SERVICING & STORMWATER MANAGEMENT REPORT
MICROTEL INN & SUITES

Project No.: CP-17-0199

City File No.: D07-12-17-0158

Prepared for:

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1.0 PROJECT DESCRIPTION

1.1 Purpose

McIntosh Perry (MP) has been retained by Activar c/o Microtel Inn and Suites by Wyndham to prepare this Servicing and Stormwater Management Report in support of the Site Plan Control process for the proposed Microtel Inn & Suites, located at 340 Huntmar Drive within the City of Ottawa (City File No. D07-12-17-0158).

The main purpose of this report is to present a servicing design for the development in accordance with the recommendations and guidelines provided by the City of Ottawa (City), the Mississippi Valley Conservation Authority (MVCA), the Ministry of the Environment and Climate Change (MOECC) and the Ministry of Transportation (MTO). This report will address the water, sanitary and storm sewer servicing for the development, ensuring that existing and available services will adequately service the proposed development.

This report should be read in conjunction with the following drawings:

- CP-17-0199, C101 – Site Grading and Drainage Plan,
- CP-17-0199, C102 – Site Servicing Plan, and
- CP-17-0199, C103 – Sediment & Erosion Control Plan.

1.2 Site Description

The subject property is located in the City of Ottawa within Ward 4-Kanata North. The forms part of the Kanata West Concept Plan Lands and is a part of the Arcadia Commercial Development. See Figure 1 - Site Location from the *Design Brief – Arcadia Commercial* by IBI Group in Appendix 'A' of this report for more details.

The property is part of Block 1 on registered plan 4M-1563. The subject property has been subdivided from the Arcadia Commercial Development (Block 1) as part of a severance application. The subject property is described as Parts 1-3 on registered plan 4R-30733. See Appendix 'A' of this report for copies of the registered plans. The site has an area of approximately 0.64ha. It is currently undeveloped and consists mostly of grass and vegetation. The site is bound by Huntmar Drive to the west, Country Glen Way to the east and Feedmill Creek/undeveloped land to the south. See *Figure 1 - Key Map: 340 Huntmar Drive, Ottawa*.

The subject property is a severed parcel that was previously part of an approved Site Plan proposal for the Arcadia Commercial Development. The Site Plan approval was completed for City File No.: D07-12-14-0014.

The proposed development consists of a standalone 1,470m^2 hotel building. Parking and drive aisles will be provided throughout the site along with landscaping. There will be two site entrances to both Country Glen Way and to a proposed internal access road (by others). See drawing *A1 - Site Plan* by Dredge Leahy Architects Inc. within Appendix 'A' of this report for more details.

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Figure 1 - Key Map: 340 Huntmar Drive, Ottawa

2.0 BACKROUND STUDIES

Background studies that have been completed for the proposed site include City of Ottawa as-built drawings, a topographical survey, a geotechnical report and a Phase I & II Environmental Site Assessment (ESA).

As-built drawings of existing services within the vicinity of the proposed site were reviewed in order to determine accurate servicing and stormwater management schemes for the site.

A topographic survey of the site was completed by McIntosh Perry Surveying Inc.

The following reports have previously been completed and are available under separate cover:

- Kanata West Master Servicing Study completed by Stantec/Cumming Cockburn Ltd./IBI Group, dated June 2006.
- Phase I Environment Site Assessment - 370 Huntmar Drive completed by Paterson Group Inc., dated October 24th, 2013.
- Arcadia Retail Development - Transportation Impact Study completed by Delcan, dated November 2013.
- Environmental Impact Statement - Minto Arcadia Commercial Development completed by Kilgour & Associates Ltd., dated May 21st, 2014.
- Geotechnical Investigation - 370 Huntmar Drive completed by Paterson Group Inc., dated June 26th, 2014.
- Design Brief – Arcadia Commercial 370 Huntmar Drive completed by IBI Group, dated October 2014.

The following MOECC Environmental Compliance Application Approvals have been completed for the Arcadia Commercial development and existing stormwater management pond are available in Appendix 'A':

- Environmental Compliance Approval Number: 1359-8XNNKL - Arcadia Development - Phase 1 – Stormwater Management Pond
- Environmental Compliance Approval Number: 5440-9W3SZT - Country Glen Way - Ward 4 Kanata North - Storm/Sanitary Sewer Country Glen Way

3.0 PRE-CONSULTATION SUMMARY

A pre-consultation meeting was conducted on June 16th, 2017 regarding the proposed site. The notes, including specific design parameters from the City of Ottawa, can be found in Appendix 'B'.

4.0 EXISTING SERVICES

The proposed site will connect to existing services that were constructed as part of the Arcadia Commercial Development. An as-built drawing for Country Glen Way and Arcadia Commercial Development internal access road have been included within the appendix for reference.

See drawing *C-100 - Site Servicing Plan* and drawing *C-101 - Plan and Profile Country Glen Way* by IBI Group in Appendix 'A' of this report for more details.

4.1 Water Servicing

The Arcadia Commercial Development access road located along the northern property line of the proposed site has an existing 200mm diameter watermain including valves and hydrants. There is an existing 200mm diameter service stub for the proposed site. Country Glen Way has an existing 300mm diameter watermain including valve chambers and hydrants. No connection to this main is proposed.

4.2 Sanitary Sewer

The Arcadia Commercial Development access road has an existing 250mm diameter sanitary sewer. There is an existing 250mm diameter service stub extending from EX MH212A for the proposed site. Country Glen Way has a 300mm diameter trunk sanitary sewer servicing the Arcadia Commercial Development. The proposed site will flow to this sewer, however the connection will be made via the access road.

4.3 Storm Sewer

The Arcadia Commercial Development access road has an existing storm sewer network ranging in size from 600mm diameter to 975 mm diameter. There is an existing 375mm diameter service stub extending from EX MH212 for the proposed site. Country Glen Way has an existing 1350mm diameter trunk storm sewer servicing for the Arcadia Commercial Development. There is an existing 375mm diameter service stub extending from EX MH205 for the proposed site.

5.0 PROPOSED SERVICING

5.1 Water Servicing

A new 200mm PVC diameter water service will be connected to the existing 200mm diameter stub within the Arcadia Commercial Development internal access road. The water service will tee into the 200mm watermain (200x150mm diameter) and be extended to service the proposed hotel. A private hydrant will be located on a curb island across from the entrance to the hotel.

The proposed building will be equipped with a sprinkler system for fire protection. The required fire protection from the Ontario Building Code (OBC) is 9,000 L/min (See Appendix 'C' for calculation). The required fire protection from the Fire Underwriters Survey (FUS) is 11,000 L/min (provided for information purposes only).

The water demands for the proposed building have been calculated to adhere to the *Ottawa Design Guidelines – Water Distribution* manual and can be found in Appendix 'C'. The results have been summarized below:

Table 1: Water Demands

Water Demand Rate (Hotel)	225 L/(bed-space/d)
Suites	108
Average Day Demand (L/s)	0.28
Maximum Daily Demand (L/s)	0.42
Peak Hourly Demand (L/s)	0.76
FUS Fire Flow Requirement (L/s)	183.33
Max Day + Fire Flow (L/s)	183.98

A water model was previously competed for the Arcadia Commercial Development by IBI Group. The water demands assigned for the site (AC180 (Blks 100,200)) were calculated as follows: the average and maximum daily demands are 0.03 L/s and 0.04 L/s respectively. The peak hourly demand was calculated as 0.08 L/s and a fire demand of 183.33 L/s. See *Design Brief – Arcadia Commercial* by IBI Group in Appendix 'I' of this report for more details. As per correspondence with IBI Group it has been confirmed that a watermain loop is not required to service the hotel on an interim basis (prior to full buildout of the development). See Appendix 'C' for correspondence.

Boundary conditions have been provided by the City of Ottawa for the current conditions and are available in Appendix 'C'. The subject site is located in pressure zone 1W. A water model was completed using Bentley's WaterCAD based on the interim conditions of the Arcadia Commercial Development. The results determined that the proposed 200mm/150mm watermain can adequately service the proposed development and provide sufficient fire flow. A pressure reducing valve is required for the site. Refer to drawing for more details. The results are available in Appendix 'C' of this report.

5.2 Sanitary Sewer

A new 200 mm diameter gravity sanitary service will be connected to the existing 250 mm diameter service stub within the internal access road for the Arcadia Commercial Development. Two sanitary manholes will be installed to service the site. A maintenance manhole (MH2A) will be installed just inside the property line as per the *City of Ottawa – Sewer Design Guidelines*.

A sanitary sewer design was previously completed for the Arcadia Commercial Development. See *Design Brief – Arcadia Commercial* by IBI Group in Appendix 'I' of this report for more details. Sanitary flows from the building drain to the connection on the internal access road for the Arcadia Commercial Development then to the sanitary sewer within Country Glen Way. From there, the flows are directed down Campeau Drive to Didsbury Road. The sanitary sewer within Didsbury Road then outlets to the Signature Ridge Pump Station. As per the IBI design brief the Signature Ridge Pump Station was upgraded to accommodate the Arcadia Commercial Development, including the subject site.

As noted within the IBI design Brief, the subject property falls within portions of drainage areas BLK200, BLK100, 213A, 214A and 205C. A flow of 0.76 L/s was calculated for the subject property. See Appendix 'D' for the existing sanitary design sheet and drainage area plan highlighting the specific site area and relative sanitary sewers.

The subject site is proposed to be a Microtel Inn & Suites hotel. Within the building there are a total 108 rooms along with a breakfast area and swimming pool. Based on Ontario Building Code (OBC) the suggested occupancy for the building is 216. The peak design flows for the proposed building were calculated using criteria from the *City of Ottawa – Sewer Design Guidelines, October 2012*. The proposed site (0.64ha) will generate a flow of 0.986 L/s, see the *Sanitary Flow Calculation* and *Sanitary Sewer Design Sheet* in Appendix 'D' for more details.

It is acknowledged that, from time to time, the indoor swimming pool within proposed hotel will require backwashing/flushing through routine maintenance periods. The discharge will be permitted at a determined controlled rate as determined by the Mechanical Engineer. Correspondence relating to the discharge rate can be found in Appendix 'C'. The pool will only be permitted to discharge backwash to the sanitary sewer system during off-peak hours (100:00PM to 5:00AM).

The existing 250 mm diameter sanitary sewer extended from EX. MH212A, to which the proposed service is connected, has a capacity 48.85 L/s with a 0.61% slope. Therefore, it is anticipated that there is sufficient capacity for the sanitary sewer within the Arcadia Commercial Development internal access road. Although the sanitary flow is slightly higher for the proposed development, the existing sanitary sewers will adequately service the proposed site.

5.3 Storm Sewer

A new sewer system will be extended from two existing 375 mm diameter storm stubs; Country Glen Way and the Arcadia Commercial Development Access Road. The new onsite pipe network will collect storm flows and restrict runoff prior to leaving the site. The storm service from the proposed building will be connected to the existing 375mm diameter stub along the internal access road. Proposed manhole (MH1) will collect both the weeping tile subdrain and the overflow pipe from the soakaway pit which will be further detailed in Section 6.0.

Runoff from the proposed site will be collected and directed towards the entrance on Country Glen Way where it will be connected to the existing 375mm diameter stub. A catchbasin (CB1) and catchbasin manhole (CBMH2) will collect flows form the parking lot prior to outletting to the existing stub. The storm sewers will range from 250 mm to 375 mm in diameter throughout the subject property.

The minor storm sewers will be sized for the 5-year flow without any restriction. A storm sewer design sheet was created using the rational method and City of Ottawa 5-year storm event. Storm flows will be controlled by an inlet control device (ICD) to limit flows to specified release rate as per the *Design Brief – Arcadia Commercial* by IBI Group.

The storm design sheet calculates the proper sizing of the storm pipes within the development. Drainage area information, along with respective pipe slopes and other necessary information was utilized to evaluate the performance of the storm sewer network. The time of concentration calculated for the storm sewer system is based on a 10 minute inlet time at the uppermost sewer run. Within the design sheet, pipe capacities and associated full flow velocities have been calculated. The design flow (peak flow) was checked against the theoretical capacity to ensure that each storm sewer pipe can convey the 5-year unrestricted flow.

Based on the storm sewer design completed by IBI Group for the Arcadia Commercial Development, the existing 375mm diameter stub on the internal access road has a capacity of 143.09 L/s for the 5-year storm event which is adequate for the portion of subject site draining to the outlet (37.92 L/s). The existing 375mm stub on Country Club Way has a capacity of 179.22 L/s for the 5-year storm event which is adequate for the portion of subject site draining to the outlet (122.40 L/s).

See *CP-17-0199 - POST* and *Storm Sewer Design Sheet* in Appendix 'F' of this report for more details. The Stormwater Management design for the subject property will be outlined in Section 6.0.

6.0 STORMWATER MANAGEMENT

6.1 Design Criteria and Methodology

Stormwater management for the proposed site will be maintained through positive drainage away from the proposed building and into a new underground storm sewer system. The storm system will capture the parking lot runoff and direct the flow to a restriction device located within CBMH2. The restricted flow will then release into the existing trunk sewer located in Country Glen Way. Similarly the emergency overland flow route for the proposed site will be directed to the entrance at Country Glen Way. Also, as per the Kanata West Master Servicing Study (KWMSS), the site will require a soakaway pit to be incorporated into the design. The City of Ottawa has requested at the pre-consultation meeting, that the roof of the proposed building will need to be captured and directed to the soakaway pit. The quantitative and qualitative properties of the storm runoff for both the pre & post development flows are further detailed below.

6.2 Runoff Calculations

Runoff calculations presented in this report are derived using the Rational Method, given as:

$$Q = 2.78CIA \text{ (L/s)}$$

Where C = Runoff coefficient
I = Rainfall intensity in mm/hr (City of Ottawa IDF curves)
A = Drainage area in hectares

It is recognized that the Rational Method tends to overestimate runoff rates. As a result, the conservative calculation of runoff ensures that any stormwater management facility sized using this method is expected to function as intended.

The following coefficients were used to develop an average C for each area:

Roofs/Concrete/Asphalt	0.90
Gravel	0.60
Undeveloped and Grass	0.20

As per the *City of Ottawa - Sewer Design Guidelines*, the 5-year balanced ‘C’ value must be increased by 25% for a 100-year storm event to a maximum of 1.0.

As per the pre-consultation meeting with the City of Ottawa the time of concentration (Tc) used for pre-development shall be calculated using a Tc of 20 minutes and post-development flows shall be calculated using a Tc of 10 minutes.

6.2.1 Pre-Development Drainage

The existing site drainage limits are demonstrated on the Pre-Development Drainage Area Plan See *CP-17-0199 - PRE* in Appendix ‘E’ of this report for more details. A summary of the Pre-Development Runoff Calculations can be found below.

Table 2: Pre-Development Runoff Summary

Drainage Area	Area (ha)	Runoff Coefficient (2/5-Year)	Runoff Coefficient (100-Year)	2-year Peak Flow (L/s)	5-year Peak Flow (L/s)	100-year Peak Flow (L/s)
A1	0.64	0.20	0.25	18.38	24.81	52.96
Total	**0.64**			**18.38**	**24.81**	**52.96**

See Appendix ‘G’ for calculations.

6.2.2 Post-Development Drainage

The proposed site drainage limits are demonstrated on the Post-Development Drainage Area Plan. See *CP-17-0199 - POST* in Appendix ‘F’ of this report for more details. A summary of the Post-Development Runoff Calculations can be found below.

Table 3: Post-Development Runoff Summary

Drainage Area	Area (ha)	Runoff Coefficient (2/5-Year)	Runoff Coefficient (100-Year)	2-year Peak Flow (L/s)	5-year Peak Flow (L/s)	100-year Peak Flow (L/s)
B1	0.15	0.90	1.00	28.25	38.33	72.98
B2	0.21	0.87	0.96	39.70	53.86	101.85
B3	0.20	0.81	0.90	34.77	47.17	89.83
B4	0.01	0.48	0.55	1.51	2.05	4.03
B5	0.07	0.41	0.47	5.74	7.79	15.31
Sub-Total	**0.64**			**109.99**	**149.21**	**283.99**
External Drainage Areas						
EX1	0.10	0.90	1.00	18.76	25.45	48.47
EX2	0.02	0.90	1.00	2.93	3.98	7.57
Total	**0.76**			**131.68**	**178.64**	**340.04**

Runoff for area B1 will be restricted before outletting to the existing storm system within Arcadia Commercial Development access road. The flow will be controlled within roof drains for area B1. Runoff for area B2 & B3 and external drainage areas EX1 and EX2 will be restricted before outletting to the existing storm system within Country Glen Way. The flow will be controlled by an inlet control device located within CBMH2. The restriction device will account for the unrestricted flow (Area B4 & B5) leaving the site. See Appendix 'G' for calculations. This restriction and quality control will be further detailed in Sections 6.3 and 6.4.

6.3 Quantity Control

The total post-development runoff for the proposed site has been restricted to match the outlet flows calculated in the *Design Brief – Arcadia Commercial* by IBI Group. The subject property is located within 9 different drainage areas as per the *Design Brief*. A total of 6 ICD's/Roof Drains were utilized within the site area. The allocated flow for the drainage areas have been outlined below. The drainage areas associated with the subject property have been allocated total flows of 134.17 L/s and 142.85 L/s for the 5- and 100-year storm events, respectively.

Table 4: Allowable Release Rate Summary

*Existing Drainage Area	Area (ha)	*Release Rate as per Design Brief - Arcadia Commercial		ICD # / Roof Drain #	
		5-Year	100-Year		
206A/206B	0.38	85.00		206A	*Restricted*
206C	0.07	10.00		206B	
206D	0.04	14.00		206C	
BLK100	0.06	2.00		Roof 100	
BLK200	0.04	1.00		Roof 200	
215	0.04	10.00		215	
**216A/216B	0.07	12.17	20.85		*Unrestricted*
Total	**0.70**	**134.17**	**142.85**		

See Appendix 'G' for calculations.
*As per *Design Brief - Arcadia Commercial by IBI Group*.
**Area 216A/216B have been accounted for as unrestricted flow within the previous design.

As the ultimate stormwater design has two areas outletting to the subject site from the Design Brief by IBI Group, areas EX1 and EX2 have been accounted for within the stormwater management design. Reducing site flows will be achieved using flow restrictions and will create the need for onsite storage. Runoff from areas B1, B2, B3 & EX1 will be restricted as shown in the table below.

Table 5: Post-Development Restricted Runoff Summary

Drainage Area	Post Development Unrestricted Flow (L/s)			Post Development Restricted Flow (L/s)			
	2-Year	5-Year	100-Year	2-Year	5-Year	100-Year	
B1	28.25	38.33	72.98	3.12	4.68	7.80	Restricted - Roof Drains
B2	39.70	53.86	101.85	96.17	108.14	108.14	Restricted - CBMH2
B3	34.77	47.17	89.83				
EX1	18.76	25.45	48.47				
B4	1.51	2.05	4.03	1.51	2.05	4.03	Unrestricted
B5	5.74	7.79	15.31	5.74	7.79	15.31	
EX2	2.93	3.98	7.57	2.93	3.98	7.57	
Total	**131.68**	**178.64**	**340.04**	**109.48**	**126.64**	**142.85**	

See Appendix 'G' for calculations.

Runoff from Area B1 will be restricted through thirteen (13) roof drains before discharging to the new storm sewer downstream of MH#1. The total flow leaving the roof will be 3.12 L/s, 4.68 L/s and 7.80 L/s during the 2, 5 and 100-year storm events, respectively. This will result in ponding depths of 20, 30 and 50 mm for the 2, 5 and 100-year storm events, respectively. All of the storage required for this area will be located on the proposed roof, and emergency roof scuppers will be installed to ensure ponding does not exceed the proposed ponding limits.

Runoff from Areas B2 and B3 will be restricted at CBMH#2 through an IPEX Tempest HF Type E or an approved equivalent (Design Head of 2.42 m). This orifice plug will restrict areas B2 and B3 to 108.14 L/s for both the 5 and 100-year storm events. The restriction creates a water surface elevation (WSEL) of 97.74 m for the 5-year storm event and 97.90 m for the 100-year storm event. The storage for this area will be provided above the parking lot structures CB#1 and CBMH#2. See below table for details of the required and provided storage volumes.

Table 6: Storage Summary

Drainage Area	Storage Required (m^3)	Storage Available (m^3)	Depth of Ponding (m)	Storage Required (m^3)	Storage Available (m^3)	Depth of Ponding (m)	Storage Required (m^3)	Storage Available (m^3)
	2-Year		5-Year			100-Year		
B1	21.56	22.05	0.030	27.79	33.08	0.050	55.13	55.07
B2 & B3	N/A		0.14	12.96	11.01	0.30	84.78	79.24

See Appendix ‘G’ for calculations.

In the event that there is a rainfall above the 100yr storm event, or a blockage within the storm sewer system, an emergency overland flow route has been provided so that the storm water runoff will be conveyed towards the east entrance at Country Glen Way.

6.4 Quality Control

As per the Kanata West Master Servicing Study (KWMSS), a soakaway pit is required for the proposed site. See Appendix ‘A’ for the applicable excerpt. This will be furthered detailed in Section 6.5.

The development of will employ Best Management Practices (BMP’s) wherever possible. The intent of implementing stormwater BMP’s is to ensure that water quality and quantity concerns are addressed at all stages of development. Lot level BMP’s include directing the runoff from the roof into a soakaway pit. Each proposed catch basin will be equipped with a sump, which will provide an opportunity for initial filtration of any sediment by means of particle settlement.

An IPEX Tempest HF inlet control device will restrict flows from the site, causing temporary ponding. There will be an opportunity for particle settlement during this process; however the full benefits of a larger scale end-of-pipe facility will only be realized at the downstream Stormwater Management Pond. The existing SWM facility will provide the required quality control for the site. The existing storm sewer within the Arcadia Commercial Development outlets to the Campeau Drive storm sewer which outlets to an interim SWM Pond (future Pond 1 as per KWMSS) which provides the required quality control for the development prior to outletting to the Carp River. This facility has been designed to accommodate runoff from the Arcadia Commercial Development where the subject property is located. Quality control will be provided within this SWM facility, therefore no additional on-site quality treatment has been provided.

6.5 Soakaway Pit

As per the Kanata West Master Servicing Study (KWMSS) an infiltration target of 50-70mm/yr is required to be achieved on the subject site. The percolation rate from the geotechnical engineering consultant can be found in Appendix ‘A’ and was estimated to be between 12mm/hr to 17mm/hr for the site. An infiltration rate of 15mm/hr was used within the calculations. As per the *Geotechnical Investigation - 370 Huntmar Drive* by Paterson Group Inc., BH4 and BH5 had groundwater elevations of 97.12 m and 96.63 m respectively. Averaging those two values gives an average groundwater elevation of 96.88 that has been used as a reference for the subject site.

1.1.1 *Soakaway Pit Design*

A Soakaway Pit has been designed for the site in order to meet the required infiltration target as per the Ministry of the Environment (MOE) Stormwater Management Planning and Design Manual March 2003 Section 4.5.6 Roof Leader Discharge to Soakaway Pits. The Soakaway Pit will be constructed at the east side of the site within the parking area. Storm runoff from the flat roof will be collected within the storm network and discharge into the soakaway pit. The pit has been designed to meet the criteria noted in the following table:

Table 7: Soakaway Pit - MOECC Requirements

No.	Design Element	Criteria	Proposed Works
1	Water Table Depth	The seasonally high water depth should be greater than 1m below the bottom of the soakaway pit	The water table depth is greater than 1m below the bottom of the soakaway as per the geotechnical report. (97.88 – 96.88)
2	Depth to Bedrock	The depth to bedrock should be greater than 1m below the bottom of the soakaway pit	Depth of bedrock is greater than 1m below the bottom of the soakaway pit
3	Soils	Soil percolation rate should be greater than 15mm/hr	As per the correspondence with the Geotechnical Engineer the soil percolation is between 12-17 mm/hr.
4	Storage Volume	A minimum storage volume of 5 mm over the rooftop area should be accommodated in the soakaway pit without overflowing. The maximum target storage volume should be 20 mm over the rooftop area.	The maximum target storage of 20mm over the rooftop area will be used to ensure the required infiltration is met.
5	Location	>4m from the building	Soakaway pit is >4m from the building
6	Storage Media	Trench is comprised of clear stone (50 mm dimeter) with non-woven filter cloth lining the trench	Soakaway pit is specified to have 50mm clear stone and to be lined with geotextile.
7	Conveyance Pipe	The roof leader should extend into the soakaway pit for the full length of the pit. The extension of the roof leader should be perforated to allow water to fill the pit along the length of the pipe. The perforated pipe should be located near the surface of the trench.	The roof leader has been extended to run the full length of the soakaway pit and is perforated and is located near the top of the trench.

1.1.2 *Storage Configuration*

The length of the trench will be maximized as the direction of flow is parallel with the Soakaway Pit. This will ensure proper distribution of water into the entire trench.

- Maximum Allowable Soakaway Pit Depth

$$d = P\,T / 1000$$

d = maximum allowable depth of the soakaway pit (m)
P = percolation rate (mm/h)
T = drawdown time (24 - 48 h) (h)

See Appendix ‘G’ for calculations.

1.1.3 *Maintenance Design Parameters*

Maintenance will be required to ensure effective operation, longevity and aesthetic functioning of the SWMP and may include: sediment removal, trash removal, maintenance of vegetation and inspection of the inlet(s) and outlet(s).

Estimates of the longevity of infiltration SWMPs are based on professional opinion. Equation 7.1 and Table 7.4 from the MOE Stormwater Management Planning and Design Manual may be used as guidance for estimating longevity (based on monitoring results in literature and the native soil permeability). Recognizing the subjectiveness of Equation 7.1, there needs to be flexibility in assessing the lifespan of infiltration SWMPs based on site-specific information. As the majority of the site is made up of the proposed roof the runoff entering the SWM Area will have limited opportunity for carrying sediments to the infiltration structure.

Our recommendation for the SWM Area is to have annual inspections completed for the Soakaway pit including a CCTV of the pipe network within the SWM area. The inspection should note any sediment build-up, standing water or any trash on the within the structure. Based on the reviews maintenance may be required to ensure the SWM Area is functioning as designed.

7.0 SEDIMENT & EROSION CONTROL

Before construction begins, temporary silt fence, straw bale or rock flow check dams will be installed at all natural runoff outlets from the property. It is crucial that these controls be maintained throughout construction and inspection of sediment and erosion control will be facilitated by the Contractor or Contract Administration staff throughout the construction period.

Silt fences will be installed where shown on the final engineering plans, specifically along the downstream property limits. The Contractor, at their discretion or at the instruction of the City, MVCA or the Contract Administrator shall increase the quantity of sediment and erosion controls on-site to ensure that the site is operating as intended and no additional sediment finds its way off site. The rock flow, straw bale & silt fence check dams and barriers shall be inspected weekly and after rainfall events. Care shall be taken to properly remove sediment from the fences and check dams as required. Fibre roll barriers are to be installed at all existing curb inlet catchbasins and filter fabric is to be placed under the grates of all existing catchbasins and manholes along the frontage of the site and any new structures immediately upon installation. The measures for the existing/proposed structures is to be removed only after all areas have been paved. Care shall be taken at the removal stage to ensure that any silt that has accumulated is properly handled and disposed of. Removal of silt fences without prior removal of the sediments shall not be permitted.

Although not anticipated, work through winter months shall be closely monitored for erosion along sloped areas. Should erosion be noted, the Contractor shall be alerted and shall take all necessary steps to rectify the situation. Should the Contractor’s efforts fail at remediating the eroded areas, the Contractor shall contact the City and/or MVCA to review the site conditions and determine the appropriate course of action. As the ground begins to thaw, the Contractor shall place silt fencing at all required locations as soon as ground conditions both warrant and permit. Please see the *Site Grading, Drainage and Sediment & Erosion Control Plan* for additional details regarding the temporary measures to be installed and their appropriate OPSD references.

8.0 SUMMARY

- A new 1,470m^2 hotel will be constructed along the west property line at 340 Huntmar Drive.
- A new watermain, ranging in diameter from 150 mm to 200 mm watermain will be installed to service the site, connecting to the watermain on the Arcadia Commercial Development internal access road.
- A new 250mm sanitary sewer will be installed to service the proposed hotel and connect to the Arcadia Commercial Development internal access road.
- The proposed storm sewer, ranging in diameter from 250 mm to 3750 mm, will be installed throughout the site and drain to the existing storm sewers on Country Glen Way and the internal access road.
- Storage for the 5- through 100-year storm events will be provided within the parking lot areas above the proposed storm structures and on the proposed flat roof.
- An approved downstream SWM Facility (has been previously constructed to provide appropriate quality control for the Carp River.

9.0 RECOMMENDATION

Based on the information presented in this report, we recommend that City of Ottawa approve this Servicing and Stormwater Management Report in support of the proposed Microtel Inn & Suites.

This report is respectfully being submitted for approval.

Regards,

McIntosh Perry Consulting Engineers Ltd.

LICENSED PROFESSIONAL ENGINEER
2018/05/09
R. P. KENNEDY
100086734
PROVINCE OF ONTARIO

Ryan Kennedy, P.Eng.
Practice Area Lead, Land Development
T: 613.836.2184 x 2243
E: r.kenndy@mcintoshperry.com

Tyler Ferguson, E.I.T.
Engineering Intern, Land Development
T: 613.836.2184 x 2242
E: t.ferguson@mcintoshperry.com

October 27, 2017
Revised: May 9, 2018

H:\01 Project - Proposals\2017 Jobs\CP\0CP-17-0199 Activar_Kanata Microtel_Huntmar & Campeau\03 - Servicing\Report\CP-17-0199_Servicing Report.docx

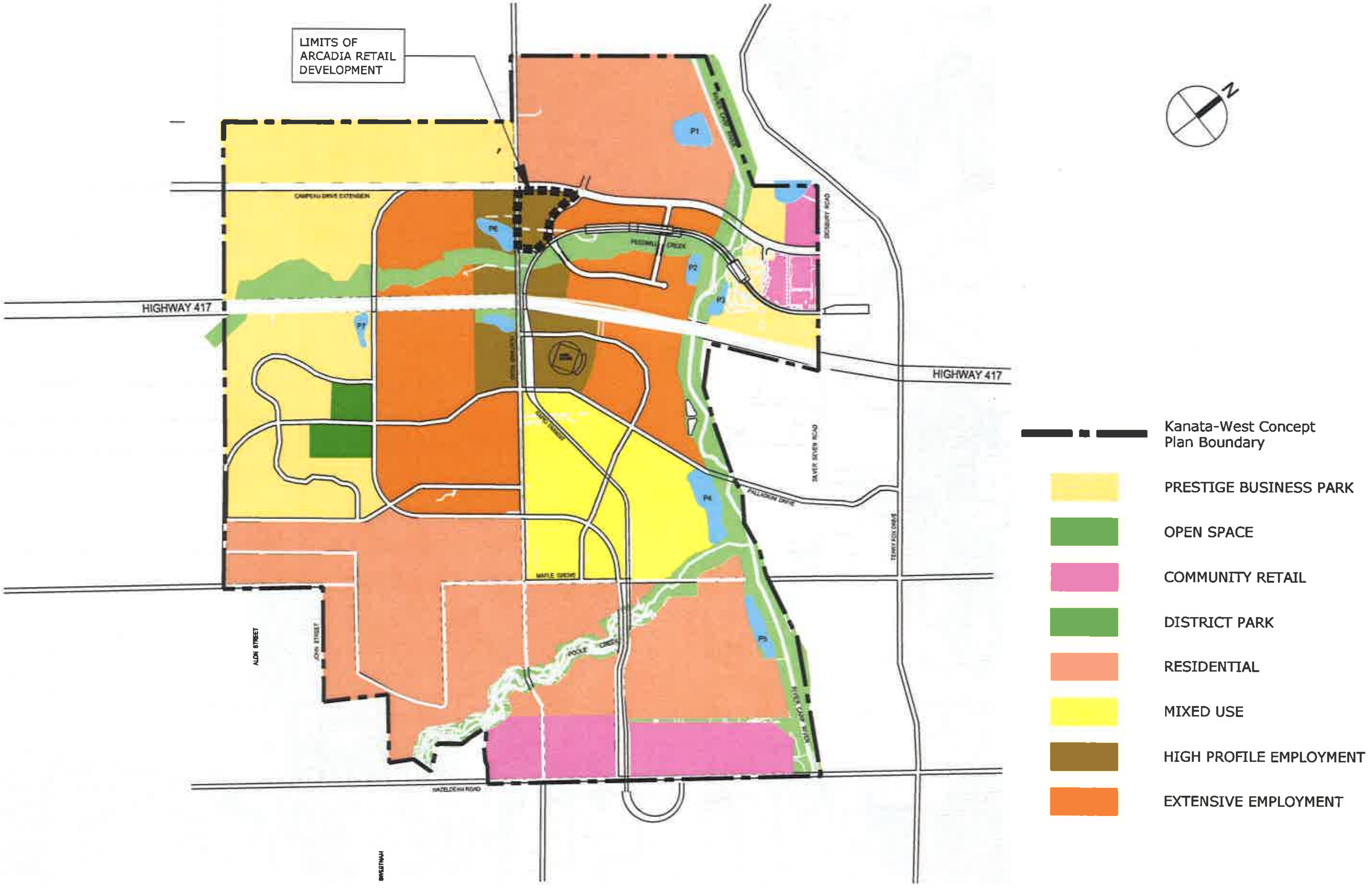
10.0 STATEMENT OF LIMITATIONS

This report was produced for the exclusive use of MasterBUILT Hotels Ltd c/o Activar. The purpose of the report is to assess the existing stormwater management system and provide recommendations and designs for the post-construction scenario that are in compliance with the guidelines and standards from the Ministry of the Environment and Climate Change, City of Ottawa and local approval agencies. McIntosh Perry reviewed the site information and background documents listed in Section 2.0 of this report. While the previous data was reviewed by McIntosh Perry and site visits were performed, no field verification/measures of any information were conducted.

Any use of this review by a third party, or any reliance on decisions made based on it, without a reliance report is the responsibility of such third parties. McIntosh Perry accepts no responsibility for damages, if any, suffered by any third party as a result of decisions or actions made based on this review.

The findings, conclusions and/or recommendations of this report are only valid as of the date of this report. No assurance is made regarding any changes in conditions subsequent to this date. If additional information is discovered or becomes available at a future date, McIntosh Perry should be requested to re-evaluate the conclusions presented in this report, and provide amendments, if required.

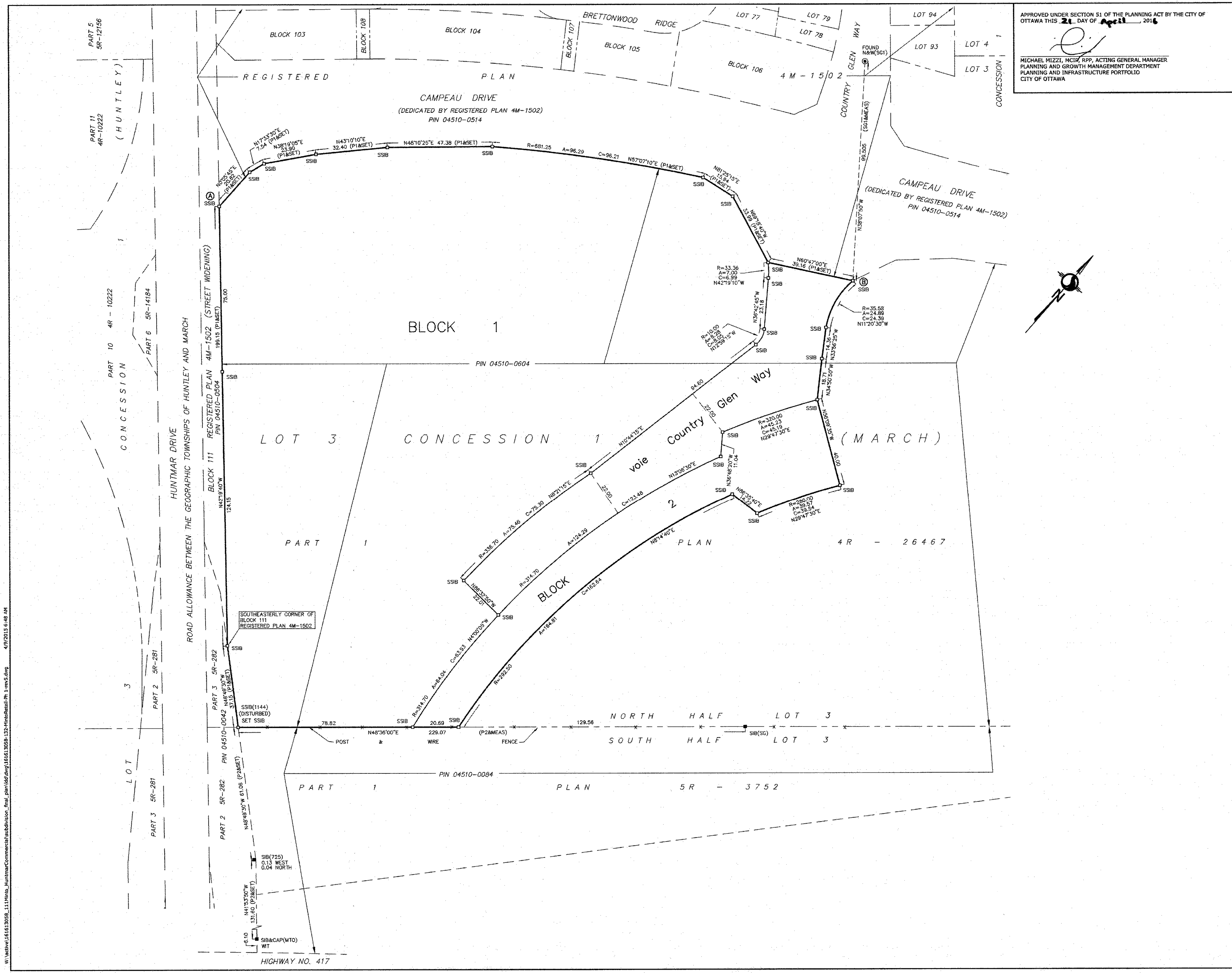
APPENDIX A
BACKGROUND DOCUMENTS



J:\35355-ArcadiaComm\5.9 Drawings\59civil\current\REPORT\Figure 1.dwg Layout Name: FIGURE 2

Plot Style: KANATA WEST.CTB Plot Scale: 0.1333:1 Plotted At: Nov. 15, 13 3:55 PM Printed By: DON SIURNA Last Saved By: DSIURNA Last Saved At: Nov. 15, 13

IBI GROUP	Scale	Project Title	Drawing Title	Sheet No.
		DESIGN BRIEF ARCADIA RETAIL DEVELOPMENT	SITE LOCATION	FIGURE 1



APPROVED UNDER SECTION 51 OF THE PLANNING ACT BY THE CITY OF OTTAWA THIS 21 DAY OF April, 2016

MICHAEL MIZZI, MCIP, RPP, ACTING GENERAL MANAGER
PLANNING AND GROWTH MANAGEMENT DEPARTMENT
PLANNING AND INFRASTRUCTURE PORTFOLIO
CITY OF OTTAWA

CERTIFICATE OF REGISTRATION

PLAN 4M-1563

I CERTIFY THAT THIS PLAN IS REGISTERED IN THE LAND REGISTRY OFFICE FOR THE LAND TITLES DIVISION OF OTTAWA-CARLETON NO.4 AT 13:56 O'CLOCK ON THE 26 DAY OF April, 2016 AND ENTERED IN THE PARCEL REGISTER FOR PROPERTY IDENTIFIER 04510-0604, AND THAT THE REQUIRED CONSENTS ARE REGISTERED AS PLAN DOCUMENT NUMBER OC1781949.

'F. Lamont'

REPRESENTATIVE FOR THE LAND REGISTRAR

THIS PLAN COMPRISES PART OF THE LAND IDENTIFIED BY PIN 04510-0604.

PLAN OF SUBDIVISION of

PART OF LOT 3
CONCESSION 1
GEOGRAPHIC TOWNSHIP OF MARCH
CITY OF OTTAWA

Scale 1 : 750

30 22.5 15 7.5 0 15 30 Metres

METRIC CONVERSION

DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

GRID SCALE CONVERSION

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999914.

BEARING NOTE

BEARINGS HEREON ARE GRID BEARINGS DERIVED FROM THE CAN-NET VRS NETWORK MONUMENT - OTTAWA - (N 5036741.327, E 327757.614) AND FITZROY (N 5036741.327, E 327757.614) AND ARE REFERRED TO THE CENTRAL MERIDIAN 76° 30' WEST LONGITUDE OF THE 3° MTM ONTARIO COORDINATE SYSTEM, NAD83 (ORIGINAL) ZONE 9.

OBSERVED REFERENCE POINTS DERIVED FROM GPS OBSERVATIONS USING THE CAN-NET VIRTUAL REFERENCE STATION NETWORK:
MTM ZONE 9, NAD83 (ORIGINAL)
COORDINATES TO URBAN ACCURACY PER SEC 14(2) OF O.REG. 216/10

POINT ID	NORTHING	EASTING
Ⓐ	5018037.34	349095.66
Ⓑ	5018201.04	349332.80

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

SURVEYOR'S CERTIFICATE

I CERTIFY THAT :

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT,THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 24th DAY OF FEBRUARY, 2015.

April 9/15
DATE

BRIAN J. WEBSTER
ONTARIO LAND SURVEYOR

OWNER'S CERTIFICATE

THIS IS TO CERTIFY THAT :

1. BLOCKS 1 AND 2 INCLUSIVE, THE STREET, NAMELY voie Country Glen Way HAVE BEEN LAID OUT IN ACCORDANCE WITH OUR INSTRUCTIONS.

2. THE STREET IS DEDICATED AS PUBLIC HIGHWAY.

MINTO COMMUNITIES INC.

DATED : 04/16/16

SUSAN MURPHY
VICE PRESIDENT,
DEVELOPMENT
I HAVE THE AUTHORITY
TO BIND THE CORPORATION

DATED : 04/16/16

BRENT STRACHAN
SENIOR VICE PRESIDENT,
MINTO COMMUNITIES ONTARIO
I HAVE THE AUTHORITY
TO BIND THE CORPORATION

LEGEND

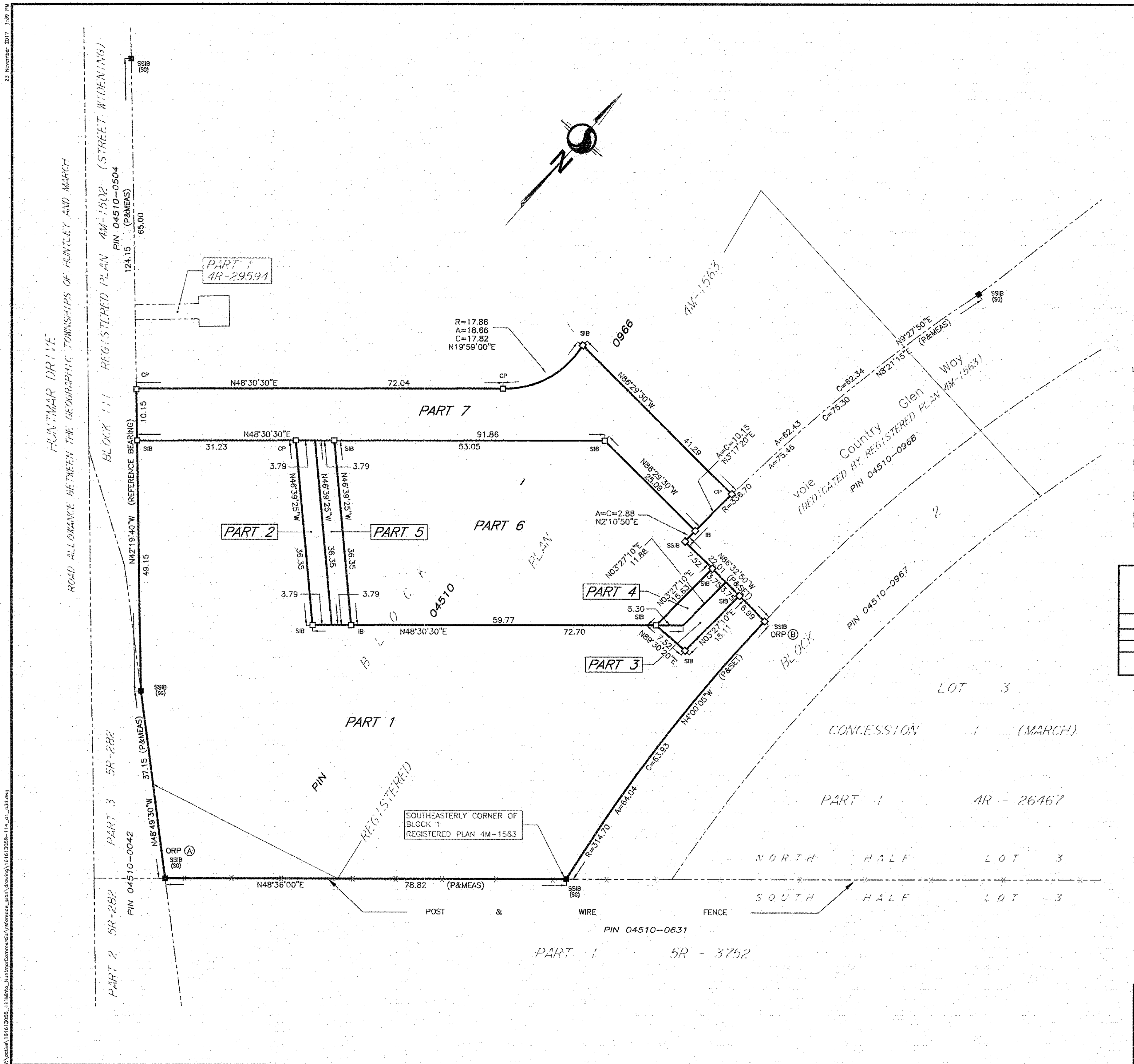
■	DENOTES	FOUND MONUMENTS
☐	"	SET MONUMENTS
IB	"	IRON BAR
IBØ	"	ROUND IRON BAR
SIB	"	STANDARD IRON BAR
SSIB	"	SHORT STANDARD IRON BAR
CC	"	CUT CROSS
CP	"	CONCRETE PIN
N&W	"	NAIL & WASHER
WIT	"	WITNESS
PIN	"	PROPERTY IDENTIFICATION NUMBER
MEAS	"	MEASURED
PROP	"	PROPORTIONED
OU	"	ORIGIN UNKNOWN
SG	"	STANTEC GEOMATICS LTD.
P1	"	REGISTERED PLAN 4M-1502
P2	"	PLAN 4R-26467
SG1	"	SG COORDINATE FILE PER 4M-1502

ALL SET MONUMENTS SHOWN HEREON ARE IRON BARS (IB) UNLESS OTHERWISE NOTED.

Stantec

Stantec Geomatics Ltd.
Ontario Land Surveyors
Canada Lands Surveyors
1331 CLYDE AVENUE, SUITE 400, OTTAWA, ON. K2C 3G4
PHONE (613)722-4420 FAX (613)722-2799
brian.webster@stantec.com
stantec.com

DRAWN BY: CEC/ME	CHECKED BY: BL	PM: BW	FIELD: AL	PROJECT No.: 161613058-132



I REQUIRE THIS PLAN TO BE DEPOSITED UNDER THE LAND TITLES ACT.

DATE: Nov 23/17

BRIAN J. WEBSTER
ONTARIO LAND SURVEYOR

PLAN 4R-30733

RECEIVED AND DEPOSITED

DATE: November 23, 2017

Vanessa Williams
REPRESENTATIVE FOR THE LAND REGISTRAR FOR THE LAND TITLES DIVISION OF OTTAWA-CARLETON No. 4

SCHEDULE

PART	BLOCK	PLAN	PIN
1	PART OF 1	4M-1563	PART OF 04510-0966
2			
3			
4			
5			
6			
7			

PLAN OF SURVEY of

PART OF BLOCK 1
REGISTERED PLAN 4M-1563
CITY OF OTTAWA

Scale 1:500

10 0 10 20 30 METRES

METRIC CONVERSION

DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

GRID SCALE CONVERSION

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999914.

BEARING NOTE

BEARINGS SHOWN HEREON ARE MTM GRID AND ARE REFERRED TO THE WESTERLY LIMIT OF REGISTERED PLAN 4M-1563, HAVING A BEARING OF N42°19'40"W .

OBSERVED REFERENCE POINTS DERIVED FROM GPS OBSERVATIONS USING THE CAN-NET VIRTUAL REFERENCE STATION NETWORK:
3° MTM ZONE 9, NAD83 (ORIGINAL)(1997.0).
COORDINATES TO URBAN ACCURACY PER SEC 14(2) OF O.REG. 216/10

ORP ID	NORTHING	EASTING
Ⓐ	5017851.66	349257.73
Ⓑ	5017981.56	349312.39

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

LEGEND

■	DENOTES	FOUND MONUMENTS
□	"	SET MONUMENTS
IB	"	IRON BAR
IBø	"	ROUND IRON BAR
SIB	"	STANDARD IRON BAR
SSIB	"	SHORT STANDARD IRON BAR
CC	"	CUT CROSS
CP	"	CONCRETE PIN
WIT	"	WITNESS
PIN	"	PROPERTY IDENTIFICATION NUMBER
MEAS	"	MEASURED
PROP	"	PROPORTIONED
OU	"	ORIGIN UNKNOWN
SG	"	STANTEC GEOMATICS LTD.
ORP	"	OBSERVED REFERENCE POINT
P	"	REGISTERED PLAN 4M-1563

SURVEYOR'S CERTIFICATE

I CERTIFY THAT :

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 16th DAY OF NOVEMBER, 2017 .

Nov 23/17
DATE

BRIAN J. WEBSTER
ONTARIO LAND SURVEYOR

Stantec Geomatics Ltd.
CANADA LANDS SURVEYORS
ONTARIO LAND SURVEYORS
1331 CLYDE AVENUE, SUITE 400
OTTAWA, ONTARIO, K2C 3G4
TEL. 613.722.4420 FAX. 613.722.2799
stantec.com

DRAWN: CEC	CHECKED: FP	PM: FP/BW	FIELD: CA	PROJECT No.: 161613058-114

MICROTEL HOTEL KANATA
340 HUNTMAR DRIVE
OTTAWA, ONTARIO

OWNER / APPLICANT:	ACTIVAR INC. 2-107 FOURTH AVE. OTTAWA, ON. K1S 2L1
ARCHITECTURE:	DREDGE LEAHY ARCHITECTS INC. 25 HOLLAND AVE. SUITE 100 OTTAWA, ON. K1Y 4R9
CIVIL ENGINEERING:	McINTOSH PERRY 115 WALGREEN RD., RR3 CARP, ON. K0A 110
PLANNING:	McINTOSH PERRY
ELECTRICAL / MECH. ENGINEERING:	LRL ENGINEERING 5430 CANOTEK RD. OTTAWA, ON. K1J 9G2
LANDSCAPE DESIGN:	GINO J. AIELLO LANDSCAPE ARCHITECT 50 CAMELOT DR., OTTAWA, ON. K2G 5X8
STRUCTURAL ENGINEERING:	McINTOSH PERRY

ZONING COMPLIANCE TABLE

Project: Microtel Kanata

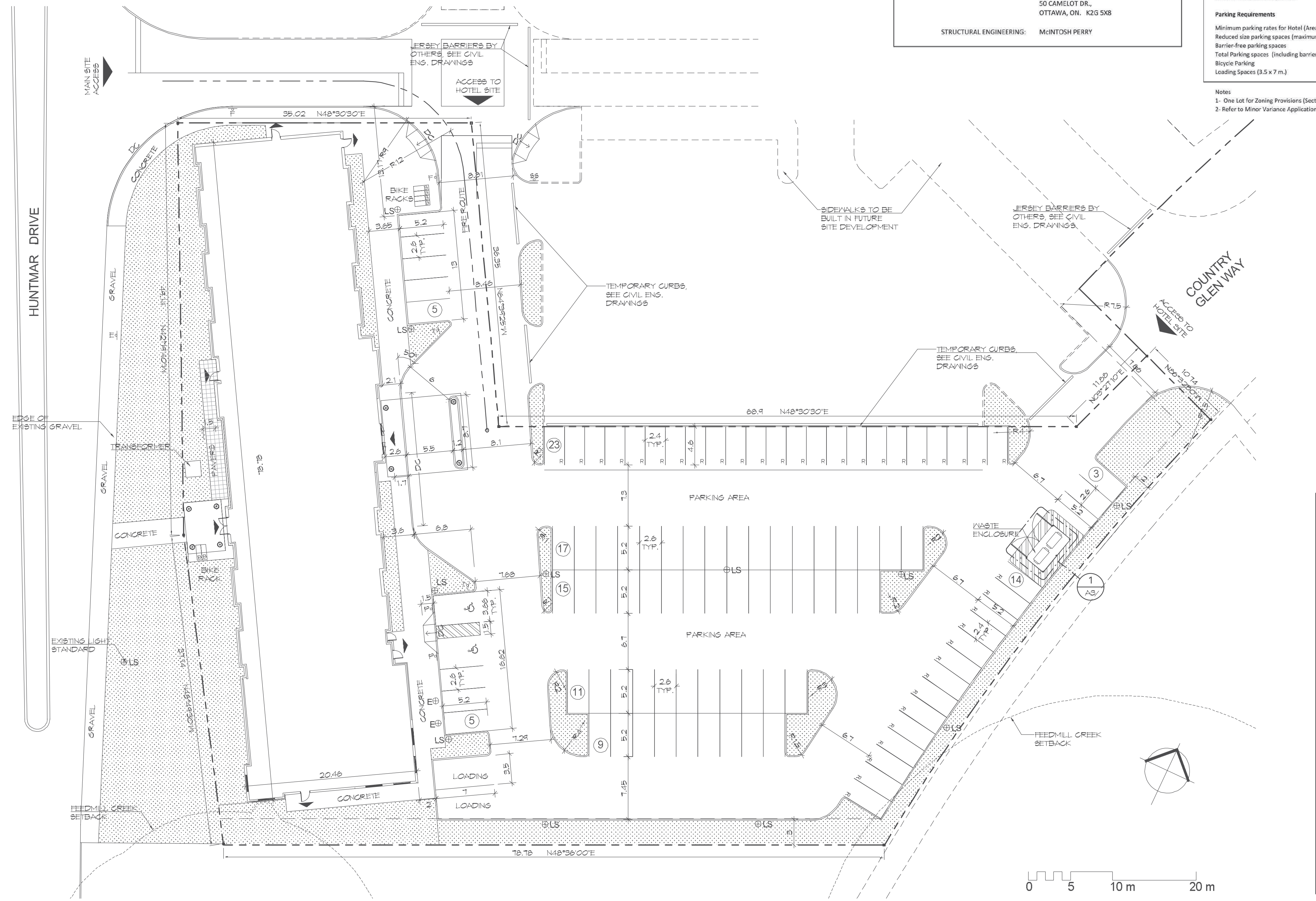
Address: 340 Huntmar Drive, Ottawa, ON

PARTS 1, 2, & 3 OF BLOCK 1
REGISTERED PLAN 4M-1563
CITY OF OTTAWA
SURVEYED BY STANTEC GEOMATICS LTD.

Zoning: MC H(45)
Property Identification Number : 045100966
Existing Lot Area: 6,350 m2
Site Development Area Frontage: 10.74 m Country Glen Way / 86.3 m Huntmar Dr.
Building Gross Floor Area: 4,035 m2

	REQUIRED	PROVIDED
Minimum Lot Area	no minimum	6,350 m2
Minimum Lot Width	no minimum	86 m
Minimum Front Yard	no minimum	2 m
Minimum Interior Side Yard	no minimum	0.5 m
Minimum Rear Yard	no minimum	58 m
Maximum Building Height	45 m	17 m
Minimum width of landscaping abutting a street	no minimum	>3 m
Minimum width of landscaping: parking to lot line not abutting a street (100 or more spaces)	3 m	3 m
Minimum % of landscape area	15 %	15 %
Parking Requirements		
Minimum parking rates for Hotel (Area C): 1 per guest unit	108	102
Reduced size parking spaces (maximum 40% of total)		37
Barrier-free parking spaces	2	2
Total Parking spaces (including barrier free parking spaces)	108	102
Bicycle Parking	5	6
Loading Spaces (3.5 x 7 m.)	2	2

Notes
1- One Lot for Zoning Provisions (Section 93) shall apply to this site and the adjacent Arcadia Retail Complex
2- Refer to Minor Variance Application D08-02-17/A-00352 for reduced parking.



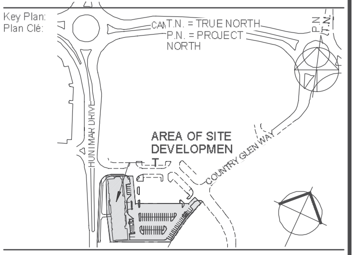
1 SITE PLAN
A1 SCALE: 1 : 250

SITE PLAN LEGEND

SYMBOL	DESCRIPTION
— — — —	PROPERTY LINE
— —— —— —	SETBACK LINE
– – – – – –	FUTURE DEVELOPMENT
═	NEW CURB
═ DC	NEW DEPRESSED CURB
▲	ENTRANCE / EXIT
⊕LS	LIGHT STANDARD (REFER TO LIGHTING PLAN)
⊕E	ELECTRIC CAR CHARGING STATION
E	EXISTING SIGN
P	ACCESSIBLE PARKING SIGN
F	FIRE ROUTE SIGN
T	TRAFFIC SIGN (ONE-WAY ONLY)
SS	STOP SIGN
♿	ACCESSIBLE PARKING SPACE
▭	STANDARD PARKING SPACE (2.6 X 5.2 M.)
▭ R	REDUCED SIZE PARKING SPACE C/W SIGNAGE (2.4 X 5.2 M. OR 2.4 X 4.6M.)
▭ B	BICYCLE PARKING SPACE (0.6 X 1.8M)
⁘	LANDSCAPED AREA
▨	PAINTED LINES

Client:

Key Plan:
Plan Clé:



3	RE-ISSUED FOR SITE PLAN APPLICATION COMMENTS	05/09/2018
2	ISSUED FOR COORDINATION	04/12/2018
1	ISSUED FOR SITE PLAN APPLICATION	10/27/2017
Issue:		Date:

Prime Consultant:
Expert-Conseil:

DREDGE LEAHY
ARCHITECTS INC.
100 - 25 Holland Ave.
Ottawa, ON K1Y 4R9
613.724.9865
dl-arch.ca

APPROVED ☐ REFUSED ☐
THIS _____ DAY OF ___________, 20___

DERRICK MOODIE, MANAGER
DEVELOPMENT REVIEW WEST
PLANNING, INFRASTRUCTURE AND ECONOMIC
DEVELOPMENT DEPARTMENT, CITY OF OTTAWA

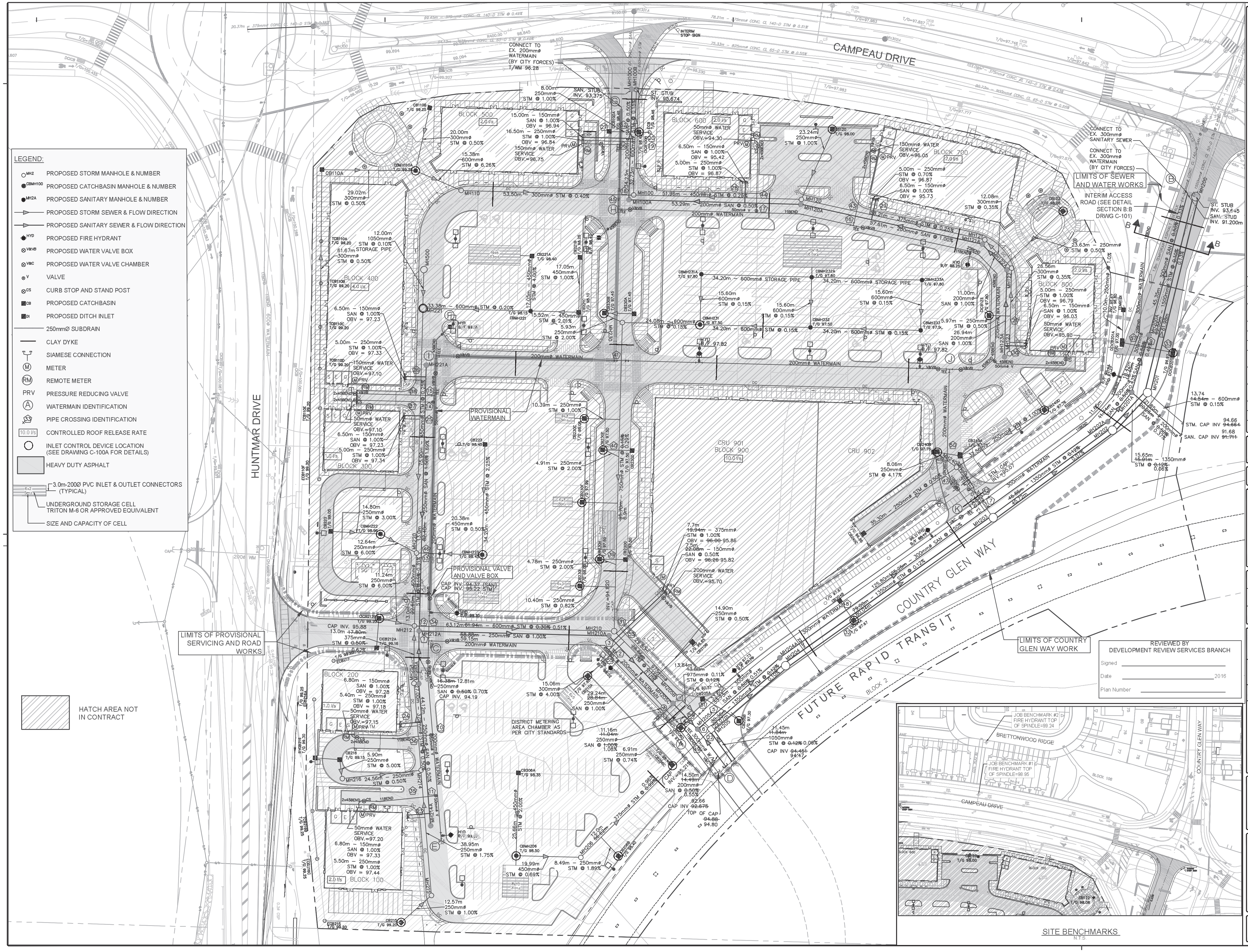
Project:
Projet:
MICROTEL KANATA - 340 HUNTMAR DRIVE, KANATA, ON

340 HUNTMAR DRIVE, KANATA, ON

Drawing:
Dessin:
SITE PLAN

Drawn by: Dessiné par: S.G.	Scale: Échelle: As indicated
Designed by: Conçu par: S.G. / M.D.	Date: 10/25/17
Approved by: Approuvé par: M.D.	Client Project No. No. du Projet du Client:
Seal: Sceau: ONTARIO ASSOCIATION OF ARCHITECTS M. Dredge MICHELE L. DREDGE LICENCE 4998	Project No.: No. du Projet: 1394 Sheet No.: No. de la feuille: A1

D07-12-17-0158



SITE BENCHMARKS
NTS

LEGEND:

○ MH2	PROPOSED STORM MANHOLE & NUMBER
● CBMH100	PROPOSED CATCHBASIN MANHOLE & NUMBER
● MH2A	PROPOSED SANITARY MANHOLE & NUMBER
—▷—	PROPOSED STORM SEWER & FLOW DIRECTION
—▷—	PROPOSED SANITARY SEWER & FLOW DIRECTION
● HYD	PROPOSED FIRE HYDRANT
⊗ V&VB	PROPOSED WATER VALVE BOX
⊗ V&C	PROPOSED WATER VALVE CHAMBER
⊗ V	VALVE
⊗ CS	CURB STOP AND STAND POST
■ CB	PROPOSED CATCHBASIN
■ DI	PROPOSED DITCH INLET
—	250mmØ SUBDRAIN
—	CLAY DYKE
⅄	SIAMESE CONNECTION
Ⓜ	METER
(RM)	REMOTE METER
PRV	PRESSURE REDUCING VALVE
Ⓐ	WATERMAIN IDENTIFICATION
33	PIPE CROSSING IDENTIFICATION
10.0 l/s	CONTROLLED ROOF RELEASE RATE
○	INLET CONTROL DEVICE LOCATION (SEE DRAWING C-100A FOR DETAILS)
▨	HEAVY DUTY ASPHALT
6x2 5m3	3.0m-200Ø PVC INLET & OUTLET CONNECTORS (TYPICAL)
	UNDERGROUND STORAGE CELL TRITON M-6 OR APPROVED EQUIVALENT
	SIZE AND CAPACITY OF CELL

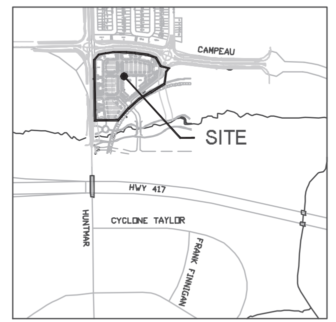
▨ HATCH AREA NOT IN CONTRACT

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ____________________

Date ____________________2016

Plan Number ____________________



KEY PLAN

APPROVED ☐ REFUSED ☐

THIS____DAY OF ____________ , 20______

DERRICK MOODIE, ACTING MANAGER
DEVELOPMENT REVIEW, SUBURBAN SERVICES

No.	Description	Date	Checked
10	As-built	17:01:17	DPS
9	Revised as per City Comments	16:08:26	DGY
8	Revised Campeau Dr per Stantec Plans	16:08:03	DGY
7	Issued for Construction	16:07:13	DGY
6	Add Interim Access Rd.	16:05:16	DGY
5	Issued for Tender	16:04:05	DGY
4	Revised as per City Comments	14:10:02	DGY
3	Revised as per City Comments	14:08:22	DGY
2	Issued for SPA Resubmission	14.06.27	DGY
1	Issued for SPA	13.11.18	D.G.Y.

Issued for

All measurements and conditions must be checked on the work by the contractor. This drawing not to be used for construction until signed.

Date

plotted J:\35355-ArcadiaComm\5.9 Drawings\59civil\layouts\C-100.dwg
Layout Name: Servicing Plan Plot Style: AIA STANDARD-FULL.CTB
Plot Scale: 1:1 Plotted At: 3/16/2017 11:06 AM Last Saved By: dsiurna Last Saved At: Mar. 16, 17

TN
PN

D. G. Yannoulopoulos

drawn by DPS	scale 1:500
checked by DGY	date NOV. 2013
printed	file 35355

Arcadia Retail Development
Kanata, Ontario

Minto Properties
200 Kent Street • Suite 180 • Ottawa, Ontario • K1P 0B6
Telephone: (613)782-3137 Fax: (613)782-5777

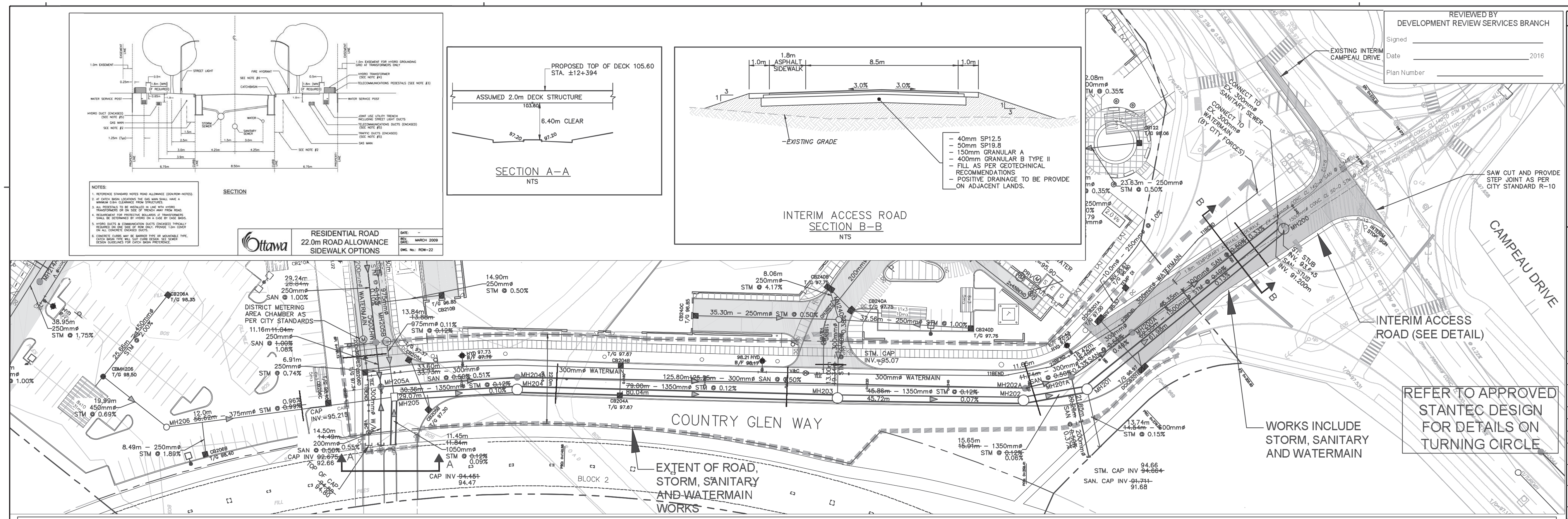
drawing title:
SITE SERVICING
PLAN
370 HUNTMAR DRIVE
OTTAWA, ON.

IBI GROUP

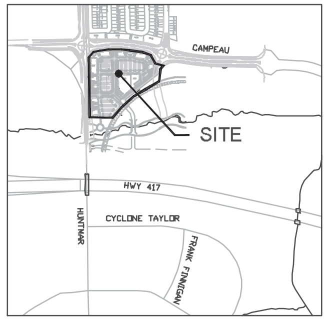
drawing no.
C-100

333 Preston Street Tower 1, Suite 400
Ottawa, Ontario Canada K1S 5N4 Tel
(613)225-1311 FAX (613)225-9868

D07-12-14-0014



REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH
Signed
Date 2016
Plan Number



KEY PLAN

APPROVED ☐ REFUSED ☐

THIS____DAY OF______________ , 20______

DERRICK MOODIE, ACTING MANAGER
DEVELOPMENT REVIEW, SUBURBAN SERVICES

No.	Description	Date	Checked
10	As–built	17:01:17	DPS
9	Revised as per City Comments	16:08:26	DGY
8	Revised as per new Campeau & asbuilt w/m	16:08:03	DGY
7	Issued for Construction	16:07:13	DGY
6	Add interim Access Rd	16:05:16	DGY
5	Issued for Tender	16:04:05	DGY
4	Revised as per City Comments	14:10:02	DGY
3	Revised as per City Comments	14:08:22	DGY
2	Issued for SPA Resubmission	14.06.27	DGY
1	Issued for SPA	13.11.18	D.G.Y.

Issued for

All measurements and conditions must be checked on the work by the contractor. This drawing not to be used for construction until signed.

Date

plotted J:\35355–ArcadiaComm\5.9 Drawings\59civil\layouts\C–101.dwg
Layout Name: C–101 Plot Style: AIA STANDARD–FULL.CTB Plot
Scale: 1:1 Plotted At: 3/16/2017 11:10 AM Last Saved By: dsiurna
Last Saved At: Mar. 16, 17

TN
PN

D. G. Yeroulopoulos

drawn by	DPS	scale	HOR 1:500 VERT. 1:50
checked by	DGY	date	NOV. 2013
printed		file	35355

Arcadia Retail Development

Kanata, Ontario

Minto Properties
200 Kent Street • Suite 180 • Ottawa, Ontario • K1P 0B6
Telephone: (613)782-3137 Fax: (613)782-5777

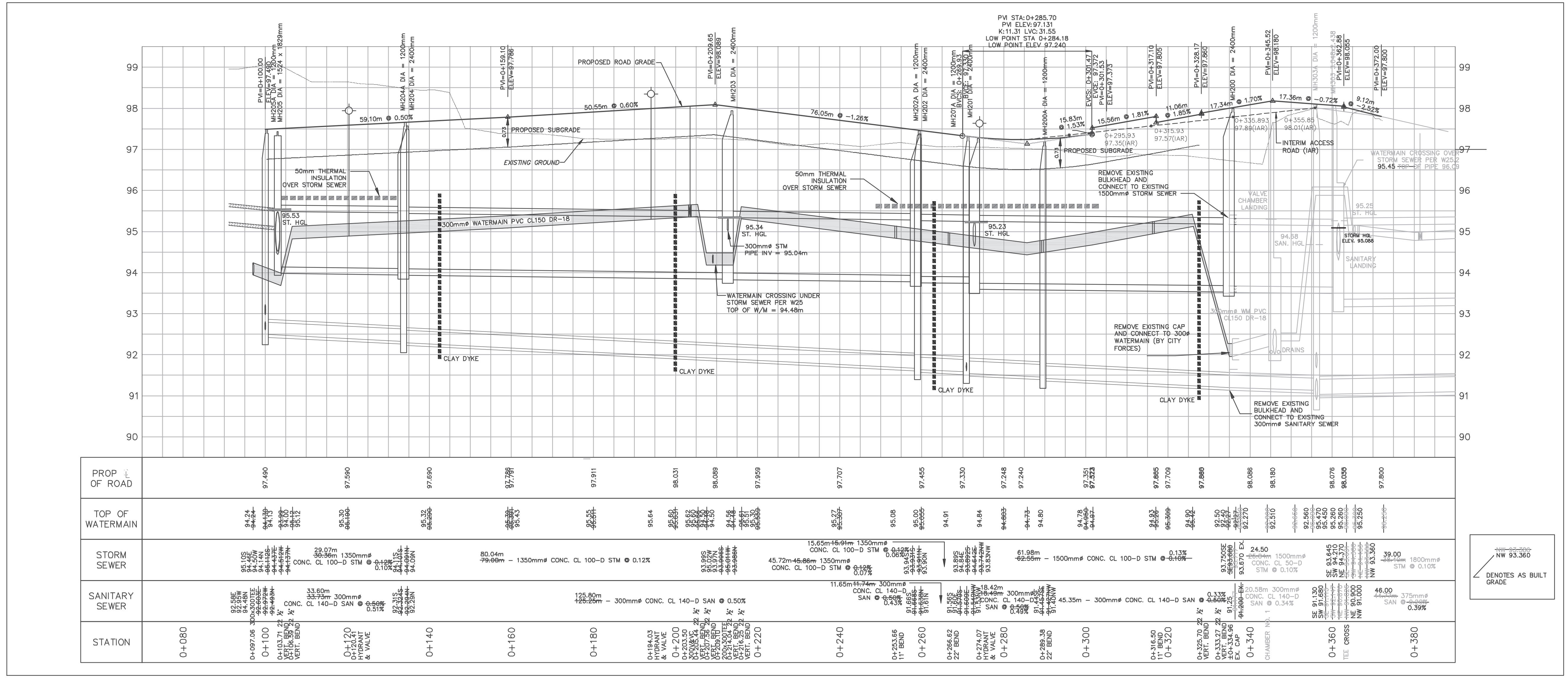
drawing title:
PLAN AND PROFILE
COUNTRY GLEN WAY
370 HUNTMAR DRIVE
OTTAWA, ON.

IBI GROUP

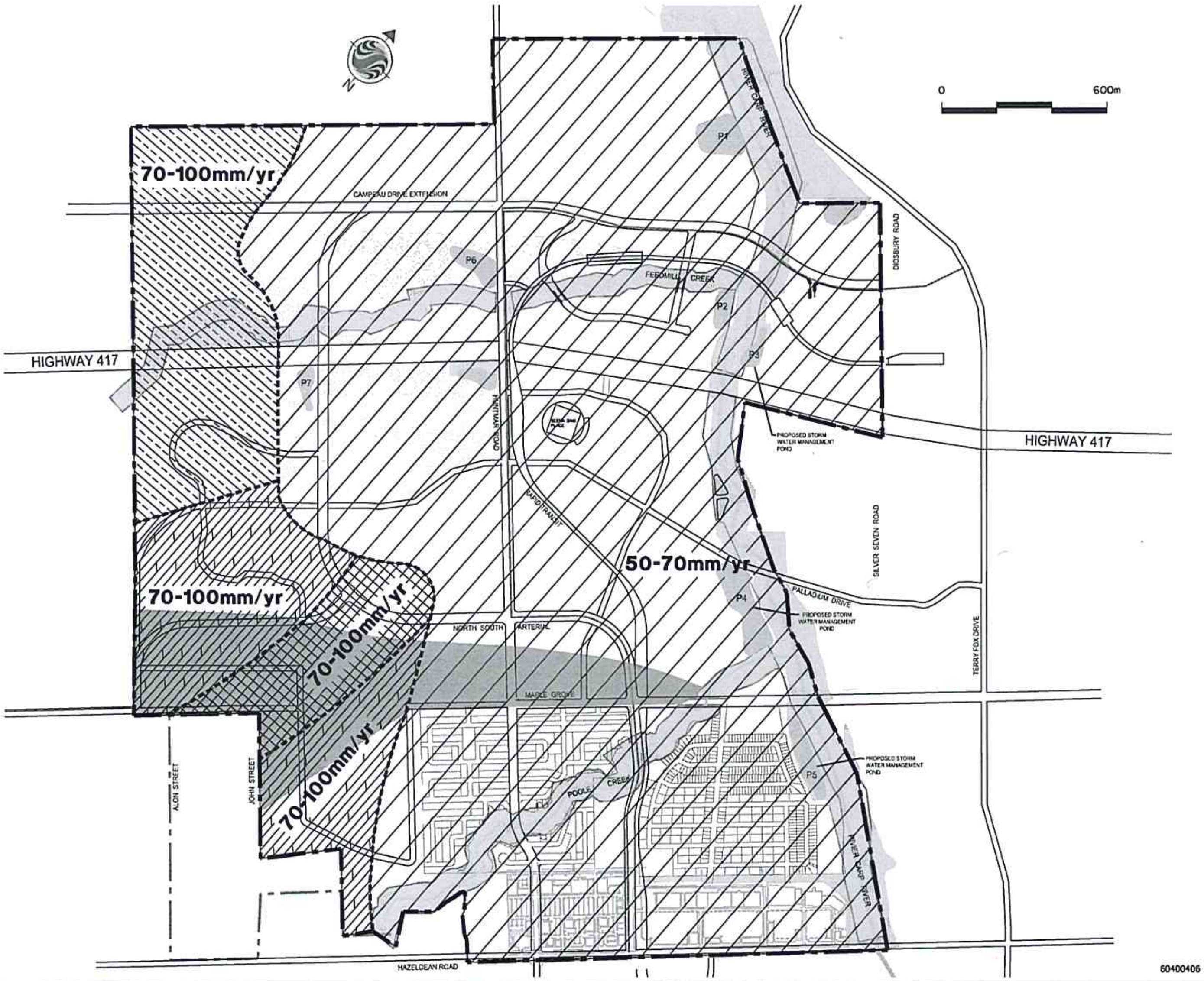
drawing no.
C–101

333 Preston Street Tower 1, Suite 400
Ottawa, Ontario Canada K1S 5N4 Tel
(613)225–1311 FAX (613)225–9868

D07-12-14-0014



INFILTRATION TARGETS



	SOIL TYPE	RECHARGE
▨	FINE SAND	MODERATE
▨	PALEOZOIC BEDROCK	MODERATE
▩	TILL	MODERATE
▨	CLAY	LOW

━ ‧ ━	Kanata-West Concept Plan Boundary
⬜	Area Tributary To Feedmill Creek (Existing Conditions)
■	Area Tributary To Maple Grove Ditch System and Poole Creek (Existing Conditions)
▒	OPEN SPACE

NOTE:
SOIL TYPES AND RECHARGE POTENTIAL FROM CARP RIVER WATERSHED/SUBWATERSHED STUDY BY ROBINSON CONSULTANTS INC. 2004.
TARGET INFILTRATION RATES OBTAINED FROM ENVIRONMENTAL FACT SHEETS FROM 2004 REPORT.

Stantec

CCL/IBI

MAY 2006

FIG. 5.4

that global climatic change may have on the stormwater infrastructure of Ontario. In this area:

- Surface storage on streets and parking lots is used in the stormwater management system during storms less frequent than the five-year storm
- ponds for water quality control only
- utilizes some of the most modern stormwater quantity control mechanisms including, orifices in the catchbasins, local infiltration, and by directing roof runoff to the lawns

Since effort has been taken to reduce the flows entering the sewer system there are few options to retrofit the existing sewer system to cope with climatic change. The study considered how the minor system might be redesigned if the design storm were to increase by 15 per cent. Existing sewer pipes would surcharge under this scenario of increased rainfall. Therefore, to convey the increased peak flows, the diameter of these pipes would need to be increased. The incremental cost of installing larger diameter pipe was estimated at about two percent of the total system cost. The additional cost of larger sewers to accommodate the increased flows expected under climate change is not large in relative terms.

Similar studies concur with this approach (Infrastructure Canada December 2006). "A study in North Vancouver found that drainage infrastructure could be "adapted to more intense rainfall events by gradually upgrading key sections of pipe during routine, scheduled infrastructure maintenance. When changes to infrastructure such as pipe size *are* necessary, it is predicted to be less costly than the possible losses due to failed infrastructure"

Changes in the Upper Carp Subwatershed
This is a large subwatershed, approximately 5000 hectares. Of this, 3000 hectares is approved for urban development in the City's Official Plan, in Stittsville and Kanata, including Kanata West.

The Kanata West Development Area is planned to be implemented over a 20 +/- year period allowing any new policies and information to be incorporated as development proceeds. As part of the Carp River Restoration Project, one of the few permanent water flow monitoring systems in Ottawa has been put in place for Kanata West. The results from this monitoring will be beneficial in determining the effects of climate change over time and the adaptive management measures that can be put in place to accommodate increased flows and assist in developing municipal policies.

Continuous monitoring of water level and/or streamflow (year round) will occur at three locations in the upper Carp River watershed: Carp River at Richardson Side Road, Carp River at Maple Grove Road, and Poole Creek at Maple Grove Road. All of these streamflow monitoring stations will be permanent gauges as part of the ongoing MVC long term monitoring program. Data from the Kinburn gauge may also be useful in assessing long term trends.

While the imperviousness of Kanata West development is expected to be typical or slightly higher than historic urban development (due to intensification requirements in the Provincial Policy Statement), both the Carp River Subwatershed Study and the Master Servicing Study require that infiltration rates be maintained. This requirement is being implemented with each development application and also moderates the increase in runoff resulting from urbanization.

Natural Environment (NE) 20%

All three alternatives will have essentially the same impact on the natural environment. Alternative I has a minor increased impact due to the number of ponds (8) and there location within the KWCP.

5.5.2 Selection of Stormwater Management Alternatives

Based on the above evaluation, Alternative III is selected as the preferred stormwater management alternative. This option offers the greatest amount of flexibility for phasing opportunities while providing an economical servicing solution that meets the objectives of the Carp River Watershed/Subwatershed Study.

5.6 Best Management Practices

The Carp River Watershed/Subwatershed Study (Robinson Consultants, November 2004) proposes target infiltration rates of 104 mm/yr and 73 mm/yr for areas of moderate and low recharge, respectively, within the KWCP. To meet the identified infiltration targets suggested the following best management practices (BMP's) were recommended and are shown on Figures 7.3.3 through 7.3.7 in Appendix 3.4.

- Subsurface Infiltration;
- Biofilters;
- Wet ponds; and
- Dry ponds.

A water balance and subsurface hydrogeological investigation at the detailed design stage will dictate which of the proposed BMPs will be selected for specific developments.

Given the establishment of the dominant soil associations that exist in the Study area **(see Figure 5.4)**, and considering the extent of the poorly draining soils within the nearly flat topography, it is apparent that drainage in the Study area is primarily governed by the characteristics of the poorly draining silty clay to clay soils underlying all but a small percentage of the Study area. As a result, the establishment of the infiltration rates of the soils can be simplified to reflect the silty clay to clay soils and the till material over bedrock. Table 5.6 below summarizes the anticipated infiltration rates of these two principal soil groups, based on soil characteristics and borehole data regarding degree of compaction.

Table 5.6 -Summary of Infiltration Rates of Principal Soil Groups

Soil Groups	**Estimated Infiltration Rates [1] (mm/yr)**	**Percent of Annual Rainfall Infiltrated**
Castor, Dalhousie, North Gower (silty clay to clay)	50-70 mm/yr	5-7
Anstruther, Farmington, Nepean (sandy loams to till)	70-100 mm/yr	7-11

Ontario

Ministry of the Environment
Ministère de l'Environnement

ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 1359-8XNNKL
Issue Date: September 17, 2012

Minto Communities Inc.
180 Kent St, No. 200
Ottawa, Ontario
K1P 0B6

Site Location: Arcadia Development - Phase I
450 Huntmar Drive
City of Ottawa, ON

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act , R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

the establishment of stormwater management *Works*for the collection, transmission, treatment and disposal of stormwater runoff from a catchment area of approximately 9 hectares, to provide Normal Level of water quality protection and to attenuate post-development peak flows to pre-development levels, discharging to the Carp River, for all storm events up to and including the 100-year return storm, consisting of the following:

Stormwater Management System

an interim stormwater management system to service the Arcadia Development Phase I, located to the east of Phase I and II developments, relying on the following:

- An interim wetland having a design minimum liquid retention volume of approximately 4,377m³ at elevation 94.22m, which includes Phase II drainage area and external arterial and commercial lands for a total drainage area of 36 hectares, with a controlled discharge flow rate of 8.03m³/sec.
- The wetland is equipped with a forebay of approximately 12m wide average and 113m in length and a bottom elevation of 92.45m with a permanent pool elevation of 93.00m, draining to the wet cell through a submerged permeable rock check dam.
- An outlet structure comprised of two components, a 400mm diameter 10m in length corrugated steel pipe (CSP) outlet pipe and an overflow weir of 4m in length with an overflow invert at 94.00m and rip rap protection.
- A baseflow drain to provide extended release of flow from the facility with a drain invert at 93.00m, 12 m in length comprised of clear stone trench wrapped in geotextile fabric.
- An outlet ditch of approximately 330m length with an upstream invert of 92.60m and a downstream invert of 91.70m, discharging to the Carp River.

The above, including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned *Works.*

For the purpose of this environmental compliance approval, the following definitions apply:

"Approval" means this entire document and any schedules attached to it, and the application;

"Director" means a person appointed by the Minister pursuant to section 5 of the *EPA* for the purposes of Part II.1 of the *EPA;*

"District Manager" means the District Manager of the Ottawa District Office;

"EPA" means the Environmental Protection Act , R.S.O. 1990, c.E.19, as amended;

"Ministry" means the ministry of the government of Ontario responsible for the *EPA* and *OWRA* and includes all officials, employees or other persons acting on its behalf;

"Owner" means Minto Communities Inc. and its successors and assignees;

"OWRA" means the Ontario Water Resources Act , R.S.O. 1990, c. O.40, as amended;

"Regional Director" means the Regional Director of the Eastern Region of the Ministry;

" *Source Protection Plan"* means a drinking water source protection plan prepared under the Clean Water Act, 2006; and

"Works" means the sewage works described in the *Owner* 's application, and this *Approval.*

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

(1) The *Owner* shall ensure that any person authorized to carry out work on or operate any aspect of the *Works* is notified of this *Approval* and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

(2) Except as otherwise provided by these conditions, the *Owner* shall design, build, install, operate and maintain the *Works* in accordance with the description given in this *Approval* , and the application for approval of the W *orks.*

(3) Where there is a conflict between a provision of any document in the schedule referred to in this *Approval* and the conditions of this *Approval* , the Conditions in this *Approval* shall take precedence, and where there is a conflict between the documents in the schedule, the document bearing the most recent date shall prevail.

(4) Where there is a conflict between the documents listed in the Schedulesubmitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

(5) The Conditions of this *Approval* are severable. If any Condition of this *Approval* , or the application of any requirement of this *Approval* to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this *Approval* shall not be affected thereby.

2. EXPIRY OF APPROVAL

The approval issued by this *Approval* will cease to apply to those parts of the *Works* which have not been constructed within five (5) years of the date of this *Approval.*

3. CHANGE OF OWNER

The *Owner* shall notify the *District Manager* and the *Director,* in writing, of any of the following changes within thirty (30) days of the change occurring:

(a) change of *Owner;*

(b) change of address of the *Owner;*

(c) change of partners where the *Owner* is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act , R.S.O. 1990, c.B17 shall be included in the notification to the *District Manager;* and

(d) change of name of the corporation where the *Owner* is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act , R.S.O. 1990, c. C39 shall be included in the notification to the *District Manager.*

4. OPERATION AND MAINTENANCE .

(1) The *Owner* shall ensure that the design minimum liquid retention volume(s) is maintained at all times .

(2) TThe *Owner* shall conduct visual inspections of the SWM facility at the time of conducting the monitoring sampling required in Condition 6, prepare a photo record of the facility and, if necessary, clean and maintain the *Works* to prevent the excessive buildup of sediments and/or vegetation.

(3) The *Owner* shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook at the Owner's offices for inspection by the *Ministry.* The logbook shall include the following:

(a) the name of the *Works;* and

(b) the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed.

5. RECORD KEEPING

The *Owner* shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the operation and maintenance and monitoring activities required by this *Approval.*

6. MONITORING PROGRAM

(1) Upon commencement of operation of the *Works* , the *Owner* shall implement a monitoring program based on water levels and effluent discharge from the site during the following number of events until such time when the works are decommissioned and/or replaced with the ultimate stormwater management facility.

Table 1 - Monitoring Program

Parameter (milligrams per litre unless otherwise indicated)	**Frequency**	**Sample Type**
Sample point: Pond's influent		
Total Suspended Solids	as per subsection (2)	Composite (*)
Sample point: Pond's effluent		
Flow drawdown estimate (m^3/sec)	as per subsection (2)	field
Total Suspended Solids	as per subsection (2)	three equal volume grab samples
Total Phosphorus	as per subsection (2)	three equal volume grab samples
Temperature (˚C)	as per subsection (2)	field
Pond and Carp River water levels (m)	as per subsection (2)	field

Note: (*) Composite samples collected utilizing automated equipment or a minimum of three equal volume grab samples per sample event.

(2) The *Owner* shall implement the monitoring program with the following minimum sample event frequency:

(a) Two (2) small rainfall events (less than 7mm);

(b) Two (2) medium rainfall events (7-15 mm); and

(c) Three (3) large rainfall events (greater than 15 mm).

(3) The *Owner* shall submit an annual stormwater monitoring report to the *District Manager* by March 31 of each calendar year and provide a copy to the City of Ottawa's Infrastructure Approvals Division - Planning Branch and to the Planning and Growth Management Department so the City can review and include results in the Kanata West Overall Monitoring Report. The annual reports shall cover the monitoring period for the previous calendar year.

(4) The *Owner* shall provide a copy of the annual monitoring reports and its associated data to the City of Ottawa, so that the City can review it and include those results in the City's Annual Overall

Monitoring Report in accordance with the Implementation Plan for the Kanata West Development Area.

(5) The *Owner* shall include in the annual monitoring reports for the reporting period the following:

(a) a description of the physical works, its location, and how it is designed to function;

(b) monitoring results and interpretation of data for acuracy or deviation from the design quality and quantity controls and confirm the current hydrological and hydraulic models and an estimate of baseflow from the stormwater management (SWM) facility;

(c) an evaluation of the pond's performance and its ability to meet the design performance criteria of 70% TSS removal (during the monitoring period);

(d) an estimate of the percentage of build out for the contributing drainage area of the SWM facility;

(e) an estimate of the SWM facility's baseflow and flow drawdown characteristics;

(f) a description of any consideration that may need to be implemented upon transition and/or decommissioning of the interim facility once an ultimate SWM facility is provided;

(g) estimated of the flow drawdown characteristics of the SWM facility;

(h) a description of any operating problems encountered and corrective actions taken during the reporting period and the need to further investigation in the following reporting period for pond refinements or ways of improving the performance of the facility to meet the performance target;

(i) any need for modifications of the monitoring program;

(j) a summary of any complaints received during the reporting period and any steps taken to address the complaints;

(k) inspection logs and facility photos taken at time of monitoring events; and

(l) any other information as required by the District Manager from time to time.

7. SOURCE WATER PROTECTION

The *Owner* shall, within sixty (60) calendar days of the Minister of the Environment posting approval of a *Source Protection Plan* on the environmental registry established under the Environmental Bill of Rights, 1993 for the area in which this *Approval* is applicable, apply to the *Director* for an amendment to this *Approval* that includes the necessary measures to conform with all applicable policies in the approved *Source Protection Plan.*

Schedule A

Environmental Compliance Approval (ECA) supporting documents:

1. Application for the Approval of Municipal and Private Water and Sewage Works submitted by Fairouz Wahab, P.Eng., Project Manager of Minto Communities Inc, dated June 7, 2012 and supporting documentation.

2. Technical Memo from the Model Keeper, Greenland International Consulting to Don Herweyer of the City of Ottawa, dated June 20, 2012.

3. Arcadia Phase I Stormwater Management Report, Rev 2- MOE Submission, prepared by IBI Group of Ottawa, ON, dated June 2012.

4. Arcadia Interim SWMF Design Brief, Rev 3 - MOE Submission, prepared by IBI Group of Ottawa, ON, dated June 2012.

5. Letter from Peter Spal, P.Eng. of IBI Group to Edgar Tovilla, P.Eng. of the MOE, dated September 4, 2012, in response to information requested.

6. City of Ottawa's Kanata West Overall Monitoring Plan, City of Ottawa's website printout dated September 4, 2012.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the *Works* are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the *Approval* and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.

2. Condition 2 is included to ensure that, when the *Works* are constructed, the *Works* will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment..

3. Condition 3 is included to ensure that the Ministry records are kept accurate and current with respect to approved *Works* and to ensure that subsequent owners of the works are made aware of the *Approval* and continue to operate the works in compliance with it.

4. Condition 4 is included to require that the *Works* be properly operated and maintained such that the environment is protected .

5. Condition 5 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the *Works.*

6. Condition 6 is included to enable the *Owner* to evaluate and demonstrate the performance of the *Works* , on a continual basis, so that the *Works* are properly operated and maintained at a level which is consistent with the Implementation Plan - Kanata West Development Area report, the Carp River Overall Monitoring Program and requirements specified in the Minister's Decision Letter of March 30, 2011, and that the *Works* does not cause any impairment to the receiving watercourse.

7. Condition 7 is included to ensure that the works covered by this *Approval* will conform to the significant threat policies and designated Great Lakes policies in the *Source Protection Plan.*

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary* Environmental Review Tribunal 655 Bay Street, Suite 1500 Toronto, Ontario M5G 1E5	AND	The Director appointed for the purposes of Part II.1 of the Environmental Protection Act Ministry of the Environment 2 St. Clair Avenue West, Floor 12A Toronto, Ontario M4V 1L5

*** Further information on the Environmental Review Tribunal 's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 17th day of September, 2012

Mansoor Mahmood, P.Eng.
Director
appointed for the purposes of Part II.1 of the *Environmental Protection Act*

ET/
c: District Manager, MOE Ottawa
Peter Spal, P. Eng., IBI Group

Content Copy Of Original

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 5440-9W3SZT
Issue Date: May 1, 2015

Minto Communities Inc.
180 Kent Street West, No. 200
Ottawa, Ontario
K1P 0B6

Site Location: Country Glen Way - Ward 4 Kanata North
Lot Part of 3, Concession 1 March
City of Ottawa

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act , R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

Installation of storm and sanitary sewers to provide service for the Arcadia Retail Development site in the Community of Kanata West, City of Ottawa. The proposed works are as follows:

Storm sewers (250-1500mm dia.) on Country Glen Way, from the parking lot near the southeast entrance of the mall, discharging to existing storm sewers on Campeau Drive;

Sanitary sewers (200-300mm dia.) on Country Glen Way, from the southeast entrance of the mall, discharging to existing sanitary sewers on Campeau Drive;

including control measures during construction and all other appurtenances essential for the proper operation of the aforementioned works;

all in accordance with the supporting documents listed in Schedule "A" forming part of this Approval.

Schedule "A"

Applications for Environmental Compliance Approval , dated February 12, 2015, received April 15, 2015, submitted by Minto Communities Inc.;
Engineering Drawings dated November 2013, prepared by Demetrius Yannoulopoulos of IBI Group;

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment and Climate Change
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal 's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 314-3717 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 1st day of May, 2015

Edgardo Tovilla, P.Eng.
Director
appointed for the purposes of Part II.1 of the *Environmental Protection Act*

HZ/
c: District Manager, MOECC Ottawa
Demetrius Yannoulopoulos, IBI Group

Subject: RE: 340 Huntmar - Percolation Rate

From: Scott Dennis <sdennis@Patersongroup.ca>
Sent: Thursday, April 26, 2018 4:13 PM
To: Curtis Melanson <c.melanson@mcintoshperry.com>
Cc: Mat Mault (mat.mault@activar.ca) <mat.mault@activar.ca>; Benjamin Clare <b.clare@mcintoshperry.com>; David Gilbert <DGilbert@Patersongroup.ca>
Subject: RE: 340 Huntmar - Percolation Rate

Curtis,

The estimated percolation rate for the silty clay at the 340 Huntmar Site is 35 to 50 mins/cm. This is based on data from a nearby site on Palladium Drive. Please let me know if you require additional information.

Regards,
Scott Dennis
Geotechnical Engineer

patersongroup
Solution Oriented Engineering

T: (613) 226-7381 ext. 332
154 Colonnade Road South
Ottawa, Ontario
K2E 7J5

APPENDIX B
CITY OF OTTAWA PRE-CONSULTATION NOTES

From:	McCreight, Laurel <Laurel.McCreight@ottawa.ca>
Sent:	Monday, June 26, 2017 2:26 PM
To:	'Mat Mault'
Cc:	Curtis Melanson; m.dredge@dl-arch.ca
Subject:	Pre-Consultation Follow-Up: 340 Huntmar
Attachments:	RE: Pre-consultation Request for Kanata Microtel Inn & Suites; Plan & Study List.pdf

Hi Mat,

Sorry for the delay in following up on our pre-consultation meeting on Friday June 16th regarding 340 Huntmar Drive. Please find a summary of our meeting below, as well as a Plan and Study list attached.

General

- Proposal for a Microtel Inn & Suites
- Land is part of a previously approved Minto for Arcadia Retail Complex
- Will sever off parcel for hotel
  - Will require a Severance application to the Committee of Adjustment
  - Please consult with Amanda Marsh (amanda.marsh@ottawa.ca) the Committee of Adjustment Planner on the severance application
- Possibly short on parking
  - Review Section 106(3) of the Zoning By-law for requirements on small car parking to potentially meet parking requirements
  - If parking requirements cannot be met, a Minor Variance can be applied for at the Committee of Adjustment
- Please use the address of 340 Huntmar and not 370
  - The Committee of Adjustment will assign a new address as part of the severance process
- A new Site Plan Control application (New- Manager Approval, Public Consultation) will be required as a result of the severance
- Please refer to the link for "Guide to Preparing Studies and Plans" in the attached plan/study list for proper submission requirements

Engineering

- Looking for verification regarding as-builts by Minto in order to support servicing through their site
- Water age analysis required
- An infiltration gallery will be required for the site, as this was missed in the previous Arcadia Site Plan and is required through the Kanata West Master Servicing Study
  - The geotechnical investigation will provide the percolation rate
- A Joint Use and Maintenance Agreement with be required
  - Can be done through the severance process
- The site has an existing ECA
  - What type of amendment is needed/required to proceed
  - Will require confirmation from MOE
- Please contact Mark Fraser (mark.fraser@ottawa.ca) for any engineering questions

Urban Design

- Keep in mind the treatment of internal drive aisles
- Respect the design of the commercial site in terms of parking in the middle

- Take advantage of the Feedmill Creek Corridor
    - Think of putting the pool component creekside near the future pedestrian pathway (which will be on the north side of the creek)
    - Outdoor patio outside of pool area
    - Access to outdoor trail network
- Design of hotel
    - Contemporary and appropriate
    - Please provide a stronger base- masonry on 1st floor
    - Provide a secondary access out to Huntmar on the backside of the building

Urban Design Review Panel

- The proposed development is subject to review by the Urban Design Review Panel
- The submission requirements and agenda schedule is contained in the UDRP link above
- An informal preconsultation is not necessary
- This can be run congruently with the site plan
- Will try to be on the agenda within the first month of site plan application being submitted
- Items to be aware of from previous UDRP (Arcadia site plan)
    - Reference the Kanata West Concept Plan
    - Address the public realm (Huntmar)
    - The Queensway is a scenic entry route; describe what would be seen from the highway
    - Animation of end treatments

Transportation

- See attached e-mail from Riley Carter's for preliminary comments (the West Group's new Project Manager for transportation is Rosanna Baggs)

Please do not hesitate to contact me if you have any questions.

Regards,
Laurel

Laurel McCreight MCIP, RPP
Planner
Development Review West
Urbaniste
Examen des demandes d'aménagement ouest

City of Ottawa | Ville d'Ottawa
☎ 613.580.2424 ext./poste 16587
ottawa.ca/planning / ottawa.ca/urbanisme

APPENDIX C
WATERMAIN FLOW & FIRE CALCULATIONS

Tyler Ferguson

Subject: RE: Follow-up on water consumption requirements - Country Glen Way Construction Drawings - Arcadia Hotel

---

From: Lance Erion <lerion@IBIGroup.com>
Sent: Monday, November 27, 2017 2:02 PM
To: Allan Kyd <AKyd@minto.com>; Ryan Kennedy <r.kennedy@mcintoshperry.com>
Cc: Curtis Melanson <c.melanson@mcintoshperry.com>; Benjamin Clare <b.clare@mcintoshperry.com>
Subject: RE: Follow-up on water consumption requirements - Country Glen Way Construction Drawings - Arcadia Hotel

Based on the daily water consumption and the required fire flow demand our water model shows that a second watermain feed is not required to service the hotel site.

Regards,

Lance Erion P.ENG

Associate

IBI GROUP
400-333 Preston Street
Ottawa ON K1S 5N4 Canada
tel +1 613 225 1311 ext 516 fax +1 613 225 9868

Defining the cities of tomorrow
ibigroup.com

From: Allan Kyd [mailto:AKyd@minto.com]
Sent: Monday, November 27, 2017 1:29 PM
To: 'Ryan Kennedy' <r.kennedy@mcintoshperry.com>; Lance Erion <lerion@IBIGroup.com>
Cc: Curtis Melanson <c.melanson@mcintoshperry.com>; Benjamin Clare <b.clare@mcintoshperry.com>
Subject: Follow-up on water consumption requirements - Country Glen Way Construction Drawings - Arcadia Hotel

Thanks Ryan. Much appreciated.

Lance is this what you're looking for?

Let me know.

Thanks,

Allan

Allan Kyd
Leasing Manager

Minto Properties
200-180 Kent St, Ottawa, ON, K1P 0B6

T 613.786.7934 | F 6137863001
minto.com

From: Ryan Kennedy [mailto:r.kennedy@mcintoshperry.com]
Sent: Monday, November 27, 2017 1:24 PM
To: Allan Kyd
Cc: Lance Erion (lerion@ibigroup.com); Curtis Melanson; Benjamin Clare
Subject: RE: Question regarding water consumption requirements - Country Glen Way Construction Drawings - Arcadia Hotel

Hi Allan,

Per IBI`s request below, please note the following demands for the hotel:

- Average daily demand = 0.28 L/s
- Maximum daily demand = 0.41 L/s
- Peak hour demand = 0.75 L/s
- Fire demand = 150 L/s

Hope this helps -let me know if you require anything further.

Thanks.

Ryan Kennedy, P. Eng.

Practice Area Lead | Land Development
115 Walgreen Road, RR 3, Carp, ON K0A 1L0
T. 613.836.2184 (ext 2243) | **F.** 613.836.3742 | **C**. 613.868.5790
r.kennedy@mcintoshperry.com | www.mcintoshperry.com

MCINTOSH PERRY

From: Benjamin Clare
Sent: Friday, November 24, 2017 10:54 AM
To: Curtis Melanson <c.melanson@mcintoshperry.com>
Subject: FW: Question regarding water consumption requirements - Country Glen Way Construction Drawings - Arcadia Hotel

Hi Curtis,

See below, for your input. Please also copy me when you respond to Allan re: servicing plans, easements, etc.

Thanks,

Benjamin Clare, MCIP RPP

Senior Land Use Planner
T. 613.836.2184 (ext 2290) | **C**. 613.552.0925

From: Allan Kyd [mailto:AKyd@minto.com]
Sent: November-24-17 10:38 AM
To: Benjamin Clare <b.clare@mcintoshperry.com>
Cc: Ed Ireland <ed.ireland@IBIGroup.com>; Jean-Michel Le Blanc <JLeBlanc@minto.com>; Curtiss Scarlett <CScarlett@minto.com>; 'Lance Erion' <lerion@IBIGroup.com>
Subject: Question regarding water consumption requirements - Country Glen Way Construction Drawings - Arcadia Hotel

Hi Ben,

We're trying to finalize our water loop requirements and our 'civil' was asking what the hotel's:

1) daily consumption requirements and
2) fire demand

Capacity currently provided is:
> My analysis shows the fire flow available, in our design we calculated a fire flow demand of 183.3 l/s for retail. Does the Hotel require a higher fire flow than 194 l/s, also the City can require a second water main connection if the average flow exceeds 50,000 l/day, do you have the Hotel's daily water demand.

Could you let us know? See Lance's email below for more detail.

Tx,

AK

Allan Kyd
Leasing Manager
Minto Properties
200-180 Kent St, Ottawa, ON, K1P 0B6
T 613.786.7934 | F 6137863001
minto.com

-----Original Message-----
From: Lance Erion [mailto:lerion@IBIGroup.com]
Sent: Friday, November 24, 2017 9:51 AM
To: Allan Kyd
Cc: Ed Ireland; Jean-Michel Le Blanc; Curtiss Scarlett
Subject: RE: AKs reply to completion of interior water loop - Country Glen Way Construction Drawings - Arcadia Hotel

There is no issue with pressure or water stagnating as a hotel is a high user of water. I need to know the fire demand for the hotel and the daily water consumption, can you request this from the hotel's civil engineer.

Regards,

Lance Erion P.Eng
Associate

IBI Group
400-333 Preston Street
Ottawa ON K1S 5N4 Canada

tel 613 225 1311 ext 516
fax 613 225 9868
email lerion@IBIGroup.com
web   www.ibigroup.com

-----Original Message-----
From: Allan Kyd [mailto:AKyd@minto.com]
Sent: Friday, November 24, 2017 7:08 AM
To: Lance Erion <lerion@IBIGroup.com>
Cc: Ed Ireland <ed.ireland@IBIGroup.com>; Jean-Michel Le Blanc <JLeBlanc@minto.com>; Curtiss Scarlett <CScarlett@minto.com>
Subject: AKs reply to completion of interior water loop - Country Glen Way Construction Drawings - Arcadia Hotel

Thanks for getting back Lance. I think we're less concerned with the water service capacity being able to service the hotel requirements but will get confirmation that we're OK. What we wanted to know is, will the City require us to complete the primary loop to Campeau Dr. before allowing the Hotel to use their water service. Apparently there could be some concern about water stagnating in the pipe and perhaps some pressure issues. I've heard the City typically wants the water to have two primary service outlets to be operational. Not exactly sure as this is not my area of expertise. Is that something you can provide us some direction on?

Let us know would you.

Thanks,

Allan
Sent from my iPad

Allan Kyd
Leasing Manager
Minto Properties
200-180 Kent St, Ottawa, ON, K1P 0B6
T 613.786.7934 | F 6137863001
minto.com

Boundary Conditions 340 Huntmar Drive.

Information Provided

Date provided: 25 April 2018

	Demand	
Scenario	L/min	L/s
Average Daily Demand	16.8	0.3
Maximum Daily Demand	24.6	0.4
Peak Hour	45	0.8
Fire Flow Demand	11000	183.3

# of connections	1

Location

Results

Connection 1 - 340 Huntmar Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	162.0	82.6
Peak Hour	158.0	76.9
Max Day plus Fire (11,000 l/min)	147.8	70.8

[1] Ground Elevation = 103.91 m

Considerations

1. Pressure reducing valves are to be installed due to pressure exceeding 80 psi (552 kPa) as per City of Ottawa Water Design Guidelines.

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.

CP-17-0199 - 340 Huntmar Drive - Water Demands

Project:	340 Huntmar Drive
Project No.:	CP-17-0199
Designed By:	PGK
Checked By:	RPK
Date:	May 9, 2018
Site Area:	0.65 gross ha
Bed-Space:	108 Suites

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	350	L/c/d
Industrial - Light	35,000	L/gross ha/d
Industrial - Heavy	55,000	L/gross ha/d
Shopping Centres	2,500	L/(1000m² /d
Hospital	900	L/(bed/day)
Schools	70	L/(Student/d)
Trailer Parks no Hook-Ups	340	L/(space/d)
Trailer Park with Hook-Ups	800	L/(space/d)
Campgrounds	225	L/(campsite/d)
Mobile Home Parks	1,000	L/(Space/d)
Motels	150	L/(bed-space/d)
Hotels	*225*	*L/(bed-space/d)*
Tourist Commercial	28,000	L/gross ha/d
Othe Commercial	28,000	L/gross ha/d
AVERAGE DAILY DEMAND	0.28	L/s

MAXIMUM DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	2.5 x avg. day	L/c/d
Industrial	1.5 x avg. day	L/gross ha/d
Commercial	*1.5 x avg. day*	*L/gross ha/d*
Institutional	1.5 x avg. day	L/gross ha/d
MAXIMUM DAILY DEMAND	0.42	L/s

MAXIMUM HOUR DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	2.2 x max. day	L/c/d
Industrial	1.8 x max. day	L/gross ha/d
Commercial	*1.8 x max. day*	*L/gross ha/d*
Institutional	1.8 x max. day	L/gross ha/d
MAXIMUM HOUR DEMAND	0.76	L/s

WATER DEMAND DESIGN FLOWS PER UNIT COUNT
CITY OF OTTAWA - WATER DISTRIBUTION GUIDELINES, JULY 2010

CP-17-0199 - 340 Huntmar Drive - OBC Fire Calculations

Project:	340 Huntmar Drive
Project No.:	CP-17-0199
Designed By:	PGK
Checked By:	RPK
Date:	May 9, 2018

Ontario 2006 Building Code Compendium (Div. B - Part 3)

Water Supply for Fire-Fighting - Hotel

Building is classified as Group: D (from table 3.2.2.55)
Building is of noncombustable construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2, including loadbearging walls, columns and arches.

From Div. B A-3.2.5.7. of the Ontario Building Code - 3. Building On-Site Water Supply:

(a) Q = K x V x Stot

where:

Q = minimum supply of water in litres

K = water supply coefficient from Table 1

V = total building volume in cubic metres

Stot = total of spatial coefficient values from the property line exposures on all sides as obtained from the formula:

Stot = 1.0 + [Sside1+Sside2+Sside3+...etc.]

K	18	(from Table 1 pg A-31) (Worst case occupancy {E / F2} 'K' value used)
V	17,149	(Total building volume in m³.)
Stot	1.7	(From figure 1 pg A-32)
Q =	524,751.75 L	

			From Figure 1 (A-32)
Snorth	6.934	m	0.3
Seast	60.266	m	0.0
Ssouth	4.925	m	0.5
Swest	14.597	m	0.0

*approximate distances

From Table 2: Required Minimum Water Supply Flow Rate (L/s)

9000 L/min (if Q >270,000 L)
2378 gpm

CP-17-0199 - 340 Huntmar Drive - Fire Underwriters Survey (FUS) Fire Calculations

Project:	340 Huntmar Drive
Project No.:	CP-17-0199
Designed By:	PGK
Checked By:	RPK
Date:	May 9, 2018

From the Fire Underwriters Survey (1999)

From Part II – Guide for Determination of Required Fire Flow Copyright I.S.O.:

F = 220 x C x √A Where:

F = Required fire flow in liters per minute
C = Coefficient related to the type of construction.
A = The total floor area in square meters (including all storey's, but excluding basements at least 50 percent below grade) in the building being considered.

A. Determine The Coefficient Related To The Type Of Construction

The building is considered to be of ordinary construction type. Therefore,

C = 1.00

B. Determine Ground Floor Area

As provided by the Architect:

Floor Area (One Floor) = 1,008.75 m²
A = 4,035.00 m²

This floor area represents the final build-out of the development; as outlined on the Site Plan drawing.

C. Determine Height in Storeys

From Architectural Drawings:

Number of Storeys = 4.00

D. Calculate Required Fire Flow

F = 220 x C x √A

F = 220.00 X 1.00 X √ 4035.00
F = 13,974.76 L/min.

E. Determine Increase or Decrease Based on Occupancy

From note 2, Page 18 of the Fire Underwriter Survey:

Low Hazard - Hotel
No Change

Occupancy Decrease = 0.00 L/min.
F = 13,974.76 L/min.

CP-17-0199 - 340 Huntmar Drive - Fire Underwriters Survey (FUS) Fire Calculations

F. Determine the Decrease, if any for Sprinkler Protection

From note 3, Page 18 of the Fire Underwriter Survey:

- The flow requirement may be reduced by up to 50% for complete automatic sprinkler protection depending upon adequacy of the system.
- The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards.
- Additional credit of 10% if water supply is standard for both the system and fire department hose lines
- If sprinkler system is fully supervised system, an additional 10% credit is granted
- The entire building will be installed with a fully automated, standardized with the City of Ottawa Fire Department and fully supervised.
- Therefore the value obtained in Step E is reduced by 30% (The building is sprinklered with a standard system and fire department hose lines)

Reduction = 13,974.76 L/min. X 30%

Reduction = 4,192.43 L/min.

G. Determine the Total Increase for Exposures

From note 4, Page 18 of the Fire Underwriter Survey:

- Exposure distance to the concept future development layout adjacent to the proposed site on the north and east sides of the building will likely be between 30.1m-45m or greater.
- There are no existing buildings surrounding the remainder of the site that are within 45m.
- Therefore the charge for exposure is 10% of the value obtained in Step E.

Increase = 13,974.76 L/min. X 10%

Increase = 1,397.48 L/min.

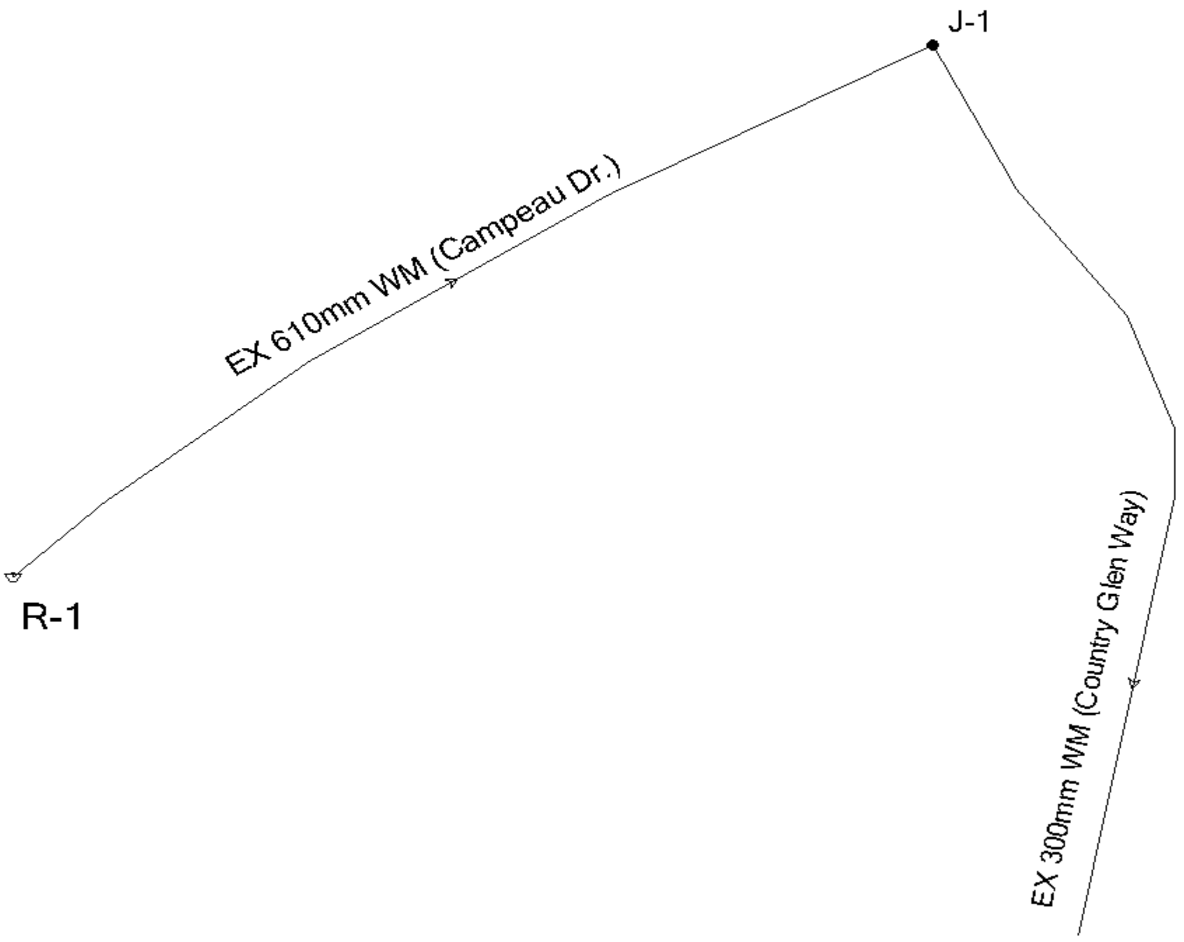
H. Determine the Total Fire Demand

- To the answer obtained in E, substract the value obtained in F and add the value obtained in G
- Fire flow should be no less than 2,000L/min. and the maximum value shoul not exceed 45,000L/min.

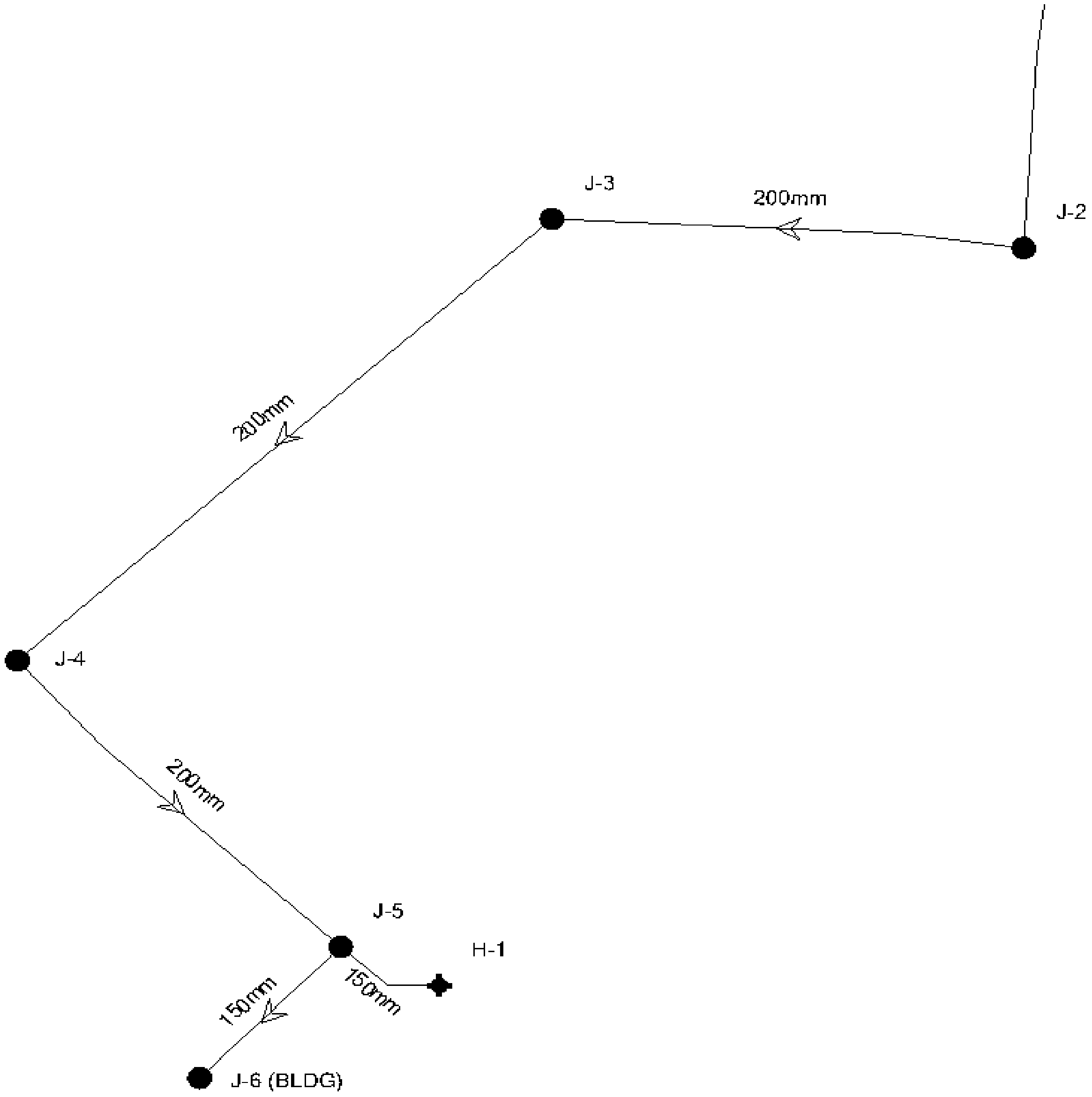
F = 13,974.76 L/min. - 4,192.43 L/min. + 1,397.48 L/min.
F = 11,179.81 L/min.

Therefore, after rounding to the nearest 1,000 L/min, the total required fire flow for the development is 11,000 L/min (3,434 GPM).

CP-17-0199 - 340 Huntmar Drive - WaterCAD Model Schematic



CP-17-0199 - 340 Huntmar Drive - WaterCAD Model Schematic



Average Day

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Hydraulic Grade (m)
J-1	92.50	0.00	98.65	162.00
J-2	94.24	0.00	96.18	162.00
J-3	95.61	0.00	94.24	162.00
J-4	96.98	0.00	92.29	162.00
J-5	96.77	0.00	92.59	162.00
J-6 (BLDG)	97.38	16.80	91.73	162.00

Peak Hourly

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Hydraulic Grade (m)
J-1	92.50	0.00	92.97	158.00
J-2	94.24	0.00	90.50	158.00
J-3	95.61	0.00	88.56	158.00
J-4	96.98	0.00	86.61	158.00
J-5	96.77	0.00	86.91	158.00
J-6 (BLDG)	97.38	45.60	86.05	158.00

Max Day + Fire Flow

ID	Label	Is Fire Flow Run Balanced?	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (L/min)	Fire Flow (Available) (L/min)	Pressure (psi)	Elevation (m)	Demand (L/min)
112	H-1	True	True	11,000.00	11,157.75	72.29	96.87	0.00
108	J-1	False	False	11,000.00	(N/A)	78.50	92.50	0.00
103	J-2	False	False	11,000.00	(N/A)	76.03	94.24	0.00
104	J-3	False	False	11,000.00	(N/A)	74.08	95.61	0.00
101	J-4	False	False	11,000.00	(N/A)	72.14	96.98	0.00
96	J-5	False	False	11,000.00	(N/A)	72.43	96.77	0.00
99	J-6 (BLDG)	False	False	11,000.00	(N/A)	71.57	97.38	25.20

APPENDIX D
SANITARY SEWER CALCULATIONS

IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: NAME OF PROJECT
LOCATION: CITY OF OTTAWA
CLIENT: NAME OF CLIENT

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			TOTAL FLOW (L/s)	PROPOSED SEWER DESIGN							
STREET	AREA ID	FROM MH	TO MH	UNIT TYPES				AREA (Ha)	POPULATION		PEAK FACTOR	PEAK FLOW (L/s)	AREA (Ha)						PEAK FLOW (L/s)	AREA (Ha)		FLOW (L/s)		CAPACITY (L/s)	LENGTH (m)	DIA (mm)	SLOPE (%)	VELOCITY (full) (m/s)	VELOCITY (actual) (m/s)	AVAILABLE CAPACITY	
				SF	SD	TH	APT		IND	CUM			INSTITUTIONAL		COMMERCIAL		INDUSTRIAL			IND	CUM									L/s	(%)
													IND	CUM	IND	CUM	IND	CUM													
	BLK800	BLK800A	MAIN						0.0	0.0	4.00	0.00		0.00	0.06	0.06		0.00	0.05	0.06	0.06	0.02	0.07	15.89	6.50	150	1.00	0.871		15.82	99.57
	123A	MH123A	MH122A						0.0	0.0	4.00	0.00		0.00	0.29	0.35		0.00	0.30	0.29	0.35	0.10	0.40	34.22	26.94	200	1.00	1.055		33.81	98.83
	122A	MH122A	MH121A						0.0	0.0	4.00	0.00		0.00	0.09	0.44		0.00	0.38	0.09	0.44	0.12	0.51	34.22	11.00	200	1.00	1.055		33.71	98.52
	BLK700	BLK700A	MAIN						0.0	0.0	4.00	0.00		0.00	0.10	0.10		0.00	0.09	0.10	0.10	0.03	0.11	15.89	6.50	150	1.00	0.871		15.77	99.28
	121A	MH121A	MH120A						0.0	0.0	4.00	0.00		0.00	0.08	0.62		0.00	0.54	0.08	0.62	0.17	0.71	34.22	57.61	200	1.00	1.055		33.50	97.92
	BLK600	BLK600A	MAIN						0.0	0.0	4.00	0.00		0.00	0.06	0.06		0.00	0.05	0.06	0.06	0.02	0.07	15.89	6.50	150	1.00	0.871		15.82	99.57
	120A	MH120A	MH100A						0.0	0.0	4.00	0.00		0.00	0.56	1.24		0.00	1.08	0.56	1.24	0.35	1.42	24.19	53.29	200	0.50	0.746		22.77	94.12
	BLK500	BLK500A	MAIN						0.0	0.0	4.00	0.00		0.00	0.09	0.09		0.00	0.08	0.09	0.09	0.03	0.10	15.89	15.00	150	1.00	0.871		15.78	99.35
	100A	MH100A	MH100C						0.0	0.0	4.00	0.00		0.00	0.46	1.79		0.00	1.55	0.46	1.79	0.50	2.06	24.19	34.23	200	0.50	0.746		22.14	91.51
		MH100C	*EXMH301A*						0.0	0.0					0.00	1.79			1.55	0.00	1.79	0.50	2.06	*24.19*	*23.50*	*200*	*0.50*	*0.746*		*22.14*	*91.51*
	BLK400	BLK400A	MAIN						0.0	0.0	4.00	0.00		0.00	0.15	0.15		0.00	0.13	0.15	0.15	0.04	0.17	15.89	6.50	150	1.00	0.871		15.72	98.92
	BLK300	BLK300A	MAIN						0.0	0.0	4.00	0.00		0.00	0.05	0.05		0.00	0.04	0.05	0.05	0.01	0.06	15.89	6.50	150	1.00	0.871		15.83	99.64
	221A	MH221A	MH212A						0.0	0.0	4.00	0.00		0.00	0.71	0.91		0.00	0.79	0.71	0.91	0.25	1.04	75.98	82.40	250	1.50	1.500	0.522	74.94	98.63
	BLK100	BLK100A	MAIN						0.0	0.0	4.00	0.00		0.00	0.06	0.06		0.00	0.05	0.06	0.06	0.02	0.07	15.89	6.85	150	1.00	0.871		15.82	99.57
	BLK200	BLK200A	MAIN						0.0	0.0	4.00	0.00		0.00	0.05	0.05		0.00	0.04	0.05	0.05	0.01	0.06	15.89	6.75	150	1.00	0.871		15.83	99.64
	214A	MH214A	MH213A						0.0	0.0	4.00	0.00		0.00	0.42	0.53		0.00	0.46	0.42	0.53	0.15	0.61	43.87	44.12	250	0.50	0.866	0.301	43.26	98.61
	213A	MH213A	MH212A						0.0	0.0	4.00	0.00		0.00	0.13	0.66		0.00	0.57	0.13	0.66	0.18	0.76	43.87	16.38	250	0.50	0.866	0.325	43.11	98.27
	212A	MH212A	MH210A						0.0	0.0	4.00	0.00		0.00	0.31	1.88		0.00	1.63	0.31	1.88	0.53	2.16	62.04	58.88	250	1.00	1.224	0.551	59.88	96.52
	BLK900	BLK900A	MAIN						0.0	0.0	4.00	0.00		0.00	0.47	0.47		0.00	0.41	0.47	0.47	0.13	0.54	11.23	22.08	150	0.50	0.616		10.69	95.20
	210A	MH210A	MH205C						0.0	0.0	4.00	0.00		0.00	0.32	2.67		0.00	2.32	0.32	2.67	0.75	3.07	62.04	28.84	250	1.00	1.224	0.633	58.97	95.06
		MH205C	MH205A						0.0	0.0	4.00	0.00		0.00	0.19	2.86		0.00	2.48	0.19	2.86	0.80	3.28	62.04	11.04	250	1.00	1.224	0.633	58.76	94.71
External South mixed	EXT 2	STUB	MH205A						0.0	0.0	4.00	0.00		0.00		0.00		0.00	3.01	2.82	2.82	0.79	3.80	24.19	14.51	200	0.50	0.746		20.39	84.29
Street 1	205A	MH205A	MH204A						0.0	0.0	4.00	0.00		0.00	0.08	2.94		0.00	5.56	0.08	5.76	1.61	7.18	71.33	33.73	300	0.50	0.978	0.620	64.16	89.94
Street 1	204A	MH204A	MH202A						0.0	0.0	4.00	0.00		0.00	0.32	3.26		0.00	5.84	0.32	6.08	1.70	7.54	71.33	125.25	300	0.50	0.978	0.628	63.79	89.43
Street 1	202A	MH202A	MH201A						0.0	0.0	4.00	0.00		0.00	0.04	3.30		0.00	5.87	0.04	6.12	1.71	7.59	71.33	11.74	300	0.50	0.978	0.633	63.75	89.36
External East Mix	EXT-1	Stub	MH201A						0.0	0.0	4.00	0.00		0.00		0.00		0.00	0.79	0.74	0.74	0.21	1.00	24.19	20.27	200	0.50	0.746		23.19	95.87
Street 1	201A	MH201A	MH200A						0.0	0.0	4.00	0.00		0.00	0.10	3.40		0.00	6.75	0.10	6.96	1.95	8.70	71.33	18.49	300	0.50	0.978	0.659	62.63	87.80
Street 1	200A	MH200A	*EX CAP*						0.0	0.0	4.00	0.00		0.00		3.40		0.00	6.75	0.00	6.96	1.95	8.70	58.82	45.35	300	0.34	0.806	0.630	50.12	85.20
		EX CAP	*EXMH303A*						0.0	0.0			*0.00*	*0.00*	*0.00*	*3.40*	*0.00*	*0.00*	*6.75*	*0.00*	*6.96*	*1.95*	*8.70*	*58.82*	*20.50*	*300*	*0.34*	*0.806*	*0.630*	*50.12*	*85.20*

Design Parameters:

Residential			ICI Areas			Peak Factor
SF	3.4	p/p/u				
TH/SD	2.7	p/p/u	INST	50,000	L/Ha/day	1.5
APT	1.8	p/p/u	COM	50,000	L/Ha/day	1.5
Other	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart
				17000	L/Ha/day	

Notes:

1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day 300 L/day
3. Infiltration allowance: 0.28 L/s/Ha 0.4 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5))
   where P = population in thousands

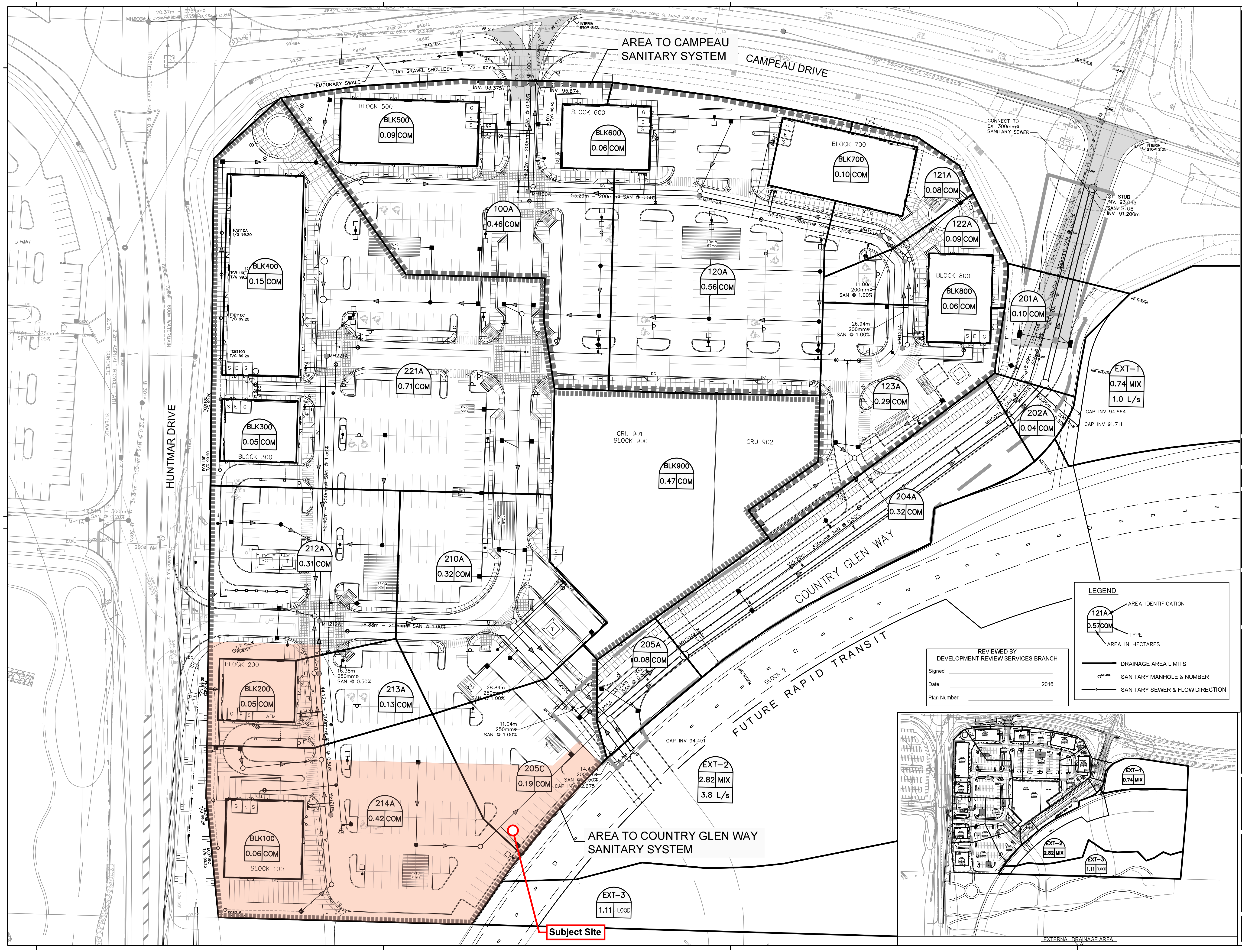
Designed: RM

Checked: DY

Dwg. Reference: 12345-501

No.	Revision	Date
1.	Issued for SPA	11/15/2013
2.	Revised as per City Comments	6/24/2014
3.	Revised as per City Comments	8/22/2014
4.	Revised as per City Comments	10/2/2014

File Reference:	Date:	Sheet No:
12345.5.7.1	11/15/2013	1 of 1



REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

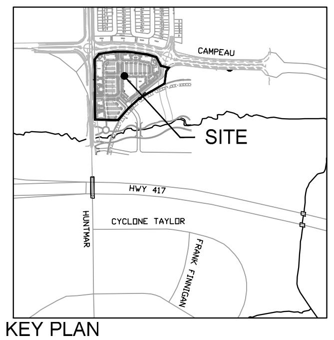
Signed ____________________

Date ____________________2016

Plan Number ____________________

LEGEND:

121A 0.57 COM	AREA IDENTIFICATION TYPE AREA IN HECTARES
▬	DRAINAGE AREA LIMITS
○ MH40A	SANITARY MANHOLE & NUMBER
◁	SANITARY SEWER & FLOW DIRECTION



KEY PLAN

APPROVED ☐ REFUSED ☐

THIS____DAY OF ____________, 20______

DERRICK MOODIE, ACTING MANAGER
DEVELOPMENT REVIEW, SUBURBAN SERVICES

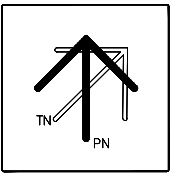
No.	Description	Date	Checked
5	Revised as per City Comments	16:08:26	DGY
4	Revised as per City Comments	14:10:02	DGY
3	Revised as per City Comments	14:08:22	DGY
2	Issued for SPA Resubmission	14.06.27	DGY
1	Issued for SPA	13.11.18	DGY

Issued for

All measurements and conditions must be checked on the work by the contractor. This drawing not to be used for construction until signed.

Date

plotted J:\35355-ArcadiaComm\5.9 Drawings\59civil\layouts\C-501.dwg Layout Name: Sanitary Drainage Plot Style: AIA STANDARD-FULL.CTB Plot Scale: 1:1 Plotted At: 9/1/2016 10:57 AM Last Saved By: dsiurna Last Saved At: Sep. 1, 16



D. G. Yarnoulcpoulos
2016/08/26

drawn by	DPS	scale	1:500
checked by	DGY	date	NOV. 2013
printed		file	35355

Arcadia Retail Development
Kanata, Ontario

Minto Properties
200 Kent Street • Suite 180 • Ottawa, Ontario • K1P 0B6
Telephone: (613)782-3137 Fax: (613)782-5777

drawing title:
SANITARY DRAINAGE AREA PLAN 370 HUNTMAR DRIVE OTTAWA, ON.

IBI GROUP

drawing no.
C-501

333 Preston Street Tower 1, Suite 400
Ottawa, Ontario Canada K1S 5N4 Tel
(613)225-1311 FAX (613)225-9868

D07-12-14-0014

Subject: RE: Microtel Kanata Pool Backwash Info

From: Nicolas Seguin <nseguin@lrl.ca>
Sent: Tuesday, April 3, 2018 3:23 PM
To: Curtis Melanson <c.melanson@mcintoshperry.com>
Cc: Martin Tessier <mtessier@lrl.ca>; Mathieu Mault <mat.mault@activar.ca>
Subject: Microtel Kanata Pool Backwash Info

Hi Curtis,

As discussed on the phone, we don't have a precise value for this at this stage of the project. The pool equipment will be designed by a pool equipment supplier. The pump will be sized based on the required filtration rate of the pool which will be determined by many factors.

This said, on past projects we have seen backwash values go up to 140gpm which would be the worst case.

Let me know if you have other questions on this and I will help as best I can.

Thank you,

Nicolas Séguin, P.Eng.
Mechanical Engineer

LRL ENGINEERING | INGÉNIERIE

LRL Associates Ltd.
5430 Canotek Road
Ottawa, Ontario K1J 9G2
T (613) 842-3434 or (877) 632-5664 ext 264
C (613) 915-6072
F (613) 842-4338
E nseguin@lrl.ca
W www.lrl.ca

Project: CP-17-0199 - Microtel Inn & Suites
Designed By: TDF
Checked By: RPK
Date: May 9, 2018

Sanitary Flow Calculations

1. Building Occupancy

The maximum number of suites will be 108 units with a breakfast area and Swimming Pool as per draft architectural floor plans.

2. Daily Volume in Litres

As per the extract of the City of Ottawa Sewer Design Guidelines, Appendix 4-A; Daily Sewage Flow for Motels and Hotels;

<u>Residential Portion</u>

- With full housekeeping facilities = 225 Liters/Person/Day

<u>Non-Residential Portion</u>

- With Dining Room = 125 Liters/Seat/Day

As per the extract of the City of Ottawa Sewer Design Guidelines, Appendix 4-A; Daily Sewage Flow for Parks, Beaches, Picnic Grounds, Public Swimming Pools;

- Swimming pools & beaches with Bathrooms, showers and toilets = 40 Liters/Person/Day

3. Peak Flow (Q/p)

- $Q_{Residential}(p) = F \times P$ Where:
  F = 225 Litres/Person/Day
  P = 216 People (Occupancy as per Section 3.1.17.1 in OBC)
- Therefore, $Q_{Residential}(p) = (225) \times (108) =$ <u>48,600 L/Day (0.563 L/s)</u>

- $Q_{Non\text{-}Residential}(p) = F \times P$ Where:
  F = 125 Litres/Seat/Day
  P = 52 Seats
- Therefore, $Q_{Non\text{-}Residential}(p) = (125) \times (52) =$ <u>6,500 L/Day (0.075 L/s)</u>

- $Q_{Pool}(p) = F \times P$ Where:
  F = 40 Litres/Person/Day
  P = 42 People (Occupancy as per Section 3.1.17.1 in OBC)
- Therefore, $Q_{Pool}(p) = (40) \times (42) =$ <u>1,680 L/Day (0.019 L/s)</u>

- $Q_{TOTAL} = Q_{Residential} + Q_{Non\text{-}Residential} + Q_{Pool}$ Where:

$Q_{Residential}$ = 48,600 L/Day
$Q_{Non\text{-}Residential}$ = 6,500 L/Day
Q_{Pool} = 1,680 L/Day

- Therefore, Q_{TOTAL} = (48,600) + (6,500) + (1,680) = **56,780 L/Day (0.657 L/s)**

  - Q_{TOTAL} * Peaking Factor = Q_{PEAK} (p)

Q_{PEAK} (p) = (0.657) x (1.5)

Q_{PEAK} (p) = **0.986 L/s**

It is anticipated that there will be no issues with capacity constraints within the existing sanitary main as the amount of flow leaving the site is negligible compared to the pipe capacity. Therefore, the existing 250mm sanitary main within the internal access road for the Arcadia Commercial Development will have sufficient capacity to accommodate the increased flows for the new development.

SANITARY SEWER DESIGN SHEET

McINTOSH PERRY

PROJECT: 340 HUNTMAR DRIVE
LOCATION: KANATA, ONTARIO
CLIENT: ACTIVAR

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			FLOW	SEWER DATA						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
STREET	AREA ID	FROM MH MH	TO MH	UNIT TYPES				AREA (ha)	POPULATION		PEAK FACTOR	PEAK FLOW (L/s)	AREA (ha)						PEAK FLOW (L/s)	AREA (ha)		FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	DIA (mm)	SLOPE (%)	VELOCITY (full) (m/s)	AVAILABLE CAPACITY	
				SF	SD	TH	APT		IND	CUM			INSTITUTIONAL		COMMERCIAL		INDUSTRIAL			IND	CUM									
													IND	CUM	IND	CUM	IND	CUM											L/s	(%)
		BUILDING	**MH1A**					**0.00**	**0.0**	**0.0**	**4.00**	**0.00**	**See Sanitary Flow Calcualtions**						**0.99**	**0.15**	**0.15**	**0.04**	**1.03**	**48.39**	**12.05**	**200**	**2.00**	**1.492**	**47.36**	**97.88%**
		MH1A	**MH2A**					**0.00**	**0.0**	**0.0**	**4.00**	**0.00**								**0.49**	**0.64**	**0.18**	**1.17**	**20.24**	**23.51**	**200**	**0.35**	**0.624**	**19.08**	**94.24%**
		MH2A	*Ex.MH212A*					**0.00**	**0.0**	**0.0**	**4.00**	**0.00**								**0.00**	**0.64**	**0.18**	**1.17**	**48.45**	*12.80*	*250*	*0.61*	**0.956**	**47.29**	**97.60%**

Design Parameters:

Residential			ICI Areas			Peak Factor
SF	3.4	p/p/u				
TH/SD	2.7	p/p/u	INST	50,000	L/Ha/day	1.5
APT	2.3	p/p/u	COM	50,000	L/Ha/day	1.5
Other	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart

Notes:

1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 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: PGK

Checked: RPK

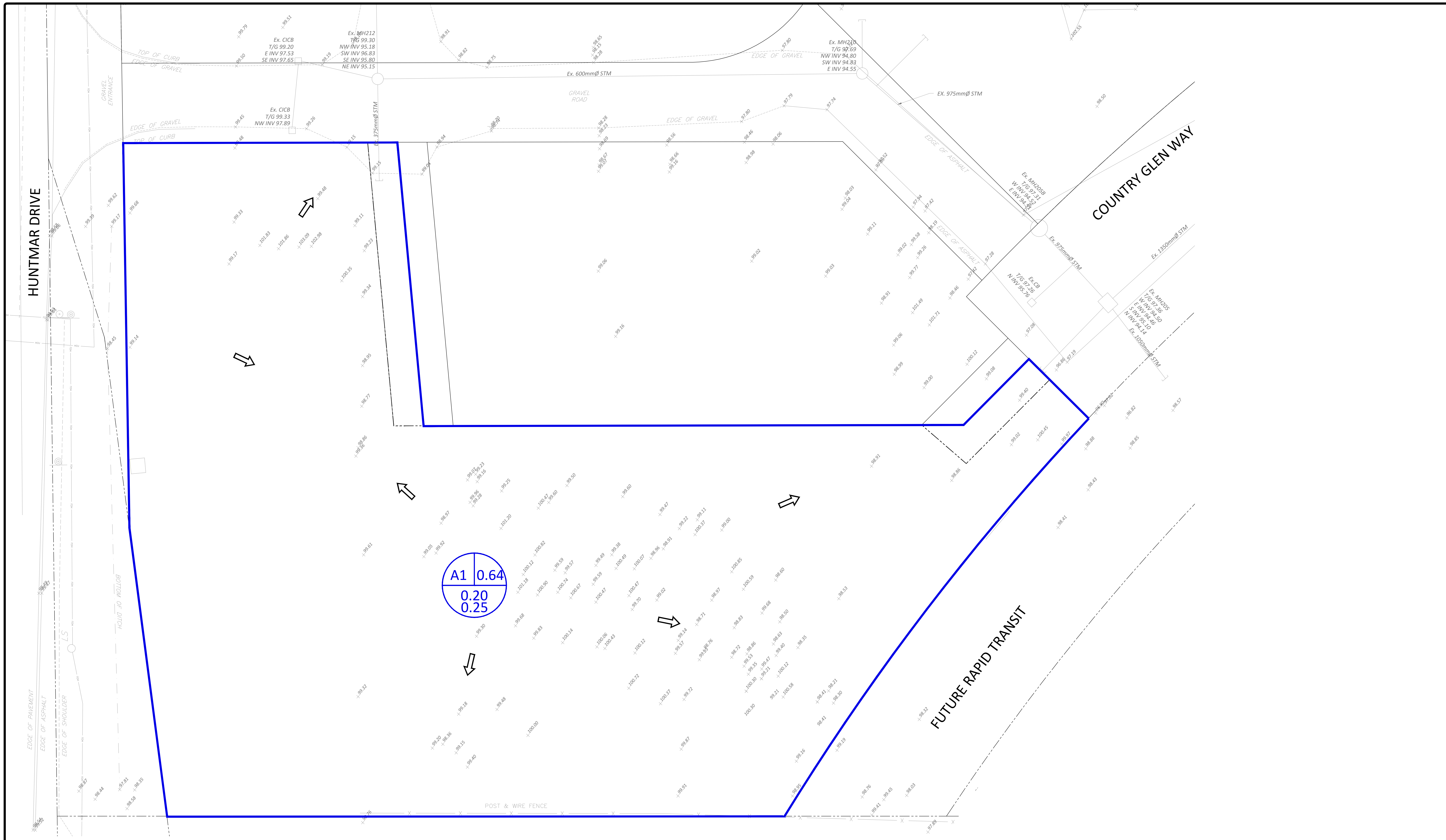
Project No.: CP-17-0199

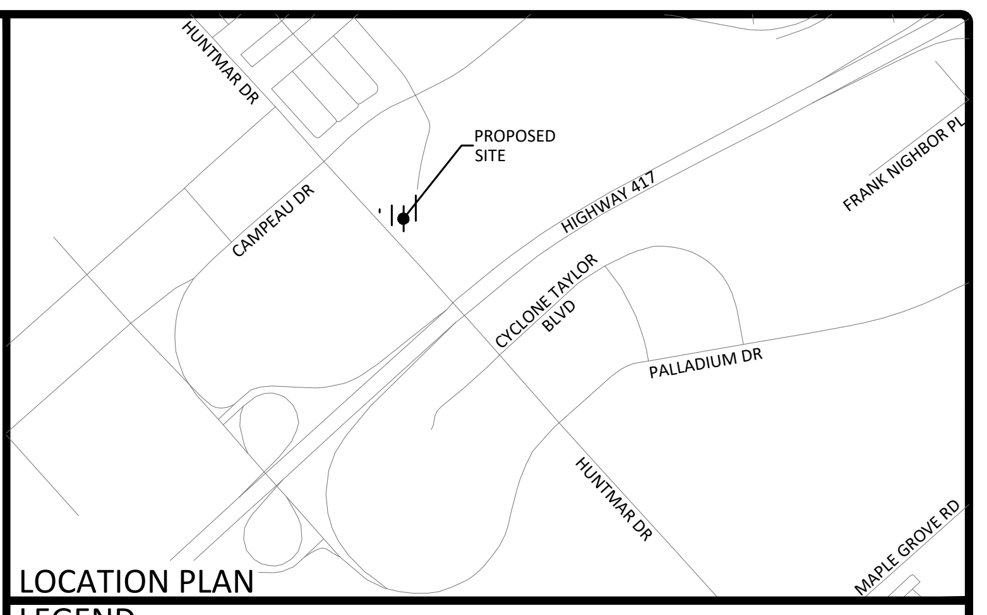
No.	Revision	Date
1.	ISSUED FOR CITY REVIEW	OCT. 27, 2017
2.	REVISED AS PER CITY COMMENTS	MAY 9, 2018

Sheet No:
1 of 1

H:\01 Project - Proposals\2017 Jobs\CP\0CP-17-0199 Activar_Kanata Microtel_Huntmar & Campeau\03 - Servicing\Sanitary\CP-17-0199_SAN_Design.xlsx

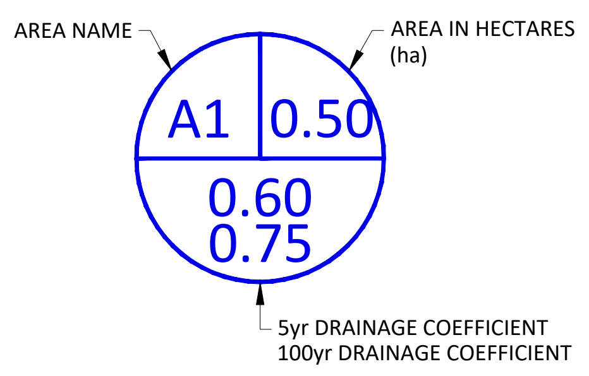
APPENDIX E
PRE-DEVELOPMENT PLAN





LOCATION PLAN

LEGEND



No.	Revision/Issue	Date
2	REVISED AS PER CITY COMMENTS	MAY 09, 2018
1	ISSUED FOR CITY REVIEW	OCT. 27, 2017

Check and verify all dimensions before proceeding with the work

Do not scale drawings

SCALE 1 : 250
0 5 10 15 20 25 Metres

McINTOSH PERRY
115 Walgreen Road, RR3, Carp, ON K0A 1L0
Tel: 613-836-2184 Fax: 613-836-3742
www.mcintoshperry.com

Stamp:

Client:
ACTIVAR
2-107 FOURTH AVENUE
OTTAWA, ON K1S 2L1
P: 613-695-0895
C: 513-720-0464

Project:
340 HUNTMAR DRIVE
PROPOSED MICROTEL HOTEL
OTTAWA
ONTARIO

Drawing Title:
PRE DEVELOPMENT DRAINAGE AREA PLAN

Scale: 1:250
Drawn by: PGK
Checked By: CJM/RPK
Designed By: PGK
Date: APR 18, 2017
Project Number: CP-17-0199
Drawing Number: PRE
SHEET 1 of 1

FILENAME: H:\01 Project - Proposals\2017 Jobs\CP\0CP-17-0199 Activar_Kanata Microtel_Huntmar & Campeau\15 - Drawings\0CP-17-0199 - PRESENTATION.dwg
LAST SAVED: Thursday, May 10, 2018 LAST SAVED BY: s.leflar
LAST PLOTTED: Thursday, May 10, 2018 CTB FILE USED: ----

APPENDIX F
POST-DEVELOPMENT PLAN

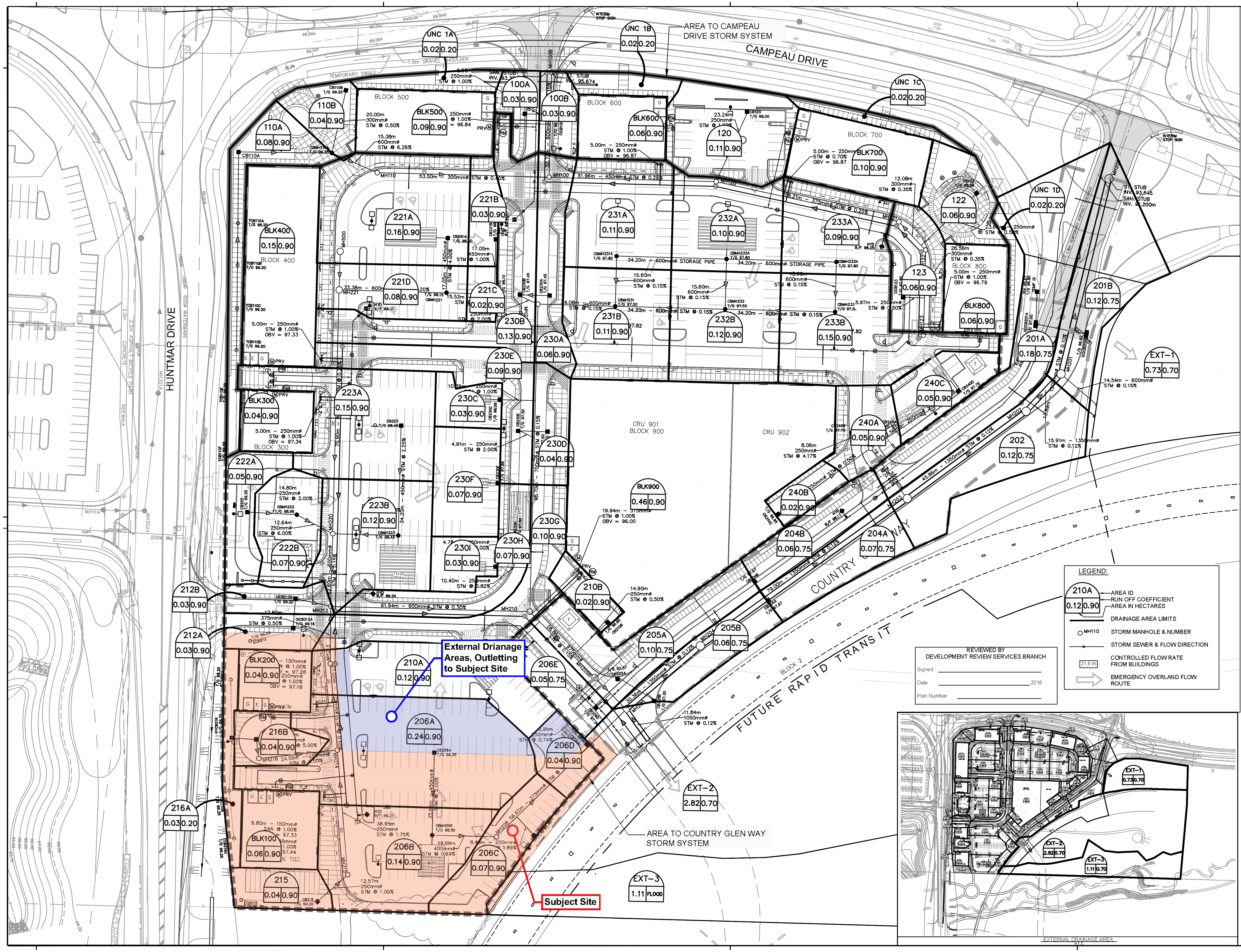
IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

STORM SEWER DESIGN SHEET

PROJECT: Arcadia Commercial
LOCATION: CITY OF OTTAWA
CLIENT: Minto Development Group

*HGL at obvert of pipe if pipe is not surcharged
** Finished floor for slab on grade commercial building
***Freeboard is from upstream MH HGL to FF

LOCATION				AREA (Ha)				RATIONAL DESIGN FLOW													SEWER DATA													
STREET	AREA ID	FROM MH	TO MH	C= 0.20	C= 0.70	C= 0.75	C= 0.90	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)	ICD FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	PIPE SIZE (mm) W	PIPE SIZE (mm) H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr) (L/s)	AVAIL CAP (5yr) (%)	surcharged pipe	upstream obvert	HGL* m	FF** m	Freeboard*** m
	223A	CB223	CBMH223				0.15	0.38	0.38	10.00	0.21	10.21	104.19	122.14	178.56	39.10				39.10	446.15	34.20	450			2.25	2.718	407.05	91.24%					
	223B	CBMH223	MH220				0.12	0.30	0.68	10.21	0.27	10.47	103.10	120.85	176.66	69.65				69.65	210.32	20.38	450			0.50	1.281	140.67	66.88%					
	-	MH220	MH212					0.00	2.18	12.21	0.44	12.65	93.82	109.93	160.62	204.22				204.22	248.09	22.60	600			0.15	0.850	43.86	17.68%	no	95.84	95.84		
	212A	CICB212A	CICB212B				0.03	0.08	0.08	10.00	0.12	10.12	104.19	122.14	178.56	7.82				7.82	62.04	8.61	250			1.00	1.224	54.22	87.39%					
	212B	CICB212B	MH212				0.03	0.08	0.15	10.12	0.06	10.18	103.58	121.42	177.49	15.55				15.55	151.96	11.24	250			6.00	2.999	136.41	89.77%					
	215	CB215	MH215				0.04	0.10	0.10	10.00	0.17	10.17	104.19	122.14	178.56	10.43				10.43	62.04	12.57	250			1.00	1.224	51.61	83.19%					
	BLK100	BLK100	MAIN				0.06	0.15	0.15	10.00	0.07	10.07	104.19	122.14	178.56	15.64				15.64	62.04	5.50	250			1.00	1.224	46.40	74.79%			97.23	99.60	2.37
	-	MH215	MH214					0.00	0.25	10.17	0.40	10.57	103.30	121.09	177.01	25.85				25.85	82.07	38.95	250			1.75	1.620	56.22	68.51%	no	97.23	97.23		
	216A	RYCB216	CB216	0.03				0.02	0.02	10.00	0.05	10.05	104.19	122.14	178.56	1.74				1.74	124.08	7.40	250			4.00	2.449	122.34	98.60%					
	216B	CB216	MH216				0.04	0.10	0.12	10.00	0.04	10.04	104.19	122.14	178.56	12.17				12.17	138.72	5.90	250			5.00	2.738	126.56	91.23%					
		MH216	MH214					0.00	0.12	10.05	0.47	10.52	103.93	121.83	178.10	12.13				12.13	43.87	24.56	250			0.50	0.866	31.73	72.34%	no	97.07	97.07		
	BLK200	BLK200	MAIN				0.04	0.10	0.10	10.00	0.07	10.07	104.19	122.14	178.56	10.43				10.43	62.04	5.40	250			1.00	1.224	51.61	83.19%			96.55	99.55	3.00
	-	MH214	MH213					0.00	0.47	10.57	0.40	10.97	101.27	118.69	173.49	47.30				47.30	129.34	27.00	375			0.50	1.134	82.04	63.43%	no	96.55	96.55		
	-	MH213	MH212					0.00	0.47	10.97	0.26	11.23	99.34	116.43	170.16	46.40				46.40	129.34	17.80	375			0.50	1.134	82.94	64.13%	no	96.39	96.39		
	-	MH212	MH210					0.00	2.79	11.23	0.86	12.09	98.12	114.98	168.05	274.12				274.12	350.85	61.94	600			0.30	1.202	76.72	21.87%	no	95.74	95.74		
	210A	CB210A	MAIN				0.12	0.30	0.30	10.00	0.09	10.09	104.19	122.14	178.56	31.28				31.28	201.76	15.06	300			4.00	2.765	170.48	84.50%					
	BLK900	BLK900	MAIN				0.46	1.15	1.15	10.00	0.21	10.21	104.19	122.14	178.56	119.92				119.92	182.91	19.94	375			1.00	1.604	62.99	34.44%			95.56	98.10	2.54
DEPRESSED LOADING	210B	CB210B	MAIN				0.02	0.05	0.05	10.00	0.29	10.29	104.19	122.14	178.56	5.21				5.21	43.87	14.90	250			0.50	0.866	38.65	88.11%					
		MH210	MH205B					0.00	7.55	13.74	0.41	14.15	87.88	102.93	150.35	663.26				663.26	905.48	28.86	975			0.15	1.175	242.23	26.75%	no	95.56	95.56		
	206E	CICB206D	MAIN			0.09		0.19	0.19	10.00	0.02	10.02	104.19	122.14	178.56	19.55				19.55	87.74	2.57	250			2.00	1.731	68.18	77.72%					
	-	MH205B	MH205					0.00	7.74	14.15	0.20	14.34	86.42	101.22	147.84	668.51				668.51	905.48	13.88	975			0.15	1.175	236.97	26.17%	no	95.50	95.50		
	206A	CB206A	CBMH206				0.24	0.60	0.60	10.00	0.17	10.17	104.19	122.14	178.56	62.57				62.57	420.63	25.66	450			2.00	2.562	358.07	85.13%					
	206B	CBMH206	MH206				0.14	0.35	0.95	10.17	0.26	10.43	103.32	121.11	177.05	98.23				98.23	210.32	19.99	450			0.50	1.281	112.09	53.29%					
	206C	CB206B	MAIN				0.07	0.18	0.18	10.00	0.08	10.08	104.19	122.14	178.56	18.25				18.25	85.29	8.49	250			1.89	1.683	67.04	78.60%					
	206D	CB206C	MAIN				0.04	0.10	0.10	10.00	0.02	10.02	104.19	122.14	178.56	10.43				10.43	87.74	2.32	250			2.00	1.731	77.31	88.11%					
	-	MH206	MH205					0.00	1.23	10.43	0.59	11.07	101.99	119.55	174.75	125.04				125.04	182.91	56.62	375			1.00	1.604	57.87	31.64%	no	96.05	96.05		
External South	EXT-2	STUB	MH205		2.82			5.49	5.49	12.00	0.17	12.17	94.70	110.96	162.13	519.66				519.66	986.85	11.55	1050			0.12	1.104	467.19	47.34%	no	95.50	95.50		

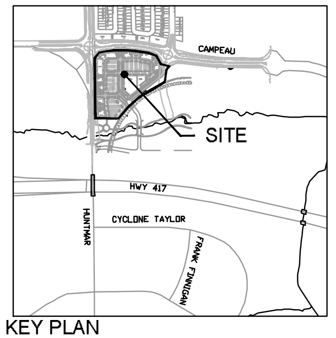


REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ______________________

Date ______________________2016

Plan Number ______________________



KEY PLAN

APPROVED ☐ REFUSED ☐

THIS___DAY OF_______________,20_____

DERRICK MOODIE, ACTING MANAGER
DEVELOPMENT REVIEW, SUBURBAN SERVICES

No.	Description	Date	Checked
5	Revised as per City Comments	16:08:26	DGY
4	Revised as per City Comments	14:10:02	DGY
3	Revised as per City Comments	14:08:22	DGY
2	Issued for SPA Resubmission	14.06.27	DGY
1	Issued for SPA	13.11.18	DGY

Issued for

All measurements and conditions must be checked on the work by the contractor.
This drawing not to be used for construction until signed.

Date

plotted J:\35355–ArcadiaComm\5.9 Drawings\59civil\layouts\C–500.dwg Layout Name: Storm Drainage Plot Style: AIA STANDARD–FULL.CTB Plot Scale: 1:1 Plotted At: 9/1/2016 10:55 AM Last Saved By: dsiurna Last Saved At: Sep. 1, 16

TN
PN

16/08/26

drawn by DPS

checked by DGY

printed

scale 1:500

date NOV. 2013

file 35355

Arcadia Retail Development

Kanata, Ontario

Minto Properties

200 Kent Street • Suite 180 • Ottawa, Ontario • K1P 0B6
Telephone: (613)782-3137 Fax: (613)782-5777

drawing title:
STORM DRAINAGE
AREA PLAN
370 HUNTMAR DRIVE
OTTAWA, ON.

IBI GROUP

drawing no.
C–500

333 Preston Street Tower 1, Suite 400
Ottawa, Ontario Canada K1S 5N4 Tel
(613)225–1311 FAX (613)225–9868

D07-12-14-0014

STORM SEWER DESIGN SHEET

McINTOSH PERRY

PROJECT: 340 HUNTMAR DRIVE
LOCATION: KANATA, ONTARIO
CLIENT: ACTIVAR

LOCATION				CONTRIBUTING AREA (ha)							RATIONAL DESIGN FLOW											SEWER DATA								
1	2	3	4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
STREET	AREA ID	FROM MH	TO MH	C-VALUE		AREA			INDIV AC	CUMUL AC	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)			SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr)	
																								DIA	W	H			(L/s)	(%)
	B1	Roof	INFIL. TRENCH	0.90		0.15			0.13	0.13	10.00	0.14	10.14	104.19	122.14	178.56	38.33				38.33	70.74	11.77	250			1.30	1.396	32.41	45.82%
	B1	Roof	MH1	0.90		0.00			0.00	0.13	10.14	0.07	10.21	103.46	121.27	177.28	38.06				38.06	139.06	8.00	300			1.90	1.906	101.00	72.63%
		MH1	*Ex.MH212*			0.00			0.00	0.13	10.21	0.17	10.38	103.09	120.85	176.66	37.92				37.92	143.09	*13.00*	*375*			*0.61*	1.255	105.17	73.50%
	B2	CB1	CBMH2	0.87		0.21			0.19	0.19	10.00	0.35	10.35	104.19	122.14	178.56	53.86				53.86	59.68	17.40	300			0.35	0.818	5.82	9.75%
	EX1			0.90		0.10			0.09																					
	B3	CBMH2	MH3	0.81		0.20			0.16	0.44	10.35	0.33	10.69	102.36	119.98	175.38	124.26				124.26	147.47	25.76	375			0.65	1.293	23.21	15.74%
		MH3	*Ex.BLKHD*			0.00			0.00	0.44	10.69	0.09	10.77	100.70	118.03	172.52	122.25				122.25	178.28	8.10	375			0.95	1.564	56.03	31.43%
		Ex.BLKHD	*Ex.MH205*			0.00			0.00	0.44	10.77	0.13	10.90	100.28	117.53	171.79	121.74				121.74	179.22	*12.00*	*375*			*0.96*	1.572	57.47	32.07%

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

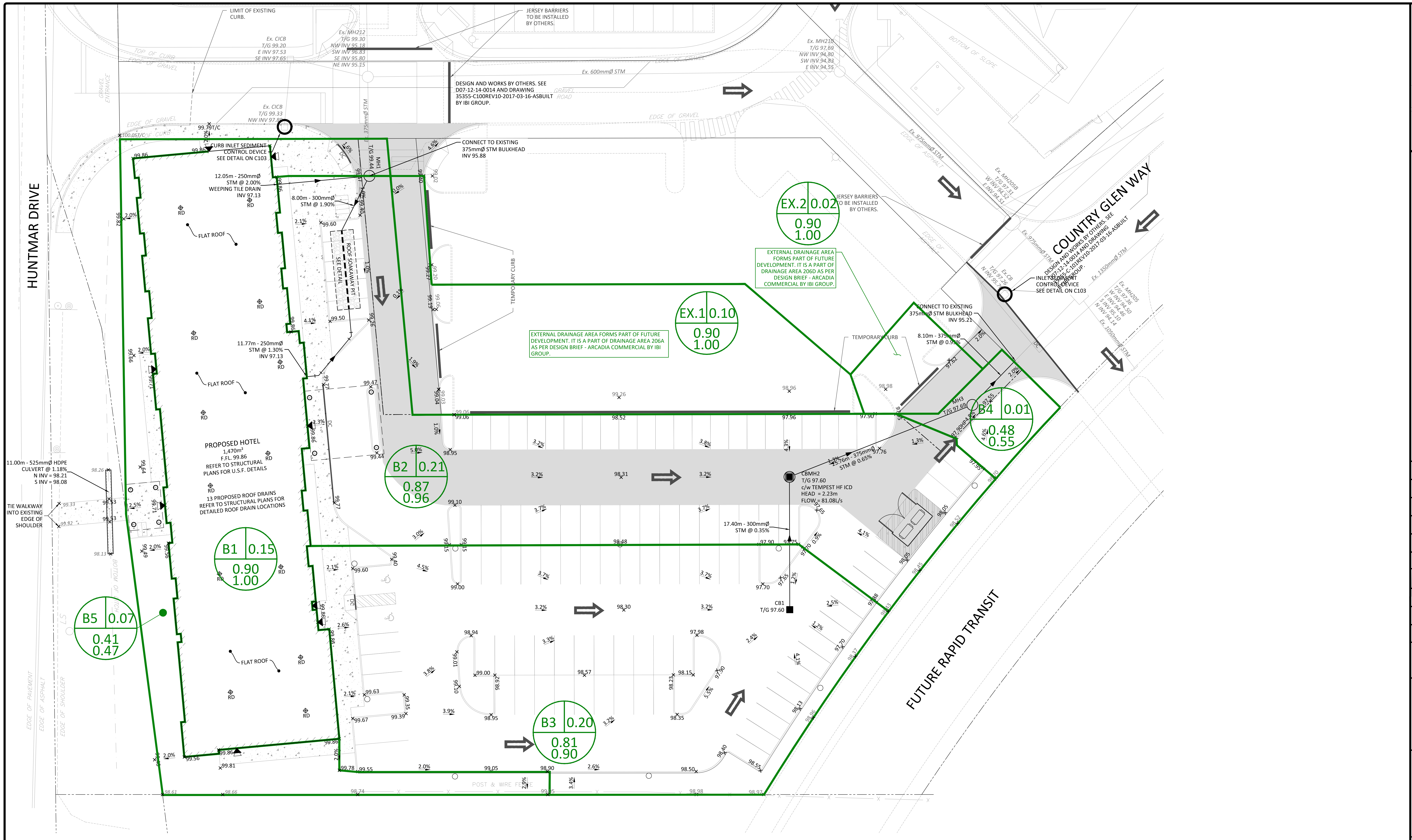
Designed: PGK

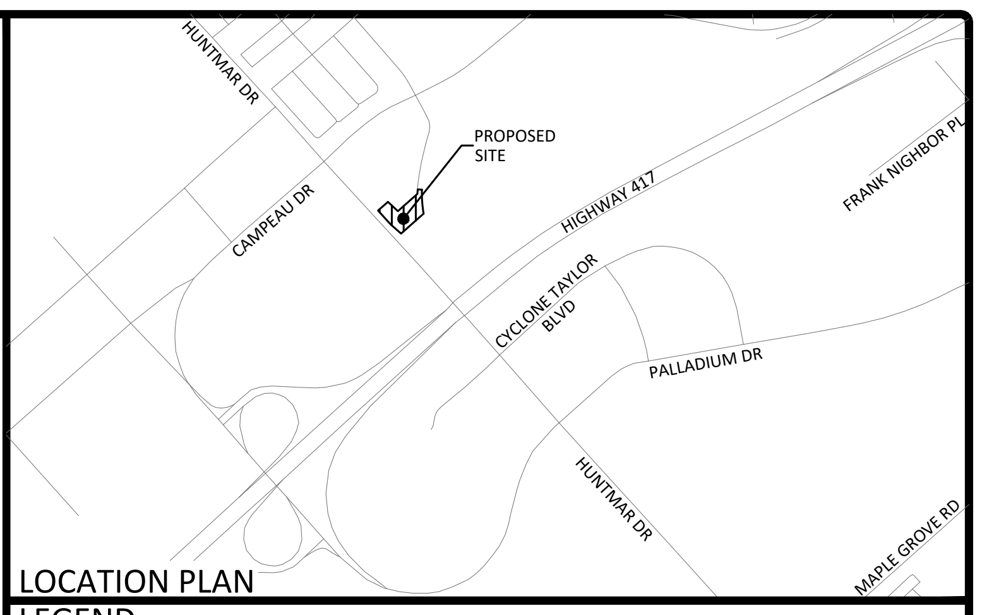
Checked: RPK

Project No.: CP-17-0199

No.	Revision	Date
1.	ISSUED FOR CITY REVIEW	OCT. 27, 2017
2.	REVISED AS PER CITY COMMENTS	MAY 9, 2018

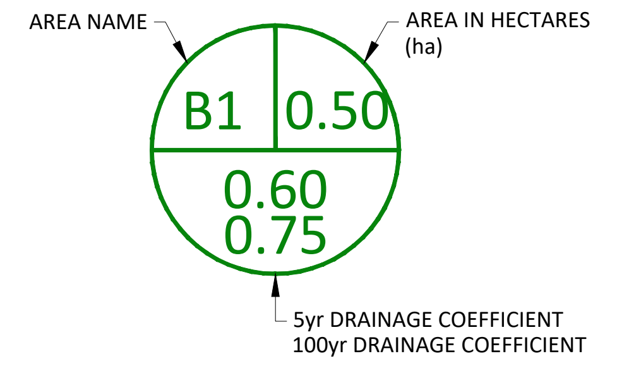
Sheet No:
1 of 1





LOCATION PLAN

LEGEND



No.	Revision/Issue	Date
2	REVISED AS PER CITY COMMENTS	MAY. 08, 2018
1	ISSUED FOR CITY REVIEW	OCT. 27, 2017

Check and verify all dimensions before proceeding with the work

Do not scale drawings

SCALE 1 : 250

0 5 10 15 20 25 Metres

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Client:
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2-107 FOURTH AVENUE
OTTAWA, ON K1S 2L1
P: 613-695-0895
C: 513-720-0464

Project:
340 HUNTMAR DRIVE
PROPOSED MICROTEL HOTEL
OTTAWA
ONTARIO

Drawing Title:
POST DEVELOPMENT DRAINAGE AREA PLAN

Scale: 1:250
Drawn by: PGK
Checked By: CJM/RPK
Designed By: PGK
Date: APR 18, 2017

Project Number: CP-17-0199

Drawing Number: POST
SHEET 1 of 1

FILENAME: H:\01 Project - Proposals\2017 Jobs\CP\0CP-17-0199 Activar_Kanata Microtel_Huntmar & Campeau\15 - Drawings\0CP-17-0199 - PRESENTATION.dwg
LAST SAVED: Wednesday, May 09, 2018 LAST SAVED BY: s.leflar
LAST PLOTTED: Wednesday, May 09, 2018 CTB FILE USED: ----

APPENDIX G
STORMWATER MANAGEMENT CALCULATIONS

AVERAGE PRE-DEVELOPMENT RUNOFF COEFFICIENT CALCULATIONS

Area A1	EXISTING SITE - DEVELOPMENT AREA				
Type	C (2-yr & 5-yr)	C (100-yr)	Area (m^2)	Product (5-yr)	Product (100-yr)
LANDSCAPE	0.20	0.25	6352.61	1270.52	1588.15
Avg C	0.20	0.25			

AVERAGE POST-DEVELOPMENT RUNOFF COEFFICIENT CALCULATIONS

Area B1	PROPOSED HOTEL				
Type	C (2-yr & 5-yr)	C (100-yr)	Area (m^2)	Product (5-yr)	Product (100-yr)
HARD	0.90	1.00	1470.19	1323.17	1470.19
Avg C	0.90	1.00			

Area B2	DRAINS TO CBMH3				
Type	C (2-yr & 5-yr)	C (100-yr)	Area (m^2)	Product (5-yr)	Product (100-yr)
HARD	0.90	1.00	2037.59	1833.83	2037.59
LANDSCAPE	0.20	0.25	99.80	19.96	24.95
Avg C	0.87	0.96			

Area B3	DRAINS TO CB1				
Type	C (2-yr & 5-yr)	C (100-yr)	Area (m^2)	Product (5-yr)	Product (100-yr)
HARD	0.90	1.00	1738.23	1564.41	1738.23
LANDSCAPE	0.20	0.25	272.44	54.49	68.11
Avg C	0.81	0.90			

Area B4	UNCONTROLLED				
Type	C (2-yr & 5-yr)	C (100-yr)	Area (m^2)	Product (5-yr)	Product (100-yr)
HARD	0.90	1.00	58.72	52.85	58.72
LANDSCAPE	0.20	0.25	88.78	17.76	22.19
Avg C	0.48	0.55			

Area B5	UNCONTROLLED				
Type	C (2-yr & 5-yr)	C (100-yr)	Area (m^2)	Product (5-yr)	Product (100-yr)
HARD	0.90	1.00	193.38	174.04	193.38
LANDSCAPE	0.20	0.25	462.67	92.53	115.67
Avg C	0.41	0.47			

External Drainage Areas *					
Area EX1	DRAINS TO CBMH2				
Type	C (2-yr & 5-yr)	C (100-yr)	Area (m^2)	Product (5-yr)	Product (100-yr)
HARD	0.90	1.00	976.43	878.78	976.43
Avg C	0.90	1.00			

Area EX2	UNCONTROLLED *				
Type	C (2-yr & 5-yr)	C (100-yr)	Area (m^2)	Product (5-yr)	Product (100-yr)
HARD	0.90	1.00	152.54	137.29	152.54
Avg C	0.90	1.00			

*Undevleoped area within external drainage areas have been calcualted as hard surface to represent the worst case scenario.

Tc (min)	2-Year (mm/hr)	5-Year (mm/hr)	100-Year (mm/hr)	
20.00	52.03	70.25	119.95	PRE-DEVELOPMENT
10.00	76.81	104.19	178.56	POST-DEVELOPMENT

PRE-DEVELOPMENT RUNOFF COEFFICIENT CALCULATIONS

Area	Drainage Area (ha)	Balanced Runoff Coefficient (C) 2-yr & 5-yr	Balanced Runoff Coefficient (C) 100-yr	2-yr Flow Rate (l/s)	5-yr Flow Rate (l/s)	100-yr Flow Rate (l/s)
A1	0.64	0.20	0.25	18.38	24.81	52.96
Total	0.64			18.38	24.81	52.96

POST-DEVELOPMENT RUNOFF COEFFICIENT CALCULATIONS

Area	Drainage Area (ha)	Balanced Runoff Coefficient (C) 2-yr & 5-yr	Balanced Runoff Coefficient (C) 100-yr	2-yr Flow Rate (l/s)	5-yr Flow Rate (l/s)	100-yr Flow Rate (l/s)
B1	0.15	0.90	1.00	28.25	38.33	72.98
B2	0.21	0.87	0.96	39.70	53.86	101.85
B3	0.20	0.81	0.90	34.77	47.17	89.83
B4	0.01	0.48	0.55	1.51	2.05	4.03
B5	0.07	0.41	0.47	5.74	7.79	15.31
Sub-Total	0.64			109.99	149.21	283.99
External Drainage Areas						
EX1	0.10	0.90	1.00	18.76	25.45	48.47
EX2	0.02	0.90	1.00	2.93	3.98	7.57
Total	0.76			131.68	178.64	340.04

REQUIRED RESTRICTED FLOW

Existing Drainage Area	Area (ha)	*Release Rate as per Design Brief - Arcadia Commercial		ICD # / Roof Drain #	
		5-Year	100-Year		
206A/206B	0.38	85.00		206A	*Restricted*
206C	0.07	10.00		206B	
206D	0.04	14.00		206C	
BLK100	0.06	2.00		Roof 100	
BLK200	0.04	1.00		Roof 200	
215	0.04	10.00		215	
216A/216B	0.07	12.17	20.85		*Unrestricted*
Total	0.70	134.17	142.85		

**Release rate was created by combining the release rates from applicable drianage areas for the subject site as per the Design Brief - Arcadia Commercial by IBI Group. See Appendix 'I' for complete report.*

ACTUAL STORM WATER RUNOFF FROM SITE (L/s)

Area	Post-Development Unrestricted (l/s)			Post-Development (Restricted) (l/s)			
	2-yr	5-yr	100-yr	2-yr*	5-yr	100-yr	
B1	28.25	38.33	72.98	3.12	4.68	7.80	*RESTRICTED - ROOF DRAINS*
B2	39.70	53.86	101.85	96.17	108.14	108.14	*RESTRICTED - CBMH2*
B3	34.77	47.17	89.83				
EX1	18.76	25.45	48.47				
B4	1.51	2.05	4.03	1.51	2.05	4.03	*UNRESTRICTED*
B5	5.74	7.79	15.31	5.74	7.79	15.31	
EX2	2.93	3.98	7.57	2.93	3.98	7.57	
Total	131.68	178.64	340.04	109.48	126.64	142.85	

**2-Year Storm Event Flows Unrestricted for Areas B2/B3/EX1*

STORAGE REQUIRMENTS FOR AREA B2 & B3

5-YEAR STORM EVENT

Tc	I (mm/hr)	Runoff (l/s) B2	Runoff (l/s) B3	Runoff (l/s) EX1	Allowable Outflow (l/s)	Runoff To Be Stored (l/s)	Storage Required (m^3)
10	104.20	53.87	47.18	25.46	108.14	18.36	11.01
20	70.30	36.34	31.83	17.17	108.14	-22.80	-27.36
30	53.90	27.86	24.40	13.17	108.14	-42.71	-76.88
40	44.20	22.85	20.01	10.80	108.14	-54.49	-130.77
50	37.70	19.49	17.07	9.21	108.14	-62.38	-187.13
60	32.90	17.01	14.90	8.04	108.14	-68.20	-245.53
70	29.40	15.20	13.31	7.18	108.14	-72.45	-304.30

Maximum Storage Required (m³) = 11.01

100-YEAR STORM EVENT

Tc	I (mm/hr)	Runoff (l/s) B2	Runoff (l/s) B3	Runoff (l/s) EX1	Allowable Outflow (l/s)	Runoff To Be Stored (l/s)	Storage Required (m^3)
10	178.60	101.88	89.85	48.48	108.14	132.06	79.24
20	120.00	68.45	60.37	32.57	108.14	53.25	63.90
30	91.90	52.42	46.23	24.95	108.14	15.46	27.82
40	75.10	42.84	37.78	20.39	108.14	-7.14	-17.14
50	64.00	36.51	32.20	17.37	108.14	-22.07	-66.21
60	55.90	31.89	28.12	15.17	108.14	-32.96	-118.67
70	49.80	28.41	25.05	13.52	108.14	-41.17	-172.90

Maximum Storage Required (m³) = 79.24

STORAGE OCCUPIED IN AREA B2 & B3

5-YEAR STORM EVENT

Other Storage Areas on Site		Water Elev. (m) =		97.74	
Location	T/G	INV. (out)	Area (m^2)	Depth (m)	Volume (m^3)
CB1	97.60	95.58	117.90	0.14	6.85
CBMH2	97.60	95.48	118.62	0.14	6.11
				Total	12.96

Storage Available (m³) = 12.96
Storage Required (m³) = 11.01

100-YEAR STORM EVENT

Other Storage Areas on Site		Water Elev. (m) =		97.90	
Location	T/G	INV. (out)	Area (m^2)	Depth (m)	Volume (m^3)
CB1	97.60	95.58	285.30	0.30	38.84
CBMH2	97.60	95.48	388.18	0.30	45.94
				Total	84.78

Storage Available (m³) = 84.78
Storage Required (m³) = 79.24

STORAGE REQUIRMENTS FOR AREA B1

2-YEAR STORM EVENT

Tc	I (mm/hr)	Runoff (l/s) B1	Allowable Outflow (l/s)	Runoff To Be Stored (l/s)	Storage Required (m^3)
40	32.90	12.10	3.12	8.98	21.56
50	28.00	10.30	3.12	7.18	21.54

Maximum Storage Required (m³) = 21.56

5-YEAR STORM EVENT

Tc	I (mm/hr)	Runoff (l/s) B1	Allowable Outflow (l/s)	Runoff To Be Stored (l/s)	Storage Required (m^3)
30	53.90	19.83	4.68	15.15	27.26
40	44.20	16.26	4.68	11.58	27.79
50	37.70	13.87	4.68	9.19	27.56
60	32.90	12.10	4.68	7.42	26.72
70	29.40	10.81	4.68	6.13	25.77

Maximum Storage Required (m³) = 27.79

100-YEAR STORM EVENT

Tc	I (mm/hr)	Runoff (l/s) B1	Allowable Outflow (l/s)	Runoff To Be Stored (l/s)	Storage Required (m^3)
30	91.90	37.56	7.80	29.76	53.57
40	75.10	30.69	7.80	22.89	54.95
50	64.00	26.16	7.80	18.36	55.07
60	55.90	22.85	7.80	15.05	54.17
70	49.80	20.35	7.80	12.55	52.73

Maximum Storage Required (m³) = 55.07

STORAGE OCCUPIED IN AREA B1

2-YEAR STORM EVENT

Roof Storage			
Location	*Area (m^2)	Depth (m)	Volume (m^3)
Roof Drain	1102.64	0.020	22.05
		Total	22.05

Storage Available (m³) =	22.05
Storage Required (m³) =	21.56

5-YEAR STORM EVENT

Roof Storage			
Location	*Area (m^2)	Depth (m)	Volume (m^3)
Roof Drain	1102.64	0.030	33.08
		Total	33.08

Storage Available (m³) =	33.08
Storage Required (m³) =	27.79

100-YEAR STORM EVENT

Roof Storage			
Location	*Area (m^2)	Depth (m)	Volume (m^3)
Roof Drain	1102.64	0.050	55.13
		Total	55.13

Storage Available (m³) =	55.13
Storage Required (m³) =	55.07

*Area is calcualted using 75% of the total roof area

SOAKAWAY PIT SIZING

Soakaway Pit Sizing as per MOE Stormwater Management Planning and Design Manual (March 2003)

Maximum allowable depth:

Equation;

$$d=\frac{PT}{1,000}$$

where;

d= maximum allowable depth of the soakway pit
P= percolation rate (Table 4.1) (mm/h)
T = drawdown time (24 to 48 hours)

Site Perameters;

P= 15.00 mm/hr
T= 24 hours

Therefore;

d= 0.36 m

Minimum volume required:

Site Perameters;

A= 1,470.19 m^2
d= 20 mm

where;

A= building area
d= depth of roof ponding (5mm - 20mm)

Therefore;

V= 29.40 m^3

Area required for the proposed soakaway pit:

A= 81.68 m^2

Roof Drain Flow (B1)

Roof Drains Summary			
Type of Control Device	Watts Drianage - Accutrol Weir		
Number of Roof Drians	13		
	2-Year	**5-Year**	**100 Year**
Rooftop Storage	22.05	33.08	55.13
Storage Depth (mm)	0.020	0.030	0.050
Flow (Per Roof Drain) (L/s)	0.24	0.36	0.60
Total Flow (L/s)	3.12	4.68	7.80

Flow Rate Vs. Build-Up (One Weir)	
Depth (mm)	Flow (L/s)
15	0.18
20	0.24
25	0.30
30	0.36
35	0.42
40	0.48
45	0.54
50	0.60
55	0.66

*Roof Drain model to be Accutrol Weirs, See attached sheets
*Roof Drain Flow information taken from Watts Drainage website

CALCULATING ROOF FLOW EXAMPLES

1 roof drain during a 5 year storm
elevation of water = 25mm
Flow leaving 1 roof drain = (1 x 0.30 L/s) = 0.30 L/s

1 roof drain during a 100 year storm
elevation of water = 50mm
Flow leaving 1 roof drain = (1 x 0.60 L/s) = 0.60 L/s

4 roof drains during a 5 year storm
elevation of water = 25mm
Flow leaving 4 roof drains = (4 x 0.30 L/s) = 1.20 L/s

4 roof drains during a 100 year storm
elevation of water = 50mm
Flow leaving 4 roof drains = (4 x 0.60 L/s) = 2.40 L/s

Roof Drain Flow		
Flow (L/s)	Storage Depth (mm)	Drains Flow (L/s)
0.18	15	2.34
0.24	20	3.12
0.30	25	3.90
0.36	30	4.68
0.42	35	5.46
0.48	40	6.24
0.54	45	7.02
0.60	50	7.80
0.66	55	8.58
0.72	60	9.36
0.78	65	10.14
0.84	70	10.92
0.90	75	11.70
0.96	80	12.48
1.02	85	13.26
1.08	90	14.04
1.14	95	14.82
1.20	100	15.60
1.26	105	16.38
1.32	110	17.16
1.38	115	17.94
1.44	120	18.72
1.50	125	19.50
1.56	130	20.28
1.62	135	21.06
1.68	140	21.84
1.74	145	22.62
1.80	150	23.40

Note:

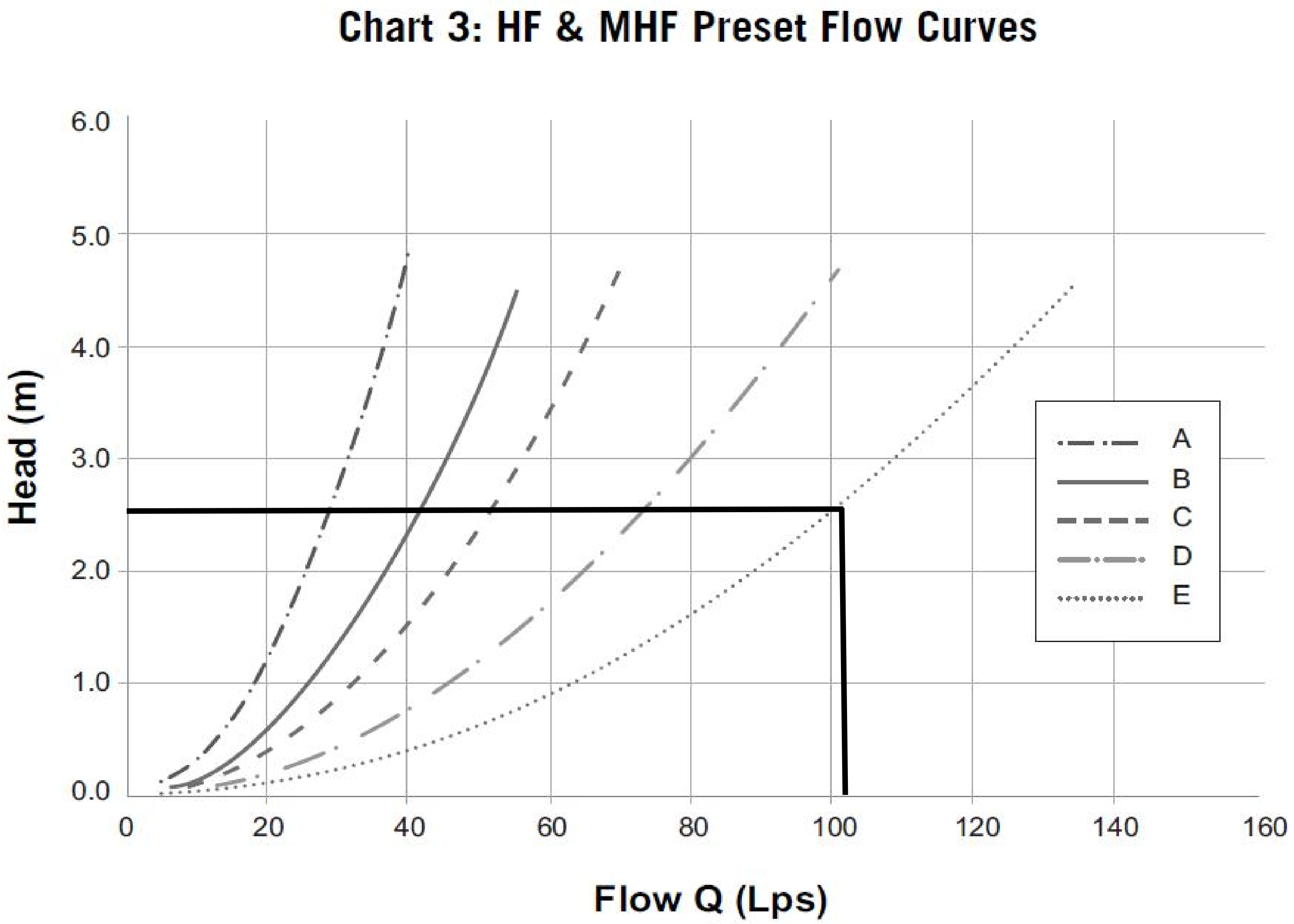
The flow leaving through a restricted roof drain is based on flow vs. head information

CBMH 2 - IPEX TEMPEST HF ICD FLOW CURVE (TO BE VERIFIED WITH MANUFACTURER)

HEAD = 2.42

FLOW = 108.14

Type = E



PRODUCT INFORMATION: TEMPEST HF & MHF ICD

Product Description

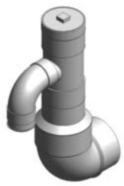
Our HF, HF Sump and MHF ICD's are designed to accommodate catch basins or manholes with sewer outlet pipes 6" in diameter or larger. Any storm sewer larger than 12" may require custom modification. However, IPEX can custom build a TEMPEST device to accommodate virtually any storm sewer size.

Available in 5 preset flow curves, these ICDs have the ability to provide constant flow rates: 9lps (143 gpm) and greater

Product Function

TEMPEST HF (High Flow): designed to manage moderate to higher flows 15 L/s (240 gpm) or greater and prevent the propagation of odour and floatables. With this device, the cross-sectional area of the device is larger than the orifice diameter and has been designed to limit head losses. The HF ICD can also be ordered without flow control when only odour and floatable control is required.

TEMPEST HF (High Flow) Sump: The height of a sewer outlet pipe in a catch basin is not always conveniently located. At times it may be located very close to the catch basin floor, not providing enough sump for one of the other TEMPEST ICDs with universal back plate to be installed. In these applications, the HF Sump is offered. The HF Sump offers the same features and benefits as the HF ICD; however, is designed to raise the outlet in a square or round catch basin structure. When installed, the HF sump is fixed in place and not easily removed. Any required service to the device is performed through a clean-out located in the top of the device which can be often accessed from ground level.



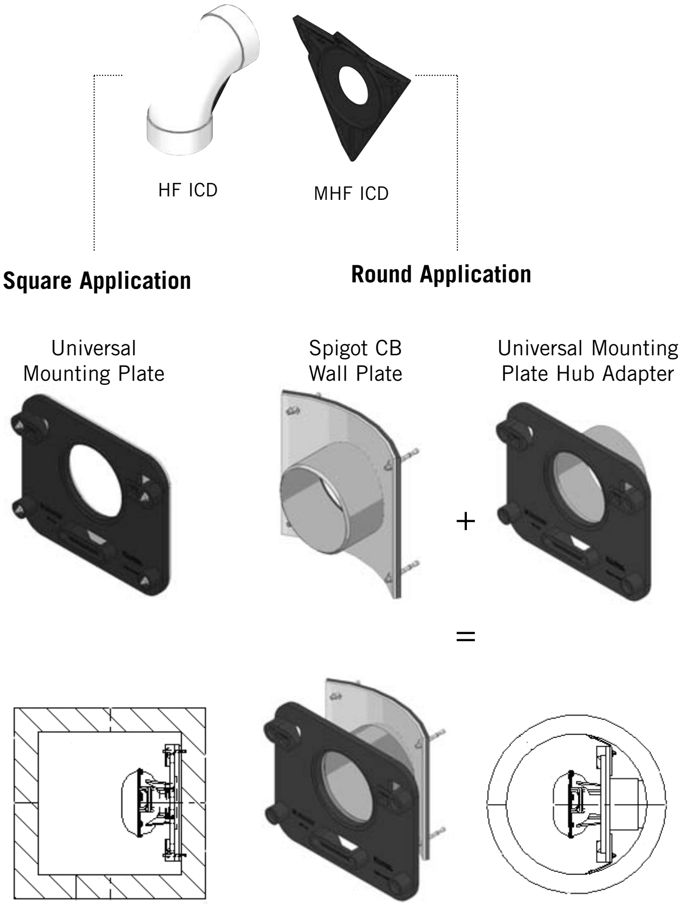
TEMPEST MHF (Medium to High Flow): The MHF plate or plug is designed to control flow rates 9 L/s (143 gpm) or greater. It is not designed to prevent the propagation of odour and floatables.

Product Construction

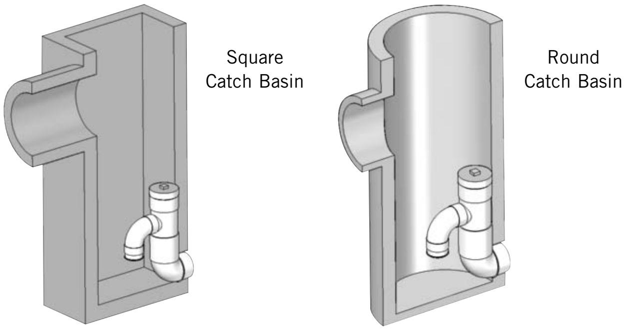
The HF, HF Sump and MHF ICDs are built to be light weight at a maximum weight of 6.8 Kg (14.6 lbs).

Product Applications

The HF and MHF ICD's are available to accommodate both square and round applications:



The HF Sump is available to accommodate low to no sump applications in both square and round catch basins:



WATTS®

Adjustable Accutrol Weir

Tag: ____________________

Adjustable Flow Control for Roof Drains

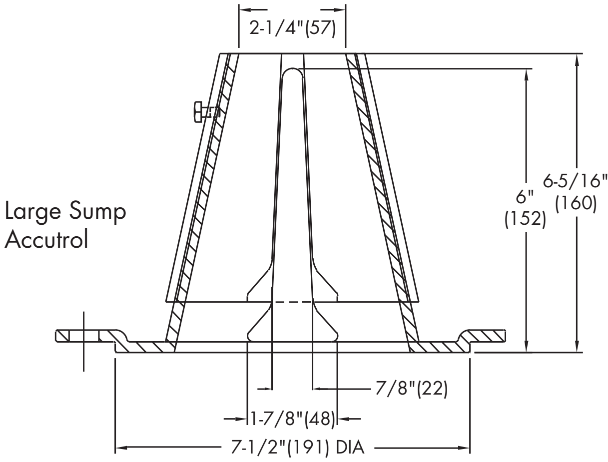
ADJUSTABLE ACCUTROL (for Large Sump Roof Drains only)

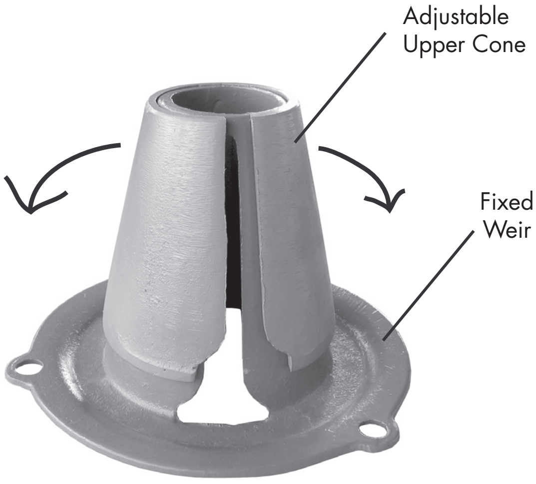
For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol. The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the flow rate for depths over 2" of head, set the slot in the adjustable upper cone according to the flow rate required. Refer to Table 1 below.
Note: Flow rates are directly proportional to the amount of weir opening that is exposed.

EXAMPLE:

For example, if the adjustable upper cone is set to cover 1/2 of the weir opening, flow rates above 2"of head will be restricted to 2-1/2 gpm per inch of head.

Therefore, at 3"of head, the flow rate through the Accutrol Weir that has 1/2 the slot exposed will be:
[5 gpm (per inch of head) x 2 inches of head] + 2-1/2 gpm (for the third inch of head) = 12-1/2 gpm.





1/2 Weir Opening Exposed Shown Above

TABLE 1. Adjustable Accutrol Flow Rate Settings

Weir Opening Exposed	1"	2"	3"	4"	5"	6"
	Flow Rate (gallons per minute)					
Fully Exposed	5	10	15	20	25	30
3/4	5	10	13.75	17.5	21.25	25
1/2	5	10	12.5	15	17.5	20
1/4	5	10	11.25	12.5	13.75	15
Closed	5	5	5	5	5	5

Job Name ____________________

Job Location ____________________

Engineer ____________________

Contractor ____________________

Contractor's P.O. No. ____________________

Representative ____________________

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APPENDIX H
CITY OF OTTAWA DESIGN CHECKLIST

City of Ottawa

4. Development Servicing Study Checklist

The following section describes the checklist of the required content of servicing studies. It is expected that the proponent will address each one of the following items for the study to be deemed complete and ready for review by City of Ottawa Infrastructure Approvals staff.

The level of required detail in the Servicing Study will increase depending on the type of application. For example, for Official Plan amendments and re-zoning applications, the main issues will be to determine the capacity requirements for the proposed change in land use and confirm this against the existing capacity constraint, and to define the solutions, phasing of works and the financing of works to address the capacity constraint. For subdivisions and site plans, the above will be required with additional detailed information supporting the servicing within the development boundary.

4.1 General Content

Criteria	Location (if applicable)
☐ Executive Summary (for larger reports only).	N/A
☐ Date and revision number of the report.	On Cover
☐ Location map and plan showing municipal address, boundary, and layout of proposed development.	Appendix E
☐ Plan showing the site and location of all existing services.	Site Servicing Plan (C102)
☐ Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	1.1 Purpose 1.2 Site Description 6.0 Stormwater Management
☐ Summary of pre-consultation meetings with City and other approval agencies.	Appendix A
☐ Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	1.1 Purpose 1.2 Site Description 6.0 Stormwater Management
☐ Statement of objectives and servicing criteria.	3.0 Pre-Consultation Summary

☐ Identification of existing and proposed infrastructure available in the immediate area.	N/A
☐ Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	Site Grading, Drainage, Sediment & Erosion Control Plan (C101)
☐ Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	Site Grading, Drainage, Sediment & Erosion Control Plan (C101)
☐ Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	N/A
☐ Proposed phasing of the development, if applicable.	N/A
☐ Reference to geotechnical studies and recommendations concerning servicing.	Section 2.0 Backround Studies
☐ All preliminary and formal site plan submissions should have the following information: ○ Metric scale ○ North arrow (including construction North) ○ Key plan ○ Name and contact information of applicant and property owner ○ Property limits including bearings and dimensions ○ Existing and proposed structures and parking areas ○ Easements, road widening and rights-of-way ○ Adjacent street names	Site Grading, Drainage, Sediment & Erosion Control Plan (C101)

4.2 Development Servicing Report: Water

Criteria	Location (if applicable)
☐ Confirm consistency with Master Servicing Study, if available	N/A
☐ Availability of public infrastructure to service proposed development	N/A
☐ Identification of system constraints	N/A
☐ Identify boundary conditions	N/A
☐ Confirmation of adequate domestic supply and pressure	N/A
☐ Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Appendix B
☐ Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	N/A
☐ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	N/A
☐ Address reliability requirements such as appropriate location of shut-off valves	N/A
☐ Check on the necessity of a pressure zone boundary modification.	N/A
☐ Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range	N/A

☐ Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	N/A
☐ Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A
☐ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Appendix B
☐ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	N/A

4.3 Development Servicing Report: Wastewater

Criteria	Location (if applicable)
☐ Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	N/A
☐ Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A
☐ Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N/A
☐ Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Section 5.2 Sanitary Sewer

☐ Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	N/A
☐ Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	N/A
☐ Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 5.2 Sanitary Sewer
☐ Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	N/A
☐ Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	N/A
☐ Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A
☐ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A
☐ Special considerations such as contamination, corrosive environment etc.	N/A

4.4 Development Servicing Report: Stormwater Checklist

Criteria	Location (if applicable)
☐ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 6.0 Stormwater Management
☐ Analysis of available capacity in existing public infrastructure.	N/A
☐ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Pre & Post-Development Plans
☐ Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5-year event (dependent on the receiving sewer design) to 100-year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Section 6.0 Stormwater Management
☐ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Section 6.0 Stormwater Management
☐ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.	Section 6.0 Stormwater Management
☐ Set-back from private sewage disposal systems.	N/A
☐ Watercourse and hazard lands setbacks.	N/A
☐ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	N/A
☐ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	N/A
☐ Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5-year return period) and major events (1:100-year return period).	Appendix F

☐ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	Site Grading, Drainage, Sediment & Erosion Control Plan
☐ Calculate pre-and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Section 6.0 Stormwater Management Appendix F
☐ Any proposed diversion of drainage catchment areas from one outlet to another.	Section 6.0 Stormwater Management
☐ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Section 6.0 Stormwater Management
☐ If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	Appendix A
☐ Identification of potential impacts to receiving watercourses	N/A
☐ Identification of municipal drains and related approval requirements.	N/A
☐ Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 6.0 Stormwater Management
☐ 100-year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	Site Grading, Drainage, Sediment & Erosion Control Plan (C101)
☐ Inclusion of hydraulic analysis including hydraulic grade line elevations.	N/A

☐ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 7.0 Sediment & Erosion Control
☐ Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A
☐ Identification of fill constraints related to floodplain and geotechnical investigation.	N/A

4.5 Approval and Permit Requirements: Checklist

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

Criteria	Location (if applicable)
☐ Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	N/A
☐ Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	N/A
☐ Changes to Municipal Drains.	N/A
☐ Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	N/A

4.6 Conclusion Checklist

Criteria	Location (if applicable)
☐ Clearly stated conclusions and recommendations	Section 8.0 Summary Section 9.0 Recommendations
☐ Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	All are stamped
☐ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	All are stamped

APPENDIX I
DESIGN BRIEF - ARCADIA COMMERICAL
BY IBI GROUP

REPORT
PROJECT: 35355-5.2.2

Design Brief
Arcadia Commercial
370 Huntmar Drive
City of Ottawa

Prepared for Minto Properties
by IBI Group

October 2014

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Appendix C –	Storm Tributary Area Plan C-500 Storm Sewer Design Sheet Modified Rational Method Design Sheets Site Ponding Plan C-400
Appendix D –	Sediment and Erosion Control Plan C-900 Paterson Group Geotechnical Report Grading Plan C-200

1 Introduction

1.1 Scope

The property owner, Minto Properties, wishes to proceed with the development of the subject lands at 370 Huntmar Drive, in accordance with the policies set out by the Planning Department of the City of Ottawa. This Design Brief is being prepared in support of the Site Plan Application for the development of the current draft plan, which identifies lands located in the Kanata West Business Park. This report will present a detailed servicing scheme to support development of the subject properties, including sections on water supply, wastewater disposal, minor and major stormwater management and erosion and sediment control.

This parcel of land is part of the proponent's larger "Arcadia" development lands which are currently being developed. This parcel is referred to as Stage 5 in other previously approved Minto reports, including "Conceptual Site Servicing Arcadia Stages 1, 2, 5 and 8", and "Arcadia Interim SWMF", which provide details related to the construction and operation of the downstream infrastructure which will service these lands.

This report was prepared in accordance with the Servicing Study Guidelines for Development Applications in the City of Ottawa. **Appendix A** contains a customized copy of the City's checklist which can be used as a quick reference for the location within this study report of each of the checklist items.

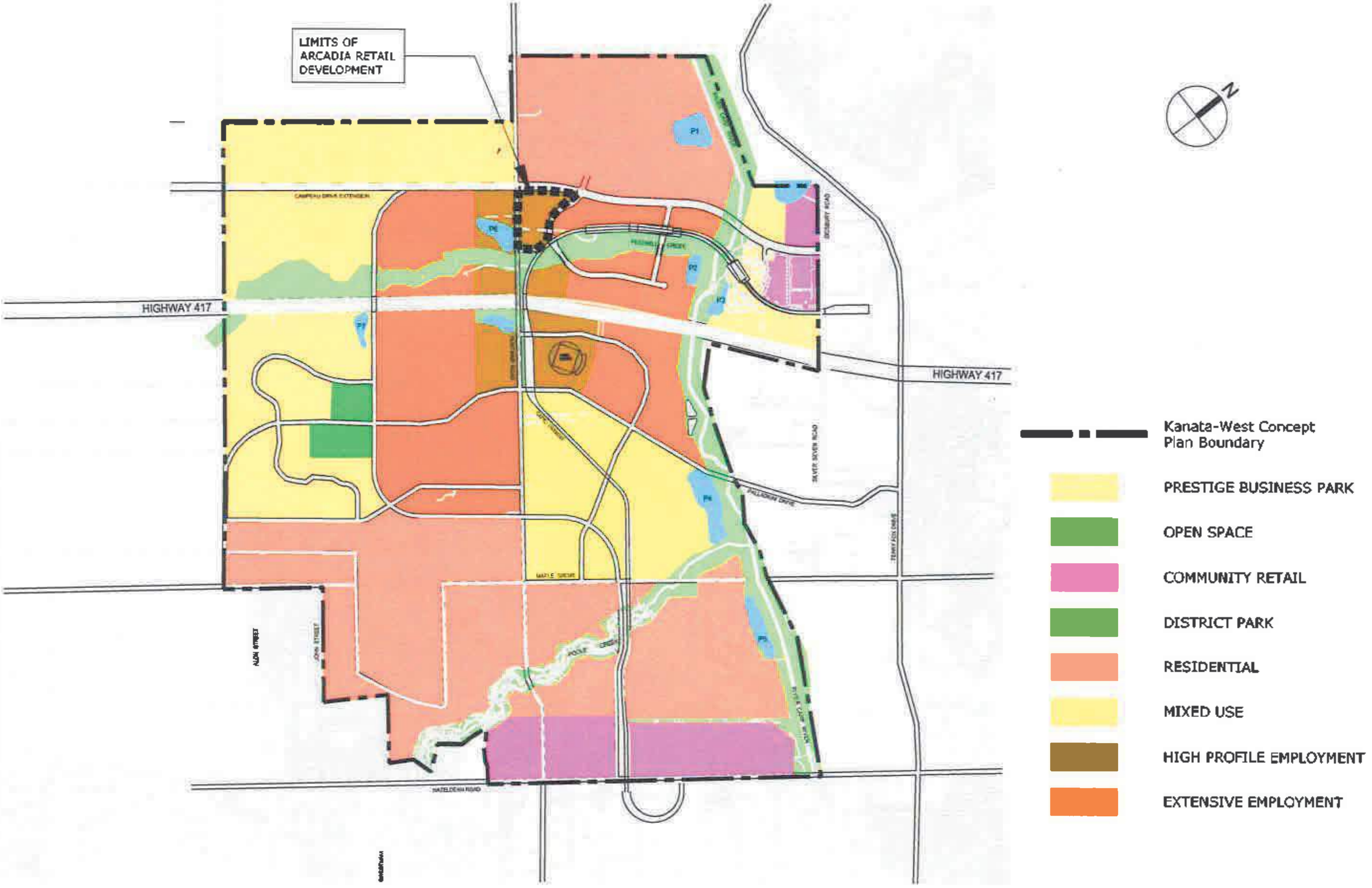
1.2 Background

In 2002, the City of Ottawa expanded its urban area to include the lands currently known as Kanata West. In March 2003, Ottawa City Council approved the general land use and development principles of the Kanata West Concept Plan (KWCP). The plan is a mixed-use community that will include a population of about 17,000 persons in 6,300 households, 24,000 jobs and approximately 1 million square meters of commercial space. Subsequent to approval of the KWCP, several supporting technical documents, including the Kanata West Master Servicing Study (KWSS), were prepared. The KWSS provided a master servicing plan for the entire KWCP, including major infrastructure such as water supply, wastewater disposal and stormwater management.

1.3 Subject Property

As shown in **Figure 1**, the subject property is located at the southeast quadrant of Huntmar Drive and Campeau Drive, and is part of the Kanata West Business Park (KWBP). The KWBP is proposed to include several types of non-residential uses including Prestige Business Park, High Profile Employment and Extensive Employment.

The proposed 5.0 Ha development will be a mixture of attached and free standing buildings. The total commercial grass floor area will be approximately 10,500 m^2, see Master Site Plan SPA-1 in **Appendix A**.



J:\35355-ArcadiaComm\5.9 Drawings\49civil\current\REPORT\Figure 1.dwg Layout Name: FIGURE 2

Plot Style: KANATA WEST.CTB Plot Scale: 0.1333:1 Plotted At: Nov. 15, 13 3:55 PM Printed By: DON SIURNA Last Saved By: DSIURNA Last Saved At: Nov. 15, 13

IBI GROUP

Scale

Project Title

DESIGN BRIEF
ARCADIA RETAIL DEVELOPMENT

Drawing Title

SITE LOCATION

Sheet No.

FIGURE 1

1.4 Phasing

The Owner's intent at this time is to proceed immediately upon SPA approval to service the entire development in a single phase, with building construction to occur as tenants are secured.

1.5 Previous Studies

1. Kanata West Concept Plan

The Kanata West Concept Plan (KWCP) was approved by the City of Ottawa in 2003. The plan provides a framework for the current and future development of the Kanata West lands. It also provides the guidelines and requirements for concept planning, the recommended concept plan, and an implementation strategy. The plan focuses on development of the urban lands with mix uses including office, housing, retail, institutional, entertainment and leisure activities.

2. Kanata West Servicing Study

The Kanata West Servicing Study (KWSS) was completed by the City of Ottawa in 2006. That study provided detailed guidelines for provision of major municipal infrastructure in support of the Kanata West Concept Plan. Among other things it provided guidelines and criteria for water supply, wastewater collection and stormwater management.

3. Third Party Review

The Third Party Review (TPR) was completed after potential omissions in the stormwater management model for KWSS were identified. The TPR was commissioned to be an arm's length review of the model to ensure that it was property calibrated and validated.

4. Signature Ridge Pump Station Hydraulic Grade Line Analysis

A March 2012 report by IBI Group was completed for Minto Properties and completed an update to the Signature Ridge Pump Station sanitary hydraulics. The report predicted HGL's for several scenarios for the tributary sewers including the sanitary sewer servicing the subject parcel. The HGL analysis was further refined in September 2012 based on current overflow proposals by the City.

5. Implementation Plan – Kanata West Development Area

This Plan was prepared for the City of Ottawa and the Kanata West Land Owners Group. The Implementation Plan recognizes that Kanata West is a large planning area which will take years to fully develop and therefore includes a mixture of short and long-term development plans and the associated infrastructure requirements to support them. The Plan builds on the framework of the KWCP and KWSS and provides updated comments for future approvals and the actions that would bring about the approval requirements. The Plan further reviews actions that would be conducted if "triggered" by an event or set of circumstances, while allowing sufficient flexibility to ensure that appropriate changes to the undertaking(s), once identified, are made.

6. Conceptual Site Servicing Arcadia Stages 1, 2, 5 & 8 Kanata West – Minto Communities

This IBI Group report, completed in September 2012, provided a high level conceptual site servicing plan specifically for Minto Arcadia Lands, including the subject site which is Stage 5 of the report. The report focused on details related to water supply, wastewater disposal and stormwater management.

7. Arcadia interim Stormwater Management Facility Design Brief June 2012

This IBI Group report outlines the design of the interim SWM Facility to service Minto's Arcadia development lands, including these commercial lands, until such time as the ultimate stormwater management facility is constructed.

1.6 Environmental Issues

In July 2012, Kilgour & Associates prepared and submitted, as part of the Stage 1 approval, an Intergraded Environmental Review (IER) for the entire 80 ha Minto property. The report assessed the natural features on the site including trees, watercourses, fish and fish habitat and species at risk. The report findings concluded that the project had no significant effect on the existing natural features on the site, as the value of the features was low due to the past history of agricultural activity. It did identify that there are three (3) watercourses on the site: the Carp River, Feedmill Creek and an unnamed creek, for which specific conditions have been put on the development through the “Carp River, Poole Creek and Feedmill Creek Restoration Plan”, the “Kanata West Implementation Plan” and the “Carp River, Poole Creek and Feedmill Creek Corridor Width Limits Rationale”.

1.7 Geotechnical Considerations

The Owner has commissioned a preliminary geotechnical investigation for the proposed development. The preliminary report was based on information from 21 boreholes on the subject site. The report (No. PG3045-1R) was updated by Paterson Group Inc. in June 2014.

The objectives of the investigations 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 reports comment on the following:

- Site grading;
- Foundation design;
- Pavement structure;
- Infrastructure construction;
- Groundwater Control
- Design for Earthquakes
- Corrosion potential;
- Grade raise considerations

Most of the soils on site consist of silty clay underlain by glacial till layer. While many other geotechnical recommendations are provided in the reports, two of those include maximum grade raises in the order of 2 meters and long-term groundwater lowering be controlled with the use of clay dykes in sewer trenches.

2 Water Supply

2.1 Existing Conditions

The Kanata West community is located in the City's 3W water pressure zone. Potable water to this area is pressurized at the Glen Cairn Pump Station where a major water storage reservoir (Glen Cairn Reservoir) is located. Major watermains into this pressure zone from the pump station are located along Castlefrank Road (going north), Hazeldean Road and Campeau Drive (going west) and Terry Fox Drive (going south). In support of the KWCP which includes the subject site, the June 2006 Master Servicing Study completed a review of the existing water plan adjacent to the KWCP and made recommendations for improvements and expansion to the City's water transmission and distribution system to support the proposed development.

As part of the development of Phase 1 of the Arcadia subdivision located north of Campeau Drive adjacent to the commercial site, a 600 mm diameter watermain was extended from Didsbury Road to Huntmar Drive along the future Campeau Drive ROW. The 600 mm diameter watermain is currently in service and Phase 1 has been constructed. A 300 mm diameter watermain has been extended west across Campeau Drive to service the Tanger commercial development which is currently under construction. The 600 mm diameter watermain is being extended south along Huntmar Drive to connect to existing watermains on Cyclone Taylor Boulevard south of Highway 417. Construction of the 600 mm diameter watermain is being completed in two stages with the work on Huntmar Drive at Campeau Drive currently under construction and the Highway 417 to be crossing completed in early 2015.

Two watermain stubs have been provided from the 600 mm watermain on Campeau Drive that will be used to service the commercial site. A 300 mm diameter main is provided at the intersection of Campeau Drive and Country Glen Way and a 200 mm diameter main from Campeau Drive approximately 100 meters east of Huntmar Drive.

2.2 Design Criteria

In order to determine the watermain plan needed to adequately service the subject site, a hydraulic model was prepared using H20 MAP software by MWH Soft Inc. The City of Ottawa supplied boundary conditions at the intersection of Campeau Drive and Huntmar Drive. The specific boundary conditions are:

Max Day and Fire Flow = 152.0 m
Peak Hour = 155.1 m
Max Pressure Check = 163.1 m

As stated in the boundary conditions, the 300 mm diameter watermain on Campeau Drive at Huntmar Drive is required to be interconnected to the 600 mm watermain at Huntmar Drive and Campeau Drive. The connection has recently been completed and the watermain will be in service in September 2014.

Water consumption rates for the commercial site and adjacent subdivision is taken from Table 4.2 of the Ottawa Design Guideline Water Distribution. For the commercial site, a rate of 2500 L/(1000 m^2/d) is used for each of the 9 blocks. In the Master Servicing Study a rate of 50,000l/ha/day is used for commercial areas, for a gross area of 5 ha, the basic day flow rate calculates as 2.9 l/s while the basic day rate calculated using the floor area of each block adds up to 0.31 l/s. Water demands for development west of Huntmar Road are also included in the water model. The calculated demands are tabulated in **Appendix A**.

In order to determine the fire flow requirements, calculations based on the criteria of the Fire Underwriters Survey was carried out for several blocks. The calculations resulted in a maximum fire flow requirement of 183.3 l/s (11,000 l/min) which has been applied to all nodes in the commercial site. A copy of the calculations are included in **Appendix A**.

2.3 Proposed Water Plan

A figures showing the water model for the Arcadia commercial site are included in **Appendix A** along with the results of the hydraulic modelling.

A computer model of the water distribution network for the Arcadia development was developed using the H20MAP water program provided by MWH Soft Inc. Water demands and HGL boundary conditions as described in Section 2.2 were incorporated into the model. The results of the hydraulic analysis are as follows:

SCENARIO	ARCADIA COMMERCIAL SITE
Basic Day Pressure	624.6 to 644.2 kPa (90.6 to 93.4 psi)
Maximum Day plus Fire Design Fire Flow	Minimum 253.3 l/s (15,198 l/min)
Peak Hour Pressure	542.6 to 562.2 kPa (78.7 to 81.5 psi)

For all nodes the basic day pressure exceeds 552 kPa (80 psi) requiring all buildings to have pressure reducing valves installed. Pressure reducing valves will be installed immediately downstream of the isolation valve inside the buildings located downstream of the water meter and be maintained by the building owner in accordance with Technical Bulletin ISDTB-2014-02. Sizing of the pressure reducing valves will be conducted by the building's mechanical engineer. The basic day pressure does not exceed the maximum 689 kPa (100 psi) at any node in the system. All nodes exceed the required fire flow while maintaining a residual pressure of 140 kPa (20 psi) at any node in the system. Peak hour pressures in excess of the minimum requirement of 276 kPa (40 psi) at all nodes.

The proposed water distribution system for this development is shown on the General Plan of Services drawing C-100 with additional notes and details on Details drawing C-100A in **Appendix A**.

3 Wastewater Disposal

3.1 Existing Conditions

The Signature Ridge Pump Station (SRPS) is the wastewater outlet for all lands in the KWCP north of Highway 417, including the subject site. The SRPS was constructed in 1991 with an ultimate capacity of 250 l/s to service an area of Kanata, both north and south of Highway 417 including Signature Ridge, Interstitial lands, the Broughton/Richardson lands and developments along Palladium Drive south of Highway 417. This station is being upgraded to accommodate additional lands as per the KWSS.

3.2 Master Servicing Studies

The Kanata West Master Servicing Study (KWSS) was completed in 2006 in support of the KWCP. It recommended a wastewater master plan for the entire KWCP. For lands north of Highway 417, including the subject site, all wastewater flows are to be routed to the SRPS. The KWSS Section 4.3 recommended that the capacity of the pump station be upgraded to 400 l/s to accommodate the wastewater flow from the expanded drainage area. The relevant portion of KWSS Section 4.3 is included in **Appendix B**. To convey flows from the subject site, the 2006 report recommended that a 525 mm diameter sewer be constructed in the extended Campeau Drive across Huntmar Drive into the subject site. Because of hydraulic gradient constraints, the 2006 KWSS was very conservative with recommendations for sub-trunk sanitary sewer sizes.

Subsequent to completion of the KWSS report, several additional reviews have been completed with respect to sanitary HGL and overflow impacts at the SRPS. The most recent of these is the “Signature Ridge Pump Station Hydraulic Grade Line Analysis (IBI Group July 2014) completed for Minto Properties in support of its Arcadia development. The HGL analysis was further refined in July 2014 based on more up-to-date development conditions with the construction of Phase 1 Arcadia and Richardson Ridge.

As part of Arcadia’s Stage 2 development the 375 mm diameter sanitary sewer sub-trunk was extended along Campeau Drive to Huntmar Drive. This sewer will provide the wastewater outlet for the subject site.

3.3 Design Criteria

In accordance with the City’s current “Ottawa Sewer Design Guidelines”, the following design criteria were used to predict wastewater flow rates for the subject site and to size the sanitary sewers:

- Minimum velocity – 0.6 m/s
- Maximum velocity – 3.0 m/s
- Manning roughness coefficient for all smooth wall pipes – 0.013
- Residential average flow – 350 L/c/d
- Commercial (Employment Area) average flow – 50,000 L/gross ha/d
- Industrial (Business Park) average flow – 35,000 L/gross ha/d
- Residential peaking factor – Harmon Formula
- Commercial/Institutional peaking factor – 1.5
- Industrial peaking factor as per the guidelines
- Infiltration inflow – 0.28 l/s effective gross ha
- Minimum allowable slopes as listed below

DIAMETER	SLOPE
200	0.320
250	0.240
300	0.816
375	0.140
450	0.111
525 and larger	0.100

3.4 Recommended Wastewater Plan

The recommended wastewater plan for the subject site is shown on Drawing C-100 along with details on drawing C-100A. The plan recommends that all wastewater flows from the subject site be conveyed to the Campeau Drive sewer. The 375 mm diameter sanitary sewer currently terminates at Huntmar Drive and has two connection points for the subject site. The west connection point is a 200 mm Ø sanitary service stub, while the east is a 300 mm Ø sanitary sewer stub.

3.5 Hydraulic Grade Line

The above referenced July 2014 technical Memorandum by IBI Group estimated the full build-out hydraulic grade line (HGL) at the intersection of Campeau Drive and north entrance to be 95.47 m, and at Campeau Drive and Street 1, 94.76 m. The lowest finished floor elevation for all of the Arcadia commercial development is 98.10 m and since all buildings will be slab on grade type, the sanitary HGL will not negatively impact the development.

3.6 Sewer Calculations

The on-site sanitary sewers have been designed in accordance with City of Ottawa and Ministry of the Environment of Ontario (MOE) criteria. The detailed sanitary sewer design sheets and related sanitary drainage area plan C-501 are included in **Appendix B**.

The July 2012 Site Servicing Report 'Arcadia – Kanata West Ph 1' by IBI Group identified conceptually the servicing for the 9.84 Ha parcel of land south of Campeau Drive. This site comprises approximately 5.2 Ha of that area. The Campeau Drive sewer was designed and constructed assuming 0.85 Ha of commercial lands connecting to MH301A and 9.99 Ha of mixed use lands (3.82 Industrial, 3.82 Residential, 1.35 Ha commercial) connecting to MH 303A, with peak flows of 0.98 l/s and 9.77 l/s, respectively, for a total of 10.75 l/s. This site generates approximately 5.95 l/s peak flow – 2.06 l/s to MH 301A and 3.89 l/s to MH 303A. The minor (1.08 l/s) increase in flow to MH 301A has no negative impact on the system as it has over 34 l/s spare capacity up to MH 303A.

As noted above, the site is comprised of slab on grade construction (no basements). The minor (1.08 l/s) increase in flow from MH 301A to 303A will not negatively impact this site. There are existing houses along Campeau Drive and the current freeboard between the HGL and USF is approximately 1.18 m at MH301A. It is anticipated that any minor HGL adjustment (1 to 2 cm) due to the 1.08 l/s at this MH will leave these units with in excess of 1 m of freeboard.

The remaining lands from the 9.84 Ha parcel has been divided into two external areas; EXT1(0.74 Ha) which is north of the future Rapid Transit Line, and EXT2 (2.82 Ha), south of the

Rapid Transit Line. These areas will be mixed use development areas and will split prorate the residual flow assigned this area. 10.75 L/S less 2.06 l/s and less 3.89 l/s equals 4.8 l/s which will be split 1.0 l/s for EXT1 and 3.8 for EXT2.

The total flow from this 9.84 Ha area to the Campeau Drive trunk sewer is 2.06 + 3.89 + 1.0 + 3.8 = 10.75 l/s. As a comparison, the KWSS had applied 50,000.00 l/Ha/d for this area which would equate to 11.29 l/s peak flow when using Peak Factor 1.5 and infiltration rate of 0.28 l/s/Ha. To this end, the total flow from this area to the Campeau Drive sewer and SRPS is less than the flow allocated in the KWSS.

4 Stormwater Management

4.1 Existing Conditions

As previously noted, the subject site, which is located east of Huntmar Drive north of the proposed Rapid Transit Route and Feedmill Creek is currently vacant except for a temporary sales trailer for Minto's residential lands. The site was previously stripped and the excavated material was used to preload the initial phase of Minto's residential development. As such, the topography is fairly consistent and ranges from about 100 m in the west to about 97 m in the east.

As part of the Arcadia development Stage 1 works, an interim SWM facility was constructed in the future Stage 4 area to service Stages 1, 2 and 5. Storm sewers within Stage 1 and the portion of Campeau Drive fronting on Stage 1 are currently in service and outlet to the interim SWM facility.

Details related to the design elements of the stormwater management facility are presented in the previously approved report entitled "Arcadia Interim SWMF Design Brief, June 2012". This section of the report will focus only on the onsite stormwater system proposed for the site.

4.2 Minor Storm Sewers Design Criteria

The minor storm sewers for this site will be sized based on the recommendations of the KWSS and standards of both the City of Ottawa and the provincial Ministry of the Environment. Some of the key criteria will include the following:

• Design Return Periods:	Local and Collector Roads	1:5 yr (Ottawa)
• Sewer Sizing by Rational Method		
• Runoff Coefficients:	Roof	C=0.90
	Asphalt	C=0.90
	Landscaped Areas	C=0.2
• Initial T of C	10 min	
• Min Velocity:	City Design Guidelines	0.80 m/s

The SWM report for the neighbourhood recommended that for the subject lands, runoff discharged to the downstream storm system should be limited to 240 l/s/Ha.

The minor storm sewers for the subject site, will be sized based on the rational method and the City of Ottawa 1:5 yr. event. Minor storm flow into these sewers will be controlled by Inlet Control Devices (ICD) to limit flows and prevent sewer surcharging.

The minor storm sewer system is illustrated on the General Plan C-100 plus additional specifications and details are provided on Drawing C-100A. The storm sewer design sheets and related Storm Sewer Drainage Area plans C-500 is included in **Appendix C**.

The servicing report for Arcadia Phase 1 included capacity for 163 l/s and 1822 l/s at MH's 301 and 303 in Campeau Drive. The detail design sheets note the peak flows of 158.8 and 1354.27 at MH's 301 and 303 respectively. To this end, no negative impact on the existing downstream system is anticipated.

4.3 Stormwater Management

In accordance with the neighbourhood SWM, the site is proposed to outlet to the existing Campeau Drive storm sewer, which outlets to the Interim SWM pond and eventually to the future Pond 1 as per KWDA Master Servicing Report. The downstream sewers and interim SWMF have been constructed and are operational. As per the recommendation of the Servicing Report for the downstream storm sewers, all drainage from this site is restricted to a maximum release rate of 240 l/s/ha.

In order to control flow into the downstream sewers, Inlet Control Devices (ICD) and roof drain restrictors are proposed. These flow control devices will be required to restrict flow into the minor system and to the downstream storm sewers, to a maximum of 240 l/s/Ha, or 192 l/s for the 0.8 Ha tributary to MH 301 in Campeau Drive, and 1027.2 l/s for the 4.28 ha tributary to MH 303 in Campeau Drive for a total of 1219.2 l/s.

The KWSS identified the major storm route for these lands to discharge to Feedmill Creek. This site will be designed to accommodate the 100 year event with minimal over flow off site, however, should a major event in excess of the 1:100 year event occur, runoff which exceeds the available spare storage would be routed along the parking lot and internal roads to Feedmill Creek. Figure C-500 in **Appendix C** also illustrates the proposed major storm routing for the site system.

As noted above, the development must limit flow to the storm trunk sewer to 240 l/s/Ha during a 1:100 year rainfall event to provide flood protection for downstream properties. In order to control flow into the downstream sewers to meet this criteria, Inlet Control Devices (ICD) are proposed. Drawing C-100 illustrates the location of ICD’s for the various inlets and roof drains and drawing C-100A provides additional details on the ICD’s. These ICD’s restrict flow into the minor system resulting in ponding as illustrated on drawing C-400. The modified rational method was used to determine the volume of storage required to capture the 100 year event while limiting the accumulated flow to the downstream storm sewers to a maximum of 240 l/s/Ha.

Approximately 0.19 Ha will shed uncontrolled runoff to the Huntmar Road and Campeau Drive storm sewers. The net allowable from the site shall be reduced by the 100 yr. flow provided by this area which is approximately 46.66 l/s. To this end the maximum allowable flow from the onsite sewers is 1219.2 l/s – 46.66 l/s = 1172.54 l/s.

Based on the proposed ICD’s during a 100 yr. event, a total of 1142 l/s is being allowed into the system, while a maximum of 1357.48 m^3 of storage has been provided as summarized in the table below. The modified rational method analysis is included in **Appendix C** along with the above noted drawings. It can be noted that on site storage (roof top, inline and surface), attenuates the 100 year event with minimal overflow to future phases.

ICD #	TRIBUTARY AREA (m^{2})	100 YR. FLOW (l/s)	100 YR. STORAGE (m^{3})	5 YR. FLOW (l/s)	5 YR. STORAGE (m^{3})
100	600	30	4.17	15	2.07
110	1100	40	20.65	20	20.65
120	1100	15	34.51	7.5	14.76
122	600	10	19.52	5	19.52
123	600	15	1.74	7.5	1.74
201	2900	60	11.06	30	19.97
204	1300	55	1.82	27.5	1.82
205	1600	60	4.33	30	4.33
206A	3800	85	104.32	42.5	37.34
206B	700	10	29.25	5	9.27
206C	400	14	9.27	7	5.52
206D	500	60	1.68	30	0.52
210A	1200	77	13.50	38.5	10.52
212	600	24	3.73	12	3.73
215	400	10	7.07	5	3.59
221	2900	85	69.97	42.5	69.83
222	1200	15	31.00	7.5	16.98
223	2700	32	116.57	16	57.66
230B	1900	70	32.11	35	10.57
230C	300	10	6.49	5	5.52
230D	1300	67	21.16	33.5	3.97
230F	700	38	11.77	34	5.52
230G	1200	53	43.07	26.5	27.57
230I	300	11	8.62	5.5	5.52
231	6800	150	204.32	75	139.9
240A	500	10	14.22	5	11.57
240C	500	10	15.07	5	5.52
Roof 100	600	2	26.48	2	11.12
Roof 200	400	1	19.3	1	8.31
Roof 300	400	1	19.3	1	8.31
Roof 400	1500	4	70.97	4	30.4
Roof 500	900	2	44.93	2	19.51
Roof 600	600	2	26.48	2	11.12
Roof 700	1000	2	51.44	2	22.49
Roof 800	600	2	26.48	2	11.12
Roof 900	4600	10	231.11	10	100.49
TOTAL	**47700**	**1142**	**1357.48**	**584**	**738.33**

4.4 Hydraulic Grade Line

The storm HGL is dictated by downstream infrastructure. The storm HGL within the existing storm sewer on Campeau Drive is at 96.05 m and 95.09 m at existing MH's 301 and 303 respectively. The sewers are not surcharged at these points and since the internal sewers are restricted to meet the downstream system design requirements and sized to accommodate the restricted flow. The onsite sewers will not be surcharged and as such the HGL will follow the obvert of the pipes. Additionally, this is a slab on grade development and the City requirement for 0.3 m freeboard to USF to protect basements from flooding is a mute point. The minimum freeboard from the onsite HGL (obvert of storm sewer) to finished floor elevation is 1.51 m. Additional columns have been added on the storm sewer design sheet to identify relationship between HGL (obvert of pipe) and FF for buildings.

5 Sediment and Erosion Control Plan

During construction, existing stream and conveyance system can be exposed to significant sediment loadings. Although construction techniques to reduce unnecessary construction sediment loadings. These will include:

- groundwater in trench will be pumped into a filter mechanism prior to release to the environment;
- seepage barriers will be constructed in any temporary drainage ditches;
- filter cloths will remain on open surface structure such as manholes and filter socks on catchbasins until structures are commissioned and put into use.

During construction of municipal services, 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 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.

In order to reduce sediment loading to the adjacent lands via overland flow, seepage barriers will be installed along the property limits will be used. Light Duty Silt Fence Barrier as per OPSD 219.110. All seepage barriers will be inspected and maintained as needed.

All catchbasins, and to a lesser degree manholes, convey surface water to sewers. However, until the surrounding surface has been completed theses structures will be covered to prevent sediment from entering the minor storm sewer system. Until the parking lots are asphalted and curbed, all catchbasins and manholes will be constructed with a geotextile filter fabric 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.

During construction of any development both imported and native soils are stockpiled. Mitigative measures and proper management to prevent these materials entering the sewer system is needed.

During construction of the deeper municipal services, water, sewers and service connections, imported granular bedding materials are temporarily stockpiled on site. These materials are however quickly used up and generally before any catchbasins are installed. Street catchbasins are installed at the time of roadway construction and rear yard catchbasins are usually installed after base course asphalt is placed.

Contamination of the environment as a result of stock piling of imported construction materials is generally not a concern. These materials are quickly used and in mitigative measures stated previously, such as and filter fabric in catchbasins and manholes help to manage these concerns.

Roadway granular materials are not stockpiled on site. They are immediately placed in the roadway and have little opportunity of contamination. Lot grading sometimes generates stockpiles of native materials. However, this is only temporary event since the materials are quickly moved off site.

To reduce the potential for tracking of sediment off-site, mud mats will be constructed at each entrance and maintained until site is ready for paving.

A sediment and erosion control plan is provided as Drawing C-900 in **Appendix D**.

6 Geotechnical

Paterson Group prepared a geotechnical report updated June 26, 2014 for the subject lands. A copy of the Paterson report has been provided in **Appendix D**. The report provides recommendations for various site servicing and building construction issues. The recommendations impacting site servicing include, but are not limited to the following, see report for details:

- Permissible grade raise: 2 m within 5 m of building 3 m elsewhere.
- Pavement Structure: The following is the recommended pavement structure.

PAVEMENT STRUCTURE	THICKNESS (mm)	
	CAR PARK AREA	ACCESS LANES & HEAVY TRUCK PARKING
Superpave 12.5	50	40
Superpave 19.0		50
Granular “A”	150	150
Granular “B” Type II	400	450

- Pavement Structure Drainage: Subdrains at CB’s 3 m long orthogonally or longitudinally when along a curb.
- Pipe Bedding and Backfill: 150-300 mm OPSS Granular ‘A’ crushed stone bedding compacted to 95% SPMDD. Cover to extend 300 mm above pipe obvert to be OPSS Granular ‘A’ compacted to 95% SPMDD.
- Clay Seals: To be provided at 60 m intervals

The proposed Grading Plan C-200 is included in **Appendix D**. The grading plan was prepared with a view to limit grade raise to 2.0 m or less. Paterson Group has reviewed this plan and via their comments to the City dated June 26, 2014, Item #13 included in **Appendix D** noting their concurrence of the plan from a geotechnical perspective.

Infiltration targets for the proposed site were outlined in Figure 5.4 of the KWSS. The soil type within the proposed development area is characterized as clay with low recharge potential. The infiltration target for the area, as identified within the KWSS, is 50-70mm/year. The site is primarily comprised of impervious parking lot and roof surfaces. Infiltration targets for the neighbourhood are detailed under a separate approved report, IBI Arcadia Stage 2 SWM Report and Stage 2 Inlet Design Brief dated September 2014. Section 3.2 of that report identifies how the target for the neighbourhood is to be achieved; summary calculations including these commercial lands are included in **Appendix D**, illustrating an infiltration rate of 122 mm/yr for the neighbourhood which exceeds the 50-70 mm/yr required.

7 Approvals and Permit Requirements

7.1 City of Ottawa

The City of Ottawa will review all and approve most development applications as they relate to provision of water supply, wastewater collection and stormwater conveyance and treatment. Ultimately, the City will issue final approvals for construction including:

- MOE Section 53 Application for Sewers
- Form 1 for Watermains
- Commence Work Notifications
- Site Plan Approval

7.2 Province of Ontario

At the time of final design approvals, the Ministry of Ontario (MOE) will approve the local sewers under Section 53 of the Ontario Water Resources Act and issue an Environmental Compliance Approval. Also if required, the MOE will issue a Permit To Take Water (PTTW).

8 Recommendations

The development of 370 Huntmar Drive will be completed by extension of existing external infrastructure, including water, wastewater and stormwater systems. This report provides sufficient information and demonstrates that water, wastewater and stormwater systems required to develop this site have been designed in accordance with MOE and City of Ottawa current level of service requirements and/or requirements of the existing downstream systems. This report therefore recommends that the City provide the relevant approvals and Commence Work Notifications as needed to start site construction.

Report Prepared By:

D.G. Yannoulopoulos

Demetrius Yannoulopoulos, P. Eng.
Associate Director

APPENDIX A

ARCADIA DEVELOPMENT

Development Servicing Study Checklist

4.1 General Content

☐ Executive Summary – *Not applicable*

☐ Date and revision number of the report – *On cover*

☐ Location map and plan showing municipal address, boundary, and layout of proposed development – *key map Figure 1*

☐ Plan showing the site and location of all existing services – *Drawing C-100*

☐ Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere – *Section 1*

☐ Summary of Pre-consultation Meetings with City and other approval agencies – *Section 1*

☐ Reference and confirm conformance to higher level studies and reports (master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria – *Overall: Section 1, Water: Section 2, Sanitary: Section 3, Storm: Section 4*

☐ Statement of objectives and servicing criteria – *Overall: Section 1, Water: Section 2, Sanitary: Section 3, Storm: Section 4*

☐ Identification of existing and proposed infrastructure available in the immediate area –*Water Section 2; Sanitary; Section 3, Storm Section 4*

☐ Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available) – *Carp River, Section 1*

☐ Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts – *not applicable*

☐ Proposed phasing of the development, if applicable – *Section 1*

☐ Reference to geotechnical studies and recommendations concerning servicing – *Sections 1 & 7*

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

- Metric scale
- North arrow (including construction North)
- Key plan
- Name and contact information of applicant and property owner
- Property limits including bearings and dimensions
- Existing and proposed structures and parking areas
- Easements, road widening and rights-of-way
- Adjacent street names

– *See detail drawings*

4.2 Development Servicing Report: Water

☐ Confirm consistency with Master Servicing Study, if available – *Section 2*

☐ Availability of public infrastructure to service proposed development – *Section 2*

☐ Identification of system constraints – Section 2

☐ Identify boundary conditions – *Section 2*

☐ Confirmation of adequate domestic supply and pressure – *Section 2*

☐ Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development – *Section 2*

☐ Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure decuding valves – *Section 2*

☐ Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design – *Section 2*

☐ Address reliability requirements such as appropriate location of shut-off valves – *Section 2*

☐ Check on the necessity of a pressure zone boundary modification – *Not applicable*

☐ Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range – *Section 2*

☐ Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions – *Section 2*

☐ Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation – *Not required.*

☐ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines – *Section 2*

☐ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference – Section 2

4.3 Development Servicing Report: Wastewater

☐ Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure – *Section 3*

☐ Confirm consistency with Master Servicing Study and/or justifications for deviations – *Section 3*

☐ Consideration of local conditions that may contriburte to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers – *Not applicable*

☐ Description of existing sanitary sewer available for discharge of wastewater from proposed development – *Section 3*

☐ Verify available capacity in downstream Sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable) – *Section 3*

☐ Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format – *Section 3*

☐ Description of proposed sewer network including sewers, pumping stations, and forcemains – *Section 3*

☐ Discussion of previously identified environmental constraints and impact on servicing (environmental constrains are related to imitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality) – *Section 4*

☐ Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development – *Section 3*

☐ Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity – *Not applicable*

☐ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding – *Not applicable*

☐ Special considerations such as contamination, corrosive environment etc – *Not applicable*

4.4 Development Servicing Report: Stormwater Checklist

☐ Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property) – *Section 4*

☐ Analysis of available capacity in existing public infrastructure – *Section 4*

☐ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern – *Section 4*

☐ Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects – *Section 4*

☐ Water quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements – *Not applicable*

☐ Description of the stormwater management concept with facility locations and descriptions with references and supporting information – *Not applicable*

☐ Set-back from private sewage disposal systems – *Not applicable*

☐ Watercourse and hazard lands setbacks – *Not applicable*

☐ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed – *Section 1*

☐ Confirm consistency with subwatershed and Master Servicing Study, if applicable study exists – *Section 4*

☐ Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period) – *Not applicable*

☐ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals – *Section 4*

☐ Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions – *Not applicable*

☐ Any proposed diversion of drainage catchment areas from one outlet to another – *Not applicable*

☐ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities – *Section 4*

☐ If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event – *Section 4*

☐ Identification of potential impacts to receiving watercourses – *Not applicable*

☐ Identification of municipal drains and related approval requirements – *Not applicable*

☐ Descriptions of how the conveyance and storage capacity will be achieved for the development – *Not applicable*

☐ 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading – *Section 4*

☐ Inclusion of hydraulic analysis including hydraulic grade line elevations – *Not applicable*

☐ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors – *Section 5*

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

☐ Identification of fill constraints related to floodplain and geotechnical investigation – *Section 6*

4.5 Approval and Permit Requirements: Checklist

☐ Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams or defined in the Act. – *Section 7*

☐ Application for Certificate of Approval (CofA) under the Ontario Water Resources Act – *Section 7*

☐ Changes to Municipal Drains – *not applicable*

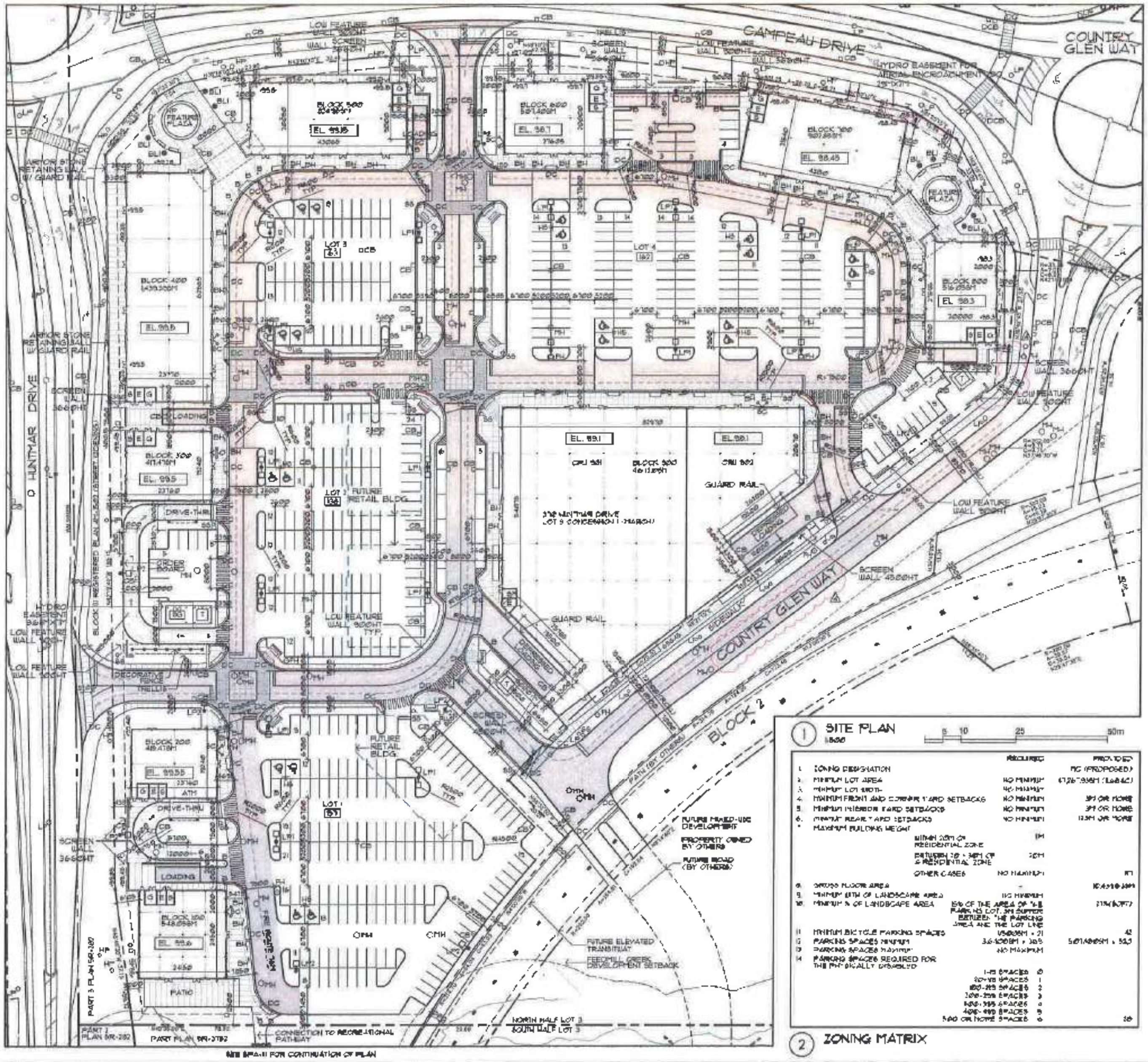
☐ Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation – *Section 7*

4.6 Conclusion Checklist

☐ Clearly stated conclusions and recommendations - *Section 8*

☐ Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency – *not applicable*

☐ All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario - *Section 8*



① SITE PLAN
1:500

0 5 10 25 50m

		REQUIRED	PROVIDED
1.	ZONING DESIGNATION		MC (PROPOSED)
2.	MINIMUM LOT AREA	NO MINIMUM	47,267.93SM (11.68AC)
3.	MINIMUM LOT WIDTH	NO MINIMUM	
4.	MINIMUM FRONT AND CORNER YARD SETBACKS	NO MINIMUM	3M OR MORE
5.	MINIMUM INTERIOR YARD SETBACKS	NO MINIMUM	3M OR MORE
6.	MINIMUM REAR YARD SETBACKS	NO MINIMUM	12M OR MORE
7.	MAXIMUM BUILDING HEIGHT		
	WITHIN 20M OF RESIDENTIAL ZONE	11M	
	BETWEEN 20 + 30M OF A RESIDENTIAL ZONE	15M	
	OTHER CASES	NO MAXIMUM	8M
8.	GROSS FLOOR AREA	-	10,243.83SM
9.	MINIMUM WIDTH OF LANDSCAPE AREA	3M MINIMUM	
10.	MINIMUM % OF LANDSCAPE AREA	15% OF THE AREA OF THE PARKING LOT, 3M BUFFER BETWEEN THE PARKING AREA AND THE LOT LINE	21% (SOFT)
11.	MINIMUM BICYCLE PARKING SPACES	1/500SM = 21	42
12.	PARKING SPACES MINIMUM	3.6/100SM = 369	5.07/100SM = 520
13.	PARKING SPACES MAXIMUM	NO MAXIMUM	
14.	PARKING SPACES REQUIRED FOR THE PHYSICALLY DISABLED		
	1-9 SPACES	0	
	10-99 SPACES	1	
	100-199 SPACES	2	
	200-299 SPACES	3	
	300-399 SPACES	4	
	400-499 SPACES	5	
	500 OR MORE SPACES	6	30

② ZONING MATRIX

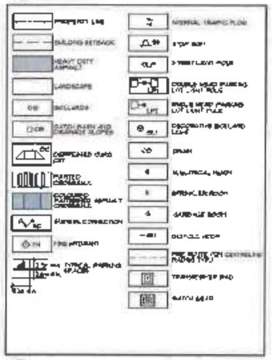
⑥ LOCATION PLAN
NTS

CERTIFICATE OF REGISTRATION
PLAN 4M-1482

PLAN OF SUBDIVISION OF
PART OF LOT 3
CONCESSION 1
GEOGRAPHIC TOWNSHIP OF MARCH
CITY OF OTTAWA

SURVEYOR: STANTEC GEOMATICS LTD.
(OTTAWA, ON)
ONTARIO LAND SURVEYORS

⑤ LEGAL DESCRIPTION



④ LEGEND

1. SITE AREA 47247.93SM (4.72HA)
(EXCLUDES NEW STREET NO.1)

2. BUILDING AREA	GSA (SM)	GFA (SM)
.1 BLOCK 100	571.88	546.88
.2 BLOCK 200	446.27	418.47
.3 BLOCK 300	446.27	417.47
.4 BLOCK 400	1470.15	1439.36
.5 BLOCK 500	895.75	884.86
.6 BLOCK 600	[illegible]	[illegible]
.7 BLOCK 700	923.59	902.85
.8 BLOCK 800	[illegible]	[illegible]
.9 BLOCK 900	[illegible]	4672.0
.10 TOTAL	[illegible]	10243.83

3. FSI 10243.83/47247.93 = [illegible]
4. LANDSCAPE AREAS
   - .1 SOFT 9,758.84 SM
   - .2 HARD 1,796.51 SM
   - .3 PAVED SURFACES 22,980.55 SM
5. PARKING
   - .1 PARKING REQUIRED (3.6/100SM GFA) 369 STALLS
   - .2 PARKING PROVIDED (INC STALLS INCL.) 520 STALLS
6. BICYCLE PARKING
   - .1 PARKING REQUIRED (1/250SM GFA) 41 SPACES
   - .2 PARKING PROVIDED 42 SPACES
7. LOADING
   - .1 LOADING PROVIDED
     - STANDARD SIZE 8 BAYS
     - OVERSIZE 3 BAYS

③ PROJECT STATISTICS

Revisions

No.	Description	Date	By	Chkd
1	SPA Comments	14.05.17	JG/DC	
2	Unmoved Block 300 Transformer + Switch Gear	14.07.23	JG	
3	SPA Comments	14.08.06	JG	
4	SPA Comments	14.10.01	MJ	

KEY PLAN

APPROVED ☐ REFUSED ☐

DATE ____________

Felice Petti, P.Eng., Manager, Development Review
Suburban Services
City of Ottawa

No.	Description	Date	Checked
5	Site Plan Application Resubmission	14.08.21	DM
4	Site Plan Application Resubmission	14.06.16	DM
3	For Review	14.06.16	
2	For Review	14.04.30	
1	Site Plan Application	3.1.08	DM

issued for

plotted

drawn by	JG	scale	As Noted
checked by	DM	date	12.12.07
printed		file	1207B

Arcadia Retail Development
Kanata, Ontario

Minto Properties
200 Kent Street • Suite 180 • Ottawa, Ontario • K1P 5S8
Telephone (613)782-2137 Fax (613)782-0777

drawing title
SITE PLAN

drawing no.
SPA-1

pellow + associates architects inc.

Lance Erion

From: Fraser, Mark [Mark.Fraser@ottawa.ca]
Sent: Tuesday, August 26, 2014 2:54 PM
To: Lance Erion
Cc: Demetrius Yannoulopoulos; Ogilvie, Chris
Subject: RE: D07-12-14-0014_370 Huntmar Drive (Arcadia Commercial Development) - Request for Updated Boundary Conditions
Attachments: FUS Fireflow Block 900.pdf; CCS_WaterDemands.pdf

Lance,

Please find below City of Ottawa watermain boundary conditions as requested based on the provided water demand and fire flow demand requirements.

Water Demand and Fire Flow Requirements:

Proposed Development Location: 370 Huntmar Drive
Average Daily Demand = 0.31 L/s
Max Daily Demand = 0.44 L/s
Peak Hour Demand = 0.83 L/s
Fire Flow = 183.3 L/s

City of Ottawa Watermain Boundary Conditions:

PKHR = 155.1m
MXDY+Fire = 152.0 m
Max HGL = 163.1m

Please note that the boundary conditions provided are based on the following:

- Boundary condition location is on the existing 305mm dia. watermain, about 25m north of the E-W 305mm watermain on Campeau Drive at Huntmar Drive.
- As required for all development beyond the initial 200 units approved for the Arcadia development, it is assumed that the 610mm Campeau feedermain extension south on Huntmar to Cyclone-Taylor is in operation.
- To supply the required fire demand provided, the future interconnection between the 610 and the 305 on Campeau Drive at Huntmar Drive (as per 2013-01-18 IBI report, Campeau Drive Watermain, Didsbury to Huntmar Road) MUST BE CONSTRUCTED.
- Pressure Reducing Valves (PRV) are likely required for this development.

Please refer to City of Ottawa, *Ottawa Design Guidelines – Water Distribution*, First Edition, July 2010, WDG001 Clause 4.2.2 for watermain pressure and demand objectives.

These boundary conditions are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

If you have any questions please let me know.

IBI GROUP
333 PRESTON STREET
OTTAWA, ON
K1S 5N4

WATERMAIN DEMAND CALCULATION SHEET

PROJECT : **ARCADIA COMMERCIAL**
LOCATION : **CITY OF OTTAWA**
DEVELOPER : **MINTO**

FILE: 35355.5.7
DATE PRINTED: 16-Aug-14
DESIGN: LE
PAGE : 1 OF 1

NODE	RESIDENTIAL				NON-RESIDENTIAL			AVERAGE DAILY DEMAND (l/s)			MAXIMUM DAILY DEMAND (l/s)			MAXIMUM HOURLY DEMAND (l/s)			FIRE DEMAND
	UNITS			POP'N	INDTRL (ha.)	COMM. (ha.)	RETAIL (m^2)	Res.	Non-res.	Total	Res.	Non-res.	Total	Res.	Non-res.	Total	(l/min)
	SF	SD & TH	ST														
ARCADIA COMMERCIAL																	
AC-120 (Blk 800)							547	0.00	0.02	0.02	0.00	0.02	0.02	0.00	0.04	0.04	11,000
AC-130 (Blks 600,700)							1472	0.00	0.04	0.04	0.00	0.06	0.06	0.00	0.12	0.12	11,000
AC-140 (Blk 500)							856	0.00	0.02	0.02	0.00	0.04	0.04	0.00	0.07	0.07	11,000
AC-160 (Blks 300,400)							1918	0.00	0.06	0.06	0.00	0.08	0.08	0.00	0.15	0.15	11,000
AC-180 (Blks 100,200)							1025	0.00	0.03	0.03	0.00	0.04	0.04	0.00	0.08	0.08	11,000
AC-190 (Blk 900)							4694	0.00	0.14	0.14	0.00	0.20	0.20	0.00	0.37	0.37	11,000
TOTAL										0.31			0.44			0.83	
ARCADIA STAGE 1																	
PH1-100		4		11				0.04	0.00	0.04	0.11	0.00	0.11	0.24	0.00	0.24	10,000
PH1-101		4		11				0.04	0.00	0.04	0.11	0.00	0.11	0.24	0.00	0.24	10,000
PH1-105		5		14				0.05	0.00	0.05	0.14	0.00	0.14	0.30	0.00	0.30	10,000
PH1-110		8		22				0.09	0.00	0.09	0.22	0.00	0.22	0.48	0.00	0.48	10,000
PH1-115		8		22				0.09	0.00	0.09	0.22	0.00	0.22	0.48	0.00	0.48	10,000
PH1-120		5		14				0.05	0.00	0.05	0.14	0.00	0.14	0.30	0.00	0.30	10,000
PH1-160	9	6		47				0.19	0.00	0.19	0.47	0.00	0.47	1.04	0.00	1.04	10,000
PH1-170	8	8		49				0.20	0.00	0.20	0.49	0.00	0.49	1.09	0.00	1.09	10,000
PH1-180		7		19				0.08	0.00	0.08	0.19	0.00	0.19	0.42	0.00	0.42	10,000
PH1-185		7		19				0.08	0.00	0.08	0.19	0.00	0.19	0.42	0.00	0.42	10,000
PH1-190		9		24				0.10	0.00	0.10	0.25	0.00	0.25	0.54	0.00	0.54	10,000
PH1-200		16		43				0.18	0.00	0.18	0.44	0.00	0.44	0.96	0.00	0.96	10,000
PH1-210		17		46				0.19	0.00	0.19	0.46	0.00	0.46	1.02	0.00	1.02	10,000
PH1-220		8		22				0.09	0.00	0.09	0.22	0.00	0.22	0.48	0.00	0.48	10,000
PH1-230	11			37				0.15	0.00	0.15	0.38	0.00	0.38	0.83	0.00	0.83	10,000
PH1-240	7			24				0.10	0.00	0.10	0.24	0.00	0.24	0.53	0.00	0.53	10,000
PH1-250	11			37				0.15	0.00	0.15	0.38	0.00	0.38	0.83	0.00	0.83	10,000
PH1-260	11			37				0.15	0.00	0.15	0.38	0.00	0.38	0.83	0.00	0.83	10,000
PH1-270	12			41				0.17	0.00	0.17	0.41	0.00	0.41	0.91	0.00	0.91	10,000
PH1-280	12			41				0.17	0.00	0.17	0.41	0.00	0.41	0.91	0.00	0.91	10,000
C-140					65.40	19.10		0.00	37.55	37.55	0.00	56.32	56.32	0.00	101.38	101.38	10,000

ASSUMPTIONS

RESIDENTIAL DENSITIES

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

AVG. DAILY DEMAND

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

MAX. DAILY DEMAND

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

MAX. HOURLY DEMAND

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

FIRE FLOW

- SF, SD & TH	10,000	l / min
- Retail	11,000	l / min

Fire Flow Requirement from Fire Underwriters Survey

Building Floor Area Block 900

floor area 4,694 m^2

$F = 220C\sqrt{A}$

C	1.0	
A	4,694	m^2
F	15,073	l/min
use	15,000	l/min

C =

1.5	wood frame
1.0	ordinary
0.8	non-combustible
0.6	fire-resistive

Occupancy Adjustment

Use	0%	
Adjustment	0	l/min
Fire flow	15,000	l/min

-25%	non-combustible
-15%	limited combustible
0%	combustible
+15%	free burning
+25%	rapid burning

Sprinkler Adjustment

Use	30%	
Adjustment	4500	l/min

-30%	system conforming to NFPA 13
-50%	complete automatic system

Exposure Adjustment

Building Face	Separation	Charge
north		0%
east	37	5%
south		0%
west		0%
Total		5%

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	750	l/min
Fire flow	11,250	l/min
Use	**11,000**	**l/min**

Note: This is the highest value for all buildings and will be used as the fire flow rate for the site

Fire Flow Requirement from Fire Underwriters Survey

Building Floor Area Block 400

floor area 1,470 m^2

$F = 220C\sqrt{A}$

C	1.0	
A	1,470	m^2
F	8,435	l/min
use	8,000	l/min

C =

1.5	wood frame
1.0	ordinary
0.8	non-combustile
0.6	fire-resistive

Occupancy Adjustment

Use	0%	
Adjustment	0	l/min
Fire flow	8,000	l/min

-25%	non-combustile
-15%	limited combustile
0%	combustile
+15%	free burning
+25%	rapid burning

Sprinkler Adjustment

-30%	system conforming to NFPA 13
-50%	complete automatic system

Use	30%	
Adjustment	2400	l/min

Exposure Adjustment

Building Face	Separation	Charge
north		0%
east	10	20%
south	8	20%
west		0%
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	3,200	l/min
Fire flow	8,800	l/min
Use	**9,000**	**l/min**

Fire Flow Requirement from Fire Underwriters Survey

Building Floor Area Block 700

floor area 4,694 m^2

$F = 220C\sqrt{A}$

C	1.0	
A	934	m^2
F	6,724	l/min
use	7,000	l/min

C =

1.5	wood frame
1.0	ordinary
0.8	non-combustile
0.6	fire-resistive

Occupancy Adjustment

Use	0%	
Adjustment	0	l/min
Fire flow	7,000	l/min

-25%	non-combustile
-15%	limited combustile
0%	combustile
+15%	free burning
+25%	rapid burning

Sprinkler Adjustment

Use	30%	
Adjustment	2100	l/min

-30%	system conforming to NFPA 13
-50%	complete automatic system

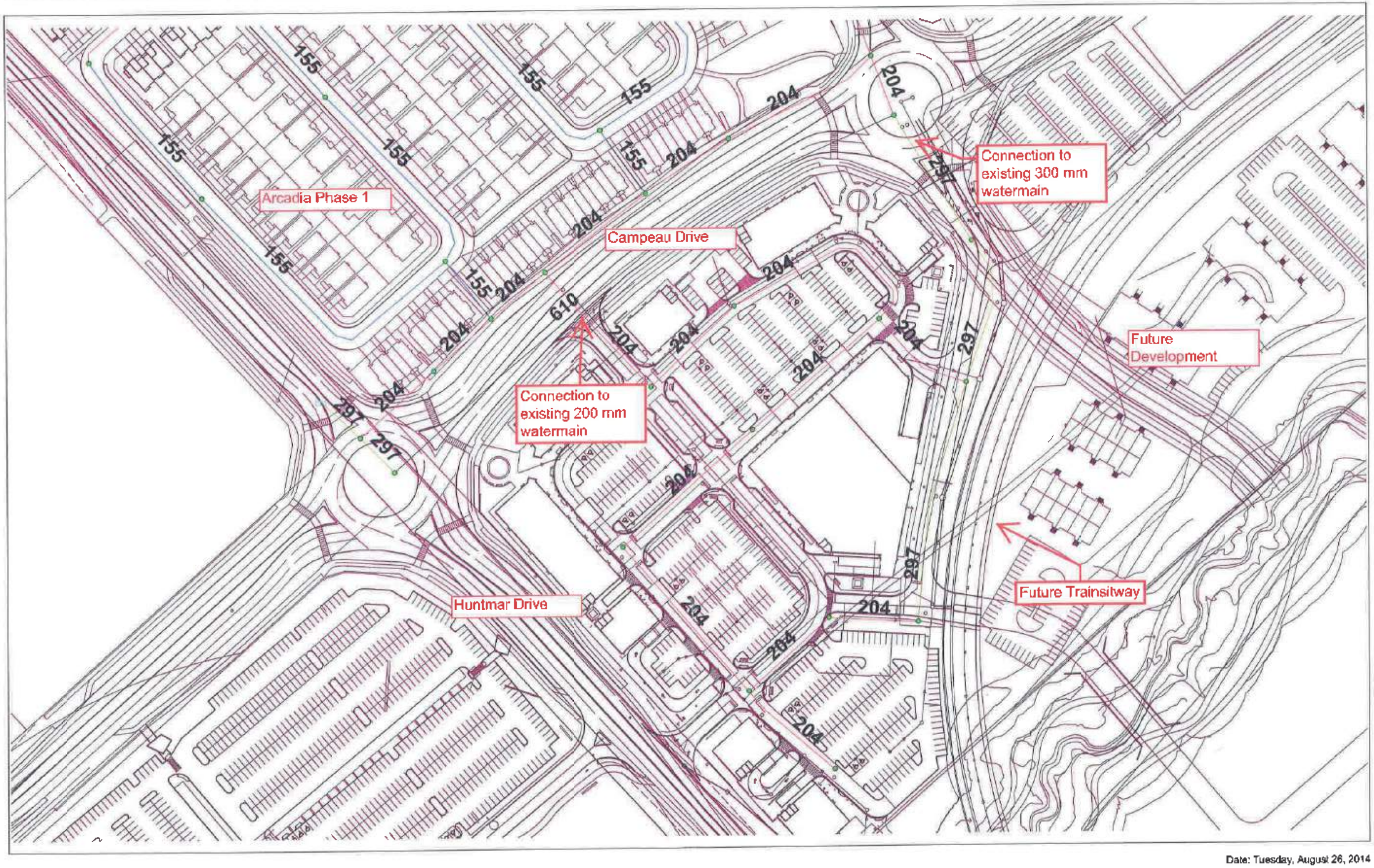
Exposure Adjustment

Building Face	Separation	Charge
north		0%
east	13	15%
south		0%
west	37	5%
Total		20%

Adjustment	1,400	l/min
Fire flow	6,300	l/min
Use	**6,000**	**l/min**

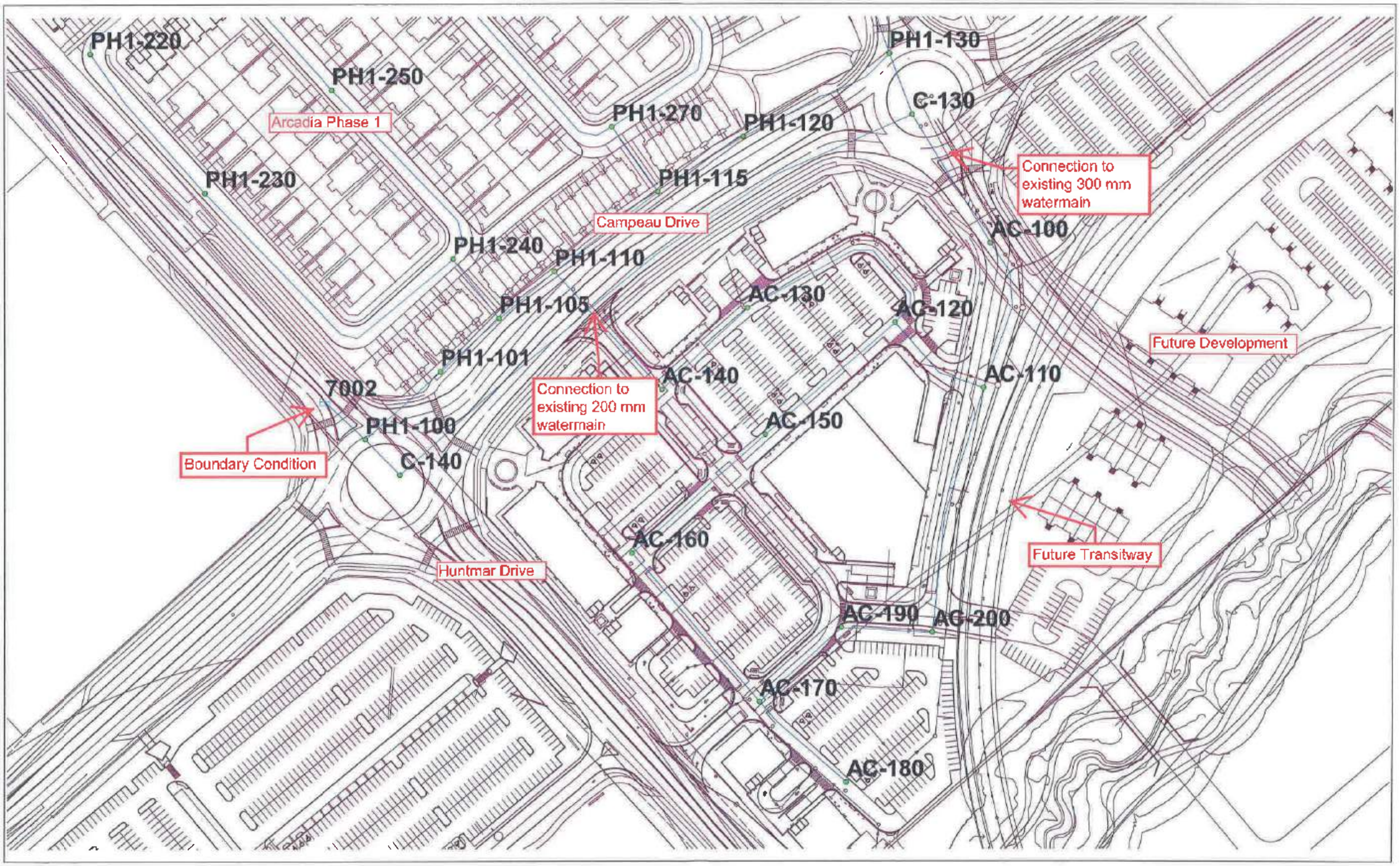
Separation	Charge
0 to 3m	+25%
3.1 to 10m	+20%
10.1 to 20m	+15%
20.1 to 30m	+10%
30.1 to 45m	+5%

ARCADIA COMMERCIAL - PIPE SIZES



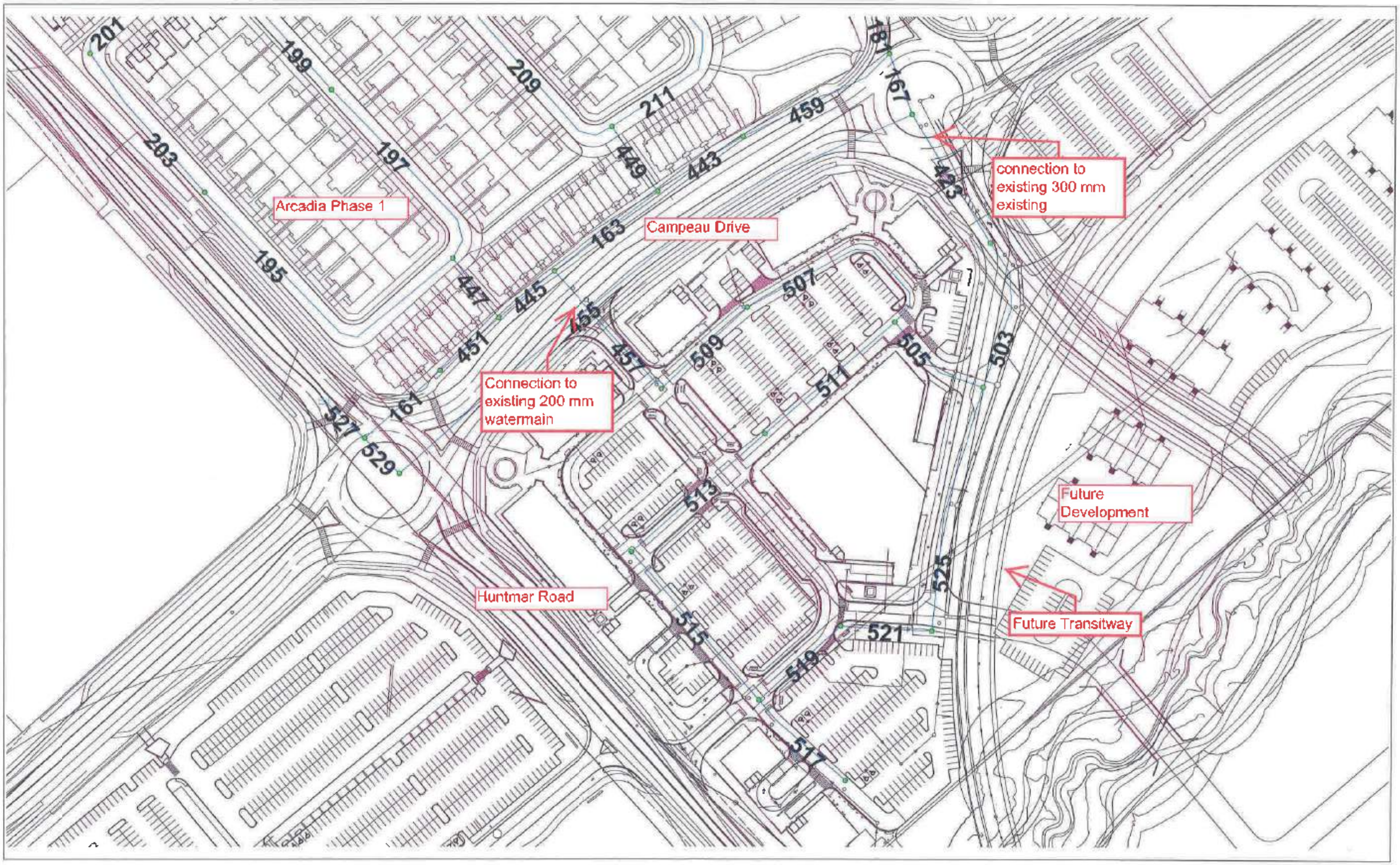
Date: Tuesday, August 26, 2014

ARCADIA COMMERCIAL - NODE ID'S



Date: Tuesday, August 26, 2014

ARCADIA COMMERCIAL - PIPE ID'S



Date: Tuesday, August 26, 2014

Basic Day HGL 163.1 m - Junction Report

		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
1	▣	AC-100	0.00	97.40	163.04	643.21
2	▣	AC-110	0.00	97.90	163.04	638.31
3	▣	AC-120	0.02	97.95	163.04	637.82
4	▣	AC-130	0.04	98.30	163.04	634.41
5	▣	AC-140	0.02	98.50	163.04	632.46
6	▣	AC-150	0.00	97.85	163.04	638.80
7	▣	AC-160	0.06	99.10	163.04	626.55
8	▣	AC-170	0.00	99.20	163.04	625.57
9	▣	AC-180	0.03	99.30	163.04	624.59
10	▣	AC-190	0.14	97.75	163.04	639.78
11	▣	AC-200	0.00	97.30	163.04	644.19
12	▣	C-130	0.00	98.10	163.04	636.35
13	▣	C-140	37.55	100.20	163.04	615.77
14	▣	PH1-100	0.04	100.25	163.06	615.53
15	▣	PH1-101	0.04	99.50	163.05	622.78
16	▣	PH1-105	0.05	99.00	163.05	627.61
17	▣	PH1-110	0.09	98.65	163.04	631.00
18	▣	PH1-115	0.09	98.20	163.04	635.39
19	▣	PH1-120	0.05	98.10	163.04	636.36
20	▣	PH1-130	0.00	97.90	163.04	638.31
21	▣	PH1-160	0.19	97.15	163.04	645.66
22	▣	PH1-170	0.20	97.25	163.04	644.68
23	▣	PH1-180	0.08	97.25	163.04	644.68
24	▣	PH1-185	0.08	96.95	163.04	647.62
25	▣	PH1-190	0.10	97.10	163.04	646.15
26	▣	PH1-200	0.18	97.15	163.04	645.67
27	▣	PH1-210	0.19	97.80	163.04	639.30
28	▣	PH1-220	0.09	99.70	163.04	620.68
29	▣	PH1-230	0.15	99.60	163.04	621.67
30	▣	PH1-240	0.10	99.70	163.04	620.72
31	▣	PH1-250	0.15	97.90	163.04	638.33
32	▣	PH1-260	0.15	97.50	163.04	642.24
33	▣	PH1-270	0.17	98.15	163.04	635.87
34	▣	PH1-280	0.17	97.20	163.04	645.17

Peak Hour HGL 155.1 m - Junction Report

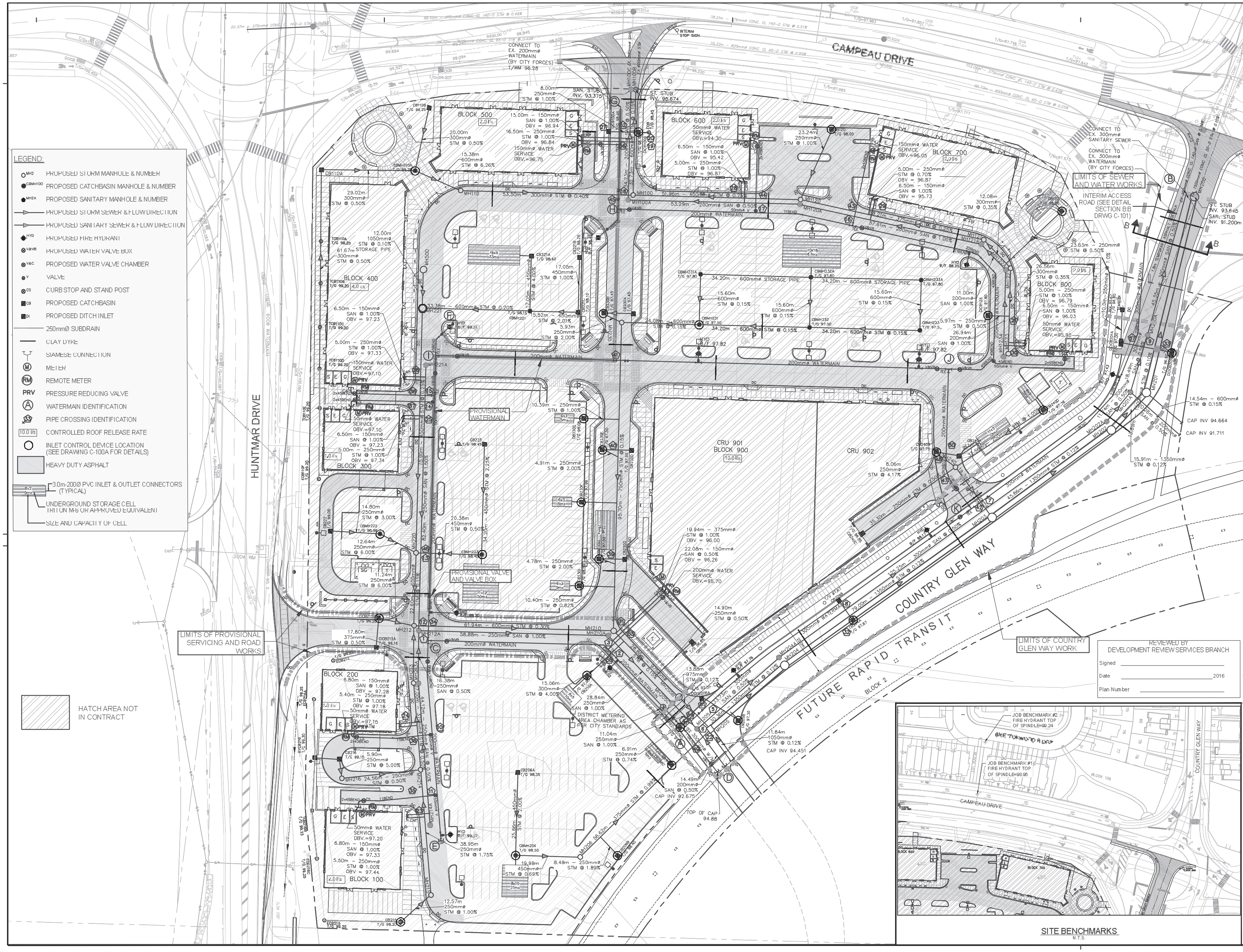
		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
1		AC-100	0.00	97.40	154.67	561.22
2		AC-110	0.00	97.90	154.67	556.32
3		AC-120	0.04	97.95	154.67	555.85
4		AC-130	0.12	98.30	154.68	552.51
5		AC-140	0.07	98.50	154.69	550.59
6		AC-150	0.00	97.85	154.67	556.83
7		AC-160	0.15	99.10	154.67	544.57
8		AC-170	0.00	99.20	154.67	543.59
9		AC-180	0.08	99.30	154.67	542.61
10		AC-190	0.37	97.75	154.67	557.79
11		AC-200	0.00	97.30	154.67	562.20
12		C-130	0.00	98.10	154.67	554.35
13		C-140	101.38	100.20	154.67	533.78
14		PH1-100	0.24	100.25	154.85	535.01
15		PH1-101	0.24	99.50	154.77	541.64
16		PH1-105	0.30	99.00	154.72	545.99
17		PH1-110	0.48	98.65	154.69	549.19
18		PH1-115	0.48	98.20	154.68	553.43
19		PH1-120	0.30	98.10	154.67	554.38
20		PH1-130	0.00	97.90	154.67	556.31
21		PH1-160	1.04	97.15	154.66	563.57
22		PH1-170	1.09	97.25	154.66	562.55
23		PH1-180	0.42	97.25	154.66	562.54
24		PH1-185	0.42	96.95	154.66	565.48
25		PH1-190	0.54	97.10	154.66	564.01
26		PH1-200	0.96	97.15	154.66	563.52
27		PH1-210	1.02	97.80	154.66	557.16
28		PH1-220	0.48	99.70	154.66	538.54
29		PH1-230	0.83	99.60	154.66	539.57
30		PH1-240	0.53	99.70	154.69	538.84
31		PH1-250	0.83	97.90	154.67	556.26
32		PH1-260	0.83	97.50	154.66	560.10
33		PH1-270	0.91	98.15	154.66	553.78
34		PH1-280	0.91	97.20	154.66	563.03

Max Day + Fire HGL 182.0 m - Fireflow Design Report

		ID	Total Demand (L/s)	Critical Node 1 ID	Critical Node 1 Pressure (kPa)	Critical Node 1 Head (m)	Adjusted Fire-Flow (L/s)	Available Flow @Hydrant (L/s)	Critical Node 2 ID	Critical Node 2 Pressure (kPa)	Critical Node 2 Head (m)	Adjusted Available Flow (L/s)	Design Flow (L/s)
1		AC-100	183.33	AC-180	486.56	147.05	805.24	814.83	AC-180	134.46	111.12	808.24	805.24
2		AC-110	183.33	AC-180	476.67	146.54	667.94	673.57	AC-180	134.24	111.80	667.94	667.94
3		AC-120	183.35	AC-120	467.20	146.83	514.49	514.49	AC-120	139.96	112.23	514.49	514.49
4		AC-130	183.30	AC-130	434.53	142.84	408.64	406.56	AC-130	139.96	112.50	408.58	408.54
5		AC-140	183.37	AC-140	438.97	143.30	424.74	424.74	AC-140	139.96	112.78	424.74	424.74
6		AC-150	183.33	AC-150	419.70	140.98	368.76	368.78	AC-150	139.96	112.13	368.78	368.76
7		AC-160	183.41	AC-180	390.76	138.89	334.83	334.84	AC-180	139.96	113.30	334.84	334.83
8		AC-170	183.33	AC-180	400.95	140.12	353.27	383.80	AC-180	139.98	113.38	353.29	353.27
9		AC-180	183.37	AC-180	307.26	130.00	253.28	253.28	AC-180	139.96	113.58	253.28	253.28
10		AC-190	183.53	AC-180	432.54	141.89	424.72	409.93	AC-190	139.96	112.03	409.93	409.93
11		AC-200	183.33	AC-180	462.20	144.47	560.25	634.74	AC-200	139.97	111.88	634.74	634.74
12		PH1-101	166.81	PH1-101	477.37	148.22	618.56	616.55	PH1-101	139.97	113.78	618.55	618.56
13		PH1-105	166.84	PH1-240	474.39	147.41	617.01	585.42	PH1-105	139.97	113.26	585.43	585.43
14		PH1-110	166.92	PH1-110	479.25	147.56	574.77	574.76	PH1-110	139.97	112.93	574.77	574.77
15		PH1-115	166.92	PH1-115	473.34	146.50	509.37	509.37	PH1-115	139.96	112.48	509.37	509.37
16		PH1-120	166.84	PH1-120	467.62	145.82	475.21	475.21	PH1-120	139.96	112.38	475.21	475.21
17		PH1-130	166.70	PH1-220	496.30	147.53	803.63	651.73	PH1-130	139.97	112.18	651.73	651.73
18		PH1-160	167.17	PH1-160	440.56	142.11	367.46	367.46	PH1-160	139.96	111.43	367.46	367.46
19		PH1-170	167.19	PH1-170	417.89	139.90	327.15	327.17	PH1-170	139.96	111.53	327.17	327.15
20		PH1-180	166.89	PH1-180	410.15	139.11	315.49	315.51	PH1-180	139.96	111.53	315.51	315.40
21		PH1-185	166.89	PH1-185	305.39	128.11	224.01	224.01	PH1-185	139.96	111.23	224.01	224.01
22		PH1-190	168.95	PH1-190	419.28	139.89	327.87	327.89	PH1-190	139.96	111.38	327.89	327.87
23		PH1-200	167.14	PH1-220	405.07	138.49	335.23	320.49	PH1-200	139.96	111.43	320.49	320.49
24		PH1-210	167.16	PH1-220	371.80	135.72	286.96	289.50	PH1-220	134.00	111.47	286.97	286.96
25		PH1-220	166.92	PH1-220	316.24	131.97	237.67	237.88	PH1-220	139.96	113.96	237.86	237.87
26		PH1-230	167.08	PH1-230	168.95	118.88	180.46	180.46	PH1-230	139.96	113.88	180.46	180.46
27		PH1-240	166.94	PH1-240	378.93	138.37	294.74	294.75	PH1-240	139.96	113.98	294.75	294.74
28		PH1-250	167.08	PH1-250	254.81	123.90	202.31	202.31	PH1-250	139.96	112.18	202.31	202.31
29		PH1-260	167.08	PH1-260	270.45	125.10	208.36	208.36	PH1-260	139.96	111.78	208.36	208.38
30		PH1-270	167.11	PH1-270	395.35	138.49	303.27	303.28	PH1-270	139.96	112.43	303.28	303.27
31		PH1-280	167.11	PH1-280	236.30	121.21	194.27	194.27	PH1-280	139.96	111.48	194.27	194.27

Peak Hour HGL 155.1 m - Pipe Report

		ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)
1	▣	161	PH1-100	PH1-101	46.85	284.00	110.00	14.49	0.44	0.07	1.60
2	▣	163	PH1-110	PH1-115	59.57	284.00	110.00	5.79	0.18	0.02	0.29
3	▣	167	PH1-130	C-130	29.61	204.00	110.00	-1.20	0.04	0.000	0.02
4	▣	181	PH1-130	PH1-160	90.83	204.00	110.00	3.27	0.10	0.01	0.10
5	▣	183	PH1-160	PH1-170	69.47	204.00	110.00	2.23	0.07	0.00	0.05
6	▣	185	PH1-170	PH1-180	85.41	204.00	110.00	1.14	0.03	0.00	0.01
7	▣	187	PH1-180	PH1-190	70.16	204.00	110.00	0.30	0.01	0.0000	0.00
8	▣	189	PH1-190	PH1-200	76.23	204.00	110.00	-0.24	0.01	0.0000	0.000
9	▣	191	PH1-200	PH1-210	69.87	204.00	110.00	-0.91	0.03	0.000	0.01
10	▣	195	PH1-230	PH1-240	152.92	155.00	100.00	-1.88	0.10	0.03	0.17
11	▣	197	PH1-250	PH1-240	101.05	155.00	100.00	-2.19	0.12	0.02	0.22
12	▣	199	PH1-250	PH1-210	88.07	155.00	100.00	1.36	0.07	0.01	0.09
13	▣	201	PH1-210	PH1-220	72.36	204.00	110.00	-0.57	0.02	0.000	0.00
14	▣	203	PH1-220	PH1-230	61.93	155.00	100.00	-1.06	0.06	0.00	0.06
15	▣	207	PH1-200	PH1-260	98.75	155.00	100.00	-0.28	0.01	0.000	0.00
16	▣	209	PH1-260	PH1-270	93.28	155.00	100.00	-1.11	0.06	0.01	0.06
17	▣	211	PH1-280	PH1-270	148.23	155.00	100.00	-0.92	0.05	0.01	0.04
18	▣	213	PH1-280	PH1-190	96.43	155.00	100.00	0.01	0.000	0.00	0.00
19	▣	215	PH1-180	PH1-185	74.29	204.00	110.00	0.42	0.01	0.000	0.00
20	▣	423	AC-100	C-130	68.35	297.00	120.00	2.25	0.03	0.000	0.01
21	▣	443	PH1-115	PH1-120	46.70	204.00	110.00	2.37	0.07	0.00	0.06
22	▣	445	PH1-105	PH1-110	33.01	204.00	110.00	9.34	0.29	0.02	0.71
23	▣	447	PH1-240	PH1-105	34.25	155.00	100.00	-4.60	0.24	0.03	0.87
24	▣	449	PH1-270	PH1-115	35.93	155.00	100.00	-2.64	0.14	0.01	0.38
25	▣	451	PH1-101	PH1-105	36.06	204.00	110.00	14.25	0.44	0.06	1.55
26	▣	455	C-130	C-140	288.14	610.00	120.00	1.05	0.00	0.0000	0.0000
27	▣	457	PH1-110	AC-140	72.77	204.00	110.00	3.08	0.09	0.01	0.09
28	▣	459	PH1-120	PH1-130	77.46	204.00	110.00	2.07	0.06	0.00	0.04
29	▣	503	AC-100	AC-110	70.63	297.00	120.00	-2.25	0.03	0.000	0.01
30	▣	505	AC-110	AC-120	51.75	204.00	110.00	-2.00	0.06	0.00	0.04
31	▣	507	AC-120	AC-130	105.72	204.00	110.00	-2.69	0.08	0.01	0.08
32	▣	509	AC-130	AC-140	54.17	204.00	110.00	-3.01	0.09	0.00	0.09
33	▣	511	AC-120	AC-150	78.22	204.00	110.00	0.85	0.03	0.000	0.01
34	▣	513	AC-150	AC-160	81.42	204.00	110.00	0.85	0.03	0.000	0.01
35	▣	515	AC-170	AC-160	89.40	204.00	110.00	-0.70	0.02	0.000	0.01
36	▣	517	AC-180	AC-170	54.29	204.00	110.00	-0.08	0.00	0.00	0.00
37	▣	519	AC-190	AC-170	60.38	204.00	110.00	-0.62	0.02	0.000	0.00
38	▣	521	AC-190	AC-200	41.61	204.00	110.00	0.25	0.01	0.0000	0.000
39	▣	525	AC-110	AC-200	113.85	297.00	120.00	-0.25	0.00	0.0000	0.000
40	▣	527	PH1-100	7002	24.69	297.00	120.00	-115.06	1.66	0.25	10.15
41	▣	529	C-140	PH1-100	22.37	297.00	120.00	-100.33	1.45	0.16	7.88

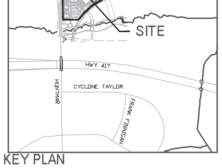


LEGEND:

MH2	PROPOSED STORM MANHOLE & NUMBER
CBMH100	PROPOSED CATCHBASIN MANHOLE & NUMBER
MH2A	PROPOSED SANITARY MANHOLE & NUMBER
──▷──	PROPOSED STORM SEWER & FLOW DIRECTION
──▷──	PROPOSED SANITARY SEWER & FLOW DIRECTION
HYD	PROPOSED FIRE HYDRANT
V&VB	PROPOSED WATER VALVE BOX
V&C	PROPOSED WATER VALVE CHAMBER
V	VALVE
CS	CURB STOP AND STAND POST
CB	PROPOSED CATCHBASIN
DI	PROPOSED DITCH INLET
──	250mmØ SUBDRAIN
----	CLAY DYKE
	SIAMESE CONNECTION
Ⓜ	METER
RM	REMOTE METER
PRV	PRESSURE REDUCING VALVE
Ⓐ	WATERMAIN IDENTIFICATION
33	PIPE CROSSING IDENTIFICATION
10.0 l/s	CONTROLLED ROOF RELEASE RATE
○	INLET CONTROL DEVICE LOCATION (SEE DRAWING C-100A FOR DETAILS)
▨	HEAVY DUTY ASPHALT
6x2 5m3	3.0m-200Ø PVC INLET & OUTLET CONNECTORS (TYPICAL) UNDERGROUND STORAGE CELL TRITON M-6 OR APPROVED EQUIVALENT SIZE AND CAPACITY OF CELL

▨ HATCH AREA NOT IN CONTRACT

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH
Signed ____________
Date ____________ 2016
Plan Number ____________



KEY PLAN

APPROVED ☐ REFUSED ☐

THIS____DAY OF____________, 20______

DERRICK MOODIE, ACTING MANAGER
DEVELOPMENT REVIEW, SUBURBAN SERVICES

No.	Description	Date	Checked
9	Revised as per City Comments	16:08:26	DGY
8	Revised Campeau Dr per Stantec Plans	16:08:03	DGY
7	Issued for Construction	16:07:13	DGY
6	Add Interim Access Rd.	16:05:16	DGY
5	Issued for Tender	16:04:05	DGY
4	Revised as per City Comments	14:10:02	DGY
3	Revised as per City Comments	14:08:22	DGY
2	Issued for SPA Resubmission	14.06.27	DGY
1	Issued for SPA	13.11.18	D.G.Y.

Issued for

All measurements and conditions must be checked on the work by the contractor.
This drawing not to be used for construction until signed.

Date

plotted J:\35355-ArcadiaComm\5.9 Drawings\59civil\layouts\C-100.dwg
Layout Name: Servicing Plan Plot Style: AIA STANDARD-FULL.CTB
Plot Scale: 1:1 Plotted At: 9/1/2016 10:37 AM Last Saved By: deturna Last Saved At: Aug. 29, 16

TN PN

2016/08/26

drawn by DPS	scale 1:500
checked by DGY	date NOV. 2013
printed	file 35355

Arcadia Retail Development
Kanata, Ontario

Minto Properties
200 Kent Street • Suite 180 • Ottawa, Ontario • K1P 0B6
Telephone: (613)782-3137 Fax: (613)782-5777

drawing title:
SITE SERVICING
PLAN
370 HUNTMAR DRIVE
OTTAWA, ON.

IBI GROUP

drawing no.
C-100

333 Preston Street Tower 1, Suite 400
Ottawa, Ontario Canada K1S 5N4 Tel
(613)225-1311 FAX (613)225-9868

D07-12-14-0014

WATERMAIN SCHEDULE

	STATION	DESCRIPTION	FINISHED	TOP OF	AS-BUILT
A	0+000.00	300Ø x 300Ø TEE	97.24	94.24	
	0+004.00	-	97.31	94.19	
	0+007.00	-	97.32	93.82	
	0+008.47	22.5° VERTICAL BEND	97.33	94.25	
	0+009.92	22.5° VERTICAL BEND	97.28	94.88	
	0+013.98	-	97.29	94.89	
	0+015.00	-	97.30	94.90	
	0+027.40	300ø x 150ø HYDRANT TEE	97.34	94.94	
	0+040.00	-	97.24	94.98	
	0+058.96	300Ø – 11 1/4° BEND	97.44	95.04	
	0+075.00	-	97.55	95.15	
	0+092.41	300Ø x 150Ø HYDRANT TEE	97.67	95.27	
	0+109.87	300ø VAC	97.77	95.37	
	0+113.60	22.5° VERTICAL BEND	97.78	95.37	
	0+113.71	22.5° VERTICAL BEND	97.79	94.48	
K	0+114.22	300ø X 200ø TEE	97.79	94.48	
	0+118.37	22.5° VERTICAL BEND	97.76	94.49	
	0+120.51	22.5° VERTICAL BEND	97.75	95.35	
	0+135.00	-	97.67	95.27	
	0+153.49	300Ø-22 ½° BEND	97.57	95.17	
	0+159.43	300Ø - 11 ¼° BEND	97.50	95.10	
	0+166.99	300Ø - 11 ¼° BEND	97.46	95.06	
	0+181.92	300Ø - 11 ¼° BEND	97.37	94.97	
	0+185.96	300Ø x 150Ø HYDRANT TEE	97.33	94.93	
	0+195.40	300Ø - 11 ¼° BEND	97.29	94.89	
	0+213.00	-	97.34	94.94	
	0+230.00	-	97.41	95.01	
B	0+245.15	EX. 300Ø CAP	97.46	95.06	
C	0+000.00	200Ø x 200ø TEE	98.23	95.83	
	0+003.50	200ø V&VB	98.12	95.72	
	0+025.00	-	98.43	96.03	
	0+050.19	200ø 45° BEND	97.62	95.22	
	0+064.88	200ø x 200ø TEE DOMESTIC SERVICE	97.57	95.17	
	0+080.32	200ø x 150ø HYDRANT TEE	97.53	95.13	
	0+083.70	200ø V&VB	97.33	94.90	
	0+088.00	200ø x 300ø REDUCER	97.28	94.88	
	0+088.13	22.5° VERTICAL BEND	97.27	94.87	
	0+090.79	22.5° VERTICAL BEND	97.25	94.25	
A	0+092.29	300ø x 300ø TEE	97.23	94.24	
	0+099.50	22.5° VERTICAL BEND	97.26	94.25	
	0+103.96	22.5° VERTICAL BEND	97.25	94.85	
	0+103.70	300Ø VAC	97.26	94.86	
D	0+107.36	300Ø CAP	97.28	94.88	
E	0+000.00	200Ø CAP	99.18	96.78	
	0+003.33	200Ø x 150Ø HYDRANT TEE	99.17	96.77	
	0+009.80	200Ø C/W 50ø TVS DOMESTIC SERVICE	99.12	96.72	
	0+029.68	200Ø C/W 50Ø TVS DOMESTIC SERVICE	99.16	96.76	
	0+045.09	200Ø - 11 ¼° BEND	99.18	96.78	
	0+054.52	200ø V&VB	99.22	96.82	
C	0+058.02	200ø x 200Ø TEE	99.23	96.83	
	0+065.80	200Ø x 150Ø HYDRANT TEE	99.21	96.81	
	0+085.00	-	99.19	96.79	
	0+100.00	-	99.17	96.77	
	0+115.00	-	99.15	96.75	
	0+132.00	200Ø C/W 50Ø TVS DOMESTIC SERVICE	99.13	96.73	
	0+134.00	200Ø x 150Ø TEE DOMESTIC SERVICE	99.13	96.73	
	0+140.92	200Ø V&VB	99.13	96.73	
I	0+146.42	200Ø x 200Ø TEE	99.13	96.73	
	0+151.50	200Ø - 45° BEND	99.10	96.70	
	0+153.50	200ø MV	99.07	96.67	
F	0+157.18	HYDRANT	99.22	96.82	
G	0+000.00	200Ø CAP	98.68	96.28	
	0+009.33	200Ø x 150Ø TEE DOMESTIC SERVICE	98.38	95.98	
	0+015.00	-	98.35	95.95	
	0+025.52	45° BEND VERTICAL BEND	98.58	96.18	
	0+026.09	45° BEND VERTICAL BEND	98.58	95.52	
	0+027.24	-	98.53	95.52	
	0+028.38	45° BEND VERTICAL BEND	98.52	95.92	
	0+028.91	45° BEND VERTICAL BEND	98.52	96.12	
H	0+031.74	200Ø x 200Ø TEE	98.45	96.05	
	0+037.84	200Ø - 45° BEND	98.36	95.96	
	0+039.33	200Ø MV	98.27	95.87	
	0+043.16	HYDRANT	98.40	96.00	
H	0+000.00	200Ø X200ø TEE	98.45	96.05	
	0+003.53	200Ø V&VB	98.43	96.03	
	0+025.00	-	98.34	95.94	
	0+042.85	200Ø C/W 50Ø TVS DOMESTIC SERVICE	98.33	95.93	
	0+058.07	200Ø - 11 ¼° BEND	98.32	95.92	
	0+073.14	200Ø x 150Ø TEE DOMESTIC SERVICE	98.09	95.69	
	0+078.14	200Ø V&VB	98.10	95.70	
	0+090.00	-	98.09	95.69	
	0+110.32	200Ø x 150ø HYDRANT TEE	98.28	95.88	
	0+110.74	200Ø - 11 ¼° BEND	98.08	95.68	
	0+113.24	200Ø – 22 ½ BEND	98.05	95.65	
	0+121.71	200Ø – 45° BEND	97.99	95.59	
	0+135.00	-	97.92	95.52	
	0+147.40	200Ø – 45° BEND	97.86	95.46	
	0+148.09	200Ø C/W 50Ø TVS DOMESTIC SERVICE	97.84	95.44	
	0+152.76	200Ø – 45° BEND	97.82	95.42	
	0+158.42	200Ø – V&VB	97.76	95.36	
J	0+162.92	200Ø X200ø TEE	97.72	95.32	
	0+168.42	200Ø – V&VB	97.72	95.32	
	0+172.13	200Ø x 150Ø HYDRANT TEE	97.73	95.33	
	0+185.00	-	97.73	95.33	
	0+205.00	-	97.73	95.33	
	0+225.00	-	97.73	95.33	
	0+240.53	200Ø x 150Ø HYDRANT TEE	97.73	95.33	
	0+255.00	-	97.71	95.31	
	0+265.51	45° BEND VERTICAL BEND	97.69	95.29	
	0+266.29	45° BEND VERTICAL BEND	97.71	94.30	
	0+268.96	45° BEND VERTICAL BEND	97.65	94.30	
	0+269.80	45° BEND VERTICAL BEND	97.75	95.35	
	0+275.00	-	97.88	95.48	
	0+300.00	-	98.53	96.13	
	0+319.53	200ø V&VB	99.04	96.64	
I	0+323.03	200Ø x 200ø TEE	99.13	96.73	
J	0+000.00	200Ø X200ø TEE	97.72	95.32	
	0+015.00	-	97.81	95.41	
	0+030.95	200Ø – 22 ½ BEND	97.80	95.40	
	0+034.23	200Ø - 11 ¼° BEND	97.80	95.39	
	0+037.14	45° BEND VERTICAL BEND	97.81	95.38	
	0+037.63	45° BEND VERTICAL BEND	97.83	95.00	
	0+039.76	-	97.90	94.70	
	0+045.04	200Ø – V&VB	98.05	94.59	
K	0+052.68	300ø x 200ø TEE	97.79	94.48	

CATCH BASIN DATA TABLE

STRUCTURE ID	AREA ID	ELEVATION			OUTLET PIPE		100 yr HEAD	FLOW (l/s)	CUSTOM IPEX TEMPEST ICD
		TOP OF GRATE	INVERT		DIAMETER (mm)	TYPE			
			INLET	OUTLET					*SEE NOTE 3.9*
CICB125	125	97.80		96.55	250	PVC DR-35	1.225	15.0	LMF
CB122	122	98.06	97.03 96.71	96.61	250	PVC DR-35	1.265	10.0	LMF
CB120	120	98.00		96.55	250	PVC DR-35	1.475	15.0	LMF
CB110B		99.25		97.75	300	PVC DR-35			
CB110A		99.25	97.60	97.45	300	PVC DR-35			
CBMH110A	110	99.35	97.45	97.35	600	PVC DR-35	1.700	40.0	HF
CICB100A		98.45		97.05	250	PVC DR-35			
CICB100B	100	98.45	96.97	96.91	250	PVC DR-35	1.515	30.0	LMF
CBMH233A		97.80		95.64	600	CONC			
CBMH233		97.50	95.62	95.56	600	CONC			
CBMH232A		97.80	96.77 96.37	95.57	600	CONC			
CBMH232		97.50	95.51	95.49	600	CONC			
CBMH231A		97.80		95.46	600	CONC			
CBMH231	231	97.50	95.44	95.14	600	CONC	2.264	150.0	HF
CICB230A		97.45		96.00	250	PVC DR-35			
CICB230B	230B	97.45	95.92	95.79	250	PVC DR-35	1.715	70.0	HF
CB230C	230C	98.08	97.05 96.73	96.63	250	PVC DR-35	1.395	10.0	LMF
CB230D		97.50		96.05	250	PVC DR-35			
CB230E	230D	97.50	95.97	95.85	250	PVC DR-35	1.679	67.0	HF
CB230F	230F	97.99	96.96 96.64	96.54	250	PVC DR-35	1.535	38.0	HF
CB230G		97.50		96.05	250	PVC DR-35			
CB230H	230G	97.50	95.97 96.47(N) 96.07(N)	95.84	250	PVC DR-35	1.710	53.0	HF
CB230I	230I	98.09	97.06 96.74	96.64	250	PVC DR-35	1.435	11.0	LMF
CB221A		98.40	97.37 96.97	96.75	450	CONC			
CB221B		98.25		96.50	450	CONC			
CB221C		98.10	96.33	96.33	450	CONC			
CBMH221		98.11	96.02	95.87	600	CONC			
MH221	221	99.22	95.80	95.58	450	CONC	2.349	85.0	HF
CB222		99.05		97.60	250	PVC DR-35			
CBMH222	222	98.90	97.10	96.58	250	PVC DR-35	2.440	15.0	LMF
CB223		98.45		96.80	450	CONC			
CBMH223	223	98.45	96.03 97.42(S) 97.02(S)	95.81	450	CONC	2.669	32.0	HF
CICB212A		99.16		97.71	250	PVC DR-35			
CICB212B	212	99.16	97.62	97.50	250	PVC DR-35	1.626	24.0	LMF
CB215	215	99.20		97.75	250	PVC DR-35	1.575	10.0	LMF
RYCB216		99.30		97.50	250	PVC DR-35			
CB216		99.15		97.17	250	PVC DR-35			
MH216		99.29	96.88	96.82	250	PVC DR-35			
CB210A	210A	97.90	96.87 96.50	96.40	300	PVC DR-35	1.550	77.0	HF
CB210B		96.85		95.40	250	PVC DR-35			
CB206A		98.35		96.70	450	PVC DR-35			
CBMH206	206A	98.50	96.39 97.47(S) 97.07(S)	95.96	450	CONC	2.413	85.0	HF
MH206		98.58	95.82	95.67	375	PVC DR-35			
CB206B	206B	98.40		96.95	250	PVC DR-35	1.575	10.0	LMF
CB206C	206C	98.40	97.37 97.05	96.95	250	PVC DR-35	1.475	14.0	LMF
CB206D	206D	97.34		95.89	250	PVC DR-35	1.465	60.0	HF
CB205A		97.37		95.92	250	PVC DR-35			
CB205B	205	97.30	95.80	95.68	250	PVC DR-35	1.680	60.0	HF
CB204B		97.67		96.25	250	PVC DR-35			
CB204A	204	97.67	96.10	96.04	250	PVC DR-35	1.510	55.0	HF
CB240A		97.75	96.72 96.40	96.30	250	PVC DR-35			
CB240B	240A	97.75	96.20	96.07	250	PVC DR-35	1.652	10.0	LMF
CB240C		96.85		95.40	250	PVC DR-35			
CB240D	240D	97.76	96.73 96.43	96.31	250	PVC DR-35	1.465	10.0	LMF
DCB201A		97.02		95.57	250	PVC DR-35			
DCB201B	201	97.02	95.42	95.30	250	PVC DR-35	1.707	60.0	HF

CROSSING SCHEDULE

Location	Below Pipe		Above Pipe		Difference	Location	Below Pipe		Above Pipe		Difference
	Size (mm)	Obvert	Size (mm)	Invert	(m)		Size (mm)	Obvert	Size (mm)	Invert	(m)
1	250Ø SAN	94.41	200Ø W/M	96.65	2.20	30	150Ø SAN	95.98	300Ø STM	96.55	0.49
2	250Ø SAN	93.68	250Ø STM	95.95	2.23	31	975Ø STM	95.61	150Ø SAN	96.01	0.27
3	250Ø SAN	93.33	200Ø W/M	93.85	0.50	32	1350Ø STM	95.44	250Ø STM	95.97	0.37
4	250Ø SAN	93.69	300Ø W/M	96.16	2.42	33	1500Ø STM	95.23	250Ø STM	95.63	0.25
5	300Ø SAN	92.80	250Ø STM	95.67	2.79	34	600Ø STM	95.78	200Ø W/M	96.62	0.73
6	300Ø SAN	92.82	975Ø STM	94.57	1.55	35	250Ø STM	96.74	50Ø W/M	97.35	0.57
7	300Ø SAN	92.24	300Ø STM	95.07	2.69	36	375Ø STM	96.54	50Ø W/M	97.15	0.52
8	300Ø SAN	92.50	250Ø STM	96.00	3.43	37	450Ø STM	96.00	50Ø W/M	96.75	0.68
9	300Ø SAN	91.78	250Ø STM	95.68	3.83	38	450Ø STM	96.01	150Ø W/M	96.65	0.57
10	250Ø SAN	94.79	50Ø W/M	97.35	2.52	39	675Ø STM	95.64	250Ø STM	95.91	0.15
11	250Ø SAN	94.69	50Ø W/M	97.15	2.41	40	675Ø STM	95.70	250Ø STM	95.99	0.18
12	250Ø SAN	94.52	600Ø STM	95.19	0.54	41	200Ø W/M	94.30	675Ø STM	95.06	0.65
13	250Ø SAN	94.86	450Ø STM	95.50	0.55	42	300Ø W/M	94.48	300Ø STM	95.04	0.56
14	250Ø SAN	95.56	50Ø W/M	96.73	1.12	43	150Ø W/M	95.63	375Ø STM	96.21	0.50
15	250Ø SAN	95.59	150Ø W/M	96.63	0.99	44	50Ø W/M	95.42	450Ø STM	96.03	0.53
16	250Ø SAN	94.95	150Ø W/M	95.47	0.50	45	200Ø W/M	95.60	300Ø STM	96.10	0.50
17	250Ø SAN	94.68	50Ø W/M	95.35	0.63	46	450Ø STM	96.10	200Ø W/M	96.78	0.68
18	250Ø SAN	93.30	300Ø STM	96.09	2.68	47	200Ø W/M	94.70	250Ø STM	95.23	0.50
19	250Ø SAN	93.23	250Ø STM	96.99	3.72	48	200Ø W/M	95.40	250Ø STM	95.90	0.50
20	250Ø SAN	93.21	250Ø STM	96.44	3.19	49	300Ø W/M	94.35	375Ø STM	95.23	0.79
21	250Ø SAN	95.91	250Ø STM	96.57	0.62	50	200Ø W/M	95.45	250Ø STM	96.26	0.79
22	250Ø SAN	92.91	375Ø STM	95.19	2.18	51	300Ø W/M	94.89	250Ø STM	95.71	0.79
23	250Ø STM	96.83	150Ø SAN	97.13	0.26	52	200Ø W/M	96.24	250Ø STM	97.02	0.78
24	375Ø STM	96.52	150Ø SAN	97.07	0.47	53	975Ø STM	95.60	200Ø W/M	96.15	0.50
25	450Ø STM	95.99	150Ø SAN	97.03	0.97	54	300Ø W/M	94.01	975Ø STM	94.57	0.50
26	450Ø STM	96.02	150Ø SAN	97.03	0.94	55	200Ø W/M	95.16	250Ø STM	96.15	0.97
27	200Ø W/M	95.98	150Ø SAN	96.67	0.69	56	200Ø W/M	95.97	250Ø STM	96.47	0.50
28	150Ø SAN	95.36	450Ø STM	96.02	0.59	57	300Ø W/M	94.89	250Ø STM	95.71	0.80
29	150Ø SAN	95.68	375Ø STM	96.23	0.47						

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ____________________

Date ____________________ 2016

Plan Number ____________________

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 PELLOW + ASSOCIATES ARCHITECTS INC.FOR SITE PLAN LAYOUT.

1.9 REFER TO LANDSCAPE ARCHITECTURAL DRAWINGS FOR SURFACE FEATURES DETAILS.

1.10 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.

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

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

1.13 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.

1.14 ALL CONSTRUCTION TRAFFIC TO ACCESS SITE FROM CAMPEAU DRIVE.

1.15 FOR DETAILS OF TEST PITS SEE GEOTECHNICAL REPORT.

1.16 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.

1.17 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.

1.18 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.

1.19 CONTRACTOR TO HAUL EXCESS MATERIAL OFF SITE 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.

1.20 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.

1.21 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.

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

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

1.24 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.

1.25 ALL PIPE BEDDING TO BE OPSS GRANULAR 'A' PLACED A MINIMUM OF 300mm BELOW SEWER AND WATER PIPES AND COMPACTED TO SPRING LINE. BEDDING AND COVER MATERIAL AS PER RECOMMENDATIONS FROM GEOTECHNICAL ENGINEER.

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:
250mm Ø AND SMALLER - PVC DR 28
300mm Ø AND LARGER - CONC. CL. 140-D

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.

Commercial—Storm STRUCTURE TABLE

NAME	RIM ELEV.	INVERT IN	INVERT OUT	DESCRIPTION
MH100	98.51	NE95.873 SW96.023	NW95.723	1200ø OPSD 701.010
MH100B	98.58	SE95.674	NW95.674	1200ø OPSD 701.010
MH110	98.95	W96.387	NE96.237	1200ø OPSD 701.010
MH120	98.24	NE96.108 N96.318	SW96.003	1200ø OPSD 701.010
MH121	98.17	E96.329	SW96.254	1200ø OPSD 701.010
MH122	98.24	SE96.401	W96.371	1200ø OPSD 701.010
MH123	97.97		NW96.494	1200ø OPSD 701.010
MH200	97.80	SE93.680	NW93.670	2400ø OPSD 701.013
MH201	97.27	S93.892 E94.642	NW93.742	2400ø OPSD 701.013
MH202	97.38	S93.931	N93.911	2400ø OPSD 701.013
MH203	97.94	S93.996 W95.011	N93.986	2400ø OPSD 701.013
MH204	97.57	S94.101	N94.091	2400ø OPSD 701.013
MH205	97.43	W94.512 E94.437 S95.112	N94.137	1524x1829mm Rectangular Metric
MH205B	97.47	W94.538	E94.528	1800ø OPSD 701.012
MH206	98.59	SW95.824	N95.674	1200ø OPSD 701.010
MH210	97.78	SW94.957 NW94.807	E94.582	1500ø OPSD 701.011
MH212	99.30	SE95.927 NW95.202 SW96.824	NE95.142	1200ø OPSD 701.010
MH213	99.27	SE96.036	NW96.016	1200ø OPSD 701.010
MH214	99.19	SE96.296 SW96.696	NW96.171	1200ø OPSD 701.010
MH215	99.30	S97.624	NW96.978	1200ø OPSD 701.010
MH216	99.29	NW96.879	NE96.819	1200ø OPSD 701.010
MH220	99.12	NW95.386 W95.826 NE95.704	SE95.236	1200ø OPSD 701.010
MH221	99.22	NE95.801 NW95.596	SE95.576	1800ø OPSD 701.012
MH230	97.56	NE95.100 W95.676	SE94.950	1200ø OPSD 701.010
MH240	97.86	S95.224 N95.984 W95.737	E95.089	1200ø OPSD 701.010
MH500	99.21		SE95.608	1800ø OPSD 701.012

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 : 375mm Ø AND SMALLER - PVC DR 35
450mm Ø AND LARGER - CONC. CL 100-D

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 AND CBMH'S TO BE OPSD, SIZE AS SPECIFIED, TAPER TOP FOR MH AND FLAT TOP FOR CBMH, UNLESS OTHERWISE NOTED.

3.5 ALL CATCH BASINS TO BE AS PER OPSD 705.010, FRAME & FISH TYPE GRATE AS PER CITY OF OTTAWA STD. S19.1, ALL CB LEAD PIPES TO BE 250mm DIAMETER PVC DR 35 @ 1.00% SLOPE WITH OUTLET INVERT AT 1.45m BELOW TOP OF GRATE, UNLESS OTHERWISE NOTED.

3.6 150mm DIAMETER SOCK-WRAPPED PERFORATED PVC SUBDRAINS TO BE INSTALLED AT ALL CB'S, EXTEND 3.0m FROM 4 SIDES OF CB. WHERE CB IS ADJACENT TO CURB EXTEND SUBDRAIN 3.0m IN EACH DIRECTION ALONG CURB.

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 ICD'S (OR EQUIVALENT)SHOP DRAWINGS BASED ON HEAD AND FLOW RATE SPECIFIED IN CB DATA TABLE, FOR ENGINEERS REVIEW PRIOR TO ORDERING ICD'S.

3.10 CONTRACTOR TO PROVIDE TRITON M-6 STORAGE CELL (OR EQUIVALENT) SHOP DRAWING BASED ON VOLUME SPECIFIED FOR ENGINEERS APPROVAL PRIOR TO ORDERING MATERIAL.

4.0 WATER

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

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

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

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

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

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

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

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

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

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 ANY DITCHES DISTURBED DURING SERVICING AND GRADING OPERATIONS ARE TO BE REINSTATED TO THEIR ORIGINAL CONDITION AND FLOWLINE GRADES.

5.12 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 OFF SITE 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.

Commercial—Sanitary STRUCTURE TABLE

NAME	RIM ELEV.	INVERT IN	INVERT OUT	DESCRIPTION
BLK100A	99.58		NE97.184	BLDG SERVICE
BLK200A	99.44		NE97.126	BLDG SERVICE
BLK300A	99.43		NE97.081	BLDG SERVICE
BLK400A	99.40		NE97.077	BLDG SERVICE
BLK600A	98.68		SE95.265	BLDG SERVICE
BLK700A	98.43		SE95.580	BLDG SERVICE
BLK800A	98.28		SW95.878	BLDG SERVICE
BLK900A	97.99			BLDG SERVICE
MH100A	98.50	NE94.283	NW93.061	OPSD 701.010
MH100C	94.42	SE92.890		OPSD 701.010
MH120A	98.21	NE94.580	SW94.550	OPSD 701.010
MH121A	98.13	E95.356	SW95.156	OPSD 701.010
MH122A	98.06	SE95.566	W95.466	OPSD 701.010
MH123A	97.93		NW95.835	OPSD 701.010
MH200A	97.18	SE91.457	NW91.427	OPSD 701.010
MH201A	97.30	S91.579 E91.609	NW91.549	OPSD 701.010
MH202A	97.45	S91.668	N91.638	OPSD 701.010
MH204A	97.66	S92.324	N92.294	OPSD 701.010
MH205A	97.49	W92.972 E92.603	N92.493	OPSD 701.010
MH205C	97.55	W93.112	E93.082	OPSD 701.010
MH210A	97.82	SW93.530	E93.400	OPSD 701.010
MH212A	99.24	SE94.179 NW94.179	NE94.119	OPSD 701.010
MH213A	99.23	SE94.291	NW94.261	OPSD 701.010
MH214A	99.25		NW94.512	OPSD 701.010
MH221A	99.18		SE95.415	OPSD 701.010

PAVEMENT STRUCTURE

LIGHT DUTY

50mm 12.5 SUPERPAVE
150mm GRANULAR 'A'
400mm GRANULAR 'B' TYPE II

HEAVY DUTY

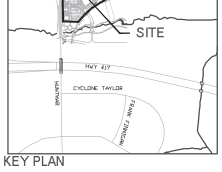
40mm 12.5 SUPERPAVE
50mm 19.0 SUPERPAVE
150mm GRANULAR 'A'
450mm GRANULAR 'B' TYPE II

COUNTRY GLEN WAY

40mm 12.5 SUPERPAVE
50mm 19.8 SUPERPAVE
50mm 19.8 SUPERPAVE
150mm GRANULAR 'A'
450mm GRANULAR 'B' TYPE II

INTERIM ACCESS ROAD

40mm 12.5 SUPERPAVE
50mm 19.8 SUPERPAVE
150mm GRANULAR 'A'
400mm GRANULAR 'B' TYPE II



KEY PLAN

APPROVED ☐ REFUSED ☐

THIS____DAY OF ____________ , 20______

DERRICK MOODIE, ACTING MANAGER
DEVELOPMENT REVIEW, SUBURBAN SERVICES

No.	Description	Date	Checked
8	Revised as per City Comments	16:08:26	DGY
7	Issued for Construction	16:07:13	DGY
6	Revised per Interim Access Road	16:05:16	DGY
5	Issued for Tender	16:04:05	DGY
4	Revised as per City Comments	14:10:02	DGY
3	Revised as per City Comments	14:08:22	DGY
2	Issued for SPA Resubmission	14.06.27	DGY
1	Issued for SPA	13.11.18	DGY

Issued for

All measurements and conditions must be checked on the work by the contractor. This drawing not to be used for construction until signed.

Date

plotted J:\35355-ArcadiaComm\5.9 Drawings\59civil\layouts\C-100A.dwg Layout Name: Detail Sheet Plot Style: AIA STANDARD-FULL.CTB Plot Scale: 1:1 Plotted At: 9/1/2016 10:40 AM Last Saved By: delurna Last Saved At: Aug. 29, 16

2016/08/26

drawn by DPS
checked by DGY
printed

scale 1:500
date NOV. 2013
file 35355

Arcadia Retail Development
Kanata, Ontario

Minto Properties
200 Kent Street • Suite 180 • Ottawa, Ontario • K1P 0B6
Telephone: (613)782-3137 Fax: (613)782-5777

drawing title:
DETAILS AND SCHEDULES
370 HUNTMAR DRIVE
OTTAWA, ON.

IBI GROUP

drawing no.
C-100A

333 Preston Street Tower 1, Suite 400
Ottawa, Ontario Canada K1S 5N4 Tel
(613)225-1311 FAX (613)225-9868

D07-12-14-0014

APPENDIX B

Economy (E) 25%

The reconstruction of the Signature Ridge Pumping Station is significantly more than the costs to upgrade the existing station.

Caring and Healthy Community (CHC) 25%

In terms of the impact on the Community, there are no significant differences between the two alternatives.

Natural Environment (NE) 14%

There are no significant differences between the two options with respect to impacts to the natural environment. Both alternatives require the construction of an emergency overflow to the Carp River. Impacts to surface water quality as a result of potential station overflows during an emergency situation are not expected to occur. Should an overflow occur for either alternative, the impacts would be mitigated by a SWM pond. Increases in CO_2 emissions as a result of the use of diesel generators during power failures or maintenance procedures will be negligible and are similar in both alternatives.

4.2.6.3 Selection of Preferred Signature Ridge Pumping Station Alternative

Based on the above evaluation, the Signature Ridge Pumping Station Alternative I, station upgrade, is selected as the preferred alternative. This alternative maximizes the use of existing infrastructure and offers the most flexibility in phasing of the works with the least amount of capital expenditure or impacts.

4.2.6.4 Summary

The preferred alternatives selected for the wastewater outlet, the internal servicing system, the temporary forcemain, the trunk sewer alignment, and the Signature Ridge Pumping Station have been used to develop a comprehensive wastewater servicing plan for the KWCP. This servicing plan is discussed in future detail in the following section of this report.

4.3 Preferred Sanitary Sewer Servicing Plan

Section 4.2 has detailed the selection of preferred alternatives for the major infrastructure required to provide sanitary sewer service to the KWCP. These preferred alternatives have been used to develop a Master Sanitary Servicing Plan for the area. This plan is illustrated on **Drawing S-1** (appended to this report). The major features of this plan are:

(i.) An upgraded Signature Ridge Pumping Station (SRPS) to service all the KWCP lands north of the Queensway, the existing urban area north of the Queensway currently proposed to drain to the SRPS, and the Broughton/Richardson Interstitial lands. A spreadsheet detailing the exact areas and flows tributary to the SRPS is included in **Figure 4.2-1**.

The 400 l/sec peak flow capacity identified in **Figure 4.2-1** for the upgraded SRPS, is consistent with the findings of the R.V. Anderson Report titled "Signature Ridge Pumping Station Upgrades Feasibility Study".

SANITARY SEWER DESIGN SHEET
PROJECT : Kanata West Serviceability Study
LOCATION : CITY OF OTTAWA

PAGE 1 OF 1
PROJECT: [illegible]
DATE: [illegible]
DESIGN: [illegible]
FILE: [illegible]

MODEL 1 ULTIMATE (population based criteria, ICI simultaneous peaking)

LOCATION				TOTAL AREA	RESIDENTIAL							EMPLOYMENT/RETAIL/BUSINESS PARK/OPEN SPACES							INFILTRATION				TOTAL FLOW	PROPOSED SEWER						HARMON PF	ACTUAL q/Q	v/V	ACTUAL VELOCITY
STREET	FROM MH	TO MH		(Ha)	APPLIC AREA (Ha)	UNIT/Ha	TOTAL UNITS	POPULATION INDIV	POPULATION ACCUM	PEAK FACTOR	PEAK FLOW (l/s)	APPLIC AREA (Ha)	ACCUM AREA (Ha)	TOTAL AREA (Ha)	FLOW RATE (l/Ha/d)	PEAK FLOW INDIV (l/s)	PEAK FLOW ACCUM (l/s)	PEAK FLOW TOTAL (l/s)	AREA (Ha) INDIV	AREA (Ha) CUMUL	TOTAL CUMUL	PEAK FLOW (l/s)	(l/s)	CAPACITY l/s	VELOCITY (full) m/s	LGTH. (m)	PIPE (mm)	GRADE %	AVAIL. CAP. (%)				(m/s)
Campeau Drive Trunk Sewer	1	2	Area 1 (PBP)	38.11								38.11	38.11		35000	23.16	23.16		38.11	38.11													
			Area 2 (PBP)	27.29								27.29	65.40		35000	16.58	39.74		27.29	65.40													
			Area 3 Ext Employment	14.05								14.05	79.45		50000	12.20	51.94		14.05	79.45													
			Area 4 HP Employment	10.93								10.93	90.38	90.38	50000	9.49	61.42	61.42	10.93	90.38	90.38	25.31	86.73	283.79	1.27	525.0	525	0.40	69.44%		0.308	[illegible]	[illegible]
	2	3	Area 5 Residential	29.19	29.19	19	555	1664	1664	3.65	24.58			90.38				61.42	29.19	29.19										3.65			
			Area 9 Ext Employment	8.45							24.58	8.45	8.45	98.83	50000	7.34	7.34	68.76	8.45	128.02	128.02	35.85	129.18	286.61	0.98	700.0	600	0.20	54.93%		[illegible]	0.830	0.815
	14	3	Area 6/8 Ext Employment	16.65								16.65	16.65		50000	14.45	14.45		16.65	16.65													
			Area 7 HP Employment	-5.48								5.48	22.13	22.13	50000	4.76	19.21	19.21	5.48	22.13	22.13	6.20	25.41	148.74	0.91	910.0	450	0.25	82.92%		0.171	0.610	0.571
	3	4							1664	3.65	24.58	0.00	0.00	120.96		0.00	0.00	87.97	0.00	0.00	150.15	42.04	154.59	392.29	1.06	300.0	675	0.20	60.59%	[illegible]	[illegible]	0.790	[illegible]
	4A	4	Area 10 Residential	27.86	27.86	19	529	1588	1588	3.66	23.55								27.86	27.86	27.86	7.80	31.36	148.74	0.91	750.0	450	0.25	78.92%	[illegible]	[illegible]	0.640	0.598
	4	5	14 Mixed Use	4.13	1.76	50	88	263	3515	3.38	48.17	2.37	2.37	123.33	35000	1.44	1.44	89.41	4.13	4.13	182.14	51.00	188.58	392.29	1.06	450.0	675	0.20	51.93%	[illegible]	[illegible]	0.840	[illegible]
	Queenswa	5	Area 13 Community Retail	6.35								6.35	6.35	6.35	35000	3.86	3.86	3.86	6.35														
			Area 11/12 Mixed Use	11.80	5.02	50	251	752	752	3.88	11.81	6.79	13.14	13.14	35000	4.12	7.98	7.98	11.80	18.15	18.15	5.08	34.88	43.88	0.87	420.0	250	0.50	43.31%	[illegible]	[illegible]	0.880	0.782
	5	5A	Area 15 Community Retail	3.88				0	4267	3.31	57.19	3.88			35000	2.36			3.88											3.31			
First Line Road Sewer			Area 44	25.54							57.19	25.54	29.42	165.89	35000	15.52	17.88	115.27	25.54	29.42	229.71	64.32	236.77	519.43	1.14	300.0	750	0.20	54.42%		0.458	[illegible]	0.845
				229.71							57.19							115.27				64.32	236.77										
Signature Ridge		5A	Area 100 Residential	90.20	90.20	19	1714	5141	5141	3.23	67.35	0.00																		[illegible]			
Signature Ridge		5A	Area 100 Non-Residential	4.88							67.35	4.88	4.88	4.88	50000	4.24	4.24	4.24	95.08	95.08	95.08	26.62	98.21										
Intersticial Lands & Broughton/Richardson		5A																					65.00										
Total To SRPS	**5A**	**SRPS**		**324.79**	**154.02**		**9136**		**9489**		**124.54**	**170.77**						**119.51**			**324.79**	**90.94**	**399.98**	**580.51**	**1.27**	**30.0**	**750**	**0.25**	**31.10%**	[illegible]	[illegible]	[illegible]	[illegible]
Palladium Drive Trunk Sewer	6	7	Area 32 (PBP)	57.03								57.03	57.03		50000	49.51	49.51		57.03	57.03													
			Area 32A Park	8.34								8.34	65.37		0	0.00	49.51		8.34	65.37													
			Area 33/34 Ext Employment	54.85								54.85	120.22	120.22	50000	47.61	97.12	97.12	54.85	120.22	120.22												
	7	8	Area 37 Mixed Use	36.70	15.60	50	780	2340	2340	3.53	33.47	21.10	21.10	141.32	50000	18.32	18.32	115.44	36.70	36.70	156.92	43.94	192.85	455.83	1.23	925.0	675	0.27	57.69%	[illegible]	0.423	0.810	1.400
				156.92	15.60		780		2340		33.47	141.32						115.44	156.92		156.92	43.94	192.85							3.53			
Corel Centre Etc. (Existing Sewer) *		16	Area 35 HP Employment	6.05								6.05	6.05		30000	3.15	3.15		6.05														
		16	Area 36 (Corel Centre)																			30.00											
		16	Area 38 Exten Employment	20.15								20.15	26.20	26.20	14400	5.04	8.19	[illegible]	20.15	26.20	26.20	7.34	45.52				Existing						
First Line Road Sewer	15	16	Area 40 Employment	14.59								14.59	14.59		35000	8.87	8.87		14.59	14.59													
			Area 41 Employment	11.97								11.97	26.56		35000	7.27	16.14		11.97	26.56													
			Area 42 Employment	20.66								20.66	47.22		35000	12.55	28.69		20.66	47.22													
			Area 43 Employment	28.89								28.89	76.11	76.11	35000	17.55	46.25	46.25	28.89	76.11	76.11	21.31	67.56	224.35	1.00	525.0	525	0.25	69.89%		0.301	0.730	[illegible]
Carp River Trunk	16	8	Nothing To Add	102.31	15.60		780		2340	3.53	33.47	102.31	102.31	102.31	0	0.00	54.44	54.44	0.00	102.31	102.31	28.65	113.08	286.61	0.98	400.0	600	0.20	60.54%	3.53	[illegible]	0.790	0.776
Carp River Trunk	8	10A	Nothing To Add	259.23	15.60		780		2340		33.47	0.00	0.00	243.63		0.00	0.00	169.87	0.00	139.01	259.23	109.92	305.93	579.95	1.05	550.0	[illegible]	0.15	47.25%	3.53	[illegible]	[illegible]	0.904
Marle Grove Road Trunk Sewer	9	10	Area 18/19 Exist. Residential	23.34	23.34	19	443	1330	1330										23.34	23.34										3.72			
			Area 22/26/27 Residential	79.32	79.32	30	2380	7139	8469	3.03	103.82								79.32	102.66	102.66	28.74	132.56	405.11	1.39	775.0	400	0.40	67.28%	[illegible]	0.527	0.740	[illegible]
Hazeldean/Huntmar Trunk Sewer	11	12	Area 16/20 Residential	99.01	99.01	19	1881	5644	5644	3.20	73.06								99.01	99.01										3.20			
			Area 16/20 Commercial	33.50								33.50	33.50	33.50	50000	29.08	29.08	29.08	33.50	132.51													
			Area 16/20 Open Space	14.13								14.13							14.13	146.64													
			Area 17 Ex. Commercial	3.44							73.06	3.44	36.94	36.94	35000	2.09	31.17	31.17	3.44	150.08	150.08	42.02	146.26	554.82	1.50	775.0	675	0.40	73.64%		0.264	0.700	[illegible]
	12	10	Area 21 Exist. Employment	10.89								10.89	10.89	10.89	50000	9.45	9.45		10.89	10.89													
			Area 19A Exist Residential	6.63	6.63	19	126	378									9.45		6.63	17.52													
			Area 23/24 Community Retail	17.61								17.61	28.50	28.50	35000	10.70	20.15	[illegible]	17.61	35.13													
			Area 28/30 Residential	27.10	27.10	30	813	2439	8460	3.03	103.72	0.00	0.00	65.44				[illegible]	27.10	62.23	212.31	59.45	214.49	519.43	1.14	950.0	750	0.20	58.71%	3.03	[illegible]	0.800	0.911
Marle Grove Road Trunk Sewer	10	10A	Area 39 Mixed Use	21.13	8.98	50	449	1347				12.15	12.15	77.59	35000	7.38	7.38	18.71	21.13														
			Area 29 Residential	15.00	15.00	30	450	1350	19627	2.66	211.54							38.71	15.00	36.13	351.10	98.31	368.56	669.89	1.21	1000.0	[illegible]	0.20	44.98%	2.66	0.550	[illegible]	[illegible]
Carp River Trunk Sewer	13	10A	Area 25 Community Retail	20.24								20.24	20.24	20.24	35000	12.30	12.30	12.36	20.24														
			Area 31 residential	38.72	38.72	30	1162	3485	3485	3.39	47.30							13.30	38.72	58.96	58.96	16.51	76.61	320.17	1.10	1000.0	[illegible]	0.25	76.07%	[illegible]	[illegible]	0.680	0.746
		10A	Area 31A (PBP)	0.75								0.75	0.75	0.75	50000	0.65	0.65	0.65	0.75	0.75	0.75	0.21	0.86	36.69	0.72	100.0	250	0.35	97.65%		0.023	[illegible]	0.246
Pumping Station 2 to KWPS	**10A**	**KWPS**		**670.04**	**313.70**		**8484**		**15451**		**292.82**	**356.34**						**241.53**			**670.04**	**224.95**	**759.29**	**1273.71**	**1.43**	**30.0**	**1050**	**0.20**	**40.39%**	[illegible]	[illegible]	[illegible]	[illegible]
STUDY TOTALS				994.83	467.72		11620		34860			527.11																		2.41			

Average Daily Per capita Flow Rate =	350 l/cap/d
Infiltration Allowance Flow Rate =	0.28 l/s/ha

Residential Peaking Factor = 1+(14/(4+(P^0.5))), P=Pop. in 1000's, Max of 4

Population density per unit =	3.00
PF for Employment/Retail/Business Park =	1.50

Mixed Uses Assumes: 15% Community Retail, 42.5% Business Park and 42.5% Residential

Revision No. 1:	April 01, 2005	Revision No. 6:	Oct. 14, 2005
Revision No. 2:	April 11, 2005	Revision No. 7:	Nov. 10, 2005
Revision No. 3:	April 21, 2005	Revision No. 8:	Nov. 11, 2005
Revision No. 4:	June 07, 2005	Revision No. 9:	Apr. 19, 2006
Revision No. 5:	August 11, 2005		

Stantec

CCL/IBI

FIG. 4.2-1

SANITARY SEWER DESIGN SHEET
PROJECT : Kanata West Serviceability Study
LOCATION : CITY OF OTTAWA

PAGE 1 OF 1
PROJECT: [illegible]
DATE: Apr 2005
DESIGN: [illegible]
FILE: [illegible]

PHASE 1 SIGNATURE RIDGE (population based criteria, ICI simultaneous peaking)

LOCATION STREET	LOCATION FROM MH	LOCATION TO MH		TOTAL AREA (Ha)	RESIDENTIAL APPLIC AREA (Ha)	RESIDENTIAL UNIT/Ha	RESIDENTIAL TOTAL UNITS	RESIDENTIAL POPULATION INDIV	RESIDENTIAL POPULATION ACCUM	RESIDENTIAL PEAK FACTOR	RESIDENTIAL PEAK FLOW (l/s)	EMPLOYMENT/RETAIL/BUSINESS PARK/OPEN SPACES APPLIC AREA (Ha)	ACCUM AREA (Ha)	TOTAL AREA (Ha)	FLOW RATE (l/Ha/d)	PEAK FLOW INDIV (l/s)	PEAK FLOW ACCUM (l/s)	PEAK FLOW TOTAL (l/s)	INFILTRATION AREA (Ha) INDIV	INFILTRATION AREA (Ha) CUMUL	INFILTRATION TOTAL CUMUL	INFILTRATION PEAK FLOW (l/s)	TOTAL FLOW (l/s)	PROPOSED SEWER CAPACITY l/s	VELOCITY (full) m/s	LGTH (m)	PIPE (mm)	GRADE %	AVAIL. CAP. (%)
Campeau Drive Trunk Sewer	1	2	Area 1 (PBP)	0.00								0.00	0.00		35000	0.00	0.00		0.00	0.00									
			Area 2 (PBP)	0.00								0.00	0.00		35000	0.00	0.00		0.00	0.00									
			Area 3 Ext Employment	0.00								0.00	0.00		50000	0.00	0.00		0.00	0.00									
			Area 4 HP Employment	0.00								0.00	0.00	0.00	50000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	281.79	1.27	500.0	525	0.40	100.00%
	2	3	Area 5 Residential	29.19	29.19	19	555	1664	1664	3.65	24.58			0.00				0.00	29.19	29.19									
			Area 9 Ext Employment	0.00							24.58	0.00	0.00		50000	0.00	0.00	0.00	0.00	0.00	29.19	8.17	32.75	286.61	0.98	700.0	600	0.20	88.57%
	14	3	Area 6/8 Ext Employment	0.00								0.00	0.00	0.00	50000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
			Area 7 HP Employment	0.00								0.00	0.00	0.00	50000	0.00	0.00	0.00	0.00	0.00				148.74	0.91	320.0	450	0.25	100.00%
	3	4							1664	3.65	24.58	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	29.19	8.17	32.75	200.67	0.90	150.0	475	0.20	83.68%
	4A	4	Area 10 Residential	27.86	27.86	19	529	1588	1588	3.66	23.55								27.86	27.86	27.86	7.80	31.36	34.00	0.67	750.0	450	0.25	7.76%
	4	5	14 Mixed Use	4.13	1.76	50	88	263	3515	3.38	48.17	2.37	2.37	131.13	15000	1.44	1.44	1.44	4.13	4.13	61.18	17.13	66.74	200.67	0.90	690.0	750	0.20	66.74%
Corel Centre Etc. (Existing Sewer)		15	Area 35 HP Employment	6.04								6.05	6.05		30000	3.15	3.15		6.05										
			Area 36 (Corel Centre)																			30.00							
			Area 38 Exten Employment	20.13								20.15	26.20	26.20	14000	5.04	8.19	8.19	20.15	26.20	26.20	7.34	45.52				Existing		
First Line Road Sewer		15	Area 40 Employment	14.59								14.59	14.59		39000	8.87	8.87		14.59	14.59									
			Area 41 Employment	11.97								11.97	26.56		25300	7.27	16.14		11.97	26.56									
			Area 42 Employment	20.66								20.66	47.22		33500	12.55	28.69		20.66	47.22									
			Area 43 Employment	28.89								28.89	76.11	76.11	35300	17.55	46.23	46.23	28.89	76.11	76.11	21.31	67.56	100.31	0.88	674.0	375	0.30	32.39%
Totals South Of Queensway To SRPS	15	5A		102.31	0.00		0		0		0.00	102.31						54.44	102.31		102.31	58.64	113.08	203.90	1.24	230.0	450	0.47	44.54%
	Queensway	5	Area 13 Community Retail	6.35								6.35	108.66		35000	3.86	58.29		6.35	6.35									
			Area 11/12 Mixed Use	11.80	5.02	50	251	752	752	3.88	11.81	6.79	115.45	115.45	35000	4.12	62.42	62.42	11.80	18.15	120.46	63.73	137.96	203.90	1.24	420.0	450	0.47	32.34%
	5	5A	Area 15 Community Retail	3.88								3.88	119.33		35000	2.36	64.77		3.88	124.34									
			Area 44	25.54							59.98	25.54	144.87	268.20	35000	15.52	81.73	81.73	25.54	149.88	211.06	89.10	230.81	519.43	1.14	300.0	750	0.20	55.56%
				149.88																		63.73	63.73						
Heritage Hills		5A	Area 100 Residential	90.20	90.20	19	1714	5141	5141	3.23	67.35	0.00							90.20										
Heritage Hills		5A	Area 100 Non-Residential	4.88							67.35	4.88	4.88	4.88	50000	4.24	4.24	4.24	4.88	95.08	95.08	26.62	98.21						
Broughton-Richardson / Interstitial		5A																					65.00						
Total To SRPS	**5A**	**SRPS**		**306.14**	**154.03**		**5136**		**9409**		**127.33**	**151.12**						**85.97**			**306.14**	**115.72**	**394.02**	**615.68**	**1.37**	**30.0**	**750**	**0.29**	**37.03%**

Revision No. 1: April 11, 2005
Revision No. 2: April 20, 2005
Revision No. 3: June 07, 2005
Revision No. 4: Oct. 14, 2005
Revision No. 5: Feb. 15, 2006

Note: Sewer from node 5 to SRPS is existing and is to be replaced.

Average Daily Per capita Flow Rate =	350 l/cap/d
Infiltration Allowance Flow Rate =	0.28 l/sec/Ha

Residential Peaking Factor = 1+(14/(4+(P^0.5))), P=Pop. in 1000's, Max of 4

Population density per unit =	3.00
P. F. For Employment/Retail/Business Park =	1.50

Mixed Uses Assumes: 15% Community Retail, 42.5% Business Park and 42.5% Residential

Stantec CCL/IBI

FIG. 4.2-2

IBI GROUP

IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: NAME OF PROJECT
LOCATION: CITY OF OTTAWA
CLIENT: NAME OF CLIENT

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			TOTAL FLOW	PROPOSED SEWER DESIGN							
				UNIT TYPES				AREA	POPULATION		PEAK FACTOR	PEAK FLOW (L/s)	AREA (Ha)						PEAK FLOW (L/s)	AREA (Ha)		FLOW (L/s)	(L/s)	CAPACITY (L/s)	LENGTH (m)	DIA (mm)	SLOPE (%)	VELOCITY (full) (m/s)	VELOCITY (actual) (m/s)	AVAILABLE CAPACITY	
													INSTITUTIONAL		COMMERCIAL		INDUSTRIAL														
STREET	AREA ID	FROM MH	TO MH	SF	SD	TH	APT	(Ha)	IND	CUM			IND	CUM	IND	CUM	IND	CUM		IND	CUM									L/s	(%)
	BLK800	BLK800A	MAIN						0.0	0.0	4.00	0.00		0.00	0.06	0.06		0.00	0.05	0.06	0.06	0.02	0.07	15.89	6.50	150	1.00	0.871		15.82	99.57
	123A	MH123A	MH122A						0.0	0.0	4.00	0.00		0.00	0.29	0.35		0.00	0.30	0.29	0.35	0.10	0.40	34.12	26.94	200	1.00	1.066		33.72	98.83
	122A	MH122A	MH121A						0.0	0.0	4.00	0.00		0.00	0.09	0.44		0.00	0.38	0.09	0.44	0.12	0.51	34.12	11.00	200	1.00	1.066		33.61	98.51
	BLK700	BLK700A	MAIN						0.0	0.0	4.00	0.00		0.00	0.10	0.10		0.00	0.09	0.10	0.10	0.03	0.11	15.89	6.50	150	1.00	0.871		15.78	99.28
	121A	MH121A	MH120A						0.0	0.0	4.00	0.00		0.00	0.08	0.62		0.00	0.54	0.08	0.62	0.17	0.71	34.22	57.61	200	1.00	1.055		33.50	97.92
	BLK600	BLK600A	MAIN						0.0	0.0	4.00	0.00		0.00	0.06	0.06		0.00	0.05	0.06	0.06	0.02	0.07	15.89	6.50	150	1.00	0.871		15.82	99.57
	120A	MH120A	MH100A						0.0	0.0	4.00	0.00		0.00	0.56	1.24		0.00	1.08	0.56	1.24	0.35	1.42	24.19	53.23	200	0.50	0.746		22.77	94.12
	BLK500	BLK500A	MAIN						0.0	0.0	4.00	0.00		0.00	0.09	0.09		0.00	0.08	0.09	0.09	0.03	0.10	15.89	14.00	150	1.00	0.871		15.78	99.35
	200A	MH100A	MH100C						0.0	0.0	4.00	0.00		0.00	0.46	1.79		0.00	1.55	0.46	1.79	0.50	2.06	24.19	24.23	200	0.50	0.746		22.14	91.51
		MH100C	EXMH301A						0.0	0.0					0.00	1.79			1.55	0.00	1.79	0.50	2.06	24.19	23.50	200	0.50	0.746		22.14	91.51
	BLK400	BLK400A	MAIN						0.0	0.0	4.00	0.00		0.00	0.15	0.15		0.00	0.13	0.15	0.15	0.04	0.17	15.89	6.50	150	1.00	0.871		15.72	98.92
	BLK300	BLK300A	MAIN						0.0	0.0	4.00	0.00		0.00	0.05	0.05		0.00	0.04	0.05	0.05	0.01	0.06	15.89	6.50	150	1.00	0.871		15.83	99.64
	221A	MH221A	MH213A						0.0	0.0	4.00	0.00		0.00	0.71	0.91		0.00	0.79	0.71	0.91	0.25	1.04	75.98	82.40	250	1.50	1.500	0.522	74.94	98.63
	BLK100	BLK100A	MAIN						0.0	0.0	4.00	0.00		0.00	0.06	0.06		0.00	0.05	0.06	0.06	0.02	0.07	15.89	6.85	150	1.00	0.871		15.82	99.57
	BLK200	BLK200A	MAIN						0.0	0.0	4.00	0.00		0.00	0.05	0.05		0.00	0.04	0.05	0.05	0.01	0.06	15.89	6.75	150	1.00	0.871		15.83	99.64
	214A	MH214A	MH213A						0.0	0.0	4.00	0.00		0.00	0.42	0.53		0.00	0.46	0.42	0.53	0.15	0.61	43.87	44.32	250	0.50	0.866	0.301	43.26	98.61
	213A	MH213A	MH212A						0.0	0.0	4.00	0.00		0.00	0.13	0.66		0.00	0.57	0.13	0.66	0.18	0.76	43.87	16.38	250	0.50	0.866	0.325	43.11	98.27
	212A	MH212A	MH210A						0.0	0.0	4.00	0.00		0.00	0.31	1.88		0.00	1.63	0.31	1.88	0.53	2.16	62.04	58.88	250	1.00	1.224	0.551	59.88	96.52
	BLK900	BLK900A	MAIN						0.0	0.0	4.00	0.00		0.00	0.47	0.47		0.00	0.41	0.47	0.47	0.13	0.54	11.23	22.04	150	0.50	0.636		10.69	95.20
	210A	MH210A	MH205C						0.0	0.0	4.00	0.00		0.00	0.32	2.67		0.00	2.32	0.52	2.67	0.75	3.07	62.04	21.84	250	1.00	1.224	0.632	58.97	95.06
		MH205C	MH205A						0.0	0.0	4.00	0.00		0.00	0.19	2.86		0.00	2.48	0.19	2.86	0.80	3.28	62.04	11.04	250	1.00	1.224	0.633	58.76	94.71
External South mixed	EXT 2	STUB	MH205A						0.0	0.0	4.00	0.00		0.00		0.00		0.00	3.01	2.87	2.87	0.79	3.80	24.19	14.51	200	0.50	0.746		20.39	84.29
Street 1	205A	MH205A	MH204A						0.0	0.0	4.00	0.00		0.00	0.08	2.94		0.00	5.56	0.08	5.76	1.61	7.18	71.33	33.79	300	0.50	0.978	0.620	64.16	89.94
Street 1	204A	MH204A	MH202A						0.0	0.0	4.00	0.00		0.00	0.32	3.26		0.00	5.84	0.32	6.08	1.70	7.54	71.33	125.25	300	0.50	0.978	0.628	63.79	89.43
Street 1	202A	MH202A	MH201A						0.0	0.0	4.00	0.00		0.00	0.04	3.30		0.00	5.87	0.04	6.12	1.71	7.59	71.33	11.74	300	0.50	0.978	0.633	63.75	89.36
External East MH	EXT-1	Stub	MH201A						0.0	0.0	4.00	0.00		0.00		0.00		0.00	0.79	0.74	0.74	0.21	1.00	24.19	10.27	200	0.50	0.746		23.19	95.87
Street 1	201A	MH201A	MH200A						0.0	0.0	4.30	0.00		0.00	0.10	3.40		0.00	6.75	0.10	6.96	1.95	8.70	71.33	31.49	300	0.50	0.978	0.659	62.63	87.80
Street 1	200A	MH200A	EX CAP						0.0	0.0	4.30	0.00		0.00		3.40		0.00	6.75	0.00	6.96	1.95	8.70	58.82	45.35	300	0.34	0.806	0.630	50.12	85.20
		EX CAP	EXMH303A						0.0	0.0			0.00	0.00	0.00	3.47	0.00	0.00	6.73	0.00	6.96	1.95	8.70	58.82	20.50	300	0.34	0.806	0.630	50.12	85.20

Design Parameters:

Residential			ICI Areas			Peak Factor
SF	3.4	p/p/u				
TH/SD	2.7	p/p/u	INST	50,000	L/Ha/day	1.5
APT	1.8	p/p/u	COM	50,000	L/Ha/day	1.5
Other	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart
				17000	L/Ha/day	

Notes:

1. Mannings coefficient (n) =	0.013	
2. Demand (per capita):	350 L/day	300 L/day
3. Infiltration allowance:	0.28 L/s/Ha	0.4 L/s/Ha
4. Residential Peaking Factor:		
Harmon Formula = 1+(14/(4+P^0.5))		
where P = population in thousands		

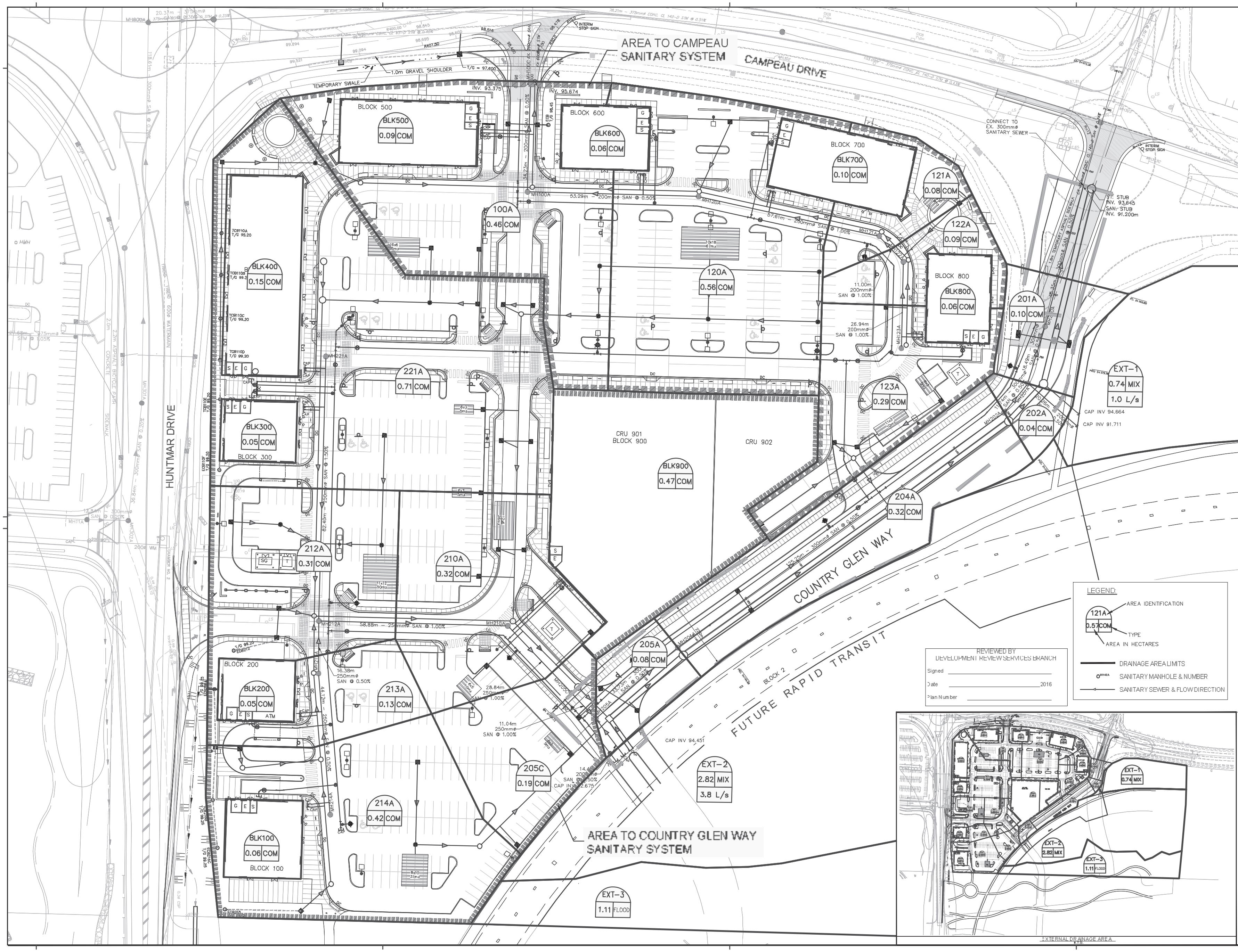
Designed: RM

Checked: DY

Dwg. Reference: 12345-501

No.	Revision	Date
1.	Issued for SPA	11/15/2013
2.	Revised as per City Comments	6/24/2014
3.	Revised as per City Comments	8/22/2014
4.	Revised as per City Comments	10/2/2014

File Reference:	Date:	Sheet No:
12345.5.7.1	11/15/2013	1 of 1



KEY PLAN

APPROVED ☐ REFUSED ☐

THIS____DAY OF__________, 20_____

DERRICK MOODIE, ACTING MANAGER
DEVELOPMENT REVIEW, SUBURBAN SERVICES

No.	Description	Date	Checked
5	Revised as per City Comments	16:08:26	DGY
4	Revised as per City Comments	14:10:02	DGY
3	Revised as per City Comments	14:08:22	DGY
2	Issued for SPA Resubmission	14.06.27	DGY
1	Issued for SPA	13.11.18	DGY

Issued for

All measurements and conditions must be checked on the work by the contractor. This drawing not to be used for construction until signed.

Date

plotted J:\35355-ArcadiaComm\5.9 Drawings\59civil\layouts\C-501.dwg Layout Name: Sanitary Drainage Plot Style: AIA STANDARD-FULL.CTB Plot Scale: 1:1 Plotted At: 9/1/2016 10:57 AM Last Saved By: dafuma Last Saved At: Sep. 1, 16

TN PN

2016/08/26

drawn by DPS
checked by DGY
printed
scale 1:500
date NOV. 2013
file 35355

Arcadia Retail Development

Kanata, Ontario

Minto Properties

200 Kent Street • Suite 180 • Ottawa, Ontario • K1P 0B6
Telephone: (613)782-3137 Fax: (613)782-5777

drawing title:
SANITARY DRAINAGE
AREA PLAN
370 HUNTMAR DRIVE
OTTAWA, ON.

IBI GROUP

drawing no.
C-501

333 Preston Street Tower 1, Suite 400
Ottawa, Ontario Canada K1S 5N4 Tel
(613)225-1311 FAX (613)225-9868

D07-12-14-0014

APPENDIX C

IBI GROUP

IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

STORM SEWER DESIGN SHEET

PROJECT: Arcadia Commercial
LOCATION: CITY OF OTTAWA
CLIENT: Minto Development Group

*HGL at obvert of pipe if pipe is not surcharged
** Finished floor for slab on grade commercial building
***Freeboard is from upstream MH HGL to FF

LOCATION				AREA (Ha)				RATIONAL DESIGN FLOW													SEWER DATA													
STREET	AREA ID	FROM MH	TO MH	C= 0.20	C= 0.70	C= 0.75	C= 0.90	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)	ICD FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm)			SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr)		surcharged pipe	upstream obvert	HGL* m	FF** m	Freeboard*** m
																							DIA	W	H			(L/s)	(%)					
	BLK800	BLK800	MAIN				0.06	0.15	0.15	10.00	0.07	10.07	104.19	122.14	178.56	15.64				15.64	62.04	5.00	250			1.00	1.224	46.40	74.79%			96.79	98.30	1.51
	123	CICB123	MAIN				0.06	0.15	0.15	10.00	0.11	10.11	104.19	122.14	178.56	15.64				15.64	43.87	5.97	250			0.50	0.866	28.23	64.34%					
	-	MH123	MH122					0.00	0.30	10.07	0.54	10.61	103.83	121.72	177.94	31.18				31.18	59.68	26.56	300			0.35	0.818	28.51	47.76%	no	96.79	96.79		
	122	CB122	MAIN				0.06	0.15	0.15	10.00	0.45	10.45	104.19	122.14	178.56	15.64				15.64	43.87	23.03	250			0.50	0.866	28.23	64.34%					
	-	MH122	MH121					0.00	0.45	10.61	0.25	10.86	101.08	118.48	173.18	45.52				45.52	59.68	12.08	300			0.35	0.818	14.16	23.72%	no	96.67	96.67		
	BLK700	BLK700	MAIN				0.10	0.25	0.25	10.00	0.08	10.08	104.19	122.14	178.56	26.07				26.07	51.91	5.00	250			0.70	1.024	25.84	49.78%			96.63	98.45	1.82
	-	MH121	MH120					0.00	0.70	10.86	1.21	12.06	99.86	117.06	171.10	69.97				69.97	91.46	58.21	375			0.75	0.802	21.49	23.49%	no	96.63	96.63		
	120	CB120	MH120				0.11	0.28	0.28	10.00	0.57	10.57	104.19	122.14	178.56	28.48				28.48	62.04	23.24	250			1.00	1.224	33.56	53.79%					
	BLK600	BLK600	MAIN				0.06	0.15	0.15	10.00	0.07	10.07	104.19	122.14	178.56	15.64				15.64	62.04	5.00	250			1.00	1.224	46.40	74.79%			96.45	98.70	2.25
	-	MH120	MH100					0.00	1.13	12.06	0.96	13.02	94.47	110.63	161.66	106.31				106.31	148.72	51.98	450			0.25	0.906	42.41	28.52%	no	96.45	96.45		
	110	CB110A	CBMH110A				0.08	0.20	0.20	10.00	0.49	10.49	104.19	122.14	178.56	20.86				20.86	71.33	29.02	300			0.50	0.978	50.48	70.75%					
		CB110B	CBMH110A				0.04	0.10	0.10	10.00	0.34	10.34	104.19	122.14	178.56	10.43				10.43	71.33	20.00	300			0.50	0.978	60.91	85.38%					
		CBMH110A	MH110					0.00	0.30	10.49	0.26	10.75	101.65	119.15	174.18	30.52				30.52	256.47	15.38	600			0.20	0.982	225.95	88.10%					
	-	MH110	MH100					0.00	0.30	10.76	1.02	11.78	100.46	117.63	171.93	30.13				30.13	63.80	53.50	300			0.40	0.874	33.67	52.77%	no	96.54	96.54		
	BLK500	BLK500	MAIN				0.09	0.23	0.23	10.00	0.22	10.22	104.19	122.14	178.56	23.46				23.46	62.04	16.50	250			1.00	1.224	38.58	62.18%			96.32	99.15	2.83
	100A	CICB100A	CICB100B				0.03	0.08	0.08	10.00	0.11	10.11	104.19	122.14	178.56	7.82				7.82	62.04	8.00	250			1.00	1.224	54.22	87.39%					
	100B	CICB100B	MAIN				0.03	0.08	0.15	10.11	0.01	10.12	103.62	121.47	177.57	15.56				15.56	62.04	0.74	250			1.00	1.224	46.48	74.93%					
	-	MH100	MH100B					0.00	1.80	13.02	0.64	13.66	90.55	106.08	154.97	163.12				163.12	248.09	32.73	600			0.15	0.850	84.97	34.25%	no	96.32	96.32		
	EXISTING	MH100B	EXMH301					0.00	1.80	13.66	0.51	13.96	88.14	103.25	150.81	158.78				158.78	248.09	16.00	600			0.15	0.850	89.30	36.00%	no				
				0.00	0.00	0.00	0.72	1.80	TRUE																					no	96.25	96.052		

IBI GROUP

IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

STORM SEWER DESIGN SHEET

PROJECT: Arcadia Commercial
LOCATION: CITY OF OTTAWA
CLIENT: Minto Development Group

*HGL at obvert of pipe if pipe is not surcharged
** Finished floor for slab on grade commercial building
***Freeboard is from upstream MHHGL to FF

LOCATION				AREA (Ha)				RATIONAL DESIGN FLOW													SEWER DATA													
STREET	AREA ID	FROM MH	TO MH	C= 0.20	C= 0.70	C= 0.75	C= 0.90	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)	ICD 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)	(%)	surcharged pipe	upstream obvert	HGL* m	FF** m	Freeboard*** m
	233A	CBMH233A	CBMH233				0.09	0.23	0.23	10.00	0.32	10.31	104.19	122.14	178.56	23.46				23.46	248.09	18.90	600			0.15	0.850	224.63	90.54%					
	233B	CBMH233	CBMH232				0.15	0.38	0.60	10.31	0.67	10.98	102.80	120.27	175.81	61.61				61.61	248.09	34.20	600			0.15	0.850	186.48	75.17%					
	232A	CBMH232A	CBMH232				0.10	0.25	0.25	10.00	0.31	10.31	104.19	122.14	178.56	26.07				26.07	248.09	15.60	600			0.15	0.850	222.02	89.49%					
	232B	CBMH232	CBMH231				0.12	0.30	1.15	10.98	0.67	11.65	99.90	116.38	170.10	114.29				114.29	248.09	34.20	600			0.15	0.850	133.80	53.93%					
	231A	CBMH231A	CBMH231				0.11	0.28	0.28	10.00	0.31	10.31	104.19	122.14	178.56	28.68				28.68	248.09	15.80	600			0.15	0.850	219.41	88.44%					
	231B	CBMH231	MH230				0.11	0.28	1.70	11.65	0.47	12.12	96.29	112.76	164.79	163.72				163.72	248.09	24.88	600			0.15	0.850	84.37	34.01%					
	230A	CICB230A	CICB230B				0.06	0.15	0.15	10.00	0.11	10.11	104.19	122.14	178.56	15.64				15.64	62.04	8.04	250			1.00	1.224	46.40	74.79%					
	230B	CICB230B	MH230				0.13	0.33	0.48	10.11	0.06	10.17	103.67	121.47	177.56	49.26				49.26	87.74	5.93	250			2.00	1.731	38.48	43.86%					
	230C	CB230C	MAIN				0.03	0.08	0.08	10.00	0.14	10.14	104.19	122.14	178.56	7.82				7.82	62.04	10.39	250			1.00	1.224	54.22	87.39%					
	230D	CB230D	CB230E				0.04	0.10	0.10	10.00	0.11	10.11	104.19	122.14	178.56	10.43				10.43	62.04	7.95	250			1.00	1.224	51.61	83.19%					
	230E	CB230E	MAIN				0.09	0.23	0.33	10.11	0.05	10.16	103.62	121.47	177.58	33.70				33.70	87.74	4.91	250			2.00	1.731	54.03	61.58%					
	230F	CB230F	MAIN				0.07	0.18	0.18	10.00	0.17	10.17	104.19	122.14	178.56	18.25				18.25	62.04	12.50	250			1.00	1.224	43.79	70.59%					
	230G	CB230G	CB230H				0.10	0.25	0.25	10.00	0.11	10.11	104.19	122.14	178.56	26.07				26.07	62.04	8.00	250			1.00	1.224	35.97	57.98%					
	230H	CB230H	MAIN				0.07	0.18	0.43	10.11	0.05	10.15	103.63	121.47	177.57	44.07				44.07	87.74	4.78	250			2.00	1.731	43.66	49.77%					
	230I	CB230I	MAIN				0.03	0.08	0.08	10.00	0.12	10.12	104.19	122.14	178.56	7.82				7.82	62.04	6.57	250			1.00	1.224	54.22	87.39%					
	-	MH230	MH218					0.00	3.25	12.12	1.62	13.74	94.19	110.36	161.26	306.36				306.36	449.81	95.70	750			0.15	0.988	143.45	31.89%	no	95.70	95.70		
	221A	CB221A	CBMH221				0.16	0.40	0.40	10.00	0.11	10.11	104.19	122.14	178.56	41.71				41.71	420.63	17.05	450			2.30	2.562	378.92	90.08%					
	221B	CB221B	CB221C				0.03	0.08	0.08	10.00	0.16	10.16	104.19	122.14	178.56	7.82				7.82	297.43	17.05	450			1.00	1.812	289.61	97.37%					
	221C	CB221C	CBMH221				0.02	0.05	0.13	10.16	0.08	10.24	103.27	121.17	177.14	12.93				12.93	488.73	15.32	450			2.70	2.977	475.80	97.35%					
	221D	CBMH221	MH221				0.08	0.20	0.73	10.24	0.57	10.81	102.92	120.65	176.36	74.68				74.68	286.47	33.38	600			0.20	0.982	211.79	73.93%					
	BLK400	BLK400	MAIN				0.15	0.38	0.38	10.00	0.07	10.07	104.19	122.14	178.56	39.10				39.10	62.04	5.00	250			1.00	1.224	22.94	36.97%			96.03	99.50	3.47
	BLK300	BLK300	MAIN				0.04	0.10	0.10	10.00	0.07	10.07	104.19	122.14	178.56	10.43				10.43	62.04	5.00	250			1.00	1.224	51.61	83.19%			96.03	99.50	3.47
		MH500	MH221				0.00	0.00	0.00	10.00	0.20	10.20	104.19	122.14	178.56	0.00				0.00	900.87	12.00	1050			0.10	1.008	900.87	100.00%					
	-	MH221	MH220					0.00	1.20	10.81	1.40	12.21	100.10	117.32	171.47	120.21				120.21	148.72	75.90	450			0.25	0.908	28.50	19.17%	no	96.03	96.03		
	222A	CB222	CBMH222				0.05	0.13	0.13	10.00	0.12	10.12	104.19	122.14	178.56	13.03				13.03	107.45	14.80	250			3.00	2.121	94.42	87.87%					
	222B	CBMH222	MH220				0.07	0.18	0.30	10.12	0.07	10.19	103.58	121.42	177.50	31.10				31.10	151.96	12.64	250			6.00	2.999	120.86	79.53%					

IBI GROUP

IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

STORM SEWER DESIGN SHEET

PROJECT: Arcadia Commercial
LOCATION: CITY OF OTTAWA
CLIENT: Minto Development Group

*HGL at obvert of pipe if pipe is not surcharged
** Finished floor for slab on grade commercial building
*** Freeboard is from upstream MH HGL to FF

LOCATION				AREA (Ha)				RATIONAL DESIGN FLOW													SEWER DATA													
STREET	AREA ID	FROM MH	TO MH	C= 0.20	C= 0.70	C= 0.75	C= 0.90	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)	ICD 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)	(%)	surcharged pipe	upstream obvert	HGL* m	FF** m	Freeboard*** m
	223A	CB223	CBMH223				0.15	0.38	0.38	10.00	0.21	10.21	104.19	122.14	178.56	39.10				39.10	445.15	34.20	450			2.25	2.728	407.05	91.21%					
	223B	CBMH223	MH220				0.12	0.30	0.68	10.21	0.27	10.47	103.10	120.85	176.66	69.65				69.65	210.32	20.38	450			0.50	1.281	140.67	66.89%					
	-	MH220	MH212					0.00	2.18	12.21	0.44	12.65	93.82	109.99	160.62	204.22				204.22	248.08	22.60	600			0.15	0.850	43.86	17.68%	no	95.84	95.84		
	212A	CICB212A	CICB212B				0.03	0.08	0.08	10.00	0.12	10.12	104.19	122.14	178.56	7.83				7.83	62.04	8.61	250			1.00	1.224	54.22	87.39%					
	212B	CICB212B	MH212				0.03	0.08	0.15	10.12	0.06	10.18	103.58	121.42	177.49	15.55				15.55	151.96	11.14	250			6.00	2.999	136.41	89.77%					
	215	CB215	MH215				0.04	0.10	0.10	10.00	0.17	10.17	104.19	122.14	178.56	10.43				10.43	62.04	12.57	250			1.00	1.224	51.61	83.19%					
	BLK100	BLK100	MAIN				0.06	0.15	0.15	10.00	0.07	10.07	104.19	122.14	178.56	15.64				15.64	62.04	5.50	250			1.00	1.224	46.40	74.79%			97.23	99.60	2.37
	-	MH215	MH214					0.00	0.25	10.17	0.40	10.57	103.30	121.09	177.03	25.85				25.85	82.07	38.45	250			1.75	1.620	56.22	68.51%	no	97.23	97.23		
	216A	RYCB216	CB214	0.03				0.02	0.02	10.00	0.05	10.05	104.19	122.14	178.56	1.74				1.74	124.08	7.40	250			4.00	2.449	122.34	98.60%					
	216B	CB216	MH216				0.04	0.10	0.12	10.00	0.04	10.04	104.19	122.14	178.56	12.17				12.17	138.72	5.90	250			5.00	2.738	126.56	91.23%					
		MH216	MH214					0.00	0.12	10.05	0.47	10.52	103.93	121.83	178.10	12.13				12.13	43.87	24.56	250			0.50	0.866	31.73	72.34%	no	97.07	97.07		
	BLK200	BLK200	MAIN				0.04	0.10	0.10	10.00	0.07	10.07	104.19	122.14	178.56	10.43				10.43	62.04	5.40	250			1.00	1.224	51.61	83.19%			96.55	99.55	3.00
	-	MH214	MH213					0.00	0.47	10.57	0.40	10.97	101.27	118.69	173.49	47.30				47.30	129.34	17.00	375			0.50	1.134	82.04	63.43%	no	96.55	96.55		
	-	MH213	MH212					0.00	0.47	10.97	0.26	11.23	99.34	116.43	170.16	46.40				46.40	129.34	17.80	375			0.50	1.134	82.94	64.13%	no	96.39	96.39		
	-	MH212	MH210					0.00	2.75	11.23	0.86	12.09	98.12	114.98	168.05	274.12				274.12	350.85	61.94	600			0.30	1.202	76.72	21.87%	no	95.74	95.74		
	210A	CB210A	MAIN				0.32	0.80	0.80	10.00	0.04	10.04	104.19	122.14	178.56	31.28				31.28	201.76	15.06	300			4.00	2.765	170.48	84.50%					
	BLK900	BLK900	MAIN				0.46	1.15	1.15	10.00	0.21	10.21	104.19	122.14	178.56	119.92				119.92	182.91	14.94	375			1.00	1.604	62.99	34.44%			95.56	98.10	2.54
DEPRESSED LOADING	210B	CB210B	MAIN				0.02	0.05	0.05	10.00	0.29	10.29	104.19	122.14	178.56	5.21				5.21	43.87	14.90	250			0.50	0.866	38.65	88.11%					
		MH210	MH205B					0.00	7.55	13.74	0.41	14.15	87.88	102.93	150.35	663.26				663.26	905.48	18.86	975			0.15	1.175	242.23	26.75%	no	95.56	95.56		
	206F	CICB206D	MAIN			0.09		0.19	0.19	10.00	0.02	10.02	104.19	122.14	178.56	19.55				19.55	87.74	2.37	250			2.00	1.731	68.18	77.72%					
	-	MH205B	MH205					0.00	7.79	14.15	0.20	14.35	86.82	101.72	147.84	668.51				668.51	905.48	13.88	975			0.15	1.175	236.97	26.17%	no	95.50	95.50		
	206A	CB206A	CBMH206				0.24	0.60	0.60	10.00	0.17	10.17	104.19	122.14	178.56	62.57				62.57	420.63	25.66	450			2.00	2.562	358.07	85.13%					
	206B	CBMH206	MH205				0.14	0.35	0.95	10.17	0.26	10.43	103.32	121.11	177.05	98.23				98.23	210.32	19.99	450			0.50	1.281	112.09	53.29%					
	206C	CB206B	MAIN				0.07	0.18	0.18	10.00	0.08	10.08	104.19	122.14	178.56	18.25				18.25	85.29	6.44	250			1.69	1.683	67.04	78.60%					
	206D	CB206C	MAIN				0.04	0.10	0.10	10.00	0.02	10.02	104.19	122.14	178.56	10.43				10.43	87.74	2.37	250			2.00	1.781	77.31	88.11%					
	-	MH206	MH205					0.00	1.23	10.43	0.59	11.02	101.99	119.55	174.75	125.04				125.04	182.91	56.62	375			1.00	1.604	57.87	31.64%	no	96.05	96.05		
External South	EXT-2	STUB	MH205		2.82			5.49	5.49	12.00	0.17	12.17	94.70	110.96	162.13	519.66				519.86	986.85	11.55	1050			0.22	1.304	467.19	47.34%	no	95.50	95.50		

IBI GROUP

IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

STORM SEWER DESIGN SHEET

PROJECT: Arcadia Commercial
LOCATION: CITY OF OTTAWA
CLIENT: Minto Development Group

*HGL is obvert of pipe if pipe is not surcharged
** Finished floor for slab on grade commercial building
***Freeboard is from upstream MH HGL to FF

LOCATION				AREA (Ha)				RATIONAL DESIGN FLOW													SEWER DATA													
STREET	AREA ID	FROM MH	TO MH	C= 0.20	C= 0.70	C= 0.75	C= 0.90	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)	ICD 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)	(%)	surcharged pipe	upstream obvert	HGL* m	FF** m	Freeboard*** m
	205A	CICB205A	CICB205B			0.10		0.21	0.11	10.00	0.16	10.16	104.19	122.14	178.56	21.72				21.72	62.04	11.97	250			1.00	1.224	40.31	64.98%					
	205B	CICB205B	MAIN			0.06		0.13	[illegible]	10.00	0.01	[illegible]	104.19	122.14	178.56	34.76				34.76	87.74	0.64	250			2.00	1.731	52.98	60.38%					
Street 1	-	MH205	MH204					0.00	14.78	14.34	1.39	14.73	85.74	100.07	146.67	1,267.51				1,267.51	1,928.87	30.86	1350			0.12	1.305	661.36	34.29%	no	95.48	95.48		
Street 1	204B	CICB204B	CICB204A			0.08		0.13	0.13	10.00	0.12	10.12	104.19	122.14	178.56	13.03				13.03	62.04	9.00	250			1.00	1.224	49.00	78.99%					
Street 1	204A	CICB204A	MAIN			0.07		0.15	0.27	10.12	0.02	10.14	103.55	121.38	177.45	28.07				28.07	87.74	2.34	250			2.00	1.731	59.67	68.01%					
	-	MH204	MH203					0.00	15.05	14.73	1.01	15.74	80.64	94.89	144.42	1,271.12				1,271.12	1,928.87	79.00	1350			0.12	1.301	657.75	34.10%	no	95.43	95.43		
	240A	CICB240A	CICB240B					0.00	0.00	10.00	0.14	10.14	104.19	122.14	178.56	0.06				0.06	62.04	10.23	250			1.00	1.224	62.04	100.00%					
		CICB240B	MH240				0.04	0.13	0.13	10.14	0.16	10.30	103.46	121.28	177.30	12.94				12.94	87.74	16.81	250			2.00	1.731	74.79	85.25%					
DEPRESSED LOADING	240B	CB240C	MH240				0.02	0.05	0.05	10.00	0.68	10.68	104.19	122.14	178.56	5.21				5.21	43.87	35.30	250			0.50	0.866	38.65	88.11%					
	240C	CB240D	MH240				0.04	0.13	0.13	10.00	0.44	10.44	104.19	122.14	178.56	13.03				13.03	62.04	32.56	250			1.00	1.224	49.00	78.99%					
	-	MH240	MH203					0.00	0.39	10.68	0.37	11.05	100.74	118.07	172.53	30.24				30.24	63.80	19.34	300			0.40	0.874	33.56	52.60%	no	95.39	95.34		
Street 1	-	MH203	MH202					0.00	15.35	15.74	0.59	16.33	81.24	95.13	138.90	1,247.42				1,247.42	1,928.87	45.86	1350			0.12	1.305	681.46	35.33%	no	95.31	95.31		
Street 1		MH202	MH201					0.00	15.35	16.33	0.20	16.53	79.51	93.09	135.91	1,220.78				1,220.78	1,928.87	15.91	1350			0.12	1.305	708.09	36.71%	no	95.23	95.23		
Street 1	201A	DCICB201A	DCICB201B	0.02		0.18		0.39	0.39	12.00	0.20	12.20	94.70	110.96	162.13	36.59				36.59	62.04	14.74	250			1.00	1.224	25.45	41.02%					
Street 1	201B, 202	DCICB201B	MAIN			0.24		0.50	0.89	12.00	0.04	12.04	94.70	110.96	162.13	83.98				83.98	87.74	5.43	250			2.00	1.731	3.76	4.29%					
External East	EXT-1	CAP	MH201		0.73			1.42	1.42	10.00	0.29	10.29	104.19	122.14	178.56	148.01				148.01	248.09	14.54	600			0.15	0.850	100.07	40.34%	no	95.23	95.23		
street 1	-	MH201	CAP					0.00	17.66	16.53	0.82	17.34	78.93	92.41	134.90	1,393.95				1,393.95	2,332.02	62.55	1500			0.10	1.278	938.07	40.23%	no	95.21	95.21		
street 1	existing	Ex CAP	EXMH303					0.00	17.66	17.34	0.32	17.66	76.68	89.77	131.09	1,354.27				1,354.27	2,332.02	24.30	1500			0.10	1.278	977.75	41.93%	no				
				0.06	3.55	0.80	3.62	11.66	TRUE																					no	95.17	95.086		
					AREA CHECK																													
						TOTAL AREA	8.02																											
						EXTERNAL AREA	3.55																											
							4.47																											

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) =

Designed: RM

Checked: DY

Dwg. Reference: 31855-500

No.	Revision	Date
1	Issued for SPA	11/15/2013
2	Revised per City Comments	6/27/2014
3	Revised per City Comments	8/22/2014
	Revised per City Comments	10/2/2014

File Reference:	Date:	Sheet No:
31655.5.7.1	11/15/2013	3 of 3

IBI
GROUP

IBI
333 Preston St
OTTAWA, ONTARIO
K1S 5N4

ONSITE SWM 100yr design
PROJECT: Arcadia commercial
CITY OF OTTAWA
DEVELOPER Minto

PAGE: 1 OF 1
JOB #: 35355
DATE: Oct 1, 2014
DESIGN: DY
Rev#3

Outlet EX MH 303
100yr design

MAXIMUM ALLOWABLE FLOW - Flow Restricted to 240 l/s/Ha

Time of concentration = 10 minutes

Area (ha) =	4.280
C Average =	0.90

Intensity - 5 year event storm

10 min Tc	i5yr = 998.071/(T+6.053)^0.814=	104.2	mm/hr

Unrestricted Flowrate (Q5)

10 min Tc	Qpre-devo = 2.78*A*Cw*i =	1115.76 l/s

Restricted Flowrate (Q5)

10 min Tc	Q= 85 l/s/Ha	363.80 l/s

Intensity - 100 year event storm

10 min Tc	i100yr = 1735.688/(T+6.014)^0.82=	178.6	mm/hr

Unrestricted Flowrate (Q100)

10 min Tc	Qpost-devo = 2.78*A*Cw*i =	**1912.11 l/s**

Restricted Flowrate ($Q_{rest\ 100yr}$)

10 min Tc	Q= 240 l/s/Ha	**1027.20** l/s

Uncontrolled runoff (Q100)

Location	Area	C	AxC
Area 216 A	0.03	0.2	0.006
Area 216B	0.04	0.9	0.036
Depressed Loading BLK900-230G	0.02	0.9	0.018
Depressed Loading BLK900-240C	0.02	0.9	0.018
Total	0.11	0.71	0.078

10 min Tc	Q_{unc}= 2.78 Aci	**38.72 l/s**

Allowable Release
$Q_{rest\ 100yr}$ - Q_{unc} = Q_{allow} **988.48 l/s**

STORM WATER MANAGEMENT - Post-Development Controlled

(5 year post-development with 100yr inlets)

ROOF BLOCK 100

600 sm

100 -YR FLOW

Qp (l/s)

Area(ha)= 0.0600

Cw = 1.00

STORMWATER MANAGEMENT Qm = 2.00 l/s

Tc		Qp	Qm	Qp-Qm	Volume		
Variable	i	2.78 x Area x c x i					
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)		
63	53.9	9.0	2.00	7.0	26.42		
65	52.6	8.8	2.00	6.8	26.45		
67	51.5	8.6	2.00	6.6	26.47		
69	50.3	8.4	2.00	6.4	**26.48**	<===	Required volume
71	49.3	8.2	2.00	6.2	26.48		for roof storage
73	48.2	8.0	2.00	6.0	26.48		
75	47.3	7.9	2.00	5.9	26.47		
77	46.3	7.7	2.00	5.7	26.45		
79	45.4	7.6	2.00	5.6	26.43		
81	44.6	7.4	2.00	5.4	26.41		
83	43.7	7.3	2.00	5.3	26.38		
85	43.0	7.2	2.00	5.2	26.34		

Req. Storage volume **26.48** m3

Average depth **0.044** m

ROOF BLOCK 200

400 sm

100 -YR FLOW

Qp (l/s)

Area(ha)= 0.0400

Cw = 1.00

STORMWATER MANAGEMENT Qm = 1.00 l/s

Tc		Qp	Qm	Qp-Qm	Volume		
Variable	i	2.78 x Area x c x i					
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)		
90	41.1	4.6	1.00	3.6	19.29		
92	40.4	4.5	1.00	3.5	19.29		
94	39.8	4.4	1.00	3.4	19.29		
96	39.1	4.3	1.00	3.3	**19.30**	<===	Required volume
98	38.5	4.3	1.00	3.3	19.29		for roof storage
100	37.9	4.2	1.00	3.2	19.29		
102	37.3	4.2	1.00	3.2	19.28		
104	36.8	4.1	1.00	3.1	19.27		
106	36.2	4.0	1.00	3.0	19.26		
108	35.7	4.0	1.00	3.0	19.25		
110	35.2	3.9	1.00	2.9	19.24		
112	34.7	3.9	1.00	2.9	19.22		

Req. Storage volume **19.30** m3

Average depth **0.048** m

ROOF BLOCK 300

400 sm

100 -YR FLOW

Qp (l/s)

Area(ha)= 0.0400

Cw = 1.00

STORMWATER MANAGEMENT Qm = 1.00 l/s

Tc		Qp	Qm	Qp-Qm	Volume		
Variable	i	2.78 x Area x c x i					
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)		
90	41.1	4.6	1.00	3.6	19.29		
92	40.4	4.5	1.00	3.5	19.29		
94	39.8	4.4	1.00	3.4	19.29		
96	39.1	4.3	1.00	3.3	**19.30**	<===	Required volume
98	38.5	4.3	1.00	3.3	19.29		for roof storage
100	37.9	4.2	1.00	3.2	19.29		
102	37.3	4.2	1.00	3.2	19.28		
104	36.8	4.1	1.00	3.1	19.27		
106	36.2	4.0	1.00	3.0	19.26		
108	35.7	4.0	1.00	3.0	19.25		
110	35.2	3.9	1.00	2.9	19.24		
112	34.7	3.9	1.00	2.9	19.22		

Req. Storage volume **19.30** m3

Average depth **0.048** m

ROOF BLOCK 400

1500 sm

100 -YR FLOW

Qp (l/s)

Area(ha)= 0.1500

Cw = 1.00

STORMWATER MANAGEMENT Qm = 4.00 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)	
82	44.2	18.4	4.00	14.4	70.90	
84	43.3	18.1	4.00	14.1	70.94	
86	42.6	17.8	4.00	13.8	70.96	
88	41.8	17.4	4.00	13.4	**70.97**	<=== Required volume for roof storage
90	41.1	17.1	4.00	13.1	70.97	
92	40.4	16.9	4.00	12.9	70.96	
94	39.8	16.6	4.00	12.6	70.95	
96	39.1	16.3	4.00	12.3	70.92	
98	38.5	16.1	4.00	12.1	70.88	
100	37.9	15.8	4.00	11.8	70.83	
102	37.3	15.6	4.00	11.6	70.78	
104	36.8	15.3	4.00	11.3	70.72	

Req. Storage volume	**70.97**	**m3**
Average depth	**0.047**	**m**

ROOF BLOCK 900

4600 sm

100 -YR FLOW

Qp (l/s)

Area(ha)= 0.4600

Cw = 1.00

STORMWATER MANAGEMENT Qm = 10.00 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)	
104	36.8	47.0	10.00	37.0	231.01	
106	36.2	46.3	10.00	36.3	231.06	
108	35.7	45.7	10.00	35.7	231.10	
110	35.2	45.0	10.00	35.0	**231.11**	<=== Required volume for roof storage
112	34.7	44.4	10.00	34.4	231.10	
114	34.2	43.8	10.00	33.8	231.07	
116	33.8	43.2	10.00	33.2	231.03	
118	33.3	42.6	10.00	32.6	230.96	
120	32.9	42.1	10.00	32.1	230.87	
122	32.5	41.5	10.00	31.5	230.77	
124	32.1	41.0	10.00	31.0	230.65	
126	31.7	40.5	10.00	30.5	230.52	

Req. Storage volume	**231.11**	**m3**
Average depth	**0.050**	**m**

PARKING LOT Area # 221

2900 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 85 l/s

Area(ha)=	0.2900				
Cw =	1.00	STORMWATER MANAGEMENT Qm =		42.50 l/s	
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
13	155.1	125.0	42.50	82.5	64.39
14	148.7	119.9	42.50	77.4	65.02
15	142.9	115.2	42.50	72.7	65.43
16	137.5	110.9	42.50	68.4	65.66
17	132.6	106.9	42.50	64.4	**65.71**
18	128.1	103.3	42.50	60.8	65.62
19	123.9	99.9	42.50	57.4	65.39
20	120.0	96.7	42.50	54.2	65.04
21	116.3	93.8	42.50	51.3	64.59
22	112.9	91.0	42.50	48.5	64.03
23	109.7	88.4	42.50	45.9	63.38

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB221A	1.00	0.36
CB221B	1.30	0.47
CB221C	1.50	0.54
		0.00
	Total:	**1.37**

IN-LINE STORAGE (Structure)

CBMH's		
1.2m dia=1.13 m3/m	Height	Storage
1.8m dia=2.54m3/m	(m)	(m3)
CBMH221(1.2m)	2.20	2.49
MH221 (1.8m)	2.20	5.59
	Total:	**2.49**

OFF-LINE STORAGE (Structure)

MH's		
1.8m dia=2.54m3/m	Height	Storage
	(m)	(m3)
MH500	2.20	5.59
	Total:	**5.59**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

ICD use Tempest HF 85l/s @ 2.35m head, or approved equal

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CB221A - CBMH221	17.05	0.45	2.71
CB221B - CB221C	12.00	0.45	1.91
CB221C-CBMH221	18.50	0.45	2.94
CBMH221 - MH221	33.38	0.60	9.44
		Total:	**17.00**

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
221C	8.28	0.05	0.14
		Total:	**0.14**

OFF-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
MH500 - MH221	12.00	1.05	10.39
16X6 Triton M-6 storage cell			33.00
		Total:	**43.39**

Overflow from area 110	**4.25**
Total Storage required	**69.97**
Total Storage provided	**69.97**
Overflow to Area 230A	**0.00**

PARKING LOT Area # 231

6800 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 150 l/s

Area(ha)=	0.6800					
Cw =	1.00	STORMWATER MANAGEMENT Qm =			75.00 l/s	
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume	
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)	
17	132.6	250.7	75.00	175.7	179.24	
19	123.9	234.2	75.00	159.2	181.44	
20	120.0	226.8	75.00	151.8	182.11	
21	116.3	219.8	75.00	144.8	182.51	
22	112.9	213.4	75.00	138.4	**182.68**	<=== Required volume for storage on-site
23	109.7	207.3	75.00	132.3	182.63	
24	106.7	201.7	75.00	126.7	182.39	
25	103.8	196.3	75.00	121.3	181.97	
26	101.2	191.3	75.00	116.3	181.38	
27	98.7	186.5	75.00	111.5	180.64	
29	94.0	177.7	75.00	102.7	178.74	

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
	Total:	0.00

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CB233-CBMH233	15.60	0.60	4.41
CBMH233-CBMH232	34.20	0.60	9.67
CB232-CBMH323	15.60	0.60	4.41
CBMH232 - CBMH231	34.20	0.60	9.67
CB231-CBMH231	15.60	0.60	4.41
		Total:	32.57

IN-LINE STORAGE (Structure)

1.2mDia CBMH's=1.13m3/m		
1.5m dia=1.77m3/m	Height	Storage
	(m)	(m3)
CBMH233 (1.5m)	1.42	2.5134
CBMH232 (1.5m)	1.49	2.6373
CBMH231 (1.5m)	1.53	2.7081
	Total:	7.86

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
231	295.46	0.20	19.70
232	337.60	0.20	22.51
233	333.20	0.20	22.21
		Total:	64.42

OFF-LINE STORAGE (Structure)

MH's		
1.8m dia=2.55m3/m	Height	Storage
	(m)	(m3)
CBMH231A	1.81	4.62
CBMH232A	1.70	4.34
CBMH233A	1.64	4.18
	Total:	13.13

OFF-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
MH501 - MH230	68.40	0.60	19.34
10X18 Trilon M-6 storage cell			67.00
		Total:	86.34

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

Overflow from area 100, 123	**20.74**
Total Storage required	**203.42**
Total Storage provided	**204.32**
Overflow to area 230A	**0.00**

ICD use Tempest HF 150l/s @ 2.26m head, or approved equal

PARKING LOT Area # 230B

1900 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 70 l/s

Area(ha)= 0.1900

Cw = 1.00

STORMWATER MANAGEMENT Qm = 35.00 l/s

Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
9	188.3	99.4	35.00	64.4	34,80
11	169.9	89.7	35.00	54.7	36.13
12	162.1	85.6	35.00	50.6	36.46
13	155.1	81.9	35.00	46.9	**36,60**
14	148.7	78.6	35.00	43.8	36.59
15	142.9	75.5	35.00	40.5	36,43
16	137.5	72.7	35.00	37.7	36.15
17	132.6	70.1	35.00	35.1	35.76
18	128.1	67.7	35.00	32.7	35.27
19	123.9	65.4	35.00	30.4	34.69
21	116.3	61.4	35.00	26.4	33.30

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB230A	1.45	0.52
CB230B	1.55	0.56
	Total:	**1.08**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CB230A - CB230B	10.00	0.25	0.49
		Total:	**0.49**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
223C	366.50	0.25	30.54
		Total:	**30.54**

Overflow from area 221 & 231	**0.00**
Total Storage required	**36.60**
Total Storage provided	**32.11**
Overflow to area 230D	**4.49**

ICD use Tempest HF 70l/s @ 1.71m head, or approved equal

PARKING LOT Area # 230C

300 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 10 l/s

Area(ha)= 0.0300

Cw = 1.00

STORMWATER MANAGEMENT Qm = 5.00 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)	
11	169.9	14.2	5.00	9.2	6.05	
13	155.1	12.9	5.00	7.9	6.19	
14	148.7	12.4	5.00	7.4	6.22	
15	142.9	11.9	5.00	6.9	**6.23**	<=== Required volume for storage on-site
16	137.5	11.5	5.00	6.5	6.21	
17	132.6	11.1	5.00	6.1	6.18	
18	128.1	10.7	5.00	5.7	6.14	
19	123.9	10.3	5.00	5.3	6.08	
20	120.0	10.0	5.00	5.0	6.00	
21	116.3	9.7	5.00	4.7	5.92	
23	109.7	9.1	5.00	4.1	5.72	

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB230C	1.45	0.52
		0.00
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
		0.20	0.00
		Total:	0.00

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
	41.50	0.07	0.97
		Total:	0.97

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	0.00

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6 storage cell	6.00	3.00	5.00
		Total:	**5.00**

Total Storage required	6.23
Total Storage provided	6.49
Overflow to area 230D	0.00

ICD use Tempest LMF 10l/s @ 1.4m head, or approved equal

PARKING LOT Area 230D

1300 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 67 l/s

Area(ha)=	0.1300	STORMWATER MANAGEMENT Qm =			33.50 l/s	
Cw =	1.00					
Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)	
5	242.7	87.7	33.50	54.2	16.26	
6	226.0	81.7	33.50	48.2	17.34	
7	211.7	76.5	33.50	43.0	18.06	
8	199.2	72.0	33.50	38.5	18.48	
9	188.3	68.0	33.50	34.5	**18.65**	<=== Required volume for storage on-site
10	178.6	64.5	33.50	31.0	18.62	
11	169.9	61.4	33.50	27.9	18.42	
12	162.1	58.6	33.50	25.1	18.07	
13	155.1	56.1	33.50	22.6	17.59	
14	148.7	53.7	33.50	20.2	17.01	
16	137.5	49.7	33.50	16.2	15.56	

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height (m)	Storage (m3)
CB230D	1.45	0.52
CB230E	1.55	0.56
	Total:	**1.08**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length (m)	Dia (m)	Storage (m3)
CB230D-CB230E	10.00	0.25	0.49
		0.30	**0.00**
		Total:	**0.49**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height (m)	Storage (m3)
		0.00
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA (SM)	Depth (m)	Storage (m3)
230D	391.79	0.15	19.59
			0.00
			0.00
			0.00
			0.00
		Total:	**19.59**

Overflow from 230A, 230C	**4.49**
Total Storage required	**23.14**
Total Storage provided	**21.16**
Overflow to area 230G	**1.98**

ICD use Tempest HF 67l/s @ 1.68m head, or approved equal

PARKING LOT Area 230F

700 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 38 l/s

Area(ha)=	0.0700				
Cw =	1.00	STORMWATER MANAGEMENT Qm =		19.00 l/s	
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
6	226.0	44.0	19.00	25.0	8.99
7	211.7	41.2	19.00	22.2	9.32
8	199.2	38.8	19.00	19.8	9.49
9	188.3	36.6	19.00	17.6	**9.52**
10	178.6	34.7	19.00	15.7	9.45
11	169.9	33.1	19.00	14.1	9.28
12	162.1	31.6	19.00	12.6	9.04
13	155.1	30.2	19.00	11.2	8.72
14	148.7	28.9	19.00	9.9	8.35
15	142.9	27.8	19.00	8.8	7.93
17	132.6	25.8	19.00	6.8	6.95

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB203F	1.45	0.52
		0.00
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
		0.20	0.00
		Total:	**0.00**

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
18A	89.22	0.21	6.25
		0.00	**0.00**
		Total:	**6.25**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6 storage cell	6.00	3.00	5.00
		Total:	**5.00**

Overflow from Area 223	**0.00**
Total Storage required	**9.52**
Total Storage provided	**11.77**
Overflow to Area 230G	**0.00**

ICD use Tempest HF 38l/s @ 1.53m head, or approved equal

PARKING LOT Area 230G

1700 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 53 l/s

Area(ha)=	0.1700	STORMWATER MANAGEMENT Qm =			26.50 l/s
Cw =	1.00				
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
13	155.1	73.3	26.50	46.8	36.51
14	148.7	70.3	26.50	43.8	36.78
15	142.9	67.5	26.50	41.0	36.93
16	137.5	65.0	26.50	38.5	**36.97**
17	132.8	62.7	26.50	36.2	36.90
18	128.1	60.5	26.50	34.0	36.75
19	123.9	58.5	26.50	32.0	36.53
20	120.0	56.7	26.50	30.2	36.23
21	116.3	55.0	26.50	28.5	35.86
22	112.9	53.3	26.50	26.8	35.44
24	106.7	50.4	26.50	23.9	34.44

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB230G	1.45	0.52
CB230H	1.55	0.56
	Total:	**1.08**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CB230G-CB230H	10.00	0.25	0.49
		Total:	**0.49**

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
230G	258.40	0.18	15.50
		Total:	**15.50**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

CBMH height for storage equals top of grate to invert less 0.64m to account for flat top and iron frame/grate

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6 storage cell	12.00	6.00	26.00
		Total:	**26.00**

overflow from 230D, 230F	1.98
Total Storage required	38.95
Total Storage provided	43.07
1/2 Overflow to Area 206D	0.00
1/2 Overflow to Area 205	0.00

ICD use Tempest HF 53l/s @ 1.71m head, or approved equal

PARKING LOT Area 230I

300 sm

100 -YR FLOW

Flow restricted to 11 l/s

Qp (l/s)					
Area(ha)=	0.0300				
Cw =	1.00	STORMWATER MANAGEMENT Qm =	5.50 l/s		
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
9	188.3	15.7	5.50	10.2	5.51
11	169.9	14.2	5.50	8.7	5.72
12	162.1	13.5	5.50	8.0	5.78
13	155.1	12.9	5.50	7.4	**5.80**
14	148.7	12.4	5.50	6.9	5.80
15	142.9	11.9	5.50	6.4	5.78
16	137.5	11.5	5.50	6.0	5.73
17	132.6	11.1	5.50	5.6	5.67
18	128.1	10.7	5.50	5.2	5.60
19	123.9	10.3	5.50	4.8	5.51
21	116.3	9.7	5.50	4.2	5.29

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB230I	1.45	0.52
		0.00
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
		0.20	0.00
		Total:	**0.00**

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA	Depth	Storage
		(m)	(m3)
230I	66.30	0.14	3.09
		Total.	**3.09**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6 storage cell	6.00	3.00	5.00
		Total:	**5.00**

Total Storage required	**5.80**
Total Storage provided	**8.62**
Overflow to Area 230G	**0.00**

ICD use Tempest LMF 11l/s @ 1.44m head, or approved equal

PARKING LOT Area # 222

1200 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 15 l/s

Area(ha)= 0.1200

Cw = 1.00

STORMWATER MANAGEMENT Qm = 7.50 l/s

Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
35	82.6	27.5	7.50	20.0	42.10
37	79.4	26.5	7.50	19.0	42.17
38	77.9	26.0	7.50	18.5	42.18
39	76.5	25.5	7.50	18.0	**42.18**
40	75.1	25.1	7.50	17.6	42.16
41	73.8	24.6	7.50	17.1	42.14
42	72.6	24.2	7.50	16.7	42.11
43	71.4	23.8	7.50	16.3	42.06
44	70.2	23.4	7.50	15.9	42.01
45	69.1	23.0	7.50	15.5	41.95
47	66.9	22.3	7.50	14.8	41.79

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB222	1.45	0.52
		0.00
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CB222	14.80	0.25	0.73
		Total:	**0.73**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
CBMH222	1.50	1.70
	Total:	**1.70**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
222	340.74	0.19	21.58
222A	129.60	0.15	6.48
		Total:	**28.06**

Total Storage required	**42.18**
Total Storage provided	**31.00**
Overflow to area 223	**11.17**

ICD use Tempest LMF 15l/s @ 2.44m head, or approved equal

PARKING LOT Area # 223

2700 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 32 l/s

Area(ha)= 0.2700

Cw = 1.00

STORMWATER MANAGEMENT Qm = 16.00 l/s

Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume	
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)	
35	82.6	62.0	16.00	46.0	96.57	
36	81.0	60.8	16.00	44.8	96.71	
37	79.4	59.6	16.00	43.6	96.81	
38	77.9	58.5	16.00	42.5	96.89	
39	76.5	57.4	16.00	41.4	**96.95**	<=== Required volume for storage on-site
40	75.1	56.4	16.00	40.4	96.97	
41	73.8	55.4	16.00	39.4	96.97	
42	72.6	54.5	16.00	38.5	96.94	
43	71.4	53.6	16.00	37.6	96.90	
44	70.2	52.7	16.00	36.7	96.83	
46	68.0	51.0	16.00	35.0	96.63	

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB223	1.45	0.52
		0.00
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CB223 - CBMH223	34.20	0.45	5.44
		0.30	0.00
		Total:	**5.44**

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
223	706.92	0.25	58.91
		Total:	**58.91**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
CBMH223	1.50	1.70
	Total:	**1.70**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6 storage cell	11.00	12.00	50.00
		Total:	**50.00**

Overflow from area 212, 222	**18.27**
Total Storage required	**115.22**
Total Storage provided	**116.57**
Overflow to area 230F	**0.00**

ICD use Tempest HF 32l/s @ 2.67mhead, or approved equal

PARKING LOT Area # 212

600 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 24 l/s

Area(ha)=	0.0600				
Cw =	1.00	STORMWATER MANAGEMENT Qm =		12.00 l/s	
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
8	199.2	33.2	12.00	21.2	10.19
10	178.6	29.8	12.00	17.8	10.67
11	169.9	28.3	12.00	16.3	10.78
12	162.1	27.0	12.00	15.0	10.83
13	155.1	25.9	12.00	13.9	10.82
14	148.7	24.8	12.00	12.8	10.76
15	142.9	23.8	12.00	11.8	10.65
16	137.5	22.9	12.00	10.9	10.51
17	132.6	22.1	12.00	10.1	10.32
18	128.1	21.4	12.00	9.4	10.11
20	120.0	20.0	12.00	8.0	9.61

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CICB212B	1.45	0.52
CICB212B	1.55	0.56
	Total:	**1.08**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CICB212A-CICB212B	10.28	0.25	0.50
		Total:	**0.50**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
	92.12	0.07	2.15
		Total:	**2.15**

Total Storage required	**10.83**
Total .Storage provided	**3.73**
Overflow to area 223	**7.10**

ICD use Tempest LMF 24l/s @ 1.63m head, or approved equal

PARKING LOT Area # 215

400 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 10 l/s

Area(ha)= 0.0400

Cw = 1.00

STORMWATER MANAGEMENT Qm = 5.00 l/s

Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume	
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)	
16	137.5	15.3	5.00	10.3	9.88	
18	128.1	14.2	5.00	9.2	9.98	
19	123.9	13.8	5.00	8.8	10.00	
20	120.0	13.3	5.00	8.3	**10.01**	<=== Required volume for storage on-site
21	116.3	12.9	5.00	7.9	9.99	
22	112.9	12.6	5.00	7.6	9.97	
23	109.7	12.2	5.00	7.2	9.93	
24	106.7	11.9	5.00	6.9	9.88	
25	103.8	11.5	5.00	6.5	9.82	
26	101.2	11.3	5.00	6.3	9.75	
28	96.3	10.7	5.00	5.7	9.59	

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB213	1.45	0.52
		0.00
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
ECB-CB215	24.00	0.25	1.18
		Total:	**1.18**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
	64.44	0.25	5.37
		Total:	**5.37**

Total Storage required	**10.01**
Total Storage provided	**7.07**
Overflow to 206A	**2.94**

ICD use Tempest LMF 10l/s @ 1.57m head, or approved equal

PARKING LOT Area # 206B

700 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 10 l/s

Area(ha)=	0.0700				
Cw =	1.00	STORMWATER MANAGEMENT Qm =			5.00 l/s
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
30	91.9	17.9	5.00	12.9	23.18
32	87.9	17.1	5.00	12.1	23.24
33	86.0	16.7	5.00	11.7	23.25
34	84.3	16.4	5.00	11.4	**23.25**
35	82.6	16.1	5.00	11.1	23.25
36	81.0	15.8	5.00	10.8	23.23
37	79.4	15.5	5.00	10.5	23.21
38	77.9	15.2	5.00	10.2	23.18
39	76.5	14.9	5.00	9.9	23.14
40	75.1	14.6	5.00	9.6	23.10
42	72.6	14.1	5.00	9.1	22.99

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB206B	1.45	0.52
		0.00
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
		0.20	0.00
		Total:	**0.00**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
206B	344.76	0.25	28.73
		0.13	0.00
		Total:	**28.73**

Total Storage required	**23.25**
Total Storage provided	**29.25**
Overflow to area 206A	**0.00**

ICD use Tempest LMF 10l/s @ 1.57m head, or approved equal

PARKING LOT Area # 206A

3800 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 85 l/s

Area(ha)=	0.3800	STORMWATER MANAGEMENT Qm =	42.50 l/s		
Cw =	1.00				
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
17	132.6	140.1	42.50	97.6	99.56
19	123.9	130.9	42.50	88.4	100.72
20	120.0	126.7	42.50	84.2	101.06
21	116.3	122.9	42.50	80.4	101.25
22	112.9	119.2	42.50	76.7	**101.31**
23	109.7	115.9	42.50	73.4	101.25
24	106.7	112.7	42.50	70.2	101.08
25	103.8	109.7	42.50	67.2	100.81
26	101.2	106.9	42.50	64.4	100.44
27	98.7	104.2	42.50	61.7	99.99
29	94.0	99.3	42.50	56.8	98.86

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB206	1.58	0.57
		0.00
	Total:	**0.57**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
CBMH206	1.50	1.70
	Total:	**1.70**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CB206-CBMH206	25.60	0.45	4.07
		Total:	**4.07**

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
206A	772.10	0.25	64.34
206	79.40	0.10	2.65
		Total:	**66.99**

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6 storage cell	10.00	8.00	31.00
		Total:	**31.00**

Overflow from area 206B, 215	**2.94**
Total Storage required	**104.24**
Total Storage provided	**104.32**
Overflow to 210A	**0.00**

ICD use Tempest HF 85l/s @ 2.41m head, or approved equal

PARKING LOT Area # 210A

1200 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 77 l/s

Area(ha)= 0.1200

Cw = 1.00

STORMWATER MANAGEMENT Qm = 38.50 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)	
5	242.7	81.0	38.50	42.5	12.74	
5.5	234.0	78.1	38.50	39.6	13.06	
6.5	218.6	72.9	38.50	34.4	13.42	
7.5	205.2	68.5	38.50	30.0	**13.48**	<=== Required volume for storage on-site
8.5	193.6	64.6	38.50	26.1	13.30	
9.5	183.3	61.1	38.50	22.6	12.90	
10.5	174.1	58.1	38.50	19.6	12.34	
11.5	165.9	55.4	38.50	16.9	11.63	
12.5	158.5	52.9	38.50	14.4	10.79	
13.5	151.8	50.7	38.50	12.2	9.84	
15.5	140.2	46.8	38.50	8.3	7.68	

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB210A	1.45	0.52
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
		Total:	**0.00**

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
8B	44.62	0.20	2.97
		Total:	**2.97**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6 storage cell	5.00	6.00	10.00
		Total:	**10.00**

Overflow from area 206A	**0.00**
Total Storage required	**13.48**
Total Storage provided	**13.50**
Overflow to 206D	**0.00**

ICD use Tempest HF 77l/s @ 1.55m head, or approved equal

PARKING LOT Area # 206D

400 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 14 l/s

Area(ha)= 0.0400

Cw = 1.00

STORMWATER MANAGEMENT Qm = 7.00 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)	
11	169.9	18.9	7.00	11.9	7.85	
12	162.1	18.0	7.00	11.0	7.94	
13	155.1	17.2	7.00	10.2	7.99	
14	**148.7**	16.5	7.00	9.5	**8.01**	<=== Required volume
15	142.9	15.9	7.00	8.9	8.00	for storage on-site
16	137.5	15.3	7.00	8.3	7.96	
17	132.6	14.7	7.00	7.7	7.90	
18	128.1	14.2	7.00	7.2	7.82	
19	123.9	13.8	7.00	6.8	7.72	
20	120.0	13.3	7.00	6.3	7.61	
21	116.3	12.9	7.00	5.9	7.47	

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB206C	1.45	0.52
		0.00
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
		0.20	0.00
		Total:	**0.00**

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
206C	75.00	0.15	3.75
		Total:	**3.75**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6 storage cell	6.00	3.00	5.00
		Total:	**5.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

Total Storage required	**8.01**
Total Surface Storage provided	**9.27**
Overflow to area 206D	**0.00**

ICD use Tempest LMF 14l/s @ 1.47m head, or approved equal

Street 1, Area # 206E

500 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 60 l/s

Area(ha)=	0.0500				
Cw =	0.94	STORMWATER MANAGEMENT Qm =	30.00 l/s		
Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x I (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)
0.5	373.4	48.8	30.00	18.8	0.56
1	351.4	45.9	30.00	15.9	0.95
1.5	332.1	43.4	30.00	13.4	1.21
2	315.0	41.2	30.00	11.2	1.34
2.5	299.8	39.2	30.00	9.2	**1.37**
3	286.0	37.4	30.00	7.4	1.33
3.5	273.7	35.8	30.00	5.8	1.21
4	262.4	34.3	30.00	4.3	1.03
4.5	252.1	32.9	30.00	2.9	0.79
5	242.7	31.7	30.00	1.7	0.51
5.5	234.0	30.6	30.00	0.6	0.19

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height (m)	Storage (m3)
CB206D	1.45	0.52
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length (m)	Dia (m)	Storage (m3)
		0.30	0.00
		Total:	**0.00**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height (m)	Storage (m3)
		0.00
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA (SM)	Depth (m)	Storage (m3)
206D	24.81	0.14	1.16
		Total:	**1.16**

Overflow from 206C 210A 230G	0.00
Total Storage required	0.00
Total Storage provided	1.68
Overflow to future area	0.00

ICD use Tempest HF 60l/s @ 1.46m head, or approved equal

Street 1 Area # 205

1600 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 60 l/s

Area(ha)=	0.1600				
Cw =	0.94	STORMWATER MANAGEMENT Qm =		30.00 l/s	
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
8	199.2	83.3	30.00	53.3	25.58
9	188.3	78.7	30.00	48.7	26.30
10	178.6	74.7	30.00	44.7	26.79
11	169.9	71.0	30.00	41.0	27.09
12	162.1	67.8	30.00	37.8	**27.21**
13	155.1	64.9	30.00	34.9	27.18
14	148.7	62.2	30.00	32.2	27.03
15	142.9	59.7	30.00	29.7	26.77
16	137.5	57.5	30.00	27.5	26.41
17	132.6	55.5	30.00	25.5	25.96
18	128.1	53.6	30.00	23.6	25.44

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CICB205A	1.45	0.52
CICB205B	1.55	0.56
	Total:	**1.08**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CICB205A-CICB205B	14.00	0.25	0.69
			0.00
		Total:	**0.69**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
		0.00
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
205	69.82	0.11	2.56
		Total:	2.56

Overflow from 204, 206D, 1/2 230G	**18.13**
Total Storage required	**45.34**
Total Storage provided	**4.33**
Overflow to Area Future	**41.01**

ICD use Tempest HF 60l/s @ 1.68m head, or approved equal

PARKING LOT Area # 240A

500 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 10 l/s

Area(ha)=	0.0500				
Cw =	1.00	STORMWATER MANAGEMENT Qm =		5.00 l/s	
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
20	120.0	16.7	5.00	11.7	14.01
21	116.3	16.2	5.00	11.2	14.07
22	112.9	15.7	5.00	10.7	14.11
23	109.7	15.2	5.00	10.2	14.14
24	106.7	14.8	5.00	9.8	14.15
25	103.8	14.4	5.00	9.4	14.15
26	101.2	14.1	5.00	9.1	14.14
27	98.7	13.7	5.00	8.7	14.12
28	96.3	13.4	5.00	8.4	14.08
29	94.0	13.1	5.00	8.1	14.04
30	91.9	12.8	5.00	7.8	13.99

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CICB240A	1.45	0.52
CICB240B	1.55	0.56
		0.00
	Total:	1.08

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
		0.00
		0.00
		0.00
	Total:	0.00

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

ICD use Tempest LMF 10l/s @ 1.65m head, or approved equal

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CICB240A-CICB240B	10.00	0.25	0.49
			0.00
			0.00
			0.00
			0.00
		Total:	0.49

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
240A	79.61	0.10	2.65
		Total:	2.65

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6 storage cell	11.00	3.00	10.00
		Total:	10.00

Total Storage required	**14.15**
Total Storage provided	**14.22**
1/2 Overflow to Area 204	**0.00**
1/2 Overflow to Area 201	**0.00**

Street 1 Area # 204

1300 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 55 l/s

Area(ha)= 0.1300

Cw = 0.94

STORMWATER MANAGEMENT Qm = 27.50 l/s

Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
8	199.2	67.7	27.50	40.2	19.28
9	188.3	64.0	27.50	36.5	19.68
10	178.6	60.7	27.50	33.2	19.90
11	169.9	57.7	27.50	30.2	**19.95**
12	162.1	55.1	27.50	27.6	19.86
13	155.1	52.7	27.50	25.2	19.65
14	148.7	50.5	27.50	23.0	19.34
15	142.9	48.5	27.50	21.0	18.94
16	137.5	46.7	27.50	19.2	18.46
17	132.6	45.1	27.50	17.6	17.91
18	128.1	43.5	27.50	16.0	17.29

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CICB204A	1.45	0.52
CICB204B	1.55	0.56
	Total:	**1.08**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CICB204A-CICB204B	15.00	0.25	0.74
		Total:	**0.74**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
		0.13	0.00
		0.13	0.00
		Total:	**0.00**

Overflow from area 1/2 240A	**0.00**
Total Storage required	**19.95**
Total Storage provided	**1.82**
Overflow to Area 205	**18.13**

ICD use Tempest HF 55l/s @ 1.51m head, or approved equal

PARKING LOT Area 240D

500 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 10 l/s

Area(ha)= 0.0500

Cw = 1.00

STORMWATER MANAGEMENT Qm = 5.00 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)	
16	137.5	19.1	5.00	14.1	13.55	
18	126.1	17.8	5.00	12.8	13.83	
20	120.0	16.7	5.00	11.7	14.01	
22	112.9	15.7	5.00	10.7	14.11	
24	106.7	14.8	5.00	9.8	14.15	<=== Required volume for storage on-site
26	101.2	14.1	5.00	9.1	14.14	
28	96.3	13.4	5.00	8.4	14.08	
30	91.9	12.8	5.00	7.8	13.99	
32	87.9	12.2	5.00	7.2	13.85	
34	84.3	11.7	5.00	6.7	13.69	
35	82.6	11.5	5.00	6.5	13.60	

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height (m)	Storage (m3)
CB240D	1.45	0.52
	Total:	**0.52**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height (m)	Storage (m3)
		0.00
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

ICD use Tempest LMF 10l/s @ 1.46m head, or approved equal

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length (m)	Dia (m)	Storage (m3)
		0.25	0.00
		0.30	0.00
		Total:	**0.00**

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA (SM)	Depth (m)	Storage (m3)
240C	204.50	0.14	9.54
		Total:	**9.54**

OFF-LINE STORAGE (Cell)

Cell storage			
	Length (m)	width (m)	Storage (m3)
Triton M-6 storage cell	6.00	3.00	5.00
		Total:	**5.00**

Total Storage required	**14.15**
Total Storage provided	**15.07**
Overflow to Area 201	**0.00**

Street 1 Area 201

2900 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 60 l/s

Area(ha)=	0.2900				
Cw =	0.94	STORMWATER MANAGEMENT Qm =	30.00 l/s		
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
19	123.9	93.9	30.00	63.9	72.81
20	120.0	90.9	30.00	60.9	73.08
21	116.3	88.1	30.00	58.1	73.25
22	112.9	85.5	30.00	55.5	**73.32**
23	109.7	83.1	30.00	53.1	73.31
24	106.7	80.8	30.00	50.8	73.21
25	103.8	78.7	30.00	48.7	73.05
26	101.2	76.7	30.00	46.7	72.82
27	98.7	74.6	30.00	44.8	72.52
28	96.3	73.0	30.00	43.0	72.17
29	94.0	71.2	30.00	41.2	71.77

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CICB201A**	1.45	0.52
CICB201B**	1.65	0.59
	Total:	**2.23**

**double CB's, volume x 2.

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CICB201A - CICB201B	15.00	0.25	0.74
		Total:	**0.74**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 100yr Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
201	649.30	0.29	62.77
			0.00
		Total:	**62.77**

Overflow from Area 240D, 122	**0.00**
Total Storage required	**73.32**
Total Storage provided	**65.73**
overflow to future area	**7.59**

ICD use Tempest HF 60l/s @ 1.71m head, or approved equal

OUTLET # 1 (MH301) SUMMARY

Total Flow from Roofs=	**,18.00 l/s**
Total Roof Area =	**0.750 Ha**
Average roof flow =	**24.00 l/s/Ha**
Volume Stored on Roofs	**367.15 cm**
Total Roof Storage rate	**489.54 cm/Ha**
Total flow from parking lot =	**1006.00 l/s**
Total parking Lot area =	**3.420 Ha**
Average parking lot flow =	**294.15 l/s/Ha**
Volume Stored on Parking lot	**815.08 cm**
Total Parking lot Storage rate	**238.33 cm/Ha**
Total uncontrolled flow from site	**38.72 l/s**
Total uncontrolled area	**0.110 Ha**
Total flow	**1062.72 l/s**
Total area	**4.280 Ha**
Average flow	**248.30 l/s/Ha**
Volume Stored	**1182.23 cm**
Total Storage rate	**276.22 cm/Ha**

IBI
333 Preston St
OTTAWA, ONTARIO
K1S 5N4

ONSITE SWM 100yr design
PROJECT: **Arcadia commercial**
CITY OF OTTAWA
DEVELOPER Minto

PAGE: 1 OF 1
JOB #: 35355
DATE. Oct 1, 2014
DESIGN: DY
Rev#3

Outlet # 2 EX MH 301
100yr design

MAXIMUM ALLOWABLE FLOW - Flow Restricted to 240 l/s/Ha

Time of concentration = 10 minutes

Area (ha) =	**0.800**
C Average =	**0.90**

Intensity - 5 year event storm

10 min Tc	i5yr = 998.071/(T+6.053)^0.814=	**104.2**	mm/hr

Unrestricted Flowrate (Q5)

10 min Tc	Qpre-devo = 2.78*A*Cw*i =	**208.55** l/s

Restricted Flowrate (Q5)

10 min Tc	Q= 240 l/s/Ha	**192.00** l/s

Intensity - 100 year event storm

10 min Tc	i100yr = 1735.688/(T+6.014)^0.82=	**178.6**	mm/hr

Unrestricted Flowrate (Q100)

10 min Tc	Qpost-devo = 2.78*A*Cw*i =	**357.40** l/s

Restricted Flowrate (Q5)

10 min Tc	Q= 240 l/s/Ha	**192.00** l/s

Uncontrolled runoff (Q100)

Location	Area	C	AxC
UNC 1A	0.02	0.2	0.004
UNC 1B	0.02	0.2	0.004
UNC 1C	0.02	0.2	0.004
UNC 1D	0.02	0.2	0.004
			0
Total	0.08	0.20	0.016
10 min Tc	Q_{uno}= 2.78 Aci	**7.94** l/s	

Allowable Release
$Q_{rest\ 100yr}$ - Q_{unc} = Q_{allow} **184.06** l/s

STORM WATER MANAGEMENT - Post-Development Controlled

(5 year post-development with 100yr inlets)

ROOF AREA 500

900 sm

100 -YR FLOW

Qp (l/s)

Area(ha)=	0.0900	STORMWATER MANAGEMENT Qm =			2.00 l/s
Cw =	1.00				
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
100	37.9	9.5	2.00	7.5	44.90
102	37.3	9.3	2.00	7.3	44.92
104	36.8	9.2	2.00	7.2	44.93
106	36.2	9.1	2.00	7.1	**44.93**
108	35.7	8.9	2.00	6.9	44.93
110	35.2	8.8	2.00	6.8	44.93
112	34.7	8.7	2.00	6.7	44.92
114	34.2	8.6	2.00	6.6	44.91
116	33.8	8.5	2.00	6.5	44.90
118	33.3	8.3	2.00	6.3	44.88
120	32.9	8.2	2.00	6.2	44.86
122	32.5	8.1	2.00	6.1	44.83

<=== Required volume for roof storage

Req. Storage volume	**44.93**	**m3**
Average depth	**0.050**	**m**

ROOF AREA 600

600 sm

100 -YR FLOW

Qp (l/s)

Area(ha)=	0.0600	STORMWATER MANAGEMENT Qm =			2.00 l/s
Cw =	1.00				
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
66	52.0	8.7	2.00	6.7	26.46
68	50.9	8.5	2.00	6.5	26.47
70	49.8	8.3	2.00	6.3	26.48
72	48.7	8.1	2.00	6.1	**26.48**
74	47.7	8.0	2.00	6.0	26.48
76	46.8	7.8	2.00	5.8	26.46
78	45.9	7.7	2.00	5.7	26.45
80	45.0	7.5	2.00	5.5	26.42
82	44.2	7.4	2.00	5.4	26.39
84	43.3	7.2	2.00	5.2	26.36
86	42.6	7.1	2.00	5.1	26.32
88	41.8	7.0	2.00	5.0	26.28

<=== Required volume for roof storage

Req. Storage volume	**26.48**	**m3**
Average depth	**0.044**	**m**

ROOF AREA 700

1000 sm
100 -YR FLOW
Qp (l/s)

Area(ha)=	0.1000
Cw =	1.00

STORMWATER MANAGEMENT Qm = 2.00 l/s

Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume	
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)	
115	34.0	9.5	2.00	7.5	51.43	
117	33.6	9.3	2.00	7.3	51.44	
119	33.1	9.2	2.00	7.2	51.44	
121	32.7	9.1	2.00	7.1	**51.44**	<=== Required volume for roof storage
123	32.3	9.0	2.00	7.0	51.44	
125	31.9	8.9	2.00	6.9	51.43	
127	31.5	8.7	2.00	6.7	51.42	
129	31.1	8.6	2.00	6.6	51.41	
131	30.7	8.5	2.00	6.5	51.39	
133	30.4	8.4	2.00	6.4	51.37	
135	30.0	8.3	2.00	6.3	51.35	
137	29.7	8.2	2.00	6.2	51.32	

Req. Storage volume	**51.44**	**m3**
Average depth	**0.051**	**m**

ROOF AREA 800

600 sm
100 -YR FLOW
Qp (l/s)

Area(ha)=	0.0600
Cw =	1.00

STORMWATER MANAGEMENT Qm = 2.00 l/s

Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume	
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)	
66	52.0	8.7	2.00	6.7	26.46	
68	50.9	8.5	2.00	6.5	26.47	
70	49.8	8.3	2.00	6.3	26.48	
72	48.7	8.1	2.00	6.1	**26.48**	<=== Required volume for roof storage
74	47.7	8.0	2.00	6.0	26.48	
76	46.8	7.8	2.00	5.8	26.46	
78	45.9	7.7	2.00	5.7	26.45	
80	45.0	7.5	2.00	5.5	26.42	
82	44.2	7.4	2.00	5.4	26.39	
84	43.3	7.2	2.00	5.2	26.36	
86	42.6	7.1	2.00	5.1	26.32	
88	41.8	7.0	2.00	5.0	26.28	

Req. Storage volume	**26.48**	**m3**
Average depth	**0.044**	**m**

PARKING LOT Area # **120**

1100 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 15 l/s

Area(ha)= 0.1100

Cw = 1.00

STORMWATER MANAGEMENT Qm = 7.50 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)
31	89.8	27.5	7.50	20.0	37.14
32	87.9	26.9	7.50	19.4	37.20
33	86.0	26.3	7.50	18.8	37.24
34	84.3	25.8	7.50	18.3	37.27
35	82.6	25.3	7.50	17.8	**37.28**
36	81.0	24.8	7.50	17.3	37.28
37	79.4	24.3	7.50	16.8	37.26
38	77.9	23.8	7.50	16.3	37.24
39	76.5	23.4	7.50	15.9	37.20
40	75.1	23.0	7.50	15.5	37.15
41	73.8	22.6	7.50	15.1	37.09

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB120	1.45	0.52
		0.00
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to	Length	Dia	Storage
	(m)	(m)	(m3)
		0.25	0.00
		0.30	0.00
		Total:	**0.00**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
		0.00
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING l Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
120	407.88	0.25	33.99
		0.00	0.00
			0.00
		Total:	**33.99**

Total Storage required	**37.28**
Total Storage provided	**34.51**
Overflow to area 231	**2.77**

ICD use Tempest LMF 15l/s @ 1.47m head, or approved equal

PARKING LOT Area # 100

600 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 30 l/s

Area(ha)=	0.0600	STORMWATER MANAGEMENT Qm =			15.00 l/s
Cw =	1.00				
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
6	226.0	37.7	15.00	22.7	8.17
7	211.7	35.3	15.00	20.3	8.53
8	199.2	33.2	15.00	18.2	8.75
9	188.3	31.4	15.00	16.4	8.86
10	178.6	29.8	15.00	14.8	**8.87**
11	169.9	28.3	15.00	13.3	8.80
12	162.1	27.0	15.00	12.0	8.67
13	155.1	25.9	15.00	10.9	8.48
14	148.7	24.8	15.00	9.8	8.24
15	142.9	23.8	15.00	8.8	7.95
16	137.5	22.9	15.00	7.9	7.63

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CICB100A	1.45	0.52
CICB100B	1.55	0.56
	Total:	**1.08**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to	Length	Dia	Storage
	(m)	(m)	(m3)
CICB100A-CICB100B	10.00	0.25	0.49
		Total:	**0.49**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING I Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
100	78.00	0.10	2.60
		Total:	**2.60**

Total Storage required	**8.87**
Total Storage provided	**4.17**
Overflow to area 231	**4.70**

ICD use Tempest LMF 30l/s @ 1.51m head, or approved equal

PARKING LOT Area # 110

1200 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 40 l/s

Area(ha)=	0.1200				
Cw =	1.00	STORMWATER MANAGEMENT Qm = 20.00 l/s			
Tc Variable	i	Qp 2.78 x Area x c x I	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
11	169.9	56.7	20.00	36.7	24.21
13	155.1	51.7	20.00	31.7	24.76
14	148.7	49.6	20.00	29.6	24.88
15	142.9	47.7	20.00	27.7	**24.90**
16	137.5	45.9	20.00	25.9	24.85
17	132.6	44.2	20.00	24.2	24.73
18	128.1	42.7	20.00	22.7	24.55
19	123.9	41.3	20.00	21.3	24.31
20	120.0	40.0	20.00	20.0	24.02
21	116.3	38.8	20.00	18.8	23.68
23	109.7	36.6	20.00	16.6	22.89

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB= 0.36m3/m		
.45ecb=	**Height**	Storage
	(m)	(m3)
CB110B	1.21	0.44
CB110A	1.46	0.53
6 x ECB/TCB	1.00	0.96
		0.00
	Total:	**1.92**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to	Length	Dia	Storage
	(m)	(m)	(m3)
CBMH110A-MH110	14.50	0.60	4.10
CB110A - CBMH110	23.00	0.30	1.63
ECB-CB110A	95.00	0.30	6.72
CB110B - CBMH110	20.00	0.30	1.41
		Total:	**13.85**

IN-LINE STORAGE (Structure)

1.2mDia MH's=1.13m3/m		
1.5mDia MH's=1.77m3/m	Height	Storage
	(m)	(m3)
CBMH110A	1.56	2.76
MH110	1.87	2.11
	Total:	**4.87**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING I Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
		Total:	**0.00**

Total Storage required	**24.90**
Total Storage provided	**20.65**
Overflow to area 221	**4.25**

ICD use Tempest HF 40l/s @ 1.7m head, or approved equal

Flow restricted to 15 l/s

PARKING LOT Area # 123						
600 sm						
100 -YR FLOW						
Qp (l/s)						
Area(ha)=	0.0600					
Cw =	1.00	STORMWATER MANAGEMENT Qm =			7.50 l/s	
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume	
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)	
17	132.6	22.1	7.50	14.6	14.91	
18	128.1	21.4	7.50	13.9	14.97	
19	123.9	20.7	7.50	13.2	15.00	
20	120.0	20.0	7.50	12.5	**15.01**	<=== Required volume for storage on-site
21	116.3	19.4	7.50	11.9	14.99	
22	112.9	18.8	7.50	11.3	14.95	
23	109.7	18.3	7.50	10.8	14.90	
24	106.7	17.8	7.50	10.3	14.82	
25	103.8	17.3	7.50	9.8	14.73	
26	101.2	16.9	7.50	9.4	14.63	
28	96.3	16.1	7.50	8.6	14.38	

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB123	1.45	0.52
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to	Length	Dia	Storage
	(m)	(m)	(m3)
			0.00
		Total:	**0.00**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

PARKING I Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
123	36.40	0.10	1.21
		Total:	**1.21**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

Total Storage required	**15.01**
Total Storage provided	**1.74**
Overflow to area 231	**13.27**

ICD use Tempest LMF 15l/s @ 1.22m head, or approved equal

PARKING LOT Area #122

600 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 10 l/s

Area(ha)=	0.0600					
Cw =	1.00	STORMWATER MANAGEMENT Qm =			5.00 l/s	
Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)	
25	103.8	17.3	5.00	12.3	18.46	
26	101.2	16.9	5.00	11.9	18.53	
27	98.7	16.5	5.00	11.5	18.56	
28	96.3	16.1	5.00	11.1	18.58	
29	94.0	15.7	5.00	10.7	**18.59**	<=== Required volume for storage on-site
30	91.9	15.3	5.00	10.3	18.58	
31	89.8	15.0	5.00	10.0	18.57	
32	87.9	14.7	5.00	9.7	18.55	
33	86.0	14.4	5.00	9.4	18.51	
34	84.3	14.1	5.00	9.1	18.47	
35	82.6	13.8	5.00	8.8	18.43	

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB122	1.45	0.52
		0.00
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to	Length	Dia	Storage
	(m)	(m)	(m3)
			0.00
			0.00
		Total:	**0.00**

PARKING I Maximum available

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
		Total:	**0.00**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
		0.00
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6	5.00	10.00	19.00
		Total:	**19.00**

Total Storage required	**18.59**
Total Storage provided	**19.52**
Overflow to area 201	**0.00**

ICD use Tempest LMF 10l/s @ 1.26m head, or approved equal

Outlet # 2 (MH301) SUMMARY

Total Flow from Roofs=	8.00	l/s
Total Roof Area =	0.310	Ha
Average roof flow =	25.81	l/s/Ha
Volume Stored on Roofs	149.34	cm
Total Roof Storage rate	481.73	cm/Ha
Total flow from parking lot =	110.00	l/s
Total parking Lot area =	0.410	Ha
Average parking lot flow =	268.29	l/s/Ha
Volume Stored on Parking lot	80.59	cm
Total Parking lot Storage rate	196.56	cm/Ha
Total uncontrolled flow from site	7.94	l/s
Total uncontrolled area	0.080	Ha
Total flow	125.94	l/s
Total area	0.80	Ha
Average flow	157.43	l/s/Ha
Volume Stored	229.93	cm
Total Storage rate	287.41	cm/Ha

Outlet # 1 & 2 SUMMARY

Total Flow from Roofs=	26.00	l/s
Total Roof Area =	1.06	Ha
Average roof flow =	24.53	l/s/Ha
Volume Stored on Roofs	516.49	cm
Total Roof Storage rate	487.25	cm/Ha
Total flow from parking lot =	1116.00	l/s
Total parking Lot area =	3.83	Ha
Average parking lot flow =	291.38	l/s/Ha
Volume Stored on Parking lot	895.67	cm
Total Parking lot Storage rate	233.86	cm/Ha
Total uncontrolled flow from site	46.66	l/s
Total uncontrolled area	0.190	Ha
Total flow	1188.66	l/s
Total area	5.080	Ha
Average flow	233.99	l/s/Ha
Volume Stored	1412.16	cm
Total Storage rate	277.98	cm/Ha

IBI
333 Preston St
OTTAWA, ONTARIO
K1S 5N4

ONSITE SWM 100yr design
PROJECT: Arcadia commercial
CITY OF OTTAWA
DEVELOPER Minto

PAGE: 1 OF 1
JOB #: 35355
DATE: Oct 1, 2014
DESIGN: DY
Rev#3

Outlet EX MH 303
5yr design

MAXIMUM ALLOWABLE FLOW - Flow Restricted to 240 l/s/Ha

Time of concentration = 10 minutes

Area (ha) =	4.280
C Average =	0.90

Intensity - 5 year event storm

10 min Tc	i5yr = 998.071/(T+6.053)^0.814=	104.2	mm/hr

Unrestricted Flowrate (Q5)

10 min Tc	Qpre-devo = 2.78*A*Cw*i =	1115.76 l/s

Restricted Flowrate (Q5)

10 min Tc	Q= 85 l/s/Ha	**363.60 l/s**

Intensity - **100 year event storm**

10 min Tc	i100yr = 1735.688/(T+6.014)^0.82=	178.6	mm/hr

Unrestricted Flowrate (Q100)

10 min Tc	Qpost-devo = 2.78*A*Cw*i =	**1912.11 l/s**

Restricted Flowrate ($Q_{rest\ 100yr}$)

10 min Tc	Q= 240 l/s/Ha	**1027.20 l/s**

Uncontrolled runoff (Q5)

Location	Area	C	AxC
Area 216 A	0.03	0.2	0.006
Area 216B	0.04	0.9	0.036
Depressed Loading BLK900-230G	0.02	0.9	0.018
Depressed Loading BLK900-240C	0.02	0.9	0.018
Total	0.11	0.71	0.078
10 min Tc	Q_{unc}= 2.78 AcI	**22.59 l/s**	

Allowable Release

$Q_{rest\ 100yr} - Q_{unc} = Q_{allow}$ **1004.61 l/s**

STORM WATER MANAGEMENT - Post-Development Controlled

(5 year post-development with 100yr inlets)

ROOF BLOCK 100

600 sm

100 -YR FLOW

Qp (l/s)

Area(ha)= 0.0600

Cw = 0.90

STORMWATER MANAGEMENT Qm = 2.00 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)	
34	49.5	7.4	2.00	5.4	11.08	
36	47.6	7.1	2.00	5.1	11.11	
38	45.8	6.9	2.00	4.9	11.12	
40	44.2	6.6	2.00	4.6	**11.12**	<=== Required volume for roof storage
42	42.7	6.4	2.00	4.4	11.11	
44	41.3	6.2	2.00	4.2	11.08	
46	40.0	6.0	2.00	4.0	11.05	
48	38.8	5.8	2.00	3.8	11.01	
50	37.7	5.7	2.00	3.7	10.96	
52	36.6	5.5	2.00	3.5	10.90	
54	35.6	5.3	2.00	3.3	10.83	
56	34.7	5.2	2.00	3.2	10.76	

Req. Storage volume **11.12** **m3**

Average depth **0.019** **m**

ROOF BLOCK 200

400 sm

100 -YR FLOW

Qp (l/s)

Area(ha)= 0.0400

Cw = 0.90

STORMWATER MANAGEMENT Qm = 1.00 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)	
47	39.4	3.9	1.00	2.9	8.29	
49	38.2	3.8	1.00	2.8	8.30	
51	37.1	3.7	1.00	2.7	8.31	
53	36.1	3.6	1.00	2.6	**8.31**	<=== Required volume for roof storage
55	35.1	3.5	1.00	2.5	8.30	
57	34.2	3.4	1.00	2.4	8.29	
59	33.4	3.3	1.00	2.3	8.28	
61	32.5	3.3	1.00	2.3	8.26	
63	31.8	3.2	1.00	2.2	8.24	
65	31.0	3.1	1.00	2.1	8.22	
67	30.4	3.0	1.00	2.0	8.19	
69	29.7	3.0	1.00	2.0	8.16	

Req. Storage volume **8.31** **m3**

Average depth **0.021** **m**

ROOF BLOCK 300

400 sm

100 -YR FLOW

Qp (l/s)

Area(ha)= 0.0400

Cw = 0.90

STORMWATER MANAGEMENT Qm = 1.00 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)	
47	39.4	3.9	1.00	2.9	8.29	
49	38.2	3.8	1.00	2.8	8.30	
51	37.1	3.7	1.00	2.7	8.31	
53	36.1	3.6	1.00	2.6	**8.31**	<=== Required volume for roof storage
55	35.1	3.5	1.00	2.5	8.30	
57	34.2	3.4	1.00	2.4	8.29	
59	33.4	3.3	1.00	2.3	8.28	
61	32.5	3.3	1.00	2.3	8.26	
63	31.8	3.2	1.00	2.2	8.24	
65	31.0	3.1	1.00	2.1	8.22	
67	30.4	3.0	1.00	2.0	8.19	
69	29.7	3.0	1.00	2.0	8.16	

Req. Storage volume **8.31** **m3**

Average depth **0.021** **m**

ROOF BLOCK 400

1500 sm

100 -YR FLOW

Qp (l/s)

Area(ha)= 0.1500

Cw = 0.90

STORMWATER MANAGEMENT Qm = 4.00 l/s

Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume	
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)	
43	42.0	15.8	4.00	11.8	30.32	
45	40.6	15.2	4.00	11.2	30.37	
47	39.4	14.8	4.00	10.8	30.39	
49	38.2	14.3	4.00	10.3	**30.40**	<=== Required volume
51	37.1	13.9	4.00	9.9	30.38	for roof storage
53	36.1	13.5	4.00	9.5	30.35	
55	35.1	13.2	4.00	9.2	30.30	
57	34.2	12.8	4.00	8.8	30.23	
59	33.4	12.5	4.00	8.5	30.15	
61	32.5	12.2	4.00	8.2	30.06	
63	31.8	11.9	4.00	7.9	29.96	
65	31.0	11.7	4.00	7.7	29.84	

Req. Storage volume	**30.40**	**m3**
Average depth	**0.020**	**m**

ROOF BLOCK 900

4600 sm

100 -YR FLOW

Qp (l/s)

Area(ha)= 0.4600

Cw = 0.90

STORMWATER MANAGEMENT Qm = 10.00 l/s

Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume	
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)	
54	35.6	41.0	10.00	31.0	100.35	
56	34.7	39.9	10.00	29.9	100.44	
58	33.8	36.9	10.00	28.9	100.49	
60	32.9	37.9	10.00	27.9	**100.49**	<=== Required volume
62	32.2	37.0	10.00	27.0	100.46	for roof storage
64	31.4	36.1	10.00	26.1	100.39	
66	30.7	35.3	10.00	25.3	100.29	
68	30.0	34.5	10.00	24.5	100.15	
70	29.4	33.8	10.00	23.8	99.98	
72	28.8	33.1	10.00	23.1	99.78	
74	28.2	32.4	10.00	22.4	99.56	
76	27.6	31.8	10.00	21.8	99.31	

Req. Storage volume	**100.49**	**m3**
Average depth	**0.022**	**m**

PARKING LOT Area # **221**

2900 sm
100 -YR FLOW
Qp (l/s)

Flow restricted to 85 l/s

Area(ha)= 0.2900
Cw = 0.90

STORMWATER MANAGEMENT Qm = 42.50 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)
5	141.2	102.4	42.50	59.9	17.98
6	131.6	95.5	42.50	53.0	19.07
7	123.3	89.5	42.50	47.0	19.73
8	116.1	84.2	**42.50**	41.7	**20.04**
9	109.8	79.7	42.50	37.2	**20.07**
10	104.2	75.6	42.50	33.1	19.86
11	99.2	72.0	42.50	29.5	19.45
12	94.7	68.7	42.50	26.2	18.87
13	90.6	65.8	42.50	23.3	18.14
14	86.9	63.1	42.50	20.6	17.28
15	83.6	60.6	42.50	18.1	16.31

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB221A	1.00	0.36
CB221B	1.30	0.47
CB221C	1.50	0.54
		0.00
	Total:	**1.37**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CB221A - CBMH221	17.05	0.45	2.71
CB221B - CB221C	12.00	0.45	1.91
CB221C-CBMH221	18.50	0.45	2.94
CBMH221 - MH221	33.38	0.60	9.44
		Total:	**17.00**

IN-LINE STORAGE (Structure)

CBMH's		
1.2m dia=1.13 m3/m	Height	Storage
1.8m dia=2.54m3/m	(m)	(m3)
CBMH221(1.2m)	2.20	2.49
MH221 (1.8m)	2.20	5.59
	Total:	**2.49**

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
221C	0.00	0.00	0.00
		Total:	0.00

OFF-LINE STORAGE (Structure)

MH's		
1.8m dia=2.54m3/m	Height	Storage
	(m)	(m3)
MH500	2.20	5.59
	Total:	5.59

OFF-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
MH500 - MH221	12.00	1.05	10.39
16X6 Triton M-6 storage cell			33.00
		Total:	**43.39**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

Overflow from area 110	**4.25**
Total Storage required	**24.32**
Total Storage provided	**69.83**
Overflow to Area 230A	**0.00**

ICD use Tempest HF 65l/s @ 2.35m head, or approved equal

PARKING LOT Area # 231

6800 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 150 l/s

Area(ha)= 0.6800

Cw = 0.90

STORMWATER MANAGEMENT Qm = 75.00 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)
7	123.3	209.8	75.00	134.8	56.61
9	109.8	186.8	75.00	111.8	60.37
10	104.2	177.3	75.00	102.3	61.36
11	99.2	168.8	75.00	93.9	61.88
12	94.7	161.1	75.00	86.1	**62.00**
13	90.6	154.2	75.00	79.2	61.77
14	86.9	147.9	75.00	72.9	61.24
15	83.6	142.2	75.00	67.2	60.44
16	80.5	136.9	75.00	61.9	59.42
17	77.6	132.0	75.00	57.0	58.18
19	72.5	123.4	75.00	48.4	55.17

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CB233-CBMH233	15.60	0.60	4.41
CBMH233-CBMH232	34.20	0.60	9.67
CB232-CBMH323	15.60	0.60	4.41
CBMH232 - CBMH231	34.20	0.60	9.67
CB231-CBMH231	15.60	0.60	4.41
		Total:	**32.57**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's=1.13m3/m		
1.5m dia=1.77m3/m	Height	Storage
	(m)	(m3)
CBMH233 (1.5m)	1.42	2.5134
CBMH232 (1.5m)	1.49	2.6373
CBMH231 (1.5m)	1.53	2.7081
	Total:	**7.86**

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
231	0.00	0.00	0.00
232	0.00	0.00	0.00
233	0.00	0.00	0.00
		Total:	0.00

OFF-LINE STORAGE (Structure)

MH's		
1.8m dia=2.55m3/m	Height	Storage
	(m)	(m3)
CBMH231A	1.81	4.62
CBMH232A	1.70	4.34
CBMH233A	1.64	4.18
	Total:	**13.13**

OFF-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
MH501 - MH230	68.40	0.60	19.34
10X18 Triton M-6 storage cell			67.00
		Total:	**86.34**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

Overflow from area 100, 123	**20.74**
Total Storage required	**82.74**
Total Storage provided	**139.90**
Overflow to area 230A	**0.00**

ICD use Tempest HF 150l/s @ 2.25m head, or approved equal

PARKING LOT Area # 230B

1900 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 70 l/s

Area(ha)=	0.1900					
Cw =	0.90	STORMWATER MANAGEMENT Qm =		35.00 l/s		
Tc Variable	i	Qp 2.78 x Area x c x I	Qm	Qp-Qm	Volume	
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)	
2	182.7	86.8	35.00	51.8	6.22	
4	152.5	72.5	35.00	37.5	9.00	
5	141.2	67.1	35.00	32.1	9.63	
6	131.6	62.5	35.00	27.5	**9.92**	<=== Required volume
7	123.3	58.6	35.00	23.6	9.92	for storage on-site
8	116.1	55.2	35.00	20.2	9.69	
9	109.8	52.2	35.00	17.2	9.28	
10	104.2	49.5	35.00	14.5	8.72	
11	99.2	47.2	35.00	12.2	8.02	
12	94.7	45.0	35.00	10.0	7.21	
14	86.9	41.3	35.00	6.3	5.31	

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB230A	1.45	0.52
CB230B	1.55	0.56
	Total:	**1.08**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CB230A - CB230B	10.00	0.25	0.49
		Total:	**0.49**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
223C	207.80	0.13	9.00
		Total:	**9.00**

Overflow from area 221 & 231	**0.00**
Total Storage required	**9.92**
Total Storage provided	**10.58**
Overflow to area 230D	**0.00**

ICD use Tempest HF 70l/s @ 1.71m head, or approved equal

PARKING LOT Area # 230C

300 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 10 l/s

Area(ha)=	0.0300				
Cw =	0.90	STORMWATER MANAGEMENT Qm =	5.00 l/s		
Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)
3	166.1	12.5	5.00	7.5	1.34
5	141.2	10.6	5.00	5.6	1.68
6	131.6	9.9	5.00	4.9	1.76
7	123.3	9.3	5.00	4.3	**1.79**
8	116.1	8.7	5.00	3.7	1.78
9	109.8	8.2	5.00	3.2	1.75
10	104.2	7.8	5.00	2.8	1.69
11	99.2	7.4	5.00	2.4	1.61
12	94.7	7.1	5.00	2.1	1.52
13	90.6	6.8	5.00	1.8	1.41
15	83.6	6.3	5.00	1.3	1.14

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB230C	1.45	0.52
		0.00
	Total:	0.52

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
		0.20	0.00
		Total:	0.00

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
	0.00	0.00	0.00
		Total:	0.00

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	0.00

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6 storage cell	6.00	3.00	5.00
		Total:	5.00

Total Storage required	**1.79**
Total Storage provided	**5.52**
Overflow to area 230D	**0.00**

ICD use Tempest LMF 10l/s @ 1.4m head, or approved equal

PARKING LOT Area 230D

1300 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 67 l/s

Area(ha)= 0.1300

Cw = 0.90

STORMWATER MANAGEMENT Qm = 33.50 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)
0	230.5	75.0	33.50	41.5	0.00
1	203.5	66.2	33.50	32.7	1.96
2	182.7	59.4	33.50	25.9	3.11
3	166.1	54.0	33.50	20.5	3.69
4	152.5	49.6	33.50	16.1	**3.87**
5	141.2	45.9	33.50	12.4	3.73
6	131.6	42.8	33.50	9.3	3.35
7	123.3	40.1	33.50	6.6	2.77
8	116.1	37.8	33.50	4.3	2.05
9	109.8	35.7	33.50	2.2	1.19
11	99.2	32.3	33.50	-1.2	-0.82

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height (m)	Storage (m3)
CB230D	1.45	0.52
CB230E	1.55	0.56
	Total:	**1.08**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length (m)	Dia (m)	Storage (m3)
CB230D-CB230E	10.00	0.25	0.49
		0.30	0.00
		Total:	**0.49**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height (m)	Storage (m3)
		0.00
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 5yr

AREA #	AREA (SM)	Depth (m)	Storage (m3)
230D	103.00	0.07	2.40
			0.00
			0.00
			0.00
			0.00
		Total:	**2.40**

Overflow from 230A, 230C	**0.00**
Total Storage required	**3.87**
Total Storage provided	**3.97**
Overflow to area 230G	**0.00**

ICD use Tempest HF 67l/s @ 1.68m head, or approved equal

PARKING LOT Area 230F

700 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 38 l/s

Area(ha)= 0.0700

Cw = 0.90

STORMWATER MANAGEMENT Qm = 19.00 l/s

Tc Variable	i	Qp 2.78 x Area x c x I	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
1	203.5	35.6	19.00	16.6	1.00
2	182.7	32.0	19.00	13.0	1.56
3	166.1	29.1	19.00	10.1	1.82
4	152.5	26.7	19.00	7.7	1.85
5	141.2	24.7	19.00	5.7	1.72
6	131.6	23.0	19.00	4.0	1.46
7	123.3	21.6	19.00	2.6	1.09
8	116.1	20.3	19.00	1.3	0.64
9	109.8	19.2	19.00	0.2	0.12
10	104.2	18.2	19.00	-0.8	-0.45
12	94.7	16.6	19.00	-2.4	-1.74

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB203F	1.45	0.52
		0.00
	Total:	0.52

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	0.00

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
		0.20	0.00
		Total:	0.00

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
18A	0.00	0.00	0.00
		0.00	0.00
		Total:	0.00

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6 storage cell	6.00	3.00	5.00
		Total:	5.00

Overflow from Area 223	**0.00**
Total Storage required	**1.85**
Total Storage provided	**5.52**
Overflow to Area 230G	**0.00**

ICD use Tempest HF 38l/s @ 1.53m head, or approved equal

PARKING LOT Area 230G

1700 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 53 l/s

Area(ha)= 0.1700

Cw = 0.90

STORMWATER MANAGEMENT Qm = 26.50 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)
5	**141.2**	60.0	26.50	33.5	10.06
6	131.6	56.0	26.50	29.5	10.61
7	123.3	52.4	26.50	25.9	10.90
8	**116.1**	49.4	26.50	22.9	**10.99**
9	109.8	46.7	26.50	20.2	10.91
10	104.2	44.3	26.50	17.8	10.69
11	99.2	42.2	26.50	15.7	10.36
12	94.7	40.3	26.50	13.8	9.92
13	90.6	38.5	26.50	12.0	9.40
14	86.9	37.0	26.50	10.5	8.80
16	80.5	34.2	26.50	7.7	7.41

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB230G	1.45	0.52
CB230H	1.55	0.56
	Total:	**1.08**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CB230G-CB230H	10.00	0.25	0.49
		Total:	**0.49**

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
230G	0.00	0.00	0.00
		Total:	**0.00**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6 storage cell	12.00	6.00	26.00
		Total:	**26.00**

overflow from 230D, 230F	**0.00**
Total Storage required	**10.99**
Total Storage provided	**27.57**
1/2 Overflow to Area 206D	**0.00**
1/2 Overflow to Area 205	**0.00**

ICD use Tempest HF 53l/s @ 1.71m head, or approved equal

PARKING LOT Area 230I

300 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to **11** l/s

Area(ha)=	0.0300					
Cw =	0.90	STORMWATER MANAGEMENT Qm =			5.50 l/s	
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume	
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)	
3	166.1	12.5	5.50	7.0	1.25	
5	141.2	10.6	5.50	5.1	1.53	
6	131.6	9.9	5.50	4.4	1.58	
7	123.3	9.3	5.50	3.8	**1.58**	<=== Required volume for storage on-site
8	116.1	8.7	5.50	3.2	1.54	
9	109.8	8.2	5.50	2.7	1.48	
10	104.2	7.8	5.50	2.3	1.39	
11	99.2	7.4	5.50	1.9	1.28	
12	94.7	7.1	5.50	1.6	1.16	
13	90.6	6.8	5.50	1.3	1.02	
15	83.6	6.3	5.50	0.8	0.69	

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB230I	1.45	0.52
		0.00
	Total:	**0.52**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
		0.20	0.00
		Total:	**0.00**

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
		(m)	(m3)
230I	0.00	0.00	0.00
		Total:	**0.00**

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6 storage cell	6.00	3.00	5.00
		Total:	**5.00**

Total Storage required	**1.58**
Total Storage provided	**5.52**
Overflow to Area 230G	**0.00**

ICD use Tempest LMF 11l/s @ 1.44m head, or approved equal

PARKING LOT Area # 222

1200 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 15 l/s

Area(ha)=	0.1200				
Cw =	0.90	STORMWATER MANAGEMENT Qm =	7.50 l/s		
Tc Variable	i	Qp 2.78 x Area x c x I	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
17	77.6	23.3	7.50	15.8	16.12
19	72.5	21.8	7.50	14.3	16.27
20	70.3	21.1	7.50	13.6	16.31
21	68.1	20.5	7.50	13.0	**16.32**
22	66.1	19.9	7.50	12.4	16.31
23	64.3	19.3	7.50	11.8	16.29
24	62.5	18.8	7.50	11.3	16.24
25	60.9	18.3	7.50	10.8	16.18
26	59.3	17.8	7.50	10.3	16.10
27	57.9	17.4	7.50	9.9	16.00
29	55.2	16.6	7.50	9.1	15.78

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB222	1.45	0.52
		0.00
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CB222	14.80	0.25	0.73
		Total:	**0.73**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
CBMH222	1.50	1.70
	Total:	**1.70**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
222	248.90	0.16	13.27
222A	32.50	0.07	0.76
		Total:	14.03

Total Storage required	**16.32**
Total Storage provided	**16.98**
Overflow to area 223	**0.00**

ICD use Tempest LMF 15l/s @ 2.44m head, or approved equal

PARKING LOT Area # 223

2700 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 32 l/s

Area(ha)=	0.2700	
Cw =	0.90	STORMWATER MANAGEMENT Qm = 16.00 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)
18	75.0	50.6	16.00	34.6	37.42
19	72.5	49.0	16.00	33.0	37.61
20	70.3	47.5	16.00	31.5	37.75
21	68.1	46.0	16.00	30.0	37.83
22	66.1	**44.7**	16.00	28.7	**37.86**
23	64.3	43.4	16.00	27.4	37.85
24	62.5	42.2	16.00	26.2	37.80
25	60.9	41.1	16.00	25.1	37.71
26	59.3	40.1	16.00	24.1	37.58
27	57.9	39.1	16.00	23.1	37.42
29	55.2	37.3	16.00	21.3	37.02

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB223	1.45	0.52
		0.00
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CB223 - CBMH223	34.20	0.45	5.44
		0.30	0.00
		Total:	**5.44**

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
223	0.00	0.00	0.00
		Total:	**0.00**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
CBMH223	1.50	1.70
	Total:	**1.70**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6 storage cell	11.00	12.00	50.00
		Total:	**50.00**

Overflow from area 212, 222	**0.00**
Total Storage required	**37.86**
Total Storage provided	**57.66**
Overflow to area 230F	**0.00**

ICD use Tempest HF 32l/s @ 2.67mhead, or approved equal

PARKING LOT Area # 212

600 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 24 l/s

Area(ha)=	0.0600				
Cw =	0.90	STORMWATER MANAGEMENT Qm =	12.00 l/s		
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
2	182.7	27.4	12.00	15.4	1.85
4	152.5	22.9	12.00	10.9	2.61
5	141.2	21.2	12.00	9.2	2.76
6	131.6	19.8	12.00	7.8	**2.79**
7	123.3	18.5	12.00	6.5	2.73
8	116.1	17.4	12.00	5.4	2.61
9	109.8	16.5	12.00	4.5	2.42
10	104.2	15.6	12.00	3.6	2.16
11	99.2	14.9	12.00	2.9	1.91
12	94.7	14.2	12.00	2.2	1.60
14	86.9	13.1	12.00	1.1	0.88

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CICB212B	1.45	0.52
CICB212B	1.55	0.56
	Total:	**1.08**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CICB212A-CICB212B	10.28	0.25	0.50
		Total:	**0.50**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
	92.12	0.07	2.15
		Total:	**2.15**

Total Storage required	**2.79**
Total .Storage provided	**3.73**
Overflow to area 223	**0.00**

ICD use Tempest LMF 24l/s @ 1.63m head, or approved equal

PARKING LOT Area # 215

400 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 10 l/s

Area(ha)=	0.0400	STORMWATER MANAGEMENT Qm =			5.00 l/s
Cw =	0.90				
Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x I (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)
6	131.6	13.2	5.00	8.2	2.94
8	116.1	11.6	5.00	6.6	3.18
9	109.8	11.0	5.00	6.0	3.23
10	104.2	10.4	5.00	5.4	**3.26**
11	99.2	9.9	5.00	4.9	3.25
12	94.7	9.5	5.00	4.5	3.22
13	90.6	9.1	5.00	4.1	3.17
14	86.9	8.7	5.00	3.7	3.11
15	83.6	8.4	5.00	3.4	3.03
16	80.5	8.1	5.00	3.1	2.93
18	75.0	7.5	5.00	2.5	2.70

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height (m)	Storage (m3)
CB213	1.45	0.52
		0.00
	Total:	0.52

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length (m)	Dia (m)	Storage (m3)
ECB-CB215	24.00	0.25	1.18
		Total:	**1.18**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height (m)	Storage (m3)
	Total:	0.00

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 5yr

AREA #	AREA (SM)	Depth (m)	Storage (m3)
	31.10	0.18	1.87
		Total:	**1.87**

Total Storage required	3.26
Total Storage provided	3.57
Overflow to 206A	0.00

ICD use Tempest LMF 10l/s @ 1.57m head, or approved equal

PARKING LOT Area # 206B

700 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 10 l/s

Area(ha)=	0.0700				
Cw =	0.90	STORMWATER MANAGEMENT Qm =			5.00 l/s
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
15	83.6	14.6	5.00	9.6	8.67
17	77.6	13.6	5.00	8.6	8.76
18	75.0	13.1	5.00	8.1	8.78
19	72.5	12.7	5.00	7.7	8.78
20	70.3	12.3	5.00	7.3	8.76
21	68.1	11.9	5.00	6.9	8.73
22	66.1	11.6	5.00	6.6	8.69
23	64.3	11.3	5.00	6.3	8.64
24	62.5	11.0	5.00	6.0	8.57
25	60.9	10.7	5.00	5.7	8.50
27	57.9	10.1	5.00	5.1	8.32

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB206B	1.45	0.52
		0.00
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
		0.20	0.00
		Total:	**0.00**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
206B	154.40	0.17	8.75
			0.00
		Total:	**8.75**

Total Storage required	**8.78**
Total Storage provided	**9.27**
Overflow to area 206A	**0.00**

ICD use Tempest LMF 10l/s @ 1.57m head, or approved equal

PARKING LOT Area # 206A

3800 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 85 l/s

Area(ha)= 0.3800

Cw = 0.90

STORMWATER MANAGEMENT Qm = 42.50 l/s

Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
7	123.3	117.2	42.50	74.7	31.39
9	109.8	104.4	42.50	61.9	33.42
10	104.2	99.1	42.50	56.6	33.94
11	99.2	94.3	42.50	51.8	34.19
12	94.7	90.0	42.50	47.5	**34.22**
13	90.6	86.2	42.50	43.7	34.06
14	86.9	82.7	42.50	40.2	33.73
15	83.6	79.4	42.50	36.9	33.25
16	80.5	76.5	42.50	34.0	32.64
17	77.6	73.8	42.50	31.3	31.91
19	72.5	69.0	42.50	26.5	30.16

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB206	1.58	0.57
		0.00
	Total:	**0.57**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
CBMH206	1.50	1.70
	Total:	**1.70**

CBMH height for storage equals top of grate to invert less 0.64m to account for flat top and iron frame/grate

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CB206-CBMH206	25.60	0.45	**4.07**
		Total:	**4.07**

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
206A	0.00	0.00	0.00
206	0.00	0.00	0.00
		Total:	**0.00**

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6 storage cell	10.00	8.00	31.00
		Total:	**31.00**

Overflow from area 206B, 215	**0.00**
Total Storage required	**34.22**
Total Storage provided	**37.34**
Overflow to 210A	**0.00**

ICD use Tempest HF 85l/s @ 2.41m head, or approved equal

PARKING LOT Area # 210A

1200 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 77 l/s

Area(ha)=	0.1200				
Cw =	0.90	STORMWATER MANAGEMENT Qm =	38.50 l/s		
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
0	230.5	69.2	38.50	30.7	0.00
0.5	216.1	64.9	38.50	26.4	0.79
1.5	192.5	57.8	38.50	19.3	1.74
2.5	173.9	52.2	38.50	13.7	**2.08**
3.5	159.0	47.7	38.50	9.2	1.94
4.5	146.6	44.0	38.50	5.5	1.49
5.5	136.2	40.9	38.50	2.4	0.79
6.5	127.3	38.2	38.50	-0.3	-0.11
7.5	119.6	35.9	38.50	-2.6	-1.17
8.5	112.9	33.9	38.50	-4.6	-2.35
10.5	101.6	30.5	38.50	-8.0	-5.03

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB210A	1.45	0.52
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
		Total:	**0.00**

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
8B	0.00	0.00	0.00
		Total:	**0.00**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6 storage cell	5.00	6.00	10.00
		Total:	**10.00**

Overflow from area 206A	**0.00**
Total Storage required	**2.06**
Total Storage provided	**10.52**
Overflow to 206D	**0.00**

ICD use Tempest HF 77l/s @ 1.55m head, or approved equal

PARKING LOT Area # 206D

400 sm

100 -YR FLOW

Flow restricted to 14 l/s

Qp (l/s)

Area(ha)=	0.0400
Cw =	0.90

STORMWATER MANAGEMENT Qm = 7.00 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)	
4	152.5	15.3	7.00	8.3	1.98	
5	141.2	14.1	7.00	7.1	2.14	
6	131.6	13.2	7.00	6.2	2.22	
7	123.3	12.3	7.00	5.3	**2.24**	<=== Required volume for storage on-site
8	116.1	11.6	7.00	4.6	2.22	
9	109.8	11.0	7.00	4.0	2.15	
10	104.2	10.4	7.00	3.4	2.06	
11	99.2	9.9	7.00	2.9	1.93	
12	94.7	9.5	7.00	2.5	1.78	
13	90.6	9.1	7.00	2.1	1.61	
14	86.9	8.7	7.00	1.7	1.43	

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height (m)	Storage (m3)
CB206C	1.45	0.52
		0.00
	Total:	**0.52**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height (m)	Storage (m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

ICD use Tempest LMF 14l/s @ 1.47m head, or approved equal

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length (m)	Dia (m)	Storage (m3)
		0.20	0.00
		Total:	**0.00**

PARKING LOT STORAGE 5yr

AREA #	AREA (SM)	Depth (m)	Storage (m3)
206C	0.00	0.00	0.00
		Total:	**0.00**

OFF-LINE STORAGE (Cell)

Cell storage			
	Length (m)	width (m)	Storage (m3)
Triton M-6 storage cell	6.00	3.00	5.00
		Total:	**5.00**

Total Storage required	**2.24**
Total Surface Storage provided	**5.52**
Overflow to area 206D	**0.00**

Street 1, Area # 206E

500 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 60 l/s

Area(ha)= 0.0500

Cw = 0.75

STORMWATER MANAGEMENT Qm = 30.00 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)	
0	230.5	24.0	30.00	-6.0	0.00	
0	230.5	24.0	30.00	-6.0	0.00	
0	230.5	24.0	30.00	-6.0	0.00	
0	230.5	24.0	30.00	-6.0	0.00	
0	230.5	24.0	30.00	-6.0	**0.00**	<=== Required volume
0.5	216.1	22.5	30.00	-7.5	-0.22	for storage on-site
1	203.5	21.2	30.00	-8.8	-0.53	
1.5	192.5	20.1	30.00	-9.9	-0.89	
2	182.7	19.0	30.00	-11.0	-1.31	
2.5	173.9	18.1	30.00	-11.9	-1.78	
3	166.1	17.3	30.00	-12.7	-2.28	

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB206D	1.45	0.52
	Total:	0.52

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
		0.00	0.00
		Total:	**0.00**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
		0.00
	Total:	0.00

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
206D	0.00	0.00	0.00
		Total:	**0.00**

Overflow from 206C 210A 230G	0.00
Total Storage required	0.00
Total Storage provided	0.52
Overflow to future area	0.00

ICD use Tempest HF 60l/s @ 1.46m head, or approved equal

Street 1 Area # 205

1600 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 60 l/s

Area(ha)=	0.1600
Cw =	0.75

STORMWATER MANAGEMENT Qm = 30.00 l/s

Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
1	203.5	67.9	30.00	37.9	2.27
2	182.7	60.9	30.00	30.9	3.71
3	166.1	55.4	30.00	25.4	4.57
4	152.5	50.9	30.00	20.9	5.01
5	141.2	47.1	30.00	17.1	**5.13**
6	131.6	43.9	30.00	13.9	5.00
7	123.3	41.1	30.00	11.1	4.68
8	116.1	38.7	30.00	8.7	4.19
9	109.8	36.6	30.00	6.6	3.58
10	104.2	34.8	30.00	4.8	2.86
11	99.2	33.1	30.00	3.1	2.04

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CICB205A	1.45	0.52
CICB205B	1.55	0.56
	Total:	**1.08**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CICB205A-CICB205B	14.00	0.25	0.69
			0.00
		Total:	**0.69**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
		0.00
	Total:	**0.00**

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
205	69.82	0.11	2.56
		Total:	**2.56**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

Overflow from 204, 206D, 1/2 230G	**1.50**
Total Storage required	**6.63**
Total Storage provided	**4.33**
Overflow to Area Future	**2.31**

ICD use Tempest HF 60l/s @ 1.68m head, or approved equal

PARKING LOT Area # 240A

500 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 10 l/s

Area(ha)= 0.0500

Cw = 0.90

STORMWATER MANAGEMENT Qm = 5.00 l/s

Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume	
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)	
9	109.8	13.7	5.00	8.7	4.72	
10	104.2	13.0	5.00	8.0	4.82	
11	99.2	12.4	5.00	7.4	4.89	
12	94.7	11.8	5.00	6.8	4.93	
13	90.6	11.3	5.00	6.3	**4.94**	<=== Required volume
14	86.9	10.9	5.00	5.9	4.94	for storage on-site
15	83.6	10.5	5.00	5.5	4.91	
16	80.5	10.1	5.00	5.1	4.86	
17	77.6	9.7	5.00	4.7	4.80	
18	75.0	9.4	5.00	4.4	4.73	
19	72.5	9.1	5.00	4.1	4.64	

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CICB240A	1.45	0.52
CICB240B	1.55	0.56
		0.00
	Total:	**1.08**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
CICB240A-CICB240B	10.00	0.25	0.49
			0.00
			0.00
			0.00
			0.00
		Total:	**0.49**

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
240A	0.00	0.00	0.00
		Total:	**0.00**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
		0.00
		0.00
		0.00
	Total:	**0.00**

CBMH height for storage equals top of grate to invert less 0.64m to account for flat top and iron frame/grate

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6 storage cell	11.00	3.00	10.00
		Total:	**10.00**

Total Storage required	**4.94**
Total Storage provided	**11.57**
1/2 Overflow to Area 204	**0.00**
1/2 Overflow to Area 201	**0.00**

ICD use Tempest LMF 10l/s @ 1.65m head, or approved equal

Street 1 Area # 204

1300 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 55 l/s

Area(ha)= 0.1300

Cw = 0.75

STORMWATER MANAGEMENT Qm = 27.50 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)
1	203.5	55.2	27.50	27.7	1.66
2	182.7	49.5	27.50	22.0	2.64
3	166.1	45.0	27.50	17.5	3.15
4	152.5	41.3	27.50	13.8	**3.32**
5	141.2	38.3	27.50	10.8	3.23
6	131.6	35.7	27.50	8.2	2.94
7	123.3	33.4	27.50	5.9	2.49
8	116.1	31.5	27.50	4.0	1.91
9	109.8	29.8	27.50	2.3	1.22
10	104.2	28.2	27.50	0.7	0.44
11	99.2	26.9	27.50	-0.6	-0.41

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height (m)	Storage (m3)
CICB204A	1.45	0.52
CICB204B	1.55	0.56
	Total:	**1.08**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length (m)	Dia (m)	Storage (m3)
CICB204A-CICB204B	15.00	0.25	0.74
		Total:	**0.74**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height (m)	Storage (m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 5yr

AREA #	AREA (SM)	Depth (m)	Storage (m3)
		0.00	0.00
		0.00	0.00
		Total:	**0.00**

Overflow from area 1/2 240A	**0.00**
Total Storage required	**3.32**
Total Storage provided	**1.82**
Overflow to Area 205	**1.50**

ICD use Tempest HF 55l/s @ 1.51m head, or approved equal

PARKING LOT Area 240D

500 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 10 l/s

Area(ha)=	0.0500
Cw =	0.90

STORMWATER MANAGEMENT Qm = 5.00 l/s

Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume	
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)	
6	131.6	16.5	5.00	11.5	4.13	
8	116.1	14.5	5.00	9.5	4.57	
10	104.2	13.0	5.00	8.0	4.82	
12	94.7	11.8	5.00	6.8	4.93	
14	86.9	10.9	5.00	5.9	**4.94**	<=== Required volume
16	80.5	10.1	5.00	5.1	4.86	for storage on-site
18	75.0	9.4	5.00	4.4	4.73	
20	70.3	8.8	5.00	3.8	4.55	
22	66.1	8.3	5.00	3.3	4.32	
24	62.5	7.8	5.00	2.8	4.07	
25	60.9	7.6	5.00	2.6	3.93	

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB240D	1.45	0.52
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length	Dia	Storage
	(m)	(m)	(m3)
		0.25	0.00
		0.30	0.00
		Total:	**0.00**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
		0.00
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
240C	0.00	0.00	0.00
		Total:	**0.00**

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6 storage cell	6.00	3.00	5.00
		Total:	**5.00**

Total Storage required	**4.94**
Total Storage provided	**5.52**
Overflow to Area 201	**0.00**

ICD use Tempest LMF 10l/s @ 1.46m head, or approved equal

Street 1 Area 201

2900 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 60 l/s

Area(ha)= 0.2900

Cw = 0.75

STORMWATER MANAGEMENT Qm = 30.00 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)
7	123.3	74.6	30.00	44.6	18.71
8	116.1	70.2	30.00	40.2	19.30
9	109.8	66.4	30.00	36.4	19.65
10	104.2	63.0	30.00	33.0	**19.80**
11	99.2	60.0	30.00	30.0	19.78
12	94.7	57.3	30.00	27.3	19.63
13	90.6	54.8	30.00	24.8	19.34
14	86.9	52.6	30.00	22.6	18.95
15	83.6	50.5	30.00	20.5	18.47
16	80.5	48.6	30.00	18.6	17.90
17	77.6	46.9	30.00	16.9	17.26

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height (m)	Storage (m3)
CICB201A**	1.45	0.52
CICB2018**	1.65	0.59
	Total:	2.23

**double CB's, volume x 2.

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to Structure	Length (m)	Dia (m)	Storage (m3)
CICB201A - CICB201B	15.00	0.25	0.74
		Total:	0.74

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height (m)	Storage (m3)
	Total:	0.00

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 5yr

AREA #	AREA (SM)	Depth (m)	Storage (m3)
201	300.00	0.17	17.00
			0.00
		Total:	17.00

Overflow from Area 240D, 122	0.00
Total Storage required	19.80
Total Storage provided	19.97
overflow to future area	0.00

ICD use Tempest HF 60l/s @ 1.71m head, or approved equal

OUTLET # 1 (MH301) SUMMARY

Total Flow from Roofs=	18.00	l/s
Total Roof Area =	0.750	Ha
Average roof flow =	24.00	l/s/Ha
Volume Stored on Roofs	158.62	cm
Total Roof Storage rate	211.50	cm/Ha
Total flow from parking lot =	503.00	l/s
Total parking Lot area =	3.420	Ha
Average parking lot flow =	147.08	l/s/Ha
Volume Stored on Parking lot	456.73	cm
Total Parking lot Storage rate	133.55	cm/Ha
Total uncontrolled flow from site	22.59	l/s
Total uncontrolled area	0.110	Ha
Total flow	543.59	l/s
Total area	4.280	Ha
Average flow	127.01	l/s/Ha
Volume Stored	615.36	cm
Total Storage rate	143.78	cm/Ha

IBI
333 Preston St
OTTAWA, ONTARIO
K1S 5N4

ONSITE SWM 100yr design
PROJECT: Arcadia commercial
CITY OF OTTAWA
DEVELOPER Minto

PAGE: 1 OF 1
JOB #: 35355
DATE: Oct 1, 2014
DESIGN: DY
Rev#3

Outlet # 2 EX MH 301
5yr design

MAXIMUM ALLOWABLE FLOW - Flow Restricted to 240 l/s/Ha

Time of concentration = 10 minutes

Area (ha) =	**0.800**
C Average =	**0.90**

Intensity - 5 year event storm

10 min Tc	i5yr = 998.071/(T+6.053)^0.814=	**104.2**	mm/hr

Unrestricted Flowrate (Q5)

10 min Tc	Qpre-devo = 2.78*A*Cw*i =	**208.55**	l/s

Restricted Flowrate (Q5)

10 min Tc	Q= 240 l/s/Ha	**192.00**	l/s

Intensity - 100 year event storm

10 min Tc	i100yr = 1735.688/(T+6.014)^0.82=	**178.6**	mm/hr

Unrestricted Flowrate (Q100)

10 min Tc	Qpost-devo = 2.78*A*Cw*i =	**357.40**	l/s

Restricted Flowrate (Q5)

10 min Tc	Q= 240 l/s/Ha	**192.00**	l/s

Uncontrolled runoff (Q5)

Location	Area	C	AxC
UNC 1A	0.02	0.2	0.004
UNC 1B	0.02	0.2	0.004
UNC 1C	0.02	0.2	0.004
UNC 1D	0.02	0.2	0.004
			0
Total	0.08	0.20	0.016
10 min Tc	Q_{unc}= 2.78 Aci	**4.63**	l/s

Allowable Release
$Q_{rest\ 100yr} - Q_{unc} = Q_{allow}$ **187.37 l/s**

STORM WATER MANAGEMENT - Post-Development Controlled

(5 year post-development with 100yr inlets)

ROOF AREA 500

900 sm

100 -YR FLOW

Qp (l/s)

Area(ha)= 0.0900

Cw = 0.90

STORMWATER MANAGEMENT Qm = 2.00 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)	
53	36.1	8.1	2.00	6.1	19.48	
55	35.1	7.9	2.00	5.9	19.50	
57	34.2	7.7	2.00	5.7	19.51	
59	33.4	7.5	2.00	5.5	**19.51**	<=== Required volume for roof storage
61	32.5	7.3	2.00	5.3	19.50	
63	31.8	7.2	2.00	5.2	19.49	
65	31.0	7.0	2.00	5.0	19.46	
67	30.4	6.8	2.00	4.8	19.43	
69	29.7	6.7	2.00	4.7	19.40	
71	29.1	6.5	2.00	4.5	19.36	
73	28.5	6.4	2.00	4.4	19.31	
75	27.9	6.3	2.00	4.3	19.26	

Req. Storage volume **19.51** **m3**

Average depth **0.022** **m**

ROOF AREA 600

600 sm

100 -YR FLOW

Qp (l/s)

Area(ha)= 0.0600

Cw = 0.90

STORMWATER MANAGEMENT Qm = 2.00 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)	
34	49.5	7.4	2.00	5.4	11.08	
36	47.6	7.1	2.00	5.1	11.11	
38	45.8	6.9	2.00	4.9	11.12	
40	44.2	6.6	2.00	4.6	**11.12**	<=== Required volume for roof storage
42	42.7	6.4	2.00	4.4	11.11	
44	41.3	6.2	2.00	4.2	11.08	
46	40.0	6.0	2.00	4.0	11.05	
48	38.8	5.8	2.00	3.8	11.01	
50	37.7	5.7	2.00	3.7	10.96	
52	36.6	5.5	2.00	3.5	10.90	
54	35.6	5.3	2.00	3.3	10.83	
56	34.7	5.2	2.00	3.2	10.76	

Req. Storage volume **11.12** **m3**

Average depth **0.019** **m**

ROOF AREA 700

1000 sm
100 -YR FLOW
Qp (l/s)

Area(ha)=	0.1000					
Cw =	0.90	STORMWATER MANAGEMENT Qm =			2.00 l/s	
Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)	
57	34.2	8.6	2.00	6.6	22.44	
59	33.4	8.3	2.00	6.3	22.46	
61	32.5	8.1	2.00	6.1	22.48	
63	31.8	7.9	2.00	5.9	**22.49**	<=== Required volume
65	31.0	7.8	2.00	5.8	22.49	for roof storage
67	30.4	7.6	2.00	5.6	22.49	
69	29.7	7.4	2.00	5.4	22.47	
71	29.1	7.3	2.00	5.3	22.46	
73	28.5	7.1	2.00	5.1	22.43	
75	27.9	7.0	2.00	5.0	22.40	
77	27.3	6.8	2.00	4.8	22.36	
79	26.8	6.7	2.00	4.7	22.32	

Req. Storage volume	**22.49**	**m3**
Average depth	**0.022**	**m**

ROOF AREA 800

600 sm
100 -YR FLOW
Qp (l/s)

Area(ha)=	0.0600					
Cw =	0.90	STORMWATER MANAGEMENT Qm =			2.00 l/s	
Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)	
34	49.5	7.4	2.00	5.4	11.08	
36	47.6	7.1	2.00	5.1	11.11	
38	45.8	6.9	2.00	4.9	11.12	
40	44.2	6.6	2.00	4.6	**11.12**	<=== Required volume
42	42.7	6.4	2.00	4.4	11.11	for roof storage
44	41.3	6.2	2.00	4.2	11.08	
46	40.0	6.0	2.00	4.0	11.05	
48	38.8	5.8	2.00	3.8	11.01	
50	37.7	5.7	2.00	3.7	10.96	
52	36.6	5.5	2.00	3.5	10.90	
54	35.6	5.3	2.00	3.3	10.83	
56	34.7	5.2	2.00	3.2	10.76	

Req. Storage volume	**11.12**	**m3**
Average depth	**0.019**	**m**

PARKING LOT Area # 120

1100 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 15 l/s

Area(ha)=	0.1100				
Cw =	0.90	STORMWATER MANAGEMENT Qm =	7.50 l/s		
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
15	83.6	23.0	7.50	15.5	13.95
16	80.5	22.1	7.50	14.6	14.06
17	77.6	21.4	7.50	13.9	14.14
18	75.0	20.6	7.50	13.1	14.16
19	72.5	20.0	7.50	12.5	**14.20**
20	70.3	19.3	7.50	11.8	14.20
21	68.1	18.8	7.50	11.3	14.18
22	66.1	18.2	7.50	10.7	14.13
23	64.3	17.7	7.50	10.2	14.07
24	62.5	17.2	7.50	9.7	13.99
25	60.9	16.8	7.50	9.3	13.89

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0,6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB120	1.45	0.52
		0.00
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to	Length	Dia	Storage
	(m)	(m)	(m3)
		0.25	0.00
		0.30	0.00
		Total:	**0.00**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
		0.00
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
120	251.20	0.17	14.23
		0.00	0.00
			0.00
		Total:	**14.23**

Total Storage required	**14.20**
Total Storage provided	**14.76**
Overflow to area 231	**0.00**

ICD use Tempest LMF 15l/s @ 1.47m head, or approved equal

PARKING LOT Area # 100

600 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 30 l/s

Area(ha)=	0.0600				
Cw =	0.90	STORMWATER MANAGEMENT Qm = 15.00 l/s			
Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)
0	230.5	34.6	15.00	19.6	0.00
1	203.5	30.6	15.00	15.6	0.93
2	182.7	27.4	15.00	12.4	1.49
3	166.1	24.9	15.00	9.9	1.79
4	152.5	22.9	15.00	7.9	**1.89**
5	141.2	21.2	15.00	6.2	1.86
6	131.6	19.8	15.00	4.8	1.71
7	123.3	18.5	15.00	3.5	1.47
8	116.1	17.4	15.00	2.4	1.17
9	109.8	16.5	15.00	1.5	0.80
10	104.2	15.6	15.00	0.6	0.38

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height (m)	Storage (m3)
CICB100A	1.45	0.52
CICB100B	1.55	0.56
	Total:	**1.08**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to	Length (m)	Dia (m)	Storage (m3)
CICB100A-CICB100B	10.00	0.25	0.49
		Total:	**0.49**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height (m)	Storage (m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 5yr

AREA #	AREA (SM)	Depth (m)	Storage (m3)
100	30.00	0.05	0.50
		Total:	**0.50**

Total Storage required	**1.89**
Total Storage provided	**2.07**
Overflow to area 231	**0.00**

ICD use Tempest LMF 30l/s @ 1.51m head, or approved equal

PARKING LOT Area # 110

1200 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 40 l/s

Area(ha)=	0.1200
Cw =	0.90

STORMWATER MANAGEMENT Qm = 20.00 l/s

Tc Variable (min)	i (mm/hour)	Qp 2.78 x Area x c x i (l/s)	Qm (l/s)	Qp-Qm (l/s)	Volume (m3)
3	166.1	49.9	20.00	29.9	5.38
5	141.2	42.4	20.00	22.4	6.72
6	131.6	39.5	20.00	19.5	7.02
7	123.3	37.0	20.00	17.0	**7.15**
8	116.1	34.9	20.00	14.9	7.13
9	109.8	33.0	20.00	13.0	7.00
10	104.2	31.3	20.00	11.3	6.77
11	99.2	29.8	20.00	9.8	6.46
12	94.7	28.4	20.00	8.4	6.07
13	90.6	27.2	20.00	7.2	5.62
15	83.6	25.1	20.00	5.1	4.58

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB= 0.36m3/m

.45ecb=	Height (m)	Storage (m3)
CB110B	1.21	0.44
CB110A	1.46	0.53
6 x ECB/TCB	1.00	0.96
		0.00
	Total:	**1.92**

IN-LINE STORAGE (Pipe)

Pipe storage

Structure to	Length (m)	Dia (m)	Storage (m3)
CBMH110A-MH110	14.50	0.60	4.10
CB110A - CBMH110	23.00	0.30	1.63
ECB-CB110A	95.00	0.30	6.72
CB110B - CBMH110	20.00	0.30	1.41
		Total:	**13.85**

IN-LINE STORAGE (Structure)

1.2mDia MH's=1.13m3/m

1.5mDia MH's=1.77m3/m	Height (m)	Storage (m3)
CBMH110A	1.56	2.76
MH110	1.87	2.11
	Total:	**4.87**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 5yr

AREA #	AREA (SM)	Depth (m)	Storage (m3)
		Total:	**0.00**

Total Storage required	**7.15**
Total Storage provided	**20.65**
Overflow to area 221	**0.00**

ICD use Tempest HF 40l/s @ 1.7m head, or approved equal

PARKING LOT Area # 123

600 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 15 l/s

Area(ha)=	0.0600
Cw =	0.90

STORMWATER MANAGEMENT Qm = 7.50 l/s

Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume	
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)	
7	123.3	18.5	7.50	11.0	4.62	
8	116.1	17.4	7.50	9.9	4.77	
9	109.8	16.5	7.50	9.0	4.85	
10	104.2	15.6	7.50	8.1	**4.88**	<=== Required volume
11	99.2	14.9	7.50	7.4	4.88	for storage on-site
12	94.7	14.2	7.50	6.7	4.84	
13	90.6	13.6	7.50	6.1	4.76	
14	86.9	13.1	7.50	5.6	4.66	
15	83.6	12.5	7.50	5.0	4.54	
16	80.5	12.1	7.50	4.6	4.40	
18	75.0	11.3	7.50	3.8	4.05	

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB123	1.45	0.52
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to	Length	Dia	Storage
	(m)	(m)	(m3)
			0.00
		Total:	**0.00**

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
	Total:	**0.00**

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
123	36.40	0.10	1.21
		Total:	**1.21**

Total Storage required	**4.88**
Total Storage provided	**1.74**
Overflow to area 231	**3.15**

ICD use Tempest LMF 15l/s @ 1.22m head, or approved equal

PARKING LOT Area #122

600 sm

100 -YR FLOW

Qp (l/s)

Flow restricted to 10 l/s

Area(ha)=	0.0600				
Cw =	0.90	STORMWATER MANAGEMENT Qm =			5.00 l/s
Tc Variable	i	Qp 2.78 x Area x c x i	Qm	Qp-Qm	Volume
(min)	(mm/hour)	(l/s)	(l/s)	(l/s)	(m3)
12	94.7	14.2	5.00	9.2	6.64
13	90.6	13.6	5.00	8.6	6.71
14	86.9	13.1	5.00	8.1	6.76
15	83.6	12.5	5.00	7.5	6.79
16	80.5	12.1	5.00	7.1	**6.80**
17	77.6	11.7	5.00	6.7	6.78
18	75.0	11.3	5.00	6.3	6.75
19	72.5	10.9	5.00	5.9	6.71
20	70.3	10.5	5.00	5.5	6.66
21	68.1	10.2	5.00	5.2	6.59
22	66.1	9.9	5.00	4.9	6.51

<=== Required volume for storage on-site

IN-LINE STORAGE (Structure)

0.6m X 0.6m CB		
0.36 m3/m	Height	Storage
	(m)	(m3)
CB122	1.45	0.52
		0.00
	Total:	**0.52**

IN-LINE STORAGE (Pipe)

Pipe storage			
Structure to	Length	Dia	Storage
	(m)	(m)	(m3)
			0.00
			0.00
		Total:	**0.00**

PARKING LOT STORAGE 5yr

AREA #	AREA	Depth	Storage
	(SM)	(m)	(m3)
		Total:	0.00

IN-LINE STORAGE (Structure)

1.2mDia CBMH's		
1.13 m3/m	Height	Storage
	(m)	(m3)
		0.00
	Total:	0.00

CBMH height for storage equals top of grate
to invert less 0.64m to account for
flat top and iron frame/grate

OFF-LINE STORAGE (Cell)

Cell storage			
	Length	width	Storage
	(m)	(m)	(m3)
Triton M-6	5.00	10.00	19.00
		Total:	**19.00**

Total Storage required	**6.80**
Total Storage provided	**19.52**
Overflow to area 201	**0.00**

ICD use Tempest LMF 10l/s @ 1.26m head, or approved equal

Outlet # 2 (MH301) SUMMARY

Total Flow from Roofs=	8.00	l/s
Total Roof Area =	0.310	Ha
Average roof flow =	25.81	l/s/Ha
Volume Stored on Roofs	64.24	cm
Total Roof Storage rate	207.22	cm/Ha
Total flow from parking lot =	55.00	l/s
Total parking Lot area =	0.410	Ha
Average parking lot flow =	134.15	l/s/Ha
Volume Stored on Parking lot	58.73	cm
Total Parking lot Storage rate	143.26	cm/Ha
Total uncontrolled flow from site	4.63	l/s
Total uncontrolled area	0.080	Ha
Total flow	67.63	l/s
Total area	0.80	Ha
Average flow	84.54	l/s/Ha
Volume Stored	122.97	cm
Total Storage rate	153.71	cm/Ha

Outlet # 1 & 2 SUMMARY

Total Flow from Roofs=	26.00	l/s
Total Roof Area =	1.06	Ha
Average roof flow =	24.53	l/s/Ha
Volume Stored on Roofs	222.86	cm
Total Roof Storage rate	210.25	cm/Ha
Total flow from parking lot =	558.00	l/s
Total parking Lot area =	3.83	Ha
Average parking lot flow =	145.69	l/s/Ha
Volume Stored on Parking lot	515.47	cm
Total Parking lot Storage rate	134.59	cm/Ha
Total uncontrolled flow from site	27.23	l/s
Total uncontrolled area	0.19	Ha
Total flow	611.23	l/s
Total area	5.080	Ha
Average flow	120.32	l/s/Ha
Volume Stored	738.33	cm
Total Storage rate	145.34	cm/Ha

WATTS DRAINAGE

RD-100

Tag: ____________

Large Capacity Roof Drain

Components:


B2


B2-DM

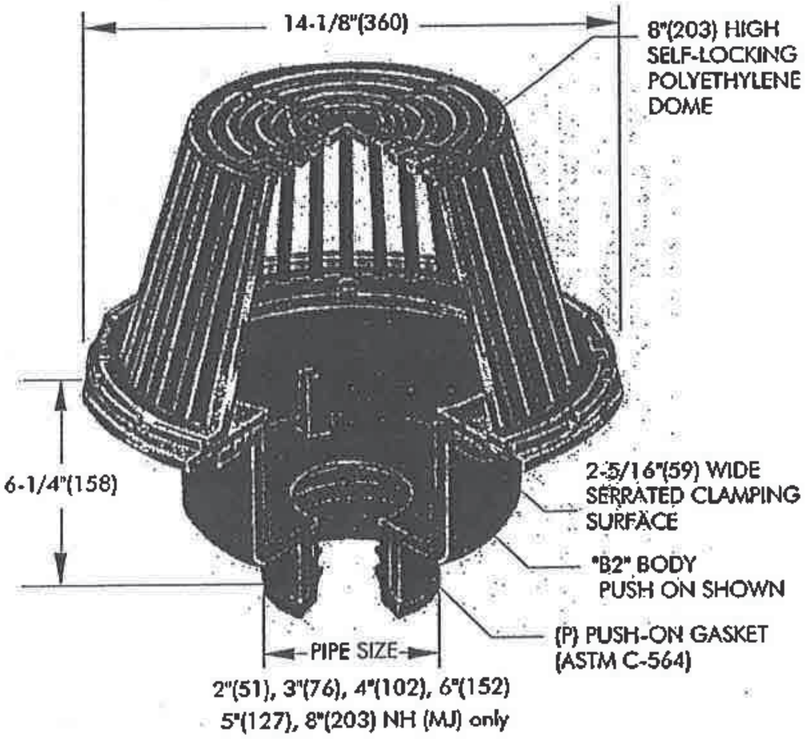

B2-FLG


FC-2

Order Code: RD-10☐☐-☐-☐

Ex. RD-102P-K

SPECIFICATION: Watts Drainage Products RD-100 epoxy coated cast iron roof drain with deep sump, wide serrated flashing flange, flashing clamp device with integral gravel stop and self-locking polyethylene (standard) dome strainer.



Pipe Sizing (Select One)

Suffix	Description	
2	2"(51) Pipe Size	☐
3	3"(76) Pipe Size	☐
4	4"(102) Pipe Size	☐
5	5"(127) Pipe Size	☐
6	6"(152) Pipe Size	☐
8	8"(203) Pipe Size	☐

Outlet Type (Select One)

Suffix	Description	
NH	No Hub (MJ)	☐
P	Push On	☐
T	Threaded Outlet	☐
X	Inside Caulk	☐

Options (Select One or More)

Suffix	Description	
-A	Accutrol weir (specify # 1-6 slots)	☐
-B	Sump Receiver Flange	☐
-BED	Sump Receiver, Adj Ext., Deck Clamp	☐
-C	Secondary Membrane Clamp	☐
-D	Underdeck Clamp	☐
-E	Adjustable Extension	☐
-GSS	Stainless Steel Ballast Guard	☐
-H	Adj. to 6" IRMA Ballast Guard	☐
-K	Ductile Iron Dome	☐
-K80	Aluminum Dome	☐
-L	Vandal Proof Dome	☐
-R	2" High External Water Dam	☐
-SO	Side Outlet**	☐
-V	Fixed Extension (1-1/2",2",3",4")	☐
-W	Adj. Water Level Regulator	☐
-W-1	Waterproofing Flange	☐
-Z	Extended Integral Wide Flange	☐
-5	Sediment Bucket	☐
-12	Galvanized Dome	☐
-13	All Galvanized	☐
-83	Mesh Covered Dome	☐
-113M	Special Epoxy from 3M Range	☐

Optional Body Material (NH Only)

Suffix	Description	
-60	PVC Body w/Socket Outlet	☐
-61	ABS Body w/Socket Outlet	☐

Free Area Sq. In.
137

Deck opening [illegible]
With sump receiver [illegible]

** Side Outlet (-SO) option only available in 2"(51), 3"(76), 4"(102) pipe sizes. Underdeck Clamp (-BED and -D options) are not available when -SO is selected.

Job Name ____________ Contractor ____________

Job Location ____________ Contractor's P.O. No. ____________

Engineer ____________ Representative ____________

CANADA

WATTS DRAINAGE
CANADA: 5435 North Service Road, Burlington, ON, L7L 5H7 TEL: 905-332-4718 TOLL-FREE: 1-888-208-8927 Website: www.wattsdrainage.ca

(Dimension) Denotes Millimeters

WATTS® DRAINAGE

Adjustable Accutrol Weir

Tag: ____________

Adjustable Flow Control for Roof Drains

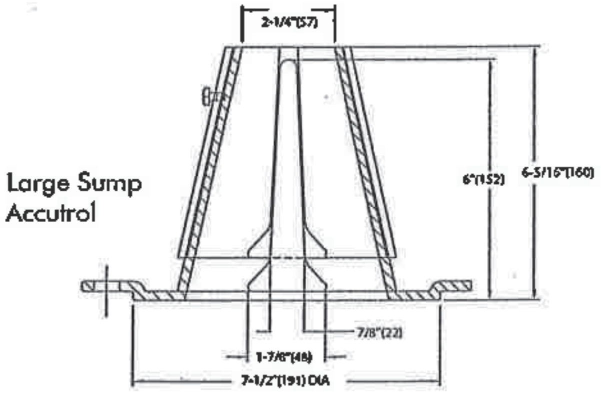
ADJUSTABLE ACCUTROL(for Large Sump Roof Drains only)

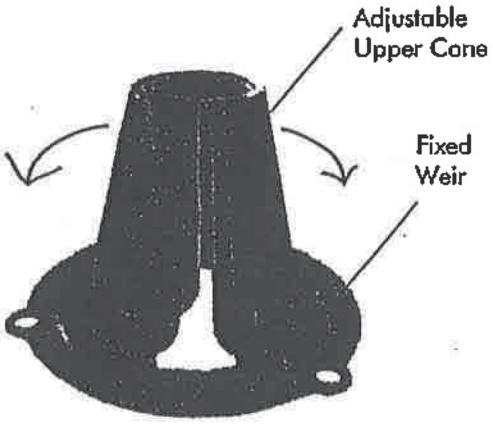
For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol. The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the flow rate for depths over 2" of head, set the slot in the adjustable upper cone according to the flow rate required. Refer to Table 1 below.
Note: Flow rates are directly proportional to the amount of weir opening that is exposed.

EXAMPLE:

For example, if the adjustable upper cone is set to cover 1/2 of the weir opening, flow rates above 2" of head will be restricted to 2-1/2 gpm per inch of head.

Therefore, at 3" of head, the flow rate through the Accutrol Weir that has 1/2 the slot exposed will be:
[5 gpm(per inch of head) x 2 inches of head] + 2-1/2 gpm(for the third inch of head) = 12-1/2 gpm.





1/2 Weir Opening Exposed Shown Above

TABLE 1. Adjustable Accutrol Flow Rate Settings

Weir Opening Exposed	Head of Water					
	1"	2"	3"	4"	5"	6"
	Flow Rate (gallons per minute)					
Fully Exposed	5	10	15	20	25	30
3/4	5	10	13.75	17.5	21.25	25
1/2	5	10	12.5	15	17.5	20
1/4	5	10	11.25	12.5	13.75	15
Closed	5	10	10	10	10	10

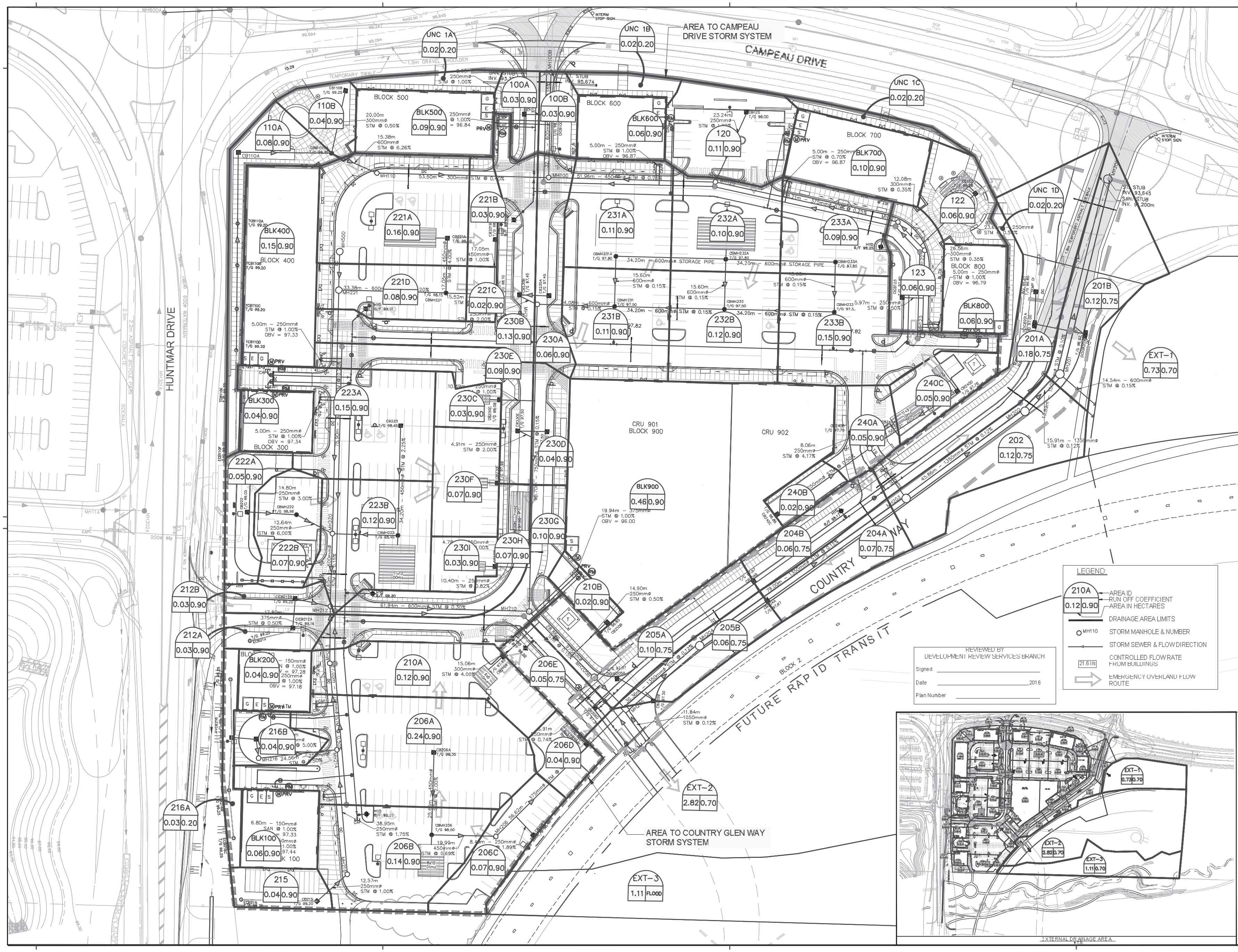
Job Name ____________________ Contractor ____________________

Job Location ____________________ Contractor's P.O. No. ____________________

Engineer ____________________ Representative ____________________

CANADA

(Dimension) Denotes Millimeters



LEGEND

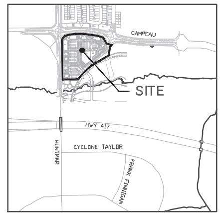
210A	AREA ID
0.12 0.90	RUN OFF COEFFICIENT AREA IN HECTARES
	DRAINAGE AREA LIMITS
MH110	STORM MANHOLE & NUMBER
	STORM SEWER & FLOW DIRECTION
21.6 l/s	CONTROLLED FLOWRATE FROM BUILDINGS
⇨	EMERGENCY OVERLAND FLOW ROUTE

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ____________________

Date ____________________ 2016

Plan Number ____________________



KEY PLAN

APPROVED ☐ REFUSED ☐

THIS____DAY OF____________, 20______

DERRICK MOODIE, ACTING MANAGER
DEVELOPMENT REVIEW, SUBURBAN SERVICES

No.	Description	Date	Checked
5	Revised as per City Comments	16:08:26	DGY
4	Revised as per City Comments	14:10:02	DGY
3	Revised as per City Comments	14:08:22	DGY
2	Issued for SPA Resubmission	14.06.27	DGY
1	Issued for SPA	13.11.18	DGY

Issued for

All measurements and conditions must be checked on the work by the contractor. This drawing not to be used for construction until signed.

Date

plotted J:\35355-ArcadiaComm\5.9 Drawings\59civil\layouts\C-500.dwg Layout Name: Storm Drainage Plot Style: AIA STANDARD-FULL.CTB Plot Scale: 1:1 Plotted At: 9/1/2016 10:55 AM Last Saved By: deturna Last Saved At: Sep. 1, 16

TN PN

16/08/26

drawn by DPS
checked by DGY
printed

scale 1:500
date NOV. 2013
file 35355

Arcadia Retail Development
Kanata, Ontario

Minto Properties
200 Kent Street • Suite 180 • Ottawa, Ontario • K1P 0B6
Telephone: (613)782-3137 Fax: (613)782-5777

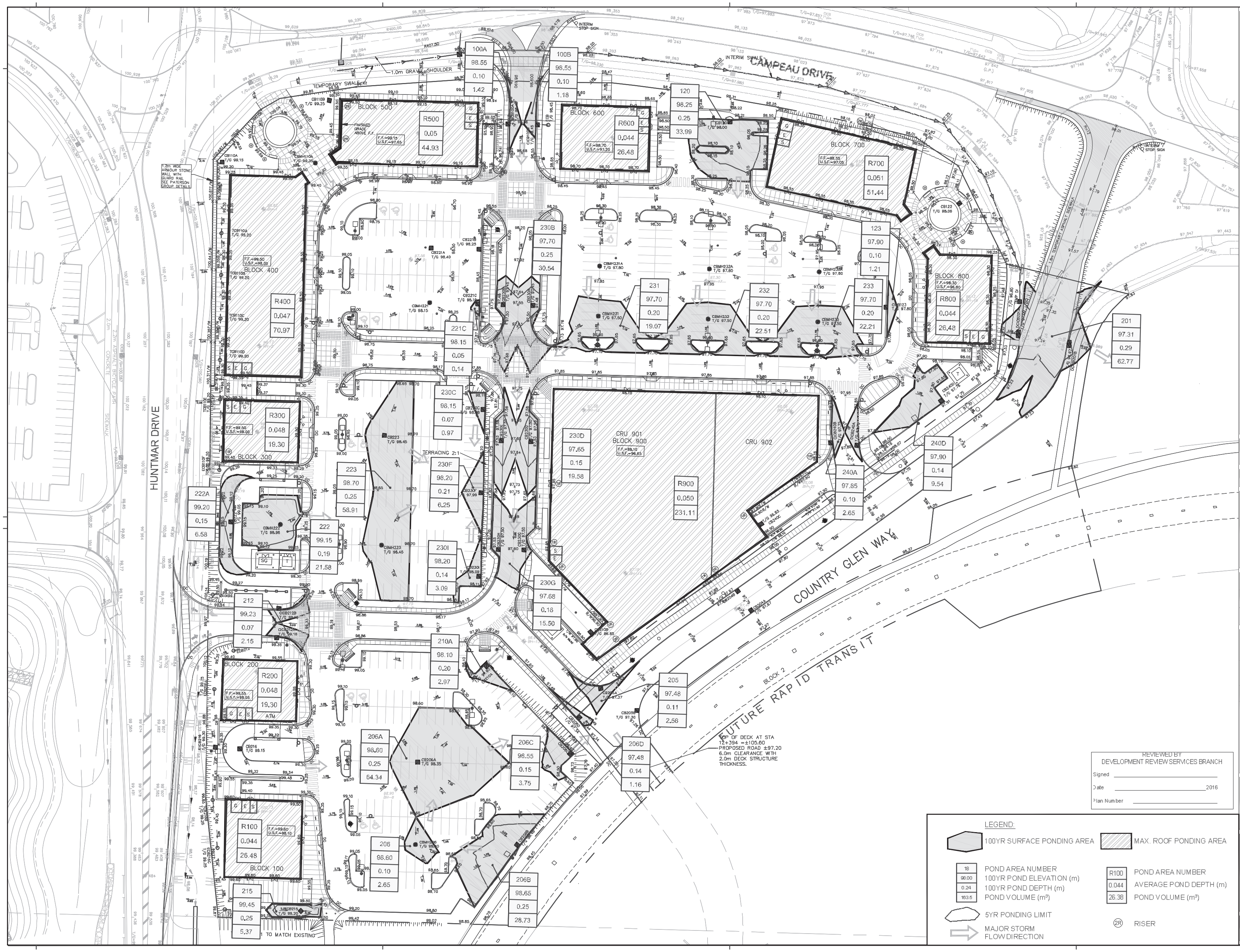
drawing title:
STORM DRAINAGE
AREA PLAN
370 HUNTMAR DRIVE
OTTAWA, ON.

IBI GROUP

drawing no.
C-500

333 Preston Street Tower 1, Suite 400
Ottawa, Ontario Canada K1S 5N4 Tel (613)225-1311 FAX (613)225-9868

D07-12-14-0014



REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ______________________

Date ______________________2016

Plan Number ______________________

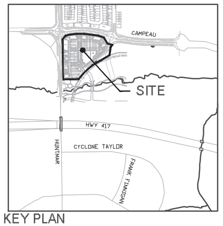
LEGEND:

- ▨ 100YR SURFACE PONDING AREA
- ▨ MAX. ROOF PONDING AREA

18	POND AREA NUMBER
98.00	100YR POND ELEVATION (m)
0.24	100YR POND DEPTH (m)
163.5	POND VOLUME (m³)

R100	POND AREA NUMBER
0.044	AVERAGE POND DEPTH (m)
26.38	POND VOLUME (m³)

- 5YR PONDING LIMIT
- ⇨ MAJOR STORM FLOW DIRECTION
- ②R RISER



KEY PLAN

APPROVED ☐ REFUSED ☐

THIS____DAY OF____________, 20______

DERRICK MOODIE, ACTING MANAGER
DEVELOPMENT REVIEW, SUBURBAN SERVICES

No.	Description	Date	Checked
5	Revised as per City Comments	16:08:26	DGY
4	Revised as per City Comments	14:10:02	DGY
3	Revised as per City Comments	14:08:22	DGY
2	Issued for SPA Resubmission	14.06.27	DGY
1	Issued for SPA	13.11.18	DGY

Issued for

All measurements and conditions must be checked on the work by the contractor. This drawing not to be used for construction until signed.

Date

plotted J:\35355-ArcadiaComm\5.9 Drawings\59civil\layouts\C-400.dwg Layout Name: Ponding Plan Plot Style: AIA STANDARD-FULL.CTB Plot Scale: 1:1 Plotted At: 9/1/2016 10:52 AM Last Saved By: dsiurna Last Saved At: Sep. 1, 16

TN
PN

2016/08/26

drawn by DPS
checked by DGY
printed
scale 1:500
date NOV. 2013
file 35355

Arcadia Retail Development
Kanata, Ontario

Minto Properties
200 Kent Street • Suite 180 • Ottawa, Ontario • K1P 0B6
Telephone: (613)782-3137 Fax: (613)782-5777

drawing title:
SITE PONDING
PLAN
370 HUNTMAR DRIVE
OTTAWA, ON.

IBI GROUP

drawing no.
C-400

333 Preston Street Tower 1, Suite 400
Ottawa, Ontario Canada K1S 5N4 Tel
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D07-12-14-0014

APPENDIX D

patersongroup **memorandum**
consulting engineers

to:	City of Ottawa - **Mr. Mark Fraser** - mark.fraser@ottawa.ca
re:	Response to City of Ottawa Comments **Proposed Arcadia Commercial Development -** 370 Huntmar Drive, Ottawa, ON
date:	August 12, 2014
file:	PG3045 - MEMO.01
from:	Joe Forsyth

The present memorandum has been prepared to address the geotechnical item noted, in the City of Ottawa comments prepared for the aforementioned site. The relevant comments were part of a series of comments presented in the letter dated July 31, 2014 and issued by Mr. Mark Fraser with City of Ottawa Planning and Growth Management. Paterson's response is summarized below:

Item 1 - Shear Strengths Values

As per the previous 1st Engineering Review comments (2014-03-28) on Soil Profile and Test Data sheet BH1 a ground surface consistency classification of "very stiff" to "stiff" was applied to the full depth of ground. Based on the undisturbed shear strength values provided a ground surface consistency classification of "very stiff" is not appropriate for the soil. A shear strength of between 100-200kPa would have been anticipated for the ground surface to be classified as "very stiff". BH1 does not indicate shear strength values greater than approximately 92 kPa. The borehole log has not been revised as indicated. Please review all borehole logs to confirm the ground surface consistency classifications are appropriate based on the shear strength values provided.

Response

Paterson has revised the borehole logs to indicate proper classifications as per Mark Fraser's comment. See attached updated report PG3045 -1R dated June 26, 2014.

Best Regards,

Paterson Group Inc.

Joe Forsyth, P.Eng.

patersongroup

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

Geotechnical Investigation

Proposed Commercial Development
370 Huntmar Drive
Ottawa, Ontario

Prepared For

Minto Properties

June 26, 2014

Report: PG3045-1R

Paterson Group Inc.
Consulting Engineers
154 Colonnade Road South
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Canada K2E 7J5

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APPENDICES

1.0 INTRODUCTION

Paterson Group (Paterson) was commissioned by Minto Properties (Minto) to conduct a geotechnical investigation for the proposed commercial development to be located at 370 Huntmar Drive along Campeau Drive, in the City of Ottawa, Ontario (refer to Figure 1 - Key Plan in Appendix 2).

The objectives of the current investigation were:

- ☐ to determine the subsurface soil and groundwater conditions by means of boreholes,

- ☐ to provide geotechnical recommendations pertaining to design of the proposed development including construction considerations which may affect the design.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. It contains our findings and includes geotechnical recommendations pertaining to the design and construction of the subject development as they are understood at the time of writing this report.

Investigating the presence or potential presence of contamination on the subject property was not part of the scope of work of this present investigation. Therefore, the present report does not address environmental issues.

2.0 PROPOSED DEVELOPMENT

It is understood that the proposed commercial development will consist of a large building (anchor store) and eight (8) smaller box store buildings of slab-on-grade construction. It is further understood that associated access lanes, parking and landscaped areas will occupy the remainder of the site.

3.0 METHOD OF INVESTIGATION

3.1 Field Investigation

Field Program

The field program for the geotechnical investigation was conducted on October 9 to 11, and 15, 2013. At that time, twenty-one (21) boreholes were completed by Paterson to provide general coverage of the subject site. The locations of the test holes are shown on Drawing PG3045-1 - Test Hole Location Plan included in Appendix 2.

The boreholes were drilled using a track-mounted auger drill rig operated by a two person crew. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer. The drilling procedure consisted of augering to the required depths at the selected locations and sampling the overburden. Sampling and testing of the overburden was completed in general accordance with ASTM D5434-12 - Guide for Field Logging of Subsurface Explorations of Soil and Rock.

Sampling and In Situ Testing

Soil samples were recovered from the auger flights and a 50 mm diameter split-spoon sampler. The soil from the auger flights and split-spoon samples were classified on site and placed in sealed plastic bags. All samples were transported to our laboratory. The depths at which the auger flight and split-spoon samples were recovered from the boreholes are depicted as AU and SS, respectively, on the Soil Profile and Test Data sheets in Appendix 1.

The Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split-spoon samples. The SPT results are recorded as "N" values on the Soil Profile and Test Data sheets. The "N" value is the number of blows required to drive the split-spoon sampler 300 mm into the soil after a 150 mm initial penetration using a 63.5 kg hammer falling from a height of 760 mm.

Undrained shear strength testing were conducted at regular intervals of depth in cohesive soils.

The thickness of the overburden was evaluated by dynamic cone penetration testing (DCPT) at BH 5, BH 10 and BH 19. The DCPT consists of driving a steel drill rod, equipped with a 50 mm diameter cone at the tip, using a 63.5 kg hammer falling from a height of 760 mm. The number of blows required to drive the cone into the soil is recorded for each 300 mm increment.

The subsurface conditions observed in the test holes were recorded in detail in the field. The soil profiles are logged on the Soil Profile and Test Data sheets in Appendix 1.

Groundwater

Flexible PVC standpipes were installed in all boreholes to permit monitoring of the groundwater levels subsequent to the completion of the sampling program.

Sample Storage

All samples will be stored in the laboratory for a period of one month after issuance of this report. They will then be discarded unless we are otherwise directed.

3.2 Field Survey

The test hole locations were selected by Paterson and located and surveyed in the field by Stantec Geomatics. The ground surface elevations at the test hole locations are understood to be referenced to a geodetic datum. The locations and ground surface elevations of the test holes are presented on Drawing PG3045-1 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Testing

Soil samples were recovered from the subject site and visually examined in our laboratory to review the results of the field logs. Selected soil samples were weighed and dried to determine moisture contents.

3.4 Analytical Testing

One (1) soil sample from the subject site was submitted for analytical testing to assess the corrosion potential for exposed ferrous metals and the potential of sulphate attacks against subsurface concrete structures. The sample was submitted to determine the concentration of sulphate and chloride, the resistivity and the pH of the soil. The analytical test results are presented in Appendix 1 and discussed in Subsection 6.7.

4.0 OBSERVATIONS

4.1 Surface Conditions

Generally, the ground surface across the subject site slopes downward to the northeast towards the Carp River. The majority of the subject site is undeveloped with the exception of the existing Minto sales centre and associated parking area located within the southwest corner of the site adjacent to Huntmar Drive. The majority of the subject site has been stripped of topsoil and several fill piles were noted throughout the site. However, some minor vegetative growth was noted over the silty clay surface throughout the majority of the subject site. Also, it is understood that the original grade has been lowered by 1 to 1.5 m within the north portion of the subject site.

The south property boundary of the subject site is adjacent to the Feedmill Creek valley corridor. The ground surface within the south portion of the site is tree covered and heavily vegetated. The adjacent section of Feedmill Creek meanders in a west to east direction toward the Carp River within the approximately 15 to 25 m wide valley corridor with a 2 to 2.5 m high valley wall. It was noted that the watercourse is approximately 0.3 to 0.6 m deep, 2 to 3 m wide and is located along the toe of the south valley wall.

4.2 Subsurface Profile

Generally, the subsurface profile encountered at the test hole locations consists of a silty clay deposit underlain by a glacial till layer. The silty clay deposit consists of a stiff to very stiff brown silty clay crust overlying a firm to stiff grey silty clay. Minor roots were noted to extend to depths varying between 100 to 200 mm below the existing silty clay surface. Reference should be made to the Soil Profile and Test Data sheets in Appendix 1 for specific details of the soil profiles encountered at each test hole location.

Based on available geological mapping, the site is located in an area where the bedrock consists of interbedded limestone and shale of the Verulam formation. Also, the bedrock surface is expected at depths ranging from 15 to 25 m.

4.3 Groundwater

Groundwater levels were measured in the standpipes on October 21, 2013 for boreholes completed as part of our current investigation. The results of our groundwater readings from existing boreholes are presented in Table 1. It should be noted that surface water can become trapped within the backfilled borehole, which can lead to higher than normal groundwater level readings. The long term groundwater level can also be estimated based on the recovered soil sample's moisture level and consistency. Based on these observations, the long term groundwater table is anticipated to be at a 2.5 to 4 m depth. It should be further noted that the groundwater level could vary at the time of construction.

Table 1 - Measured Groundwater Levels

Test Hole Number	Ground Surface Elevation (m)	Water Level		Date
		Depth (m)	Elevation (m)	
BH 1	98.82	Damaged	98.82	October 21, 2013
BH 2	98.77	4.48	94.29	October 21, 2013
BH 3	99.00	0.82	98.18	October 21, 2013
BH 4	99.35	2.23	97.12	October 21, 2013
BH 5	98.99	2.36	96.63	October 21, 2013
BH 6	98.90	Damaged	98.90	October 21, 2013
BH 7	97.75	Damaged	97.75	October 21, 2013
BH 8	97.47	0.10	97.37	October 21, 2013
BH 9	97.56	Damaged	97.56	October 21, 2013
BH 10	97.57	3.88	93.69	October 21, 2013
BH 11	97.36	3.56	93.80	October 21, 2013
BH 12	97.38	1.40	95.98	October 21, 2013
BH 13	97.19	1.74	95.45	October 21, 2013
BH 14	97.41	Damaged	97.41	October 21, 2013
BH 15	97.25	2.71	94.54	October 21, 2013
BH 16	97.30	Damaged	97.30	October 21, 2013
BH 17	97.05	3.58	93.47	October 21, 2013
BH 18	98.12	Damaged	98.12	October 21, 2013
BH 19	97.43	Damaged	97.43	October 21, 2013
BH 20	97.08	0.77	96.31	October 21, 2013
BH 21	98.55	0.91	97.64	October 21, 2013

5.0 DISCUSSION

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is satisfactory for the proposed development. It is expected that the proposed commercial buildings will be founded by conventional shallow footings placed on an undisturbed, stiff silty clay bearing surface.

Due to the presence of the silty clay layer, the proposed development will be subjected to a permissible grade raise restriction. If the grade raise restriction is exceeded, several options are available, such as a preload/surcharge program or the placement of lightweight fill below the proposed buildings.

The above and other considerations are further discussed in the following sections.

5.2 Site Grading and Preparation

Stripping Depth

Topsoil and deleterious fill, such as those containing organic materials, should be stripped from under any buildings, paved areas, pipe bedding and other settlement sensitive structures.

Existing foundation walls, and other construction debris should be entirely removed from within proposed building perimeters. Under paved areas, existing construction remnants such as foundation walls should be excavated to a minimum of 1 m below final grade.

Fill Placement

Fill used for grading beneath the building areas should consist, unless otherwise specified, of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. This material should be tested and approved prior to delivery to the site. The fill should be placed in lifts no greater than 300 mm thick and compacted using suitable compaction equipment for the lift thickness. Fill placed beneath the building areas should be compacted to at least 98% of the standard proctor maximum dry density (SPMDD).

Non-specified existing fill along with site-excavated soil can be used as general landscaping fill and beneath parking areas where settlement of the ground surface is of minor concern. In landscaped areas, these materials should be spread in thin lifts and at least compacted by the tracks of the spreading equipment to minimize voids. If these materials are to be used to build up the subgrade level for areas to be paved, the material should be compacted in thin lifts to a minimum density of 95% of the respective SPMDD.

Backfill against foundation walls should consist of free-draining non frost susceptible granular materials. Non-specified existing fill and site-excavated soils are not suitable for use as backfill against the foundation walls, unless used in conjunction with a composite drainage blanket connected to the perimeter foundation drainage system.

5.3 Foundation Design

Bearing Resistance Values

Strip footings, up to 3 m wide, and pad footings, up to 5 m wide, placed on an undisturbed, stiff silty clay bearing surface can be designed using a bearing resistance value at serviceability limit states (SLS) of **150 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **225 kPa**. A geotechnical resistance factor of 0.5 was applied to the above-noted bearing resistance value at ULS.

Footings designed using the above-noted bearing resistance value at SLS will be subjected to potential post-construction total and differential settlements of 25 and 20 mm, respectively.

An undisturbed soil bearing surface consists of a surface from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, whether in situ or not, have been removed, in the dry, prior to the placement of concrete for footings.

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to a stiff silty clay above the groundwater table when a plane extending down and out from the bottom edge of the footing at a minimum of 1.5H:1V passes only through in situ soil of the same or higher capacity as the bearing medium soil.

Permissible Grade Raise Recommendations

A permissible grade raise restriction of **2 m** is recommended for grading within 5 m of the proposed buildings. A permissible grade raise restriction of **3 m** is recommended in the parking areas and access lanes. A post-development groundwater lowering of 0.5 m was considered in our permissible grade raise calculations.

5.4 Design for Earthquakes

Foundation design at the subject site can utilize a seismic site response **Class D** as defined in the Ontario Building Code 2006 (OBC 2006; Table 4.1.8.4.A). The soils underlying the site are not susceptible to liquefaction.

5.5 Slab on Grade Construction

With the removal of the topsoil layer and fill, containing deleterious or organic materials, the native soil will be considered to be an acceptable subgrade surface on which to commence backfilling for slab on grade construction. Any soft areas should be removed and backfilled with appropriate backfill material. OPSS Granular A or Granular B Type II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab. It is recommended that the upper 200 mm of sub-floor fill consists of OPSS Granular A crushed stone. All backfill materials within the footprint of the proposed buildings should be placed in maximum 300 mm thick loose layers and compacted to at least 98% of the SPMDD.

5.6 Pavement Structure

For design purposes, the pavement structures presented in the following tables shall be used for the design of car only parking areas, heavy truck parking areas and access lanes.

It is anticipated that the proposed pavement structures will be placed over either a stiff silty clay or engineered fill subgrade.

Table 2 - Recommended Pavement Structure - Car Only Parking Areas

Thickness (mm)	Material Description
50	**Wear Course** - Superpave 12.5 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
400	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either in situ soil, fill or OPSS Granular B Type I or II material placed over in situ soil	

Table 3 - Recommended Pavement Structure
Heavy Truck Parking Areas and Access Lanes

Thickness (mm)	Material Description
40	**Wear Course** - Superpave 12.5 Asphaltic Concrete
50	**Binder Course** - Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
450	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either in situ soil, fill or OPSS Granular B Type I or II material placed over in situ soil	

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project.

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type I or II material.

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 98% of the SPMDD using suitable vibratory equipment.

Pavement Structure Drainage

Satisfactory performance of the pavement structure is largely dependent on keeping the contact zone between the subgrade material and the base stone in a dry condition. Failure to provide adequate drainage under conditions of heavy wheel loading can result in the fine subgrade soil being pumped into the voids in the stone subbase, thereby reducing the load bearing capacity.

Due to the impervious nature of the subgrade materials consideration should be given to installing subdrains during the pavement construction. These drains should be installed at each catch basin, be at least 3 m long and should extend in four orthogonal directions or longitudinally when placed along a curb. Along local streets, the drains should be placed along the edges of the pavement. The subdrain inverts should be approximately 300 mm below subgrade level. The subgrade surface should be crowned to promote water flow to the drainage lines.

6.0 DESIGN AND CONSTRUCTION PRECAUTIONS

6.1 Foundation Drainage and Backfill

It is recommended that a perimeter foundation drainage system be provided for the proposed structures. It is understood that the proposed buildings will be of slab-on-grade construction and it should be noted that the perimeter foundation drainage system provides an outlet for perched water below the proposed sidewalks anticipated to be surrounding the buildings. Perched water below the sidewalks can lead to heaved sidewalks due to freeze/thaw cycles. The system should consist of a 100 to 150 mm diameter perforated corrugated plastic pipe, surrounded on all sides by 150 mm of 10 mm clear crushed stone, placed at the footing level around the exterior perimeter of the structure. The pipe should have a positive outlet, such as a gravity connection to the storm sewer.

Backfill against the exterior sides of the foundation walls should consist of free-draining non frost susceptible granular materials. Imported granular materials, such as clean sand or OPSS Granular B Type I granular material, should be used for this purpose. The greater part of the site excavated materials will be frost susceptible and, as such, are not recommended for re-use as backfill against the foundation walls, unless used in conjunction with a composite drainage blanket, such as Miradrain G100N or Delta Drain 6000.

6.2 Protection of Footings Against Frost Action

Perimeter footings, of heated structures are required to be insulated against the deleterious effect of frost action. A minimum of 1.5 m thick soil cover (or equivalent) should be provided in this regard.

A minimum of 2.1 m thick soil cover (or equivalent) should be provided for other exterior unheated footings.

6.3 Excavation Side Slopes

The side slopes of excavations in the soil and fill overburden materials should be either cut back at acceptable slopes or should be retained by shoring systems from the start of the excavation until the structure is backfilled. It is assumed that sufficient room will be available for the greater part of the excavation to be undertaken by open-cut methods (i.e. unsupported excavations).

The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or flatter. The flatter slope is required for excavation below groundwater level. The subsoil at this site is considered to be mainly a Type 2 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides.

Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

It is recommended that a trench box be used at all times to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by "cut and cover" methods and excavations will not be left open for extended periods of time.

6.4 Pipe Bedding and Backfill

The pipe bedding for sewer and water pipes should consist of at least 150 mm of OPSS Granular A crushed stone. Where the bedding is located within the firm grey silty clay, the thickness of the bedding material should be increased to a minimum of 300 mm. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 95% of its SPMDD. The bedding material should extend at least to the spring line of the pipe.

The cover material, which should consist of OPSS Granular A, should extend from the spring line of the pipe to at least 300 mm above the obvert of the pipe. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 95% of the SPMDD.

It should generally be possible to re-use the moist (not wet) brown silty clay above the cover material if the excavation and filling operations are carried out in dry weather conditions. Wet silty clay materials will be difficult to re-use, as the high water contents make compacting impractical without an extensive drying period.

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.8 m below finished grade) should match the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the SPMDD.

To reduce long-term lowering of the groundwater level at this site, clay seals should be provided in the service trenches. The seals should be at least 1.5 m long (in the trench direction) and should extend from trench wall to trench wall. Generally, the seals should extend from the frost line and fully penetrate the bedding, subbedding and cover material. The barriers should consist of relatively dry and compactable brown silty clay placed in maximum 225 mm thick loose layers and compacted to a minimum of 95% of the SPMDD. The clay seals should be placed at the site boundaries and at strategic locations at no more than 60 m intervals in the service trenches.

6.5 Groundwater Control

The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

It is anticipated that pumping from open sumps will be sufficient to control the groundwater influx through the sides of the excavations.

A temporary MOE permit to take water (PTTW) will be required for this project if more than 50,000 L/day are to be pumped during the construction phase. At least 4 to 5 months should be allowed for completion of the application and issuance of the permit by the MOE.

6.6 Winter Construction

Precautions must be taken if winter construction is considered for this project. The subsoil conditions at this site consist of frost susceptible materials. In the presence of water and freezing conditions, ice could form within the soil mass. Heaving and settlement upon thawing could occur.

In the event of construction during below zero temperatures, the founding stratum should be protected from freezing temperatures by the use of straw, propane heaters and tarpaulins or other suitable means. In this regard, the base of the excavations should be insulated from sub-zero temperatures immediately upon exposure and until such time as heat is adequately supplied to the building and the footings are protected with sufficient soil cover to prevent freezing at founding level.

Trench excavations and pavement construction are also difficult activities to complete during freezing conditions without introducing frost in the subgrade or in the excavation walls and bottoms. Precautions should be taken if such activities are to be carried out during freezing conditions.

6.7 Corrosion Potential and Sulphate

The analytical testing results are presented in Table 3 along with industry standards for the applicable threshold values. These results are indicative that Type 10 Portland cement (Type GU, or normal cement) would be appropriate for this site.

Table 3 - Corrosion Potential

Parameter	Laboratory Results	Threshold	Commentary
	BH 3		
Chloride	11 µg/g	Chloride content less than 400 mg/g	Negligible concern
pH	7.98	pH value less than 5.0	Neutral Soil
Resistivity	55.4 ohm.m	Resistivity greater than 1,500 ohm.cm	Moderate Corrosion Potential
Sulphate	43 µg/g	Sulphate value greater than 1 mg/g	Negligible Concern

7.0 RECOMMENDATIONS

It is a requirement for the foundation design data provided herein to be applicable that a materials testing and observation services program including the following aspects be performed by the geotechnical consultant.

- ☐ Review grading plan from a geotechnical perspective, once available.
- ☐ Observation of all bearing surfaces prior to the placement of concrete.
- ☐ Sampling and testing of the concrete and granular fill materials used.
- ☐ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ☐ Observation of all subgrades prior to backfilling.
- ☐ Field density tests to determine the level of compaction achieved.
- ☐ Sampling and testing of the bituminous concrete including mix design reviews.

A report confirming that these works have been conducted in general accordance with our recommendations could be issued, upon request, following the completion of a satisfactory materials testing and observation program by the geotechnical consultant.

8.0 STATEMENT OF LIMITATIONS

The recommendations provided in this report are in accordance with our present understanding of the project. We request permission to review our recommendations when the drawings and specifications are completed.

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, we request immediate notification to permit reassessment of our recommendations.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Minto Properties or their agents is not authorized without review by Paterson for the applicability of our recommendations to the alternative use of the report.

Paterson Group Inc.

Michael Killam, B.Eng.

David J. Gilbert, P.Eng.

LICENSED PROFESSIONAL ENGINEER
D. J. GILBERT
100116130
PROVINCE OF ONTARIO

Report Distribution:

- ☐ Minto Properties (3 copies)
- ☐ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

ANALYTICAL TESTING RESULTS

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 370 Huntmar Drive
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatic Ltd.

REMARKS

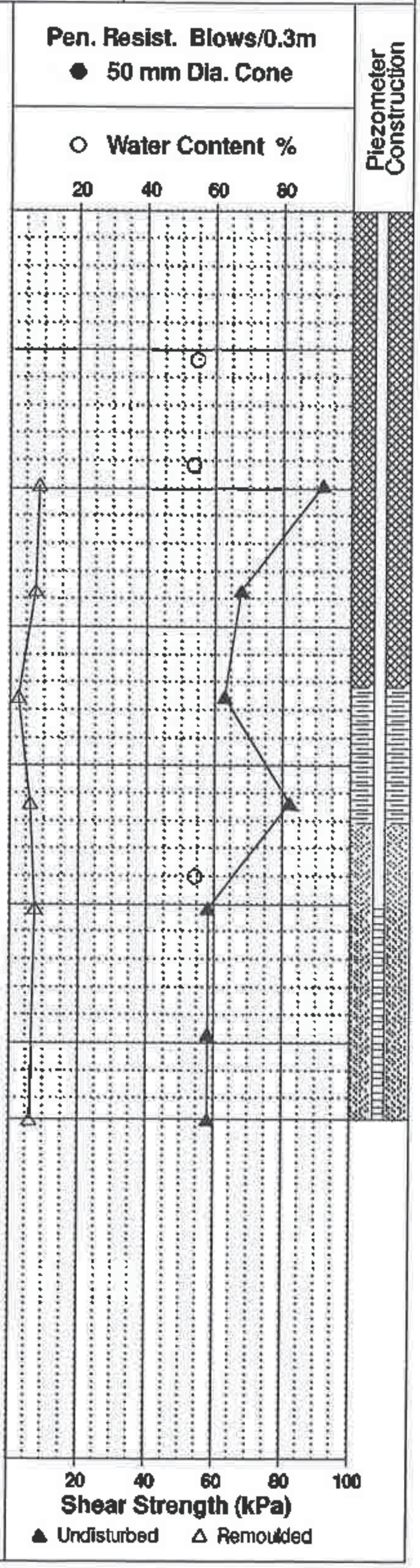
BORINGS BY CME 55 Power Auger

DATE October 9, 2013

FILE NO. PG3045

HOLE NO. BH 1

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.82
		AU	1				
		SS	2	100	4	1	97.82
Stiff, brown **SILTY CLAY**						2	96.82
- grey by 3.0m depth						3	95.82
						4	94.82
						5	93.82
						6	92.82
6.55							
End of Borehole (Piezometer damaged - Oct. 21, 2013)							



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Geotechnical Investigation
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Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatic Ltd.

REMARKS

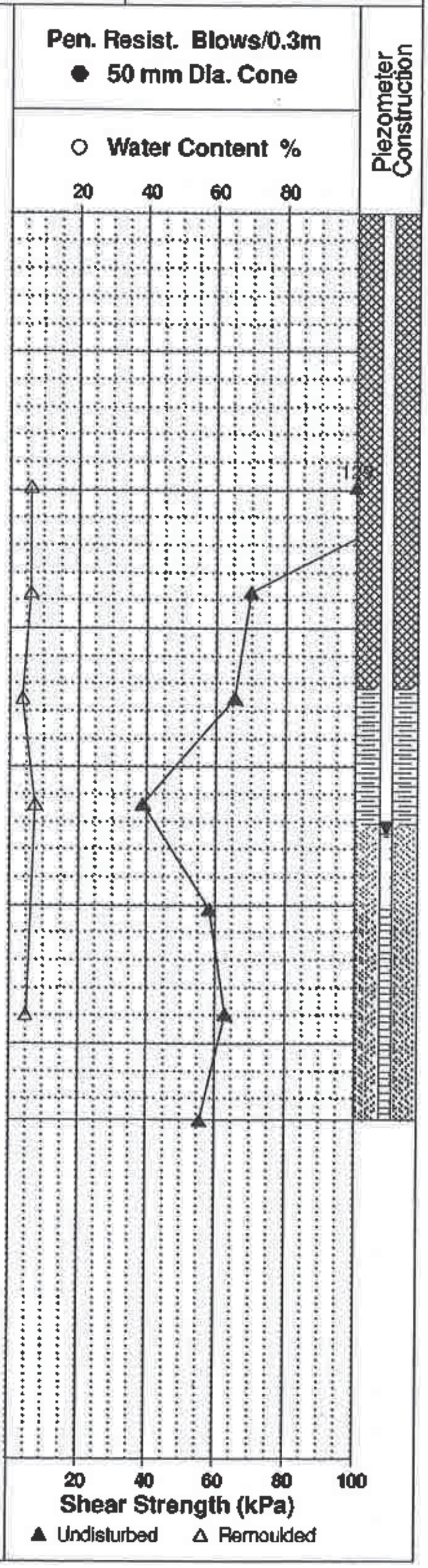
BORINGS BY CME 55 Power Auger

DATE October 9, 2013

FILE NO. PG3045

HOLE NO. BH 2

SOIL DESCRIPTION	STRATA PLOT	TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
		AU	1			0	98.77
Very stiff to stiff, brown **SILTY CLAY** - rootlets extending to 0.2m depth noted		SS	2	100	5	1	97.77
						2	96.77
- grey by 2.5m depth							
						3	95.77
- firm by 4.0m depth						4	94.77
						5	93.77
						6	92.77
6.55							
End of Borehole (GWL @ 4.48m-Oct. 21, 2013)							



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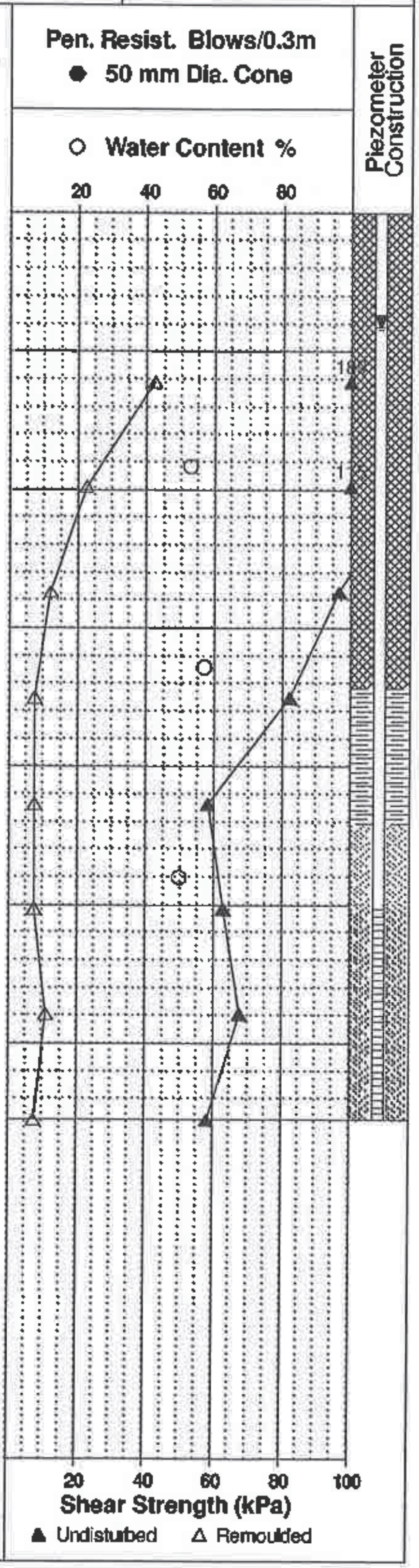
REMARKS

BORINGS BY CME 55 Power Auger **DATE** October 9, 2013

FILE NO. PG3045

HOLE NO. BH 3

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.00
		AU	1				
						1	98.00
Very stiff to stiff, brown **SILTY CLAY** - rootlets extending to 0.15m depth noted							
						2	97.00
- grey by 3.0m depth						3	96.00
						4	95.00
						5	94.00
						6	93.00
6.55							
End of Borehole (GWL @ 0.82m-Oct. 21, 2013)							



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REMARKS

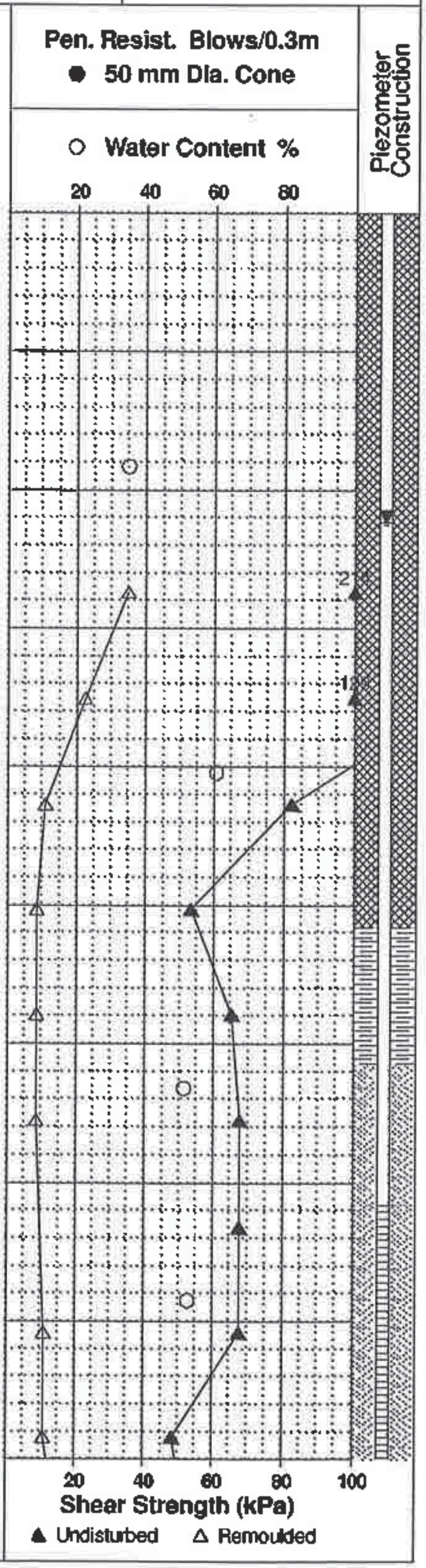
BORINGS BY CME 55 Power Auger

DATE October 10, 2013

FILE NO. PG3045

HOLE NO. BH 4

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.35
FILL: Brown silty sand with gravel and cobbles		AU	1				
0.60							
		SS	2	42	13	1	98.35
		SS	3	100	14		
Hard to very stiff, brown **SILTY CLAY**						2	97.35
						3	96.35
- stiff and grey by 3.7m depth							
						4	95.35
						5	94.35
						6	93.35
						7	92.35
						8	91.35
						9	90.35



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REMARKS

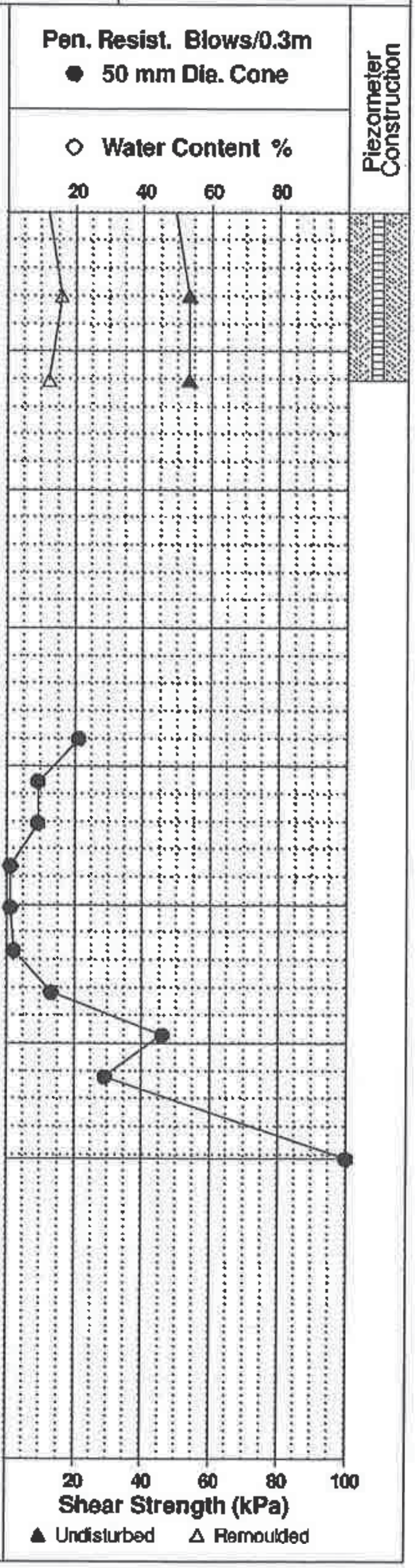
BORINGS BY CME 55 Power Auger

DATE October 10, 2013

FILE NO. PG3045

HOLE NO. BH 4

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
						9	90.35
Stiff, grey **SILTY CLAY**	▨						
						10	89.35
10.21							
Dynamic Cone Penetration Test commenced at 10.21m depth. Cone pushed to 12.8m depth.							
						11	88.35
						12	87.35
						13	86.35
						14	85.35
						15	84.35
15.83							
End of Borehole Practical DCPT refusal at 15.83m depth (GWL @ 2.23m-Oct. 21, 2013)							



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REMARKS

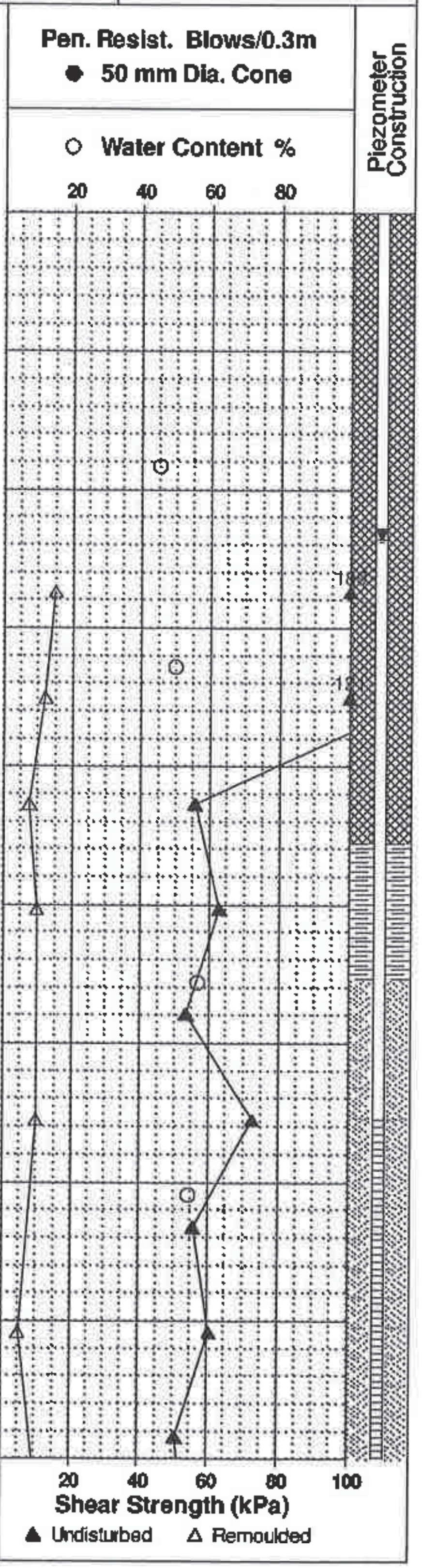
BORINGS BY CME 55 Power Auger

DATE October 10, 2013

FILE NO. PG3045

HOLE NO. BH 5

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.99
		SS	1	100	12	1	97.99
		SS	2	100	4	2	96.99
Very stiff to stiff, brown **SILTY CLAY**							
						3	95.99
- grey by 3.5m depth							
						4	94.99
						5	93.99
						6	92.99
						7	91.99
						8	90.99
						9	89.99



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REMARKS

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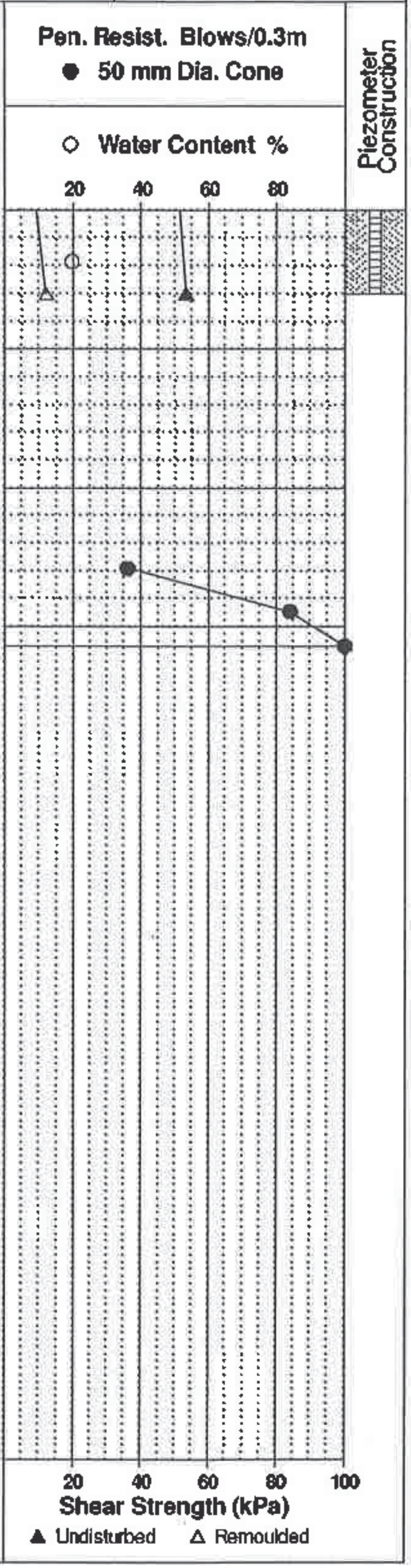
DATE October 10, 2013

FILE NO. PG3045

HOLE NO. BH 5

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE							
Stiff, grey **SILTY CLAY**	▨					9	89.99
9.60							
Dynamic Cone Penetration Test commenced at 9.60m depth. Cone pushed to 11.3m depth.						10	88.99
						11	87.99
						12	86.99
12.14							
End of Borehole Practical DCPT refusal at 12.14m depth (GWL @ 2.36m-Oct. 21, 2013)							



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REMARKS

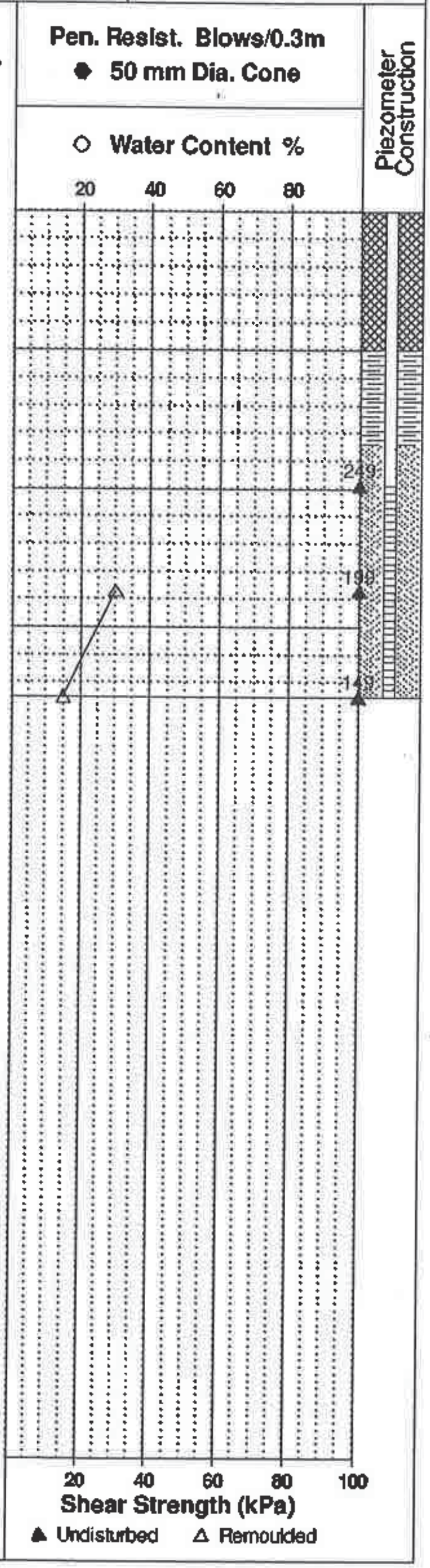
BORINGS BY CME 55 Power Auger

DATE October 15, 2013

FILE NO. PG3045

HOLE NO. BH 6

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)
		TYPE	NUMBER	% RECOVERY	N VALUE or RQD		
GROUND SURFACE						0	98.90
Hard to very stiff, brown **SILTY CLAY**	▨	SS	1	100	16	1	97.90
						2	96.90
						3	95.90
3.50							
End of Borehole (Piezometer damaged - Oct. 21, 2013)							



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REMARKS

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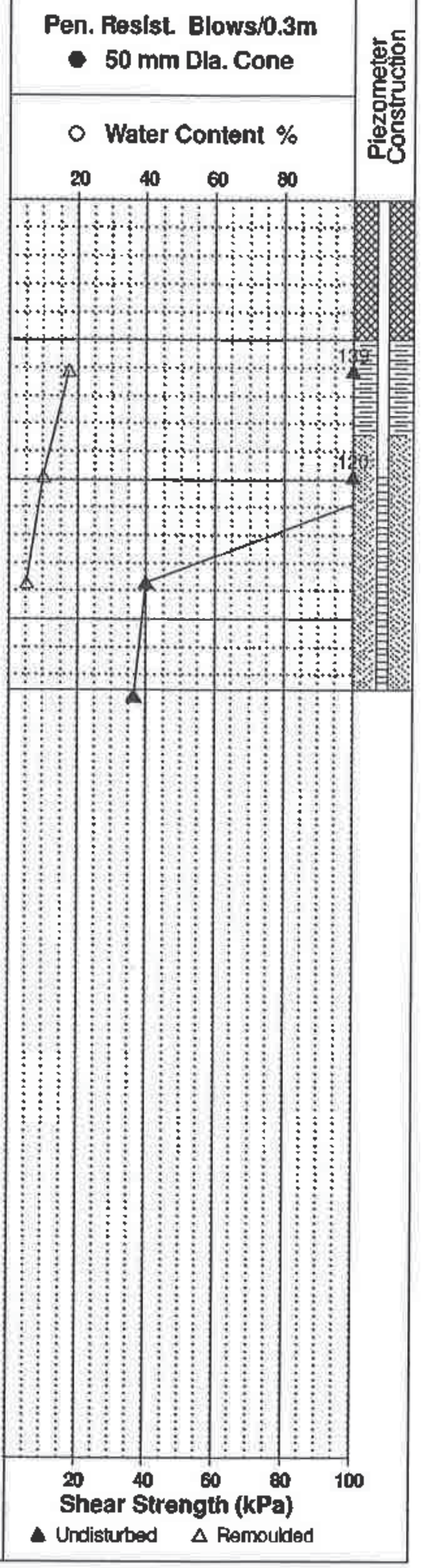
DATE October 9, 2013

FILE NO. PG3045

HOLE NO. BH 7

SOIL DESCRIPTION GROUND SURFACE	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
	▨	AU	1			0	97.75
	▨	AU	2				
Very stiff to stiff, brown **SILTY CLAY** - rootlets extending to 0.2m depth noted	▨					1	96.75
	▨					2	95.75
- firm and grey by 2.6m depth	▨						
	▨					3	94.75
3.50							
End of Borehole (Piezometer damaged - Oct. 21, 2013)							



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REMARKS

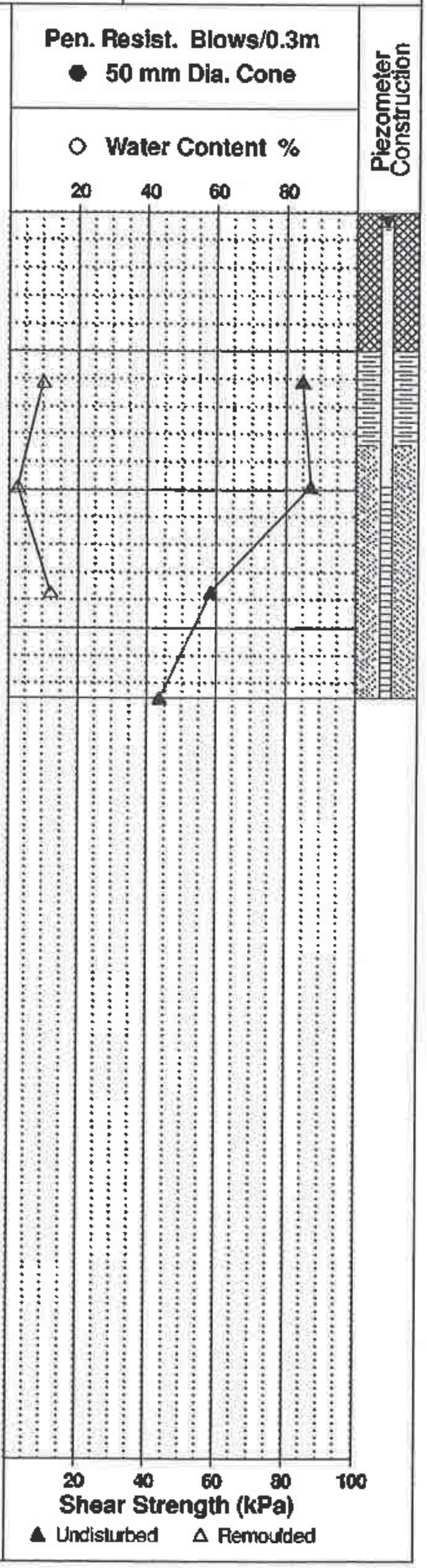
BORINGS BY CME 55 Power Auger

DATE October 15, 2013

FILE NO. PG3045

HOLE NO. BH 8

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.47
	▨					1	96.47
Stiff to firm, brown **SILTY CLAY**	▨						
	▨					2	95.47
- grey by 2.3m depth	▨						
	▨					3	94.47
3.50							
End of Borehole (GWL @ 0.10m-Oct. 21, 2013)							



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REMARKS

BORINGS BY CME 55 Power Auger

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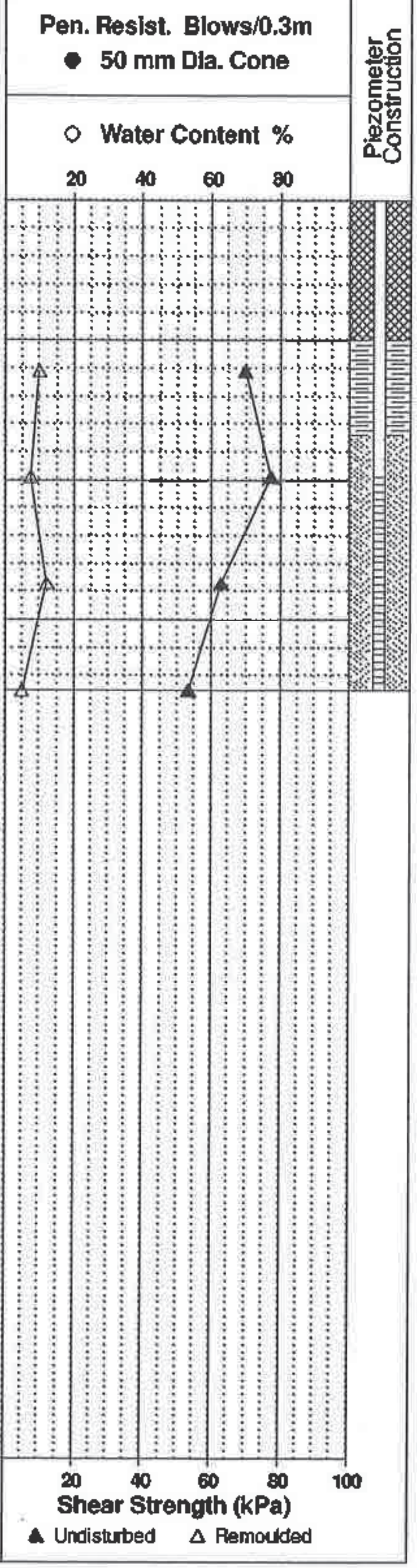
FILE NO. PG3045

HOLE NO. BH 9

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.56
Stiff, brown **SILTY CLAY**	▨					1	96.56
	▨					2	95.56
- grey by 2.4m depth	▨					3	94.56
3.50							
End of Borehole (Piezometer damaged - Oct. 21, 2013)							



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REMARKS

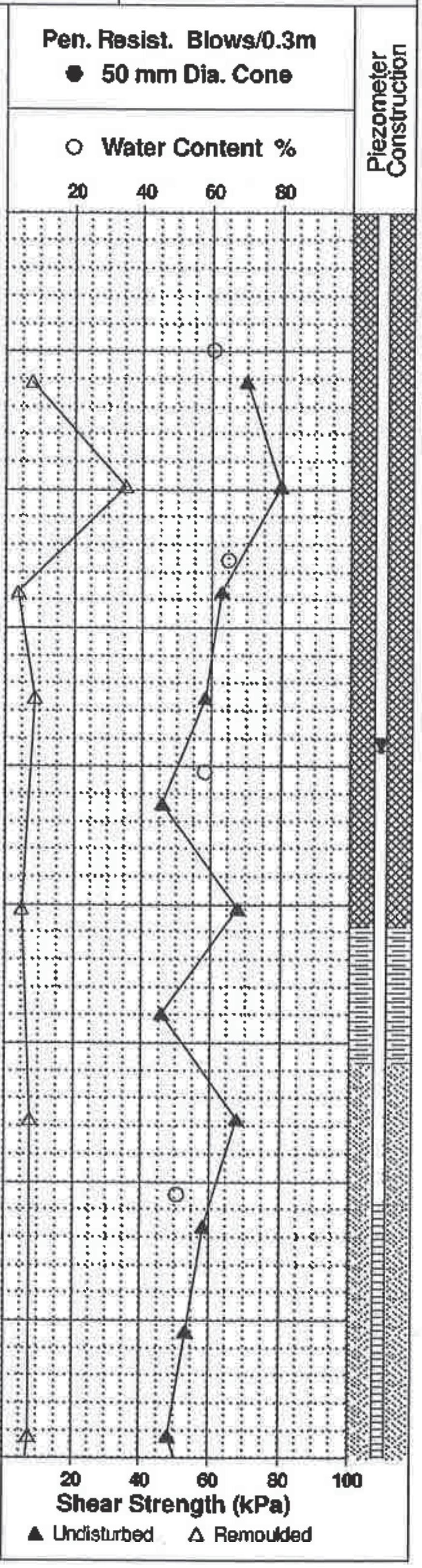
BORINGS BY CME 55 Power Auger

DATE October 11, 2013

FILE NO. PG3045

HOLE NO. BH10

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.57
		AU	1				
						1	96.57
Stiff to firm, brown **SILTY CLAY**							
						2	95.57
- grey by 2.5m depth							
						3	94.57
						4	93.57
						5	92.57
						6	91.57
						7	90.57
						8	89.57
						9	88.57



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REMARKS

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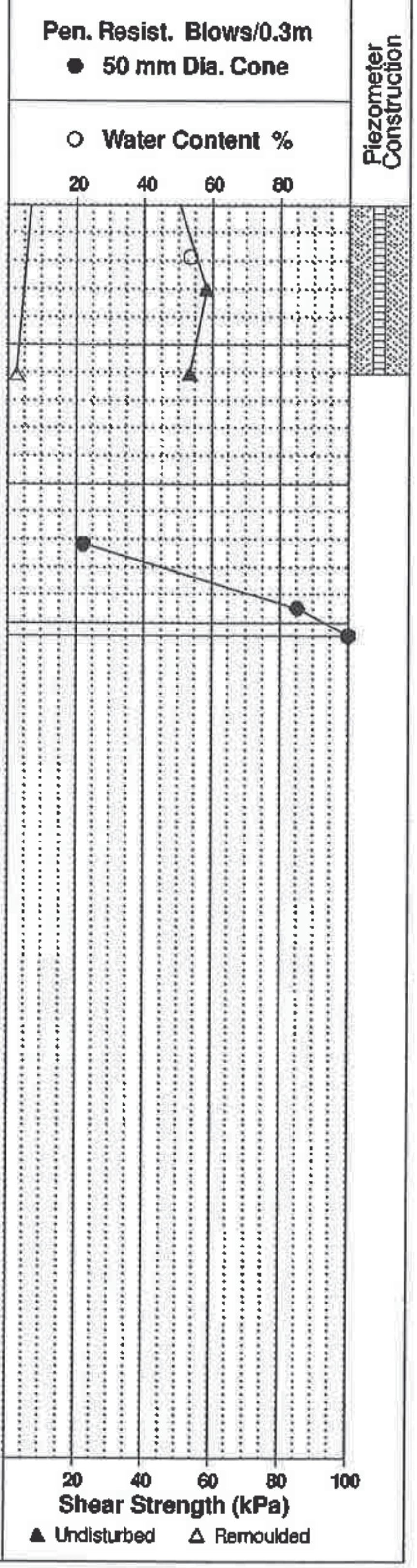
FILE NO. PG3045

HOLE NO. BH10

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						9	88.57
Stiff, brown **SILTY CLAY**	▨						
10.21	▨					10	87.57
Dynamic Cone Penetration Test commenced at 10.21m depth. Cone pushed to 11.4m depth.						11	86.57
12.09						12	85.57
End of Borehole Practical DCPT refusal at 12.09m depth (GWL @ 3.88m-Oct. 21, 2013)							



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REMARKS

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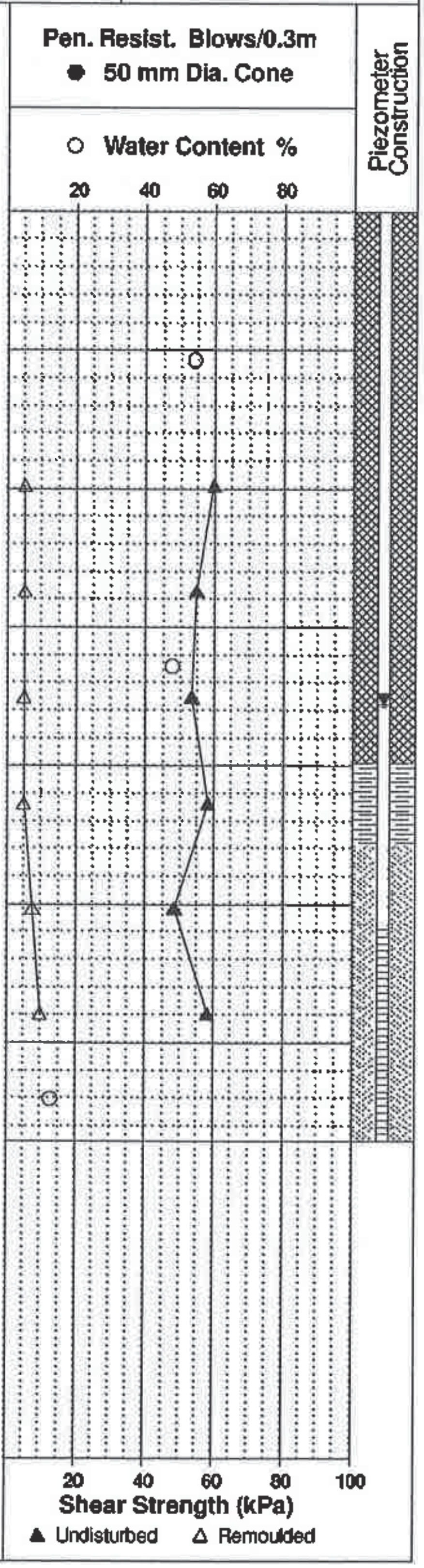
FILE NO. PG3045

HOLE NO. BH11

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.36
		AU	1				
Stiff, brown **SILTY CLAY** - rootlets extending 0.15m depth noted		SS	2	100	2	1	96.36
						2	95.36
- grey by 2.5m depth						3	94.36
						4	93.36
- firm to stiff by 5.0m depth						5	92.36
5.79							
						6	91.36
GLACIAL TILL: Grey silty clay with sand, gravel and cobbles		SS	3	100	3		
6.70							
End of Borehole (GWL @ 3.56m-Oct. 21, 2013)							



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REMARKS

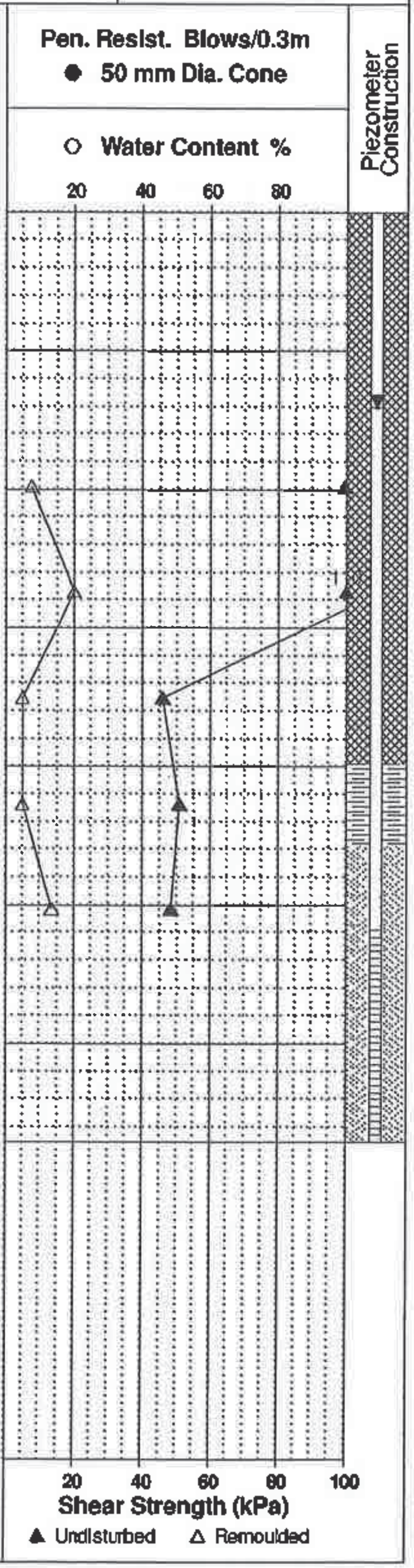
BORINGS BY CME 55 Power Auger

DATE October 10, 2013

FILE NO. PG3045

HOLE NO. BH12

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	97.38
	SS	1	100	3	1	96.38
Very stiff to stiff, brown **SILTY CLAY**					2	95.38
					3	94.38
- firm and grey by 3.4m depth						
					4	93.38
5.18					5	92.38
GLACIAL TILL: Grey silty clay with sand, gravel and cobbles					6	91.38
	SS	2	100	27		
6.70						
End of Borehole						
(GWL @ 1.40m-Oct. 21, 2013)						



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REMARKS

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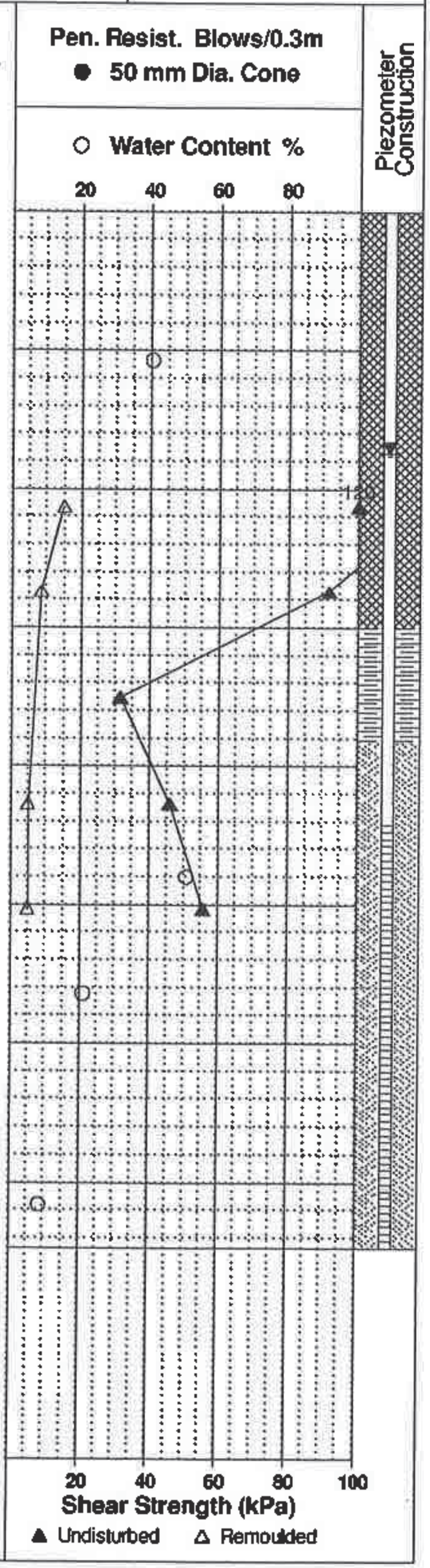
DATE October 10, 2013

FILE NO. PG3045

HOLE NO. BH13

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	97.19
Very stiff to stiff, brown **SILTY CLAY** - rootlets extending to 0.3m depth noted	AU	1				
	SS	2	100	4	1	96.19
					2	95.19
- firm to stiff and grey by 3.3m depth					3	94.19
					4	93.19
5.18					5	92.19
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders	SS	3	83	3		
					6	91.19
	SS	4	83	11		
					7	90.19
	SS	5	83	31		
7.47 End of Borehole (GWL @ 1.74m-Oct. 21, 2013)						



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REMARKS

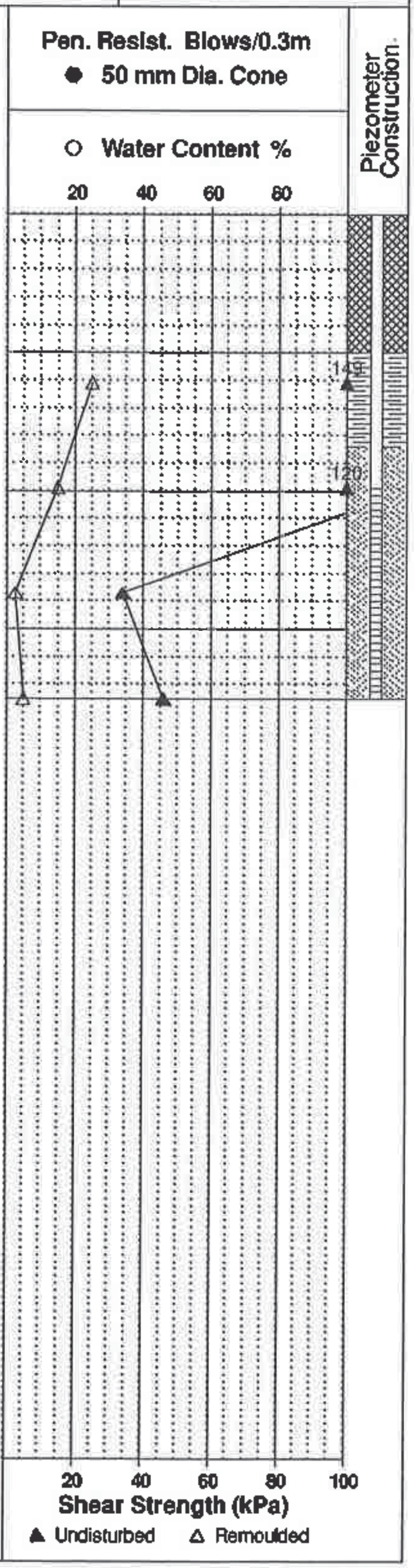
BORINGS BY CME 55 Power Auger

DATE October 15, 2013

FILE NO. PG3045

HOLE NO. BH14

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.41
Very stiff to stiff, brown **SILTY CLAY**	▨					1	96.41
	▨					2	95.41
- firm and grey by 2.6m depth	▨					3	94.41
3.50							
End of Borehole (Piezometer damaged - Oct. 21, 2013)							



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REMARKS

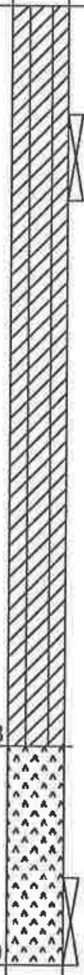
BORINGS BY CME 55 Power Auger

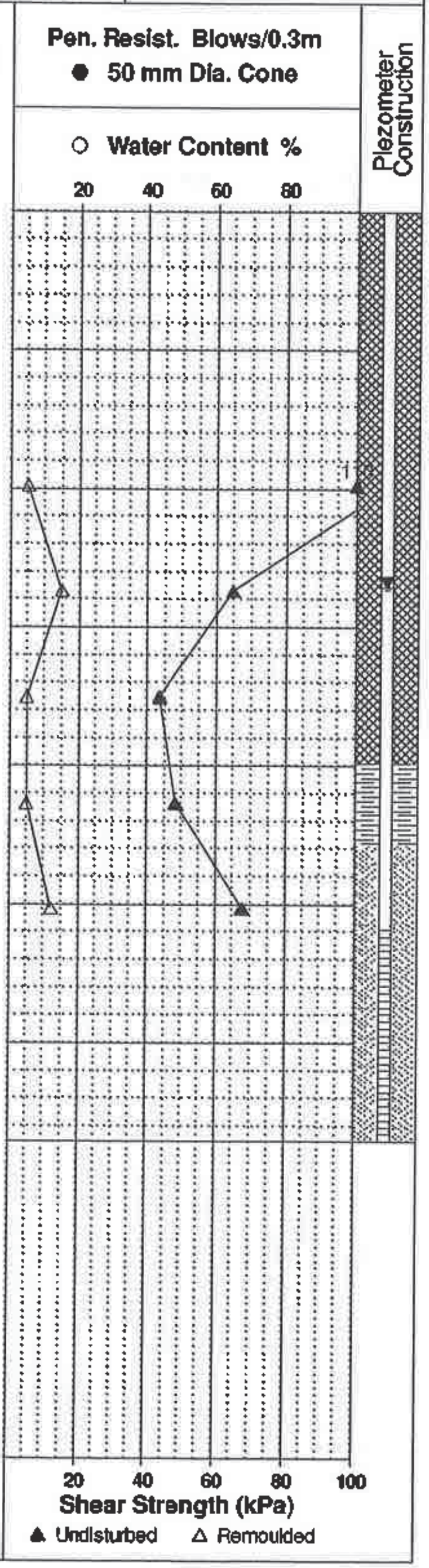
DATE October 15, 2013

FILE NO. PG3045

HOLE NO. BH15

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	97.25
	SS	1			1	96.25
Very stiff to stiff, brown **SILTY CLAY**					2	95.25
					3	94.25
- firm to stiff and grey by 3.3m depth						
					4	93.25
- sand seam at 4.7m depth						
5.18					5	92.25
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders					6	91.25
	SS	2	100	16		
6.70						
End of Borehole						
(GWL @ 2.71m-Oct. 21, 2013)						





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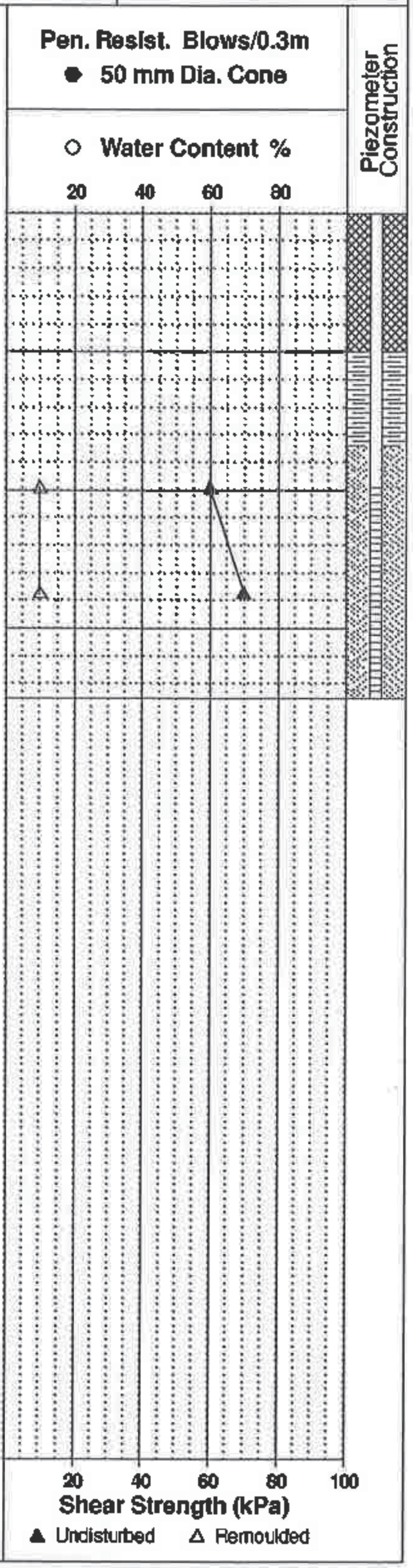
FILE NO. PG3045

REMARKS

HOLE NO. BH16

BORINGS BY CME 55 Power Auger **DATE** October 15, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.30
	▨	AU	1				
Stiff, brown **SILTY CLAY**	▨	SS	2	100	3	1	96.30
- rootlets extending to 0.15m depth noted	▨						
	▨					2	95.30
- increasing sand content below 2.9m depth	▨					3	94.30
3.50	▨						
End of Borehole (Piezometer damaged - Oct. 21, 2013)							



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REMARKS

BORINGS BY CME 55 Power Auger

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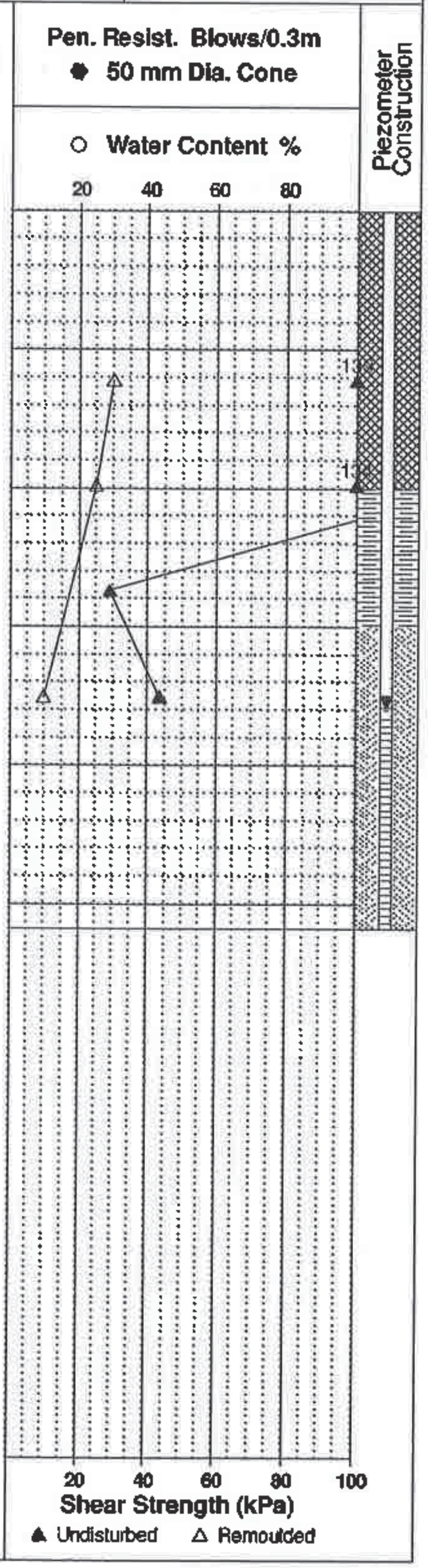
FILE NO. PG3045

HOLE NO. BH17

SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	97.05
	AU	1				
Very stiff to stiff, brown **SILTY CLAY** - rootlets extending to 0.2m depth noted - firm and grey by 2.6m depth					1	96.05
					2	95.05
					3	94.05
3.66						
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders	SS	2	100	18	4	93.05
	SS	3	100	10	5	92.05
5.18						
End of Borehole (GWL @ 3.58m-Oct. 21, 2013)						



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FILE NO. PG3045

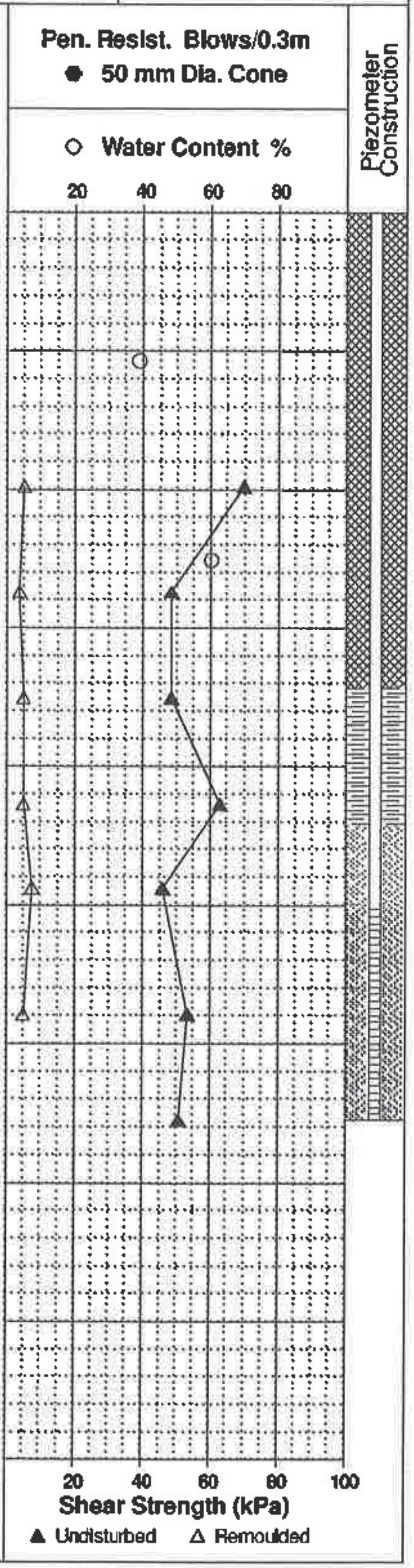
REMARKS

HOLE NO. BH18

BORINGS BY CME 55 Power Auger

DATE October 11, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.12
		SS	1	100	4	1	97.12
Stiff to firm, brown **SILTY CLAY**	▨					2	96.12
- grey by 2.7m depth						3	95.12
						4	94.12
						5	93.12
6.55						6	92.12
Dynamic Cone Penetration Test commenced at 6.55m depth. Cone pushed to 11.5m depth.						7	91.12
						8	90.12
						9	89.12



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 370 Huntmar Drive
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatic Ltd.

REMARKS

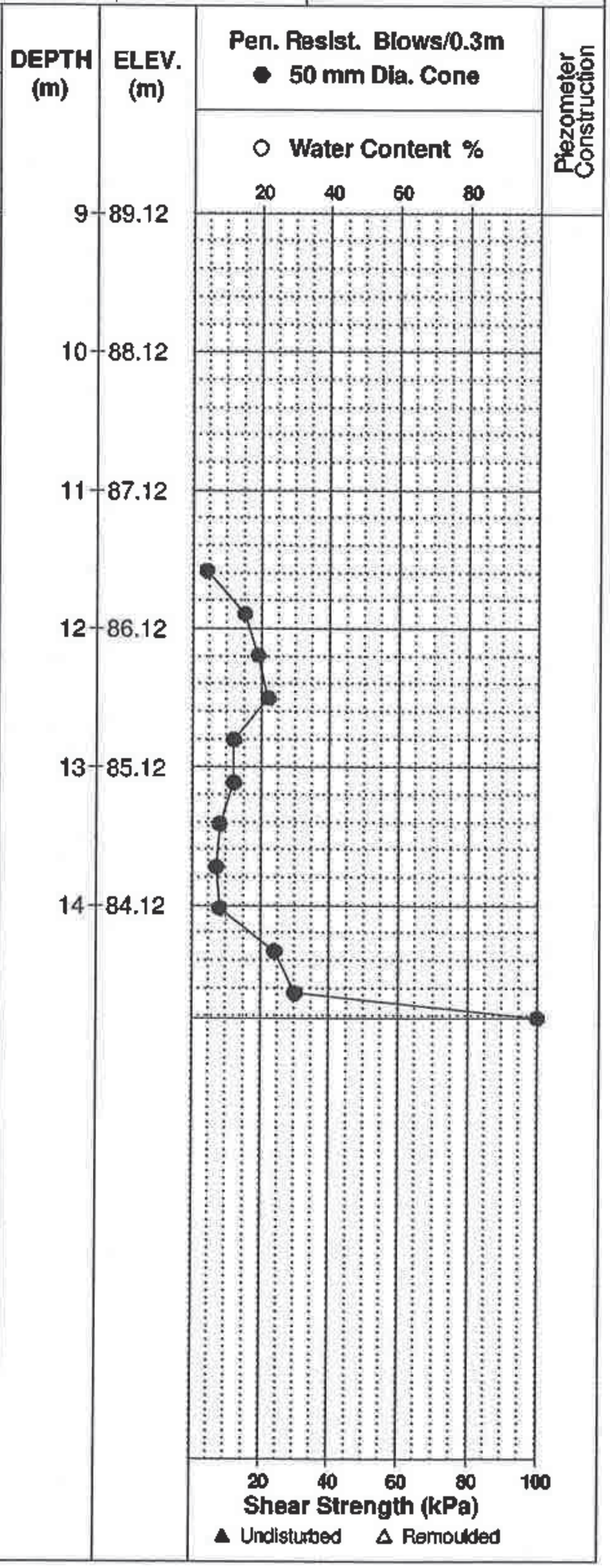
BORINGS BY CME 55 Power Auger

DATE October 11, 2013

FILE NO. PG3045

HOLE NO. BH18

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
GROUND SURFACE					
14.81					
End of Borehole Practical DCPT refusal at 14.81m depth (Piezometer damaged - Oct. 21, 2013)					



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 370 Huntmar Drive
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatic Ltd.

REMARKS

BORINGS BY CME 55 Power Auger

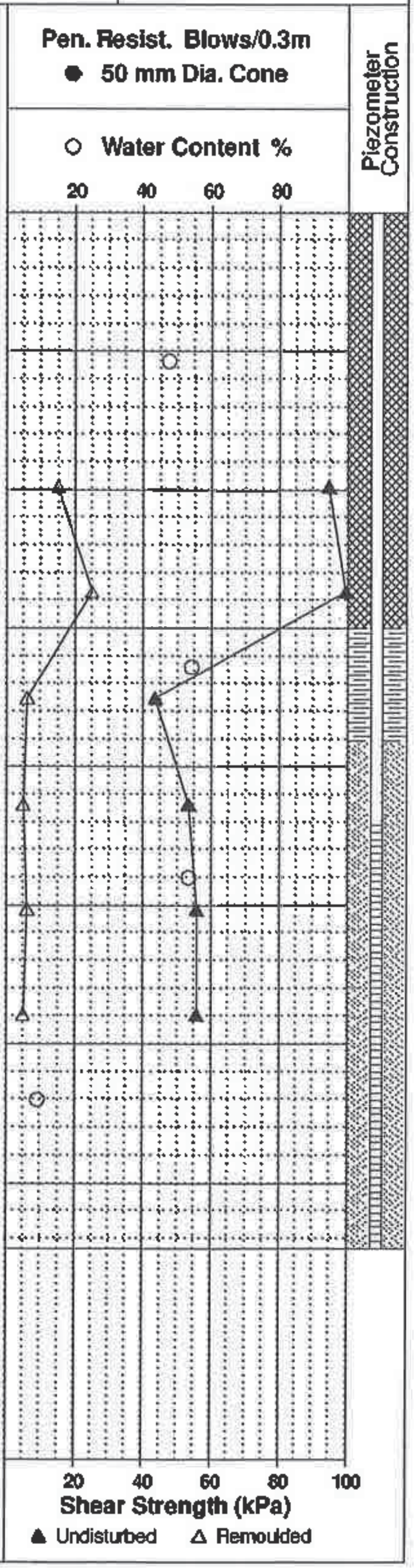
DATE October 15, 2013

FILE NO. PG3045

HOLE NO. BH19

SOIL DESCRIPTION	TYPE	NUMBER	% RECOVERY	N VALUE or RQD
GROUND SURFACE				
	AU	1		
Stiff, brown **SILTY CLAY** - rootlets extending to 0.2m depth noted	SS	2	100	5
-firm to stiff and grey by 3.4m depth				
5.90				
GLACIAL TILL: Brown silty clay with sand, gravel, cobbles and boulders	SS	3	100	9
	SS	4	67	15
7.47				
End of Borehole (Piezometer damaged - Oct. 21, 2013)				

DEPTH (m)	ELEV. (m)
0	97.43
1	96.43
2	95.43
3	94.43
4	93.43
5	92.43
6	91.43
7	90.43



patersongroup Consulting Engineers
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 370 Huntmar Drive
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatic Ltd.

REMARKS

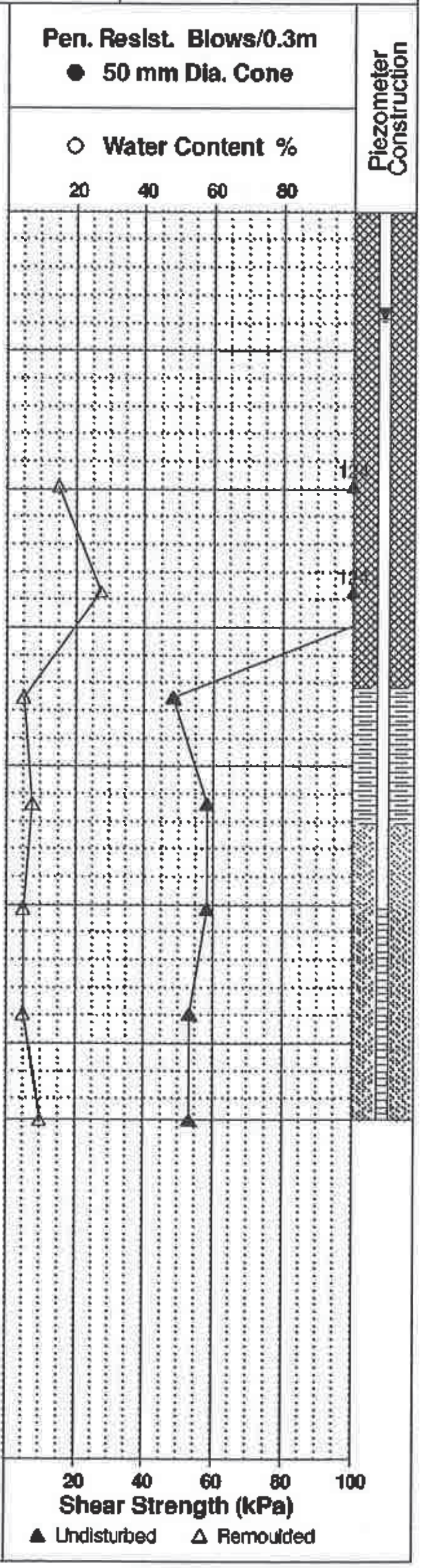
BORINGS BY CME 55 Power Auger

DATE October 15, 2013

FILE NO. PG3045

HOLE NO. BH20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE				DEPTH (m)	ELEV. (m)
GROUND SURFACE		TYPE	NUMBER	% RECOVERY	N VALUE or RQD		
						0	97.08
Very stiff to stiff, brown **SILTY CLAY** - rootlets extending to 0.2m depth noted		SS	1	100	5	1	96.08
						2	95.08
						3	94.08
- firm to stiff and grey by 3.5m depth						4	93.08
						5	92.08
						6	91.08
6.55							
End of Borehole (GWL @ 0.77m-Oct. 21, 2013)							



patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Commercial Development - 370 Huntmar Drive
Ottawa, Ontario

DATUM Ground surface elevations provided by Stantec Geomatic Ltd.

FILE NO. **PG3045**

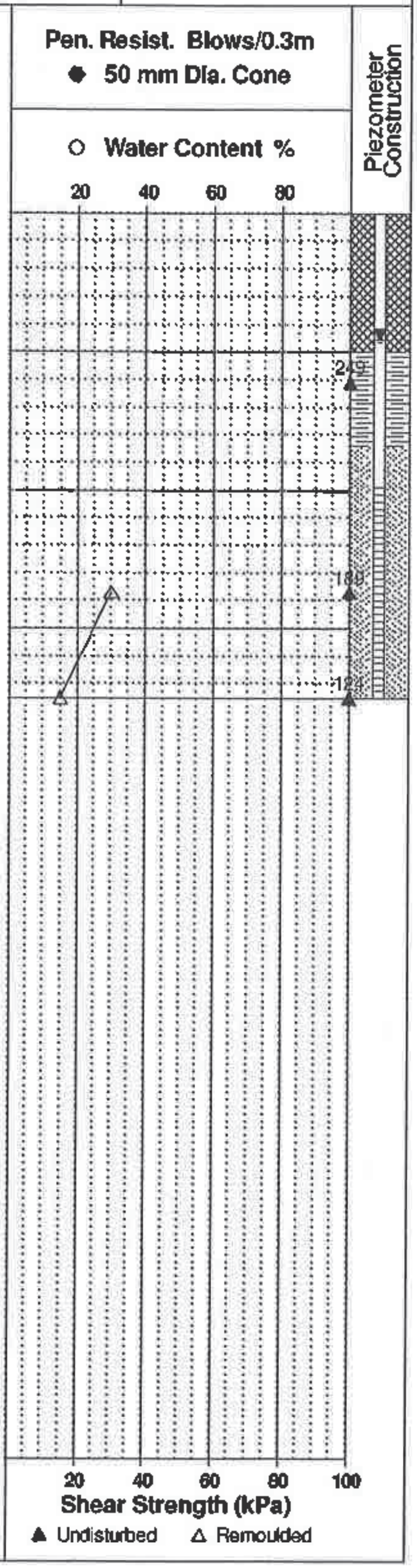
REMARKS

HOLE NO. **BH21**

BORINGS BY CME 55 Power Auger

DATE October 15, 2013

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.55
						1	97.55
Hard to very stiff, brown **SILTY CLAY**		SS	1	100	9		
						2	96.55
						3	95.55
3.50							
End of Borehole (GWL @ 0.91m-Oct. 21, 2013)							



SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

Relative Density	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their "sensitivity". The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NXL size core. However, it can be used on smaller core sizes, such as BX, if the bulk of the fractures caused by drilling stresses (called "mechanical breaks") are easily distinguishable from the normal in situ fractures.

RQD %	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC% - Natural moisture content or water content of sample, %
LL - Liquid Limit, % (water content above which soil behaves as a liquid)
PL - Plastic limit, % (water content above which soil behaves plastically)
PI - Plasticity index, % (difference between LL and PL)

Dxx - Grain size which xx% of the soil, by weight, is of finer grain sizes
These grain size descriptions are not used below 0.075 mm grain size
D10 - Grain size at which 10% of the soil is finer (effective grain size)
D60 - Grain size at which 60% of the soil is finer

Cc - Concavity coefficient = $(D30)^2 / (D10 \times D60)$
Cu - Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay (more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

p'_o - Present effective overburden pressure at sample depth
p'_c - Preconsolidation pressure of (maximum past pressure on) sample
Ccr - Recompression index (in effect at pressures below p'_c)
Cc - Compression index (in effect at pressures above p'_c)

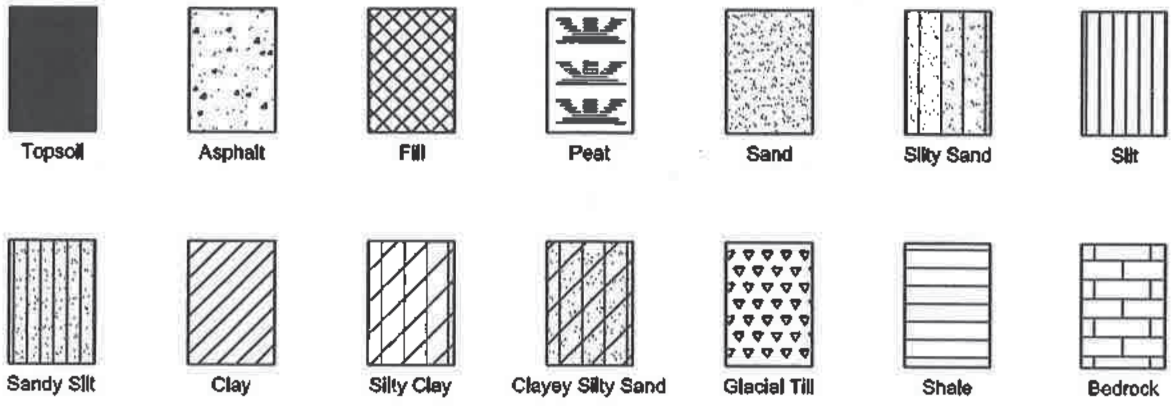
OC Ratio Overconsolidaton ratio = p'_c / p'_o
Void Ratio Initial sample void ratio = volume of voids / volume of solids
Wo - Initial water content (at start of consolidation test)

PERMEABILITY TEST

k - Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

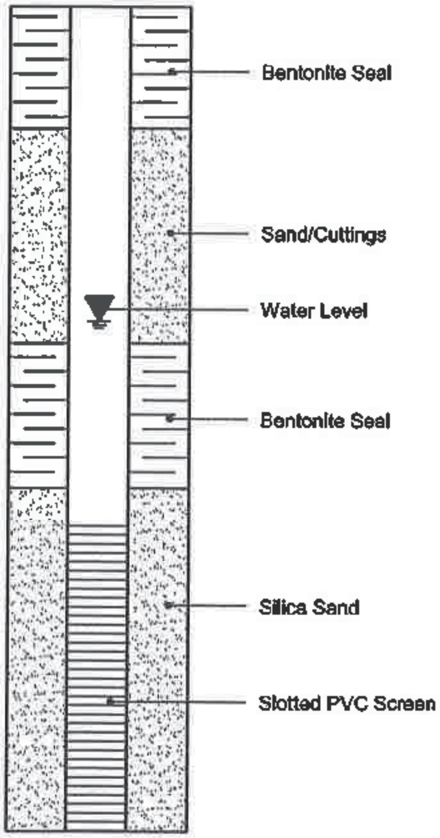
SYMBOLS AND TERMS (continued)

STRATA PLOT

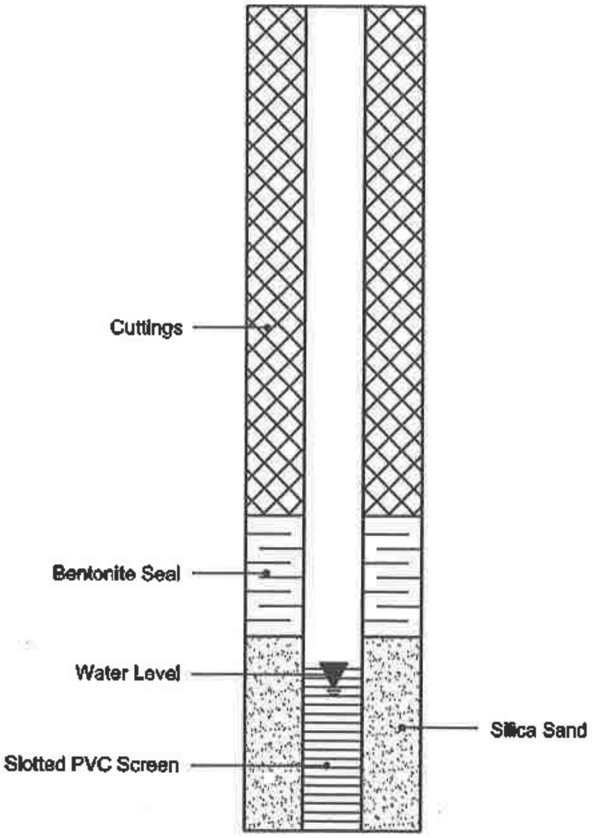


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 15096

Project Description: PG3045

Report Date: 22-Oct-2013

Order Date: 16-Oct-2013

	Client ID:	BH12-SS1	-	-	-
	Sample Date:	10-Oct-13	-	-	-
	Sample ID:	1342113-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	68.0	-	-	-
General Inorganics					
pH	0.05 pH Units	7.61	-	-	-
Resistivity	0.10 Ohm.m	31.5	-	-	-
Anions					
Chloride	5 ug/g dry	79	-	-	-
Sulphate	5 ug/g dry	47	-	-	-

APPENDIX 2

FIGURE 1 - KEY PLAN

DRAWING PG3045-1 - TEST HOLE LOCATION PLAN

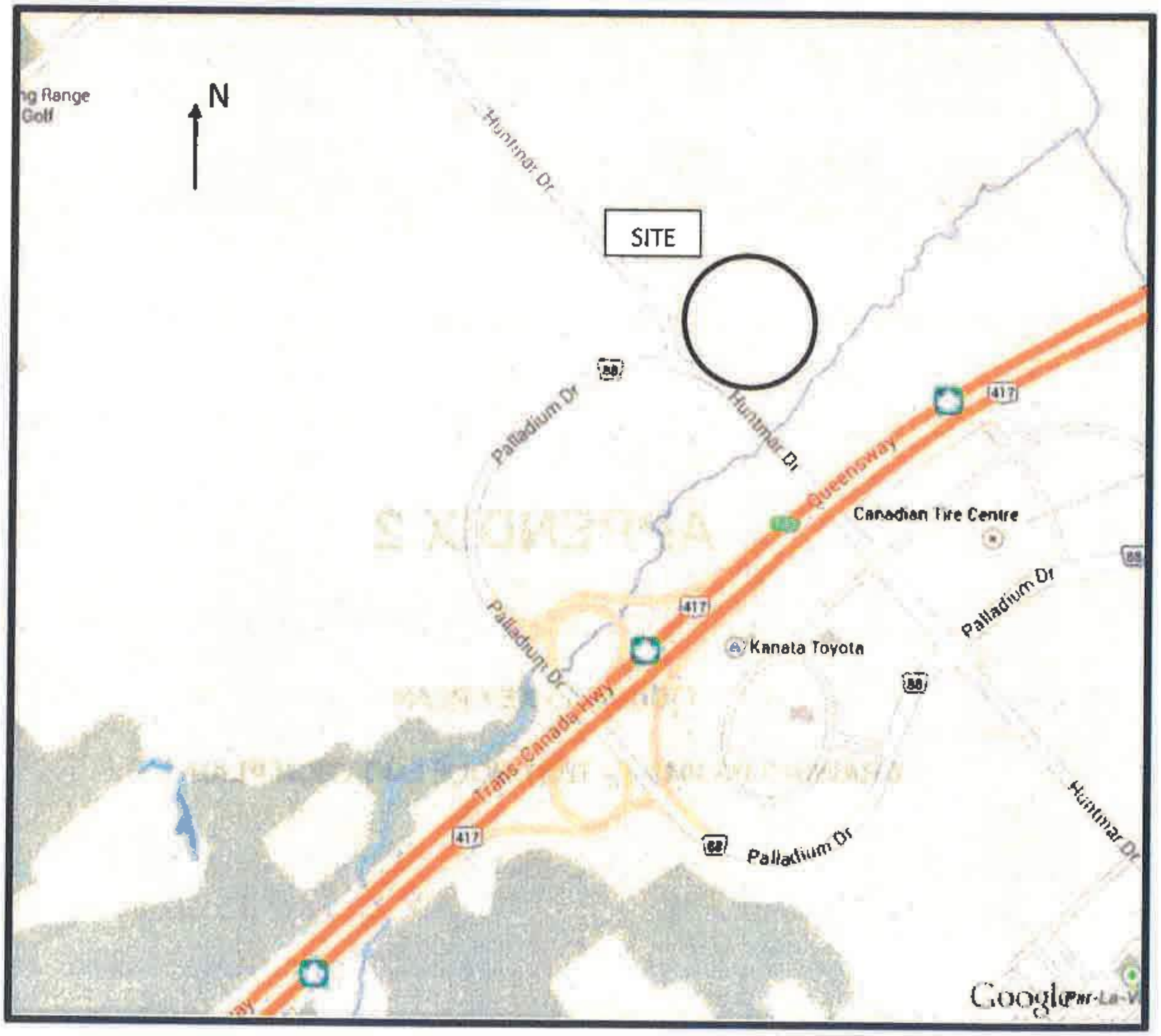
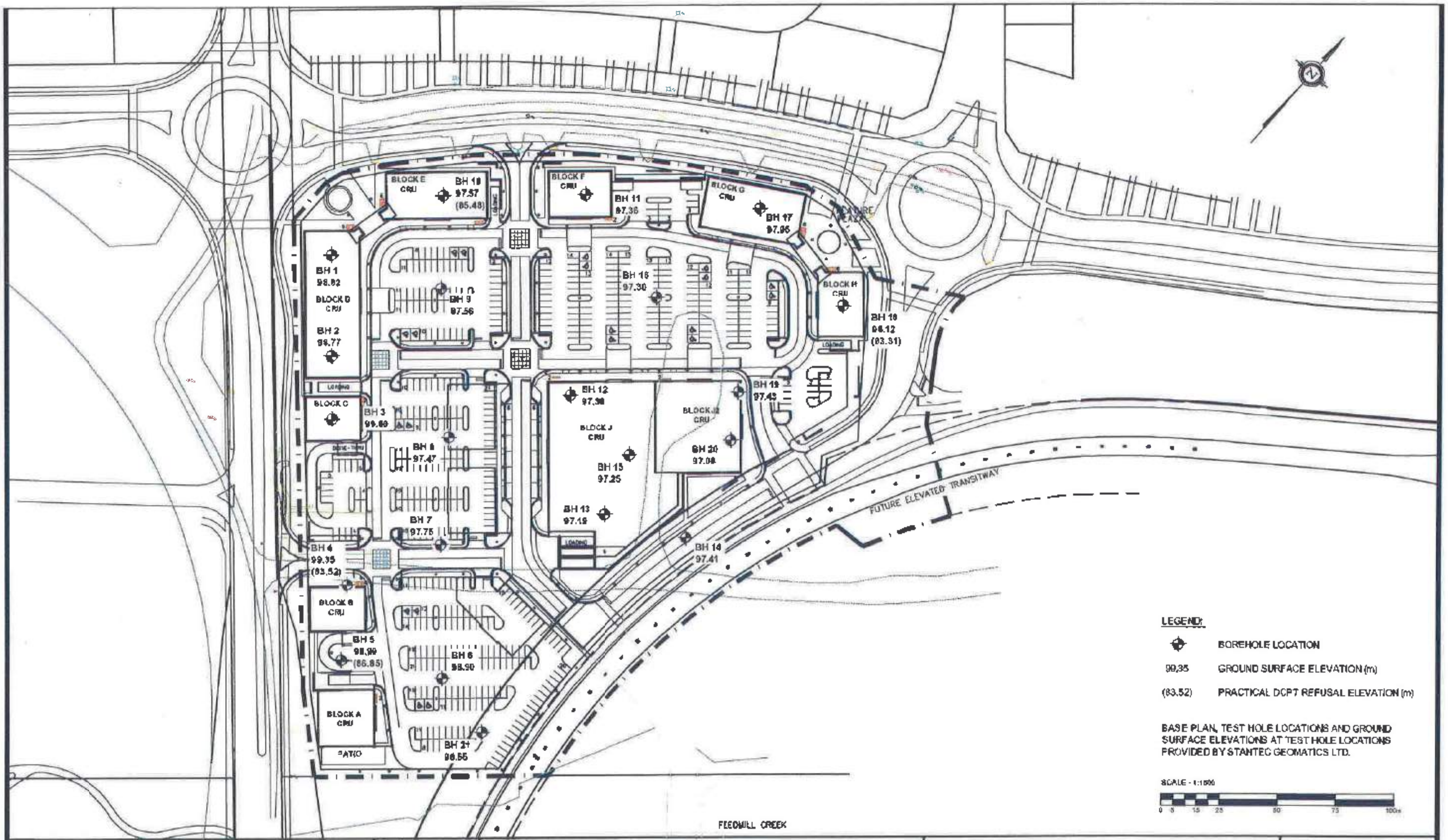


FIGURE 1

KEY PLAN



paterson group
consulting engineers
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

Scale:	1:1500
Des.:	MK
Dwn:	MFG
Chkd:	DG

MINTO PROPERTIES

GEOTECHNICAL INVESTIGATION
PROP. COMMERCIAL DEVELOPMENT - 370 HUNTMAR DR.
OTTAWA, ONTARIO

TEST HOLE LOCATIONPLAN

Dwg. No.
PG3045-1
Report No.: PG3045-1
Date: 10/2013

11x17

Infiltration Calculations
Arcadia

The Kanata West Master Servicing Study indicated infiltration targets for the Kanata West development area. The Arcadia development is situated within the target area of between 50-70mm/year. The KWMSS also indicated that post-development infiltration rates are to be increased by 25% above this rate, to 63-88mm/year. A site specific Geotechnical review of the pre-development infiltration conditions indicates that the subsoil conditions consist of a deep silty clay deposit which is considered to be impermeable. The findings of the memo indicate vertical groundwater movement and deep groundwater recharge is non-existing, and horizontal movement is conveyed on the surface and immediate layer below the surface, discharging to the adjacent Carp River.

Under post-development conditions, the horizontal movement and discharge to the Carp River will be augmented with base flows from the SWM facility servicing the Arcadia development. The site will be provided with typical storm collection system complete with foundation drains for the residential homes. The foundation drains will provide a regular flow that will be conveyed to the SWM facility and outlet as base flow to the Carp River. Our field measurement of baseflow from a similar residential development (Avalon Community) in clay soils with an end of pipe SWM facility indicates a baseflow rate of approximately 0.1 L/s/ha. The infiltration requirements from the KWMSS will be translated from the post development baseflow from the SWMF to the Carp River. The following table outlines the calculations for the site.

1. **Infiltration Summary:**

Arcadia Site Location	Area (ha)	Annual Baseflow Volume (m^3/year)	Required Infiltration (m^3/year)	Equivalent Infiltration Provided as Base Flow (mm/year)
Phase 1	9.39	15786	5916	168
Campeau Dr.	2.09	n/a	1317	n/a
Stage 2	11.79	18743	7428	159
Commercial Site	5.10	n/a	3213	n/a
Total	28.37	34529	17874	122

Where:

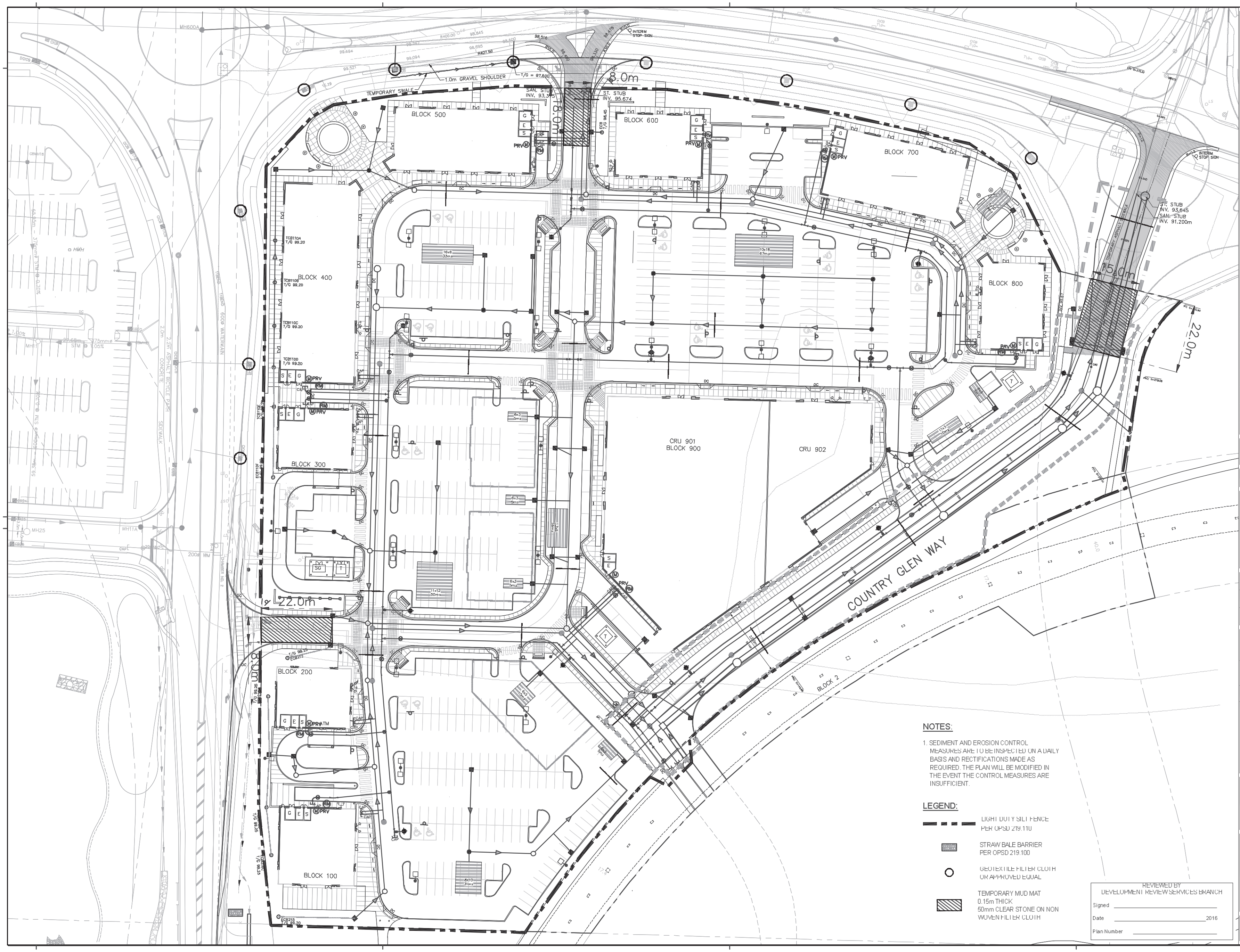
- Provided Annual Base flow is based on drainage area, field measured baseflow rate from Avalon SWM Facility, and 6 months of available flow (May 1st to October 31st), example calculation is provided below:

$$Annual\ Baseflow = 11.79ha\ x\frac{0.1\frac{L}{s}}{ha}x\ \frac{1m^3}{1000L}\ \frac{3600s}{hr}x\frac{24hr}{day}x\frac{184days}{year} = 18743m^3$$

- Required infiltration is based on drainage area and 63mm/year as per the KWMSS (25% increase of target rate of 50mm/year)
- Equivalent Infiltration provided as base flow is based on drainage area and annual baseflow from SWMF, example calculation is provided below:

$$Equivalent\ Infiltration = \frac{18743m^3}{11.79ha}x\frac{1\ hectare}{10000m^2}x\ \frac{1000mm}{1m} = 159mm/year$$

On an annual basis, approximately 17874m^3 of infiltration is required for the site based on the 28.37ha drainage area and 63mm/year infiltration target. Based on the above calculations, the site will provide approximately 34529m^3 of baseflow, which is approximately 122mm/year of equivalent infiltration. The above calculations indicate that the required infiltration targets for the site will be met.



NOTES:

1. SEDIMENT AND EROSION CONTROL MEASURES ARE TO BE INSPECTED ON A DAILY BASIS AND RECTIFICATIONS MADE AS REQUIRED. THE PLAN WILL BE MODIFIED IN THE EVENT THE CONTROL MEASURES ARE INSUFFICIENT.

LEGEND:

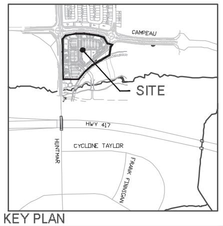
- ▬ ▪ ▪ ▬ LIGHT DUTY SILT FENCE PER OPSD 219.110
- ▩ STRAW BALE BARRIER PER OPSD 219.100
- ○ GEOTEXTILE FILTER CLOTH OR APPROVED EQUAL
- ▨ TEMPORARY MUD MAT 0.15m THICK 50mm CLEAR STONE ON NON WOVEN FILTER CLOTH

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ____________________

Date ____________________2016

Plan Number ____________________



KEY PLAN

APPROVED ☐ REFUSED ☐

THIS____DAY OF ____________ , 20______

DERRICK MOODIE, ACTING MANAGER
DEVELOPMENT REVIEW, SUBURBAN SERVICES

No.	Description	Date	Checked
8	Revised as per City Comments	16:08:26	DGY
7	Revised Campeau per Stantec plans	16:08:03	DGY
6	Issued for Construction	16.07.13	DGY
5	Issued for Tender	16.04.06	DGY
4	Revised as per City Comments	14:10:02	DGY
3	Revised as per City Comments	14:08:22	DGY
2	Issued for SPA Resubmission	14.06.27	DGY
1	Issued for SPA	13.11.18	DGY

Issued for

All measurements and conditions must be checked on the work by the contractor.
This drawing not to be used for construction until signed.

Date

plotted J:\35355-ArcadiaComm\5.9 Drawings\59civil\layouts\C-900.dwg
Layout Name: Sediment and Erosion Plot Style: AIA
STANDARD-FULL.CTB Plot Scale: 1:1 Plotted At: 9/1/2016 11:00
AM Last Saved By: defuma Last Saved At: Sep. 1, 16

TN PN PN

2016/08/26

drawn by DPS
checked by DGY
printed
scale
date NOV. 2013
file 35355

Arcadia Retail Development
Kanata, Ontario

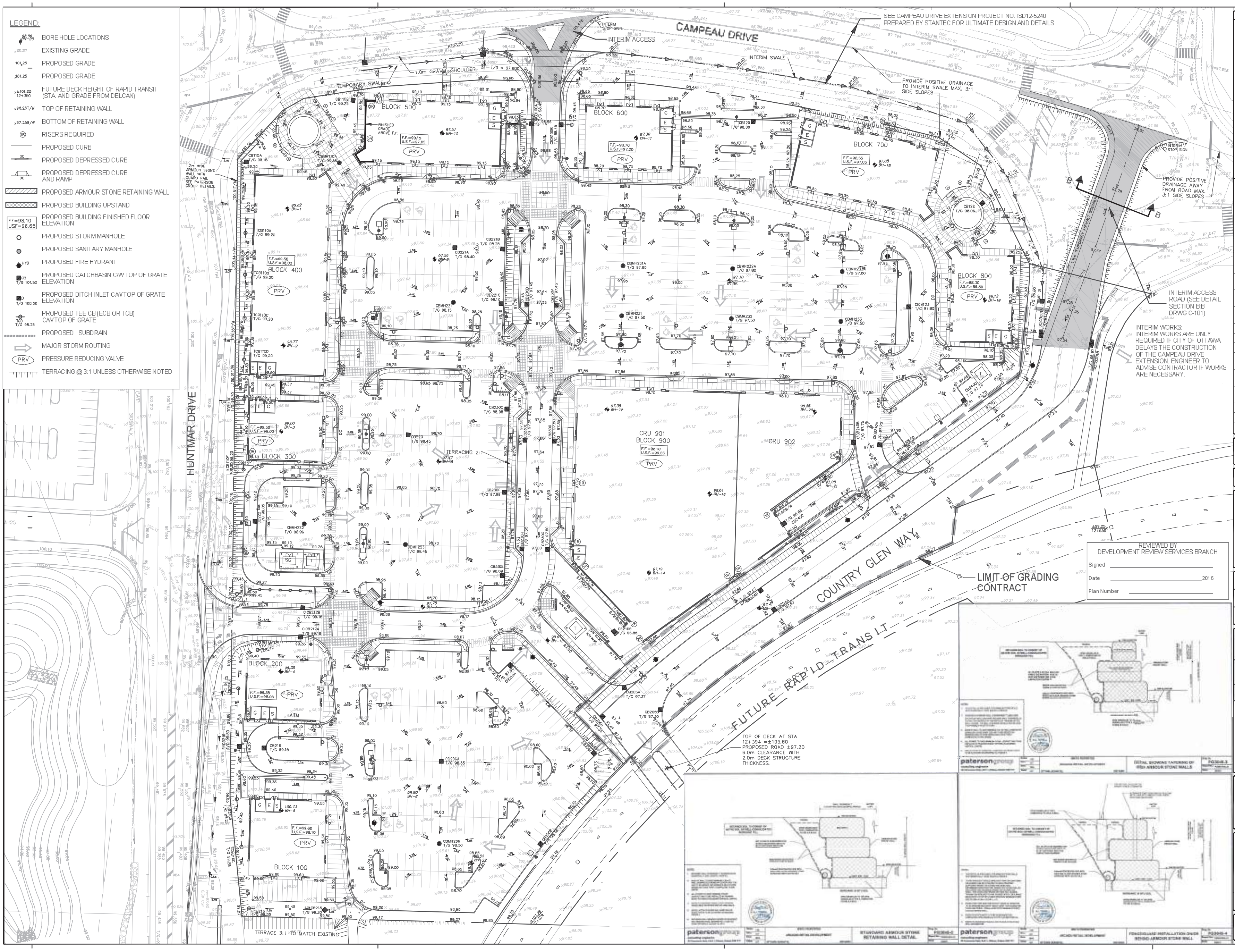
Minto Properties
200 Kent Street • Suite 180 • Ottawa, Ontario • K1P 0B6
Telephone: (613)782-3137 Fax: (613)782-5777

drawing title:
SEDIMENT AND
EROSION CONTROL PLAN
370 HUNTMAR DRIVE
OTTAWA, ON.

IBI GROUP

drawing no.
C-900

333 Preston Street Tower 1, Suite 400
Ottawa, Ontario Canada K1S 5N4 Tel
(613)225-1311 FAX (613)225-9868



SEE CAMPEAU DRIVE EXTENSION PROJECT NO. ISD12-5240 PREPARED BY STANTEC FOR ULTIMATE DESIGN AND DETAILS

PROVIDE POSITIVE DRAINAGE TO INTERIM SWALE MAX. 3:1 SIDE SLOPES

PROVIDE POSITIVE DRAINAGE AWAY FROM ROAD MAX. 3:1 SIDE SLOPES

INTERIM ACCESS ROAD (SEE DETAIL SECTION B:B DRWG C-101)

INTERIM WORKS:
INTERIM WORKS ARE ONLY REQUIRED IF CITY OF OTTAWA DELAYS THE CONSTRUCTION OF THE CAMPEAU DRIVE EXTENSION. ENGINEER TO ADVISE CONTRACTOR IF WORKS ARE NECESSARY.

1.2m WIDE ARMOUR STONE WALL WITH GUARD RAIL. SEE PATERSON GROUP DETAILS.

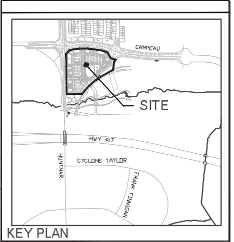
LIMIT OF GRADING CONTRACT

TOP OF DECK AT STA 12+394 =±105.60
PROPOSED ROAD ±97.20
6.0m CLEARANCE WITH 2.0m DECK STRUCTURE THICKNESS.

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH
Signed ______________
Date ______________2016
Plan Number ______________

LEGEND:

98.56 BH-20	BORE HOLE LOCATIONS
x101.37	EXISTING GRADE
101x25	PROPOSED GRADE
x101.25	PROPOSED GRADE
x±101.25 12+350	FUTURE DECK HEIGHT OF RAPID TRANSIT (STA. AND GRADE FROM DELCAN)
x98.25T/W	TOP OF RETAINING WALL
x97.25B/W	BOTTOM OF RETAINING WALL
(1R)	RISERS REQUIRED
═	PROPOSED CURB
DC	PROPOSED DEPRESSED CURB
DC	PROPOSED DEPRESSED CURB AND RAMP
▨	PROPOSED ARMOUR STONE RETAINING WALL
▩	PROPOSED BUILDING UPSTAND
FF=98.10 USF=96.65	PROPOSED BUILDING FINISHED FLOOR ELEVATION
○	PROPOSED STORM MANHOLE
●	PROPOSED SANITARY MANHOLE
HYD	PROPOSED FIRE HYDRANT
CB T/G 101.50	PROPOSED CATCHBASIN C/W TOP OF GRATE ELEVATION
DI T/G 100.50	PROPOSED DITCH INLET C/W TOP OF GRATE ELEVATION
TCB T/G 98.25	PROPOSED TEE CB (ECB OR TCB) C/W TOP OF GRATE
- - - -	PROPOSED SUBDRAIN
⇨	MAJOR STORM ROUTING
PRV	PRESSURE REDUCING VALVE
┬┬┬┬	TERRACING @ 3:1 UNLESS OTHERWISE NOTED



KEY PLAN

APPROVED ☐ REFUSED ☐

THIS___DAY OF___________, 20_____

DERRICK MOODIE, ACTING MANAGER
DEVELOPMENT REVIEW, SUBURBAN SERVICES

No.	Description	Date	Checked
10	Revised as per City Comments	16:08:25	DGY
9	Revised as per City Comments	16:08:18	DGY
8	Revised Campeau per Stantec plans	16:08:03	DGY
7	Issued for Construction	16:07:13	DGY
6	Add Interim Access Rd.	16:05:16	DGY
5	Issued for Tender	16:04:05	DGY
4	Revised as per City Comments	14:10:02	DGY
3	Revised as per City Comments	14:08:22	DGY
2	Issued for SPA Resubmission	14.06.27	DGY
1	Issued for SPA	13.11.18	DGY

Issued for

All measurements and conditions must be checked on the work by the contractor. This drawing not to be used for construction until signed.

Date

plotted J:\35355-ArcadiaComm\5.9 Drawings\59civil\layouts\C-200.dwg
Layout Name: Grading Plan Plot Style: AIA STANDARD-FULL.CTB
Plot Scale: 1:1 Plotted At: 9/1/2016 10:45 AM Last Saved By: deturna Last Saved At: Sep. 1, 16

TN
PN

2016/08/25

drawn by DPS
checked by DGY
printed
scale 1:500
date NOV. 2013
file 35355

Arcadia Retail Development
Kanata, Ontario

Minto Properties
200 Kent Street • Suite 180 • Ottawa, Ontario • K1P 0B6
Telephone: (613)782-3137 Fax: (613)782-5777

drawing title:
SITE GRADING
PLAN
370 HUNTMAR DRIVE
OTTAWA, ON.

IBI GROUP

drawing no.
C-200

333 Preston Street Tower 1, Suite 400
Ottawa, Ontario Canada K1S 5N4 Tel
(613)225-1311 FAX (613)225-9868

D07-12-14-0014