REPORT
PROJECT NO: 125599

CIVIL DESIGN BRIEF
715 MIKINAK ROAD, OTTAWA, ON

Prepared for Ottawa Community Housing
by IBI Group
August 23, 2021

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1 INTRODUCTION

IBI Group Professional Services (Canada) Inc. has been retained by Ottawa Community Housing to provide civil engineering design services for the proposed site development. In 2011, Canada Lands Company (CLC), bought and took ownership of about 125 ha of the former CFB Rockcliffe air base site. The acquisition of the decommissioned base by CLC offers the opportunity today to reconnect this site back into the urban fabric of the City and create a highly desirable mixed-use community for approximately 10,000 residents. CLC completed a Community Design Plan (CDP) in 2015. In support of the CDP, there were numerous supporting documents including the “Former CFB Rockcliffe Master Servicing Study” (MSS), August 2015, prepared by IBI Group. That report provided a plan for provision of major infrastructure needed to support the proposed development.

The proposed project site is approximately 1.22 ha located at civic address 715 Mikinak Road within the City of Ottawa, where it is bounded by Mikinak Road to the south, Hemlock Road to the north, Barielle-Snow Street to the west and Michael Stoqua Street to the east as illustrated in Figure 1.

The proposed site development consists of three mid-rise mixed-use apartment buildings together with on-site parking spaces, landscape amenities and two site entrance along the east side of the property.

The primary objective of this report is to examine the existing conditions of the site and present the proposed conditions suitable for the proposed development in accordance with the various requirements and control design criteria specified by regulatory agencies such as the City of Ottawa, The Ministry of Environment, Conservation and Parks (MECP) and Rideau Valley Conservation Authority (RVCA).

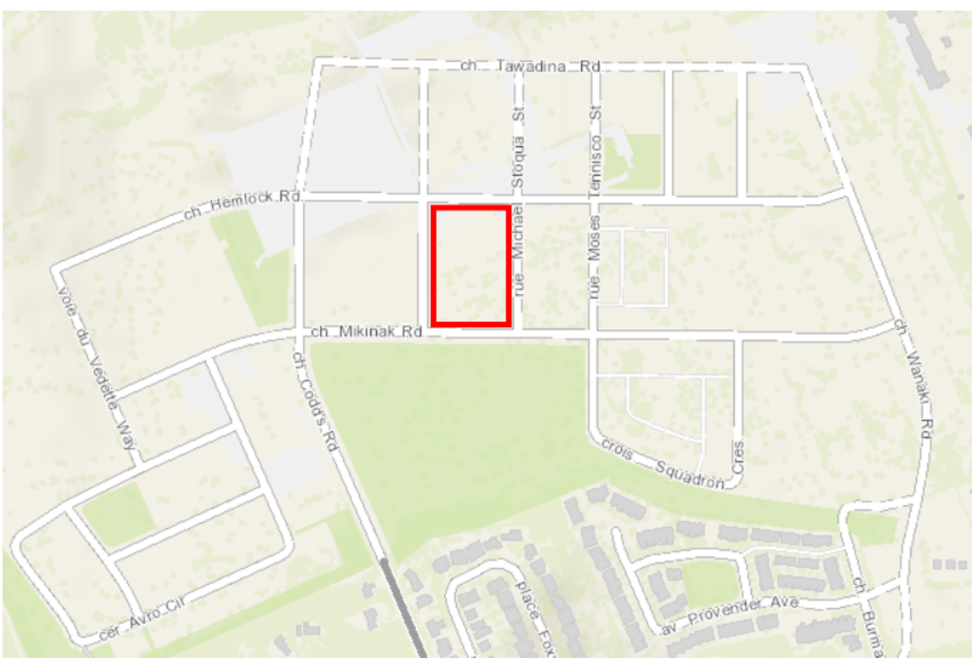

Figure 1 - Site Location

1.1 Guidelines and Standards

The evaluation takes into consideration the City of Ottawa Sewer Design Guidelines (OSDG) (October 2012), and the February 2014 Technical Bulletin ISDTB-2014-01, the September 2016 Technical Bulletin PIEDTB-2016-01, the June 2018 Technical Bulletin ISTB-2018-04, October 2019 Technical Bulletin 2019-01, and the July Technical Bulletin 2019-02.

It also considers the City of Ottawa Water Distribution Design Guidelines (OWDDG), and the 2010 Technical Bulletin 2010-02, the 2014 Technical Bulletin 2014-02, and the 2018 Technical Bulleting 2018-02.

All specifications are as per current City of Ottawa standards and specifications, and Province of Ontario (OPSS/D) standards and specifications.

1.2 Pre-Consultation Meeting

Notes of the meeting are provided in **Appendix E**. There were no engineering concerns flagged in this meeting. The City of Ottawa Servicing Study Checklist has also been included in **Appendix E**.

1.3 Environmental Issues

There are no environmental issues related to the site development, as all environmental concerns were dealt with as part of CLC's subdivision approval. The site development has been previously cleared and graded throughout the subject lands. There are no existing watercourses or drainage features associated within the site.

1.4 Geotechnical Concerns

Paterson Group was retained by Ottawa Community Housing to prepare a geotechnical report to provide site analysis of the overall condition of the site. Based on the geotechnical report, its been noted that there were no particular design concerns for this development.

1.5 Reference Reports

The design considerations for the proposed site servicing and stormwater management design takes into consideration the following documents and is included in the Appendix E for review and reference:

- Former CFB Rockcliffe Master Servicing Study, prepared by IBI Group
- Design Brief, Wateridge Village Phase 1B, prepared by IBI Group
- Wateridge Phase 1B Developer's Checklist, prepared by Aquafor Beech Ltd.
- Geotechnical Investigation, Proposed Residential Buildings, prepared by Paterson Group

2 WATER DISTRIBUTION

2.1 Existing Conditions

Existing watermains are located along the north, east, south and west of the subject site. There is an existing 300mm dia. watermain along Hemlock Road and Mikinak Road and 200mm dia. along Michael Stoqua Street and Barielle-Snow Street.

There are two existing municipal hydrants which are located along Barielle-Snow Street and Hemlock Road that are in close proximity to the subject site. Both existing hydrants are within 45m to the proposed Siamese connection for Building A and B.

According to the CFB Rockcliffe MSS, the Rockcliffe site is located in the City of Ottawa's Montreal Road Pressure Zone (MRPZ). The MRPZ is located on elevated lands with the City's Pressure Zone E1.

2.2 Proposed Water Design Criteria

2.2.1 Water Demands

It is understood that the proposed three buildings will be equipped with a sprinkler system. The proposed services for the buildings have therefore been sized to provide domestic water uses. The Watermain Demand Calculation Sheet in **Appendix B** illustrates a total of 488 population per unit which is a total contribution from all three buildings. The unit population density and consumption rates are taken from Tables 4.1 and 4.2 of the Ottawa Design Guidelines – Water Distribution and are summarized as follows:

- Pop. Studio / 1 Bedroom 1.5 person per bedroom
- Pop. 2 Bedroom 3.0 person per bedroom
- Pop. 3 Bedroom 4.0 person per bedroom
- Average Day Demand 280 l/cap/day
- Peak Daily Demand 875 l/cap/day
- Peak Hour Demand 1,925 l/cap/day

2.2.2 System Pressures

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

Minimum Pressure	Minimum system pressure under peak hour demand conditions shall not be less than 276 kPa (40 psi).
Fire Flow	During the period of maximum day demand, the system pressure shall not be less than 140 kPa (20 psi) during a fire flow event.
Maximum Pressure	Maximum pressure at any point in the distribution system in unoccupied areas shall not exceed 689 kPa (100 psi). In accordance with the Ontario Building/Plumbing Code the maximum pressure should not exceed 552 kPa (80 psi) in occupied areas. Pressure

reduction controls may be required for buildings where it is not possible/feasible to maintain the system pressure below 552 kPa.

2.2.3 Pipe Size and Connection

For the proposed buildings A, B & C, a 150mm diameter PVC DR18, C900 / AWWA watermain pipe have been selected to provide domestic water for all three buildings. There are two separate watermain tie-in connections for the subject site which are both located on the east of the property along Michael-Stoqua Street. The first proposed watermain connection is located along the north east entrance of the site while the second proposed watermain connection is located at the south east entrance of the site. The two proposed watermain will connect to the existing 200mm diameter watermain. Reference for the proposed watermain network is illustrated in the Servicing Plan - CU1101 included in **Appendix A.**

2.2.4 Hydrants

The existing watermain infrastructure is available along all side roads of the site. Existing hydrants have also been noted to be available within close proximity to the proposed three buildings. Based on the proposed fire protection for the site development, all three buildings are equipped with sprinkler systems. The sprinkler systems will be supplied via Siamese connections along the exterior wall of all three buildings. The proposed locations of the Siamese connections have been determined to be within 45m of the nearest existing hydrant in the area. The illustration of the existing hydrant in reference to the Siamese connections distances are illustrated in the Servicing Plan CU1101 which is included in **Appendix A**.

Since the perimeter of Building C cannot be fully covered from the nearest existing hydrant, a proposed hydrant has been added to the proposed water system to demonstrate that the proposed building will meet fire code requirements. Refer to Servicing Plan – CU1101 in **Appendix A.**

2.2.5 Fire Flow Rate

The site consists of three multi storey apartment blocks. A Fire Underwriters Survey (FUS) calculation has been completed for all buildings. The calculation results for fire flow are summarized below according to the FUS calculation which is also included in **Appendix B**.

BUILDING	FIRE FLOW DEMAND (L/MIN)	FIRE HYDRANT (<76M)	FIRE HYDRANT (<152M)	AVAILABLE FIRE FLOW PER TABLE 18.5.4.3 OF ISTB 2018-02 (L/MIN)
A	7,000	4	4	37,852
B	6,000	4	3	34,067
C	4,000	5	3	39,745

To summarize the nature of the surrounding fire hydrants in the area of the subject site, there is 1 proposed 150mm diameter hydrant within the site development to supplement the requirements for Building C and 5 existing fire hydrants located within 45m of the perimeter of Building A & B. A total of 6 existing hydrants are available and located within 90m range of the site. Refer to Servicing Plan CU1101 in **Appendix A** for detailed locations of the existing fire hydrants which illustrates a 45m radius to the proposed site development.

The required fire flow for each proposed building has been calculated in accordance with City of Ottawa Technical Bulletin ISTB-2018-02. The resulting fire flow requirements and the existing hydrants within proximity to the proposed site development demonstrates and will provide sufficient fire flow demands with adequate required pressures for the proposed site.

2.2.6 Boundary Conditions

The site development's boundary conditions for Wateridge Village is at the Codd's and Burma Roads connection locations for Phase 1. The boundary conditions are for existing conditions; future conditions are to be derived from the Master Servicing Study.

A copy of the boundary conditions is included in **Appendix B** and summarized as follows:

	Codd's Road	**Burma Road**
Max HGL (Basic Day)	147.1 m	147.1 m
Peak Hour	147.0 m	147.1 m
Max Day + Fire (13,000 l/min Fire Flow)	139.5 m	140.2 m
Max Day + Fire (10,000 l/min Fire Flow)	140.0 m	140.4 m

According to CFB Rockcliffe MSS, excerpt from section 4.4.4 Phasing "*under existing Basic Day and Max Day conditions, without any modifications at the Brittany Drive or Montreal Pumping Stations with respect to the discharge HGL, the areas included in Phase 1A are anticipated to experience pressures in the range of approximately 72 – 89 psi. the maximum pressures observed exceed the 80-psi threshold and would require pressure reduction measures. This further illustrates that if the HGL discharge at the pump stations is note regulated to a maximum of 143m, the majority of the development will experience pressure greater than 80 psi"*

The proposed site developments water pressure system has been reviewed according to CFB Rockcliffe MSS, excerpt from section 4.4.1 Basic Day Demands "*It is noted that a number of the service areas in the development lands are expected to exceed 550 kPa (80 psi) and therefore will require pressure reduction as per the Ontario Building Code requirements. The extent of this area is shown in **Figure 4.7**. and includes all lands below approximately 91m in elevation at a maximum discharge HGL of 174 MRPS.*

*However, if the maximum HGL at MRPS is reduced to a maximum of 143m, the areas within the development experiencing high pressures can be reduced. This would result in lands with elevations lower than 87m to experience pressures above 80 psi as oppose to elevations lower than 91m (discharge head of 147m at MRPS). A pressure distribution map is shown in **Figure 4.8** with MRPS operating at a maximum discharge HGL of 143m."*

Based on the illustration on Figure 4.8 referenced from CFB Rockcliffe MSS, it indicates that the proposed site development is within the area which could experience a pressure range of 70-80 psi. According to this pressure range, the site development will not require a pressure reduction measures.

3 WASTEWATER DISPOSAL

3.1 Existing Conditions

Canada Lands Company completed a Community Design Plan (CDP) in 2015. To support that plan, a number of technical reports were prepared including the 'Former CFB Rockcliffe Master Servicing Study, August 2015 (MSS). That report recommended that the existing combined sewers on the subject site be abandoned in favour of dedicated sanitary and storm sewer systems.

In particular, the MSS recommended that future wastewater flow from Phase 1B be directed to the Codd's Road Shaft. Accordingly, wastewater flows from the subject site will be designed to outlet to that location. Phase 1A design included the new connection to that shaft and the Phase 1B sanitary sewer will connect to the Phase 1A system. **Figure 5.1** from CFB Rockcliffe MSS illustrates the connections.

The existing sanitary sewers located along Barielle-Snow Street is a 250mm diameter sanitary sewer pipe which drains southerly to the existing 250mm sanitary sewer in Mikinak Road. General sewage flows from this location is ultimately directed to Codd's Road Shaft.

3.2 Verification of Existing Sanitary Sewer Capacity

Existing sanitary sewer capacity have been confirmed for both proposed tie-in location along Barielle Snow Street and Michael Stoqua Street. Based on the Sanitary Sewer Design Sheet prepared for the Former CFB Rockcliffe, both existing sanitary sewers have sufficient capacity to accommodate the proposed flows generated from the 3 buildings within the site development. The available capacity for Barielle Snow and Michael Stoqua demonstrates flow availability of 46.37 L/s and 48.11 L/s respectively. Reference to the Sanitary Sewer Design sheet used for verification is included in **Appendix C**.

3.3 Proposed Sewers

All on-site sewers have been designed to City of Ottawa and MOE design criteria which include but are not limited to the below listed criteria. A copy of the sanitary sewer design sheet is included in **Appendix C** which demonstrate the population densities and sanitary sewer pipe size selection.

3.3.1 Design Flow

Average Residential Flow	-	280 l/cap/day
Peak Residential Factor	-	Harmon Formula
Infiltration Allowance	-	0.33 l/sec/Ha
Minimum Pipe Size	-	200mm diameter

3.3.2 Population Density

Pop. Studio / 1 Bedroom	1.5 person per bedroom
Pop. 2 Bedroom	3.0 person per bedroom
Pop. 3 Bedroom	4.0 person per bedroom

3.3.3 Proposed Wastewater Plan

Sanitary Sewer Design calculation has been completed for the proposed three buildings within the site development. A reference of the calculated flows is provided in **Appendix C**. The proposed sanitary sewer design proposes two connection to the municipality's sanitary sewer system where the two connections has been permitted by the City of Ottawa. According to the Servicing Plan drawing – CU1101, the proposed sanitary outlet for Building C will be connected to the existing 250mm sanitary sewer pipe along Michael Stoqua Street. Verification of the available capacity has been confirmed, therefore proposed flows from Building C will not negatively impact existing sanitary sewer system downstream.

The nature of the proposed sanitary sewer design for Building B will be flowing through Building A. Within Building A, a proposed heat recovery system will receive sanitary flows from the incoming wastewater from Building B. Ultimately, the end process for the wastewater will outlet from the westerly portion of Building A and drain to the existing sanitary sewer system along Barielle Snow Street. Additionally, due to the existing depth of the existing sanitary sewer system along Barielle Snow Street, the proposed tie-in manhole will require an external drop structure manhole to prevent exceeding the maximum pipe gradient.

Verification of the available capacity has been confirmed, therefore proposed flows from Building A & B will not negatively impact existing sanitary sewer system downstream. The Sanitary Sewer Design Sheet from CFB Rockcliffe Wateridge Village Phase 1B have been used as a supporting document and has been provided in **Appendix C** for reference use.

4 STORMWATER MANAGEMENT

4.1 Existing Conditions

CLC completed the servicing report, "Former CFB Rockcliffe Master Servicing Study" in 2015. The MSS Report recommends a series of local and trunk storm sewers to collect runoff from Phases 1 and 2 and route those flows to the Eastern Facility. The Phase 1 design followed the recommendations of the MSS report, including construction of the large diameter sewers, which outlet to the Eastern Stormwater Management Facility; the Eastern Stormwater Management Facility and outlet to the Ottawa River. The Phase 1B storm sewers connect to the downstream Phase 1 sewer system.

4.2 Objective

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

4.3 Design Criteria

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

Some of the key criteria include the following:

- Design Storm — 2 & 5 year return (Ottawa)
- Modified Rational Method Sewer Sizing
- Initial Time of Concentration — 15 minutes
- Runoff Coefficients
  - Landscaped Areas — C = 0.25
  - Landscaped Area with Pathway/Roof — C = 0.50 - 0.65
  - Permeable Paver Stones — C = 0.60
  - Building and Roof Area — C = 0.90
  - Parking Area and Driveway — C = 0.90
- Pipe Velocities — 0.80 m/s to 3.0 m/s
- Minimum Pipe Size — 250 mm diameter
(200 mm CB Leads
150 mm Building Services)
- Minimal allowable slopes

DIAMETER (MM)	SLOPE (%)
250	0.43
300	0.34
375	0.25
450	0.20
525	0.16
600	0.13
675	0.11

- Minimum depth of cover of 2.0 m
- 100-year Hydraulic Grade Line (HGL) separation to be greater than 0.30 m from the underside of footings

4.4 Methodology

The existing and proposed design flows for the property were calculated using the Modified Rational Method, as described in the MTO Drainage Management Manual (MTO 1997). In order to delineate drainage areas, the existing topographic survey and proposed grading plan were used.

In order to evaluate the quantity of storm runoff, a minor storm event and a major storm event (i.e. 100-year storm) were analyzed to quantify the stormwater runoff of the site. The minor storm event intensity duration equation is used:

$$i_{(\text{Minor Storm})2yr} = \frac{732.951}{(t_c + 6.199)^{0.810}}, \quad t_{c\ (\text{hour})}$$

$$i_{(\text{Minor Storm})5yr} = \frac{998.071}{(t_c + 6.053)^{0.814}}, \quad t_{c\ (\text{hour})}$$

The major storm event is based on the 100-year storm events and based on the following equation:

$$i_{(100\ Yr)} = \frac{1735.688}{(t_c + 6.014)^{0.820}}, \quad t_{c\ (\text{hour})}$$

4.5 Drainage Design

The drainage system proposed for the subject site will accommodate both major and minor stormwater runoff. Minor and major flow from the subject site will be conveyed through the proposed storm sewer network where it will be attenuated in various storage locations.

The proposed subject site has been designed to provide adequate stormwater attenuation volume storage. The proposed SWM also adheres to the requested design objectives based on the Pre-Application to prevent stormwater ponding within the proposed site during the 2-yr minor storm event. For detailed calculation of the required volume storage is available for review as illustrated in **Appendix D.**

4.5.1 Water Quality Control

The design takes into consideration the August 2015 Master Servicing Study, where any runoff from the site, as with all future developments in CFB Rockcliffe, should include water quality end pipe treatment.

With the design intent to provide water quality control, runoff flows from the development site will provide a level of treatment through the proposed bioswales. Ultimately the end of pipe treatment will consist of one Stormceptor or approved equivalent before discharging treated runoff into the storm sewer system on Michael Stoqua Street. The results of the long-term performance analysis indicate that Stormceptor is capable of capturing and treating annual runoff from the development and providing 82% of average annual total suspended solids (TSS) removal efficiency. The water quality control criteria, therefore, can be satisfied under the proposed stormwater management plan.

4.5.2 Stormceptor STC-2000®

In consistent with the design principle outlined for CFB Rockcliffe Master Servicing Study, the minor and major stormwater runoff generated from the development site will be treated through one Stormceptor for water quality control. According to the technical design guideline, the Stormceptor Model STC-2000 is selected to be installed to provide water quality protection, considering a development area of 1.22 ha with the weighted runoff coefficient of 0.71. See **Appendix D** For sizing details.

For effective water quality treatment, the Stormceptor must be maintained by the property owner regularly. Stormceptor MHs must be maintained and cleaned once a year under normal conditions. The required frequency varies depending on amount of sediment generated from the development site. It is recommended that initial maintenance should be annually. Actual maintenance frequency be increased or reduced according to site conditions (if the unit is filling up with sediment much quicker than projected, maintenance may be required semi-annually; once the development site has stabilized, maintenance may only be required once in two/three years). The maintenance, however, should be performed immediately once sediment depth in the Stormceptor MH reaches 225 mm or depending on the to the Stormceptor Owner's Manual.

Maintenance of the Stormceptor manhole is conducted using vacuum trucks. No entry into the unit is required for maintenance in most cases, and it is recommended that confined space entry protocols must be followed if entry to the Stormceptor unit is required. The need for maintenance is determined easily by inspecting the unit from the surface. The depth of oil in the unit can be determined by inserting a dipstick in the oil inspection/cleanout port. Similarly, the sediment depth can be measured from surface without entry into the unit through a dipstick tube equipped with a ball valve. This tube would be inserted through the riser pipe.

Oil is removed through the oil inspection/cleanout port and sediment is removed through the riser pipe. Alternatively, oil could be removed from the 24 inches (600 mm) opening if water is removed from the lower chamber to lower oil level below the drop pipes.

The following procedure should be taken when cleaning out the Stormceptor:

- Check for oil through the oil cleanout port.
- Remove any oil separately using a small portable pump.
- Decant the water from the unit to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank.
- Remove the sludge from the bottom of the unit using the vacuum truck.
- Re-fill the Stormceptor with water where required by the local jurisdiction.

Disposal of materials from Stormceptor is like that of other best management practices. Normally, sediment removed from a Stormceptor manhole will not be contaminated to the point that it would be classified as hazardous waste. However, all sediment which is removed from the Stormceptor manhole should be tested to determine best disposal option. The Ontario Ministry of Environment sediment disposal requirements must be consulted for information pertaining to exact parameters and acceptable levels for various disposal options. The petroleum waste products collected in the Stormceptor (oil/chemical/fuel spills) should be removed by a licensed wastewater management company.

4.5.3 Water Quantity Control

For the purpose of water quantity control, the post-development runoff flows from the entire development site will be conveyed to and attenuated through a various storage volume. The proposed site development has been designed with 25% reduction based on the pre-development site condition which have been applied to both minor and major storm events.

The general goal for the subject site is to attenuate the stormwater runoff where it will be conveyed via high points and slope gradings to be directed towards the low points. Primarily, the low points within the subject site are in the parking lot area. The main low points where majority of runoff will be captured via proposed bio-swales.

It should be noted that there is also stormwater runoff accumulation within the building roof tops, however the volume is minimal and controlled purposely to provide timed roof drains to slow the water flow. Due to the design condition of the roof top and the proposed solar panels, the runoff accumulation from the roof top are not intended to be used for stormwater management attenuation.

In addition to water quantity, parking stall areas are intended to provide additional volume storage. Permeable paver stones are proposed for the parking stalls which will have storage capabilities due to the depth of the river rocks beneath each parking stalls. Within the given area and the proposed depth of the river rock material, the total volume will provide 30% voids, therefore allowing a storage volume for stormwater runoff.

Further to the proposed stormwater storage volume within the subject site, the parking lot area will also serve as ponding site to accommodate the major storm event. Once the stormwater network becomes full, an orifice plate located at the outlet manhole (STM MH3 & MH7) will only allow the restricted calculated volume runoff to be discharged into the existing 600 mmØ sewer along Michael Stoqua Street. The calculation for the restricted rate provided for the orifice plate is included in **Appendix D.** In the event where the proposed stormwater system is utilized and the parking lot maximum ponding depth have been reached, the excess flow will cascade along the south east entrance of the site and an emergency overflow will be directed into the municipalities storm system. The required storage volume calculations for the subject site is included in **Appendix D**.

Based on the proposed site plan, the total uncontrolled area has been calculated with a combined flow rates of 8.6 L/s based on the 100-year storm event. The flow generated from the uncontrolled areas have been designed to drain towards the existing nearby catch basins storm systems. Refer to Figure SWM 2 – Post Development in **Appendix D** for the detailed storm drainage catchment area plan for the site.

4.5.4 Orifice Plate

As part of the stormwater system and to restrict the flow based on pre-development conditions, an orifice plate is proposed at the outlet MH (STM MH3 & MH7). The orifice plate will limit the 100-year post-development design runoff peak discharge from the development site prior to discharging to the municipality's storm water system. A reference for the sizing of the Orifice Plan is included in **Appendix D.**

4.5.5 Minor Rainfall Events

The 2yr storm event has been calculated and included in the Storm Sewer Design Sheet. Additionally a summary analysis in the table below was also completed to ensure no surface ponding will occur on private parking area and drive isle. The 2yr rainfall event calculation in the table for minor event volumes amount to a total flow of 135 L/s, therefore based on this flow, a required detention volume of approximately 74m³ will be stored in the proposed detention storage via permeable pavers and bioswales within the site development.

According to the 5yr storm event, calculation illustrates that a total flow of 183 L/s will occur within the site development. The total required attenuation volume for the 5yr event amounts to 117m³. There is partial available storage of 180m³ that can attenuate the required volume immediately within the permeable paver and the bioswales. These volumes amount to 108m³ & 72m³ respectively. Therefore, the 5yr storm event demonstrates that stormwater ponding within the parking lot will not occur due to the availability of proposed storage.

MINOR EVENT VOLUMES						
tc=15 min	**Q (L/s)**	**C**	**I (mm/hr)**	**A (ha)**	**Vol. Required (m³)**	**Vol. Provided (m³)**
2YR	135	0.75	61.77	1.05	74	374
5YR	183	0.75	83.56	1.05	117	374

4.5.6 Major Rainfall Events

The 100yr major rainfall event has been reviewed to ensure water level must not touch any part of the building envelope and to remain below the lowest building opening that is in proximity of the overland flow route or ponding area. Based on the peak volume required of 269m³ a stress test with additional 20% will amount to a volume requirement of 322m³. While the total volume provided is 374m³ the stress test with the additional 20% can be accommodated without touching any part of the building envelope. In addition, should the total volume provided becomes full, the emergency flow route will overtop along the entrance of the site and continue to flow towards the road and drain to the nearest catch basin. A Ponding Plan has been prepared to illustrate the elevation and volume of the proposed storage capacity. Refer to **Appendix A** – CD1103 - Ponding Plan.

4.5.7 High Water Level

Based on the calculated flows from the 5yr and 100yr storm event, detention volumes were able to be defined within the proposed site development. Its been determined that the minor storm event will require a total storage volume of 117m³ from a 15min rainfall duration. Due to the available detention storage from the multiple attenuation system, the volume storage within the permeable pavers and bioswales will provide sufficient accommodation for the minor rainfall event without creating a water ponding along the parking lot surface.

The calculated peak flow based on the major rainfall event have been determined to be 313 L/s during the 15min storm duration. However, the stormwater sewer design demonstrate that the modified rational method will require peak detention volume of 269m³. The total attenuation volume provided from the site development amounts to a total of 374m³. Reaching the total maximum volume will consist of water ponding within the 3 bioswales and continue to rise up to a total depth of 0.28m. At this depth, an elevation of 88.80 will provide the full potential of all detention storage within the site.

4.5.8 Storm Hydraulic Grade Line

The existing HGL was reviewed for the Wateridge Village at Rockcliffe Phase 1B along Michael Stoqua Street. The hydraulic grade line values are presented in the table below for the following existing storm manholes. To confirm that the infiltration chambers within the bioswales and to ensure that there would be no severe flooding or negative effects against the existing manhole HGL, a comparison of the lowest invert elevation of the bioswales are reviewed. The storm system HGL values along Michael Stoqua demonstrates that it is not greater than 0.3m below the lowest invert elevation of the bioswales, therefore proposed site condition will not negatively affect the conditions within the city's storm system. Refer to **Appendix D** for the Wateridge Village Phase 1B Drawing – Michael Stoqua Street.

	BIOSWALE 1	BIOSWALE 2	BIOSWALE 3	EX. ST MH210 HGL	EX. ST MH211 HGL
INFILTRATION INVERT	86.73	86.73	86.86	86.43	85.94

4.5.8.1 Minor Storm HGL

The analysis provided from the HGL Sewer Design Sheet included in **Appendix D** demonstrates that the 5yr storm even will not create a surcharge condition along the proposed pipes for the site development. In addition, the tie-in location at the city's storm sewer system has also been reviewed. The HGL minor storm event has been confirmed to have no surcharge conditions.

4.5.8.2 Major Storm HGL

The outcome of the results for the 100yr storm event provided from the HGL Sewer Design Sheet demonstrates that a minor surcharge is evident towards the downstream manhole at STM MH8 – STC MH1. The next downstream location is located at the tie-in, HGL results demonstrates a surcharge of 80mm. Further, review has been completed along the city's storm sewer which demonstrates a negative surcharge during the 100yr storm event. Based on these findings, the proposed site development's HGL during the 100yr storm event demonstrates that the HGL within the city's storm sewer system has the capability of receiving flow's from the proposed site without impacting the existing storm system or creating a negative impacts downstream.

5 GEOTECHNICAL CONSIDERATIONS

Paterson Group, the geotechnical consultant was retained to prepare a report for the proposed residential site development. The objective of the investigation is to report the following:

- Determine the subsurface material, groundwater conditions, provide analysis of the field investigation and laboratory sample results.
- Provide geotechnical recommendations pertaining to the overall design development of the site.

The report titled: Geotechnical Investigation, Proposed Residential Buildings 715 Mikinak Rd. Ottawa, ON, prepared for Ottawa Community Housing provides the following recommendations pertaining to:

- Site Grading
- Pavement Structure Design
- Underground Piping Construction
- Ground Water Control
- Grade Control / Excavation Slopes

Overall, the general recommendations from the geotechnical report have been taken into consideration during the design process of the site development. A copy of the complete report is included in **Appendix E.**

5.1 Foundation Drainage

A foundation drainage plan is currently being considered and will be provided on the next submission.

The plan will illustrate the proposed drainage for each building's foundation footing perimeter. One common storm outlet will be provided as an outflow which will drain to the proposed storm pipe connection from the building and flows to be directed towards the bioswale.

6 SOURCE CONTROLS

6.1 General

On site level or source control management of runoff will be provided in order to demonstrate quality control for the subject lands. Such controls or mitigative measures are proposed for the development not only for final development but also during construction and build out. Some of these measures are:

- flat lot grading;
- vegetation planting; and
- infiltration galleries for groundwater recharge.

6.2 Lot Grading

In accordance with local municipal standards, the parking lot, pathways and the depressed driveways will be graded between 0.5% and 6.0%. Most landscaped area drainage will be directed into the bioswale/bioswale drainage system and connects to the storm sewer system. Typical swales will have slopes larger than 2.0%, or 1.5% with subdrains. Copies of the grading plans have been included in **Appendix A.**

6.3 Roof Drain

For the proposed three buildings, stormwater runoff accumulated from the roof will eventually drain internally and will be directed to be captured via storm pipes provided for each of the proposed buildings. Each building has been directed to drain to each bioswale where it will be attenuated and promote infiltration to the native soils.

6.4 Low Impact Development

The City of Ottawa and CLC have agreed to pursue phased stormwater management demonstration projects for the former CFB Rockcliffe using LID Best Management Practices (BMPs). CLC's goal is for the development to be a model community for LID.

For the proposed site development, various LID measures have been included to support the CFB Rockcliffe MSS.

6.4.1 Pervious Landscape Area Drainage

As an approved LID Best Management Practices, bioswale are widely used as a stormwater management solution to treat stormwater runoff which is also capable of storage volume attenuation. The proposed bioswale for the site development will be located along the parking areas. The bioswale area will be the low point region within the subject site to promote infiltration runoffs. Below each proposed bioswale contains a level of various media which will promote water quality treatment through filtration, settling, absorption and infiltration at a slow release rate to the conveyance network. The cross-section detail of the bioswale is included in **Appendix A.**

6.4.2 Permeable Pavement

Permeable pavement will be used along the parking stall area which are typically suitable for applications to assist with drainage management and is often used as LID stormwater solution designed to control stormwater volume as well as convey stormwater runoff from one point to another.

For this project, the objective of the permeable pavement is mainly to allow surface runoff from the site development to infiltrate through the voids, which has a porosity of 30%. The cross-section detail of the permeable pavement is included in the Detail Sheet CD1102 which is included in **Appendix A.**

6.5 Building Envelope

The surrounding building envelope for the three proposed building locations have 15cm vertical clearance from finish ground elevation to finished floor elevation. The exceptions in particular are the door entrances to the buildings where the vertical clearance of 15cm will require to be ramped to provide smooth transitions for barrier free clearance routes.

From a storm ponding perspective, all building entrances for all three buildings will not be affected from the rising high-water level should a major storm event occurs. An illustration of the Ponding Plan included in **Appendix A** demonstrates that during a major storm event a ponding elevation within the parking lot would have a maximum depth elevation of 0.28m. The extent of the ponding also illustrates that its distance away from any door entrances. It should also be noted that should rising water level continues, an emergency flow route along the site entrance will relief the rising water level.

7 CONVEYANCE CONTROLS

7.1 General

Besides source controls, the site development also proposes to use several conveyance control measures to improve runoff quality. These will include:

- flat vegetated swales;

- catchbasin and maintenance hole sumps;
- area drain basin; and
- permeable pavers.

7.2 Flat Vegetated Swales

The proposed site development will make use of relatively flat vegetation within the bioswales where possible to encourage infiltration and runoff treatment.

7.3 Catch Basins

All catchbasins within the development, will be constructed with minimum 600 mm deep sumps. These sumps trap pollutants, sand, grit and debris which can be mechanically removed prior to being flushed into the minor pipe system. Both rear yard and street catchbasins will be fabricated to OPSD 705.010 or 705.020. All storm sewer maintenance holes servicing local sewers less than 900 mm diameter shall be constructed with a 300 mm sump as per City standards.

7.4 Area Drain Basin

An area drain Basin are proposed along each of the bioswales. The purpose of the area drain is to serve as an emergency inlet at the low elevations should the proposed curb cut-outs create blockages and ice jams during the thaw season. The proposed area drains are also capable of trapping pollutants, sand, grit and debris which can be mechanically cleaned due to the sump availability of the drain basin. Refer to Details 2 drawing CD1102 in **Appendix A.**

8 SEDIMENT AND EROSION CONTROL PLAN

8.1 General

The following erosion and sediment controls are proposed for implementation during construction to minimize erosion potential and soil migration from the site to adjacent lands/receiving waters:

- Install silt fence at the downslope side of disturbed areas along the perimeter of the development site, prior to the start of construction.
- Install stone mud mats at all construction entrances.
- Stockpile topsoil at designated locations and stockpiles shall be contained by silt fences on the downslope side.
- Temporary swales with check dams are to be constructed prior to the beginning of site grading.
- The accumulated silt shall be removed from all sediment control devices as required during construction and disposed in the locations approved by the City and the Conservation Authority.
- All exposed soils are to be stabilized and vegetated as soon as possible using seed and mulch application on 100 mm of topsoil, as directed by the engineer.
- Additional erosion/sediment controls may be required on site as determined by the engineer.

- No construction activity/machinery shall intrude beyond the silt fence or property limit. All construction vehicles shall enter and leave the site via the designated entrances.
- All regraded areas that are not occupied by building facility, roads, sidewalks, driveways, parks, and other services shall be covered by 100 mm topsoil and sodded/seeded immediately after completion of final grading operations, as directed by the engineer.
- All temporary erosion and sediment controls must be installed prior to the commencement of site grading, must be inspected on a regular basis and after every rainfall event, and must be cleaned and maintained as required to prevent the migration of sediment from the site.
- All temporary erosion and sediment controls must be removed after construction once the development site has been stabilized to the City's satisfaction.
- All areas disturbed by erosion or sediment control devices are to be restored with 100 mm topsoil and sodded/seeded after construction.
- The contractor shall keep public roadways free of debris during construction. Any material tracked from the site shall be promptly removed from roadways at the contractor's expenses.
- All material and workmanship shall conform to the current OPSD and standards endorsed by the City, the Conservation Authority and other regulatory agencies.
- The contractor is responsible to locate and protect all existing utilities and municipal services and make arrangements with utility companies prior to construction.
- All excavations shall be in accordance with the Ontario "Occupational Health and Safety Act", and other federal and provincial regulations related to construction projects

8.2 Trench Dewatering

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 the fabric forming the bottom and the straw bales forming the sides. Any pumped groundwater will be filtered prior to release to the existing surface runoff. The contractor will inspect and maintain the filters as needed including sediment removal and disposal and material replacement as needed.

8.3 Bulkhead Barriers

At the first manhole constructed immediately upstream of an existing sewer, a ½ diameter bulkhead will be constructed over the lower half of the out letting sewer. This bulkhead will trap any sediment carrying flows, thus preventing any construction –related contamination of existing sewers. The bulkheads will be inspected and maintained including periodic sediment removal as needed.

8.4 Seepage Barriers

These barriers will consist of both the Light Duty Straw Bale Barrier as per OPSD 219.100 or the Light Duty Silt Fence Barrier as per OPSD 219.110 and will be installed in accordance with the sediment and erosion control drawing. The barriers are typically made of layers of straw bales or geotextile fabric staked in place. All seepage barriers will be inspected and maintained as needed.

8.5 Surface Structure Filters

All catchbasins, and to a lesser degree manhole, convey surface water to sewers. However, until the surrounding surface has been completed these structures will be covered to prevent sediment from entering the minor storm sewer system. Until landscape areas are sodded or until streets are asphalted and curbed, all catchbasins and manholes will be equipped with geotextile filter socks. These will stay in place and be maintained during construction and build until it is appropriate to remove them.

8.6 Stockpile Management

During construction of any development similar to that being proposed both imported and native soils are stockpiled. Mitigative measures and proper management to prevent these materials entering the sewer systems 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 stockpiling of imported construction materials is generally not a concern since these materials are quickly used and the mitigative measures stated previously, especially the use of filter fabric in catchbasins and manholes help to manage these concerns.

The 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 a temporary event since the materials are quickly moved off site.

The construction of this development will involve a substantial rock blasting, breaking, and crushing operation. Given the existing topography, a substantial cut and fill operation is required to construction and development that meets City Standards. As part of this operation, materials will be manipulated onsite, and provided the sediment and erosion control measures are in place, are generally inconsequential to the surrounding environment.

9 ROADS AND NOISE ATTENUATION

Vehicular access to the proposed site development is provided by 2 private entrances. Both are located on Michael Stoqua Street.

Environmental noise study has been completed for the site development. Measures and recommendations shall refer to Noise Report – 715 Mikinak Road, Ottawa, ON, prepared by IBI Group .

10 APPROVALS AND PERMIT REQUIREMENTS

10.1 City of Ottawa

The City of Ottawa reviews all development documents including this report and working drawings. Upon completion, the City will approve the local watermains and eventually issue a Commence Work Notification.

10.2 Province of Ontario

The Ministry of Environment, Conservation and Parks (MECP) Environmental Compliance Approval is not required for the subject development.

10.3 Conservation Authority

Since no watercourses are impacted by the proposed development, no permits will be required from the local Conservation Authority (Rideau Valley Conservation Authority). Correspondence letter from RVCA has been included in **Appendix E** for reference use.

10.4 Federal Government

There are no federal permits, authorizations or approvals needed for this development.

11 CONCLUSIONS AND RECOMMENDATIONS

The material in this report reflects IBI Group's judgement considering the information available to it at the time of preparation and completion of this report. Should the above information not be accurate or current or changed, it will be necessary to reconfirm the findings of this report. Any use which a Third Party makes of this report, or any reliance or decisions to be made based on it for other than its intended purpose, are the responsibility of such Third Party. IBI Group accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

Water, wastewater and stormwater systems required to develop 715 Mikinak Road will be designed in accordance with MECP and City of Ottawa's current level of service requirements.

Final detail design will be subject to governmental approval prior to construction, including but not limited to the following:

- Site Plan Approval: City of Ottawa
- Water Card Data

LICENSED PROFESSIONAL ENGINEER
August 24, 2021
W. L. THOMAS
100528014
PROVINCE OF ONTARIO

Report Prepared By:

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Appendix A – Civil Drawing Set

1. C00001 – General Notes & Detail Reference
2. CU1101 – Servicing Plan
3. CG1101 – Grading Plan (North)
4. CG1102 – Grading Plan (South)
5. CG1103 – Ponding Plan
6. CE1101 – Sediment and Erosion Plan
7. CD1101 – Details Plan 1
8. CD1102 – Details Plan 2

GENERAL NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE PROEJCT AGREEMENT (PA) AND ALL CODES, BY-LAWS, REGULATIONS AND STANDARDS INCLUDING ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD), THE NATIONAL BUILDING CODE, ONTARIO BUILDING CODE, THE "OCCUPATIONAL HEALTH AND SAFETY ACT", AS APPLICABLE.
2. ALL TRENCHING AND TUNNELING WORK SHALL BE DONE IN ACCORDANCE WITH THE ONTARIO HEALTH AND SAFETY ACT AND REGULATIONS.
3. THE CONTRACTOR IS RESPONSIBLE TO CO-ORDINATE HIS SCHEDULE AND WORK ACTIVITIES WITHIN THE AREA OF THE CONTRACT.
4. DO NOT USE LOCAL STREETS OR GRAVEL ROADS FOR STORAGE OF CONSTRUCTION MATERIAL UNLESS AUTHORIZED, IN WRITING, BY LOCAL MUNICIPALITY, ALL AUTHORITIES HAVING JURISDICTION AND MOBILINX CONSTRUCTION.
5. ALL TRENCH EXCAVATIONS SHALL BE BACKFILLED AS PER CONTRACT DOCUMENTS INCLUDING SPECIFICATIONS AND THE DESIGN DRAWINGS.
6. ALL EXCESS EXCAVATED MATERIAL SHALL BE DISPOSED OFF-SITE.
7. CONSTRUCTION LAYDOWN AREAS INCLUDING PARKING, TEMPORARY OFFICES, AND MATERIALS STORAGE SHALL HAVE A MINIMUM 150mm DEPTH 19mm CRUSHED STONE SURFACE. MAINTAIN EXISTING DRAINAGE. UPON COMPLETION OF CONTRACT, RESTORE AREA TO ORIGINAL CONDITION OR AS PER CONTRACT DOCUMENTS.
8. DURING NON-CONSTRUCTION PERIODS, ALL OPEN EXCAVATIONS ALONG THE STREETS TO BE COMPLETELY COVERED WITH ADEQUATE TIMBER OR STEEL BEAMS SUPPORTING STEEL PLATES DESIGNED BY A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN ONTARIO AND SUBMITTED TO THE ENGINEER FOR REVIEW.
9. CONTRACTOR SHALL PREVENT CONSTRUCTION DEBRIS FROM ENTERING EXISTING CATCH BASINS, MAINTENANCE HOLES AND STORM AND SANITARY SEWERS WITHIN THE AREA OF THE CONTRACT. CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL, IN A TIMELY MANNER, OF ANY CONSTRUCTION DEBRIS THAT ENTER THE EXISTING CATCH BASINS, MAINTENANCE HOLES AND STORM AND SANITARY SEWERS.
10. ACCESS TO PRIVATE AND PUBLIC PROPERTIES SHALL BE MAINTAINED AT ALL TIMES.
11. BLASTING IS NOT PERMITTED.
12. ORDER OF PRECEDENCE OF STANDARD DRAWINGS IS FIRSTLY THE AGENCY'S ENGINEERING STANDARDS, SECONDLY THE CITY OF OTTAWA AS APPICABLE, STANDARD DRAWINGS, AND THIRDLY ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD).
13. LENGTHS OF SERVICE LINES INDICATED ON DRAWINGS ARE NOT EXACT. THE CONTRACTOR SHALL CONFIRM TOTAL LENGTHS AND PROVIDE THE FULL EXTENT OF LINES (INCLUDING REQUIRED CONNECTIONS) EVEN IF ACTUAL LENGTHS VARY FROM DESIGN VALUES.
14. THE CONTRACTOR SHALL COORDINATE ITS SCHEDULE AND WORK ACTIVITIES WITH ALL OTHER STAKEHOLDERS IN THE PROJECT AREA.
15. PROVIDE FOR THE PROTECTION AND MAINTENANCE OF ALL EXISTING UTILITIES DURING EXECUTION OF WORK.
16. GRANULAR MATERIAL, USED FOR BACKFILL WHERE INDICATED ON THE DESIGN DRAWINGS, SHALL BE PLACED IN LAYERS 150mm IN DEPTH MAXIMUM AND BE COMPACTED TO 100% S.P.M.D.D. AND AS NOTED IN THE SPECIFICATIONS.
17. CONTRACTOR SHALL MAINTAIN FLOW IN ALL EXISTING SERVICES DURING CONSTRUCTION.
18. BENCHMARKS TO BE OBTAINED FROM THE CONTRACT DRAWINGS.
19. CATCH BASINS TO BE MAINTAINED DURING CONSTRUCTION UNLESS OTHERWISE SPECIFIED.
20. ALL MATERIALS AND CONSTRUCTION IS TO BE IN ACCORDANCE WITH THE CURRENT CITY OF OTTAWA STANDARD DRAWINGS & SPECIFICATIONS OR OPSD / OPSS IF CITY DRAWINGS AND SPECIFICATIONS DO NOT APPLY.
21. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATION OF ALL EXISTING SERVICES AND UTILITIES PRIOR TO CONSTRUCTION AND SHALL PROTECT AND ASSUME RESPONSIBILITY OF ALL UTILITIES WHETHER OR NOT SHOW ON THESE DRAWINGS.
22. ALL SEWER SERVICE LATERALS DEEPER THAN 5.0m REQUIRE A CONTROLLED SETTLEMENT JOINT.
23. ALL EXISTING SITE SEWERS THAT WILL BE DECOMMISSIONED WILL BE REMOVED FROM SITE.

1.0 SANITARY

1.1 ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE ONTARIO BUILDING CODE.
1.2 ALL SANITARY SEWERS AND BUILDING SERVICES TO BE CSA CERTIFIED PVC SDR 35, BELL AND SPIGOT TYPE, WITH ELSATOMERIC GASKET AS PER OPSS 1841 AND CSA B182.2 M1990. ONLY FACTORY FITTINGS TO BE USED, SEWER TO BE INSTALLED AS PER OPSD 1005.01.
1.3 MINIMUM DEPTH OF COVER FOR SANITARY SEWER MAINS AND LATERALS IS 1.5m.
1.4 SANITARY LATERAL TO BE CONNECTED TO EXISTING SEWER WITH WYE FITTING AND A LONG RADIUS BEND.
1.5 CONTRACTOR TO VERIFY EXISTING SANITARY PIPE CONDITION, LOCATION, AND ELEVATION PRIOR TO CONSTRUCTION, AND TO PROVIDE GRAVITY DRAIN FOR PROPOSED BUILDING BASEMENT LEVELS.
1.6 EXISTING SANITARY SEWER SERVICES PROPOSED FOR REMOVAL SHALL BE DISCONNECTED AND ABANDONED AT THE MAIN (UNLESS OTHERWISE STATED) TO THE SATISFACTION OF CITY OF OTTAWA. A NOTIFICATION OF 48 HRS IN ADVANCED SHALL BE PROVIDED TO THE CITY OF OTTAWA PRIOR TO ANY CONSTRUCTION WORKS.

2.0 WATER

2.1 ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE ONTARIO BUILDING CODE.
2.2 WATERMAIN PIPE AND SERVICES TO BE PVC OR COPPER AS PER ONTARIO BUILDING CODE. ALL PIPE AND FITTINGS SHALL BE CERTIFIED CSA B137.3. PROVIDE A MINIMUM COVER OF 2.4m AND INSTALL AS PER OPSD 1102.02 TYPE 2. PROVIDE A MINIMUM OF 0.5m VERTICAL SEPARATION BETWEEN WATERMAIN CROWN AND SEWER INVERT AT ALL CROSSINGS.
2.3 WATER SERVICE TIE-IN (LIVE TAP) TO BE PERFORMED BY AUTHORIZED PERSONNEL AS PER APPROVAL OF CITY OF OTTAWA. ALL SITE WORKS FOR COMPLETION OF LIVE TAP ARE TO BE PERFORMED BY THE CITY, CONTRACTOR TO BACKFILL AND PROVIDE RESTORATIONS.
2.4 ALL VALVES TO COMPLY WITH CITY OF OTTAWA DESIGN GUIDELINES .
2.5 THE PROPOSED WATER SERVICE PROVIDES DOMESTIC WATER SUPPLY ONLY. ALL PROPOSED BUILDING FIRE WATER SUPPLY AND PROTECTION MEASURES/SPRINKLER SYSTEMS ARE TO BE DESIGNED IN ACCORDANCE WITH BUILDING CODE REQUIREMENTS.
2.6 A NOTIFICATION OF 48 HRS IN ADVANCED SHALL BE PROVIDED TO CITY OF OTTAWA PRIOR TO ANY CONSTRUCTION WORKS.
2.7 WATER SERVICE LINE CONNECTION FROM WATERMAIN SHALL BE PVC DR18, AWWA C900 w/ STANDARD GATE VALVE SHUT OFF LOCATED AT PROPERTY LINE.
2.8 ALL CONNECTIONS TO EXISTING WATERMAINS ARE TO BE COMPLETED BY CITY FORCES. CONTRACTOR IS TO EXCAVATE, BACKFILL, COMPACTAND REINSTATE.

3.0 WATER SERVICE NOTE

3.1 WATER SERVICE LINE CONNECTION FROM WATERMAIN SHALL BE PVC DR18, AWWA C900 w/ STANDARD GATE VALVE SHUT OFF LOCATED AT PROPERTY LINE.

4.0 STORM

4.1 ALL STORM SEWER MAINS TO BE CSA CERTIFIED HDPE UNLESS OTHERWISE APPROVED/NOTED. ALL SEWERS TO BE INSTALLED AS PER MANUFACTURERS INSTRUCTIONS, USING ONLY FACTORY FITTINGS.
4.2 STORM MAINTENANCE HOLES TO BE AS PER OPSD 701.01 FOR 1.2mØ, OPSD 701.012 FOR 1.8mØ, OPSD 701.013 FOR 2.4mØ, ALL c/w BENCHING.
4.3 ALL CATCH BASINS TO BE AS PER OPSD 705.01, FRAME & GRATE AS PER 400.01, LEAD TO BE HDPE
4.4 STORM MH FRAMES AND COVERS TO BE OPEN TYPE, AS PER OPSD 401.01 TYPE B. CONTRACTOR TO INSTALL FILTER CLOTH UNDER STORM MH COVERS UNTIL THE BASE COURSE OF ASPHALT IS APPLIED.
4.5 STRAW BALE CHECK DAMS SHALL BE PLACED AROUND CB'S TEMPORARILY UNTIL SITE VEGETATION HAS BEEN STABLIZED.
4.6 ALL CB LEADS TO BE AT LEAST 0.5m FROM WATER AND SANITARY SEWER MAIN.
4.7 ALL PROPOSED CATCH BASIN COVER FRAMES (CB1, CB2 & CB3) LOCATED IN THE BIOSWALE NEED TO BE ANCHORED DIRECTLY TO THE TOP OF THE PRECAST CONCRETE AS PER S.P. No F-4070 TO PREVENT DISPLACEMENT.

TEMPORARY EROSION AND SEDIMENT CONTROLS

1. INSTALL SILT FENCE AT THE DOWNSLOPE SIDE OF DISTURBED AREAS AND SNOW FENCE ALONG PERIMETER OF THE DEVELOPMENT SITE, PRIOR TO THE START OF CONSTRUCTION.
2. STOCKPILE TOPSOIL AT DESIGNATED LOCATIONS NEAR THE NORTH-EAST REGION OF THE SITE. STOCKPILES WILL BE CONTAINED BY SILT FENCES ON THE DOWNSLOPE SIDE.
3. TEMPORARY SWALES WITH CHECK DAMS ARE TO BE CONSTRUCTED PRIOR TO THE BEGINNING OF SITE GRADING.
4. THE ACCUMULATED SILT SHALL BE REMOVED FROM ALL SEDIMENT CONTROL DEVICES AS REQUIRED DURING CONSTRUCTION AND DISPOSED IN THE LOCATIONS APPROVED BY THE CITY AND CRCA.
5. ALL EXPOSED SOILS ARE TO BE STABILIZED AND VEGETATED AS SOON AS POSSIBLE USING SEED AND MULCH APPLICATION ON 100mm OF TOPSOIL, AS DIRECTED BY THE ENGINEER.
6. ADDITIONAL EROSION/SEDIMENT CONTROLS MAY BE REQUIRED ON SITE AS DETERMINED BY THE ENGINEER.
7. NO CONSTRUCTION ACTIVITY/MACHINERY SHALL INTRUDE BEYOND THE SILT/SNOW FENCE OR PROPERTY LIMIT. EXCEPT, WHERE NECESSARY TO COMPLETE THE WORKS. ALL INTRUSIONS ARE TO BE KEEP TO A MINIMUM AND MUST BE APPROVED WITH THE ENGINEER PRIOR TO INTRUSION BEYOND SILT FENCE/PROPERTY LIMITS. ALL CONSTRUCTION VEHICLES SHALL ENTER AND LEAVE THE SITE VIA DESIGNATED ENTRANCES.
8. ALL REGRADED AREAS THAT ARE NOT OCCUPIED BY DWELLINGS, ROADS, SIDEWALKS, DRIVEWAYS, PARKS AND OTHER SERVICES SHALL BE COVERED BY 100mm TOPSOIL, AND SODDED/SEEDED IMMEDIATELY AFTER COMPLETION OF FINAL GRADING OPERATIONS, AS DIRECTED BY THE ENGINEER.
9. ALL TEMPORARY EROSION AND SEDIMENT CONTROLS MUST BE INSTALLED PRIOR TO THE COMMENCEMENT OF SITE GRADING, MUST BE INSPECTED ON A REGULAR BASIS AND AFTER EVERY RAINFALL EVENT, AND MUST BE CLEANED AND MAINTAINED AS REQUIRED TO PREVENT THE MIGRATION OF SEDIMENT FROM THE SITE.
10. ALL TEMPORARY EROSION AND SEDIMENT CONTROLS MUST BE REMOVED AFTER CONSTRUCTION ONCE THE DEVELOPMENT SITE HAS BEEN STABILIZED TO THE CITY'S SATISFACTION. ALL AREAS DISTURBED BY EROSION OR SEDIMENT CONTROL DEVICES ARE TO BE RESTORED WITH 100mm TOPSOIL AND SODDED/SEEDED AFTER CONSTRUCTION.
11. THE CONTRACTOR SHALL KEEP PUBLIC ROADWAYS FREE OF DEBRIS DURING CONSTRUCTION. ANY MATERIAL TRACKED FROM THE SITE SHALL BE PROMPTLY REMOVED FROM ROADWAYS AT THE CONTRACTOR'S EXPENSES.
12. PROPOSED WORKS WILL BE OCCURRING WITHIN THE REGULATED FLOOD PLAIN, THEREFORE IT IS IMPORTANT TO MONITOR THE WEATHER FOR LARGE STORM EVENTS BEFORE COMMENCING WORK.
13. CONSTRUCTION ACTIVITIES, INCLUDING MAINTENANCE PROCEDURES, WILL BE CONTROLLED TO PREVENT THE ENTRY OF PETROLEUM PRODUCTS, DEBRIS, RUBBLE, CONCRETE OR OTHER DELETERIOUS SUBSTANCE INTO THE EXISTING WATERCOURSE(S), VEHICULAR REFUELING AND MAINTENANCE WILL BE CONDUCTED 30 METERS FROM EXISTING WATERCOURSE.
14. ALL CONSTRUCTION MATERIALS, EQUIPMENT, VEHICLES AND MACHINERY ARE TO BE STORED OUTSIDE THE FLOODPLAIN LIMITS.
15. SILT FENCE TO BE ERECTED PRIOR TO EARTH WORKS BEING COMMENCED. SILT FENCE TO BE MAINTAINED UNTIL VEGETATION IS ESTABLISHED OR UNTILSTART OF SUBSEQUENT PHASE.
16. FABRIC TO BE PLACED AND MAINTAINED UNDER COVER OF ALL CATCHBASINS. GEOTEXTILE FABRIC IN STREET CBS TO REMAIN UNTIL ALL CURBS ARE CONSTRUCTED. GEOTEXTILE FABRIC IN RYCBS TO REMAIN UNTIL VEGETATION IS ESTABLISED. ALL CATCHBASINS TO BE REGULARLY INSPECTED AND CLEANED, AS NECESSARY, UNTIL SOD AND CURBS ARE CONSTRUCTED.
17. CONTRACTOR IS RESPONSIBLE TO KEEP THE ROADS FREE AND CLEAN FROM MUD OR DEBRIS.
18. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
19. SEDIMENT AND EROSION CONTROL MEASURES MAY BE MODIFIED IN THE FIELD AT THE DISCRETION OF THE CITY OF OTTAWA SITE INSPECTOR OR CONSERVATION AUTHORITY.

GENERAL NOTES FOR LOT GRADING

1. ALL LOTS AND BLOCKS FOR PRIVATE USE ON THE LANDS CORRESPONDING TO THIS DESIGN ARE TO BE DEVELOPED IN ACCORDANCE WITH THE PLAN DETAILS AND THESE NOTES.
2. THE DEVELOPER SHALL NOT BE CONSIDERED RESPONSIBLE TO THE CONTRACTOR IN ANY RESPECT FOR THE AMOUNT OF GRADING OR EARTHWORK REQUIRED TO BE PERFORMED BY THE CONTRACTOR DUE TO THE INFORMATION PROVIDED ON THESE DRAWINGS EXCEPT WHERE REQUIRED TO PROMOTE INTERIM DRAINAGE.
3. ALL GROUND SURFACES SHALL BE EVENLY GRADED WITHOUT PONDING AREAS AND WITHOUT LOW POINTS EXCEPT WHERE APPROVED SWALES ARE PROVIDED.
4. THE CONTRACTOR SHALL ENSURE POSITIVE DRAINAGE ALONG SIDE LOT LINES AS REQUIRED TO MAINTAIN THE INTENT OF THE GRADING PLAN. THE CONTRACTOR SHALL COMPLETE THE DRAINAGE SWALES IN THE LOCATIONS AND TO THE GRADES AND ELEVATIONS, DEPTHS AND SECTIONS SPECIFIED ON THE PLAN, PRIOR TO FINAL LANDSCAPING BY THE CONTRACTOR. THE CONTRACTOR SHALL ENSURE THAT THE REQUIRED SWALES ARE CONSTRUCTED IN ACCORDANCE WITH THE GRADING PLAN.
5. ANY EMBANKMENT REQUIRED FOR INTERNAL GRADING IS TO BE COMMENCED ALONG THE INSIDE EDGE OF THE PROPERTY.
6. THE GRADING OF ALL LOTS AND BLOCKS IS TO BE PERFORMED TO PROVIDE FINISHED PERIMETER SURFACES WHICH ARE FLUSH WITH GIVEN STREET LINE, REAR AND SIDE LINE ELEVATIONS.
7. FINAL PERIMETER GRADES FOR A LOT OR BLOCK WHERE NOT OTHERWISE SHOWN HEREON SHALL BE COINCIDENT WITH THE ADJOINING PERIMETER GRADES OF AN ADJACENT LOT OR BLOCK WHICH SHALL HAVE BEEN PREVIOUSLY ESTABLISHED BY, OR CONSTRUCTED IN ACCORDANCE WITH A MUNICIPAL SITE PLAN APPROVAL OR DEVELOPER GRADING APPROVAL.
8. MAXIMUM LOT OR BLOCK GRASS SURFACE GRADE AT ANY LOCATION SHALL BE 8.0% WITH EMBANKMENTS (3:1 MAX.) OR RETAINING STRUCTURES PROVIDED AS REQUIRED TO TAKE UP GRADE DIFFERENTIALS IN EXCESS OF SUCH SLOPES.
9. EMBANKMENTS FORMED DURING THE GRADING OF LOTS AND BLOCKS SHALL HAVE THE FOLLOWING MAXIMUM GRADES:
   (A) ADJACENT TO DRIVEWAYS OR SWALE SIDE SLOPES - 4:1 MAXIMUM
   (B) ELSEWHERE - 3:1 MAXIMUM
10. MAXIMUM DRIVEWAY GRADES TO BE 10.0%. MAXIMUM PARKING AREA PAVEMENT GRADES TO BE 6%.
11. UNLESS OTHERWISE INDICATED, THE LOT LINE AND CORNER ELEVATIONS SHOWN HEREON ARE GENERALLY THE MINIMUM ELEVATIONS FOR THE SPECIFIED DRAINAGE PATTERN. ANY ALTERATIONS REQUIRE THE WRITTEN APPROVAL OF THE DESIGN ENGINEER.
12. GIVEN THE PROPOSED BUILDING GRADES MAY BE RAISED TO COMPENSATE FOR DIFFERENCES BETWEEN ASSUMED AND ACTUAL BUILDING DIMENSIONS IN ACCORDANCE WITH THE ESTABLISHED CRITERIA FOR THE DRAINAGE PATTERN. REAR SPECIFIED BUILDING GRADE TO BE ESTABLISHED BY CONTRACTOR TO SUIT BUILDING TYPE HOWEVER ALL GRADING REQUIREMENTS IDENTIFIED ON THIS PLAN AND AS REQUIRED BY THE MUNICIPALITY SHALL BE CONFORMED TO.
13. GRADING AND SODDING OF ADJACENT ROADWAY BOULEVARDS WILL BE PERFORMED BY THE CONTRACTOR IN ACCORDANCE WITH MUNICIPAL SPECIFICATIONS.
14. CONTRACTOR IS RESPONSIBLE TO KEEP THE ROADS FREE AND CLEAN FROM MUD OR DEBRIS.

ENVIRONMENTAL NOTES

1. THE CONTRACTOR SHALL SUPPLY AND INSTALL ALL EROSION AND SEDIMENT CONTROLS (ESC) AS PER CONTRACT SPECIFICATIONS AND AT LOCATIONS AS DIRECTED BY THE ENGINEER. ALL DAMAGED EROSION AND SEDIMENT CONTROL MEASURES SHOULD BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OF THE INSPECTION.
2. CONTRACTOR TO PROVIDE SEDIMENT CONTROL MEASURES AND PRECAUTIONS TO PREVENT CONSTRUCTION DEBRIS FROM ENTERING EXISTING CATCH BASINS, MAINTENANCE HOLES, CULVERTS, CREEKS, ROAD SIDE DITCHES, AND STORM AND SANITARY SEWERS WITHIN THE AREA OF THE CONTRACT.
3. DISTURBED AREAS WILL BE MINIMIZED TO THE EXTENT POSSIBLE AND TEMPORARILY OR PERMANENTLY STABILIZED OR RESTORED AS THE WORK PROGRESSES.
4. THE EROSION AND SEDIMENT CONTROL STRATEGIES OUTLINED ON THE PLANS ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO MINIMIZE SEDIMENT LADEN RUNOFF FROM LEAVING THE WORK AREAS. IF THE PRESCRIBED MEASURES ON THE PLANS ARE NOT EFFECTIVE IN PREVENTING THE RELEASE OF A DELETERIOUS SUBSTANCE, INCLUDING SEDIMENT, THEN ALTERNATIVE MEASURES MUST BE IMPLEMENTED IMMEDIATELY TO MINIMIZE POTENTIAL ECOLOGICAL IMPACTS. ADDITIONAL ESC MEASURES TO BE KEPT ON SITE AND PLACED AS INSTRUCTED BY THE ENGINEER.
5. SEDIMENT AND EROSION CONTROL MEASURES TO BE INSPECTED DAILY AND ANY REQUIRED REPAIRS DONE PROMPTLY.
6. ROADS ARE TO BE CLEANED AT A MINIMUM ONCE A WEEK OR AS INSTRUCTED BY THE ENGINEER. IT WILL NOT BE CONSIDERED ACCEPTABLE TO HAVE MUD AND DEBRIS ON THE ROADS.
7. RESTORATION OF ANY DISTURBED AREAS TO BE DONE IN ACCORDANCE WITH CONTRACT SPECIFICATIONS. RESTORATION OF DISTURBED GRASS AREAS WITHIN THE EXISTING RIGHT-OF-WAY TO CONSIST OF SODDING AS PER OPSS 803.
8. ALL DEWATERING DISCHARGE EFFLUENT SHALL BE TREATED TO MEET PROVINCIAL WATER QUALITY OBJECTIVES PRIOR TO BEING DISCHARGED TO THE NATURAL ENVIRONMENT. IN CASE WATER QUALITY IS NOT SUITABLE FOR DISCHARGE INTO THE STORM SEWER, THE CONTRACTOR SHALL ACQUIRE AGENCY APPROVAL PRIOR TO DISCHARGING EFFLUENT TO THE LOCAL SANITARY SEWER SYSTEM WITH ADDITIONAL COSTS BACKCHARGED TO THE CONTRACTOR PER CUBIC METER OF DISCHARGE.

SITE SURVEY NOTES

1. CONTRACTOR IS SOLELY RESPONSIBLE FOR SITE SURVEY AND CONSTRUCTION LAYOUT.
2. THE ACCURACY OF ALL BENCHMARKS SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. ANY DEVIATIONS ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
3. CONTRACTOR IS RESPONSIBLE FOR PROVIDING SUFFICIENT SURVEY MARKERS AND GRADE SHEETS AS MAY BE REQUIRED FOR THE PROPER EXECUTION OF THE WORKS. ALL STAKES, MARKERS AND REFERENCE POINTS SHALL BE CAREFULLY PRESERVED BY THE CONTRACTOR THROUGHOUT THE CONSTRUCTION DURATION.
4. DRAWING STATIONS SHOWN ON PLAN VIEWS AND ALL LENGTHS OF PROPOSED INFRASTRUCTURE INDICATED ON THESE DRAWINGS ARE FOR DESIGN PURPOSES ONLY. THE CONTRACTOR IS RESPONSIBLE FOR CALCULATING THE EXACT LENGTHS AND SHOWING THESE ON THEIR SHOP DRAWINGS (INCLUDING REQUIRED CONNECTIONS) EVEN IF THE ACTUAL LENGTHS VARY FROM THE DESIGN VALUES.
5. THE UTILITY DESIGNS ARE BASED ON TOPOGRAPHICAL SURVEYS, BASE PLANS, AERIAL DIGITAL TERRAIN MODELS, TEST PITS , AND OTHER INFORMATION RELATED TO EXISTING INFRASTRUCTURE PROVIDED BY OTHERS. THE PERFORMING CONTRACTOR SHALL VERIFY THE ACCURACY OF THE INFORMATION PRIOR TO PROCEEDING WITH CONSTRUCTION AND REPORT ANY DISCREPANCIES TO THE ENGINEER.

UTILITIES NOTES

1. CONTRACTOR SHALL PROTECT AND MAINTAIN ALL EXISTING UNDER/ABOVEGROUND UTILITIES PRIOR TO AND DURING CONSTRUCTION.
2. WHERE SERVICES CROSS EXISTING CONCRETE OR ASPHALT ROADWAYS OR WALKWAYS, CONTRACTOR TO SAWCUT SURFACE AND RESTORE TO PRE-CONSTRUCTION CONDITIONS.
3. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE APPROXIMATE ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY OWNER OR ITS REPRESENTATIVES. THE CONTRACTOR, AS PART OF THEIR WORK SHALL VERIFY THE LOCATION OF ALL EXISTING UTILITIES WITH THE UTILITY COMPANIES AT LEAST 48 HOURS PRIOR TO COMMENCING WORK AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MAY BE CAUSED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
4. THE CONTRACTOR IS REQUIRED TO OBTAIN STAKEOUTS OF ALL UTILITIES AND CONFIRM THE EX. SEWER INVERTS AS WELL AS THE DEPTH AND LOCATIONS OF UTILITIES IN THE FIELD PRIOR TO CONSTRUCTION.
5. EXISTING SEWER INVERTS AND UTILITY DEPTHS SHALL BE CONFIRMED BY THE CONTRACTOR PRIOR TO ISSUANCE OF SHOP DRAWINGS.
6. PERFORM TEST PIT EXCAVATIONS AT ALL LOCATIONS WHERE EXISTING UTILITIES MAY BE DISTURBED. HAND DIG AS REQUIRED TO PREVENT DAMAGE TO EXISTING UTILITIES. NOTIFY UTILITY OWNERS AND AGENCY'S DEPARTMENTS IN ADVANCE OF SCHEDULED WORK NEAR THESE UTILITIES. CONTRACTOR TO COORDINATE TIMING OF NOTIFICATION WITH EACH UTILITY OWNER AT TIME OF CONSTRUCTION.
7. REPORT LOCATION AND ELEVATIONS OF ALL EXISTING UTILITIES NOT SHOWN ON THE DRAWINGS TO THE ENGINEER FOR REVIEW PRIOR TO COMMENCING WORK.
8. THE CONTRACTOR SHALL NOTIFY THE OWNER OF ANY DAMAGED UTILITY. THE OWNER MAY, AT ITS DISCRETION AND AT THE CONTRACTOR'S EXPENSE, REPAIR THE DAMAGED UTILITY OR DIRECT THE CONTRACTOR TO REPAIR THE DAMAGED UTILITY.
9. THE CONTRACTOR SHALL ALLOW ACCESS BY UTILITY OWNERS TO THEIR UTILITIES FOR INSPECTION PURPOSES AT ALL TIMES DURING CONSTRUCTION.
10. WHERE UNSHRINKABLE FILL IS USED AS BACKFILL MATERIAL, ALL EXPOSED UNDERGROUND UTILITIES MUST BE PROTECTED BY PLACING CLEARSTONE AROUND THE UTILITY.
11. DUE TO UNKNOWN EMBEDMENT DEPTH OF UTILITY POLES, CONTRACTOR TO SUPPORT AS REQUIRED. CONTRACTOR TO MINIMIZE AMOUNT OF OPEN TRENCH IN THE VICINITY OF UTILITY POLES.
12. ABANDONED WET UTILITIES TO BE REMOVED AND DISPOSED OF OFF SITE IF LOCATED UNDER TREE ZONE WITH LESS THAN 2.0M CLEARANCE BETWEEN TOP OF OD TO FINAL BLVD GRADE
13. ONTARIO ONE CALL AT 1-800-400-2255 FOR LOCATE REQUIREMENTS.

STANDARD DETAILS AND REFERENCE

WATERMAIN	DETAIL / REFERENCE
WATERMAIN PIPE (150mm)	PVC DR18, C900/AWWA
WATERMAIN TRENCHING	W17 (CITY OF OTTAWA)
HYDRANT INSTALLATION	W19 (CITY OF OTTAWA)
WATERMAIN INSULATION	W22 (CITY OF OTTAWA)
WATERMAIN VALVE BOX ASSEMBLY	W24 (CITY OF OTTAWA)
WATERMAIN CROSSING BELOW SEWER	W25 (CITY OF OTTAWA)
WATERMAIN CROSSING OVER SEWER	W25.2 (CITY OF OTTAWA)
WATERMAIN THRUST BLOCK DETAILS	W25.3 (CITY OF OTTAWA)
WATERMAIN THRUST BLOCK DIMENSIONS	W25.4 (CITY OF OTTAWA)
PIPE RESTRAINTS DETAILS	W25.5 (CITY OF OTTAWA)
PIPE RESTRAINTS LENGTHS	W25.6 (CITY OF OTTAWA)
TRACER WIRE INSTALLATION	W36 (CITY OF OTTAWA)
CATHODIC PROTECTION	W40 (CITY OF OTTAWA)
ANODE INSTALLATION	W42 (CITY OF OTTAWA)
TRACER WIRE WATER PROOFING SPLICES	W47 (CITY OF OTTAWA)
STORMWATER	DETAIL / REFERENCE
STORM PIPE (150-450mm)	PVC DR35 / AWWA
MANHOLES (1200mm)	701.010 / OPSD
CATCH BASIN (600x600mm)	705.010 / OPSD
MANHOLE COVER	S24.1 (CITY OF OTTAWA)
MANHOLE CIRCULAR FRAME	S25 (CITY OF OTTAWA)
CATCH BASIN COVER	S19.1 (CITY OF OTTAWA)
VORTEX ICD INSTALLATION	S4.1 (CITY OF OTTAWA)
SEWER TRENCHING	S6 / S7 (CITY OF OTTAWA)
SANITARY	DETAIL / REFERENCE
SANITARY PIPE (150-200mm)	PVC DR35 / AWWA
MANHOLES (1200mm)	701.010 / OPSD
MANHOLE COVER	S24 (CITY OF OTTAWA)
MANHOLE CIRCULAR FRAME	S25 (CITY OF OTTAWA)
SEWER SERVICE CONNECTION	S11.1 (CITY OF OTTAWA)
SEWER INTERNAL DROP STRUCTURE	S12 (CITY OF OTTAWA)
ROAD / SURFACE WORKS	DETAIL / REFERENCE
BARRIER CURB	SC1.1 (CITY OF OTTAWA)
SIDEWALK	SC4 (CITY OF OTTAWA)
SIDEWALK CONSTRUCTION JOINT	SC5 (CITY OF OTTAWA)
SIDEWALK RAMP	SC6 (CITY OF OTTAWA)
TWSI DETAIL	SC7.3 (CITY OF OTTAWA)
STANDARD TRENCH REINSTATEMENT IN PAVED SURFACE	R10 (CITY OF OTTAWA)
ASPHALT REINSTATEMENT	R25 (CITY OF OTTAWA)

CLIENT

OTTAWA COMMUNITY HOUSING
LOGEMENT COMMUNAUTAIRE D'OTTAWA

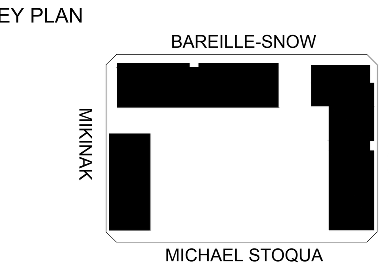
39 Auriga Dr. Nepean, ON K2E 7Y8

ISSUES

No.	DESCRIPTION	DATE
1	FIRST SUBMISSION	2021-05-20
2	SECOND SUBMISSION	2021-08-24

NOT FOR CONSTRUCTION

KEY PLAN



LICENSED PROFESSIONAL ENGINEER
August 24, 2021
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PROJECT

MIKINAK REDEVELOPMENT

715 MIKINAK ROAD, OTTAWA, ON
CANADA K1K 2G8

PROJECT NO: 125599	SCALE: AS SHOWN
DRAWN BY: NA	CHECKED BY: BT
PROJECT MGR: CW	APPROVED BY: BT

SHEET TITLE

GENERAL NOTES
& STANDARD DETAIL
REFERENCE

SHEET NUMBER: C00001
ISSUE: 2

File Location: O:\125599_MikinakRedev\7.0_Production\7.03_Design\04_Civil\Sheets\C00001.dwg Last Saved: August 23, 2021, by nino.alvarez Plotted: Monday, August 23, 2021 3:18:29 PM by Nino Alvarez

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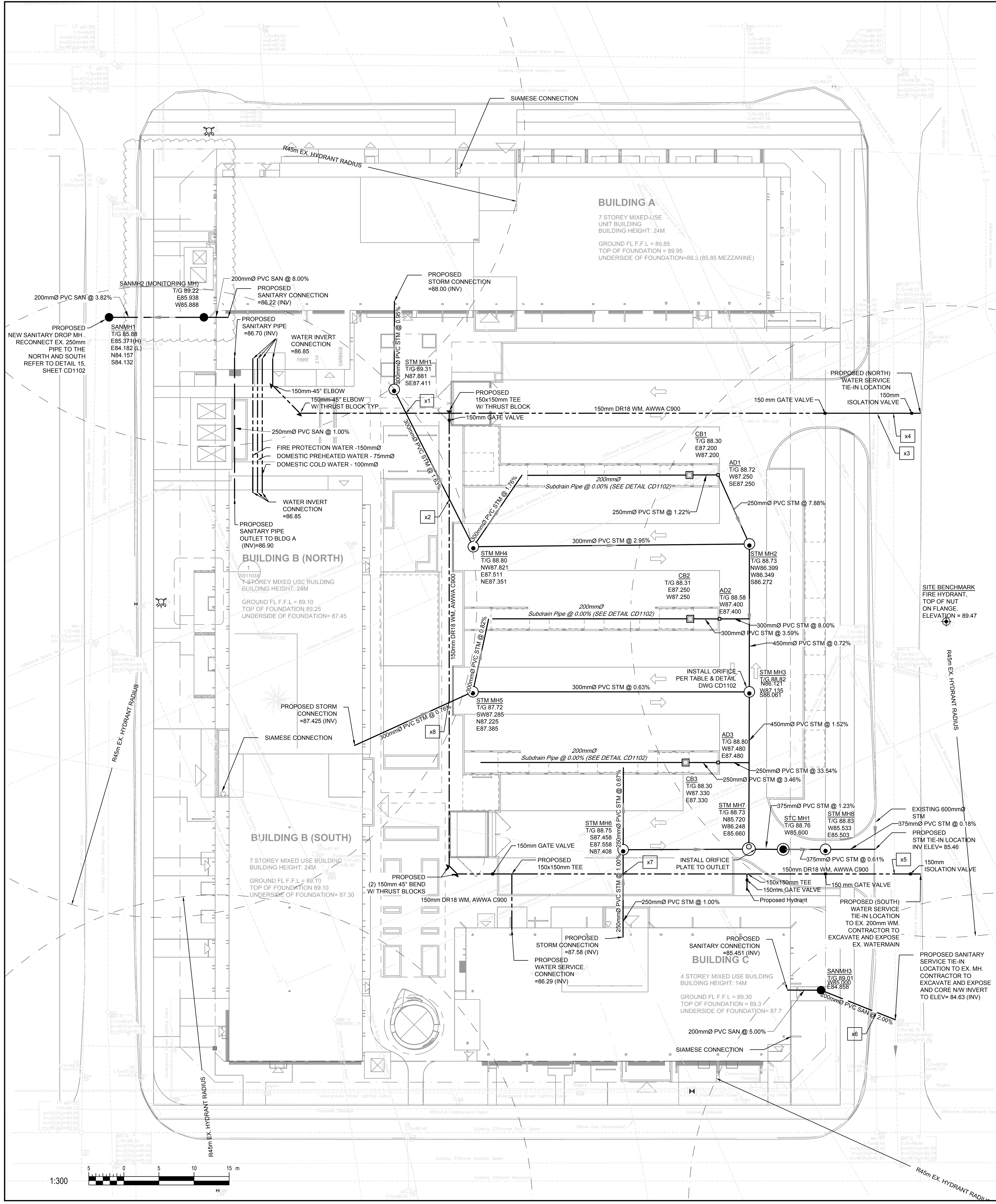
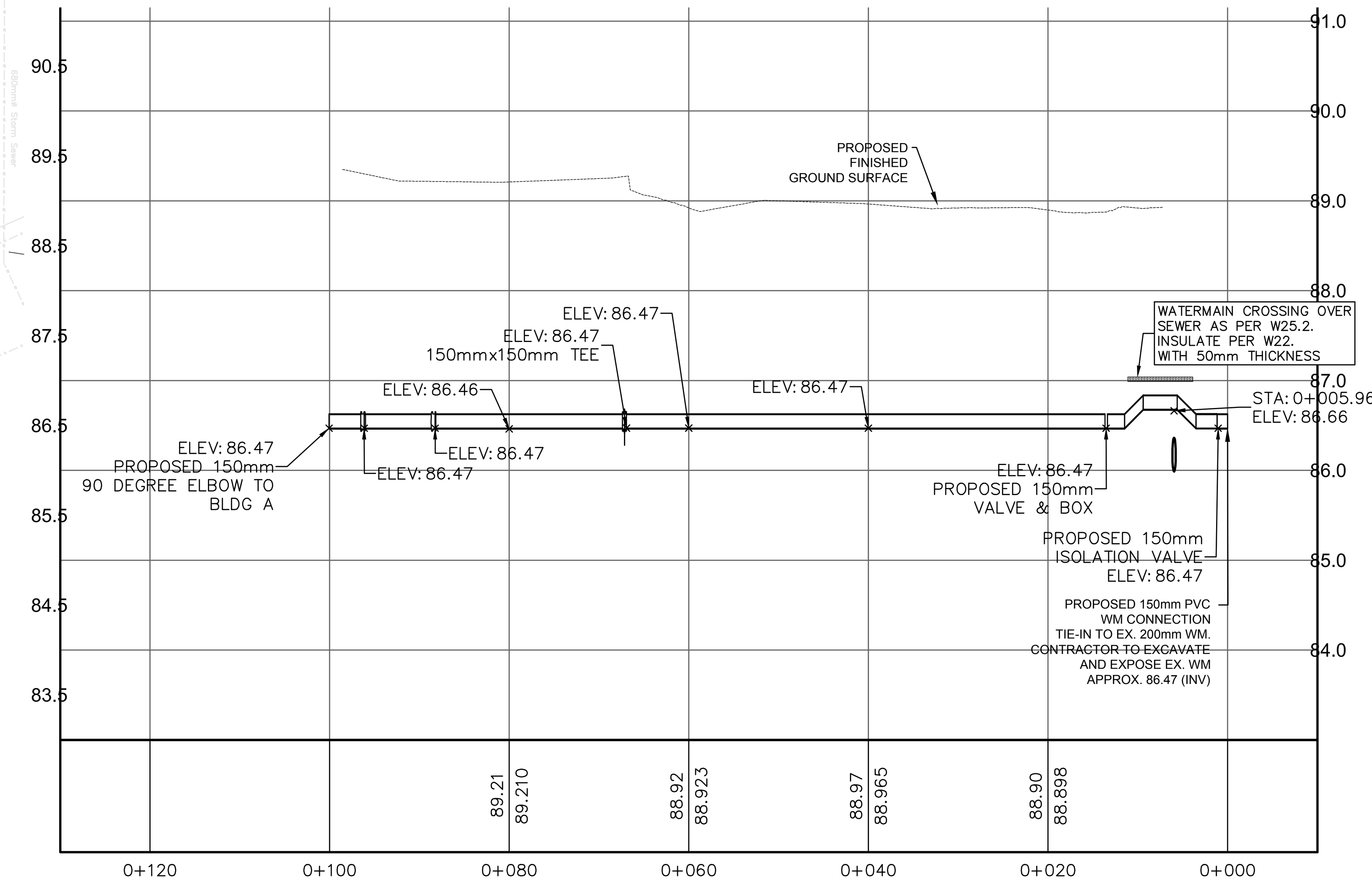
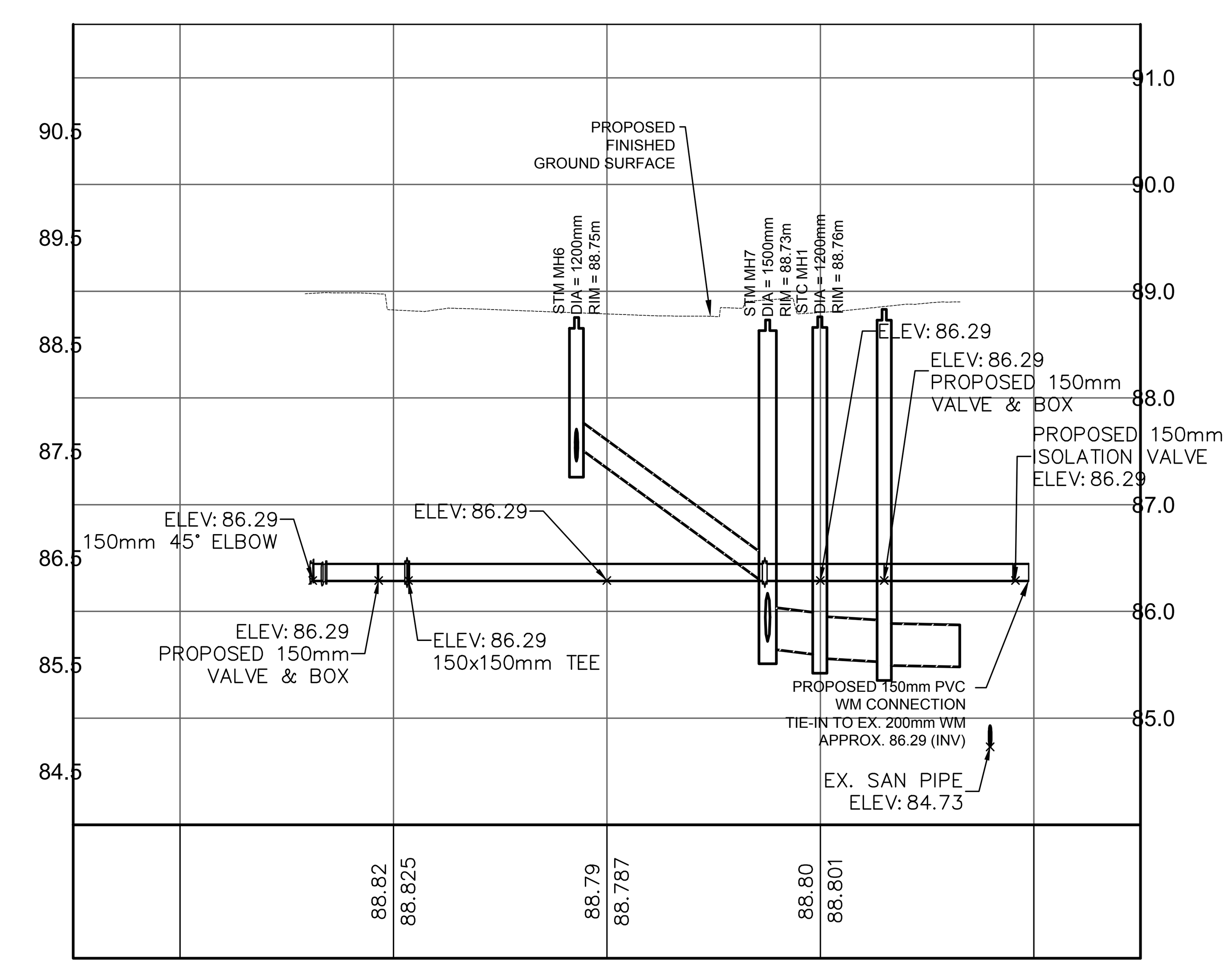


TABLE CROSSING

CROSSING NO.	LOWER PIPE (INVERT)	LOWER PIPE (OBVERT)	HIGHER PIPE (INVERT)	HIGHER PIPE (OBVERT)	DISTANCE (m)
X1	86.47 (WTR)	86.62 (WTR)	87.55 (STM)	87.85 (STM)	0.93
X2	86.45 (WTR)	86.60 (WTR)	87.77 (STM)	88.07 (STM)	1.17
X3	85.99 (EX. STM)	86.36 (EX. STM)	86.71 (WTR)	86.86 (WTR)	0.35
X4	85.22 (EX. SAN)	85.47 (EX. SAN)	86.47 (WTR)	86.62 (WTR)	1.00
X5	84.72 (EX. SAN)	84.97 (EX. SAN)	86.29 (WTR)	86.44 (WTR)	1.32
X6	84.63 (SAN)	84.83 (SAN)	85.43 (EX. STM)	86.03 (EX. STM)	0.60
X7	86.29 (WTR)	86.44 (WTR)	87.49 (STM)	87.74 (STM)	1.05
X8	86.36 (WTR)	86.51 (OBV)	87.31 (STM)	87.61 (STM)	0.80



PROPOSED WATERMAIN NORTH CONNECTION FOR BLDG A & B



PROPOSED WATERMAIN SOUTH CONNECTION FOR BLDG C

ORIFICE CONTROL

MANHOLE NO.	T/G	INVERT AT OUTLET	CENTERLINE ORIFICE ELEVATION	ORIFICE DIAMETER (mm)
STM MH3	88.82	86.061	86.12	122
STM MH7	88.730	85.660	85.720	118

NOTE:
PRIOR TO CONSTRUCTION REFER TO SHEET DETAIL II - CD1102
FOR REFERENCE OF PIPE SEGMENTS REQUIRING INSULATION.

True North

NOT FOR CONSTRUCTION

CLIENT

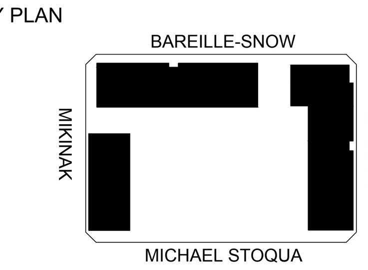
Ottawa Community Housing / Logement Communautaire d'Ottawa

39 Auriga Dr. Nepean, ON K2E 7Y8

ISSUES

No.	DESCRIPTION	DATE
1	FIRST SUBMISSION	2021-05-20
2	SECOND SUBMISSION	2021-08-24

KEY PLAN



LEGEND:

- PROPOSED SANITARY
- PROPOSED STORM
- PROPOSED WATERMAIN
- PROPOSED STORM MH
- PROPOSED CATCHBASIN
- PROPOSED OGS

LICENSED PROFESSIONAL ENGINEER
August 24, 2021
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PROJECT

MIKINAK REDEVELOPMENT

715 MIKINAK ROAD, OTTAWA, ON
CANADA K1K 2G8

PROJECT NO: 125599	SCALE: AS SHOWN
DRAWN BY: NA	CHECKED BY: BT
PROJECT MGR: CW	APPROVED BY: BT

SHEET TITLE

SERVICING PLAN

SHEET NUMBER	ISSUE
CU1101	2

File Location: O:\125599_MikinakRedev\7.0_Production\7.03_Design\04_Civil\Sheets\CU1101.dwg Last Saved: August 23, 2021 by nino.alvarez Plotted: Monday, August 23, 2021 3:20:52 PM by Nino Alvarez

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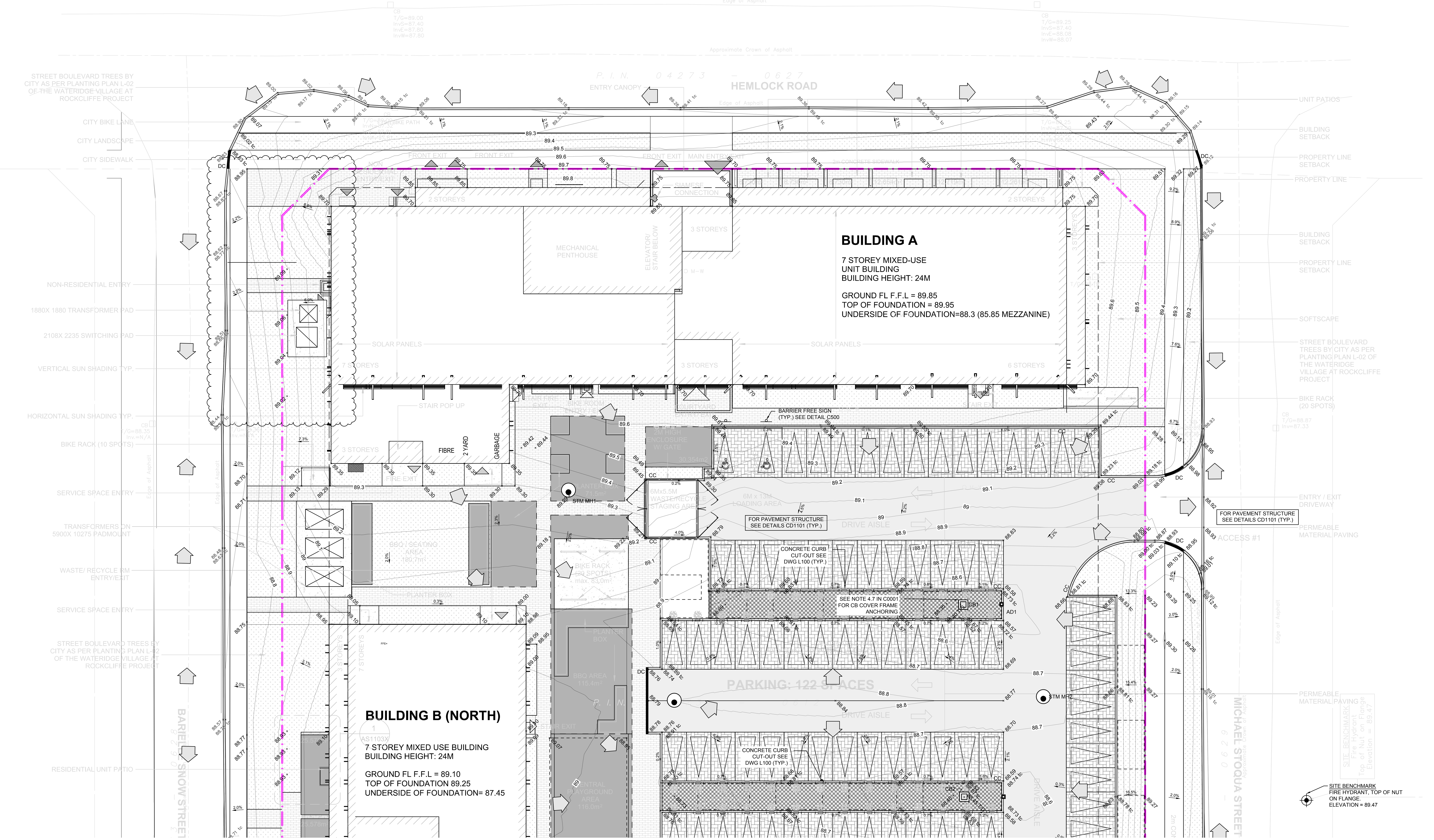

NOTE:
ALL PROPOSED FRAME COVER FOR CB1, CB2 & CB3 SHALL BE ANCHORED DIRECTLY TO THE TOP OF THE PRE-CAST CONCRETE TOP AS PER S.P. NO: F-4070 TO PREVENT DISPLACEMENT.

SITE BENCHMARK
FIRE HYDRANT ON TOP OF NUT OF FLANGE WITH AN ELEVATION OF 89.47, LOCATED ON MICHAEL STOQUA STREET EAST SIDE OF ROADWAY.

1:200 — 5 0 5 10 m

True North

CLIENT

Ottawa Community Housing / Logement Communautaire d'Ottawa

39 Auriga Dr. Nepean, ON K2E 7Y8

ISSUES

No.	DESCRIPTION	DATE
1	FIRST SUBMISSION	2021-05-20
2	SECOND SUBMISSION	2021-08-24

NOT FOR CONSTRUCTION

KEY PLAN

BAREILLE-SNOW — N — MIKINAK — HEMLOCK — MICHAEL STOQUA

LEGEND:

- TRAFFIC FLOW
- PROPOSED ELEVATION
- PROPOSED TOP OF CURB ELEVATION
- EXISTING ELEVATION
- PROPOSED SLOPE
- MAJOR OVERLAND FLOW ROUTE
- PROPOSED CONTOUR
- DEPRESSED CONCRETE CURB
- CONCRETE BARRIER CURB PER SC1.1
- PROPOSED BIO-SWALE
- PROPOSED SOFTSCAPE
- PROPOSED HARDSCAPE
- PROPOSED BUILDING
- PERMEABLE PAVER
- ASPHALT PAVED AREA
- WASTE PICK-UP AREA CONCRETE PAD

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PROJECT
MIKINAK REDEVELOPMENT

715 MIKINAK ROAD, OTTAWA, ON
CANADA K1K 2G8

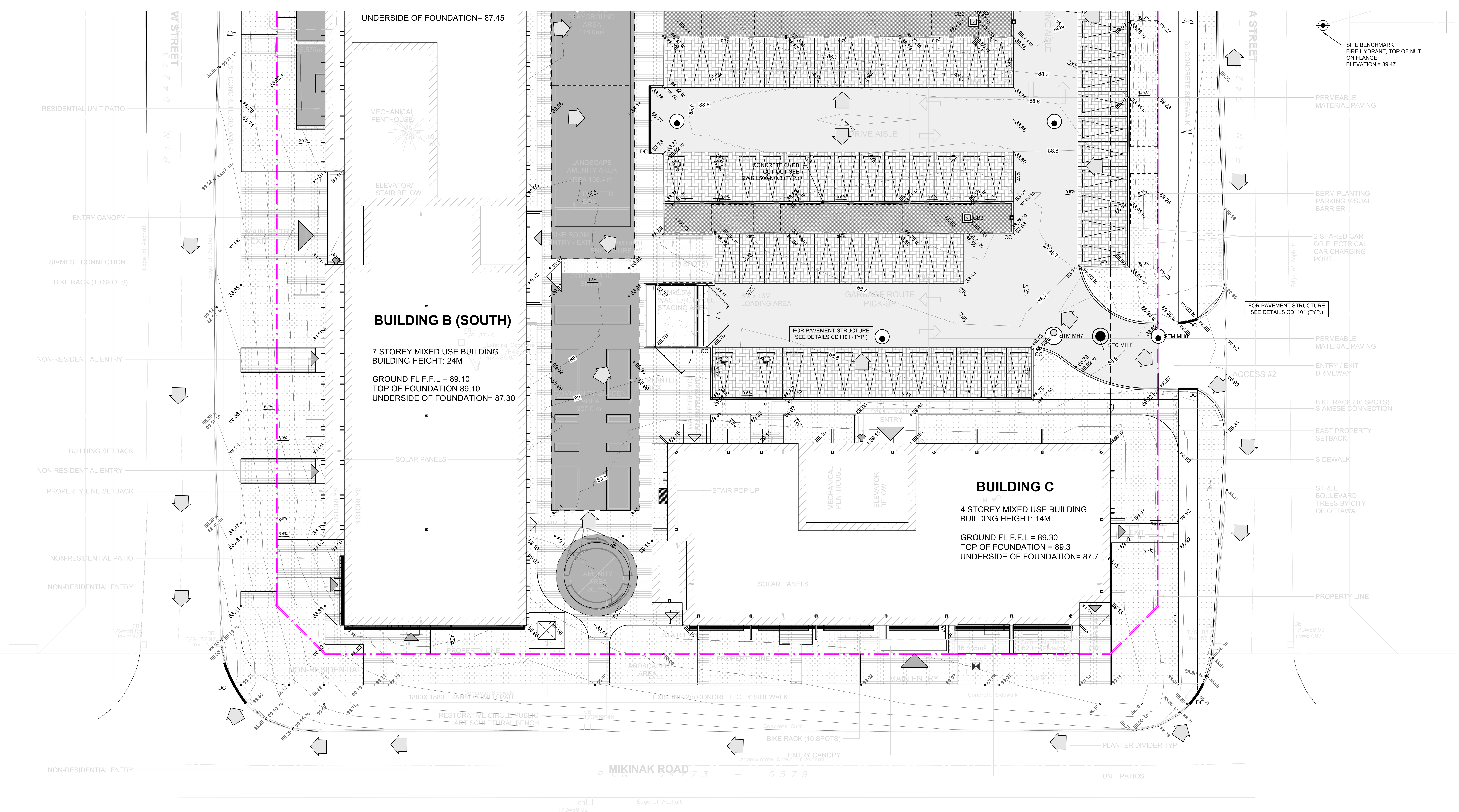
PROJECT NO: 125599	SCALE: AS SHOWN
DRAWN BY: NA	CHECKED BY: BT
PROJECT MGR: CW	APPROVED BY: BT

SHEET TITLE
GRADING PLAN (NORTH)

SHEET NUMBER: CG1101
ISSUE: 2

D07-12-21-0068

#18454



NOTE:
ALL PROPOSED FRAME COVER FOR CB1, CB2 & CB3 SHALL BE ANCHORED DIRECTLY TO THE TOP OF THE PRE-CAST CONCRETE TOP AS PER S.P. NO: F-4070 TO PREVENT DISPLACEMENT.

SITE BENCHMARK
FIRE HYDRANT ON TOP OF NUT OF FLANGE WITH AN ELEVATION OF 89.47, LOCATED ON MICHAEL STOQUOA STREET EAST SIDE OF ROADWAY.

1:200 — 5 0 5 10 m

True North

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Ottawa Community Housing / Logement Communautaire d'Ottawa
39 Auriga Dr. Nepean, ON K2E 7Y8

ISSUES

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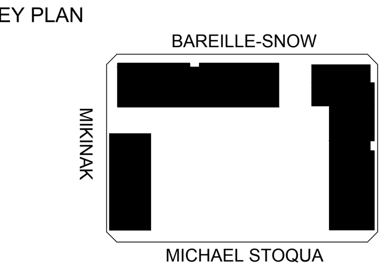
KEY PLAN



LEGEND:

- TRAFFIC FLOW
- 88.84 PROPOSED ELEVATION
- 88.75 tc PROPOSED TOP OF CURB ELEVATION
- 88.04 EXISTING ELEVATION
- 2.2% PROPOSED SLOPE
- OVERLAND FLOW
- 88.8 PROPOSED CONTOUR
- DC DEPRESSED CONCRETE CURB
- CC CONCRETE BARRIER CURB PER OPSD 600.110
- PROPOSED BIO-SWALE
- PROPOSED SOFTSCAPE
- PROPOSED HARDSCAPE
- PROPOSED BUILDING
- PERMEABLE PAVER
- ASPHALT PAVED AREA
- WASTE PICK-UP AREA CONCRETE PAD

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PROJECT
MIKINAK REDEVELOPMENT

715 MIKINAK ROAD, OTTAWA, ON
CANADA K1K 2G8

PROJECT NO: 125599	SCALE: AS SHOWN
DRAWN BY: NA	CHECKED BY: BT
PROJECT MGR: CW	APPROVED BY: BT

SHEET TITLE
GRADING PLAN (SOUTH)

SHEET NUMBER CG1102
ISSUE 2

File Location: O:\125599_MikinakRedev\7.0_Production\7.03_Design\04_Civil\Sheets\CG1101 (N).dwg Last Saved: August 23, 2021, by nino.alvarez Plotted: Monday, August 23, 2021 3:31:11 PM by Nino Alvarez

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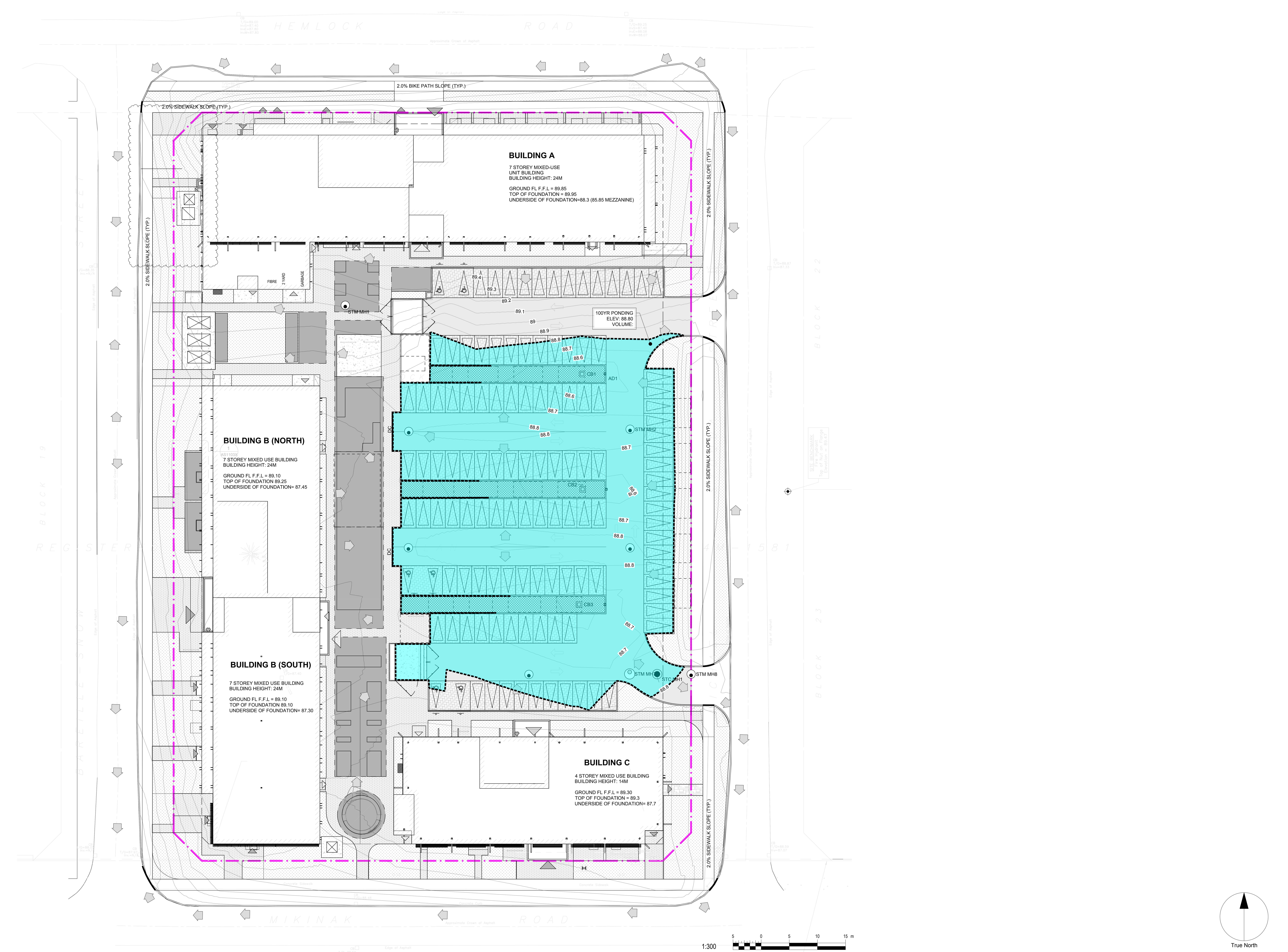

CLIENT

39 Auriga Dr. Nepean, ON K2E 7Y8

ISSUES

No.	DESCRIPTION	DATE
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2	SECOND SUBMISSION	2021-08-24

NOT FOR CONSTRUCTION

KEY PLAN

N

BAREILLE-SNOW
MIKINAK
HEMLOCK
MICHAEL STOQUA

LEGEND:

- OVERLAND FLOW
- PROPOSED CONTOUR
- DEPRESSED CONCRETE CURB
- CONCRETE BARRIER CURB PER OPSD 600.110
- PONDING (100YR)
- PROPERT YLINE
- PROPOSED BIO-SWALE
- PROPOSED SOFTSCAPE
- PROPOSED HARDSCAPE
- PROPOSED BUILDING
- PERMEABLE PAVER
- ASPHALT PAVE AREA
- WASTE PICK-UP AREA CONCRETE PAD

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PROJECT

MIKINAK REDEVELOPMENT

715 MIKINAK ROAD, OTTAWA, ON
CANADA K1K 2G8

PROJECT NO:	SCALE:
125599	AS SHOWN
DRAWN BY: NA	CHECKED BY: BT
PROJECT MGR: CW	APPROVED BY: BT

SHEET TITLE

PONDING PLAN

SHEET NUMBER	ISSUE
CG1103	2

File Location: O:\125599_MikinakRedev\7.0_Production\7.03_Design\04_Civil\Sheets\CG1101 (N).dwg Last Saved: August 21, 2021, by nino.alvarez Plotted: Monday, August 23, 2021 3:29:17 PM by Nino Alvarez

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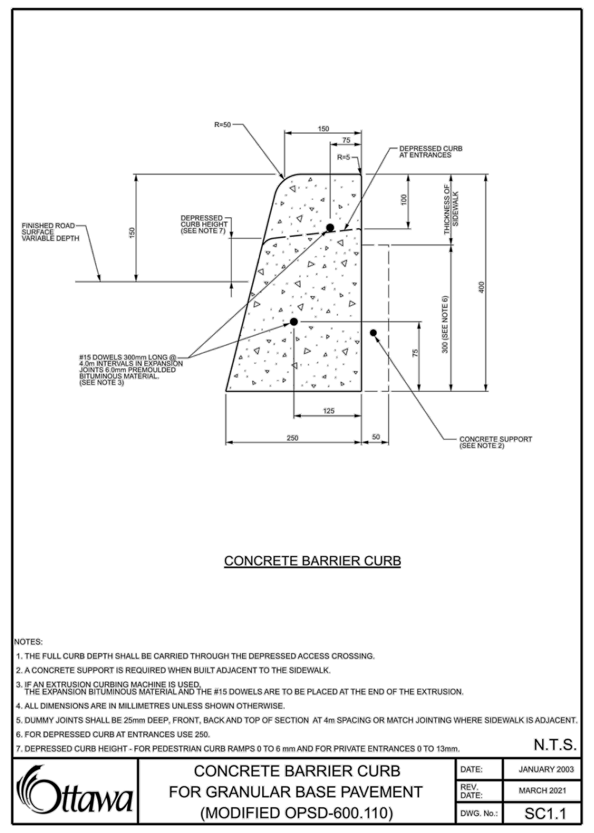
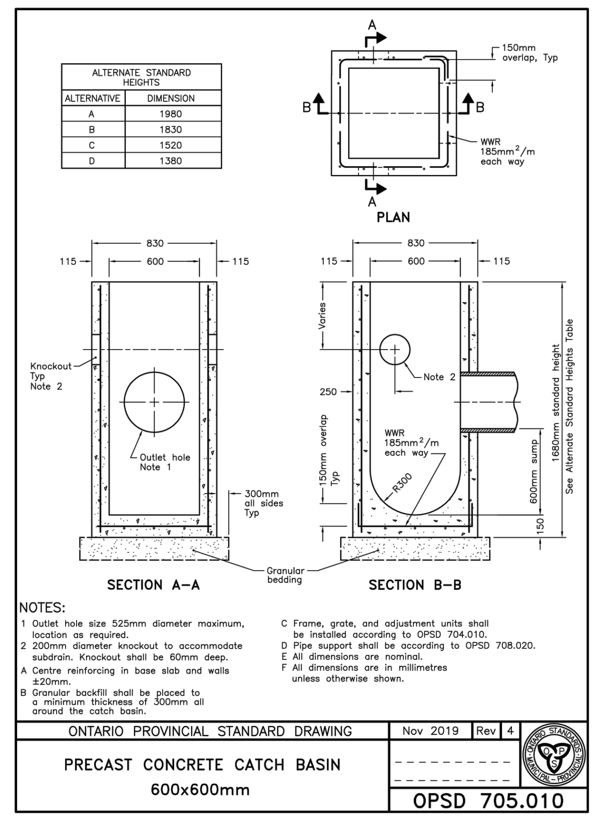
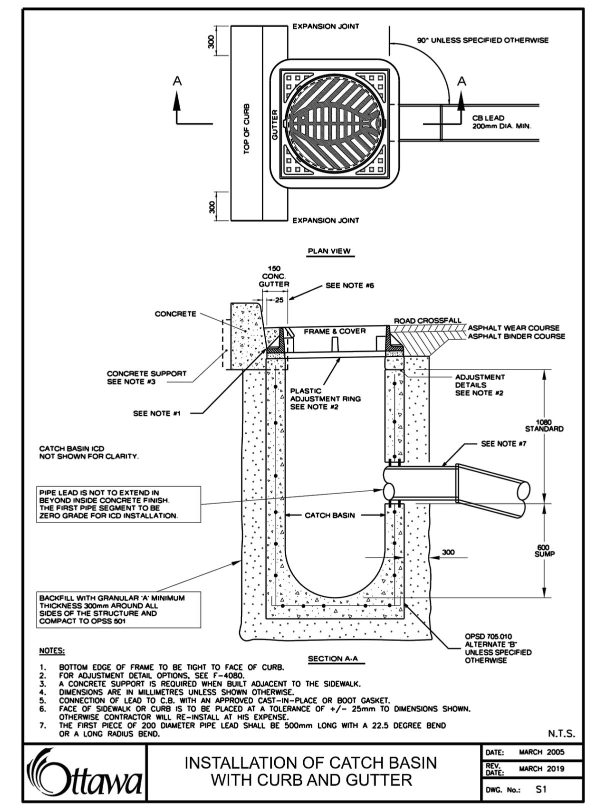


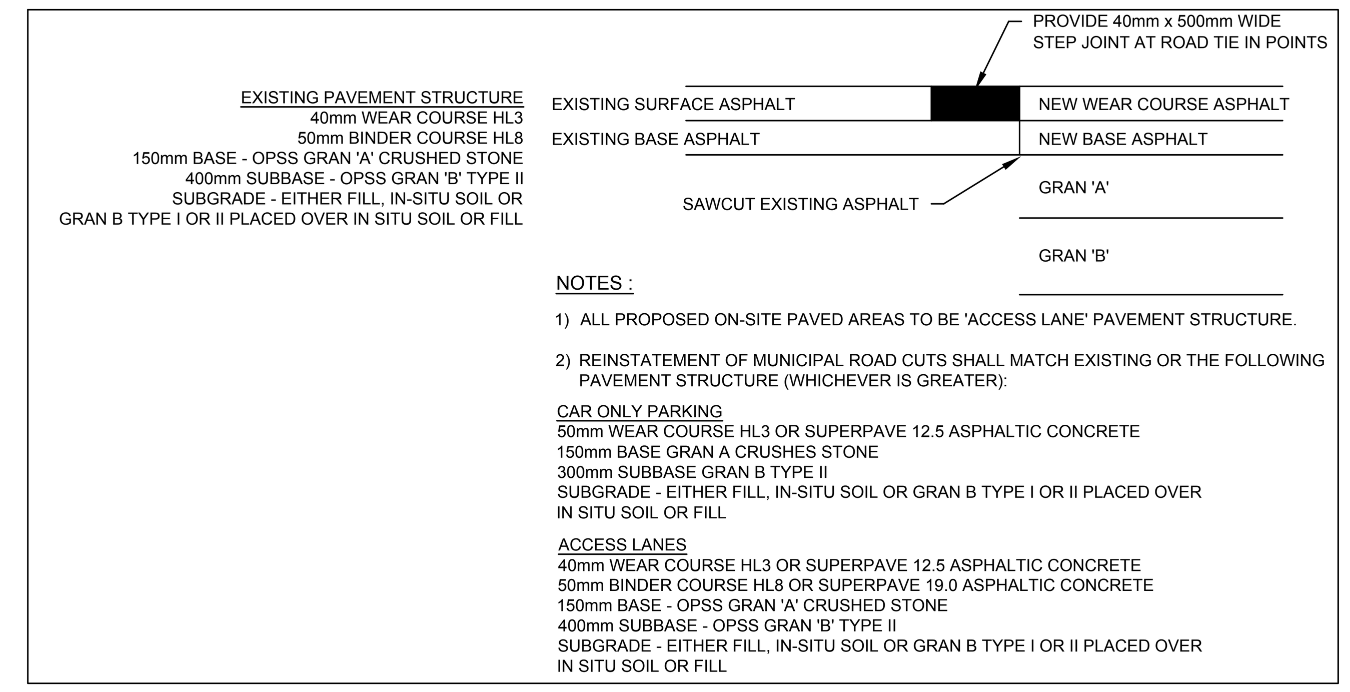
1 CONCRETE BARRIER CURB
Scale: N.T.S.



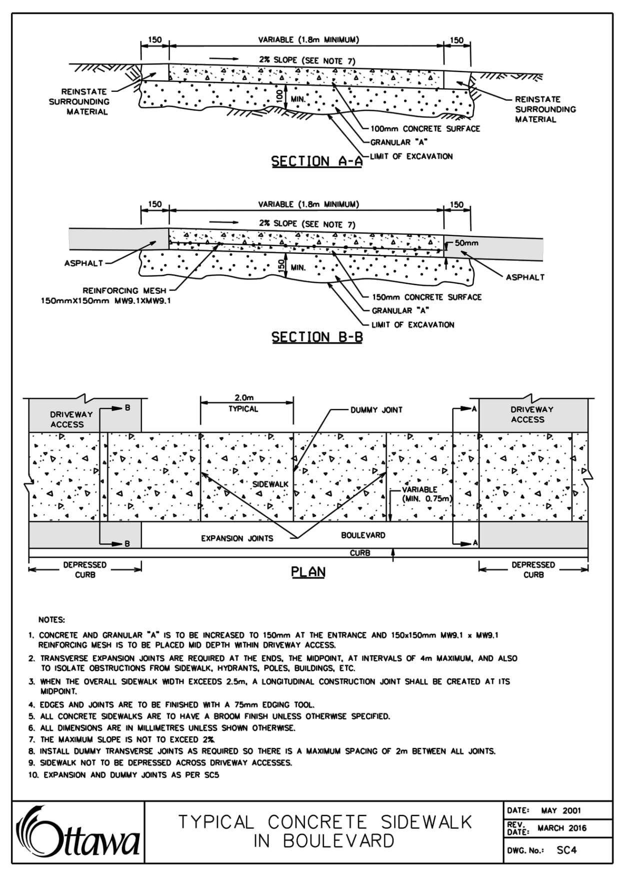
2 PRECAST CONCRETE CATCH BASIN
Scale: N.T.S.



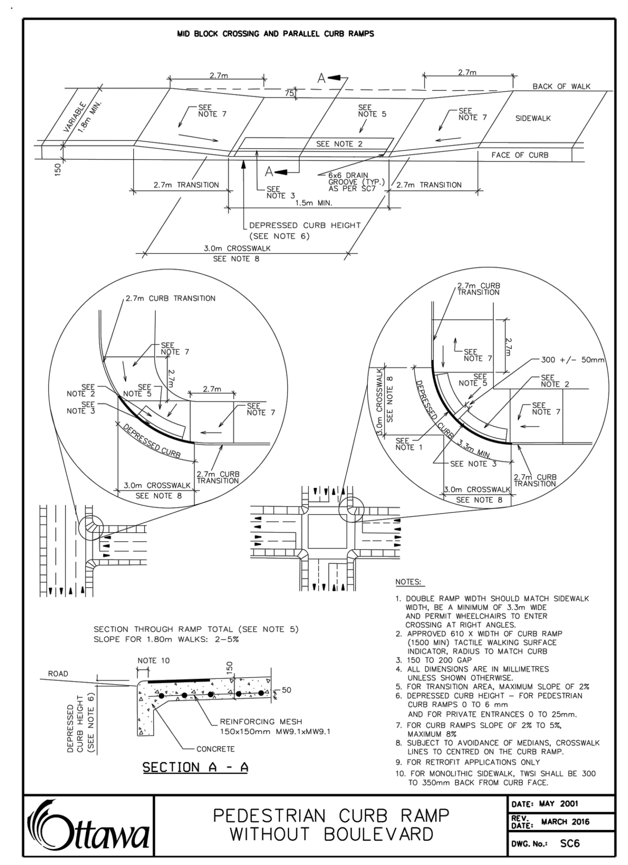
3 CATCH BASIN FLAT GRATE OPENINGS
Scale: N.T.S.



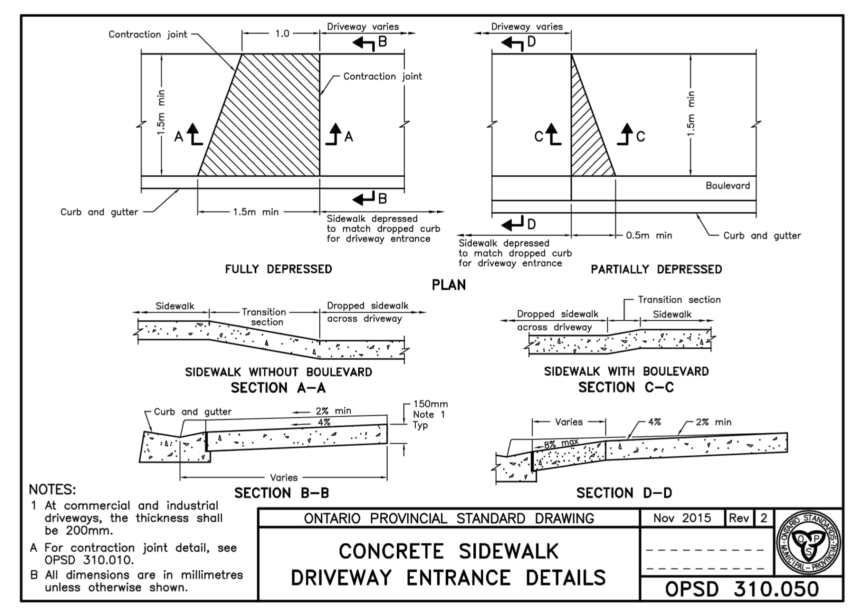
4 TYPICAL STEP JOINT & PAVEMENT STRUCTURE DETAIL
Scale: N.T.S.



5 CONCRETE SIDEWALK
Scale: N.T.S.



6 SIDEWALK RAMPS
Scale: N.T.S.

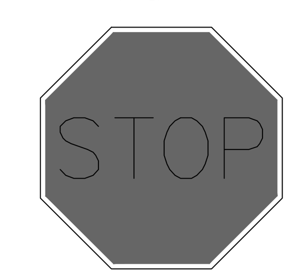


7 SIDEWALK AT DRIVEWAY ENTRANCE
Scale: N.T.S.

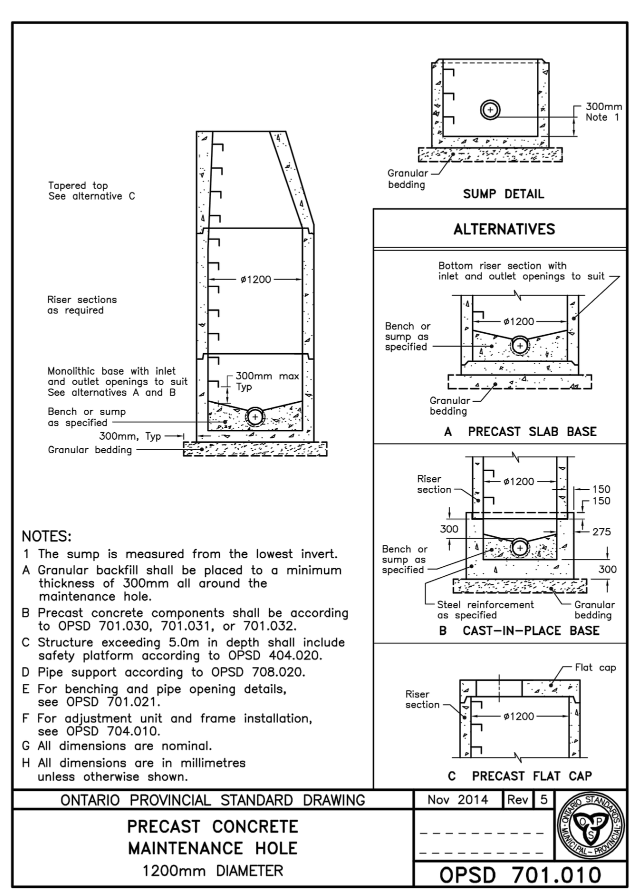
Rb-93

8 BARRIER FREE PARKING SIGN
Scale: N.T.S.

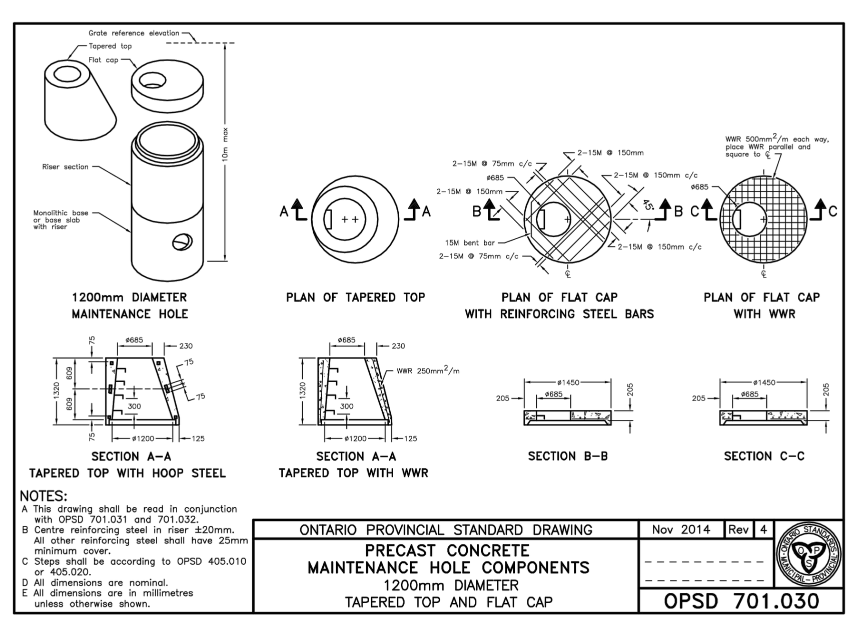
Ra-1



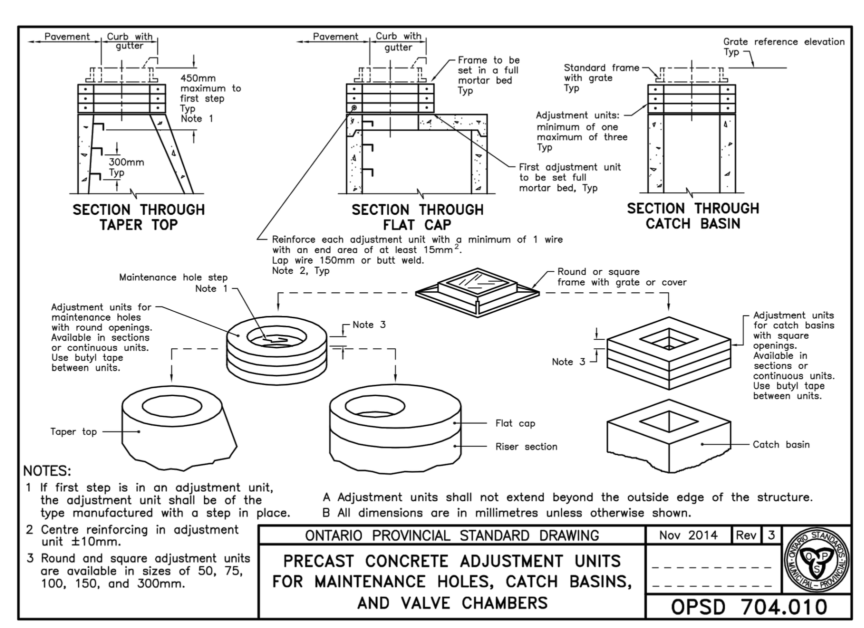
9 STOP SIGN
Scale: N.T.S.



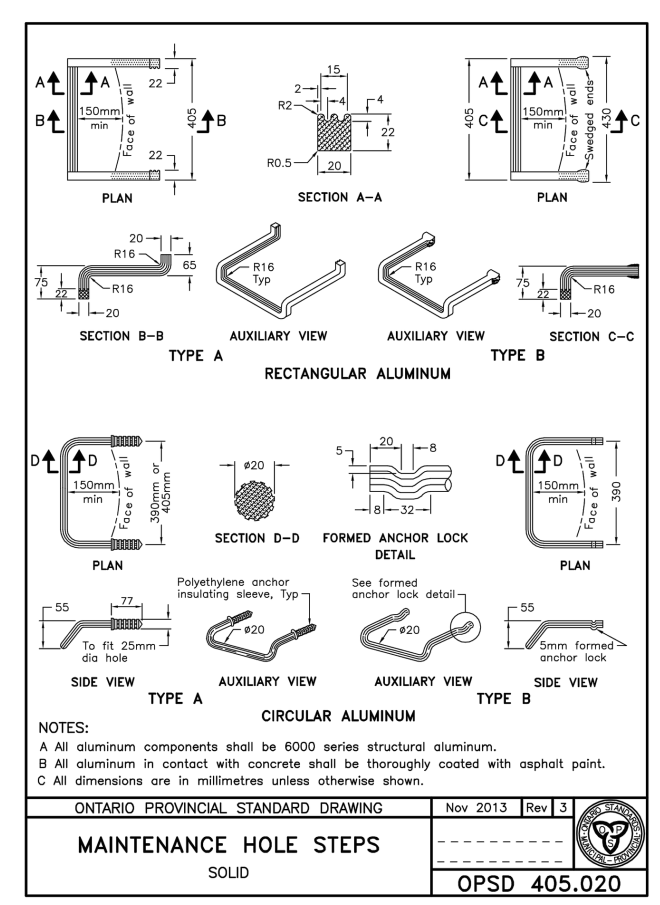
10 PRECAST CONCRETE MANHOLE
Scale: N.T.S.



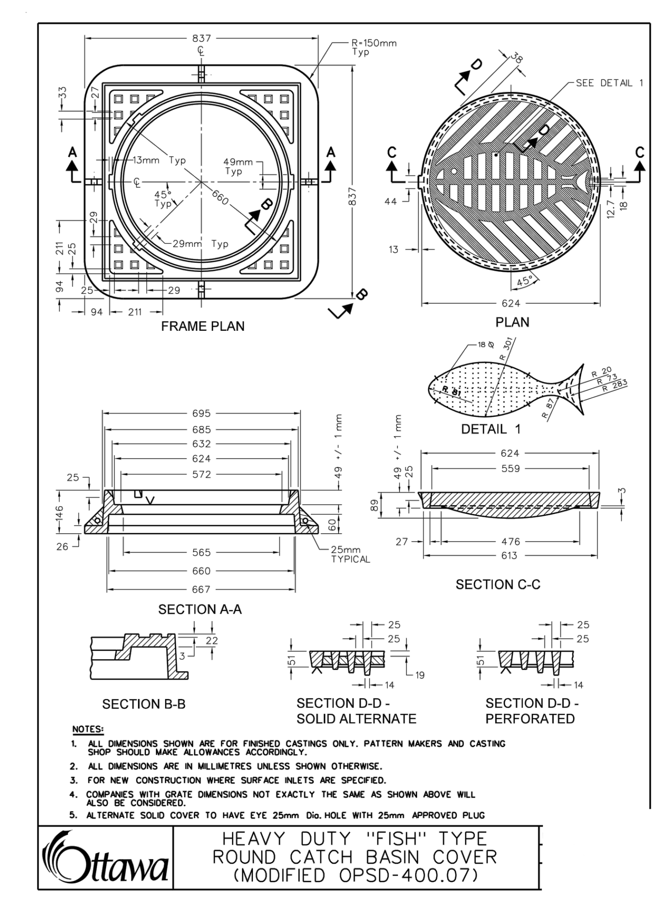
11 PRECAST MANHOLE COMPONENTS
Scale: N.T.S.



12 PRECAST MANHOLE ADJUSTMENT
Scale: N.T.S.



13 MANHOLE STEPS
Scale: N.T.S.



14 STORM MANHOLE LIDS
Scale: N.

CLIENT

39 Auriga Dr. Nepean, ON K2E 7Y8

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ISSUES

No.	DESCRIPTION	DATE
1	FIRST SUBMISSION	2021-05-...
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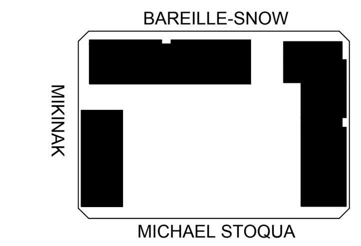
KEY PLAN



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August 24, 2021
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PROJECT

MIKINAK REDEVELOPMENT

715 MIKINAK ROAD, OTTAWA, ON CANADA K1K 2G8

PROJECT NO: 125599	SCALE: AS SHOWN
DRAWN BY: NA	CHECKED BY: BT
PROJECT MGR: CW	APPROVED BY: BT

SHEET TITLE

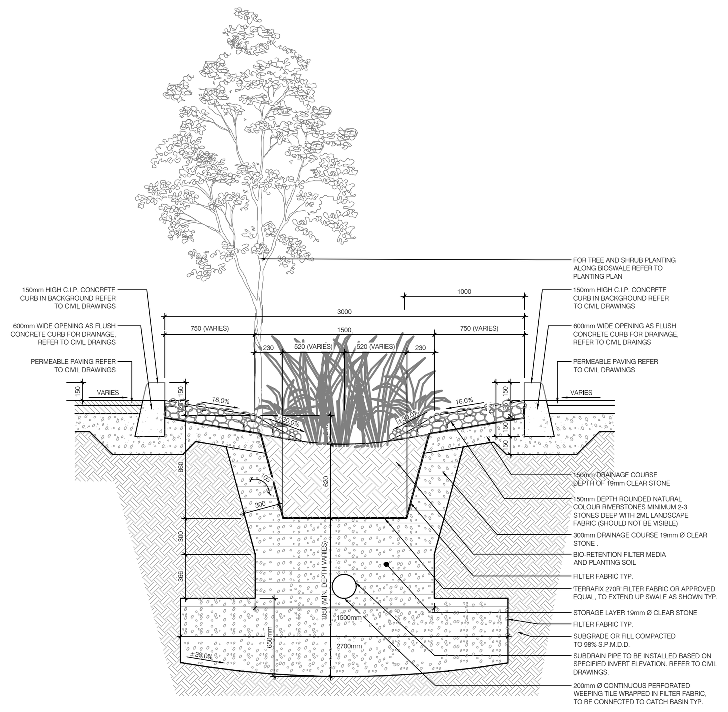
DETAILS I

SHEET NUMBER	ISSUE
CD1101	2

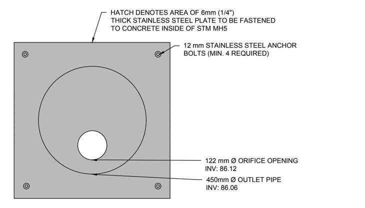
D07-12-21-0068

#18454

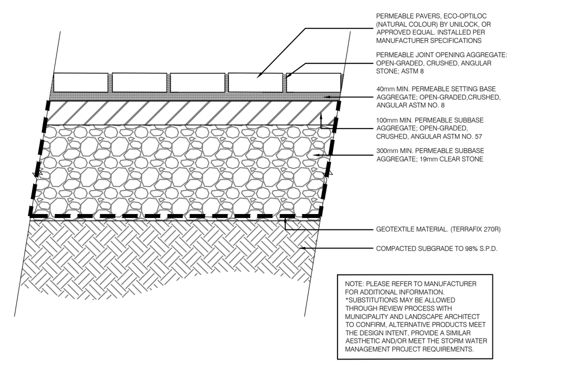
File Location: O:\125599_MikinakRedev\7.0_Production\7.03_Design\04_Civil\Sheets\CD1101.dwg Last Saved: August 22, 2021 by nino.alvarez Plotted: Monday, August 23, 2021 3:18:33 PM by Nino Alvarez



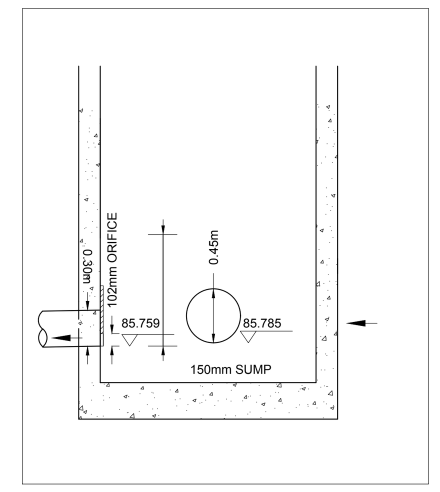
15 BIOSWALE
Scale: N.T.S.



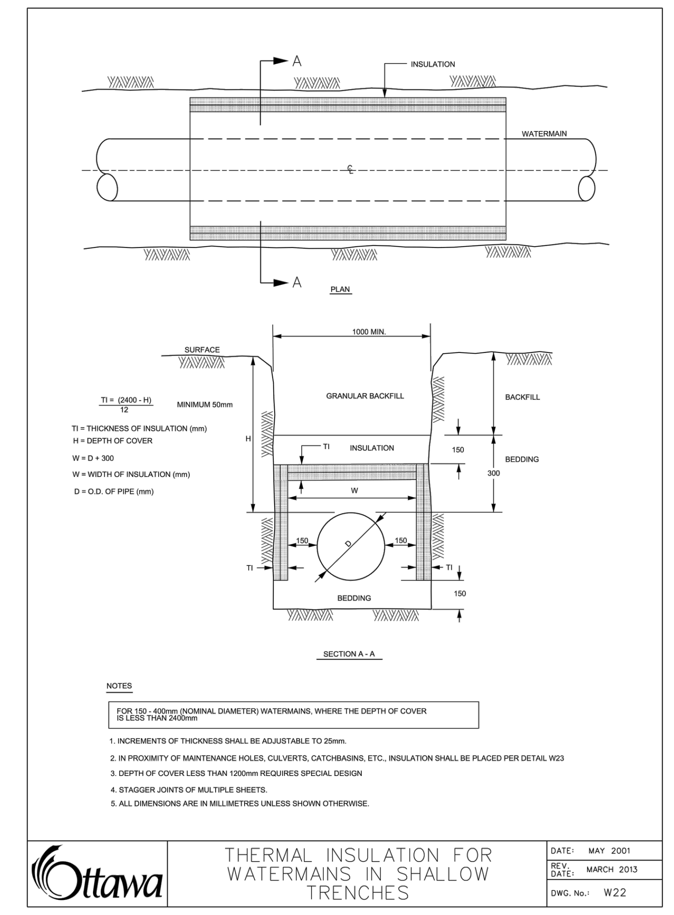
16 ORIFICE PLATE DETAIL
Scale: N.T.S.



17 PERMEABLE PAVEMENT & SUBDRAIN DETAIL
Scale: N.T.S.



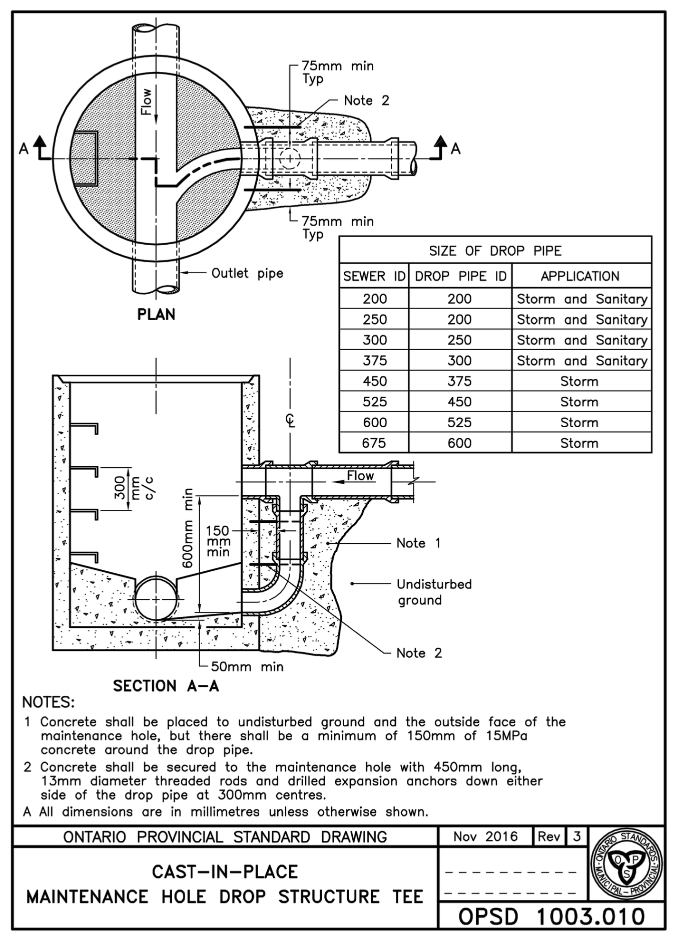
18 STM MH5 ORIFICE PLATE INSTALLATION
Scale: N.T.S.



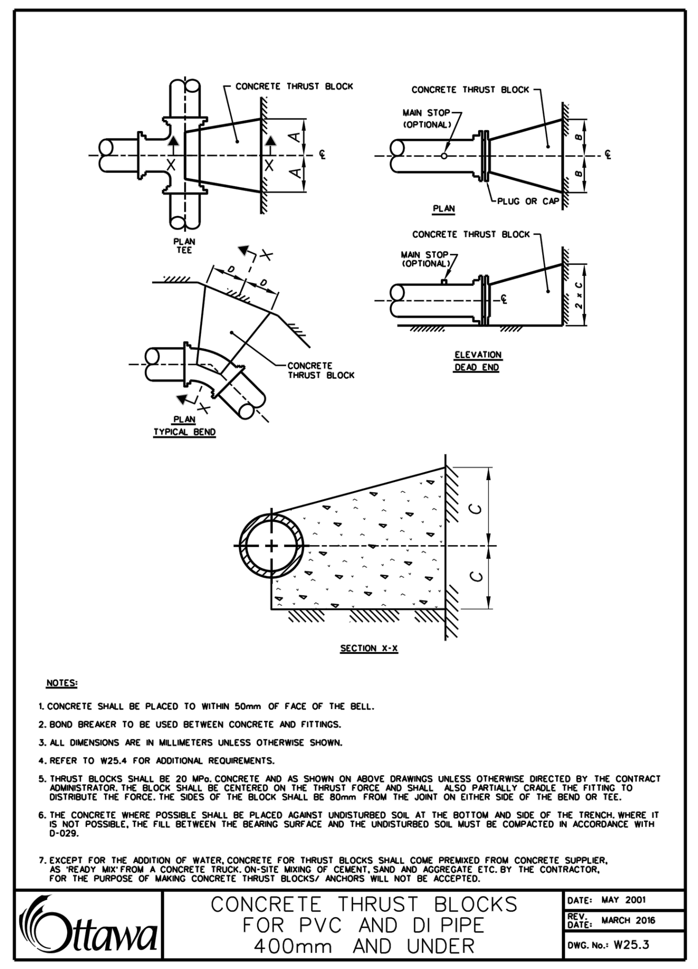
19 THERMAL INSULATION DETAIL
Scale: N.T.S.

PIPE SEGMENTS TO BE INSULATED PER W22 DETAIL

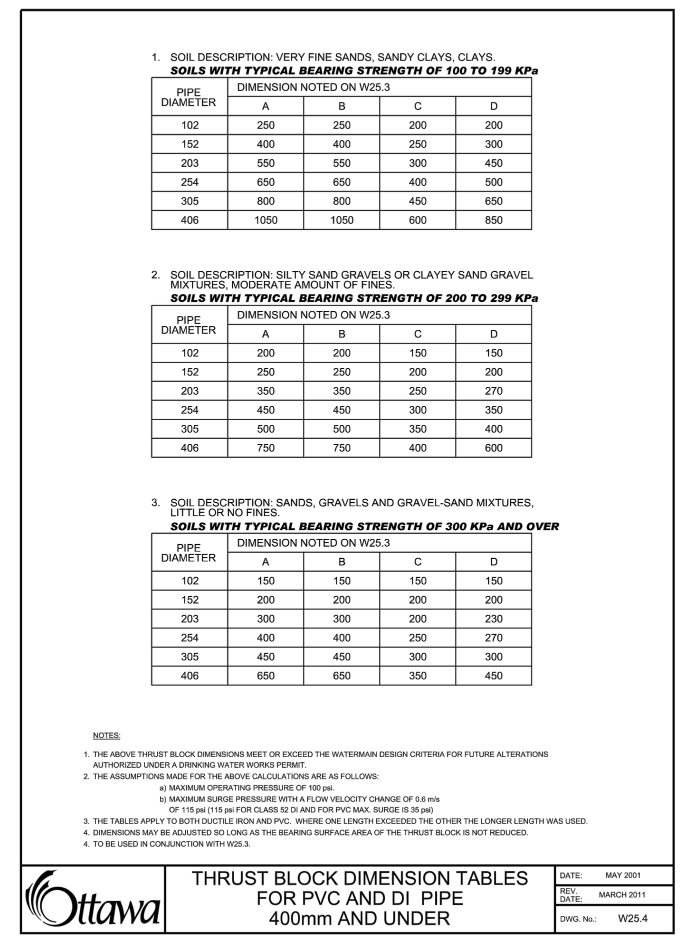
UPSTREAM MH NO.	DNSTREAM MH NO.	LENGTH (m)	THICKNESS (mm)	TYPE
BLDG A	STM MH1	12.5	50	STORM
STM MH1	STM MH4	25.0	50	STORM
STM MH4	BIOSWALE1	12.3	50	STORM
STM MH4	STM MH2	39.4	75	STORM
AD1	STM MH2	10.8	75	STORM
STM MH2	STM MH3	21.1	50	STORM
BLDG B	STM MH5	18.5	75	STORM
STM MH5	BIOSWALE2	10.6	75	STORM
STM MH5	STM MH3	39.4	75	STORM
BLDG C	STM MH6	12.4	75	STORM
STM MH6	BIOSWALE3	11.7	75	STORM
STM MH6	STM MH7	17.9	75	STORM
BLDG A	BLDG B	20.0	50	SANITARY



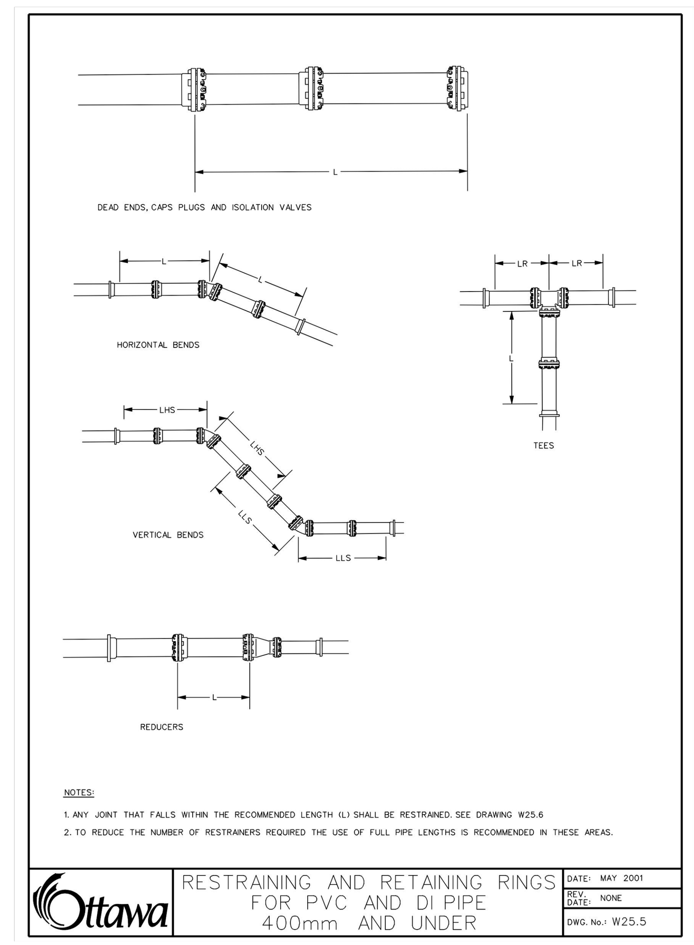
20 MANHOLE DROP STRUCTURE
Scale: N.T.S.



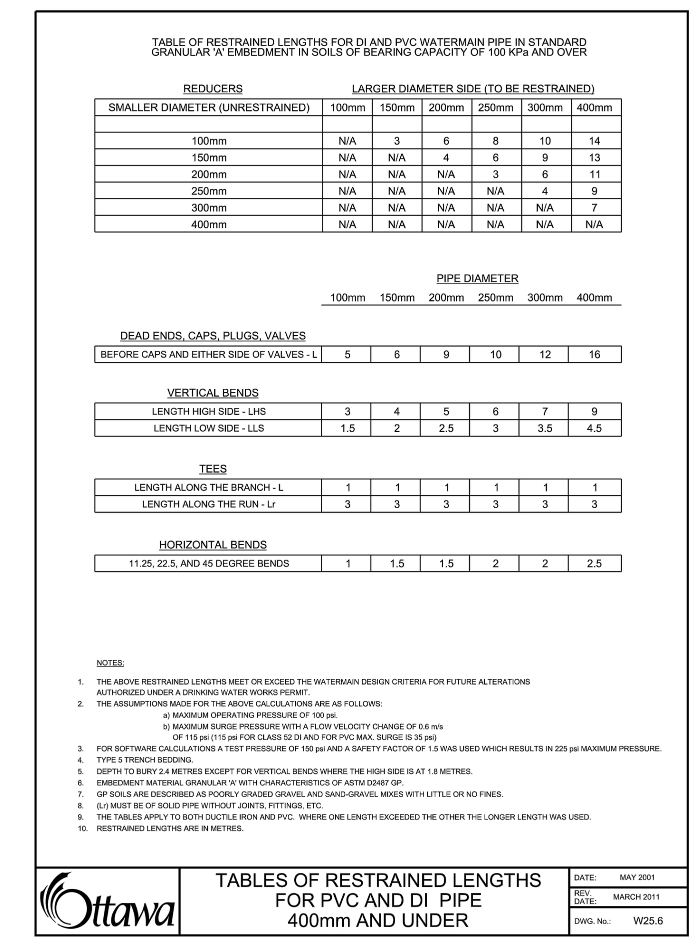
21 CONCRETE THRUST BLOCK
Scale: N.T.S.



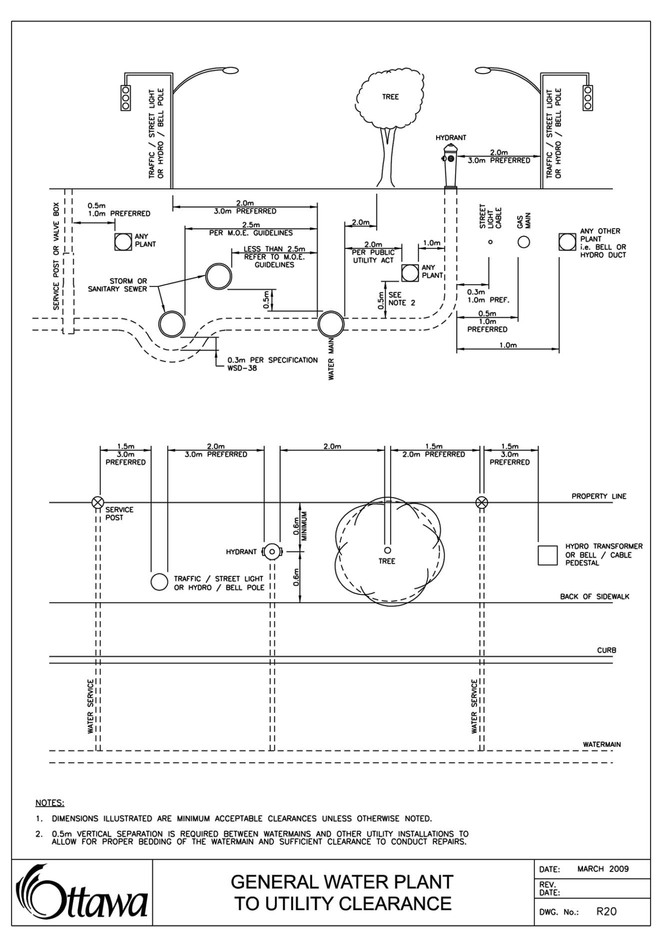
22 THRUST BLOCK DIMENSIONS
Scale: N.T.S.



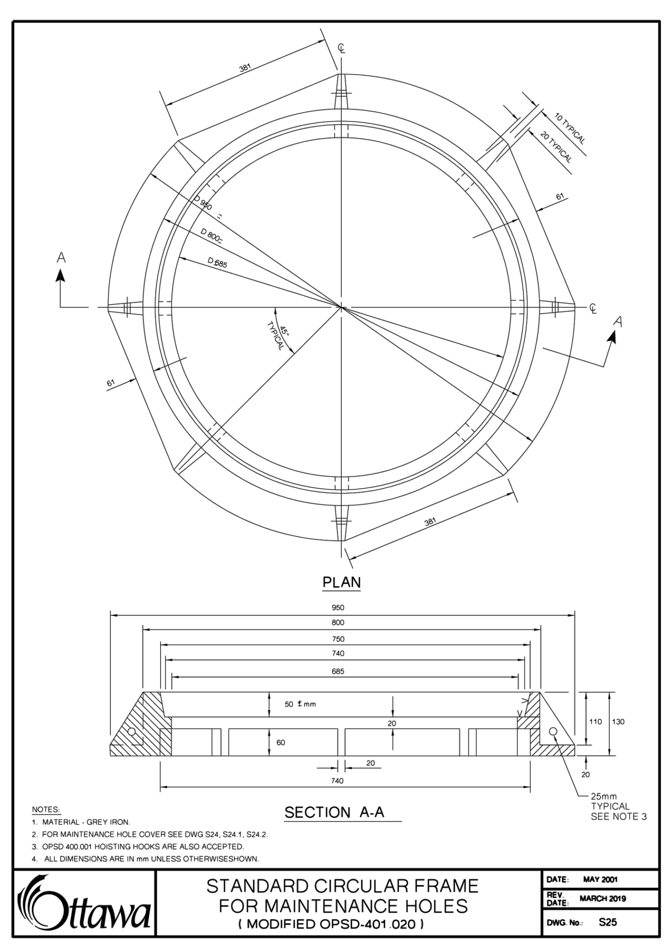
23 WM RESTRAINT DETAILS
Scale: N.T.S.



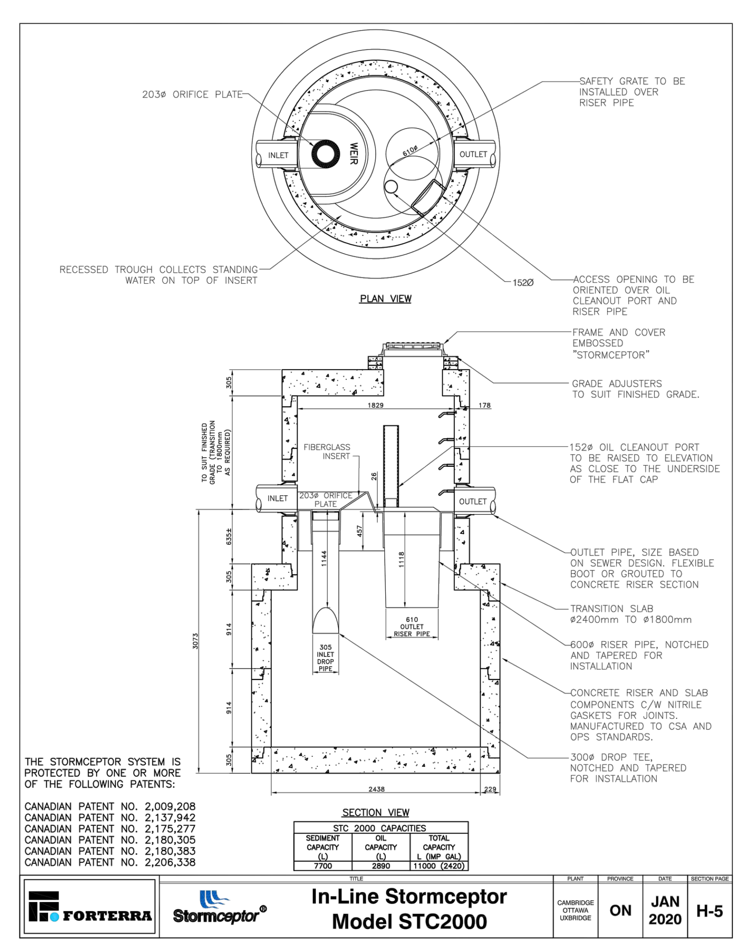
24 RESTRAINT LENGTH TABLE
Scale: N.T.S.



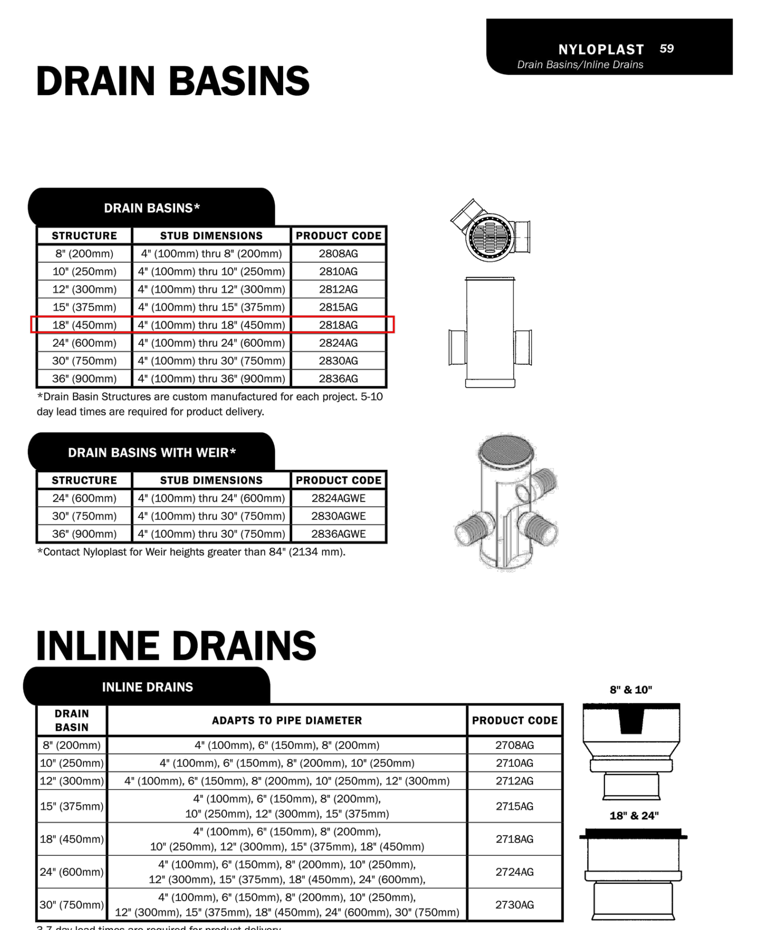
25 SEPARATION CLEARANCE
Scale: N.T.S.



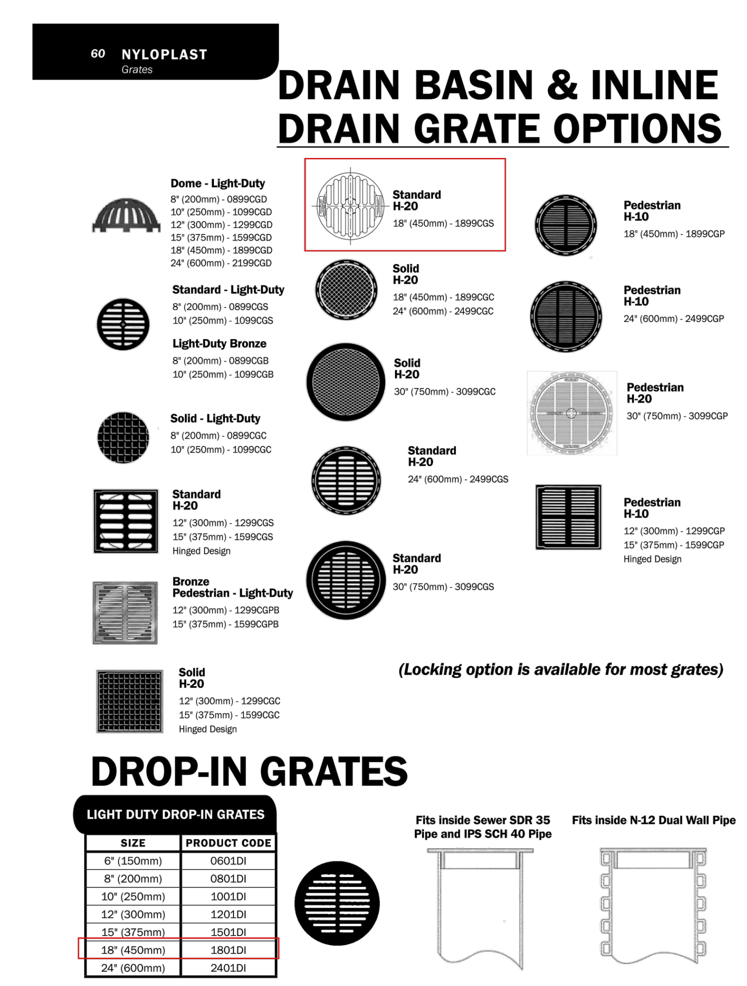
26 MANHOLE FRAME
Scale: N.T.S.



27 STC-2000
Scale: N.T.S.



28 AREA DRAIN BASIN
Scale: N.T.S.



29 DRAIN BASIN GRATE
Scale: N.T.S.

CLIENT

39 Auriga Dr. Nepean, ON K2E 7Y8

ISSUES

No.	DESCRIPTION	DATE
1	FIRST SUBMISSION	2021-05-20
2	SECOND SUBMISSION	2021-08-24

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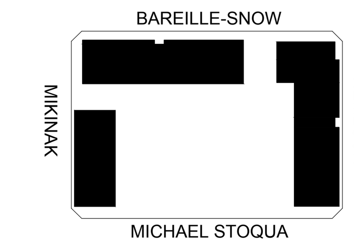
KEY PLAN



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PROJECT

MIKINAK REDEVELOPMENT

715 MIKINAK ROAD, OTTAWA, ON
CANADA K1K 2G8

PROJECT NO: 125599	SCALE: AS SHOWN
DRAWN BY: NA	CHECKED BY: BT
PROJECT MGR: CW	APPROVED BY: BT

SHEET TITLE

DETAILS II

SHEET NUMBER: CD1102
ISSUE: 2

#18454

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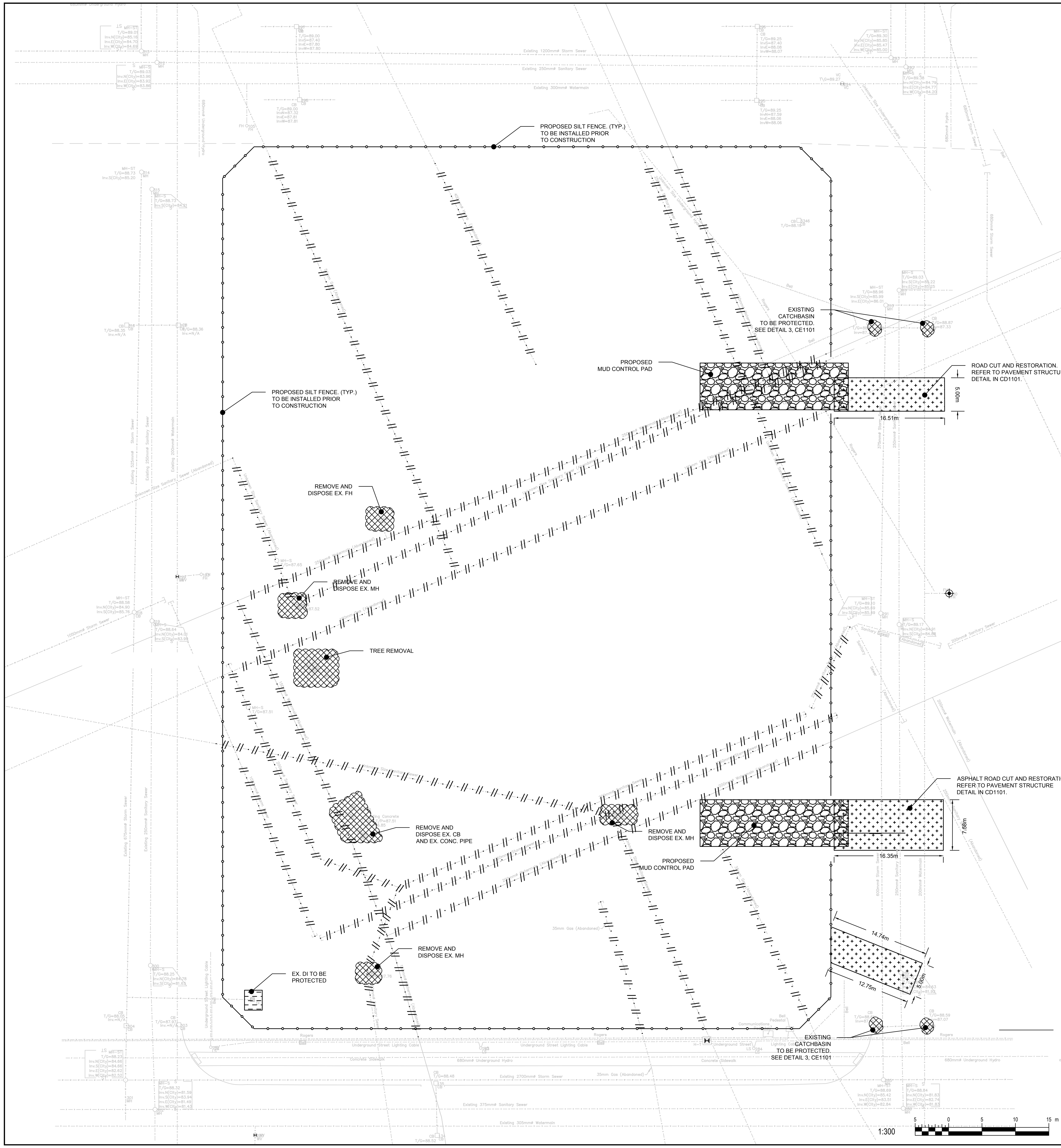
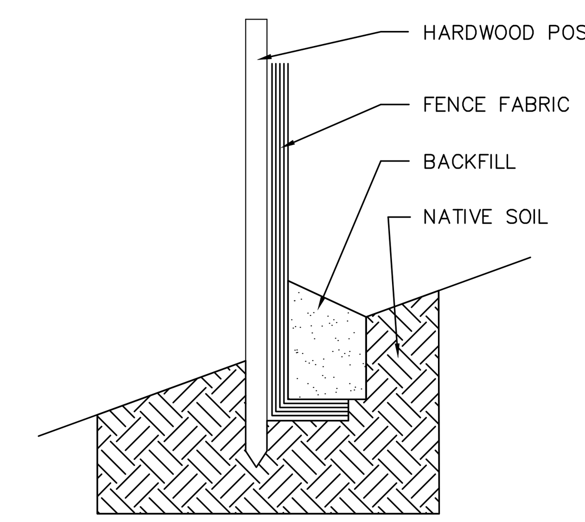
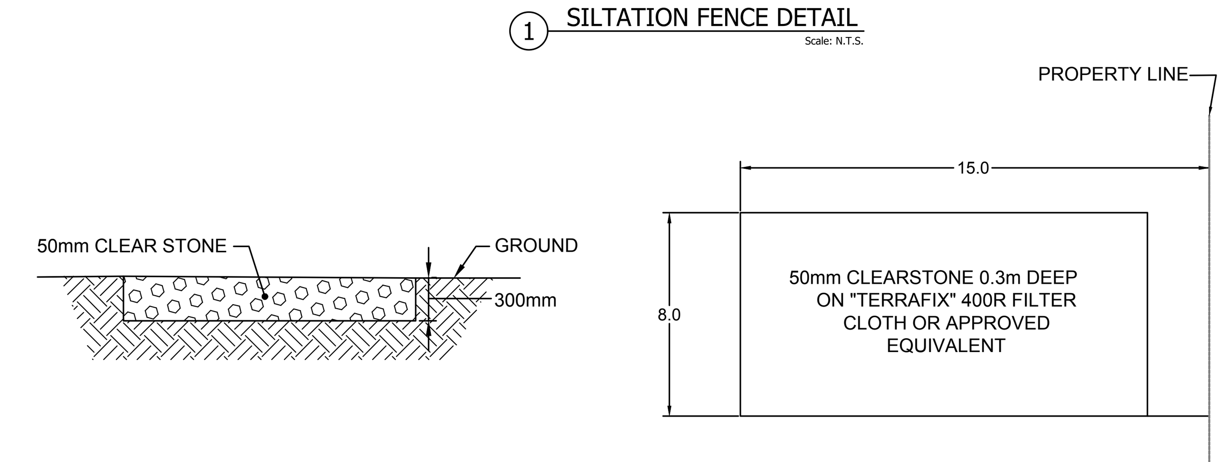




NOTES:

1. SILTATION FENCE FARIC TO BE "TERRAFENCE" OR APPROVED EQUAL.
2. FABRIC WIDTH TO BE 0.6m MINIMUM.
3. WOOD POSTS TO BE 0.9m HIGH AND INSTALLED AT 2.3m MAXIMUM SPACING.
4. FENCE INSTALLATION TO BE IN ACCORDANCE WITH MANUFACTURES RECOMENDATIONS AND TO THE SATISFACTION OF THE C.R.C.A.
5. CONTRACTOR TO INSTALL FENCE UPON COMMENCEMENT OF CONSTRUCTION. FENCE SHALL BE MAINTAINED UNTIL DISTURBED AREAS HAVE BEEN REVEGITATED.

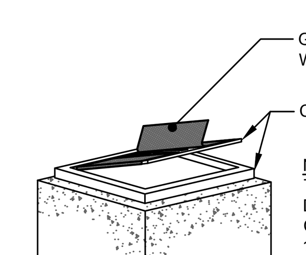
1 SILTATION FENCE DETAIL
Scale: N.T.S.



NOTES

REQUEST FOR TEMPORARY CONSTRUCTION ACCESS REQUIRES CONSENT FROM LOCAL MUNICIPALITY.

2 MUD MAT - TEMPORARY ACCESS DETAIL
Scale: N.T.S.

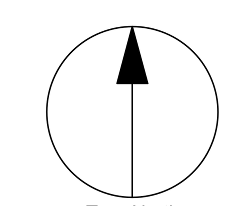


NOTES:

TO BE USED UNDER APPROPRIATE DRAINAGE CIRCUMSTANCES, DURING THE CONSTRUCTION PERIOD.

1. WOVEN GEOTEXTILE TO HAVE A MINIMUM EQUIVALENT OPENING SIZE OF 0.15mm AND A MAXIMUM EQUIVALENT OPENING SIZE OF 0.25mm.
2. WOVEN GEOTEXTILE TO BE REPLACES PERIODICALLY WHEN ACCUMULATED SEDIMENTS INTERFERE WITH DRAINAGE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.

2 CATCH BASIN SEDIMENT PROTECTION DETAIL
Scale: N.T.S.



CLIENT

Ottawa Community Housing / Logement Communautaire d'Ottawa

39 Auriga Dr. Nepean, ON K2E 7Y8

ISSUES

No.	DESCRIPTION	DATE
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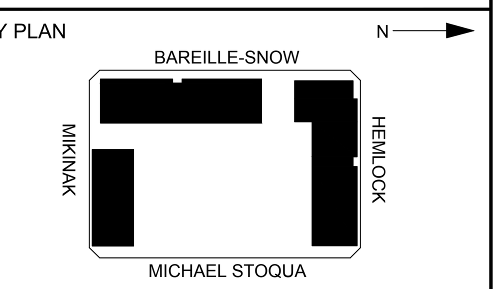
2	SECOND SUBMISSION	2021-08-24

NOT FOR CONSTRUCTION

KEY PLAN



LEGEND

- PROPOSED PIPE REMOVAL
- PROPOSED SILT FENCE
- PROPOSED MUD CONTROL PAD
- ROAD CUT AND RESTORATION
- EXISTING TO BE PROTECTED
- REMOVE AND DISPOSE

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PROJECT

MIKINAK REDEVELOPMENT

715 MIKINAK ROAD, OTTAWA, ON
CANADA K1K 2G8

PROJECT NO: 125599	SCALE: AS SHOWN
DRAWN BY: NA	CHECKED BY: BT
PROJECT MGR: CW	APPROVED BY: BT

SHEET TITLE

SEDIMENT & EROSION CONTROL PLAN

SHEET NUMBER	ISSUE
CE1101	2

D07-12-21-0068

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#18454

Appendix B – Water Distribution

1. Water Demand Calculation Sheet
2. FUS Fire Flow Calculation

IBI GROUP
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WATERMAIN DEMAND CALCULATION SHEET

PROJECT : 715 MIKINAK RD
CLIENT : OTTAWA COMMUNITY HOUSING

FILE: 125599
DATE PRINTED: 23-Aug-21
DESIGN: N.A.

NODE	RESIDENTIAL				NON-RESIDENTIAL (ICI)			AVERAGE DAILY DEMAND (l/s)			MAXIMUM DAILY DEMAND (l/s)			MAXIMUM HOURLY DEMAND (l/s)			FIRE DEMAND (l/min)
	STUDIO / 1 BEDROOM UNIT	2 BEDROOM UNITS	3 BEDROOM UNITS	POPULATION	INDUST. (ha)	COMM. (ha)	INSTIT. (ha)	RESIDENTIAL	ICI	TOTAL	RESIDENTIAL	ICI	TOTAL	RESIDENTIAL	ICI	TOTAL	
Building A	66	32	16	267		0.0083		0.87	0.0024	0.87	2.16	0.0036	2.17	4.76	0.0043	4.76	7,000
Building B	58	35	22	291.0		0.0083		0.94	0.0024	0.95	2.36	0.0036	2.36	5.19	0.0043	5.19	6,000
Building C	42	-	-	63.0		0.0073		0.20	0.0021	0.21	0.51	0.0032	0.51	1.12	0.0038	1.13	4,000
Total	166	67	38	621				2.01	0.0069	2.02	5.03	0.0104	5.04	11.07	0.0124	11.08	

POPULATION DENSITY

3 Bedroom Unit	4.5 persons/unit
2 Bedroom unit	3.0 persons/unit
Studio/1 Bedroom Unit	1.5 persons/unit

WATER DEMAND RATES

Residential	280 l/cap/day
Commercial Shopping Center	2,500 L/(1000m2)/day

PEAKING FACTORS

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

FIRE DEMANDS

Single Family	10,000 l/min (166.7 l/s)
Semi Detached & Townhouse	10,000 l/min (166.7 l/s)
Medium Density	15,000 l/min (250 l/s)

NOTE

Fire Flow Requirement from Fire Underwriters Survey - 715 Mikinak Street, Ottawa, ON

Proposed Building A

Total Floor Area 3,660 m^2

1.0) F = 220C√A *(Fire Underwriters Survey)*

C	0.8	
A	3,660	m^2
F	10,648	l/min
use	**11,000**	l/min

C =

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

2.0) Occupancy Adjustment

Use	-25%	
Adjustment	-2662	l/min
Fire flow	**8,338**	l/min

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

3.0) Sprinkler Adjustment

Use	-30%	
Adjustment	**2501**	l/min
Fire flow	**(5,837)**	l/min

-30%	system conforming to NFPA 13
-10%	Additional if water supply standard toboth system and fire department hose lines.
-50%	complete automatic system

4.0) Exposure Adjustment

Building Face	Separation (m)	Adjacent Exposed Wall Length	Stories	L*H Factor	Exposure Charge
north	>45	0.0	0	0	0%
east	>45	0.0	0	0	0%
south	17.3	21.0	7	147	15%
west	>45	0.0	0	0	0%
Total					15%

Adjustment (875) l/min

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

Maximum charge shall not exceed 75%

Fire flow	(6,712)	l/min
Use	**(7,000)**	**l/min**
	(117)	**l/s**

Fire Flow Requirement from Fire Underwriters Survey - 715 Mikinak Street, Ottawa, ON

Proposed Building B

Total Floor Area 2,483 m^2

1.0) F = 220C√A *(Fire Underwriters Survey)*

C	0.8		
A	2,483	m^2	
F	8,770	l/min	
use	**9,000**	l/min	

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

2.0) Occupancy Adjustment

Use	-25%	
Adjustment	-2250	l/min
Fire flow	**6,520**	l/min

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

3.0) Sprinkler Adjustment

Use	-30%	
Adjustment	**1956**	l/min
Fire flow	**(4,564)**	l/min

-30%	system conforming to NFPA 13
-10%	Additional if water supply standard toboth system and fire department hose lines.
-50%	complete automatic system

4.0) Exposure Adjustment

Building Face	Separation (m)	Adjacent Exposed Wall Length	Stories	L*H Factor	Exposure Charge
north	17.3	21.0	7	147	15%
east	14.8	19.2	4	77	15%
south	>45	0.0	0	0	0%
west	>45	0.0	0	0	0%
Total					30%
Adjustment			(1,369) l/min		

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

Maximum charge shall not exceed 75%

Fire flow	(5,933)	l/min
Use	**(6,000)**	**l/min**
	(100)	**l/s**

Fire Flow Requirement from Fire Underwriters Survey - 715 Mikinak Street, Ottawa, ON

Proposed Building C

Total Floor Area 1,312 m^2

1.0) $F = 220C\sqrt{A}$ *(Fire Underwriters Survey)*

C	0.8	C =	1.5 wood frame
A	1,312 m^2		1.0 ordinary
			0.8 non-combustible
F	6,375 l/min		0.6 fire-resistive
use	**6,000** l/min		

2.0) Occupancy Adjustment

Use	-25%	-25% non-combustible
		-15% limited combustible
		0% combustible
		+15% free burning
Adjustment	-1594 l/min	+25% rapid burning
Fire flow	**4,406** l/min	

3.0) Sprinkler Adjustment

Use	-30%	-30% system conforming to NFPA 13
		-10% Additional if water supply standard toboth system and fire department hose lines.
		-50% complete automatic system
Adjustment	**1322** l/min	
Fire flow	**(3,084)** l/min	

4.0) Exposure Adjustment

Building Face	Separation (m)	Adjacent Exposed Wall Length	Stories	L*H Factor	Exposure Charge
north	>45	0.0	0	0	0%
east	>45	0.0	0	0	0%
south	>45	0.0	0	0	0%
west	14.8	81.4	7	570	15%
Total					15%

Adjustment (463) l/min

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

Maximum charge shall not exceed 75%

Fire flow	(3,547) l/min
Use	**(4,000) l/min**
	(67) l/s

Appendix C – Sanitary Sewer

1. Sanitary Sewer Design Sheet
2. Former CFB Rockcliffe Sanitary Sewer Design Sheet, CLC.
3. CFB Rockcliffe Master Servicing Study Wastewater Plan
4. CFB Rockcliffe Master Servicing Study Phase 1B Wastewater Plan

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ibigroup.com

SANITARY SEWER DESIGN SHEET

PROJECT: 125599
LOCATION: 715 MIKINAK ROAD, OTTAWA, ON
CLIENT: OTTAWA COMMUNITY HOUSING

LOCATION	Tributary Area			RESIDENTIAL								INSTITUTIONAL COMMERCIAL INDUSTRIAL							INFILTRATION ALLOWANCE			TOTAL FLOW	PROPOSED SEWER DESIGN							
				UNIT				POPULATION		FLOWS		AREA (ha)																		
Street	Area ID	From BLDG	To MH	Studio / 1 Bedroom	2 Bedroom	3 Bedroom	Area (Ha.)	INDIV.	CUM.	Peaking Factor	Peak Flow (l/s)	INSTITUITION Indiv	INSTITUITION Cumm.	COMMERCIAL Indiv	COMMERCIAL Cumm.	INDUSTRIAL Indiv	INDUSTRIAL Cumm.	Pk. Flow (l/s)	Incr. Area (Ha.)	Cum. Area (Ha.)	Flow (l/s)	(l/s)	Capacity (l/s)	Pipe Size (mm)	Length (m)	Slope (%)	Velocity @ Full Pipe (m/s)	Vel @ Design (m/s)	Avail. Cap. L/s	Avail. Cap. (%)
Existing sanitary sewer - Barielle-Snow Street		*MH-208A (Upstream)*	*MH-209A (Downstream)*																			*3.64*	*50.02*	*250*	*64.85*	*0.65*	*0.99*		*46.37*	*92.72*
Existing sanitary sewer - Michael Stoqua Street		*MH-211A (Upstream)*	*MH-166B (Downstream)*																			*1.91*	*50.02*	*250*	*52.19*	*0.65*	*0.98*		*48.11*	*96.18*
BLDG C	1	BLDG C	SAN MH3	42	0	0	0.24	63	63	4.00	0.82			0.0073					0.25	0.25	0.08	0.90	73.34	200	4.8	5.00	2.34	0.79	73.32	99.97
		SAN MH3	EX. MH																			0.90	46.38	200	11.4	2.00	1.48	0.58	46.36	99.96
BLDG B	2	Proposed	BLDG A	58	35	22	0.72	280	280	4.00	3.63			0.0083					0.73	0.73	0.24	3.87	59.47	250	20.0	1.00	1.21	0.68	55.60	93.49
BLDG A	3	BLDG A	SAN MH2	66	32	16	0.72	259	539	3.96	6.91			0.0083					0.73	0.73	0.24	7.15	92.77	200	3.6	8.00	2.95	1.74	85.62	92.29
		SAN MH 2	SAN MH 1						539	3.96	6.91								0.00	0.00	0.00	6.91	64.10	200	13.5	3.82	2.04	1.33	57.19	89.22

Designed: NA		**REVISION**	**DATE**
Checked: BT			
Dwg Reference: CU1101 - Servicing Plan	**File Ref:** 125599	**Date:** 2021-08-23	**Sheet No.** 1 of 1

ICI Rates
Institution 30000
Commercial 50000
Industrial 35000

Pop. Per Bedroom (Studio / 1 Bedroom):	1.5	Bedroom/Unit
Pop. Per Bedroom (2 Bedroom):	3	Bedroom/Unit
Pop. Per Bedroom (3 Bedroom):	4	Bedroom/Unit
Avg. Per Capita Flow Rate:	280	L/day/cap
Infiltration Allowance:	0.33	l/sec/Ha
Assumed pipe loss ceofficient =	0.013	
Residential Peaking Factor:	4.00	

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SANITARY SEWER DESIGN SHEET

Former CFB Rockcliffe
City of Ottawa
Canada Lands Company

LOCATION				RESIDENTIAL										ICI AREAS							INFILTRATION ALLOWANCE			FIXED	TOTAL	PROPOSED SEWER DESIGN						
				AREA	UNIT TYPES				AREA	POPULATION		PEAK	PEAK	AREA (Ha)						PEAK	AREA (Ha)		FLOW	FLOW	FLOW	CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
														INSTITUTIONAL		COMMERCIAL		INDUSTRIAL		FLOW										(full)		
STREET	AREA ID	FROM MH	TO MH	Phase 1B (Ha)	SF	SD	TH	APT	EXTERNAL (Ha)	IND	CUM	FACTOR	FLOW (L/s)	IND	CUM	IND	CUM	IND	CUM	(L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(m/s)	L/s	(%)
Phase 1A																																
croissant Squadron Crescent		*MH169A*	*MH165A*							0.0	3078.5	3.43	42.81		2.62		3.83		0.00	5.60	0.00	36.35	10.18	0.00	58.59	63.80	*27.00*	*300*	*0.40*	0.874	5.22	8.18%
Phase 1B																																
rue Moses Tennisco Street	212A	MH213A	MH212A	1.20						252.0	252.0	4.00	4.08		0.00		0.00		0.00	0.00	1.20	1.20	0.34	0.00	4.42	50.02	44.22	250	0.65	0.987	45.60	91.16%
rue Moses Tennisco Street	BLOCK 24	BLK212AE	MH212A	Design by Others																						62.04	10.00	250	1.00	1.224	62.04	100.00%
rue Moses Tennisco Street	213A	MH212A	*BULK165AN*	0.35						52.5	304.5	4.00	4.93		0.00		0.00		0.00	0.00	0.35	1.55	0.43	0.00	5.37	39.24	10.84	250	0.40	0.774	33.87	86.32%
Phase 1A																																
rue Moses Tennisco Street		*BULK165AN*	*MH165A*							0.0	304.5	4.00	4.93		0.00		0.00		0.00	0.00	0.00	1.55	0.43	0.00	5.37	39.24	*22.50*	*250*	*0.40*	0.774	33.87	86.32%
Phase 1B																																
rue Michael Stoqua Street	BLOCK 22	BLK210AE	MH210A	Design by Others																						62.04	10.00	250	1.00	1.224	62.04	100.00%
rue Michael Stoqua Street	210A	MH210A	MH211A	0.40						52.5	52.5	4.00	0.85		0.00		0.00		0.00	0.00	0.40	0.40	0.11	0.00	0.96	50.02	48.73	250	0.65	0.987	49.05	98.08%
rue Michael Stoqua Street	211A	MH211A	MH166B	0.35						52.5	105.0	4.00	1.70		0.00		0.00		0.00	0.00	0.35	0.75	0.21	0.00	1.91	50.02	52.19	250	0.65	0.987	48.11	96.18%
Phase 1A																																
rue Michael Stoqua Street		MH166B	*MH166A*							0.0	105.0	4.00	1.70		0.00		0.00		0.00	0.00	0.00	0.75	0.21	0.00	1.91	39.24	*21.10*	*250*	*0.40*	0.774	37.33	95.13%
Phase 1B																																
rue Bareille-Snow Street	208A	MH208A	MH209A	1.01						207.4	207.4	4.00	3.36		0.00		0.00		0.00	0.00	1.01	1.01	0.28	0.00	3.64	50.02	64.85	250	0.65	0.987	46.37	92.72%
rue Bareille-Snow Street	209A	MH209A	MH167B	0.35						52.6	260.0	4.00	4.21		0.00		0.00		0.00	0.00	0.35	1.36	0.38	0.00	4.59	50.02	52.87	250	0.65	0.987	45.42	90.82%
Phase 1A																																
rue Bareille-Snow Street		MH167B	*MH167A*							0.0	260.0	4.00	4.21		0.00		0.00		0.00	0.00	0.00	1.36	0.38	0.00	4.59	63.80	*20.43*	*300*	*0.40*	0.874	59.21	92.80%
Phase 1B																																
Codd's Road	230A	BLK231AN	MH231A						0.87	85.7	85.7	4.00	1.39		0.00		0.00		0.00	0.00	0.87	0.87	0.24	0.00	1.63	75.98	3.00	250	1.50	1.500	74.35	97.85%
Codd's Road	231A, EXPARK1	MH231A	*BULK176AN*						0.76	43.3	129.0	4.00	2.09		0.00		0.00		0.00	0.00	0.76	1.63	0.46	0.00	2.55	87.74	50.22	250	2.00	1.731	85.19	97.10%
Phase 1A																																
Codd's Road		*BULK176AN*	*MH176A*							0.0	129.0	4.00	2.09		0.00		0.00		0.00	0.00	0.00	1.63	0.46	0.00	2.55	55.49	*23.23*	*250*	*0.80*	1.095	52.94	95.41%

Design Parameters:

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

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

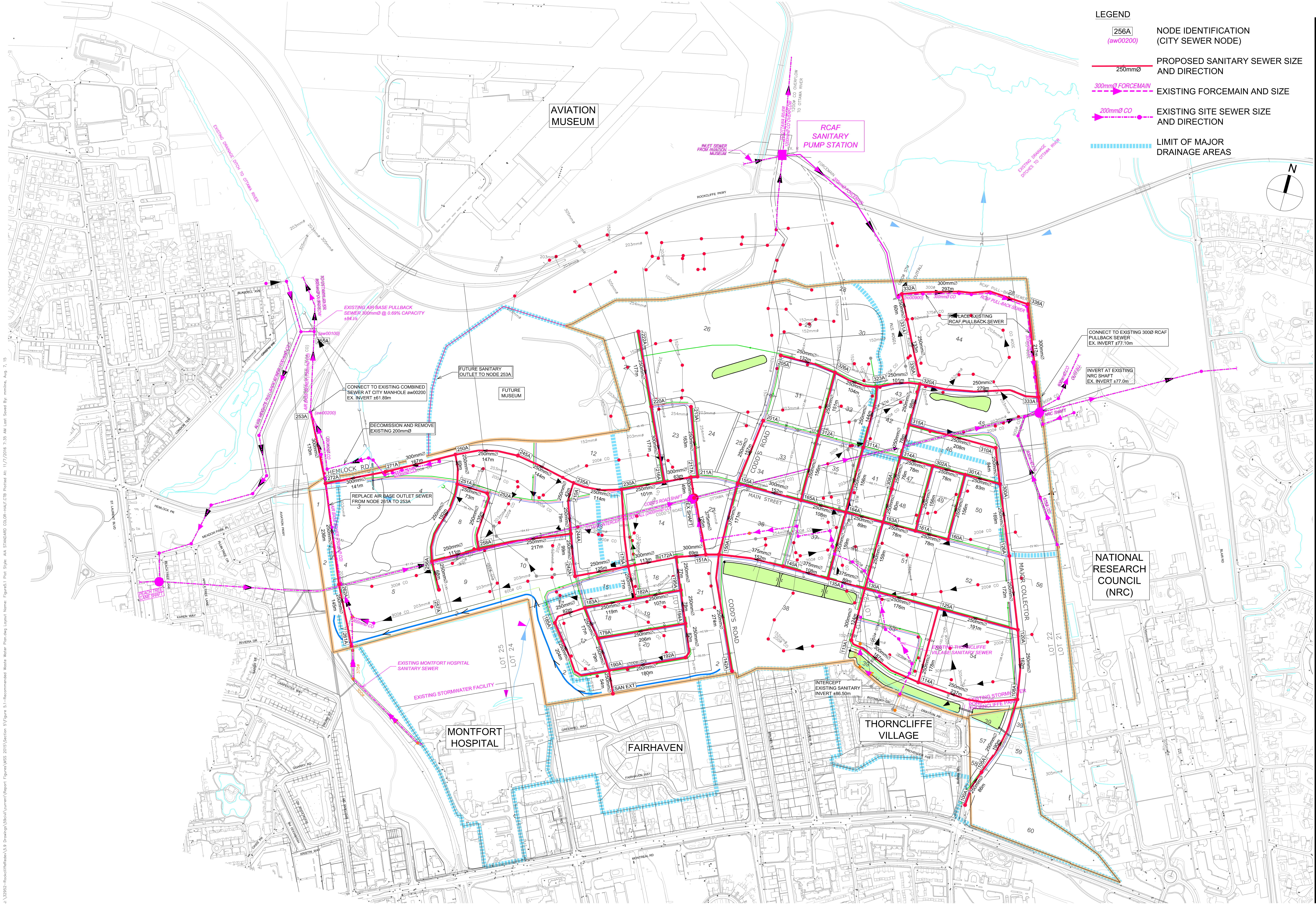
Designed: WY

Checked: JIM

Dwg. Reference: 38298-501

No.	Revision	Date
1.	City submission No. 1	2016-07-08
2.	City submission No. 2	2016-11-04
3.	City submission No. 3	2017-01-25
4.	Revised as per Mattamy's Design	2017-12-08

File Reference:	Date:	Sheet No:
38298.5.7.1	2016-07-08	2 of 2



Scale

Project Title

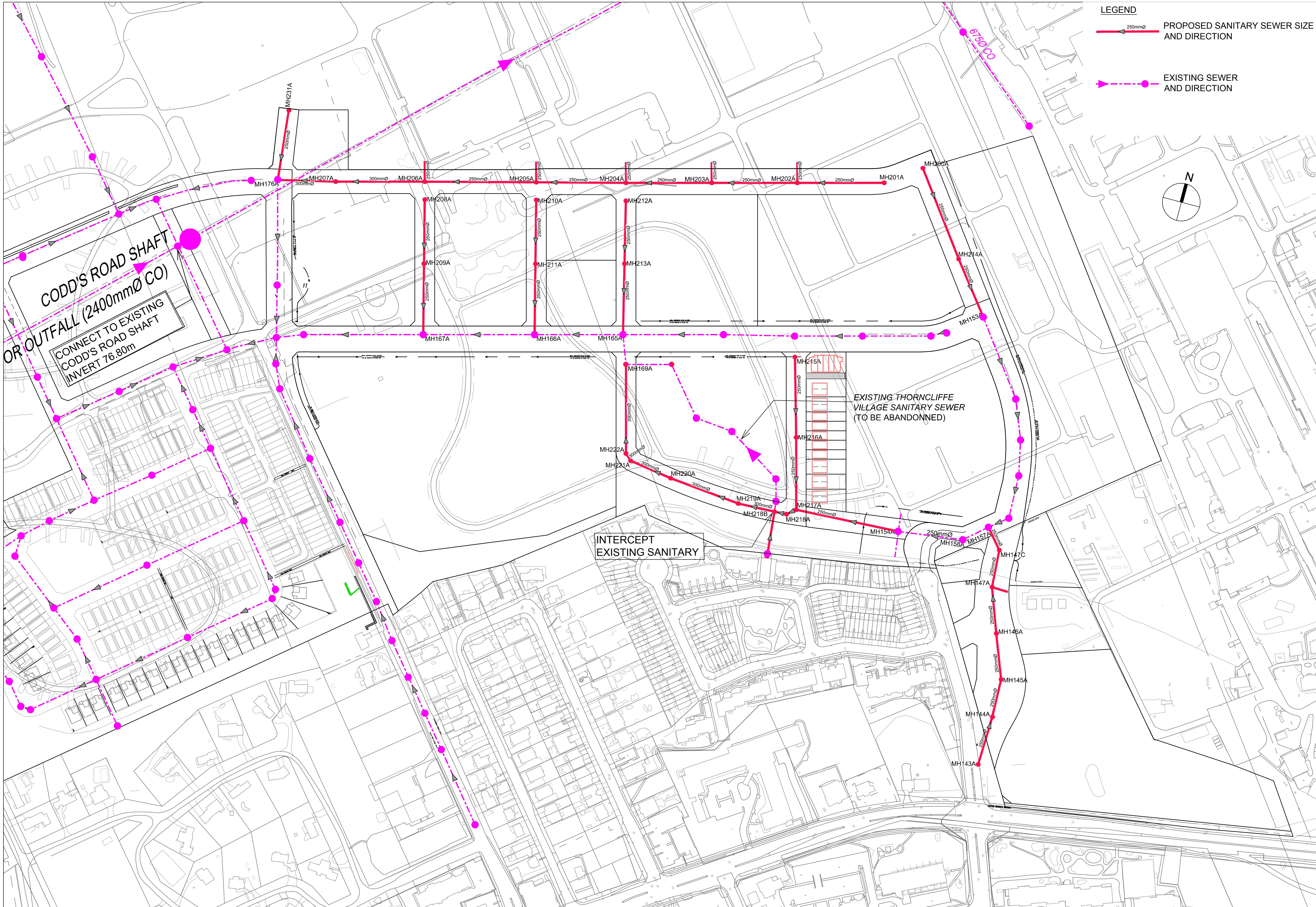
FORMER CFB ROCKCLIFFE MASTER SERVICING STUDY

Drawing Title

RECOMMENDED WASTEWATER PLAN

Sheet No.

FIGURE 5.1



Scale

Project Title

DESIGN BRIEF
WATERIDGE VILLAGE
AT ROCKCLIFFE
PHASE 1B

Drawing Title

RECOMMENDED
WASTEWATER PLAN

Sheet No.

FIGURE 3.1

Appendix D – Stormwater

1. Storm Sewer Design Sheet
2. SWM Pre-Post Figures
3. Storage Volume Calculations
4. Orifice Plate Calculation
5. Stormceptor STC-2000
6. Ponding Plan
7. Storm HGL Calculation Sheet
8. Wateridge Village Ph1B – Michael Stoqua St.

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WEIGHTED RUNOFF COEFFICIENTS

PROJECT: 125599
LOCATION: 715 MIKINAK ROAD, OTTAWA, ON
CLIENT: OTTAWA COMMUNITY HOUSING

Drainage Area		Weighted Runoff Coefficient					
		Grass		Pavers		Bldg/Asphalt/Concrete	
ID	Total Area (m^2)	0.25	0.40	0.60	0.80	0.90	Cw
Existing - See SWM1							
100	12,184	12,184	0	0	0	0	0.25
Total.-	12,184	12,184	0	0	0	0	0.25
Proposed - See SWM2							
UNC1	180	59	0	0	0	107	0.62
UNC2	633	410	0	0	0	198	0.44
BLDG A	1,879	0	0	0	0	1,879	0.90
100	2,409	663	0	616	0	1,128	0.64
BLDG B	1,742	0	0	0	0	1,742	0.90
UNC3	646	439	0	94	0	115	0.42
200	1,242	306	0	446	0	490	0.63
300	2,300	672	0	597	0	1,032	0.63
BLDG C	929	0	0	0	0	929	0.90
UNC4	223	137	0	0	0	86	0.50
Total.-	12,184	2,686	0	1,754	0	7,705	0.71

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EXISTING MINOR STORM EVENT

PROJECT: 125599
LOCATION: 715 MIKINAK ROAD, OTTAWA, ON
CLIENT: OTTAWA COMMUNITY HOUSING

Drainage Area			AREA (ha)						RATIONAL DESIGN FLOW					
CP	Area ID	Area	C= 0.25	C= 0.40	C= 0.60	C= 0.80	C= 0.90	Cw	Indiv. 2.78AC	Accum. 2.78AC	Inlet (min.)	Total Time (min.)	I (mm/Hr)	Peak Flow (L/s)
CP # 1	100	1.22	1.22	0.00	0.00	0.00	0.00	0.25	0.85	0.85	15.00	15.00	83.56	**70.8**

Designed:
NA

Checked:
BT

Dwg. Reference:
FIGURE SWM1 - EXISTING DRAINAGE EXHIBIT

Revision

Sheet No:	Date
1 of 1	2021-08-23

Q = 2.78AIC, 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] 5yr

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EXISTING MAJOR STORM EVENT

PROJECT: 125599
LOCATION: 715 MIKINAK ROAD, OTTAWA, ON
CLIENT: OTTAWA COMMUNITY HOUSING

Drainage Area			AREA (ha)						RATIONAL DESIGN FLOW					
CP	Area ID	Area	C= 0.25	C= 0.40	C= 0.60	C= 0.80	C= 0.90	Cw	Indiv. 2.78AC	Accum. 2.78AC	Inlet (min.)	Total Time (min.)	I (mm/Hr)	Peak Flow (L/s)
CP # 1	100	1.22	1.22	0.00	0.00	0.00	0.00	0.25	0.85	0.85	15.00	15.00	142.89	**121.0**

Designed: NA			Q = 2.78AIC, 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=1735.688/(tc+6.014)^0.820]
Checked: BT			
	Revision		
Dwg. Reference: FIGURE SWM1 - EXISTING DRAINAGE EXHIBIT	**Sheet No:** 1 of 1	**Date** 2021-05-12	

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STORM SEWER DESIGN - MINOR STORM

PROJECT: 125599
LOCATION: 715 MIKINAK ROAD, OTTAWA, ON
CLIENT: OTTAWA COMMUNITY HOUSING

LOCATION					AREA (ha)								RATIONAL DESIGN FLOW							SEWER DATA							
Concentration Point	Area ID	FROM MH	TO MH	Area (ha)	C= 0.25	C= 0.40	C= 0.60	C= 0.80	C= 0.90	Cw	Indiv. 2.78AC	Accum. 2.78AC	Inlet (min.)	Time In Pipe (min.)	Total Time (min.)	I (2YR) (mm/Hr)	I (5YR) (mm/Hr)	Peak Flow (2YR) (L/s)	Peak Flow (5YR) (L/s)	Cap. (L/s)	Length (m)	Pipe Dia. (mm)	Slope (%)	Full Pipe Vel. (m/s)	Design Vel. (m/s)	Avail. Cap. (L/s)	Avail. Cap. (%)
Proposed																											
	UNC1	Site	Ex. CB	0.0180	0.006	0.000	0.000	0.000	0.011	0.616	0.031	0.031	15.00	0.00	15.00	61.77	83.56	1.9	2.6								
	UNC2	Site	Ex. CB	0.0633	0.041	0.000	0.000	0.000	0.020	0.443	0.078	0.078	15.00	0.00	15.00	61.77	83.56	4.8	6.5								
	100	BLDG A	STMMH1	0.1879	0.000	0.000	0.000	0.000	0.188	0.900	0.470	0.470	15.00	0.16	15.16	61.77	83.56	29.0	39.3	98.4	12.6	300	0.95	1.35	1.27	59.08	60.1%
	100	STMMH1	STMMH4									0.470	15.00	0.27	15.27	61.77	83.56	29.0	39.3	128.8	25.1	300	1.63	1.77	1.55	89.50	69.5%
	100	STMMH4	BIO SWALE1									**0.470**	15.00	0.13	15.13	61.77	83.56	29.0	39.3	133.8	12.3	300	1.76	1.83	1.59	94.54	70.6%
	100	STMMH4	STMMH2									0.470	15.00	0.34	15.34	61.77	83.56	29.0	39.3	173.3	39.4	300	2.95	2.38	1.92	134.01	77.3%
	100	CB1	AD1	0.2409	0.066	0.000	0.062	0.000	0.113	0.644	0.431	0.431	15.00	0.05	15.05	61.77	83.56	26.6	36.0	68.5	4.1	250	1.22	1.35	1.37	32.49	47.4%
	100	AD1	STMMH2									**0.431**	15.00	0.07	15.07	61.77	83.56	26.6	36.0	174.2	10.8	250	7.88	3.44	2.71	138.14	79.3%
	200	BLDG B	STMMH5	0.1742	0.000	0.000	0.000	0.000	0.174	0.900	0.436	0.436	15.00	0.27	15.27	61.77	83.56	26.9	36.4	87.9	18.5	300	0.76	1.21	1.15	51.51	58.6%
	200	STMMH5	BIO SWALE 2									**0.436**	15.00	0.15	15.15	61.77	83.56	26.9	36.4	91.4	10.6	300	0.82	1.25	1.18	54.94	60.1%
	200	STMMH5	STMMH3									0.436	15.00	0.61	15.61	61.77	83.56	26.9	36.4	80.0	39.4	300	0.63	1.10	1.07	43.63	54.5%
	200	CB2	AD2	0.1242	0.031	0.000	0.045	0.000	0.049	0.632	0.218	**0.654**	15.00	0.30	15.30	61.77	83.56	40.4	54.7	191.2	40.6	300	3.59	2.62	2.25	136.52	71.4%
	200	AD2	TEE									**0.654**	15.00	0.02	15.02	61.77	83.56	40.4	54.7	285.4	4.2	300	8.00	3.91	3.01	230.72	80.8%
	UNC3	Site	Ex. CB	0.0646	0.044	0.000	0.009	0.000	0.011	0.417	0.075	0.075	15.00	0.00	15.00	61.77	83.56	4.6	6.3								
		STMMH2	**STMMH3**									**0.634**	**15.00**	**0.29**	**15.29**	61.77	83.56	**39.2**	**53.0**	252.3	21.1	450	0.72	1.54	1.21	199.33	79.0%
	300	CB3	AD3	0.2300	0.067	0.000	0.060	0.000	0.103	0.632	0.404	0.404	15.00	0.04	15.04	61.77	83.56	25.0	33.8	115.4	4.3	250	3.46	2.28	1.98	81.59	70.7%
	300	AD3	TEE									**0.404**	15.00	0.03	15.03	61.77	83.56	25.0	33.8	175.5	4.4	250	8.00	3.46	2.67	141.69	80.7%
	300	BLDG C	STMMH6	0.0929	0.000	0.000	0.000	0.000	0.093	0.900	0.233	0.233	15.00	0.19	15.19	61.77	83.56	14.4	19.4	62.0	12.4	250	1.00	1.22	1.08	42.59	68.7%
	300	STMMH6	BIO SWALE 3									**0.233**	15.00	0.21	15.21	61.77	83.56	14.4	19.4	50.8	11.7	250	0.67	1.00	0.93	31.34	61.7%
	300	STMMH6	STMMH7									0.233	15.00	0.14	15.14	61.77	83.56	14.4	19.4	167.7	17.9	250	7.31	3.31	2.20	148.29	88.4%
	300	**STMMH3**	**STMMH7**									**0.634**	**15.00**	**0.24**	**15.24**	61.77	83.56	**39.2**	**53.0**	366.8	22.4	450	1.52	2.23	1.59	313.76	85.5%
	300	**STMMH7**	**STC MH1**									**0.634**	**15.00**	**0.05**	**15.05**	61.77	83.56	**39.2**	**53.0**	202.8	4.9	375	1.23	1.78	1.50	149.82	73.9%
	300	**STC MH1**	**STMMH8**									**0.634**	**15.00**	**0.07**	**15.07**	61.77	83.56	**39.2**	**53.0**	142.9	4.9	375	0.61	1.25	1.16	89.85	62.9%
		STMMH8	EX. STM									**0.634**	**15.00**	**0.11**	**15.11**	61.77	83.56	**39.2**	**53.0**	77.6	4.9	375	0.18	0.68	0.73	24.64	31.7%
	UNC4	Site	Ex. CB	0.0223	0.014	0.000	0.000	0.000	0.009	0.501	0.031	0.031	15.00	0.00	15.00	61.77	83.56	1.9	2.6								

Designed:
NA

Checked:
BT

Revision | **Date**

Dwg. Reference: FIGURE SWM 2 - POST DEV. DRAINAGE EXHIBIT
File Ref: 125599
Date: 2021-08-20
Sheet No: 1 of 1

Q = 2.78AIC, where:
Q = Peak Flow in Liters per Second (l/s)
A = Area in Hectares (ha.)
I = Rainfall Intensity in Millimeters per Hour (mm/hr)
[I=732.951/(tc+6.199)^0.810] 2yr
[I=998.071/(tc+6.053)^0.814] 5yr
* A minimum tc of 15 minutes was used for design development

Manning's Coefficient (n) = 0.013

Max Velocity @Design Flow = 6.0 m/s
Min. Velocity @ Design Flow = 0.75 m/s

Flow limit controlled with Orifice Plate at 53.0 L/s

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STORM SEWER DESIGN - MINOR STORM

PROJECT: 125599
LOCATION: 715 MIKINAK ROAD, OTTAWA, ON
CLIENT: OTTAWA COMMUNITY HOUSING

LOCATION				AREA (ha)									RATIONAL DESIGN FLOW					SEWER DATA							
Concentration Point	Area ID	FROM MH	TO MH	Area (ha)	C= 0.25	C= 0.40	C= 0.60	C= 0.80	C= 0.90	Cw	Indiv. 2.78AC	Accum. 2.78AC	Inlet (min.)	Time In Pipe (min.)	Total Time (min.)	I (mm/Hr)	Peak Flow (L/s)	Cap. (L/s)	Length (m)	Pipe Dia. (mm)	Slope (%)	Full Pipe Vel. (m/s)	Design Vel. (m/s)	Avail. Cap. (L/s)	Avail. Cap. (%)
Proposed																									
	UNC1	Site	Ex. CB	0.0180	0.006	0.000	0.000	0.000	0.011	0.616	0.031	0.031	15.00	0.00	15.00	142.89	4.4								
	UNC2	Site	Ex. CB	0.0633	0.041	0.000	0.000	0.000	0.020	0.443	0.078	0.078	15.00	0.00	15.00	142.89	11.1								
	100	BLDG A	STMMH1	0.1879	0.000	0.000	0.000	0.000	0.188	0.900	0.470	0.470	15.00	0.14	15.14	142.89	67.2	98.4	12.6	300	0.95	1.35	1.45	31.18	31.7%
	100	STMMH1	STMMH4									0.470	15.00	0.23	15.23	142.89	67.2	128.8	25.1	300	1.63	1.77	1.78	61.61	47.8%
	100	STMMH4	BIO SWALE1									**0.470**	15.00	0.11	15.11	142.89	67.2	133.8	12.3	300	1.76	1.83	1.83	66.64	49.8%
	100	STMMH4	STMMH2									0.470	15.00	0.29	15.29	142.89	67.2	173.3	39.4	300	2.95	2.38	2.22	106.12	61.2%
	100	CB1	AD1	0.2409	0.066	0.000	0.062	0.000	0.113	0.644	0.431	0.431	15.00	0.04	15.04	142.89	61.6	68.5	4.1	250	1.22	1.35	1.53	6.91	10.1%
	100	AD1	STMMH2									**0.431**	15.00	0.06	15.06	142.89	61.6	174.2	10.8	250	7.88	3.44	3.14	112.56	64.6%
	200	BLDG B	STMMH5	0.1742	0.000	0.000	0.000	0.000	0.174	0.900	0.436	0.436	15.00	0.24	15.24	142.89	62.3	87.9	18.5	300	0.76	1.21	1.31	25.65	29.2%
	200	STMMH5	BIO SWALE 2									**0.436**	15.00	0.13	15.13	142.89	62.3	91.4	10.6	300	0.82	1.25	1.35	29.08	31.8%
	200	STMMH5	STMMH3									0.436	15.00	0.54	15.54	142.89	62.3	80.0	39.4	300	0.63	1.10	1.21	17.77	22.2%
	200	CB2	AD2	0.1242	0.031	0.000	0.045	0.000	0.049	0.632	0.218	**0.654**	15.00	0.26	15.26	142.89	93.5	191.2	40.6	300	3.59	2.62	2.60	97.71	51.1%
	200	AD2	TEE									**0.654**	15.00	0.02	15.02	142.89	93.5	285.4	4.2	300	8.00	3.91	3.49	191.91	67.2%
	UNC3	Site	Ex. CB	0.0646	0.044	0.000	0.009	0.000	0.011	0.417	0.075	0.075	15.00	0.00	15.00	142.89	10.7								
		STMMH2	**STMMH3**									**0.371**	**15.00**	**0.29**	**15.29**	142.89	**53.0**	252.3	21.1	450	0.72	1.54	1.21	199.33	79.0%
	300	CB3	AD3	0.2300	0.067	0.000	0.060	0.000	0.103	0.632	0.404	0.404	15.00	0.03	15.03	142.89	57.8	115.4	4.3	250	3.46	2.28	2.28	57.60	49.9%
	300	AD3	TEE									**0.404**	15.00	0.02	15.02	142.89	57.8	175.5	4.4	250	8.00	3.46	3.10	117.69	67.1%
	300	BLDG C	STMMH6	0.0929	0.000	0.000	0.000	0.000	0.093	0.900	0.233	0.233	15.00	0.17	15.17	142.89	33.2	62.0	12.4	250	1.00	1.22	1.24	28.80	46.4%
	300	STMMH6	BIO SWALE 3									**0.233**	15.00	0.18	15.18	142.89	33.2	50.8	11.7	250	0.67	1.00	1.07	17.55	34.6%
	300	STMMH6	STMMH7									0.233	15.00	0.12	15.12	142.89	33.2	167.7	17.9	250	7.31	3.31	2.57	134.50	80.2%
	300	**STMMH3**	**STMMH7**									**0.371**	**15.00**	**0.24**	**15.24**	142.89	**53.0**	366.8	22.4	450	1.52	2.23	1.59	313.76	85.5%
	300	**STMMH7**	**STC MH1**									**0.371**	**15.00**	**0.05**	**15.05**	142.89	53.0	202.8	4.9	375	1.23	1.78	1.50	149.81	73.9%
	300	**STC MH1**	**STMMH8**									**0.371**	**15.00**	**0.10**	**15.10**	142.89	53.0	114.0	6.0	375	0.61	1.00	0.98	61.00	53.5%
		STMMH8	EX. STM									**0.371**	**15.00**	**0.11**	**15.11**	142.89	53.0	82.1	4.9	375	0.18	0.72	0.77	29.07	35.4%
	UNC4	Site	Ex. CB	0.0223	0.014	0.000	0.000	0.000	0.009	0.501	0.031	0.031	15.00	0.00	15.00	142.89	4.4								

Designed: NA		Revision	Date
Checked: BT			
Dwg. Reference: FIGURE SWM 2 - POST DEV. DRAINAGE EXHIBIT	File Ref: 125599	Date: 2021-08-20	Sheet No: 1 of 1

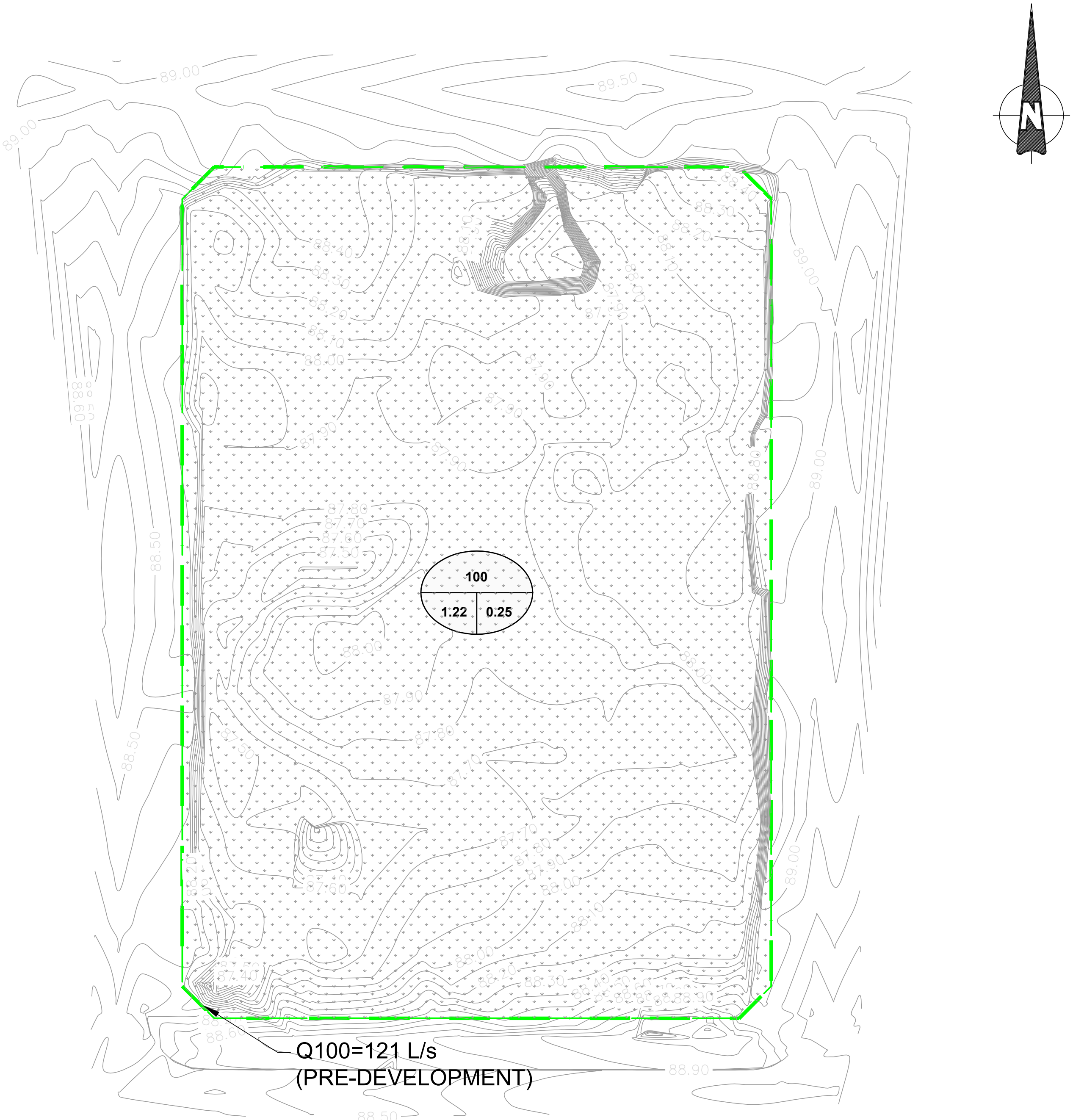
Q = 2.78AIC, where:
Q = Peak Flow in Liters per Second (l/s)
A = Area in Hectares (ha.)
I = Rainfall Intensity in Millimeters per Hour (mm/hr)
[I=1735.688/(tc+6.014)^0.820] 100yr

* A minimum tc of 15 minutes was used for design development

Manning's Coefficient (n) = 0.013

Max Velocity @Design Flow = 6.0 m/s
Min. Velocity @ Design Flow = 0.75 m/s

Flow limit controlled with Orifice Plate at 53.0 L/s



LEGEND

EX. LANDSCAPED AREA

DRAINAGE AREA LABEL

1
0.75 | 0.90

AREA (ha.)

RUNOFF COEFFICIENT

EX. CATCHMENT AREA

10 0 10 20 30 40 50 60 70 m

1:1000

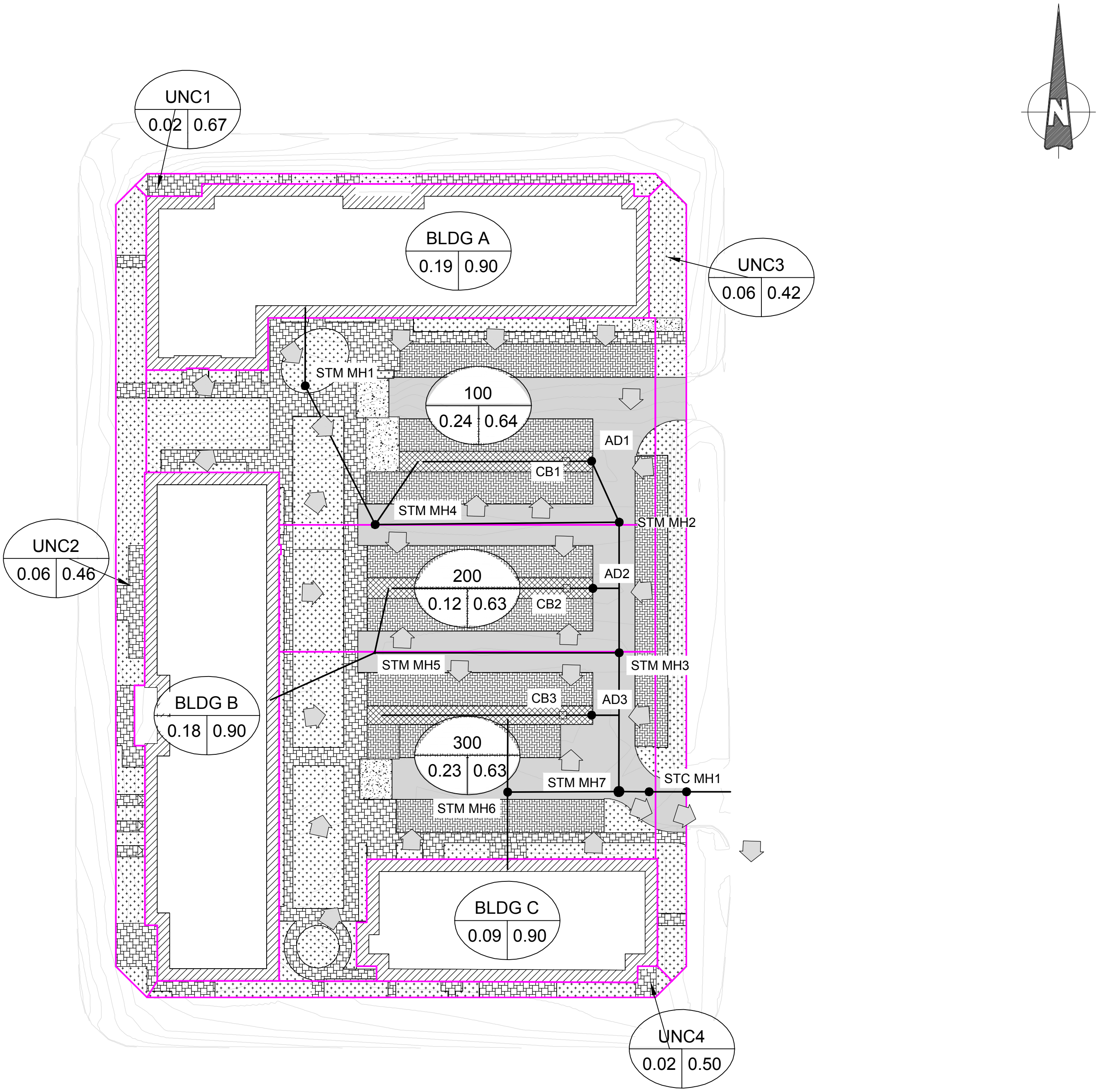
CLIENT	PROJECT NAME	PRIME CONSULTANT
OTTAWA COMMUNITY HOUSING (OCH) Ottawa Community Housing / Logement Communautaire d'Ottawa 39 Auriga Dr. Nepean, ON K2E 7Y8	MIKINAK REDEVELOPMENT 715 MIKINAK ROAD OTTAWA, ON	IBI **IBI GROUP** Unit 110 - 650 Dalton Avenue Kingston ON K7M 8N7 Canada tel 613 531 4440 fax 613 531 7789 **ibigroup.com**

SCALE:	DATE:	FIGURE NAME	FIGURE NO.	REVISION
1:1000	2021-04-21	EXISTING DRAINAGE EXHIBIT	SWM1	0
PROJECT ENG: B.T.	DRAWN BY: N.A.			
CHECKED BY: B.T.	APPROVED BY: B.T.			
PROJECT NO: 125599				

File Location: O:\125599_MikinakRedev\7.0_Production\7.03_Design\04_CivilSheets\125599_SWM-Pre.dwg Last Saved: April 27, 2021, by nino.alvarez Plotted: Wednesday, May 12, 2021 6:46:42 PM by Nino Alvarez

10mm

SCALE CHECK 1 in



LEGEND

- LANDSCAPED AREA
- ASPHALT/CONCRETE
- STAMPED CONCRETE
- PERMEABLE PAVERS
- BIO-SWALE AREA
- BUILDING
- CATCHMENT AREA

DRAINAGE AREA LABEL — 1 | 0.75 | 0.90

AREA (ha.)

RUNOFF COEFFICIENT

MAJOR OVERLAND FLOW ROUTE

1:1000

10 0 10 20 30 40 50 60 70 m

CLIENT OTTAWA COMMUNITY HOUSING (OCH) Ottawa Community Housing / Logement Communautaire d'Ottawa	PROJECT NAME MIKINAK REDEVELOPMENT 715 MIKINAK ROAD OTTAWA, ON	PRIME CONSULTANT IBI **IBI GROUP** Unit 110 - 650 Dalton Avenue Kingston ON K7M 8N7 Canada tel 613 531 4440 fax 613 531 7789 **ibigroup.com**	
	SCALE: 1:1000 / DATE: 2021-05-12 PROJECT ENG: B.T. / DRAWN BY: N.A. CHECKED BY: B.T. / APPROVED BY: B.T. PROJECT NO: 125599	FIGURE NAME POST DEVELOPMENT DRAINAGE EXHIBIT	FIGURE NO. SWM2 / REVISION 0

File Location: O:\125599_MikinakRedev\7.0_Production\7.03_Design\04_Civil\Sheets\125599_SWM-Post.dwg Last Saved: August 18, 2021, by nino.alvarez Plotted: Monday, August 23, 2021 1:46:05 PM by Nino Alvarez

10mm

SCALE CHECK 1 in

IBI GROUP
650 Dalton Avenue
Kingston ON K7M 8N7 Canada
tel 613 531 4440 fax 613 531 7789
ibigroup.com

STORAGE ATTENUATION CALCULATIONS
PROJECT: 125599
LOCATION: CITY OF OTTAWA
CLIENT: OCH

1.0 SITE DESCRIPTION

PRE DEVELOPMENT DRAINAGE

External Catchment Area	0.000 ha
Onsite Catchment Area	1.22 ha
Total Catchment Area	**1.22 ha**

Detailed Drainage Areas:

Drainage Area ID	Area (ha)	Cw
100	1.22	0.25
TOTAL	**1.22**	0.25

POST DEVELOPMENT DRAINAGE

External Catchment Area	0.00 ha
Onsite Catchment Area	1.22 ha
Total Catchment Area	**1.22 ha**

Attenuated Drainage Areas:

Drainage Area ID	Area (ha)	Cw
100	0.2409	0.64
200	0.1242	0.63
300	0.2300	0.63
BLDG A	0.1879	0.90
BLDG B	0.1742	0.90
BLDG C	0.0929	0.90
TOTAL ATTENUATED	**1.05**	0.75

Unattenuated Drainage Areas:

Drainage Area ID	Area (ha)	Cw
UNC1	0.0180	0.62
UNC2	0.0633	0.44
UNC3	0.0646	0.42
UNC4	0.0223	0.50
TOTAL UNATTENUATED	**0.17**	0.39
TOTAL	**1.22**	0.70

2.0 ALLOWABLE POST DEVELOPMENT FLOW

Runoff analysis

For a Minor Storm event, the 5-yr Ottawa formula for intensity equation is used:

[I=998.071/(tc+6.053)^0.814]

For the Major Storm event, 100-yr, the Ottawa formula for intensity equation is used:

[I=1735.688/(tc+6.014)^0.820]

Post development flows from the site during the post development Minor and 100 year storm events are to be controlled to predevelopment flow rates reduced by 25% as recommended under "Former CFB Rockcliffe Master Servicing Study" prepared by IBI GROUP

with Tc = 15 minutes for pre development event.

Qpre = AIR/360, where	R = runoff coefficient =			0.25	
	I = Rainfall Intensity		for a Minor Stm. =	83.6	mm/hr
	Tc =	15	minutes		
	A = area of the site =		1.22 ha		
			Qpre =	70.7 L/sec	
			Qpre (reduced) =	Qpre * 0.75	

Therefore, during the Minor storm event, post development flows are to be controlled to **53.0** L/sec

Qpre = AIR/360, where	R = runoff coefficient =			0.25	
	I = Rainfall Intensity		for a 100 yr. Stm. =	142.9 mm/hr	
	Tc =	15	minutes		
	A = area of the site =			1.22 ha	
				Qpre =	120.9 L/sec
				Qpre (reduced) =	Qpre * 0.75

Therefore, during the 100 year storm event, post development flows are to be controlled to 90.7 L/sec

3.0 STORAGE REQUIRED

STORAGE REQUIRED TO CONTROL FLOWS DURING THE MINOR STORM (5YR) EVENT TO PREDEVELOPMENT LEVELS

Rainfall Duration min.	s	Minor Storm Rainfall Intensity (I) mm/h	Attenuated Flow From Site m^3/s	Unattenuated Flow From Site m^3/s	Total Runoff From Site m^3/s	Allowable Release Rate m^3/s	Required Storage Rate m^3/s	Aprox. Detention Volumes m^3
15	900	83.6	0.1830	0.0153	0.1830	0.053	0.1300	117.0
20	**1200**	**70.3**	**0.1539**	**0.0129**	**0.1539**	**0.053**	**0.1008**	**121.0**
25	1500	60.9	0.1334	0.0112	0.1334	0.053	0.0804	120.5
30	1800	53.9	0.1181	0.0099	0.1181	0.053	0.0651	117.2
40	2400	44.2	0.0968	0.0081	0.0968	0.053	0.0438	105.0
50	3000	37.7	0.0825	0.0069	0.0825	0.053	0.0294	88.3
60	3600	32.9	0.0722	0.0060	0.0722	0.053	0.0191	68.9
65	3900	31.0	0.0680	0.0057	0.0680	0.053	0.0150	58.4
70	4200	29.4	0.0643	0.0054	0.0643	0.053	0.0113	47.5
75	4500	27.9	0.0611	0.0051	0.0611	0.053	0.0081	36.3

Minor Storm Event
Volume Required: **121.0 cu.m**

STORAGE REQUIRED TO CONTROL FLOWS DURING THE 100 YEAR STORM EVENT TO 100 YEAR PREDEVELOPMENT LEVELS

Rainfall Duration min.	s	100 Year Rainfall Intensity (I) mm/h	Attenuated Flow From Site m^3/s	Unattenuated Flow From Site m^3/s	Total Runoff From Site m^3/s	Allowable Release Rate m^3/s	Required Storage Rate m^3/s	Aprox. Detention Volumes m^3
15	900	142.89	0.3130	0.0262	0.3130	0.0530	0.2600	234.0
20	1200	119.95	0.2627	0.0220	0.2627	0.0530	0.2097	251.6
25	1500	103.85	0.2275	0.0191	0.2275	0.0530	0.1744	261.6
30	1800	91.87	0.2012	0.0169	0.2012	0.0530	0.1482	266.8
35	**2100**	**82.58**	**0.1809**	**0.0152**	**0.1809**	**0.0530**	**0.1278**	**268.5**
40	2400	75.15	0.1646	0.0138	0.1646	0.0530	0.1116	267.8
50	3000	63.95	0.1401	0.0117	0.1401	0.0530	0.0871	261.2
60	3600	55.89	0.1224	0.0103	0.1224	0.0530	0.0694	249.8
65	3900	52.65	0.1153	0.0097	0.1153	0.0530	0.0623	242.9
70	4200	49.79	0.1091	0.0091	0.1091	0.0530	0.0560	235.3
80	4800	44.99	0.0985	0.0083	0.0985	0.0530	0.0455	218.5
90	5400	41.11	0.0900	0.0075	0.0900	0.0530	0.0370	199.9
		84	0.1830	0.0153	0.183	0.0530	0.1300	117.0

100 Year Storm
Max Volume Required: **268.5 cu.m** **322.18**

4.0 STORAGE PROVIDED

DETENTION VOLUME AVAILABLE WITHIN THE STORM PIPES

From	To	Diameter (mm)	Length (m)	Volume (m^3)
BLDG A	STM MH 1	300	12.55	**0.887**
STM MH 1	STM MH 4	300	25.04	**1.770**
STM MH 4	BIO SWALE1	300	12.37	**0.874**
STM MH 4	STM MH 2	300	39.47	**2.790**
CB1	AD1	250	4.09	**0.201**
AD1	STM MH 2	250	10.81	**0.531**
STM MH 2	STM MH 3	450	21.08	**3.353**
BLDG B	STM MH 5	300	17.46	**1.234**
STM MH 5	BIO SWALE2	300	10.89	**0.770**
STM MH 5	STM MH 3	300	40.55	**2.866**
CB2	AD2	300	4.18	**0.295**
AD2	TEE	300	4.24	**0.300**
STM MH 3	STM MH 7	450	23.13	**3.679**
CB3	AD3	250	4.33	0.21
AD3	TEE	250	4.41	0.22
BLDG C	STM MH 6	250	11.81	0.58
STM MH 6	BIO SWALE3	250	12.31	0.60
STM MH 6	STM MH 7	250	17.91	0.88

Total Pipe Storage: **22.04 m^3**

DETENTION VOLUME AVAILABLE WITHIN THE PARKING LOT PONDING AREAS

Structure	Grate Elevation	Ponding Elevation	Area (m^2)	Max Depth (m)	Volume (m^3)
CB1	88.52	88.80		0.28	
CB2	88.53	88.80	2925.52	0.27	171.49
CB3	88.56	88.80		0.24	

Total Ponding Surface Volume: **171.49 m^3**

DETENTION VOLUME AVAILABLE WITHIN THE PERMEABLE PAVERS

Based on the foregoing calculations, a permeable paver stone area with a total infiltration surface of 1203.503 m², and a depth of 0.3 m within the parking area filled with river rock that provide 30% voids, will provide total storage volume of **108.32** m³

DETENTION VOLUME AVAILABLE WITHIN THE BIO-SWALES

Based on the foregoing calculations, a Bio-swale with a cross-sectional area of 2.22 m², and a length of storage media of 36.2 m filled with river rock with 30% voids, will provide a total storage volume of 24.1 m³. Based on three proposed bio-swales located along the parking lot the total volume amounts to **72.33 m³**

TOTAL ATTENUATION VOLUME

Storage	Volume (m^3)
Detention Volume Available Within the Storm Pipes	22.0
Detention Volume Available Within the Parking Lot Ponding Areas	171.50
Detention Volume Available Within the Permeable Pavers	108.3
Detention Volume Available Within the Bio-Swales	72.3

Total attenuation volume provided is: **374.2 m^3**

According to the calculation for the major storm event, the max volume required is **268.5 m^3**
Therefore, the provided attenuation volume amounts to a total of **139%**

5.0 ORIFICE CONTROL

An orifice plate will be installed over the outlet of the STM MH3 outfall that will control peak flows during the Minor Storm and the 100 year storm events to the predevelopment flow rates.

5.1 ORIFICE CALCULATION - MINOR STORM EVENT

Determine the diameter of the orifice required to control the flow from the site during the Minor Storm to less than 53.0 l/sec.

STM MH3	Invert at controlled outlet =	86.06 m
	Ponding Elev. during Minor Storm =	88.80 m
	Centreline Orifice Elevation =	86.12 m
	Maximum Head on Orifice (H)	2.68 m

Orifice Equation: Qa =(CA*(2gh)^1/2)

WHERE

C	co-efficient of discharge (-)	**g**	gravitational constant (9.81m/s^2)
A	cross-sectional area (sq.m.)	**h**	distance between the orifice centreline and the HWL
Qa	orifice discharge flow (m^3/s)		

Head (H) =	2.68 m	**Area (A) =**	0.012 m^2	**g =**	9.81
Discharge (Q) =	0.0525 m^3/s	**Diameter =**	122 mm.	**C =**	0.62

Therefore, a 122 mm orifice will control the Minor Storm post development flows to approximately 52.5 l/sec.
which is equivalent to the maximum allowable control flow of: 53.0 l/sec.

5.2 ORIFICE CALCULATION - MAJOR STORM EVENT

The controlled flow rate with the selected orifice based on 100 yr ponding elevation is as follows:

STM MH3	Invert at controlled outlet =	86.06 m.
	Ponding Elev. during 1:100 yr. storm =	88.80 m
	Centreline Orifice Elevation =	86.12 m
	Maximum Head on Orifice (H)	2.68 m

Head (H) =	2.68 m	**Area (A) =**	0.012 m^2	**g =**	9.81
Discharge (Q) =	0.0525 m^3/s	**Diameter =**	122 mm	**C =**	0.62

Therefore, a 122 mm orifice will control post development flows to approximately 52.5 l/sec.
which is less than the maximum allowable control flow of: 90.7 L/s

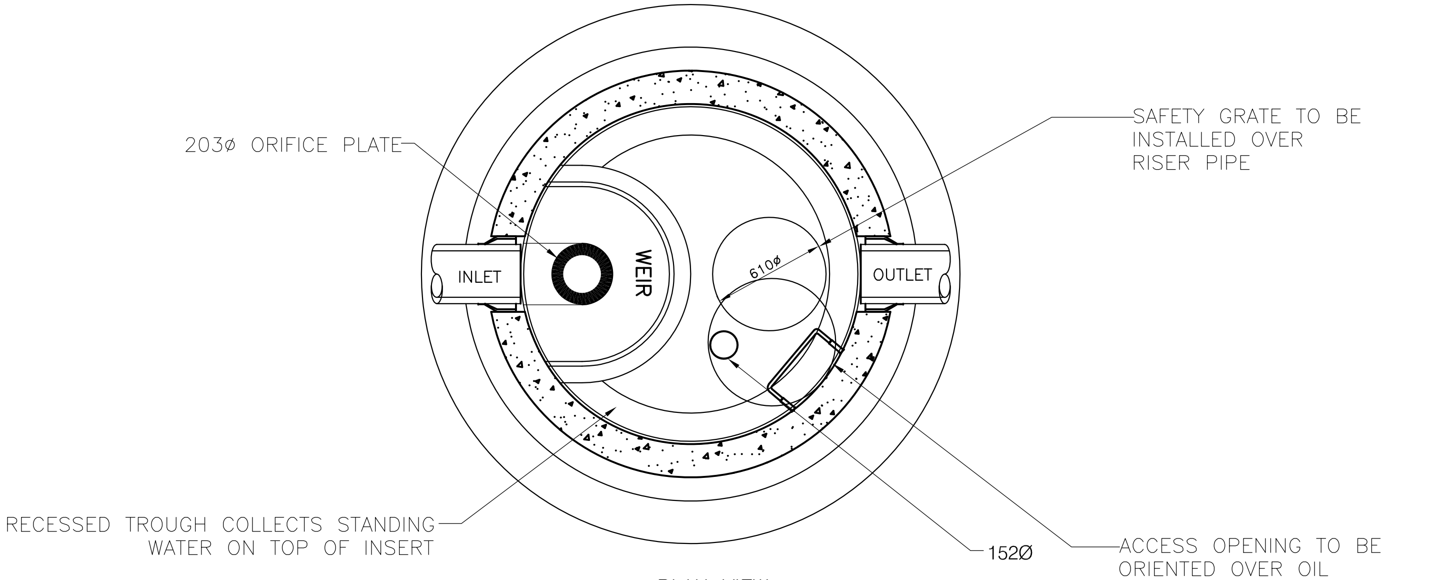
5.2 ORIFICE CALCULATION - MAJOR STORM EVENT

The controlled flow rate with the selected orifice based on 100 yr ponding elevation is as follows:

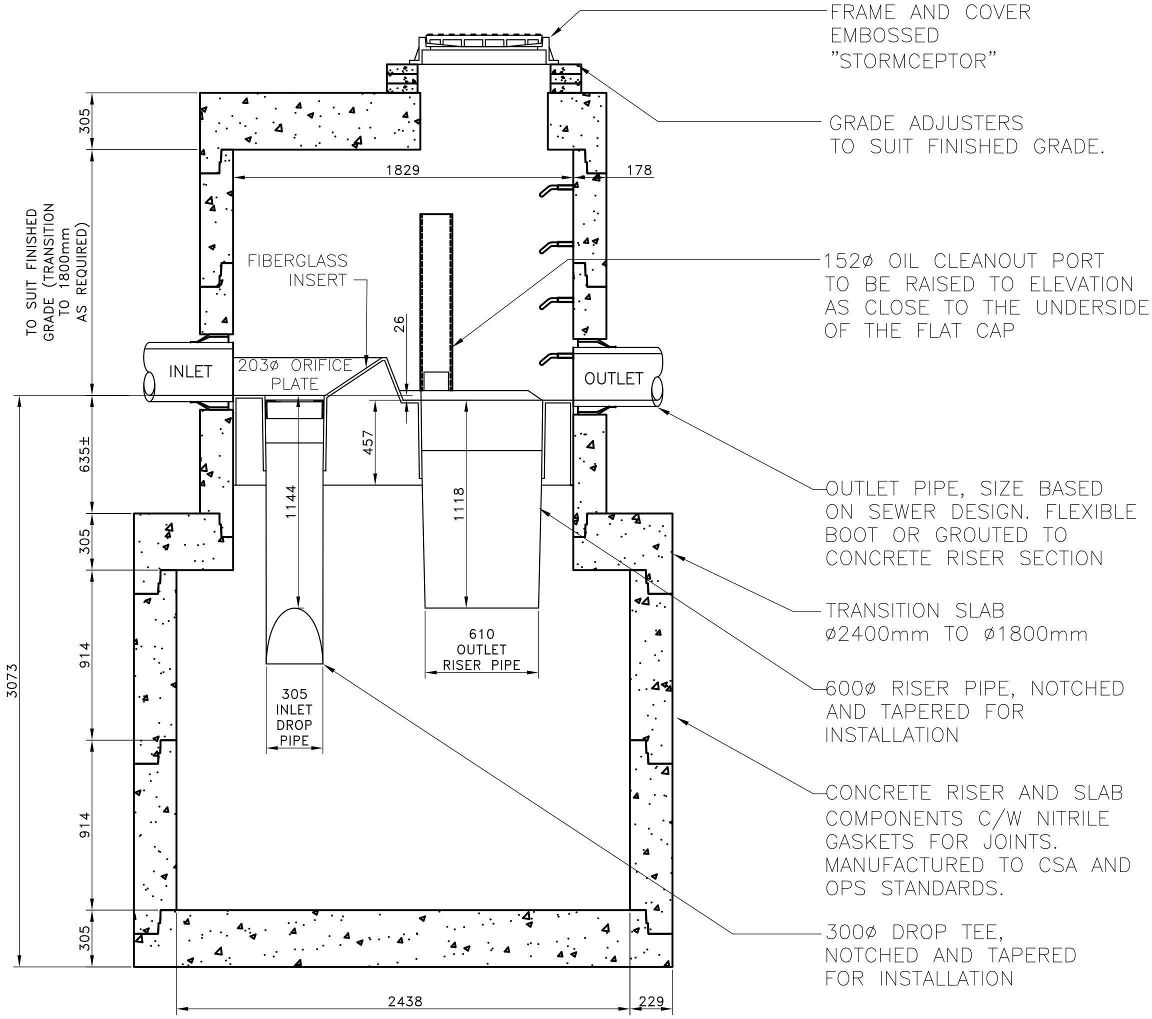
STM MH7	Invert at controlled outlet =	85.66 m.
	Ponding Elev. during 1:100 yr. storm =	88.80 m
	Centreline Orifice Elevation =	85.75 m
	Maximum Head on Orifice (H)	3.05 m

Head (H) =	3.05 m	**Area (A) =**	0.011 m^2	**g =**	9.81
Discharge (Q) =	0.0524 m^3/s	**Diameter =**	118 mm	**C =**	0.62

Therefore, a 118 mm orifice will control post development flows to approximately 52.4 l/sec.
which is less than the maximum allowable control flow of: 0.1 L/s



PLAN VIEW



SECTION VIEW

THE STORMCEPTOR SYSTEM IS PROTECTED BY ONE OR MORE OF THE FOLLOWING PATENTS:

CANADIAN PATENT NO. 2,009,208
CANADIAN PATENT NO. 2,137,942
CANADIAN PATENT NO. 2,175,277
CANADIAN PATENT NO. 2,180,305
CANADIAN PATENT NO. 2,180,383
CANADIAN PATENT NO. 2,206,338

STC 2000 CAPACITIES		
SEDIMENT CAPACITY (L)	OIL CAPACITY (L)	TOTAL CAPACITY L (IMP GAL)
7700	2890	11000 (2420)

	TITLE	PLANT	PROVINCE	DATE	SECTION PAGE
FORTERRA / Stormceptor®	In-Line Stormceptor Model STC2000	CAMBRIDGE OTTAWA UXBRIDGE	ON	JAN 2020	H-5

Detailed Stormceptor Sizing Report – OCH

Project Information & Location			
Project Name	OCH	**Project Number**	125599
City	Ottawa	**State/ Province**	Ontario
Country	Canada	**Date**	5/18/2021
Designer Information		**EOR Information (optional)**	
Name	Nino Alvarez	**Name**	
Company	IBI Group	**Company**	
Phone #	613-531-4440	**Phone #**	
Email	nino.alvarez@ibigroup.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	OCH
Recommended Stormceptor Model	STC 2000
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	80
PSD	Fine Distribution
Rainfall Station	OTTAWA MACDONALD-CARTIER INT'L A

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary		
Stormceptor Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**
STC 300	64	80
STC 750	75	90
STC 1000	76	90
STC 1500	77	90
STC 2000	80	95
STC 3000	82	95
STC 4000	85	98
STC 5000	86	98
STC 6000	88	99
STC 9000	91	100
STC 10000	91	100
STC 14000	93	100
StormceptorMAX	Custom	Custom

Stormceptor® FORTERRA

Stormceptor

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).
Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Ontario	**Total Number of Rainfall Events**	4093
Rainfall Station Name	OTTAWA MACDONALD-CARTIER INT'L A	**Total Rainfall (mm)**	20978.1
Station ID #	6000	**Average Annual Rainfall (mm)**	567.0
Coordinates	45°19'N, 75°40'W	**Total Evaporation (mm)**	1223.9
Elevation (ft)	370	**Total Infiltration (mm)**	7742.3
Years of Rainfall Data	37	**Total Rainfall that is Runoff (mm)**	12011.9

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Stormceptor®

FORTERRA

Drainage Area	
Total Area (ha)	1.22
Imperviousness %	63.00

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.091

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	62.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	247.00
Water Quality Flow Rate (L/s)	156.00

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	

Design Details	
Stormceptor Inlet Invert Elev (m)	85.65
Stormceptor Outlet Invert Elev (m)	85.60
Stormceptor Rim Elev (m)	86.51
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	450
Pipe Material	PVC - plastic
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	OCH

Site Details

Drainage Area

Total Area (ha)	1.22
Imperviousness %	63.00

Surface Characteristics

Width (m)	221.00
Slope %	2
Impervious Depression Storage (mm)	0.508
Pervious Depression Storage (mm)	5.08
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (mm/hr)	61.98
Min. Infiltration Rate (mm/hr)	10.16
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation

Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow

Dry Weather Flow (lps)	0

Winter Months

Winter Infiltration	0

TSS Loading Parameters

TSS Loading Function	

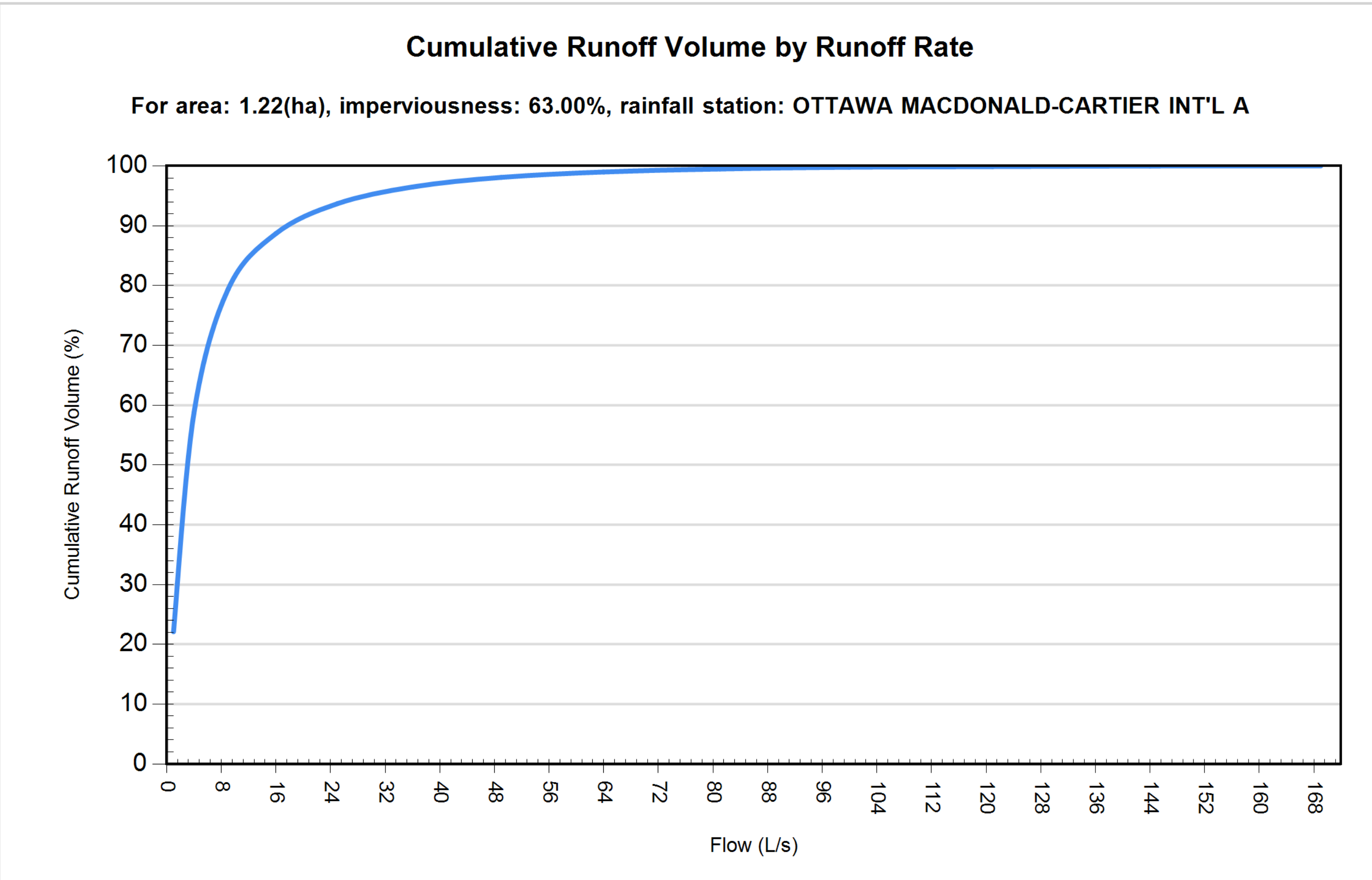
Buildup/Wash-off Parameters

Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

TSS Availability Parameters

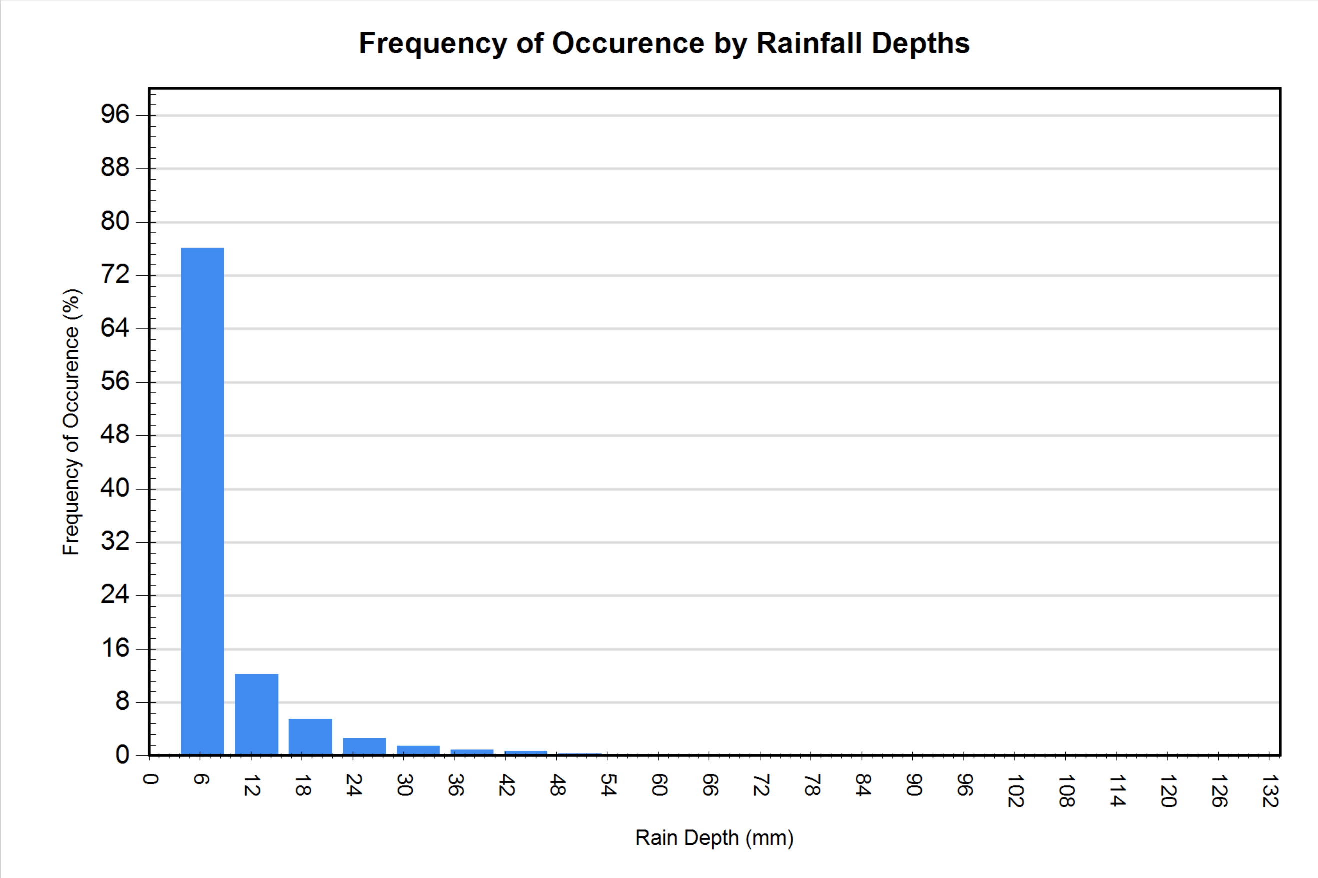
Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (L/s)	Runoff Volume (m³)	Volume Over (m³)	Cumulative Runoff Volume (%)
1	32611	114868	22.1
4	86643	60830	58.7
9	117092	30400	79.4
16	130870	16609	88.7
25	138215	9266	93.7
36	142256	5223	96.5
49	144621	2858	98.1
64	145949	1530	99.0
81	146786	692	99.5
100	147199	279	99.8
121	147380	99	99.9
144	147459	20	100.0
169	147479	0	100.0

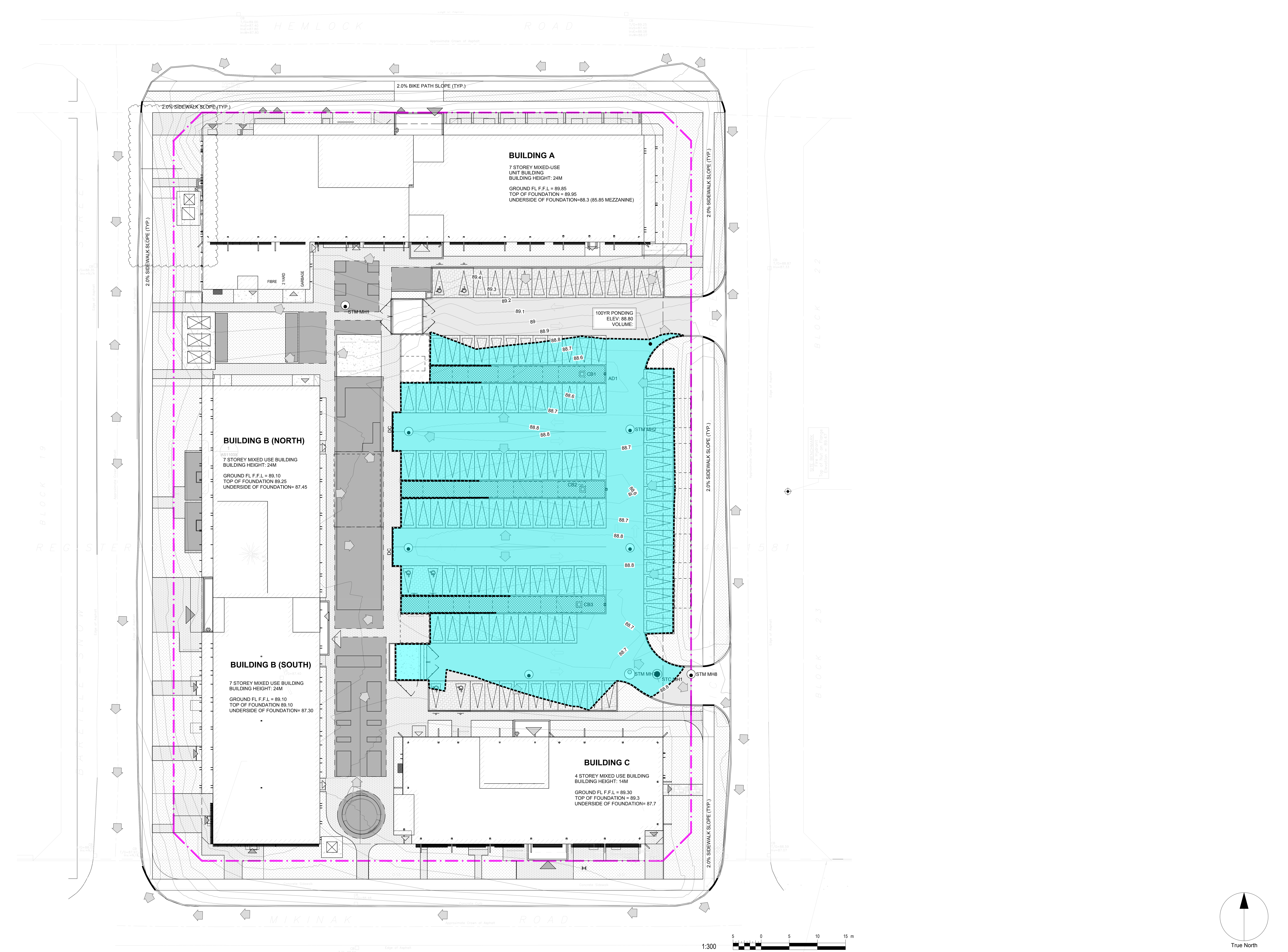


Rainfall Event Analysis

Rainfall Depth (mm)	No. of Events	Percentage of Total Events (%)	Total Volume (mm)	Percentage of Annual Volume (%)
6.35	3113	76.1	5230	24.9
12.70	501	12.2	4497	21.4
19.05	225	5.5	3469	16.5
25.40	105	2.6	2317	11.0
31.75	62	1.5	1765	8.4
38.10	35	0.9	1206	5.8
44.45	28	0.7	1163	5.5
50.80	12	0.3	557	2.7
57.15	7	0.2	378	1.8
63.50	1	0.0	63	0.3
69.85	1	0.0	64	0.3
76.20	1	0.0	76	0.4
82.55	0	0.0	0	0.0
88.90	1	0.0	84	0.4
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0
107.95	0	0.0	0	0.0
114.30	1	0.0	109	0.5
120.65	0	0.0	0	0.0
127.00	0	0.0	0	0.0



For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications



CLIENT

Ottawa Community Housing / Logement Communautaire d'Ottawa

39 Auriga Dr. Nepean, ON K2E 7Y8

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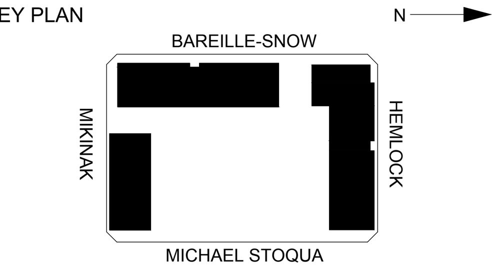
ISSUES

No.	DESCRIPTION	DATE
1	FIRST SUBMISSION	2021-05-20
2	SECOND SUBMISSION	2021-08-24

NOT FOR CONSTRUCTION

KEY PLAN



LEGEND:

- OVERLAND FLOW
- PROPOSED CONTOUR
- DEPRESSED CONCRETE CURB
- CONCRETE BARRIER CURB PER OPSD 600.110
- PONDING (100YR)
- PROPERT YLINE
- PROPOSED BIO-SWALE
- PROPOSED SOFTSCAPE
- PROPOSED HARDSCAPE
- PROPOSED BUILDING
- PERMEABLE PAVER
- ASPHALT PAVED AREA
- WASTE PICK-UP AREA CONCRETE PAD

PRIME CONSULTANT

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PROJECT

MIKINAK REDEVELOPMENT

715 MIKINAK ROAD, OTTAWA, ON
CANADA K1K 2G8

PROJECT NO: 125599	SCALE: AS SHOWN
DRAWN BY: NA	CHECKED BY: BT
PROJECT MGR: CW	APPROVED BY: BT

SHEET TITLE

PONDING PLAN

SHEET NUMBER: CG1103

ISSUE: 2

File Location: O:\125599_MikinakRedev\7.0_Production\7.03_Design\04_Civil\Sheets\CG1101 (N).dwg Last Saved: August 21, 2021, by nino.alvarez Plotted: Monday, August 23, 2021 3:29:17 PM by Nino Alvarez

D07-12-21-0068

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STORM HYDRAULIC GRADE LINE DESIGN SHEET (MAJOR STORM)
MIKINAK REDEVELOPMENT
CITY OF OTTAWA
OTTAWA COMMUNITY HOUSING

PROJECT #: 125599
DATE: 2021-08-16
DESIGN: NA
CHECKED: BT
REV #: -

FRICTION LOSS	FROM MH	TO MH	PIPE ID
	Ex	**TIE-IN**	
INVERT ELEVATION (m)	85.445	85.491	
OBVERT ELEVATION (m)	86.045	86.091	
DIAMETER (mm)			600
LENGTH (m)			55.7
FLOW (l/s)			53.00
HGL (m) ***	**85.940**	**85.944**	**0.004**
MANHOLE COEF K= 0.75	LOSS (m)	0.001	
TOTAL HGL (m)		**85.945**	
MAX. SURCHARGE (mm)		**-145**	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.6	0.28	1.88	0.080	0.15	0.62	175.40

HYDRAULIC SLOPE = 0.01 %
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) 0.302
DESIGN FLOW DEPTH = 0.222

Head loss in manhole simplified method p. 71 (MWDM)
fig1.7.1, Kratio = 0.75 for 45 bends K_L=0.75
Velocity = Flow / Area = 0.19 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
	TIE-IN	**STM MH8**	
INVERT ELEVATION (m)	85.460	85.503	
OBVERT ELEVATION (m)	85.835	85.878	
DIAMETER (mm)			375
LENGTH (m)			6.0
FLOW (l/s)			53.00
HGL (m) ***	**85.944**	**85.950**	**0.006**
MANHOLE COEF K= 0.75	LOSS (m)	0.009	
TOTAL HGL (m)		**85.958**	
MAX. SURCHARGE (mm)		**80**	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.375	0.11	1.18	0.610	0.09	1.34	147.86

HYDRAULIC SLOPE = 0.24 %
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) 0.358
DESIGN FLOW DEPTH = 0.154

Head loss in manhole simplified method p. 71 (MWDM)
fig1.7.1, Kratio = 0.75 for 45 bends K_L=0.75
Velocity = Flow / Area = 0.48 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
	STM MH8	**STC MH1**	
INVERT ELEVATION (m)	85.533	85.570	
OBVERT ELEVATION (m)	85.908	85.945	
DIAMETER (mm)			375
LENGTH (m)			6.0
FLOW (l/s)			53.00
HGL (m) ***	**85.958**	**85.964**	**0.006**
MANHOLE COEF K= 0.75	LOSS (m)	0.009	
TOTAL HGL (m)		**85.973**	
MAX. SURCHARGE (mm)		**28**	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.375	0.11	1.18	0.610	0.09	1.24	137.16

HYDRAULIC SLOPE = 0.24 %
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) 0.386
DESIGN FLOW DEPTH = 0.161

Head loss in manhole simplified method p. 71 (MWDM)
fig1.7.1, Kratio = 0.75 for 45 bends K_L=0.75
Velocity = Flow / Area = 0.48 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
	STC MH1	**STM MH7**	
INVERT ELEVATION (m)	85.600	85.660	
OBVERT ELEVATION (m)	85.975	86.035	
DIAMETER (mm)			375
LENGTH (m)			4.9
FLOW (l/s)			53.00
HGL (m) ***	**85.973**	**85.977**	**0.004**
MANHOLE COEF K= 0.05	LOSS (m)	0.001	
TOTAL HGL (m)		**85.978**	
MAX. SURCHARGE (mm)		**-57**	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.375	0.11	1.18	1.230	0.09	1.76	193.92

HYDRAULIC SLOPE = 0.10 %
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) 0.273
DESIGN FLOW DEPTH = 0.131

Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L=0.05
Velocity = Flow / Area = 0.48 m/s
HL = K_L * V^2/ 2g

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STORM HYDRAULIC GRADE LINE DESIGN SHEET (MAJOR STORM)
MIKINAK REDEVELOPMENT
CITY OF OTTAWA
OTTAWA COMMUNITY HOUSING

PROJECT #: 125599
DATE: 2021-08-16
DESIGN: NA
CHECKED: BT
REV #: -

FRICTION LOSS	FROM MH	TO MH	PIPE ID
	STM MH7	**STM MH3**	
INVERT ELEVATION (m)	85.720	86.061	
OBVERT ELEVATION (m)	86.170	86.511	
DIAMETER (mm)			450
LENGTH (m)			22.4
FLOW (l/s)			**53.00**
HGL (m) ***	**85.978**	**85.986**	**0.008**
MANHOLE COEF K= 0.05	LOSS (m)	0.000	
TOTAL HGL (m)		86.178	
MAX. SURCHARGE (mm)		-333	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.45	0.16	1.41	1.520	0.11	2.21	351.59

HYDRAULIC SLOPE = 0.89 %
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) 0.151
DESIGN FLOW DEPTH = 0.117

Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L=0.05
Velocity = Flow / Area = 0.33 m/s
HL = K_L * V^2/ 2g

Flow restriction installed at STM MH7 (OUTLET) = 53.0 L/s

FRICTION LOSS	FROM MH	TO MH	PIPE ID
	STM MH3	**STM MH2**	
INVERT ELEVATION (m)	86.121	86.272	
OBVERT ELEVATION (m)	86.571	86.722	
DIAMETER (mm)			450
LENGTH (m)			21.1
FLOW (l/s)			**53.00**
HGL (m) ***	**86.178**	**86.185**	**0.007**
MANHOLE COEF K= 0.05	LOSS (m)	0.000	
TOTAL HGL (m)		86.412	
MAX. SURCHARGE (mm)		-311	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.45	0.16	1.41	0.720	0.11	1.52	241.18

HYDRAULIC SLOPE = 1.11 %
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) 0.220
DESIGN FLOW DEPTH = 0.140

Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L=0.05
Velocity = Flow / Area = 0.33 m/s
HL = K_L * V^2/ 2g

Flow restriction installed at STM MH3 (OUTLET) = 53.0 L/s

FRICTION LOSS	FROM MH	TO MH	PIPE ID
	STM MH2	**STM MH4**	
INVERT ELEVATION (m)	86.349	87.511	
OBVERT ELEVATION (m)	86.649	87.811	
DIAMETER (mm)			300
LENGTH (m)			39.4
FLOW (l/s)			67.20
HGL (m) ***	**86.412**	**86.602**	**0.190**
MANHOLE COEF K= 0.05	LOSS (m)	0.002	
TOTAL HGL (m)		87.643	
MAX. SURCHARGE (mm)		-168	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.3	0.07	0.94	2.950	0.08	2.35	166.09

HYDRAULIC SLOPE = 3.13 %
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) 0.405
DESIGN FLOW DEPTH = 0.132

Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L=0.05
Velocity = Flow / Area = 0.95 m/s
HL = K_L * V^2/ 2g

FRICTION LOSS	FROM MH	TO MH	PIPE ID
	STM MH4	**STM MH1**	
INVERT ELEVATION (m)	87.821	87.411	
OBVERT ELEVATION (m)	88.121	87.711	
DIAMETER (mm)			300
LENGTH (m)			25.1
FLOW (l/s)			67.20
HGL (m) ***	**87.643**	**87.764**	**0.121**
MANHOLE COEF K= 0.05	LOSS (m)	0.002	
TOTAL HGL (m)		#NUM!	
MAX. SURCHARGE (mm)		#NUM!	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.3	0.07	0.94	1.630	0.08	#NUM!	#NUM!

HYDRAULIC SLOPE = #NUM! %
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) #NUM!
DESIGN FLOW DEPTH = #NUM!

Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L=0.05
Velocity = Flow / Area = 0.95 m/s
HL = K_L * V^2/ 2g

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STORM HYDRAULIC GRADE LINE DESIGN SHEET (MINOR STORM)
MIKINAK REDEVELOPMENT
CITY OF OTTAWA
OTTAWA COMMUNITY HOUSING

PROJECT #:	132870
DATE:	2021-08-12
DESIGN:	NA
CHECKED:	BT
REV #:	-

FRICTION LOSS	FROM MH	TO MH	PIPE ID
	Ex.	**TIE-IN**	
INVERT ELEVATION (m)	85.445	85.491	
OBVERT ELEVATION (m)	86.045	86.091	
DIAMETER (mm)			600
LENGTH (m)			55.7
FLOW (l/s)			53.00
HGL (m) ***	**85.940**	**85.944**	**0.004**
MANHOLE COEF K= 0.75	LOSS (m)	0.001	
TOTAL HGL (m)		**85.945**	
MAX. SURCHARGE (mm)		**-145**	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.6	0.28	1.88	0.080	0.15	0.62	175.40

HYDRAULIC SLOPE = 0.01 %
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) = 0.302
DESIGN FLOW DEPTH = 0.222

Head loss in manhole simplified method p. 71 (MWDM)
fig1.7.1, Kratio = 0.75 for 45 bends K_L=0.75
Velocity = Flow / Area = 0.19 m/s
$HL = K_L * V^2/ 2g$

FRICTION LOSS	FROM MH	TO MH	PIPE ID
	TIE-IN	**STM MH8**	
INVERT ELEVATION (m)	85.460	85.503	
OBVERT ELEVATION (m)	85.835	85.878	
DIAMETER (mm)			375
LENGTH (m)			6.0
FLOW (l/s)			53.00
HGL (m) ***	**85.944**	**85.950**	**0.006**
MANHOLE COEF K= 0.75	LOSS (m)	0.009	
TOTAL HGL (m)		**85.958**	
MAX. SURCHARGE (mm)		**80**	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.375	0.11	1.18	0.610	0.09	1.34	147.86

HYDRAULIC SLOPE = 0.24 %
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) = 0.358
DESIGN FLOW DEPTH = 0.154

Head loss in manhole simplified method p. 71 (MWDM)
fig1.7.1, Kratio = 0.75 for 45 bends K_L=0.75
Velocity = Flow / Area = 0.48 m/s
$HL = K_L * V^2/ 2g$

FRICTION LOSS	FROM MH	TO MH	PIPE ID
	TIE-IN	**STC MH1**	
INVERT ELEVATION (m)	85.533	85.570	
OBVERT ELEVATION (m)	85.908	85.945	
DIAMETER (mm)			375
LENGTH (m)			6.0
FLOW (l/s)			53.00
HGL (m) ***	**85.945**	**85.951**	**0.005**
MANHOLE COEF K= 0.75	LOSS (m)	0.009	
TOTAL HGL (m)		**85.960**	
MAX. SURCHARGE (mm)		**15**	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.375	0.11	1.18	0.610	0.09	1.25	137.61

HYDRAULIC SLOPE = 0.24 %
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) = 0.385
DESIGN FLOW DEPTH = 0.161

Head loss in manhole simplified method p. 71 (MWDM)
fig1.7.1, Kratio = 0.75 for 45 bends K_L=0.75
Velocity = Flow / Area = 0.48 m/s
$HL = K_L * V^2/ 2g$

FRICTION LOSS	FROM MH	TO MH	PIPE ID
	STC MH1	**STM MH7**	
INVERT ELEVATION (m)	85.600	85.660	
OBVERT ELEVATION (m)	85.975	86.035	
DIAMETER (mm)			375
LENGTH (m)			4.9
FLOW (l/s)			53.00
HGL (m) ***	**85.960**	**85.964**	**0.004**
MANHOLE COEF K= 0.05	LOSS (m)	0.001	
TOTAL HGL (m)		**85.965**	
MAX. SURCHARGE (mm)		**-70**	

MANNING FORMULA - FLOWING FULL

DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.375	0.11	1.18	1.230	0.09	1.76	193.92

HYDRAULIC SLOPE = 0.10 %
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) = 0.273
DESIGN FLOW DEPTH = 0.131

Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L=0.05
Velocity = Flow / Area = 0.48 m/s
$HL = K_L * V^2/ 2g$

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tel 613 531 4440 fax 613 531 7789
ibigroup.com

STORM HYDRAULIC GRADE LINE DESIGN SHEET (MINOR STORM)
MIKINAK REDEVELOPMENT
CITY OF OTTAWA
OTTAWA COMMUNITY HOUSING

PROJECT #: 132870
DATE: 2021-08-12
DESIGN: NA
CHECKED: BT
REV #: -

FRICTION LOSS		FROM MH	TO MH	PIPE ID
		STM MH7	**STM MH3**	
INVERT ELEVATION (m)		85.720	86.061	
OBVERT ELEVATION (m)		86.170	86.511	
DIAMETER (mm)				450
LENGTH (m)				22.4
FLOW (l/s)				**53.00**
HGL (m)	***	**85.965**	**85.973**	**0.008**
MANHOLE COEF K=	0.05	LOSS (m)	0.000	
TOTAL HGL (m)			**86.178**	
MAX. SURCHARGE (mm)			**-333**	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.45	0.16	1.41	1.520	0.11	2.21	351.59

HYDRAULIC SLOPE = 0.95 %
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) = 0.151
DESIGN FLOW DEPTH = 0.117

Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L=0.05
Velocity = Flow / Area = 0.33 m/s
HL = K_L * V^2/ 2g

Flow restriction installed at STM MH7 (OUTLET) = 53.0 L/s

FRICTION LOSS		FROM MH	TO MH	PIPE ID
		STM MH3	**STM MH2**	
INVERT ELEVATION (m)		86.121	86.272	
OBVERT ELEVATION (m)		86.571	86.722	
DIAMETER (mm)				450
LENGTH (m)				21.0
FLOW (l/s)				**53.00**
HGL (m)	***	**86.178**	**86.185**	**0.007**
MANHOLE COEF K=	0.05	LOSS (m)	0.000	
TOTAL HGL (m)			**86.412**	
MAX. SURCHARGE (mm)			**-311**	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.45	0.16	1.41	0.720	0.11	1.52	241.64

HYDRAULIC SLOPE = 1.11 %
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) = 0.219
DESIGN FLOW DEPTH = 0.140

Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L=0.05
Velocity = Flow / Area = 0.33 m/s
HL = K_L * V^2/ 2g

Flow restriction installed at STM MH7 (OUTLET) = 53.0 L/s

FRICTION LOSS		FROM MH	TO MH	PIPE ID
		STM MH2	**STM MH4**	
INVERT ELEVATION (m)		86.349	87.511	
OBVERT ELEVATION (m)		86.649	87.811	
DIAMETER (mm)				300
LENGTH (m)				39.4
FLOW (l/s)				39.30
HGL (m)	***	**86.412**	**86.477**	**0.065**
MANHOLE COEF K=	0.05	LOSS (m)	0.001	
TOTAL HGL (m)			**87.610**	
MAX. SURCHARGE (mm)			**-201**	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.3	0.07	0.94	2.950	0.08	2.35	165.98

HYDRAULIC SLOPE = 3.04 %
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) = 0.237
DESIGN FLOW DEPTH = 0.099

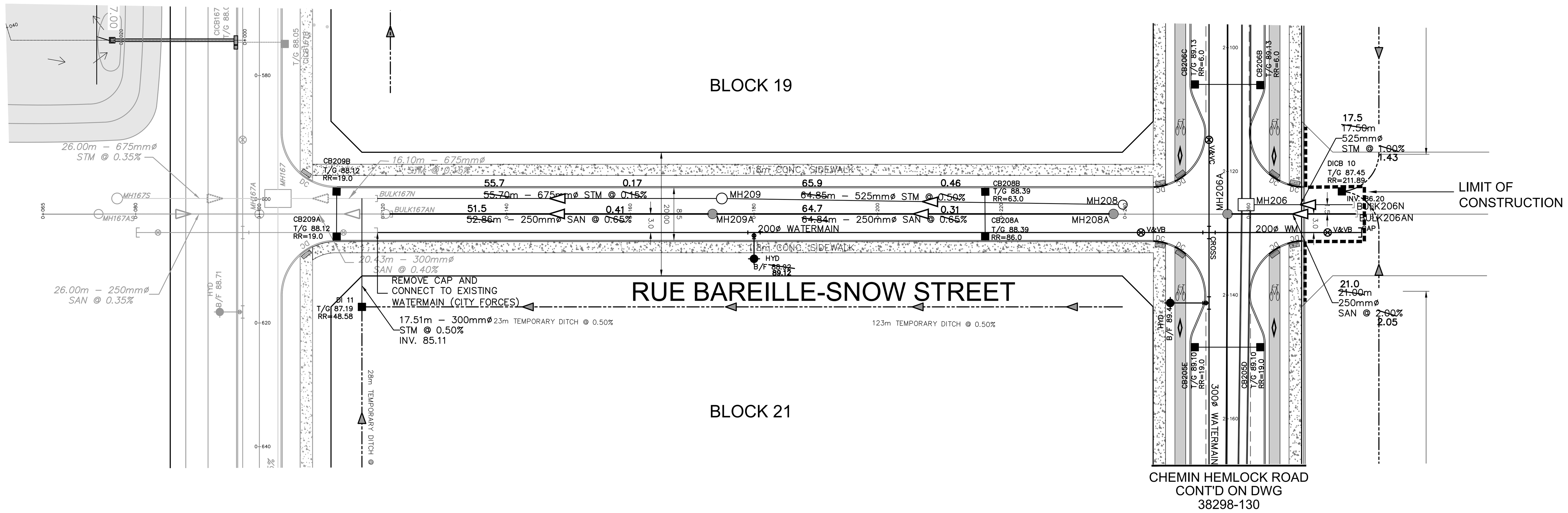
Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L=0.05
Velocity = Flow / Area = 0.56 m/s
HL = K_L * V^2/ 2g

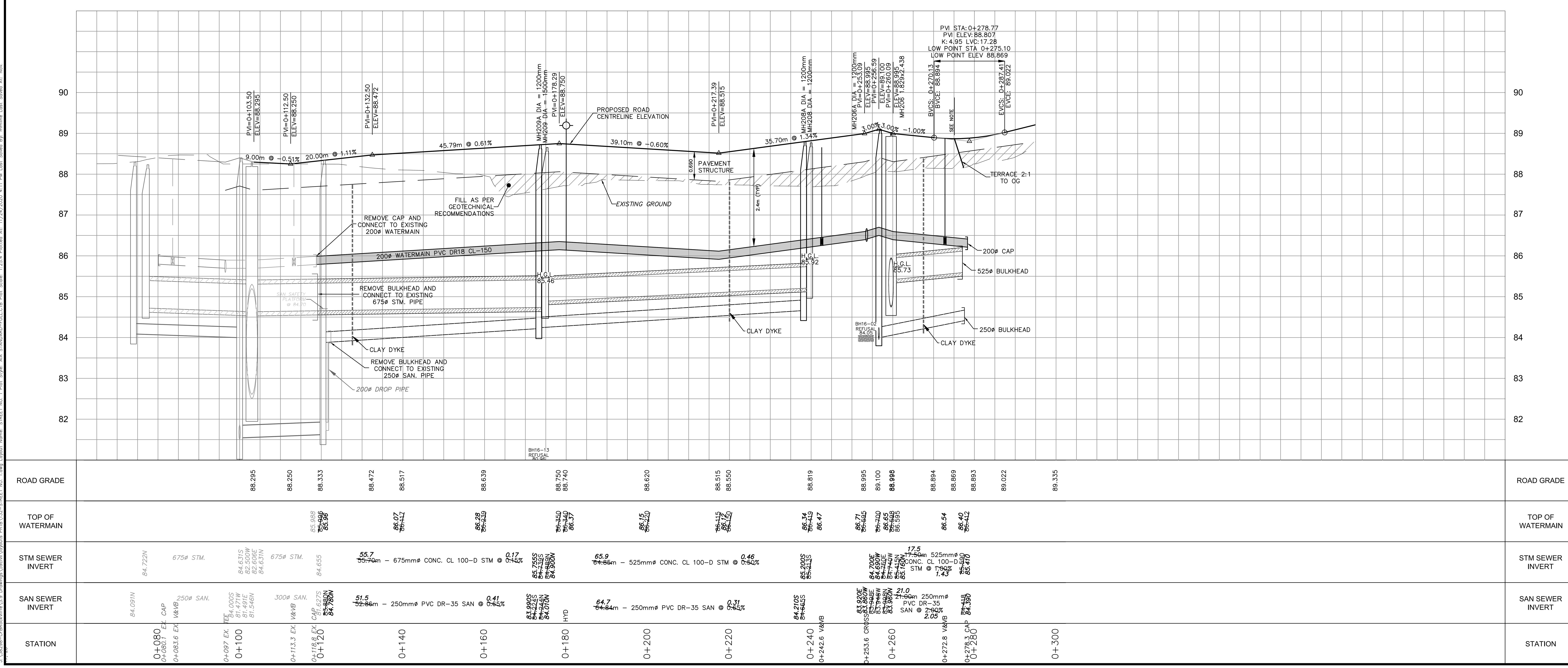
FRICTION LOSS		FROM MH	TO MH	PIPE ID
		STM MH4	**STM MH1**	
INVERT ELEVATION (m)		87.821	87.411	
OBVERT ELEVATION (m)		88.121	87.711	
DIAMETER (mm)				300
LENGTH (m)				25.1
FLOW (l/s)				39.30
HGL (m)	***	**87.610**	**87.651**	**0.041**
MANHOLE COEF K=	0.05	LOSS (m)	0.001	
TOTAL HGL (m)			**#NUM!**	
MAX. SURCHARGE (mm)			**#NUM!**	

MANNING FORMULA - FLOWING FULL						
DIA (m)	Area (m2)	Perim. (m)	Slope (%)	Hyd.R. (m)	Vel. (m/s)	Q (l/s)
0.3	0.07	0.94	1.630	0.08	#NUM!	#NUM!

HYDRAULIC SLOPE = #NUM! %
DESIGN FLOW TO FULL FLOW RATIO (Q/Qf) = #NUM!
DESIGN FLOW DEPTH = #NUM!

Head loss in manhole simplified method p. 71 (MWDM)
straight through K_L=0.05
Velocity = Flow / Area = 0.56 m/s
HL = K_L * V^2/ 2g





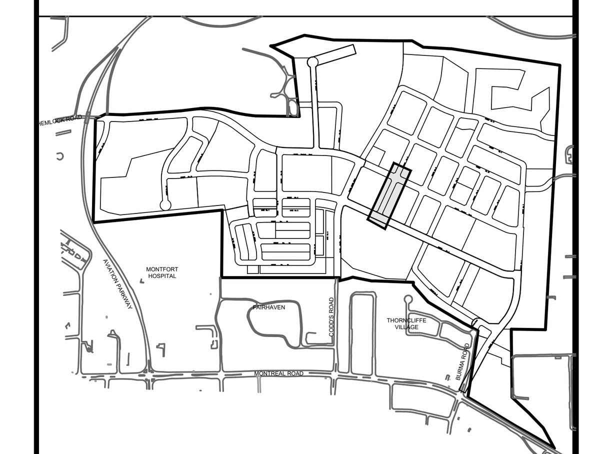
REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ______________________

Date ______________________ 2017

Plan Number ______________________

NOTE:
FROM ±STA. 0+278-FUTURE ROAD CENTRE LINE PROFILE IS PROVIDED FOR CONTINUITY.



No.	REVISIONS	By	Date
14			
13			
12			
11			
10	RECORD DRAWING	J.I.M.	2020:11:17
9	AS BUILT	J.I.M.	2018:06:15
8	ISSUED FOR CONSTRUCTION	J.I.M.	2017:08:02
7	REVISED PER CITY COMMENTS	J.I.M.	2017:06:16
6	REVISED PER MOECC COMMENTS	J.I.M.	2017:06:07
5	ISSUED FOR TENDER	J.I.M.	2017:03:23
4	SUBMISSION FOR MOECC APPROVAL	J.I.M.	2017:02:16
3	SUBMISSION No.3 FOR CITY REVIEW	J.I.M.	2017:01:25
2	SUBMISSION No.2 FOR CITY REVIEW	J.I.M.	2016:11:04
1	SUBMISSION No.1 FOR CITY REVIEW	J.I.M.	2016:07:08

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Project Title
WATERIDGE VILLAGE AT ROCKCLIFFE
PHASE 1B

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2020/11/17
PROVINCE OF ONTARIO

N

Drawing Title
BARIELLE-SNOW STREET

MIKINAK ROAD TO HEMLOCK ROAD

Scale
HORIZ. SCALE 1 : 500
VERT. SCALE 1 : 50

Design	Date
J.I.M.	MAY 2016
Drawn	Checked
M.M.	J.I.M.
Project No.	Drawing No.
38298	132

D07-16-15-0003

#17063

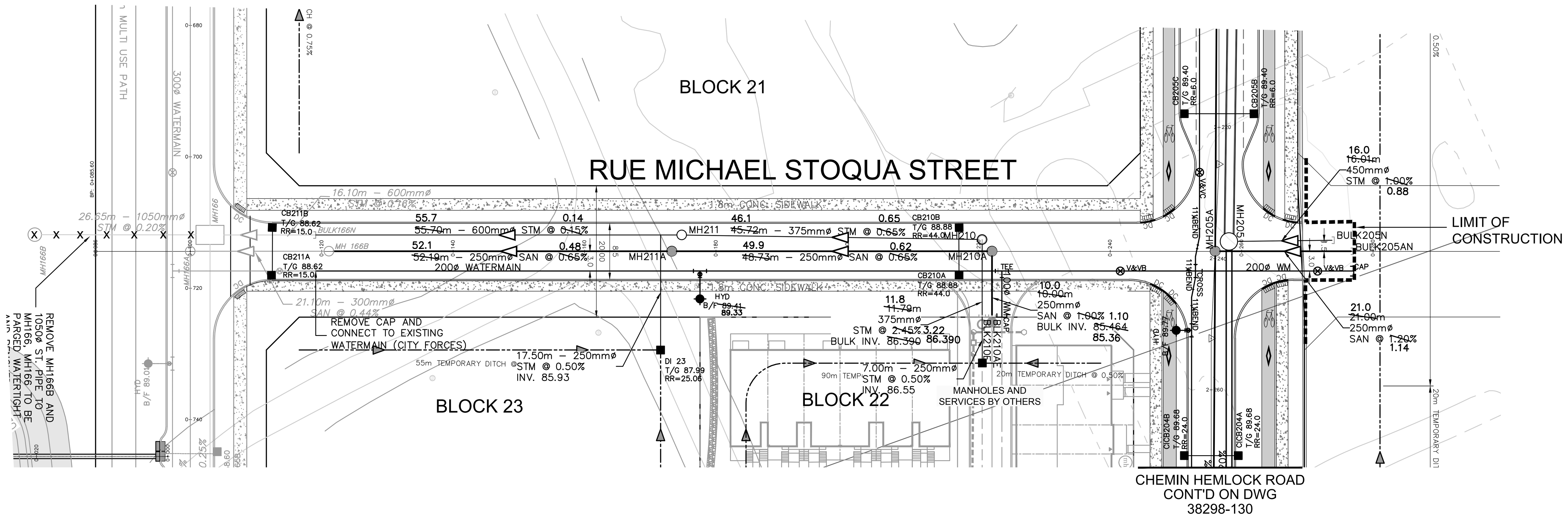
REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

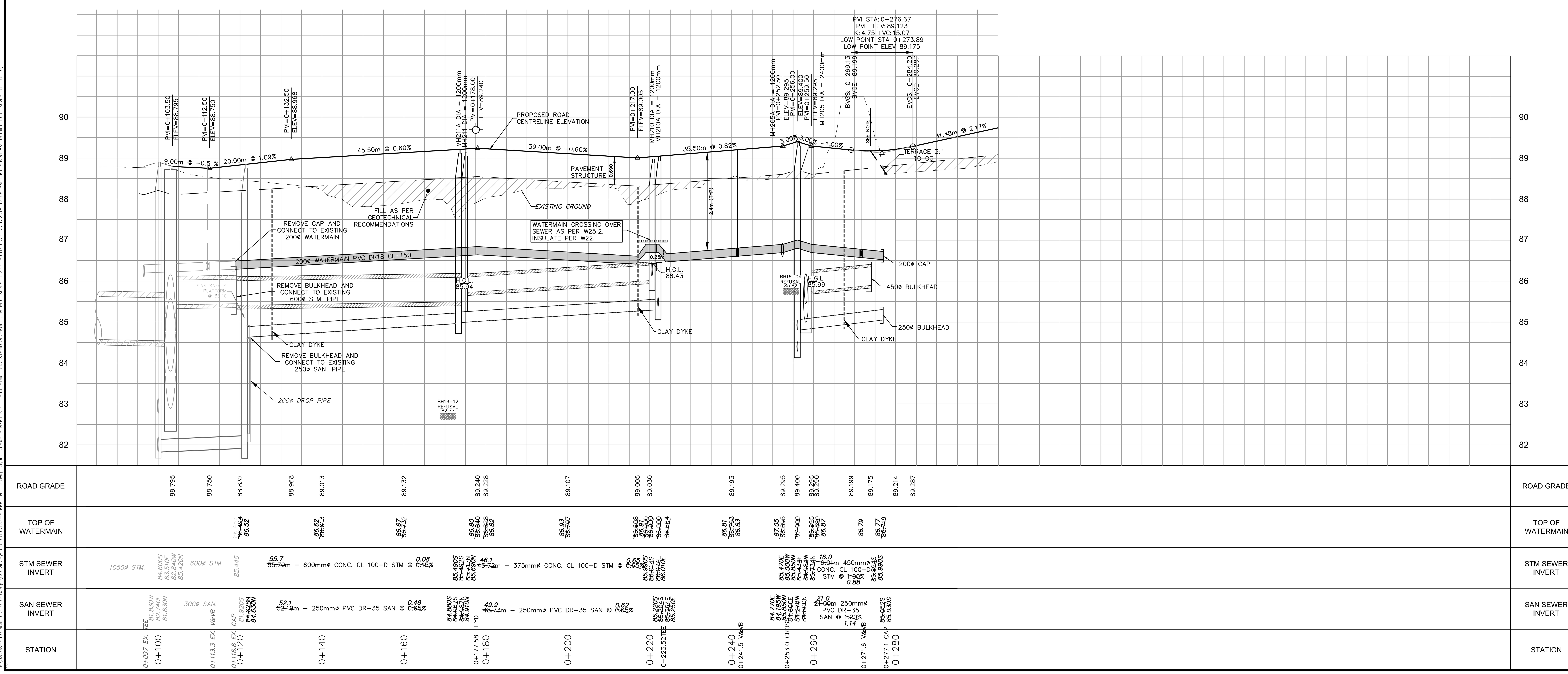
Signed ______________________

Date ______________________ 2017

Plan Number ______________________

NOTE:
FROM ±STA. 0+277-FUTURE ROAD CENTRE LINE PROFILE IS PROVIDED FOR CONTINUITY.





No.	REVISIONS	By	Date
14			
13			
12			
11			
10	AS BUILT	J.I.M.	2018:06:15
9	REVISED PER MATTAMY DESIGN FOR BLOCKS 22, 24 AND 15	J.I.M.	2017:09:15
8	ISSUED FOR CONSTRUCTION	J.I.M.	2017:08:02
7	REVISED PER CITY COMMENTS	J.I.M.	2017:06:16
6	REVISED PER MOECC COMMENTS	J.I.M.	2017:06:07
5	ISSUED FOR TENDER	J.I.M.	2017:03:23
4	SUBMISSION FOR MOECC APPROVAL	J.I.M.	2017:02:16
3	SUBMISSION No.3 FOR CITY REVIEW	J.I.M.	2017:01:25
2	SUBMISSION No.2 FOR CITY REVIEW	J.I.M.	2016:11:04
1	SUBMISSION No.1 FOR CITY REVIEW	J.I.M.	2016:07:08

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Project Title

WATERIDGE VILLAGE AT ROCKCLIFFE

PHASE 1B

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
18/06/15
PROVINCE OF ONTARIO

Drawing Title

MICHAEL STOQUA STREET

MIKINAK ROAD TO HEMLOCK ROAD

Scale
HORIZ. SCALE 1 : 500
VERT. SCALE 1 : 50

Design	Date
J.I.M.	MAY 2016
Drawn	Checked
M.M.	J.I.M.
Project No.	Drawing No.
38298	133

D07-16-15-0003

#17063

Appendix E – Referenced Reports

1. Pre-Consultation Meeting
2. Design Brief, Wateridge Village Phase 1B, by IBI Group
3. Wateridge Phase 1B Developer's Checklist, by Aquafor Beech Ltd.
4. Geotechnical Investigation Report, Paterson Group
5. Geotechnical Memorandum with Infiltration Rates
6. GWAL email confirmation
7. City of Ottawa Servicing Study Checklist
8. RVCA Correspondence
9. Email Confirmation from Architect Dated Aug 23, 2021.
10. Letter Confirmation from GWA, Dated Aug 23, 2021.

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OCH- 715 Mikinak Road
Pre-Application Consultation Meeting – City of Ottawa

Microsoft Teams
July 15, 2020 9:30am-11:00am

Agenda

1. **Project Overview – Chun Wang**
   a. Project and site layout description
   b. Site history and understanding of development concept
2. **Zoning – Tess Gilchrist / Chun Wang**
   a. Non-residential use at grade requirements on Hemlock and Mikinak Roads
   b. Length of Building 1 façade on Hemlock and articulation requirements
   c. Step back at 4^{th} storey, acceptable at 2^{nd} storey?
   d. Setback of Buildings 2 & 3 on Mikinak (front and side)
   e. Building 1 – potential for two towers but one podium, each at 750 m2 GFA?
   f. Parking rate (residential and commercial), driveways and aisle requirements
   g. Height limitations (30 metres, 9 storey mid-rise max)
3. **Minor Variance Application – Tess Gilchrist**
   a. Potential application for reduced residential parking
4. **Landscape – Neno Kovacevic / Leah Lanteigne**
5. **Waste Management – Chun Wang**
   a. Low-rise versus high-rise guideline (high-rise separate compactor for waste)
   b. Bulky items area, 10 m2 for low-rise, what is high-rise requirement?
   c. Commercial versus multi-unit residential eligibility
6. **Traffic – David Hook / Ben Pascolo-Neveu / Chun Wang**
   a. Screening form submitted
   b. TIA to focus on site impacts
   c. Site entry expectation and limitations
7. **Civil – Bill Thomas**
   a. Servicing tie-in locations
8. **City Feedback – various**
9. **Site Plan Application Submission Requirements**

CANADA LANDS COMPANY
SOCIÉTÉ IMMOBILIÈRE DU CANADA

REPORT
Project: 38298-5.2.2

DESIGN BRIEF
WATERIDGE VILLAGE AT ROCKCLIFFE
PHASE 1B

Prepared for CANADA LANDS COMPANY
by IBI GROUP
JUNE 07, 2017
JUNE 16, 2017

Document Control Page

CLIENT:	CANADA LANDS COMPANY
PROJECT NAME:	
REPORT TITLE:	DESIGN BRIEF WATERIDGE VILLAGE AT ROCKCLIFFE PHASE 1B
IBI REFERENCE:	
VERSION:	
DIGITAL MASTER:	[File Location]
ORIGINATOR:	[Name]
REVIEWER:	[Name]
AUTHORIZATION:	[Name]
CIRCULATION LIST:	
HISTORY:	

Table of Contents

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List of Appendices

1 Introduction

1.1 Scope

This report was prepared in accordance with the November 2009 Servicing Study Guidelines for Development Applications in the City of Ottawa. **Appendix A** contains a customized copy of those guidelines which can be used as a quick reference for the location of each of the guideline items within this report.

The purpose of this Design Brief is to provide stakeholder regulators with the project background together with the design philosophy and criteria incorporated in the sub-division design. This report will provide a logical framework to assist reviewers with evaluation of the design of the development.

1.2 Background

1.2.1 General

In 2011, Canada Lands Company (CLC), bought and took ownership of about 125 ha of the former CFB Rockcliffe air base site. The acquisition of the decommissioned base by CLC offers the opportunity today to reconnect this site back into the urban fabric of the City and create a highly desirable mixed-use community for approximately 10,000 residents. The long-term development period to full build out is estimated to be 15-20 years. There is also the opportunity to provide space for a variety of employment uses providing up to 2,600 permanent jobs.

Due to the proximity to the downtown, the new community will allow for more intensive development than in the outer suburbs, yet at a lower scale than one would see closer to the core.

A variety of housing types will be built to provide a range of choices for people with different housing needs. A community core will have the greatest mix of land uses to provide amenities to the new neighbourhoods, and it will also have the most active and vibrant streets in the community.

1.2.2 Previous Studies

In anticipation of development of the subject site, numerous reports and studies have been completed over the last five years. The most significant of these is the Community Design Plan (CDP) for which a Master Servicing Study was also prepared as a supporting document. Those documents were approved by City Council on October 14, 2015.

The “Former CFB Rockcliffe Community Design Plan, August 14, 2015”, includes a Draft Preferred Plan – Land Use which is shown in **Figure 1.1**. That figure illustrates the overall land use, road and block pattern for the community. That land use plan provides guidance and information upon which the balance of the development will be based.

In support of the CDP, there were numerous supporting documents including the “Former CFB Rockcliffe Master Servicing Study” (MSS), August 2015, prepared by IBI Group. That report provided a plan for provision of major infrastructure needed to support the proposed development of the subject site. The first development on the site by CLC was Wateridge Village by Rockcliffe Phase 1A. That phase was designed and approved in 2015/16 and is currently under construction. One of the design documents included the “Design Brief Wateridge Village at Rockcliffe Phase 1A” dated April 2016. That report built upon the infrastructure recommendations of the earlier MSS document including the Eastern Stormwater Management Facility with an outlet to the Ottawa River; major trunk sewer outlets and most of the backbone watermain designs. The current Phase 1B will essentially connect to the major infrastructure designed in Phase 1A.

1.2.3 Municipal Infrastructure

The former site was serviced with central municipal services including a potable water supply and combined sewers. The combined sewers discharged to the Ottawa Interceptor Sewer (IOS) which is a large diameter trunk combined sewer servicing a large portion of the City of Ottawa and a portion of which is located about 40 m below the Wateridge Village at Rockcliffe site. Combined sewage from the west portion of the site previously discharged to the Alvin Heights Pullback Sewer and combined flows from the eastern portion of the site discharged to the RCAF Pullback Sewer. Both these connections are fitted with overflow mechanisms which divert some flow away from the IOS sewer towards the Ottawa River during infrequent storm events.

There are two dedicated storm sewers which are still in service on the subject site. Both these sewers discharge stormwater from an existing quantity control facility designed to handle flows from the adjacent Thorncliffe Village Community located to the south of the subject site. One of these sewers discharges to an open ditch near the western portion of the site which eventually outlets to the Western Creek located west of the Aviation Parkway adjacent to the RCMP training site. The Western Creek eventually empties into the Ottawa River. The second storm sewer discharges over the eastern escarpment eventually outletting into the Eastern Creek which also empties into the Ottawa River.

There is also one existing dedicated sanitary sewer on the subject site. That sewer also services the adjacent Thorncliffe Village and discharges into the IOS Trunk Sewer via the Codd's Road Shaft which is located in the center of the subject site. The Phase 1A design included temporary interception of the three existing active sewers.

The water distribution system that previously serviced the property has been decommissioned and is no longer in service.

It is the intention to replace the existing sewer system with a separated system consisting of new sanitary sewers and minor storm sewers. The existing water system is also planned to be replaced with new watermains.

1.3 Subject Property

Although CLC owns about 125 ha of the former air base property, it plans to develop the lands in several phases. The first Phase 1A included much of the lower density housing types in the south central portion of the site identified as blocks 11, and 15 to 21 on **Figure 1.1**. Phase 1A also included the east-west collector sewer (Mikinak Road) adjacent to blocks 38, 53 and 54 as well as the southern leg of the major collector. Phase 1B is proposed to include development of Main Street (Hemlock Road); and two sections of the Major Collector (Wanaki Road); the crescent street around block 53 (Squador Crescent), connetcting streets: Bareille Snow Street, Michael Stoguq Street and Moses Tennisco Street between Hemlock and Mikinak and the stormwater management improvements to the existing "Burma" Pond. The draft M-Plan, **Figure 1.2**, for Phase 1B is included in **Appendix A**.

1.4 Watercourses

There are two significant watercourses downstream of the Rockcliffe property. These are the Western Creek located west of the Aviation Parkway and the Eastern Creek located east of the Aviation Museum. Runoff from the subject site presently drains to both those watercourses. However, runoff from Phase 1A will be directed away from those two creeks and routed to a new stormwater management facility which will discharge directly to the Ottawa River in a new pipe.

There is an existing shallow ditch that runs along the southern and western edges of the subject site (Southwest Swale). That ditch collects runoff from adjacent upstream developments, including Codd's Road, the Fairhaven Community and the Montfort Woods. Runoff from the existing ditch is eventually captured in the local storm sewer system and outlets to an existing ditch upstream of Hemlock Road. That runoff eventually discharges to the Western Creek.

There are also a series of existing drainage ditches on the NRC property which collect and convey runoff to the existing Burma Road Stormwater Management Facility. All existing watercourses are indicated on **Figure 1.3**.

The Phase 1B development will have no physical impact on the downstream watercourses. Two of the upstream ditches on the NRC property will need to be re-routed to accommodate Wanaki Road.

1.5 Limits of Existing Infrastructure

Figures 1.4 to Figure 1.6 indicate the limits of the existing municipal infrastructure which was constructed to provide the servicing requirements of the former CFB Rockcliffe airbase and subsequently revised as per the previous development Phase. **Figure 1.4** indicates the limits of existing water plant infrastructure and **Figure 1.5** and **Figure 1.6** respectively show the locations of existing sanitary and storm sewers. Both the Brittany Drive Pump Station and Montreal Road Pump Station provide water to both the Zone 1E and Zone Mont. The subject site is located in Zone Mont. The Ottawa Interceptor Sewer (IOS) is a 2400 mm diameter combined sewer to which wastewater and some storm runoff presently outlets. Codd's Road was the approximate drainage divide for the former development and combined site sewers to the west of Codd's Road discharged to the existing 300 mm diameter Airbase Pullback sewer which empties into the Alvin Heights Pullback Sewer which discharges to the IOS at the Peach Tree Road Shaft located west of the CLC property. Wastewater flows from the east portion of the site previously outletted to the existing 300 mm diameter RCAP Pullback sewer which connects to the IOS via the NRC shaft.

Sanitary flows from the Thorncliffe Village Community were previously routed through the subject site and connected to the IOS at the Codd's Road Shaft which is located in the center of the site. Development of Phase 1A included a revised connection at the Codd's Road Shaft including a temporary interception of the sanitary sewer from the Thorncliffe Village development.

All existing site sewers are proposed to be eventually removed in favour of new sewers. There were no existing stormwater management facilities servicing the former development.

1.6 Pre-Consultation

A pre-consultation meeting with the City of Ottawa was held on May 24, 2016. Although there were no formal meeting notes issued, the City provided general input and guidance including discussions about Tree Conservation Report, Transportation Study, Geotechnical Report, Noise Study, landscape drawings, urban design, parks, roads, registration and servicing.

1.7 Geotechnical Considerations

DST Consulting Engineers (DST) was retained to prepare a geotechnical investigation report for Phase 1B Wateridge Village by Rockcliffe Development. The objectives of the investigation was to prepare a report to:

- Determine the subsoil and groundwater conditions at the site by means of test pits and boreholes and

- To provide geotechnical recommendations pertaining to design of the proposed development including construction considerations.

The Phase 1B report IN-SO-026755 “Geotechnical Investigation Phase 1B Development – Site Servicing Wateridge Village at Rockcliffe, Ottawa Ontario was prepared on October 25, 2016. The report recommendations were based on findings and observations from several boreholes and test pits. Among other items, the report recommendations deal with:

- Site grading;
- Foundation design;
- Pavement structure;
- Sewer and Watermain construction;
- Groundwater control;
- Grade raises

With respect to Phase 1B, the geotechnical investigation report confirmed that the site consists mostly of deep deposits of clay. Because of the presence of the thick clay layer, the investigation report recommended grade raises be limited to between 1.25 m and 2.0 m in most areas of the subdivision. The approximate grade raise limits are included on the Grading Plans.

1.8 Existing Private Services

There are existing private services within the Fairhaven Community located south of and adjacent to Phase 1A and at the Aviation Museum. None of the private services will be impacted by Phase 1B construction.

1.9 Phasing

The development of the future Wateridge Village at Rockcliffe site will be completed in multiple phases. CLC envisioned the development will be completed in three phases. The first phase will be completed in two sub-phases – Phase 1A and 1B. **Figure 1.7** shows the limits of the four proposed phases.

2 Water Supply

2.1 Existing Conditions

Phase 1B of Wateridge Village at Rockcliffe will be serviced with potable water from the City of Ottawa's Montreal Road Pressure Zone (Zone MONT). The water distribution system that previously serviced the property has been decommissioned. An existing 406 mm diameter watermain on Montreal road will supply the site with connections at Codd's Road and Burma Road.

As part of the Phase 1A designs a 400 mm main is proposed to extend north on Codd's Road to future Hemlock Road, replacing an existing 150 mm main. A second connection is proposed to Phase 1A by connecting to an existing 300 mm main at Burma Road and Drayton Private and extending a 300 mm main west on Mikinak Road in Phase 1B to the Codd's Road main. At the time of writing this report the Phase 1A construction is ongoing, watermains to be constructed for the Phase 1A design are shown on **Figure 2.1**.

2.2 Master Servicing Study

A recommended water distribution plan was included in the former CFB Rockcliffe Master Servicing Study, August 2015 by IBI Group. The recommended plan for Phase 1A was implemented in the Phase 1A design as discussed in Section 2.1. For Phase 1B the Master Servicing Study calls for a 300 mm main on Hemlock Road and a 400 mm main on Wanaki Road connecting to an existing 400 mm main on Burma Road at Montreal Road. All other mains in Phase 1B are 200 mm diameter. A copy of Figure 4.4 Proposed Pipe Alignment and Diameters from the Master Servicing Study is included in **Appendix B**.

2.3 Design Criteria

2.3.1 Water Demands

Water demands for Phase 1B are based on **Table 4.2** – Consumption Rates for Subdivisions of 501 to 3,000 Persons of the Ottawa Design Guidelines – Water Distribution. In the preferred Concept Plan from the Master Servicing Study land use in Phase 1B consists of low rise residential, mid-rise mixed use, institutional (school) and commercial (high rise employment). As there are no details for the residential development, population projections are derived from the projected population densities for the blocks. For institutional and commercial blocks an average day rate of 50,000 l/s/h is used to determine the water demands. A watermain demand calculation sheet is included in **Appendix B** and the total water demands for Phase 1B are summarized as follows:

- Average Day 17.46 l/s
- Maximum Day 38.45 l/s
- Peak Hour 81.54 l/s

2.3.2 System Pressure

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

Minimum Pressure	Minimum system pressure under peak hour demand conditions shall not be less than 276 kPa (40 psi)
Fire Flow	During the period of maximum day demand, the system pressure shall not be less than 140 kPa (20 psi) during a fire flow event.
Maximum Pressure	Maximum pressure at any point in the distribution system shall not exceed 689 kPa (100 psi). In accordance with the Ontario Building/Plumbing Code, the maximum pressure should not exceed 552 kPa (80 psi). Pressure reduction controls may be required for buildings where it is not possible/feasible to maintain the system pressure below 552 kPa.

2.3.3 Fire Flow Rate

In the recent Technical Bulletin 'ISDTB-2014-02, Revisions to Ottawa Design Guidelines – Water', the fire flow requirements for single detached dwellings and traditional town and row houses can be capped at 10,000 l/min providing that there is a minimum separation of 10 meters between the backs of adjacent units and that the town and row house blocks are limited to 600 square meters of building areas and seven dwelling units. As the residential units in Phase 1Bmeet the requirements of ISDTB-2014-02, the fire flow rate of 10,000 l/min (166.7 l/s) was used in the fire flow analysis.

As there are no specific details for the residential development in Phase 1B the Technical Bulletin IDSTD-2014-02 may not be applicable. A fire flow rate of 13,000 l/main will be used to evaluate fire flows for all of Phase 1B; that is consistent with the Master Servicing Study. The 13,000 l/min rate will also be used for the commercial and institutional blocks, the rate should be considered conservative for a school with a sprinkler system. As the Phase 1B area is serviced by 400 mm mains on Codd's Road and Wanaki Road and by 300 mm mains on Hemlock Road and Mininak Road a future fire flow demand larger than the 13,000 l/s can likely be accommodated without requiring a larger main.

2.3.4 Boundary Conditions

The City of Ottawa has provided hydraulic boundary conditions at the Codd's and Burma Roads connection locations for Phase 1. The boundary conditions are for existing conditions; future conditions are to be derived from the Master Servicing Study.

A copy of the boundary conditions is included in **Appendix B** and summarized as follows:

	Codd's Road	**Burma Road**
Max HGL (Basic Day)	147.1 m	147.1 m
Peak Hour	147.0 m	147.1 m
Max Day + Fire (13,000 l/min Fire Flow)	139.5 m	140.2 m
Max Day + Fire (10,000 l/min Fire Flow)	140.0 m	140.4 m

The August, 2015 Master Servicing Study states that the existing discharge HGLs into Zone MONT ranges between 142 m to 147 m and that controlling the HGL discharge head at the Montreal Road PS to 143 m can reduce pressures to the entire development. Based on this information, a max HGL analysis for future conditions will be assessed with a boundary HGL of 143 m and the future peak hour will be assessed with a HGL of 142 m.

2.3.5 Hydraulic Model

A computer model for the Phase 1B site has been developed using the H20 MAP version 6.0 program produced by MWH Soft Inc. which includes the Phase 1A site. The model incorporates the boundary conditions at Codd's Road and Burma Road. Current and future basic day (max HGL) and peak hour scenarios were run using the HGLs discussed in **Section 2.3.4**. For the Max Day Plus + Fire scenario, the 13,000 l/min fire flow HGL was used as it represents the worst case for Phase 1B.

2.4 Proposed Water Plan

The hydraulic model for Phased 1B has 400 mm mains on the extension of Codd's Road, and on Wanaki Road connecting to the existing 400 mm main on Burma Road at Montreal Road. On Hemlock and Mininak Roads 300 mm watermains are used in accordance with the Master Servicing Study. All other mains are 200 mm diameter, the recommended water plan for Phase 1B is shown on **Figure 2.2**

Results of the hydraulic model for both the current and future conditions are included in **Appendix B** and summarized as follows:

Scenario	Results
Basic Day (Max HGL) Current Pressure (kPa)	512.3 to 575.5
Basic Day (Max HGL) Future Pressure (kPa)	472.1 to 534.8
Peak Hour Current Pressure (kPa)	508.7 to 570.5
Peak Hour Future Pressure (kPa)	459.1 to 521.0
Max Day + Fire Minimum Fire Flow (l/s	312.4

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

Maximum Pressure	Under current conditions, the basic day (Max HGL) scenario yields the majority of the nodes above 552 kPa (80 psi) require pressure reducing control except for units at the north east corner of the site. Under future conditions, pressure is reduced below 552 kPa for all of the locations. There are no areas for current or future conditions where the pressure exceeds 689 kPa (100 psi).
Minimum Pressure	For both current and future conditions, the minimum peak hour pressures at all nodes exceed the minimum requirement of 276 kPa (40 psi).
Fire Flow	The minimum design fire flow under maximum day conditions with a minimum system pressure of 140 kPa (20 psi) is 312.4 l/s which exceeds the requirement of 216.7 l/s (13,000 l/min).

2.5 External Improvements

The "Former CFB Rockcliffe Master Servicing Study" completed a review of the external delivery system to Zone Mont. The subject site is located in that zone. The zone is serviced with potable water from the City of Ottawa's Montreal Road Pressure Zone (Zone Mont). The Montreal Road Pump Station (MRPS) and the Brittany Drive Pump Station (BDPS) boost water pressure to these lands. The MSS report noted that, in accordance with the 2013 WMP, BDPS is currently at a deficiency for pumping capacity and needs to be upgraded to meet the City's reliability Level of Service requirements. The MSS report recommended that immediate improvements be made to the Zone Mont pumping capabilities. The City of Ottawa is currently in the process of making those improvements.

3 Wastewater Disposal

3.1 Existing Conditions

The existing wastewater collection system for the Wateridge Village at Rockcliffe property consists of the new Phase 1A sanitary sewers as well as the Thorncliffe Village sanitary sewer together with many of the older combined sewers. All wastewater flow from the former air base development was directed to the Ottawa Interceptor Sewer (IOS). That sewer is a 2.4 mm diameter trunk facility which bisects the Rockcliffe site about 40 meters below ground. The IOS is a large combined sewer which services a large portion of the City of Ottawa.

Combined wastewater flow from the former development was directed to the IOS via one of two existing connections. **Figure 1.5** shows the existing wastewater network in and around the subject site

Prior to the Phase 1A development, generally wastewater flow from lands located west of Codd's Road was directed to the IOS sewer via the Air Base and Alvin Heights pull-back sewers. Wastewater flows east of Codd's Road were routed and connected to the IOS via the RCAF pull back sewer.

There are also three external areas which pass wastewater flows through the CLC lands and also outlet to the IOS. The Montfort Hospital is located adjacent to and immediately southwest of the CLC property. Sanitary wastewater flow from the hospital outlets to an existing combined sewer located near the west portion of the CLC lands which in turn outlets to the Air Base Pull back sewer and the Alvin Heights sewer. That pull back sewer system will remain in service and will not be impacted by the proposed development of Wateridge Village.

The National Research Council (NRC) campus abuts the CLC property to the east. Combined wastewater from the NRC campus is collected in a 750 mm diameter combined sewer and routed through the CLC property to the NRC Shaft at the IOS. The development of Phase 1B will not impact the NRC outlet sewer.

The Thorncliffe Community is located south of the Wateridge Village at Rockcliffe site. Wastewater from the community is routed in a dedicated sanitary sewer through the subject site and temporarily connects to the Phase 1A sanitary sewer system, where flows are routed to the IOS sewer via the Codd's Road Shaft. The Codd's Road Shaft location is indicated on **Figure 1.5**. This connection to the Interceptor Outfall Sewer was added in 1991 as part of the development of the Thorncliffe Village community.

3.2 Master Servicing Study

Canada Lands Company completed a Community Design Plan (CDP) in 2015. To support that plan, a number of technical reports were prepared including the 'Former CFB Rockcliffe Master Servicing Study, August, 2015' (MSS). That report recommended that the existing combined sewers on the subject site be abandoned in favour of dedicated sanitary and storm sewer systems.

In particular, the MSS recommended that future wastewater flow from Phase 1B be directed to the Codd's Road Shaft. Accordingly, wastewater flows from the subject site will be designed to outlet to that location. The previous Phase 1A design included the new connection to that shaft and the Phase 1B sanitary sewers will connect to the Phase 1A system. For reference, a copy of Figure 5.1, Recommended Wastewater Plan, from the MSS document is included in **Appendix C**.

3.3 Design Criteria

In accordance with the City's 'Ottawa Sewer Design Guidelines' and the recommendations in the 'Former CFB Rockcliffe Master Servicing Study, August, 2015', the following design criteria were used to predict wastewater flow rates 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
- Residential Peaking Factor – Harmon Formula (2.00 to 4.00)
- Commercial/Institutional average flow – 50,000 l/gross/ha/d
- Residential/Institutional peaking factor – 1.5
- Infiltration inflow – 0.28 l/s effective gross ha
- Minimum allowable slopes as listed below:

DIAMETER (mm)	SLOPE (%)
250	0.240
300	0.186
375	0.140
450	0.111
525 and larger	0.100

Where practical and where there are less than 10 residential connections, the first lengths of sanitary sewers are designed as 250 mm diameter pipes with a minimum slope of 0.65%.

The population densities identified in the CFB Rockcliffe MSS are:

- Single Family Units 3.4 ppu
- Semi Detached Units 2.7 ppu
- Freehold Townhouses 2.7 ppu

3.4 Proposed Wastewater Plan

The recommended wastewater plan for Phase 1B is shown on **Figure 3.1** which is included in **Appendix C**. All wastewater flows will be directed and connected to the new Phase 1A sewers. In accordance with the MSS report, the Phase 1B sanitary sewer will be oversized to provide capacity for future developments within the CLC property as well as external properties.

The existing Thorncliffe Community has an existing sanitary sewer which collects wastewater from the community and directs it through a dedicated sanitary sewer through the CLC property. The Phase 1A sewers temporarily intercept the existing sewer near MH 169A in Mikinak Road. The Phase 1B design proposes to permanently intercept the Thorncliffe Community sewer in croissant Squadron Crescent at MH 128B. The existing sewer section under the stormwater pond will need to be lowered to accommodate construction of the new Burma Pond.

3.5 Local Extraneous Flows

Ground water levels are expected to be in the clay stratum. All new sanitary sewers will be tested to the City of Ottawa standards prior to being put into service. For the subject site, there are no unusual local conditions that are expected to contribute to extraneous flows that are higher than those noted in the City's guidelines.

3.6 Wastewater Outlet

As stated above, the wastewater outlet for the subject site will be the Ottawa Interceptor Sewer. That sewer bisects the CLC property and previously accepted combined flows from the site and wastewater from both the Thorncliffe Village Community and the Montfort Hospital. The Phase 1A wastewater plan included new local sewers that are routed to the reconstructed Codd's Road Shaft. Wastewater flows from Phase 1B are proposed to connect to the upper reaches of the Phase 1A sewer system.

3.7 Sewer Calculations

Detailed sewer design spreadsheets, using MOE design criteria, together with Sanitary Drainage Area Plan 501A is included in **Appendix C**. In accordance with the recommendations of the MSS document, wastewater flows from the Phase 1B site will be routed to the IOS trunk sewer via the new Phase 1A sewers. The Phase 1B sanitary design also intercepts and provides capacity for the Thorncliffe Village flows as well as other site areas that will be developed in the future but which will also outlet through the Phase 1B sewers. Those external areas are identified on the Drainage Area Plans, and relevant design elements such as areas and population estimates were interpreted from the MSS document.

3.8 Environmental Constraints

There are limited environmental constraints for the development of Phase 1B. Any SAR vegetation will be protected on defined park blocks such as Block 18. Other than scattered road side ditches remaining from the former airbase development and the existing drainage ditches on the NRC property which outlet to the existing Burma SWM Facility, there are no significant water courses on the subject site which are impacted by the development of Phase 1B.

3.9 Emergency Overflow

All wastewater flows from the Wateridge Village at Rockcliffe site, including Phase 1B, are proposed to be directed to their outlets by gravity. Therefore, no pumping stations and related emergency overflows are needed for this development.

4 Minor Storm System

4.1 Existing Conditions

Figure 1.6 shows the existing storm sewers in and around the Wateridge Village at Rockcliffe site. Prior to the Phase 1A development, most of the existing site sewers were combined sewers. Ultimately the existing combined sewers are proposed to be abandoned in favour of separated sanitary and storm sewers. Accordingly the Phase 1A design included both dedicated storm and sanitary sewers.

Prior to Phase 1A the only dedicated storm sewers on the CLC property include two 1050 mm diameter sewer outlet pipes from the existing Burma Road SWM Facility. The Phase 1A minor storm sewer plan included temporary interception of the two existing storm sewers. Flows from the Burma Pond are now directed to the Eastern SWM facility before release to the Ottawa River.

Other than the above noted Burma Road SWM Facility, which is located on CLC property (Block 20), there are no SWM facilities on or adjacent to the CLC property which can potentially provide treatment for the Wateridge Village at Rockcliffe site, including Phase 1B.

4.2 Master Servicing Study

CLC completed the servicing report, '2015 Former CFB Rockcliffe Master Servicing Study, in 2015. That report recommended a preferred Stormwater Management Plan for the Wateridge Village at Rockcliffe site. The report recommended construction of two stormwater ponds and related appurtenances to service the CLC property; the Western Stormwater Management Facility and the Eastern Stormwater Management Facility.

The Eastern Pond is proposed to provide management of flows from both Phase 1 and 3 of the CLC property. Therefore, the Eastern pond construction was included as part of the development of Phase 1A.

The MSS Report also recommends a series of local and trunk storm sewers to collect runoff from Phases 1 and 3 and route those flows to the Eastern Facility. The Phase 1A design followed the recommendations of the MSS report, including construction of the large diameter sewers, which outlet to the Eastern Stormwater Management Facility; the Eastern Stormwater Management Facility and outlet to the Ottawa River. The proposed Phase 1B storm sewers will connect to the downstream Phase 1A sewer system. For reference, a copy of Figure 6.7, Recommended Storm Sewer System from the MSS Report, is included in **Appendix D**.

4.3 Minor Storm Sewer Design Criteria

In keeping with guidelines published in the City of Ottawa for storm sewers, the storm drainage system proposed for the Wateridge Village at Rockcliffe Phase 1B lands will follow the principles of dual drainage.

The minor storm flow estimates were calculated by the Rational Method. Some of the significant criteria used in the minor storm sewer design are:

- Initial Time of Concentration 10 min
- Runoff Coefficients 0.73 front yards
  0.56 rear yards
  0.80 ICI lands
  0.30 parks

- Velocities 0.80 m/s to 6.0 m/s
- Manning roughness coefficients 0.013 (smooth wall pipes)
- Minimal allowable slopes

DIAMETER (MM)	SLOPE (%)
250	0.43
300	0.34
375	0.25
450	0.20
525	0.16
600	0.13
675	0.11

- Minimum depth of cover of 2.0 m
- Inlet-control rate to capture 5 year peak flows
- 100 year Hydraulic Grade Line (HGL) separation to be greater than 0.30 m from the underside of footings
- HGL analysis calculated with XPSWMM

4.4 Proposed Minor Storm Sewer Plan

The minor storm sewer design sheets together with the Storm Drainage Area Plan, drawing 500A is included in **Appendix D**. **Figure 4.1**, which is also included in **Appendix D**, shows the recommended minor storm plan. Most of the Phase 1B sewers will connect to the Phase 1A sewers in Hemlock Road and along Mikinak Road. The new sewers will range in size from 300 mm dia to 2400 mm dia.

The minor storm sewer system will be oversized to account for the 8.10 cms expected from the re-designed Burma SWM facility.

The development of Phase 1B will also impact existing surface runoff patterns. A series of temporary drainage ditches is recommended to ensure existing undeveloped areas do not flood. These temporary ditches are included in **Figure 4.1**, Proposed Minor Storm Plan. Capacity calculations and stage-storage curves for three proposed temporary ditches are included in **Appendix E**. When appropriate, each of the proposed temporary drainage ditches will be removed.

Surface drainage from the NRC property was temporarily captured in a ditch included in the Phase 1A design. That ditch will be impacted twice by the Phase 1B design. It will be bisected by the Phase 1B section of Wanaki Road. In that location, it is proposed to expand and re-direct southward the existing temporary ditch towards an existing drainage ditch on NRC property which itself will be re-directed towards the re-designed Burma Pond. Further west the existing temporary drainage ditch, located immediately north of Mikinak Road, will be bisected again by the Moses Tennisco Street. At that location a temporary ditch inlet (DI1) is proposed to be installed and capture and direct any runoff to the new Phase 1B sewer system.

There are two existing drainage ditches which carry runoff from the south portion of the NRC properties. The runoff outlets to the existing Burma SWM facility. The lower reaches of the two ditches are proposed to be redirected to the proposed 1800 x 2400 culvert under Wanaki Road.

4.5 Erosion and Sedimentation Control

Development of a subdivision such as Phase 1B of the Wateridge Village at Rockcliffe site can potentially create deleterious material which can enter the natural environment and gain access to fish habitat. In order to prevent site generated sediments from entering the environment, an Erosion and Sedimentation Control Plan will be implemented prior to development.

The erosion and sedimentation strategy for the subject site will include erection of silt fences around most of the site perimeter. The silt fences will ensure protection of both adjacent developments and the natural environment including the Western and Eastern Creeks and the Ottawa River. Straw bale check dams and rock check dams are also recommended to control site generated sediments from entering existing watercourses and ditches.

It is expected that installation of municipal infrastructure on the subject site will include some dewatering. Accordingly, the Erosion and Sedimentation Control Plan also includes the installation of dewatering traps (OPSD 219-240). The final Erosion and Sedimentation Plan will be designed by the site's civil contractor.

A copy of the Erosion and Sedimentation Control Plan, drawing 38298-900A, is included in **Appendix F**.

4.6 Miscellaneous Elements

The following section includes brief comments for items indicated in the current Servicing Study Guidelines for which the proposed development will have little or no impact.

These include:

- Setbacks
- Drainage catchment diversions
- Municipal drains
- 100 year flood lands
- Floodplains

The geotechnical report completed as part of the supporting documents for the CDP included recommended setbacks along the northern escarpment of the CLC lands. **Figure 4.2** shows the proposed development setbacks along the northern escarpment. These setbacks are not impacted by the proposed Phase 1B development.

Any runoff from the site, as with all future developments in Wateridge Village at Rockcliffe, will have end of pipe quality treatment. Any impacts to receiving watercourses will therefore be mitigated.

There are no municipal drains in the vicinity of the subject development and there are no drainage catchment diversions proposed by the Phase 1B development.

Because the site is located well above the receiving waters of the Ottawa River, there will be no 1:100 yr water levels in that watercourse that will impact the site development.

5 Stormwater Management

5.1 Background

The subject site is part of the larger development referred to as the Former CFB Rockcliffe. The stormwater management strategy was outlined in the “Former CFB Rockcliffe Master Servicing Study” (MSS) (IBI Group, August 2015). The subject site, Phase 1B, is located north and south of Mikinak Road. It is bounded by Hemlock Road to the north, Burma SWM Facility to the south, Codd’s Road to the west and Wanaki Road to the east. Phase 1B is proposed to include development of Main Street (Hemlock Road); and two sections of the Major Collector (Wanaki Road); the crescent street around block 15 (Squadron Crescent), and connecting streets between Hemlock and Mikinak. The draft M-Plan, **Figure 1.2**, for Phase 1B is included in **Appendix A**.

Phase 1B also includes design of the retrofitted Burma SWM Facility and the proposed culvert crossing Wanaki Road, and the three cells park dry pond as outlined in the August 2015 MSS prepared by IBI Group. The design of the retrofitted Burma SWM facility and the proposed culvert crossing is being completed concurrently with this report and it is outlined in the Draft “Burma Stormwater Management Facility Design Wateridge Village at Rockcliffe Phase 1B” (IBI Group, November 2016).

The subject site is part of the drainage area which ultimately discharges into the Eastern SWM Facility. The design of the Eastern SWM Facility was outlined in the “Eastern Stormwater Management Facility Design Wateridge Village at Rockcliffe Phase 1A” (IBI Group, February 2016). The facility is now under construction and it has been designed to provide an Enhanced Level of Protection according to MOE *Stormwater Management Planning and Design Guidelines* (March 2003). The design of the Phase 1A storm sewer trunk was also completed in April 2016 and the results of the stormwater evaluation are presented in the “Design Brief Wateridge Village at Rockcliffe Phase 1A (IBI Group, April 2016)”.

5.2 Objective

The purpose of this evaluation is to prepare the dual drainage design, including the minor and major system, of the Rockcliffe Phase 1B development. The evaluation includes assessment of the on-site detention versus cascading major flow, maximum depth and velocity of flow on the street segments, sizing of inlet control devices and hydraulic grade line analysis. The evaluation also includes design of the park dry pond as outlined in the August 2015 MSS.

The evaluation and design takes into consideration the August 2015 MSS, the Draft “Burma Stormwater Management Facility Design Wateridge Village at Rockcliffe Phase 1B” (IBI Group, November 2016), the “Design Brief Wateridge Village at Rockcliffe Phase 1A” (IBI Group, April 2016), the City of Ottawa Sewer Design Guidelines (OSDG) (October 2012), and the Technical Bulletin ‘ISDTB-2014-01, Revisions to Ottawa Design Guidelines – SEWER dated 2012.

5.3 Stormwater Management Design

The site was designed with dual drainage features, accommodating minor and major system flow. Due to the flat topography of the majority of street segments within the site, on-site detention is available to facilitate ponding in street sags or low points within the major system. Inlet control devices (ICDs) are proposed to minimize the surcharge in the minor system during infrequent storm events and maximize use of available on-site storage. The minor system capture of ICDs is generally based on the 5 year simulated flow for individual catchments. The balance of the surface flow not captured by the minor system will be conveyed via the major system.

As established in the August 2015 MSS, two attenuation ponds (park dry pond, and retrofitted Burma SWM Facility) are to be constructed as part of Phase 1B to capture runoff from the site. The areas contributing flow to each pond are indicated on **Drawing 750** and further discussions are provided within **Sections 5.3.2** and **5.3.3**.

The dual drainage system has been evaluated using the DDSWMM hydrological model, while the minor system hydraulic grade line analysis has been evaluated using the XPSWMM dynamic model.

5.3.1 External Areas

Areas external to Phase 1B which contribute flow to the site have been modeled on a semi-lumped basis. These drainage areas are prefaced with "EX" as shown on the drainage area plan (**Drawing 750**).

5.3.2 Park Dry Pond

The August 2015 MSS recommended construction of a three cell dry pond in the park (Area P167) to aid in reducing surface flow to meet City of Ottawa criteria within the Rockcliffe development. The proposed dry pond is located at the northern boundary of the park, south of Mikinak Road (see **Drawing 750**). It is designed to provide water quantity control for approximately 37 ha of development as shown in **Figure 5.1**.

Major flow from the majority of the site and flows from the external areas south of the park (Area EXTFOX, and Area EXTPRK) will be conveyed to the three cell dry pond in the park for attenuation, prior to being released to the minor system (see **Figure 5.1**). At the City's request, cascading flow from Phase 1B areas will be conveyed to the park dry pond via pipes. Further discussion on the major flow routing is provided in **Section 5.3.5.1**.

Table 5-1 lists the areas tributary to the park dry pond. The catchment areas are shown on **Drawing 750**. The hydraulic functioning of the park dry pond has been confirmed in XPSWMM and the results are provided within **Section 5.5.2**.

Table 5-1: Areas Tributary to the Park Dry Pond

CONTRIBUTING DRAINAGE AREA (LOCATION, AREA ID)		CONTRIBUTING FLOW
Foxview Community	EXTFOX	Major Flow
Thorncliffe Village	EXTRNW	Major Flow
Codd's Road	S168	Cascading Flow*
Mikinak Road	S165A	Major Flow
	S167A	Major Flow
	S167B	Major Flow
Squadron Crescent	S222B	Major Flow
Park area	P167	Major Flow

Note: * maximum ponding is utilized on-site during the 100 year design storm event, prior to being discharged to the park dry pond.

5.3.3 Retrofitted Burma SWM Facility

The August 2015 MSS recommended the existing Burma pond, located at the northern boundary of Thorncliffe Village, be retrofitted to increase available storage to aid in reducing storm sewer sizes in the Rockcliffe development. The retrofit includes the installation of a new culvert at Wanaki Road to convey runoff to the pond; the widening and deepening of the existing pond, including the introduction of a permanent pool; and a new outlet structure.

In addition, as part of the Burma SWM facility construction, it is proposed to install three end-of-pipe Stormwater Treatment Units (Vortechs) for a basic treatment of the minor flows, or 60% removal of total suspended solids, from Thorncliffe Village, prior to being discharged to the pond. Detailed design of the retrofitted Burma SWM facility, including the proposed Wanaki Road culvert and the Stormwater Treatment Units (Vortechs), is being completed concurrently with this report and is outlined in the Draft "Burma Stormwater Management Facility Design Wateridge Village at Rockcliffe Phase 1B" (IBI Group, January 2017).

The retrofitted Burma Road SWM Facility will provide water quantity control for approximately 60 ha of development as shown in **Figure 5.2**. The 57 ha area tributary to Burma SWM Facility includes the NRC lands, and the employment lands (Areas LOT 200, LOT214, LOT152, LOT151, and LOT150). It should be noted that 100 year on-site storage have been determined for the employment lands, and the future high-rise mix use (Area EX145) within the NRC land. **Figure 5.2** shows the area tributary to Burma SWM Facility.

The outflow from the facility will be conveyed to the Eastern SWM Facility for water quality control, prior to being released to the Ottawa River.

Areas tributary to the retrofitted Burma SWM Facility are listed in **Table 5-2** and are shown on **Drawing 750**. Further discussion on the flow routing is provided within **Sections 5.3.4.1** and **5.3.5.2**. The hydraulic functioning of the retrofitted facility has been confirmed in XPSWMM and the results are provided in the Draft "Burma Stormwater Management Facility Design Wateridge Village at Rockcliffe Phase 1B" (IBI Group, January 2017).

Table 5-2: Areas Tributary to the Retrofitted Burma SWM Facility

CONTRIBUTING DRAINAGE AREA (LOCATION, AREA ID)		CONTRIBUTING FLOW
Thorncliffe Village	EXTRNE	Total Flow
	EXTRNC	Total Flow
	EXTRNN	Total Flow
	EXTRNW	Minor Flow
NRC Lands	EXNRCN	Total Flow
	EXNRCS	Total Flow
	SWM1	Total Flow
Wanaki Road	S149	Cascading Flow*
Future High-Rise Mix Use, east side of Wanaki Road (NRC land)	EXP147	Total Flow
South End of Wanaki Road	MH 147	Minor Flow

Notes: * maximum ponding is utilized on-site during the 100 year design storm event, prior to being discharged to the park dry pond.
on-site storage requirements up to the 100 year storm event to be provided.

5.3.4 Minor System

Due to the flat topography of the majority of street segments within the site, on-site detention is available for the subject site (see **Drawing 751**). Inlet control devices (ICDs) are proposed to limit the flow into the minor system during the less frequent storm events. The minor system analysis was evaluated with XPSWMM and is discussed in **Section 5.5.** It should be noted that the trunk sewers were designed to accommodate flows from the ultimate Rockcliffe development. The minor system for Phase 1B is tributary to the Eastern SWMF. The main storm trunk was designed as part of the Phase 1A to convey flows (up to the ICD restriction) to the Eastern SWMF. The results are outlined in the “Design Brief Wateridge Village at Rockcliffe Phase 1A” (IBI Group, April 2016).

5.3.4.1 Contributing Minor Flow to Burma SWM Facility

As outlined in **Table 5-2**, all the external areas (tributary to the facility and prefaced with “EX”) contribute minor flow to the retrofitted facility. The facility is designed to provide capacity for: the minor runoff from the NRC lands, once the sewer separation has been completed; and the existing minor flow from the Thorncliffe Village (DDSWMM IDs EXTRNE, EXTRNN, EXTRNC, EXTRNW), which is currently conveyed to the existing Burma pond. The NRC sewer separation is under design by CIMA.

The storm sewers, servicing the NRC lands, will be tie into the proposed swale along the employment land, see **Drawing 214**. From there, flows will be conveyed to the retrofitted Burma SWMF via the proposed Wanaki Culvert Crossing.

Water quality for each of the three existing storm sewers, Thorncliffe Village, will be provided via Stormwater Treatment Units (Vortechs) prior to discharge to the pond. The Vortechs Treatment Units are designed to provide a Basic Level of Protection, or 60% removal of total suspended solids. Further discussion is provided in the Draft “Burma Stormwater Management Facility Design Wateridge Village at Rockcliffe Phase 1B” (IBI Group, January 2017).

The storm sewers servicing Phase 1B will be tied into the main storm trunk along Codd’s Road except the storm sewers servicing the south end of Wanaki Road. These sewers will be connected to the proposed Wanaki Road culvert crossing at MH147 (**Drawing 750**). Minor runoff from there will be discharged into the retrofitted Burma SWM facility via the Wanaki Road culvert. Detailed design of the proposed culvert crossing is provided in the Draft “Burma Stormwater Management Facility Design Wateridge Village at Rockcliffe Phase 1B” (IBI Group, January 2017).

Outflow from the Burma SWM Facility will be conveyed via the main storm trunk to the Eastern SWMF for water quality treatment.

5.3.5 Major System

The major system analysis was evaluated with DDSWMM and is discussed in **Section 5.4.** On-site storage requirements up to the 100 year storm event have been determined for schools, the employment lands (Areas LOT 200, LOT214, LOT152, LOT151, and LOT150), and the future NRC high-rise mix use (Area EX145) within the study area. Surface runoff in excess of the minor system capture will cascade via street segments and rear yard swales, eventually reaching either the park dry pond or the retrofitted Burma SWM facility, as discussed below.

5.3.5.1 Contributing Major Flow to Park Dry Pond

As summarized in **Table 5-1**, only major flows from the subject site and some adjacent external areas will be conveyed to the dry pond for attenuation.

Major flow from Foxview (Area EXTFOX) and major flow from a portion of Thorncliffe Village (Area EXTRNW) will be conveyed to the park dry pond via surface ditches. The detailed design of the proposed ditches in the park area P167 will be completed as part of the park design.

Flows from Phase 1B areas south of Mikinak Road and north of Burma SWM Facility will cascade via street segments and will reach to the low points at S222B. At this location, at the City’s request, surface runoff (in excess of the minor system capture) will be captured by the proposed catch basins and from there will be conveyed to the upstream cell (Cell1) via a 525mm storm pipe. Detailed discussion is provided within **Section 5.6.1**.

Surface runoff from Phase 3 areas north of Hemlock Road and south of Cottage Private Road and cascading flow from Phase 1B areas north of Mikinak Road outlet to the park dry pond at low point locations listed in **Table 5-1** and shown on **Drawing 750**. At each location, similar to S222B, it is proposed to install a catch basin to capture the major flows. From there flows will be conveyed to the dry cells via proposed storm pipes. The hydraulic functioning of the park dry pond, including the inlet pipes, has been confirmed in XPSWMM and the results are provided within **Section 5.5.2**. Detailed design of the park dry pond and inlet systems are provided within **Section 5.6**.

Major flow from Codd's Road outlet overland to the park dry pond at S168 as shown on **Drawing 750**. It should be noted that during the 100 year storm event, the maximum storage is utilized in all available on-site detentions on Mikinak Road and Codd's Road.

5.3.5.2 Contributing Major Flow to Burma SWM Facility

Major flow from the majority of Thorncliffe Village (Areas EXTRNE, EXTRNC, EXTRNN) will be conveyed overland to the retrofitted facility, consistent with the existing drainage to the existing Burma pond.

Major flow from NRC lands (Areas EXNRCN, EXNRCS, EX145, EX143, EX144, EXP147, SWM1) will be conveyed via the Wanaki Road culvert crossing to the retrofitted Burma SWM Facility. It was proposed to construct a swale along the employment land, on the CLC land, to convey the NRC flow to the upstream of the culvert. Refer to **Drawing 214** for the proposed swale profile and cross-sections.

On-site storage requirements up to the 100 year storm event have been determined for employment lands, and the future high-rise mix use (Area EX145) within NRC lands.

Detailed design of the retrofitted Burma SWM facility and the proposed Wanaki Road culvert crossing is being completed concurrently with this report and it is outlined in the Draft "Burma Stormwater Management Facility Design Wateridge Village at Rockcliffe Phase 1B" (IBI Group, January 2017).

5.4 Hydrological Analysis

Hydrological analysis of the proposed dual drainage system of the subject site was conducted using DDSWM. This technique offers a single storm event flow generation and routing. Land use, selected modeling routines, and input parameters are discussed in the following sections. A drainage area plan is presented in **Drawing 750** and the model schematic and model files are included in **Appendix E**.

The model was based on the ultimate design of the Rockcliffe development and external areas to the site. The model includes the total runoff from approximately 37 ha of the NRC Lands as recommended in the August 2015 MSS. The Phase 1B DDSWMM model also includes the Phase 1A drainage areas that are contributing flow to Phase 1B. It should be noted that the design parameters for Phase 1A areas were adopted from the "Design Brief Wateridge Village at Rockcliffe Phase 1A (IBI Group, April 2016)".

The primary focus of the hydrological analysis was to evaluate surface flow and ponding conditions during the 100 year storm event in order to satisfy City of Ottawa Sewer Design Guidelines (October, 2012) in terms of velocity x depth. The 5 year simulation was performed to ensure that after the storm is over there will be no ponding on the streets. The parameters used to model the subject site are presented in **Table 5-3**.

5.4.1 Summary of Model Files

For ease of review, the following is a reference list of the model output files including file names and storm events evaluated. The files are included on the CD enclosed in **Appendix E**.

DDSWM:

<u>Phase 1B and Phase 1A area tributary to Phase 1B (refer to Drawing 750 for DDSWMM schematic)</u>

- 5 year 3 hour Chicago: 38298-PH1B-5CH.DAT/out
- 100 year 3 hour Chicago: 38298-PH1B-100CH.DAT/out
- 100 year 3 hour Chicago + 20%: 38298-PH1B-100CH_20.DAT/out
- 100 year 24 hour SCS Type II (103.2 mm): 38298-PH1B-100SC1032.DAT/out
- July 1979: 38298-PH1B-JUL79.DAT/out
- August 1988: 38298-PH1B-AUG88.DAT/out
- August 1996: 38298-PH1B-AUG96.DAT/out

<u>Phase 1A (as per "Design Brief Wateridge Village at Rockcliffe Phase 1A (IBI Group, April 2016)", excluding Codd's Road, Mikinak Road, and Wanaki Road</u>

- 5 year 3 hour Chicago: 38298-PH1A-5CH.DAT/out
- 100 year 3 hour Chicago: 38298-PH1A-100CH.DAT/out
- 100 year 3 hour Chicago + 20%: 38298-PH1A-100CH_20.DAT/out
- 100 year 24 hour SCS Type II (103.2 mm): 38298-PH1A-100SC1032.DAT/out
- July 1979: 38298-PH1A-JUL79.DAT/out
- August 1988: 38298-PH1A-AUG88.DAT/out
- August 1996: 38298-PH1A-AUG96.DAT/out

SWMHYMO – Velocity x Depth:

- 38298-PH1B-VXD.DAT/OUT

XPSWMM:

- 5 year 3 hour Chicago: 38298-Ph1B-5ch.xp/out
- 100 year 3 hour Chicago: 38298-ph1B-100ch.xp/out
- 100 year 3 hour Chicago + 20%: 38298- ph1B-120ch.xp/out
- 100 year 12 hour SCS Type II: 38298- ph1B-100scs.xp/out
- July 1979: 38298- ph1B-JUL79.xp /out
- August 1988: 38298-Ph1B-AUG88.xp/out
- August 1996: 38298-Ph1B-AUG96. xp/out

5.4.2 Design Parameters

The following design parameters were used in the evaluation of the stormwater management system for the subject site:

5.4.2.1 Design Storms

- 5 and 100 year 3 hour Chicago storm events (10 minute time step), as per the OSDG;
- 100 year 24 hour SCS Type II storm event (103.2 mm) as per OSDG;
- July 1, 1979 Historical storm (5 minute time step) as per the OSDG;
- 100 year 3 hour Chicago storm event (10 minute time step) with 20% increase for Climate Change consideration, as per OSDG.

5.4.2.2 Area and Imperviousness

Catchment areas are based on the rational method spreadsheet. See **Drawing 750** for the catchment areas used in the DDSWMM modeling for the subject site.

For the future external areas in Phase 1B, the semi-lumped drainage area base from the August 2015 MSS was used and slightly modified to tie-in with the detail drainage area plan.

Imperviousness for the subject site was determined by obtaining the footprint of the model units intended for the site and placing the maximum footprint on the lots. The imperviousness ratios for single family units were calculated for a typical single family unit street segment and rear yard segment (calculations are enclosed in **Appendix D**). Runoff coefficient values used in the rational method design are based on these values. The park was assigned an impervious rate of 14%.

5.4.2.3 Infiltration

Infiltration losses were selected to be consistent with the OSDG. The Horton values are as follows: f_o = 76.2 mm/h, f_c = 13.2 mm/h, k = 0.00115 s^{-1}.

5.4.2.4 Subcatchment Width

The catchment width was based on the conveyance route length of the drainage area and multiplied by two. The multiplier of two was only used if the drainage area had runoff contribution from both sides of the drainage area. For the future external areas the subcatchment width of 225 m/ha was used.

5.4.2.5 Slope

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

5.4.2.6 Initial Abstraction (Detention Storage)

Detention storage depths of 1.5 mm and 4.67 mm were used for impervious and pervious areas, respectively. These values are consistent with the OSDG.

5.4.2.7 Manning's roughness

Manning's roughness coefficients of 0.013 and 0.25 were used for impervious and pervious areas, respectively.

5.4.2.8 Baseflow

No baseflow components were assumed for any of the areas contributing runoff to the minor system within the DDSWMM model.

5.4.2.9 Minor System Capture

The minor system from the subject site is tributary to the Eastern SWM facility. The proposed Phase 1B storm sewers will connect to the downstream Phase 1A large diameter sewers, which outlet to the Eastern Stormwater Management Facility.

Inlet control devices (ICDs) are proposed to limit the flow into the minor system during the 100 year event. At the City's request, the ICD sizes were selected from the standard orifice sizes summarized in the City of Ottawa Standard tender Documents MS-18.4 (March, 2017). This results in some ponding on the street segments after the 5 year storm event. The minor system inflow rate was optimized to minimize ponding at street segments during the 5 year storm event. Further information on the ICDs can be found in the catchbasin table in **Appendix E**.

On-site storage requirements up to the 100 year storm event has been determined for schools (DDSWMM IDs SC162, SC157), the employment lands (DDSWMM IDs LOT200, LOT214, LOT152, LOT151, and LOT150), and the future NRC high-rise mix use (DDSWMM ID EX145) within the study area.

All the park and school areas were assumed to be restricted to the 5 year modeled flow.

5.4.2.10 Major System Storage and Routing

The subject site contains portions with a saw-tooth design grade pattern with catchbasins installed with inlet control devices (ICDs) at the low points. The flow is attenuated within these localized low points with potential overflow cascading to the next segment downstream. The total volume at each low point, up to the overflow depth, is the maximum static storage.

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

The DDSWMM model does not have a direct way of coding double routing since it does not allow the user to code dynamic storage over the high point. For this analysis, an alternative method was employed where the overflow from a street segment (regular static storage at a sag) is conveyed to a dummy segment. In other words, a regular low point segment was provided with a downstream dummy segment for further flow attenuation to account for the dynamic ponding during overflow.

The dummy segment does not have any drainage area attributes associated with it since it is a segment for routing. In addition, there is no inflow to the minor system from these dummy segments. The overflow hydrograph from the upstream catchment is routed in the dummy segment to the next “real” downstream segment. The dummy segments have specific characteristics which are noted below:

- Segment Length – equivalent to length of maximum static storage from the street segment contributing to it.
- Road Type – equivalent to appropriate right-of-way characteristics from the segment contributing to it, but with a longitudinal slope is 0.01% (0.0001 m/m).

The double routing method noted above, and applied to DDSWMM, is a recommended double routing method presented within the February 2014 City of Ottawa Technical Bulletin.

The dummy segments for major system routing were applied to the analysis of the subject site. The segments are referenced as D1, D2, D3, etc. within the DDSWMM modelling file. The DDSWMM schematic presented in **Drawing 750** does not show the dummy segments, but DDSWMM computer output file shows the dummy segments immediately following the corresponding major segment which cascades into that dummy segment.

Street segments

The majority of street segments within the subject site have a saw-tooth road grade pattern with on-site detention. For saw-tooth profiles, the computer simulations were based on the constraint that during the critical storms the maximum depth of ponding or cascading flow would not exceed 300 mm. This was achieved by adjusting the spacing of catchbasins and providing shallower sags where possible. This design allows more major flow to cascade to the next downstream segment while ensuring a maximum depth of 300 mm and property protection.

Where surface storage is available, the storage-outflow characteristics for each low point were taken into consideration. The evaluation was undertaken assuming static conditions. The ponding plan for the subject site is presented on **Drawing 751**.

For continuous grade profiles, the computer simulations were based on the approach-capture characteristics of the catchbasin with the constraint that during the critical storms the maximum cascading flow would not exceed 300 mm.

The restricted inflow from street segments in Phase 1B is approximately 1421 l/s, which an average flow rate of 284 l/s/ha.

Rear yards

Rear yards were considered independently of street segments and rear yard catch basins were incorporated in the DDSWMM model. Simulations were based on the total interception of runoff by the storm inlets. This was done by specifying a one-to-one relationship between approach flow and capture flow. Storage volume in rear yards was not accounted for as available on-site storage. Overflow from the rear yards cascades to a major system road segment via swales.

External Areas

In addition to the above noted assumptions with respect to Phase 1B, the following assumptions were used to model the minor and major system flow from the future external areas which contribute to the subject site:

- Future Development Areas Phase 3 (DDSWMM ID: EX202A, EX202B, EX201, EX203, EX202C, EX204A, EXP203, EX204B, EX205A, EX205B, EX206A, EX206B, EX208A, EX208B, EX166, EX209)

  The future development areas contribute minor and major flow through the subject site as per the August 2015 MSS. The minor flow from the future development areas were modeled as combined rear yards and street segments. The minor flow from the areas EX202B, EX202A, EX203, EX204A, EX205A, and EX206A were modeled as Street segments and the rest were modeled as Rear yards (refer to **Section 5.4.2.10**). The minor system inflow rate for these areas are summarized in **Table 5-3**.

  Based on the macro grading plan from the MSS, some on-site storages have been assumed for areas EX203, EX204A, EX205A, and EX206A. The ponding volume are summarized in **Table 5-3.**

- Foxview Community (DDSWMM ID: EXTFOX)

  As per the August 2015 MSS, only major flow from this area was assumed to contribute to the subject site. Major flow from the Foxview community (Area EXTFOX) was directed to the proposed dry pond in the park (Area P139) as discussed in **Section 5.3.5.1**. The area delineation was based on the semi-lumped storm drainage areas presented in the August 2015 MSS and was slightly modified to tie-in with the detail drainage area plan. The minor system inflow rate for Area EXTFOX was assumed to be 311 l/s as per the August 2015 MSS.

- Thorncliffe Village (DDSWMM ID: EXTRNE, EXTRNC, EXTRNN, EXTRNW)

  Total flow from the majority of the Thorncliffe Village (Areas EXTRNE, EXTRNC, EXTRNN) and minor flow from the remainder of the development (Area EXTRNW) was conveyed to the Burma SWM Facility via the existing storm sewers, as per the August 2015 MSS. The minor system inflow rate for Area EXTRNW is adopted from the 2015 Rockcliffe MSS (IBI, August 2015). As per August 2015 MSS, major flow from the portion of the Thorncliffe development (Area EXTRNW) was directed to the proposed park dry pond (Area P167) for attenuation prior to being released to the minor system.

The area delineation was based on the semi-lumped storm drainage areas presented in the 2015 Rockcliffe MSS and was slightly modified to tie-in with the detail drainage area plan.

- NRC Lands (DDSWMM ID: EXNRCN, EXNRCS, EX143, EX145, EX144, EXP147)

  Total flow from the NRC lands was directed to the proposed retrofitted Burma SWM Facility as established in the August 2015 MSS. Detailed discussion was provided in **Section 5.3.5.2**. The area delineation was based on the semi-lumped storm drainage areas presented in the August 2015 MSS. The lengths and impervious values are also consistent with the August 2015 MSS.

  No on-site storage has been assumed for the NRC lands except for EX145. On-site storage requirements up to the 100 year storm event has been determined for EX145.

Drawing 750 presents the external areas contributing major and minor flow to the subject site including their segment IDs.

5.4.2.11 Summary of Design Parameters

The below **Table 5-3** summarizes the main hydrological parameters used in the DDSWM model. The storm drainage area plan (**Drawing 750**) is provided within **Appendix E**, along with the rational method storm sewer design sheet and model output files.

Table 5-3: Hydrological Parameters and Modeling Results

Drainage Area		Downstream Segment ID‡	MH	IMP Ratio (%)	Segment Length (m)	Subcatchment Width (m)	Road ROW Cross Section (m)	Ponding Area ID¶	Maximum Storage Available (m^3)	5 Year Modeled Flow (l/s)*	100 Year Captured Flow (l/s)†
Segment ID	Area (ha)										
WATERIDGE VILLAGE - PHASE 1B											
Street Segments											
S144	0.18	S145	S144	0.71	67.00	67.00	26			32	19
S145	0.15	S147A	S145	0.71	57.00	57.00	26			26	21
S147A	0.14	S149	S147	0.71	65.00	65.00	26			25	23
S200	0.20	S214	S200	0.71	78.00	78.00	26			36	19
S201A1	0.08	S201B	S201	0.71	63.00	63.00	26			15	10
S201A2	0.08	S201B	S201	0.71	63.00	63.00	26			15	4
S201B	0.15	S202A	S201	0.71	64.50	64.50	26	PA201B	21.24	26	88
S202A	0.10	S203A	S202	0.71	41.00	41.00	26			18	26
S203A	0.16	S212	S203	0.71	90.00	90.00	26			29	35
S203B	0.09	S203A	S203	0.71	56.00	64.00	26			17	27
S204A	0.14	S205A	S204	0.71	57.50	115.00	26			27	41
S204B	0.08	S212	S204	0.71	52.00	62.00	26			15	24
S205A	0.08	S210	S205	0.71	47.00	67.00	20			15	163
S205B	0.03	S210	S205	0.71	13.00	26.00	24			6	5
S205C	0.14	S206A	S205	0.71	57.50	57.50	24			25	38
S206A	0.06	S208	S206	0.71	35.00	55.00	20			11	163
S206B	0.03	S208	S206	0.71	11.00	22.00	24			6	5

Drainage Area		Downstream Segment ID‡	MH	IMP Ratio (%)	Segment Length (m)	Subcatchment Width (m)	Road ROW Cross Section (m)	Ponding Area ID¶	Maximum Storage Available (m^3)	5 Year Modeled Flow (l/s)*	100 Year Captured Flow (l/s)†
Segment ID	Area (ha)										
S207	0.22	S142	S207	0.71	90.00	90.00	24			40	30
S208	0.19	S209	S208	0.71	77.00	77.00	20	PA208	33.02	35	149
S209	0.20	S167A	S209	0.71	77.00	77.00	20	PA209	3.80	36	38
S210	0.20	S211	S210	0.71	77.00	77.00	20	PA210	39.50	36	88
S211	0.17	S165	S211	0.71	77.00	77.00	20	PA211	4.74	31	30
S212	0.08	S213	S212	0.71	57.00	98.00	20			14	73
S213	0.40	S165	S213	0.71	78.00	78.00	20	PA213	3.15	62	126
S214	0.19	S152	S214	0.71	74.00	74.00	20			33	30
S215	0.38	S216	S215	0.76	89.00	89.00	20	PA215	67.41	69	68
S216	0.28	S218	S216	0.76	89.00	89.00	20	PA216	10.54	53	48
S218	0.17	S220	S218	0.71	88.00	88.00	20	PA218	16.42	32	30
S220	0.18	S222A	S220	0.71	91.00	91.00	20	PA220	17.62	33	30
S222A	0.12	S222B	S222	0.71	59.00	59.00	20			22	48
S222B	0.14	CB222B	CB222B	0.71	60.50	60.50	20	PA222B	12.95	22	79**
S231	0.12	S142	S231	0.71	61.00	61.00	20			22	21
Total Flow for Street Segments to Minor System (l/s)											1597
Rear Yards and Semi_lumped Areas											
BRMA	1.64	DUMBRM	NONE	0.14	184.50	369.00	N/A			66	0
LOT141	0.96	LOT167	S141	0.86	108.00	216.00	N/A			194	283
LOT164	0.80	S164A	S164	0.86	90.00	180.00	N/A			162	164
LOT167	0.28	S167B	S167	0.86	31.50	63.00	N/A			57	83
LOT200	0.91	S200	S200	0.86	102.38	204.75	N/A	100yr S.C.	109.00¥	184	184
LOT209	0.20	S167A	S209	0.86	77.00	77.00	N/A			43	46
LOT210	0.23	S210	S210	0.86	25.88	51.75	N/A			46	44
LOT211	0.23	S165	S211	0.86	25.88	51.75	N/A			46	46
LOT213	0.23	S165	S213	0.86	25.88	51.75	N/A			46	44
LOT214	0.84	S214	S214	0.86	94.50	189.00	N/A	100yr S.C	97.00¥	170	174
LOT220	1.96	S222A	S220	0.86	220.50	441.00	N/A			396	396
LT208B	0.20	S208	S208	0.86	22.50	45.00	N/A			40	63
LT212A	0.80	S212	S212	0.86	90.00	180.00	N/A			162	162
LT212B	0.23	S212	S212	0.86	25.88	51.75	N/A			46	46
P167A	3.05	CELL1	S167S	0.23	342.56	685.13	N/A			187	190
P167B	3.05	CELL2	S167S	0.23	342.56	685.13	N/A			187	190
P207	0.32	S207	S207	0.14	36.00	72.00	N/A			13	19
R215	0.14	R216	S215	0.51	70.00	70.00	N/A			19	20
R216A	0.14	R216B	S216	0.51	68.00	68.00	N/A			19	20
R216B	0.06	MH217	S216	0.51	21.00	21.00	N/A			8	15
SC157	2.62	S149	S157	0.86	294.75	589.50	N/A	100yr S.C	294.00¥	529	529
SC162	2.49	S164B1	S162	0.86	280.13	560.25	N/A	100yr S.C	250.00¥	503	529
SWM1	0.37	USBRM	USBRM	0.86	41.63	83.25	N/A			74	159

Drainage Area		Downstream Segment ID[‡]	MH	IMP Ratio (%)	Segment Length (m)	Subcatchment Width (m)	Road ROW Cross Section (m)	Ponding Area ID[¶]	Maximum Storage Available (m^3)	5 Year Modeled Flow (l/s)*	100 Year Captured Flow (l/s)[†]
Segment ID	Area (ha)										
Total Flow for Semi-lumped Area to Minor System (l/s)											3246.80
Total Flow from Street and Semi-lumped Area to Minor System (l/s)											4843.70
External Areas											
EX143	0.33	S144	S143	0.86	37.13	74.25	N/A			67	67
EX144	0.55	EX145	S144	0.14	61.88	123.75	N/A			22	26
EX145	2.74	S145	S145	0.86	308.25	616.50	N/A	100yr S.C	352.00[¥]	554	554
EX147	0.13	EXTRNE	S147	0.86	40.00	29.25	N/A			26	26
EX166	0.61	S166	S166	0.86	68.63	137.25	N/A			123	128
EX201	0.56	S201B	S201	0.86	63.00	126.00	N/A			113	165
EX202A	0.90	EX202B	S202	0.86	101.25	202.50	20			182	265
EX202B	0.35	S202A	S202	0.86	39.38	78.75	20			71	103
EX202C	0.20	S203B	S202	0.86	22.50	45.00	N/A			40	59
EX203	0.73	S203B	S203	0.86	82.13	164.25	20	PA203B	5.30[€]	147	215
EX204A	0.72	S204A	S204	0.86	81.00	162.00	20	PA204B	7.82[€]	145	145
EX204B	0.47	S204A	S204	0.86	52.88	105.75	N/A			95	139
EX205A	0.81	S205A	S205	0.86	91.13	182.25	20	PA205A	45.01[€]	164	165
EX205B	0.63	S205C	S205	0.86	70.88	141.75	N/A			127	128
EX206A	1.02	S206A	S206	0.86	114.75	229.50	20	PA206A	46.77[€]	206	206
EX206B	0.46	S207	S206	0.86	51.75	103.50	N/A			93	95
EX208A	0.81	S208	S208	0.86	91.13	182.25	N/A			164	164
EX231A	0.86	S231	S231	0.86	96.75	193.50	20			174	174
EX231B	0.30	S231	S231	0.86	33.75	67.50	N/A			61	64
EXNRCN	18.39	USBRM	USBRM	0.71	450.00	1200.00	N/A			2578	4847
EXNRCS	18.65	USBRM	USBRM	0.71	514.00	2628.00	N/A			2994	5641
EXP147	0.40	SWM1	S147	0.14	45.00	90.00	N/A			16	15
EXP203	0.44	S204B	S203	0.14	49.50	99.00	N/A			18	20
EXTFOX	1.90	CELL3	OUT	0.86	213.75	427.50	N/A			384	311
EXTRNE	0.99	BRMA	BURMA	0.71	111.38	222.75	N/A			169	340
EXTRNC	5.70	BRMA	BURMA	0.71	239.00	4282.50	N/A			1086	2076
EXTRNN	0.53	BRMA	BURMA	0.71	59.63	119.25	N/A			91	172
EXTRNW	2.18	CELL1	BURMA	0.71	193.00	981.00	N/A			399	435
WATERIDGE VILLAGE - PHASE 1A AREA - TRIBUTARY TO PHASE 1B											
Street Segments											
S176C	0.05	S142	S176	0.76	40.00	40.00	26	PA176C	1.14	10	10
S176D	0.13	S142	S176	0.76	95.00	95.00	26	PA176D	2.58	26	26
S176E	0.09	S142	S176	0.76	80.00	80.00	26			18	11
S142	0.18	S141B	S142	0.76	108.00	108.00	26			34	34
S141B	0.15	S141A	S141	0.76	57.00	57.00	26	PA141B	13.02	26	332
S141A	0.16	S168	S141	0.76	70.50	70.50	26	PA141A	5.35	31	35
S141C	0.09	S168	S141	0.76	42.00	42.00	26	PA141C	3.79	18	20

Drainage Area		Downstream Segment ID‡	MH	IMP Ratio (%)	Segment Length (m)	Subcatchment Width (m)	Road ROW Cross Section (m)	Ponding Area ID¶	Maximum Storage Available (m^3)	5 Year Modeled Flow (l/s)*	100 Year Captured Flow (l/s)†
Segment ID	Area (ha)										
S130	0.38	OUTS	S130	0.76	67.00	134.00	26			72	32
S132	0.37	S134	S132	0.76	67.00	134.00	26			71	34
S134	0.47	S136	S133	0.76	86.00	172.00	26			88	54
S136	0.24	S137	S136	0.76	83.00	166.00	26			46	27
S137	0.35	S139	S137	0.76	77.00	77.00	26			61	47
S139	0.37	S168	S139	0.76	84.00	84.00	26	PA139	56.27	64	259
S168	0.12	CELL3	S168	0.76	97.00	97.00	26	PA168	3.20	24	41
S161	0.24	S162A	S161	0.76	90.00	90.00	26			46	27
S162A	0.12	S164B2	S162	0.76	83.00	83.00	26			23	23
S162B	0.10	S164B1	S162	0.76	83.00	83.00	26			20	5
S164B1	0.12	S164A	S164	0.76	102.00	102.00	26			23	11
S164B2	0.10	S164A	S164	0.76	102.00	102.00	26			19	18
S164A	0.18	S222B	S164	0.76	70.00	70.00	26			30	15
S165	0.21	CB165A	CB165A	0.76	63.00	63.00	26			39	88**
S166	0.13	S167A	S166	0.76	125.00	125.00	26			27	40
S167A	0.17	CB167A	CB167A	0.76	47.00	47.00	26	PA167A	5.23	30	89**
S167B	0.13	CB167C	CB167C	0.76	50.00	50.00	26	PA167B	6.72	25	67**
S167C	0.02	S168	S167	0.76	20.00	20.00	26			4	3
S152	0.23	S150	S152	0.76	100.00	100.00	26	PA152	6.50	41	88
S150	0.20	S149	S150	0.76	97.00	97.00	26	PA150	4.99	39	47
S151	0.02	S150	S151	0.76	15.00	15.00	26			4	4
S149	0.29	DUMBRM	S149	0.76	120.00	120.00	26	PA149	9.76	53	107
P141	0.86	S141B	S141	0.14	96.75	193.50	N/A			35	35
LOT152	0.92	S152	S152	0.86	103.50	207.00	N/A	100yr S.C	110.00¥	186	186
LOT151	0.41	S150	S151	0.86	46.13	92.25	N/A	100yr S.C	50.00¥	83	83
LOT150	0.96	S150	S150	0.86	108.00	216.00	N/A	100yr S.C	114.00¥	194	194

Notes:

* 5 year generated flow values are from the DDSWMM file (38298-PH1B-5CH.dat/out) presented on the CD in Appendix E.
† Minor flow restriction is from the DDSWMM output files 38298-PH1B-100CH.dat/out presented on the CD in Appendix E.
‡ Downstream segment presented is the segment which that area ultimately drains to and excludes the dummy segments introduced for routing. The dummy segment characteristics are presented in Appendix E.
¥ On-site storage assumed up to the 100 year storm event for self-contained sites.
€ Ponding volume assumed for external areas based on the macro grading plan from the MSS
¶ See Drawing 751 for ponding area ID presented in Appendix E.
** For catch basins connecting to the cells, the ICDs were sized in XPSWMM model (38298-Ph1B-100CH(06-15).out) presented on the CD in Appendix E.

5.4.3 Results of Hydrological Modeling

The storage available on-site, and its corresponding maximum depth, and the results of the DDSWMM major system evaluation for the subject site are presented in**Table 5-4**. Also included in **Table 5-4** is the duration of ponding and amount of ponding utilized for the 5 year, 100 year Chicago, and the stress test storm events. The ponding plan for the subject site is presented in **Appendix E** on **Drawing 751.** The DDSWMM output files are presented in **Appendix E**.

Table 5-4: Summary of On-Site Storage and Duration of Ponding

Major System Segment ID	Maximum Available Storage (m^3)			TOTAL STORAGE UTILIZED (m^3)						MAJOR SYSTEM CASCADING OVERFLOW (l/s)			
		2 YEAR 3HR CHICAGO	DURATION (min)	5 YEAR 3HR CHICAGO	DURATION (min)	100 YEAR 3HR CHICAGO	DURATION (min)	SENSITIVITY ANALYSIS: 100 YEAR chicago +20%	Duration (min)	2 year 3hr chicago	5 year 3hr chicago	100 YEAR 3HR CHICAGO	SENSITIVITY ANALYSIS :100 YEAR Chicago +20%
		MODEL FILE: 38298--2ch.OUT		MODEL FILE: 38298--5ch.OUT		MODEL FILE: 38298--100ch.OUT		MODEL FILE: 38298--100ch_20.OUT				MODEL FILE: 38298--100ch.OUT	MODEL FILE: 38298--100ch_20.OUT
Wateridge Village - Phase 1B													
S144	0.0	0	0	0	0	0	0	0	0	0.019	0.027	0.099	0.141
S145	0.0	0	0	0	0	0	0	0	0	0.032	0.044	0.128	0.61
S147A	0.0	0	0	0	0	0	0	0	0	0.041	0.057	0.151	0.62
S200	0.0	0	0	0	0	0	0	0	0	0.019	0.026	0.05	0.153
S201A1	0.0	0	0	0	0	0	0	0	0	0.006	0.009	0.019	0.025
S201A2	0.0	0	0	0	0	0	0	0	0	0.009	0.013	0.025	0.032
S201B	21.2	0	0	0	0	20.5	20	21.2	30	0	0	0	0.099
S202A	0.0	0	0	0	0	0	0	0	0	0.01	0.014	0.1	0.291
S203A	0.0	0	0	0	0	0	0	0	0	0.024	0.033	0.19	0.479
S203B	0.0	0	0	0	0	0	0	0	0	0	0	0.078	0.169
S204A	0.0	0	0	0	0	0	0	0	0	0.014	0.019	0.17	0.282
S204B	0.0	0	0	0	0	0	0	0	0	0	0	0.045	0.079
S205A	0.0	0	0	0	0	0	0	0	0	0	0	0.043	0.361
S205B	0.0	0	0	0	0	0	0	0	0	0.002	0.003	0.006	0.008
S205C	0.0	0	0	0	0	0	0	0	0	0.01	0.015	0.116	0.185
S206A	0.0	0	0	0	0	0	0	0	0	0	0	0.144	0.309
S206B	0.0	0	0	0	0	0	0	0	0	0.002	0.003	0.006	0.008
S207	0.0	0	0	0	0	0	0	0	0	0.017	0.024	0.133	0.207
S208	33.0	0	0	0	0	33	20	33	30	0	0	0	0.372
S209	3.8	0	0	0	0	3.8	20	3.8	50	0	0	0.027	0.385
S210	39.5	0	0	0	0	**24**	**30**	39.5	30	0	0	0	0.318
S211	4.7	0	0	0	0	4.7	30	4.7	60	0	0	0.025	0.331
S212	0.0	0	0	0	0	0	0	0	0	0.019	0.03	0.325	0.72
S213	3.2	0	0	0	0	3.1	20	3.1	30	0	0	0.299	0.707
S214	0.0	0	0	0	0	0	0	0	0	0.026	0.039	0.083	0.28
S215	67.4	0	0	0	0	44.3	40	67.4	50	0	0	0	0.025
S216	10.5	0	0	0.2	0	10.5	30	10.5	40	0	0	0.04	0.064
S218	16.4	0	0	0	0	16.4	50	16.4	50	0	0	0.042	0.08
S220	17.6	0	0	0.2	0	17.6	50	17.6	60	0	0	0.038	0.092
S222A	0.0	0	0	0	0	0	0	0	0	0.009	0.013	0.332	0.562

Major System Segment ID	Maximum Available Storage (m³)			TOTAL STORAGE UTILIZED (m³)						MAJOR SYSTEM CASCADING OVERFLOW (l/s)			
		2 YEAR 3HR CHICAGO	DURATION (min)	5 YEAR 3HR CHICAGO	DURATION (min)	100 YEAR 3HR CHICAGO	DURATION (min)	SENSITIVITY ANALYSIS: 100 YEAR chicago +20%	Duration (min)	2 year 3hr chicago	5 year 3hr chicago	100 YEAR 3HR CHICAGO	SENSITIVITY ANALYSIS :100 YEAR Chicago +20%
		MODEL FILE: 38298--2ch.OUT		MODEL FILE: 38298--5ch.OUT		MODEL FILE: 38298--100ch.OUT		MODEL FILE: 38298--100ch_20.OUT				MODEL FILE: 38298--100ch.OUT	MODEL FILE: 38298--100ch_20.OUT
S222B	13.0	0	0	0	0	0	0	0	0	0	0	0	0
S231	0.0	0	0	0	0	0	0	0	0	0.008	0.011	0.215	0.329
Wateridge Village - Phase 1A Tributary to Phase 1B													
S176C	1.1	0	0	0	0	1.1	20	1.1	20	0	0	0.007	0.011
S176D	2.6	0	0	0	0	2.5	20	2.5	20	0	0	0.019	0.03
S176E	0.0	0	0	0	0	0	0	0	0	0.008	0.011	0.023	0.032
S142	0.0	0	0	0	0	0	0	0	0	0.036	0.054	0.413	0.639
S141B	13.0	0	0	0	0	13	20	13	20	0	0	0.1	0.371
S141A	5.4	0	0	0	0	5.3	50	5.3	60	0	0	0.104	0.379
S141C	3.8	0	0	0	0	3.7	20	3.7	20	0	0	0.009	0.019
S130	0.0	0	0	0	0	0	0	0	0	0.037	0.052	0.104	0.139
S132	0.0	0	0	0	0	0	0	0	0	0.034	0.049	0.099	0.133
S134	0.0	0	0	0	0	0	0	0	0	0.069	0.103	0.213	0.289
S136	0.0	0	0	0	0	0	0	0	0	0.075	0.122	0.274	0.372
S137	0.0	0	0	0	0	0	0	0	0	0.084	0.136	0.342	0.469
S139	56.3	0	0	0	0	56.2	30	56.2	30	0	0	0.099	0.248
S168	3.2	0	0	0	0	3.2	50	3.2	70	0	0	0.157	0.548
S161	0.0	0	0	0	0	0	0	0	0	0.019	0.029	0.06	0.082
S162A	0.0	0	0	0	0	0	0	0	0	0.023	0.035	0.08	0.113
S162B	0.0	0	0	0	0	0	0	0	0	0.013	0.017	0.033	0.043
S164B1	0.0	0	0	0	0	0	0	0	0	0.024	0.034	0.065	0.409
S164B2	0.0	0	0	0	0	0	0	0	0	0.024	0.038	0.097	0.138
S164A	0.0	0	0	0	0	0	0	0	0	0.059	0.087	0.321	0.622
S165	4.0	0	0	0	0	0	0	0	0	0	0	0	0
S166	0.0	0	0	0	0	0	0	0	0	0.011	0.015	0.108	0.162
S167A	5.2	0	0	0	0	0	0	0	0	0	0	0	0
S167B	6.7	0	0	0	0	0	0	0	0	0	0	0	0
S167C	0.0	0	0	0	0	0	0	0	0	0.001	0.002	0.004	0.006
S152	6.5	0	0	0	0	6.5	20	6.5	30	0	0	0.059	0.32
S150	5.0	0	0	0	0	4.9	30	4.9	40	0	0	0.064	0.428
S151	0.0	0	0	0	0	0	0	0	0	0.001	0.002	0.004	0.006
S149	9.8	0	0	0.3	0	9.7	30	9.7	40	0	0	0.141	1.047

The results of the on-site detention analysis show that during the 2 year storm event there is no ponding on the street segments. During the 5 year storm event there is ponding on the subject site at several low points. However, the duration is short in order of several minutes. The maximum ponding duration is 30 minutes for the areas S215 and S216.

During the 100 year Chicago storm event, the maximum ponding is utilized on-site in all locations except S210. The maximum available storage at this location is 39.5 m^3 while 24 m^3 of the storage has been utilized during the 100 year storm event.

Maximum ponding is utilized on-site in all locations during the 100 year Chicago increased by 20% storm events. It should be noted that storage volumes of 0.01 m^3 indicated in the computer output were not considered in the calculation of ponding duration since this volume is considered to be below the level of threshold recognition.

5.4.3.1 Major System Outlets

As noted in **Section 5.3,** major flow from across the subject site is routed to two major system features – Burma SWM facility and the three cell dry pond in the park. Detailed design of the retrofitted Burma SWM facility is provided in the Draft ""Burma Stormwater Management Facility Design Wateridge Village at Rockcliffe Phase 1B" (IBI Group, January 2017). The design of the park dry pond is provided within **Section 5.6**.

Table 5-5 summarizes the total flow contributing to each pond during the 100 year 3 hour Chicago storm event. Areas tributary to each feature are indicated in **Drawing 750**.

Table 5-5: Contributing Flows to Major Flow Features during the 100 Year Chicago Design Event

OUTLET	DRAINAGE AREA (LOCATION, AREA ID)		FLOW (CMS)
Burma SWM Facility	Thourncliffe Village	EXTRNE	0.34
		EXTRNC	2.08
		EXTRNN	0.17
		EXTRNW	0.76
	NRC Lands	EXNRCN	4.86
		EXNRCS	5.66
		SWM1	0.16
	Wanakin Road	S149	0.14
	Total Minor System Inflow at MH 147		0.74
		Total flow (cms)	**14.91**
Park Dry Pond	Foxview Community	EXTFOX	0.40
	Thorncliffe Village	EXTRNW	0.33
	Codd's Road	S168	0.16
	Mikinak Road	S165	0.40
		S167A	0.17
		S167B	0.19
	Squadron Crescent	S222B	0.65
	Park area	P167	0.70
		Total flow (cms)	**3.00**

5.4.3.2 Velocity x Depth

According to the City of Ottawa Sewer Design Guidelines (October, 2012), the maximum depth of flow should not exceed 300 mm and the product of velocity x depth on all the street segments should not exceed 0.6 m^2/s during the 100 year storm event.

The cascading overflow is the flow exiting a drainage area when maximum minor system inflow and maximum available ponding has been utilized. To determine velocity of the cascading overflow, a SWMHYMO was created (38298VXD.dat/out).

To determine velocity of the cascading overflow at critical locations, SWMHYMO was used. It should be noted that non-standard cross-sections are proposed for major roads across the site. The non-standard 26 m and 20 m ROW sections were entered into the model with the appropriate longitudinal slopes to obtain the maximum velocity of flow using the Route Channel routine. The output files and the road cross-sections are provided in **Appendix E**. The overflow is obtained from the respective DDSWMM output file and is noted in the title in the tables below.

To determine depth of the cascading overflow, the *Calculation Sheet: Overflow From Typical Road Ponding Area* provided at the Technical Bulletin 'ISDTB-2014-01, Revisions to Ottawa Design Guidelines – SEWER dated 2012 was used. The exception to this is where the road is on grade in which case the depths were obtained from the SWMHYMO model.

It should be noted that the *Calculation sheet* was developed for the cross-sections with typical 5.5 m, 8.5 m, and 11 m asphalt width. To determine depth of cascading overflow for those cross-sections with 9.5 m asphalt width, linear interpolation between the results of 8.5 m and 11 m asphalt width was applied. The table is provided in **Appendix E**. The results are presented in **Table 5-6** and **Table 5-7** and the supporting calculations and modeling is presented within **Appendix E**. The results of velocity by depth for the Phase 1A streets that servicing the Phase 1B areas are also included in below tables.

Table 5-6: Summary of Cascading Major Flow: 100 Year Chicago Design Storm Event (38298-100CH.dat/out)

MAJOR SYSTEM SEGMENT ID	ROAD ROW SECTION	LONGITUDINAL SLOPE (%)	OVERFLOW (L/S)	VELOCITY (M/S)	DYNAMIC DEPTH (M)	VELOCITY X DEPTH (M^2/S)	MAXIMUM PONDING DEPTH (M)	MAXIMUM PONDING DEPTH PLUS OVERFLOW DEPTH (M) – IF APPLICABLE
Cascading Flow – WATERIDGE VILLAGE PH1B								
S201B(D1)	26	1.81	0	0.00	0.00	0.00	0.21	0.21
S212	20	0.70	325	0.88	0.10	0.09	N/A	0.10
S147A	26	5.00	151	1.24	0.06	0.07	N/A	0.06
S213(D9)	20	0.60	299	0.82	0.13	0.11	0.13#	0.26
S210(D10)	20	0.60	0	0.00	0.00	0.00	0.23	0.23
S211(D11)	20	1.02	25	0.53	0.05	0.03	0.13	0.18
S208(D12)	20	0.60	0	0.00	0.00	0.00	0.23	0.23
S209(D13)	20	0.91	27	0.52	0.05	0.03	0.13	0.18
S215(D14)	20	1.00	0	0.00	0.00	0.00	0.25	0.25
S216(D15)	20	1.00	40	0.59	0.06	0.04	0.15	0.21
S218(D16)	20	0.70	42	0.52	0.07	0.03	0.18	0.25
S220(D17)	20	0.90	38	0.56	0.06	0.03	0.17	0.23
S222B¶	20	1.00	0	0.00	0.00	0.00	0.19	0.19
S201A1	26	1.00	19	0.47	0.03	0.01	N/A	0.03

MAJOR SYSTEM SEGMENT ID	ROAD ROW SECTION	LONGITUDINAL SLOPE (%)	OVERFLOW (L/S)	VELOCITY (M/S)	DYNAMIC DEPTH (M)	VELOCITY X DEPTH (M^2/S)	MAXIMUM PONDING DEPTH (M)	MAXIMUM PONDING DEPTH PLUS OVERFLOW DEPTH (M) – IF APPLICABLE
S201A2	26	1.00	25	0.50	0.03	0.02	N/A	0.03
S202A	26	1.81	100	0.89	0.05	0.05	N/A	0.05
S203A	26	2.33	190	1.21	0.07	0.08	N/A	0.07
S212	20	0.70	325	0.88	0.10	0.09	N/A	0.10
S204A	26	1.22	170	0.89	0.07	0.06	N/A	0.07
S205B	24	0.71	6	0.30	0.02	0.01	N/A	0.02
S205C	24	0.71	116	0.68	0.07	0.05	N/A	0.07
S207	24	0.51	133	0.63	0.08	0.05	N/A	0.08
S206B	24	0.86	6	0.33	0.02	0.01	N/A	0.02
S222A	20	0.90	332	0.97	0.10	0.10	N/A	0.10
S144	26	5.00	99	1.12	0.05	0.06	N/A	0.05
S145	26	5.00	128	1.19	0.06	0.07	N/A	0.06
S214	26	0.50	83	0.53	0.06	0.03	N/A	0.06
S200	26	1.22	50	0.65	0.04	0.03	N/A	0.04
Cascading Flow – WATERIDGE VILLAGE PH1A								
S176C(D2)	26	0.55	7	0.36	0.03	0.01	0.1	0.13
S176D(D3)	26	0.55	19	0.47	0.05	0.02	0.15	0.20
S141B(D4)	26	0.63	100	0.65	0.09	0.06	0.16	0.25
S141A(D5)	26	0.99	104	0.78	0.09	0.07	0.1	0.19
S141C(D6)	26	0.99	18*	0.44	0.04	0.02	0.1	0.14
S168(D8)	26	0.99	314*	1.10	0.11	0.12	0.1	0.21
S152(D18)	26	0.52	59	0.52	0.07	0.04	0.11	0.18
S149(D20)	26	0.65	141	0.57	0.10	0.06	0.17	0.27
S150(D19)	26	0.50	64	0.52	0.08	0.04	0.08	0.16
S166	26	1.00	108	0.79	0.07	0.06	N/A	0.07
S167C	26	0.99	4	0.35	0.02	0.01	N/A	0.02

Notes: * Flow multiplied by 2 for half street and then used City sheets
The greatest of the two spill elevations has been considered in VXD analysis. See Drawing 751 for the Ponding area ID and the spill elevations.
¶ the flow depth is based on the proposed 6m wide depressed curb cross section at this location.

Table 5-7: Summary of Cascading Major Flow: 100 Year SCS Plus 20% Design Storm Event (38298--100CH_20.dat/out)

MAJOR SYSTEM SEGMENT ID	ROAD ROW SECTION	LONGITUDINAL SLOPE (%)	OVERFLOW (L/S)	VELOCITY (M/S)	DEPTH (M)	VELOCITY X DEPTH (M2/S)	MAXIMUM PONDING DEPTH (M)	MAXIMUM PONDING DEPTH PLUS OVERFLOW DEPTH (M) – IF APPLICABLE
Cascading Flow – ROCKCLIFFE PH1A								
S201B(D1)	26	1.81	0.00	0.89	0.09	0.08	0.21	0.30
S212	20	0.70	325.00	1.12	0.18	0.21	N/A	0.18
S147A	26	5.00	151.00	1.78	0.17	0.30	N/A	0.17

MAJOR SYSTEM SEGMENT ID	ROAD ROW SECTION	LONGITUDINAL SLOPE (%)	OVERFLOW (L/S)	VELOCITY (M/S)	DEPTH (M)	VELOCITY X DEPTH (M2/S)	MAXIMUM PONDING DEPTH (M)	MAXIMUM PONDING DEPTH PLUS OVERFLOW DEPTH (M) – IF APPLICABLE
S213(D9)	20	0.60	299.00	1.06	0.18	0.19	0.13#	**0.31**
S210(D10)	20	0.60	0.00	0.83	0.14	0.11	0.23	**0.37**
S211(D11)	20	1.02	25.00	1.02	0.14	0.14	0.13	0.27
S208(D12)	20	0.60	0.00	0.86	0.14	0.12	0.23	**0.37**
S209(D13)	20	0.91	27.00	1.02	0.14	0.15	0.13	0.27
S215(D14)	20	1.00	0.00	0.52	0.05	0.03	0.25	0.30
S216(D15)	20	1.00	40.00	0.67	0.08	0.05	0.15	0.23
S218(D16)	20	0.70	42.00	0.62	0.08	0.05	0.18	0.26
S220(D17)	20	0.90	38.00	0.70	0.09	0.06	0.17	0.26
S222B¶	20	1.00	0.00	0.00	0.00	0.00	0.19	0.19
S201A1	26	1.00	19.00	0.50	0.03	0.02	N/A	0.03
S201A2	26	1.00	25.00	0.53	0.04	0.02	N/A	0.04
S202A	26	1.81	100.00	1.18	0.08	0.09	N/A	0.08
S203A	26	2.33	190.00	1.53	0.10	0.15	N/A	0.10
S212	20	0.70	325.00	1.12	0.14	0.16	N/A	0.14
S204A	26	1.22	170.00	1.01	0.08	0.08	N/A	0.08
S205B	24	0.71	6.00	0.33	0.02	0.01	N/A	0.02
S205C	24	0.71	116.00	0.77	0.08	0.06	N/A	0.08
S207	24	0.51	133.00	0.70	0.09	0.07	N/A	0.09
S206B	24	0.86	6.00	0.35	0.02	0.01	N/A	0.02
S222A	20	0.90	332.00	1.11	0.12	0.14	N/A	0.12
S144	26	5.00	99.00	1.22	0.06	0.07	N/A	0.06
S145	26	5.00	128.00	1.77	0.10	0.18	N/A	0.10
S214	26	0.50	83.00	0.72	0.10	0.07	N/A	0.10
S200	26	1.22	50.00	0.86	0.07	0.06	N/A	0.07
Cascading Flow – WATERIDGE VILLAGE PH1A								
S176C(D2)	26	0.55	11.00	0.40	0.04	0.02	0.10	0.14
S176D(D3)	26	0.55	30.00	0.53	0.06	0.03	0.15	0.21
S141B(D4)	26	0.63	371.00	0.89	0.14	0.13	0.16	0.30
S141A(D5)	26	0.99	379.00	1.06	0.14	0.15	0.10	0.24
S141C(D6)	26	0.99	38.00*	0.53	0.05	0.03	0.10	0.15
S168(D8)	26	0.99	1096.00*	1.81	0.16	0.29	0.10	0.26
S152(D18)	26	0.52	320	0.80	0.14	0.110	0.11	0.25
S149(D20)	26	0.65	1047	0.93	0.21	0.196	0.17	**0.38**
S150(D19)	26	0.5	428	0.89	0.15	0.135	0.08	0.23
S166	26	1	162	0.87	0.08	0.073	N/A	0.08
S167C	26	0.99	6	0.41	0.03	0.010	N/A	0.03

Notes: * Flow multiplied by 2 for half street and then used City sheets
The greatest of the two spill elevations has been considered in VXD analysis. See Drawing 751 for the Ponding area ID and the spill elevations.
¶ the flow depth is based on the proposed 6m wide depressed curb cross section at this location.

In all locations within the subject site and under the 100 year Chicago storm event, the velocity by depth product is less than the maximum allowable product of 0.6 per City's OSDG. During the sensitivity analysis, using the 100 year Chicago storm with a 20% increase, the velocity by depth product is less than the maximum allowable product of 0.6 for all locations throughout the site.

Within the subject site under the 100 year Chicago design storm event, for all the street segments the summation of depth of ponding and depth of cascading flow is less than 0.3 m per City's OSDG.

During the 100 year Chicago design storm event increased by 20%, the summation of depth of ponding and depth of cascading flow is less than 0.30 m in the majority of the locations throughout the site. However, there are four (4) locations where the total depth exceeds 0.30 m. The street segments are S210, S208, S213, and S149. These areas are noted in **Table 5-7** in red and bold.

The following table summarizes the elevation of the low points and high points, depth of the sags, property line elevation and the garage elevations for the street segments where summation of depth of ponding and depth of cascading flow exceeds 0.30 m during the 100 year Chicago design storm event increased by 20%.

Table 5-8: Summary of Extent of Cascading Flow in Relation to Property Lines and Garage Elevations (38298--100CH_20.dat/out)

MAJOR SYSTEM SEGMENT ID	TOP OF GRATE ELEVATION (M)	SPILL POINT ELEVATION (M)	DEPTH OF SAG (M)	LOWEST PROPERTY LINE ELEVATION (M)	ELEVATION AT CLOSEST GARAGE (M)	EXTEND OF PONDING AND CASCADING DEPTH (M)*
Wateridge Village - Phase 1B Area						
S210(D10)	88.88	89.11	0.23	89.14	N/A	89.25
S208(D12)	88.39	88.62	0.23	88.65	N/A	88.76
S213(D9)	89.07	89.2	0.13	89.53	N/A	89.38
Wateridge Village - Phase 1A Area - Servicing Phase 1B						
S149(D20)	91.94	92.05	0.11	91.3	N/A	92.32

Notes:
* Extent of ponding and cascading depth is the addition of the low point elevation for each major system segment with the cascading depth presented in **Table 5-7** (i.e., for S141B: 87.39 + 0.31 = 87.70 m).

During the 100 year Chicago design storm event increased by 20%, the major system will cascade from each street segment noted in **Table 5-8** and will encroach the lowest property line for all street segments.

5.5 Hydraulic Analysis

5.5.1 Storm Hydraulic Grade Line

The hydraulic grade line (HGL) was evaluated using the XPSWMM hydraulic model. A model was created for the detail design of the laterals and storm sewers within the subject site. The model also includes the Phase 1A laterals and trunk sewers. The XPSWMM analysis was also used to evaluate the hydraulic function of the park dry pond; the retrofitted Burma SWM Facility; and the proposed culvert crossing along Wanaki Road.

The hydraulic function of the retrofitted Burma SWM Facility is discussed in the Draft "Burma Stormwater Management Facility Design Wateridge Village at Rockcliffe Phase 1B" (IBI Group, January 2017), and the Phase 1A hydraulic grade line results were presented in the "Design

Brief Wateridge Village at Rockcliffe Phase 1A (IBI Group, April 2016)". The models terminates at the Eastern SWMF.

The minor system hydrographs for the subject site and Phase 1A development were obtained from the DDSWMM evaluation undertaken as outlined in **Section 5.4**. Relevant hydrographs developed in the MSS study using SWMHYMO model were downloaded into the XPSWMM model at nodes S320, S323, and S225 to account for the future Phase 3 flows. Locations of the imported hydrographs are indicated in bold in XPSWMM schematic provided within **Appendix E**.

The stage-area curves of the park dry pond and the retrofitted Burma SWM Facility have been entered into the model. Minor system losses along the storm sewer pipes were accounted for in accordance with Appendix 6-B of the City of Ottawa Sewer Design Guidelines (November 2012).

XPSWMM simulations were conducted for the 100 year 3 hour Chicago storm to ensure that the HGL is at least 0.3m below the underside of footing elevations. It was assumed that the underside of footing elevations are 2.4 m below ground elevation. A sensitivity analysis was also performed using the 100 year Chicago storm with a 20% increase in intensity and the July 1 1979 historical storm to ensure that there would be no severe flooding to properties. Hydraulic grade line values for the various storms are presented in **Table 5-9** below, along with a comparison of under-side of footing (USF) elevations.

The XPSWMM model schematic and model files are provided within **Appendix E**.

Table 5-9: Summary of Hydraulic Grade Line Analysis

XP-SWMM NODE ID	MH NO.	GROUND ELEVATION (M)	USF (M)	100 YEAR 3 HOUR CHICAGO†		100 YEAR 24 HOUR SCS (103.2MM)‡		JULY 1, 1979¥		100 YEAR 3 HOUR CHICAGO INCREASED BY 20%£	
				HGL (M)	FREE BOARD (M)*	HGL (M)	FREE BOARD (M)*	HGL (M)	FREE BOARD (M)*	HGL (M)	FREE BOARD (M)*
Wateridge Village Phase 1B											
S143	143	102.40	100.00	98.16	1.84	98.16	1.84	98.16	1.84	98.16	1.84
S144	144	99.41	97.01	95.79	1.22	95.78	1.23	95.78	1.23	95.79	1.22
S145	145	97.64	95.24	93.01	2.23	93.01	2.23	93.00	2.24	93.01	2.23
S146	146	95.28	92.88	90.96	1.92	90.77	2.11	90.91	1.97	91.82	1.06
S147	147	93.27	N/A	90.93	N/A	90.72	N/A	90.88	N/A	91.78	N/A
USBRM	N/A	N/A	N/A	90.88	N/A	90.67	N/A	90.83	N/A	91.72	N/A
BURMA	N/A	N/A	N/A	89.41	N/A	89.24	N/A	89.43	N/A	89.87	N/A
OUTLET	N/A	N/A	N/A	89.26	N/A	89.07	N/A	89.28	N/A	89.76	N/A
S152	152	92.73	90.33	89.71	0.62	89.71	0.62	89.71	0.62	89.71	0.62
S151	151	92.50	90.10	89.58	0.52	89.58	0.52	89.58	0.52	89.58	0.52
S150	150	92.32	89.92	89.49	0.43	89.49	0.43	89.49	0.43	89.49	0.43
S149	149	92.34	89.94	89.42	0.52	89.42	0.52	89.42	0.52	89.43	0.51
S148	148	92.14	89.74	89.30	0.44	89.30	0.44	89.30	0.44	89.30	0.44
S157	157	91.24	N/A	89.21	N/A	89.21	N/A	89.21	N/A	89.21	N/A
S154	154	91.02	N/A	87.68	N/A	87.68	N/A	87.68	N/A	87.68	N/A
S215	215	90.77	88.37	87.58	0.79	87.58	0.79	87.58	0.79	87.58	0.79
S216	216	90.85	88.45	87.30	1.15	87.30	1.15	87.30	1.15	87.30	1.15
S217	217	90.66	88.26	87.14	1.12	87.12	1.14	87.14	1.12	87.19	1.07

XP-SWMM NODE ID	MH NO.	GROUND ELEVATION (M)	USF (M)	100 YEAR 3 HOUR CHICAGO†		100 YEAR 24 HOUR SCS (103.2MM)‡		JULY 1, 1979¥		100 YEAR 3 HOUR CHICAGO INCREASED BY 20%£	
				HGL (M)	FREE BOARD (M)*	HGL (M)	FREE BOARD (M)*	HGL (M)	FREE BOARD (M)*	HGL (M)	FREE BOARD (M)*
S218	218	90.40	88.00	87.04	0.96	87.02	0.98	87.05	0.95	87.11	0.89
S219	219	90.08	87.68	86.85	0.83	86.82	0.86	86.87	0.81	86.95	0.73
S220	220	89.86	87.46	86.74	0.72	86.70	0.76	86.75	0.71	86.85	0.61
S221	221	89.88	87.48	86.57	0.91	86.51	0.97	86.59	0.89	86.74	0.74
S222	222	89.86	87.46	86.38	1.08	86.32	1.14	86.40	1.06	86.52	0.94
S200	200	94.71	92.31	90.76	1.55	90.75	1.56	90.75	1.56	90.77	1.54
S214	214	93.52	91.12	90.30	0.82	90.29	0.83	90.29	0.83	90.32	0.80
S201	201	94.29	91.89	91.20	0.69	91.14	0.75	91.15	0.74	91.22	0.67
S202	202	93.91	91.51	90.51	1.00	90.49	1.02	90.49	1.02	90.58	0.93
S203	203	92.38	89.98	89.34	0.64	88.96	1.02	89.04	0.94	89.52	0.46
S204	204	90.40	88.00	87.23	0.77	87.14	0.86	87.16	0.84	87.33	0.67
S205	205	89.35	86.95	85.99	0.96	85.90	1.05	85.91	1.04	86.01	0.94
S206	206	89.10	86.70	85.73	0.97	85.65	1.05	85.66	1.04	85.74	0.96
S207	207	88.53	86.13	84.74	1.39	84.67	1.46	84.68	1.45	84.75	1.38
S176E	BULK176E	N/A	N/A	84.60	N/A	84.55	N/A	84.55	N/A	84.61	N/A
S212	212	90.25	87.85	86.86	0.99	86.83	1.02	86.83	1.02	86.87	0.98
S213	213	89.74	87.34	86.45	0.89	86.43	0.91	86.44	0.90	86.47	0.87
S210	210	89.14	86.74	86.43	0.31	86.42	0.32	86.42	N/A	86.43	0.31
S211	211	89.15	86.75	85.94	0.81	85.93	0.82	85.93	0.82	85.94	0.81
S208	208	88.77	86.37	85.92	0.45	85.78	0.59	85.81	0.56	85.92	0.45
S209	209	88.75	86.35	85.46	0.89	85.41	0.94	85.42	0.93	85.47	0.88
S231	231	89.84	87.44	85.82	1.62	85.82	1.62	85.82	1.62	85.82	1.62
Wateridge Village Phase 1A -Main Trunk											
S153	153	92.78	90.38	89.47	0.91	89.46	0.92	89.46	0.92	89.48	0.90
S160	160	92.27	89.87	89.03	0.84	89.02	0.85	89.02	0.85	89.03	0.84
S161	161	91.94	89.54	88.58	0.96	88.58	0.96	88.58	0.96	88.59	0.95
S162	162	91.34	88.94	88.27	0.67	88.26	0.68	88.26	0.68	88.27	0.67
S163	163	90.94	88.54	87.69	0.85	87.68	0.86	87.69	0.85	87.69	0.85
S164	164	90.22	87.82	87.01	0.81	87.00	0.82	87.00	0.82	87.01	0.81
S165B	165	89.61	87.21	86.46	0.75	86.44	0.77	86.45	0.76	86.46	0.75
S165	165	89.30	86.90	85.98	0.92	85.93	0.97	85.99	0.91	86.07	0.83
S166	166	88.90	86.50	84.87	1.63	84.76	1.74	84.86	1.64	85.03	1.47
S167	167	88.40	86.00	84.70	1.30	84.58	1.42	84.68	1.32	84.85	1.15
S168	168	87.70	85.30	84.52	0.78	84.40	0.90	84.50	0.80	84.66	0.64
S141	141	87.32	84.92	84.25	0.67	84.14	0.78	84.23	0.69	84.38	0.54
S142	142	87.52	85.12	83.99	1.13	83.89	1.23	83.97	1.15	84.10	1.02

XP-SWMM NODE ID	MH NO.	GROUND ELEVATION (M)	USF (M)	100 YEAR 3 HOUR CHICAGO†		100 YEAR 24 HOUR SCS (103.2MM)‡		JULY 1, 1979¥		100 YEAR 3 HOUR CHICAGO INCREASED BY 20%£	
				HGL (M)	FREE BOARD (M)*	HGL (M)	FREE BOARD (M)*	HGL (M)	FREE BOARD (M)*	HGL (M)	FREE BOARD (M)*
S176	176	88.03	85.63	83.73	1.90	83.62	2.01	83.69	1.94	83.82	1.81
S178	178	89.00	86.60	83.37	3.23	83.28	3.32	83.35	3.25	83.46	3.14
S180	180	N/A	N/A	81.85	N/A	81.60	N/A	81.81	N/A	82.23	N/A
S190	190	N/A	N/A	81.54	N/A	81.33	N/A	81.51	N/A	81.91	N/A
S191	191	N/A	N/A	81.33	N/A	81.14	N/A	81.31	N/A	81.66	N/A
S192	192	N/A	N/A	81.11	N/A	80.95	N/A	81.09	N/A	81.39	N/A
S193	193	N/A	N/A	80.96	N/A	80.80	N/A	80.95	N/A	81.22	N/A

Notes:

* The free board is the USF minus the HGL (USF – HGL).
† HGL results for the 100 year 3 hour Chicago storm event were taken from the results of the XPSWMM model entitled "38298-ph1B-100ch.xp/out" and presented on the CD in **Appendix E**.
‡ HGL results for the 100 year 24 hour SCS Type II storm event were taken from the results of the XPSWMM model entitled "38298- ph1B-100SCS.xp/out" and presented on the CD in **Appendix E**.
¥ HGL results for the July 1, 1979 historical storm were taken from the results of the XPSWMM model entitled "38298- ph1B-JUL79.xp/out" and presented on the CD in **Appendix E**.
£ HGL results for the 100 year 3 hour Chicago storm event increased by 20% were taken from the results of the XPSWMM model entitled "38298- ph1B-120CH.xp/out" and presented on the CD in **Appendix E**.

The results indicate that the minimum 0.3 m clearance between the USF and HGL is maintained across the proposed Phase 1B site during the 100 year 3 hour Chicago design storm event. The results of the sensitivity analysis show that the minimum 0.3 m clearance is maintained across the site and there would be no flooding to properties during the 100 year Chicago storm with a 20% increase in intensity or the July 1, 1979 historical storm.

5.5.2 Performance of the Park Dry Pond

The hydraulic functioning of the park dry pond has been confirmed in XPSWMM. The hydraulic evaluation was completed for the following storm events:

- 100 year 3 hour Chicago storm event with a 10 minute time step
- 100 year 24 hour SCS Type II storm event with a 12 minute time step
- July 1 1979, August 4 1988 and August 8 1996 historical storms with a 5 minute time step
- and 100 year 3 hour Chicago storm event with a 20% increase in intensity, 10 minute time step

The dry pond is designed to provide water quantity control for approximately 41 ha of the ultimate Rockcliffe development as discussed in **Section 5.3.2**. Outflow from the facility will be ultimately conveyed to the Eastern SWM Facility for treatment, via storm sewers, prior to being released to the Ottawa River.

The results are provided in **Table 5-10** and detailed discussion on each component of the proposed dry pond is provided in **Section 5.6**.

Table 5-10: Performance of the Park Dry Pond Including the Inlet Systems and Duration of Ponding (XPSWMM model files listed in table)

Storm Event		Duration of Ponding (min)			Outflow Rate (cms)			HGL Elevation (m)						
								CELL1			CELL2		CELL3	
								XPSWMM NODE ID						
		CELL1	CELL2	CELL3	CELL1	CELL2	CELL3	CB222B	CELL1	CB165A	CB167A	CELL2	CB167C	CELL3
Bottom Elevation (m)								87.7			87.1		86.8	
100 Year 3 Hours Chicago (38298- PH1B-100CH.xp/out)		510	270	336	0.04	0.05	0.05	88.34	88.34	88.36	87.78	87.50	87.12	87.10
100 YEAR 24 HOUR SCS (103.2MM) (38298- PH1B-100SCS.xp/out)		348	282	210	0.04	0.04	0.05	88.10	88.10	88.10	87.45	87.46	86.88	86.88
Sensitivity Analysis														
Historical Storms	Aug-88 (38298-PH1B-Aug88.xp/out)	390	270	210	0.04	0.04	0.05	88.09	88.07	88.07	87.46	87.41	86.87	86.87
Historical Storms	Aug-96 (38298-PH1B-Aug96.xp/out)	204	264	270	0.04	0.04	0.04	87.91	87.86	87.86	87.18	87.19	86.85	86.84
Historical Storms	Jul-79 (38298-PH1B-Jul79.xp/out)	420	540	132	0.04	0.04	0.05	88.16	88.16	88.16	87.55	87.56	86.88	86.88
100 year 3 Hour Chicago – 20% increase in intensity (38298- PH1B-120CH.xp/out)		960	402	546	0.05	0.05	0.06	89.14	88.89	89.10	88.44	87.93	87.33	87.35

5.6 Design Components of the Park Dry Pond

The park dry pond incorporates the features listed below, each of which is discussed in the following sections.

- Inlet Systems
- Three Dry Cells
- Outlet Systems
- Emergency Overflow

The overall plan of the facility is presented on **Drawing 700A** and the facility cross sections are presented on **Drawings 701A**. The hydraulic functioning of the park dry pond has been confirmed in XPSWMM, results of which are summarized in **Section 5.5.2**. A description regarding the main features of the facility is presented in the following sections.

5.6.1 Inlet Systems

As discussed in **Section 5.3.5.1**, major flow from the majority of the Phase 1B will be conveyed to the park dry cells via proposed storm pipes at four locations along Mikinak Road and Squadron Crescent. The outlet locations are shown on **Drawing 750**.

At the City's request, the catch basins along Mikinak Road (Areas S165, S167A, and S167B), and Squadron Crescent (Area S222B) have been provided with storm pipes to convey the surface runoff (in excess of the minor system capture) to the park dry cells.

On Squadron Crescent (Area S222B), it is proposed to install two twin inlet catch basins OPSD 705.020 (CICB222D), complete with four frames and covers per City of Ottawa Standard S22, to capture the approaching surface flow. The catch basins are interconnected and are provided with a 200 mm diameter catch basin lead, and a 12.3 m – 525 mm diameter storm pipe. The 525 mm diameter storm pipe will convey the surface flow to a ditch inlet catch basin OPSD 705.040 (DI6) installed on the eastern side slope of Cell 1. The invert elevation of DI6 is 88.26 m, corresponding to the maximum 100 year water level in Cell 1 (see **Drawing 700A**). The upstream invert elevation of the 525 mm pipe is 87.32 m, and at DI6 the invert is 87.28 m, providing a positive slope of 0.32%.

At Mikinak Road (Area S165), it is proposed to install four twin inlet catch basins OPSD 705.020 (CB-CICB165A) to capture the approaching surface flow. The location is shown on **Drawing 700A.** In consultation with the City of Ottawa, two of the four twin inlet catch basins will be provided with four frame and covers per City of Ottawa Standard S19; and the other two will be provided with four frame and covers per City of Ottawa Standard S22. The configuration is shown on **Drawing 701A.** The catch basins are interconnected and are provided with a 200 mm diameter catch basin lead, and a 22.4 m - 525 mm diameter storm pipe. The 525 mm diameter storm pipe incorporates a reverse slope to function as both an inlet and outlet pipe for Cell 1. The 525 mm diameter pipe extends 28 m downstream from DI165A to DI7 (OPSD 705.040), which is installed at the bottom of Cell 1, elevation 87.70 m. The upstream invert of the 525 mm diameter pipe is 86.79 m, and at DI7 the invert is 86.82 m, for a slope of -0.16%. The catch basin lead invert is installed at elevation 86.85 m, providing a positive outlet to storm sewers.

At Mikinak Road (Area S167A), it is proposed to install a twin inlet catch basin OPSD 705.020 interconnected to a single catch basin OPSD 705.010, as shown on **Drawing 701A**. The structure will be completed with three frames and covers per City of Ottawa Standard S22, a 200 mm diameter catch basin lead, and a 19 m - 300 mm diameter storm pipe. The 300mm diameter storm pipe will convey the major flows from CICB167A to DI8 (OPSD 705.030), which is installed at the bottom of Cell 2, elevation 87.10 m. The pipe incorporates a reverse slope to function as both an inlet and outlet pipe for Cell 2. The upstream invert is 86.37 m, and at DI8 the invert is 86.40 m, for a slope of -0.16%. The catch basin lead invert is at 85.90 m providing a positive outlet to storm sewers.

Similar to Area S222B, two interconnected twin inlet catch basins OPSD 705.020 (CICB167C), complete with four frames and covers per City of Ottawa Standard S22, will be installed on Mikinak Road (Area S167B). As shown on **Drawing 700A**, CICB167C will be provided with a 200 mm diameter catch basin lead, and a 16.8 m long 375 mm diameter storm pipe. The 375 mm diameter storm pipe incorporates a reverse slope to function as both an inlet and outlet pipe for Cell 3. The 375 mm diameter pipe extends 18 m downstream from DI167C to DI9 (OPSD 705.030), which is installed at the bottom of Cell 3, elevation 86.80 m. The upstream invert of the 375 mm diameter pipe is 86.02 m, and at DI9 the invert is 86.05 m, for a slope of -0.16%. The catch basin lead invert is installed at elevation 85.85 m, providing positive outlet to storm sewers.

Details of the dry pond inlet and outlet systems are provided in **Drawings 700A, 701A,** and **702A.**

Major flow from Codd's Road (Phase 1A) outlets overland to the park dry pond at S168 as shown on **Drawing 750**.

Major flow from Foxview (Area EXTFOX) and major flow from a portion of Thorncliffe Village (Area EXTRNW) will be conveyed to the park dry pond via surface ditches. The detailed design of the proposed ditches in the park area P167 will be completed as part of the park design.

5.6.2 Dry Cells

The dry pond is divided into three cells. The three cells are designed with flat bottoms, ranging from 87.70 m at the upstream, 87.10 m at the intermediate cell, and 86.80 m at the downstream cell. The hydraulic functioning of the park dry pond has been confirmed in XPSWMM. The 100 year water level in the cells are 88.34 m in Cell 1, 87.50 m in Cell 2, and 87.10 in Cell 3.

5.6.3 Outlet Systems

As mentioned in **Section 5.6.1**, the proposed pipes along Mikinak Road (Area S165, S167A, S167B) will function as both inlets and outlets for each dry cell. Each cell is provided with a ditch inlet catchbasin, installed at the bottom of the cell, to convey the outflow to the main storm trunk on Mikinak Road via the proposed storm pipes. The invert elevation of each pipe was discussed in **Section 5.6.1.**

The dynamic model XPSWMM was used to evaluate the hydraulic design and performance of the outlet pipes (refer to **Appendix E** for output).

5.6.4 Emergency Overflow

In the event where the outlet pipes become fully blocked and the dry cells continue to receive inflow, there is potential for the water level to rise and overtop the facility. In this case, the runoff from Cell 1 will discharge to Mikinak Road at the location shown on **Drawing 700A**. In the case of emergency, runoff from Cell 2 will cascade to Cell 3, and from there will discharge to Codd's Road at the location shown on **Drawing 700A**.

6 Approvals and Permit Requirements

6.1 City of Ottawa

The City of Ottawa reviews all development documents including this report and working drawings. Upon completion, the City will approve the local watermains under Permit NO. 008-202, submit the sewer ECA application to the province, and eventually issue a Commence Work Notification.

6.2 Province of Ontario

The Ministry of Environment (MOE) will approve the local sewers under Section 53 of the Ontario Water Resources Act and issue an Environmental Compliance Approval. A Permit To Take Water for the subject site has been provided by the MOECC. The permit, number 0565-A5AMP8, expires on December 31, 2025.

6.3 Conservation Authority

Permits from Rideau Valley Conservation may be needed for proposed changes to the drainage ditches on NRC property.

6.4 Federal Government

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

7 Conclusions and Recommendations

7.1 Conclusions

This report and the accompanying working drawings clearly indicate that the proposed development meets the requirements of the stakeholder regulators, including the City of Ottawa, provincial MOECC, RVCA and NCC. The proposed development is in conformance with the 'Former CFB Rockcliffe Master Servicing Study, August 2015', including provision of major municipal infrastructure such as water supply, wastewater collection and disposal, and stormwater management.

7.2 Recommendations

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

Report Prepared by:

IBI Group

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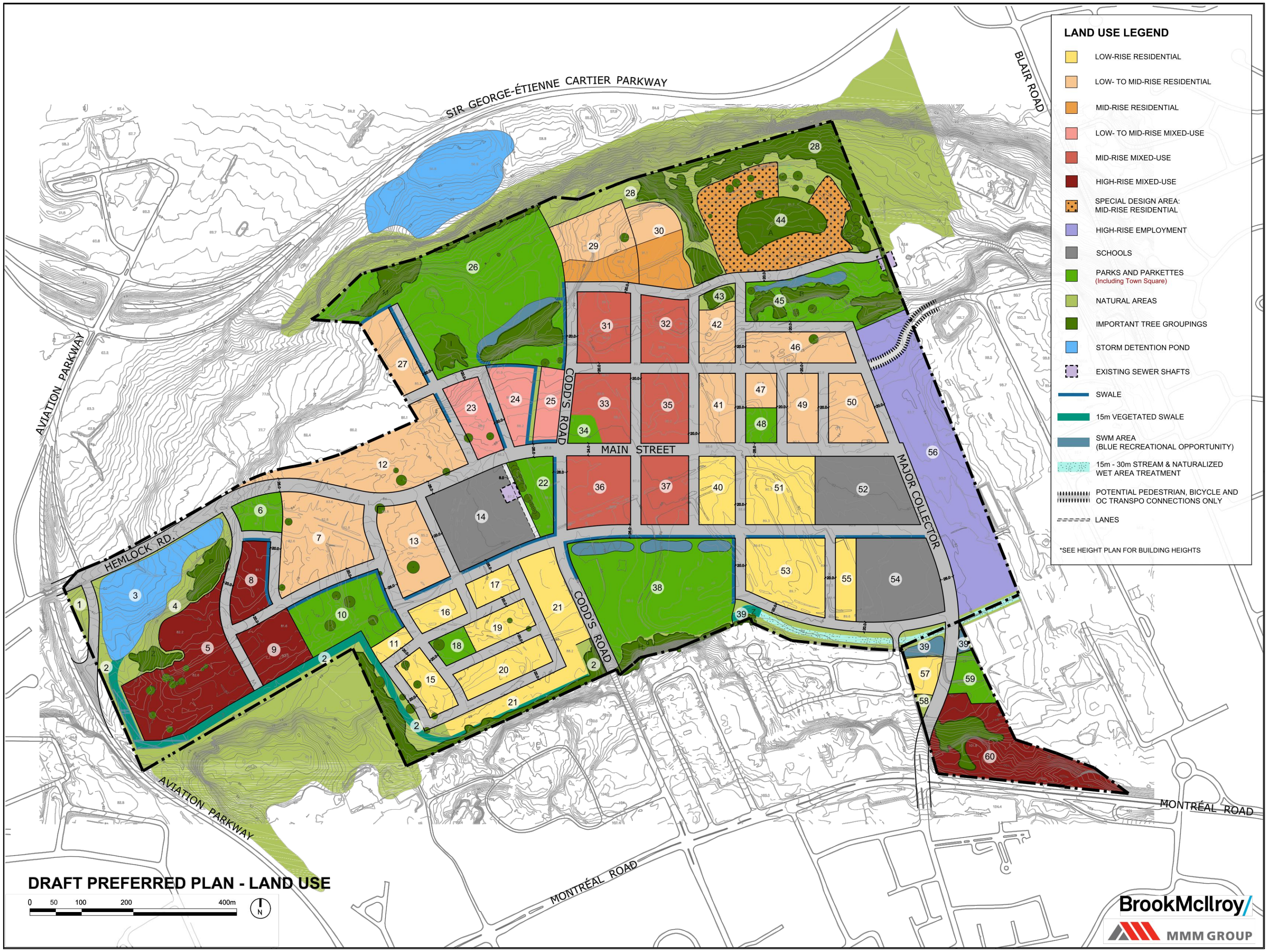
J:\38298-CFBRockvliffe\5.2 Reports\5.2.2 Civil\PHASE 1B\PH1B Design Brief - REV6 - June 15, 2017 (MOECC)\CTR_Design Brief Phase 1B_Rev6-2017-06-15.docx\2017-06-16

J:\38298-CFBRockvliffe\5.9 Drawings\59civil\current Ph1B\Design Brief\Figure 1.1-Preferred Concept Plan.dwg Layout Name: Model



Scale	Project Title	Drawing Title	Sheet No.
NTS	DESIGN BRIEF WATERIDGE VILLAGE AT ROCKCLIFFE PHASE 1B	PREFERRED CONCEPT PLAN	FIGURE 1.1

IBI

Project Title

DESIGN BRIEF
WATERIDGE VILLAGE
AT ROCKCLIFFE
PHASE 1B

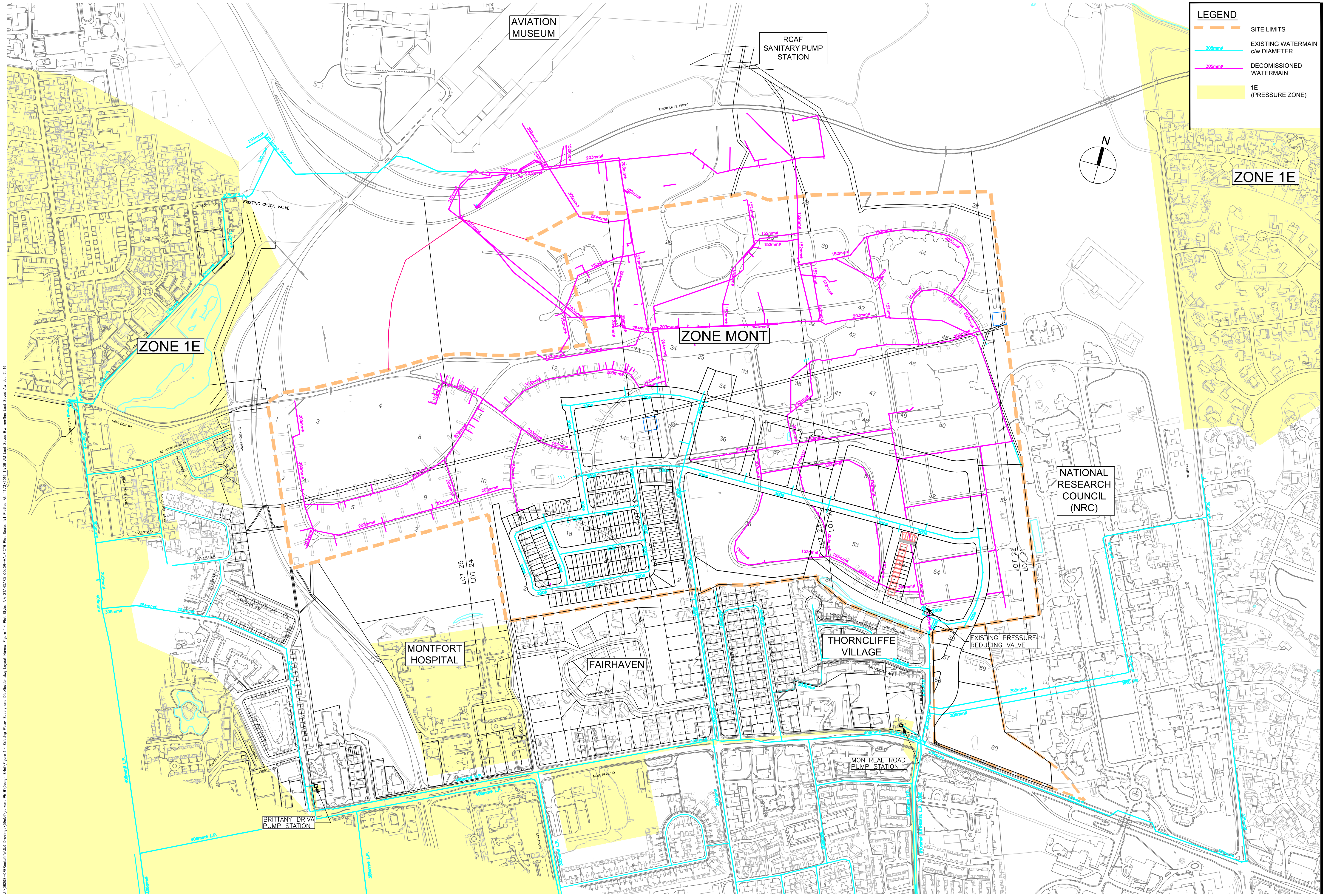
Scale

Drawing Title

EXISTING
WATER COURSES

Sheet No.

FIGURE 1.3



Scale

Project Title

DESIGN BRIEF
WATERIDGE VILLAGE
AT ROCKCLIFFE
PHASE 1B

Drawing Title

EXISTING WATER SUPPLY
AND DISTRIBUTION

Sheet No.

FIGURE 1.4

Project Title

DESIGN BRIEF
WATERIDGE VILLAGE
AT ROCKCLIFFE
PHASE 1B

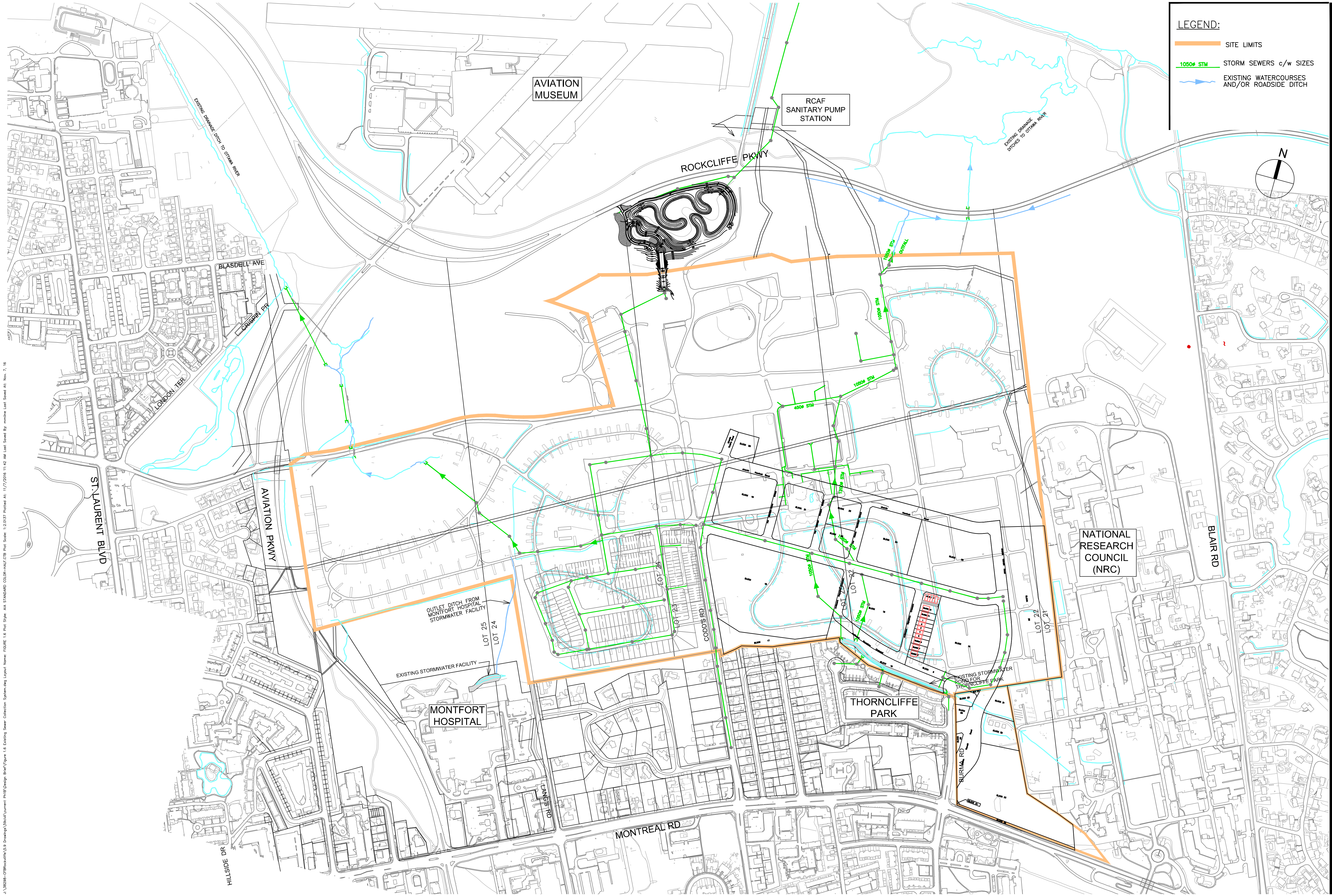
Drawing Title

EXISTING SANITARY
COLLECTION SYSTEM

Sheet No.

FIGURE 1.5

Scale



Scale

Project Title

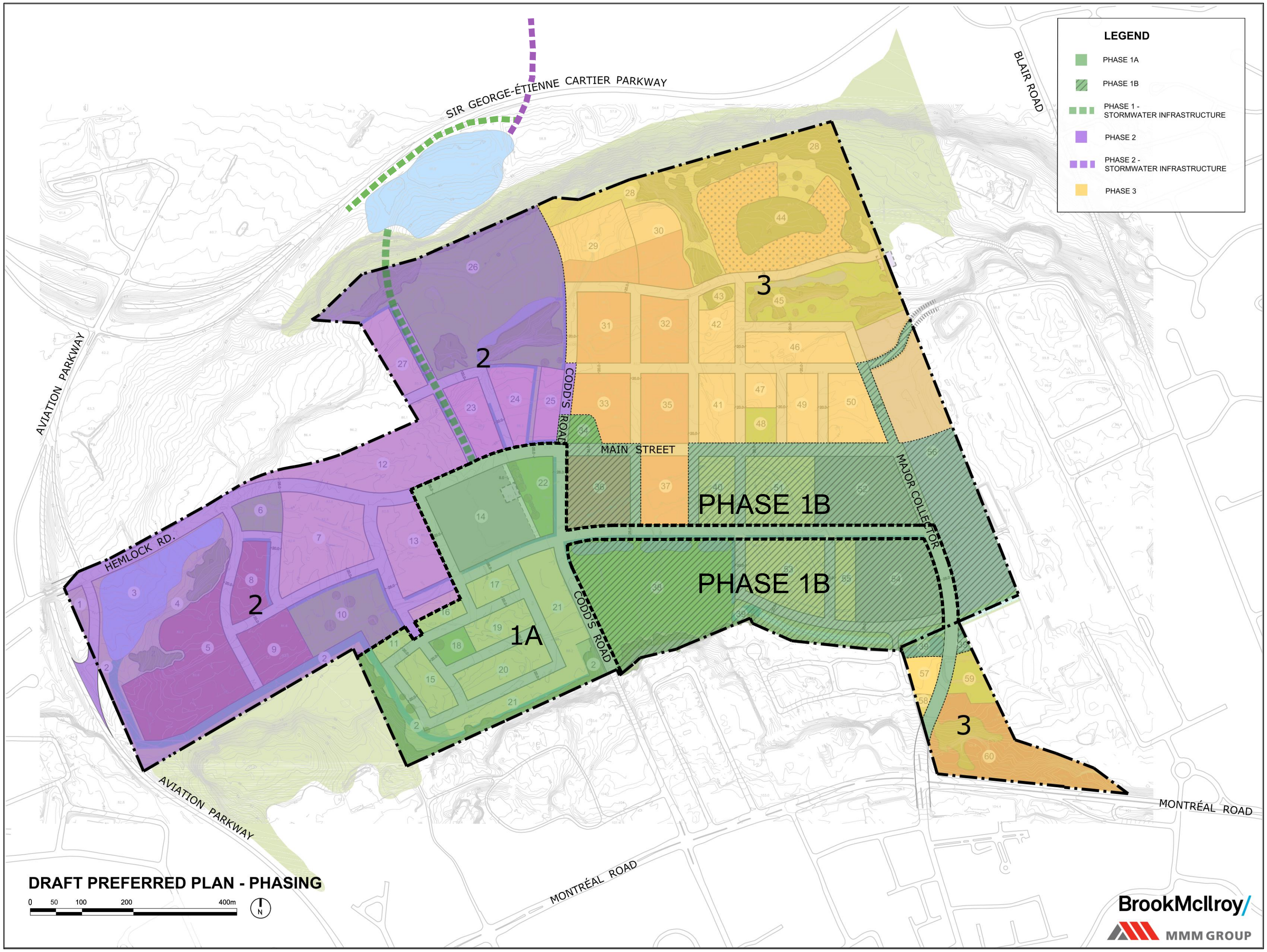
DESIGN BRIEF
WATERIDGE VILLAGE
AT ROCKCLIFFE
PHASE 1B

Drawing Title

EXISTING STORM
COLLECTION SYSTEM

Sheet No.

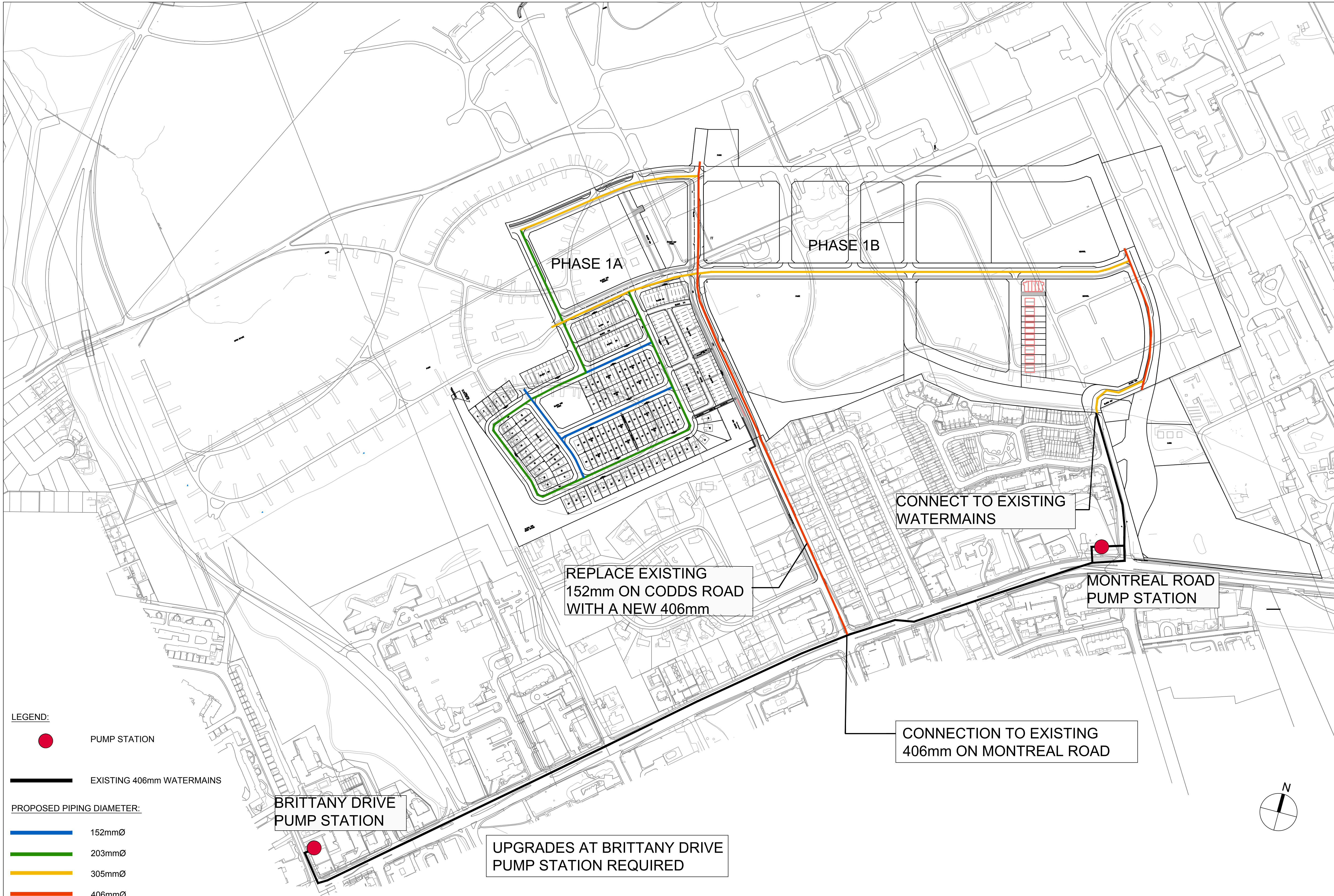
FIGURE 1.6



J:\38298-CFBRockvliffe\5.9 Drawings\59civil\current Ph1B\Design Brief\Figure 1.7-Development Phasing.dwg Layout Name: Layout1

IBI

Scale	Project Title	Drawing Title	Sheet No.
NTS	DESIGN BRIEF WATERIDGE VILLAGE AT ROCKCLIFFE PHASE 1B	DEVELOPMENT PHASING PLAN	FIGURE 1.7



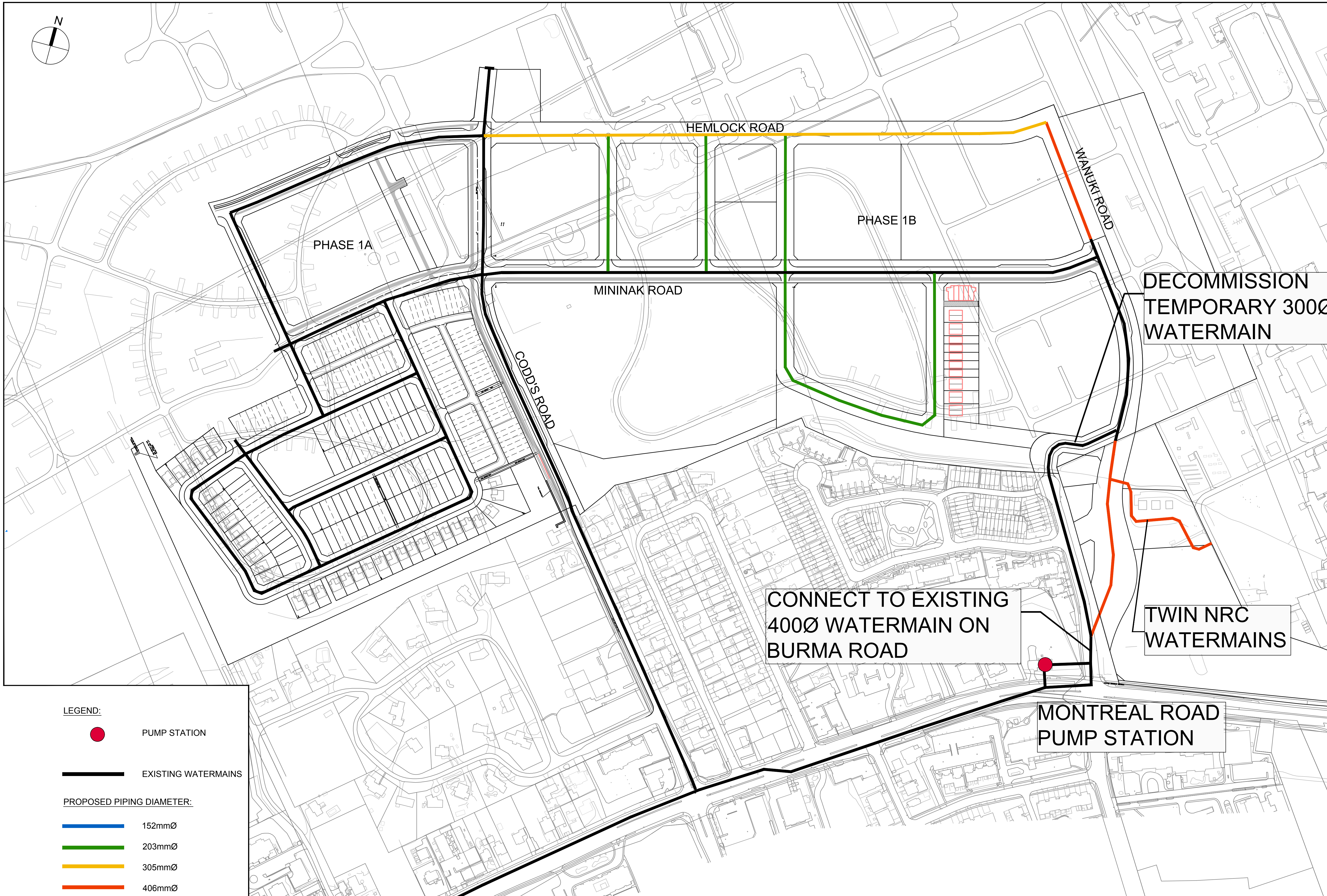
[B]

Scale

Project Title
DESIGN BRIEF
WATERIDGE VILLAGE
AT ROCKCLIFFE
PHASE 1B

Drawing Title
PHASE 1A
WATER PLAN

Sheet No.
FIGURE 2.1

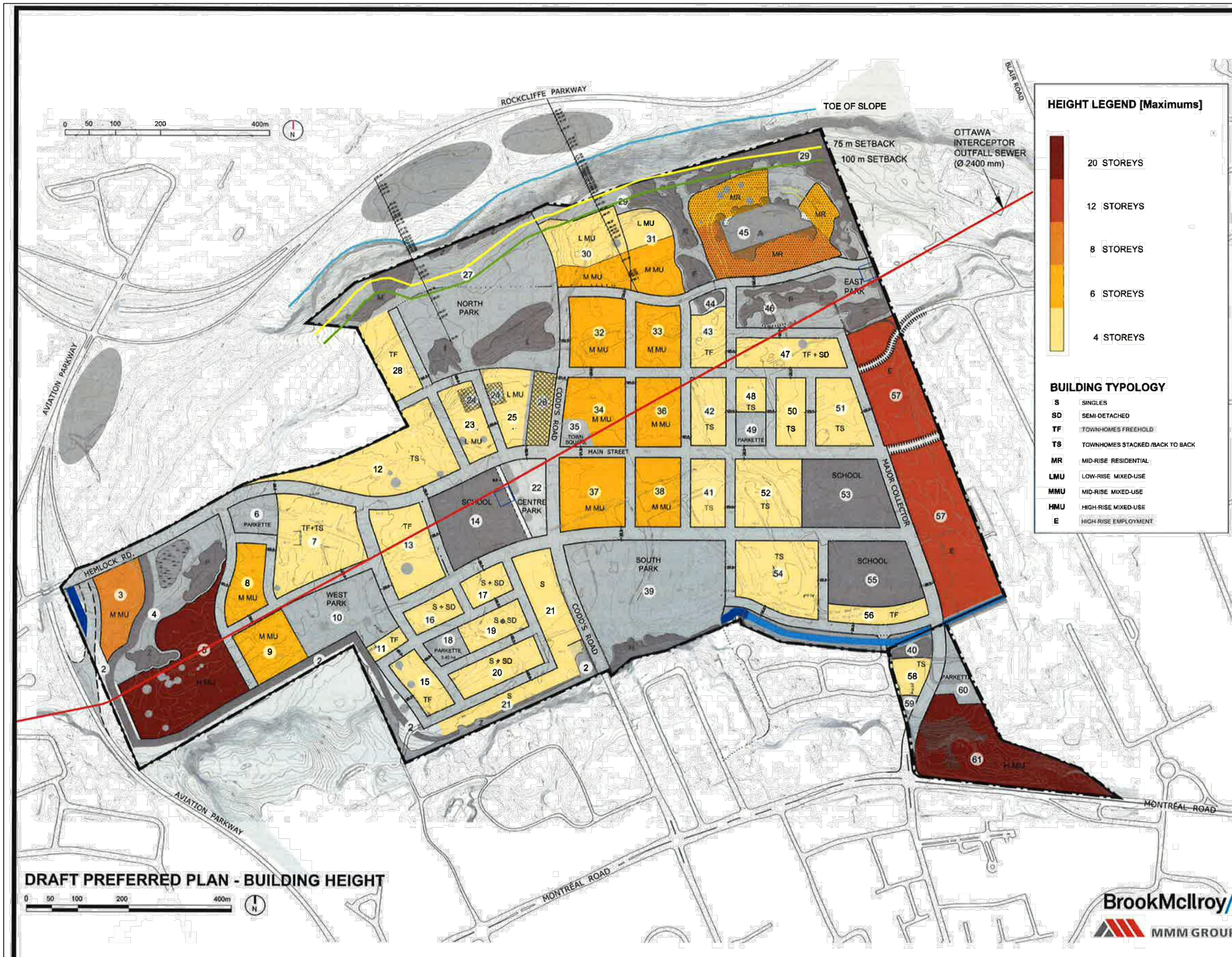


Scale

Project Title
DESIGN BRIEF
WATERIDGE VILLAGE
AT ROCKCLIFFE
PHASE 1B

Drawing Title
RECOMMENDED
WATER PLAN

Sheet No.
FIGURE 2.2



Base map and survey drawing provided by BrookMcIlroy/MMM GROUP

DST consulting engineers
2150 THURSTON DRIVE, SUITE 203
OTTAWA, ONTARIO, K1G 5T9
TEL (613) 748-1415 FAX (613) 748-1356
www.dstgroup.com

NOTES:
1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE ASSOCIATED TECHNICAL REPORT.
2. DO NOT SCALE DRAWING.

LEGEND:
- Toe of Slope
- 75 m Setback
- 100 m Setback

REV	DATE	ISSUE	APPROVAL
0	MAR. 27, 2014	Original	M.W.B.

PROJECT TITLE

Geotechnical Investigation
Former CFB Rockcliffe
Ottawa, Ontario

DRAWING TITLE

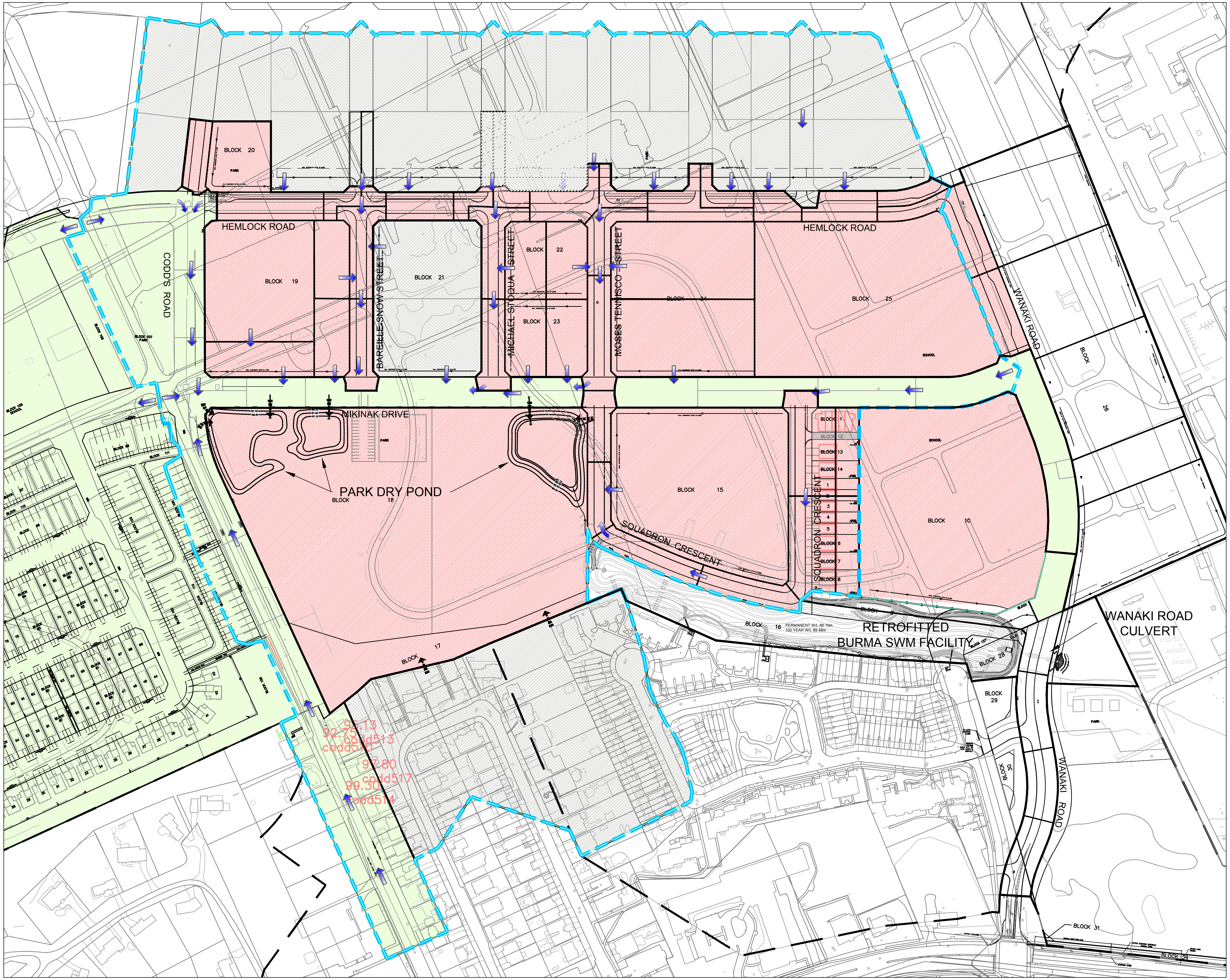
SETBACK DISTANCES
NORTH ESCARPMENT

DESIGNED BY B.V.	SCALE As Shown
DRAWN BY M.L.	DATE MARCH 2014
APPROVED BY M.W.B	PROJECT NO.: OE-OT-015358

Figure 10

J:\38298-CFBRockvliffe\5.9 Drawings\59civil\current Ph1B\Design Brief\Figure 4.2-Development Setback Limits.dwg Layout Name: Model

IBI	Scale	Project Title	Drawing Title	Sheet No.
	NTS	DESIGN BRIEF WATERIDGE VILLAGE AT ROCKCLIFFE PHASE 1B	DEVELOPMENT SETBACK LIMITS	FIGURE 4.2

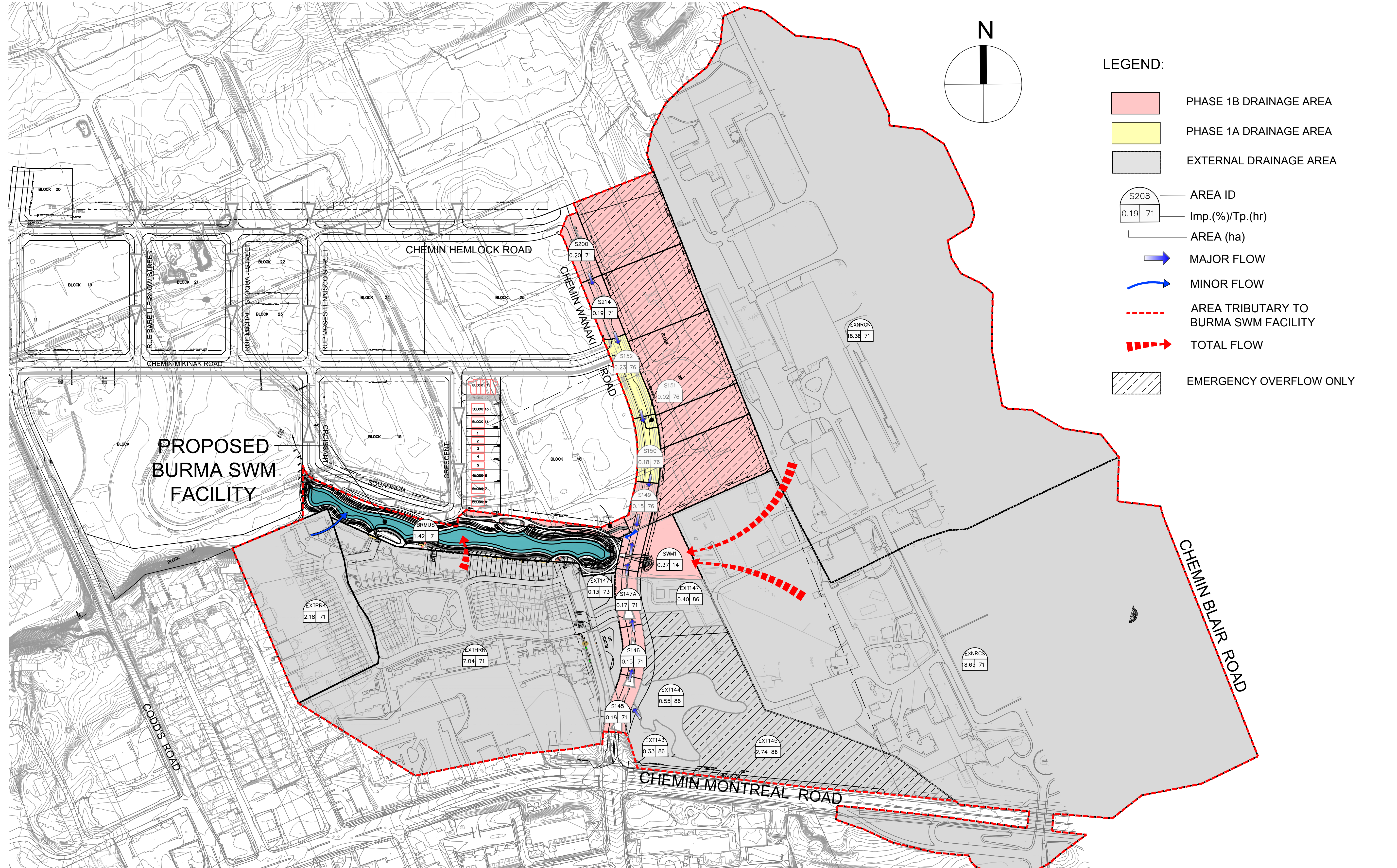


LEGEND:

- PHASE 1B DRAINAGE AREA
- PHASE 1A DRAINAGE AREA
- EXTERNAL DRAINAGE AREA
- AREA TRIBUTARY TO PARK DRY POND
- MAJOR FLOW
- MAJOR FLOW TO PARK DRY POND

J:\38298-CFBRockliffe\5.9 Drawings\59civil\SWM Ph1B\Figures\Subdivision\38298-Ph1B_Swm_Figure5.1.dwg Layout Name: FIGURE 5-1 Plot Scale: 1:5.13 Plotted At: 1/19/2017 Last Saved By: Josee.Forget Last Saved At: Oct. 31, 16

Scale	Project Title	Drawing Title	Sheet No.
N.T.S.	DESIGN BRIEF WATER VILLAGE AT ROCKLIFFE PHASE 1B	AREA TRIBUTARY TO PARK DRY POND CELLS	FIGURE 5.1



Plot Style: ---- Plot Scale: 0.195:1 Plotted At: Jan. 23, 17 3:06 PM Printed By: JOSEE FORGET Last Saved By: JOSEE.FORGET Last Saved At: Jan. 23, 17

J:\38298-CFBRockcliffe\5.9 Drawings\59civil\SWM Ph1B\Figures\Subdivision\38298-Ph1B_Swm_Figure5.2.dwg Sheet Set: ####

IBI

Scale

N.T.S.

Project Title

DESIGN BRIEF
WATERIDGE VILLAGE AT ROCKLIFFE
PHASE 1B

Drawing Title

AREA TRIBUTARY TO
BURMA SWM FACILITY

Sheet No.

FIGURE 5.2

APPENDIX A

- Servicing Study Guidelines
- Figure 1.2, Draft M-Plan

Development Servicing Study Checklist

The following table is a customized copy of the current City of Ottawa's Development Servicing Study Checklist. It is meant to be a quick reference for location of each of the items included on the list. The list contains the various item description and the study section in which the topic is contained.

GENERAL CONTENT

	ITEM DESCRIPTION	LOCATION
	Executive Summary (for larger reports only)	N/A
√	Date and revision number of the report	Front Cover
√	Location Map and plan showing municipal address, boundary, and layout of proposed development.	Figure 1.2
√	Plan showing the site and location of all existing services.	Figures 1.4 to 1.6
√	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.	Sections 2.3, 3.3 & 4.3
√	Summary of Pre-consultation Meeting with City and other approval agencies.	Sections 1.6 & 2.3.1
√	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.	Sections 1.2.2, 2.2, 3.2 & 4.2
√	Statement of objectives and servicing criteria	Sections 1.1, 2.3, 3.3 & 4.3
√	Identification of existing and proposed infrastructure available in the immediate area.	Figures 1.4 to 1.6
√	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).	Sections 1.4
√	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.	Design Drawings
√	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.	Section 1.8
	Proposed phasing of the development, if applicable.	Section 1.9
√	Reference to geotechnical studies and recommendations concerning servicing.	Section 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	Design Drawings

DEVELOPMENT SERVICING REPORT: WATER

	ITEM DESCRIPTION	LOCATION
√	Confirm consistency with Master Servicing Study, if available	Section 2.2
√	Availability of public infrastructure to service proposed development	Section 2.1
√	Identification of system constraints – external water needed	Sections 2.3
√	Identify boundary conditions	Section 2.3.4
√	Confirmation of adequate domestic supply and pressure	Section 2.4 & Appendix B
√	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 2.3 & 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.	Section 2.4 & Appendix B
	Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defining phases of the project including the ultimate design.	N/A
	Address reliability requirements such as appropriate location of shut-off valves.	Design Drawings
√	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.	Section 2.4 & Appendix B
√	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 2.4, Figure 2.2 & Design Drawings
√	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.	Section 2.5
√	Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Section 2.3
√	Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	Appendix B

DEVELOPMENT SERVICING REPORT: WASTEWATER

	ITEM DESCRIPTION	LOCATION
√	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 3.3
√	Confirm consistency with Master Servicing Study and/or justifications for deviations.	Section 3.2
√	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 condition of sewers.	Section 3.5
√	Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Sections 3.4 & 3.6, Figure 3.1
√	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 3.4
	Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix “C”) format.	Sections 3.3, 3.7 & Appendix C
√	Description of proposed sewer network including sewers, pumping stations and forcemains.	Figure 3.1
√	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).	Section 3.8
√	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.	Section 3.9
√	Special considerations such as contamination, corrosive environment etc.	Section 1.7

DEVELOPMENT SERVICING REPORT: STORMWATER CHECKLIST

	ITEM DESCRIPTION	LOCATION
√	Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 4.2 Figure 1.6
√	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.	Figure 1.3 & Grading Plan
√	Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5	N/A

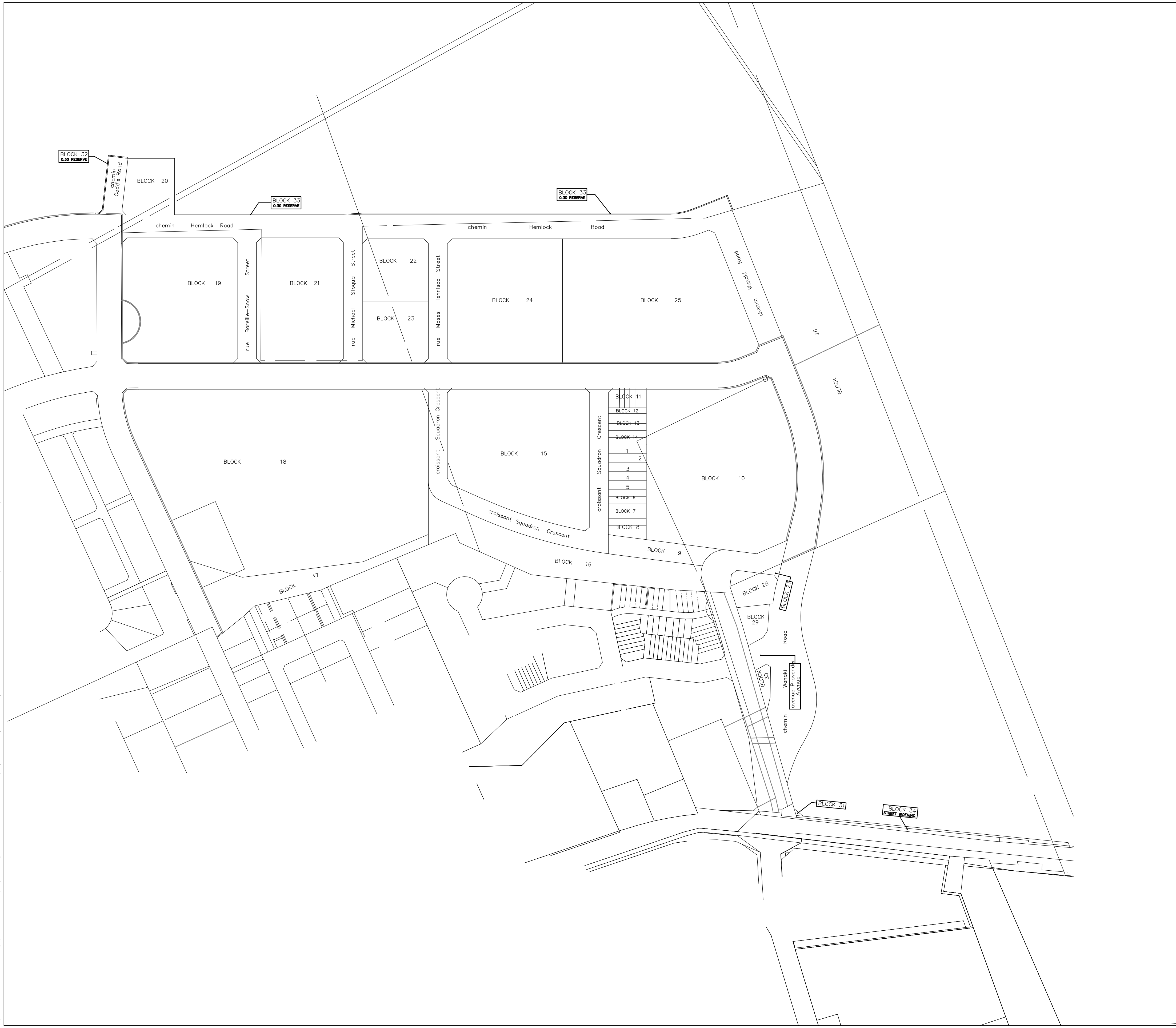
	year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	
√	Water quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	N/A
√	Description of the stormwater management concept with facility locations and descriptions with references and supporting information.	Section 5.2.1
√	Set-back from private sewage disposal systems.	N/A
√	Watercourse and hazard lands setbacks.	Section 4.6
√	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.	Section 4.2 & 5.1
√	Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).	N/A
√	Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	Sections 1.4 & 4.4
	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.	N/A
√	Any proposed diversion of drainage catchment areas from one outlet to another.	Section 4.6
√	Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Figure 4.2
	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.	N/A
√	Identification of potential impacts to receiving watercourses	N/A
√	Identification of municipal drains and related approval requirements.	Section 4.6
√	Descriptions of how the conveyance and storage capacity will be achieved for the development.	N/A
√ √	100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	Sections 5.3 & 5.4
	Inclusion of hydraulic analysis including hydraulic grade line elevations.	Section 5.4
√	Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 4.5
√	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.	Section 4.6
√	Identification of fill constraints related to floodplain and geotechnical investigation.	Sections 1.7 & 4.6

APPROVAL AND PERMIT REQUIREMENTS: CHECKLIST

	ITEM DESCRIPTION	LOCATION
√	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.	Section 6.3
	Application for Certification of Approval (CofA) under the Ontario Water resources Act.	Section 6.2 Final Design
√	Changes to Municipal Drains	Section 4.6
√	Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	Section 6.4

CONCLUSION CHECKLIST

	ITEM DESCRIPTION	LOCATION
√	Clearly stated conclusions and recommendations	Sections 7.1 & 7.2
	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.	Final Design
√	All draft and final reports shall be signed and stamped by professional Engineer registered in Ontario.	Completed



APPROVED UNDER SECTION 51 OF THE PLANNING ACT
BY THE CITY OF OTTAWA.

THIS _______ DAY OF __________________ , _______

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

PLAN 4M-

I CERTIFY THAT THIS PLAN
IS REGISTERED IN THE LAND REGISTRY OFFICE
FOR THE LAND TITLES DIVISION OF OTTAWA-CARLETON NO. 4
AT _____ O'CLOCK ON THE ____ DAY OF _________, ____
AND ENTERED IN THE PARCEL REGISTER FOR
PROPERTY IDENTIFIERS ________________________
AND THE REQUIRED CONSENTS ARE REGISTERED AS
PLAN DOCUMENT NO. ___________

LAND REGISTRAR

This plan comprises all of the land identified by PIN's 04273-0561, 04273-0562, 04273-0563, 04273-0564, 04273-0565, 04273-0566, 04273-0567 and part of the land identified by PIN's 04372-0580, 04372-0581 and 04273-0434.

REVISION SCHEDULE

Revision No.	Date	Comments
1	May 18, 2016	First Draft
2	May 18, 2016	Amended Street Names
3	May 19, 2016	26m Servicing Easement
4	May 24, 2016	Added Block for Veteran's House
5	May 30, 2016	24m Servicing Easement

PLAN OF SUBDIVISION OF
PART OF LOTS 21, 22 And **23**
CONCESSION 1 (OTTAWA FRONT)
Geographic Township of Gloucester
And
BLOCKS 118, 121, 122, 123, 124
And
PART OF BLOCKS 119 And **120**
REGISTERED PLAN 4M-1559
CITY OF OTTAWA
Surveyed by Annis , O'Sullivan , Vollebekk Ltd.

Scale 1 : 1250
50 37.5 25 12.5 0 25 50 Metres

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

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 day of , 2016.

__________ Date

____________________ E. H. Herweyer
Ontario Land Surveyor

OWNER'S CERTIFICATE

THIS IS TO CERTIFY THAT :

1. Blocks 1 to 22, both inclusive, t he Streets, namely, Streets (1-5), chemin Burma Road, chemin Codd's Road, chemin Hemlock Road, avenue Provender Avenue, chemin Wanaki Road, the Street Widening, namely, Block 23 and the Reserves, namely, Blocks 24, 25 and 26 have been laid out in accordance with our instructions.
2. The Streets and Street Widening are dedicated as public highways.

Dated the _____ day
of _________, 2016

____
Rodger Martin, Vice President,
Real Estate Ontario & Atlantic
Canada Lands Company CLC Limited
I have the authority to bind the corporation.

Dated the _____ day
of _________, 2016

____
Jean B. Lachance, Director
Real Estate Canada Lands Company CLC Limited
I have the authority to bind the corporation.

NOTES AND LEGEND

-□-	denotes	Survey Monument Planted.
-■-	"	Survey Monument Found
SIB	"	Standard Iron Bar.
SSIB	"	Short Standard Iron Bar.
CC	"	Cut Cross.
IB	"	Iron Bar.
(WIT)	"	Witness
CLF	"	Chain Link Fence
BF	"	Board Fence
R/W	"	Right-of-Way
(AOG)	"	Annis, O'Sullivan, Vollebekk Ltd.
(P1)	"	Registered Plan 4M-1559
(P2)	"	Plan 4R-26142
(P3)	"	Plan 4R-29484
(P4)	"	Plan 4R-29367
(P5)	"	Plan 4R-28966

All planted survey monuments are IB's unless otherwise noted.

Distances shown on curved limits are Arc distances unless otherwise noted.

Distances shown on this plan are ground distances and can be converted to grid distances by multiplying by the combined scale factor of 0.999947.

Bearings are grid, derived from the southerly limit of chemin Mikinak Road, shown to be N90°00'00" W on Registered Plan 4M-1559, and are referred to the Central Meridian of MTM Zone 9 (76°30' West Longitude) NAD-83 (original).

Coordinates are derived from Can-Net 3.0 Real Time Network GPS observations referenced to Specified Control Points 01919680105 and 0198434761, MTM Zone 9 (76°30' West Longitude) NAD-83 (original).

Coordinate values are to urban accuracy in accordance with O. Reg. 216/10.

. 019198434761	Northing	5036178.12	Easting	372436.11
. 01919680146	Northing	5035456.42	Easting	372208.81
. Point A	Northing	5034986.54	Easting	373170.44
. Point B	Northing	5034986.54	Easting	372556.54

Caution: Coordinates cannot, in themselves, be used to re-establish corners or boundaries shown on this plan.

ELEVATION NOTES

1. Elevations are geodetic, referred to City of Ottawa Vertical Bench Mark No. 396 (01919680138), having an elevation of 95.06 metres.

ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079
Email: Nepean@aovltd.com
Ontario Land Surveyors
Job No. Figure 1.2 Draft Plan Of Subdivision | N

[B]

Scale
NTS

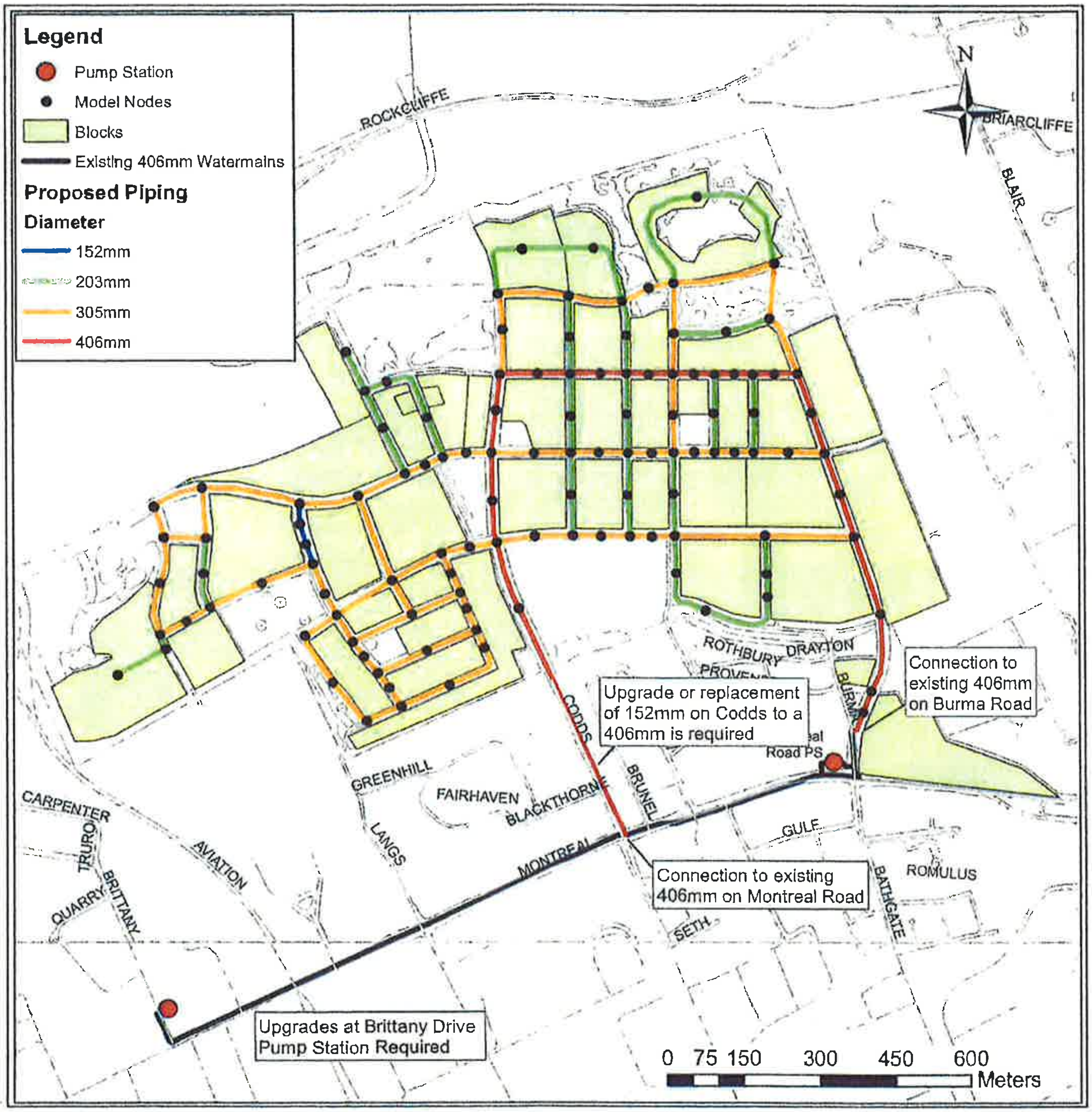
Project Title
DESIGN BRIEF
WATERIDGE VILLAGE
AT ROCKCLIFFE
PHASE 1B

Drawing Title
DRAFT M-PLAN

Sheet No.
FIGURE 1.2

APPENDIX B

- Figure 4.4 Proposed Pipe alignment and Diameters
- Watermain Demand Calculation Sheet
- Boundary Conditions
- Hydraulic Modeling Results



J:\32952-RockcliffeRedev\5.9 Drawings\59civil\current\Report Figures\MSS 2015\Section 4\FIG...4.4 Proposed Pipe alignment and Diameters-REV.dwg Layout Name: FIGURE4.4

Stantec

IBI

Project Title	Drawing Title	Sheet No.
FORMER CFB ROCKCLIFFE MASTER SERVICING STUDY	PROPOSED PIPE ALIGNMENT AND DIAMETERS	FIGURE 4.4

IBI GROUP
333 PRESTON STREET
OTTAWA, ON
K1S 5N4

WATERMAIN DEMAND CALCULATION SHEET

PROJECT : FORMER CFB ROCKCLIFFE - PHASE 1B
LOCATION : CITY OF OTTAWA

FILE: 38298.5.7
DATE PRINTED: 29-Jun-16
DESIGN: LE

NODE	RESIDENTIAL UNITS				NON-RESIDENTIAL			AVERAGE DAILY DEMAND (l/s)			MAXIMUM DAILY DEMAND (l/s)			MAXIMUM HOURLY DEMAND (l/s)			FIRE DEMAND
	SF	SD	TH	POP'N	INDTRL (ha.)	COMM. (ha.)	INST. (ha.)	Res.	Non-res.	Total	Res.	Non-res.	Total	Res.	Non-res.	Total	(l/min)
PHASE 1B																	
J50				76.0				0.31	0.00	0.31	0.77	0.00	0.77	1.69	0.00	1.69	13,000
J52				146.5				0.59	0.00	0.59	1.48	0.00	1.48	3.26	0.00	3.26	13,000
J54				199.5				0.81	0.00	0.81	2.02	0.00	2.02	4.44	0.00	4.44	13,000
J56							2.49	0.00	1.44	1.44	0.00	2.16	2.16	0.00	3.89	3.89	13,000
J58				319.0				1.29	0.00	1.29	3.23	0.00	3.23	7.11	0.00	7.11	13,000
J60				212.3				0.86	0.00	0.86	2.15	0.00	2.15	4.73	0.00	4.73	13,000
J62				129.0				0.52	0.00	0.52	1.31	0.00	1.31	2.87	0.00	2.87	13,000
J64				367.0				1.49	0.00	1.49	3.72	0.00	3.72	8.18	0.00	8.18	13,000
J66				241.5				0.98	0.00	0.98	2.45	0.00	2.45	5.38	0.00	5.38	13,000
J68				153.5				0.62	0.00	0.62	1.55	0.00	1.55	3.42	0.00	3.42	13,000
J70				160.5				0.65	0.00	0.65	1.63	0.00	1.63	3.58	0.00	3.58	13,000
J72				358.5				1.45	0.00	1.45	3.63	0.00	3.63	7.99	0.00	7.99	13,000
J74						0.90		0.00	0.52	0.52	0.00	0.78	0.78	0.00	1.41	1.41	13,000
J76						0.65		0.00	0.38	0.38	0.00	0.56	0.56	0.00	1.02	1.02	13,000
J78				304.5				1.23	0.00	1.23	3.08	0.00	3.08	6.78	0.00	6.78	13,000
J80				105.0				0.43	0.00	0.43	1.06	0.00	1.06	2.34	0.00	2.34	13,000
J82				260.0				1.05	0.00	1.05	2.63	0.00	2.63	5.79	0.00	5.79	13,000
J84						0.88		0.00	0.51	0.51	0.00	0.76	0.76	0.00	1.38	1.38	13,000
J86						0.45	2.62	0.00	1.78	1.78	0.00	2.66	2.66	0.00	4.80	4.80	13,000
J88						0.95		0.00	0.55	0.55	0.00	0.82	0.82	0.00	1.48	1.48	13,000
TOTALS	0	0	0	3033	0.00	3.83	5.11	12.28	5.18	17.46	30.71	7.74	38.45	67.56	13.98	81.54	

ASSUMPTIONS

RESIDENTIAL DENSITIES
- Single Family (SF) 3.4 p / p / u
- Semi Detached (SD) 2.7 p / p / u
- Townhouse (TH) 2.7 p / p / u

AVG. DAILY DEMAND
- Residential 350 l / cap / day
- Institutional 50,000 l / ha / day

MAX. DAILY DEMAND
- Residential 875 l / cap / day
- Institutional 75,000 l / ha / day

MAX. HOURLY DEMAND
- Residential 1,925 l / cap / day
- Institutional 135,000 l / ha / day

FIRE FLOW
- SF, SD & TH 10,000 l / min
- ICI 13,000 l / min

IBI GROUP
333 PRESTON STREET
OTTAWA, ON
K1S 5N4

WATERMAIN DEMAND CALCULATION SHEET

PROJECT : FORMER CFB ROCKCLIFFE - PHASE 1B
LOCATION : CITY OF OTTAWA

FILE: 38298.5.7
DATE PRINTED: 29-Jun-16
DESIGN: LE
PAGE : 2 OF 2

NODE	RESIDENTIAL UNITS SF	SD	TH	POP'N	NON-RESIDENTIAL INDTRL (ha.)	COMM. (ha.)	INST. (ha.)	AVERAGE DAILY DEMAND (l/s) Res.	Non-res.	Total	MAXIMUM DAILY DEMAND (l/s) Res.	Non-res.	Total	MAXIMUM HOURLY DEMAND (l/s) Res.	Non-res.	Total	FIRE DEMAND (l/min)
PHASE 1A																	
J01			18	48.6				0.20	0.00	0.20	0.49	0.00	0.49	1.08	0.00	1.08	10,000
J02			11	29.7				0.12	0.00	0.12	0.30	0.00	0.30	0.66	0.00	0.66	10,000
J04		4	9	35.1				0.14	0.00	0.14	0.36	0.00	0.36	0.78	0.00	0.78	10,000
J06		4	3	18.9				0.08	0.00	0.08	0.19	0.00	0.19	0.42	0.00	0.42	10,000
J10	4	6	5	43.3				0.18	0.00	0.18	0.44	0.00	0.44	0.96	0.00	0.96	10,000
J12	8			27.2				0.11	0.00	0.11	0.28	0.00	0.28	0.61	0.00	0.61	10,000
J14	10	2		39.4				0.16	0.00	0.16	0.40	0.00	0.40	0.88	0.00	0.88	10,000
J16	16	4		65.2				0.26	0.00	0.26	0.66	0.00	0.66	1.45	0.00	1.45	10,000
J18	9	2		36.0				0.15	0.00	0.15	0.36	0.00	0.36	0.80	0.00	0.80	10,000
J20	5	6		33.2				0.13	0.00	0.13	0.34	0.00	0.34	0.74	0.00	0.74	10,000
J22	11	6		53.6				0.22	0.00	0.22	0.54	0.00	0.54	1.19	0.00	1.19	10,000
J24	8	4	10	65.0				0.26	0.00	0.26	0.66	0.00	0.66	1.45	0.00	1.45	10,000
J26	4	12	3	54.1				0.22	0.00	0.22	0.55	0.00	0.55	1.21	0.00	1.21	10,000
J28	4	10	9	64.9				0.26	0.00	0.26	0.66	0.00	0.66	1.45	0.00	1.45	10,000
J30	6			20.4				0.08	0.00	0.08	0.21	0.00	0.21	0.45	0.00	0.45	10,000
J32				210.8				0.85	0.00	0.85	2.13	0.00	2.13	4.70	0.00	4.70	13,000
R02	26			88.4				0.36	0.00	0.36	0.90	0.00	0.90	1.97	0.00	1.97	10,000
J34							2.50	0.00	1.45	1.45	0.00	2.17	2.17	0.00	3.91	3.91	13,000
TOTA_S	111	60	68	934	0.00	0.00	2.50	3.78	1.45	5.23	9.47	2.17	11.64	20.80	3.91	24.71	

ASSUMPTIONS

RESIDENTIAL DENSITIES
- Single Family (SF) 3.4 p / p / u
- Semi Detached (SD) 2.7 p / p / u
- Townhouse (TH) 2.7 p / p / u

AVG. DAILY DEMAND
- Residential 350 l / cap / day
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MAX. DAILY DEMAND
- Residential 875 l / cap / day
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MAX. HOURLY DEMAND
- Residential 1,925 l / cap / day
- Institutional 135,000 l / ha / day

FIRE FLOW
- SF, SD & TH 10,000 l / min
- ICI 13,000 l / min

Lance Erion

From: Mottalib, Abdul [Abdul.Mottalib@ottawa.ca]
Sent: Wednesday, June 03, 2015 2:00 PM
To: Lance Erion
Cc: Mottalib, Abdul
Subject: FW: Former CFB Rockcliffe - Request for Watermain Boundary Conditions - Phase 1

Please see below:

Thanks,

Abdul Mottalib, P. Eng.

Sent: June 03, 2015 11:29 AM
To: Mottalib, Abdul
Subject: RE: Former CFB Rockcliffe - Request for Watermain Boundary Conditions - Phase 1

Abdul,

Please note the following:

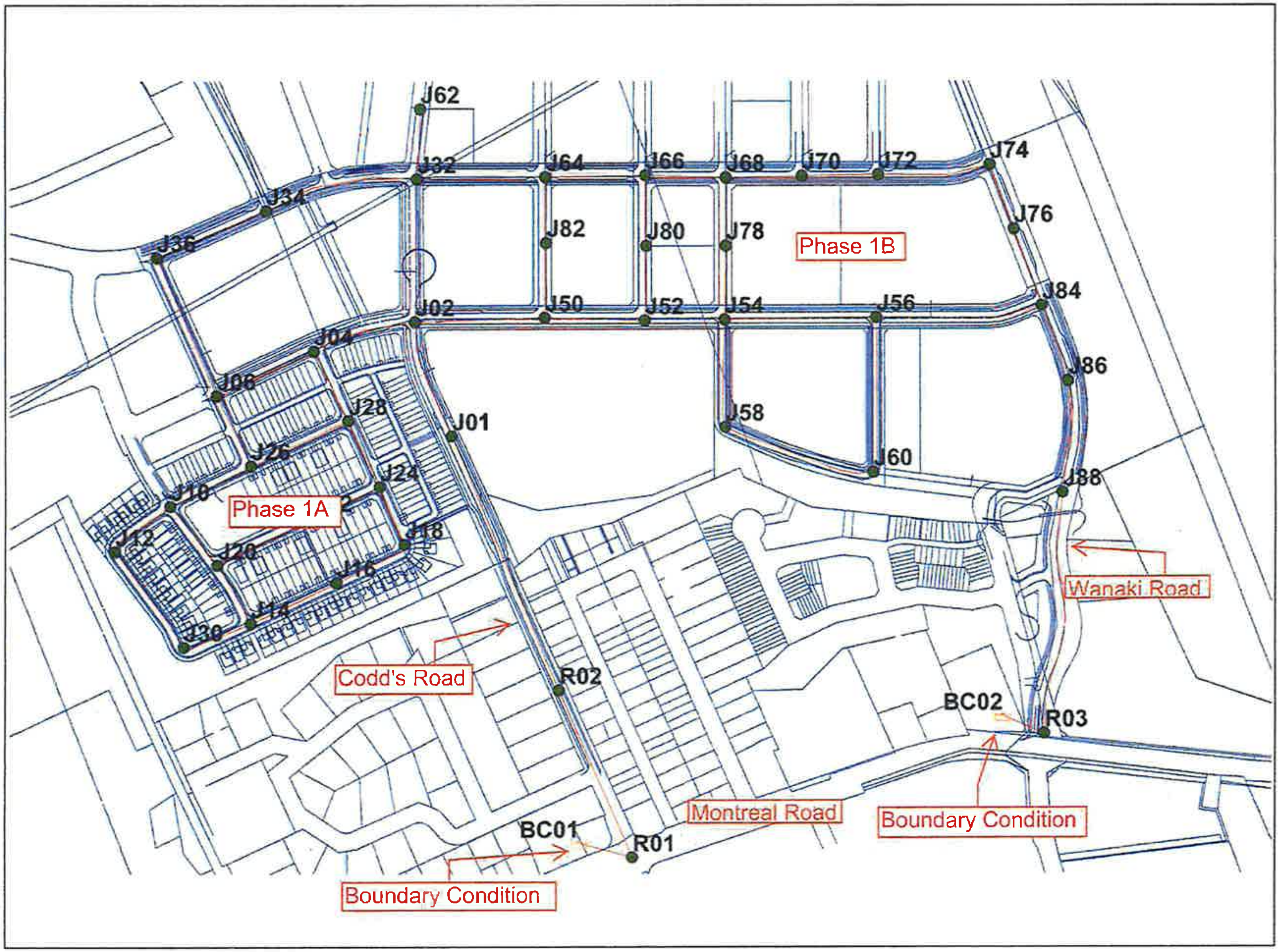
- Boundary conditions provided below are provided for existing conditions. The MSS for CFB Rockcliffe should be carefully reviewed by the designer to assess future conditions (changes to MTL PZ discharge pressures affecting boundary conditions).
- Upgrades to the MTL PZ pump stations are currently being planned to support the CFB Rockcliffe development. These upgrades must be implemented before subdivision construction to ensure adequate reliability of supply. The Class EA and functional design for the station upgrades are currently being updated. Schedule for design and construction will need to be reviewed by my staff with Construction Services if there is a need to confirm timing.

Codd's Road:
MAX HGL = 147.1m
PKHR = 147.0m
MXDY+Fire (13,000 Lpm) = 139.5m
MXDY+Fire (10,000 Lpm) = 140.0m

Burma Road:
MAX HGL = 147.1m
PKHR = 147.1m
MXDY+Fire (13,000 Lpm) = 140.2m
MXDY+Fire (10,000 Lpm) = 140.4m

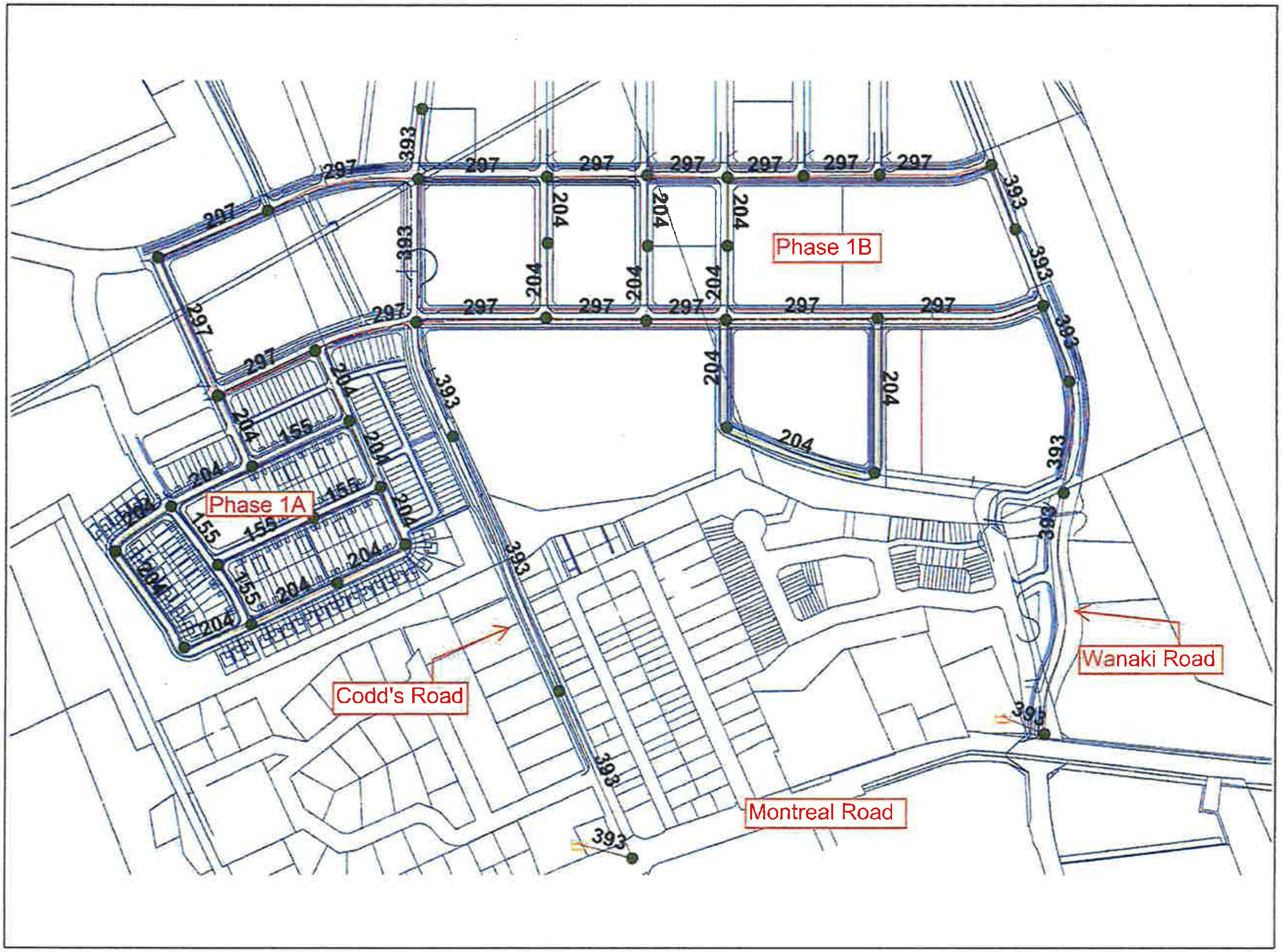
Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation 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.

Phase 1B - Node ID's



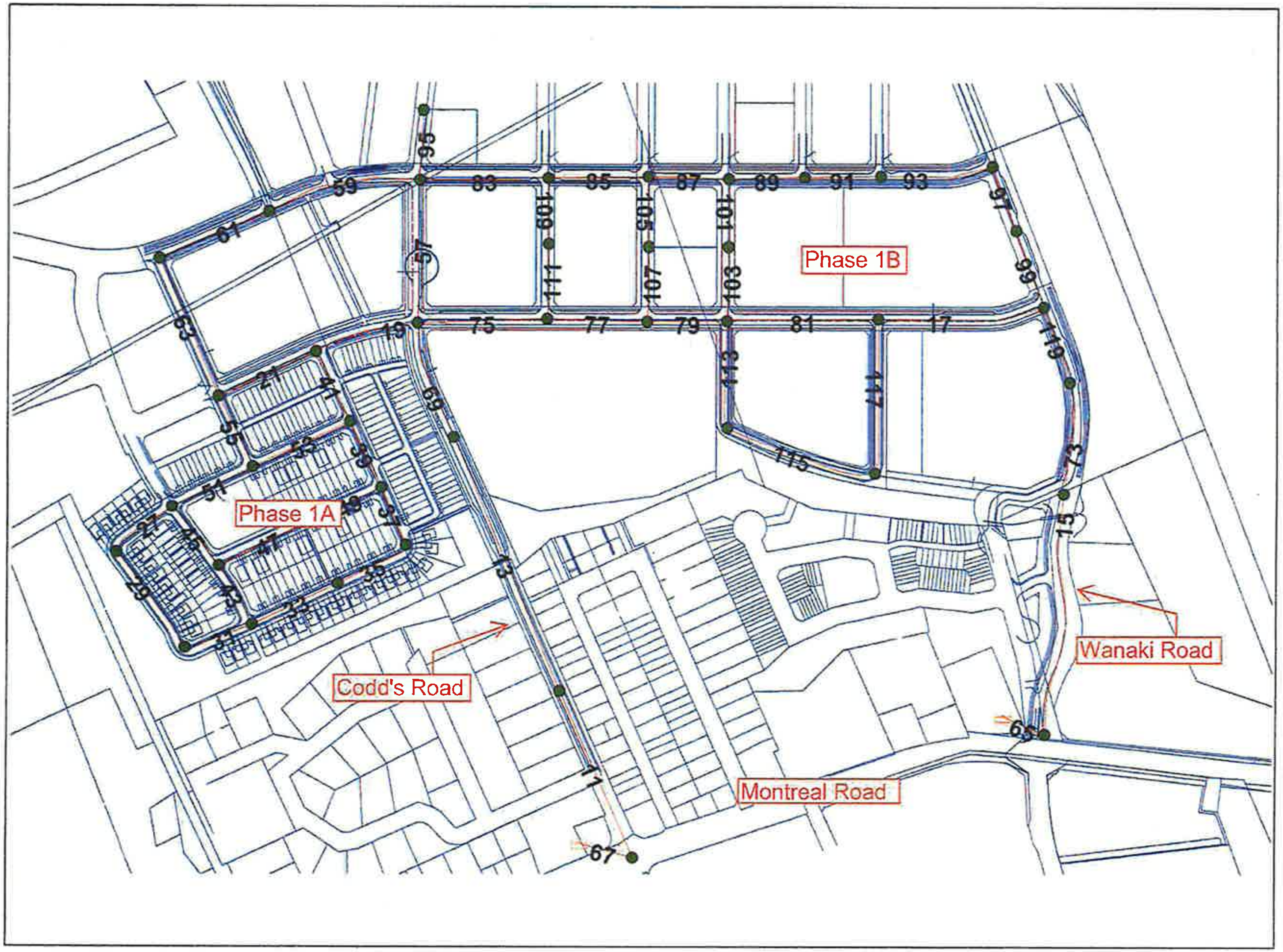
Date: Wednesday, June 29, 2016

Phase 1B - Pipe Sizes



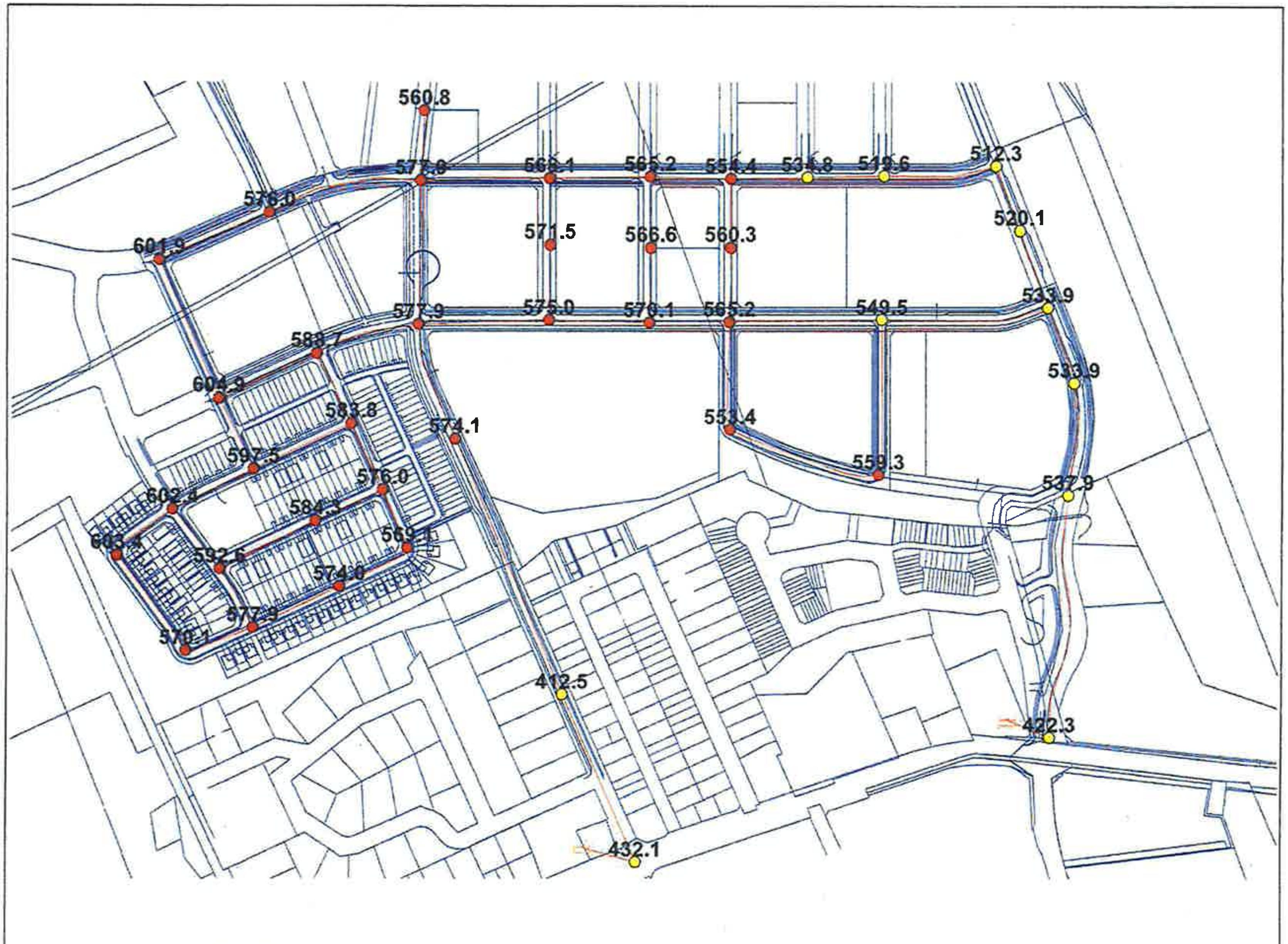
Date: Wednesday, June 29, 2016

Phase 1B - Pipe ID's



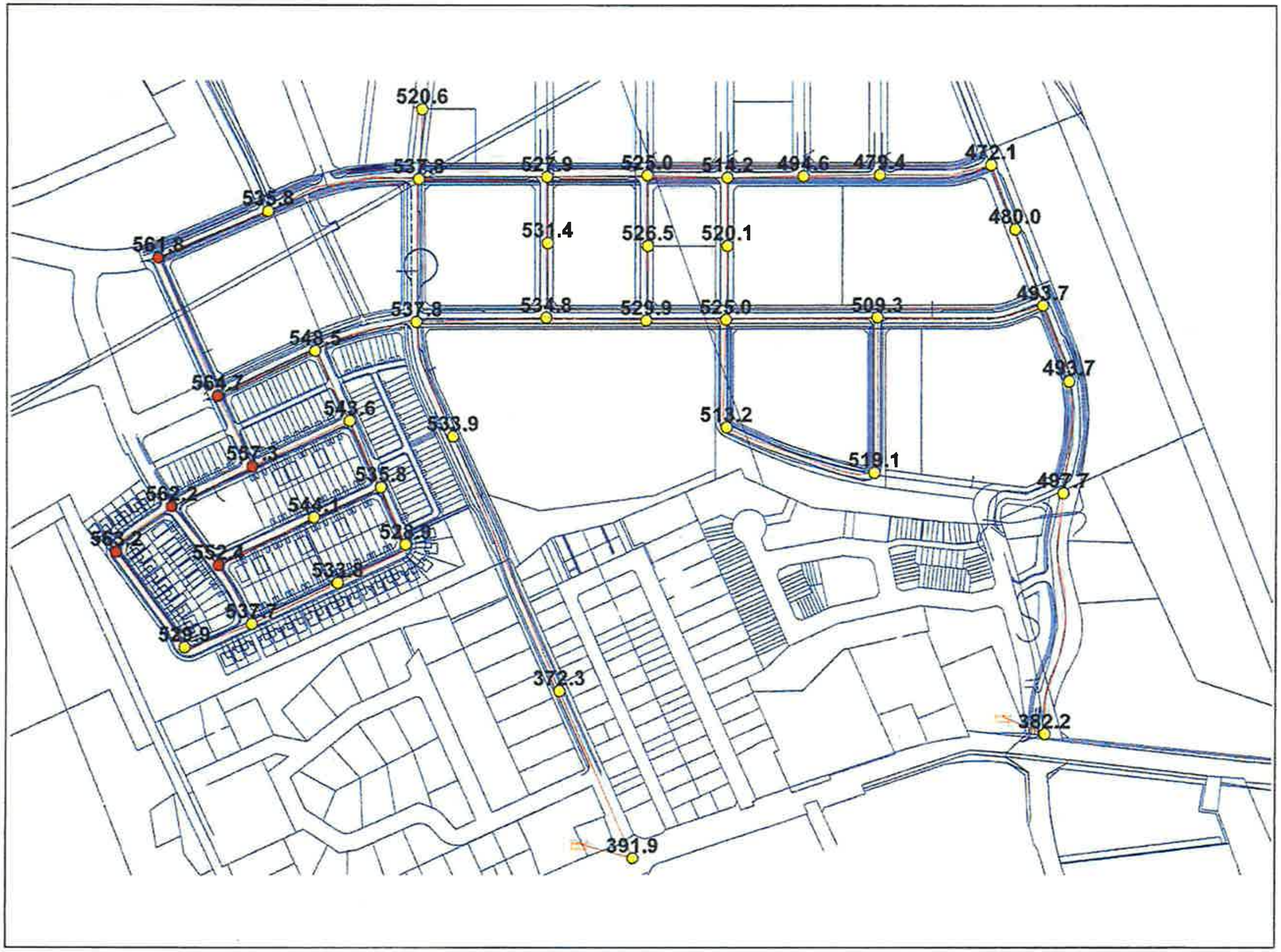
Date: Wednesday, June 29, 2016

Phase 1B - Basic Day (Max HGL) Pressures (kPa) Existing HGL 147.1m



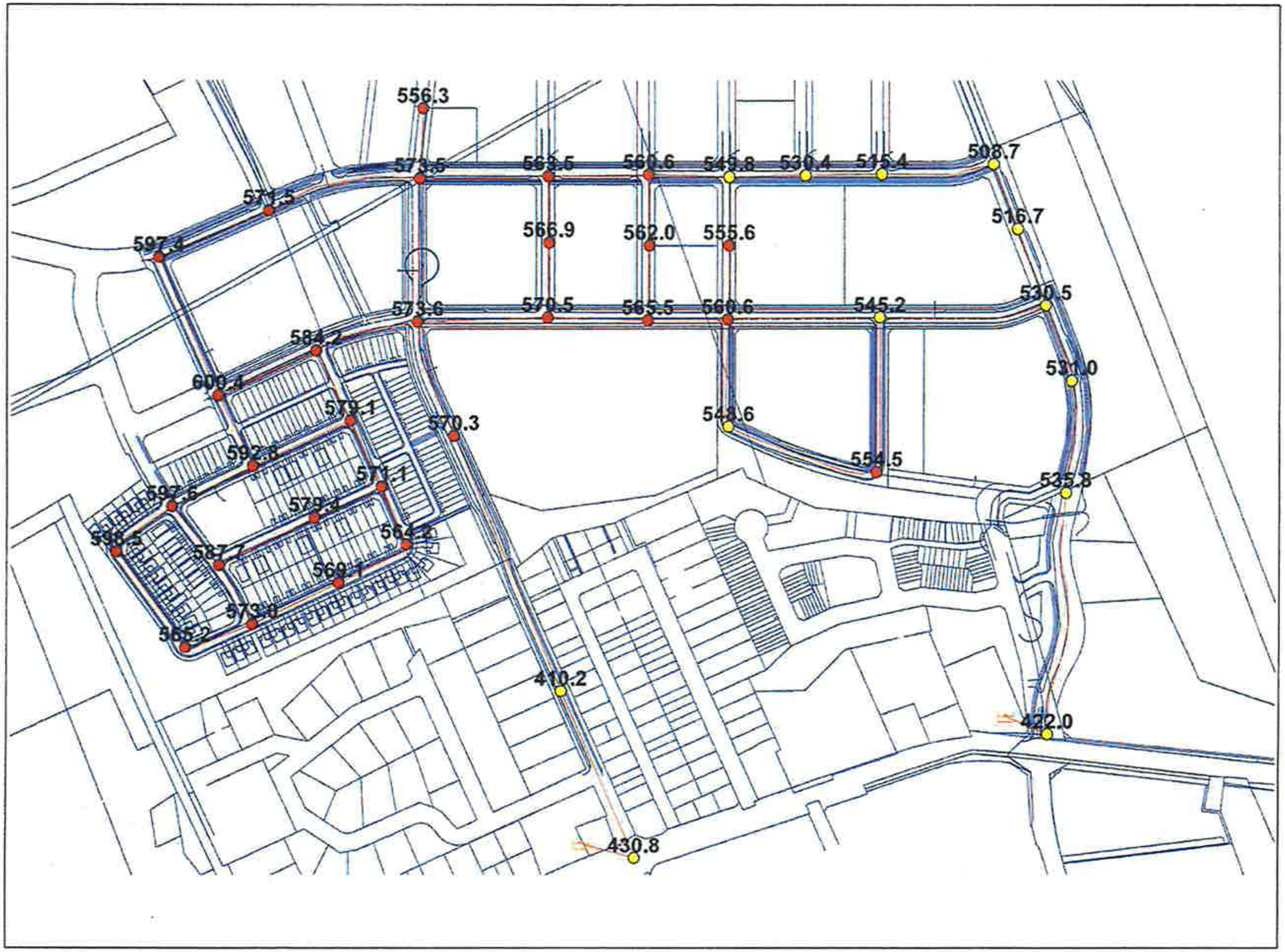
Date: Wednesday, June 29, 2016

Phase 1B - Basic Day (Max HGL) Pressures (kPa) Future HGL 143.0m



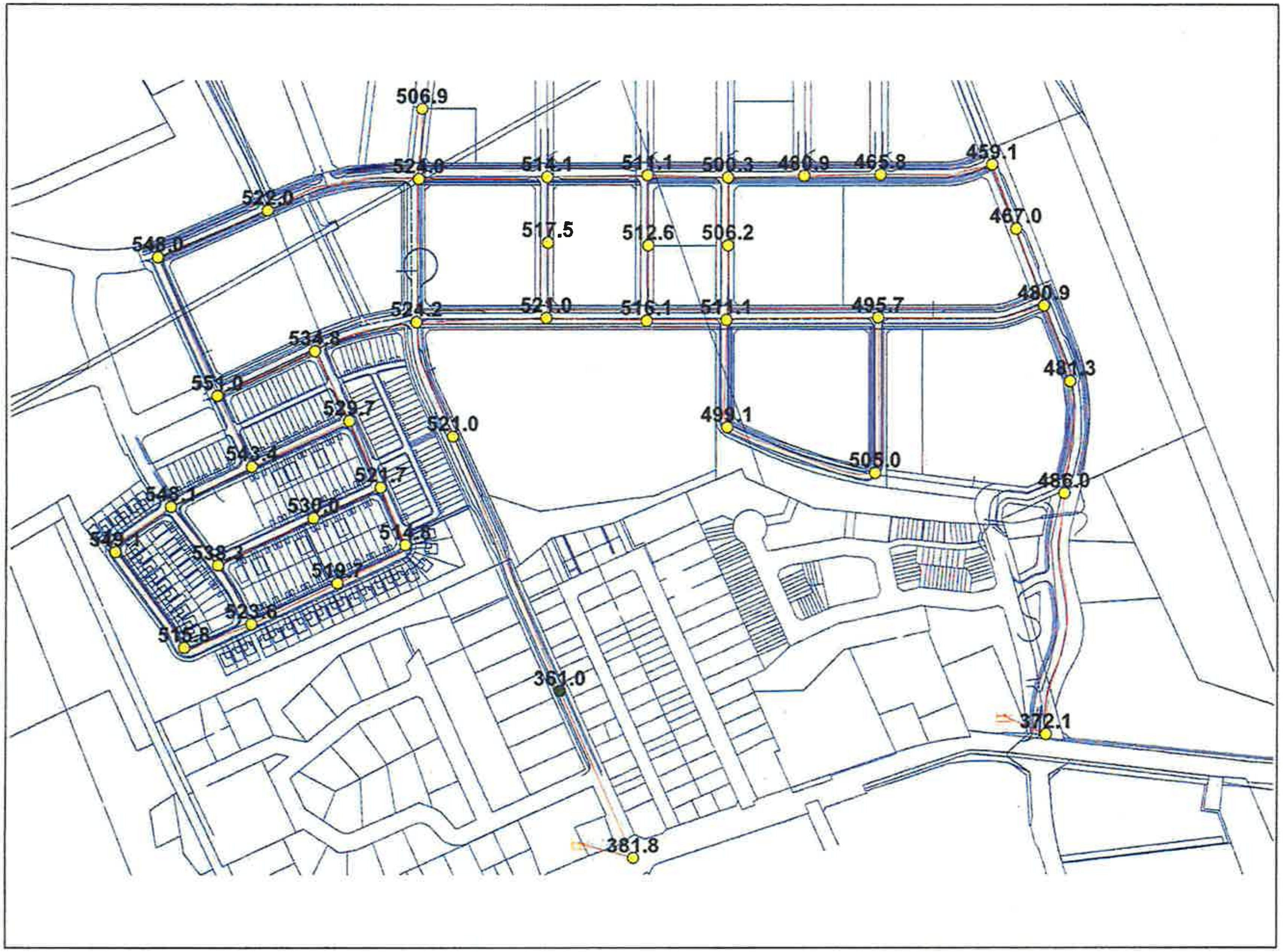
Date: Wednesday, June 29, 2016

Phase 1B - Peak Hour Pressures (kPa) Existing HGL 147.0 - 147.1m



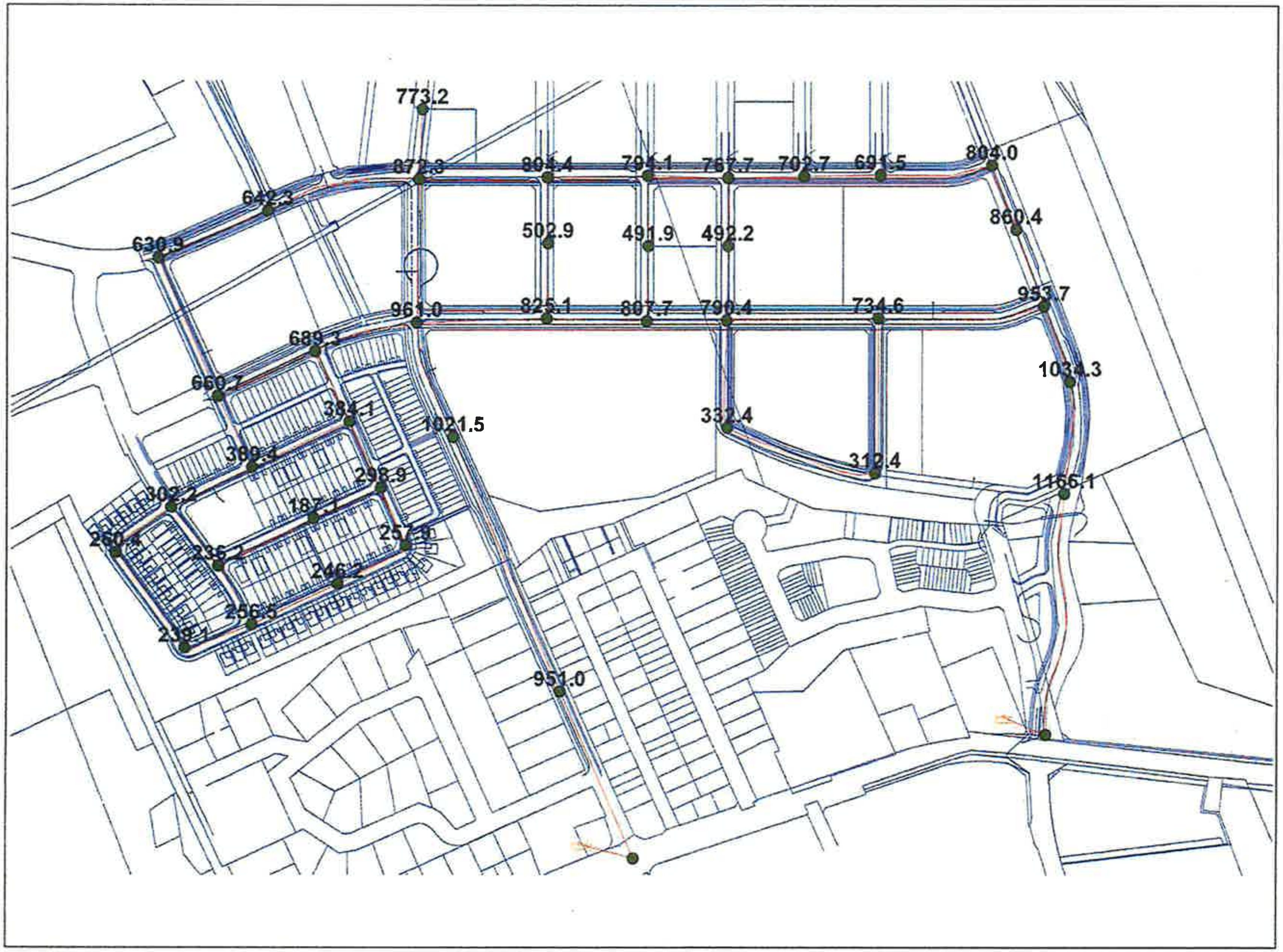
Date: Wednesday, June 29, 2016

Phase 1B - Peak Hour Pressures (kPa) Future HGL 142.0m



Date: Wednesday, June 29, 2016

Phase 1B - Max Day Fireflows (l/s) HGL 139.5 - 140.2m



Date: Wednesday, June 29, 2016

Phase 1A - Basic Day (Max HGL) HGL 147.1m - Junction Report

	ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
1	J01	0.20	88.50	147.08	574.06
2	J02	0.12	88.10	147.08	577.94
3	J04	0.14	87.00	147.08	588.71
4	J06	0.08	85.35	147.08	604.87
5	J10	0.18	85.60	147.08	602.41
6	J12	0.11	85.50	147.08	603.39
7	J14	0.16	88.10	147.08	577.91
8	J16	0.26	88.50	147.08	573.99
9	J18	0.15	89.00	147.08	569.09
10	J20	0.13	86.60	147.08	592.61
11	J22	0.22	87.45	147.08	584.28
12	J24	0.26	88.30	147.08	575.95
13	J26	0.22	86.10	147.08	597.52
14	J28	0.26	87.50	147.08	583.80
15	J30	0.08	88.90	147.08	570.07
16	J32	0.85	88.10	147.08	577.93
17	J34	1.45	88.30	147.08	575.97
18	J36	0.00	85.65	147.08	601.93
19	J50	0.31	88.40	147.08	574.98
20	J52	0.59	88.90	147.08	570.08
21	J54	0.81	89.40	147.08	565.18
22	J56	1.44	91.00	147.08	549.51
23	J58	1.29	90.60	147.07	553.41
24	J60	0.86	90.00	147.07	559.29
25	J62	0.52	89.85	147.08	560.78
26	J64	1.49	89.10	147.08	568.12
27	J66	0.98	89.40	147.08	565.18
28	J68	0.62	90.50	147.08	554.40
29	J70	0.65	92.50	147.08	534.81
30	J72	1.45	94.05	147.08	519.62
31	J74	0.52	94.80	147.08	512.30
32	J76	0.38	94.00	147.08	520.14
33	J78	1.23	89.90	147.08	560.28
34	J80	0.43	89.25	147.08	566.65
35	J82	1.05	88.75	147.08	571.55
36	J84	0.51	92.60	147.08	533.87
37	J86	1.78	92.60	147.08	533.89
38	J88	0.55	92.20	147.09	537.86
39	R01	0.00	103.00	147.10	432.13
40	R02	0.36	105.00	147.09	412.46
41	R03	0.00	104.00	147.10	422.33

Phase 1B - Peak Hour Existing HGL 147.0 - 147.1m

	ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
1	J01	1.08	88.50	146.70	570.35
2	J02	0.66	88.10	146.64	573.64
3	J04	0.78	87.00	146.62	584.24
4	J06	0.42	85.35	146.62	600.37
5	J10	0.96	85.60	146.58	597.56
6	J12	0.61	85.50	146.58	598.51
7	J14	0.88	88.10	146.57	573.01
8	J16	1.45	88.50	146.57	569.09
9	J18	0.80	89.00	146.58	564.20
10	J20	0.74	86.60	146.58	587.71
11	J22	1.19	87.45	146.58	579.38
12	J24	1.45	88.30	146.58	571.09
13	J26	1.21	86.10	146.60	592.81
14	J28	1.45	87.50	146.60	579.08
15	J30	0.45	88.90	146.58	565.18
16	J32	4.70	88.10	146.62	573.46
17	J34	3.91	88.30	146.62	571.46
18	J36	0.00	85.65	146.62	597.43
19	J50	1.69	88.40	146.62	570.48
20	J52	3.26	88.90	146.61	565.53
21	J54	4.44	89.40	146.61	560.63
22	J56	3.89	91.00	146.64	545.25
23	J58	7.11	90.60	146.58	548.55
24	J60	4.73	90.00	146.58	554.47
25	J62	2.87	89.85	146.62	556.31
26	J64	8.18	89.10	146.61	563.52
27	J66	5.38	89.40	146.61	560.58
28	J68	3.42	90.50	146.61	549.83
29	J70	3.58	92.50	146.62	530.36
30	J72	7.99	94.05	146.64	515.38
31	J74	1.41	94.80	146.71	508.71
32	J76	1.02	94.00	146.72	516.66
33	J78	6.78	89.90	146.60	555.63
34	J80	2.34	89.25	146.61	562.05
35	J82	5.79	88.75	146.60	566.92
36	J84	1.38	92.60	146.74	530.53
37	J86	4.80	92.60	146.79	531.02
38	J88	1.48	92.20	146.87	535.77
39	R01	0.00	103.00	146.97	430.85
40	R02	1.97	105.00	146.86	410.16
41	R03	0.00	104.00	147.07	422.01

Phase 1B - Peak Hour Future HGL 142.0m - Junction Report

	ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
1	J01	1.08	88.50	141.67	521.02
2	J02	0.66	88.10	141.60	524.24
3	J04	0.78	87.00	141.58	534.83
4	J06	0.42	85.35	141.57	550.95
5	J10	0.96	85.60	141.54	548.15
6	J12	0.61	85.50	141.54	549.10
7	J14	0.88	88.10	141.53	523.59
8	J16	1.45	88.50	141.53	519.67
9	J18	0.80	89.00	141.53	514.79
10	J20	0.74	86.60	141.53	538.30
11	J22	1.19	87.45	141.53	529.97
12	J24	1.45	88.30	141.54	521.68
13	J26	1.21	86.10	141.55	543.39
14	J28	1.45	87.50	141.55	529.67
15	J30	0.45	88.90	141.53	515.76
16	J32	4.70	88.10	141.58	524.04
17	J34	3.91	88.30	141.57	522.04
18	J36	0.00	85.65	141.57	548.01
19	J50	1.69	88.40	141.57	521.02
20	J52	3.26	88.90	141.56	516.05
21	J54	4.44	89.40	141.56	511.15
22	J56	3.89	91.00	141.59	495.71
23	J58	7.11	90.60	141.53	499.05
24	J60	4.73	90.00	141.53	504.97
25	J62	2.87	89.85	141.58	506.89
26	J64	8.18	89.10	141.56	514.05
27	J66	5.38	89.40	141.56	511.11
28	J68	3.42	90.50	141.56	500.35
29	J70	3.58	92.50	141.57	480.85
30	J72	7.99	94.05	141.59	465.84
31	J74	1.41	94.80	141.65	459.09
32	J76	1.02	94.00	141.66	467.03
33	J78	6.78	89.90	141.55	506.15
34	J80	2.34	89.25	141.56	512.58
35	J82	5.79	88.75	141.56	517.46
36	J84	1.38	92.60	141.67	480.88
37	J86	4.80	92.60	141.72	481.33
38	J88	1.48	92.20	141.80	485.99
39	R01	0.00	103.00	141.96	381.81
40	R02	1.97	105.00	141.84	361.01
41	R03	0.00	104.00	141.97	372.06

Basic Day Future HGL 142.0m - Junction Report

	ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
1	J01	0.20	88.50	142.98	533.88
2	J02	0.12	88.10	142.98	537.76
3	J04	0.14	87.00	142.98	548.53
4	J06	0.08	85.35	142.98	564.70
5	J10	0.18	85.60	142.98	562.23
6	J12	0.11	85.50	142.98	563.21
7	J14	0.16	88.10	142.98	537.73
8	J16	0.26	88.50	142.98	533.81
9	J18	0.15	89.00	142.98	528.91
10	J20	0.13	86.60	142.98	552.43
11	J22	0.22	87.45	142.98	544.10
12	J24	0.26	88.30	142.98	535.77
13	J26	0.22	86.10	142.98	557.34
14	J28	0.26	87.50	142.98	543.62
15	J30	0.08	88.90	142.98	529.89
16	J32	0.85	88.10	142.98	537.75
17	J34	1.45	88.30	142.98	535.79
18	J36	0.00	85.65	142.98	561.76
19	J50	0.31	88.40	142.98	534.81
20	J52	0.59	88.90	142.98	529.90
21	J54	0.81	89.40	142.98	525.00
22	J56	1.44	91.00	142.98	509.33
23	J58	1.29	90.60	142.97	513.23
24	J60	0.86	90.00	142.97	519.11
25	J62	0.52	89.85	142.98	520.60
26	J64	1.49	89.10	142.98	527.94
27	J66	0.98	89.40	142.98	525.00
28	J68	0.62	90.50	142.98	514.22
29	J70	0.65	92.50	142.98	494.63
30	J72	1.45	94.05	142.98	479.45
31	J74	0.52	94.80	142.98	472.12
32	J76	0.38	94.00	142.98	479.97
33	J78	1.23	89.90	142.98	520.10
34	J80	0.43	89.25	142.98	526.47
35	J82	1.05	88.75	142.98	531.37
36	J84	0.51	92.60	142.98	493.69
37	J86	1.78	92.60	142.98	493.72
38	J88	0.55	92.20	142.99	497.68
39	R01	0.00	103.00	143.00	391.95
40	R02	0.36	105.00	142.99	372.29
41	R03	0.00	104.00	143.00	382.15

Phase 1B - Max Day + Fire HGL 139.5 - 140.2m - Fireflow Design Report

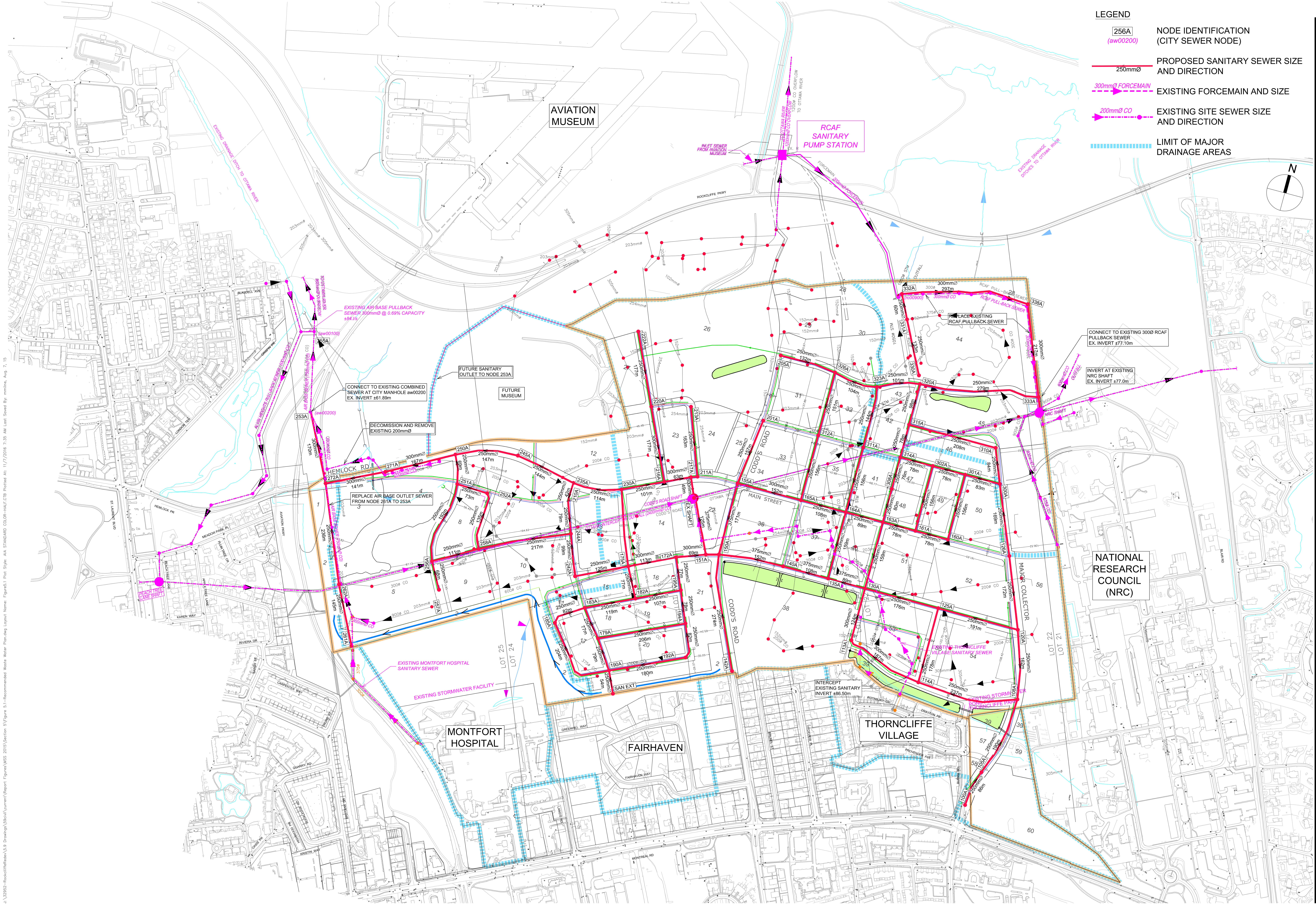
		ID	Total Demand (L/s)	Critical Node 1 ID	Critical Node 1 Pressure (kPa)	Critical Node 1 Head (m)	Adjusted Fire-Flow (L/s)	Available Flow @Hydrant (L/s)	Critical Node 2 ID	Critical Node 2 Pressure (kPa)	Critcal Node 2 Head (m)	Adjusted Available Flow (L/s)	Design Flow (L/s)
1		J01	167.16	R02	331.32	122.31	1,121.92	1,021.46	J01	139.97	102.78	1,021.48	1,021.48
2		J02	166.97	R02	331.94	121.97	1,198.01	976.69	J62	129.72	101.34	960.99	960.99
3		J04	167.03	R02	331.97	120.88	1,201.90	700.87	J18	129.19	100.18	689.35	689.35
4		J06	166.86	R02	331.98	119.23	1,203.78	660.69	J06	139.97	99.63	660.69	660.69
5		J10	167.11	R02	331.97	119.48	1,202.62	302.21	J10	139.96	99.88	302.21	302.21
6		J12	166.95	R02	331.97	119.38	1,202.42	260.38	J12	139.96	99.78	260.38	260.38
7		J14	167.07	R02	331.97	121.98	1,202.50	256.53	J14	139.96	102.38	256.53	256.53
8		J16	167.33	J16	321.74	121.33	246.17	246.17	J16	139.96	102.78	246.17	246.17
9		J18	167.03	R02	331.97	122.88	1,202.42	257.94	J18	139.96	103.28	257.94	257.94
10		J20	167.01	J20	317.31	118.98	236.20	236.20	J20	139.96	100.88	236.20	236.20
11		J22	167.21	J22	208.86	108.76	187.09	187.09	J22	139.96	101.73	187.09	187.09
12		J24	167.33	R02	331.97	122.18	1,202.69	298.92	J24	139.96	102.58	298.92	298.92
13		J26	167.22	R02	331.97	119.98	1,202.95	389.43	J26	139.96	100.38	389.43	389.43
14		J28	167.33	R02	331.97	121.38	1,202.60	384.11	J28	139.96	101.78	384.11	384.11
15		J30	166.88	J30	310.88	120.63	239.06	239.06	J30	139.96	103.18	239.06	239.06
16		J32	218.80	R02	328.76	121.65	1,230.08	895.98	J62	122.82	100.63	872.30	872.30
17		J34	218.84	R02	328.59	121.83	1,215.80	642.28	J34	139.97	102.58	642.29	642.29
18		J36	216.67	R02	328.53	119.18	1,208.48	630.89	J36	139.97	99.93	630.90	630.90
19		J50	217.44	R02	329.56	122.03	1,306.50	825.07	J50	139.97	102.68	825.07	825.07
20		J52	218.15	R02	330.35	122.61	1,395.62	807.70	J52	139.97	103.18	807.70	807.70
21		J54	218.69	R02	331.05	123.18	1,484.86	790.43	J54	139.97	103.68	790.44	790.44
22		J56	218.83	R02	331.90	124.87	1,607.21	734.61	J56	139.97	105.28	734.61	734.61
23		J58	219.90	J58	320.28	123.28	332.38	332.38	J58	139.96	104.88	332.39	332.38
24		J60	218.82	J60	305.43	121.17	312.36	312.37	J60	139.96	104.28	312.37	312.36
25		J62	217.98	R02	328.76	123.40	1,229.26	773.19	J62	139.97	104.13	773.20	773.20
26		J64	220.39	R02	329.62	122.74	1,315.85	804.42	J64	139.97	103.38	804.43	804.43
27		J66	219.12	R02	330.35	123.11	1,397.22	794.11	J66	139.97	103.68	794.12	794.12
28		J68	218.22	R02	331.00	124.28	1,479.87	767.72	J68	139.97	104.78	767.73	767.73
29		J70	218.30	R02	331.59	126.34	1,563.02	702.65	J70	139.97	106.78	702.65	702.65
30		J72	220.30	R02	332.08	127.94	1,632.26	691.52	J72	139.97	108.33	691.53	691.53
31		J74	217.45	R02	332.67	128.75	1,753.48	804.04	J74	139.97	109.08	804.04	804.04
32		J76	217.23	R02	332.82	127.96	1,794.90	864.82	J74	137.21	108.00	860.44	860.44
33		J78	219.75	R02	330.85	123.66	1,467.48	492.19	J78	139.96	104.18	492.19	492.19
34		J80	217.73	R02	330.27	122.95	1,388.98	491.89	J80	139.96	103.53	491.90	491.90
35		J82	219.30	R02	329.53	122.38	1,306.06	502.89	J82	139.96	103.03	502.89	502.89
36		J84	217.43	R02	333.09	126.59	1,865.81	977.08	J74	126.62	105.52	953.70	953.70
37		J86	219.33	R02	333.73	126.66	2,029.46	1,034.26	J86	139.97	106.88	1,034.28	1,034.28
38		J88	217.49	R02	334.75	126.36	2,359.29	1,166.02	J88	139.98	106.48	1,166.05	1,166.05
39		R02	167.57	R02	329.43	138.62	951.03	951.01	R02	139.97	119.28	951.03	951.03

Peak Hour Existing HGL 147.0 - 147.2m - 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	101	J68	J78	74.96	204.00	110.00	3.26	0.10	0.01	0.10
2	103	J78	J54	82.08	204.00	110.00	-3.52	0.11	0.01	0.12
3	105	J66	J80	77.33	204.00	110.00	-0.19	0.01	0.0000	0.000
4	107	J80	J52	82.87	204.00	110.00	-2.53	0.08	0.01	0.06
5	109	J64	J82	72.60	204.00	110.00	1.71	0.05	0.00	0.03
6	11	R01	R02	205.21	393.00	120.00	49.27	0.41	0.11	0.54
7	111	J82	J50	82.87	204.00	110.00	-4.08	0.12	0.01	0.15
8	113	J54	J58	118.98	204.00	110.00	5.56	0.17	0.03	0.27
9	115	J58	J60	175.07	204.00	110.00	-1.55	0.05	0.00	0.03
10	117	J60	J56	171.69	204.00	110.00	-6.28	0.19	0.06	0.34
11	119	J84	J86	88.16	393.00	120.00	-50.70	0.42	0.05	0.57
12	13	J01	R02	306.73	393.00	120.00	-47.30	0.39	0.15	0.50
13	15	R03	J88	270.72	393.00	120.00	56.98	0.47	0.19	0.71
14	17	J84	J56	186.99	297.00	120.00	23.20	0.33	0.10	0.52
15	19	J02	J04	118.60	297.00	120.00	12.00	0.17	0.02	0.15
16	21	J04	J06	119.01	297.00	120.00	5.34	0.08	0.00	0.03
17	27	J10	J12	81.37	204.00	110.00	1.86	0.06	0.00	0.04
18	29	J12	J30	131.14	204.00	110.00	1.25	0.04	0.00	0.02
19	31	J30	J14	79.50	204.00	110.00	0.80	0.02	0.000	0.01
20	33	J14	J16	105.90	204.00	110.00	0.16	0.01	0.0000	0.000
21	35	J16	J18	88.67	204.00	110.00	-1.29	0.04	0.00	0.02
22	37	J24	J18	69.60	204.00	110.00	2.09	0.06	0.00	0.04
23	39	J24	J28	81.38	204.00	110.00	-4.58	0.14	0.02	0.19
24	41	J28	J04	86.06	204.00	110.00	-5.88	0.18	0.03	0.30
25	43	J14	J20	75.25	155.00	100.00	-0.25	0.01	0.000	0.00
26	45	J20	J10	83.78	155.00	100.00	-1.14	0.06	0.01	0.07
27	47	J20	J22	118.40	155.00	100.00	0.15	0.01	0.000	0.00
28	49	J22	J24	81.94	155.00	100.00	-1.04	0.06	0.00	0.06
29	51	J10	J26	100.14	204.00	110.00	-3.95	0.12	0.01	0.14
30	53	J26	J28	119.49	155.00	100.00	0.14	0.01	0.000	0.00
31	55	J26	J06	87.10	204.00	110.00	-5.31	0.16	0.02	0.25
32	57	J02	J32	157.46	393.00	120.00	21.51	0.18	0.02	0.12
33	59	J32	J34	175.10	297.00	120.00	4.30	0.06	0.00	0.02
34	61	J34	J36	132.79	297.00	120.00	0.39	0.01	0.0000	0.000
35	63	J36	J06	165.55	297.00	120.00	0.39	0.01	0.0000	0.000
36	65	R03	BC02	48.86	393.00	120.00	-56.98	0.47	0.03	0.71
37	67	R01	BC01	60.49	393.00	120.00	-49.27	0.41	0.03	0.54
38	69	J01	J02	133.74	393.00	120.00	46.22	0.38	0.06	0.48
39	73	J86	J88	125.70	393.00	120.00	-55.50	0.46	0.08	0.67
40	75	J50	J02	145.16	297.00	120.00	-12.05	0.17	0.02	0.16
41	77	J52	J50	112.09	297.00	120.00	-6.28	0.09	0.01	0.05
42	79	J54	J52	89.74	297.00	120.00	-0.49	0.01	0.0000	0.000
43	81	J56	J54	170.28	297.00	120.00	13.03	0.19	0.03	0.18
44	83	J32	J64	143.50	297.00	120.00	9.64	0.14	0.01	0.10
45	85	J64	J66	112.06	297.00	120.00	-0.25	0.00	0.00000	0.0000
46	87	J66	J68	89.98	297.00	120.00	-5.44	0.08	0.00	0.04
47	89	J68	J70	85.23	297.00	120.00	-12.12	0.17	0.01	0.16
48	91	J70	J72	85.23	297.00	120.00	-15.70	0.23	0.02	0.25
49	93	J72	J74	126.16	297.00	120.00	-23.69	0.34	0.07	0.54
50	95	J32	J62	77.50	393.00	120.00	2.87	0.02	0.000	0.00
51	97	J74	J76	75.91	393.00	120.00	-25.10	0.21	0.01	0.15
52	99	J76	J84	90.33	393.00	120.00	-26.12	0.22	0.02	0.17

APPENDIX C

- **Figure 5.1 – Recommended Wastewater Plan (MSS)**
- **Figure 3.1 – Recommended Wastewater Plan**
- **Sanitary Sewer Design Sheets**
- **Drawing 38298-501A, Sanitary Drainage Area Plan**



Scale

Project Title

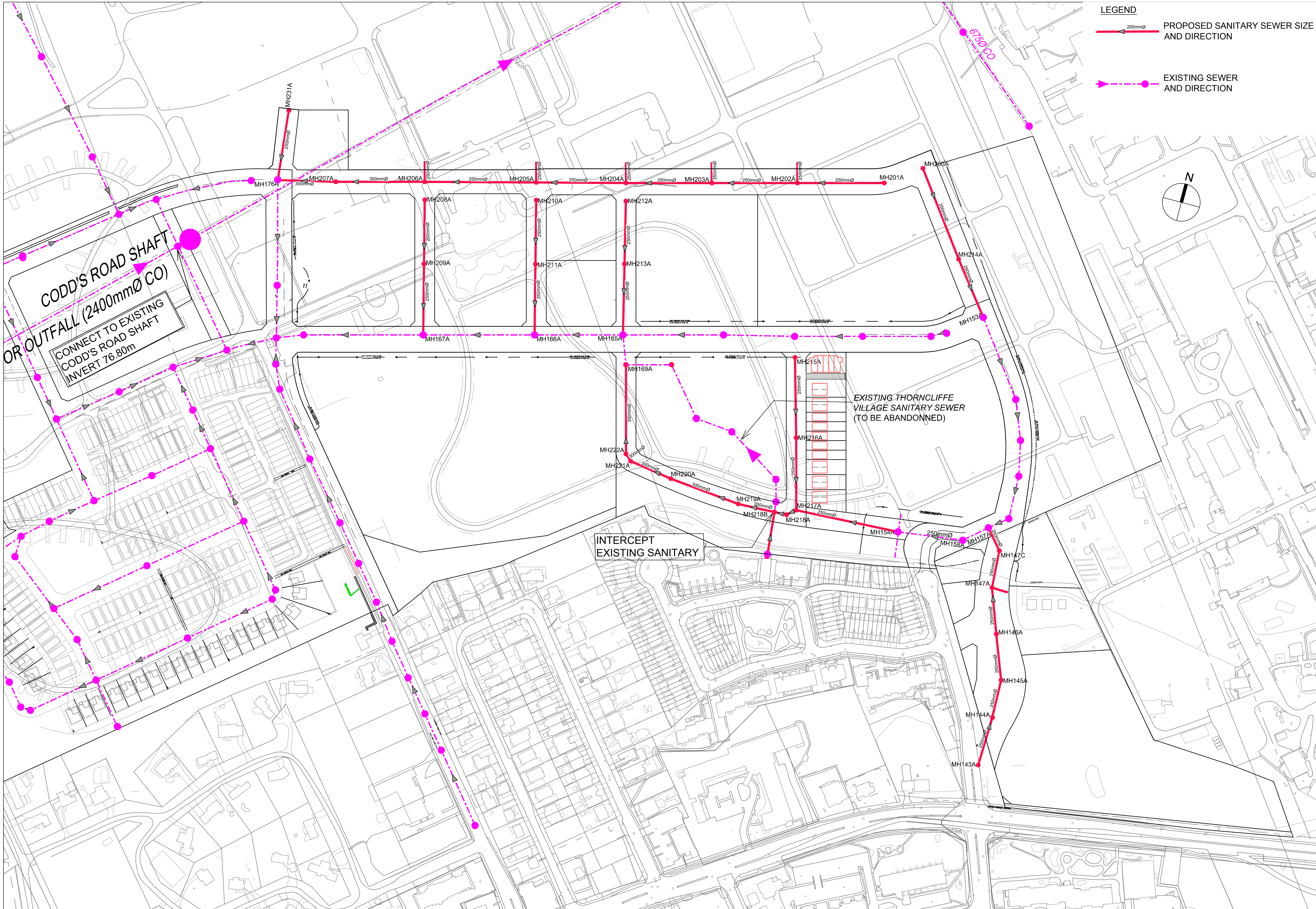
FORMER CFB ROCKCLIFFE
MASTER SERVICING STUDY

Drawing Title

RECOMMENDED
WASTEWATER PLAN

Sheet No.

FIGURE 5.1



Scale

Project Title

DESIGN BRIEF
WATERIDGE VILLAGE
AT ROCKCLIFFE
PHASE 1B

Drawing Title

RECOMMENDED
WASTEWATER PLAN

Sheet No.

FIGURE 3.1

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

SANITARY SEWER DESIGN SHEET

Former CFB Rockcliffe
City of Ottawa
Canada Lands Company

LOCATION				RESIDENTIAL										ICI AREAS							INFILTRATION ALLOWANCE			FIXED	TOTAL	PROPOSED SEWER DESIGN						
STREET	AREA ID	FROM MH	TO MH	AREA Phase 1B (Ha)	UNIT TYPES SF	SD	TH	APT	AREA EXTERNAL (Ha)	POPULATION IND	CUM	PEAK FACTOR	PEAK FLOW (L/s)	AREA (Ha) INSTITUTIONAL IND	CUM	COMMERCIAL IND	CUM	INDUSTRIAL IND	CUM	PEAK FLOW (L/s)	AREA (Ha) IND	CUM	FLOW (L/s)	FLOW (L/s)	FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	DIA (mm)	SLOPE (%)	VELOCITY (full) (m/s)	AVAILABLE CAPACITY L/s	(%)
Phase 1B																																
Hemlock Road	201A	MH201A	MH202A	0.31						0.0	0.0	4.00	0.00		0.00		0.00		0.00	0.00	0.31	0.31	0.09	0.00	0.09	50.02	87.06	250	0.65	0.987	49.93	99.83%
Future Street No. 6	EX202A	BULK202AN	MH202A						2.08	358.5	358.5	4.00	5.81		0.00		0.00		0.00	0.00	2.08	2.08	0.58	0.00	6.39	31.02	21.00	250	0.25	0.612	24.63	79.40%
Hemlock Road	202A	MH202A	MH203A	0.21						0.0	358.5	4.00	5.81		0.00		0.00		0.00	0.00	0.21	2.60	0.73	0.00	6.54	75.98	86.00	250	1.50	1.500	69.44	91.40%
Future Street No. 5	EX203A	BULK203AN	MH203A						1.40	160.5	160.5	4.00	2.60		0.00		0.00		0.00	0.00	1.40	1.40	0.39	0.00	2.99	83.23	21.00	250	1.80	1.643	80.24	96.40%
Hemlock Road	203A, EXPARK2	MH203A	MH204A	0.20					0.44	0.0	0.0	4.00	0.00		0.00		0.00		0.00	0.00	0.64	0.64	0.18	0.00	0.18	82.07	86.00	250	1.75	1.620	81.89	99.78%
rue Moses Tennisco Street	EX204A	BULK204AN	MH204A						1.39	153.5	153.5	4.00	2.49		0.00		0.00		0.00	0.00	1.39	1.39	0.39	0.00	2.88	83.23	21.00	250	1.80	1.643	80.36	96.54%
Hemlock Road	204A	MH204A	MH205A	0.21						0.0	153.5	4.00	2.49		0.00		0.00		0.00	0.00	0.21	1.60	0.45	0.00	2.94	67.96	90.00	250	1.20	1.341	65.02	95.68%
rue Michael Stoqua Street	EX205A	BULK205AN	MH205A						1.38	241.5	241.5	4.00	3.91		0.00		0.00		0.00	0.00	1.38	1.38	0.39	0.00	4.30	67.96	21.00	250	1.20	1.341	63.66	93.67%
Hemlock Road	205A	MH205A	MH206A	0.25						0.0	395.0	4.00	6.40		0.00		0.00		0.00	0.00	0.25	3.23	0.90	0.00	7.30	31.02	112.00	250	0.25	0.612	23.71	76.45%
rue Bareille-Snow Street	EX206A-B	BULK206AN	MH206A						9.61	1755.0	1755.0	3.63	25.80		0.00		0.00		0.00	0.00	9.61	9.61	2.69	0.00	28.49	87.74	21.00	250	2.00	1.731	59.24	67.52%
Hemlock Road	206A	MH206A	MH207A	0.20						0.0	2150.0	3.56	31.02		0.00		0.00		0.00	0.00	0.20	13.04	3.65	0.00	34.67	55.26	89.33	300	0.30	0.757	20.59	37.26%
Block 20	PARK1	MH207AN	MH207A	0.32						0.0	0.0	4.00	0.00		0.00		0.00		0.00	0.00	0.32	0.32	0.09	0.00	0.09	39.24	14.00	250	0.40	0.774	39.15	99.77%
Hemlock Road	PARK1, 207A	MH207A	*BULK176AE*	0.12						0.0	2150.0	3.56	31.02		0.00		0.00		0.00	0.00	0.12	13.48	3.77	0.00	34.79	65.38	33.16	300	0.42	0.896	30.59	46.79%
Phase 1A																																
Hemlock Road		*BULK176AE*	*MH176A*							0.0	2150.0	3.56	31.02		0.00		0.00		0.00	0.00	0.00	13.48	3.77	0.00	34.79	65.38	*21.97*	*300*	*0.42*	0.896	30.59	46.79%
Phase 1B																																
chemin Wanaki Road	200A, COM1	MH200A	MH214A	0.25						0.0	0.0	4.00	0.00		0.00	0.90	0.90		0.00	0.78	1.15	1.15	0.32	0.00	1.10	73.41	98.28	250	1.40	1.449	72.30	98.50%
chemin Wanaki Road	214A, COM2	MH214A	*BULK153AN*	0.16						0.0	0.0	4.00	0.00		0.00	0.65	1.55		0.00	1.35	0.81	1.96	0.55	0.00	1.89	51.91	44.22	250	0.70	1.024	50.01	96.35%
Phase 1B																																
chemin Wanaki Road	143B	BULK143AE	MH143A	0.31						104.0	104.0	4.00	1.69		0.00		0.00		0.00	0.00	0.31	0.31	0.09	0.00	1.77	43.87	21.50	250	0.50	0.866	42.10	95.96%
chemin Wanaki Road	143A	MH143A	MH144A	0.27						0.0	104.0	4.00	1.69		0.00		0.00		0.00	0.00	0.27	0.58	0.16	0.00	1.85	87.74	47.73	250	2.00	1.731	85.89	97.89%
chemin Wanaki Road	144A, 144B	MH144A	MH145A	0.72						0.0	104.0	4.00	1.69		0.00		0.00		0.00	0.00	0.72	1.30	0.36	0.00	2.05	87.74	40.57	250	2.00	1.731	85.69	97.66%
chemin Wanaki Road	145A, 145B, 145C	MH145A	MH146A	2.77						835.6	939.6	3.82	14.53		0.00		0.00		0.00	0.00	2.77	4.07	1.14	0.00	15.67	107.45	53.01	250	3.00	2.121	91.79	85.42%
chemin Wanaki Road	146A	MH146A	MH147A	0.14						0.0	939.6	3.82	14.53		0.00		0.00		0.00	0.00	0.14	4.21	1.18	0.00	15.71	43.54	37.48	250	1.00	1.224	27.83	63.92%
chemin Wanaki Road	PARK2	BLK147AE	MH147A	0.55						0.0	0.0	4.00	0.00		0.00		0.00		0.00	0.00	0.55	0.55	0.15	0.00	0.15	39.24	17.66	250	0.40	0.774	39.08	99.61%
chemin Wanaki Road	147C	BLK147AW	MH147A	0.10						33.6	33.6	4.00	0.54		0.00		0.00		0.00	0.00	0.10	0.10	0.03	0.00	0.57	43.87	17.33	250	0.50	0.866	43.30	98.70%
chemin Wanaki Road	147A	MH147A	MH170A	0.03						0.0	973.2	3.81	15.01		0.00		0.00		0.00	0.00	0.03	4.89	1.37	0.00	16.38	31.02	10.23	250	0.25	0.612	14.64	47.19%
chemin Wanaki Road	147B	MH107A	MH147C	0.16						0.0	973.2	3.81	15.01		0.00		0.00		0.00	0.00	0.16	5.05	1.41	0.00	16.42	31.02	39.00	250	0.25	0.612	14.59	47.05%
chemin Wanaki Road		MH147C	*BLK148AW*							0.0	973.2	3.81	15.01		0.00		0.00		0.00	0.00	0.00	5.05	1.41	0.00	16.42	31.02	11.77	250	0.25	0.612	14.59	47.05%
Phase 1B																																
Block 9	154A	*MH158A*	MH217A	0.19						0.0	973.2	3.81	15.01		2.62		3.83		0.00	5.60	0.19	12.94	3.62	0.00	24.23	53.37	171.95	250	0.74	1.053	29.13	54.59%
croissant Squadron Crescent	215Aa-b	MH215A	MH216A	0.79	3	4				117.8	117.8	4.00	1.91		0.00		0.00		0.00	0.00	0.79	0.79	0.22	0.00	2.13	50.02	80.00	250	0.65	0.987	47.89	95.74%
croissant Squadron Crescent	216Aa-b	MH216A	MH217A	0.67	2	6				94.5	212.3	4.00	3.44		0.00		0.00		0.00	0.00	0.67	1.46	0.41	0.00	3.85	50.02	71.19	250	0.65	0.987	46.17	92.30%
croissant Squadron Crescent	217A	MH217A	MH218A	0.02						0.0	1185.5	3.75	18.01		2.62		3.83		0.00	5.60	0.02	14.42	4.04	0.00	27.65	36.70	10.52	250	0.35	0.724	9.05	24.66%
croissant Squadron Crescent	218A	MH218A	MH218B	0.02						0.0	1185.5	3.75	18.01		2.62		3.83		0.00	5.60	0.02	14.44	4.04	0.00	27.66	36.70	12.49	250	0.35	0.724	9.05	24.65%
	THORN1	*EX SANMH*	MH218B						5.55	1574.0	1574.0	3.66	23.36		0.00		0.00		0.00	0.00	5.55	5.55	1.55	0.00	24.92	74.13	46.02	300	0.54	1.016	49.21	66.39%
croissant Squadron Crescent	218B	MH218B	MH219A	0.07						0.0	2759.5	3.47	38.82		2.62		3.83		0.00	5.60	0.07	20.06	5.62	0.00	50.04	59.68	37.08	300	0.35	0.818	9.64	16.16%
croissant Squadron Crescent	219A	MH219A	MH220A	0.15						0.0	2759.5	3.47	38.82		2.62		3.83		0.00	5.60	0.15	20.21	5.66	0.00	50.08	59.68	72.49	300	0.35	0.818	9.60	16.09%
croissant Squadron Crescent	220A, 220B	MH220A	MH221A	1.46						319.0	3078.5	3.43	42.81		2.62		3.83		0.00	5.60	1.46	21.67	6.07	0.00	54.48	59.68	43.77	300	0.35	0.818	5.21	8.72%
croissant Squadron Crescent	221A	MH221A	MH222A	0.02						0.0	3078.5	3.43	42.81		2.62		3.83		0.00	5.60	0.02	21.69	6.07	0.00	54.48	59.68	8.66	300	0.35	0.818	5.20	8.71%
croissant Squadron Crescent	222A	MH222A	*MH169A*	0.22						0.0	3078.5	3.43	42.81		2.62		3.83		0.00	5.60	0.22	21.91	6.13	0.00	54.54	59.68	89.42	300	0.35	0.818	5.14	8.61%

Design Parameters:

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

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

Designed: WY

Checked: JIM

Dwg. Reference: 38298-501

No.	Revision	Date
1.	City submission No. 1	7/8/2016
2.	City submission No. 2	11/4/2016
3.	City submission No. 3	1/25/2017

File Reference:	Date:	Sheet No:
38298.5.7.1	7/8/2016	1 of 2

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

SANITARY SEWER DESIGN SHEET

Former CFB Rockcliffe
City of Ottawa
Canada Lands Company

LOCATION				RESIDENTIAL										ICI AREAS							INFILTRATION ALLOWANCE			FIXED	TOTAL	PROPOSED SEWER DESIGN						
				AREA	UNIT TYPES				AREA	POPULATION		PEAK	PEAK	AREA (Ha)						PEAK	AREA (Ha)		FLOW	FLOW	FLOW	CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
														INSTITUTIONAL		COMMERCIAL		INDUSTRIAL		FLOW										(full)		
STREET	AREA ID	FROM MH	TO MH	Phase 1B (Ha)	SF	SD	TH	APT	EXTERNAL (Ha)	IND	CUM	FACTOR	FLOW (L/s)	IND	CUM	IND	CUM	IND	CUM	(L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(m/s)	L/s	(%)
Phase 1A																																
croissant Squadron Crescent		*MH169A*	*MH165A*							0.0	3078.5	3.43	42.81		2.62		3.83		0.00	5.60	0.00	21.91	6.13	0.00	54.54	63.80	*27.00*	*300*	*0.40*	0.874	9.26	14.51%
Phase 1B																																
rue Moses Tennisco Street	212A	MH212A	MH213A	1.20						252.0	252.0	4.00	4.08		0.00		0.00		0.00	0.00	1.20	1.20	0.34	0.00	4.42	50.02	63.80	250	0.65	0.987	45.60	91.16%
rue Moses Tennisco Street	213A	MH213A	*BULK165AN*	0.35						52.5	304.5	4.00	4.93		0.00		0.00		0.00	0.00	0.35	1.55	0.43	0.00	5.37	39.24	50.79	250	0.40	0.774	33.87	86.32%
Phase 1A																																
rue Moses Tennisco Street		*BULK165AN*	*MH165A*							0.0	304.5	4.00	4.93		0.00		0.00		0.00	0.00	0.00	1.55	0.43	0.00	5.37	39.24	*22.50*	*250*	*0.40*	0.774	33.87	86.32%
Phase 1B																																
rue Michael Stoqua Street	210A	MH210A	MH211A	0.40						52.5	52.5	4.00	0.85		0.00		0.00		0.00	0.00	0.40	0.40	0.11	0.00	0.96	50.02	64.80	250	0.65	0.987	49.05	98.08%
rue Michael Stoqua Street	211A	MH211A	MH166B	0.35						52.5	105.0	4.00	1.70		0.00		0.00		0.00	0.00	0.35	0.75	0.21	0.00	1.91	50.02	52.19	250	0.65	0.987	48.11	96.18%
Phase 1A																																
rue Michael Stoqua Street		MH166B	*MH166A*							0.0	105.0	4.00	1.70		0.00		0.00		0.00	0.00	0.00	0.75	0.21	0.00	1.91	39.24	*21.10*	*250*	*0.40*	0.774	37.33	95.13%
Phase 1B																																
rue Bareille-Snow Street	208A	MH208A	MH209A	1.01						207.4	207.4	4.00	3.36		0.00		0.00		0.00	0.00	1.01	1.01	0.28	0.00	3.64	50.02	64.85	250	0.65	0.987	46.37	92.72%
rue Bareille-Snow Street	209A	MH209A	MH167B	0.35						52.6	260.0	4.00	4.21		0.00		0.00		0.00	0.00	0.35	1.36	0.38	0.00	4.59	50.02	52.87	250	0.65	0.987	45.42	90.82%
Phase 1A																																
rue Bareille-Snow Street		MH167B	*MH167A*							0.0	260.0	4.00	4.21		0.00		0.00		0.00	0.00	0.00	1.36	0.38	0.00	4.59	63.80	*20.43*	*300*	*0.40*	0.874	59.21	92.80%
Phase 1B																																
Codd's Road	230A	BLK231AN	MH231A						0.87	85.7	85.7	4.00	1.39		0.00		0.00		0.00	0.00	0.87	0.87	0.24	0.00	1.63	75.98	3.00	250	1.50	1.500	74.35	97.85%
Codd's Road	231A, EXPARK1	MH231A	*BULK176AN*						0.76	43.3	129.0	4.00	2.09		0.00		0.00		0.00	0.00	0.76	1.63	0.46	0.00	2.55	87.74	50.22	250	2.00	1.731	85.19	97.10%
Phase 1A																																
Codd's Road		*BULK176AN*	*MH176A*							0.0	129.0	4.00	2.09		0.00		0.00		0.00	0.00	0.00	1.63	0.46	0.00	2.55	55.49	*23.23*	*250*	*0.80*	1.095	52.94	95.41%

Design Parameters:

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

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

Designed: WY
Checked: JIM
Dwg. Reference: 38298-501

No.	Revision	Date
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File Reference:	Date:	Sheet No:
38298.5.7.1	7/8/2016	2 of 2

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ______________________

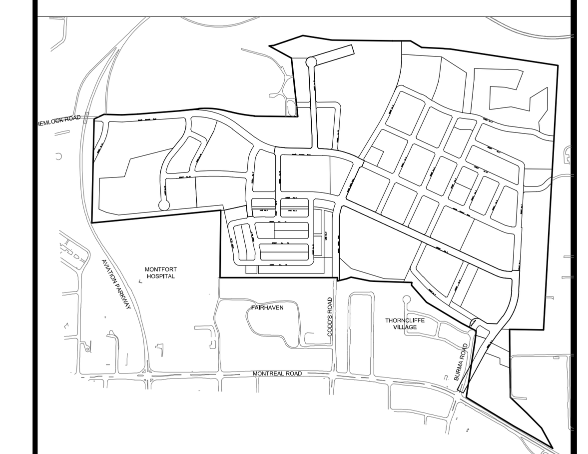
Date ______________________ 2017

Plan Number ______________________

LEGEND :

S168 — AREA NUMBER
2.01 | 0.80 — RUNOFF COEFFICIENT / AREA IN HECTARES

POTENTIAL DRAINAGE DIRECTION



No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6	REVISED PER MOECC COMMENTS	J.I.M.	2017:06:07
5	ISSUED FOR TENDER	J.I.M.	2017:03:23
4	SUBMISSION FOR MOECC APPROVAL	J.I.M.	2017:02:16
3	SUBMISSION No.3 FOR CITY REVIEW	J.I.M.	2017:01:25
2	SUBMISSION No.2 FOR CITY REVIEW	J.I.M.	2016:11:04
1	SUBMISSION No.1 FOR CITY REVIEW	J.I.M.	2016:07:08

CANADA LANDS COMPANY
SOCIÉTÉ IMMOBILIÈRE DU CANADA
30 Metcalfe Street Suite 601
Ottawa, On K1P 5L4
613 998 7777

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

Project Title

WATERIDGE VILLAGE AT ROCKCLIFFE

PHASE 1B

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
17/06/07
PROVINCE OF ONTARIO

N

Drawing Title

SANITARY DRAINAGE AREA PLAN

Scale 1 : 2000

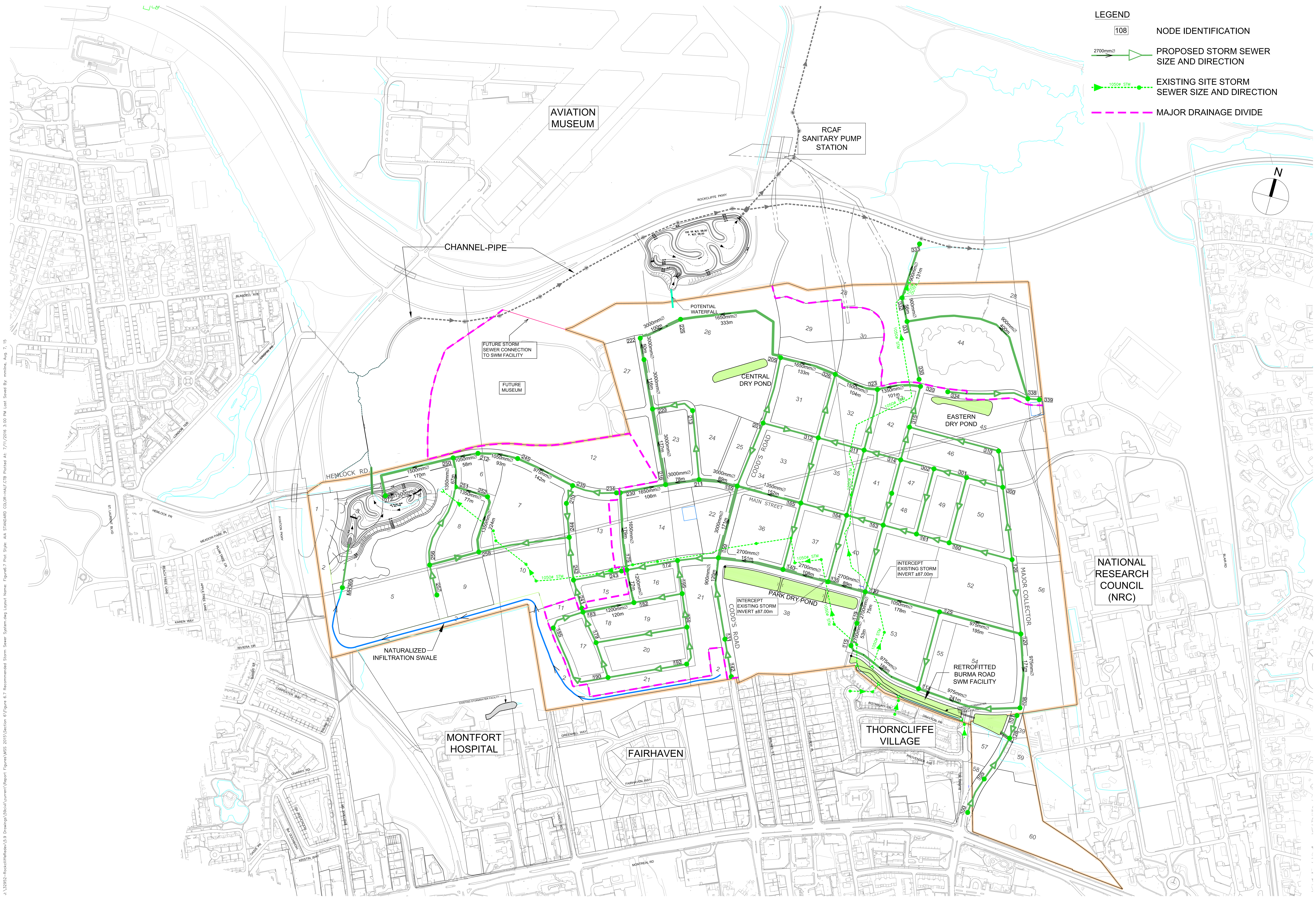
Design J.I.M.	Date MAY 2016
Drawn M.M.	Checked J.I.M.
Project No. 38298	Drawing No. 501A

D07-16-15-0003

#17063

APPENDIX D

- Figure 6.7 – Recommended Storm Sewer System (MSS)
- Figure 4.1 – Proposed Minor Storm Plan
- Storm Sewer Design Sheets
- Drawing 38298-500A, Storm Drainage Area Plan

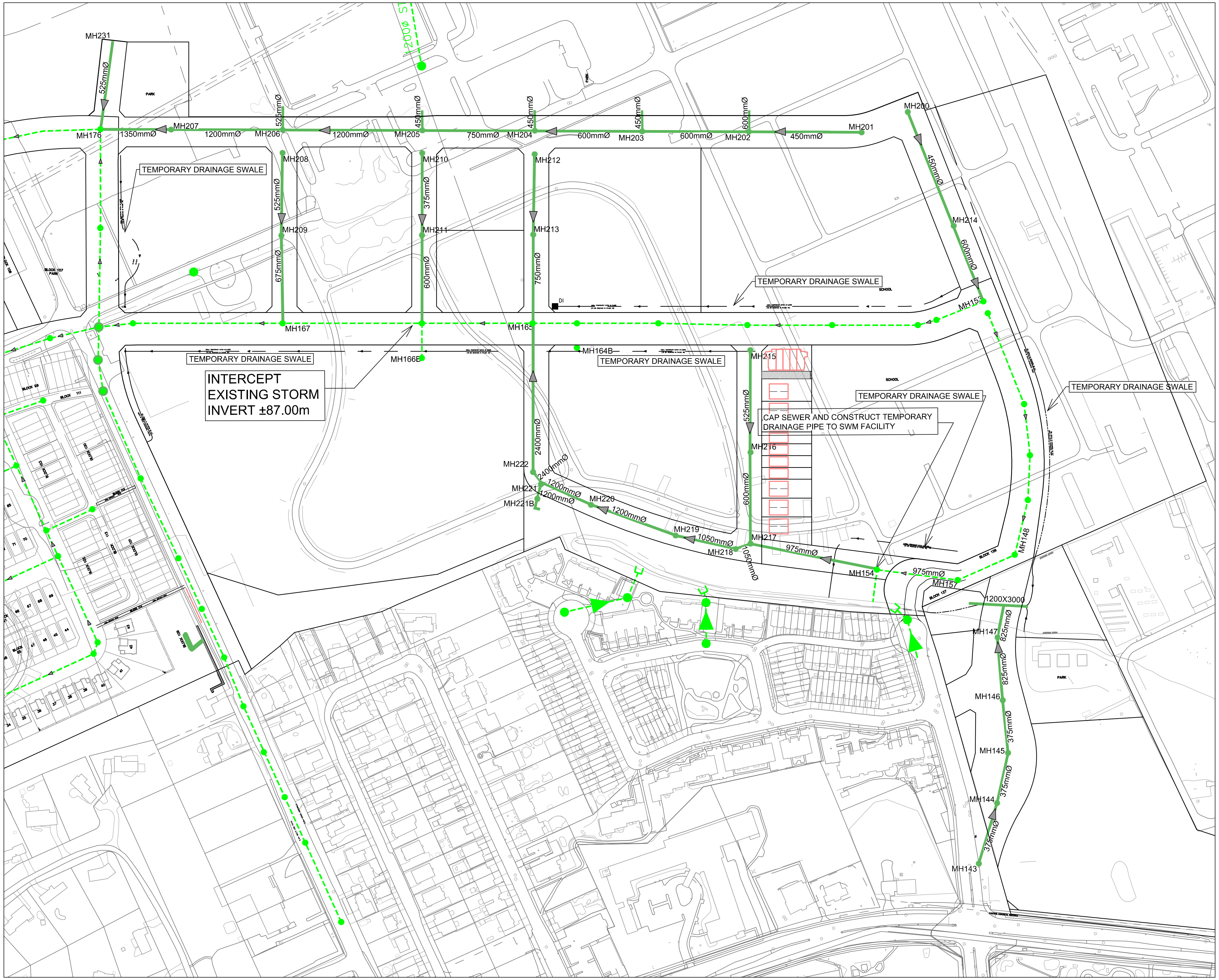


Scale

Project Title
FORMER CFB ROCKCLIFFE
MASTER SERVICING STUDY

Drawing Title
RECOMMENDED STORM
SEWER SYSTEM

Sheet No.
FIGURE 6.7



LEGEND

MH200	NODE IDENTIFICATION
450mmØ	PROPOSED STORM SEWER SIZE AND DIRECTION
1200Ø STM	EXISTING SITE STORM SEWER SIZE AND DIRECTION

N

Scale

0 100 200

Project Title

DESIGN BRIEF
WATERIDGE VILLAGE
AT ROCKCLIFFE
PHASE 1B

Drawing Title

RECOMMENDED MINOR
STORM PLAN

Sheet No.

FIGURE 4.1

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

STORM SEWER DESIGN SHEET

Former CFB Rockcliffe
City of Ottawa
Name of Client/Developer

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW													SEWER DATA								
STREET	AREA ID	FROM	TO	C= 0.20	C= 0.30	C= 0.45	C= 0.50	C= 0.56	C= 0.60	C= 0.65	C= 0.70	C= 0.73	C= 0.80	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	W	H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr) (L/s)	(%)
Phase 1B																																			
Hemlock Road	S201A-B, EX201	MH201	MH202								0.31		0.56	1.85	1.85	10.00	1.17	11.17	104.19	122.14	178.56	192.62				192.62	210.32	90.18	450			0.50	1.281	17.70	8.41%
Future Street No. 6	EX202A	BULK202N	MH202										0.90	2.00	2.00	12.23	0.27	12.50	93.72	109.82	160.45	187.60				187.60	286.47	16.00	600			0.20	0.982	98.87	34.51%
Hemlock Road	S202A, EX202B-C	MH202	MH203								0.10		0.55	1.42	5.27	12.50	0.53	13.03	92.61	108.50	158.52	487.86				487.86	784.52	86.00	600			1.50	2.688	296.66	37.81%
Future Street No. 5	S203B, EX203	BULK203N	203								0.09		0.73	1.80	1.80	10.88	0.12	11.00	99.76	116.92	170.90	179.44				179.44	351.93	16.00	450			1.40	2.144	172.49	49.01%
Hemlock Road	S203A, EXP203	MH203	MH204		0.44						0.16			0.68	7.75	13.03	0.49	13.53	90.49	106.01	154.87	700.89				700.89	847.38	86.00	600			1.75	2.903	146.49	17.29%
rue Moses Tennisco Street	S204B, EX204A	BULK204N	MH204								0.08		0.72	1.76	1.76	10.89	0.11	11.00	99.72	116.87	170.81	175.20				175.20	399.05	16.00	450			1.80	2.431	223.85	56.10%
Hemlock Road	S204A, EX204B	MH204	MH205								0.14		0.47	1.32	10.82	13.53	0.54	14.07	88.63	103.82	151.66	958.99				958.99	1,272.26	90.00	750			1.20	2.790	313.27	24.62%
rue Michael Stoqua Street	S205A, EX205A	BULK205N	MH205								0.08		0.81	1.96	1.96	11.15	0.15	11.30	98.49	115.42	168.69	192.75				192.75	297.43	16.01	450			1.00	1.812	104.68	35.20%
Hemlock Road	S205B-C, EX205B	MH205	MH206								0.17		0.63	1.73	14.51	14.07	1.20	15.26	86.70	101.55	148.32	1,257.92				1,257.92	1,818.95	112.01	1200			0.20	1.558	561.03	30.84%
Temp Ditch	FUTURE PHASE	DI 10	BULK206N		7.68									6.41	6.41	59.66	0.16	59.82	33.08	38.61	56.13	211.89				211.89	297.43	17.03	450			1.00	1.812	85.54	28.76%
rue Bareille-Snow Street	S206A, EX206A	BULK206N	MH206								0.06		1.02	2.39	2.39	10.85	0.15	11.00	99.91	117.09	171.14	238.30				238.30	448.66	17.50	525			1.00	2.008	210.35	46.89%
Hemlock Road	S206B, EX206B	MH206	MH207								0.03		0.46	1.08	17.98	15.26	0.78	16.04	82.71	96.86	141.44	1,486.80				1,486.80	2,227.75	89.33	1200			0.30	1.908	740.96	33.26%
Block 20	P207	CBMH207N	MH207		0.32									0.27	0.27	10.00	0.27	10.27	104.19	122.14	178.56	27.81				27.81	63.80	14.00	300			0.40	0.874	36.00	56.42%
Hemlock Road	S207	MH207	*BULK176E*								0.22			0.43	18.67	16.04	0.37	16.42	80.33	94.05	137.32	1,499.75				1,499.75	2,156.55	32.62	1350			0.15	1.460	656.80	30.46%
Phase 1A																																			
Ex. Hemlock Road	S176C	*BULK176E*	*MH176*								0.02			0.04	18.71	16.42	0.27	16.69	79.24	92.78	135.45	1,482.57				1,482.57	2,156.55	*24.06*	*1350*			*0.15*	1.460	673.98	31.25%
Phase 1B																																			
Codd's Road	S230, LOT230A-B	230	231								0.16		0.70	1.87	1.87	10.00	0.63	10.63	104.19	122.14	178.56	194.65				194.65	364.28	84.30	450			1.50	2.219	169.63	46.57%
Codd's Road	S231, LOT231	231	*BULK176N*								0.12		0.30	0.90	2.77	10.63	0.36	11.00	100.96	118.34	172.97	279.55				279.55	549.49	53.76	525			1.50	2.459	269.94	49.12%
Phase 1A																																			
Ex. Codd's Road	---	*BULK176N*	*MH176*											0.00	2.95	11.77	0.29	12.06	95.69	112.12	163.84	281.96				281.96	339.63	*18.21*	*525*			*1.50*	0.919	57.67	16.98%
Phase 1B																																			
chemin Wanaki Road	S200, LOT200	MH200	MH214								0.20		0.91	2.41	2.41	10.00	0.78	10.78	104.19	122.14	178.56	251.42				251.42	351.93	99.75	450			1.40	2.144	100.51	28.56%
chemin Wanaki Road	S214, LOT214	MH214	*BULK152N*								0.19		0.84	2.24	4.65	10.78	0.42	11.20	100.27	117.52	171.77	466.34				466.34	535.93	46.51	600			0.70	1.836	69.59	12.99%
Phase 1B																																			
chemin Wanaki Road	EX143	BULK143E	MH143										0.33	0.73	0.73	10.00	0.29	10.29	104.19	122.14	178.56	76.47				76.47	129.34	20.00	375			0.50	1.134	52.87	40.88%
chemin Wanaki Road		MH143	MH144											0.00	0.73	10.29	0.37	10.66	102.67	120.34	175.92	75.35				75.35	258.68	50.50	375			2.00	2.269	183.33	70.87%
chemin Wanaki Road	S144, EX144	MH144	MH145		0.55						0.18			0.81	1.54	10.66	0.30	10.97	100.81	118.15	172.70	155.54				155.54	258.68	41.15	375			2.00	2.269	103.14	39.87%
chemin Wanaki Road	S145, EX145	MH145	MH146								0.15		2.74	6.39	7.93	10.97	0.28	11.24	99.35	116.44	170.18	787.69				787.69	1,324.21	48.01	750			1.30	2.904	536.53	40.52%
chemin Wanaki Road		MH146	MH147											0.00	7.93	11.24	0.25	11.49	98.06	114.92	167.95	777.46				777.46	2,296.77	38.53	1050			0.65	2.570	1519.32	66.15%
chemin Wanaki Road	S147C	BULK147E	MH147		0.40									0.33	0.33	10.00	0.28	10.28	104.19	122.14	178.56	34.76				34.76	71.33	16.51	300			0.50	0.978	36.58	51.27%
chemin Wanaki Road	EX147	BULK 147W	MH147	0.16										0.09	0.09	12.00	0.32	12.32	94.70	110.96	162.13	8.42				8.42	71.33	18.72	300			0.50	0.978	62.91	88.19%
chemin Wanaki Road		MH147	MH170											0.00	8.35	12.32	0.09	12.41	93.35	109.38	159.81	779.62				779.62	2,296.77	13.96	1050			0.65	2.570	1517.16	66.06%
chemin Wanaki Road	S147A	MH170	BOX CULVERT								0.14			0.27	8.62	12.41	0.10	12.51	92.98	108.94	159.17	801.83				801.83	2,296.77	15.00	1050			0.65	2.570	1494.94	65.09%
Phase 1B																																			
rue Moses Tennisco Street	S212, LOT212A-B	MH212	MH213								0.15		1.03	2.58	2.58	10.00	0.66	10.66	104.19	122.14	178.56	269.09				269.09	361.72	63.80	525			0.65	1.619	92.63	25.61%
rue Moses Tennisco Street	S213, LOT213	MH213	*BULK165N*								0.21		0.23	0.92	3.50	10.66	0.82	11.47	100.85	118.20	172.77	353.25				353.25	519.40	55.71	750			0.20	1.139	166.15	31.99%
Temp Ditch	BLOCK 24	DI 1	MH165N		1.60									1.33	1.33	26.41	0.25	26.66	58.73	68.69	100.13	78.37				78.37	129.34	17.03	375			0.50	1.134	50.96	39.40%
Phase 1A																																			
Ex. Street No. 3	---	*BULK165N*	*MH165*											0.00	3.50	11.47	0.24	11.71	97.01	113.68	166.14	339.81				339.81	519.40	*16.10*	*750*			*0.20*	1.139	179.59	34.58%

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: WY
Checked: JIM
Dwg. Reference: 38298-500

No.	Revision	Date
1.	City submission No. 1	7/8/2016
2.	City submission No. 2	11/4/2016
3.	City submission No. 3	1/25/2017

File Reference:	Date:	Sheet No:
38298.5.7.1	7/8/2016	1 of 2

IBI GROUP
400-333 Preston Street
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STORM SEWER DESIGN SHEET

Former CFB Rockcliffe
City of Ottawa
Name of Client/Developer

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW													SEWER DATA								
STREET	AREA ID	FROM	TO	C= 0.20	C= 0.25	C= 0.40	C= 0.50	C= 0.56	C= 0.60	C= 0.65	C= 0.70	C= 0.73	C= 0.80	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	W	H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr) (L/s)	(%)
Phase 1B																																			
Block 9	---	MH157	MH217											0.00	12.28	13.26	0.93	14.19	89.63	105.00	153.38	1,100.86				1,100.86	2,337.95	168.50	975			1.00	3.034	1237.09	52.91%
croissant Squadron Crescent	S215, R215	MH215	MH216					0.14				0.38		0.99	0.99	10.00	0.94	10.94	104.19	122.14	178.56	103.06				103.06	317.25	79.94	525			0.50	1.420	214.19	67.51%
croissant Squadron Crescent	S216, R216A-B	MH216	MH217					0.20				0.28		0.88	1.87	10.94	0.86	11.80	99.48	116.60	170.41	185.91				185.91	429.70	75.99	600			0.45	1.472	243.79	56.74%
croissant Squadron Crescent	---	MH217	MH218											0.00	14.15	14.19	0.10	14.29	86.28	101.05	147.59	1,220.93				1,220.93	1,911.03	12.94	1050			0.45	2.138	690.10	36.11%
croissant Squadron Crescent	S218	MH218	MH219								0.17			0.33	14.48	14.29	0.51	14.80	85.93	100.64	146.99	1,244.42				1,244.42	1,424.40	49.00	1050			0.25	1.594	179.98	12.64%
croissant Squadron Crescent	---	MH219	MH220											0.00	14.48	14.80	0.90	15.70	84.21	98.62	144.02	1,219.47				1,219.47	1,575.26	73.09	1200			0.15	1.349	355.79	22.59%
croissant Squadron Crescent	S220, LOT220	MH220	MH221								0.18		1.96	4.71	19.19	15.70	0.54	16.24	81.35	95.26	139.09	1,561.24				1,561.24	1,575.26	43.47	1200			0.15	1.349	14.02	0.89%
														FIXED OUTLET FLOW FROM SWM FACILITY = 6660 L/s																					
croissant Squadron Crescent	---	MH221	MH222											0.00	19.19	16.24	0.11	16.35	79.75	93.38	136.33	1,530.55			6,660.00	8,190.55	8,565.43	11.97	2400			0.11	1.834	374.88	4.38%
croissant Squadron Crescent	S222A-B	MH222	BULK165S								0.26			0.51	19.70	16.35	0.86	17.21	79.44	93.01	135.79	1,564.69			6,660.00	8,224.69	8,565.43	94.49	2400			0.11	1.834	340.74	3.98%
Phase 1A																																			
croissant Squadron Crescent	---	*BULK165S*	*MH165*											0.00	19.70	17.21	0.23	17.43	77.04	90.19	131.66	1,517.52			6,660.00	8,177.52	8,565.43	*24.90*	*2400*			*0.11*	1.834	387.92	4.53%
Temp Ditch	BLOCK 15	DI 4	MH165S		1.96									1.63	1.63	50.88	0.17	51.05	37.18	43.41	63.14	60.73				60.73	182.91	16.50	375			1.00	1.604	122.18	66.80%
Phase 1B																																			
rue Michael Stoqua Street	S210, LOT210	MH210	MH211								0.20		0.23	0.90	0.90	10.00	0.83	10.83	104.19	122.14	178.56	93.85				93.85	147.47	64.80	375			0.65	1.293	53.62	36.36%
Temp Ditch	BLOCK 22	DI 12	MH211N		0.46									0.38	0.38	19.39	0.33	19.72	71.62	83.82	122.31	27.44				27.44	43.87	17.38	250			0.50	0.866	16.43	37.45%
Temp Ditch	BLOCK 23	DI 13	MH166N		0.46									0.38	0.38	22.34	0.34	22.68	65.50	76.63	111.77	25.06				25.06	43.87	17.50	250			0.50	0.866	18.81	42.88%
rue Michael Stoqua Street	S211, LOT211	MH211	BULK166N								0.17		0.23	0.84	1.74	10.83	1.09	11.93	99.98	117.18	171.27	174.27				174.27	248.09	55.70	600			0.15	0.850	73.82	29.75%
Phase 1A																																			
rue Michael Stoqua Street	---	*BULK166N*	*MH166*											0.00	1.74	11.93	0.32	12.24	95.01	111.33	162.67	165.61				165.61	248.09	*16.10*	*600*			*0.15*	0.850	82.48	33.25%
Phase 1B																																			
rue Bareille-Snow Street	S208, LOT208A-B	MH208	MH209								0.19		0.81	2.17	2.17	10.00	0.76	10.76	104.19	122.14	178.56	226.22				226.22	317.25	64.85	525			0.50	1.420	91.03	28.69%
rue Bareille-Snow Street	S209, LOT209	MH209	BULK167N								0.20		0.20	0.83	3.01	10.76	1.01	11.77	100.34	117.60	171.89	301.53				301.53	339.63	55.70	675			0.15	0.919	38.10	11.22%
Temp Ditch	BLOCK 21	DI 11	MH167N		1.22									1.02	1.02	35.74	0.21	35.95	47.82	55.88	81.38	48.58				48.58	100.88	17.52	300			1.00	1.383	52.30	51.84%
Phase 1A																																			
rue Bareille-Snow Street	---	*BULK167N*	*MH167*											0.00	3.01	11.77	0.29	12.06	95.69	112.12	163.84	287.55				287.55	339.63	*16.10*	*675*			*0.15*	0.919	52.08	15.34%

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: WY
Checked: JIM
Dwg. Reference: 38298-500

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File Reference:	Date:	Sheet No:
38298.5.7.1	7/8/2016	1 of 2

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ____________________

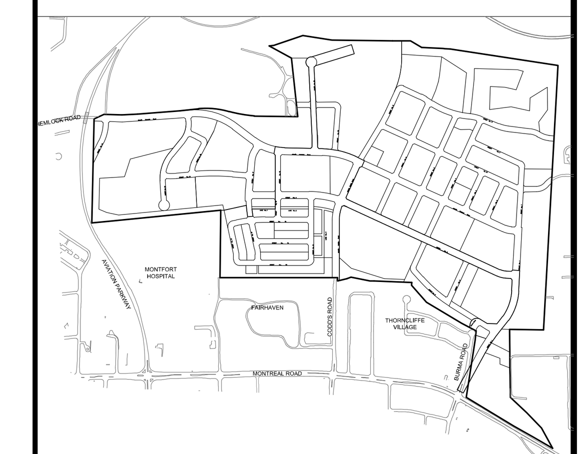
Date ____________________ 2017

Plan Number ____________________

LEGEND :

S168 2.01 0.80 — AREA NUMBER — RUNOFF COEFFICIENT — AREA IN HECTARES

POTENTIAL DRAINAGE DIRECTION



No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6	REVISED PER MOECC COMMENTS	J.I.M.	2017:06:07
5	ISSUED FOR TENDER	J.I.M.	2017:03:23
4	SUBMISSION FOR MOECC APPROVAL	J.I.M.	2017:02:16
3	SUBMISSION No.3 FOR CITY REVIEW	J.I.M.	2017:01:25
2	SUBMISSION No.2 FOR CITY REVIEW	J.I.M.	2016:11:04
1	SUBMISSION No.1 FOR CITY REVIEW	J.I.M.	2016:07:08

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30 Metcalfe Street Suite 601
Ottawa, On K1P 5L4
613 998 7777

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Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title

WATERIDGE VILLAGE AT ROCKCLIFFE
PHASE 1B

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
17/06/07
PROVINCE OF ONTARIO

N

Drawing Title

STORM DRAINAGE AREA PLAN

Scale 1 : 2000

Design	Date
J.I.M.	MAY 2016
Drawn	Checked
M.M.	J.I.M.
Project No.	Drawing No.
38298	500A

D07-16-15-0003

#17063

APPENDIX E

- Drawing 750, DDSWMM Model Schematic
- Drawing 751, Ponding Plan
- Summary of DDSWMM Modeling Parameters
- Catch Basin Data Table
- Road Cross Sections
- Velocity X Depth Calculation Sheet
- Hydraulic Losses at Bends
- XPSWMM Schematic

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ____________

Date ____________ 2016

Plan Number ____________

LEGEND:

- PHASE 1B DRAINAGE AREA
- PHASE 1A DRAINAGE AREA
- EXTERNAL DRAINAGE AREA
- PHASE 1B DRAINAGE BOUNDARY
- S208 — AREA ID; 0.19 — AREA (ha); 71 — Imp.(%)
- MAJOR FLOW
- TOTAL FLOW
- MH136 — MANHOLE ID
- FLOW ROUTE TO PARK DRY POND
- MAJOR FLOW TO BURMA SWMF

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6	REVISED PER CITY COMMENTS	P.S.	2017:06:16
5	REVISED PER MOECC COMMENTS	P.S.	2017:06:07
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3	SUBMISSION No.3 FOR CITY REVIEW	P.S.	2017:01:25
2	SUBMISSION No.2 FOR CITY REVIEW	P.S.	2016:11:04
1	SUBMISSION No.1 FOR CITY REVIEW	P.S.	2016:07:11

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Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title

WATERIDGE VILLAGE AT ROCKCLIFFE
PHASE 1B

P. SPAL
2017/06/16

N

Drawing Title

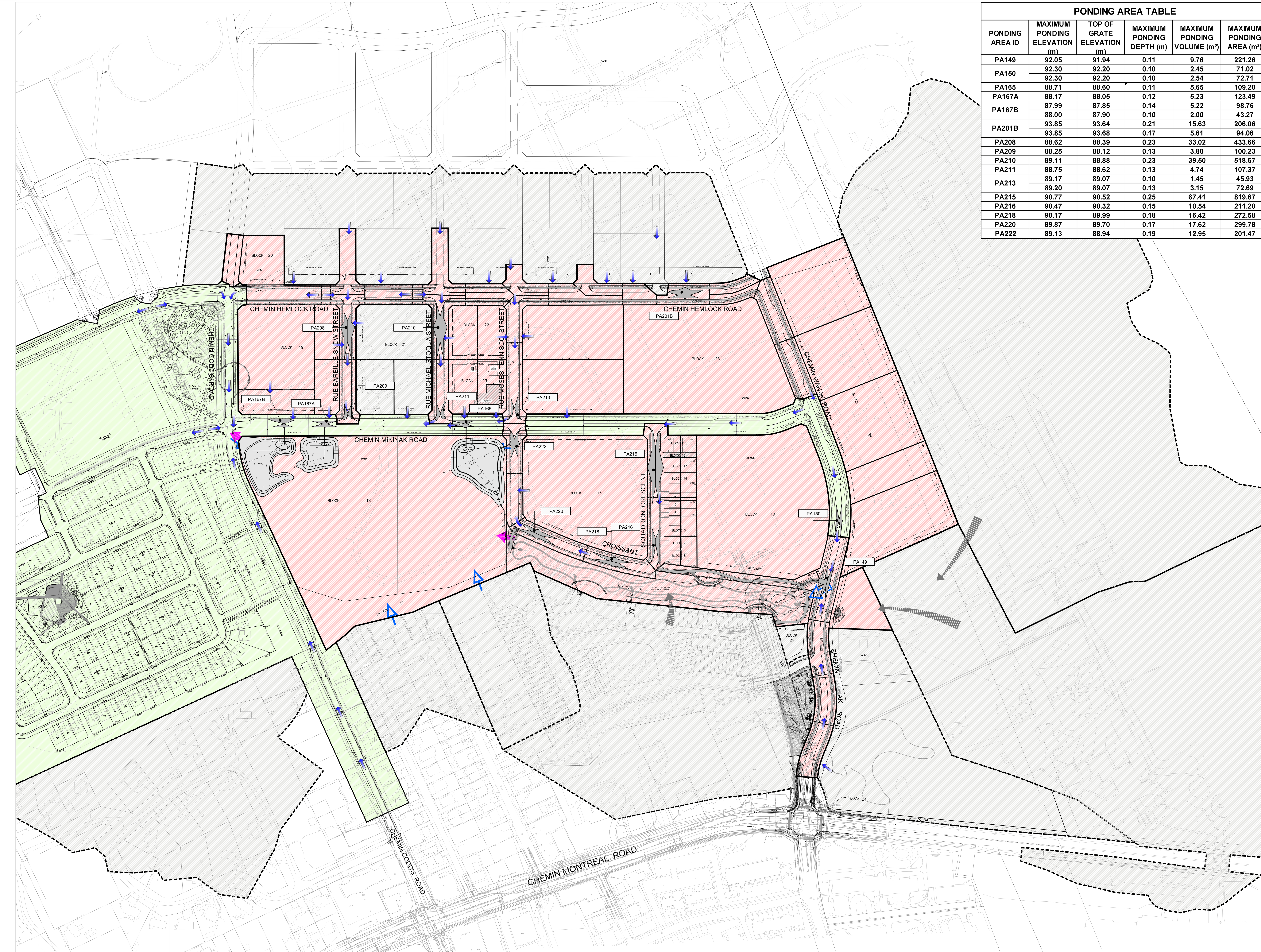
DDSWMM
MODEL SCHEMATIC

Scale
1:2500

Design	Scale
P.S.	JULY 2016
Drawn	Checked
S.V.	P.S.
Project No.	Drawing No.
38298	750

D07-16-15-0003

#17063



PONDING AREA TABLE

PONDING AREA ID	MAXIMUM PONDING ELEVATION (m)	TOP OF GRATE ELEVATION (m)	MAXIMUM PONDING DEPTH (m)	MAXIMUM PONDING VOLUME (m^3)	MAXIMUM PONDING AREA (m^2)
PA149	92.05	91.94	0.11	9.76	221.26
PA150	92.30	92.20	0.10	2.45	71.02
	92.30	92.20	0.10	2.54	72.71
PA165	88.71	88.60	0.11	5.65	109.20
PA167A	88.17	88.05	0.12	5.23	123.49
PA167B	87.99	87.85	0.14	5.22	98.76
	88.00	87.90	0.10	2.00	43.27
PA201B	93.85	93.64	0.21	15.63	206.06
	93.85	93.68	0.17	5.61	94.06
PA208	88.62	88.39	0.23	33.02	433.66
PA209	88.25	88.12	0.13	3.80	100.23
PA210	89.11	88.88	0.23	39.50	518.67
PA211	88.75	88.62	0.13	4.74	107.37
PA213	89.17	89.07	0.10	1.45	45.93
	89.20	89.07	0.13	3.15	72.69
PA215	90.77	90.52	0.25	67.41	819.67
PA216	90.47	90.32	0.15	10.54	211.20
PA218	90.17	89.99	0.18	16.42	272.58
PA220	89.87	89.70	0.17	17.62	299.78
PA222	89.13	88.94	0.19	12.95	201.47

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ______________

Date ______________ 2016

Plan Number ______________

LEGEND:

- PHASE 1B DRAINAGE AREA
- PHASE 1A DRAINAGE AREA
- EXTERNAL DRAINAGE AREA
- PA116 — POND ID
- MAJOR FLOW
- TOTAL FLOW
- MAJOR FLOW TO PARK DRY POND
- MAJOR FLOW TO BURMA SWMF
- EMERGENCY OVERLAND FLOW
- MH136 MANHOLE ID

No.	REVISIONS	By	Date
14			
13			
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11			
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8			
7			
6	REVISED PER CITY COMMENTS	J.I.M.	2017:06:16
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Project Title

WATERIDGE VILLAGE AT ROCKCLIFFE
PHASE 1B

J.I. MOFFATT
17/06/16

N

Drawing Title

PONDING PLAN

Scale
1:2000

Design	Scale
P.S.	JULY 2016
Drawn	**Checked**
S.V.	P.S.
Project No.	**Drawing No.**
38298	751

D07-16-15-0003

#17063

CATCHBASIN/CATCHBASIN MANHOLE/DITCH INLET DATA

STRUCTURE ID	AREA ID	STRUCTURE	COVER	ELEVATION TOP OF GRATE	ELEVATION INVERT INLET	ELEVATION INVERT OUTLET	OUTLET PIPE DIAMETER (mm)	OUTLET PIPE TYPE	HEAD	DYNAMIC FLOW DEPTH	DYNAMIC HEAD	RESTRICTED FLOW (L/s)	ICD TYPE	ORIFICE SIZE AREA (m^2)	ORIFICE SIZE CIRCULAR (mm dia.)	COMMENTS
CICB200B	S200	OPSD 705.010	S22 & S23	93.72	---	92.01	200	PVC DR35	1.610	0.04	1.650	15.00		0.004	75	
CICB200A		OPSD 705.010	S22 & S23	93.72	---	92.01	200	PVC DR35	1.610	0.04	1.650	15.00		0.004	75	
CB201A	S201A	OPSD 705.010	S19 & S20	93.93	---	92.21	200	PVC DR35	1.620	0.03	1.650	15.00		0.004	75	
CICB201B		OPSD 705.010	S22 & S23	93.98	---	92.26	200	PVC DR35	1.620	0.03	1.650	6.00	VORTEX TYPE			(As per MS-18.4 (March, 2017)
CB201C	S201B	OPSD 705.010	S19 & S20	93.64	---	92.10	200	PVC DR35	1.650	0	1.650	44.00		0.013	127	
CICB201D		OPSD 705.010	S22 & S23	93.68	---	92.10	200	PVC DR35	1.650	0	1.650	44.00		0.013	127	
CICB202A	S202A	OPSD 705.010	S22 & S23	93.36	---	91.66	200	PVC DR35	1.600	0.05	1.650	15.00		0.004	75	
CICB202B		OPSD 705.010	S22 & S23	93.36	---	91.66	200	PVC DR35	1.600	0.05	1.650	15.00		0.004	75	
CICB203A	S203A	OPSD 705.010	S22 & S23	91.35	---	89.67	200	PVC DR35	1.580	0.07	1.650	19.00		0.005	83	
CICB203B		OPSD 705.010	S22 & S23	91.35	---	89.67	200	PVC DR35	1.580	0.07	1.650	19.00		0.005	83	
CICB204A	S204A	OPSD 705.010	S22 & S23	89.68	---	88.00	200	PVC DR35	1.580	0.07	1.650	24.00		0.007	94	
CICB204B		OPSD 705.010	S22 & S23	89.68	---	88.00	200	PVC DR35	1.580	0.07	1.650	24.00		0.007	94	
CB205B	S205B	OPSD 705.010	S19 & S20	89.40	---	87.67	200	PVC DR35	1.630	0.02	1.650	6.00	VORTEX TYPE			(As per MS-18.4 (March, 2017)
CB205C		OPSD 705.010	S19 & S20	89.40	---	87.67	200	PVC DR35	1.630	0.02	1.650	6.00	VORTEX TYPE			(As per MS-18.4 (March, 2017)
CB205D	S205C	OPSD 705.010	S19 & S20	89.10	---	87.42	200	PVC DR35	1.580	0.07	1.650	19.00		0.005	83	
CB205E		OPSD 705.010	S19 & S20	89.10	---	87.42	200	PVC DR35	1.580	0.07	1.650	19.00		0.005	83	
CB206B	S206B	OPSD 705.010	S19 & S20	89.13	---	87.40	200	PVC DR35	1.630	0.02	1.650	6.00	VORTEX TYPE			(As per MS-18.4 (March, 2017)
CB206C		OPSD 705.010	S19 & S20	89.13	---	87.40	200	PVC DR35	1.630	0.02	1.650	6.00	VORTEX TYPE			(As per MS-18.4 (March, 2017)
CB207A	S207	OPSD 705.010	S19 & S20	88.06	---	86.39	200	PVC DR35	1.570	0.08	1.650	15.00		0.004	75	
CB207B		OPSD 705.010	S19 & S20	88.06	---	86.39	200	PVC DR35	1.570	0.08	1.650	15.00		0.004	75	
CB208A	S208	OPSD 705.010	S19 & S20	88.39	---	86.87	200	PVC DR35	1.650	0	1.650	86.00		0.025	178	
CB208B		OPSD 705.010	S19 & S20	88.39	---	86.85	250	PVC DR35	1.650	0	1.650	63.00		0.018	152	
CB209A	S209	OPSD 705.010	S19 & S20	88.12	---	86.56	200	PVC DR35	1.590	0.06	1.650	19.00		0.005	83	
CB209B		OPSD 705.010	S19 & S20	88.12	---	86.56	200	PVC DR35	1.590	0.06	1.650	19.00		0.005	83	
CB210A	S210	OPSD 705.010	S19 & S20	88.88	---	87.36	200	PVC DR35	1.650	0	1.650	44.00		0.013	127	
CB210B		OPSD 705.010	S19 & S20	88.88	---	87.36	200	PVC DR35	1.650	0	1.650	44.00		0.013	127	
CB211A	S211	OPSD 705.010	S19 & S20	88.62	---	87.05	200	PVC DR35	1.600	0.05	1.650	15.00		0.004	75	
CB211B		OPSD 705.010	S19 & S20	88.62	---	87.05	200	PVC DR35	1.600	0.05	1.650	15.00		0.004	75	
CB212A	S212	OPSD 705.010	S19 & S20	89.87	---	88.22	200	PVC DR35	1.550	0.10	1.650	44.00		0.013	127	
CB212B		OPSD 705.010	S19 & S20	89.87	---	88.22	200	PVC DR35	1.550	0.10	1.650	44.00		0.013	127	
CB213A	S213	OPSD 705.010	S19 & S20	89.12	---	87.56	250	PVC DR35	1.520	0.13	1.650	63.00		0.018	152	
CB213B		OPSD 705.010	S19 & S20	89.12	---	87.53	250	PVC DR35	1.520	0.13	1.650	63.00		0.018	152	
CB153A	S214	OPSD 705.010	S19 & S20	92.76	---	91.07	200	PVC DR35	1.590	0.06	1.650	15.00		0.004	75	
CB153B		OPSD 705.010	S19 & S20	92.77	---	91.08	200	PVC DR35	1.590	0.06	1.650	15.00		0.004	75	
CB215A	S215	OPSD 705.010	S19 & S20	90.52	---	89.02	200	PVC DR35	1.650	0	1.650	44.00		0.013	127	
CB215B		OPSD 705.010	S19 & S20	90.52	---	89.02	200	PVC DR35	1.650	0	1.650	24.00		0.007	94	
CB216A	S216	OPSD 705.010	S19 & S20	90.32	---	88.78	200	PVC DR35	1.590	0.06	1.650	24.00		0.007	94	
CB216B		OPSD 705.010	S19 & S20	90.32	---	88.78	200	PVC DR35	1.590	0.06	1.650	24.00		0.007	94	
CB218A	S218	OPSD 705.010	S19 & S20	89.99	---	88.49	200	PVC DR35	1.580	0.07	1.650	15.00		0.004	75	
CB218B		OPSD 705.010	S19 & S20	89.99	---	88.49	200	PVC DR35	1.580	0.07	1.650	15.00		0.004	75	
CB220A	S220	OPSD 705.010	S19 & S20	89.70	---	88.18	200	PVC DR35	1.590	0.06	1.650	15.00		0.004	75	
CB220B		OPSD 705.010	S19 & S20	89.70	---	88.18	200	PVC DR35	1.590	0.06	1.650	15.00		0.004	75	
CB222A	S222A	OPSD 705.010	S19 & S20	89.35	---	87.70	200	PVC DR35	1.550	0.10	1.650	24.00		0.007	94	
CB222B		OPSD 705.010	S19 & S20	89.35	---	87.70	200	PVC DR35	1.550	0.10	1.650	24.00		0.007	94	
CB222C	S222B	OPSD 705.010	S19 & S20	89.04	---	87.36	250	PVC DR35	1.650	0	1.650	44.00		0.013	127	
CICB222D		OPSD 705.010	S22 & S23	89.04	---	86.85	200	PVC DR35	2.380	0	2.380	39.00		0.013	127	
CICB165B	S165***	OPSD 705.010	S22 & S23	88.60	---	86.96	200	PVC DR35	1.650	0	1.650	44.00		0.013	127	
CICB165A		OPSD 705.040	S22 & S23	88.60	---	86.60	200	PVC DR35	2.210	0	2.210	44.00		0.013	127	
CICB166B	S166***	OPSD 705.010	S22 & S23	88.58	---	86.90	200	PVC DR35	1.580	0.07	1.650	44.00		0.013	127	
CB166A		OPSD 705.010	S19 & S20	88.58	---	86.90	200	PVC DR35	1.580	0.07	1.650	44.00		0.013	127	
CICB167B	S167A***	OPSD 705.010	S22 & S23	88.05	---	86.42	200	PVC DR35	1.650	0	1.650	44.00		0.013	127	
CICB167A		OPSD 705.010	S22 & S23	88.05	---	85.90	200	PVC DR35	2.370	0	2.370	45.00		0.013	127	
CB167D	S167B***	OPSD 705.010	S19 & S20	87.85	---	86.24	200	PVC DR35	1.650	0	1.650	15.00		0.004	75	
CICB167C		OPSD 705.030	S22 & S23	87.90	---	85.85	250	PVC DR35	2.275	0	2.275	52.00		0.018	152	
CB167E	S167C***	OPSD 705.010	S19 & S20	87.69	---	85.96	200	PVC DR35	1.630	0.02	1.650	6.00	VORTEX TYPE			(As per MS-18.4 (March, 2017)
CICB144A	S144	OPSD 705.010	S22 & S23	98.55	---	96.85	200	PVC DR35	1.600	0.05	1.650	15.00		0.004	75	
CICB144B		OPSD 705.010	S22 & S23	98.55	---	96.85	200	PVC DR35	1.600	0.05	1.650	15.00		0.004	75	
CICB145A	S145	OPSD 705.010	S22 & S23	95.56	---	93.87	200	PVC DR35	1.590	0.06	1.650	15.00		0.004	75	
CICB145B		OPSD 705.010	S22 & S23	95.56	---	93.87	200	PVC DR35	1.590	0.06	1.650	15.00		0.004	75	
CICB147A	S147A	OPSD 705.010	S22 & S23	92.61	---	90.92	200	PVC DR35	1.590	0.06	1.650	15.00		0.004	75	
CICB147B		OPSD 705.010	S22 & S23	92.61	---	90.92	200	PVC DR35	1.590	0.06	1.650	15.00		0.004	75	
CB149B	S149	OPSD 705.010	S19 & S20	91.94	---	90.40	200	PVC DR35	1.550	0.10	1.650	63.00		0.018	152	
CB149A		OPSD 705.010	S19 & S20	91.94	---	90.38	250	PVC DR35	1.550	0.10	1.650	44.00		0.013	127	
CBMH1	P207	OPSD 701.010	S28.1	87.60	---	85.80	300	PVC DR35	1.650	0	1.650	19.00		0.005	83	
RYCB200	R216	OPSD 705.010	S19 & S20	90.26	---	89.06	200	PVC DR35	1.100	0	1.100	20.00		0.007	94	
RYCB201	R215	OPSD 705.010	S19 & S20	90.48	---	89.28	200	PVC DR35	1.100	0	1.100	20.00		0.007	94	
RYCB202	R216B	OPSD 705.010	S19 & S20	90.34	---	89.14	200	PVC DR35	1.100	0	1.100	20.00		0.007	94	
RYCB204	BMOS**	OPSD 705.010	S19 & S20	93.30	---	91.55	250	PVC DR35	1.625	0	1.625	27.64	CUSTOM ICD TYPE	0.008	101	TEMPORARY ICD
RYCB205	BMOS**	OPSD 705.010	S19 & S20	96.75	---	95.00	250	PVC DR35	1.625	0	1.625	16.59	CUSTOM ICD TYPE	0.005	78	TEMPORARY ICD
RYCB206	BMOS**	OPSD 705.010	S19 & S20	100.65	---	98.65	250	PVC DR35	1.875	0	1.875	9.48	CUSTOM ICD TYPE	0.004	75	TEMPORARY ICD
DI 1	BLOCK 24	OPSD 705.040	OPSD 403.010	88.81	---	86.12	375	PVC DR35	2.508	0	2.508	78.37	CUSTOM ICD TYPE	0.018	135	TEMPORARY ICD
DI 2	BLOCK 19	OPSD 706.030	OPSD 403.010	86.40	---	82.65	1200	CONC CL100D	3.148	0	3.148	64.53	CUSTOM ICD TYPE	0.013	116	TEMPORARY ICD
DI 4	BLOCK 15	OPSD 706.010	OPSD 403.010	88.00	---	86.12	250	PVC DR35	1.760	0	1.760	60.73	CUSTOM ICD TYPE	0.017	147	TEMPORARY ICD
DI 10	MIS*	OPSD 706.010	OPSD 403.010	87.45	---	86.20	450	PVC DR35	1.025	0	1.025	211.89	CUSTOM ICD TYPE	0.077	314	TEMPORARY ICD
DI 11	BLOCK 21	OPSD 706.010	OPSD 403.010	88.17	---	86.12	300	PVC DR35	1.905	0	1.905	48.58	CUSTOM ICD TYPE	0.013	129	TEMPORARY ICD
DI 12	BLOCK 22	OPSD 706.010	OPSD 403.010	87.87	---	86.12	250	PVC DR35	1.630	0	1.630	27.44	CUSTOM ICD TYPE	0.008	101	TEMPORARY ICD
DI 13	BLOCK 23	OPSD 706.010	OPSD 403.010	87.99	---	86.12	250	PVC DR35	1.750	0	1.750	25.06	CUSTOM ICD TYPE	0.007	94	TEMPORARY ICD
DI 14	BLOCK 29	OPSD 706.010	OPSD 403.010	90.96	---	89.49	250	PVC DR35	1.345	0	1.345	10.27	CUSTOM ICD TYPE	0.004	75	TEMPORARY ICD

* Miscellaneous flow from future areas
** Burma Open Space
*** Replace ICD as per Ph1B design

Wateridge Village at Rockcliffe - Phase 1B

Summary of DDSWMM Modeling Parameters

The following outlines the modeling parameters used and the justification for those parameters for the DDSWMM modeling.

DDSWMM Input Parameters

Table 1. Summary of DDSWMM Modeling Parameters

Drainage Area		Downstream Segment ID‡	MH	IMP Ratio (%)	Segment Length (m)	Subcatchment Width (m)	Road ROW Cross Section (m)	Ponding Area ID¶	Maximum Storage Available (m^3)	5 Year Modeled Flow (l/s)*	100 Year Captured Flow (l/s)†
Segment ID	Area (ha)										
Storm Sewer Trunk – Phase 1B											
Street Segments											
S201A1	0.08	S201B	S201	0.71	63.00	63.00	26.00			15.00	10.00
S201A2	0.08	S201B	S201	0.71	63.00	63.00	26.00			15.00	4.00
S201B	0.15	D1	S201	0.71	64.50	64.50	26.00	PA201B	21.24	26.00	88.00
D1		S202A			38.50						
S202A	0.10	S203A	S202	0.71	41.00	41.00	26.00			18.00	25.80
S203B	0.09	S203A	S203	0.71	56.00	64.00	26.00			17.00	26.50
S203A	0.16	S212	S203	0.71	90.00	90.00	26.00			29.00	34.50
S204B	0.08	S212	S204	0.71	52.00	62.00	26.00			15.00	23.60
S204A	0.14	S205A	S204	0.71	57.50	115.00	26.00			27.00	41.00
S205A	0.08	S210	S205	0.71	47.00	67.00	20.00			15.00	162.90
S205B	0.03	S210	S205	0.71	13.00	26.00	24.00			6.00	5.00
S205C	0.14	S206A	S205	0.71	57.50	57.50	24.00			25.00	38.00
S206A	0.06	S208	S206	0.71	35.00	55.00	20.00			11.00	163.00
S206B	0.03	S208	S206	0.71	11.00	22.00	24.00			6.00	4.80
S207	0.22	S142	S207	0.71	90.00	90.00	24.00			40.00	30.00
S231	0.12	S142	S231	0.71	61.00	61.00	20.00			22.00	21.00
S176C	0.05	D2	S176	0.76	40.00	40.00	26.00	PA176C	1.14	10.00	10.00
D2		S142			23.00						
S176D	0.13	D3	S176	0.76	95.00	95.00	26.00	PA176D	2.58	26.00	26.00
D3		S142			23.75						
S176E	0.09	S142	S176	0.76	80.00	80.00	26.00			18.00	11.40
S142	0.18	S141B	S142	0.76	108.00	108.00	26.00			34.00	34.00
S141B	0.15	D4	S141	0.76	57.00	57.00	26.00	PA141B	13.02	26.00	332.30
D4		S141A			54.33						
S141A	0.16	D5	S141	0.76	70.50	70.50	26.00	PA141A	5.35	31.00	34.70
D5		S168			16.70						
S141C	0.09	D6	S141	0.76	42.00	42.00	26.00	PA141C	3.79	18.00	20.10
D6		S168			16.70						
S130	0.38	OUTS	S130	0.76	67.00	134.00	26.00			72.00	32.30

Drainage Area		Downstream Segment ID‡	MH	IMP Ratio (%)	Segment Length (m)	Subcatchment Width (m)	Road ROW Cross Section (m)	Ponding Area ID¶	Maximum Storage Available (m^3)	5 Year Modeled Flow (l/s)*	100 Year Captured Flow (l/s)†
Segment ID	Area (ha)										
S132	0.37	S134	S132	0.76	67.00	134.00	26.00			71.00	33.80
S134	0.47	S136	S133	0.76	86.00	172.00	26.00			88.00	54.10
S136	0.24	S137	S136	0.76	83.00	166.00	26.00			46.00	27.10
S137	0.35	S139	S137	0.76	77.00	77.00	26.00			61.00	46.60
S139	0.37	D7	S139	0.76	84.00	84.00	26.00	PA139	56.27	64.00	259.10
D7		S168			97.70						
S168	0.12	D8	S168	0.76	97.00	97.00	26.00	PA168	3.20	24.00	41.40
D8		CELL3			61.70						
S212	0.08	S213	S212	0.71	57.00	98.00	20.00			14.00	72.90
S213	0.40	D9	S213	0.71	78.00	78.00	20.00	PA213	3.15	62.00	126.00
D9		S165			17.00						
S210	0.20	D10	S210	0.71	77.00	77.00	20.00	PA210	39.50	36.00	88.00
D10		S211			65.50						
S211	0.17	D11	S211	0.71	77.00	77.00	20.00	PA211	4.74	31.00	30.00
D11		S165			18.50						
S208	0.19	D12	S208	0.71	77.00	77.00	20.00	PA208	33.02	35.00	149.00
D12		S209			55.00						
S209	0.20	D13	S209	0.71	77.00	77.00	20.00	PA209	3.80	36.00	38.00
D13		S167A			17.50						
S161	0.24	S162A	S161	0.76	90.00	90.00	26.00			46.00	27.00
S162A	0.12	S164B2	S162	0.76	83.00	83.00	26.00			23.00	23.00
S162B	0.10	S164B1	S162	0.76	83.00	83.00	26.00			20.00	5.30
S164B1	0.12	S164A	S164	0.76	102.00	102.00	26.00			23.00	10.60
S164B2	0.10	S164A	S164	0.76	102.00	102.00	26.00			19.00	18.00
S164A	0.18	S222B	S164	0.76	70.00	70.00	26.00			30.00	15.40
S165	0.21	CB165A	CB165A	0.76	63.00	63.00	26.00			39.00	44.00
S166	0.13	S167A	S166	0.76	125.00	125.00	26.00			27.00	39.90
S167A	0.17	D18	CB167A	0.76	47.00	47.00	26.00	PA167A	5.23	30.00	45.00
S167B	0.13	CB167C	CB167C	0.76	32.50	50.00	26.00	PA167B	6.72	25.00	52.00
S167C	0.02	S168	S167	0.76	20.00	20.00	26.00			4.00	3.30
S215	0.38	D14	S215	0.76	89.00	89.00	20.00	PA215	67.41	69.00	68.00
D14		S216			91.00						
S216	0.28	D15	S216	0.76	89.00	89.00	20.00	PA216	10.54	53.00	48.00
D15		S218			39.00						
S218	0.17	D16	S218	0.71	87.00	88.00	20.00	PA218	16.42	32.00	30.00
D16		S220			47.00						
S220	0.18	D17	S220	0.71	87.00	91.00	20.00	PA220	17.62	33.00	30.00
D17		S222A			88.00						
S222A	0.12	S222B	S222	0.71	89.00	59.00	20.00	0.00	0.00	22.00	48.00
S222B	0.14	CB222B	CB222B	0.71	60.50	60.50	20.00	PA222B	12.95	22.00	39.00

Drainage Area		Downstream Segment ID‡	MH	IMP Ratio (%)	Segment Length (m)	Subcatchment Width (m)	Road ROW Cross Section (m)	Ponding Area ID¶	Maximum Storage Available (m^3)	5 Year Modeled Flow (l/s)*	100 Year Captured Flow (l/s)†
Segment ID	Area (ha)										
S200	0.20	S214	S200	0.71	50.00	78.00	26.00			36.00	19.20
S214	0.19	S152	S214	0.71	74.00	74.00	20.00			33.00	30.00
S152	0.23	D18	S152	0.76	100.00	100.00	26.00	PA152	6.50	41.00	88.00
D18		S150			38.04						
S150	0.20	D19	S150	0.76	97.00	97.00	26.00	PA150	4.99	39.00	46.50
D19		S149			33.00						
S151	0.02	S150	S151	0.76	15.00	15.00	26.00			4.00	3.60
S149	0.29	D20	S149	0.76	38.00	120.00	26.00	PA149	9.76	53.00	107.00
D20		DUMBRM			78.00						
S144	0.18	S145	S144	0.71	33.00	67.00	26.00			32.00	18.50
S145	0.15	S147A	S145	0.71	57.00	57.00	26.00			26.00	21.10
S147A	0.14	S149	S147	0.71	65.00	65.00	26.00			25.00	23.10
Rear Yard Segments											
P167A	3.05	CELL1	S167S	0.23	342.56	685.13	N/A			187.00	190.00
P167B	3.05	CELL2	S167S	0.23	342.56	685.13	N/A			187.00	190.00
SC162	2.49	S164B1	S162	0.86	280.13	560.25	N/A	100yr S.C	250.00	503.00	529.00
LT212A	0.80	S212	S212	0.86	90.00	180.00	N/A			162.00	162.00
LT212B	0.23	S212	S212	0.86	25.88	51.75	N/A			46.00	46.00
LOT164	0.80	S164A	S164	0.86	90.00	180.00	N/A			162.00	164.00
LOT213	0.23	S165	S213	0.86	25.88	51.75	N/A			46.00	44.00
LOT210	0.23	S210	S210	0.86	25.88	51.75	N/A			46.00	44.00
LOT211	0.23	S165	S211	0.86	25.88	51.75	N/A			46.00	46.00
LOT141	0.96	LOT167	S141	0.86	108.00	216.00	N/A			194.00	283.20
LOT167	0.28	S167B	S167	0.86	31.50	63.00	N/A			57.00	82.60
SC157	2.62	S149	S157	0.86	294.75	589.50	N/A	100yr S.C	294.00	529.00	529.00
R215	0.14	R216	S215	0.51	70.00	70.00	N/A			19.00	20.00
R216A	0.14	R216B	S216	0.51	68.00	68.00	N/A			19.00	20.00
R216B	0.06	MH217	S216	0.51	21.00	21.00	N/A			8.00	15.00
LOT220	1.96	S222A	S220	0.86	220.50	441.00	N/A			396.00	396.00
LOT200	0.91	S200	S200	0.86	102.38	204.75	N/A	100yr S.C.	109.00	184.00	184.00
LOT214	0.84	S214	S214	0.86	94.50	189.00	N/A	100yr S.C	97.00	170.00	174.00
P207	0.32	S207	S207	0.14	36.00	72.00	N/A			13.00	19.00
SWM1	0.37	USBRM	USBRM	0.86	41.63	83.25	N/A			74.00	158.50
BRMA	1.64	DUMBRM	NONE	0.14	184.50	369.00	N/A			66.00	0.00
LOT152	0.92	S152	S152	0.86	103.50	207.00	N/A	100yr S.C	110.00	186.00	186.00
LOT151	0.41	S150	S151	0.86	46.13	92.25	N/A	100yr S.C	50.00	83.00	83.00
LOT150	0.96	S150	S150	0.86	108.00	216.00	N/A	100yr S.C	114.00	194.00	194.00
External Areas											
EX143	0.33	S144	S143	0.86	37.13	74.25	N/A			67.00	67.00
EX144	0.55	EX145	S144	0.14	61.88	123.75	N/A			22.00	26.00

Drainage Area		Downstream Segment ID‡	MH	IMP Ratio (%)	Segment Length (m)	Subcatchment Width (m)	Road ROW Cross Section (m)	Ponding Area ID¶	Maximum Storage Available (m^3)	5 Year Modeled Flow (l/s)*	100 Year Captured Flow (l/s)†
Segment ID	Area (ha)										
EX145	2.74	S145	S145	0.86	308.25	616.50	N/A	100yr S.C	352.00	554.00	554.00
EX147	0.13	EXTRNE	S147	0.86	40.00	29.25	N/A			26.00	26.00
EX166	0.61	S166	S166	0.86	68.63	137.25	N/A			123.00	128.00
EX201	0.56	S201B	S201	0.86	63.00	126.00	N/A			113.00	165.20
EX202A	0.90	EX202B	S202	0.86	101.25	202.50	20.00			182.00	265.40
EX202B	0.35	S202A	S202	0.86	39.38	78.75	20.00			71.00	103.20
EX202C	0.20	S203B	S202	0.86	22.50	45.00	N/A			40.00	59.00
EX203	0.73	S203B	S203	0.86	82.13	164.25	20.00			147.00	215.30
EX204A	0.72	S204A	S204	0.86	81.00	162.00	20.00			145.00	145.00
EX204B	0.47	S204A	S204	0.86	52.88	105.75	N/A			95.00	138.60
EX205A	0.81	S205A	S205	0.86	91.13	182.25	20.00			164.00	165.00
EX205B	0.63	S205C	S205	0.86	70.88	141.75	N/A			127.00	128.00
EX206A	1.02	S206A	S206	0.86	114.75	229.50	20.00			206.00	206.00
EX206B	0.46	S207	S206	0.86	51.75	103.50	N/A			93.00	95.00
EX208A	0.81	S208	S208	0.86	91.13	182.25	N/A			164.00	164.00
EX231A	0.86	S231	S231	0.86	96.75	193.50	20.00			174.00	174.00
EX231B	0.30	S231	S231	0.86	33.75	67.50	N/A			61.00	64.00
EXNRCN	18.39	USBRM	USBRM	0.71	450.00	1200.00	N/A			2578.00	4847.30
EXNRCS	18.65	USBRM	USBRM	0.71	514.00	2628.00	N/A			2994.00	5641.40
EXP147	0.40	SWM1	S147	0.14	45.00	90.00	N/A			16.00	15.00
EXP203	0.44	S204B	S203	0.14	49.50	99.00	N/A			18.00	20.00
EXTFOX	1.90	CELL3	OUT	0.86	213.75	427.50	N/A			384.00	311.00
EXTRNE	0.99	BRMA	BURMA	0.71	111.38	222.75	N/A			169.00	340.00
EXTRNC	5.70	BRMA	BURMA	0.71	239.00	4282.50	N/A			1086.00	2075.50
EXTRNN	0.53	BRMA	BURMA	0.71	59.63	119.25	N/A			91.00	171.60
EXTRNW	2.18	CELL1	BURMA	0.71	193.00	981.00	N/A			399.00	435.00

Notes: * Values reported are from the DDSWMM output file 38298-PH1B-5CH.dat/out. † ICD flow is from the DDSWMM output file 38298--100CH.dat/out.

FOR HYDROLOGICAL PARAMETERS:

1. Refer to **Drawing 750** for the DDSWMM model schematic.

2. Catchment areas are based on the rational method spreadsheet with some minor modifications for modeling purposes. See **Drawing 750** for the catchment areas used in the DDSWMM modeling for the subject site.

   Imperviousness for the subject site was determined by obtaining the footprint of the model units intended for the site and placing the maximum footprint on the lots. The imperviousness ratios for single family units were calculated for a typical single family unit street segment and rear yard segment.

3. Subcatchment width was measured from the segment length multiplied by 2 for those drainage areas where residences are located on both sides of the road (See **Figure 1**). For those drainage areas where there are no residences on one side of the road, the subcatchment width is equal to the segment length.

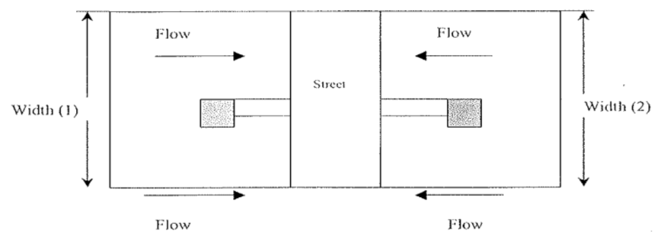


Figure 1. **Schematic of Width Parameter for Typical Subdivision**

(Reference: Figure 5.4, page 5.3 from the City of Ottawa Sewer Design Guidelines (November 2004)

For the Parks, Schools and all areas that areas are prefaced with “LOT”, the subcatchment width of 225 m/ha was used.

4. Drainage area slope is based on the average of the impervious area slope (1%) and the pervious area slope (3%). The average slope is 2% (0.02 m/m).

5. Segment length for a street or rear yard is the measured length of the major system segment. See **Figure 2** for an example.

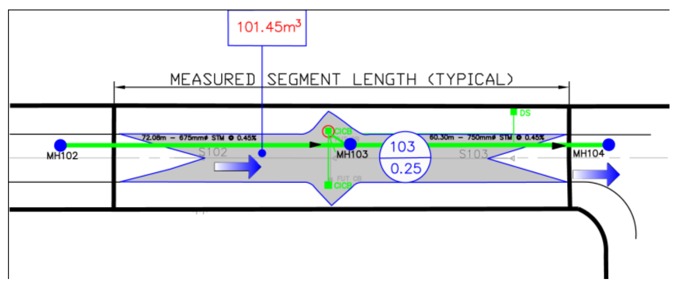


Figure 2. **Segment Length for Street or Rear Yard (Typical)**

6. Segment length for the dummy segment for routing is the measured length of the static ponding available in the street segment which drains to the dummy. **See Figure 3** for an example.

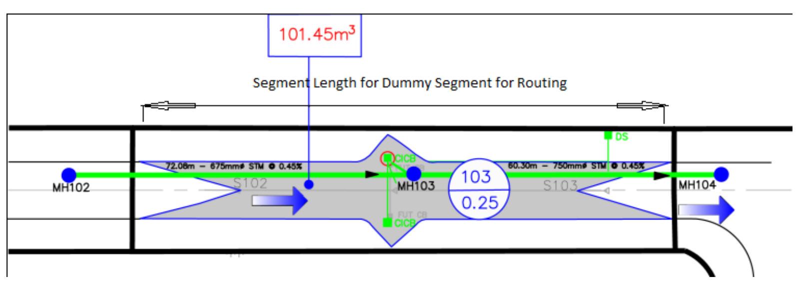
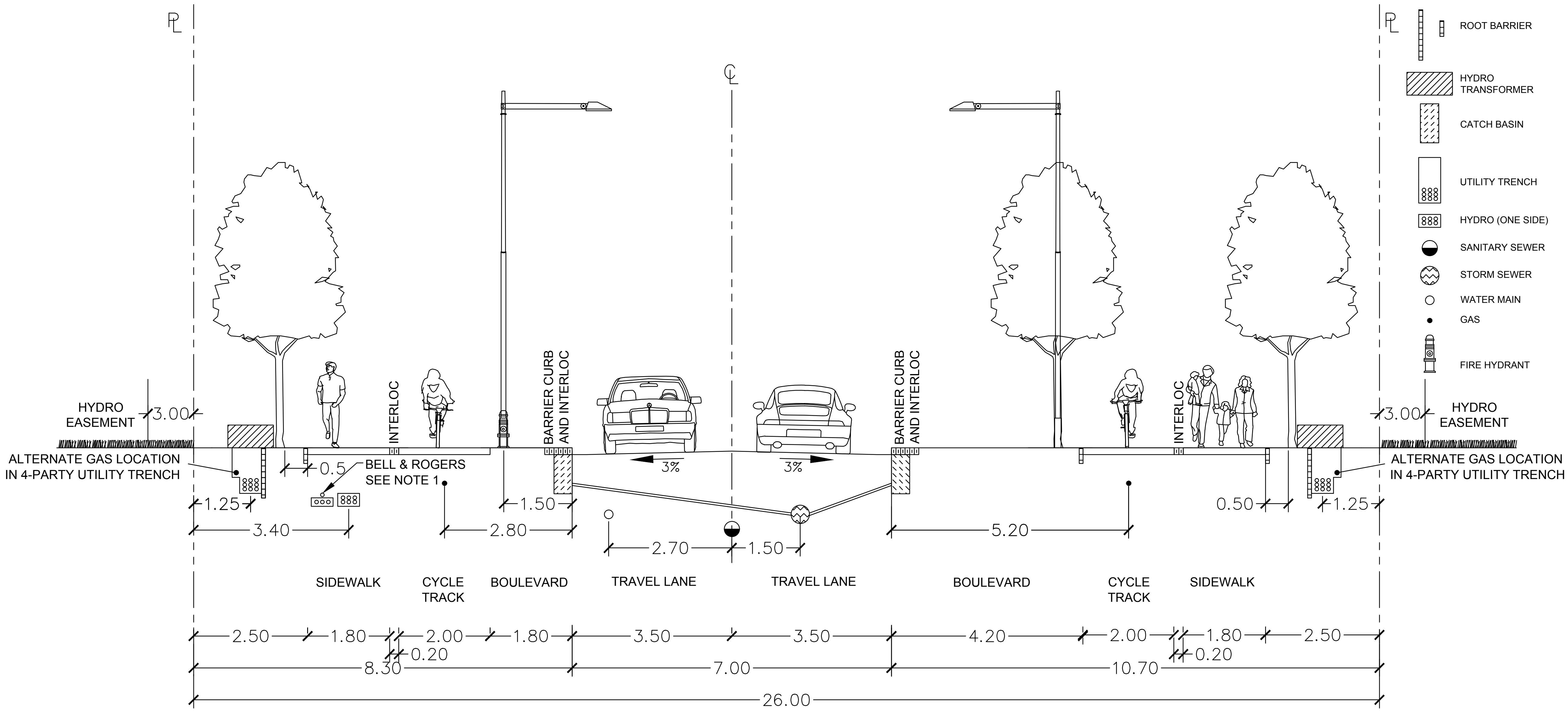


Figure 3. **Segment Length for Dummy Segment for Routing (Typical)**

Infiltration

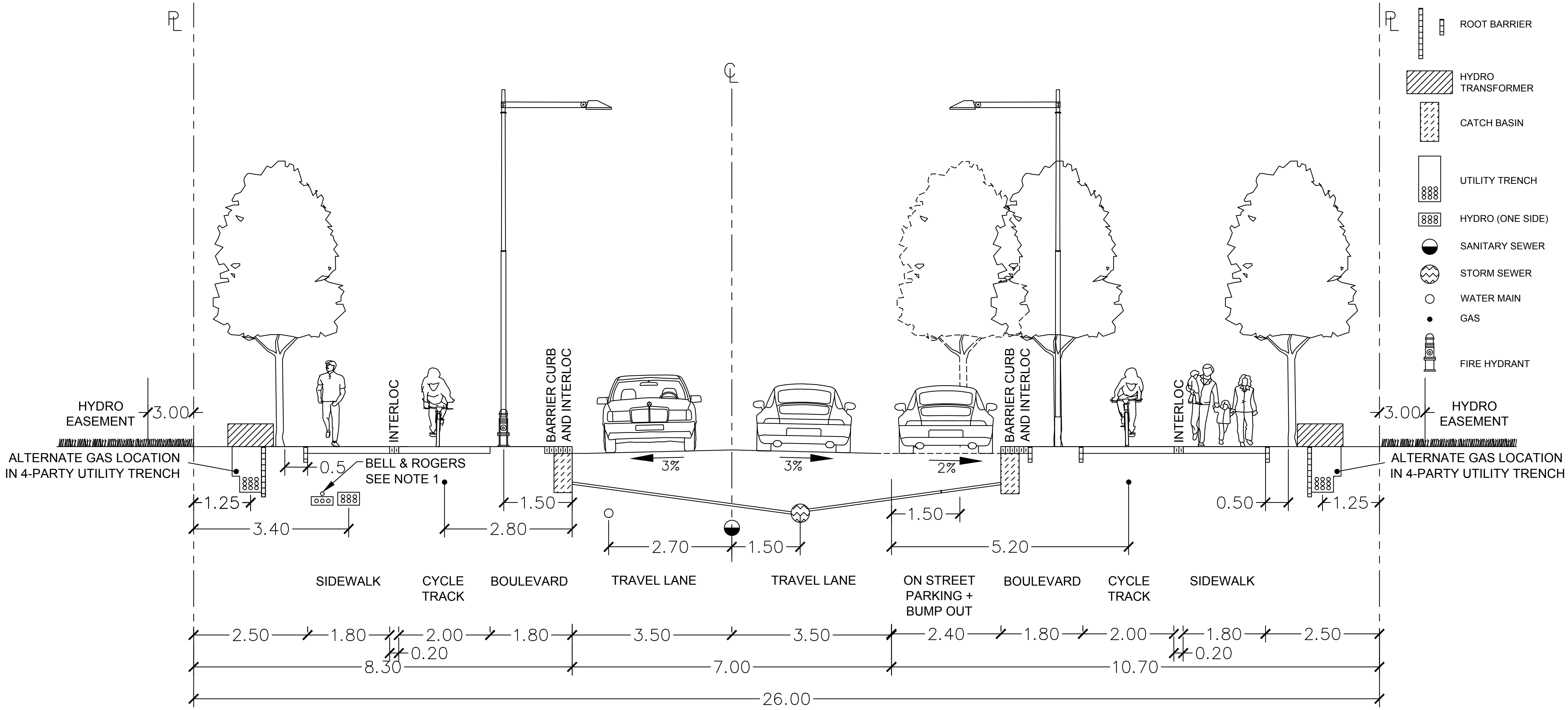
Infiltration losses were selected to be consistent with the OSDG. The Horton values are as follows: f_o = 76.2 mm/h, f_c = 13.2 mm/h, k = 0.00115 s^{-1}.



NOTES:
1. HYDRO DUCTBANK PER UDS0001. NUMBER OF DUCTS SPECIFIED PER HYDRO DRAWINGS. MINIMUM 0.10m SEPARATION BETWEEN BELL CONCRETE ENCASED DUCTBANK AND HYDRO CONCRETE ENCASED DUCTBANK. DUCTBANKS TO BE FORMED WITH PLYWOOD AND 2x4 LUMBER WITH CLEAR STONE SEPARATION.

2. INTERLOC PAVERS AS PER SC.28 DETAIL.

26m ROW
HEMLOCK ROAD (NO LAY-BY)

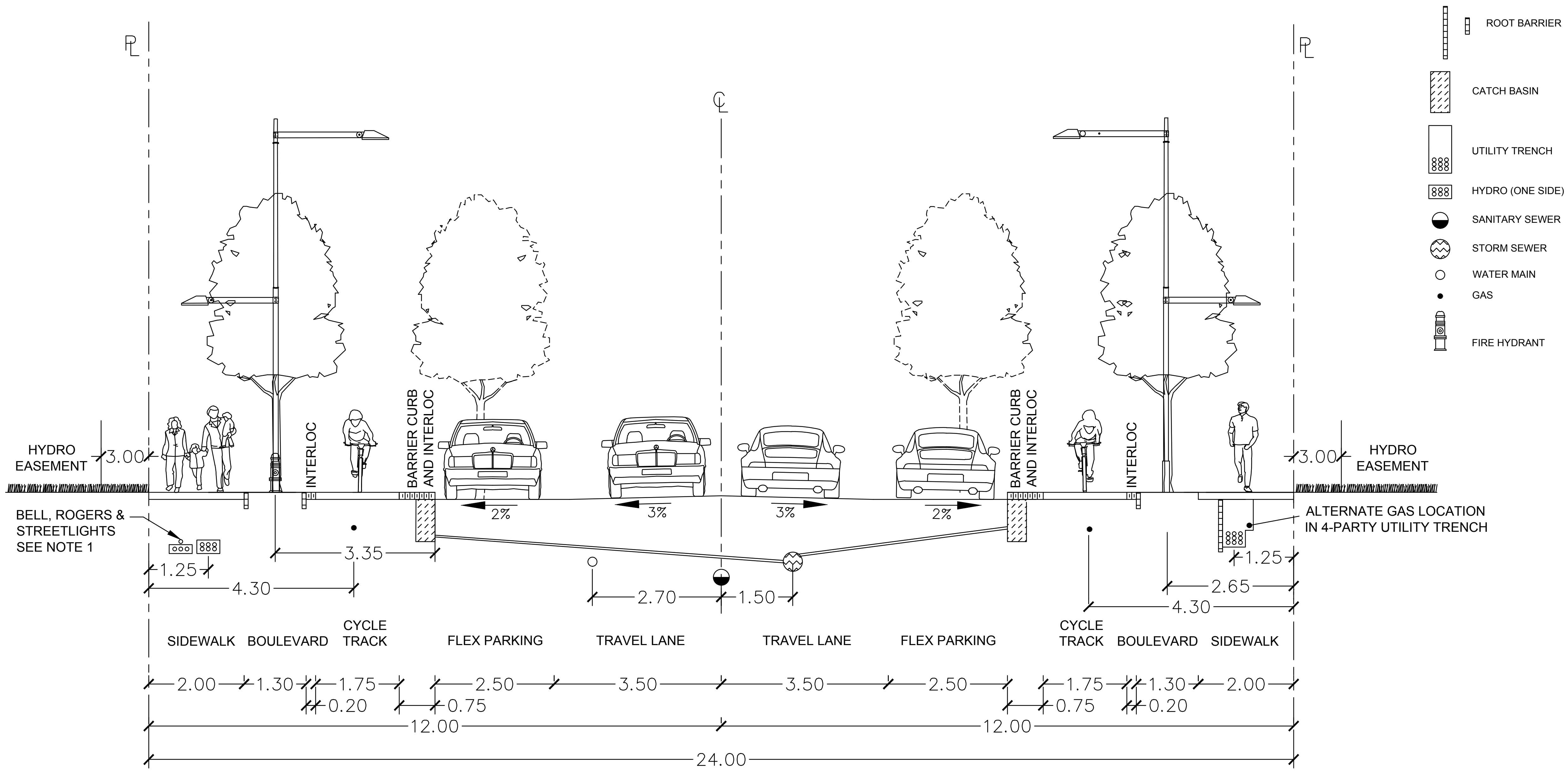


NOTES:

1. HYDRO DUCTBANK PER UDS0001. NUMBER OF DUCTS SPECIFIED PER HYDRO DRAWINGS. MINIMUM 0.10m SEPARATION BETWEEN BELL CONCRETE ENCASED DUCTBANK AND HYDRO CONCRETE ENCASED DUCTBANK. DUCTBANKS TO BE FORMED WITH PLYWOOD AND 2x4 LUMBER WITH CLEAR STONE SEPARATION.

2. INTERLOC PAVERS AS PER SC.28 DETAIL.

26m ROW
HEMLOCK ROAD (EAST OF MICHAEL STOQUA STREET) AND WANAKI ROAD



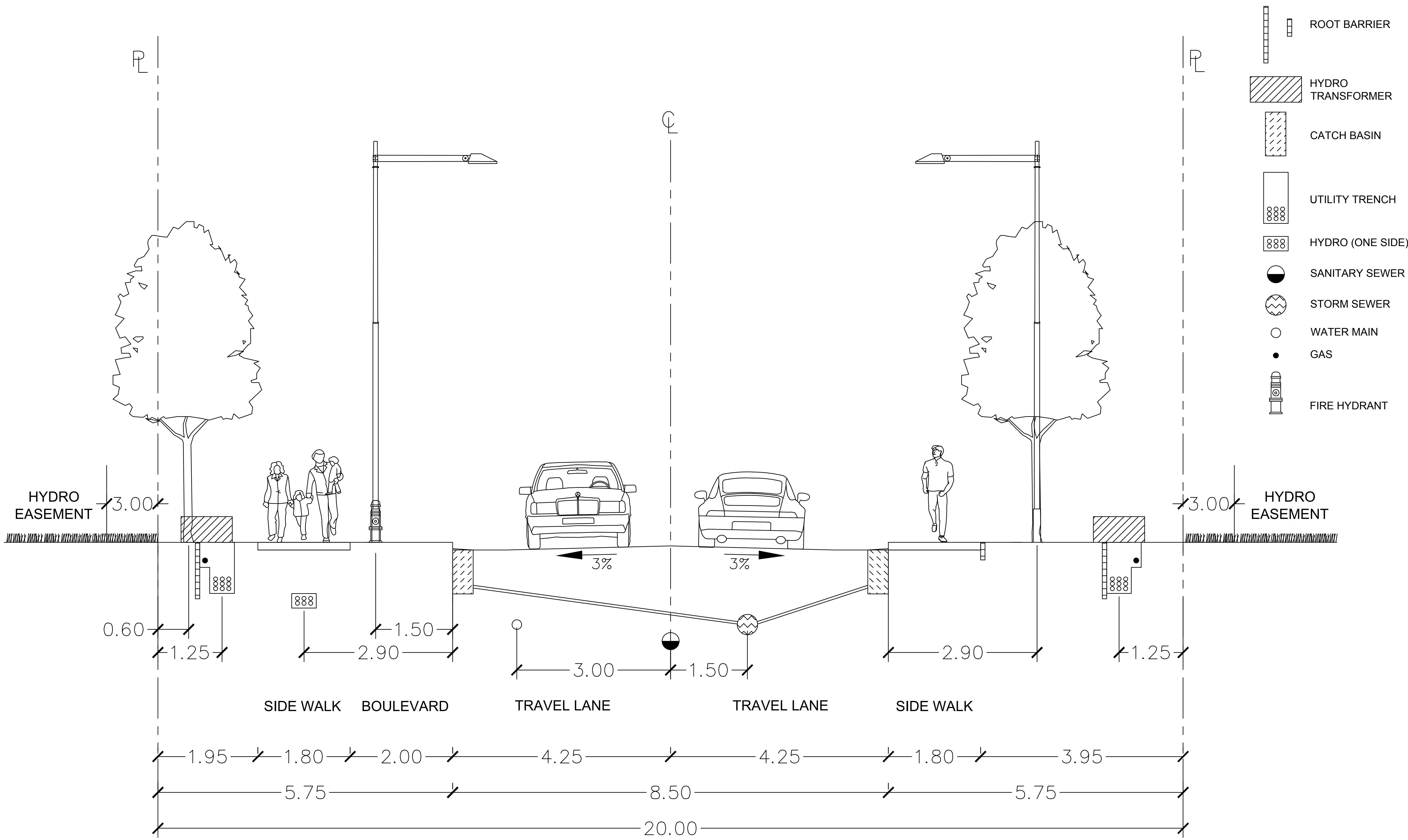
NOTES:

1. HYDRO DUCTBANK PER UDS0001. NUMBER OF DUCTS SPECIFIED PER HYDRO DRAWINGS. MINIMUM 0.10m SEPARATION BETWEEN BELL CONCRETE ENCASED DUCTBANK AND HYDRO CONCRETE ENCASED DUCTBANK. DUCTBANKS TO BE FORMED WITH PLYWOOD AND 2x4 LUMBER WITH CLEAR STONE SEPARATION..

2. INTERLOC PAVERS AS PER SC.28 DETAIL.

24m ROW

HEMLOCK ROAD (CODDS ROAD TO MICHAEL STOQUA STREET)



20.0m LOCAL ROAD

Velocity x Depth Calculation

Iteration equation:

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

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

100 Year 3 Hour Chicago Storm																			
Area ID (Dummy Segment, if applicable)	Road ROW Section	Longitudinal Slope (%)			SWMHYMO (38298vxd.out)					Calculation Sheet: Overflow for Typical Saw Tooth Road					Continuous Grade (SWMHYMO 38298 vxd.out)			
			Overflow Flowrate		Flowrate (cms)		Velocity (m/s)			Flowrate (cms)		Dynamic Depth (m)			Dynamic Depth (m)			Velocity x Depth
			Qx (l/s)	Qx (cms)	Qmin	Qmax	vmin	vmax	vx	Qmin	Qmax	dmin	dmax	dx	dmin	dmax	dx	(m^2/s)
S201B(D1)	26	1.81	0	0.000	0.000	0.004	0.000	0.393	0.000	0.000	0.000	0.000	0.000	0.000	N/A	N/A	N/A	0.000
S212	20	0.70	325	0.325	0.253	0.362	0.831	0.909	0.883	0.304	0.340	0.135	0.140	N/A	0.095	0.109	0.104	0.092
S147A	26	5.00	151	0.151	0.080	0.172	1.070	1.295	1.244	0.145	0.165	0.100	0.105	N/A	0.047	0.063	0.059	0.074
S213(D9)	20	0.60	299	0.299	0.234	0.335	0.770	0.841	0.816	0.269	0.304	0.130	0.135	0.134	N/A	N/A	N/A	0.110
S210(D10)	20	0.60	0	0.000	0.000	0.001	0.000	0.210	0.000	0.000	0.000	0.000	0.000	0.000	N/A	N/A	N/A	0.000
S211(D11)	20	1.02	25	0.025	0.011	0.032	0.435	0.570	0.525	0.021	0.028	0.050	0.055	0.053	N/A	N/A	N/A	0.028
S208(D12)	20	0.60	0	0.000	0.000	0.001	0.000	0.210	0.000	0.000	0.000	0.000	0.000	0.000	N/A	N/A	N/A	0.000
S209(D13)	20	0.91	27	0.027	0.010	0.030	0.411	0.539	0.520	0.021	0.028	0.050	0.055	0.054	N/A	N/A	N/A	0.028
S215(D14)	20	1.00	0	0.000	0.000	0.002	0.000	0.271	0.000	0.000	0.000	0.000	0.000	0.000	N/A	N/A	N/A	0.000
S216(D15)	20	1.00	40	0.040	0.032	0.068	0.565	0.684	0.591	0.035	0.043	0.060	0.065	0.063	N/A	N/A	N/A	0.037
S218(D16)	20	0.70	42	0.042	0.026	0.057	0.472	0.572	0.524	0.042	0.051	0.065	0.070	0.065	N/A	N/A	N/A	0.034
S220(D17)	20	0.90	38	0.038	0.030	0.065	0.536	0.649	0.562	0.035	0.043	0.060	0.065	0.062	N/A	N/A	N/A	0.035
S222B	20	1.00	0	0.000	0.000	0.063	0.000	0.634	0.000	0.000	0.000	0.000	0.000	N/A	0.000	0.016	0.000	0.000
S176C(D2)	26	0.55	7	0.007	0.005	0.015	0.341	0.446	0.362	0.005	0.008	0.030	0.035	0.033	N/A	N/A	N/A	0.012
S176D(D3)	26	0.55	19	0.019	0.015	0.033	0.446	0.541	0.467	0.016	0.021	0.045	0.050	0.048	N/A	N/A	N/A	0.023
S141B(D4)	26	0.63	100	0.100	0.072	0.120	0.607	0.680	0.650	0.100	0.115	0.090	0.095	0.090	N/A	N/A	N/A	0.059
S141A(D5)	26	0.99	104	0.104	0.091	0.150	0.761	0.852	0.781	0.103	0.119	0.090	0.095	0.090	N/A	N/A	N/A	0.071
S141C(D6)	26	0.99	18	0.009	0.006	0.019	0.407	0.534	0.436	0.008	0.012	0.035	0.040	0.036	N/A	N/A	N/A	0.016
S168(D8)	26	0.99	314	0.157	0.142	0.209	1.062	1.239	1.102	0.155	0.176	0.105	0.110	0.105	N/A	N/A	N/A	0.116
S165	26	1.00	0	0.000	0.000	0.001	0.148	0.235	0.148	0.000	0.000	0.000	0.000	0.000	0.008	0.015	N/A	0.000
S167A	26	1.00	0	0.000	0.000	0.002	0.183	0.291	0.183	0.000	0.000	0.000	0.000	0.000	0.008	0.015	N/A	0.000
S167B	26	1.00	0	0.000	0.000	0.002	0.245	0.388	0.245	0.000	0.000	0.000	0.000	0.000	0.008	0.015	N/A	0.000
S152(D18)	26	0.52	59	0.059	0.029	0.063	0.434	0.526	0.515	0.051	0.061	0.070	0.075	0.074	N/A	N/A	N/A	0.038
S149(D20)	26	0.65	141	0.141	0.113	0.183	0.542	0.612	0.570	0.132	0.150	0.100	0.105	0.102	N/A	N/A	N/A	0.058
S150(D19)	26	0.50	64	0.064	0.062	0.112	0.515	0.598	0.518	0.061	0.073	0.075	0.080	0.076	N/A	N/A	N/A	0.039
S201A1	26	1.00	19	0.019	0.017	0.050	0.466	0.611	0.475	N/A	N/A	N/A	N/A	N/A	0.03	0.045	0.031	0.015
S201A2	26	1.00	25	0.025	0.017	0.050	0.466	0.611	0.501	N/A	N/A	N/A	N/A	N/A	0.03	0.045	0.034	0.017
S202A	26	1.81	100	0.100	0.066	0.143	0.818	0.991	0.894	N/A	N/A	N/A	N/A	N/A	0.045	0.06	0.052	0.046
S203A	26	2.33	190	0.190	0.188	0.306	1.212	1.368	1.215	N/A	N/A	N/A	N/A	N/A	0.068	0.082	0.068	0.083
S212	20	0.70	325	0.325	0.253	0.362	0.831	0.909	0.883	N/A	N/A	N/A	N/A	N/A	0.095	0.109	0.104	0.092
S204A	26	1.22	170	0.170	0.117	0.213	0.814	0.944	0.886	N/A	N/A	N/A	N/A	N/A	0.06	0.075	0.068	0.060

Velocity x Depth Calculation

100 Year 3 Hour Chicago Storm																		
Area ID (Dummy Segment, if applicable)	Road ROW Section	Longitudinal Slope (%)			SWMHYMO (38298vxd.out)					Calculation Sheet: Overflow for Typical Saw Tooth Road					Continuous Grade (SWMHYMO 38298 vxd.out)			
			Overflow Flowrate		Flowrate (cms)		Velocity (m/s)			Flowrate (cms)		Dynamic Depth (m)			Dynamic Depth (m)			Velocity x Depth
			Qx (l/s)	Qx (cms)	Qmin	Qmax	vmin	vmax	vx	Qmin	Qmax	dmin	dmax	dx	dmin	dmax	dx	(m^2/s)
S205B	26	0.71	6	0.006	0.002	0.012	0.244	0.387	0.301	N/A	N/A	N/A	N/A	N/A	0.015	0.03	0.021	0.006
S205C	26	0.71	116	0.116	0.074	0.134	0.614	0.713	0.683	N/A	N/A	N/A	N/A	N/A	0.06	0.075	0.071	0.048
S207	26	0.51	133	0.133	0.113	0.185	0.604	0.682	0.626	N/A	N/A	N/A	N/A	N/A	0.075	0.09	0.079	0.050
S206B	26	0.86	6	0.006	0.002	0.013	0.268	0.426	0.325	N/A	N/A	N/A	N/A	N/A	0.015	0.03	0.020	0.007
S222A	20	0.90	332	0.332	0.287	0.410	0.942	1.030	0.974	N/A	N/A	N/A	N/A	N/A	0.095	0.109	0.100	0.098
S144	26	5.00	99	0.099	0.080	0.172	1.070	1.295	1.116	N/A	N/A	N/A	N/A	N/A	0.047	0.063	0.050	0.056
S145	26	5.00	128	0.128	0.080	0.172	1.070	1.295	1.187	N/A	N/A	N/A	N/A	N/A	0.047	0.063	0.055	0.066
S214	26	0.50	83	0.083	0.075	0.136	0.521	0.604	0.532	N/A	N/A	N/A	N/A	N/A	0.06	0.075	0.062	0.033
S200	26	1.22	50	0.050	0.018	0.054	0.513	0.672	0.654	N/A	N/A	N/A	N/A	N/A	0.03	0.045	0.043	0.028
S166	26	1.00	108	0.108	0.089	0.118	0.760	0.811	0.793	N/A	N/A	N/A	N/A	N/A	0.068	0.075	0.073	0.058
S167C	26	0.99	4	0.004	0.001	0.006	0.256	0.407	0.347	N/A	N/A	N/A	N/A	N/A	0.013	0.025	0.020	0.007

flow multiplied by 2 for half st and then used City sheets

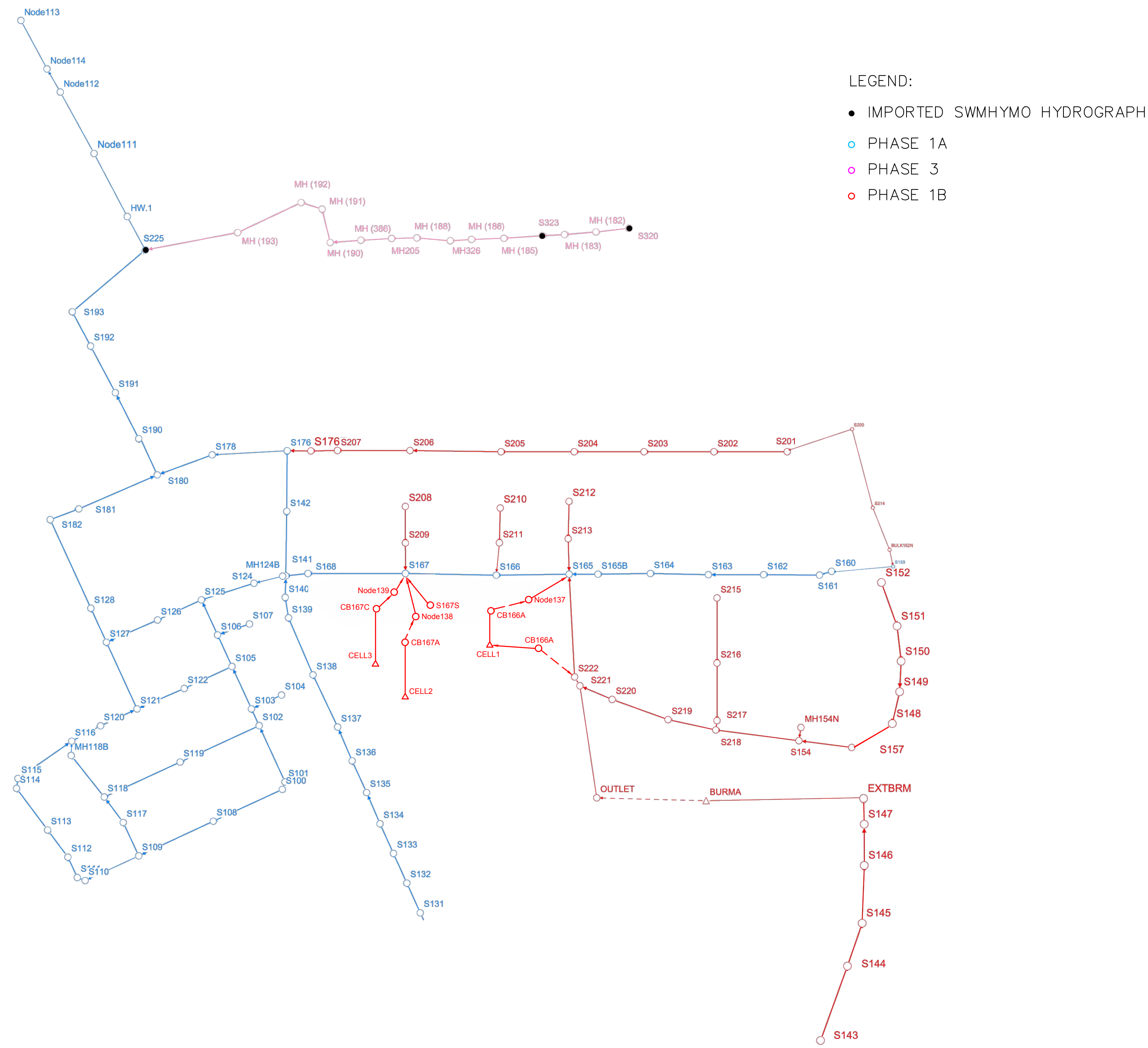
Velocity x Depth Calculation

100 Year 3 Hour Chicago Storm with 20% Incerease																		
Area ID (Dummy Segment, if applicable)	Road ROW Section	Longitudinal Slope (%)			SWMHYMO (38298vxd.out)					Calculation Sheet: Overflow for Typical Saw Tooth Road					Continuous Grade (SWMHYMO 38298 vxd.out)			
			Overflow Flowrate		Flowrate (cms)		Velocity (m/s)			Flowrate (cms)		Dynamic Depth (m)			Dynamic Depth (m)			Velocity x Depth
			Qx (l/s)	Qx (cms)	Qmin	Qmax	vmin	vmax	vx	Qmin	Qmax	dmin	dmax	dx	dmin	dmax	dx	(m^2/s)
S201B(D1)	26	1.81	99	0.099	0.066	0.143	0.818	0.991	0.892	0.091	0.106	0.085	0.090	0.088	N/A	N/A	N/A	0.078
S212	20	0.70	720	0.720	0.681	0.904	1.099	1.230	1.122	0.689	0.741	0.180	0.185	0.183	0.136	0.150	0.138	0.155
S147A	26	5.00	620	0.620	0.508	0.767	1.697	1.881	1.777	0.597	0.647	0.165	0.170	0.167	0.095	0.110	0.101	0.180
S213(D9)	20	0.60	707	0.707	0.630	0.837	1.018	1.139	1.063	0.689	0.741	0.180	0.185	0.182	N/A	N/A	N/A	0.193
S210(D10)	20	0.60	318	0.318	0.234	0.335	0.770	0.841	0.829	0.304	0.340	0.135	0.140	0.137	N/A	N/A	N/A	0.114
S211(D11)	20	1.02	331	0.331	0.306	0.436	1.003	1.097	1.021	0.314	0.351	0.135	0.140	0.137	N/A	N/A	N/A	0.140
S208(D12)	20	0.60	372	0.372	0.335	0.458	0.841	0.910	0.862	0.340	0.377	0.140	0.145	0.144	N/A	N/A	N/A	0.124
S209(D13)	20	0.91	385	0.385	0.289	0.412	0.948	1.036	1.017	0.351	0.390	0.140	0.145	0.144	N/A	N/A	N/A	0.147
S215(D14)	20	1.00	25	0.025	0.011	0.032	0.431	0.565	0.520	0.021	0.028	0.050	0.055	0.053	N/A	N/A	N/A	0.027
S216(D15)	20	1.00	64	0.064	0.032	0.068	0.565	0.684	0.671	0.063	0.075	0.075	0.080	0.075	N/A	N/A	N/A	0.050
S218(D16)	20	0.70	80	0.080	0.057	0.103	0.572	0.664	0.618	0.073	0.086	0.080	0.085	0.083	N/A	N/A	N/A	0.051
S220(D17)	20	0.90	92	0.092	0.065	0.117	0.649	0.753	0.703	0.088	0.103	0.085	0.090	0.086	N/A	N/A	N/A	0.061
S222B	20	1.00	0	0.000	0.000	0.063	0.000	0.634	0.000	0.000	0.000	0.000	0.000	N/A	0.000	0.016	0.000	0.000
S176C(D2)	26	0.55	11	0.011	0.005	0.015	0.341	0.446	0.404	0.008	0.011	0.035	0.040	0.039	N/A	N/A	N/A	0.016
S176D(D3)	26	0.55	30	0.030	0.015	0.033	0.446	0.541	0.525	0.027	0.034	0.055	0.060	0.057	N/A	N/A	N/A	0.030
S141B(D4)	26	0.63	371	0.371	0.269	0.376	0.823	0.892	0.889	0.340	0.377	0.140	0.145	0.144	N/A	N/A	N/A	0.128
S141A(D5)	26	0.99	379	0.379	0.338	0.471	1.032	1.118	1.059	0.351	0.390	0.140	0.145	0.144	N/A	N/A	N/A	0.152
S141C(D6)	26	0.99	38	0.019	0.019	0.040	0.534	0.646	0.534	0.016	0.021	0.045	0.050	0.048	N/A	N/A	N/A	0.025
S168(D8)	26	0.99	1096	0.548	0.467	0.569	1.697	1.833	1.805	0.517	0.563	0.160	0.165	0.163	N/A	N/A	N/A	0.295
S165	26	1.00	0	0.000	0.000	0.001	0.148	0.235	0.148	0.000	0.000	0.000	0.000	0.000	0.008	0.015	N/A	0.000
S167A	26	1.00	0	0.000	0.000	0.002	0.183	0.291	0.183	0.000	0.000	0.000	0.000	0.000	0.008	0.015	N/A	0.000
S167B	26	1.00	0	0.000	0.000	0.002	0.245	0.388	0.245	0.000	0.000	0.000	0.000	0.000	0.008	0.015	N/A	0.000
S152(D18)	26	0.52	320	0.320	0.281	0.426	0.763	0.900	0.800	0.304	0.340	0.135	0.140	0.137	N/A	N/A	N/A	0.110
S149(D20)	26	0.65	1047	1.047	0.928	1.213	0.900	0.966	0.928	1.031	1.095	0.210	0.215	0.211	N/A	N/A	N/A	0.196
S150(D19)	26	0.50	428	0.428	0.418	0.582	0.883	1.006	0.891	0.417	0.458	0.150	0.155	0.151	N/A	N/A	N/A	0.135
S201A1	26	1.00	25	0.025	0.017	0.05	0.466	0.611	0.501	N/A	N/A	N/A	N/A	N/A	0.03	0.045	0.034	0.017
S201A2	26	1.00	32	0.032	0.017	0.05	0.466	0.611	0.532	N/A	N/A	N/A	N/A	N/A	0.03	0.045	0.037	0.020
S202A	26	1.81	291	0.291	0.259	0.421	1.15	1.299	1.179	N/A	N/A	N/A	N/A	N/A	0.075	0.09	0.078	0.092
S203A	26	2.33	479	0.479	0.462	0.66	1.516	1.658	1.528	N/A	N/A	N/A	N/A	N/A	0.095	0.109	0.096	0.147
S212	20	0.70	720	0.72	0.681	0.904	1.099	1.23	1.122	N/A	N/A	N/A	N/A	N/A	0.136	0.15	0.138	0.155
S204A	26	1.22	282	0.282	0.213	0.346	0.944	1.066	1.007	N/A	N/A	N/A	N/A	N/A	0.075	0.09	0.083	0.083

Velocity x Depth Calculation

100 Year 3 Hour Chicago Storm																		
Area ID (Dummy Segment, if applicable)	Road ROW Section	Longitudinal Slope (%)			SWMHYMO (38298vxd.out)					Calculation Sheet: Overflow for Typical Saw Tooth Road					Continuous Grade (SWMHYMO 38298 vxd.out)			
			Overflow Flowrate		Flowrate (cms)		Velocity (m/s)			Flowrate (cms)		Dynamic Depth (m)			Dynamic Depth (m)			Velocity x Depth
			Qx (l/s)	Qx (cms)	Qmin	Qmax	vmin	vmax	vx	Qmin	Qmax	dmin	dmax	dx	dmin	dmax	dx	(m^2/s)
S205B	26	0.71	8	0.008	0.002	0.012	0.244	0.387	0.330	N/A	N/A	N/A	N/A	N/A	0.015	0.03	0.024	0.008
S205C	26	0.71	185	0.185	0.134	0.218	0.713	0.805	0.769	N/A	N/A	N/A	N/A	N/A	0.075	0.09	0.084	0.065
S207	26	0.51	207	0.207	0.185	0.278	0.682	0.756	0.700	N/A	N/A	N/A	N/A	N/A	0.09	0.105	0.094	0.065
S206B	26	0.86	8	0.008	0.002	0.013	0.268	0.426	0.354	N/A	N/A	N/A	N/A	N/A	0.015	0.03	0.023	0.008
S222A	20	0.90	562	0.562	0.561	0.772	1.114	1.247	1.115	N/A	N/A	N/A	N/A	N/A	0.123	0.136	0.123	0.137
S144	26	5.00	141	0.141	0.08	0.172	1.07	1.295	1.219	N/A	N/A	N/A	N/A	N/A	0.047	0.063	0.058	0.070
S145	26	5.00	610	0.61	0.508	0.767	1.697	1.881	1.769	N/A	N/A	N/A	N/A	N/A	0.095	0.11	0.101	0.179
S214	26	0.50	280	0.28	0.221	0.334	0.683	0.756	0.721	N/A	N/A	N/A	N/A	N/A	0.09	0.105	0.098	0.071
S200	26	1.22	153	0.153	0.117	0.213	0.814	0.944	0.863	N/A	N/A	N/A	N/A	N/A	0.06	0.075	0.066	0.057
S166	26	1.00	162	0.162	0.154	0.197	0.861	0.912	0.870	N/A	N/A	N/A	N/A	N/A	0.083	0.09	0.084	0.073
S167C	26	0.99	6	0.006	0.006	0.019	0.407	0.534	0.407	N/A	N/A	N/A	N/A	N/A	0.025	0.038	0.025	0.010

flow multiplied by 2 for half st and then used City sheets



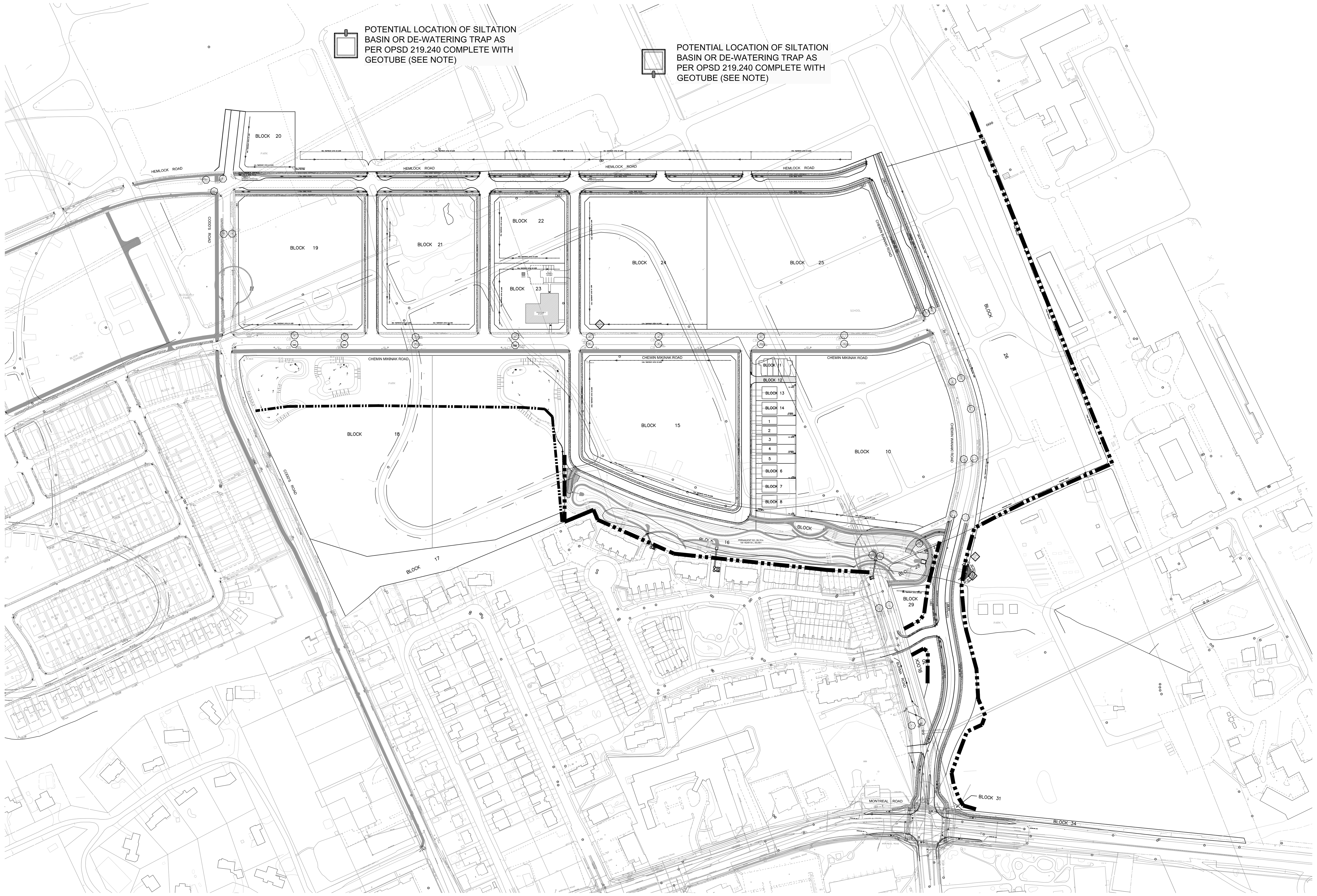
J:\38298-CFBRockvliffe\5.9 Drawings\59civil\SWM Ph1B\Figures\Subdivision\Figure XPSWMM Schematic.dwg Layout Name: Figure

IBI

Scale	Project Title	Drawing Title	Sheet No.
NTS	DESIGN BRIEF WATERIDGE VILLAGE AT ROCKCLIFFE PHASE 1B	XPSWMM SCHEMATIC	

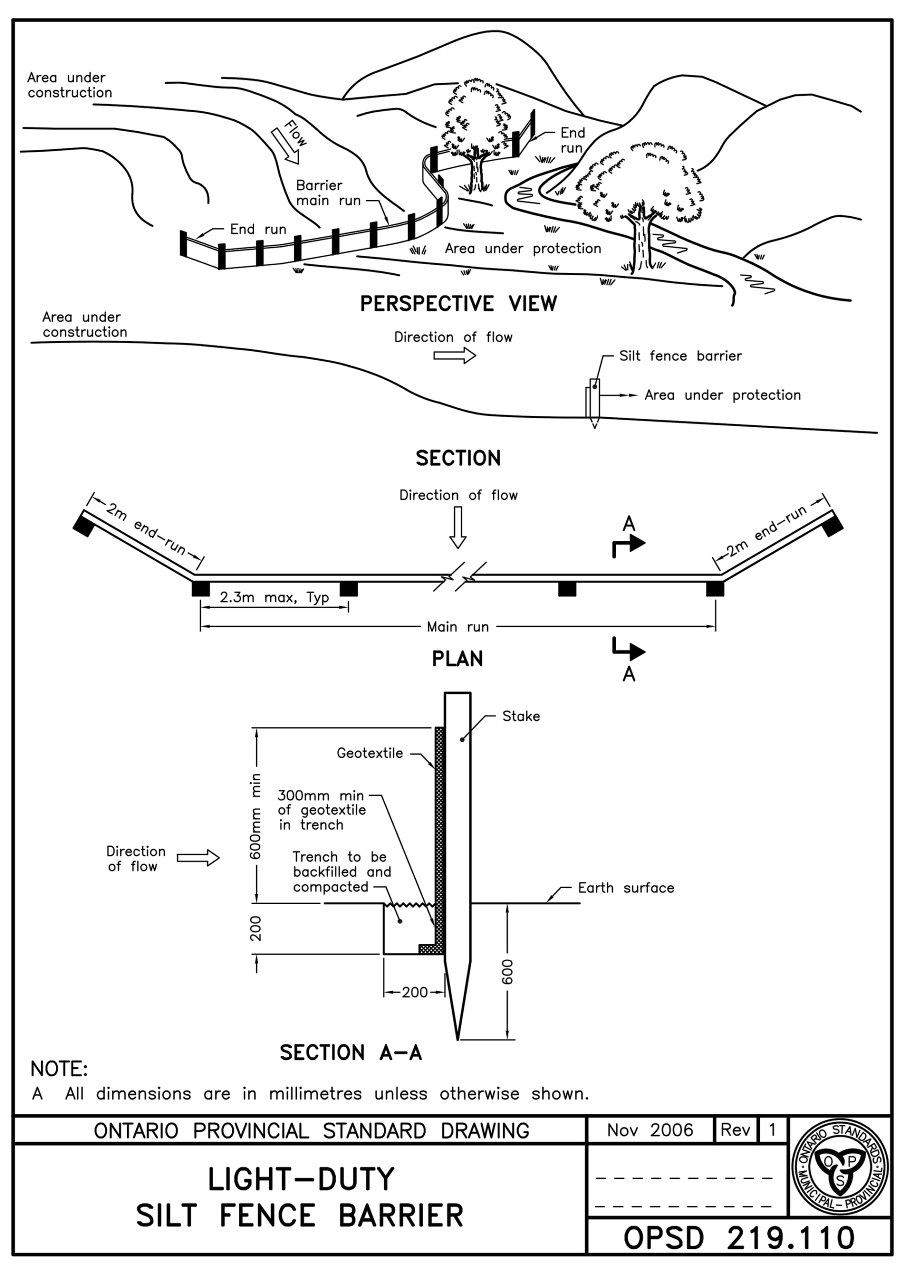
APPENDIX F

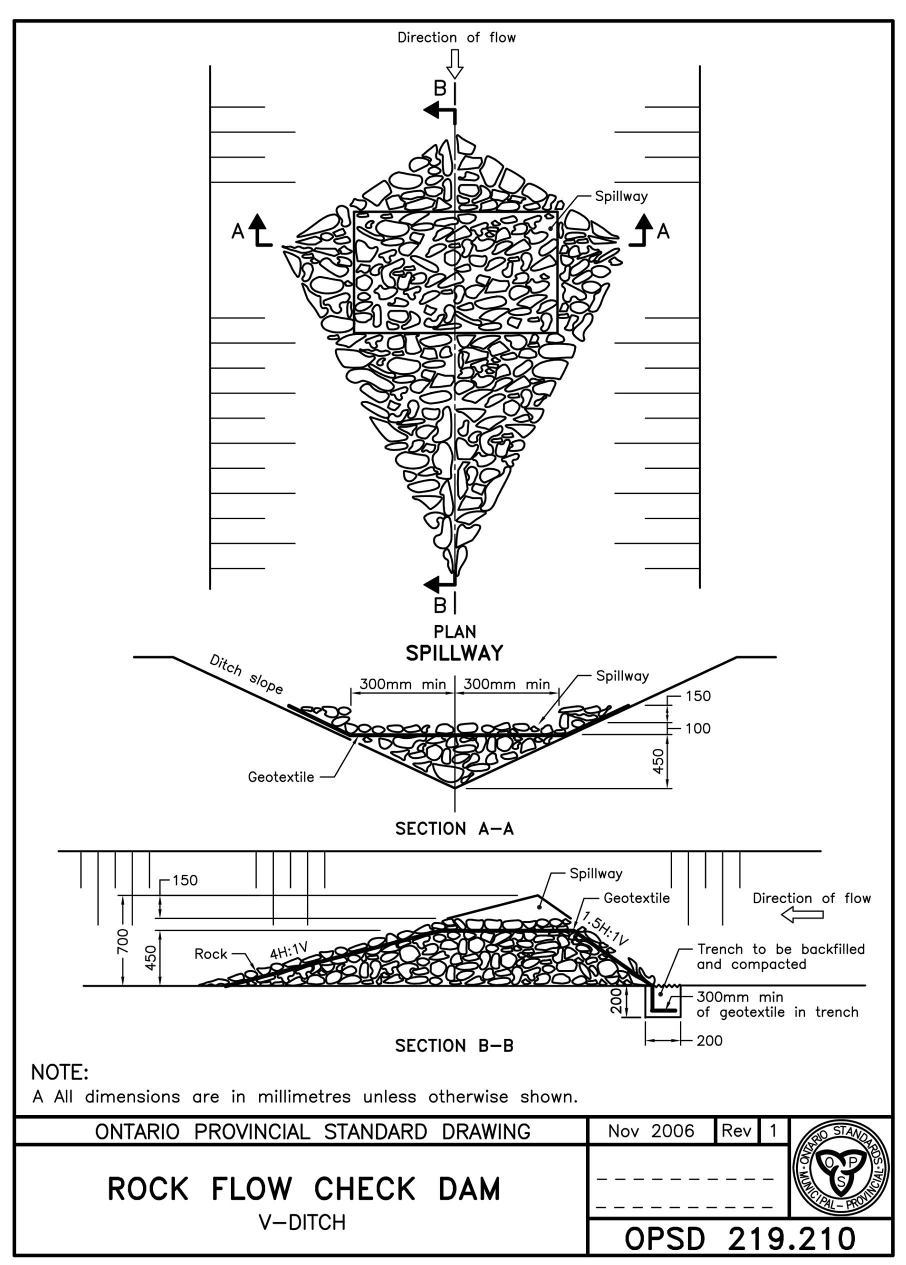
- Drawing 38298-900A, Erosion and Sedimentation Control Plan

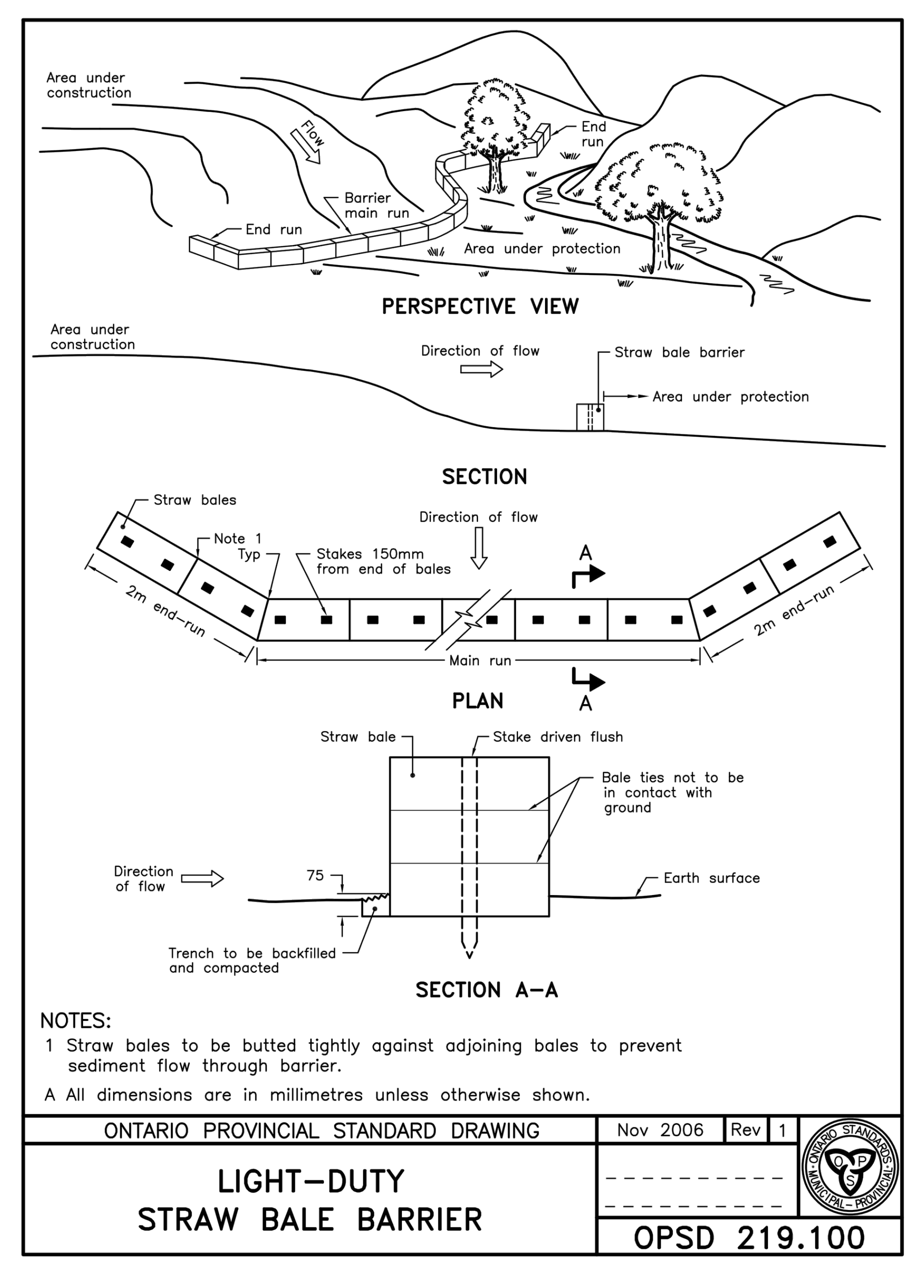


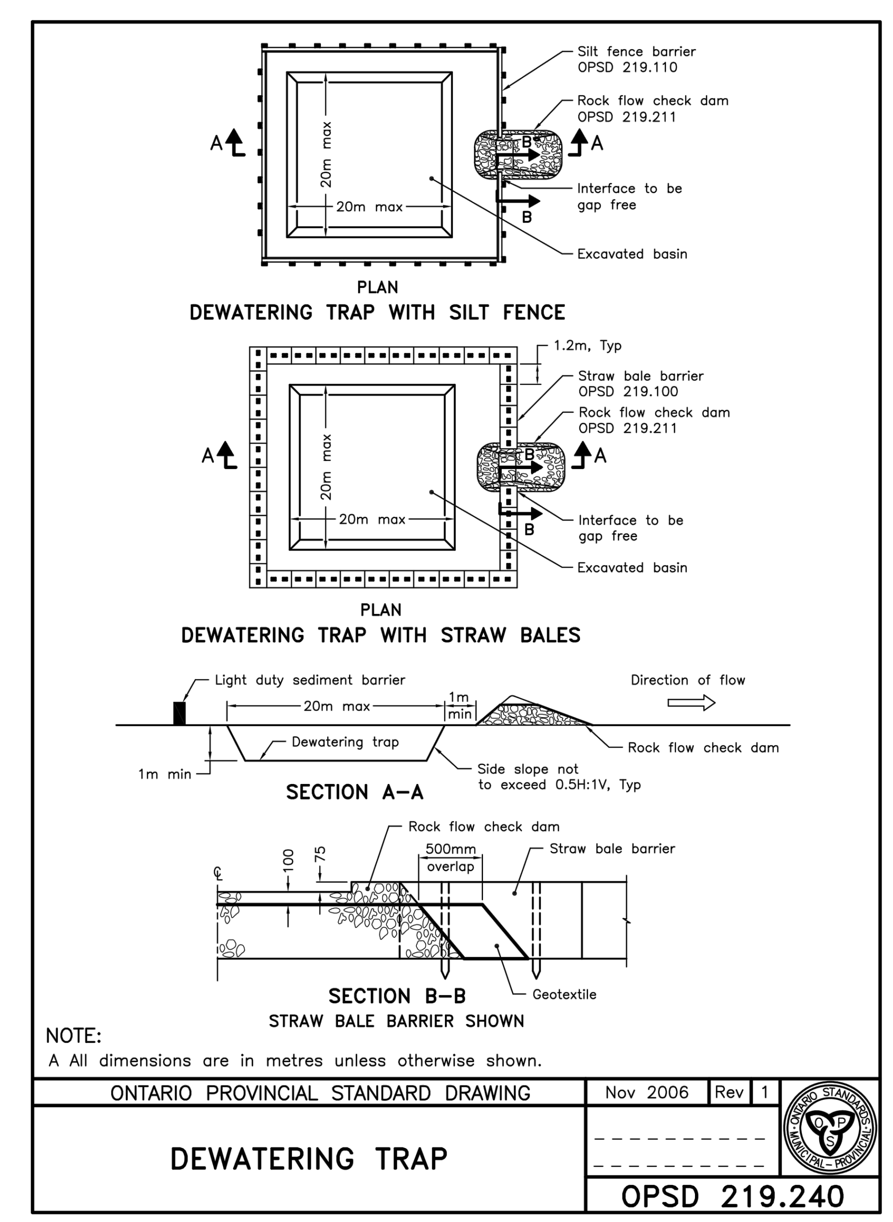
NOTES:

1. SILT FENCE TO BE ERECTED PRIOR TO EARTH WORKS BEING COMMENCED. SILT FENCE TO BE MAINTAINED UNTIL VEGETATION IS ESTABLISHED OR UNTIL START OF SUBSEQUENT PHASE.
2. STRAW BALE SEDIMENT TRAPS TO BE CONSTRUCTED IN EXISTING ROAD SIDE DITCHES. TRAPS TO REMAIN AND BE MAINTAINED UNTIL VEGETATION IS ESTABLISHED.
3. GEOTEXTILE FABRIC TO BE PLACED UNDER COVER OF ALL CATCHBASINS. GEOTEXTILE FABRIC IN STREET CB'S TO REMAIN UNTIL BASE COURSE ASPHALT IS LAID. GEOTEXTILE FABRIC IN RYCB'S TO REMAIN UNTIL VEGETATION IS ESTABLISHED. ALL CATCHBASINS TO BE REGULARLY INSPECTED AND CLEANED, AS NECESSARY, UNTIL SOD AND CURBS ARE CONSTRUCTED.
4. CONTRACTOR TO PROVIDE DETAILS ON LOCATION(S) AND DESIGN OF DEWATERING TRAP(S) PRIOR TO COMMENCING WORK. CONTRACTOR ALSO RESPONSIBLE FOR MAINTAINING TRAP(S) AND ADJUSTING SIZE(S) IF DEEMED REQUIRED BY THE ENGINEER DURING CONSTRUCTION.
5. CONTRACTOR TO PROTECT EXISTING CATCHBASINS WITH FILTER CLOTH UNDER THE COVERS TO TRAP SEDIMENTATION. REFER TO IDENTIFIED STRUCTURES.









REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ________

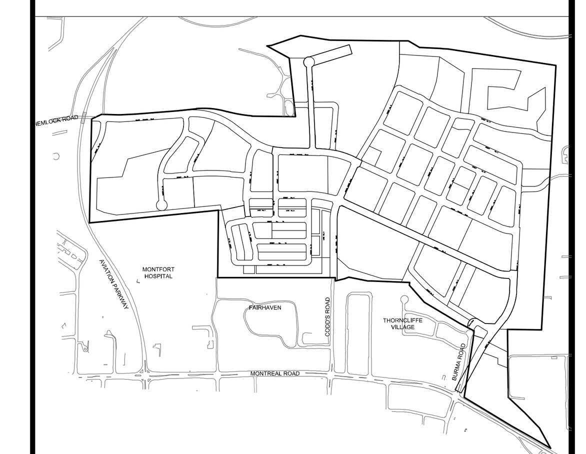
Date ________ 2017

Plan Number ________

LEGEND :

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

NOTE:
CONTRACTOR TO SUBMIT AN APPROVED EROSION AND SEDIMENTATION CONTROL PLAN PRIOR TO POND CONSTRUCTION. AS A MINIMUM, THE PLAN IS TO SATISFY THE TAKEN WATER DISCHARGE CONDITIONS OF THE PTTW.



No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6	REVISED PER MOECC COMMENTS	J.I.M.	2017:06:07
5	ISSUED FOR TENDER	J.I.M.	2017:03:23
4	SUBMISSION FOR MOECC APPROVAL	J.I.M.	2017:02:16
3	SUBMISSION No.3 FOR CITY REVIEW	J.I.M.	2017:01:25
2	SUBMISSION No.2 FOR CITY REVIEW	J.I.M.	2016:11:04
1	SUBMISSION No.1 FOR CITY REVIEW	J.I.M.	2016:07:08

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Ottawa ON K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

Project Title
WATERIDGE VILLAGE AT ROCKCLIFFE
PHASE 1B

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
17/06/07
PROVINCE OF ONTARIO

N

Drawing Title
EROSION AND SEDIMENTATION CONTROL PLAN

Scale	1 : 3000
Design: J.I.M.	Date: MAY 2016
Drawn: M.M.	Checked: J.I.M.
Project No.: 38298	Drawing No.: 900A

D07-16-15-0003

#17063

October 22nd, 2019
Ref No. 65578.1

To: **Jean Lachance, Canada Lands Company (CLC)**

From: **Chris Denich, M.Sc., Aquafor Beech Ltd., Meaghan Dustin, E.I.T., Aquafor Beech Ltd.**

Re: **Wateridge Phase 1B Developer's Checklist**

1.0 Phase 1B

Wateridge Village Phase 1B includes 7 development blocks located between Codd's Road and Wanaki Road to the west and east, and Hemlock Road and Wanaki Road to the north and south, in addition to Squadron Crescent. The land-use within this block includes semi-detached singles, townhouse blocks, low-rise residential, mid-rise residential, mid-rise mixed-use, and parks.

As part of the Wateridge Village low impact development (LID) Demonstration project, this phase will include stormwater management treatment strategies that maximize pervious surfaces and increase infiltration and groundwater recharge through a combination of lot-level (source), conveyance and end-of-pipe stormwater management controls.

The following sections outline the stormwater criteria the developer is required to meet with the implementation of LID measures. The testing requirements necessary for design and implementation are also described. Finally, LIDs recommended to be incorporated within Phase 1B are summarized.

2.0 SWM Criteria

All LID measures implemented in Phase 1B of the Wateridge Village development shall be designed to achieve the infiltration, erosion, and water quality design targets summarized in **Table 2.1**. These targets represent minimum volumes to achieve water balance (infiltration), water quality, and erosion controls.

All landscaped areas (turf or garden) will require Topsoil Amendments per Option 1 or Option 2; these options are outlined in **Appendix B**.

Table 2.1 LID Design Targets

LID Design Targets		
Infiltration*	**Erosion***	**Water Quality†**
LID Infiltration target = 4mm Maintain groundwater recharge per the existing conditions water budget. Groundwater recharge includes hydrological connection and linkages to wetlands, woodlots, streams and other natural features. LID lot-level and conveyance controls shall infiltrate an equivalent volume a 4mm event applied to the full catchment area.	LID Erosion Control Target = 4mm LID lot-level and conveyance controls shall match the existing conditions water balance through the application of the infiltration targets in order to reduce or eliminate the effects of hydro-modification (magnitude, duration and frequency) form the contributing drainage area. As such the infiltration targets shall be considered the erosion control targets for LID controls.	Min. Target = 15mm The minimum water quality event for LID lot-level and conveyance controls for the Former CFB Rockcliffe shall be the 15mm event. LID controls shall treat the runoff from a 15mm event through filtration, detention, evapotranspiration, detention and release and infiltration. Drainage areas which achieve the minimum 15mm water quality target shall be required to discharge to another LID in the treatment train and or an end-of-pipe pond to achieve the full enhanced level of control per the MOE SWMPD. Enhanced Target = 25mm To achieve the enhanced level of control, per the MSS, the target water quality event for LID lot-level and conveyance controls shall be the 25mm event. LID controls shall treat the runoff from a 25mm event through filtration, detention, evapotranspiration, detention and release and infiltration. Drainage areas which achieve the enhanced water quality target do not require treatment in an end-of-pipe facility.
*Catchment Based Target – target applied over the full catchment area †Contributing Impervious Area Target – applied to the directly contributing impervious area to the LID control and should focus on the "treatment" of the required event through a combination of filtration, storage and release, evaporation and infiltration. Note: the water quality target shall include the required water balance (infiltration) targets i.e. water quality treatment = 15mm water quality event – 4mm infiltration/erosion target.		

3.0 Testing Requirements

The implementation of LIDs requires a geotechnical assessment (including groundwater monitoring) and infiltration tests to determine the in-situ conditions prior to design.

3.1 Geotechnical Assessment

A soils report will be required to accompany the design of all infiltration facilities to ensure adequate soil permeability and depth to the seasonally high water table. This report should include:

- Borehole information, including soil stratigraphy, composition, grain-size and chemical analysis (additional testing may be required for individual LID techniques per the requirement of the Low Impact Development Stormwater Management Planning and Design Guide, Version 1.0 (TRCA/CVC - 2010); number of boreholes can range from 2 to greater than 20 based on size of facility and site specific conditions. Boreholes should be extended a minimum of 1.5m below the proposed invert of the proposed LID facility.
- Geotechnical assessment will generally include:
  - particle size distribution (ASTM D422 and D2217),
  - Stratigraphy, Piezometer(s) and Standpipes –to determine seasonally high (March – April or Late fall before snowfall) groundwater elevation information per O.Reg 389/09
  - natural moisture content (ASTM D2216),
  - plasticity characteristics (ASTM D4318),
  - soil strength assessment (CBR and Soaked CBR) for permeable pavement designs.

The scope of the geotechnical assessment shall be determined based on the need to confirm that the following conditions are not present. The following conditions are considered unsuitable or may increase facility failure rate for infiltration based controls.

1. Slopes ≥20% and contributing catchment area slopes ≥15%;
2. Seasonally-high water table elevations that are within 1.0-0.60 metres of the bottom of proposed infiltration based facilities;
3. Bedrock within 1 metre of the bottom of the proposed infiltration facility;
4. Wetlands and associated hydric soils;
5. Proposed Land uses that are classified as potential “hot spots”;
6. Drinking water wells within 30 metres; and
7. Karst topography.

It is not anticipated that conditions 1, 6 or 7 above will be of concern.

3.2 Infiltration Testing

For design purposes, the preferred approach to measure field saturated hydraulic conductivity (Kfs) at a subject site include:

- Guelph Permeameter
- Double Ring Infiltrometers (constant head)
- Single ring (constant head pressure)

At least one (1) test will be required at 2 soil depths for each 450m^2 footprint surface area at each location. **Note: Infiltration rates derived from borehole analysis, T-test, slug or other generalized test shall not be accepted for design purposes.** All infiltration testing should be completed per Appendix C of the TRCA/CVC LID Planning and Design Guide (2010). As per this procedure, the safety factor should account for the fill implementation required for the grade raise in this phase overlaying the existing native material. Based on in-situ soil testing of previous phases, it is anticipated that the soils tested in Phase 1B will have a field saturated hydraulic conductivity below 15mm/hr and therefore will require the installation of an underdrain per the TRCA/CVC LID Stormwater Planning and Design Guide (2010).

4.0 Recommended LID Types

The Draft Wateridge Village Phases 1B - Master Concept Plan (Appendix A) displays the proposed land-use in Phase 1B; including: low & medium rise residential and mixed-use, parks, and municipal ROW. Table 4.1 summarizes suitable LID measures by each land use.

Table 4.1 Low Impact Development (LID) Suitability Matrix by Land-Use

		Phase 1B Proposed Land-Uses			
		Low & Medium Rise Residential	Low and Medium Rise Mixed-Use	Schools & Parks	Municipal ROW
	Assumed Lot Coverage	50-60%	80-100%	10-30%	n/a
LID Type					
Lot-Level Controls	Green Roofs	□	□	n/a	n/a
	Bioretention	□□	□□	□□□	□□□
	Rainwater Harvesting	□	□	n/a	n/a
	Soakaways, Trenches & Chambers	□□□	□□□	□□□	n/a
	Downspout Disconnection	□□□	□□□	n/a	n/a
	Soil Amendments	□□□	□□□	□□□	n/a
	Permeable Pavements	□□	□□	□□	See Conveyance Controls
	Infiltration Basins	n/a	n/a	□□□	n/a
Conveyance Controls	Vegetated/Grass Swales	n/a	n/a	□	□□
	Bioswales/Biofilters	n/a	n/a	□□	□□□
	Perforated Pipes	n/a	n/a	□	□□
	Permeable Pavements	n/a	n/a	□□	□□□
*Assumed lot coverage indicates percentage of development with hard surface land cover					
□□□ **= Highly Suitable,** □□ **= Suitable,** □ **= Poor Suitability,** n/a **= Not Applicable**					

In areas where infiltration is not possible, i.e. over underground parking structures, runoff can be collected using ditch inlets, catch basins, or eavestroughs for roof surfaces and conveyed via pipe to an infiltration system or end-of-pipe facility.

Based on the land-use proposed in the Master Concept Plan for Phase 1B, the following LIDs can be implemented in Phase 1B:

- Soakaways, Trenches & Chambers
- Downspout Disconnection
- Soil Amendments
- Bioretention
- Infiltration Basins

- Bioswales/Biofilters
- Permeable Pavements
- Vegetated/Grass Swales
- Perforated Pipe

Of the options listed above, bioswales, permeable pavement laybys, and soil amendments have been implemented in the proposed Phase 1B design.

Relevant resources detailing the constraints, implementation, construction, and monitoring of all suitable LID measures are included in **Appendix C**. These resources also include the Stormwater Management Planning and Design Manual, background groundwater information, permitting requirements, and monitoring and costing information.

Appendix A: Draft Wateridge Village Phases 1B - Master Concept Plan

NOTES

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PLANNING+DESIGN

MUNICIPAL PLANNING APPROVALS FOR WATERIDGE VILLAGE PHASE 1B

ILLUSTRATIVE MODEL

CANADA LANDS COMPANY
SOCIÉTÉ IMMOBILIÈRE DU CANADA

CREATED BY: MB

REVIEWED BY: MS

DATE: 14/11/2016

REVISION NO. 07

NOTES

FOTENN
PLANNING+DESIGN

MUNICIPAL PLANNING APPROVALS FOR WATERIDGE VILLAGE PHASE 1B

ILLUSTRATIVE MODEL

CANADA LANDS COMPANY
SOCIÉTÉ IMMOBILIÈRE DU CANADA

CREATED BY: MB

REVIEWED BY: MS

DATE: 14/11/2016

REVISION NO. 07

Appendix B: Topsoil Amendment Options

OPTION 1
On-Site Soil Amendment - Default Ratio 3:1
All Building Types

Materials

- Amend existing site topsoil using 3:1 ratio by <u>volume</u> (3 parts existing topsoil, 1 part amendment material)
- Amendment Material: organic matter primarily leaf, yard and bark waste compost of 20-30% by <u>dry weight</u> as determined by Loss-on-Ignition (LOI) and a pH of 6.0 to 8.0
- No uncomposted manure or other organic materials, sphagnum peat or organic amendments that contain sphagnum peat

Placement and Amendments

1. Remove existing topsoil and preserve on-site.
2. Rip native subsoil (decompaction) using the teeth of an excavator or bobcat bucket or equivalent to a depth of 100-200mm. Rip using a perpendicular pattern (See Detail No.1) ensuring full site coverage. No ripping within tree protection areas (See Detail No.2) or within 3m of building foundations (See Detail No.3).
3. Amend existing site topsoil to meet post construction soil amendment requirements using 3:1 ratio by <u>volume</u> (topsoil : amendment material).
4. Two (2) methods for amending the existing soils in place are acceptable:

   <u>Method No.1 - Layer and Incorporate (Detail No.4)</u>
   - i. Apply 100mm of existing site topsoil followed by 50mm of amendment material and incorporate/mix amended material.
   - ii. Lightly roll or smooth using the back of the machinery bucket.
   - iii. Repeat i. and ii.
   - iv. Adjust layer quantities to ensure a settled amended topsoil depth of 300m and compliance with site grading. Placement should account for 10% settlement.

   <u>Method No.2 - Mechanical or Bucket Mix</u>
   - i. Successively add, mix and pile one (1) unit of amendment material with three (3) units of existing site topsoil.
   - ii. Thoroughly mix.
   - iii. Repeat i. and ii to ensure thorough mixing until required volume is achieved.
   - iv. Place 150mm of amended topsoil, lightly roll or smooth using the back of the machinery bucket.
   - v. Repeat iv.
   - vi. Adjust layer quantities to ensure a settled amended topsoil depth of 300m and compliance with site grading.

   Amended topsoil should be wetted after application, allowed to settle for a minimum of one (1) week and grades adjusted as required prior to installation of turf.

-IMPORTANT-

Documentation Requirements

As part of verification, the owners shall produce delivery tickets, receipts and specifications detailing the delivery address, quantities and product description and sources for verification by City inspectors. Delivery address is to be listed and must correspond to the property/site being inspected. Site without proper documentation may be subject to additional verification procedures including laboratory testing at the expense of the owner. The owner's engineer shall provide a duly notarized letter with all supporting documentation certifying the proper installation and placement of amended soil.

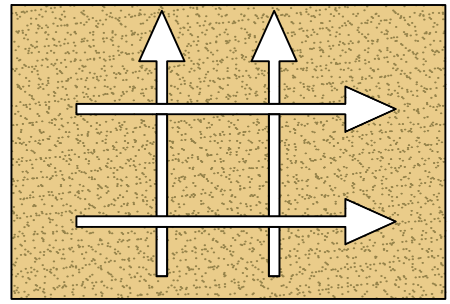
Consultant Verification/Inspection

Verification may occur after the minimum one (1) week settlement period. Verification is suggested prior to turf placement. Non-compliant sites shall be rectified at the expense of the owner.

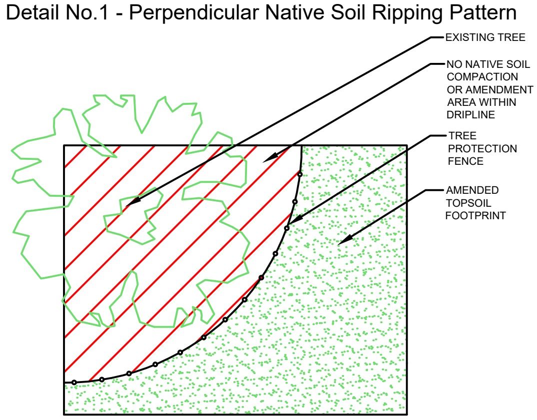
At random, the Developer's consultant shall dig at least one (1) test hole to verify amended topsoil depth and uncompacted soil depths.

Requirements:

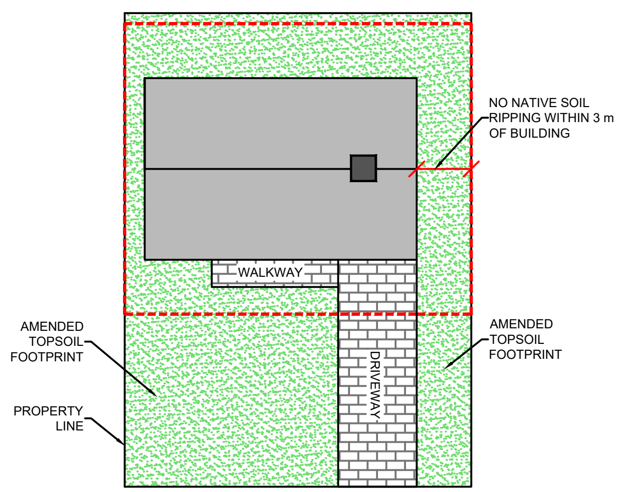
1. Amended topsoil layer shall be easily dug using only the inspector's weight or cored without other mechanical assistance.
2. The amended topsoil layer shall be darker in color than the unamended- ripped subsoil and particles of organic matter should be easily visible.
3. Measured amended topsoil depths shall be deemed to be in conformance based on the following:
   - Using a common garden spade, the measured depth of amended topsoil shall be equal to the required 300mm depth (±25mm)
   - Using a small diameter coring unit, the measured core depth of amended topsoil shall be equal to the required 300mm depth (±50mm)



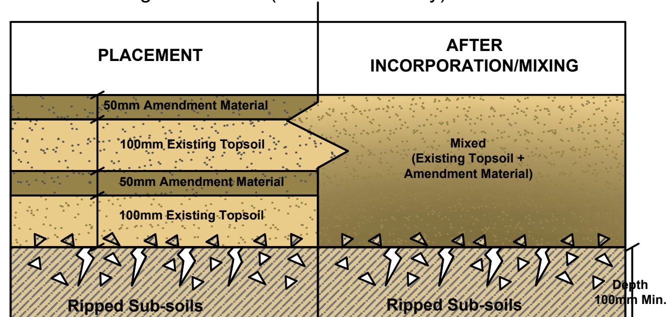
Detail No.1 - Perpendicular Native Soil Ripping Pattern



Detail No.2 - No Native Soil Ripping within Tree Protection Areas or Amendment



Detail No.3 - No native soil ripping within 3.0m of Building Foundation (Amendment Only)

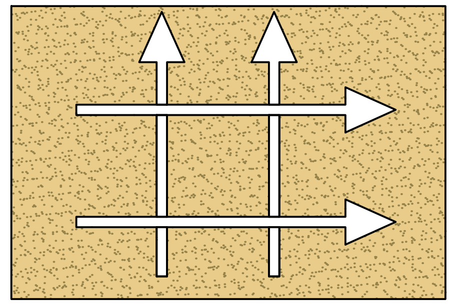


Detail No.4 Amendment Method No. 1

OPTION 2
On-Site Soil Amendment
Import and Replace Topsoil with Amendment Material
All Building Types and Parks

Materials

- Amendment material shall be obtained from a Compost Quality Assurance (CQA) licensed and OMOE/ CCME approved facility and shall comply with the Category “A” compost designation. The amendment material must contain:
  - Organic matter primarily leaf, yard and bark waste compost of 8-15% by dry weight as determined by Loss-on-Ignition (LOI) and a pH of 6.0 to 8.0.
  - No uncomposted manure or other organic materials, sphagnum peat or organic amendments that contain sphagnum peat.

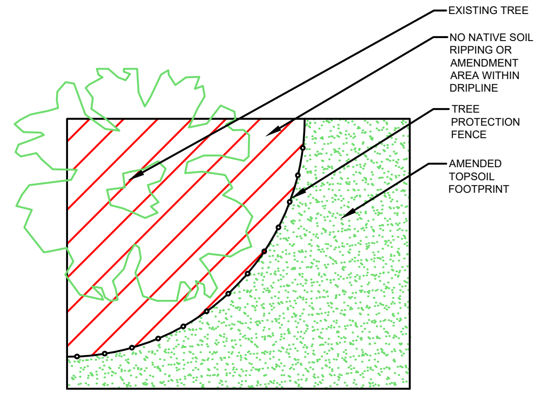


Detail No.1 - Perpendicular Native Soil Ripping Pattern

Placement and Amendments

1. Remove existing topsoil and dispose off-site in accordance with OPSS 206 and OPSS 180, O. Reg. 153/06, the Environmental Protection Act or municipal by-laws and policies, whichever supersedes.
2. Rip native subsoil (decompaction) using the teeth of an excavator or bobcat bucket or equivalent to a native subsoil at depth of 100-200mm. Rip using a perpendicular pattern (See Detail No.1) ensuring full site coverage. No ripping within tree protection areas (See Detail No.2) or within 3m of building foundations (See Detail No.3).
3. Import pre-mixed amended topsoil (300mm depth of coverage required).
4. Place imported pre-mixed amended topsoil in 150mm lifts, lightly roll or smooth using machinery bucket and repeat. Adjust layer quantities to ensure a settled amended topsoil depth of 300mm and compliance with site grading. (See Detail No.4).

Amended topsoil should be wetted after application, allowed to settle for a minimum of one (1) week and grades adjusted as required prior to installation of turf.



Detail No.2 - No Native Soil Ripping within Tree Protection Areas or Amendment

-IMPORTANT-

Documentation Requirements

As part of verification, the owners shall produce delivery tickets, receipts and specifications detailing the delivery address, quantities and product description and sources for verification by City inspectors. Delivery address is to be listed and must correspond to the property/site being inspected. Sites without proper documentation may be subject to additional verification procedures including laboratory testing at the expense of the owner. The owner's engineer shall provide a duly notarized letter with all supporting documentation certifying the proper installation and placement of amended soil.

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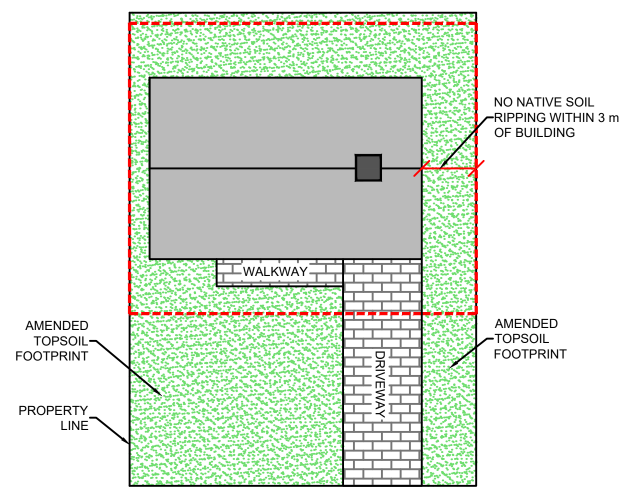
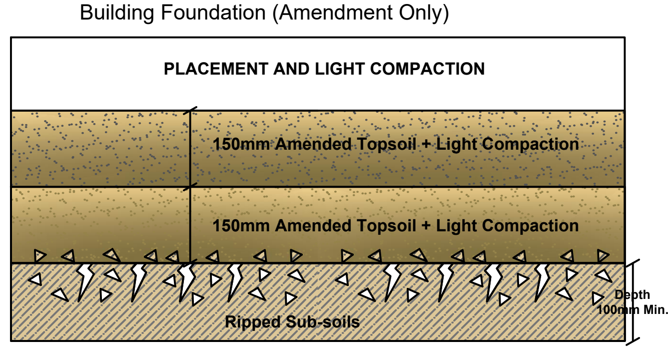
3. Measured amended topsoil depths shall be deemed to be in conformance based on the following:
   - Using a common garden spade, the measured depth of amended topsoil shall be equal to the required 300mm depth (±25mm)
   - Using a small diameter coring unit, the measured core depth of amended topsoil shall be equal to the required 300mm depth (±50mm)



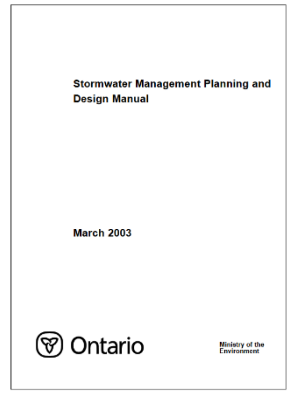
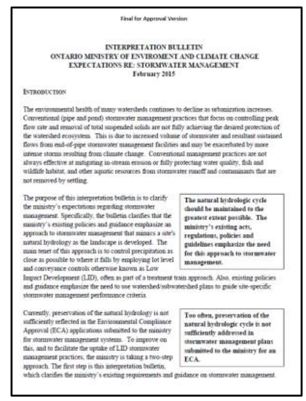
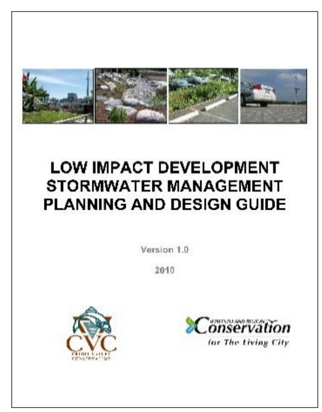
Detail No.3 - No Native Soil Ripping within 3.0m of Building Foundation (Amendment Only)

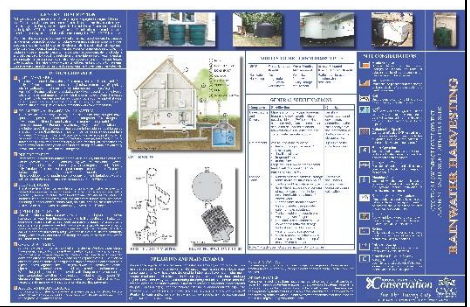
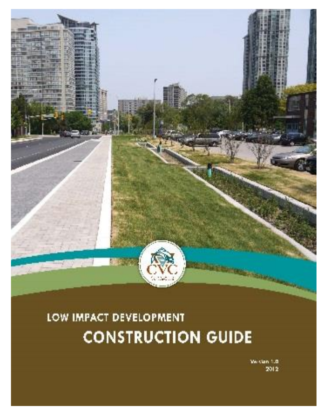
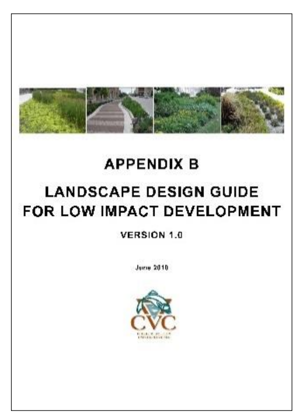


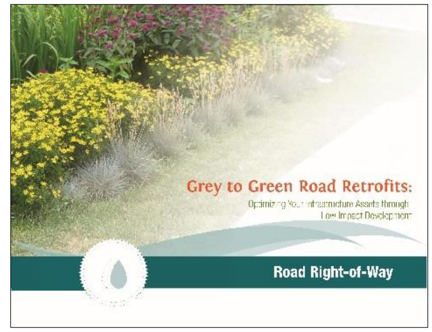
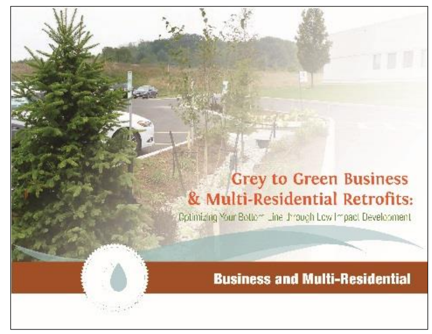
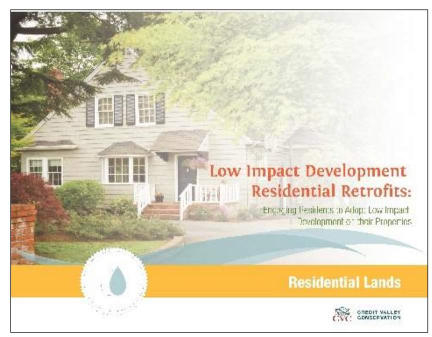
Detail No.4 Placement and Compaction Lifts for Amended Topsoil

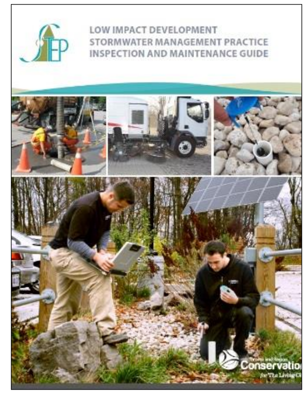
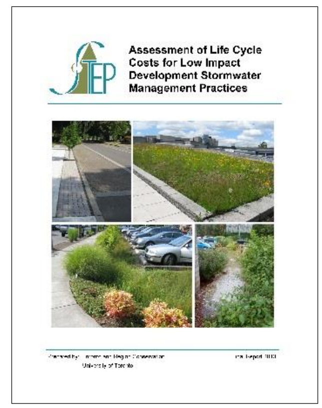
Appendix C: Resource Directory

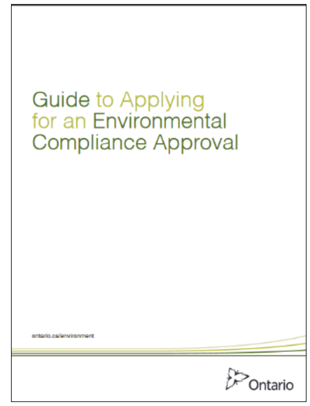
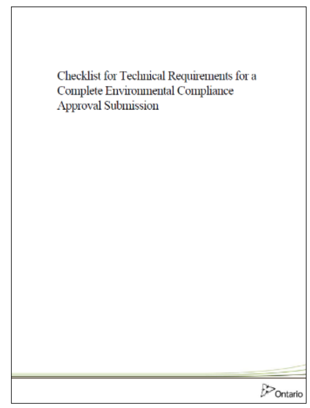
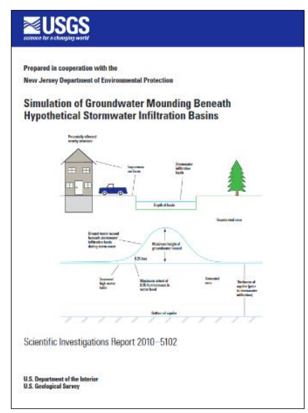
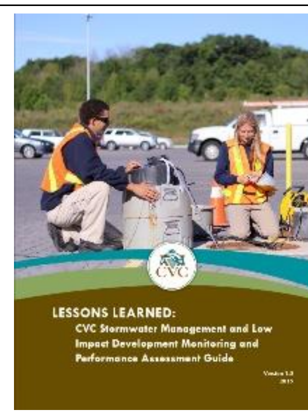
Resource Directory

Provincial Manual	**Stormwater Management Planning and Design Manual (MOE, 2003)** https://www.ontario.ca/document/stormwater-management-planning-and-design-manual-0	
Interpretation Bulletin	**Interpretation Bulletin Ontario Ministry of Environment and Climate Change Expectation Re: Stormwater Management (MOE, 2015)** http://www.raincommunitysolutions.ca/wp-content/uploads/2015/07/MOECC-interpretation-bulletin-re-stormwater-management.pdf	
Planning and Design Guide	**Low Impact Development Stormwater Management Planning and Design Guide (TRCA/CVC, 2101, Version 1.0)** http://sustainabletechnologies.ca/wp/wp-content/uploads/2013/01/LID-SWM-Guide-v1.0_2010_1_no-appendices.pdf	
Planning Guide	**Grey to Green Enhanced Stormwater Management Master Planning: Guide to Optimizing Municipal Infrastructure Assets and Reducing Risk (CVC)** http://www.creditvalleyca.ca/wp-content/uploads/2016/01/ORGuide.pdf	

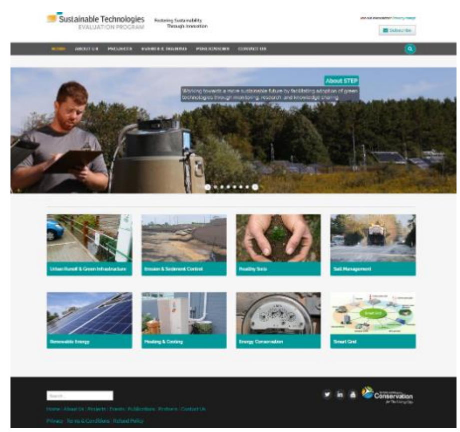
		
Planning & Design Fact Sheets	**Low Impact Development Stormwater Management Planning and Design Guide, including Fact Sheets:** http://www.creditvalleyca.ca/low-impact-development/low-impact-development-support/stormwater-management-lid-guidance-documents/low-impact-development-stormwater-management-planning-and-design-guide/	
Construction Guide	**Construction Guide for Low Impact Development (CVC, 2012, Version 1.0)** http://www.creditvalleyca.ca/wp-content/uploads/2013/03/CVC-LID-Construction-Guide-Book.pdf	
Landscape Design Guide	**Landscape Design Guide for Low Impact Development (CVC – Version 1.0)** http://www.creditvalleyca.ca/low-impact-development/low-impact-development-support/stormwater-management-lid-guidance-documents/andscape-design-guide-for-low-impact-development-version-1-0-june-2010/	

Roads Retrofit Design Guide	**Low Impact Development Road Retrofits: Optimizing Your Infrastructure through Low Impact Development (CVC)** http://www.creditvalleyca.ca/wp-content/uploads/2014/08/Grey-to-Green-Road-ROW-Retrofits-Complete_1.pdf	
Business & Multi- Res. Retrofit Design Guide	**Grey to Green Business & Multi- Residential Retrofits: Optimizing Your Infrastructure through Low Impact Development (CVC)** http://www.creditvalleyca.ca/wp-content/uploads/2015/01/Grey-to-Green-Business-and-Multiresidential-Guide1.pdf	
Residential Retrofit Design Guide	**Low Impact Development Residential Retrofits: Engaging Residents to Adopt Low Impact Development in their Properties (CVC)** http://www.creditvalleyca.ca/wp-content/uploads/2015/01/Grey-to-Green-Residential-Guide1.pdf	
Public Lands Retrofit Design Guide	**Grey to Green Public Lands Retrofits: Optimizing Your Infrastructure through Low Impact Development (CVC)** http://www.creditvalleyca.ca/wp-content/uploads/2015/01/Grey-to-Green-Pulic-Lands-Guide.pdf	

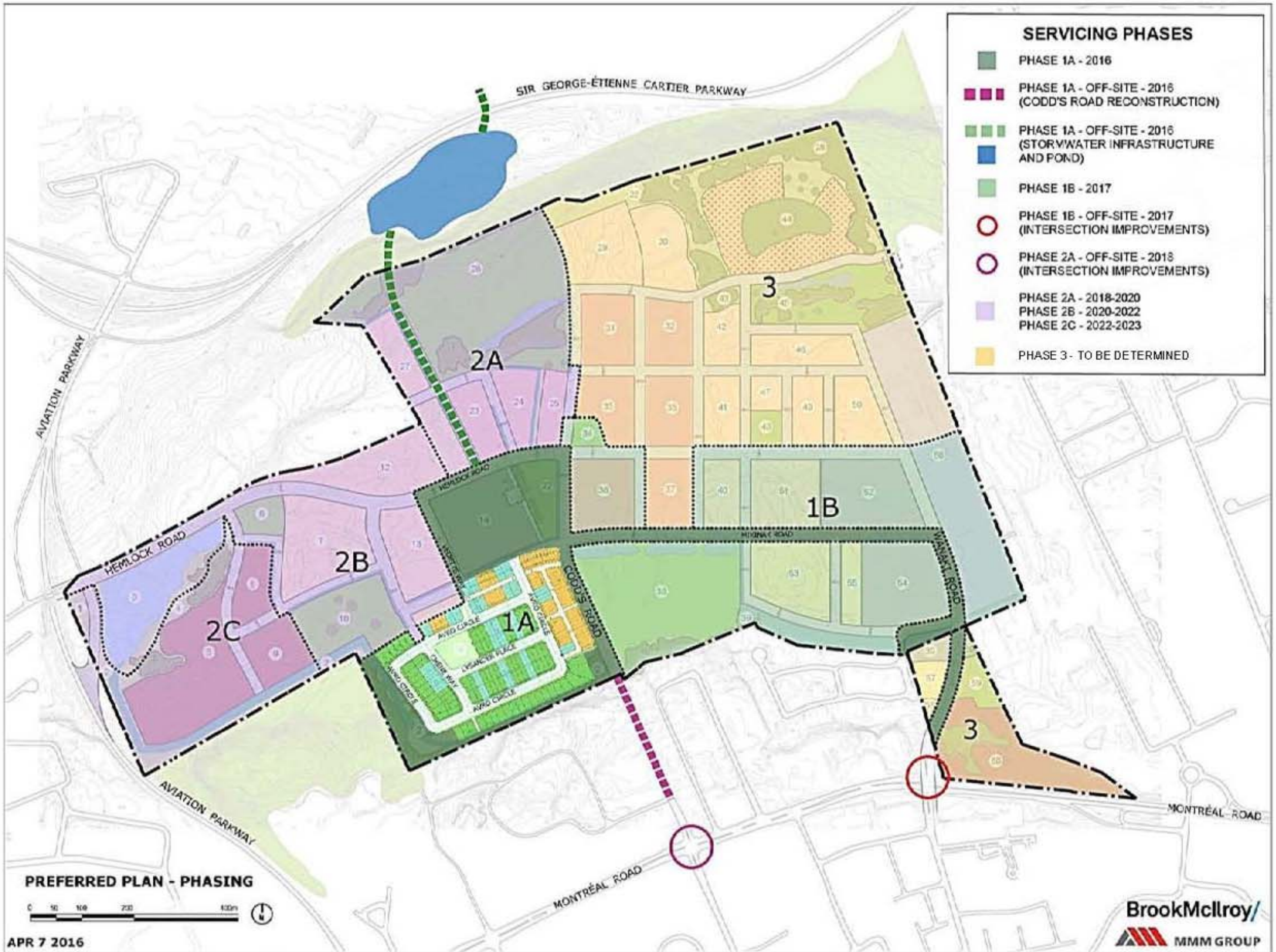
Maintenance Guide	**Low Impact Development Stormwater Management Practice Inspection and Maintenance Guide (TRCA/ STEP, 2016, Version 1.0)** http://www.sustainabletechnologies.ca/wp/home/urban-runoff-green-infrastructure/low-impact-development/low-impact-development-stormwater-practice-inspection-and-maintenance-guide/	
Life Cycle Costs Report	**Assessment of Life Cycle Costs for Low Impact Development Stormwater Management Practices (TRCA, UofT, 2013)** http://www.sustainabletechnologies.ca/wp/wp-content/uploads/2013/06/LID-LCC-final-2013.pdf	
Costing Tool	**Low Impact Development Life Cycle Costing Tool (STEP)** http://www.sustainabletechnologies.ca/wp/home/urban-runoff-green-infrastructure/low-impact-development/low-impact-development-life-cycle-costs/	

Approval Guide	**Guide to Applying for an Environmental Compliance Approval** https://www.ontario.ca/document/guide-applying-environmental-compliance-approval	
ECA Submission Checklist	**Checklist for Technical Requirements for Complete Environmental Compliance Approval Submission** https://www.ontario.ca/document/checklist-technical-requirements-complete-environmental-compliance-approval-submission	
Groundwater Mounding Analysis	**Simulation of Groundwater Mounding Beneath Hypothetical Stormwater Infiltration Basins** **USGS** https://pubs.usgs.gov/sir/2010/5102/ Spreadsheet Hantush_USGS_SIR_2010-5102-1110.xlsm	
Monitoring Guide	**CVC Stormwater Management and Low Impact Development Monitoring and Performance Assessment Guide (2015, V1.0)** http://www.creditvalleyca.ca/wp-content/uploads/2016/06/Monitoring_Guide_Final.pdf	

Planning Level Modelling Tool (Class A)	**LID Treatment Train Tool (LID TTT)** http://www.sustainabletechnologies.ca/wp/low-impact-development-treatment-train-tool/	
LID Performance Resources	**Sustainable Technologies Evaluation Program available** https://wiki.sustainabletechnologies.ca/wiki/Main_Page **LID BMP monitoring plans, technical reports and case studies** http://www.creditvalleyca.ca/low-impact-development/lid-maintenance-monitoring/ **International Stormwater BMP Database** http://www.bmpdatabase.org/index.htm.	

Other Resources and Reports		
	Sustainable Technologies Evaluation Program (STEP): www.sustainabletechnologies.ca/ **Resources, Studies and Reports** 1. Green Infrastructure Map 2. Stormwater Infiltration in Cold Climates Review (2009) 3. Stormwater Management and Watercourse Impacts: The Need for a Water Balance Approach 4. Preserving and Restoring Healthy Soil: Best Practices for Urban Construction 5. LID Discussion Paper 6. Urban Water Balance 7. LID "Barrier Buster" fact sheet series **Features Studies and Resources:** 8. Bioretention and Rain Gardens 9. Green Roofs 10. Soakaways, Infiltration Trenches and Chambers 11. Permeable Pavement 12. Swales and Roadside Ditches 13. Perforated Pipe Systems 14. Rainwater Harvesting 15. Residential Stormwater Landscaping 16. Water Balance for the Protection of Natural Features	

Appendix D: Phasing Plan



Timing and phases are subject to change.

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Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Services

Geotechnical Investigation

Proposed Residential Buildings
715 Mikinak Road
Ottawa, Ontario

Prepared For

Ottawa Community Housing

July 14, 2020

Report: PG5354-1

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1.0 Introduction

Paterson Group (Paterson) was commissioned by Ottawa Community Housing to conduct a geotechnical investigation for the proposed residential development to be located 715 Mikinak Road in the City of Ottawa (refer to Figure 1 - Key Plan in Appendix 2 of this report).

The objective of the geotechnical investigation was to:

❏ Determine the subsoil and groundwater conditions at this site by means of test holes.

❏ 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.

2.0 Proposed Development

Based on the available drawings, it is understood that the proposed development will consist of three multi-storey residential buildings. It is expected that one basement/underground parking will be associated to the buildings. Associated access lanes, parking area, walkways, and landscaped areas are expected for the proposed development. The subject site is surrounded by roadways with Hemlock Road to the north, Michael Stoqua Street to the east, Barielle-Snow Street to the west, and Mikinak Road to the south.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

A previous field which included the subject site was completed on November 11, 2004 by DST. A total of 2 boreholes with monitoring wells were advanced to a maximum depth of 5.2 m. The locations of the test holes from the previous investigation are shown on Drawing PG5354-1 - Test Hole Location Plan included in Appendix 2.

The current field program was completed on June 15 and 16, 2020 by Others, which included a total of 13 boreholes. The boreholes were advanced to a maximum depth of 8.3 m. The test hole locations were distributed in a manner to provide general coverage of the subject site taking into consideration underground utilities and site features. The locations of the test holes are shown on Drawing PG5354-1 - Test Hole Location Plan included in Appendix 2.

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 presented in Appendix 1 of this report.

Sampling and In Situ Testing

Soil samples were collected from the boreholes using two different techniques, namely, sampled directly from the auger flights (AU) or collected using a 50 mm diameter split-spoon (SS) sampler. All samples were visually inspected and initially classified on site. The auger and split-spoon samples were placed in sealed plastic bags, and rock cores were placed in cardboard boxes. All samples were transported to our laboratory for further examination and classification. The depths at which the auger and split spoon samples were recovered from the boreholes are shown as AU and SS, respectively, on the Soil Profile and Test Data sheets presented in Appendix 1.

A 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. This testing was done in general accordance with ASTM D1586-11 - Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils.

Undrained shear strength testing was conducted in cohesive soils using a field vane apparatus.

The subsurface conditions observed in the test holes were recorded in detail in the field. The soil profiles are presented on the Soil Profile and Test Data sheets in Appendix 1 of this report.

Groundwater

PVC groundwater monitoring wells were installed within borehole BH 1-20, BH 6-20, BH 12-20 and BH 13-20 to permit monitoring of the groundwater level subsequent to the completion of the sampling program.

Previously installed monitoring wells were also observed and water levels measured during the field program. The locations of borehole BH8-1, BH 18-1 and BH18-2 are shown on Drawing PG5354-1 - Test Hole Location Plan included in Appendix 2.

3.2 Field Survey

The boreholes were selected, located and surveyed in the field by Others. The ground surface elevations at the test hole locations were referenced to a temporary benchmark (TBM). The TBM used was the top of spindle of the fire hydrant located on the corner of Barille-Snow Street and Hemlock Road. An assumed elevation of 100.00 m was assigned to the TBM. The locations and ground surface elevation at each test hole location are presented on Drawing PG5354-1 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Testing

The soil samples recovered from the subject site were visually examined in our laboratory to review the results of the field logging.

A total of 3 soil samples were submitted for hydrometer analysis from different sections of the site to provide a general coverage. The Grain Size Distribution sheets are provided in Appendix 1.

Furthermore, Atterberg Limits testing was also conducted which included 3 representative soil samples from different sections of the site to provide a general coverage. The Atterberg Limits testing sheets are provided in Appendix 1.

4.0 Observations

4.1 Surface Conditions

The aforementioned site is located in a former residential neighborhood. The majority of the subject section of the site was occupied by single residential homes and linked by asphalt covered roadways. By 2008, all structures within the subject section of the site were demolished while leaving the bulk of the asphalt covered roadways and municipal services intact.

The location of the former structures are illustrated on the 1991 aerial photograph provided on Figure 2 - 1991 Arial Photograph - in Appendix 2.

Currently, 715 Mikinak Road is vacant. The subject site is bordered by Hemlock Road to the north, Michael Stoqua Street to the east, Barielle-Snow Street to the west, and Mikinak Road to the south. The site is generally at grade with neighbouring properties and appears to be at grade with the existing roadways.

4.2 Subsurface Profile

The subsurface profile at the borehole and test hole locations in the subject site consists of fill material which generally extends to approximate depths of 0.3 to 1.4 m below the existing ground surface. The fill material was observed to vary from crushed stone to silty clay, with occasional gravel, asphalt and other debris. A firm, brown to grey silty clay deposit was encountered underlying the fill, extending to depths ranging from 3 m at the northwest end of the site to approximately 8 m at the southwest end of the site. A compact to dense glacial till deposit was encountered underlying the silty clay at the northwest end of the site, extending to depths ranging from approximately 3.6 m. Brown silty sand was observed at ground surface to a depth of approximately 1.4 m at the southeast end of the of the site, with stiff to firm, brown to grey silty clay underlying the brown silty sand. The glacial till deposit was generally observed to consist of a compact to dense, brown silty clay with sand, gravel, cobbles, and boulders.

Practical refusal to augering was generally encountered at depths ranging between approximately 3.6 to 8.3 m below existing ground surface.

Bedrock

Based on available geological mapping, the bedrock in this area consists of interbedded limestone and dolomite of the Gull River formation with an overburden drift thickness of 2 to 10 m.

Atterberg Limit and Shrinkage Tests

Atterberg limits testing, as well as associated moisture content testing, were completed on the recovered silty clay samples at selected locations throughout the subject site. The results of the Atterberg limits tests are presented in Table 1 and on the Atterberg Limits Results sheet in Appendix 1.

Table 1 - Summary of Atterberg Limits Results

Borehole	Depth (m)	Liquid Limit %	Plastic Limit %	Plasticity Index %	Classification
BH 4-20	2.10	78	39	39	MH
BH 5-20	2.10	80	36	44	CH
BH 8-20	2.10	85	34	51	CH

Note: CH: Inorganic Clays of High Plasticity MH: Inorganic Silts of High Plasticity

4.3 Groundwater

Groundwater level readings were recorded on June 24, 2020, at the borehole locations. The groundwater level readings are presented in Table 2 below. Long-term groundwater level can also be estimated based on the observed colour, moisture levels and consistency of the recovered soil samples. Based on these observations, the long-term groundwater level is expected between 4 to 5 m depth. It should be noted that groundwater levels are subject to seasonal fluctuations, therefore, the groundwater levels could vary at the time of construction.

Table 2 - Summary of Groundwater Level Readings

Borehole Number	Ground Elevation (m)	Groundwater Levels (m)		Recording Date
		Depth	Elevation	
BH 1-20	98.58	4.62	Dry	June 15, 2020
BH 6-20	97.90	6.39	91.51	June 15, 2020
BH 12-20	93.82	4.58	Dry	June 16, 2020
BH 13-20	98.85	5.30	93.55	June 16, 2020

Note:
* - Denotes borehole instrumented with a 51 mm diameter monitoring well.
- The ground surface elevations at each borehole location were provided by Lopers and Associates.

Groundwater level readings from existing wells installed in 2018 were recorded on June 24, 2020, at the borehole locations. The groundwater level readings are presented in Table 3 below.

Table 3 - Existing Well Groundwater Readings

Borehole Number	Ground Elevation (m)	Groundwater Levels (m)		Recording Date
		Depth	Elevation	
BH8-1	99.07	5.41	93.66	June, 2020
BH18-2	98.72	5.13	93.59	June, 2020
BH18-1	98.62	5.03	93.59	June, 2020

Note:
* - Denotes borehole instrumented with a 51 mm diameter monitoring well.
- The ground surface elevations at each borehole location were provided by Lopers and Associates.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is suitable for the proposed development. It is expected that the proposed buildings will generally be founded on conventional footings bearing on the undisturbed, hard to stiff silty clay, compact to dense glacial till, and/or clean, surface sounded bedrock. If the building loads exceed the bearing resistance values provided for conventional spread footing foundations, consideration can be given to a raft foundation. Due to the presence of a the silty clay deposit encountered at the site, a permissible grade raise restriction is required for the subject site.

The above and other considerations are discussed in the following sections.

5.2 Site Grading and Preparation

Stripping Depth

Topsoil, asphalt and fill, containing deleterious or organic materials, should be stripped from under any building, paved areas, pipe bedding and other settlement sensitive structures. Under paved areas, existing construction remnants, such as foundation walls, pipe ducts, etc., should be excavated to a minimum depth of 1 m below final grade.

Bedrock Removal

Bedrock removal can be accomplished by hoe ramming where only a small quantity of bedrock needs to be removed. Sound bedrock may be removed by line drilling and controlled blasting and/or hoe ramming.

Prior to considering blasting operations, the blasting effects on the existing services, buildings, and other structures should be addressed. A pre-blast or pre-construction survey of the existing structures located in the proximity of the blasting operations should be carried out prior to commencing site activities. The extent of the survey should be determined by the blasting consultant and should be sufficient to respond to any inquiries or claims related to the blasting operations.

As a general guideline, peak particle velocities (measured at the structures) should not exceed 25 mm/s during the blasting program to reduce the risks of damage to the existing surrounding structures. The blasting operations should be planned and conducted under the supervision of a licensed professional engineer who is also an experienced blasting consultant.

Excavation side slopes in sound bedrock can be carried out using near vertical sidewalls. A minimum 1 m horizontal ledge should be left between the bottom of the overburden excavation and the top of the bedrock surface to provide an area to allow for potential sloughing. The 1 m horizontal ledge set back can be eliminated with a shoring program which has drilled piles extending below the proposed founding elevation.

Lean Concrete In-Filled Trenches

Where bedrock is encountered below the design underside of footing elevation, consideration should be given to excavating vertical trenches to expose the underlying bedrock surface and backfilling with lean concrete (15 MPa 28-day compressive strength). Typically, the excavation sidewalls will be used as the form to support the concrete. The additional width of the concrete poured against an undisturbed trench sidewall will suffice in providing a direct transfer of the footing load to the underlying bedrock.

The effectiveness of this operation will depend on the ability of maintaining vertical trenches until the lean concrete can be poured. It is suggested that once the bottom of the excavation is exposed, an assessment should be completed to determine the water infiltration and stability of the excavation sidewalls extending to the bedrock surface.

The trench excavation should be at least 150 mm wider than all sides of the footing at the base of the excavation. The excavation bottom should be relatively clean using the hydraulic shovel only (workers will not be permitted in the excavation below a 1.5 m depth). Once approved by the geotechnical engineer, lean concrete can be poured up to the proposed founding elevation.

Footings placed on lean concrete filled trenches extending to the bedrock surface can be designed using a factored bearing resistance value at ultimate limit states (ULS) of 1,500 kPa.

Vibration Considerations

Construction operations could cause vibrations, and possibly, sources of nuisance to the community. Therefore, means to reduce the vibration levels as much as possible should be incorporated in the construction operations to maintain a cooperative environment with the residents.

Two parameters determine the recommended vibration limit, the maximum peak particle velocity and the frequency. For low frequency vibrations, the maximum allowable peak particle velocity is less than that for high frequency vibrations. As a guideline, the peak particle velocity should be less than 15 mm/s between frequencies of 4 to 12 Hz, and 50 mm/s above a frequency of 40 Hz (interpolate between 12 and 40 Hz). These guidelines are for current construction standards. These guidelines are above perceptible human level and, in some cases, could be very disturbing to some people. A pre-construction survey is recommended to minimize the risks of claims during or following the construction of the proposed building.

Fill Placement

Fill used for grading purposes beneath the proposed buildings should consist of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. The fill should be tested and approved prior to delivery to the site. It should be placed in lifts no greater than 300 mm in thickness and compacted using suitable compaction equipment for the specified lift thickness. Fill placed beneath the building areas should be compacted to at least 98% of its standard Proctor maximum dry density (SPMDD).

Non-specified existing fill along with site-excavated soil can be used as general landscaping fill where settlement of the ground surface is of minor concern. These materials should be spread in thin lifts and be compacted at minimum 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, they should be compacted in thin lifts to a minimum density of 95% of their respective SPMDD. Non-specified existing fill and site-excavated soils are not suitable for use as backfill against foundation walls unless used in conjunction with a composite drainage membrane.

5.3 Foundation Design

It is expected that the proposed buildings and exterior structures, if present, will generally be founded on conventional spread footing foundations founded on the bedrock, on concrete filled trenches extending to bedrock, undisturbed the glacial till deposit and/or the stiff to firm silty clay deposit.

Conventional Spread Footings

Bearing resistance values are provided in Table 4, below, for footings placed on a bearing surface consisting of undisturbed, hard to stiff silty clay, glacial till, or clean, surface sounded bedrock. Footings supported on undisturbed, hard to stiff silty clay and compact to dense glacial till, designed using the bearing resistance values at SLS provided in Table 4, will be subjected to potential post construction total and differential settlements of 25 and 20 mm, respectively. Footings placed on clean, surface sounded bedrock will be subjected to negligible settlements.

An undisturbed soil bearing surface consists of a surface from which all organic materials 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. A clean, surface-sounded bedrock bearing surface should be free of loose materials, and have no near surface seams, voids, fissures or open joints which can be detected from surface sounding with a rock hammer.

Table 4 - Bearing Resistance Values

Bearing Surface	Factored Bearing Resistance Values at ULS (kPa)	Bearing Resistance Values at SLS (kPa)
Hard to Very Stiff Silty Clay	250	150
Glacial Till	400	250
Clean Surface Sounded Bedrock	3000	1500

Notes:
- ULS - Ultimate Limit States
- SLS - Serviceability Limit States
- A geotechnical resistance factor of 0.5 was applied to the provided bearing resistance values at ULS

For adjacent footings where one is bearing on bedrock and the other is bearing on soil, it is recommended to decrease the soil bearing resistance value by 25% for the footings placed on soil bearing media to reduce the potential long term total and differential settlements. Also, for a given footing supported on both soil and bedrock, it is recommended that the upper 0.5 m of the bedrock be removed for a minimum length of 2 m (on the bedrock side) and replaced with nominally compacted OPSS Granular A or Granular B Type II material. The width of the subexcavation should be at least the proposed footing width plus 0.5 m. Steel reinforcement, extending at least 3 m on both sides of the 2 m long transition, should be placed in the top part of the footings and foundation walls.

Permissible Grade Raise Recommendations

Permissible grade raise recommendations have been determined for the proposed development based on the undrained shear strength values observed within the silty clay deposit during our field investigation. Based on our findings, our preliminary permissible grade raise recommendations are presented in Drawing PG5354-2 - Permissible Grade Raise in Appendix 2.

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 the insitu soils 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. In sound, unfractured bedrock, a 1H:6V slope may be used.

5.4 Design for Earthquakes

The site class for seismic site response can be taken as **Class C** for the subject site. Soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest revision of the Ontario Building Code (OBC) 2012 for a full discussion of the earthquake design requirements.

A higher seismic site class, (**Class A or B)**, is be available for foundations placed on or near bedrock. However, this higher site class would have to be confirmed by site specific shear wave velocity testing.

5.5 Basement Slab

With the removal of all topsoil and deleterious fill, such as those containing organic materials, within the footprint of the proposed buildings, the native soil or bedrock surface will be considered to be an acceptable subgrade on which to commence backfilling for floor slab construction.

Any soft areas should be removed and backfilled with appropriate backfill material prior to placing any fill. OPSS 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 19 mm clear crushed stone. All backfill material within the footprint of the proposed buildings should be placed in maximum 300 mm thick loose layers and compacted to at least 98% of its SPMDD.

It is expected that the basement area for the proposed multi-storey building will be mostly parking and the recommended pavement structure noted in Subsection 5.7 will be applicable. However, if storage or other uses of the lower level are proposed where a concrete floor slab will be used, it is recommended that the upper 200 mm of sub-slab fill consist of 19 mm clear crushed stone.

5.6 Basement Wall

There are several combinations of backfill materials and retained soils that could be applicable for the basement walls of the subject structure. However, the conditions can be well-represented by assuming the retained soil consists of a material with an angle of internal friction of 30 degrees and a bulk (drained) unit weight of 20 kN/m^3.

However, undrained conditions are anticipated (i.e. below the groundwater level). Therefore, the applicable effective (undrained) unit weight of the retained soil can be taken as 13 kN/m^3, where applicable. A hydrostatic pressure should be added to the total static earth pressure when using the effective unit weight.

Lateral Earth Pressures

The static horizontal earth pressure (p_o) can be calculated using a triangular earth pressure distribution equal to $K_o \cdot \gamma \cdot H$ where:

K_o = at-rest earth pressure coefficient of the applicable retained soil (0.5)
γ = unit weight of fill of the applicable retained soil (kN/m^3)
H = height of the wall (m)

An additional pressure having a magnitude equal to $K_o \cdot q$ and acting on the entire height of the wall should be added to the above diagram for any surcharge loading, q (kPa), that may be placed at ground surface adjacent to the wall. The surcharge pressure will only be applicable for static analyses and should not be used in conjunction with the seismic loading case.

Actual earth pressures could be higher than the "at-rest" case if care is not exercised during the compaction of the backfill materials to maintain a minimum separation of 0.3 m from the walls with the compaction equipment.

Seismic Earth Pressures

The total seismic force (P_{AE}) includes both the earth force component (P_o) and the seismic component (ΔP_{AE}).

The seismic earth force (ΔP_{AE}) can be calculated using $0.375 \cdot a_c \cdot \gamma \cdot H^2/g$ where:

a_c = $(1.45 - a_{max}/g)a_{max}$
γ = unit weight of fill of the applicable retained soil (kN/m^3)
H = height of the wall (m)
g = gravity, 9.81 m/s^2

The peak ground acceleration, (a_{max}), for the Ottawa area is 0.32 g according to OBC 2012. Note that the vertical seismic coefficient is assumed to be zero.

The earth force component (P_o) under seismic conditions can be calculated using $P_o = 0.5\ K_o\ \gamma\ H^2$, where $K_o = 0.5$ for the soil conditions noted above.

The total earth force (P_{AE}) is considered to act at a height, h (m), from the base of the wall, where:

$h = \{P_o \cdot (H/3) + \Delta P_{AE} \cdot (0.6 \cdot H)\}/P_{AE}$

The earth forces calculated are unfactored. For the ULS case, the earth loads should be factored as live loads, as per OBC 2012.

5.7 Pavement Design

Car only parking areas, access lanes and local roadways are anticipated within the subject site. The proposed pavement structures are shown in Tables 5 and 6.

Table 5 - Recommended Pavement Structure - Car Only Parking Areas

Thickness (mm)	Material Description
50	**Wear Course -** HL-3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill	

Table 6 - Recommended Pavement Structure - Access Lanes and Local Roadways

Thickness (mm)	Material Description
40	**Wear Course -** HL-3 or Superpave 12.5 Asphaltic Concrete
50	**Binder Course -** HL-8 or Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
400	**SUBBASE** - OPSS Granular B Type II
	SUBGRADE - Either fill, in situ soil, or OPSS Granular B Type I or II material placed over in situ soil or fill

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project. The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 98% of the material's SPMDD using suitable compaction equipment.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

Foundation Drainage

It is recommended that a perimeter foundation drainage system be provided for the proposed buildings. The system should consist of a 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 underground parking structure. The pipe should have a positive outlet, such as a gravity connection to the storm sewer.

Sub-Slab Drainage

It is anticipated that sub-slab drainage will be required to control water infiltration. For preliminary design purposes, we recommend that 150 mm perforated pipes be placed at 6 to 9 m centres underlying the basement slab. The spacing of the sub-slab drainage system should be confirmed at the time of completing the excavation when water infiltration can be better assessed.

Foundation Backfill

Backfill against the exterior sides of the foundation walls should consist of free-draining, non frost susceptible granular materials. 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 drainage geocomposite, such as Miradrain G100N or Delta Drain 6000, connected to the perimeter foundation drainage system. Imported granular materials, such as clean sand or OPSS Granular B Type I granular material, should otherwise be used for this purpose. A waterproofing system should be provided to the elevator pits (pit bottom and walls).

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.

Exterior unheated footings, such as those for isolated exterior piers, are more prone to deleterious movement associated with frost action than the exterior walls of the structure proper and require additional protection, such as soil cover of 2.1 m or a combination of soil cover and foundation insulation.

The parking garage may require protection against frost action depending on the founding depth. Unheated structures, such as the access ramp wall footings, may be required to be insulated against the deleterious effect of frost action. A minimum of 2.1 m of soil cover alone, or a minimum of 0.6 m of soil cover, in conjunction with foundation insulation, should be provided.

The effectiveness of this operation will depend on the ability of maintaining vertical trenches until the lean concrete can be poured. It is suggested that once the bottom of the excavation is exposed, an assessment should be completed to determine the water infiltration and stability of the excavation sidewalls extending to the bedrock surface.

The trench excavation should be at least 150 mm wider than all sides of the footing at the base of the excavation. The excavation bottom should be relatively clean using the hydraulic shovel only (workers will not be permitted in the excavation below a 1.5 m depth). Once approved by the geotechnical engineer, lean concrete can be poured up to the proposed founding elevation.

Footings placed on lean concrete filled trenches extending to the bedrock surface can be designed using a factored bearing resistance value at ultimate limit states (ULS) of 1,500 kPa. 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 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).

Unsupported Side Slopes

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 and 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

In bedrock, almost vertical side slopes can be used provided that all loose rock and blocks with unfavourable weak planes are removed or stabilized.

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.

Temporary Shoring

The design and approval of the temporary shoring system will be the responsibility of the shoring contractor and the shoring designer who is a licensed professional engineer and is hired by the shoring contractor. It is the responsibility of the shoring contractor to ensure that the temporary shoring system is in compliance with safety requirements, designed to avoid any damage to adjacent structures and include dewatering control measures. In the event that subsurface conditions differ from the approved design during the actual installation, it is the responsibility of the shoring contractor to commission the required experts to re-assess the design and implement the required changes. Furthermore, the design of the temporary shoring system should take into consideration a full hydrostatic condition which can occur during significant precipitation events.

The temporary shoring system could consist of a soldier pile and lagging system or steel sheet piles. Any additional loading due to street traffic, construction equipment, adjacent structures and facilities, etc., should be included to the earth pressures described below. This system could be cantilevered, anchored or braced. The shoring system is recommended to be adequately supported to resist toe failure, if required, by means of extending the piles into the bedrock through pre-augered holes, if a soldier pile and lagging system is the preferred method.

The earth pressures acting on the temporary shoring system may be calculated with the following parameters.

Table 7 - Soil Parameters for Shoring System Design

Parameters	Values
Active Earth Pressure Coefficient (K_a)	0.33
Passive Earth Pressure Coefficient (K_p)	3
At-Rest Earth Pressure Coefficient (K_o)	0.5
Unit Weight (γ), kN/m^3	20
Submerged Unit Weight (γ), kN/m^3	13

The active earth pressure should be calculated where wall movements are permissible while the at-rest pressure should be calculated if no movement is permissible. The dry unit weight should be calculated above the groundwater level while the effective unit weight should be calculated below the groundwater level.

The hydrostatic groundwater pressure should be included to the earth pressure distribution wherever the effective unit weight are calculated for earth pressures. If the groundwater level is lowered, the dry unit weight for the soil/bedrock should be calculated full weight, with no hydrostatic groundwater pressure component.

For design purposes, the minimum factor of safety of 1.5 should be calculated.

6.4 Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with the most recent Material Specifications and Standard Detail Drawings from the Department of Public Works and Services, Infrastructure Services Branch of the City of Ottawa.

At least 150 mm of OPSS Granular A should be used for pipe bedding for sewer and water pipes. The bedding should extend to the spring line of the pipe. Cover material, from the spring line to at least 300 mm above the obvert of the pipe, should consist of OPSS Granular A or Granular B Type II with a maximum size of 25 mm. The bedding and cover materials should be placed in maximum 225 mm thick lifts compacted to 95% of the material's standard Proctor maximum dry density.

It should generally be possible to re-use the site materials above the cover material if the operations are carried out in dry weather conditions.

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) and above the cover material should match the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 225 mm thick loose lifts and compacted to a minimum of 95% of the material standard Proctor maximum dry density.

6.5 Groundwater Control

Due to the relatively impervious nature of the overlying silty clay at the site, it is anticipated that groundwater infiltration into the excavations should be low and controllable using open sumps. Where excavations are extended within the glacial till and/or bedrock surface below the long term groundwater level, the groundwater infiltration is anticipated to be moderate to high. Generally, pumping from open sumps should be sufficient to control the groundwater influx through the sides of shallow excavations.

A temporary Ministry of the Environment, Conservation and Parks (MECP) permit to take water (PTTW) may be required for this project if more than 400,000 L/day of ground and/or surface water is to be pumped during the construction phase. A minimum 4 to 5 months should be allowed for completion of the PTTW application package and issuance of the permit by the MECP.

For typical ground or surface water volumes, being pumped during the construction phase, between 50,000 to 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR). A minimum of two to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan to be prepared by a Qualified Person as stipulated under O.Reg. 63/16. If a project qualifies for a PTTW based upon anticipated conditions, an EASR will not be allowed as a temporary dewatering measure while awaiting the MOECC review of the PTTW application.

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.

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. Additional information could be provided, if required.

6.7 Landscaping Considerations

Tree Planting Restrictions

In accordance with the City of Ottawa Tree Planting in Sensitive Marine Clay Soils (2017 Guidelines), Paterson completed a soils review of the site to determine applicable tree planting setbacks. Atterberg limits testing was completed for the recovered silty clay samples at selected locations throughout the subject site. The soil samples were recovered from elevations 2.1 m below the current ground surface elevation. The results of our testing are presented in Table 1 in Subsection 4.2 and in Appendix 1.

Based on the results of our testing, two areas have been outlined in Drawing PG5354-3 - Tree Planting Setback Recommedations presented in Appendix 2. **Area 1** defines areas of **high plasticity silty clay** (Plasticity index > 40%) and **Area 2** defines areas of **low to medium plasticity silty clay** (Plasticity index < 40%). In accordance with the City of Ottawa guidelines, the tree planting setback limits may be reduced to 4.5 m for small (mature tree height up to 7.5m) and medium size trees (mature tree height 7.5 m to 14 m) in Area 2. As per the guideline, trees in Area 1 shall be planted with a minimum setback equal to the mature height of the tree.

However, based on Paterson's experience with housing constructed over low to medium and high sensitivity soils in the Ottawa area, a tree planting setback of 4.5 m from tree to foundation is recommended for small (mature tree height up to 7.5m) and medium size trees (mature tree height 7.5 m to 14 m) for both areas of the subject site provided that the following conditions are met.

❏ The underside of footing (USF) is 2.1m or greater below the lowest finished grade must be satisfied for footings within 10 m from the tree, as measured from the center of the tree trunk and verified by means of the Grading Plan as indicated procedural changes below.

❏ A small tree must be provided with a minimum of 25 m^3 of available soil volume while a medium tree must be provided with a minimum of 30 m^3 of available soil volume, as determined by the Landscape Architect. The developer is to ensure that the soil is generally un-compacted when backfilling in street tree planting locations.

❏ The tree species must be small (mature tree height up to 7.5 m) to a medium size (mature tree height 7.5 m to 14 m) as confirmed by the Landscape Architect.

- ❑ The foundation walls are to be reinforced at least nominally (minimum of two upper and two lower 15M bars in the foundation wall).

- ❑ Grading surrounding the tree must promote drainage to the tree root zone (in such a manner as to not be detrimental to the tree), as noted on the Grading Plan.

7.0 Recommendations

It is a requirement for the foundation design data provided herein to be applicable that the following material testing and observation program be performed by the geotechnical consultant.

- ❑ Review of the grading plan from a geotechnical perspective.
- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Sampling and testing of the concrete and fill materials.
- ❑ 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 the completion of a satisfactory inspection program by the geotechnical consultant.

8.0 Statement of Limitations

The recommendations provided are in accordance with the present understanding of the project. Paterson requests permission to review the 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, Paterson requests immediate notification to permit reassessment of our recommendations.

The recommendations provided herein should only be used by the design professionals associated with this project. They are not intended for contractors bidding on or undertaking the work. The latter should evaluate the factual information provided in this report and determine the suitability and completeness for their intended construction schedule and methods. Additional testing may be required for their purposes.

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 Ottawa Community Housing 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.

LICENSED PROFESSIONAL ENGINEER
July 14, 2020
J. R. VILLENEUVE
100504344
PROVINCE OF ONTARIO

Joey R. Villeneuve, M.A.Sc.,P.Eng.

David J. Gilbert, P.Eng.

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APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

TEST HOLE LOG SHEETS BY OTHERS

GRAIN SIZE DISTRIBUTION ANALYSIS

ATTERBERG LIMITS TESTING RESULTS

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Building - 715 Mikinak Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the corner of Barille-Snow Street and Hemlock Road. An arbitrary elevation of 100.00m was assigned to the TBM.

REMARKS

BORINGS BY CME 55 Power Auger

DATE June 15, 2020

FILE NO. PG5354

HOLE NO. BH 1-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.58
Loose to dense, grey **SILTY SAND** with gravel, trace clay		AU	1				
		SS	2	25	30	1	97.58
		SS	3	25	17	2	96.58
		SS	4	33	50+		
						3	95.58
		SS	5	50	9		
3.94		SS	6	89	50+		
End of Borehole Practical refusal to augering at 3.94m depth (BH dry - June 24, 2020)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Monitoring Well Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Building - 715 Mikinak Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the corner of Barille-Snow Street and Hemlock Road. An arbitrary elevation of 100.00m was assigned to the TBM.

REMARKS

BORINGS BY CME 55 Power Auger

DATE June 15, 2020

FILE NO. PG5354

HOLE NO. BH 2-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.16
FILL: Brown silty sand and gravel with organics		AU	1				
1.07		SS	2	75	13	1	97.16
Firm, grey **SILTY CLAY**		SS	3	100	13	2	96.16
		SS	4	100	8		
3.00						3	95.16
Loose to dense, brown **SILTY SAND** with gravel		SS	5	52	32		
3.63							
End of Borehole Practical refusal to augering at 3.63m depth							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Monitoring Well Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Building - 715 Mikinak Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the corner of Barille-Snow Street and Hemlock Road. An arbitrary elevation of 100.00m was assigned to the TBM.

REMARKS

BORINGS BY CME 55 Power Auger

DATE June 15, 2020

FILE NO. PG5354

HOLE NO. BH 3-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.94
Compact to dense, brown **SILTY SAND** with gravel, trce clay		AU	1				
0.60							
Firm, grey **SILTY CLAY**		SS	2	42	28	1	96.94
		SS	3	50	12	2	95.94
		SS	3	25	12	3	94.94
		SS	4	25	5		
4.17		SS	5	46	50+	4	93.94
End of Borehole Practical refusal to augering at 4.17m depth							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Monitoring Well Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Building - 715 Mikinak Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the corner of Barille-Snow Street and Hemlock Road. An arbitrary elevation of 100.00m was assigned to the TBM.

REMARKS

BORINGS BY CME 55 Power Auger

DATE June 15, 2020

FILE NO. PG5354

HOLE NO. BH 4-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % (20 40 60 80)	Monitoring Well Construction
GROUND SURFACE						0	97.89		
Compact, brown **SILTY SAND** with gravel, some organics		AU	1						
1.07		SS	2	100	13	1	96.89		
Very stiff to firm, grey **SILTY CLAY**		SS	3	100	16	2	95.89		
		SS	4	100	13	3	94.89		
		SS	5	100	10	4	93.89		
		SS	6	100	6				
4.50									
End of Borehole Practical refusal to augering at 4.50m depth									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Building - 715 Mikinak Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the corner of Barille-Snow Street and Hemlock Road. An arbitrary elevation of 100.00m was assigned to the TBM.

REMARKS

BORINGS BY CME 55 Power Auger

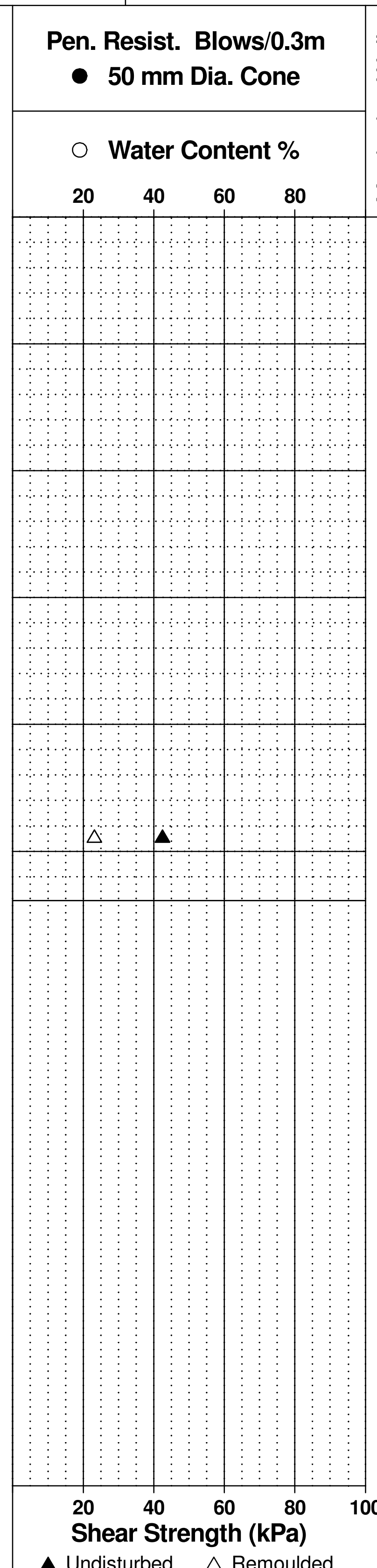
DATE June 15, 2020

FILE NO. PG5354

HOLE NO. BH 5-20

SOIL DESCRIPTION	TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	97.84
Loose, brown **SILTY SAND** with gravel (to 0.60)	AU	1				
Stiff to firm, grey **SILTY CLAY** (0.60 to 5.39)	SS	2	0	16	1	96.84
	SS	3	100	12	2	95.84
	SS	4	100	7	3	94.84
	SS	5	100	4	4	93.84
	SS	6	100	2	5	92.84
	SS	7	100	50+		
End of Borehole (5.39)						

Practical refusal to augering at 5.39m depth



Monitoring Well Construction

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Building - 715 Mikinak Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the corner of Barille-Snow Street and Hemlock Road. An arbitrary elevation of 100.00m was assigned to the TBM.

REMARKS

BORINGS BY CME 55 Power Auger

DATE June 15, 2020

FILE NO. PG5354

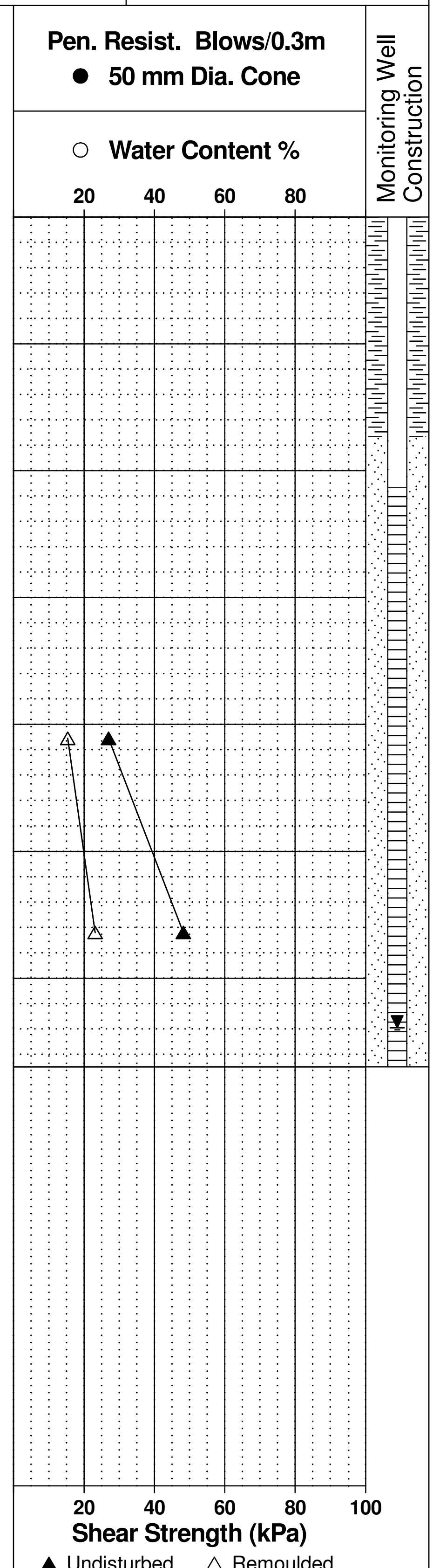
HOLE NO. BH 6-20

SOIL DESCRIPTION	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	97.90
Loose, brown **SILTY SAND** with gravel, some organics	AU	1				
0.90						
Firm, grey **SILTY CLAY**	SS	2	100	14	1	96.90
	SS	3	100	10	2	95.90
	SS	4	100	6	3	94.90
	SS	5	100	3	4	93.90
	SS	6	100	W	5	92.90
	SS	7	100	W	6	91.90
6.70						

End of Borehole

Practical refusal to augering at 6.70m depth

(GWL @ 6.39m - June 24, 2020)



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
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DATUM TBM - Top spindle of fire hydrant located on the corner of Barille-Snow Street and Hemlock Road. An arbitrary elevation of 100.00m was assigned to the TBM.

REMARKS

BORINGS BY CME 55 Power Auger **DATE** June 15, 2020

FILE NO. PG5354

HOLE NO. BH 7-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % (20 40 60 80)	Monitoring Well Construction
GROUND SURFACE						0	97.75		
Compact, brown **SILTY SAND** with gravel		AU	1						
0.60									
		SS	2	100	13	1	96.75		
		SS	3	100	9	2	95.75		
		SS	4	100	5	3	94.75		
		SS	5	100	2				
Stiff to firm, grey **SILTY CLAY**		SS	6	100	W	4	93.75		
		SS	7	100	W	5	92.75		
		SS	8	100	W	6	91.75		
		SS	9	100	W				
		SS	10	100	W	7	90.75		
8.23						8	89.75		
End of Borehole Practical refusal to augering at 8.23m depth									

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Building - 715 Mikinak Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the corner of Barille-Snow Street and Hemlock Road. An arbitrary elevation of 100.00m was assigned to the TBM.

REMARKS

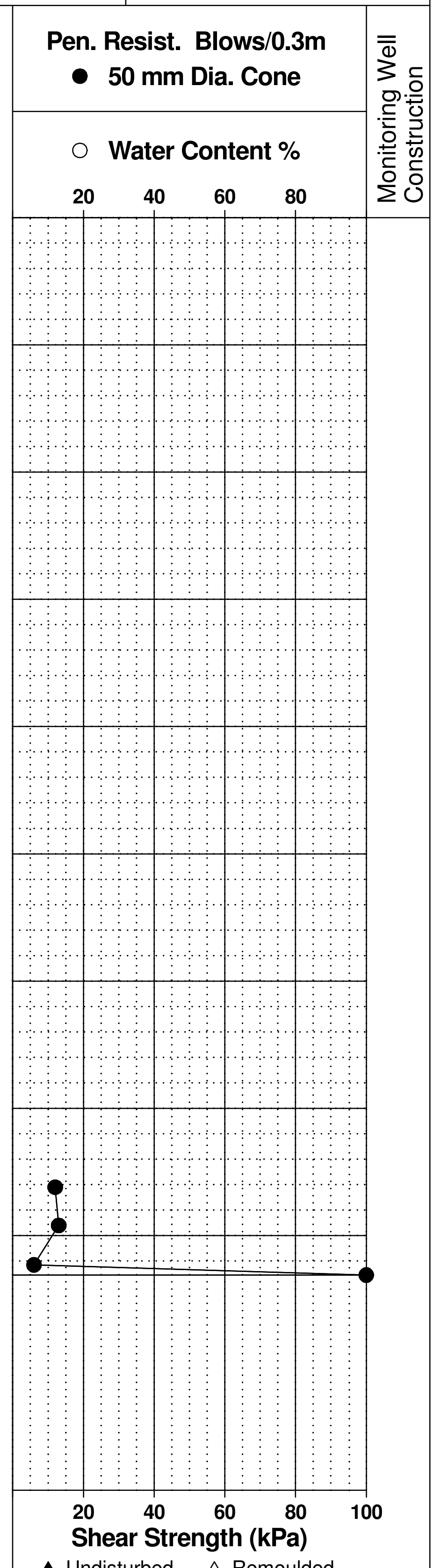
BORINGS BY CME 55 Power Auger

DATE June 16, 2020

FILE NO. PG5354

HOLE NO. BH 8-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	97.45
Compact, brown **SILTY SAND** with gravel							
0.90		SS	1	75	13	1	96.45
		SS	2	75	12	2	95.45
		SS	3	100	6	3	94.45
		SS	4	100	3	4	93.45
		SS	5	100	W		
Stiff to firm, grey **SILTY CLAY**		SS	6	67	W	5	92.45
		SS	7	83	W		
6.10						6	91.45
Dynamic Cone Penetration Test commenced at 6.10m depth. Cone pushed to 7.6m depth						7	90.45
						8	89.45
8.31							
End of Borehole Practical DCPT refusal at 8.31m depth.							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Building - 715 Mikinak Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the corner of Barille-Snow Street and Hemlock Road. An arbitrary elevation of 100.00m was assigned to the TBM.

REMARKS

BORINGS BY CME 55 Power Auger

DATE June 16, 2020

FILE NO. PG5354

HOLE NO. BH 9-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % (20, 40, 60, 80)	Monitoring Well Construction
GROUND SURFACE						0	97.61		
Compact, brown **SILTY SAND** with gravel, some clay		AU	1						
		SS	2	67	50+	1	96.61		
1.68									
Stiff to firm, grey **SILTY CLAY**		SS	3	100	18	2	95.61		
		SS	4	100	14				
		SS	5	100	8	3	94.61		
3.66									
End of Borehole									

Shear Strength (kPa): 20, 40, 60, 80, 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Building - 715 Mikinak Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the corner of Barille-Snow Street and Hemlock Road. An arbitrary elevation of 100.00m was assigned to the TBM.

REMARKS

BORINGS BY CME 55 Power Auger

DATE June 16, 2020

FILE NO. PG5354

HOLE NO. BH10-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % (20, 40, 60, 80)	Monitoring Well Construction
GROUND SURFACE						0	97.71		
FILL: Brown silty sand with gravel, trace asphalt		AU	1						
		SS	2	50	34	1	96.71		
		SS	3	50	14	2	95.71		
		SS	4	67	14	3	94.71		
3.66		SS	5	33	8				
End of Borehole									

Shear Strength (kPa): 20, 40, 60, 80, 100

▲ Undisturbed △ Remoulded

patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Building - 715 Mikinak Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the corner of Barille-Snow Street and Hemlock Road. An arbitrary elevation of 100.00m was assigned to the TBM.

REMARKS

BORINGS BY CME 55 Power Auger

DATE June 16, 2020

FILE NO. PG5354

HOLE NO. BH11-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % (20 40 60 80)	Monitoring Well Construction
GROUND SURFACE						0	97.71		
Dense, brown **SILTY SAND** with gravel		AU	1						
		SS	2	67	45	1	96.71		
1.83		SS	3	50	11				
Firm, grey **SILTY CLAY**						2	95.71		
2.29									
Compact, brown **SILTY SAND** with gravel		SS	4	50	17				
						3	94.71		
		SS	5	67	22				
3.66									
End of Borehole									

Shear Strength (kPa) 20 40 60 80 100

▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Building - 715 Mikinak Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the corner of Barille-Snow Street and Hemlock Road. An arbitrary elevation of 100.00m was assigned to the TBM.

REMARKS

BORINGS BY CME 55 Power Auger

DATE June 16, 2020

FILE NO. PG5354

HOLE NO. BH12-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % (20, 40, 60, 80)	Monitoring Well Construction
GROUND SURFACE						0	97.67		
FILL: Brown silty sand with gravel		AU	1						
0.90									
FILL: Grey silty clay with gravel and sand, trace asphalt		SS	2	17	10	1	96.67		
		SS	3	0	3	2	95.67		
		SS	4	50	3				
3.05						3	94.67		
FILL: Grey silty sand with gravel, trace asphalt		SS	5	33	2				
4.06		SS	6	80	50+	4	93.67		

End of Borehole

Practical refusal to augering at 4.06m depth

(BH dry - June 24, 2020)

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Building - 715 Mikinak Road
Ottawa, Ontario

DATUM TBM - Top spindle of fire hydrant located on the corner of Barille-Snow Street and Hemlock Road. An arbitrary elevation of 100.00m was assigned to the TBM.

REMARKS

BORINGS BY CME 55 Power Auger

DATE June 16, 2020

FILE NO. PG5354

HOLE NO. BH13-20

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % (20 40 60 80)	Monitoring Well Construction
GROUND SURFACE						0	98.07		
Compact to dense, brown to grey **SILTY SAND** with gravel, some clay		AU	1						
		SS	2	42	18	1	97.07		
		SS	3	25	12	2	96.07		
		SS	4	67	44	3	95.07		
		SS	5	100	70				
		SS	6	75	20	4	94.07		
4.70		SS	7	100	50+				

End of Borehole

Practical refusal to augering at 4.70m depth

(BH dry - June 24, 2020)

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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 relative strength of cohesionless soils is the compactness condition, 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. An SPT N value of “P” denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

Compactness Condition	‘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 shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

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, S_t, is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

Low Sensitivity:	$S_t < 2$
Medium Sensitivity:	$2 < S_t < 4$
Sensitive:	$4 < S_t < 8$
Extra Sensitive:	$8 < S_t < 16$
Quick Clay:	$S_t > 16$

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 NQ or larger size core. However, it can be used on smaller core sizes, such as BQ, 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, generally recovered using a piston sampler
G	-	"Grab" sample from test pit or surface materials
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

WC%	-	Natural water 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 at 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

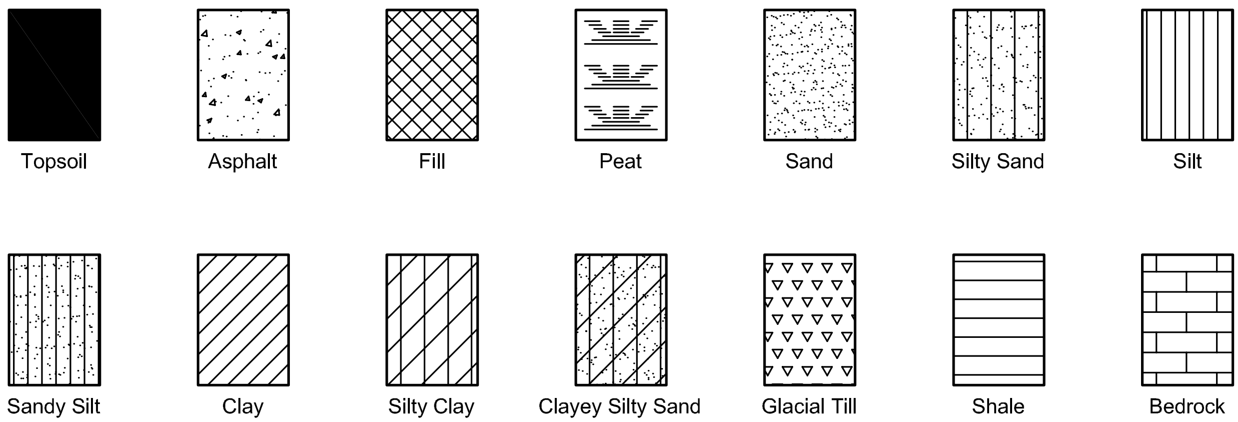
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void 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.

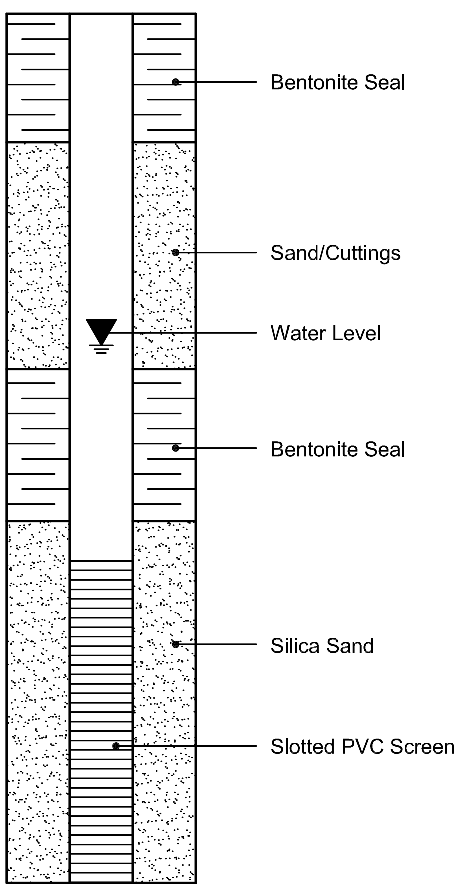
SYMBOLS AND TERMS (continued)

STRATA PLOT

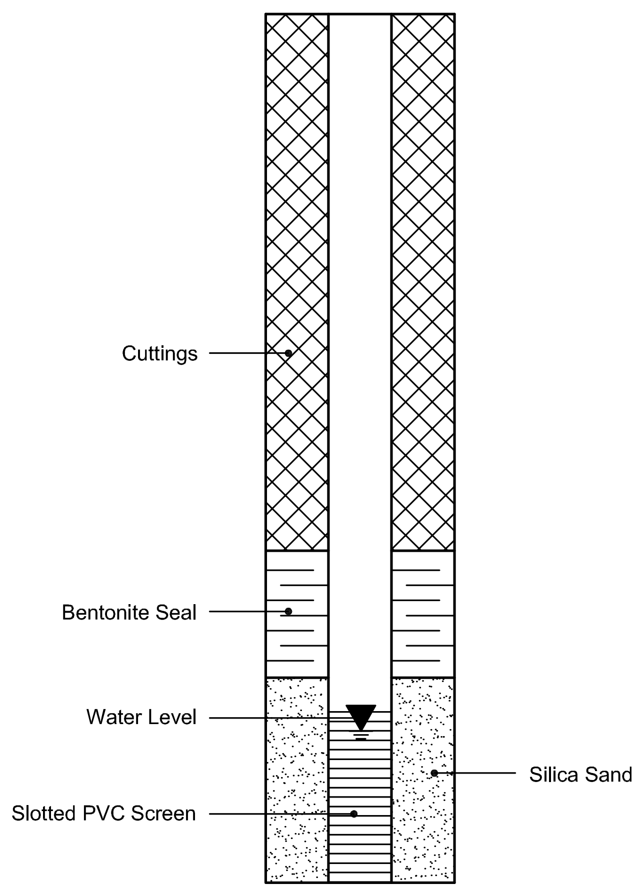


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



LOG OF BOREHOLE / MONITORING WELL BHMW7

DST REF. No.: **OE04940**
CLIENT: **Canada Lands Company**
PROJECT: **Steam Line Decommissioning**
LOCATION: **Canadian Forces Base, Rockcliffe, Ottawa, Ontario**
SURFACE ELEV.: **--/--**

Drilling Data
METHOD: **CME 55 Track Mounted Drill Rig**
DIAMETER: **200 mm**

DATE: **November 11 2004**

CCGD * RKI EAGLE (PPM) 20 40 60 80 / MINIRAE (PPM) 5 10 15 20	PPM	SAMPLES No.	Type	SPT N-Value	SYMBL	SUBSURFACE PROFILE MATERIAL DESCRIPTION	DPTH m	ELEV m	WATER DATA	REMARKS
						SURFACE				
		SS1	Split Spoon	10		FILL - sand and gravel, some silt, loose, brown	0.5			Groundwater level observed 2.1 m below grade on November 25, 2004.
		SS2	Split Spoon	13		- clay, sandy, some silt, compact, olive grey	1.0			
O	55	SS3	Split Spoon	5			1.5			
O	5	SS4	Split Spoon	5		- silt, clayey, some sand, trace gravel, loose, brown	2.0		▼	
O	5	SS5	Split Spoon	12		CLAY - silty, firm to stiff, olive grey	2.5			
O	5	SS6	Split Spoon	10			3.0 / 3.5			
O	0	SS7	Split Spoon	12		- clayey sand layer ~20 cm thick	4.0			
O	70	SS8	Split Spoon	12		- trace cobbles	4.5			Strong petroleum hydrocarbon odour noted
		SS9	Split Spoon	>100			5.0			Sheen noted on water
						End of borehole at 5.2 m depth.				

GASTECBH (OTTAWA) OE04940.GPJ DST_MIN.GDT 10/3/06

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* - Catalytic Combustible Gas Detector

SAMPLE TYPE LEGEND

Auger Sample | Rock Core | Ponar Sample
Split Spoon Sample | Side Sampler
Thin Wall Tube | Grab Sample

APPENDIX H

LOG OF BOREHOLE / MONITORING WELL BHMW8

DST REF. No.: **OE04940**
CLIENT: **Canada Lands Company**
PROJECT: **Steam Line Decommissioning**
LOCATION: **Canadian Forces Base, Rockcliffe, Ottawa, Ontario**
SURFACE ELEV.: **--/--**

Drilling Data
METHOD: **CME 55 Track Mounted Drill Rig**
DIAMETER: **200 mm**

DATE: **November 11 2004**

CCGD * — O RKI EAGLE (PPM) 20 40 60 80; □ MINIRAE (PPM) 5 10 15 20

SUBSURFACE PROFILE — SURFACE

PPM	Sample No.	Type	SPT N-Value	Material Description	DPTH m	Remarks
				ASPHALT - ~100 mm thick		
70	SS1	Split Spoon	17	FILL - sand and gravel, some silt, compact		Groundwater level observed 2.0 m below grade on November 25, 2004.
310	SS2	Split Spoon	18	CLAY - silty, very stiff to stiff, olive grey	0.5, 1.0	
>1000	SS3	Split Spoon	13		1.5	Petroleum hydrocarbon odour noted
30	SS4	Split Spoon	22		2.0	
10	SS5	Split Spoon	11		2.5	
50	SS6	Split Spoon	9		3.0, 3.5	
20	SS7	Split Spoon	8		4.0	
0	SS8	Split Spoon	11		4.5	
				End of borehole at 4.9 m depth.		

GASTECBH (OTTAWA) OE04940.GPJ DST_MIN.GDT 10/3/06

DST CONSULTING ENGINEERS

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Web: www.dstgroup.com

* - Catalytic Combustible Gas Detector

SAMPLE TYPE LEGEND

Auger Sample | Rock Core | Ponar Sample
Split Spoon Sample | Side Sampler
Thin Wall Tube | Grab Sample

APPENDIX H

LOG OF BOREHOLE BH16-02

DST REF. No.: **IN-SO-026755**
CLIENT: **Canada Lands Company**
PROJECT: **Site Servicing Phase 1B**
LOCATION: **Wateridge Village, Ottawa, Ontario**
SURFACE ELEV.: **88.05 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
DIAMETER: **200 mm**
DATE: **August 26, 2016**
COORDINATES: **5035157.52** m N, **372671.86** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (W_p W W_l)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	SPT (N) Blows/0.3m	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
	88				ASPHALT - 250 mm thick					
					FILL - SAND AND GRAVEL - trace clay and silt, brown, compact	SS1	Split Spoon	28	28	37 57 (6)
1.0	87					SS2	Split Spoon	18	18	
					FILL - GRAVELLY SAND - trace clay and silt, brown, compact to dense	SS3	Split Spoon	10	10	22 65 (13)
2.0	86					SS4	Split Spoon	37	37	29 60 (11)
3.0	85					SS5	Split Spoon	16	16	
						SS6	Split Spoon	50+	50+	
4.0	84				End of Borehole at 4.0 m Split Spoon Sampler and Auger Refusal on Inferred Bedrock					
5.0	83									
6.0	82									
7.0	81									

VANE (kPa) ✖ 20 40 60 80
SPT (N) ☐ DCPT ◆ 20 40 60 80

consulting engineers
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SAMPLE TYPE LEGEND

Auger Sample
Split Spoon Sample
Bulk Sample
Rock Core
Hiller Peat Sampler
70mm Thick Wall Tube
Bentonite
Sand

LOG OF BOREHOLE BH16-03

DST REF. No.: **IN-SO-026755**
CLIENT: **Canada Lands Company**
PROJECT: **Site Servicing Phase 1B**
LOCATION: **Wateridge Village, Ottawa, Ontario**
SURFACE ELEV.: **88.25 metres**

Drilling Data
METHOD: **Hollow Stem Auger / NQ Size Core Barrel**
DIAMETER: **200 mm**
DATE: **September 16, 2016**
COORDINATES: **5035157.56** m N, **372725.95** m E

DEPTH (m)	ELEV. (m)	MATERIAL DESCRIPTION	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
0.0	88.25	ASPHALT - 75 mm thick	
0.075		FILL - SAND AND GRAVEL - trace of clay, brown, compact	
3.0	85.25	TILL - Clay, some sand, trace of gravel, grey, hard	
3.5		LIMESTONE BEDROCK - Light grey RC1 = 0.61 m TCR = 87% RQD = 56% RC2 = 1.55 m TCR = 95% RQD = 95% RC3 = 0.46 m TCR = 100% RQD = 47%	Possible 50 mm thick clay seam at 4.4 m
6.1		End of Borehole at 6.1 m	

SAMPLE #	SAMPLE TYPE	'N' VALUE (SPT (N) Blows/0.3m)
SS1	Split Spoon Sample	29
SS2	Split Spoon Sample	10
SS3	Split Spoon Sample	26
SS4	Split Spoon Sample	16
SS5	Split Spoon Sample	50+
RC1	Rock Core	
RC2	Rock Core	
RC3	Rock Core	

% MOISTURE: Wp, W, Wl (20 40 60 80)
VANE (kPa) ✖ 20 40 60 80
SPT (N) □ DCPT ◆ 20 40 60 80

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SAMPLE TYPE LEGEND

Auger Sample — Rock Core — Bentonite
Split Spoon Sample — Hiller Peat Sampler — Sand
Bulk Sample — 70mm Thick Wall Tube

LOG OF BOREHOLE BH16-04

DST REF. No.: **IN-SO-026755**
CLIENT: **Canada Lands Company**
PROJECT: **Site Servicing Phase 1B**
LOCATION: **Wateridge Village, Ottawa, Ontario**
SURFACE ELEV.: **88.52 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
DIAMETER: **200 mm**
DATE: **September 2, 2016**
COORDINATES: **5035156.93** m N, **372783.61** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (W_p W W_l; 20 40 60 80)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) / SPT (N) Blows/0.3m / DCPT (20 40 60 80)	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
					ASPHALT - 75 mm thick					
	88				FILL - SAND AND GRAVEL - brown, compact	SS1		13		
1.0					CLAY - silty, trace of sand and gravel, brown (possible fill), stiff to very stiff	SS2		14		
	87					SS3		20		
2.0										
	86				TILL - sand, gravelly, trace clay, brown, compact	SS4		25		
					End of Borehole at 2.7 m Split Spoon Sampler and Auger Refusal on Inferred Bedrock					
3.0										
	85									
4.0										
	84									
5.0										
	83									
6.0										
	82									
7.0										
	81									

DST Consulting Engineers
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Web: www.dstgroup.com

SAMPLE TYPE LEGEND

Auger Sample | Split Spoon Sample | Bulk Sample | Rock Core | Hiller Peat Sampler | 70mm Thick Wall Tube | Bentonite | Sand

LOG OF BOREHOLE BH16-12

DST REF. No.: **IN-SO-026755**
CLIENT: **Canada Lands Company**
PROJECT: **Site Servicing Phase 1B**
LOCATION: **Wateridge Village, Ottawa, Ontario**
SURFACE ELEV.: **87.87 metres**

<u>Drilling Data</u>
METHOD: **Hollow Stem Auger**
DIAMETER: **200 mm**
DATE: **August 31, 2016**
COORDINATES: **5035071.7** m N, **372783.61** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE Wp W Wl (20 40 60 80)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) ✖ 20 40 60 80 / SPT (N) □ Blows/0.3m DCPT ◆ 20 40 60 80	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
					ASPHALT - 75 mm thick					
					FILL - SAND AND GRAVEL - some silt, brown, loose	SS1		9		
	87				CLAY - Silty, brown, hard					
1.0						SS2		8		
	86					SS3		12		
2.0									>>✖	
						SS4		10		
	85									
3.0						SS5		2		
					CLAY - Silty, grey, firm					
	84									
4.0						SS6		0		
	83					SS7		2		
5.0					TILL - silty clay, some sand and gravel, grey					
					End of Borehole at 5.1 m Split Spoon Sampler and Auger Refusal on Inferred Bedrock					
	82									
6.0										
	81									
7.0										
	80									

consulting engineers
DST Consulting Engineers
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SAMPLE TYPE LEGEND

Auger Sample	Rock Core	Bentonite
Split Spoon Sample	Hiller Peat Sampler	Sand
Bulk Sample	70mm Thick Wall Tube	

LOG OF BOREHOLE BH16-13

DST REF. No.: **IN-SO-026755**
CLIENT: **Canada Lands Company**
PROJECT: **Site Servicing Phase 1B**
LOCATION: **Wateridge Village, Ottawa, Ontario**
SURFACE ELEV.: **87.66 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
DIAMETER: **200 mm**
DATE: **August 26, 2016**
COORDINATES: **5035075.11** m N, **372672.07** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE (W_p, W, W_l; 20 40 60 80)	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) ✖ / SPT (N) □ Blows/0.3m / DCPT ◆ (20 40 60 80)	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
					ASPHALT - 75 mm thick					
					TOPSOIL - 50 mm thick					
					FILL - SAND - gravelly, trace clay and silt, brown, compact	SS1	Split Spoon	13		22 67 (11)
	87				CLAY - Silty, brown, stiff to hard					
1.0			●			SS2	Split Spoon	8		
	86									
2.0						SS3	Split Spoon	10		
									>>✖	
	85									
3.0			●			SS4	Split Spoon	2		
	84									
4.0						SS5	Split Spoon	0		
					CLAY - Silty, grey, soft to stiff				✖	
	83								✖	
			●			SS6	Split Spoon	0		
5.0										
	82					SS7	Split Spoon	0	✖	
6.0					TILL - Silty clay, grey, stiff					
			●			SS8	Split Spoon	14		
	81				End of Borehole at 6.7 m					
7.0										
	80									

BOREHOLE (STANDARD) PHASE 1B BOREHOLES V1.3.GPJ DST_MIN.GDT 10-24-16

DST consulting engineers

DST Consulting Engineers
Email: thunderbay@dstgroup.com
Web: www.dstgroup.com

SAMPLE TYPE LEGEND

Auger Sample	Rock Core	Bentonite
Split Spoon Sample	Hiller Peat Sampler	Sand
Bulk Sample	70mm Thick Wall Tube	

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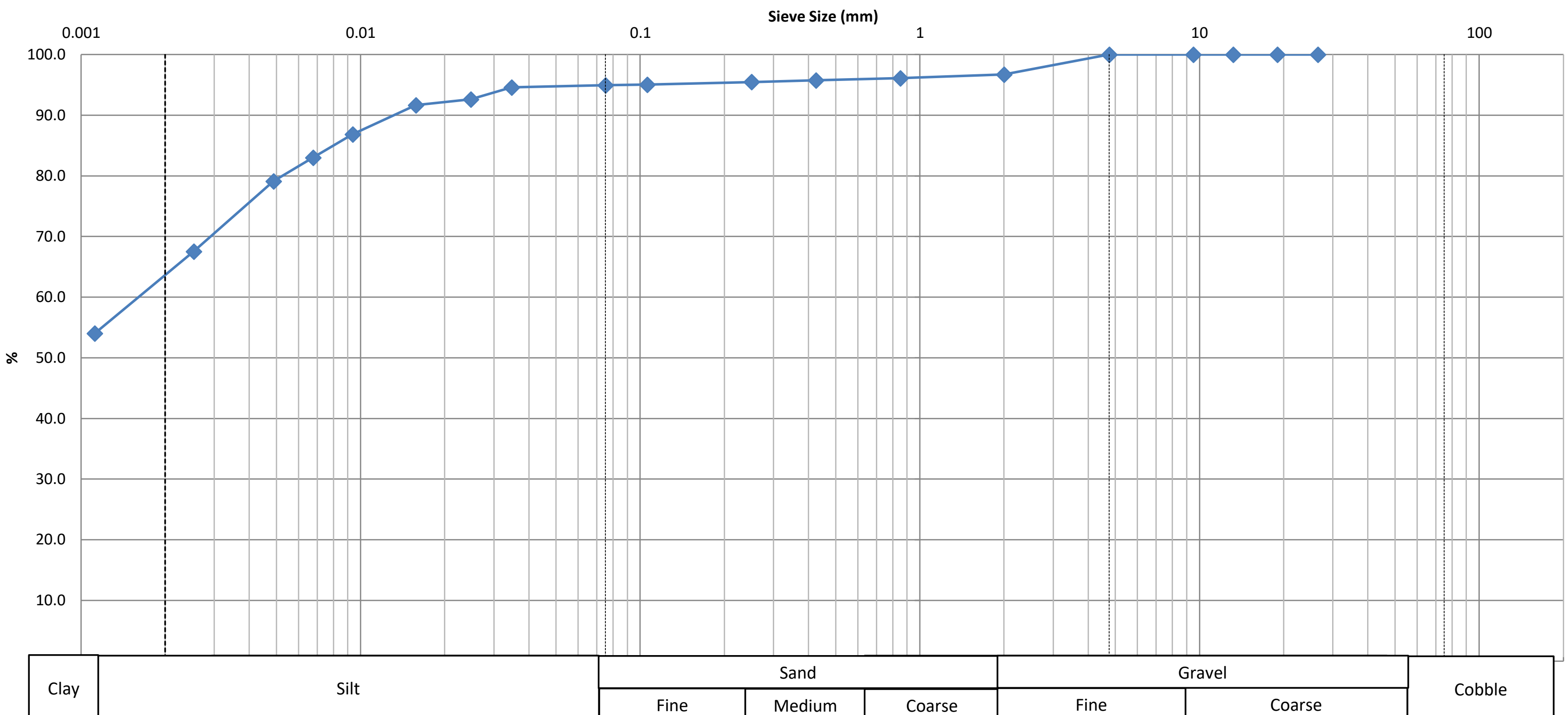
consulting engineers

SIEVE ANALYSIS	ASTM C136

CLIENT:	Ottawa Community Housing	DEPTH:	-	FILE NO:	PG 5354
CONTRACT NO.:		BH OR TP No.:	BH8 SS4	LAB NO:	17097
PROJECT:	715 Mikinak Rd.			DATE RECEIVED:	22-Jun-20
				DATE TESTED:	24-Jun-20
DATE SAMPLED:	15-Jun-20			DATE REPORTED:	29-Jun-20
SAMPLED BY:	Luke Lopers			TESTED BY:	DB



Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					35.5					
	D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)		
					0.0	5.1	31.4	63.5		

Comments:

REVIEWED BY:	Curtis Beadow	Joe Fosyth, P. Eng.

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HYDROMETER
LS-702 ASTM-422

CLIENT:	Ottawa Community Housing	DEPTH:	-	FILE NO.:	PG 5354
PROJECT:	715 Mikinak Rd.	BH OR TP No.:	BH8 SS4	DATE SAMPLED	15-Jun-20
LAB No. :	17097	TESTED BY:	DB	DATE RECEIVE	22-Jun-20
SAMPLED BY:	Luke Lopers	DATE REPT'D:	29-Jun-20	DATE TESTED:	24-Jun-20

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
100.3	2.700

		HYGROSCOPIC MOISTURE		
INITIAL WEIGHT	50.00			
WEIGHT CORRECTED	45.60	TARE WEIGHT	50.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	0.93	AIR DRY	150.00	100.00
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	141.20	91.20
		CORRECTED	0.912	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5		0.0	**100.0**
19	**0**	0.0	**100.0**
13.2	**0.0**	0.0	**100.0**
9.5	**0.0**	0.0	**100.0**
4.75	**0.0**	0.0	**100.0**
2.0	**3.3**	3.3	**96.7**
Pan	**97.0**		
0.850	**0.31**	3.9	**96.1**
0.425	**0.50**	4.3	**95.7**
0.250	**0.64**	4.5	**95.5**
0.106	**0.85**	4.9	**95.1**
0.075	**0.92**	5.1	**94.9**
Pan	**0.93**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (^oC)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	8:54	54.0	5.0	23.0	0.0346	97.8	**94.6**
2	8:55	53.0	5.0	23.0	0.0248	95.8	**92.6**
5	8:58	52.5	5.0	23.0	0.0158	94.8	**91.7**
15	9:08	50.0	5.0	23.0	0.0094	89.8	**86.8**
30	9:23	48.0	5.0	23.0	0.0068	85.8	**83.0**
60	9:53	46.0	5.0	23.0	0.0049	81.8	**79.1**
250	1:03	40.0	5.0	23.0	0.0025	69.8	**67.5**
1440	8:53	33.0	5.0	23.0	0.0011	55.9	**54.0**

COMMENTS:

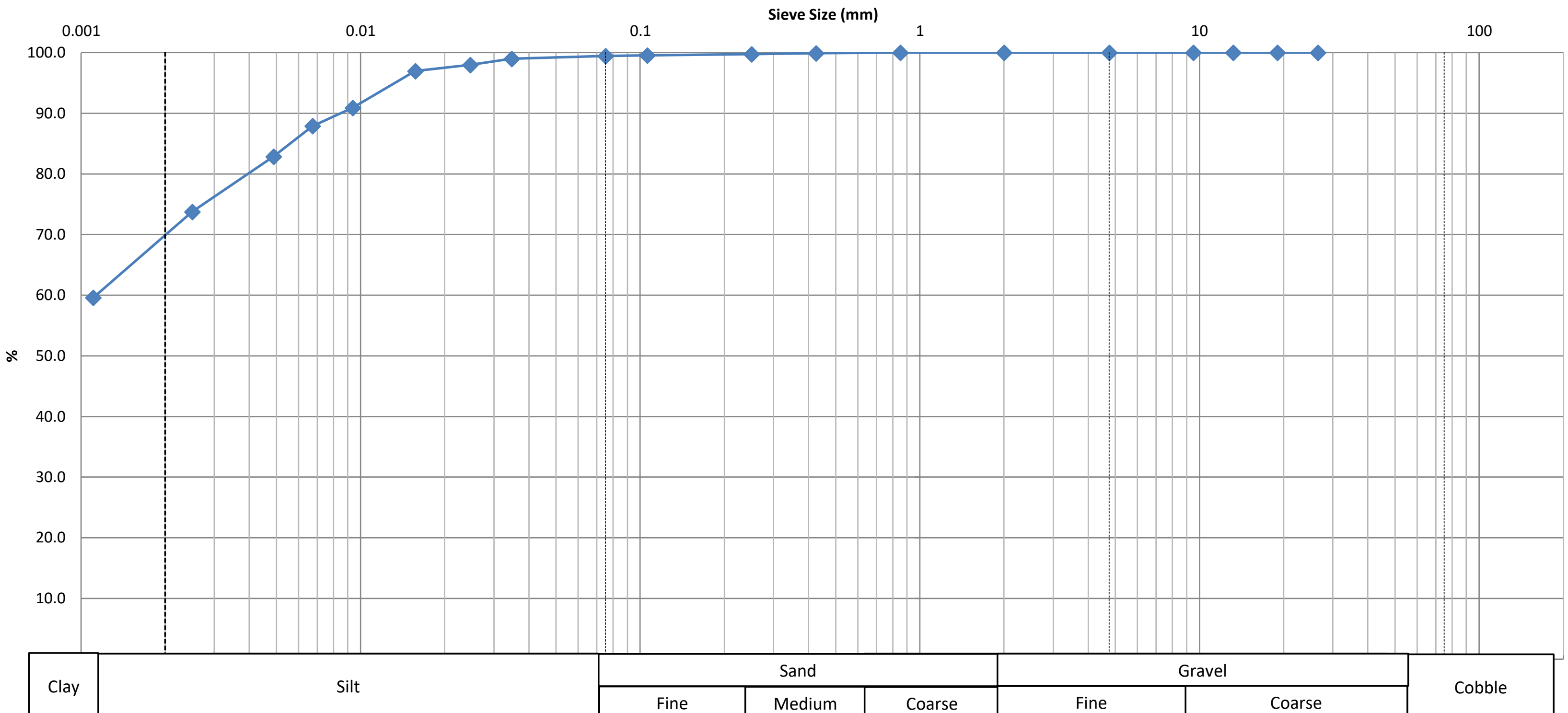
Moisture = 35.5%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

patersongroup
consulting engineers

SIEVE ANALYSIS **ASTM C136**

CLIENT:	Ottawa Community Housing	DEPTH:	-	FILE NO:	PG 5354
CONTRACT NO.:		BH OR TP No.:	BH4 SS4	LAB NO:	17095
PROJECT:	715 Mikinak Rd.			DATE RECEIVED:	22-Jun-20
				DATE TESTED:	24-Jun-20
DATE SAMPLED:	15-Jun-20			DATE REPORTED:	29-Jun-20
SAMPLED BY:	Luke Lopers			TESTED BY:	DB



Identification	Soil Classification				MC(%)	LL	PL	PI	Cc	Cu
					28.2					
	D100	D60	D30	D10	Gravel (%)	Sand (%)	Silt (%)	Clay (%)		
					0.0	0.6	29.4	70.0		

Comments:

REVIEWED BY:	Curtis Beadow	Joe Fosyth, P. Eng.

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HYDROMETER
LS-702 ASTM-422

CLIENT:	Ottawa Community Housing	DEPTH:	-	FILE NO.:	PG 5354
PROJECT:	715 Mikinak Rd.	BH OR TP No.:	BH4 SS4	DATE SAMPLED	15-Jun-20
LAB No. :	17095	TESTED BY:	DB	DATE RECEIVE	22-Jun-20
SAMPLED BY:	Luke Lopers	DATE REPT'D:	29-Jun-20	DATE TESTED:	24-Jun-20

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
109.6	2.700

INITIAL WEIGHT	50.00	**HYGROSCOPIC MOISTURE**		
WEIGHT CORRECTED	46.53	TARE WEIGHT	50.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	0.30	AIR DRY	150.00	100.00
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	143.05	93.05
		CORRECTED	0.931	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5		0.0	**100.0**
19	**0**	0.0	**100.0**
13.2	**0.0**	0.0	**100.0**
9.5	**0.0**	0.0	**100.0**
4.75	**0.0**	0.0	**100.0**
2.0	**0.0**	0.0	**100.0**
Pan	**109.6**		
0.850	**0.00**	0.0	**100.0**
0.425	**0.05**	0.1	**99.9**
0.250	**0.13**	0.3	**99.7**
0.106	**0.24**	0.5	**99.5**
0.075	**0.29**	0.6	**99.4**
Pan	**0.30**		
SIEVE CHECK 0.0	MAX = 0.3%		

HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (°C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	8:27	54.0	5.0	23.0	0.0346	99.0	**99.0**
2	8:28	53.5	5.0	23.0	0.0246	98.0	**98.0**
5	8:31	53.0	5.0	23.0	0.0157	97.0	**97.0**
15	8:41	50.0	5.0	23.0	0.0094	90.9	**90.9**
30	8:56	48.5	5.0	23.0	0.0067	87.9	**87.9**
60	9:26	46.0	5.0	23.0	0.0049	82.8	**82.8**
250	12:36	41.5	5.0	23.0	0.0025	73.7	**73.7**
1440	8:26	34.5	5.0	23.0	0.0011	59.6	**59.6**

COMMENTS:

Moisture = 28.2%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.

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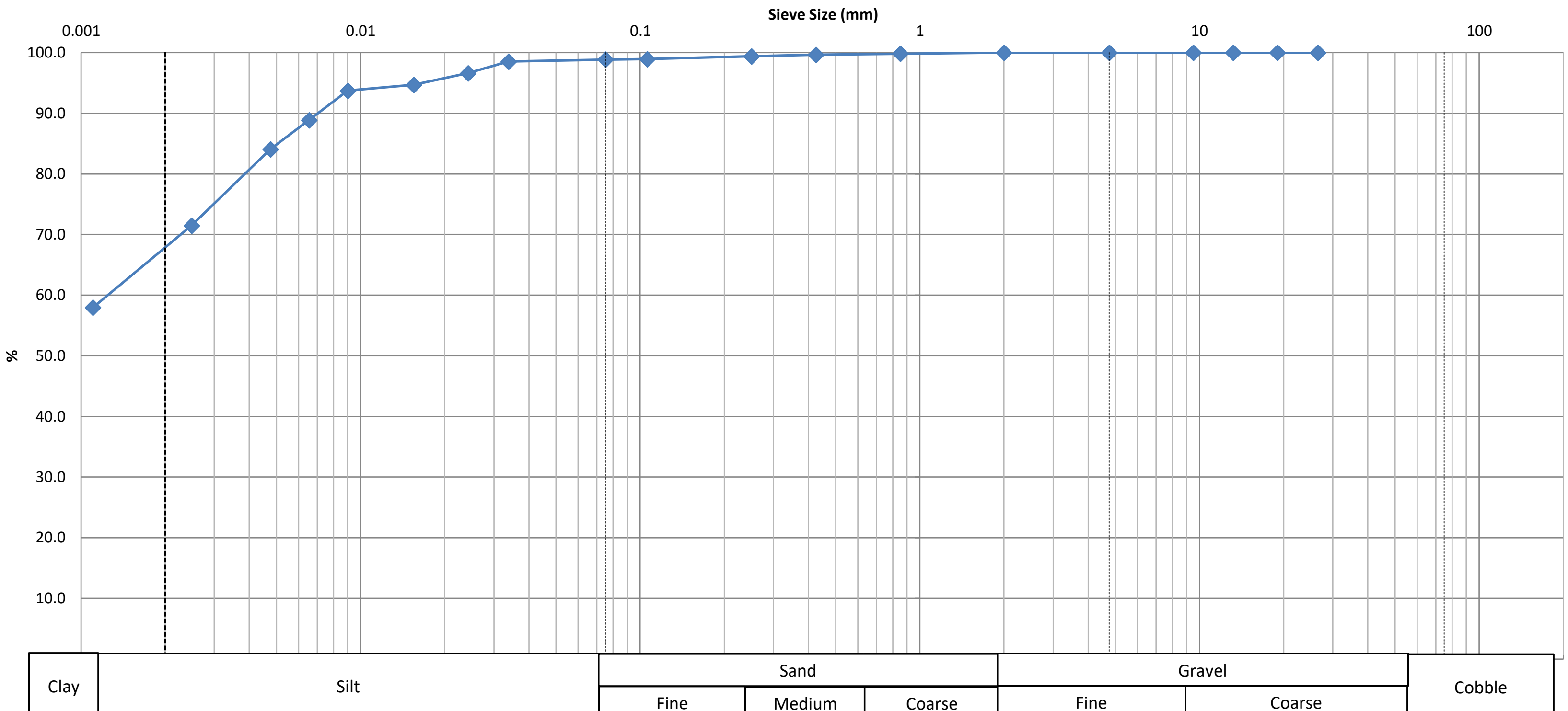
SIEVE ANALYSIS ASTM C136	

CLIENT:	Ottawa Community Housing	DEPTH:	-	FILE NO:	PG 5354
CONTRACT NO.:		BH OR TP No.:	BH5 SS4	LAB NO:	17096
PROJECT:	715 Mikinak Rd.			DATE RECEIVED:	22-Jun-20
				DATE TESTED:	24-Jun-20
DATE SAMPLED:	15-Jun-20			DATE REPORTED:	29-Jun-20
SAMPLED BY:	Luke Lopers			TESTED BY:	DB



Identification	Soil Classification					MC(%)	LL	PL	PI	Cc	Cu
						29.1					
	D100	D60	D30	D10	Gravel (%)	Sand (%)		Silt (%)		Clay (%)	
					0.0	1.1		30.4		68.5	

Comments:

REVIEWED BY:	Curtis Beadow	Joe Fosyth, P. Eng.

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consulting engineers

HYDROMETER
LS-702 ASTM-422

CLIENT:	Ottawa Community Housing	DEPTH:	-	FILE NO.:	PG 5354
PROJECT:	715 Mikinak Rd.	BH OR TP No.:	BH5 SS4	DATE SAMPLED	15-Jun-20
LAB No. :	17096	TESTED BY:	DB	DATE RECEIVE	22-Jun-20
SAMPLED BY:	Luke Lopers	DATE REPT'D:	29-Jun-20	DATE TESTED:	24-Jun-20

SAMPLE INFORMATION

SAMPLE MASS	SPECIFIC GRAVITY
107.3	2.700

INITIAL WEIGHT	50.00	**HYGROSCOPIC MOISTURE**		
WEIGHT CORRECTED	46.58	TARE WEIGHT	50.00	ACTUAL WEIGHT
WT. AFTER WASH BACK SIEVE	0.57	AIR DRY	150.00	100.00
SOLUTION CONCENTRATION	40 g/L	OVEN DRY	143.15	93.15
		CORRECTED	0.932	

GRAIN SIZE ANALYSIS

SIEVE DIAMETER (mm)	WEIGHT RETAINED (g)	PERCENT RETAINED	PERCENT PASSING
26.5		0.0	**100.0**
19	**0**	0.0	**100.0**
13.2	**0.0**	0.0	**100.0**
9.5	**0.0**	0.0	**100.0**
4.75	**0.0**	0.0	**100.0**
2.0	**0.0**	0.0	**100.0**
Pan	**107.3**		
0.850	**0.09**	0.2	**99.8**
0.425	**0.17**	0.3	**99.7**
0.250	**0.31**	0.6	**99.4**
0.106	**0.53**	1.1	**98.9**
0.075	**0.57**	1.1	**98.9**
Pan	**0.57**		
SIEVE CHECK 0.0	MAX = 0.3%		

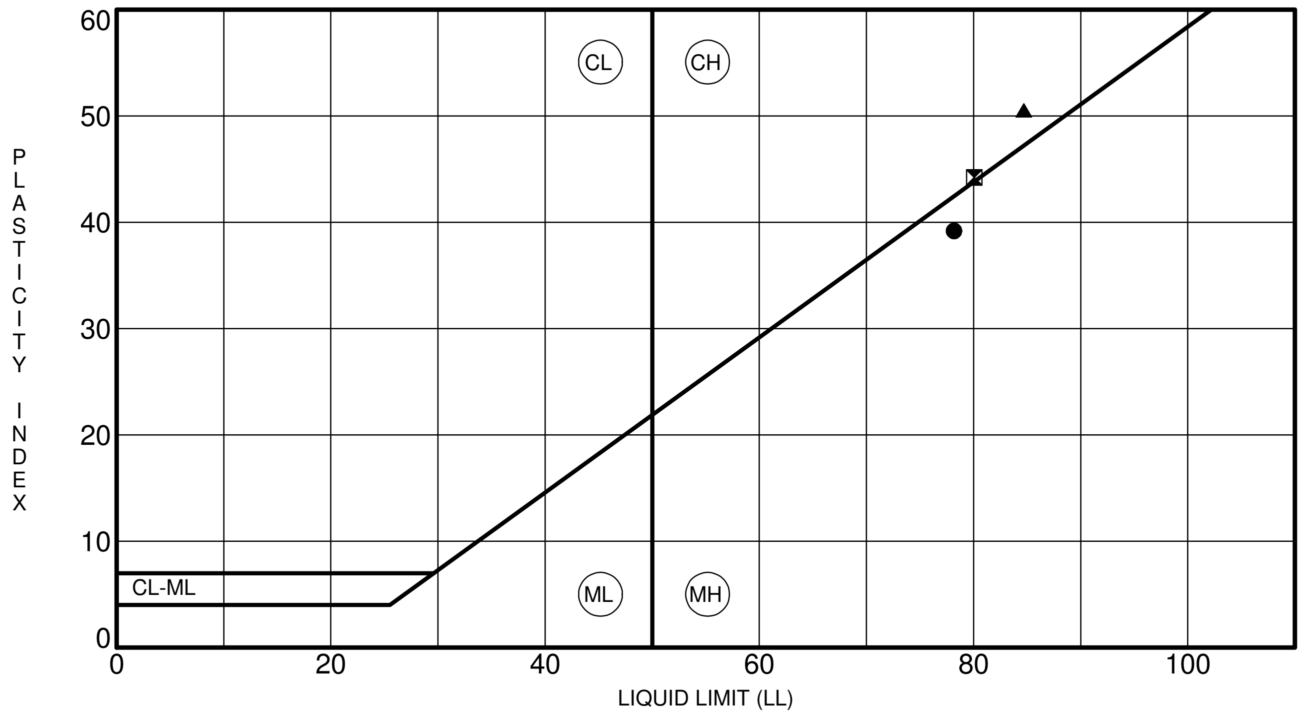
HYDROMETER DATA

ELAPSED	TIME (24 hours)	Hs	Hc	Temp. (^{o}C)	DIAMETER	(P)	TOTAL PERCENT PASSING
1	8:42	56.0	5.0	23.0	0.0338	98.6	**98.6**
2	8:43	55.0	5.0	23.0	0.0242	96.6	**96.6**
5	8:46	54.0	5.0	23.0	0.0155	94.7	**94.7**
15	8:56	53.5	5.0	23.0	0.0090	93.7	**93.7**
30	9:11	51.0	5.0	23.0	0.0065	88.9	**88.9**
60	9:41	48.5	5.0	23.0	0.0048	84.1	**84.1**
250	12:51	42.0	5.0	23.0	0.0025	71.5	**71.5**
1440	8:41	35.0	5.0	23.0	0.0011	58.0	**58.0**

COMMENTS:

Moisture = 29.1%

REVIEWED BY:	C. Beadow	Joe Forsyth, P. Eng.



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**BH 4-20**	**SS 3**	**78**	**39**	**39**		**MH - Inorganic silts of high plasticity**
⧗	**BH 5-20**	**SS 3**	**80**	**36**	**44**		**CH - Inorganic clays of high plasticity**
▲	**BH 8-20**	**SS3**	**85**	**34**	**51**		**CH - Inorganic clays of high plasticity**

CLIENT

FILE NO. **PG5354**

PROJECT **Geotechnical Investigation - Proposed Residential Building - 715 Mikinak Road**

DATE **16 Jun 20**

patersongroup **Consulting Engineers**

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

ATTERBERG LIMITS' RESULTS

APPENDIX 2

FIGURE 1 - KEY PLAN

FIGURE 2 - 1991 ARIAL PHOTOGRAPH

DRAWING PG5354-1 - TEST HOLE LOCATION PLAN

DRAWING PG5354-2 - PERMISSIBLE GRADE RAISE AREAS

DRAWING PG5354-3 - TREE PLANTING SETBACK RECOMMENDATIONS

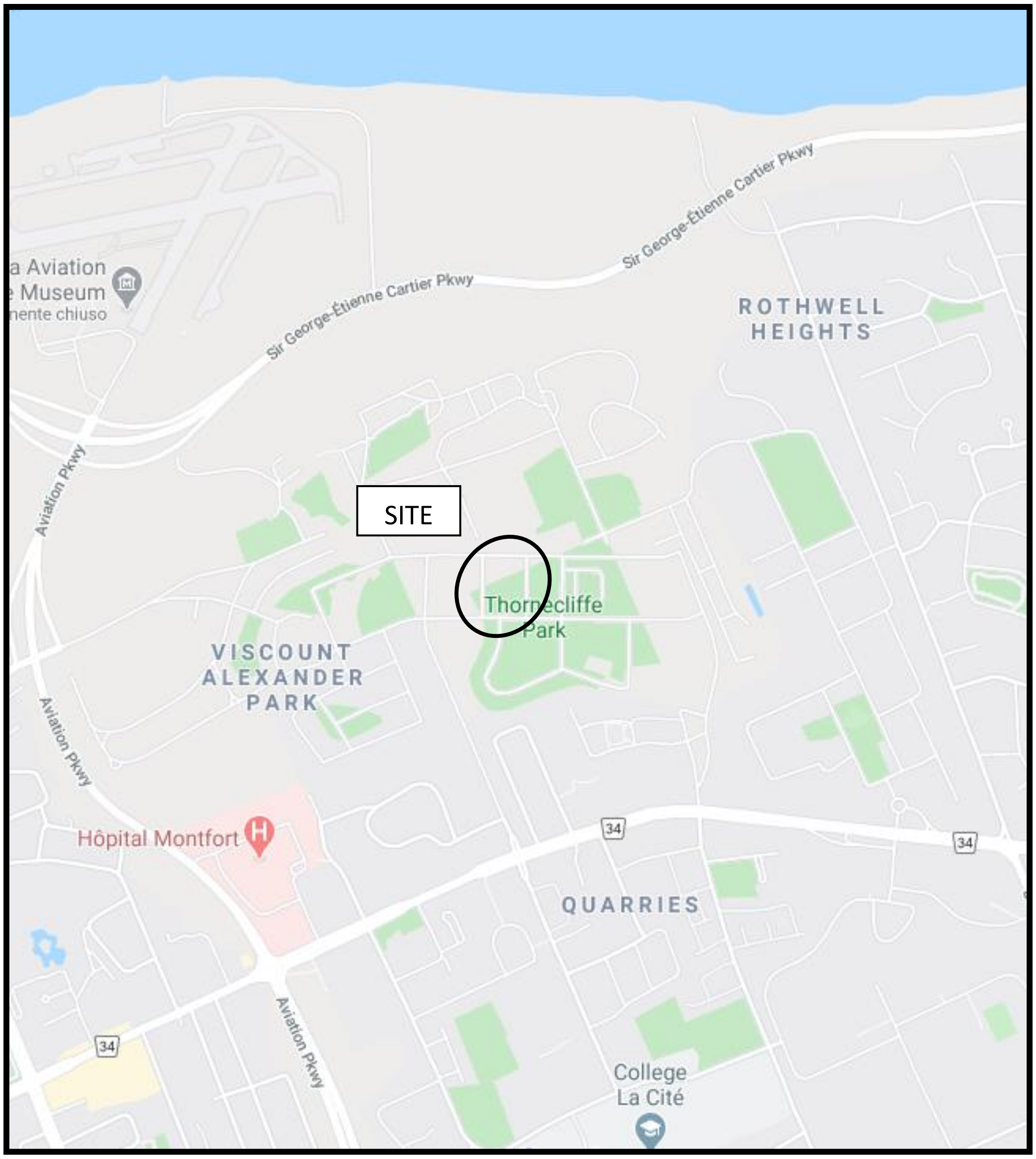


FIGURE 1

KEY PLAN

patersongroup

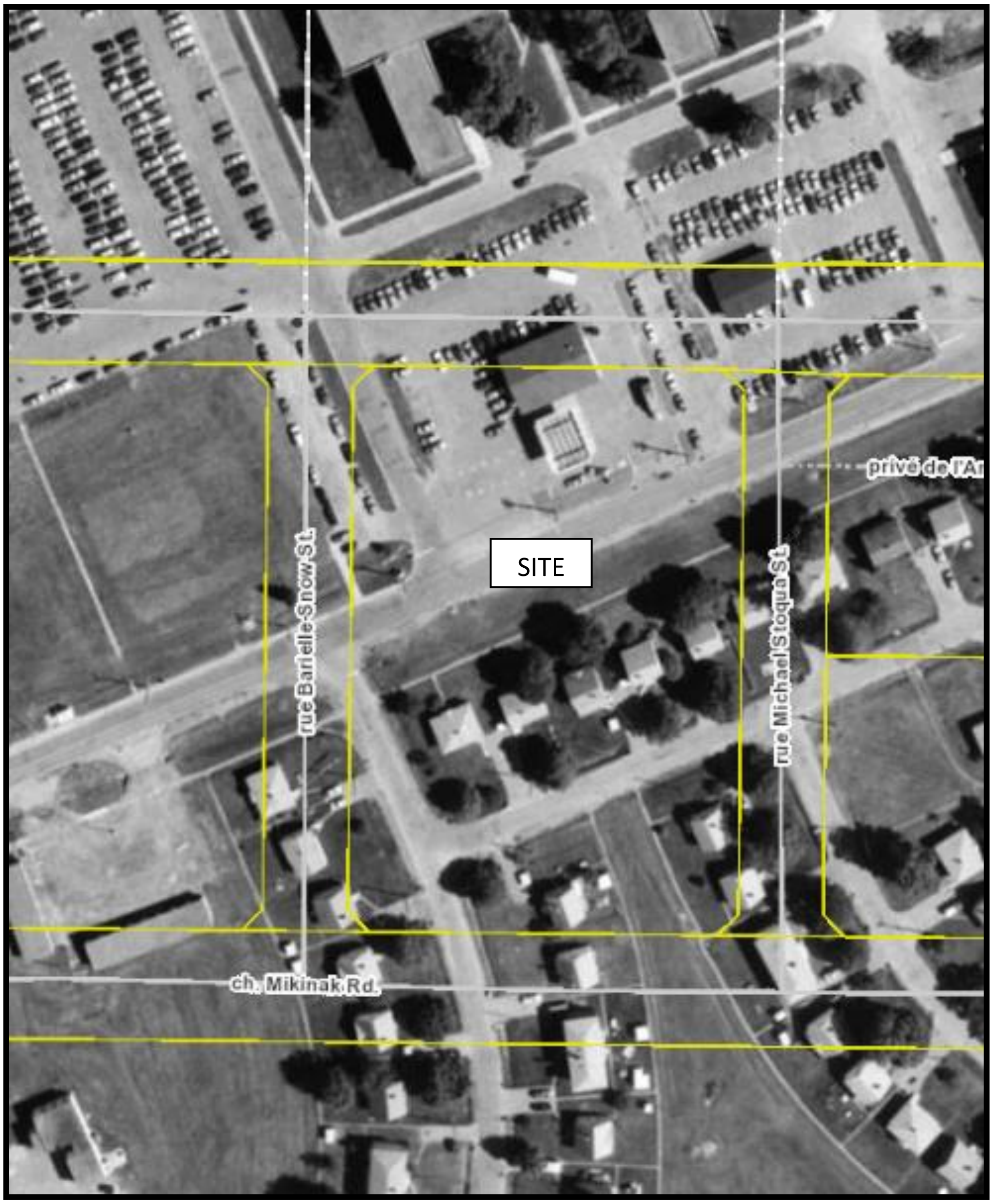
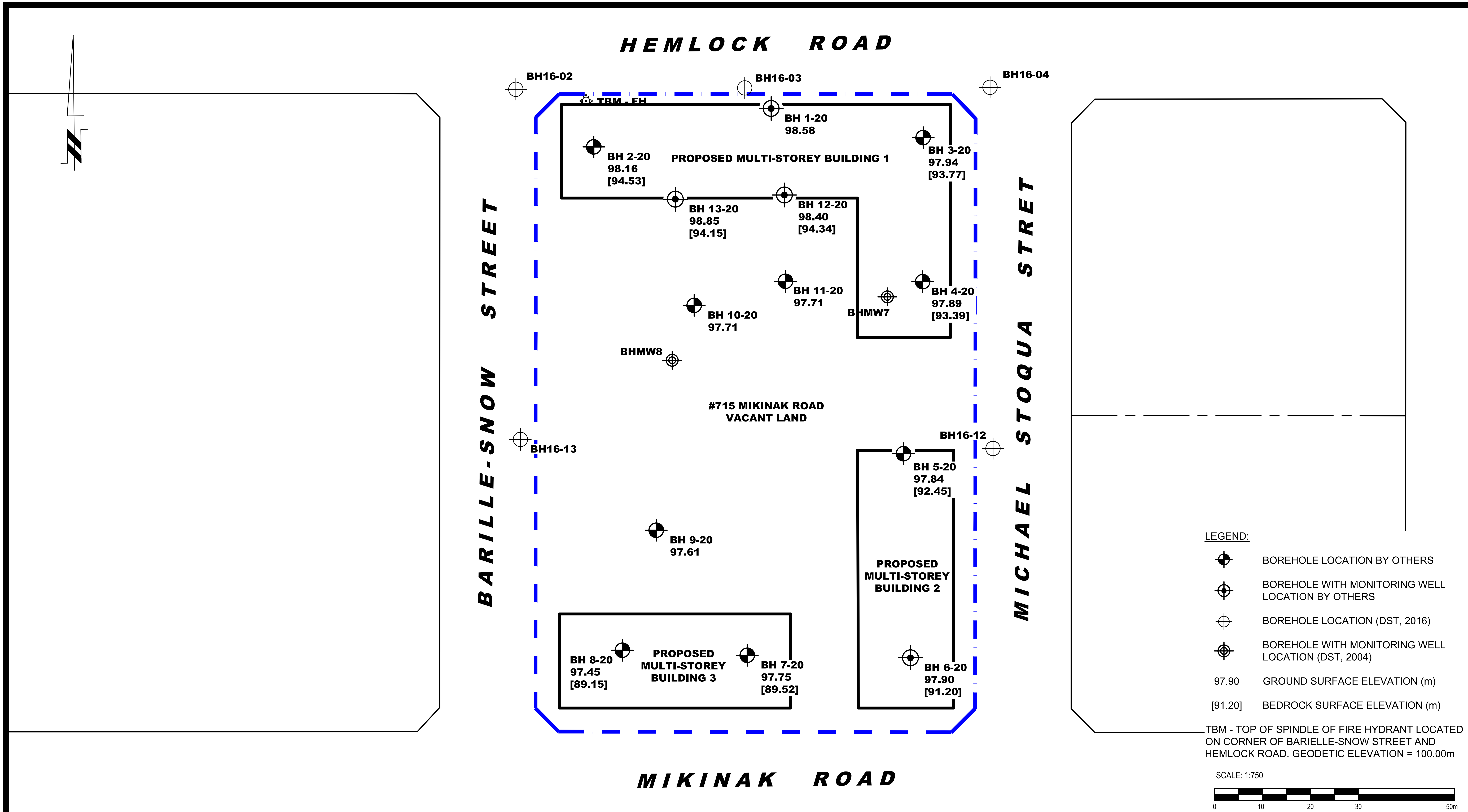


FIGURE 2

1991 ARIAL PHOTOGRAPH

patersongroup



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154 Colonnade Road South
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Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL

OTTAWA COMMUNITY HOUSING
GEOTECHNICAL INVESTIGATION
715 MIKINAK ROAD
OTTAWA, ONTARIO

Title:
TEST HOLE LOCATION PLAN

Scale: 1:750	Date: 07/2020
Drawn by: NFRV	Report No.: PG5354-1
Checked by: JV	Dwg. No.: PG5354-1
Approved by: DJG	Revision No.:

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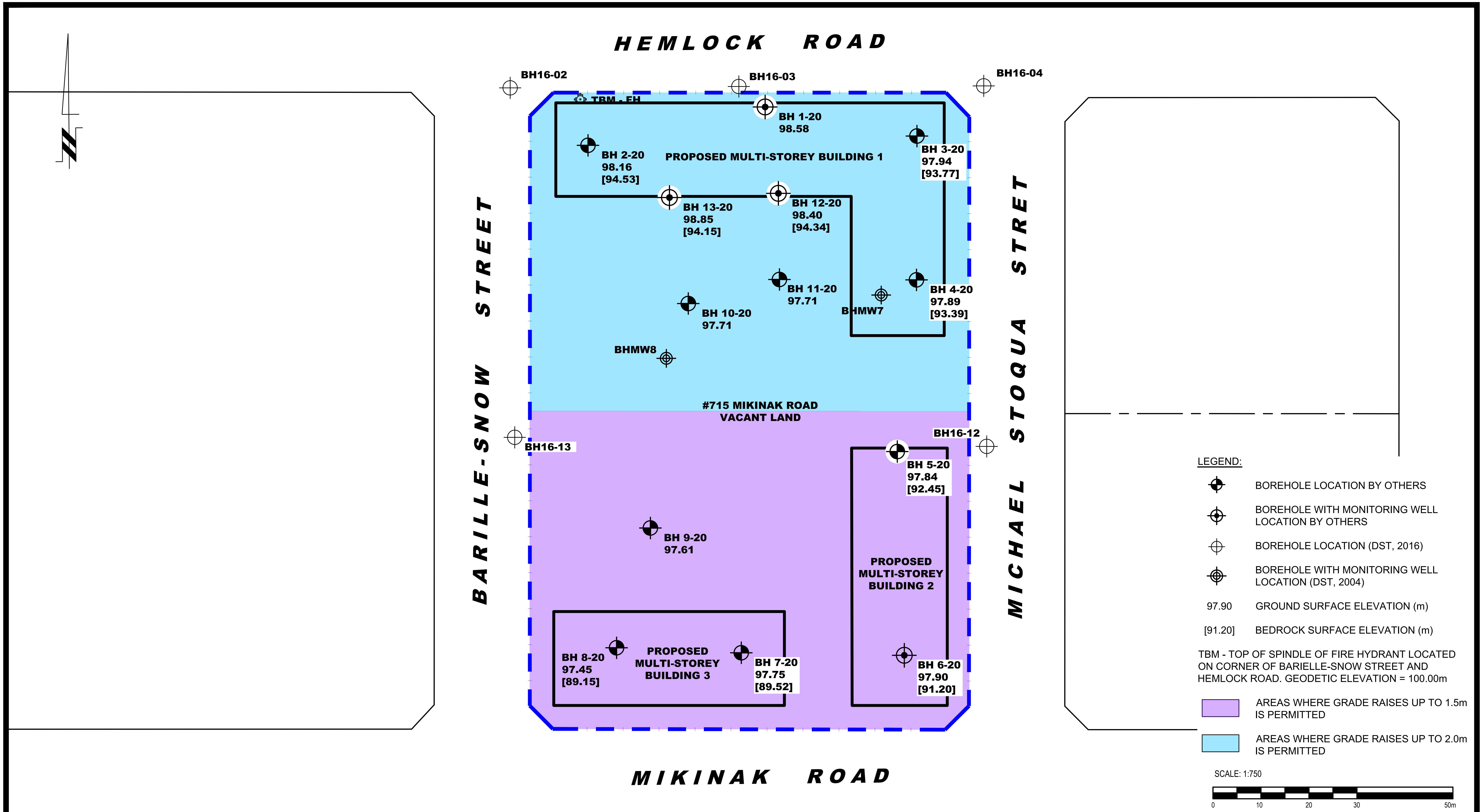

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154 Colonnade Road South
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Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL

OTTAWA COMMUNITY HOUSING

GEOTECHNICAL INVESTIGATION
715 MIKINAK ROAD

OTTAWA, ONTARIO

Title:

PERMISSIBLE GRADE RAISE PLAN

Scale: 1:750	Date: 07/2020
Drawn by: NFRV	Report No.: PG5354-1
Checked by: JV	Dwg. No.: PG5354-2
Approved by: DJG	Revision No.:

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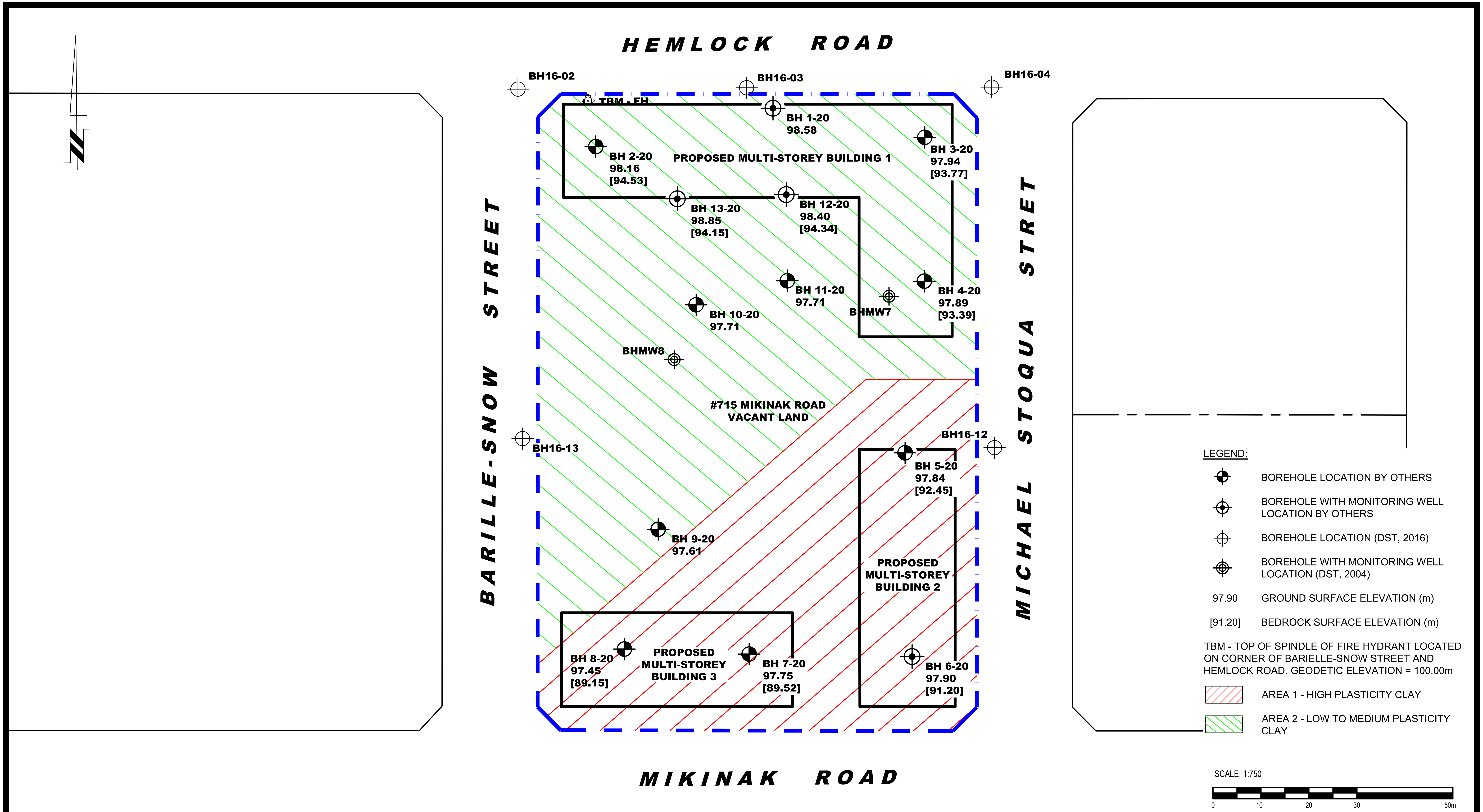

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154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL

OTTAWA COMMUNITY HOUSING

GEOTECHNICAL INVESTIGATION
715 MIKINAK ROAD

OTTAWA, ONTARIO

Title:
TREE PLANTING SETBACK RECOMMENDATIONS

Scale: 1:750	Date: 07/2020
Drawn by: NFRV	Report No.: PG5354-1
Checked by: JV	Dwg. No.: PG5354-3
Approved by: DJG	Revision No.:

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memorandum

re: **Subsoil Infiltration Review**
Proposed Residential Building
715 Mikinak Road - Ottawa

to: Ottawa Community Housing Corporation - **Dylan Bennett** - dylan_bennett@och.ca

date: August 17, 2021

file: PG5354-MEMO.03

Paterson Group (Paterson) has prepared the current memorandum report to provide anticipated infiltration rates to be encountered within the subsoils below the proposed storage media of the permeable pavers and bioswales based on Paterson's geotechnical investigations. The memo should be read in conjunction with Paterson Report PG5354-1 dated August 17, 2021.

Background Information

At the time of writing this report, it is understood that the development will consist of three multi-storey residential buildings with associated access lanes, parking area and landscaped areas. Permeable pavers and bioswales within the proposed parking area is also being considered in order to manage the stormwater accumulation at the subject site.

Geotechnical investigations have been completed by Others at the subject site between November 2004 and June 2020. At that time, a total of 20 boreholes were advanced to a maximum depth of 8.3 m below ground surface (bgs).

The results of the geotechnical investigations indicated that, in general, the subsurface profile at the test hole locations consisted of a loose to dense silty sand with varying amounts of gravel and silty clay underlain by a very stiff to firm silty clay deposit. Fill material was encountered in select boreholes across the site and consisted of silty clay, silty sand, gravel and construction debris. Practical refusal to augering was encountered at select borehole locations between 3.6 and 8.2, while practical DCPT refusal was noted at 8.3 m.

Groundwater level readings were completed at the borehole locations during the most recent field investigation and was measured at 6.4 m below existing ground surface. Long-term groundwater level can also be estimated based on the observed colour, moisture levels and consistency of the recovered soil samples. Based on these observations, the long-term groundwater level is expected between 4 to 5 m depth. It should be noted that groundwater levels are subject to seasonal fluctuations, therefore, the groundwater levels could vary at the time of construction.

Subsoil Infiltration Values

Based on the Servicing Plan (Project No. 125599 – Sheet No.C-200) prepared by IBI Group for the proposed development and the subsurface profile at the subject site, it is anticipated that the subsoil below the proposed storage media of the permeable pavers and bioswales will consist of either fill material, silty sand or silty clay. Based upon previous experience at similar sites in the area with similar stratigraphy, typical published values and permeameter testing on the adjacent block, hydraulic conductivity values and infiltration rates for the subsoils have been estimated and summarized in Table 1. It should be noted that a safety correction factor was not applied to the above noted infiltration rates for calculating the design infiltration rates.

Table 1 - Estimated Hydraulic Conductivity and Infiltration Rates

Soil Type	K (m/sec)	Infiltration Rate (mm/hr)
Silty Clay	$<9.4\times10^{-9}$ to 6.3×10^{-8}	<13 to 23
Silty Sand	1×10^{-6} to 1×10^{-4}	45 to 160
Fill Material	1×10^{-8} to 1×10^{-4}	15 to 160

It is recommended the storage media for the permeable pavers and bioswales be placed a minimum of 1 m above the seasonal high groundwater table and bedrock to provide optimal conditions for water infiltration to the subsoil.

To determine site specific design infiltration rates, it is recommended to complete a series of permeameter tests at the invert elevation of the proposed infiltration system prior to finalizing the design.

We trust that this information satisfies your requirements.

Best Regards,

August 17, 2021

LICENSED PROFESSIONAL ENGINEER
J. R. VILLENEUVE
100504344
PROVINCE OF ONTARIO

Paterson Group Inc.

Nicholas Zulinski, P.Geo., géo.

Joey R. Villeneuve, M.A.Sc., P.Eng., ing.

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Ottawa - Ontario - K2E 7T7
Tel: (613) 226-7381

Nino Alvarez

From:	Ryan Leonard <r.leonard@gwal.com>
Sent:	Tuesday, August 10, 2021 11:32 AM
To:	Nino Alvarez; Chun Wang
Cc:	Bill Thomas; Alice Tchakedjian; Alice Tchakedjian
Subject:	RE: [EXTERNAL]125599 OCH-Mikinak Redevelopment - Geothermal | DHW - Coordination

Here is some commentary from mechanical to begin the coordination.

Ryan Leonard, P.Eng., Senior Associate - Mechanical Engineer
Goodkey, Weedmark & Associates Limited
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1688 Woodward Drive, Ottawa, Ontario, K2C 3R8
Voice: 613-727-5111, ext. 203
Fax: 613-727-5115
Email: r.leonard@gwal.com
Web: www.gwal.com

From: Nino Alvarez <nino.alvarez@ibigroup.com>
Sent: August 10, 2021 10:53 AM
To: Ryan Leonard <r.leonard@gwal.com>; Chun Wang <chun.wang@ibigroup.com>
Cc: Bill Thomas <bill.thomas@ibigroup.com>; Alice Tchakedjian <alice.tchakedjian@ibigroup.com>; Alice Tchakedjian <alice.tchakedjian@ibigroup.com>
Subject: RE: [EXTERNAL]125599 OCH-Mikinak Redevelopment - Geothermal | DHW - Coordination

Hi Chun and Ryan,
I just want to coordinate some additional items to address the city comments. Would you be able to provide a short memo/responses for these items below.

Item	Comment	Action	Response
2.16	The populations for each building are based on an average apartment unit type (1.8 persons per unit). Obtain a unit type breakdown for each building from the Architect to support the calculated building populations as assumptions on unit type are not fitting when specific building details are available. Revise the water and wastewater calculation and describe the unit type breakdown and building populations in the body of the report. Include correspondence from architect in the appendix	Architect	GWA used a population estimation of 1.5 people per bed to perform the domestic hot water calculations. So that's 1.5 per studio and 1 bedroom. 3 for 2 bedrooms and 4.5 for 3 bedrooms.
2.18	Why has rooftop storage not been considered as part of stormwater management solution if there is an opportunity to control flows from the roofs?	Architect	GWA can accommodate easily. Ponding during storm events would sourround the solar field. Solar consultant would have to be contact if that's an issue.

2.35	The mechanical engineer needs to provide a letter (signed and sealed) confirming each building sprinkler system will meet the requirements of a fully supervised system as per the NFPA and are fully supervised by a monitored fire alarm system as per OBC to support applying the maximum 50% sprinkler protection credit to the FUS method. Otherwise, a maximum credit of 40% should only be applied. Provide this letter within the Appendix to confirm that the buildings will be complete with a sprinkler system conforming to NFPA13.	Mechanical	No Problem Will provide this letter right away
2.36	Please include email confirmation from the Architect within the Appendix regarding the building construction to confirm the building assumptions made in the FUS fire flow requirement calculations are accurate for type of construction, occupancy type and sprinkler protection to justify the selections. Correspondence shall be provided within the Appendix of the report as supporting documentation.	Architect	
2.75	Separate water service connection is required for building B with an isolation valve and a separate water meter	Mechanical	The buildings A and B share a common waste water heat recovery system to meet the sustainability requirements of the project and accommodates the production of the two building domestic hot water needs. Therefore, metering the domestic cold water alone for building B is not warranted. The owner of both buildings use a metering system to monitor the water consumption for both buildings individually for internal analytical analysis
2.80	Indicate roof drain locations and the emergency rooftop scupper locations for each building on the plan. Obtain such information from the mechanical engineer. Shall not spill over any public areas (sidewalks, entrances, etc.) and not negatively impact the ROW.	Mechanical	Roof drain locations and scupper are provided by architect. Mechanical follows placement and routes the internal piping network.

Thanks,
Nino

From: Ryan Leonard <r.leonard@gwal.com>
Sent: Monday, August 9, 2021 10:37 AM
To: Nino Alvarez <nino.alvarez@ibigroup.com>; Alice Tchakedjian <alice.tchakedjian@ibigroup.com>; Bill Thomas <bill.thomas@ibigroup.com>
Cc: Chun Wang <chun.wang@ibigroup.com>; Bernie Duquette <bduquette@IBIGroup.com>; knaneff@gwal.com; Heather Brouwer <heather.brouwer@ibigroup.com>
Subject: RE: [EXTERNAL]125599 OCH-Mikinak Redevelopment - Geothermal | DHW - Coordination

Hi Nino,

Servicing study guidelines for development applications

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

- ☐ Executive Summary (for larger reports only).
- ☒ Date and revision number of the report.
- ☒ Location map and plan showing municipal address, boundary, and layout of proposed development.
- ☒ Plan showing the site and location of all existing services.
- ☐ 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.
- ☒ Summary of Pre-consultation Meetings with City and other approval agencies.
- ☒ 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.
- ☒ Statement of objectives and servicing criteria.
- ☒ Identification of existing and proposed infrastructure available in the immediate area.
- ☐ 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).
- ☒ 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.
- ☐ 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.
- ☐ Proposed phasing of the development, if applicable.

☒ Reference to geotechnical studies and recommendations concerning servicing.

☒ 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

4.2 Development Servicing Report: Water

☒ Confirm consistency with Master Servicing Study, if available

☒ Availability of public infrastructure to service proposed development

☒ Identification of system constraints

☒ Identify boundary conditions

☒ Confirmation of adequate domestic supply and pressure

☒ 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.

☒ 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.

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

☒ Address reliability requirements such as appropriate location of shut-off valves

☐ Check on the necessity of a pressure zone boundary modification.

☒ 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

- ☒ 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.
- ☐ 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.
- ☒ Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.
- ☐ Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.

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).
- ☒ Confirm consistency with Master Servicing Study and/or justifications for deviations.
- ☐ 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.
- ☒ Description of existing sanitary sewer available for discharge of wastewater from proposed development.
- ☒ 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)
- ☒ Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.
- ☐ Description of proposed sewer network including sewers, pumping stations, and forcemains.
- ☐ 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).
- ☐ Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.
- ☐ Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.
- ☐ Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.
- ☐ Special considerations such as contamination, corrosive environment etc.

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)
- ☒ Analysis of available capacity in existing public infrastructure.
- ☒ A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.
- ☒ 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.
- ☒ Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.
- ☒ Description of the stormwater management concept with facility locations and descriptions with references and supporting information.
- ☐ Set-back from private sewage disposal systems.
- ☐ Watercourse and hazard lands setbacks.
- ☒ Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.
- ☒ Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.
- ☒ Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).
- ☐ Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.
- ☒ 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.
- ☐ Any proposed diversion of drainage catchment areas from one outlet to another.
- ☒ Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.
- ☐ 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.
- ☐ Identification of potential impacts to receiving watercourses
- ☒ Identification of municipal drains and related approval requirements.
- ☒ Descriptions of how the conveyance and storage capacity will be achieved for the development.
- ☒ 100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.

- ☐ Inclusion of hydraulic analysis including hydraulic grade line elevations.
- ☐ Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.
- ☐ 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.
- ☐ Identification of fill constraints related to floodplain and geotechnical investigation.

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:

- ☐ 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.
- ☐ Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.
- ☐ Changes to Municipal Drains.
- ☐ Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)

4.6 Conclusion Checklist

- ☐ Clearly stated conclusions and 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 draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario

Conservation Partners
Partenaires en conservation

Mississippi Valley Conservation Authority
Rideau Valley Conservation Authority
South Nation Conservation de la Nation Sud

File: 21-OTT-SPC-0287

June 18th, 2021

City of Ottawa
Planning, Infrastructure and Economic Development Department
110 Laurier Avenue West, 4th Floor
Ottawa, ON K1P 1J1

Attention: Kimberley Baldwin

Subject: Ottawa Community Housing Corporation
Site Plan Control Application D07-12-21-0068
715 Mikinak Road, City of Ottawa

Dear Ms. Baldwin:

The Conservation Partners Planning and Development Review Team has completed a review of the above noted application to permit the construction of two seven-storey mixed-use buildings fronting onto Hemlock Road and Barielle-Snow Street, as well as a four-stroey mixed-use building fronting onto Mikinak Road, with a central surface parking lot accessed via Michael Stoqua Street.

We have undertaken our review within the context of Sections 1.6.6 Sewage, Water and Stormwater, 2.1 Natural Heritage, 2.2 Water and 3.1 Natural Hazards of the Provincial Policy Statement, 2020 issued under Section 3 of the *Planning Act*, and from the perspective of the Conservation Authority regulations. The following comments are offered for your consideration.

Natural Heritage

There have been no natural heritage features identified on this property which would preclude this application.

Natural Hazards

There have been no natural hazards identified on the site which would preclude this application.

Stormwater Management

The stormwater management report “Civil Design Brief – 715 Mikinak Road, Ottawa, ON” dated May 20th, 2021, prepared by IBI Group indicates that stormwater from the site will ultimately outlet to an existing storm sewer on Michael Stoqua Street. The stormwater management plan proposes a water quality target of ‘enhanced’ (80% TSS removal) which will be achieved via the installation of an stormceptor unit (or equivalent). The water quality objective is appropriate for the downstream receiving watercourse.

The RVCA did not conduct a technical review of the stormwater management plan for this site. We will rely on the City of Ottawa to ensure that the stormwater management is consistent with the design assumptions of the receiving storm sewers and the Master Servicing Study.

Conclusion

In conclusion, the RVCA has no objection to this Site Plan Control application. The Conservation Authority kindly requests a copy of decision related to this file. For any questions regarding the information contained in this letter, please feel free to contact me.

Respectfully,

Jamie Batchelor, MCIP, RPP
Planner, Planning and Watershed Science
Rideau Valley Conservation Authority
613-692-3571 ext. 1191
Jamie.batchelor@rvca.ca

Cc: Alice Tchakedijan: IBI Group

Nino Alvarez

From:	Chun Wang
Sent:	Monday, August 23, 2021 10:02 AM
To:	Nino Alvarez
Cc:	Bill Thomas; Alice Tchakedjian; Alice Tchakedjian; Ryan Leonard
Subject:	RE: [EXTERNAL]125599 OCH-Mikinak Redevelopment - Geothermal | DHW - Coordination

Hi Nino, for question 2.36
Building A:
non-combustible construction with non-combustible cladding, 7-storeys sprinklered.
Group C Residential major occupancy with Group D Business and personal professionals as subsidiary occupancy.
Building height: 23.32m

Building B:
non-combustible construction with non-combustible cladding, 7-storeys sprinklered.
Group C Residential major occupancy with Group D Business and personal professionals as subsidiary occupancy.
Building height: 23.32m

Building C:
non-combustible construction with non-combustible cladding, 4-storeys sprinklered.
Group C Residential major occupancy with Group D Business and personal professionals as subsidiary occupancy.
Building height: 14.09m

Thanks,

Chun

From: Nino Alvarez <nino.alvarez@ibigroup.com>
Sent: Tuesday, August 10, 2021 10:53 AM
To: Ryan Leonard <r.leonard@gwal.com>; Chun Wang <chun.wang@ibigroup.com>
Cc: Bill Thomas <bill.thomas@ibigroup.com>; Alice Tchakedjian <alice.tchakedjian@ibigroup.com>; Alice Tchakedjian <alice.tchakedjian@ibigroup.com>
Subject: RE: [EXTERNAL]125599 OCH-Mikinak Redevelopment - Geothermal | DHW - Coordination

Hi Chun and Ryan,
I just want to coordinate some additional items to address the city comments. Would you be able to provide a short memo/responses for these items below.

Item	Comment	Action	Response
2.16	The populations for each building are based on an average apartment unit type (1.8 persons per unit). Obtain a unit type breakdown for each building from the Architect to support the calculated building populations as assumptions on unit type are not fitting when specific building details are available. Revise the water and wastewater calculation and describe the unit type breakdown and building populations in the body of the report. Include correspondence from architect in the appendix	Architect	

Goodkey, Weedmark & Associates Limited

Consulting Engineers

_1688 Woodward Dr.
Ottawa, ON
Canada
K2C 3R8_

_Tel. 613-727-5111
info@gwal.com
www.gwal.com_

August 23, 2021

VIA E-MAIL

City of Ottawa
Planning, Infrastructure & Economic Development Department
110 Laurier Avenue West, 4th Floor
Ottawa, Ontario
K1P 1J1

ATTENTION: MS. KIMBERLEY BALDWIN, MCIP, RPP, PLANNER II

**SUBJECT: 715 MIKNINAK REDEVELOPMENT, OTTAWA, ON
2 NEW 7-STOREY APARTMENT BUILDINGS & 1 NEW 4-STOREY APARTMENT BUILDING
OUR PROJECT NO. 2020-297**

Dear Madame:

The proposed Ottawa Community Housing apartment complex located at 715 Mikinak Road, Ottawa, Ontario, consisting of two (2) 7-storey buildings and, one (1) 4-storey building has been designed with a fully supervised sprinkler system and monitored fire alarm system in accordance with OBC and NFPA 13. The design is summarized as follows:

- The sites water supply consists of a 150mm looped water service with two (2) service tie-in connections to existing 200mm municipal water main under Michael Stoqua Street.
- The two (2) 7-storey buildings, Building A and B are adjacent to one another, and share common services including water supply, emergency power, waste water heat recovery system for domestic hot water production, and geothermal energy exchange system.
- The 4-storey building has a dedicated water supply and emergency power system.
- Due to the shared nature and single ownership/operation of buildings A and B, a single fire pump system has been designed to serve the fire protection sprinkler systems of both building A and B. The fire pump is powered through the emergency power system of building A.
- The fire protection main extends underground in accordance with NFPA 13, and below the frost line, approximately 2.2 meters below grade, to building B where a main fire protection header is installed with all zone valves, alarm annunciating devices, and a dedicated fire department connection extending to Siamese connection located in close proximity of the principle fire fighting entrance to building B, fronting Barielle Snow Street. Similarly, building A has independent zone valves, alarm annunciating devices and a dedicated fire department connection extending to Siamese connection located in close proximity of the principle fire fighting entrance to building A, fronting Hemlock Road.
- All 3 buildings will have independent fire alarm systems with independent monitoring as per OBC 3.2.4.10 (6). All 3 buildings fire alarm systems will be interlocked through networking, capable of allowing the owner/operator to be notified of any activity being monitored by the fire alarm system be visible at the fire alarm panel in any building.

We trust the above to be to sufficiently clear and accurate for your purposes.

Yours very truly,

GOODKEY, WEEDMARK & ASSOCIATES LIMITED

LICENSED PROFESSIONAL ENGINEER
R. T. LEONARD
100155202
2021-08-23
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
H. ROMANI
100508102
2021-08-23
PROVINCE OF ONTARIO

Ryan Leonard, P.Eng.
Senior Associate, Senior Mechanical Engineer

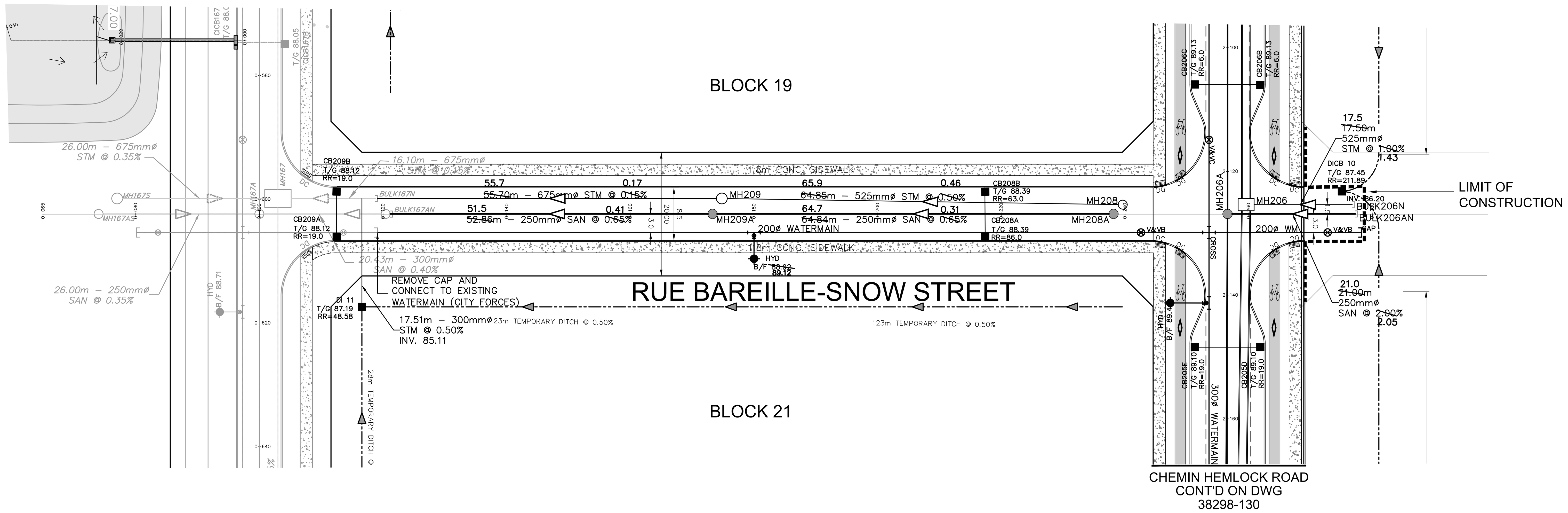
Hany Romani, P.Eng.
Senior Electrical Engineer

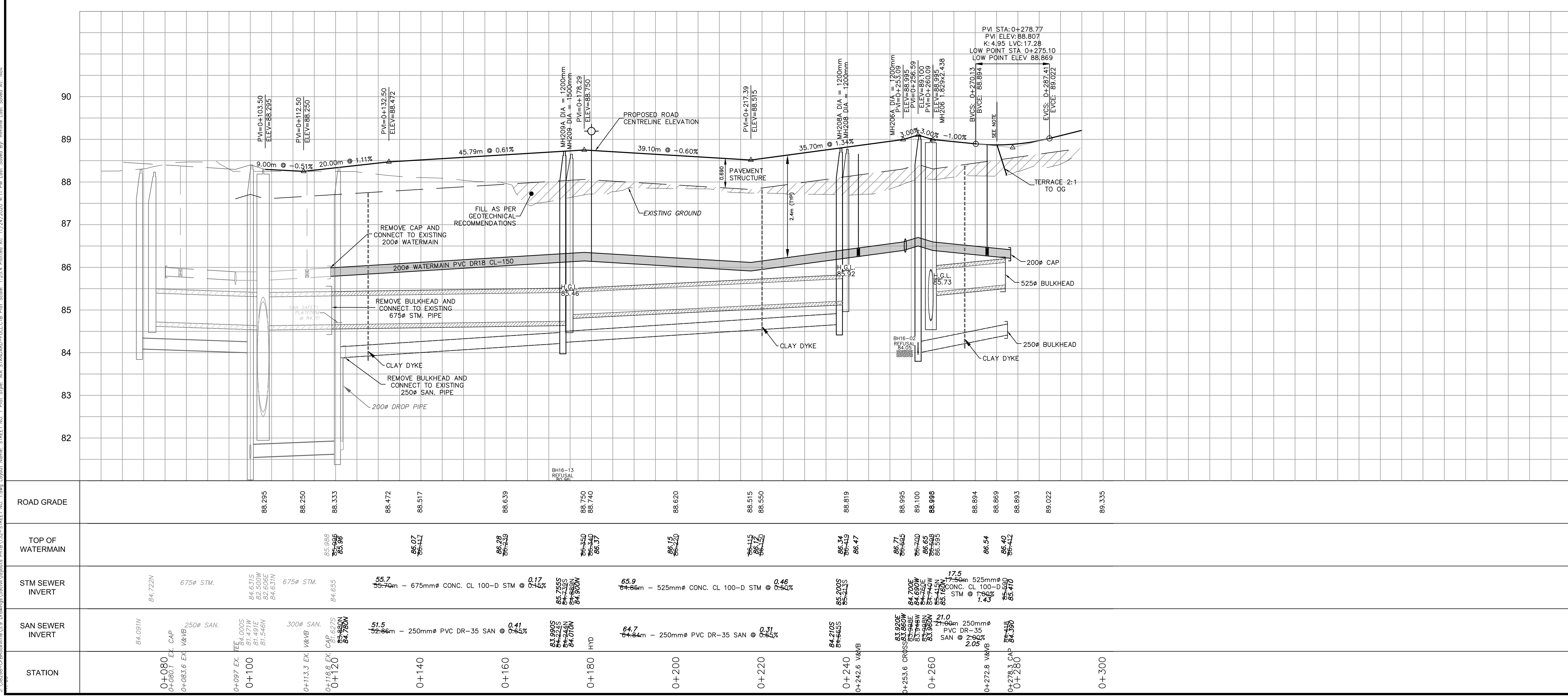
RL/HR/md

e.c.: Tess Gilchrist (IBI Group)
Alice Tchakedjian (IBI Group)

Appendix F – Referenced Drawings

1. 38298 – 132 Barielle Snow St., Wateridge Village Ph1B
2. 38298 – 133 Michael Stoqua St., Wateridge Village Ph1B
3. 38298 – 310 Composite Utility Plan, Wateridge Village Ph1B
4. 38298 – 311 Composite Utility Plan, Wateridge Village Ph1B





REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ____________________

Date ____________________ 2017

Plan Number ____________________

NOTE:
FROM ±STA. 0+278-FUTURE ROAD CENTRE LINE PROFILE IS PROVIDED FOR CONTINUITY.

No.	REVISIONS	By	Date
14			
13			
12			
11			
10	RECORD DRAWING	J.I.M.	2020:11:17
9	AS BUILT	J.I.M.	2018:06:15
8	ISSUED FOR CONSTRUCTION	J.I.M.	2017:08:02
7	REVISED PER CITY COMMENTS	J.I.M.	2017:06:16
6	REVISED PER MOECC COMMENTS	J.I.M.	2017:06:07
5	ISSUED FOR TENDER	J.I.M.	2017:03:23
4	SUBMISSION FOR MOECC APPROVAL	J.I.M.	2017:02:16
3	SUBMISSION No.3 FOR CITY REVIEW	J.I.M.	2017:01:25
2	SUBMISSION No.2 FOR CITY REVIEW	J.I.M.	2016:11:04
1	SUBMISSION No.1 FOR CITY REVIEW	J.I.M.	2016:07:08

CANADA LANDS COMPANY
SOCIÉTÉ IMMOBILIÈRE DU CANADA
30 Metcalfe Street Suite 601
Ottawa, On K1P 5L4
613 998 7777

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

Project Title
WATERIDGE VILLAGE AT ROCKCLIFFE
PHASE 1B

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2020/11/17
PROVINCE OF ONTARIO

N

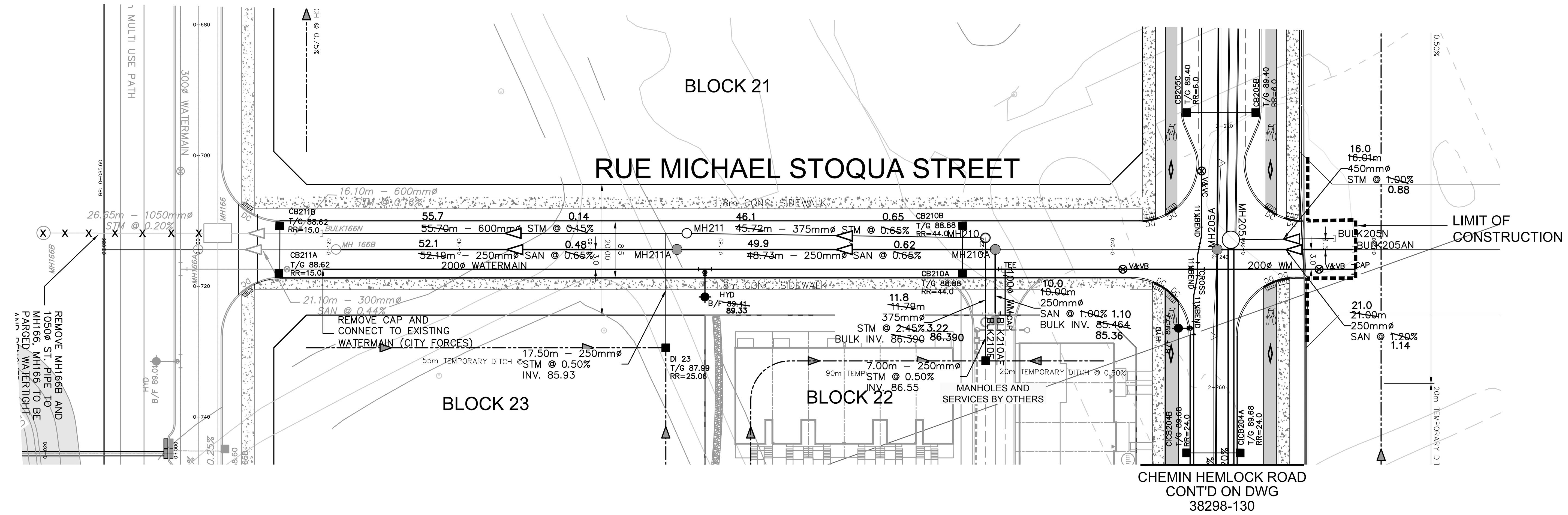
Drawing Title
BARIELLE-SNOW STREET
MIKINAK ROAD TO HEMLOCK ROAD

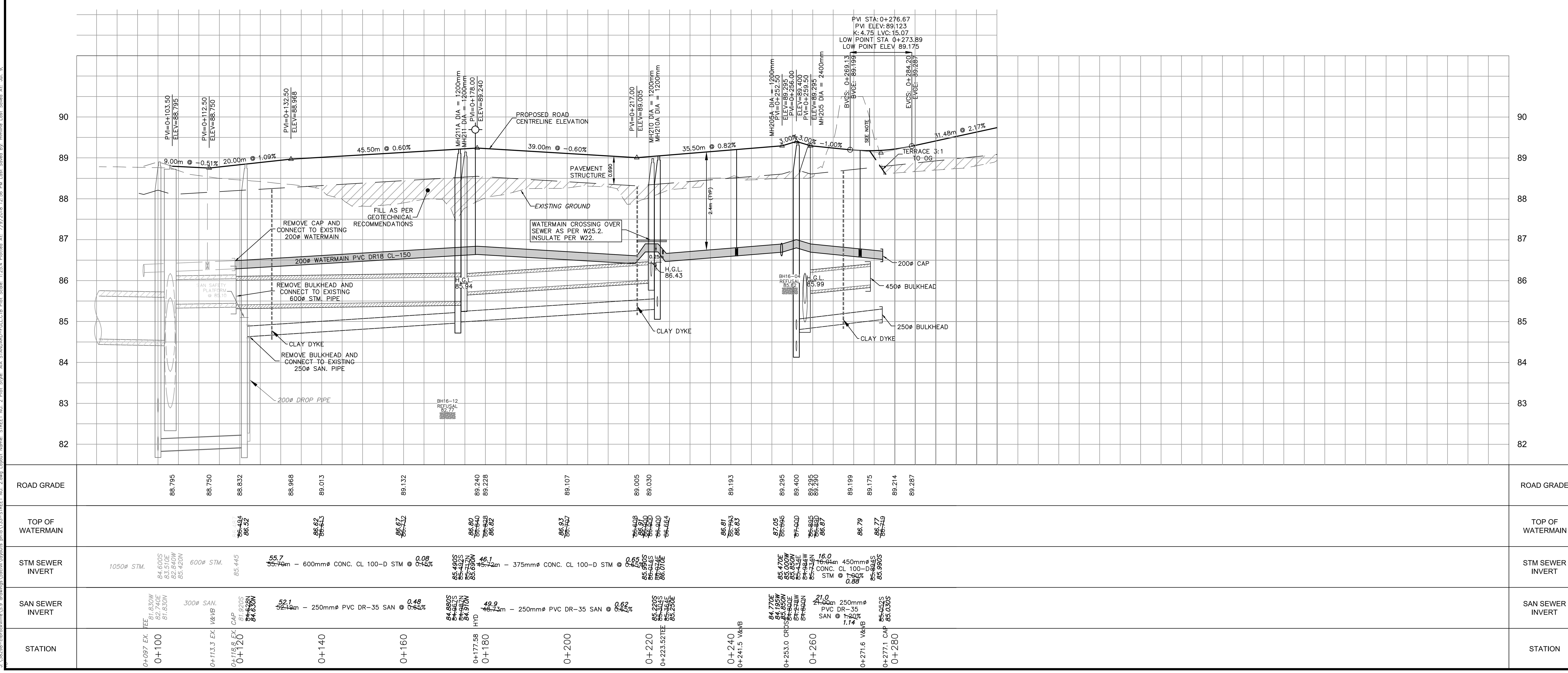
Scale
HORIZ. SCALE 1 : 500
VERT. SCALE 1 : 50

Design	Date
J.I.M.	MAY 2016
Drawn	**Checked**
M.M.	J.I.M.
Project No.	**Drawing No.**
38298	132

D07-16-15-0003

#17063





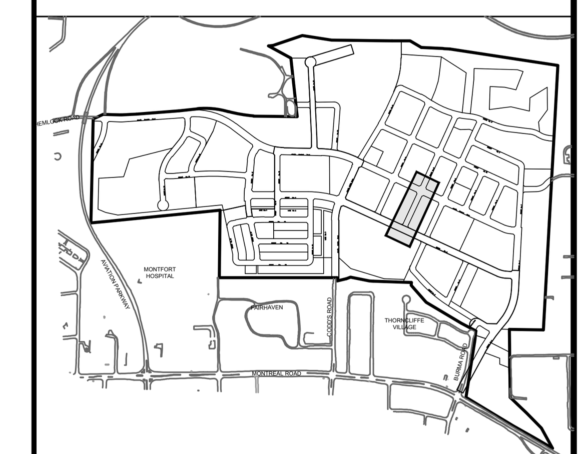
REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ______________________

Date ______________________ 2017

Plan Number ______________________

NOTE:
FROM ±STA. 0+277-FUTURE ROAD CENTRE LINE PROFILE IS PROVIDED FOR CONTINUITY.



No.	REVISIONS	By	Date
14			
13			
12			
11			
10	AS BUILT	J.I.M.	2018:06:15
9	REVISED PER MATTAMY DESIGN FOR BLOCKS 22, 24 AND 15	J.I.M.	2017:09:15
8	ISSUED FOR CONSTRUCTION	J.I.M.	2017:08:02
7	REVISED PER CITY COMMENTS	J.I.M.	2017:06:16
6	REVISED PER MOECC COMMENTS	J.I.M.	2017:06:07
5	ISSUED FOR TENDER	J.I.M.	2017:03:23
4	SUBMISSION FOR MOECC APPROVAL	J.I.M.	2017:02:16
3	SUBMISSION No.3 FOR CITY REVIEW	J.I.M.	2017:01:25
2	SUBMISSION No.2 FOR CITY REVIEW	J.I.M.	2016:11:04
1	SUBMISSION No.1 FOR CITY REVIEW	J.I.M.	2016:07:08

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IBI GROUP
400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
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ibigroup.com

Project Title
WATERIDGE VILLAGE AT ROCKCLIFFE
PHASE 1B

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
18/06/15
PROVINCE OF ONTARIO

N

Drawing Title
MICHAEL STOQUA STREET
MIKINAK ROAD TO HEMLOCK ROAD

Scale
HORIZ. SCALE 1 : 500
VERT. SCALE 1 : 50

Design	Date
J.I.M.	MAY 2016
Drawn	**Checked**
M.M.	J.I.M.
Project No.	**Drawing No.**
38298	133

D07-16-15-0003

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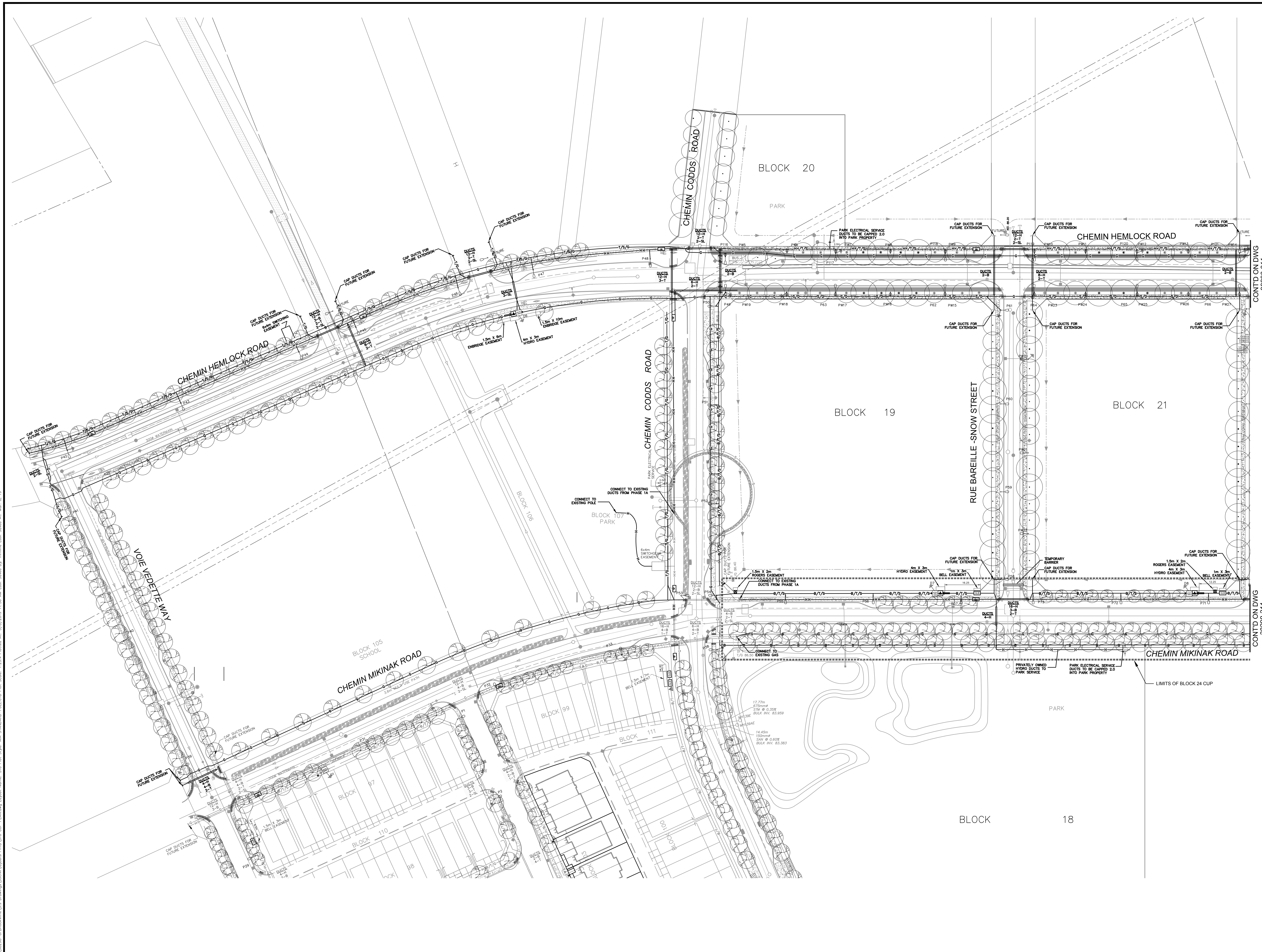

REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ______________________

Date ______________________ 2017

Plan Number ______________________

No.	REVISIONS	By	Date
16	REVISED PER HYDRO COMMENTS	J.I.M.	2019:03:08
15	REVISED PER UTILITY COMMENTS	J.I.M.	2018:12:18
14	REVISED PER UTILITY COMMENTS	J.I.M.	2018:12:05
13	REVISED PER UTILITY MEETING COMMENTS	J.I.M.	2018:11:09
12	ADDED LANDSCAPING	J.I.M.	2018:09:20
11	REVISED PER UTILITY COMMENTS	J.I.M.	2018:09:10
10	REVISED FOR BLOCK 24	J.I.M.	2018:08:23
9	ADDED PARTS 1-34 FOR UNIFORM UNITS 1-23	J.I.M.	2018:08:21
8	REVISED PER HYDRO	J.I.M.	2017:02:17
7	REVISED PER CITY COMMENTS	J.I.M.	2017:02:14
6	ISSUED FOR CIRCULATION #5	J.I.M.	2017:02:06
5	ISSUED FOR CIRCULATION #4	J.I.M.	2016:12:23
4	REVISED PER HYDRO, ROGERS, OC TRANSPO	J.I.M.	2016:11:25
3	ISSUED FOR CIRCULATION #3	J.I.M.	2016:11:16
2	ISSUED FOR CIRCULATION #2	J.I.M.	2016:10:14
1	ISSUED FOR CIRCULATION #1	J.I.M.	2016:10:03

CANADA LANDS COMPANY
SOCIÉTÉ IMMOBILIÈRE DU CANADA
30 Metcalfe Street Suite 601
Ottawa, On K1P 5L4
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IBI GROUP
400 – 333 Preston Street
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Project Title

WATERIDGE VILLAGE AT ROCKCLIFFE
PHASE 1B

LICENSED PROFESSIONAL ENGINEER
J. I. MOFFATT
2019/03/08
PROVINCE OF ONTARIO

N

Drawing Title

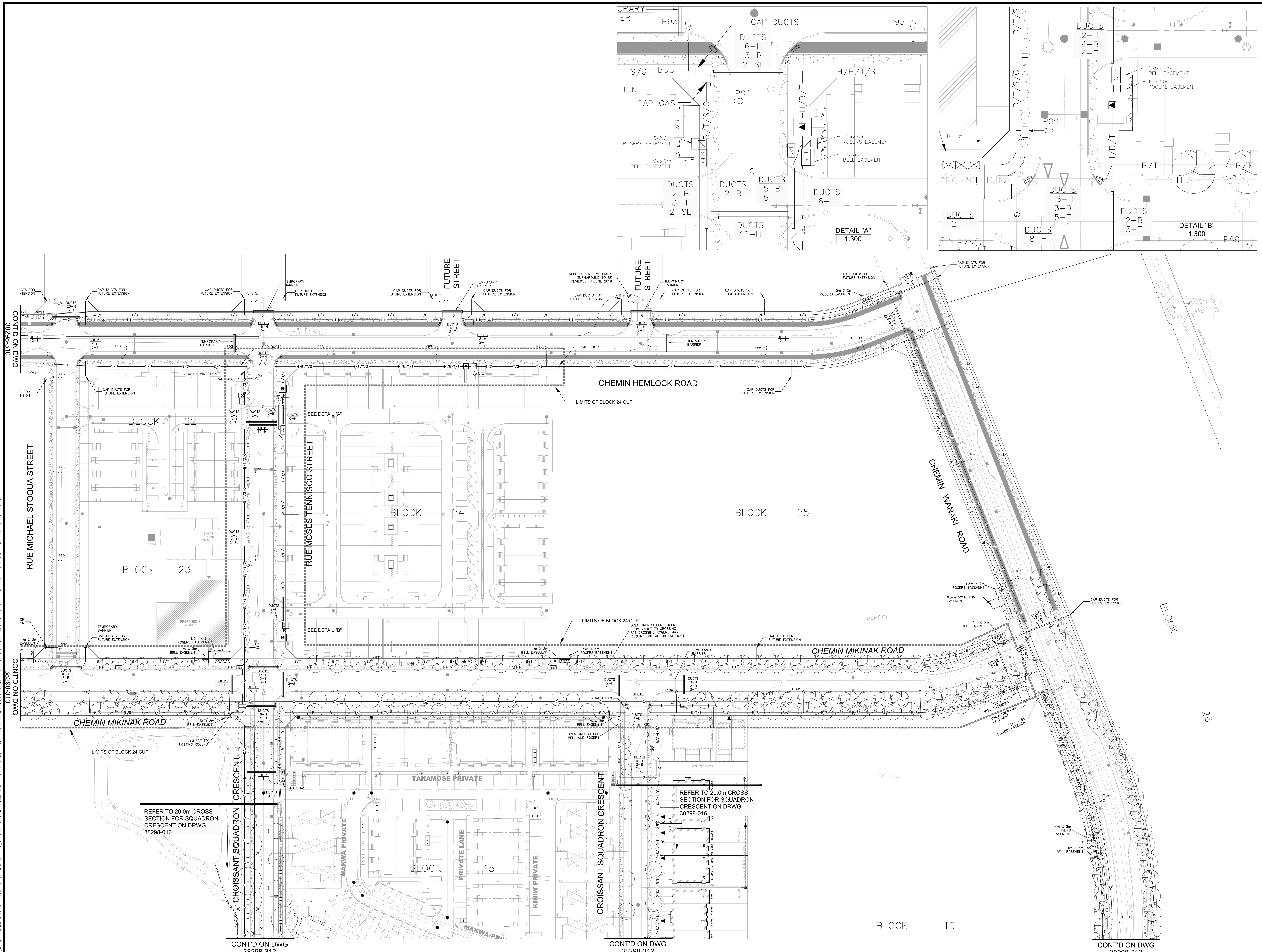
COMPOSITE UTILITY PLAN

Scale
1 : 750

Design	Date
J.I.M.	MAY 2016
Drawn	**Checked**
M.M.	J.I.M.
Project No.	**Drawing No.**
38298	310

D07-16-15-0003

#17063

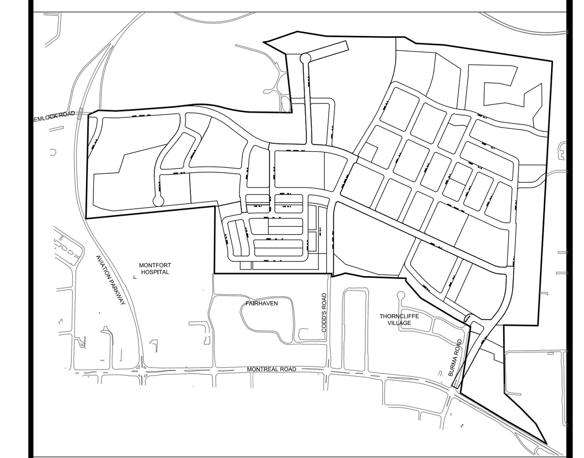


REVIEWED BY
DEVELOPMENT REVIEW SERVICES BRANCH

Signed ____________________

Date ____________________ 2018

Plan Number ____________________



No.	REVISIONS	By	Date
23	REVISED SQUADRON CRES. SIDEWALK LOCATION PER SECTION CHANGE	J.I.M.	2020:02:03
22	ADDED LANDSCAPING TO BLOCK 15	J.I.M.	2020:01:24
21	REVISED PER SQUADRON CRESCENT SECTION CHANGES FOR BLOCK 15	J.I.M.	2020:01:21
20	REVISED PER UTILITY COMMENTS FOR BLOCK 15	J.I.M.	2019:12:06
19	REVISED PER BLOCK 15 UTILITIES	J.I.M.	2019:12:03
18	REVISED PER UTILITY COMMENTS	J.I.M.	2019:08:29
17	REVISED PER UTILITY COMMENTS	J.I.M.	2018:12:05
16	REVISED UTILITIES ON SQUADRON CRESCENT	J.I.M.	2018:11:14
15	REVISED PER HYDRO FOR UNIFORM UNITS 1–23	J.I.M.	2018:10:25
14	ADD BELL AND ROGERS PEDS ON BLOCK 22	J.I.M.	2018:10:19
13	REVISED PER BELL COMMENTS	J.I.M.	2018:10:10
12	ADDED LANDSCAPING	J.I.M.	2018:09:20
11	REVISED PER UTILITY COMMENTS	J.I.M.	2018:09:10
10	REVISED FOR BLOCK 24	J.I.M.	2018:08:23
9	ADDED PARTS 1–34 FOR UNIFORM UNITS 1–23	J.I.M.	2018:08:21
8	REVISED PER HYDRO	J.I.M.	2017:02:17
7	REVISED PER CITY COMMENTS	J.I.M.	2017:02:14
6	ISSUED FOR CIRCULATION #5	J.I.M.	2017:02:06
5	ISSUED FOR CIRCULATION #4	J.I.M.	2016:12:23
4	REVISED PER HYDRO, ROGERS, OC TRANSPO	J.I.M.	2016:11:25
3	ISSUED FOR CIRCULATION #3	J.I.M.	2016:11:16
2	ISSUED FOR CIRCULATION #2	J.I.M.	2016:10:14
1	ISSUED FOR CIRCULATION #1	J.I.M.	2016:10:03

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