALL BE INSTALLED AS PER CITY OF OTTAWA STANDARDS W19 & W24.

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 STANDARD R10.

5.0 PARKING LOT AND WORK IN PUBLIC RIGHTS OF WAY

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

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

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

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

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

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

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

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

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

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

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

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

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

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

CATCH BASIN DATA TABLE

STRUCTURE ID	AREA ID	STRUCTURE	COVER	ELEVATION			OUTLET PIPE		HEAD	FLOW	ICD TYPE
				TOP OF GRATE	INVERT INLET	INVERT OUTLET	DIAMETER (mm)	TYPE			
CB1	MH8	OPSD 705.010	S19	102.05		100.570	200	HDPE PERF	1.65	13.00	Tempest Vortex
CB2	MH9B	OPSD 705.010	S19	101.75		100.350	200	HDPE PERF			
CB3	MH9	OPSD 705.010	S19	102.45		100.950	200	PVC DR-35	1.65	10.00	Tempest Vortex
CB4	MH10A	OPSD 705.010	S19	102.50		101.200	200	PVC DR-35	1.4	6.00	Tempest Vortex
CB5	CBMH1A	OPSD 705.010	S19	101.33		99.980	200	PVC DR-35	1.4	15.00	Tempest Vortex
CB6	CBMH1B	OPSD 705.010	S19	101.45		100.200	200	PVC DR-35	1.4	20.00	Tempest HF - Type A
CB7	CBMH1C	OPSD 705.010	S19	101.30		100.050	200	PVC DR-35	1.4	30.00	Tempest HF - Type B
CB8	MH1B	OPSD 705.010	S19	100.60		99.400	200	PVC DR-35	1.4	47.00	Tempest HF - Type D
CB9	MH1A	OPSD 705.010	S19	100.66		99.420	200	PVC DR-35	1.35	43.00	Tempest HF - Type D
CB10	MH1D	OPSD 705.010	S19	100.40		98.850	200	PVC DR-35	1.65	45.00	Tempest HF - Type B
CB11	MH1E	OPSD 705.010	S19	100.55		98.930	200	PVC DR-35	1.65	15.00	Tempest Vortex
CB12	MH2B	OPSD 705.010	S19	100.40		99.100	200	PVC DR-35			
CB13	MH3	OPSD 705.010	S19	100.30	99.000	99.000	200	PVC DR-35	1.5	36.00	Tempest HF - Type B
CB14	MH4	OPSD 705.010	S19	100.45		99.000	200	PVC DR-35	1.5	37.00	Tempest HF - Type B
CB15	CBMH3B	OPSD 705.010	S19	100.92		99.470	200	PVC DR-35	1.65	6.00	Tempest Vortex
CB16	MH5B	OPSD 705.010	S19	100.65		100.020	200	PVC DR-35	1.65	6.00	Tempest Vortex
CB17	MH5A	OPSD 705.010	S19	101.35		99.690	200	PVC DR-35	1.65	6.00	Tempest Vortex
CB18	MH11	OPSD 705.010	S19	100.03		98.320	200	PVC DR-35	1.65	15.00	Tempest Vortex
CBMH1	MH10B	OPSD 701.010	S25 & S28.1 Open	102.21		99.795	250	PVC DR-35	2.54	20.0	Tempest Vortex
CBMH2	CBMH2	OPSD 701.010	S25 & S28.1 Open	101.50		99.016	300	PVC DR-35	2.834	20.0	Tempest Vortex
CBMH3	CBMH3A	OPSD 701.010	S25 & S28.1 Open	100.45		98.705	200	PVC DR-35	2.045	6.0	Tempest Vortex
TCB1	MH11	CITY STD S29	S30/S31	98.70		97.700	450	HDPE PERF			
ECB2	MH11	CITY STD S29	S30/S31	100.04		98.300	450	HDPE PERF			

Bold font indicates CB's with ICD's

Revision: 2020-04-20

STM STRUCTURE TABLE

NAME	RIM ELEV.	INVERT IN	INVERT IN AS–BUILT	INVERT OUT	INVERT OUT AS–BUILT	DESCRIPTION
CB18	100.57			SW98.320		Eccentric Cylinder Metric
CBMH1	102.22	SW100.250		N99.795		1200mmø OPSD–701.010
CBMH2	101.50	S99.066		W99.016		1200mmø OPSD–701.010
CBMH3	100.83	SW99.321 NW98.116		SE98.116		1200mmø OPSD–701.010
EXBLK900	99.20			NW95.298		1350mm BULKHEAD
EXMH6140	98.93	SE95.266		SW95.206		2438mm x 2438mm RECTANGULAR METRIC
MH1	101.16			NW98.605		1200mmø OPSD–701.010
MH2	100.41	SE98.200		W98.125		1200mmø OPSD–701.010
MH3	100.39	E98.092		SW97.762		1200mmø OPSD–701.010
MH4	102.14	NE97.623 E98.900		NW97.623		1200mmø OPSD–701.010
MH5	100.96	SE97.584 W99.130		N97.584		1200mmø OPSD–701.010
MH7	102.35	SW99.562		E99.362		1200mmø OPSD–701.010
MH8	102.45	SE99.780		NE99.758		1200mmø OPSD–701.010
MH9	102.76			NW100.179		1200mmø OPSD–701.010
MH10	102.68			NE100.499		1200mmø OPSD–701.010
MH11	100.49	NE98.230		SE98.230		1200mmø OPSD–701.010
MH12	101.51	S97.475		N97.455		1200mmø OPSD–701.010

SAN STRUCTURE TABLE

NAME	RIM ELEV.	INVERT IN	INVERT IN AS–BUILT	INVERT OUT	INVERT OUT AS–BUILT	DESCRIPTION
EXBLK6138A	0.00					200mm BULKHEAD
EXMH6138A	101.10	S97.028		W96.968		1200mmø OPSD–701.010
MH1A	101.53			NW98.004		1200mmø OPSD–701.010
MH2A	100.43	SE97.713		W97.683		1200mmø OPSD–701.010
MH3A	100.41	E97.640		SW97.610		1200mmø OPSD–701.010
MH4A	102.09	NE97.370		NW97.340		1200mmø OPSD–701.010
MH5A	98.09	SE97.288 W98.640		N97.228		1200mmø OPSD–701.010
MH6A	101.01	S97.110		N97.065		1200mmø OPSD–701.010
MH7A	102.36			E98.852		1200mmø OPSD–701.010

WATERMAIN SCHEDULE

	STATION	DESCRIPTION	FINISHED GRADE (m)	TOP OF WATERMAIN	WATERMAIN COVER	AS-BUILT WATERMAIN
A	0+000	CONNECT TO EX. 400Ø W/M	101.45	99.16	2.29	
	0+008.59	200Ø V&VB	101.67	99.27	2.40	
	0+020	--	101.57	99.17	2.40	
	0+024.72	200Ø x 150Ø HYDRANT TEE	101.76	99.36	2.40	
B	0+034.70	150Ø x 200Ø TEE	102.05	99.65	2.40	
	0+040	--	102.21	99.81	2.40	
	0+048.82	200Ø – 11 1/4° BEND	102.42	100.02	2.40	
C	0+050.57	200Ø x 200Ø TEE	102.45	100.05	2.40	
	0+052.57	200Ø V&VB	102.46	100.06	2.40	
	0+060	--	102.55	100.15	2.40	
	0+080	--	102.65	100.25	2.40	
	0+97.676	200Ø x 150Ø HYDRANT TEE	102.68	100.28	2.40	
	0+100	--	102.68	100.28	2.40	
	0+100.58	200Ø x 200Ø TEE DOMESTIC WATER SERVICE	102.70	100.30	2.40	
	0+120	--	102.70	100.30	2.40	
	0+133.06	200Ø – 11 1/4° BEND	102.56	100.16	2.40	
	0+136.02	--	102.56	100.16	2.40	
D	0+142.04	200Ø x 200Ø TEE	102.42	100.02	2.40	
	0+143.71	200Ø V&VB	102.37	99.97	2.40	
E	0+144.76	200Ø CAP	102.33	99.93	2.40	
C	0+000	200Ø x 200Ø TEE	102.45	100.05	2.40	
	0+001.61	200Ø – 11 1/4° BEND	102.39	99.99	2.40	
	0+004.04	200Ø V&VB	102.34	99.94	2.40	
	0+020	--	101.91	99.51	2.40	
	0+040	--	101.35	98.95	2.40	
	0+056.69	200Ø x 150Ø HYDRANT TEE	100.90	98.50	2.40	
	0+060	--	100.74	98.34	2.40	
	0+062.44	--	100.66	98.26	2.40	
	0.081.06	200Ø – 22 1/2° BEND	100.47	98.07	2.40	
	0+084.95	200Ø – 22 1/2° BEND	100.44	98.04	2.40	
	0+088.64	200Ø – 11 1/4° BEND	100.40	98.00	2.40	
	0+093.48	200Ø x 200Ø TEE DOMESTIC WATER SERVICE	100.41	98.01	2.40	
	0+096.06	200Ø – 22 1/2° BEND	100.44	98.04	2.40	
	0+099.51	200Ø – 22 1/2° BEND	100.47	98.07	2.40	
	0+120	--	100.56	98.16	2.40	
	0+130.23	200Ø x 150Ø HYDRANT TEE	100.66	98.26	2.40	
	0+136.32	200Ø x 200Ø TEE DOMESTIC WATER SERVICE	100.82	98.42	2.40	
	0+140	--	100.85	98.45	2.40	
	0+160	--	100.88	98.48	2.40	
	0+171.94	200Ø – 11 1/4° BEND	100.97	98.57	2.40	
	0+174.66	200Ø V&VB	100.98	98.58	2.40	
F	0+177.30	200Ø x 200Ø CROSS	101.03	98.63	2.40	
	0+179.04	200Ø V&VB	101.01	98.61	2.40	
G	0+182.36	200Ø CAP	100.89	98.49	2.40	
H	0+000	CONNECT TO EX. 400Ø W/M	101.05	97.80	3.25	
	0+008.79	200Ø V&VB	101.06	98.66	2.40	
	0+012.26	200Ø – 11 1/4° BEND	101.04	98.64	2.40	
	0+020	--	100.96	98.56	2.40	
F	0+043.52	200Ø x 200Ø CROSS	101.03	98.63	2.40	
	0+048.81	--	101.12	98.72	2.40	
	0+058.52	200Ø V&VB	101.22	98.82	2.40	
	0+060	--	101.23	98.83	2.40	
	0+080	--	101.41	99.01	2.40	
	0+100	--	101.73	99.33	2.40	
	0+120	--	102.23	99.83	2.40	
	0+133.36	200Ø V&VB	102.42	100.02	2.40	
D	0+137.59	200Ø x 200Ø TEE	102.42	100.02	2.40	
B	0+000	150Ø x 200Ø TEE	102.05	99.65	2.40	
	0+003	150Ø V&VB	102.09	99.69	2.40	
	0+020	--	102.33	99.93	2.40	
	0+025.62	150Ø x 150Ø TEE DOMESTIC WATER SERVICE	102.31	99.91	2.40	
I	0+028.10	150Ø CAP	102.29	99.89	2.40	

REVISED 2020-03-13

Crossing Schedule

1	150 Φ WM INV	99.75	0.8 m CLEARANCE OVER	200 Φ SAN OBV	98.95	
3	200 Φ SAN INV	98.80	0.35 m CLEARANCE OVER	450 Φ STM OBV	98.45	
4	200 Φ SAN INV	98.85	0.25 m CLEARANCE OVER	200 Φ STM OBV	98.60	
5	200 Φ WM INV	99.55	0.8 m CLEARANCE OVER	200 Φ SAN OBV	98.75	
6	200 Φ WM INV	99.55	0.25 m CLEARANCE OVER	450 Φ STM OBV	99.30	*INSULATE PER W22
7	750 Φ STM INV	97.58	0.2 m CLEARANCE OVER	200 Φ SAN OBV	97.38	
8	200 Φ WM INV	99.50	0.95 m CLEARANCE OVER	750 Φ STM OBV	98.55	
9	200 Φ WM INV	99.50	2.1 m CLEARANCE OVER	200 Φ SAN OBV	97.40	
10	200 Φ STM INV	98.55	0.8 m CLEARANCE OVER	200 Φ SAN OBV	97.75	
11	200 Φ WM OBV	98.00	0.50 (min) m CLEARANCE UNDER	200 Φ SAN INV	98.50	
12	200 Φ WM OBV	98.00	0.50 (min) m CLEARANCE UNDER	200 Φ STM INV	98.50	
13	200 Φ STM INV	98.56	0.65 m CLEARANCE OVER	200 Φ SAN OBV	97.91	
14	200 Φ STM INV	98.75	0.9 m CLEARANCE OVER	200 Φ SAN OBV	97.85	
15	200 Φ WM OBV	98.20	0.7 m CLEARANCE UNDER	200 Φ STM INV	98.90	
16	200 Φ WM OBV	98.40	0.50 (min) m CLEARANCE UNDER	200 Φ SAN INV	98.90	
17	200 Φ STM INV	98.87	0.75 m CLEARANCE OVER	200 Φ SAN OBV	98.12	
18	200 Φ WM OBV	98.40	0.50 (min) m CLEARANCE UNDER	200 Φ STM INV	98.90	
19	200 Φ STM INV	98.95	0.8 m CLEARANCE OVER	200 Φ SAN OBV	98.15	
20	200 Φ WM OBV	98.40	0.9 m CLEARANCE UNDER	200 Φ STM INV	99.30	
21	200 Φ WM OBV	100.00	0.50 (min) m CLEARANCE UNDER	250 Φ STM INV	100.50	
22	200 Φ WM INV	98.83	0.25 m CLEARANCE OVER	525 Φ STM OBV	98.58	*INSULATE PER W22
23	200 Φ WM INV	98.78	0.5 m CLEARANCE OVER	200 Φ SAN OBV	98.28	
24	750 Φ STM INV	97.42	0.2 m CLEARANCE OVER	200 Φ SAN OBV	97.22	
25	400 Φ WM INV	98.90	0.35 m CLEARANCE OVER	750 Φ STM OBV	98.55	
26	GAS INV	100.98	1.8 m CLEARANCE OVER	200 Φ WM OBV	99.18	
27	3 PARTY DUCT INV	100.84	1.4 m CLEARANCE OVER	200 Φ WM OBV	99.44	
28	3 PARTY DUCT INV	100.75	2.5 m CLEARANCE OVER	750 Φ STM OBV	98.25	
29	GAS INV	100.78	2.9 m CLEARANCE OVER	750 Φ STM OBV	97.88	
30	GAS INV	99.24	1.8 m CLEARANCE OVER	200 Φ WM OBV	97.44	

REVISED 2020-03-13

PAVEMENT STRUCTURE **

CAR ONLY PARKING AREAS:

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

HEAVY TRUCK PARKING AREAS AND ACCESS LANES:

40mm WEAR COURSE – SUPERPAVE 12.5 ASPHALTIC CONCRETE
50mm BINDER COURSE – SUPERPAVE 19.0 ASPHALTIC CONCRETE
150mm BASE COURSE – OPSS GRANULAR "A" CRUSHED STONE
400mm SUBBASE – OPSS GRANULAR "B" TYPE II
SUBGRADE – EITHER FILL, IN SITU SOIL, OR OPSS GRANULAR "B" TYPE I OR II MATERIAL PLACED OVER IN SITU SOIL OR FILL

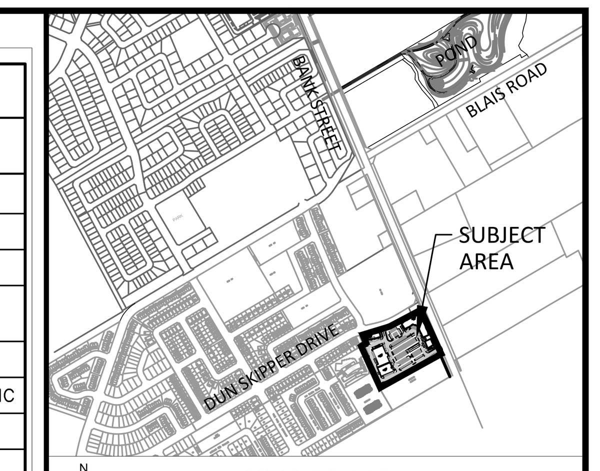
EXISTING DUN SKIPPER DRIVE ***

40mm WEAR COURSE – SUPERPAVE 12.5 ASPHALTIC CONCRETE
2x50mm BINDER COURSE – SUPERPAVE 19.0 ASPHALTIC CONCRETE
150mm BASE COURSE – OPSS GRANULAR "A" CRUSHED STONE
450mm SUBBASE – OPSS GRANULAR "B" TYPE II

** REFER TO GEOTECHNICAL REPORT PG2934–LET.01 REVISION 1 DATED NOV. 19–2019 BY PATERSON GROUP
*** REFER TO GEOTECHNICAL REPORT No. 12–1121–0286 BY GOLDER ASSOCIATES.

LEGEND:

- MH3A EXISTING SANITARY MANHOLE
- MH3 EXISTING STORM MANHOLE
- CB T/G 99.76 EXISTING STREET CATCHBASIN
- CICB G/G 99.76 EXISTING CURB INLET CATCHBASIN
- V&VB EXISTING VALVE AND VALVE BOX
- V&C EXISTING VALVE AND CHAMBER
- HYD B/F 100.56 EXISTING HYDRANT
- EXISTING BARRIER CURB
- D.C. EXISTING DEPRESSED BARRIER CURB
- EXISTING CONCRETE SIDEWALK
- PERF. SUBDRAIN (SIZE AS NOTED)
- SIAMESE CONNECTION (IF REQUIRED)
- M METER
- RM REMOTE METER
- PRV PRESSURE REDUCING VALVE
- WATERMAIN IDENTIFICATION
- 1 PIPE CROSSING IDENTIFICATION
- MH3 INLET CONTROL DEVICE LOCATION
- PROTECTIVE BOLLARD
- HEAVY DUTY ASPHALT / FIRE ROUTE
- MH3A SANITARY MANHOLE
- MH3 STORM MANHOLE
- CB T/G 99.76 CATCHBASIN c/w TOP OF GRATE
- RYCB T/G 99.76 REAR YARD CATCHBASIN c/w GUTTER GRADE
- ECB T/G 100.25 REAR YARD "END" CATCHBASIN C/W TOP OF GRATE 300ø)
- CBMH T/G 101.55 CATCHBASIN MANHOLE c/w TOP OF GRATE
- V&VB VALVE AND VALVE BOX
- V&C VALVE AND CHAMBER
- HYD B/F 100.56 HYDRANT c/w BOTTOM OF FLANGE ELEVATION
- D.C. DEPRESSED BARRIER CURB AS PER SC1.1
- BARRIER CURB AND GUTTER AS PER SC1.2
- MOUNTABLE CURB AS PER SC1.3
- PROPOSED CONCRETE SIDEWALK
- 200mmø SAN SANITARY SEWER & FLOW DIRECTION
- 825mmø STM STORM SEWER & FLOW DIRECTION
- 200ø WATERMAIN WATERMAIN
- 200ø WM RED 150ø WM WATERMAIN REDUCER
- 2 VBENDS VERTICAL BEND LOCATION
- PROPERTY LINE
- MB PROPOSED MAIL BOX
- PROPOSED SWALE C/W FLOW DIRECTION
- 0.5% PROPOSED DITCH C/W FLOW DIRECTION AND SLOPE
- 1.3% SLOPE C/W FLOW DIRECTION
- MAJOR OVERLAND FLOW ROUTE
- 104.62 PROPOSED SPOT GRADE
- 104.40 (S) PROPOSED SWALE GRADE
- 104.50 (S)HP PROPOSED SWALE HIGH POINT
- 104.60 103.59 LOT CORNER GRADE C/W EXISTING GROUND
- 86.45 EX TIE INTO EXISTING GRADE
- 96.79 FULL STATIC PONDING GRADE
- RETAINING WALL
- 105.30 T/W TOP OF RETAINING WALL
- 103.50 B/W PROPOSED BOTTOM OF RETAINING WALL
- TERRACING 3:1 MAXIMUM UNLESS NOTED OTHERWISE
- PRELIMINARY ROOF DRAIN LOCATION
- TP 13-301 TEST PITS (SEE GEOTECHNICAL REPORT)
- CLAY DYKES PER S8
- F.F.E.=106.30 PROPOSED BUILDING FINISHED FLOOR ELEVATION
- U.S.F.=104.30 PROPOSED UNDERSIDE OF FOOTING ELEVATION
- PROPOSED TRANSFORMER
- B PROPOSED BIKE RACK



N

KEY PLAN
(NTS)

NOTES:

1. SEE DRAWING C-010 FOR ADDITIONAL DETAILS AND NOTES.
2. SITE BENCHMARK TO BE OBTAINED FROM LEGAL SURVEYOR H.A. KEN SHIPMAN SURVEYING LTD.

No.	REVISIONS	By	Date
14			
13			
12			
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9			
8	REVISED AS PER CITY COMMENTS	JIM	2020:04:20
7	REVISED AS PER CITY COMMENTS	JIM	2020:04:02
6	ISSUED FOR TENDER	JIM	2020:03:18
5	REVISED AS PER CITY COMMENTS	JIM	2020:03:13
4	REVISED AS PER CITY COMMENTS	JIM	2019:12:09
3	REVISED AS PER PATERSON COMMENTS	JIM	2019:11:20
2	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	JIM	2019:10:11
1	ISSUED FOR SPA	JIM	2019:04:15

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Project Title
BANK STREET DEVELOPMENT
4836 BANK STREET

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2020/04/20
PROVINCE OF ONTARIO

Drawing Title
DETAILS AND NOTES

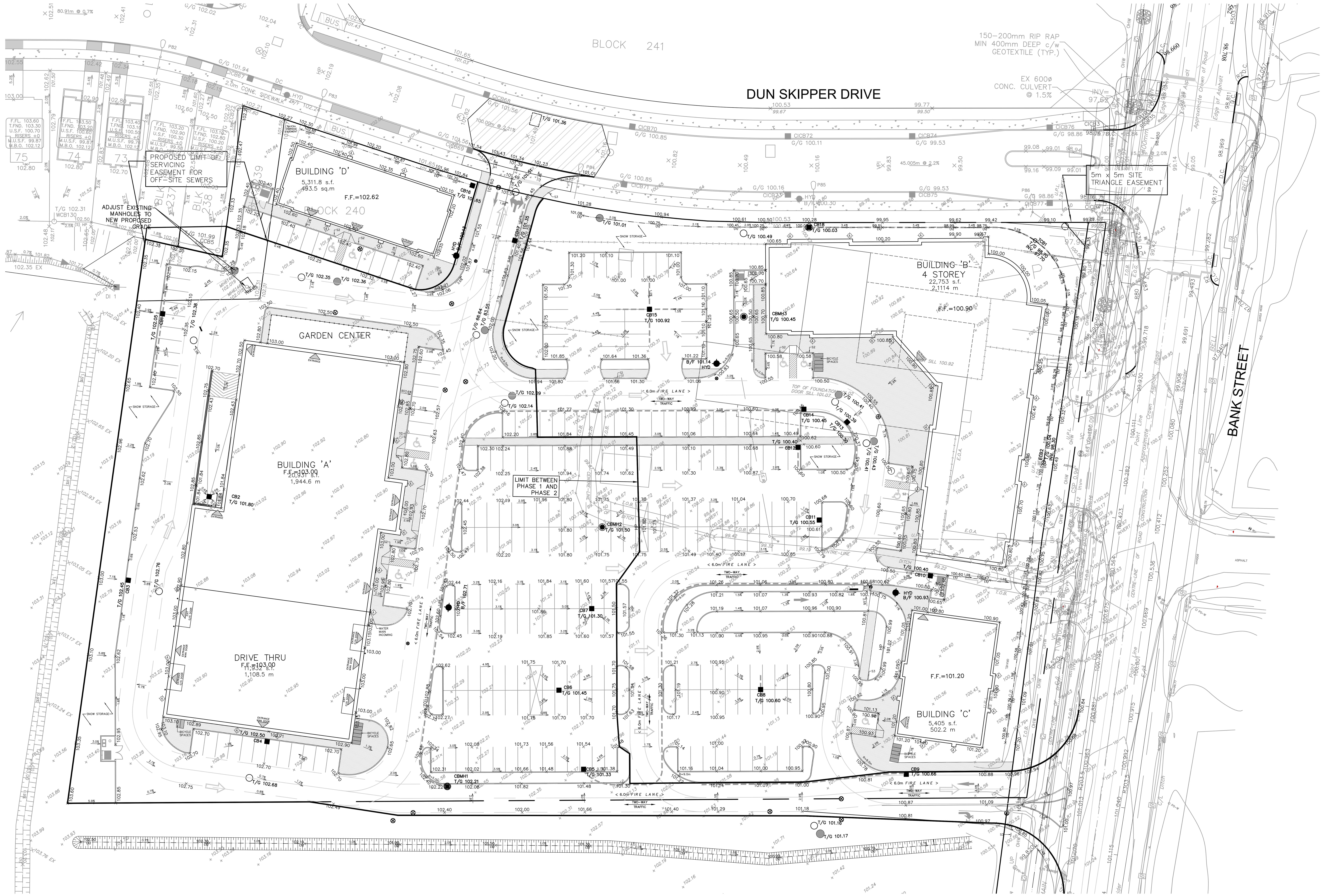
Scale: N.T.S.

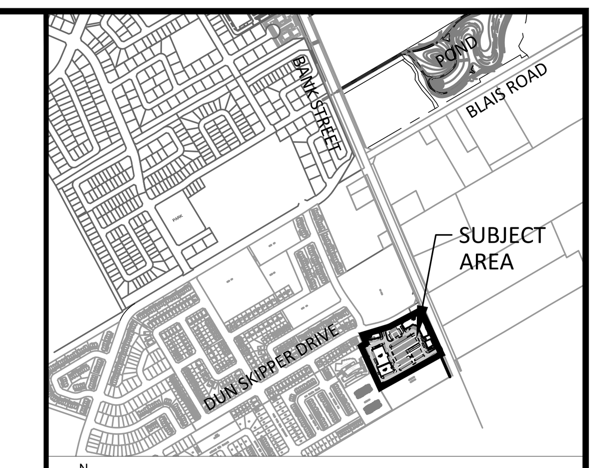
Design: SEL | Date: FEB. 2019
Drawn: DPS | Checked: JIM
Project No.: 119351 | Drawing No.: 010

D07-12-19-0092

#17977

J:\119351_4836BankSt\5.9 Drawings\59civil\layouts\010 - DETAILS AND NOTES.dwg Layout Name: 010 - DETAILS AND NOTES Plot Style: AIA STANDARD-FULL.CTB Plot Scale: 1:25.4 Plotted At: 4/28/2020 4:23 PM Last Saved By: James.Battison Last Saved At: Apr. 28, 20





KEY PLAN
(NTS)

NOTES:

1. SEE DRAWING C-010 FOR ADDITIONAL DETAILS AND NOTES.
2. SITE BENCHMARK TO BE OBTAINED FROM LEGAL SURVEYOR H.A. KEN SHIPMAN SURVEYING LTD.

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8	REVISED AS PER CITY COMMENTS	JIM	2020:04:20
7	REVISED AS PER CITY COMMENTS	JIM	2020:04:02
6	ISSUED FOR TENDER	JIM	2020:03:13
5	REVISED AS PER CITY COMMENTS	JIM	2020:03:13
4	REVISED AS PER CITY COMMENTS	JIM	2019:12:09
3	ADD EXISTING AND PROPOSED DITCHES ON WEST AND SOUTH SIDE OF PROPERTY	JIM	2019:11:26
2	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	JIM	2019:10:11
1	ISSUED FOR SPA	JIM	2019:04:15

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LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2020/04/20
PROVINCE OF ONTARIO

N

Drawing Title

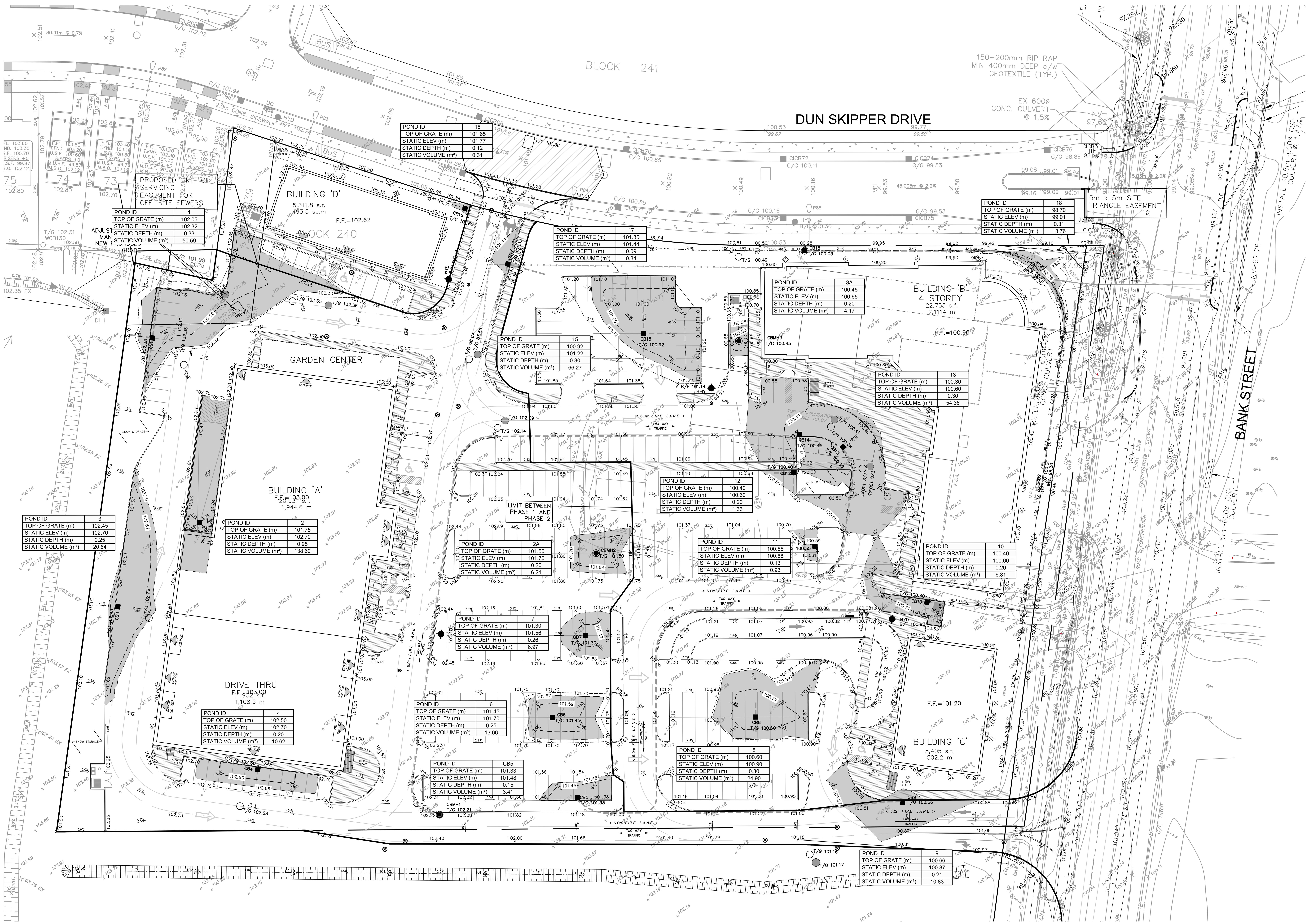
SITE GRADING PLAN

Scale
1 : 400

Design: SEL	Date: FEB. 2019
Drawn: DPS	Checked: JIM
Project No.: 119351	Drawing No.: 200

D07-12-19-0092

#17977



POND ID	16
TOP OF GRATE (m)	101.65
STATIC ELEV (m)	101.77
STATIC DEPTH (m)	0.12
STATIC VOLUME (m³)	0.31

POND ID	1
TOP OF GRATE (m)	102.05
STATIC ELEV (m)	102.32
STATIC DEPTH (m)	0.33
STATIC VOLUME (m³)	50.59

POND ID	17
TOP OF GRATE (m)	101.35
STATIC ELEV (m)	101.44
STATIC DEPTH (m)	0.09
STATIC VOLUME (m³)	0.84

POND ID	18
TOP OF GRATE (m)	98.70
STATIC ELEV (m)	99.01
STATIC DEPTH (m)	0.31
STATIC VOLUME (m³)	13.76

POND ID	3A
TOP OF GRATE (m)	100.45
STATIC ELEV (m)	100.65
STATIC DEPTH (m)	0.20
STATIC VOLUME (m³)	4.17

POND ID	15
TOP OF GRATE (m)	100.92
STATIC ELEV (m)	101.22
STATIC DEPTH (m)	0.30
STATIC VOLUME (m³)	66.27

POND ID	13
TOP OF GRATE (m)	100.30
STATIC ELEV (m)	100.60
STATIC DEPTH (m)	0.30
STATIC VOLUME (m³)	54.36

POND ID	12
TOP OF GRATE (m)	100.40
STATIC ELEV (m)	100.60
STATIC DEPTH (m)	0.20
STATIC VOLUME (m³)	1.33

POND ID	3
TOP OF GRATE (m)	102.45
STATIC ELEV (m)	102.70
STATIC DEPTH (m)	0.25
STATIC VOLUME (m³)	20.64

POND ID	2
TOP OF GRATE (m)	101.75
STATIC ELEV (m)	102.70
STATIC DEPTH (m)	0.95
STATIC VOLUME (m³)	138.60

POND ID	2A
TOP OF GRATE (m)	101.50
STATIC ELEV (m)	101.70
STATIC DEPTH (m)	0.20
STATIC VOLUME (m³)	6.21

POND ID	11
TOP OF GRATE (m)	100.55
STATIC ELEV (m)	100.68
STATIC DEPTH (m)	0.13
STATIC VOLUME (m³)	0.93

POND ID	10
TOP OF GRATE (m)	100.40
STATIC ELEV (m)	100.60
STATIC DEPTH (m)	0.20
STATIC VOLUME (m³)	6.81

POND ID	7
TOP OF GRATE (m)	101.30
STATIC ELEV (m)	101.56
STATIC DEPTH (m)	0.26
STATIC VOLUME (m³)	6.97

POND ID	6
TOP OF GRATE (m)	101.45
STATIC ELEV (m)	101.70
STATIC DEPTH (m)	0.25
STATIC VOLUME (m³)	13.66

POND ID	4
TOP OF GRATE (m)	102.50
STATIC ELEV (m)	102.70
STATIC DEPTH (m)	0.20
STATIC VOLUME (m³)	10.62

POND ID	CB5
TOP OF GRATE (m)	101.33
STATIC ELEV (m)	101.48
STATIC DEPTH (m)	0.15
STATIC VOLUME (m³)	3.41

POND ID	8
TOP OF GRATE (m)	100.60
STATIC ELEV (m)	100.90
STATIC DEPTH (m)	0.30
STATIC VOLUME (m³)	24.90

POND ID	9
TOP OF GRATE (m)	100.66
STATIC ELEV (m)	100.87
STATIC DEPTH (m)	0.21
STATIC VOLUME (m³)	10.83

KEY PLAN (NTS)

SUBJECT AREA

BLAIS ROAD

DUN SKIPPER DRIVE

NOTES:

1. SEE DRAWING C-010 FOR ADDITIONAL DETAILS AND NOTES.
2. SITE BENCHMARK TO BE OBTAINED FROM LEGAL SURVEYOR H.A. KEN SHIPMAN SURVEYING LTD.

LEGEND :

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

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3	REVISED AS PER CITY COMMENTS	JIM	2020:04:20
2	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	JIM	2019:10:11
1	ISSUED FOR SPA	JIM	2019:04:15
No.	REVISIONS	By	Date

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Project Title

BANK STREET DEVELOPMENT

4836 BANK STREET

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2020/04/20
PROVINCE OF ONTARIO

N

Drawing Title

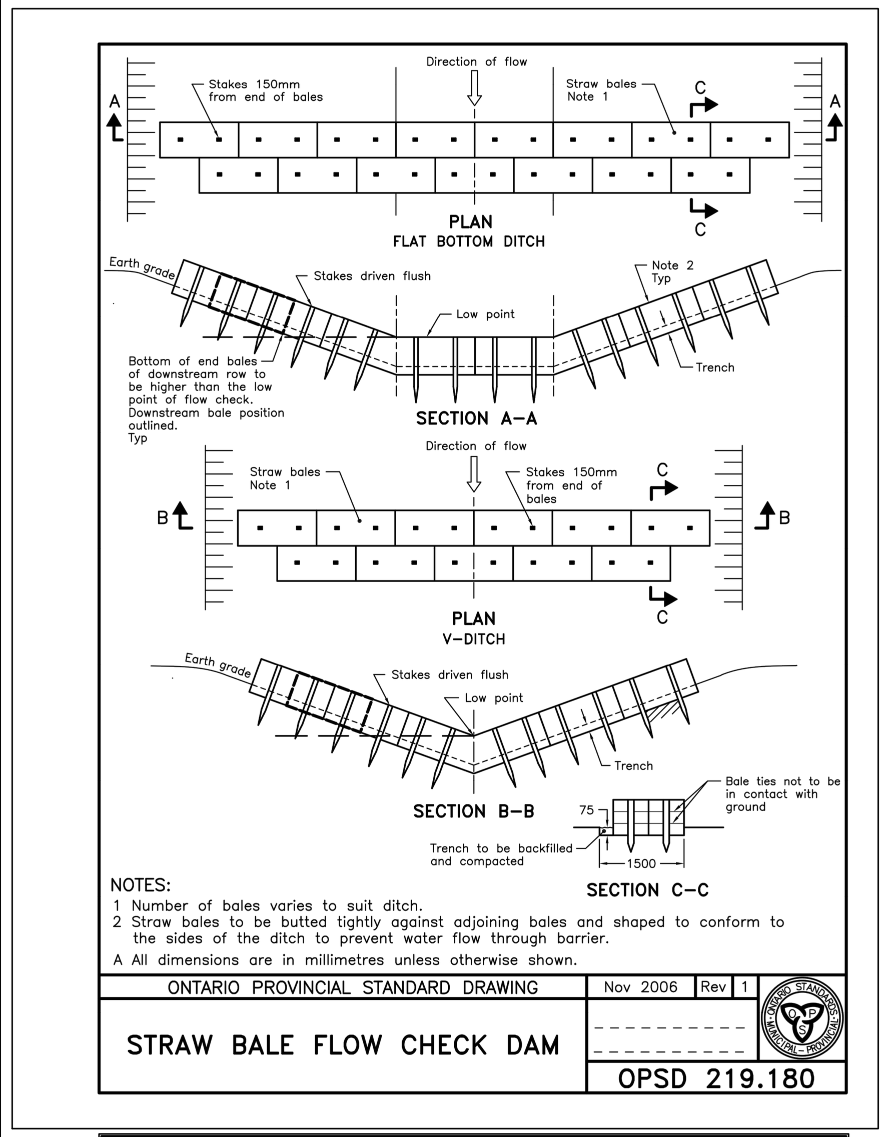
PONDING PLAN

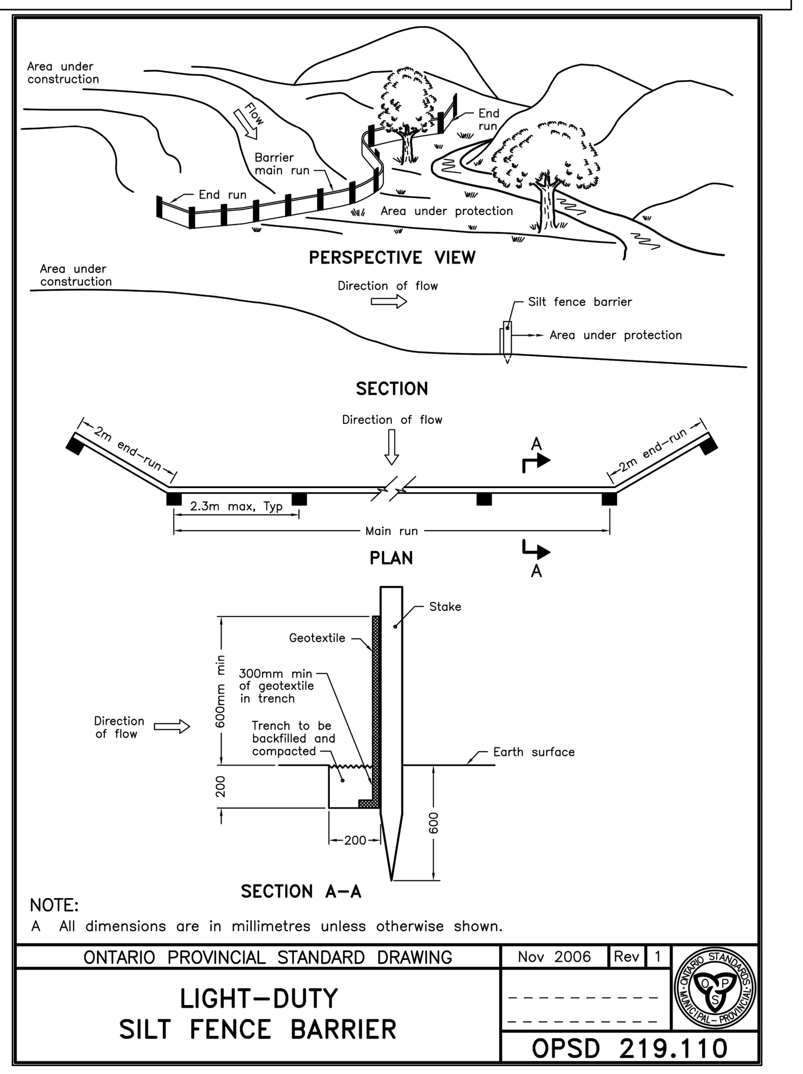
Scale 1 : 400

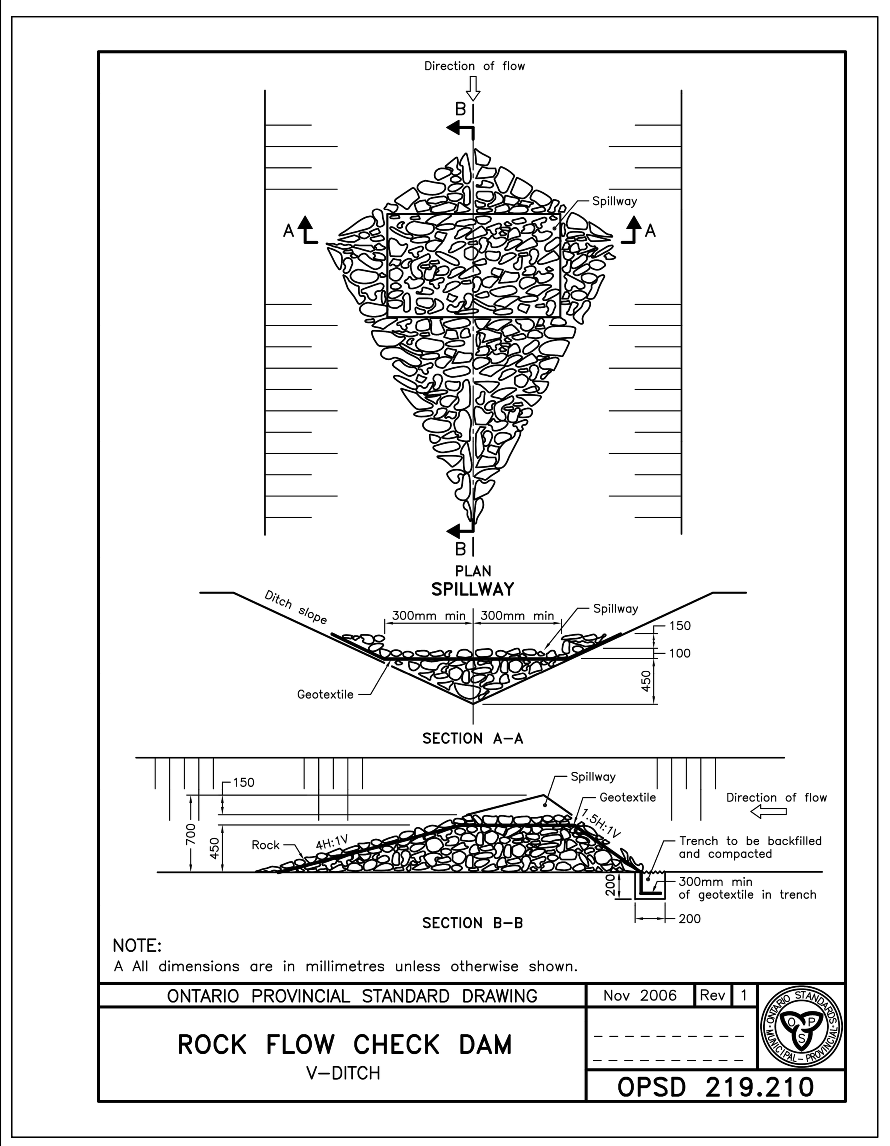
Design	SEL	Date	FEB. 2019
Drawn	DPS	Checked	JIM
Project No.	119351	Drawing No.	600

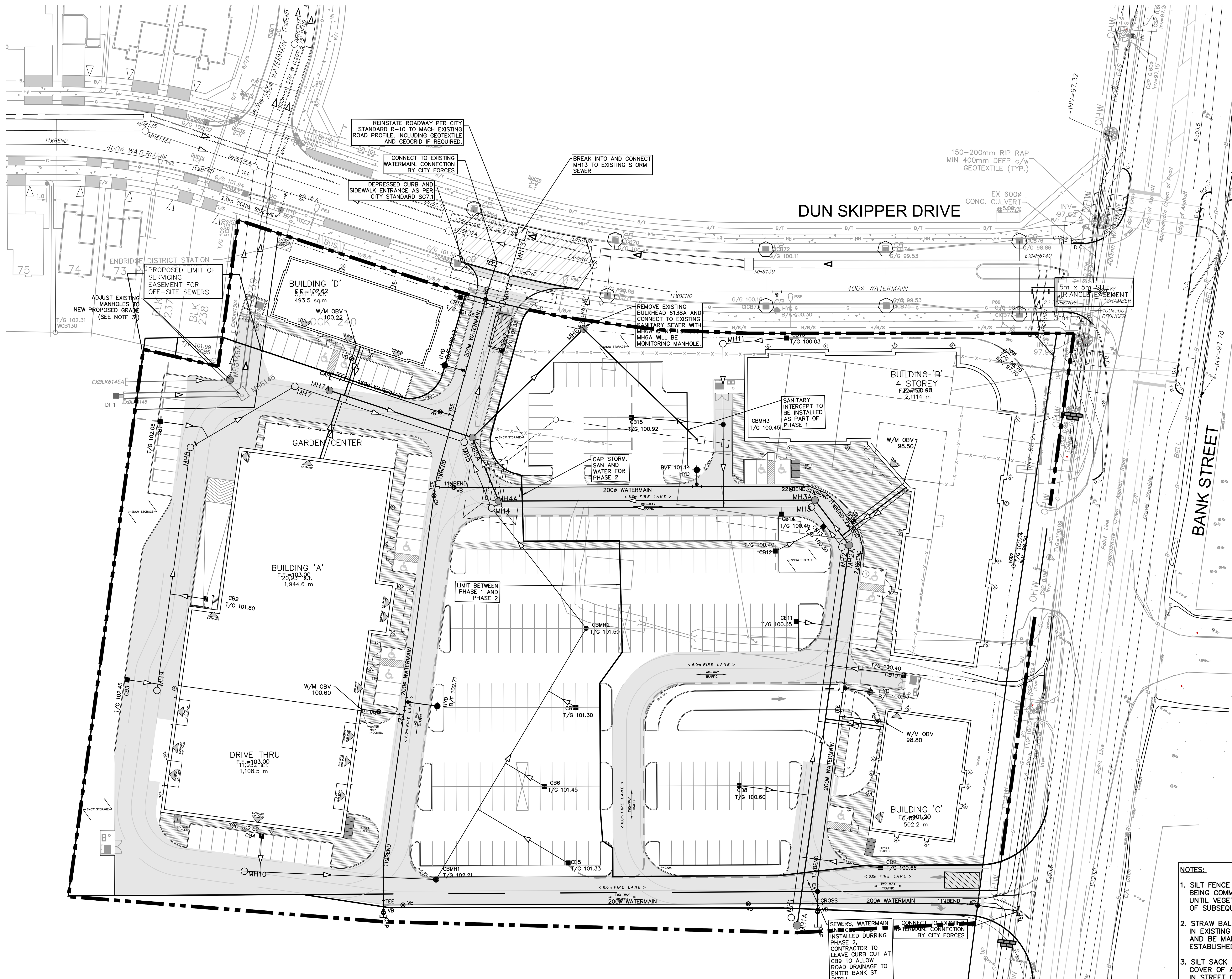
D07-12-19-0092

#17977



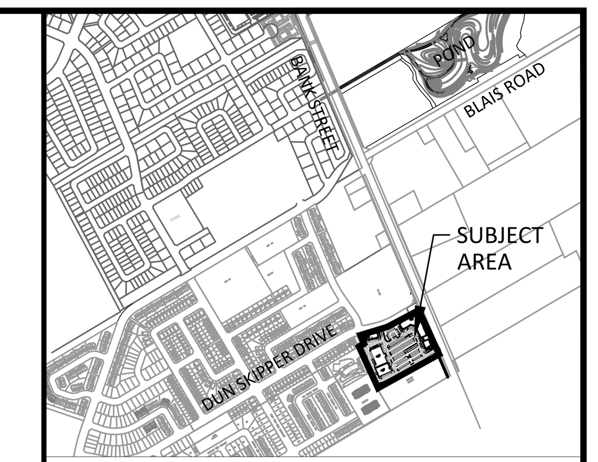






NOTES:

1. SILT FENCE TO BE ERECTED PRIOR TO EARTH WORKS BEING COMMENCED. SILT FENCE TO BE MAINTAINED UNTIL VEGETATION IS ESTABLISHED OR UNTIL START OF SUBSEQUENT PHASE.
2. STRAW BALE SEDIMENT TRAPS TO BE CONSTRUCTED IN EXISTING ROAD SIDE DITCHES. TRAPS TO REMAIN AND BE MAINTAINED UNTIL VEGETATION IS ESTABLISHED.
3. SILT SACK TO BE PLACED AND MAINTAINED UNDER COVER OF ALL CATCHBASINS. GEOTEXTILE SILT SACK IN STREET CBs TO REMAIN UNTIL ALL CURBS ARE CONSTRUCTED. GEOTEXTILE FABRIC IN RYCBs TO REMAIN UNTIL VEGETATION IS ESTABLISHED. ALL CATCHBASINS TO BE REGULARLY INSPECTED AND CLEANED, AS NECESSARY, UNTIL SOD AND CURBS ARE CONSTRUCTED.
4. WORKS NOTED ABOVE ARE TO BE INSTALLED, INSPECTED, MAINTAINED AND ULTIMATELY REMOVED BY SERVICING CONTRACTOR.
5. THIS IS A "LIVING DOCUMENT" AND MAY BE MODIFIED IN THE EVENT THE PROPOSED CONTROL MEASURES ARE INSUFFICIENT.
6. 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.



KEY PLAN
(NTS)

NOTES:

1. SEE DRAWING C-010 FOR ADDITIONAL DETAILS AND NOTES.
2. SITE BENCHMARK TO BE OBTAINED FROM LEGAL SURVEYOR H.A. KEN SHIPMAN SURVEYING LTD.

LEGEND :

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

No.	REVISIONS	By	Date
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3	REVISED AS PER CITY COMMENTS	JIM	2020:04:20
2	REVISED AS PER NEW SITE PLAN AND CITY COMMENTS	JIM	2019:10:11
1	ISSUED FOR SPA	JIM	2019:04:15

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Project Title

BANK STREET DEVELOPMENT
4836 BANK STREET

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2020/04/20
PROVINCE OF ONTARIO

Drawing Title

EROSION AND SEDIMENTATION CONTROL PLAN

Scale: 1 : 500

Design	Date
SEL	FEB. 2019
Drawn	Checked
DPS	JIM
Project No.	Drawing No.
119351	900

D07-12-19-0092

#17977