



Excellence Reliance Innovation

Preliminary Servicing and Stormwater Management Report

Bishop Drive

Hedbern Development Corp.

September 2019

The Jones Consulting Group Ltd. #1-229 Mapleview Drive East, Barrie ON L4N 0W5 HED-18022 (70)

#### **Disclaimer**

This Report was prepared by **The Jones Consulting Group Ltd.** for **Hedbern Development Corp.** The material in the Report reflects **The Jones Consulting Group Ltd.**'s best judgment in light of the information available at the time of the Report preparation. Any use which a third party makes of this Report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. **The Jones Consulting Group Ltd.** accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this Report.

### **Table of Contents**

1.	Introduction1 -
1.1. 1.2. 1.3.	Location and Description of Existing Site1 -
2.	Supporting Documents3 -
3.	Sanitary Servicing4 -
3.1. 3.2.	
4.	Water Servicing and Distribution 6 -
4.1. 4.2. 4.3. 4.4.	Domestic Water Service Design Flows7 -
5.	Stormwater Management9 -
5.1. 5.2. 5.3. 5.4. 5.5. 5.6. 5.7.	Overview
6.	Secondary Utilities 16 -
7.	Conclusions 17 -

#### **List of Appendices**

- **Appendix A** Background Information
- Appendix B Supporting Calculations Sanitary Servicing
- Appendix C Supporting Calculations Water Servicing
- Appendix D Supporting Calculations Stormwater Management
- **Appendix E** Engineering Drawings (Reduced, NTS)

#### **List of Drawings (Appendix E)**

- TITLE Title Page
- GN-1 General Notes
- ESC-1 Erosion Control and Surface Removals Plan
- ESC-2 Erosion Control Details
- G-1 General Servicing Plan
- GP-1 Site Grading Plan
- STM-1 Allowable Development Storm Drainage Plan
- STM-2 Post Development Storm Drainage Plan
- SAN-1 Sanitary Drainage Plan
- PP-1 Bishop Drive Plan and Profile
- DET-1 Standard Details
- DET-2 Standard Details
- DET-3 Standard Details

# Preliminary Servicing & Stormwater Management Report Bishop Drive

#### 1. Introduction

#### 1.1. General

The Jones Consulting Group Ltd. (TJCG) was retained by Hedbern Development Corp. (Client) to prepare this Preliminary Servicing & Stormwater Management Report for the proposed Subdivision and Site Plan development located at 158, 162, 166 and 170 Ardagh Road and Parts of Lot 5 Concession 14, in the City of Barrie (City). The site is comprised of seven (7) lots totaling approximately 1.63Ha.

The development will be serviced by existing municipal storm, sanitary and water infrastructure located within the adjacent municipal right of ways.

This Report outlines the proposed servicing of the development and is provided to the City in support of the required Zoning By-Law Amendment and proposed Draft Plan of Subdivision.

#### 1.2. Location and Description of Existing Site

The development is located on the north side of Ardagh Road and connects Bishop Drive at the north and west development limit. The site is municipally known as 158, 162, 166 and 170 Ardagh Road and Parts of Lot 5 Concession 14 in the City of Barrie, County of Simcoe. The subject lands are legally described as Part of Lot 5 Concession 14, Part 1 of Plan 51R-39410, Part 1 of 51R-39655, Part of Part 6 of Plan 51R-31976, Parts 1, 4, 5 and 6 of Plan 51R-39772 and Part of Plan 51R-16478. The location of the proposed development lands is shown overleaf in Figure 1. The property is bounded by the municipal Right of Ways known as Bishop Dive and Porritt Street to the west, Bishop Drive to the north, Ardagh Road to the south and residential lots to the east.

A portion of the development lands is vacant and currently vegetated with a mix of pasture type ground cover and trees. There are also four (4) existing single detached dwellings and auxiliary structures that will be removed as part of the development proposal. The site topography generally ranges in elevation from 262.93m to 250.88m and slopes northerly at an approximate gradient of 5-7%.

Existing municipal services along Ardagh Road front the development lands and include sanitary, water and storm infrastructure. Secondary utilities such as electrical, gas, telephone and cable are also available within the Ardagh Road Right of Way. Sanitary, water and storm services as well

as secondary utilities are also available within the Bishop Drive and Porritt Street Right of Ways. Ardagh Road is classified as an arterial road that is set to be widened to a 30 meter right of way on the City of Barrie Official Plan Schedule D: Road Plan and Schedule E: Road Widening Plan. Bishop Drive is classified as a local road and is not set to widen. Relevant Official Plan Drawings have been included in Appendix A.

The site is located within a highly vulnerable aquifer, as well as a wellhead protection area. The site is considered a Q1 wellhead protection area with a vulnerability score of 2. Relevant City of Barrie mapping has been attached in Appendix A.

Based on pre consultation correspondence with Lake Simcoe Region Conservation Authority (LSRCA) we understand that the proposed development is not within a regulated area of the LSRCA.

Based on the Soil Survey of Simcoe County Report No. 29, the soils on the site are represented by a combination of Tioga Loamy Sand and Dundonald Sandy Loam, corresponding to the hydrologic soil group 'A' and 'AB', respectively. Excerpts from the Simcoe County Report 29 and south map have been included in Appendix A.



Figure 1: Site Location Plan

#### 1.3. Proposed Land Use

The development lands are currently zoned Residential (R1 and R3) in the City's Zoning By-Law and Residential in the Official Plan. Based on the proposed Draft Plan of Subdivision and Concept Plan prepared by Innovative Planning Solutions [IPS], dated August 21, 2019, a Plan of Subdivision is proposed for the extension of Bishop Drive, consisting of 5 Townhouse Blocks (27 Units) and a Medium Density Residential Block and a Stormwater Management Block. The Medium Density Block consists of 19 Townhouse Units and 12 back-to-back Townhouse Units, complete with parking and amenity space.

Access to the subject lands will be provided via three (3) access points. Two (2) connections are proposed for the Subdivision connecting to Bishop Drive at the north and west limit of the development. In addition, the Site Plan Block will connect to Ardagh Road at the existing intersection with Snow Shoe Trail. Existing and proposed municipal water, sanitary and storm infrastructure will be used to service the development lands; however, proposed water, sanitary and storm infrastructure within the Site Plan Block will be privately owned. The proposed stormwater management facility located within the Draft Plan of Subdivision will be municipally owned and will provide the necessary quality and quantity control of stormwater run-off. In addition, this facility will assist in meeting water balance and phosphorous budget requirements.

#### 2. Supporting Documents

The following documents have been referenced in the preparation of this Report:

- Rudy Mak Surveying Ltd., Plan of Survey of Part of Block C Registered Plan 1414 and Part of Lots 15 to 21, inclusive, Registered Plan 914 and Part of Block 266 Registered Plan 51M-371 and Part of Lot 5 Concession 14 for plan 51R-31976, dated May 2003;
- Three (3) Bowers and Jones Surveying Ltd., Plans of Survey of Part of Lot 5 Concession 14 for Plans 51R-39410, dated April 25, 2014, 51R-39655 October 28, 2014 and 51R-39772 December 30, 2014;
- Innovative Planning Solutions [IPS], Conceptual Site Plan, dated August 21, 2019;
- City of Barrie Engineering Department, Ardagh Road Reconstruction Drawings PP3, G2, STM1 and SAN1, dated May 2004;
- City of Barrie Engineering Department, 664564 Ontario Limited Drawing, dated September
   5, 1986;

- City of Barrie Engineering Department, Gailcrest Homes Inc. Drawing, dated March 14, 1989;
- Simcoe County Soils Report 29;
- City of Barrie, Storm Drainage and Stormwater Management Policy and Design Guidelines, November 30, 2009;
- City of Barrie, Water Transmission and Distribution Policies and Design Guidelines, May 2015;
- City of Barrie, Sanitary Sewage Collection System Policies and Design Guidelines, September 2012;
- Ministry of the Environment (MOE), Stormwater Management Planning and Design Manual, March 2003;
- MOE, Design Guidelines for Drinking Water Systems, 2008;
- MOE, Design Guidelines for Sewage Works, 2008; and,
- County of Simcoe Interactive Mapping;
- City of Barrie Interactive Mapping;
- City of Barrie Zoning By-Law 2009-141, and
- City of Barrie Official Plan.

Copies of pertinent reference drawings are included in Appendices, for reference.

#### 3. Sanitary Servicing

#### 3.1. General

The development lands were previously accounted for in the Gailcrest Homes Inc. subdivision to the north of the site for both storm and sanitary drainage. The existing sanitary drainage plan has been included in Appendix B for reference. Refer to Gailcrest Homes Inc., Sanitary Drainage Area Plan, Dated April 1989. The development lands currently consist of existing residential that fronts onto Ardagh Road, as such, sanitary drainage has also been accounted for in the Ardagh Road sanitary sewers. Refer to City of Barrie, Ardagh Road Reconstruction, Sanitary Drainage Plan dated May 2004 in Appendix B.

The proposed sanitary servicing is shown on Drawing G-1 and SAN-1, refer to Appendix E. Internally, sewage flows will be collected via the proposed 200mm diameter (PVC SDR-35) sanitary main and a series of 1200mm diameter maintenance holes to facilitate bends, appropriate clean-out lengths, etc. The proposed internal sanitary sewer will connect to upstream Bishop Drive (West) sanitary maintenance hole SAI17373 and the downstream Bishop Drive (North) sanitary maintenance hole SAI13112. All sanitary flows from the development will be directed to the downstream sanitary maintenance hole SAI13112 and no external sanitary drainage will be conveyed through the development as the connection to the west (SAI17373) is for maintenance/clean-out purposes only.

A 100mm diameter (PVC SDR-28) sanitary service will be provided to each of the Townhouse units within the Subdivision and will connect to the proposed 200mm diameter internal sanitary main. Similarly, the Medium Density Block will be serviced with 200mm (PVC SDR-35) sanitary main with each building/unit serviced with a 100mm diameter (PVC SDR-28) service laterals.

#### 3.2. Sanitary Service Design Flows

The City of Barrie Sanitary Sewage Collection System Policies (2017) provides theoretical criteria for future developments and their projected sanitary loading demand, more specifically, Section 3 provides average daily estimated daily sewage flow rates based on the building unit types and the projected person per unit (PPU). All 58 townhouse style units have been assigned a PPU of 2.34 and a sewage demand of 225 L/day/person has been used for flow modeling and sewer capacity calculations.

Based on the proposed development plan the analytical sanitary load forecast can be calculated with the following equation based on the total number of units and the estimated population of 135 people (58 units x 2.34 PPU).

$$Q_p = \frac{P \times q \times M}{86.4} + I \times A$$

Where:  $Q_p$  = Peak residential sanitary sewage flow, including peak extraneous flows (L/s)

P = Design population in thousands (City Guidelines Section 3.3.1.1)

q = Average daily domestic flow per capita (L/day/person)(City Guidelines Section 3.3.1.2)

M = Peaking factor (City Guidelines Section 3.3.1.3)

I = Peak extraneous flow (L/s/ha) (City Guidelines Section 3.3.1.4)

A = Tributary area (ha) (City Guidelines Section 3.2.2)

M = Harmon Peaking Factor; 
$$M=1+\left[\frac{14}{4+P^{0.5}}\right]$$
 M = Babbit Peaking Factor  $M=\frac{5}{P^{0.2}}$ 

The maximum of the Harmon and Babbit Peaking Factors will be used in the pipe sizing calculations. A minimum peaking factor of 2.0 is required per the MOECC Guidelines.

The calculated peak sewage flow from the development is determined to be 2.66L/s. At this time we are not aware of any downstream sanitary capacity concerns, however, we kindly request further confirmation from the City of Barrie in this regard.

In order to confirm the proposed sanitary infrastructure within the development lands has been appropriately sized, a sanitary sewer design sheet has been completed, refer to Appendix B. The design sheet demonstrates that the proposed sewers have been appropriately sized to convey the required flows, in addition to meeting the minimum (0.6m/s) and maximum (3.0m/s) velocity requirements stipulated by the Ministry of Environment.

#### 4. Water Servicing and Distribution

#### 4.1. General

Two (2) watermain connections to existing municipal infrastructure are proposed for the Subdivision, and one (1) connection is proposed for the Site Plan Block. The Subdivision connections will loop Bishop Drive at the north and west Subdivision connection points. In accordance with City standards, the Site Plan Block will be provided with a single connection and will connect to the existing watermain on Ardagh Road.

Record drawings indicate that existing 150mm diameter watermains are located at both the north and west connection points on Bishop Drive. Accordingly, a 150mm diameter (DR-18) watermain is proposed to loop between the two existing watermains. The Subdivision portion of this development consists of twenty seven (27) townhouse units. All residential units within the proposed Subdivision will be serviced with individual 25mm diameter (Type K Copper) water service laterals. A single hydrant is proposed along Bishop Drive to meet minimum City of Barrie spacing requirements for Fire Department suppression coverage.

According to the City of Barrie Engineering Department Ardagh Road Reconstruction Drawings there is an existing 300mm diameter watermain located within the Ardagh Road right of way, fronting the development lands. The Site Plan portion of this development consists of nineteen (19) townhouse units, and twelve (12) back-to-back townhouse units. The Site Plan Block will be connected via a proposed internal 150mm diameter (DR-18) watermain to the existing Ardagh

Road watermain. Similar to the Subdivision, all residential units within the Site Plan Block will be

serviced with 25mm diameter (Type K) service laterals. Two fire hydrants are proposed within the

Site Plan portion of the development and are strategically located to meet Ontario Building Code

(OBC) hydrant spacing requirements.

The proposed domestic and fire water servicing is detailed on Drawing G-1. Refer to Appendix E.

4.2. **Domestic Water Service Design Flows** 

Similar to Section 3.2 of this Report, the total Average Daily Demand (ADF) of 30,600L/day or 0.35L/s

for the proposed development is based on the projected population and the average daily flow

per person (136 x 225L/day/person). The Bishop Drive portion of the total is (63 x 225L/day/person).

14,175L/day or 0.16L/s. The Ardagh Road portion of the total is (73 x 225L/day/person) 16,425L/day

or 0.19L/s. In order to determine the appropriate water distribution design flows for the Maximum

Daily Demand (MDD) and Peak Hour Demand (PHD), the ADF is multiplied by the Ministry of Environment standard peaking factors. Refer to Table 3-1 Peaking Factors, Design Guidelines for

Drinking-Water Systems (2008), prepared by the Ministry of Environment. This development will be

serviced by two separate watermains, with the peaking factors and corresponding flows are

summarized below:

**Population:** 500-1000

Minimum Rate Factor: 0.4

**Minimum Rate Demand**: Bishop:  $0.16 \times 0.4 = 0.064 \text{L/s}$ 

Ardagh:  $0.19 \times 0.4 = 0.076 \text{L/s}$ 

Maximum Day Factor: 2.75

**Maximum Day Demand:** Bishop:  $0.16 \times 2.75 = 0.440 \text{L/s}$ 

Ardagh:  $0.19 \times 2.75 = 0.523 \text{L/s}$ 

Peak Rate Factor: 4.13

**Peak Rate Demand:** Bishop:  $0.16 \times 4.13 = 0.661 \text{L/s}$ 

Ardagh:  $0.19 \times 4.13 = 0.785 L/s$ 

4.3. Fire Water Supply Design Flows

Based on recent correspondence with the City of Barrie, townhouse developments require a

minimum fire flow of 150 L/s. This fire flow is in excess of current City of Barrie Guidelines, as well as the minimum fire flow stipulated by the Ministry of Environment (Design Guidelines for Drinking-

Water Systems (2008), Table 8-1, 38L/s).

Minimum Fire Flow: 150 L/s

4.4. **Water Distribution System Analysis** 

The City of Barrie and Ministry of Environment require that the proposed water servicing be

designed to ensure minimum operating pressures are maintained at all times throughout the

system. The required operating pressures are outlined below:

Minimum Operation Pressure at MDD: 50 PSI

Maximum Operation Pressure at MDD: 100 PSI

Minimum Operating Pressure at MDD plus Fire Flow: 20 PSI

A detailed Water Distribution System Analysis will be completed as part of the detailed design

phase of the development. However, in order to demonstrate that the development can be

functionally serviced, three (3) hydrant flow tests have been completed on the existing municipal

infrastructure in close proximity to the proposed connection points of the municipal system. The

field investigations were completed by VIPOND Inc. on July 25th, 2019. A copy of the flow test

results can be found in Appendix C.

The first two hydrant flow tests were completed simultaneously at the Bishop Drive connection

points. This was done to imitate the expected flows that will result from the proposed looping of

the existing water system. The third test was completed on Ardagh Road, as this will be the

connection point for the proposed Site Plan Block.

In order to determine the estimated available fire flow resulting from the Bishop Drive and Ardagh

Road Connections, the results from the hydrant flows tests were used with the City's Typical Hydrant

Flow Calculations formula. The calculations and resulting flows are outlined below:

$$QA = QT \sqrt{\frac{ha}{ht}}$$

Where QA = Flow at 20 PSI.

QT = Flow at Test

ha = Pressure Drop Available

ht = Pressure Drop at Test

**Bishop Drive Available Flow:** 167L/s

Ardagh Road Available Flow: 142L/s

The above assessment reveals that adequate domestic water supply and fire flow will be available

to service the proposed Townhomes along Bishop Drive. However, the Site Plan Block connection

to Ardagh Road appears to be slightly deficient. Additional looping and/or increased pipe sizes may be required to satisfy domestic and fire servicing needs of the Site Plan Block. These potential improvements and/or upgrades will be reviewed as part of the detailed design and Water Distribution System Analysis for the development. At this time, we do not foresee any issues servicing the development and anticipate that the required domestic water and fire flows can be appropriately provided to both the Subdivision and Site Plan.

#### 5. Stormwater Management

#### 5.1. Overview

The site falls within the Hotchkiss Creek sub-watershed of the larger Lake Simcoe watershed. The site is located outside the regulated limits of the Lake Simcoe Region Conservation Authority, as such, a permit from the LSRCA will not be required for this development proposal.

The City of Barrie, Lake Simcoe Region Conservation Authority and Ministry of Environment design guidelines were used to establish the following stormwater management control Targets:

#### **Quantity Control**

- Post development flows from the development most be controlled to corresponding pre development (Allowable Development) flows for the 2 Year through 100 Year storm events.
- Volume control of the 25mm rainfall event from the total impervious surface shall be captured and retained/treated on-site.

#### Quality Control

• Best management practices must be applied to provide minimum 80% Total Suspended Solids Removal and 80% total Phosphorous Removal.

#### 5.2. Allowable & Post Development Drainage

The proposed Draft Plan of Subdivision is considered an infill type re-development project. As part of the development proposal a number of existing dwelling units will be removed and properties amalgamated to allow intensification. The proposed development drains through existing residential subdivisions, as such, allowable catchments and drainage parameters were determined as part of the downstream subdivision designs. The Allowable development catchments were determined from the Gailcrest Homes Inc., Storm Catchment and Drainage Plan dated May 30th 1989 and the City of Barrie, Tributary Areas of Storm Sewer Design (As

Constructed) dated April 15, 1988. A copy of both of these drawings is included in Appendix D for reference.

The Allowable catchments are shown on Drawing STM-1. Refer to Appendix E. Catchment Area 101 drains to the existing Bishop Drive cul-de-sac to the north. Catchments 102 and 103 drain to the storm sewer system contained within the rear yard easements of the existing lots that front onto Elizabeth Street (East limit of the Development), and ultimately drain to the Elizabeth Street Storm Sewer System.

A summary of the Allowable development catchment properties are outlined in Table 1, below. Supporting catchment property calculations are provided in Appendix D.

**Table 1: Allowable Development Catchment Properties** 

								Infiltration Parameters: Green Am Method		
Catchment	Area (ha)	Average Length (m)	Average Width (m)	Slope (%)	Imperv. (%)	Runoff Coefficient	Suction Head (mm)	Conductivity (mm/hr)	Initial Deficit (frac.)	
101	1.70	131	130	5	41	0.45	109.98	10.92	0.368	
102	0.20	80	25	5	35	0.40	109.98	10.92	0.368	
103	0.12	40	30	5	41	0.45	109.98	10.92	0.368	

Similar to the allowable development condition, the post development condition was broken down into three (3) catchments. Refer to Drawing STM-2, Appendix E. The post development drainage conditions were derived from the proposed General Servicing and Grading Plan accompanying this Report. Refer to Drawings GS-1 and GP-1, Appendix E. Catchment 201 represents the main development lands and the majority of impervious surfaces. This catchment drains to the proposed Jellyfish Treatment Unit and Infiltration/Filtration underground storage system, prior to outletting to the Bishop Drive storm sewer. Catchment 202 represents the east portion of the development lands that due to grading constraints could not be directed to the proposed Stormwater Management Facility. This catchment drains uncontrolled to the rear yard storm sewer system and ultimately to the Elizabeth Street storm sewer system. Catchment drains uncontrolled easterly along Ardagh Road and ultimately to the Elizabeth Street storm sewer system sewer system.

A summary of the post development catchment properties are outlined in Table 2, below. Supporting catchment property calculations are provided in Appendix D.

**Table 2: Post Development Catchment Properties** 

							Infiltration Parameters: Green Ampt Method				
Catchment	Area (ha)	Average Length (m)	Average Width (m)	Slope (%)	Imperv. (%)	Runoff Coefficient	Suction Head (mm)	Conductivity (mm/hr)	Initial Deficit (frac.)		
201	1.62	124	130	5	50	0.53	109.98	10.92	0.368		
202	0.14	14	100	5	4	0.13	109.98	10.92	0.368		
203	0.08	8	100	3.5	75	0.73	109.98	10.92	0.368		

The Green and Ampt parameters are for Sandy Loam and have been taken from the *PCSWMM Manual*, adapted from the *Journal of Hydrologic Engineering*, *Rawls*, *W.J. et al.*, (1983). Additional detailed site specific geotechnical investigation information for the subject lands will be submitted at the detailed design stage. These infiltration parameters will be revisited and updated for the detailed design as deemed necessary.

Depression Storage depth for pervious and impervious cover have been determined based on the *Nottawasaga Valley Conservation Authority Stormwater Technical Guide* and are summarized below in Table 3. The pervious depression storage is based on the weighted mean of cover type over the catchment area.

Table 3: Depression Storage

Land Cover	Depth (mm)
Woods	10
Pasture Meadow	8
Cultivated	7
Lawns	5
Wetland/SWM Facility	16
Impervious	2

Some of the PCSWMM model input parameters (not shown in **Table 1** or **Table 2** above) are common among all catchment areas, including the following:

Manning's N for impervious area = 0.013

Manning's N for pervious area = 0.190

Modelling of the pre and post development catchments was undertaken using the latest version of PCSWMM software. The 4-hour Chicago storm distribution and 6, 12 and 24-hour SCS Type II distribution were used to generate design storms based on the Barrie WPCC rain gauge (Station No. 6110557) for the period 1979 to 2003 and are adjusted to account for Climate Change.

Event modelling design storms included the 25mm, 2 to 100 Year 4-Hour Chicago Storms, 2 to 100 Year 6, 12 and 24-hour SCS storms, as well as the Regional (Hazel) storm. Detailed PCSWMM outputs are included in Appendix D.

#### 5.3. Quality and Quantity Control

The proposed stormwater management facility has been designed to provide the required quality and quantity control targets outlined in Section 5.1 of this Report. The proposed facility utilizes a treatment train approach incorporating a Jellyfish (Model Number JF12-22-5) filter device that pre treats flows prior to out letting to the Triton (Model S29) underground storage chambers. Below the storage chambers, a 450mm thick layer of iron enhanced red sand is provided to further enhance filtration of run-off.

As previously noted, quantity control is required in order to ensure post development run-off is controlled to allowable development levels for the 2 through 100 year design storms. Peak flow control is provided via the orifice controlled underground storage system. The Triton underground storage system has a total area of 421.1m² and total active storage volume of approximately 361m³. It is important to note that the active storage volume does not account for the volume of storage in the stone below the chambers in accordance with City of Barrie Standards.

The Bottom of the tanks/chambers have been set at an elevation of 250.80m and the top of the storage facility is 252.22m. Below the invert of the tanks is a 150mm thick layer of 50mm clear stone and 450mm thick layer of iron enhanced red sand. The bottom of the red sand filter corresponds to an elevation of 250.20m. Based on initial ground water monitoring data, the bottom of the red sand filter is located approximately 1.0m above the groundwater table. This was done to allow the facility to become an infiltration facility in the event that insitu Guelph Permeameter testing results are favourable. If the results of the infiltration testing are not favourable, the facility will incorporate a subdrain at the bottom of the red sand filter and the system will act as a filtration system instead of an infiltration gallery. Further infiltration testing (Guelph Permeamter) will be completed at the detailed design stage.

Modelling and event storage conditions of the underground storage system was completed using PCSWMM. For the purpose of this preliminary design, it was assumed that a subdrain is installed at the bottom red sand filter and connects to the downstream control structure (maintenance hole) with a 50mm diameter orifice plate. A secondary orifice (525mm diameter) is provided at an elevation of 251.15m and further attenuates flow to the outlet control structure. It is important to recognize that the elevation of the secondary orifice was set to allow 100% of the 25mm event

run-off volume to be either infiltrated or filtered through the red sand filter. This ensures the minimum volume control target is achieved in the proposed design.

A summary of the determined allowable and post development peak flows at the outlets of interest as well as the stormwater management facility stage, storage functions are outlined in Table 4. below.

Table 4: Allowable & Post Development Peak Flow Summary and SWM Facility Stage Storage Functions

	Allowable [	Development	Post Dev	Post Development		
Storm Event	Peal	c Flow	Pea	Storage Volume	Elevation	
	Bishop Drive	Easement (East) / Elizabeth Street	Bishop Drive	Easement (East) / Elizabeth Street		
	m³/s	m³/s	m³/s	m³/s	m³	m
25mm Event	0.163	0.033	0.011	0.019	128	251.19
4 HR CHI						
2-year	0.258	0.051	0.044	0.031	157	251.28
5-year	0.349	0.068	0.106	0.048	193	251.40
10-year	0.419	0.082	0.163	0.066	218	251.48
25-year	0.507	0.102	0.245	0.089	248	251.58
50-year	0.588	0.120	0.313	0.109	268	251.66
100-year	0.650	0.135	0.377	0.125	279	251.72
6 HR SCS						
2-year	0.158	0.027	0.085	0.019	182	251.36
5-year	0.249	0.048	0.197	0.042	232	251.52
10-year	0.331	0.069	0.285	0.059	260	251.63
25-year	0.454	0.097	0.395	0.080	294	251.80
50-year	0.548	0.118	0.467	0.094	321	251.96
100-year	0.643	0.138	0.535	0.107	349	252.13
12 HR SCS						
2-year	0.146	0.025	0.083	0.017	181	251.36
5-year	0.224	0.043	0.180	0.039	225	251.50
10-year	0.298	0.062	0.257	0.054	252	251.60
25-year	0.408	0.088	0.358	0.073	282	251.73
50-year	0.498	0.107	0.426	0.086	305	251.87
100-year	0.583	0.125	0.490	0.097	330	252.02
24 HR SCS						
2-year	0.145	0.025	0.092	0.020	186	251.37
5-year	0.244	0.050	0.204	0.044	234	251.53
10-year	0.355	0.077	0.285	0.059	260	251.63
25-year	0.455	0.099	0.391	0.077	293	251.80
50-year	0.534	0.115	0.451	0.088	314	251.92
100-year	0.613	0.131	0.507	0.099	337	252.06
Hazel	0.212	0.040	0.207	0.026	235	251.54

As outlined in Table 4 above, post development flows are controlled to corresponding allowable development peak flows for all storms and distributions. The maximum storage within the underground storage facility was determined to be 349m<sup>3</sup> and occurred during the 6-Hour SCS distribution.

As previously noted, a treatment train approach has been utilized to ensure the required quality control targets are achieved. The proposed Jellyfish Treatment Unit (Model Number JF12-22-5) and the Iron enhanced sand filter located below the underground storage are both considered Specialized Phosphorous Media Filters. The Total Suspended Solids (TSS) and Total Phosphorous (TP) removal efficiencies of specialized filter media are outlined below in Table 5.

Table 5 - BMP Published Removal Efficiencies

LID BMP Concentration Based Removal Efficiencies					
LID Practice TSS Removal Efficiency (%) TP Removal Efficiency (					
Filter Media (Specialized)	75	70			

<sup>\*</sup>Low Impact Development Treatment Train Tool, Version 1.2.1, April 2018

Based on the removal efficiencies above and the understanding that the proposed Jellyfish Treatment Unit and Iron Enhanced Sand Filter work in series, the total removal efficiencies can be calculated using the following formula.

$$E = A + B - \left[\frac{(AxB)}{100}\right]$$

Where: E = Total pollutant removal efficiency

A = Efficiency of the First or Upstream BMP

B = Efficiency of the Second or Downstream BMP

The corresponding total TSS and TP removal efficiencies completed as part of the proposed treatment train design are calculated as 93.75% and 91.00%, respectively. This exceeds the minimum requirements stipulated by the MOE, LSRCA and City of Barrie.

#### 5.4. Water Balance

As per City of Barrie requirements, a review of the pre to post development water balance has been undertaken for the site. The review has been completed using the Hydrologic Cycle Component Values from Table 3.1 of the Ministry of Environment Stormwater Management Planning and Design Manual dated March 2003. Supporting calculations are provided in Appendix C.

In the pre development condition or undeveloped condition, the average annual infiltration depth was determined to be approximately 170.40mm. Based on a total development area of 1.63Ha, this corresponds to an annual average infiltration volume of approximately  $2778m^3$  [1.63Ha x  $170.40mm \times 10 \text{ m/(m}^2 \text{ x mm)}$ ]. In the post development condition the average annual infiltration has been determined to be 126mm. The pervious area in the post development condition has been determined to be 0.79Ha corresponding to an average annual infiltration volume of  $995m^3$  [0.79Ha x  $126mm \times 10 \text{ m/(m}^2 \times \text{mm)}$ ]. This corresponds to a net loss of approximately  $1782m^3$  of infiltration between the pre development and post development condition.

As previously noted, depending on whether the insitu infiltration testing is favourable the proposed SWM Facility will either perform as an infiltration gallery or a filtration system. If the SWM facility functions as an infiltration gallery, infiltration of the full 25mm run-off volume will more than offset the post to pre development water balance. If the SWM Facility functions as a filtration system a best efforts approach will be required for water balance. In this scenario, it is proposed to install a 0.15m thick layer of clearstone below the filter. Based on a surface area of 421.1m and a void ratio of 0.40 for the clearstone, the resulting volume of the clearstone layer would be 25m<sup>3</sup>. The total area draining to SWM facility is 1.62Ha. Climate data for the City of Barrie indicate that an average of 99 rain events occur each year (excluding December, January and February), and that the average precipitation during an event is 4.8mm. The average rain fall event corresponds to a volume of  $78\text{m}^3$  [1.62Ha x 4.8mm x 10 m/(m<sup>2</sup> x mm)]. This is more than the volume available for storage in clearstone layer. Depending on the duration between storm events it is expected that an additional 2475m³ [25m³ x 99 events] could potentially infiltrate into the ground below the proposed filter system. This additional infiltration volume is greater than the net loss of infiltration between the pre and post development condition. Accordingly, the proposed stormwater management plan can achieve the required water balance, in turn promoting groundwater recharge in this area of the watershed.

#### 5.5. Phosphorous Budget

As required by current City of Barrie and LSRCA policy, a pre to post development phosphorous balance will be undertaken at the detailed design stage. As outlined in Section 5.3, above, the proposed SWM facility treatment train approach provides a total phosphorous removal efficiency of 91%. Based on the anticipated removal efficiency we do not foresee any issues meeting the phosphorous budget requirements.

#### 5.6. Minor and Major Stormwater Conveyance

The proposed storm sewer system has been designed to convey all storms up to and including the 100 Year event. This was done to ensure all storms are appropriately directed to the proposed SWM facility and minimizes potential impacts with overland flow conveyance. A storm sewer design sheet has been prepared to demonstrate safe conveyance of the 100 Year events to the proposed stormwater management facility. Refer to Appendix D. Additional supporting conveyance calculations will be completed during the detailed design phase.

#### 5.7. Stormwater Quality Control During Construction

To ensure stormwater quality control during construction, it is imperative that effective environmental and sedimentation controls be in place throughout the entire area prior to construction activities. Since earth grading will be required, there will be a potential for soil erosion. It is therefore, recommended that the following be implemented to assist in achieving acceptable stormwater runoff quality during construction:

- Installation of filter silt fences and mud mats throughout the site as detailed on drawings
   ESC-1 and ESC-2, and specifically during all construction activities;
- Installation of sediment and erosion control channels, rock check dams, and Hickenbottom Outlet as detailed on drawings ESC-1 and ESC-2.
- Restoration of exposed surfaces with vegetation and non-vegetative material as soon as construction schedules permit; and
- Reduce stormwater drainage velocities where possible and allow stormwater infiltration where possible.

The erosion and sediment control plan for the development is shown on Drawing ESC-1 and the corresponding details are provided on Drawing ESC-2. Through proper implementation of the detailed erosion and sediment control features, off-site impacts are not expected to occur during the construction phase of the project.

#### 6. Secondary Utilities

All secondary utility services will be co-coordinated and a Utility Servicing Plan created to indicate all underground locations once feedback from each utility company is provided. Electrical (Powerstream), Natural Gas (Enbridge Consumer Gas), Telephone (Bell Canada) and Cable (Rogers Cable) are all available within the adjacent Right of Ways. At this time we do not foresee

any limitations in servicing the development with secondary utilities; however, formal confirmation from each service provider is still required.

#### 7. Conclusions

The Bishop Drive Development has been fully examined for serviceability in this Report. The development lands can be appropriately serviced with existing municipal sanitary, water and storm infrastructure. Through proper execution of the proposed site servicing described herein and on the accompanying drawings, it is evident that the proposed development can become a functional part of the City of Barrie.

This Preliminary Servicing & Stormwater Management Report is respectfully submitted,

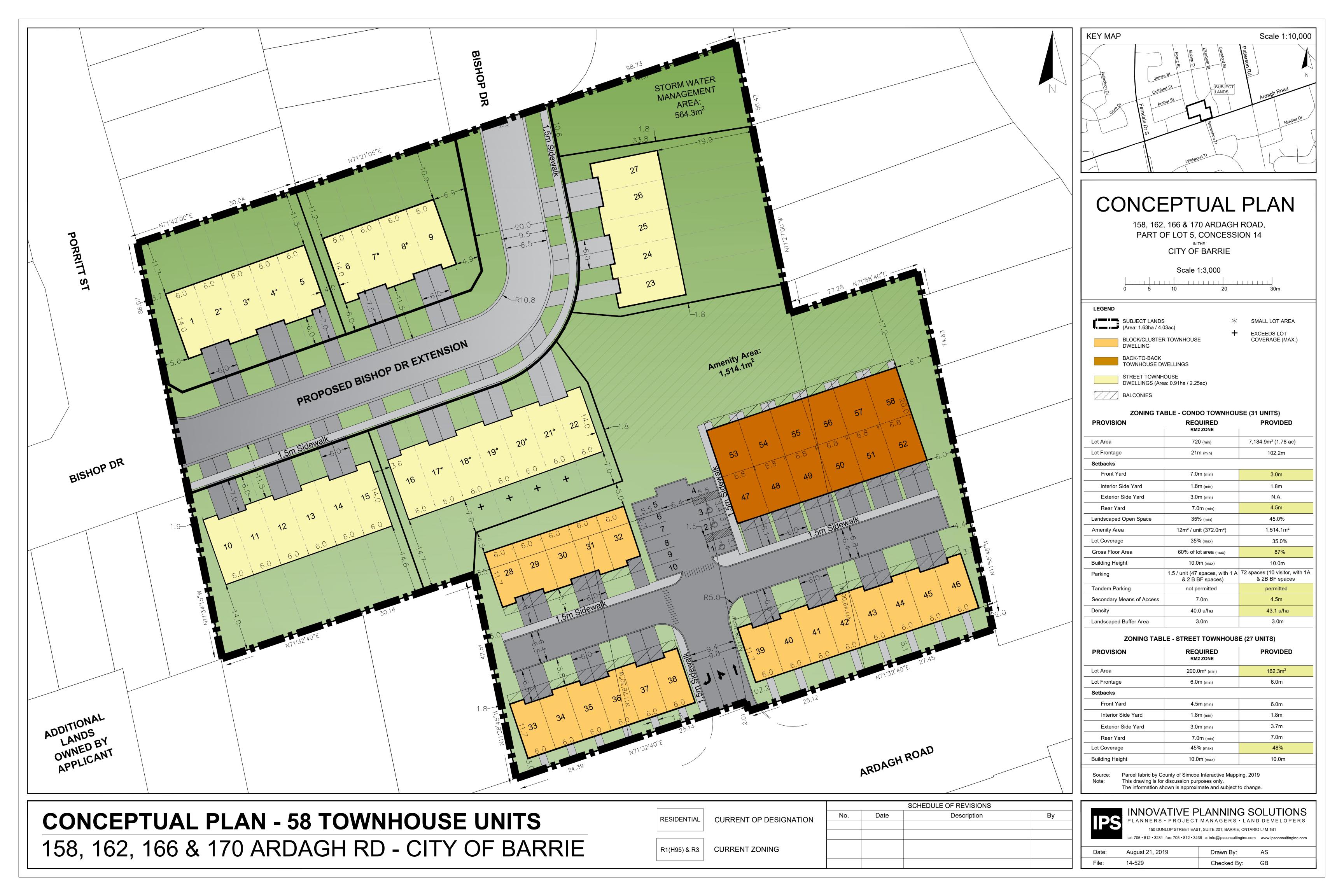
#### THE JONES CONSULTING GROUP LTD.

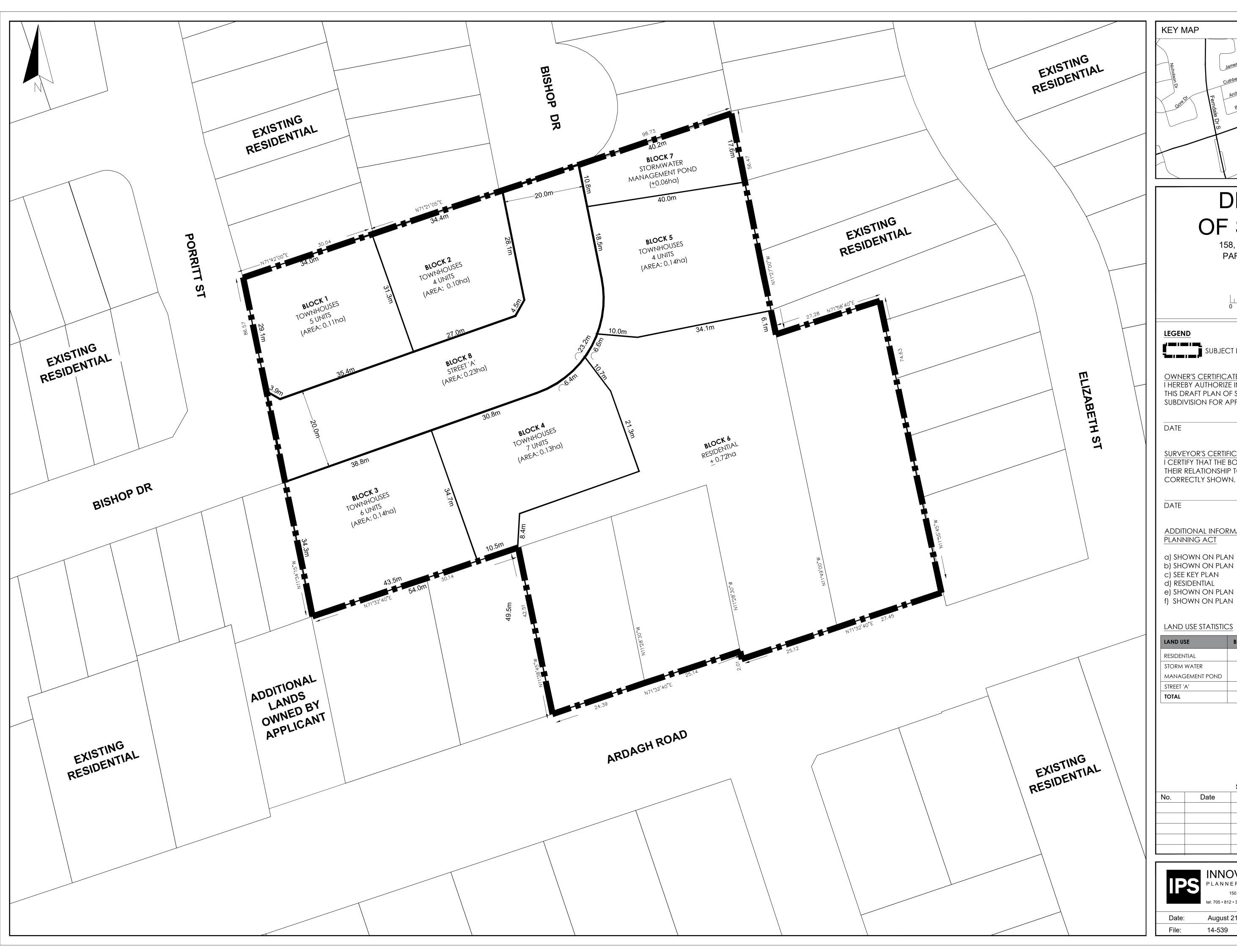


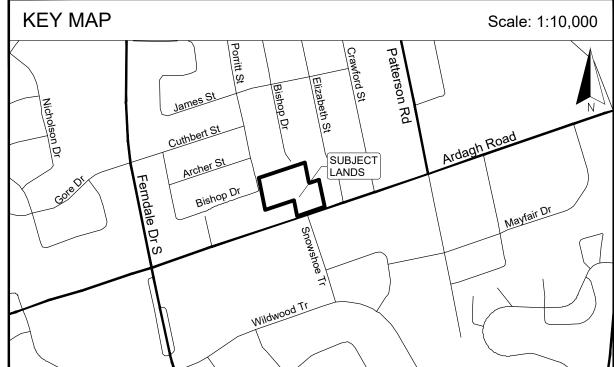
Jon W. Ingram, P. Eng. Project Engineer

# **APPENDIX A**

# **BACKGROUND INFORMATION**







# DRAFT PLAN OF SUBDIVISION

158, 162, 166 & 170 ARDAGH ROAD, PART OF LOT 5, CONCESSION 14

CITY OF BARRIE

Scale 1:2,500

0 5 10 20 30m

## **LEGEND**

SUBJECT LANDS

OWNER'S CERTIFICATE
I HEREBY AUTHORIZE INNOVATIVE PLANNING SOLUTIONS TO PREPARE THIS DRAFT PLAN OF SUBDIVISION AND SUBMIT THIS DRAFT PLAN OF

SUBDIVISION FOR APPROVAL.

HEDBERN DEVELOPMENT CORP.

# SURVEYOR'S CERTIFICATE

I CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

RUDY MAK, O.L.S.

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51 (17) OF THE PLANNING ACT

a) SHOWN ON PLAN b) SHOWN ON PLAN

g) SHOWN ON PLAN h) MUNICIPAL WATER i) SAND, SILT GLACIAL TILL

f) SHOWN ON PLAN

j) SHOWN ON PLAN k) MUNICIPAL WATER & SEWAGE I) NONE

# LAND USE STATISTICS


LAND USE	BLOCK No.	UNITS	AREA (ha)
RESIDENTIAL	1 - 6	27	1.34ha
STORM WATER	7		0.06ha
MANAGEMENT POND			
STREET 'A'	8		0.23ha
TOTAL	8	27	1.63ha

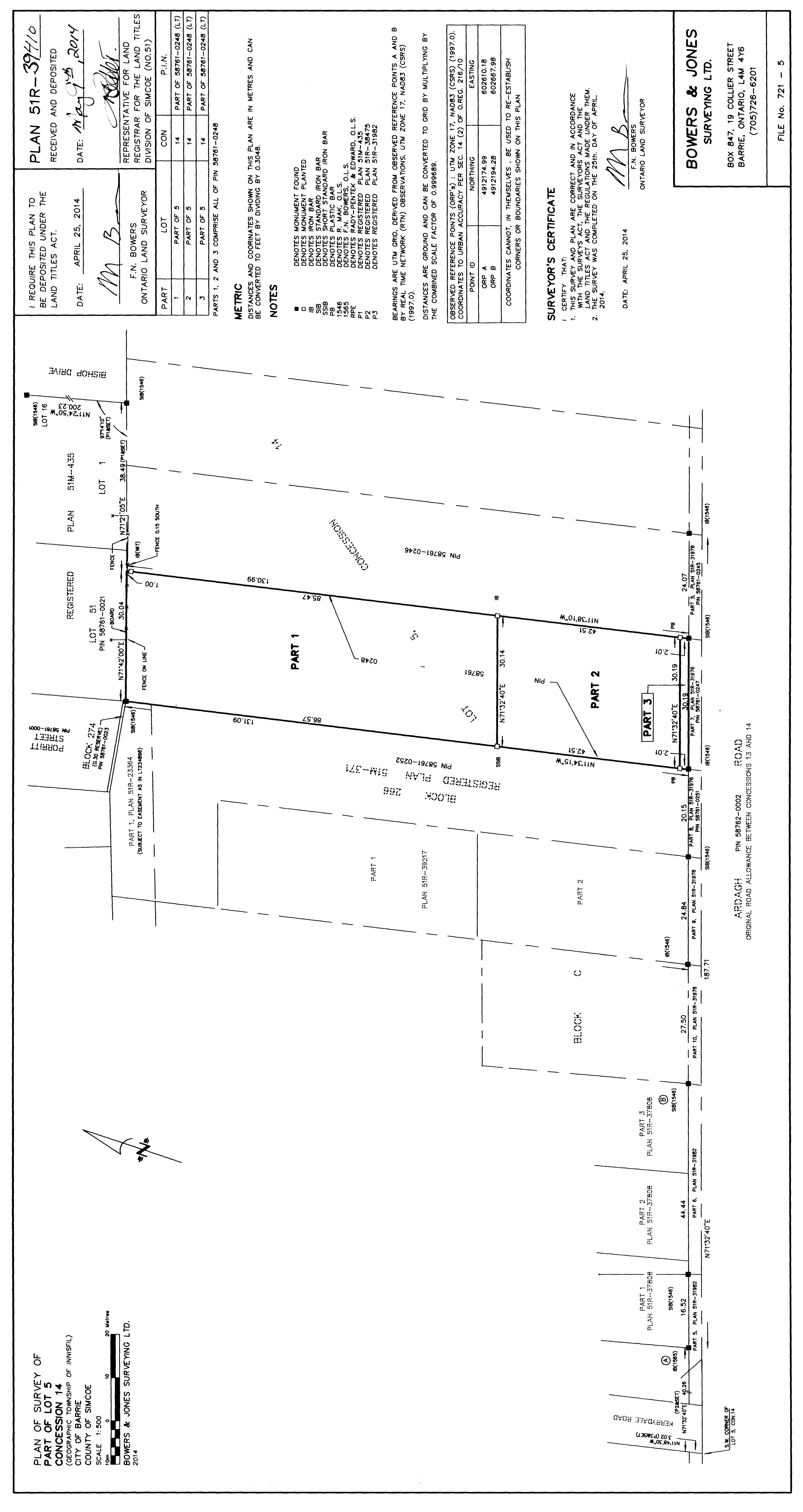
SCHEDULE OF REVISIONS

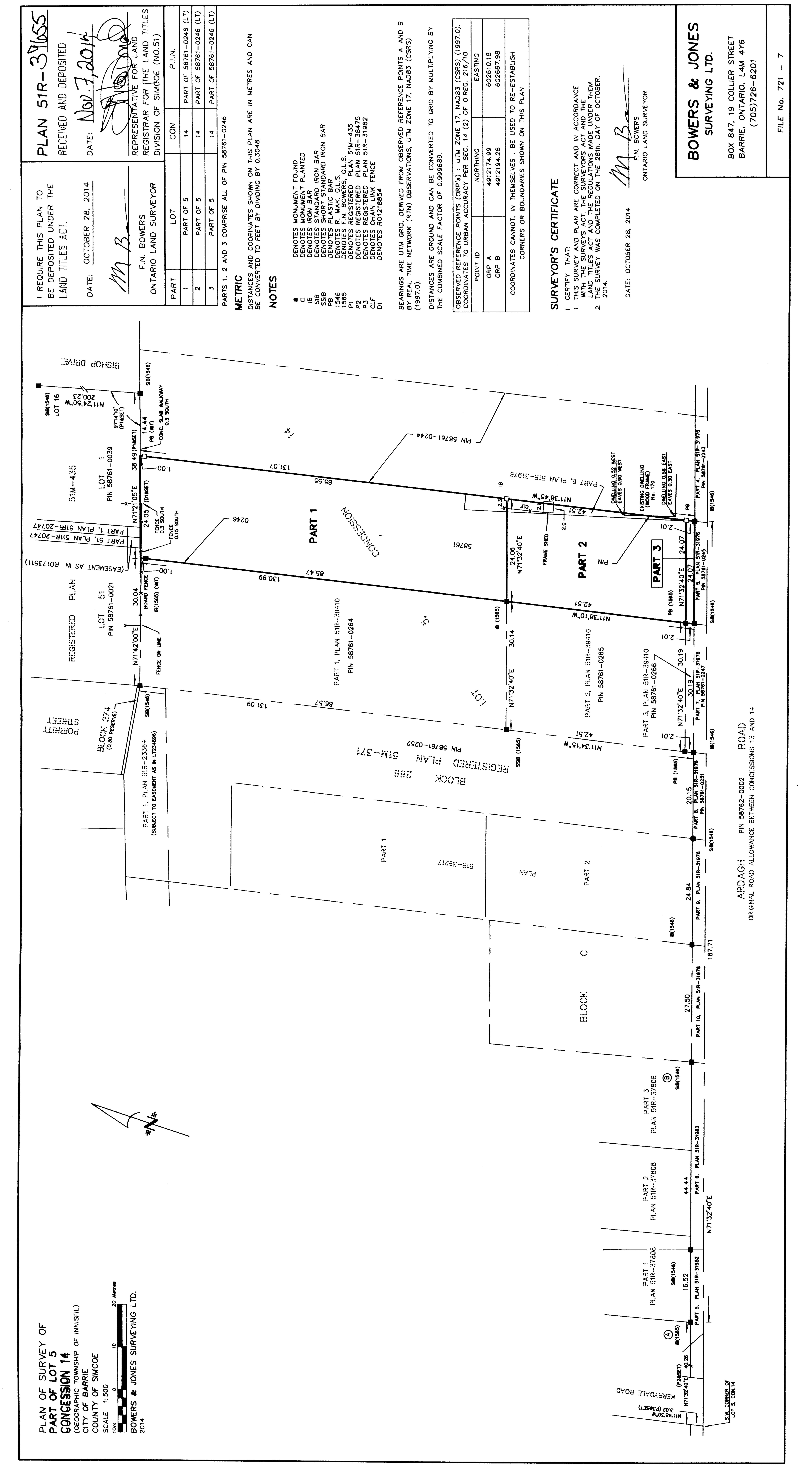
INO.	Date	Description	Ву

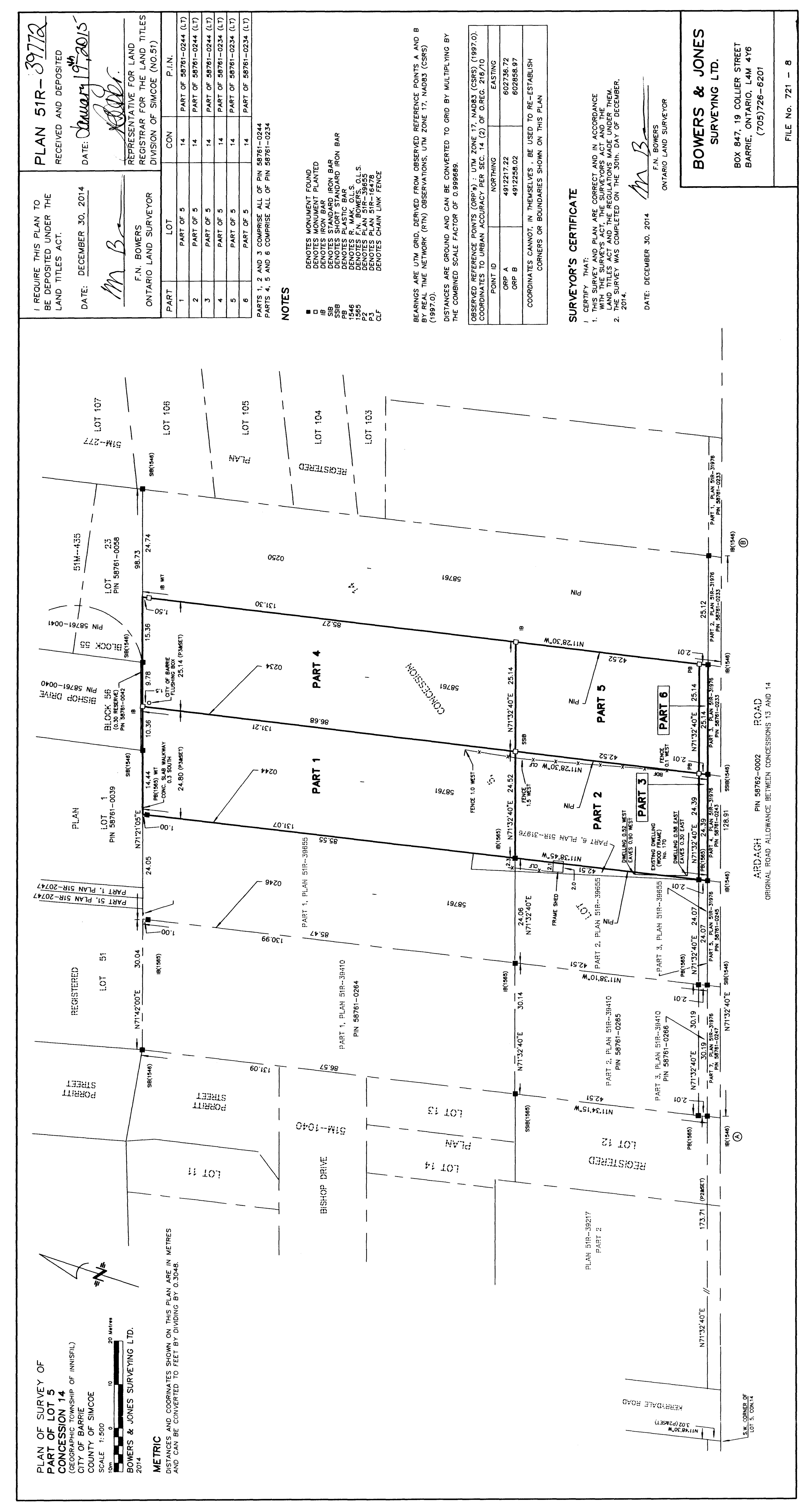


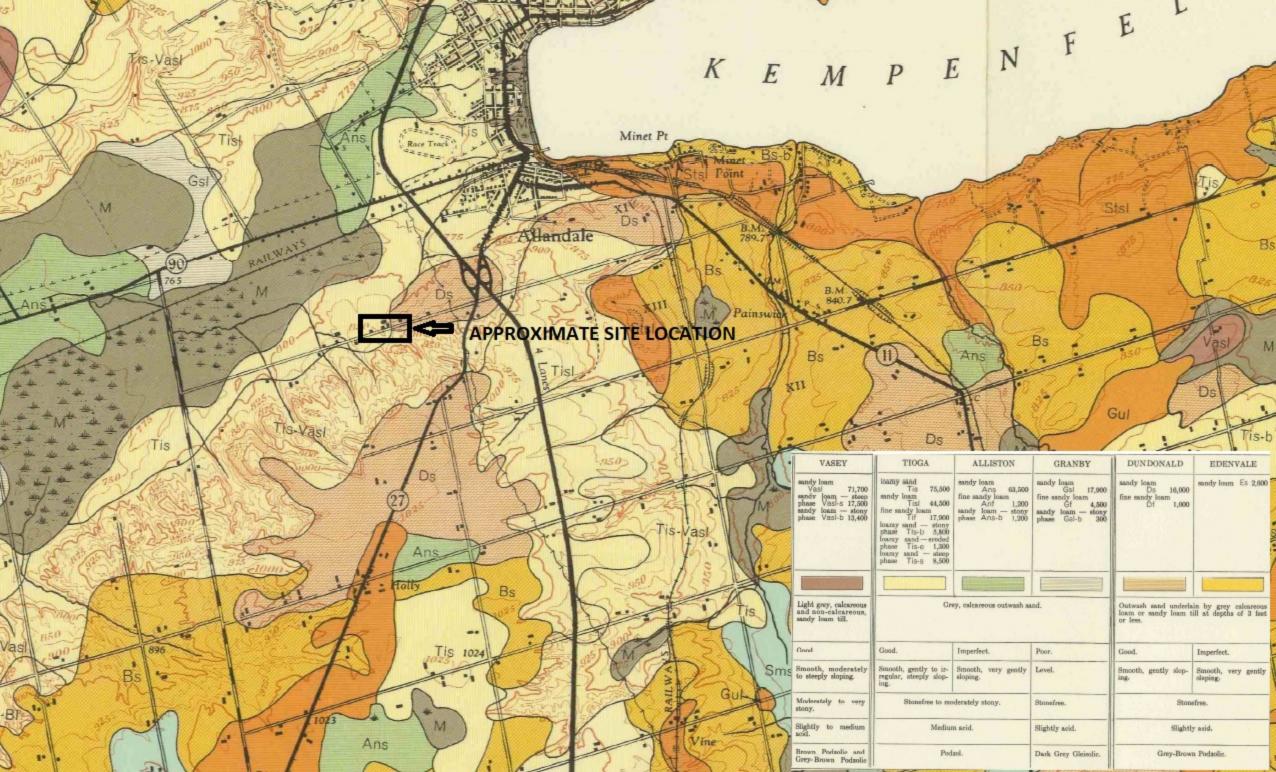
Date:	August 21, 2019	Drawn By:	AS	
File:	14-539	Checked:	GB	



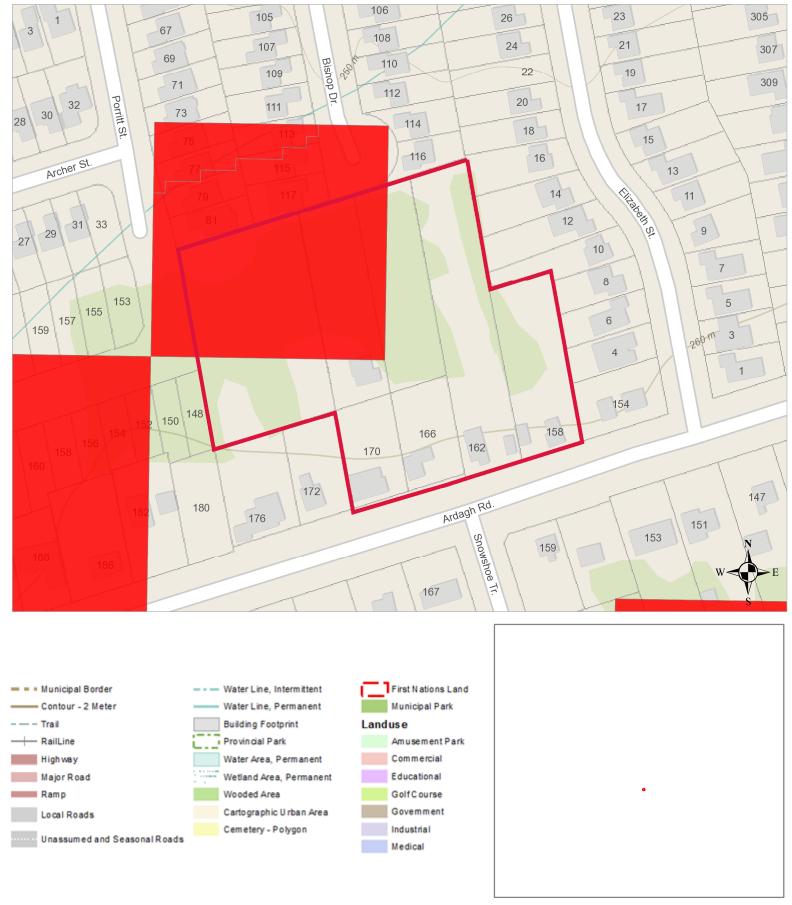








# Hedbern Homes - Highly Vulnerable Aquifer



This map, either in whole or in part, may not be reproduced without the written authority from

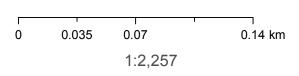
© The Corporation of the County of Simcoe.

This map is intended for personal use, has been produced using data from a variety of sources and may not be current or accurate.

Produced (in part) under license from

© Teranet Enterprises Inc. and its suppliers: © Members of the Ontario Geospatial Data Exchange. All rights reserved. THIS IS NOT A PLAN OF SURVEY.

© Her Majesty the Queen in Right of Canada, Department of Natural Resources:
© Queens Printer, Ontario Ministry of Natural Resources:





# Hedbern Homes - Wellhead Protection Area Q1





This map, either in whole or in part, may not be reproduced without the written authority from

© The Corporation of the Country of Simco.

This map is intended for personal use, has been produced using data from a variety of sources and may not be current or accurate.

Produced (in part) under license from:

© Her Majesty the Queen in Right of Canada, Department of Natural Resources:

© Queens Printer, Ontario Ministry of Natural Resources:

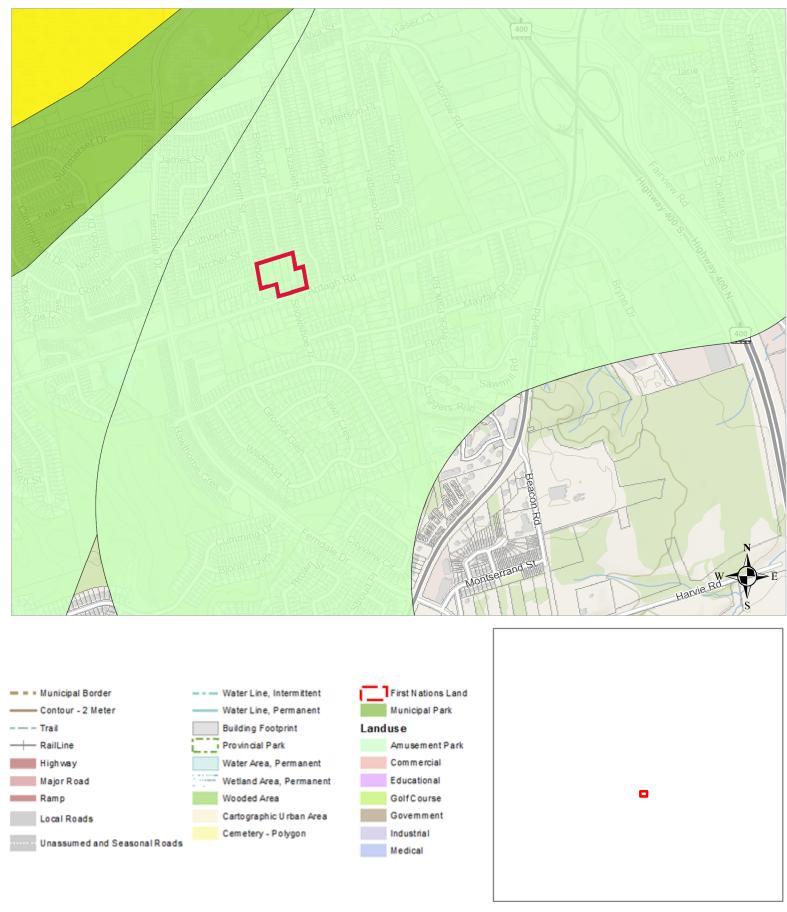
© Teranet Enterprises Inc. and its suppliers:
© Members of the Ontario Geospatial Data Exchange.
All rights reserved. THIS IS NOT A PLAN OF SURVEY.

0.55 0 0.275 1:18,056

1.1 km

SIMCOE

# Hedbern Homes - Wellhead Protection Vulnerability 2



This map, either in whole or in part, may not be reproduced without the written authority from

© The Corporation of the Country of Simcoe.

This map is intended for personal use, has been produced using data from a variety of sources and may not be current or accurate.

Produced (in part) under license from:

© Her Majesty the Queen in Right of Canada, Department of Natural Resources:

© Queens Printer, Ontario Ministry of Natural Resources:

© Teranet Enterprises Inc. and its suppliers:
© Members of the Ontario Geospatial Data Exchange.
All rights reserved. THIS IS NOT A PLAN OF SURVEY.



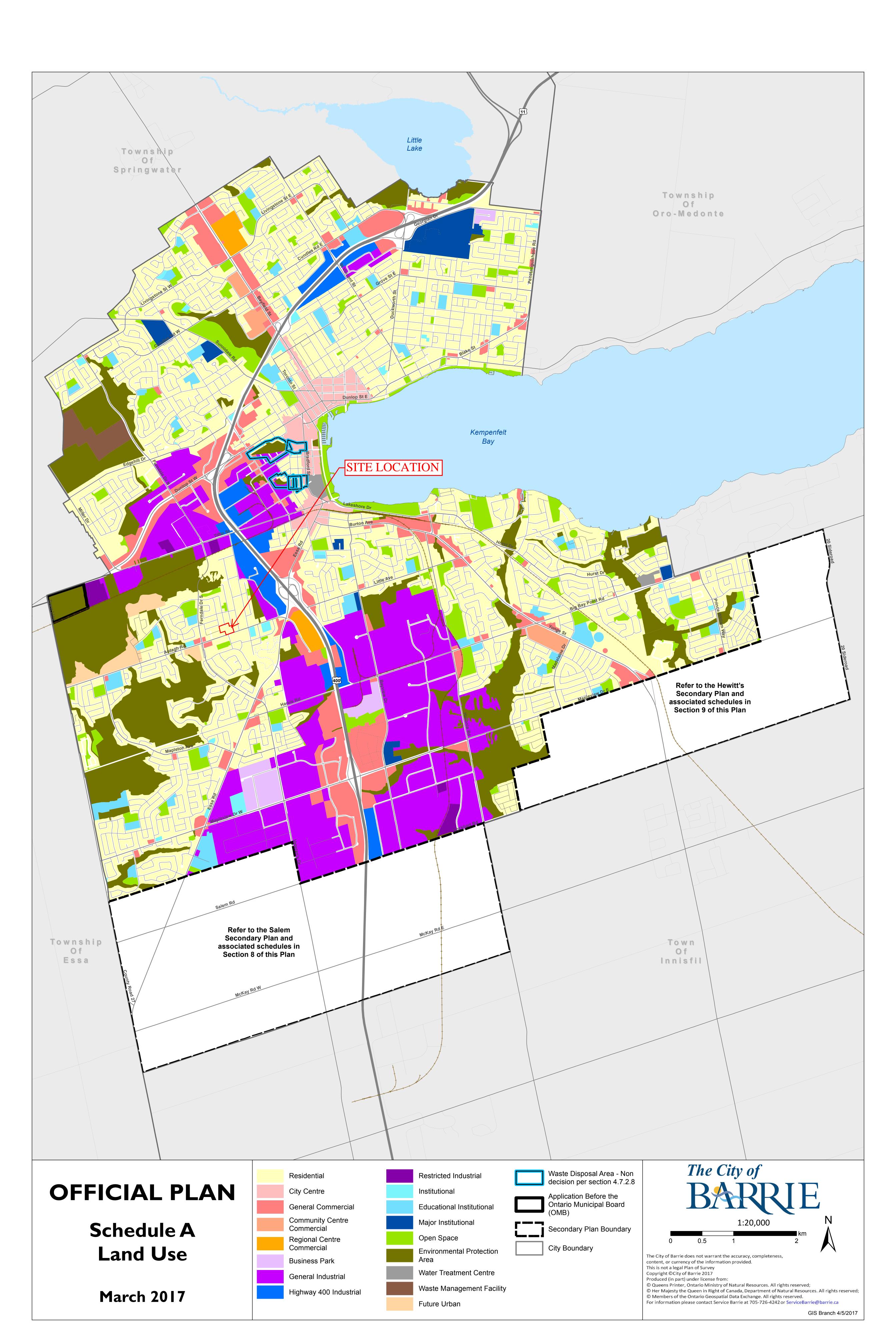
1.1 km

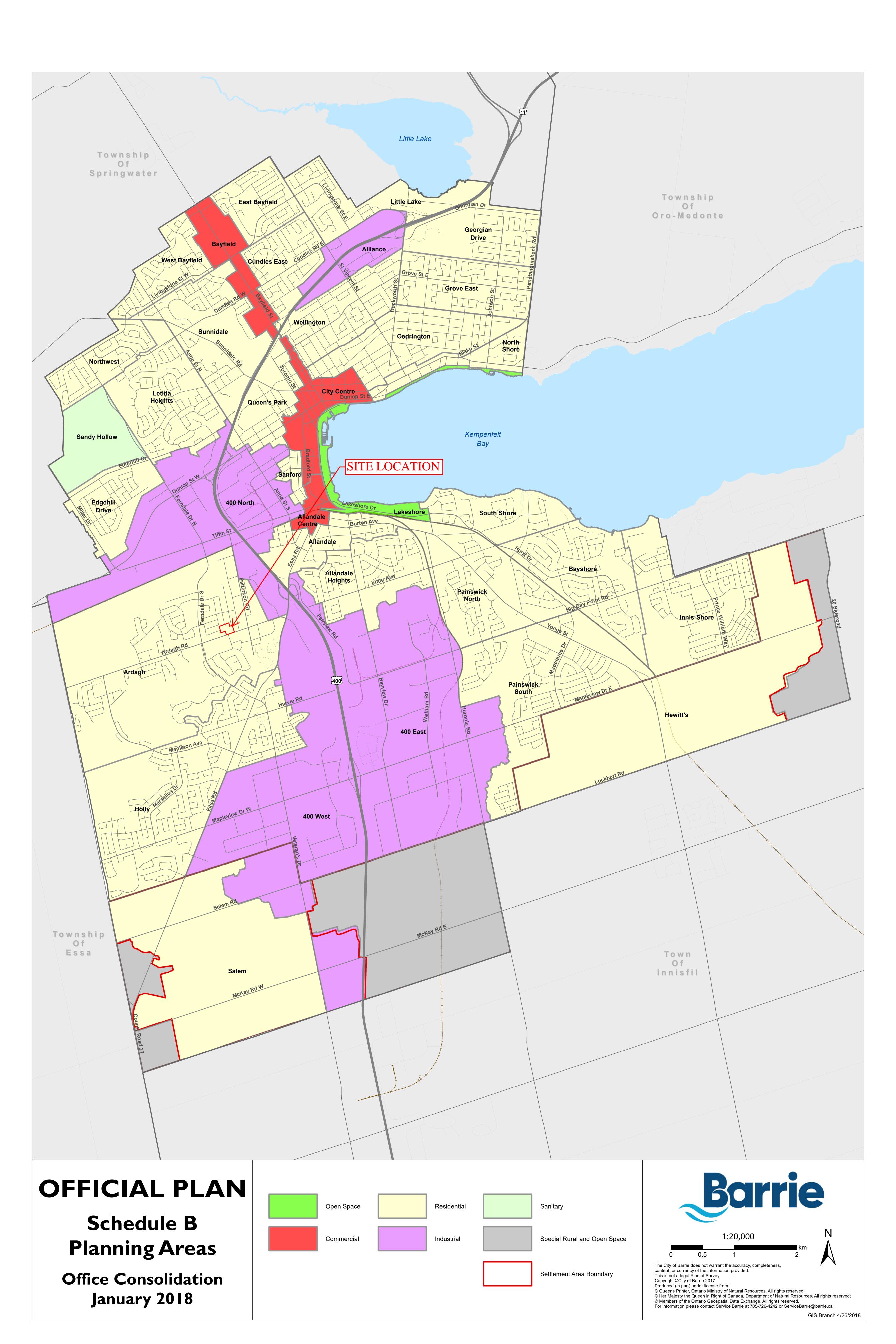
0.55

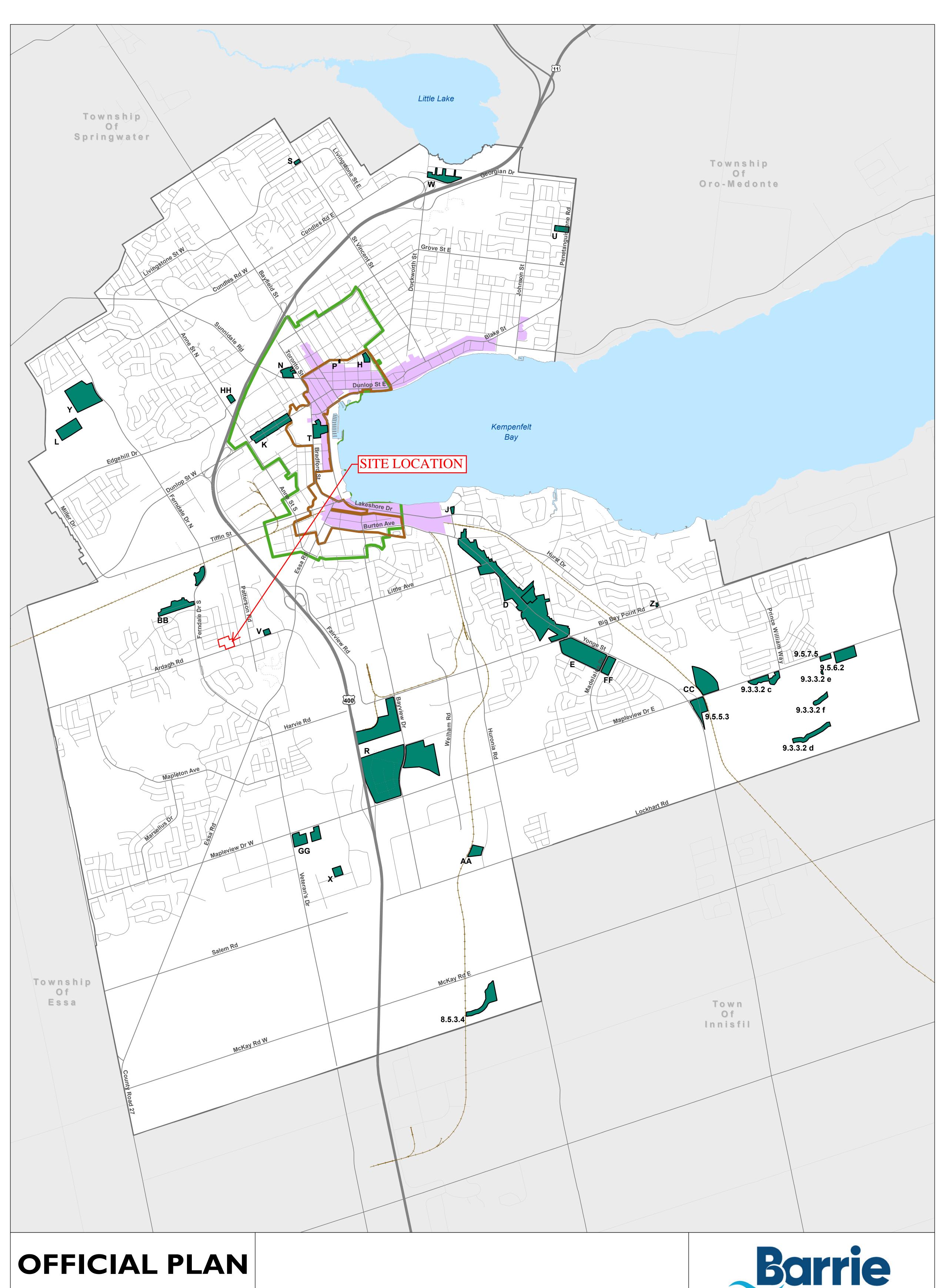
0

0.275



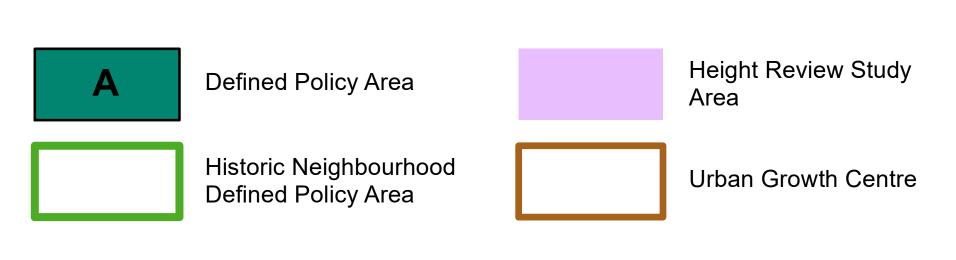


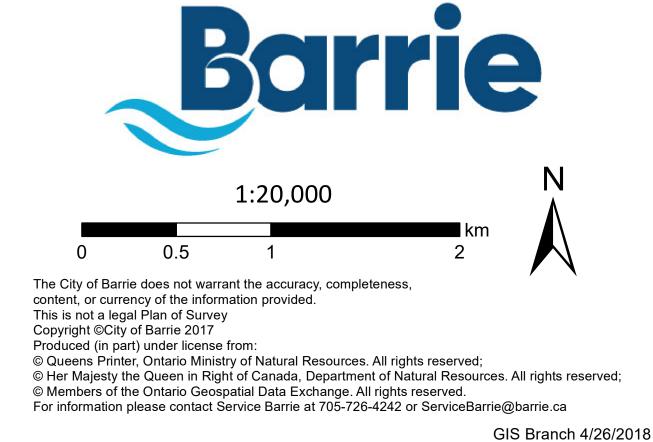




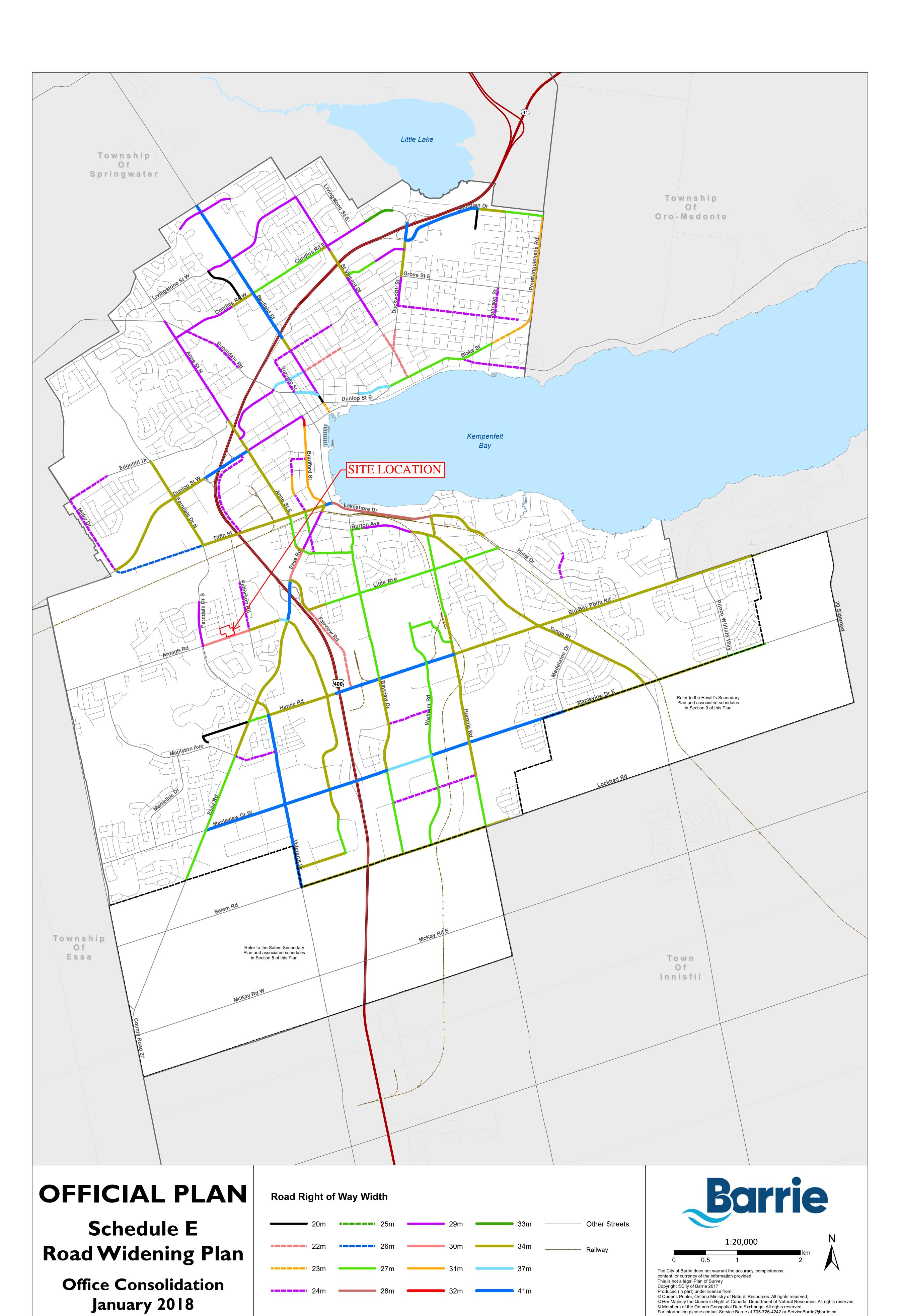
# OFFICIAL PLAN Schedule C Defined Policy Areas

Office Consolidation January 2018

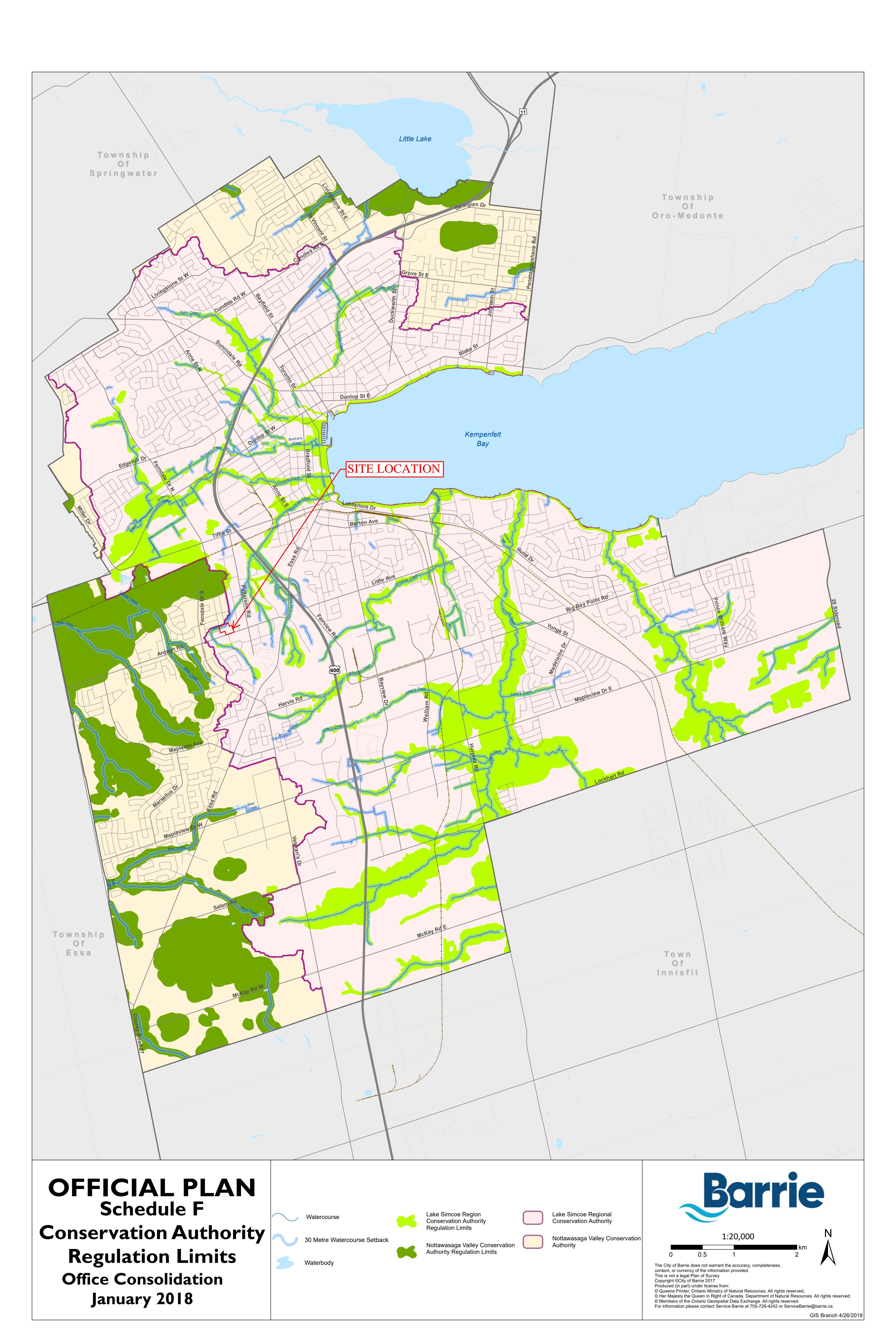


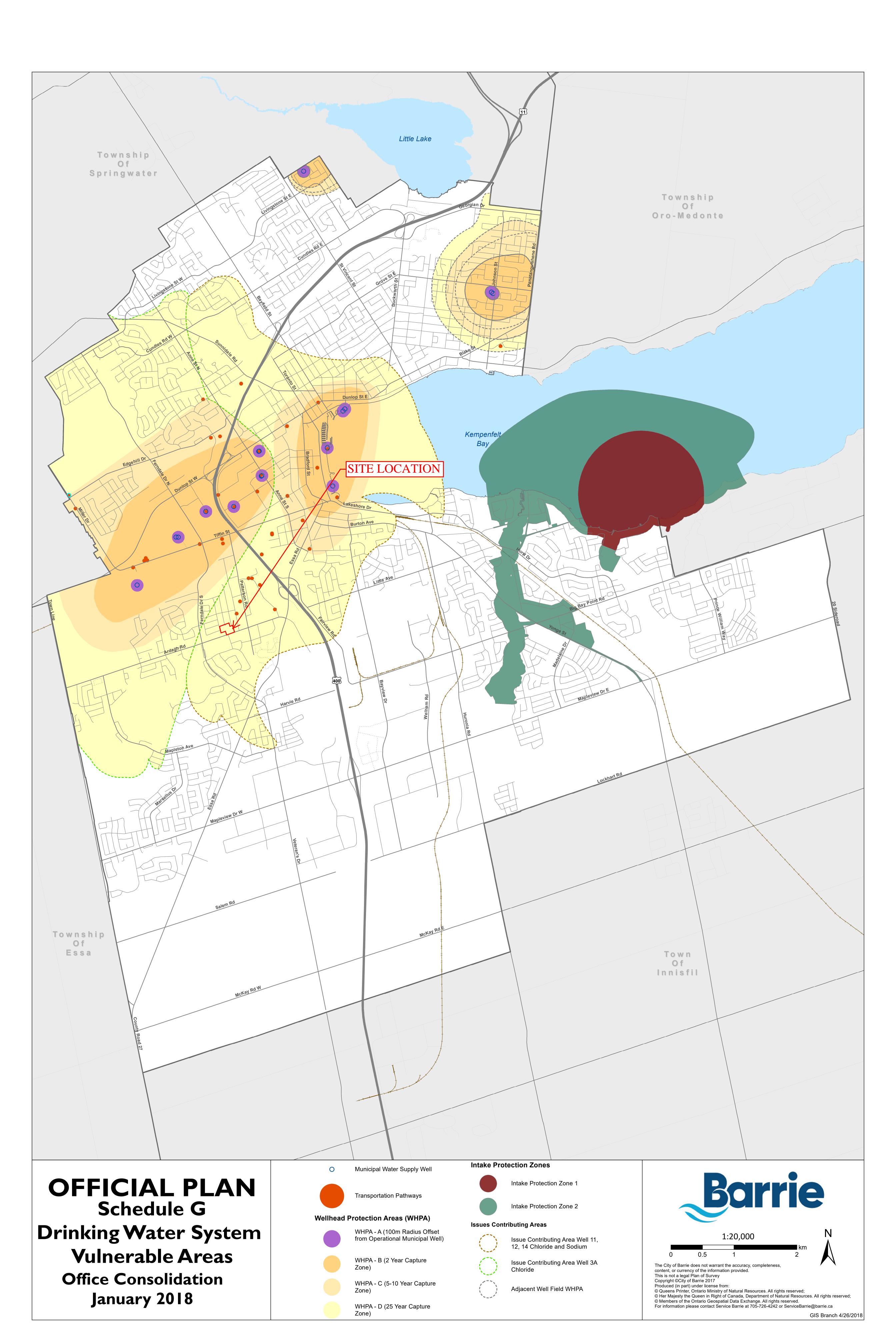


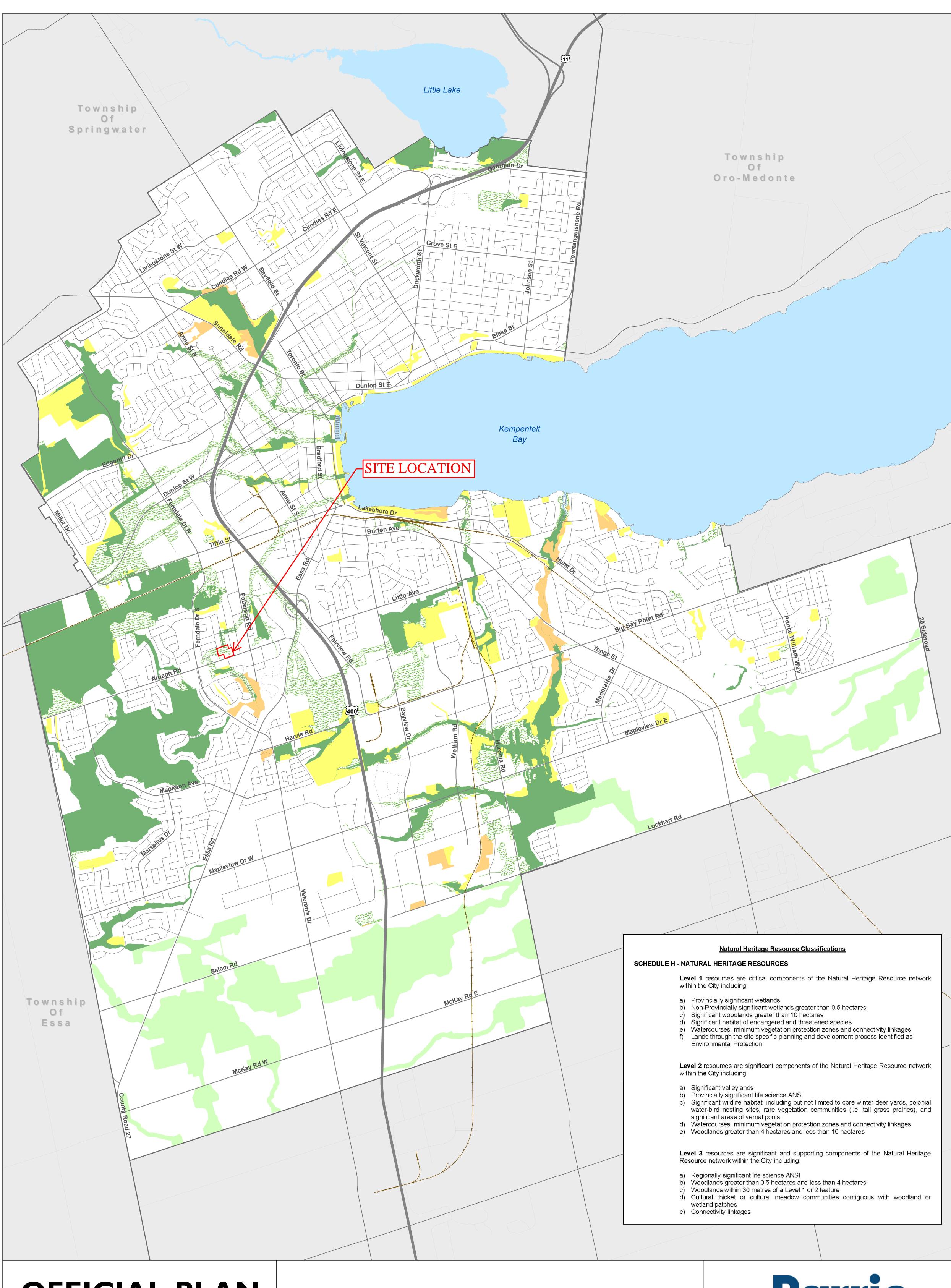




GIS Branch 4/27/2018



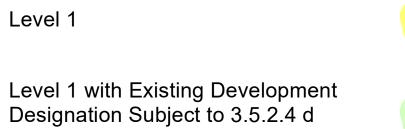




# OFFICIAL PLAN Schedule H Natural Heritage Resources **Office Consolidation** January 2018



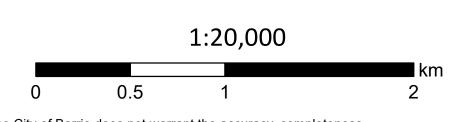
Level 2



Level 3

Natural Heritage System Salem and Hewitt's Secondary Plan

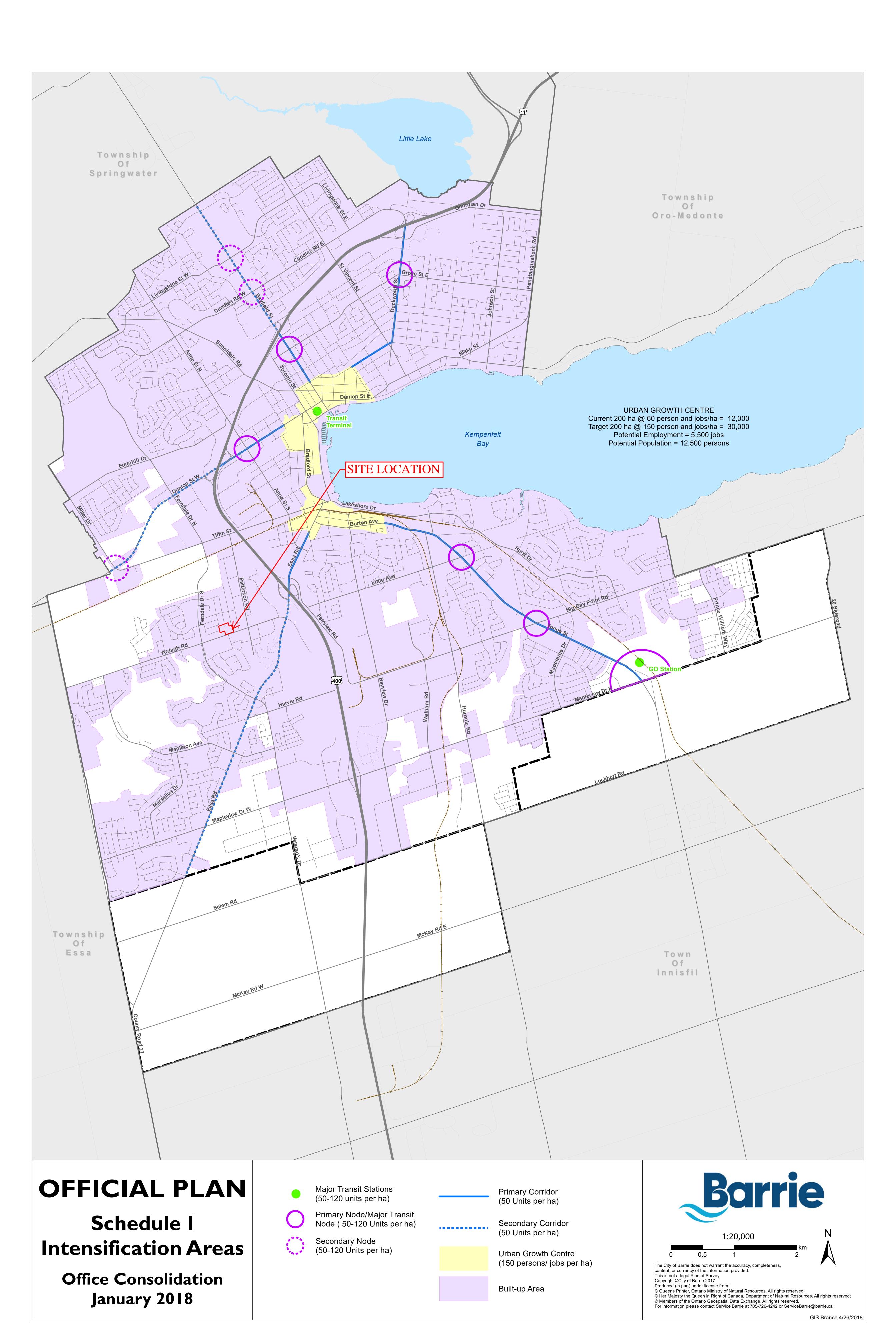


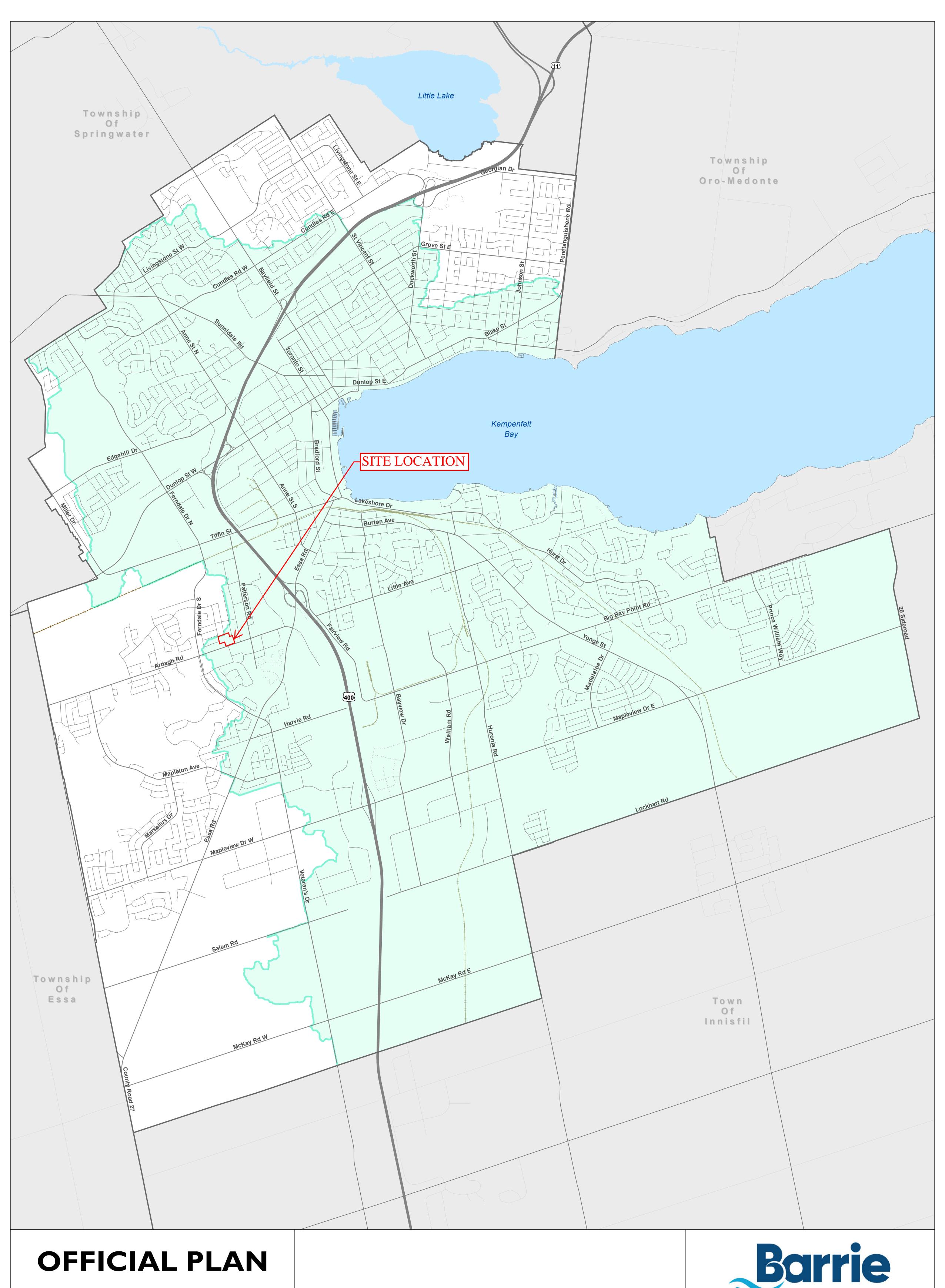


The City of Barrie does not warrant the accuracy, completeness, content, or currency of the information provided. This is not a legal Plan of Survey

Copyright ©City of Barrie 2017 Produced (in part) under license from: © Queens Printer, Ontario Ministry of Natural Resources. All rights reserved; © Her Majesty the Queen in Right of Canada, Department of Natural Resources. All rights reserved; © Members of the Ontario Geospatial Data Exchange. All rights reserved. For information please contact Service Barrie at 705-726-4242 or ServiceBarrie@barrie.ca

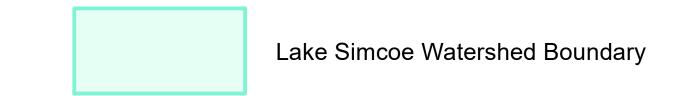
GIS Branch 4/27/2018

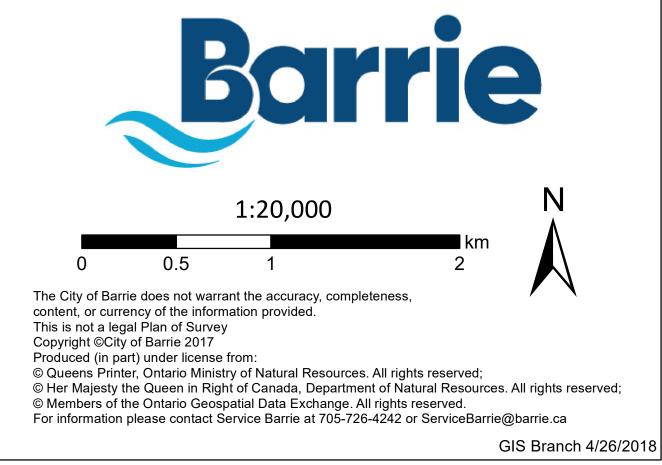


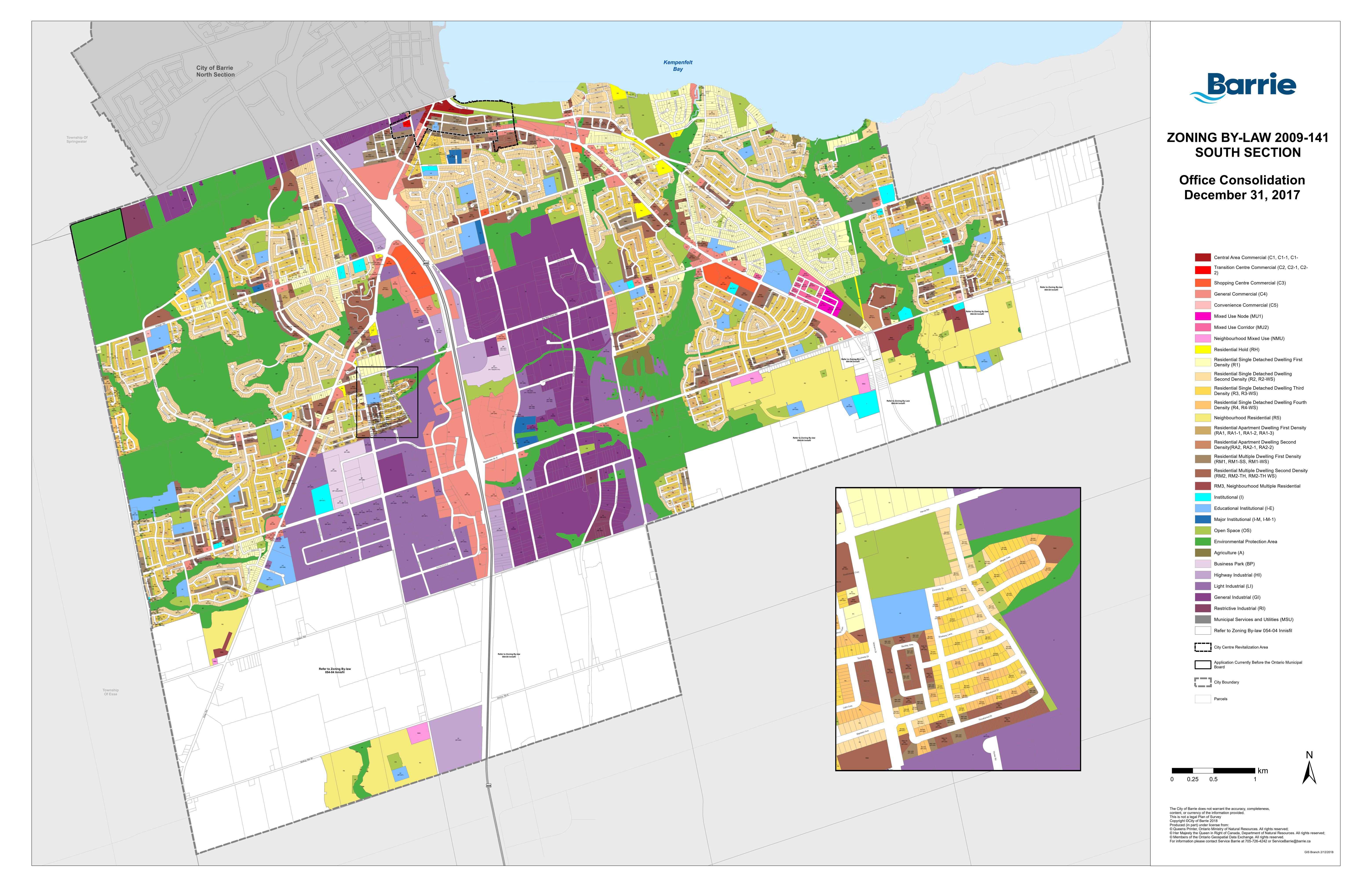


# OFFICIAL PLAN Schedule J Lake Simcoe Watershed

Office Consolidation January 2018

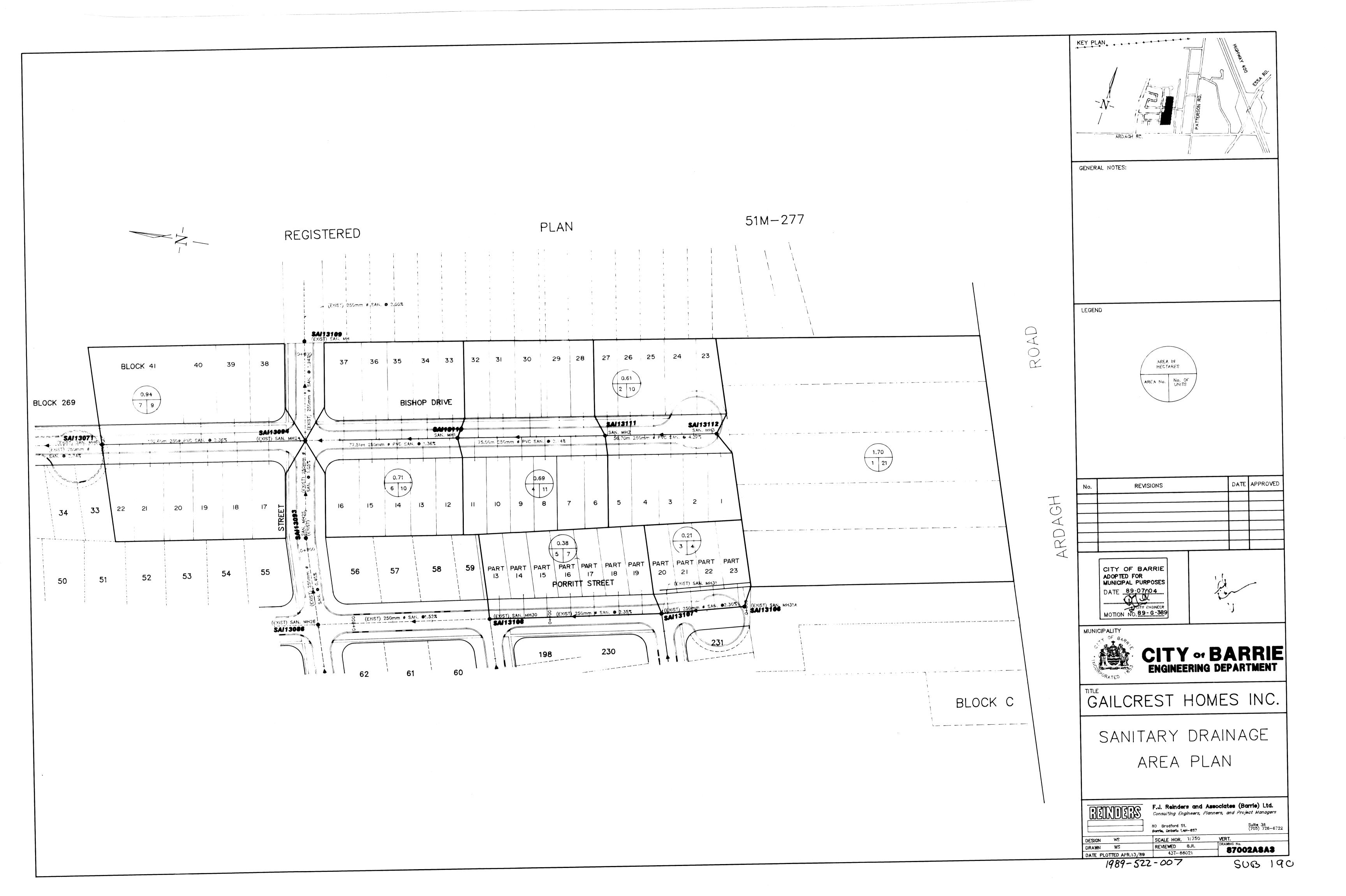


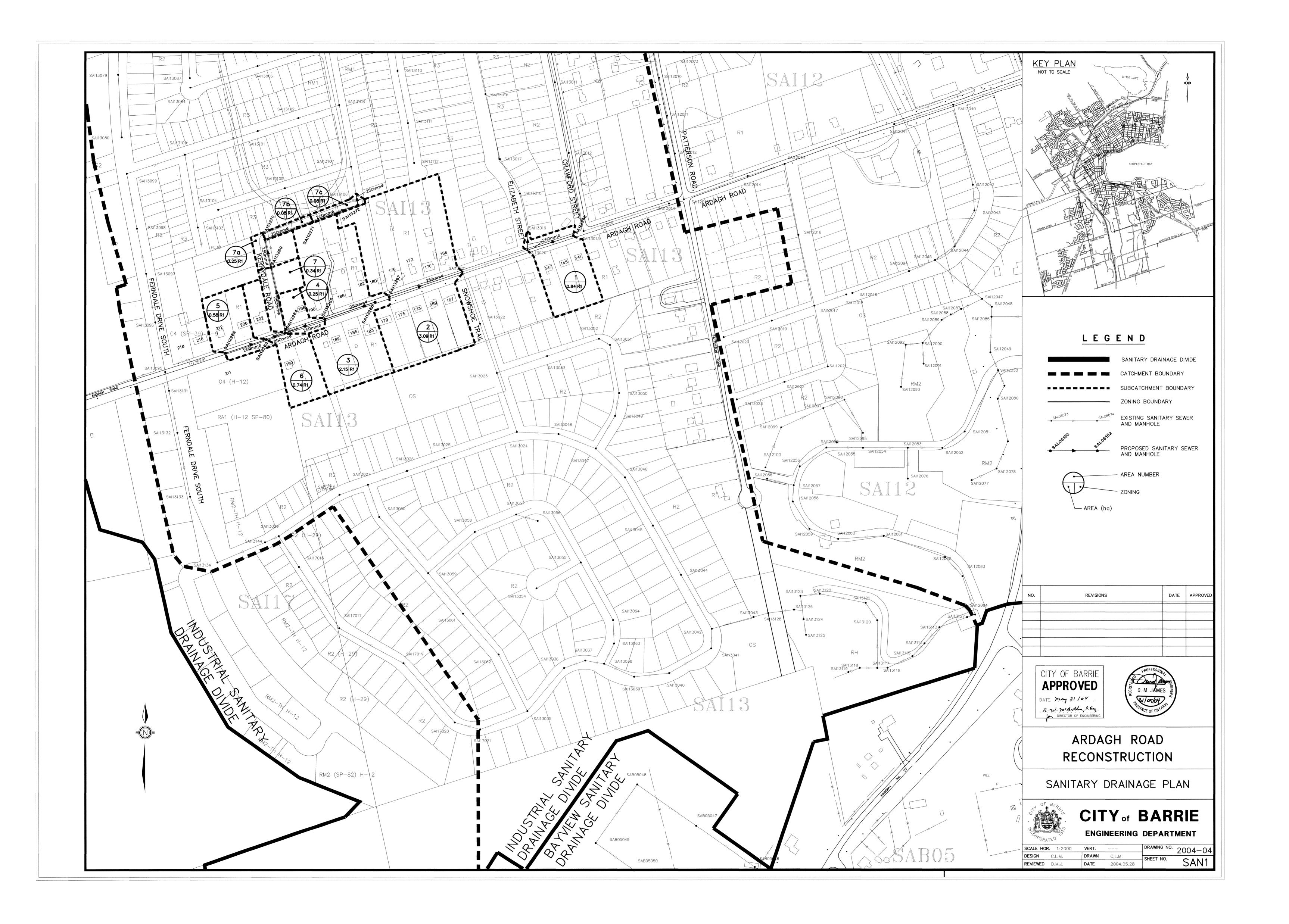




# **APPENDIX B**

# SUPPORTING CALCULATIONS – SANITARY SERVICING





# **Barrie**

#### **SANITARY SEWER DESIGN - LOCAL SEWER**

#### **Development Details Basis**

DESIGN SHEET 1 of 1 FILE NO HED-18022

CONTRACT / PROJECT

n ≥ 0.013 M = 5/P^0.2 Babbit M=1+[14/(4+P^0.5)] Harmon  $Q_p = P^*q^*M/86.4$  $Q_i = I*A$ 

Numbers in blue or text in red are equations

(Harmon or Babbitt peaking factor where; M ≥ 2), the greater of the two is used in the spreadsheet. Please refer to Section 3.3.1.1 of the Barrie Sanitary Design Guidelines for additional guidance on which peaking factor to use.

(Peak population flow where; q = 225 L/day/person; P = population in thousands)

225 litres/person/day

(Peak extraneous flow: I= 0.1L/s/ha over development area)  $Q_{tot} = Q_p + Q_i$ 

(Total peak flow as the sum of peak population flow and peak extraneous flow)

		MAINTE		DWELL	DWELL	DENSITY	POP.	POP.	М	М	Max	$Q_p$	AREA	AREA	$Q_{i}$	Q <sub>tot</sub>	L	D	S	Qf	d/D <sup>(2)</sup>	d/D <sup>(3)</sup>		(4)	Velocity <sup>(4)</sup>
STREET /	AREA	НО	LE	UNITS	(ACC)	P.P.U.	(P)	(ACC)	PEAKING	PEAKING	PEAKING			(ACC)						FULL		>0.5 or	FULL	Partial(1)	> 0.6
		FROM	то		UNITS				FACTOR BABBIT	FACTOR HARMON	FACTOR	(I/s)	(ha)	(ha)	(I/s)	(I/s)	(m)	(mm)	(%)	(I/s)		>0.7	(m/s)	(m/s)	(m/s)
Site Plan	1A	SAN 1A	SAN 2A	11	11	2.34	25.74	25.74	10.396	4.365	10.396	0.697	0.20	0.20	0.020	0.717	37.2	200	2.00	46.384	0.086	Ok	1.476	0.534	Check
Site Plan	2A	SAN 3A	SAN 2A	20	20	2.34	46.8	46.80	9.224	4.320	9.224	1.124	0.29	0.29	0.029	1.153	53.0	200	1.85	44.611	0.110	Ok	1.420	0.602	Ok
Site Plan	3A	SAN 2A	SAN 4A	0	31	2.34	0	72.54	8.450	4.279	8.450	1.596	0.21	0.70	0.070	1.666	57.1	200	8.00	92.768	0.093	Ok	2.953	1.116	Ok
Site Plan		SAN 4A	SAN 5A	0	31	2.34	0	72.54	8.450	4.279	8.450	1.596	0.00	0.70	0.070	1.666	14.4	200	1.73	43.140	0.134	Ok	1.373	0.653	Ok
Bishop Dr.	4A	SAI17373	SAN 5A	21	21	2.34	49.14	49.14	9.134	4.316	9.134	1.169	0.61	0.61	0.061	1.230	84.9	200	1.94	45.683	0.112	Ok	1.454	0.620	Ok
Bishop Dr.	5A	SAN 5A	SAN 7A	3	55	2.34	7.02	128.70	7.534	4.212	7.534	2.525	0.08	1.39	0.139	2.664	14.1	200	4.21	67.297	0.135	Ok	2.142	1.023	Ok
Bishop Dr.	6A	SAN 7A	SAI13112	3	58	2.34	7.02	135.72	7.455	4.205	7.455	2.635	0.22	1.61	0.022	2.657	36.7	200	4.44	69.111	0.133	Ok	2.200	1.055	Ok
DATE: 03-20-	19			<u>II</u>	CALCULA	TED BY:	KC									CHE	CKED BY:	JI							

<sup>(1)</sup> without extraneous flow

- (2) with extraneous flow
- (3) d/D>0.5 for pipes 375 and less, d/D>0.7 for pipes greater than 375
- (4) Velocity check based on the lesser of full flow or partial velocity

# **APPENDIX** C

**SUPPORTING CALCULATIONS -**

**WATER SERVICING** 

# FLOW TEST RESULTS



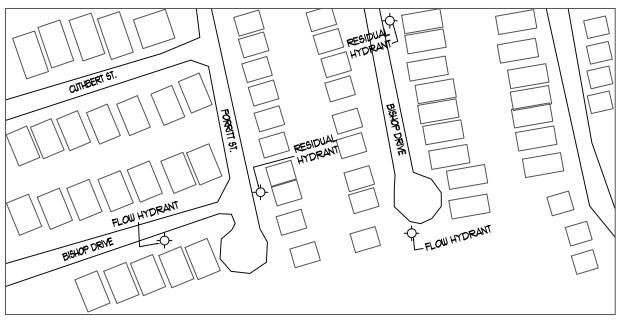
DATE: JULY 25, 2019 TIME: 10:45AM

LOCATION: 115 BISHOP DRIVE & 187 BISHOP DRIVE (SIMULTANEOUSLY)

BARRIE

ONTARIO

TEST BY: VIPOND FIRE PROTECTION AND LOCAL PUC



# SIMULTANEOUSLY

STATIC PRESSURE: <u>13</u> PSI STATIC PRESSURE: <u>85</u> PSI

		BISH	10P DR. & F	PORRITT S	oŤ.				BISHO	P DR- DEA	AD END T	EST	
TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO-EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S.G.PM)	TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO-EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S.GPM)
1	1	2 1/2"	Ø.9Ø	62	18	716	1	1	2 1/2"	0.90	71	14	653
2	2	2 1/2"	0.90	45	7	976	2	2	2 1/2"	0.90	5Ø	6	946



115 BISHOP DRIVE & 187 BISHOP DRIVE	BY:	JEROME P.
BARRIE	VIPOND OFFICE:	BARRIE
ONTARIO	TEST BY :	VIPOND & PUC
	DATE :	JULY 25, 2019

STATIC: BISHOP DR. & PORRITT ST. <u> 13 PSI</u>

RESIDUAL: FLOW:

TEST#1: 62 PSI @ 116 GPM

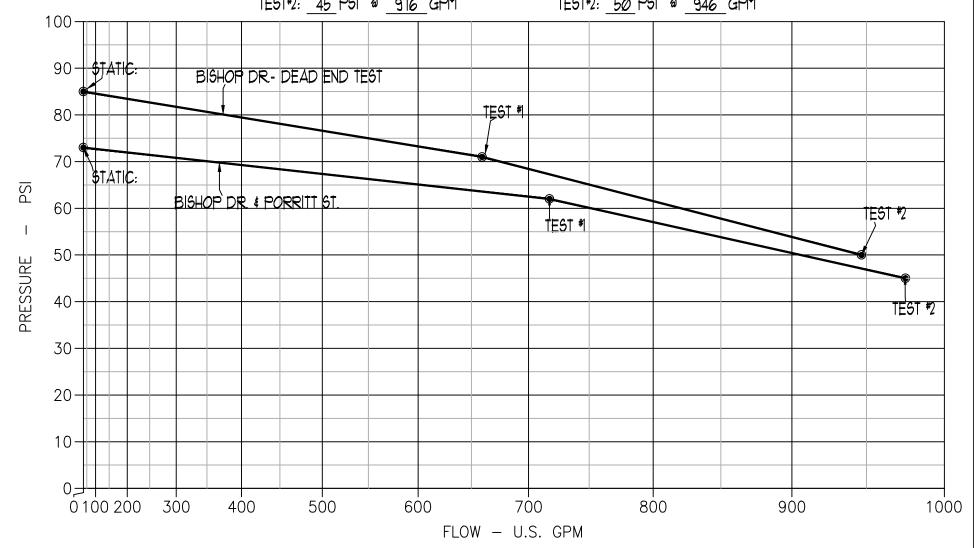
TEST\*2: 45 PSI @ 976 GPM

STATIC: BISHOP DR- DEAD END TEST

85 PSI RESIDUAL: FLOW:

TEST#: 71 PSI @ 653 GPM

TEST#2: 50 PSI @ 946 GPM



# FLOW TEST RESULTS

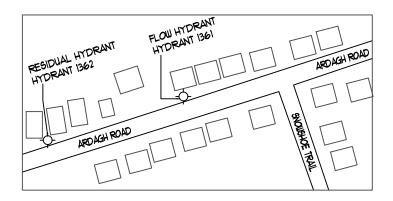


 DATE :
 JULY 25, 2019
 TIME :
 10:15 AM

 LOCATION :
 172 ARDAGH ROAD

 BARRIE
 ONTARIO

 TEST BY :
 VIPOND FIRE PROTECTION AND LOCAL PUC



STATIC PRESSURE: 65 PSI UNDERGROUND TYPE & SIZE: 150mm D.I.

TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO-EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S.G.PM)
1	1	2 1/2"	0.90	60	16	675
2	2	2 1/2"	0.90	51	6	946

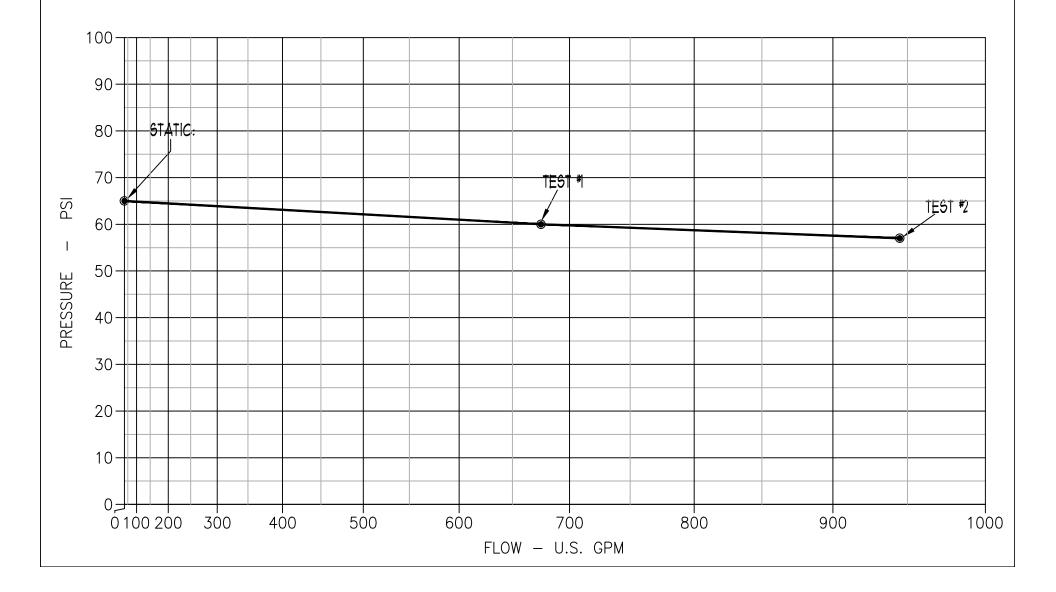


172 ARDAGH ROA	D		BY:	JEROME P.
BARRIE			VIPOND OFFICE :	BARRIE
ONTARIO			TEST BY :	VIPOND & PUC
GT ATIC	PEGIDUAL	EL OUL	DATE :	JULY 25, 2019

 STATIC:
 RESIDUAL:
 FLOW:

 65 PSI
 TEST\*I
 60 PSI
 6 ESI GPM

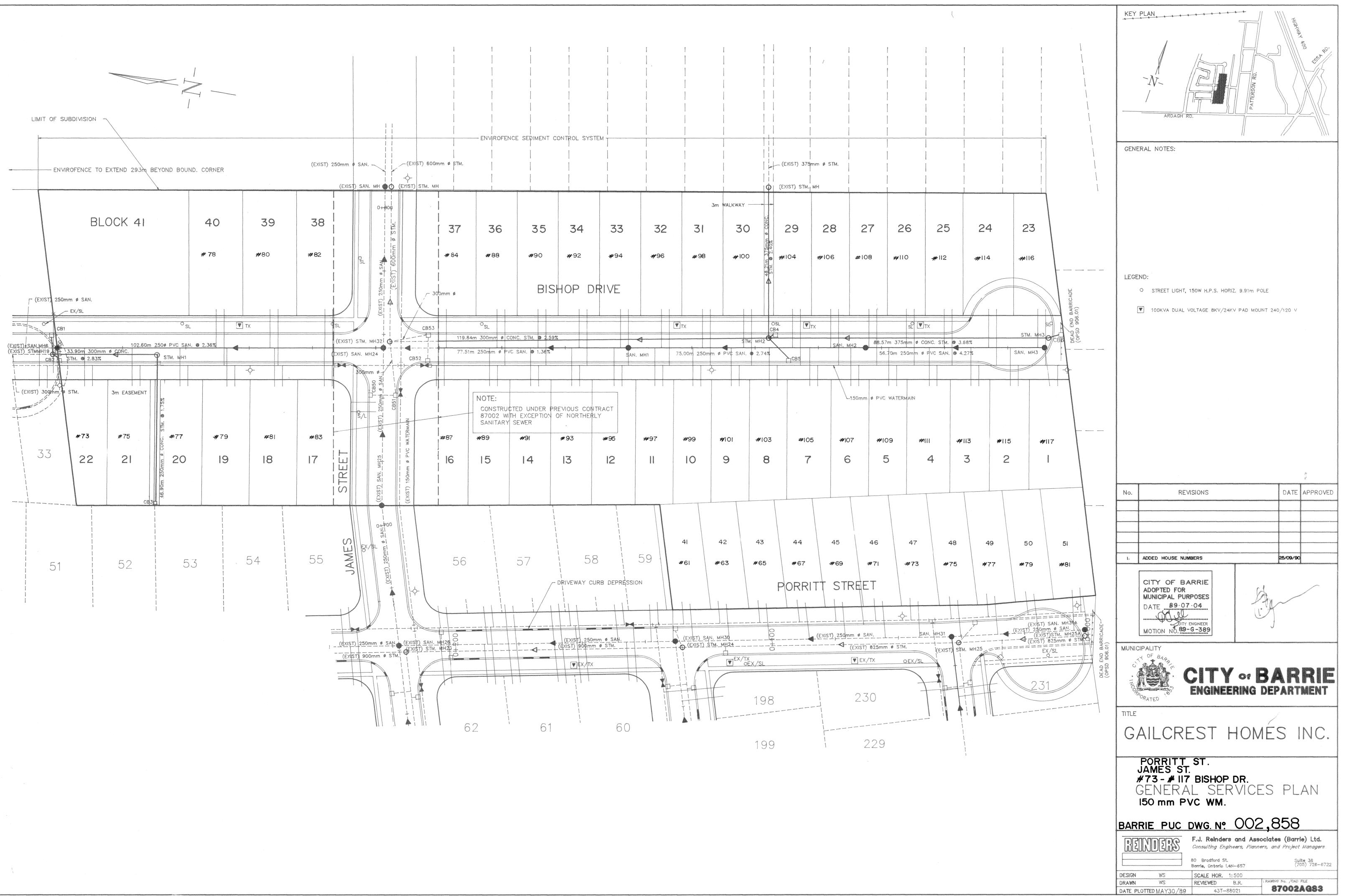
 TEST\*2
 51 PSI
 946 GPM

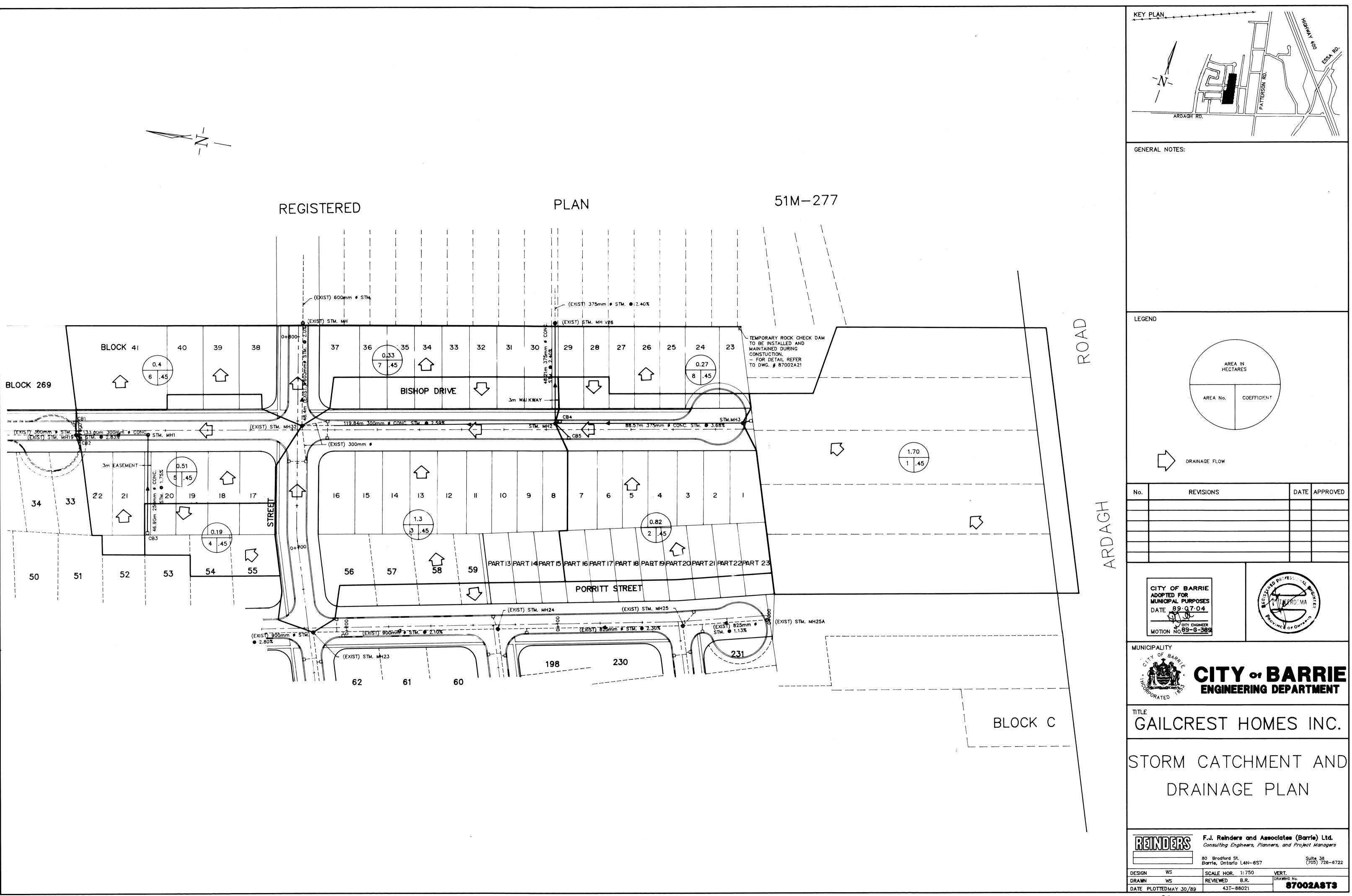


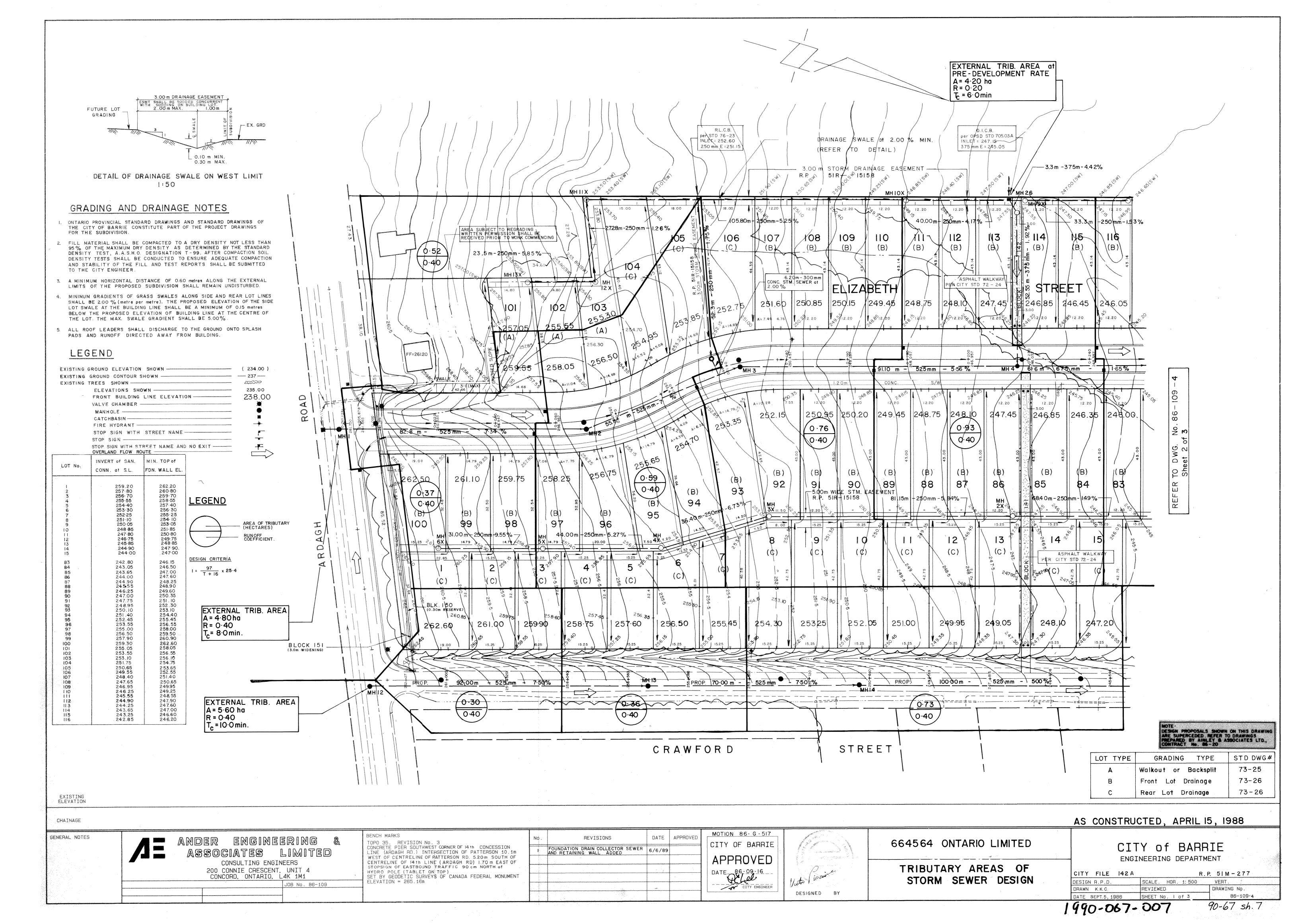
# **APPENDIX D**

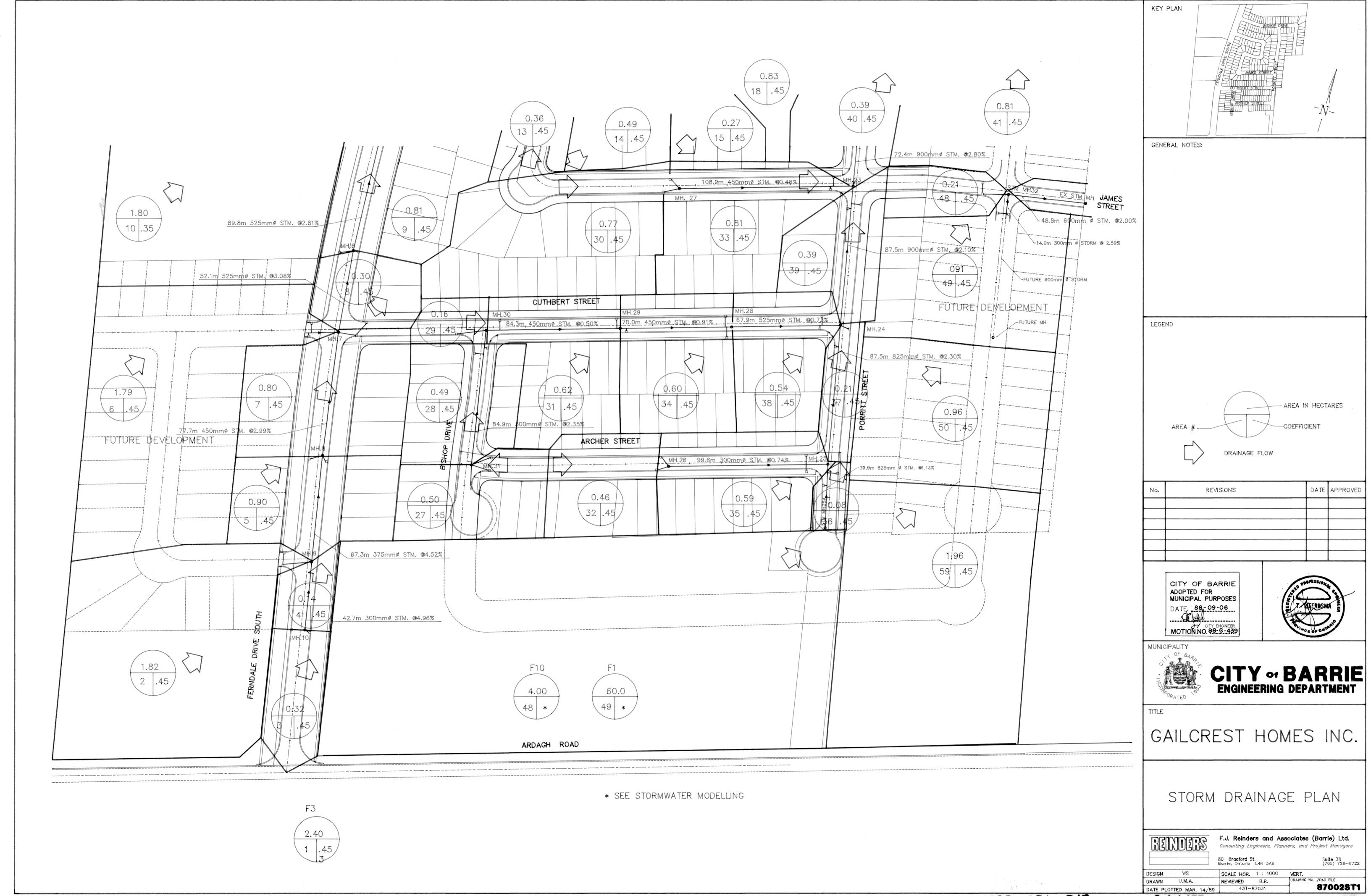
## **SUPPORTING CALCULATIONS -**

## **STORMWATER MANAGEMENT**





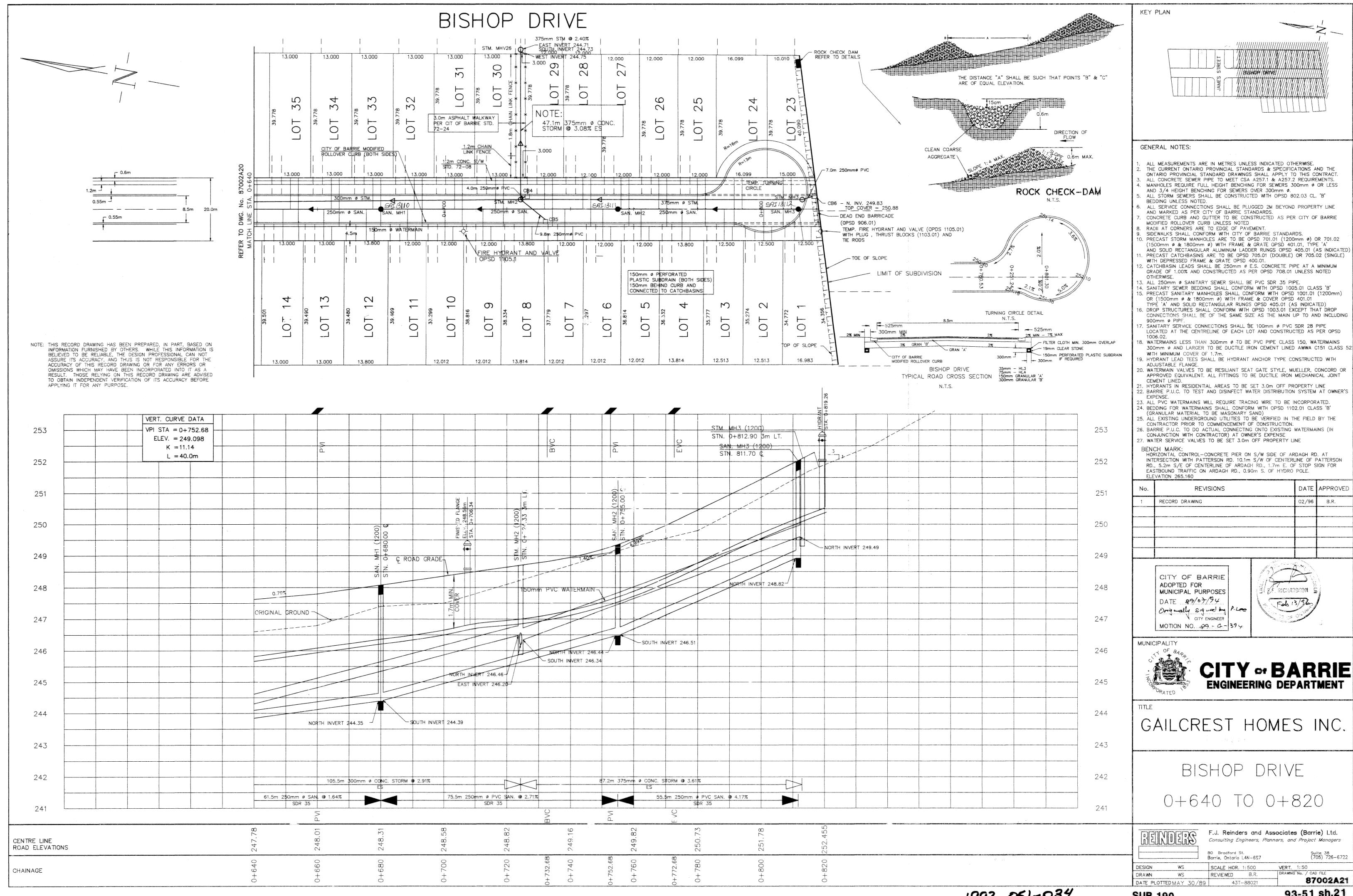


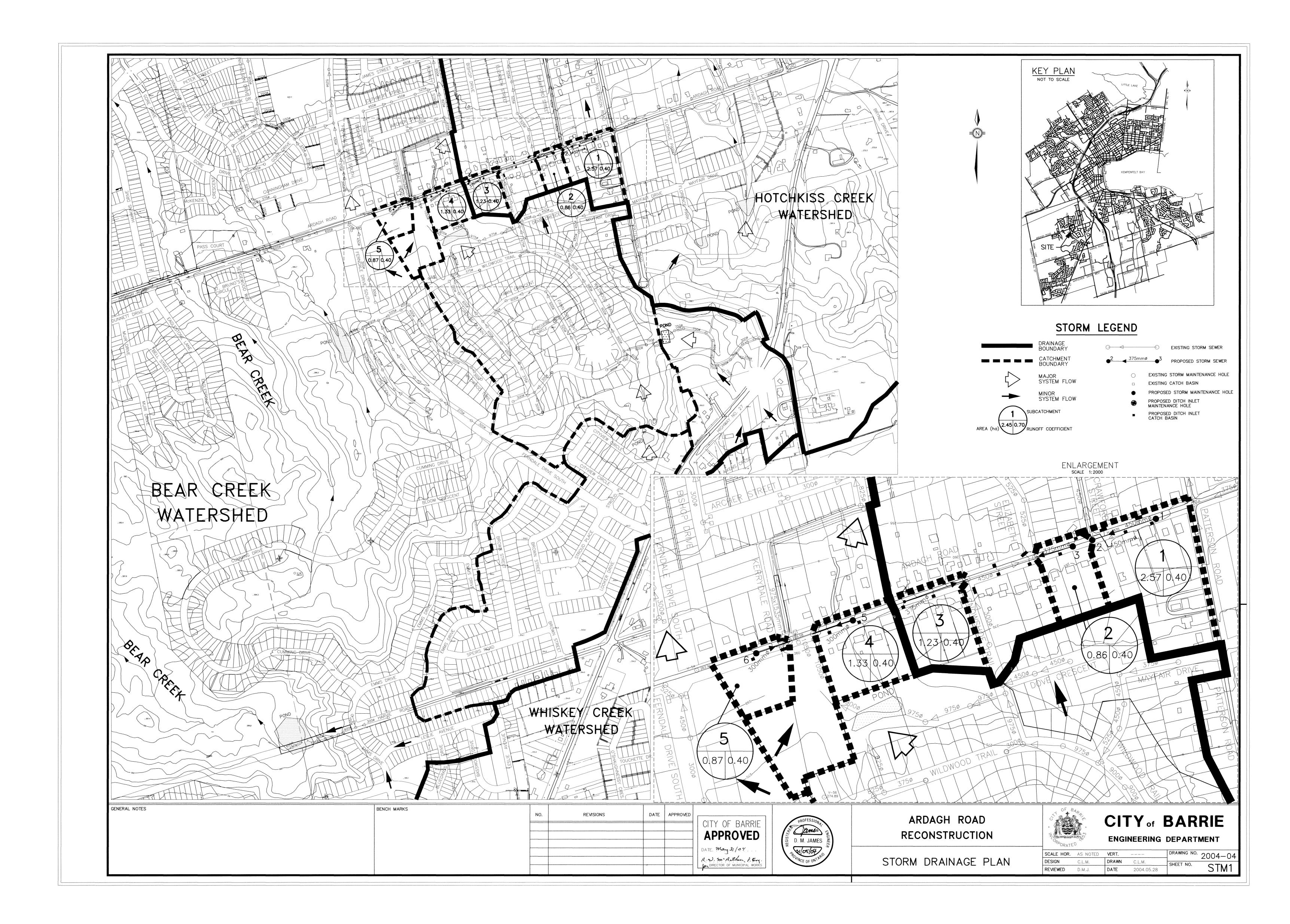


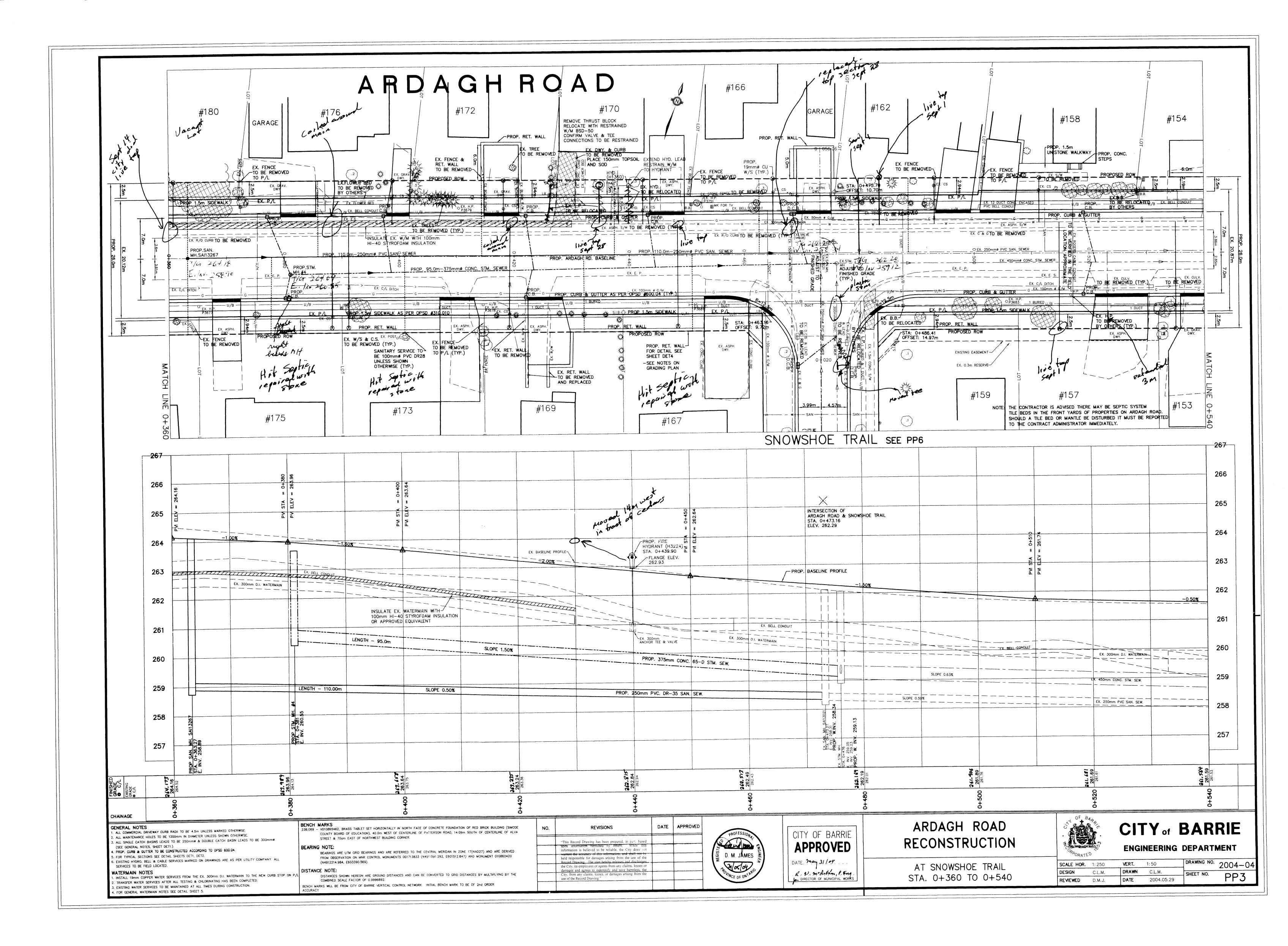
1993-051-010

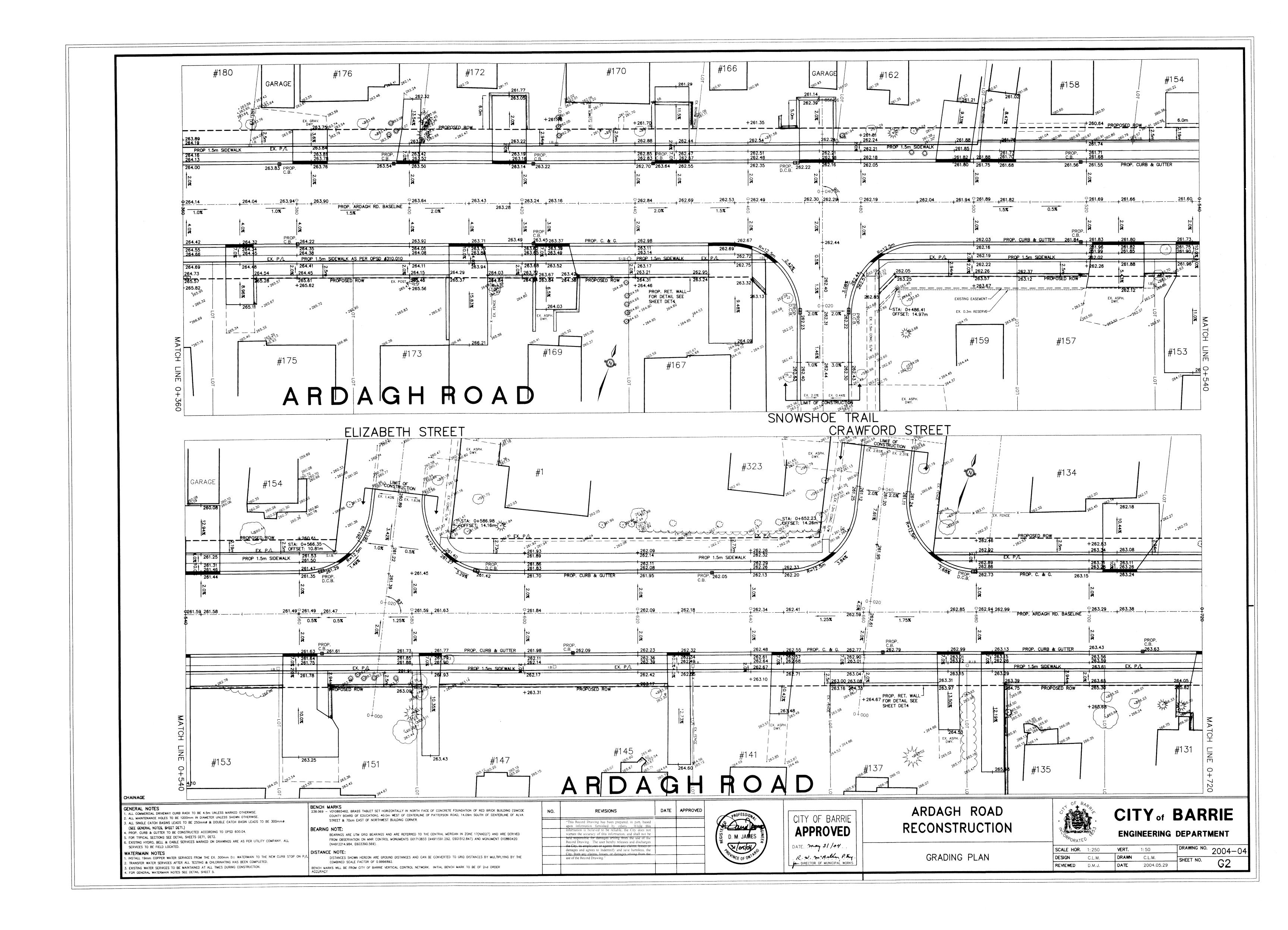
Subd.177

93-51 sh.ST1









# Hedbern Development Corp Allowable and Post Development Catchment Properties

CLIENT: Hedbern Homes

PROJECT: Bishop Drive

DATE: September 2019



FILE: HED-18022 DESIGN: KC

#### Allowable Development Drainage Area

Catchment ID	Total Area	Impervious	Bldg Area	Landscape	Rational Coefficient	% Impervious
To Bishop Drive North	١					
[Refer to Gailcrest Hon	nes Inc., Storm Catch	ment and Drainage Pl	an]			
101	1.7000	0.4700	0.2200	1.0100	0.45	41%
To Rear Yard Easem	ents (Storm Sewers)	West				
[Refer to Gailcrest Hon	nes Inc., Storm Catch	ment and Drainage Pl	an and City of Barrie,	Tributary Areas of Storr	n Sewer Design]	
102	0.2017	0.0387	0.0325	0.1305	0.40	35%
103	0.1223	0.0284	0.0220	0.0719	0.45	41%
102&103 Subtotal:	0.3240	0.0671	0.0545	0.0719	0.42	38%

#### Post Development Drainage Area

Catchment ID	Total Area	Impervious	Bldg Area	Landscape	Rational Coefficient	% Impervious
to Ardagh Road 203		•		•	•	
203	0.0788	0.0095	0.0491	0.0201	0.73	75%
to east existing storm	sewer 202					
202	0.1299	0.0052	0.0000	0.1247	0.13	4%
Storm System 201						
X-1	0.2287	0.0043	0.0337	0.1907	0.24	17%
1	0.1170	0.0637	0.0360	0.0173	0.82	85%
2	0.1738	0.0924	0.0664	0.0150	0.88	91%
3	0.0412	0.0412	0.0000	0.0000	0.95	100%
4	0.1492	0.0047	0.0477	0.0968	0.40	35%
5	0.6051	0.1628	0.1379	0.3044	0.52	50%
6	0.1366	0.0373	0.0363	0.0630	0.56	54%
7	0.0757	0.0000	0.0210	0.0547	0.34	28%
8	0.0911	0.0140	0.0168	0.0603	0.39	34%
201 Subtotal:	1.6184	0.4204	0.3958	0.8022	0.53	50%

City of Barrie Storm Drainage Manual Table 3.2 Runoff Coefficients (Type AB-Soils)

Impervious	Buildings	Grass
0.95	0.95	0.10

#### Hedbern Homes - Bishop Drive 100yr Storm Sewer Catchment Areas & Sizing

CLIENT: Hedbern Homes DATE: September 2019

PROJECT:





#### **Storm Sewer Catchment Areas & Runoff Coefficients**

					x itulion oot
Catchment Number	Total Area (ha.)	Impervious Area (ha.)	Building Area (ha.)	Lawn Area (ha.)	Weighted Runoff Coefficient
X-1	0.23	0.00	0.03	0.19	0.24
1	0.12	0.06	0.04	0.02	0.82
2	0.17	0.09	0.07	0.01	0.88
3	0.04	0.04	0.00	0.00	0.95
4	0.15	0.00	0.05	0.10	0.40
5	0.61	0.16	0.14	0.30	0.52
6	0.14	0.04	0.04	0.06	0.56
8	0.09	0.01	0.02	0.06	0.39

Impervious	Buildings	Lawn
Coefficient	Coefficient	Coefficient
0.95	0.95	

#### 100 Year Storm Sewer Sizing

AREAS	MAN	IHOLE	LENGTH		INCREMENT		TOTAL	FLOW	TIME	I	TOTAL	S	D	Q	V	% FULL
								(m	in)		Q			FULL	FULL	1
	FROM	ТО	(m)	С	Α	CA	CA	TO	IN	(mm/h)	(cms)	(%)	(mm)	(cms)	(m/s)	
1	DCB 1	STM 3	38.9	0.82	0.12	0.10	0.10	10.00	0.29	180	0.048	2.00	375	0.248	2.2	19.5
2	DCB 2	STM 3	53.6	0.88	0.17	0.15	0.15	10.00	0.40	180	0.076	2.00	375	0.248	2.2	30.8
	STM 3	DCBMH 4	19.8				0.25	10.40	0.15	177	0.122	2.00	375	0.248	2.2	49.3
3	DCBMH 4	CBMH 5	36.6	0.95	0.04	0.04	0.29	10.54	0.15	175	0.140	6.20	375	0.437	4.0	32.1
4	CBMH 5	DCBMH 6	12.5	0.40	0.15	0.06	0.35	10.70	0.06	174	0.168	4.50	375	0.372	3.4	45.2
5	DCBMH 6	STM 7	13.9	0.52	0.61	0.32	0.66	10.76	0.07	174	0.320	4.00	375	0.351	3.2	91.3
	STM 7	OGS	18.7				0.66	10.83	0.10	173	0.319	2.80	450	0.477	3.0	66.8
7	RLCB 1	DICBMH 8	32.8	0.39	0.12	0.05	0.05	10.00	0.57	180	0.023	0.50	300	0.068	1.0	34.0
8	DICBMH 8	OGS	16.4	0.39	0.09	0.04	0.08	10.57	0.28	175	0.040	0.50	300	0.068	1.0	58.2
6	OGS	Inf. Gallery	6.7	0.56	0.14	0.08	0.82	10.94	0.07	172	0.393	0.50	600	0.434	1.5	90.5
		·														
Q= 0.0028*C*I*A (c	ms);			C=RUNOFF C	OEFFICIENT;			I-RAINFALL IN	TENSITY (100 Y	ear) =1426.408	/(T.C. + 5.273)^	0.759;		A=AREA (ha)		

#### Hydraulic Calculation Sheet Storage Stage Discharge Calculations

Primary Orifice		
RADIUS=	0.025	m
Outlet Dia=	50.0	mm
Height=	0.00	m

 Secondary Pipe

 RADIUS=
 0.263 m

 Outlet Dia=
 525.0 mm

 Height=
 0.50 m

Weir 1 Detai	ls .	
Height		m
Length		m
Coefficient	1.7	(Broad-Crested)

Weir 2 Detail	ls	
Height		m
Length		m
Coefficient	1.705	(Broad-Crested)

TOTAL	ACTIVE	WATER	PRIMARY	SECONDARY	OUTFLOW	OUTFLOW	TOTAL	ELEVATION	EQUIVALENT	
STORAGE m <sup>3</sup>	STORAGE m <sup>3</sup>	DEPTH m	ORIFICE m³/s	ORIFICE m <sup>3</sup> /s	WEIR 1 m <sup>3</sup> /s	WEIR 2 m <sup>3</sup> /s	OUTFLOW m <sup>3</sup> /s	m	AREA m <sup>2</sup>	
0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	250.650	0.000	Bottom of Stone
4.21	0.00	0.00	0.000	0.000	0.000	0.000	0.000	250.675	0.000	Bottom of Stone
8.42	0.00	0.00	0.000	0.000	0.000	0.000	0.000	250.700	0.000	
12.63	0.00	0.00	0.000	0.000	0.000	0.000	0.000	250.725	0.000	
16.84	0.00	0.00	0.000	0.000	0.000	0.000	0.000	250.750	0.000	
21.05	0.00	0.00	0.000	0.000	0.000	0.000	0.000	250.775	0.000	
25.26	0.00	0.00	0.000	0.000	0.000	0.000	0.000	250.800	0.000	
25.60 34.24	0.00 8.64	0.00	0.000	0.000	0.000	0.000	0.000	250.802 250.827	0.000 345.469	Bottom of Chamber
38.45	12.85	0.05	0.000 0.001	0.000	0.000	0.000	0.000	250.827	168.432	
47.03	21.43	0.03	0.001	0.000	0.000	0.000	0.001	250.832	343.369	
55.62	30.02	0.10	0.001	0.000	0.000	0.000	0.001	250.902	343.369	
64.16	38.56	0.13	0.002	0.000	0.000	0.000	0.002	250.927	341.582	
72.69	47.09	0.15	0.002	0.000	0.000	0.000	0.002	250.952	341.269	
81.18	55.58	0.18	0.002	0.000	0.000	0.000	0.002	250.977	339.794	
89.68	64.08	0.20	0.002	0.000	0.000	0.000	0.002	251.002	339.794	
98.12	72.52	0.23	0.002	0.000	0.000	0.000	0.002	251.027	337.694	
106.56 114.96	80.96 89.36	0.25 0.28	0.003	0.000	0.000	0.000	0.003 0.003	251.052 251.077	337.694 335.907	
123.36	97.76	0.30	0.003	0.000	0.000	0.000	0.003	251.077	335.907	
131.71	106.11	0.33	0.003	0.000	0.000	0.000	0.003	251.102	334.120	
140.01	114.41	0.35	0.003	0.000	0.000	0.000	0.003	251.152	332.020	
148.28	122.67	0.38	0.003	0.000	0.000	0.000	0.003	251.177	330.545	
156.49	130.89	0.40	0.003	0.000	0.000	0.000	0.003	251.202	328.445	
164.65	139.05	0.43	0.003	0.000	0.000	0.000	0.003	251.227	326.657	
174.72	149.12	0.45	0.004	0.000	0.000	0.000	0.004	251.252	402.664	
180.84 188.84	155.24 163.24	0.48 0.50	0.004 0.004	0.000	0.000	0.000	0.004 0.004	251.277 251.302	244.976 319.821	
196.83	171.23	0.53	0.004	-0.002	0.000	0.000	0.004	251.302	319.521	
204.67	179.07	0.55	0.004	0.000	0.000	0.000	0.002	251.352	313.833	
212.52	186.92	0.58	0.004	0.003	0.000	0.000	0.007	251.377	313.833	
220.24	194.64	0.60	0.004	0.008	0.000	0.000	0.012	251.402	308.784	
227.86	202.26	0.63	0.004	0.013	0.000	0.000	0.017	251.427	304.897	
235.39	209.78	0.65	0.004	0.019	0.000	0.000	0.023	251.452	301.009	
242.79	217.18	0.68	0.004	0.026	0.000	0.000	0.030	251.477 251.502	295.960	
250.10 257.17	224.49 231.57	0.70 0.73	0.004 0.005	0.033 0.041	0.000	0.000	0.038 0.046	251.502	292.385 283.136	
264.12	238.52	0.75	0.005	0.050	0.000	0.000	0.055	251.527	277.774	
270.89	245.29	0.78	0.005	0.068	0.000	0.000	0.072	251.577	270.937	
277.43	251.83	0.80	0.005	0.117	0.000	0.000	0.122	251.602	261.687	
283.66	258.06	0.83	0.005	0.151	0.000	0.000	0.156	251.627	249.176	
289.62	264.02	0.85	0.005	0.179	0.000	0.000	0.184	251.652	238.452	
295.04	269.44	0.88	0.005	0.203	0.000	0.000	0.208	251.677	216.816	
299.93	274.33	0.90	0.005	0.224	0.000	0.000	0.229	251.702	195.586	
302.56 306.78	276.96 281.17	0.93 0.95	0.005 0.005	0.243 0.261	0.000	0.000	0.249 0.267	251.716 251.741	105.221 168.432	Top of Chamber
310.99	285.38	0.98	0.005	0.201	0.000	0.000	0.284	251.741	168.432	
315.20	289.60	1.00	0.005	0.294	0.000	0.000	0.300	251.791	168.432	
319.41	293.81	1.03	0.005	0.309	0.000	0.000	0.315	251.816	168.432	
323.62	298.02	1.05	0.006	0.324	0.000	0.000	0.329	251.841	168.432	
327.83	302.23	1.08	0.006	0.338	0.000	0.000	0.343	251.866	168.432	
332.04	306.44	1.10	0.006	0.351	0.000	0.000	0.356	251.891	168.432	
336.25 340.46	310.65	1.13	0.006	0.364	0.000	0.000	0.369	251.916	168.432	
344.67	314.86 319.07	1.15 1.18	0.006 0.006	0.376 0.388	0.000	0.000	0.382 0.394	251.941 251.966	168.432 168.432	
348.88	323.28	1.20	0.006	0.388	0.000	0.000	0.394	251.900	168.432	
353.09	327.49	1.23	0.006	0.411	0.000	0.000	0.417	252.016	168.432	
357.31	331.70	1.25	0.006	0.422	0.000	0.000	0.428	252.041	168.432	
361.52	335.91	1.28	0.006	0.432	0.000	0.000	0.438	252.066	168.432	
365.73	340.13	1.30	0.006	0.443	0.000	0.000	0.449	252.091	168.432	
369.94	344.34	1.33	0.006	0.453	0.000	0.000	0.459	252.116	168.432	
374.15 378.36	348.55 352.76	1.35 1.38	0.006 0.006	0.463 0.473	0.000	0.000	0.469 0.479	252.141 252.166	168.432 168.432	
382.57	356.97	1.40	0.006	0.473	0.000	0.000	0.479	252.100	168.432	
386.78	361.18	1.43	0.006	0.491	0.000	0.000	0.498	252.216	168.432	Top of Stone

Orifice Outflow equation is for orifice flow given by:  $Q=0.63A(2gH)^{0.5}$  - Where ponding elevation is above orifice centroid  $[0.494*[H/(D/1000)]^{1.57}-0.04*[H/(D/1000)]^{0.5}]*0.8*9.81^{1/2}*D^{5/2}$ . Where ponding elevation is at or below orifice centroid

Flow over the top of the weir is given by weir flow  $Q=1.705LH^{1.5}$ 

Where: Q=flow  $m^3/s$  H=head m

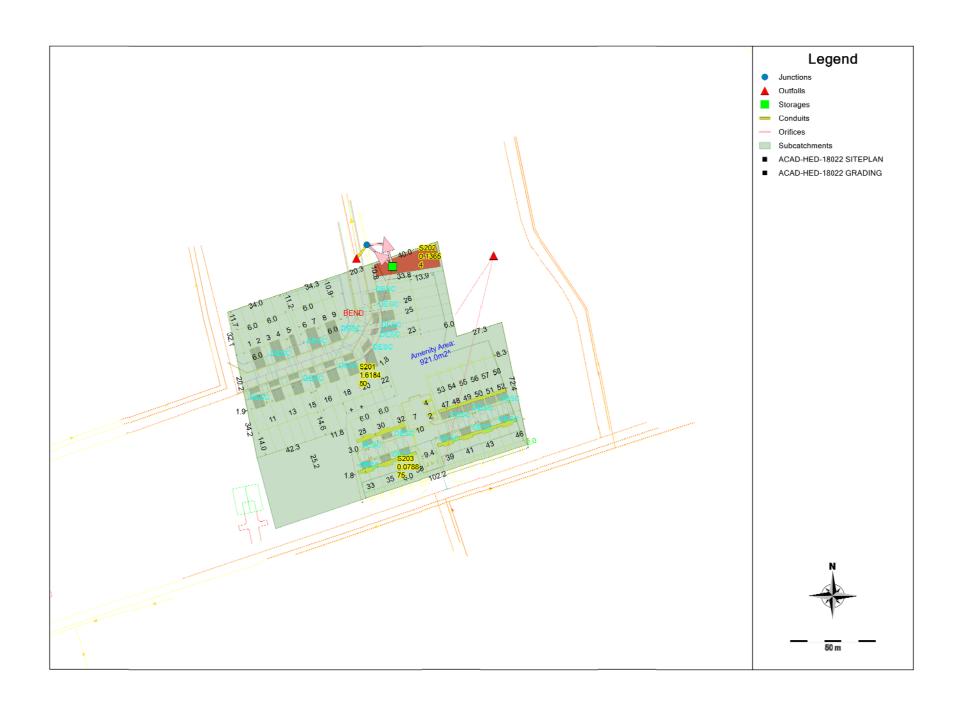
Orifice head measured from water depth to orifice centroid (where ponding elevation is above orifice centroid).

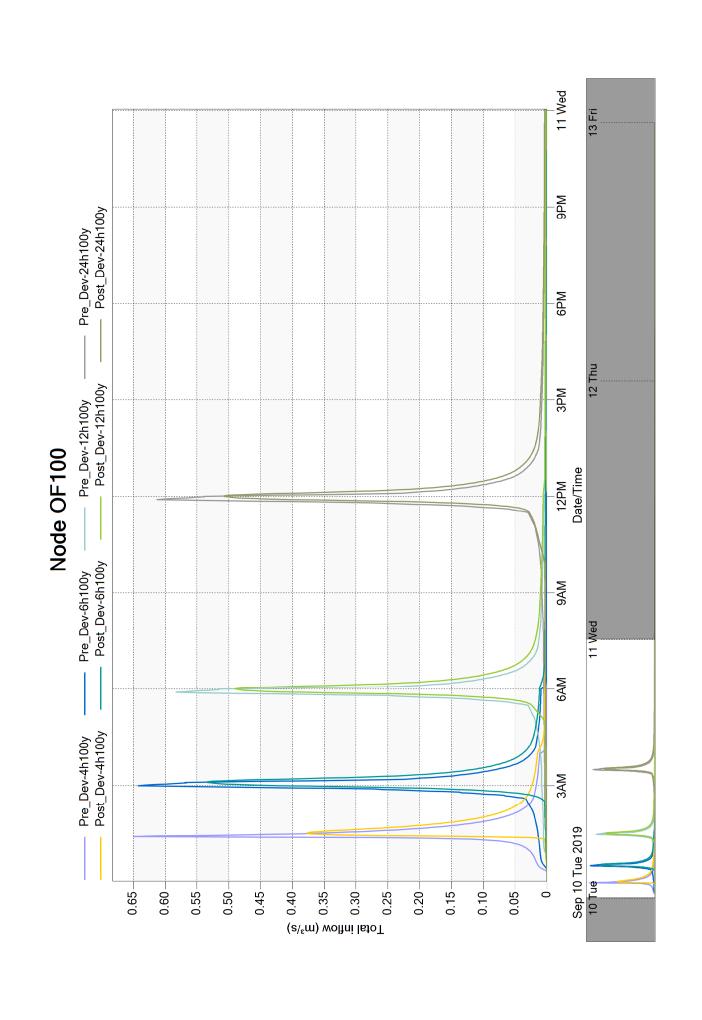
Orifice head measured from water depth to orifice invert (where ponding elevation is at or below orifice centroid).

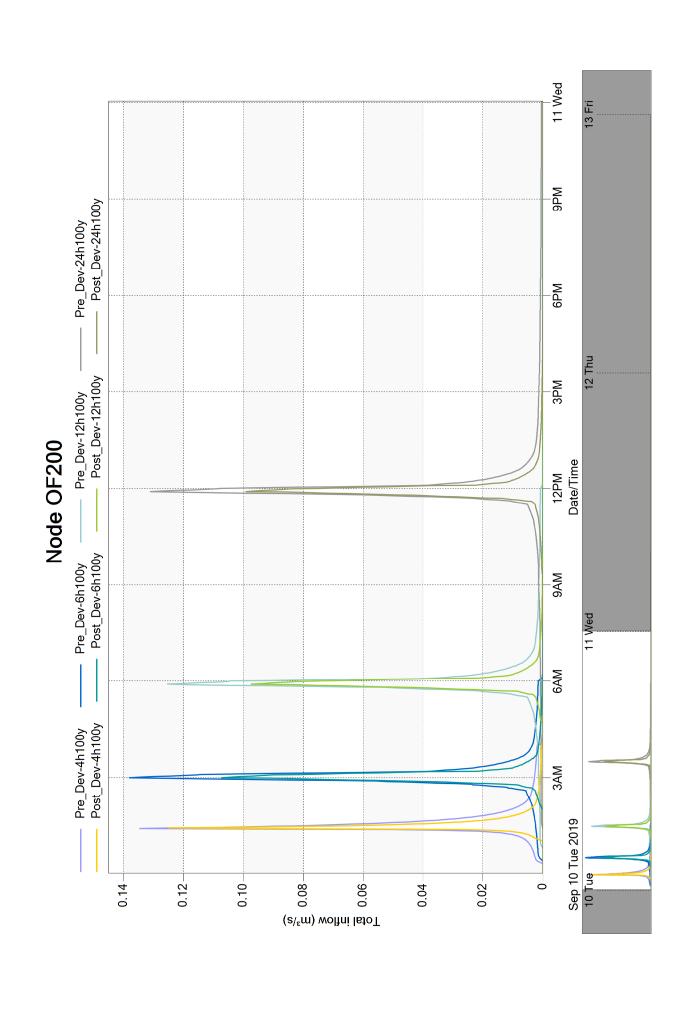
Weir head = depth from weir crest to water level

D=orifice diameter m
L=weir length m
g=9.81 m/s²
A=Area of orifice opening m²









#### Hedbern Development Corp. Water Balance

CLIENT: Hedbern Development Corp.

PROJECT: Bishop Drive

FILE: HED-18022 DESIGN: JWI



Run-off 294

4792

#### Pre-Development

	A (1.)	1.00	I.— »	Ī		
	Area (ha)	1.63	(Total)			
	Sub Area	0.815	(Hydrologic Soil Group A)			
	Sub Area		(Hydrologic Soil Group B)			
	04271104	0.010	() arelegie cell creap 2)			
	Precipitation	Evapo-Tanspiration	Infiltration*	Infiltration Factor	Actual Infiltration	Run-off
Annual Depth (mm)	940	535	284	0.60	170.40	235
Annual Volume (m3)	15322	8721	4629		2778	3824

#### Post Development

	Area (ha)	1.63	(Total)			
	Impervious Area	0.84				
	Sub Area	0.815	(Hydrologic Soil Group A)			
	Sub Area	0.815	(Hydrologic Soil Group B)			
	Precipitation	Evapo-Tanspiration	Infiltration*	Infiltration Factor	Actual Infiltration	
Annual Depth (mm)	940	520	252	0.50	126.00	
Annual Volume (m3)	15322	8476			995	

Infi	Itration	Factor

Sub Factors	Description	Factor
Topography	Flat Land	0.3
	Rolling Land	0.2
	Hilly Land	0.1
Soils	Tight Impervious Clay	0.1
	Medium Combinations of Clay/Loam	0.2
	Open Sandy Loam	0.4
Cover	Cultivated Land	0.1
	*Woodland	0.2

<sup>\*</sup>Assumed 50% Woodland in Pre Development

Pre - Post Development Volume (m <sup>3</sup> ):	1782	[2778m <sup>3</sup> -995m <sup>3</sup> ]

DATE: September 2019

Optional Infilt	ration System - Below	Sand Filter
Surface Area of Stone	421.1	$m^2$
Depth of Stone	0.15	m
Void Ratio of Stone	0.40	
Total Volume	25.266	$m^3$

# **APPENDIX E**

**ENGINEERING DRAWINGS** 

(REDUCED, NTS)

# **BISHOP DRIVE** CITY OF BARRIE D28-007-2018

#### DRAWING LEGEND

TITLE TITLE PAGE

GENERAL NOTES

ESC-1 EROSION AND SEDIMENT CONTROL PLAN

ESC-2 EROSION AND SEDIMENT CONTROL PLAN NOTES AND DETAILS

GENERAL SERVICING PLAN

GRADING PLAN

STM-1 ALLOWABLE DEVELOPMENT STORM DRAINAGE PLAN

STM-2 POST DEVELOPMENT STORM DRAINAGE PLAN

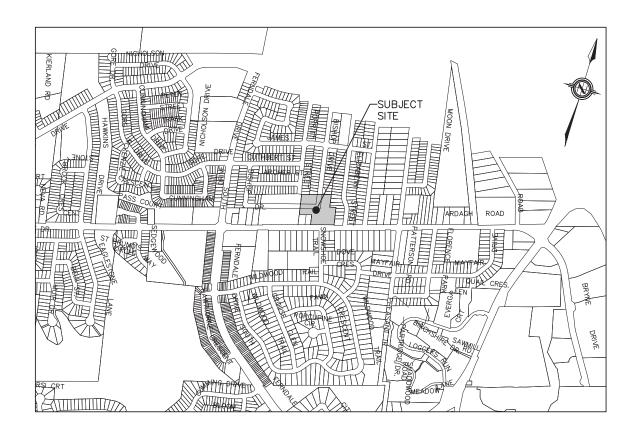
SAN-1 SANITARY DRAINAGE PLAN

BISHOP DRIVE PLAN AND PROFILE

DET-1 STANDARD DETAILS

DET-2 STANDARD DETAILS

DET-3 STANDARD DETAILS



### PRELIMINARY ONLY NOT FOR CONSTRUCTION

#### MUNICIPALITY:

CITY OF BARRIE 70 COLLIER STREET (BOX 400) BARRIE, ON L4M 4T5 PH. 705.726.4242 FAX 705.739.4243

#### CLIENT:

HEDBERN DEVELOPMENT CORPORATION 1833 QUANTZ CRESCENT INNISFIL, ON L9S 1X2

**DEVELOPER'S ENGINEER:** 



## A. ALL DIMENSIONS ARE IN METRES, EXCEPT PIPE DIAMETERS, WHICH ARE IN MILLIMETRES, UNLESS SPECIFIED OTHERWISE. A. ALL WORK SHALL BE IN ACCORDANCE WITH CURRENT CITY OF BARRIE STANDARD DRAWNGS (BSD) AND ORTHRIO PROVINCIAL STANDARD DRAWNINGS (OPED). B. ORDER OF PRECEDENCE OF STANDARD DRAWINGS IS FIRSTLY CITY OF BARRIE STANDARD DRAWINGS (BSD) AND SECONDLY ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD). LOCATION OF ENSTRING SERVICES ARE NOT GUARANTEED. THE CONTRACTOR IS REQUIRED TO NOTIFY THE VARIOUS UTLITY COMPANIES 48 HOURS PRICE TO THE COMPANICURENT OF ANY WORK. D. A ROAD OCCUPANCY PERMIT IS REQUIRED FROM THE HOAD! AND PARKS OPERATIONS BRANC PRIOR TO THE COMMENCIMENT OF WORK WITHIN ANY CITY BIGHT-OF-WAY. E. A SITE ALTERATION PERMIT IS REQUIRED FROM THE ENGINEERING DEPARTMENT PRIOR TO THE COMMENCEMENT OF ANY EARTH WORKS ON THE SITE. F. NATIVE MATERIAL, SUITABLE FOR BACKFILL, SHALL BE COMPACTED TO BIS STANDARD PRIOCEOR VAXIOUM DRY DENSITY H. ALL DISTURBED AREAS ARE TO BE REINSTATED TO THEIR ORIGINAL CONDITION OR BETTER, AS DETERMINED BY THE CITY ENDINGERING DEPARTMENT. CITY OF BARRIE STANDARD **GENERAL NOTES** BSD-N6

CITY OF BARRIE STANDARD GENERAL NOTES BSD-N3 SANITARY SEWERS

D. PVC, CONCRETE AND PROFILE WALL PVC SEWERS SHALL HAVE HUBBER GASKET TYPE JOINTS AND SHALL BE CEPTIFIED TO CONFORM TO ALL APPLICABLE CURRENT C.S.A. SPECIFICATIONS.

4. MORTAR IS USED FOR LEVELING OF PRECAST UNITS ONLY. THE THICKNESS OF MORTAR WILL BE 10mm TO FILL ALL VOIDS CREATED BY IRREGULARTIES IN THE PRECAST UNITS TO ENSURE AN EVEN SURFACE ONLY. **Barrie** 1 DATE: OCT 2017 APPROVED GENERAL NOTES ROADWORKS BSD-N2

B. LOCATION OF LATERAL TO BE MARKED 2.0H PAST PROPERTY LINE WITH A 50 x 100HHH WOOD MARKER, PAINTED GREEN, EXTENDING FROM SERVICE INVENT TO JOSHHI ABOVE GROUND LEVEL. C. PIPE TO BE MINIMUM 100 mm DIA. PVC SDR38, RUBBER (ASKET TYPE JOINTS AND SHALL CONFORM TO C.S.A. (8-182.2.3.4) (COLOURD) FOR A RESIDENTIAL HOLSE AND 150mm MINIMUM DIA. PVC SDR28 FOR INDUSTRIC/COMMERCIAL DEVELOPMENT. D. MINIMUM DEPTH OF LATERAL AT PROPERTY LINE SHALL BE 2.4m MEASURED FROM THE SEWER OBVERT TO FINISHED GROUND SURFACE ELEVATION. UNLESS HISTED OTHERWISE. ALL CONJECTIONS TO NEW SANITARY MAINS SHALL BE MPR-MANUFACTURED, FABRICATED TEES. CONNECTORS TO EXISTING SANITARY SEMER SHALL BE MDE WITH APPROVED FACTORY MADE TEES OR INSETTA-TEES IN STRICT ACCORDANCE TO MANUFACTURES QUIDELINES. CITY OF BARRIE STANDARD **GENERAL NOTES** BSD-N4 SANITARY SEWERS

A. SANITAR' LATERAL CONNECTION TO BE LOCATED AT THE SENTRELINE OF THE LOT AND CAPPED

B. PLACE ALL CATCH BASN LATERALS AT 2% GRADE UNLESS THERWISE NOTED. PIPE SZE MINIMUM ISONOM DIA SHOLE , SOCHIM DIA DOUBLE MAINTENANCE HOLE TOPS (FRAMES) AND CATCH BASIN (FRAMES) ARE TO BE SET TO BASE COURSE ASPHAT GRADE AND THEN ADJUSTED TO FINAL GRADE WHEN THE TWY LIFT OF ASPHALT IS PLACED. ALL ADJUSTMENT WILL BE ACCORDINACE WITH BEST-M2. E. STORM SEMER TO BE LOCATED OFFSET 3.0m SOUTH OR EAST OF CENTRELINE UNLESS OTHERWISE SPECIFIED. F. ALL CONNECTIONS TO THE STORM MAIN DHALL BE MADE WITH A STORM MAINHOLE OR APPROVED FACTORY TEE CONNECTION AS PER OPSD-708-01 OR 708-03. H. STORM SEACH TO BE MINIMUM 300mm DIAMETER WITH JOIN'S CONFORMING TO C.S.A. STUNDARD #257.3. LALL PIPE HANDLING INSTALLATIONS MUST BE IN STRICT COMPLIANCE WITH WANUFACTURES INSTALLATION GUIDES AND THE O.C.P.A. OR UMBELL SUDELNES. CITY OF BARRIE STANDARD GENERAL NOTES BSD-N5

BENCHMARK

BENCHMARK No: 03120080042 LOCATED ON THE WESTERLY LIMIT OF FERNDALE DRIVE SOUTH APPROXIMATELY 47m NORTH OF CENTRELINE OF GORE DRIVE AND 330m NORTH ARDAGH ROAD, ELEV 250.875

BENCHMARK No: 03120040053 LOCATED ON THE SOUTH SIDE OF ARDAGH ROAD APPROXIMATELY 32m EAST OF THE INTERSECTION OF GRANT'S WAY AND APPROX 10m EAST OF THE "MAXIMUM 50" SPEED LIMIT SIGN AND THE BUS STOP.

BENCHMARK No: 03120040045 LOCATED ON THE WEST CURB LINE OF FERNDALE DRIVE SOUTH ADJACENT TO THE FERNDALE WOODS ELEMENTARY SCHOOL SIGN.

STORM SEWERS

GENERAL NOTES - WATERMAIN 1. CONTRACTORS SHALLINFORM THE CITY OF BARRIE WATER OPERATIONS DEPARTMENT A MINIMUM OF 48 HI INTENTIONS TO PERFORM WORK ON WATER INFRASTRUCTURE. OPERATION OF HYDRIATS AND VALVES ON THE POTABLE WATER SYSTEM BY OTHER THAN QUALIFIED WATER OPERATIONS STAFF IS PROHEITED BY CURRENT BY LAW CITY SERVICE FEES AND FIRE THE CURRENT FEES BY LAW THE CITY'S WATER OPERATIONS STAFF WALL SWAR, PRESSURE TEST, CHICARNER AND LUBH ALL HEW WATERWAND. 6. RESTRAINING WALL BEREQUIRED ON ALL HYDRANTS. THRUST BLOCKS, AS PER OPS! 1103.070 AND 1103.070. RESTRAINING DEVICES MAY BE REQUIRED IN ADDITION TO STANDARD CONCRETE THRUST BLOCKING WHERE SOIL CORRITIONS WARRANT AT THE CITY'S DISCRETION. e. TRACING WINE SHALLBE 412 AND HIGH STRENGTH COPPER CLAD (HS-CSS) AND SHALL BE INSTALLED ON THE TOTAL LENGTH OF ALL WATERMAN AND BROUGHT UP AT EACH HYDRANT AND CONNECTED TO FLANGE BOLT. ALL SPLICETTO UTLIZE CONNECTORS AS PER THE APPROVED MANUFACTURESP PRODUCTS FOR UNDARE WATER SYSTEMS LIST. 8. ALL WATER SERVICE SHALL BE MINIAUN 25mm TYPE 'K COPPER OR 25mm CROSS-LINKED POLYETHYLENE UNLESS OTHERWISE APPROVED BY THE DIRECTOR OF WATER OPERATIONS. WATER SERVICE SADDLES SHALL BE USED WIRE TAPPING INTO PVC WATERMAIN. 11. RISER FIRES ARE TORE INSTALLED AS PER BSD-S10, AND REMOVED AS DIRECTED. IMABBING SCHEDULE TO BE SUPPLIED BY A WATER OPERATIONS FIELD REPRESENTATIVE. ALL RISERS ARE TO BE RESTRAINED OR THRUS' BLOCKED. SCALE NAY 2015 APPROVED 2 SCALE N.T.S. BARRIE GENERAL NOTES - WATERMAIN Linublos BSD-500

J. W. INGRAM 100143779 19.09.16

HEDBERN DEVELOPMENT CORPORATION

UNLESS OTHERWISE NOTED ON THE DRAWINGS, THE FOLLOWING REQUIREMENTS SHALL APPLY TO THE WORKS.

TONES

329 Maginalant Dr. E, Walt 1 Surve, CML L4M 8955 P. 796.784,2538 F. 795.784.1956 DATE MARCH 2019

GENERAL NOTES

FROSION CONTROL NOTES

WATER SERVICING NOTES

100mm DOMESTIC AND 150mm FIRE SERVICES

WATERMAIN TESTING AND DISINFECTION

ENGINEERING NOTES

25mm DOMESTIC SERVICES - SINGLE RESIDENTIAL UNITS

THE ACCOMPANYING PLANS SET OUT THE MEASURES THAT WILL BE TAKEN BY THE DEVELOPER AND ITS CONTRACTORS TO CONTROL DOWNSTREAM SEDIMENT TO THE LOWEST LEVEL PRACTICALLY ACHIEVABLE. THE CONDITIONS AND TECHNIQUES SET OUT ARE TO BE FOLLOWED UNLESS APPROVED OTHERWISE BY THE CONTRACT ADMINISTRATOR, CONSERVATION, AUTHORITY AND/OR MUNICIPALITY.

3. ALL TEMPORARY ST CONTROL OF THE CONTRO

BY THE CONTRACTOR UNTIL CONSTRUCTION IS COMPLETE AND THE GRASS HAS ESTABLISHED GROWTH, SUBJECT TO APPROVAL BY THE CITY ENGINEERING DEPARTMENT.

ALL SEDIMENTATION CONTROL MEASURES ARE TO BE INSPECTED REQULARLY (MINIMUM WEEKLY). AS WELL AS AFTER EVERY PAINFALL SEDIMENTATION CONTROL OF THE CONTRACTOR MUST USE MATERIALS, CONSTRUCTION PROTECTION DEWCES SHALL BE PROMPTLY REPAIRED OR REFLACED BY THE CONTRACTOR MUST USE MATERIALS, CONSTRUCTION PRACTICES, AND MINISTORY OF THE IMPARTMENT OF WATER QUALIFIED THE CONTRACTOR MUST USE MATERIALS, CONSTRUCTION OF VEGETATION OF THE IMPARTMENT OF WATER QUALIFIED THE CONTRACTOR SHALL BE PROPERTY OF CONTRACTOR THE IMPARTMENT OF WATER QUALIFIED TO THE CONTRACTOR UNTIL VEGETATION OF STRUCTION OF VEGETATION OF THE IMPARTMENT OF WATER QUALIFIED AND ASSOCIATION OF THE CONTRACTOR UNTIL VEGETATION OF STRUCTION OF AND RECORDING SEASON.

ALL EXPOSED SOIL MUST BE GRADED TO A STABLE SLOPE AND TREATED AS QUICKLY AS POSSIBLE TO PREVENT EROSION AND SEDIMENT FROM LEAVING THE STEEL ALL AREA STRIPPED OF VEGETATIVE COVER FOR LONGER THAN 30 DAYS SHALL BE STRABLIZED BY SEEDING (IF THE CONTRACTOR SHALL EXPOSED SHADES OF A STABLISHED AND THE SUBSECUENT OF THE MATERIAL SHAPE OF THE CONTRACTOR SHALL BE CONTROLLED AND THE SUBSECUENT OF THE CONTROLLED OF GRADING WORKS. THE CONTROLLED AND THE TOWN ADDITIONAL SWALES (AS NECESSARY) TO PREVENT EROSION AND SEDIMENT FROM LEAVING THE STRUCTURE OF A SUBJECT OF THE MATERIAL SHAPE OF THE CONTROLLED AND THE C

AS APPLICABLE MUNICIPAL STANDARDS AND/OR APPROVAL AGENCY STANDARDS.
THE CONTRACTOR MAY CONSIDER ALTERNATIVE SEMIMENT AND ENGISION CONTROL MEASURES, SUCH MEASURES MUST BE PRESENTED IN
WRITING FOR APPROVAL BY THE CONTRACT ADMINISTRATOR AND MUST BE APPROVED IN WRITING BY THE APPLICABLE APPROVAL AGENCIES.

GENERAL

1. ALL REQUIRED PERMITS SHALL BE IN PLACE PRIOR TO INSTALLATION OF WATERMAIN AND SERVICES.

WHIRD WATER MAIN COVER WATER MAIN TO BE 1.7m. THE MINIBULM HORIZONTALLY OR VERTICALLY WHILE PROVIDING A MINIBUM OF WATER WATER MAIN CONCILITS WITH SEWER PIPE, DEFLECT WATER MAIN HORIZONTALLY OR VERTICALLY WHILE PROVIDING A MINIBUM OF WATER WATER MAIN CONCILITS WITH SEWER PIPE, DEFLECT WATER MAIN HORIZONTALLY OR VERTICALLY WHILE PROVIDING A MINIBUM OF SAME WATER MAIN CONCILITY OF WATER MAIN COVER AT ALL THE REPORT OF WATER MAIN OF

DOMESTIC AND FIRE SERVICE VALVES SHALL BE LOCATED IN THE BOULEVARD, UNLESS OTHERWISE SHOWN ON THE CONTRACT DRAWINGS. DOMESTIC AND FIRE SERVICES AND FIRE SERVICE MINIMAL FROM FIRE SERVICE MINIMAL FROM FIRE SERVICE MINIMAL FROM FIRE SERVICE WITH A BY ASS ASSEMBLY AS PER BSD 5-533 AND SHALL BE LOCATED IN AN APPROPRIATELY SIZED MECHANICAL ROOM. BACKFLOW PREVENTION SHALL BE PROVIDED AS PER CITY OF BARRIE BY LAW 2010-102.

THE FOLLOWING SEQUENCE WILL BE UTILIZED IN THE COMMISSIONING OF THE WATER SYSTEM: SWAB AND CHARGE THE WATERMAIN, PRESSURE TEST, CHLORINATE, FLUSHING AND SAMPLING.
 ALL PROCEDURES ARE TO DE COMPLETED THROUGH A BY—PASS CONNECTION TO THE EXISTING WATERMAIN, C/W BACKFLOW PREVENTION.

ALL PROCEDURES ARE TO BE COMPLETED THROUGH A BY—PASS CONNECTION TO THE EXISTING WATERMAIN, C/W BACKFLOW PREVENTION VALVE.

ALL VALVES ARE TO BE OFFRATE BY CITY REPRESENTATIVES CINY.

ALL VALVES ARE TO BE OFFRATE BY CITY REPRESENTATIVES CINY.

HOROSTATIC RESTING OF THE DESTING SYSTEM WILL NOT BE PETWITTED UNTIL ALL COMPONENTS OF THE TESTING AND DISINFECTION PROCEDURE HAVE BEEN COMPLETED TO THE SATISFACTION OF THE CITY.

HOROSTATIC TESTING SHALL BE PREFORMED ON THE COMPLETED DISTRIBUTION SYSTEM IN SECTIONS NOT EXCEPTIONS ON METRES IN LENGTH IN ACCORDANCE WITH AWAYA COOL FOR POLYSTHYLENE PIPE THE TESTING SHALL BE COMPLETED IN ACCORDANCE WITH OWNS 701. TESTING OF SECTIONS THAT CONSIST OF VARYING PIPE MATERIALS MILL NOT BE PERMITTED. ALL SECONDARY MAIN VALVES MUST BE OPEN THE SYSTEM SHALL BE DISINFECTED USING THE "CONTINUE" OF THE SYSTEM SHALL BE DISINFECTED USING THE "CONTINUE" OF THE SYSTEM SHALL BE DISINFECTED USING THE "COUNTINUE" OF THE SYSTEM SHALL BE DISINFECTED USING THE "COUNTINUE" OF THE SYSTEM SHALL BE DISINFECTED USING THE "COUNTINUE" OF THE SYSTEM SHALL BE DISINFECTED USING THE "COUNTINUE" OF THE SYSTEM SHALL BE DISINFECTED USING THE "COUNTINUE" OF THE SYSTEM SHALL BE DISINFECTED USING THE "COUNTINUE" OF THE SYSTEM SHALL BE DISINFECTED USING THE "COUNTINUE" OF THE SYSTEM SHALL BE DISINFECTED USING THE "COUNTINUE" OF THE SYSTEM SHALL BE DISINFECTED USING THE SYSTEM SHALL BE DISINFECTED USING THE SYSTEM SHALL BE COUNTINUE. THE SYSTEM SHALL BE COUNTINUE SYSTEM SHALL BE COUNTINUE SYSTEM SHALL BE COUNTINUE. TO POINT READINGS RECORDED AND APPROPRIATE FOUNT THE EXISTING DISTRIBUTION SYSTEM. LIBE COUNTINUE SYSTEM SHALL BE COUNTINUE STING DISTRIBUTION SYSTEM. LIBE COUNTINUE SYSTEM SHALL BE COUNTINUE SYSTEM SHALL BY THE CITY WAS PROVIDE WRITTEN NOTIFICATION THAT IT RANKL CONNECTIVE O

UNLESS OTHERWISE NOTED ON THE DRAWINGS, THE FOLLOWING REQUIREMENTS SHALL APPLY TO THE WORKS.

1. ALL MEASUREMENTS FOR THIS PROJECT ARE IN METERS, EXCEPT PIPE DIAMETERS WHICH IS IN MILLMETRES, UNLESS OTHERWISE NOTED, ALL DIMENSIONS SHALL BE CHECKED AND VERRIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF ANY CONSTRUCTION. ANY DISCREPANCIES SHALL BE REPORTED IMMEDIATELY TO THE RENGISER.

2. DISCREPANCIES SHALL BE REPORTED IMMEDIATELY TO THE RENGISER.

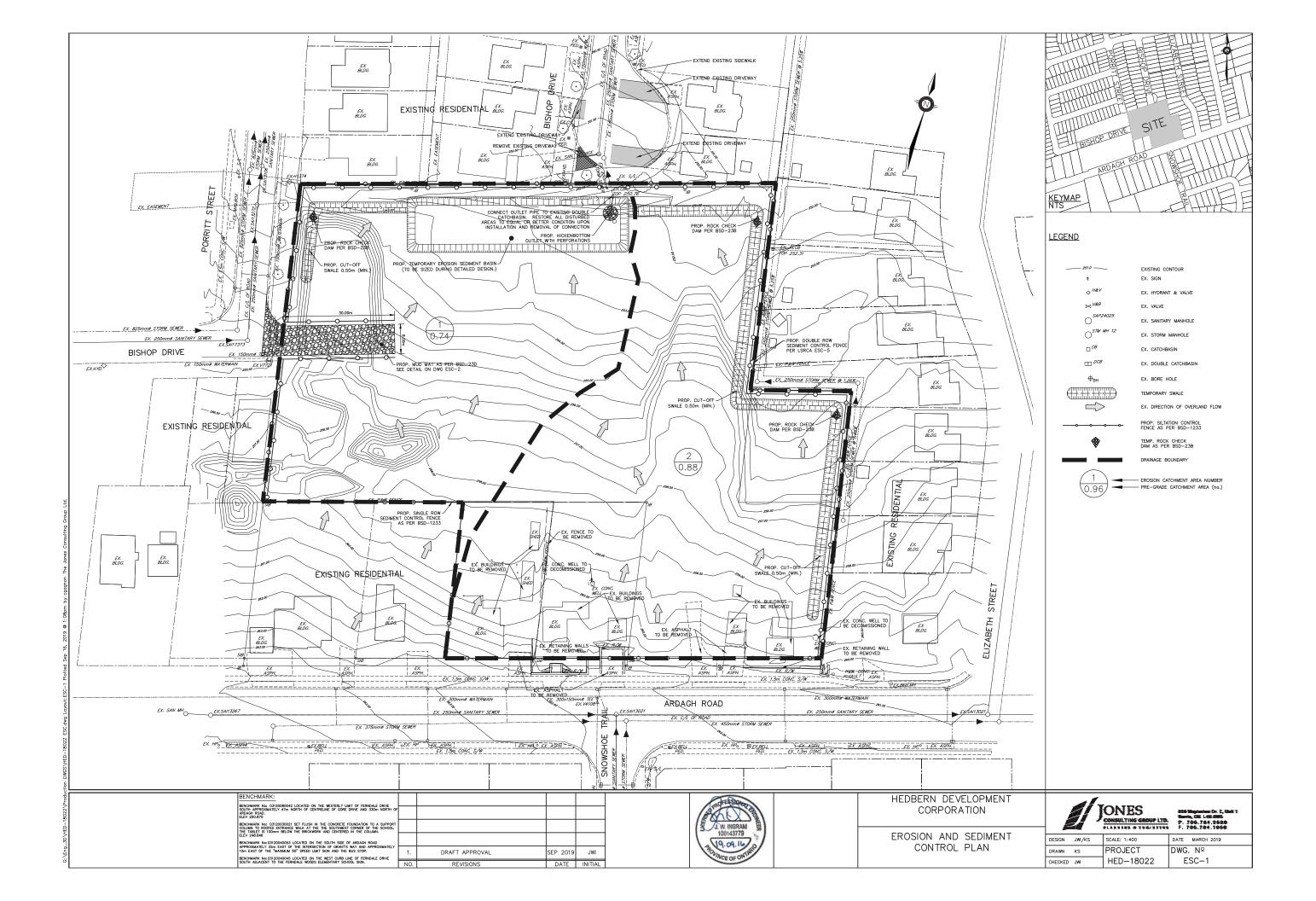
3. ALL WORK AND MATERIALS WITHIN THE PROPERTY BOUNDARIES SHALL CONFORM TO THE LATEST EDITION OF THE ONTARIO BUILDING CODE.

4. INFORMATION ON EXISTING SERVICES AND UTILITIES SHOWN ON THESE DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR GOTANING THE RECEIVE AND AVAILABLE INFORMATION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR GOTANING THE RECEIVE AND CONTRACTOR SHALL BE RESPONSIBLE FOR GOTANING THE RECEIVE AND CONTRACTOR SHALL BE RESPONSIBLE FOR GOTANING THE RECEIVE AND CONTRACTOR SHALL INFORM THE STILL FOR SHALL BE SHOWN ON THESE DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION. THE CONTRACTOR SHALL INFORM THE STILL FOR SHALL BE SHOWN ON THE SET AND AVAILABLE INFORMATION. THE CONTRACTOR SHALL INFORM THE STILL FOR SHALL BE SHOWN ON THE SET AND AVAILABLE INFORMATION TO COMMENCE OF THE INTENTION TO COMMENCE OF THE INTENTION TO COMMENCE OF THE INTENTION TO COMMENCE OF THE STILL BE SHOWN ON THE SET AND AVAILABLE INFORMATION THE CONTRACTOR SHALL BE SHOWN ON THE SHALL BE SHOWN ON THE SET AND AVAILABLE INFORMATION THE CONTRACTOR SHALL BE SHOWN ON THE SHALL BE SHOWN

ALL DISTURBED AREAS TO BE RESTORED TO EXISTING CONDITIONS OR BETTER. GRASSED LANDSCAPE AREAS TO RECIEVE A MIN. 200mm DEPTH OF TOPSOIL AND SOD IMMEDIATELY FOLLOWING COMPLETION OF GRADING.
 ALL SLOPES ALCING BERNS AND DITCHES TO BE MAXIMUM SLOPES OF 31, UNLESS OTHERWISE NOTED.

DESIGN JWI/KS SCALE: N/A PROJECT DWG. Nº DRAWN KS HED-18022 GN-1

DRAFT APPROVAL SEP 2019 JWI



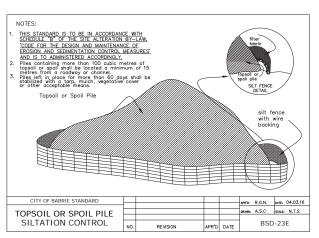
#### GENERAL NOTES 1. DRAWINGS

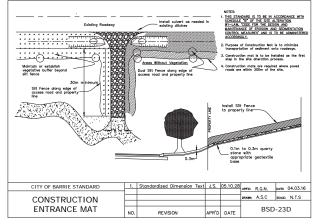
- A. ALL DRAWINGS SHALL BE PRODUCED IN ACCORDANCE WITH CURRENT CITY OF BARRIE STANDARDS & SYMBOLS FOR PLAN & PROFILE DRAWINGS, GENERAL SERVICE PLANS AND LOT CRADING PLANS.
- & SIMBOLS FOR PLAN & PROFILE DRAWINGS, GENERAL SERVICE PLANS AND LOT GRADING
- A. ALL DIMENSIONS ARE IN METRES, EXCEPT PIPE DIAMETERS, WHICH ARE IN MILLIMETRES, UNLESS SPECIFIED OTHERWISE.

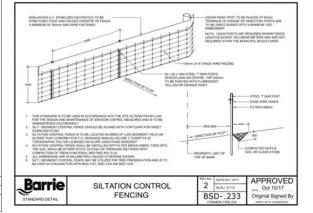
#### 3. GENERAL

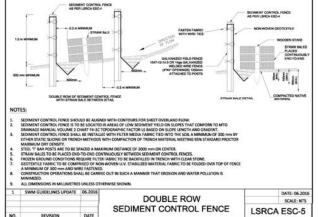
- A. ALL WORK SHALL BE IN ACCORDANCE WITH CURRENT CITY OF BARRIE STANDARD DRAWINGS (BSD) AND ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD).
- B. ORDER OF PRECEDENCE OF STANDARD DRAWINGS IS FIRSTLY CITY OF BARRIE STANDARD DRAWINGS (BSD) AND SECONDLY ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD).
- C. LOCATION OF EXISTING SERVICES ARE NOT GUARANTEED. THE CONTRACTOR IS REQUIRED TO NOTIFY THE VARIOUS UTILITY COMPANIES 48 HOURS PRIOR TO THE COMMENCEMENT OF ANY WORK.
- D. A ROAD OCCUPANCY PERMIT IS REQUIRED FROM THE ROADS AND PARKS OPERATIONS BRANCH PRIOR TO THE COMMENCEMENT OF WORK WITHIN ANY CITY RIGHT—OF—WAY.
- E. A SITE ALTERATION PERMIT IS REQUIRED FROM THE ENGINEERING DEPARTMENT PRIOR TO THE COMMENCEMENT OF ANY EARTH WORKS ON THE SITE.
- F. NATIVE MATERIAL, SUITABLE FOR BACKFILL, SHALL BE COMPACTED TO 95% STANDARD PROCTOR MAXIMUM DRY DENSITY.
- G. GRANULAR MATERIAL, USED FOR BACKFILL, SHALL BE PLACED IN LAYERS 150mm IN DEPTH MAXIMUM AND COMPACTED TO 100% STANDARD PROCTOR MAXIMUM DRY DENSITY.
- H. ALL DISTURBED AREAS ARE TO BE REINSTATED TO THEIR ORIGINAL CONDITION OR BETTER, AS DETERMINED BY THE CITY ENGINEERING DEPARTMENT.
- I. ALL SILT CONTROL AND EROSION PROTECTION DEVICES ARE TO BE IN PLACE PRIOR TO THE COMMENCEURY OF CONSTRUCTION AND SHALL REMAN IN PLACE AND BE MAINTAINED BY THE CONTRACTOR UNTIL CONSTRUCTION IS COMPLETE AND THE GRASS HAS ESTABLISHED GROWN.

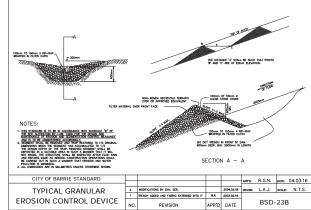
	SUBJECT TO APPROVAL BY THE CITY ENGINEERING DEPARTMENT.								
	CITY OF BARRIE STANDARD					APR'D:	R.G.N.	DATE:	92.05.15
ı	GENERAL NOTES	3.	3. NOTE: 3.E. REVISED & 3.I. ADDED	J.S.	05.01.10	APRIL	R.G.N.	DATE	32.00.10
		2.	3.D "ENGINEERING DEPARTMENT"	B.R.	02.10.28	DRAWNS	L.A.J.	SCALE:	N.T.S.
		1.	3.E. TOPSOIL PERMIT		01.12.06				
		NO	PEVISION	*DD,U	DATE		BSD	-N6	











#### **EROSION CONTROL NOTES**

- THE ACCOMPANYING PLANS SET OUT THE MEASURES THAT WILL BE TAKEN BY THE DEVELOPER AND ITS CONTRACTORS TO CONTROL DOWNSTREAM SEDIMENT TO THE LOWEST LEVEL PRACTICALLY ACHIEVABLE. THE CONDITIONS AND TECHNIQUES SET OUT ARE TO BE FOLLOWED JUNIESS APPROVED OTHERWISE BY THE CONTRACT ADMINISTRATOR. CONSERVATION AUTHORITY AND/OR MUNICIPALITY.
- ALL TEMPORARY SILT CONTROL AND EROSION PROTECTION DEVICES (I.E. SILT FENCING, DRAINAGE SWALES, ROCK CHECK DAMS, SEDIMENT BASIN, GRAVEL ACCESS PAD, ETC.) SHALL BE CONSTRUCTED PRIOR TO COMMENCEMENT OF SITE WORKS AND SHALL REMAIN IN PLACE AND BE MAINTAINED BY THE CONTRACTOR UNTIL CONSTRUCTION IS COMPLETE AND THE GRASS HAS ESTABLISHED GROWTH, SUBJECT TO APPROVAL BY THE CITY ENGINEERING DEPARTMENT.
- ALL SEDIMENTATION CONTROL MEASURES ARE TO BE INSPECTED REGULARLY (MINIMUM WEEKLY), AS WELL AS AFTER EVERY RAINFALL EVENT AND ANY DAMAGED SILT CONTROL AND EROSION PROTECTION DEVICES SHALL BE PROMPTLY REPAIRED OR REPLACED BY THE CONTRACTOR.
- THE CONTRACTOR MUST USE MATERIALS, CONSTRUCTION PRACTICES, AND MITIGATION TECHNIQUES IN ORDER TO PREVENT THE UNAUTHORIZED HARMFUL ALTERATION, DISRUPTION OR DESTRUCTION OF VEGETATION OR THE IMPAIRMENT OF WATER QUALITY.
- THE CONTRACTOR SHALL BE PREPARED FOR UNEXPECTED CONDITIONS AND ACCORDINGLY HAVE STOCKPILED MATERIALS ON SITE FOR NECESSARY REPAIRS AS A RESULT OF FAILED OR INADEQUATE CONTROL MEASURES.
- 6. AREAS WITHOUT STABLE GROUND COVER SHALL BE PROTECTED WITH SILTATION CONTROL FENCING, STRAW MULCH, ETC, AND MAINTAINED BY THE CONTRACTOR UNTIL VEGETATION HAS BECOME ESTABLISHED IN THE SUBSEQUENT GROWING SEASON.
- 7. ALL EXPOSED SOIL MUST BE GRADED TO A STABLE SLOPE AND TREATED AS QUICKLY AS POSSIBLE TO PREVENT EROSION AND SEDIMENT FROM LEAVING THE SITE. ALL AREA STRIPPED OF VEGETATIVE COVER FOR LONGER THAN 30 DAYS SHALL BE TOPSOILED AND SEEDED AT THE DIRECTION OF THE ENDINEER.
- AND SEEDED AT THE DIRECTION OF THE ENGINEER.

  8. ALL SITE DRAINAGE TO BE DIRECTED TO THE TEMPORARY SEDIMENT BASINS AND OTHER CHECK DAMS VIA SHEET DRAINAGE, BERMS OR SWALES (AS NECESSARY) TO FACILITATE THE COMPLETION OF GRADING WORKS. THE CONTRACTOR SHALL CONSTRUCT ANY ADDITIONAL SWALES OR BERMS THAT MAY BE NECESSARY TO DIRECT RUN-OFF IN A CONTROLLED MANNER OF SUITABLE QUALITY.
- 9. ALL CONSTRUCTION VEHICLES SHALL ENTER AND EXIT THE SITE FROM PROPOSED CONSTRUCTION ACCESS VIA THE GRAVEL ACCESS
- 10. ANY DEWATERING WASTE SHALL BE DISCHARGED TO A VEGETATED AREA AT LEAST 30m FROM ANY WATERCOURSE AND FILTERED. FILTERING METHOD SHALL INCLUDE APPROPRIATELY SIZED DEWATERING BAG (FILTER BAG) ON TOP OF A 300mm THICK CLEARSTONE PAD TO BE APPROVED BY SITE THE INSPECTOR AND LSRCA. DEWATERING BAG AND CLEARSTONE PAD SHALL BE MAINTAINED IN GOOD WORKING ORDER AND REPLACED AS DEEMED NECESSARY.
- 11. TECHNIQUES FOR EROSION AND SEDIMENT CONTROLS ARE TO ADHERE TO ACCEPTED ENGINEERING PRACTICE AND MUNICIPAL, CONSERVATION AUTHORITY AND ONTARIO PROVINCIAL STANDARD SPECIFICATIONS AND DRAWINGS. THE CONTRACTOR SHALL DBTAIN A CURRENT COPY AND BECOME FAMILIAR WITH DESS BOS; CONSTRUCTION SPECIFICATION FOR TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES, AS WELL AS APPLICABLE MUNICIPAL STANDARDS AND/OR APPROVAL AGENCY STANDARDS.
- 12. THE CONTRACTOR MAY CONSIDER ALTERNATIVE SEDIMENT AND EROSION CONTROL MEASURES, SUCH MEASURES MUST BE PRESENTED IN WRITING FOR APPROVAL BY THE CONTRACT ADMINISTRATOR AND MUST BE APPROVED IN WRITING BY THE APPLICABLE APPROVAL ACENCIES.

#### CONSTRUCTION SEQUENCE

THE FOLLOWING CONSTRUCTION SEQUENCE IS PROVIDED FOR CONTRACTOR GUIDANCE:

- CONSTRUCT ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES INCLUDING SILT FENCE, TREE PRESERVATION FENCE, MUD MATS, CHECK DAMS, SEDIMENT BASINS, SWALES/BERMS, ETC.
- 2. HYDRO SEED ALL EROSION CONTROL WORKS I.E. TEMPORARY DRAINAGE SWALES/BERMS AND TEMPORARY PONDS (ABOVE PERMANENT POOL ELEVATION).
- 3. COMMENCE GRUBBING AND STUMP REMOVAL.
- 4. SITE ALTERATION WORKS (TEMPORARY SEDIMENT CONTROL POND) WITHIN LSRCA REGULATED LIMIT ARE PROHIBITED UNTIL SUCH TIME THAT THE LSRCA APPROVALS HAVE BEEN OBTAINED. IN ADDITION, TOPSOIL STRIPPING AND EARTH EXCAVATION OUTSIDE THE LSRCA REGULATED AREA WILL BE SUBJECT TO PHASING AS DIRECTED BY THE ENGINEER. EACH PHASE MUSH BE SUPPORTED BY APPROPRIATE SIZED EROSION AND SEDIMENT CONTROL MEASURES.
- 5. STRIPPING AND REMOVAL OF TOPSOIL. A VOLUME OF TOPSOIL TO BE STORED ON-SITE AS REQUIRED TO FACILITATE RESTORATION OF
- PROCEED WITH EARTH EXCAVATION, CUT TO FILL AND PRE-GRADING OPERATIONS. ALL AREAS STRIPPED OF VEGETATIVE COVER FOR A PERIOD GREATER THAN 30 DAYS SHALL BE HYDRO SEEDED AS DIRECTED BY THE ENGINEER.
- 7. PROCEED WITH SITE WORKS I.E. SITE SERVICING AND SURFACE WORKS INSTALLATIONS.
- 8. COMPLETE TEMPORARY CONNECTIONS FROM SEDIMENT BASINS TO INTERNAL STORM SEWERS.
- 9. RESTORATION OF DISTURBED AREAS.
- 10. REMOVAL OF SEDIMENT AND EROSION CONTROLS.
- \*\*NOTE\*\* SILTATION AND EROSION CONTROL MEASURES ARE TO BE MONITORED AND MAINTAINED THROUGHOUT CONSTRUCTION AND NECESSARY REPAIRS TO BE PROMPTLY COMPLETED AS REQUIRED.

#### CONTINGENCY PLAN

IT UNFORESEN EVENTS CAUSE THE STRATEGIES SET OUT IN THIS PLAN TO BE INSUFFICIENT OR INAPPROPRIATE TO MEET THE OBJECTIVE, THE CONTRACTOR IS EXPECTED TO RESPOND IN A TIMELY MANNER WITH ALL REASONABLE MEASURES CONSISTENT WITH SAFETY, TO PREVENT, COUNTERACT OR REMEDY DOWNSTREAM SEDIMENTATION AND EROSION.

IF A SPILL OCCURS IT SHALL BE REPORTED TO THE MINISTRY OF ENVIRONMENT, CONSERVATION AND PARKS SPILLS ACTION CENTRE / 1-800-268-6060 AND THE ON CALL CITY OF BARRIE ENVIRONMENTAL OFFICER SHOULD ALSO BE NOTIFIED VIA CELL PHONE

IF APPROVAL AGENCIES DETERMINE THAT LONG TERM DAMAGE TO THE NATURAL ENVIRONMENT HAS OCCURRED DUE TO FAILURE OF THIS PLAN TO CONTROL SEDIMENTS, A RESTORATION PLAN WILL BE DEVELOPED BY THE CONTRACTOR IN CONSULTATION WITH AND APPROVAL FROM THE APPROPRIATE AGENCIES FOR IMPLEMENTATION BY THE CONTRACTOR.

#### HYDRO SEEDING

- 1. ALL TEMPORARY EROSION AND SEDIMENT CONTROL SWALES, BERMS AND SEDIMENT PONDS TO BE HYDRO SEEDED IMMEDIATELY FOLLOWING CONSTRUCTION.
- 2. ALL AREAS STRIPPED OF VEGETATIVE COVER FOR LONGER THAN 30 DAYS SHALL BE HYDRO SEEDED AS DIRECTED BY THE ENGINEER.
- 3. HYDRO SEED MIX TO BE 48% ANNUAL RYE GRASS, 48% FALL RYE AND 4% RED CLOVER (100 kg/Ho) WITH FIBRATAC TACTIFIER OR APPROVED FOLIVALENT.

BENCHMARK:

BENCHMARK No. 03120080042 LOCATED ON THE WESTERLY LIMIT OF FERNOLE DRIVE

BENCHMARK No. 03120080042 LOCATED ON THE WESTERLY LIMIT OF FERNOLE DRIVE

ARRAGIN ROMARKELY 47m NORTH OF CENTRELINE OF GORE DRIVE AND 330m NORTH OF

ARRAGIN ROMARK NO. 03120030021 SET FLUSH IN THE CONCEPT FOUNDATION TO A SUPPORT

COLUMN TO ROOFED INTRACE WALK AT THE THE SUCHHEST ORNER OF THE SCHOOL

LETV 240.875 AND 100 THE SHIFT ORNER OF THE SOUTH SET OF THE SCHOOL

LETV 240.875 TO THE SHIFT ORNER OF THE SOUTH SECONDARY OF THE SOUTH SET OF THE SCHOOL

LETV 240.875 TO THE SHIPT OF THE SHIPT OF THE SOUTH SET OF THE SOUTH SET OF THE SCHOOL

LETV 240.875 TO THE SHIPT OF THE SHIPT OF THE SOUTH SET OF THE SOUTH SET OF THE SHIPT OF



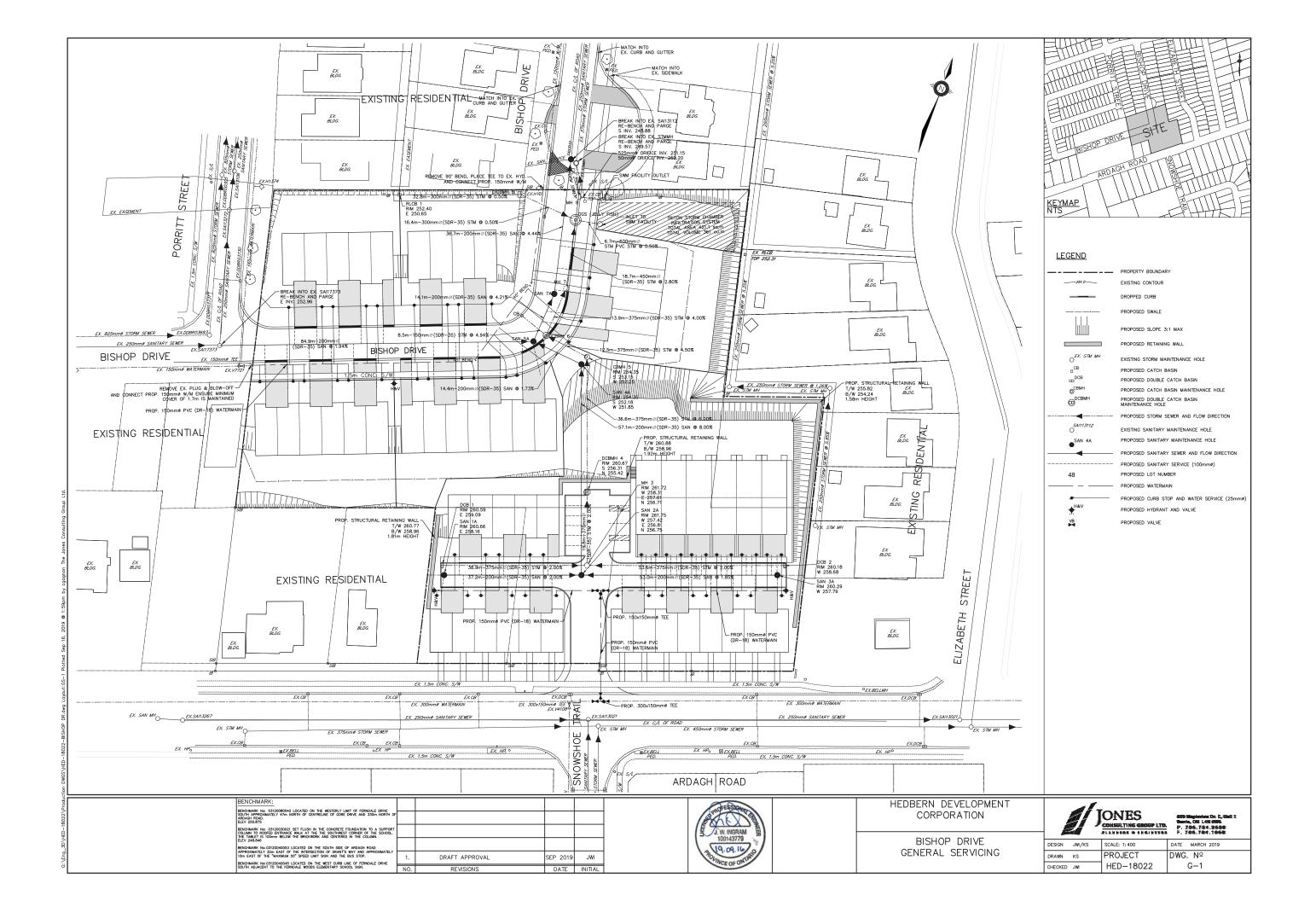


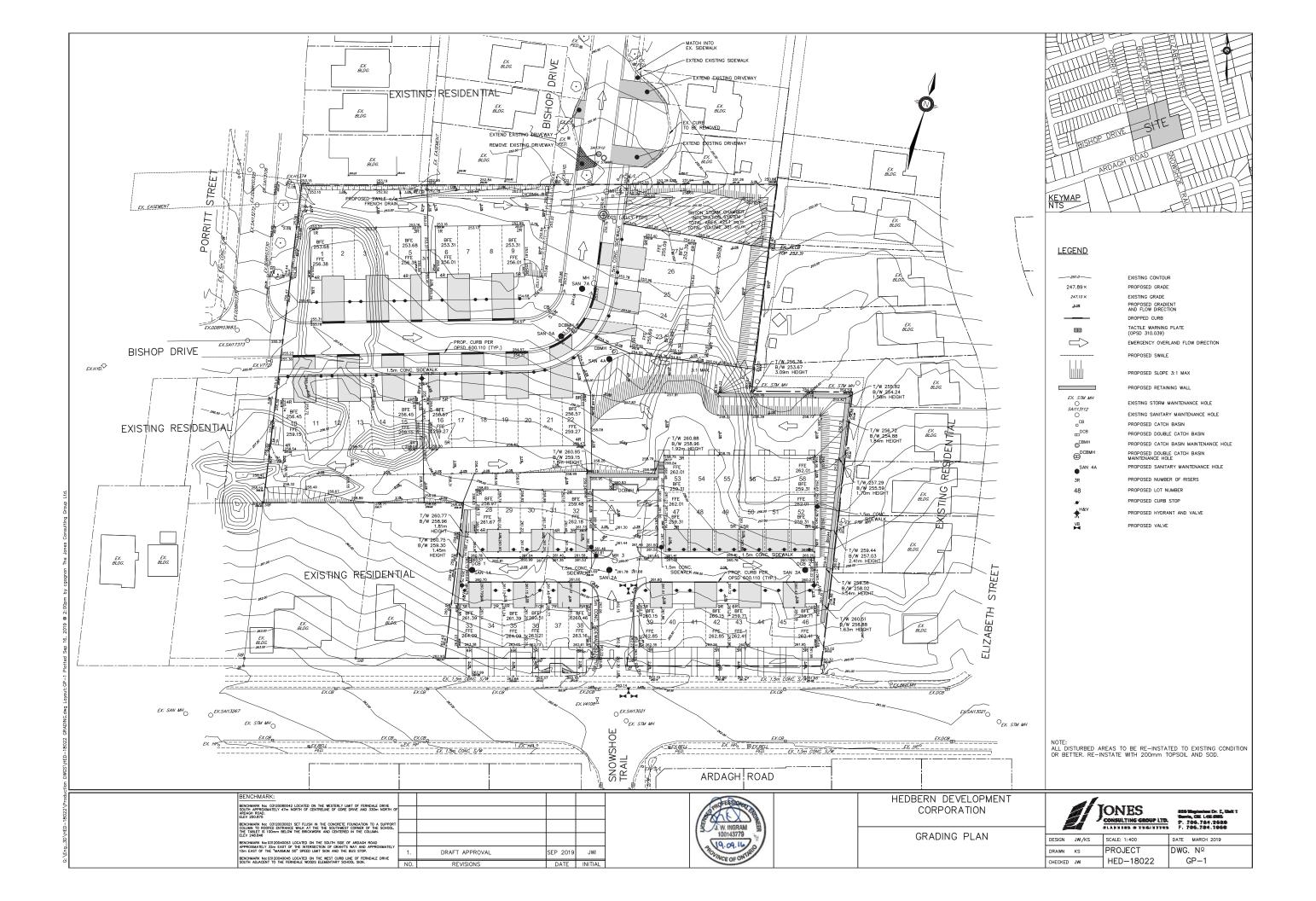
EROSION AND SEDIMENT CONTROL PLAN NOTES AND DETAILS

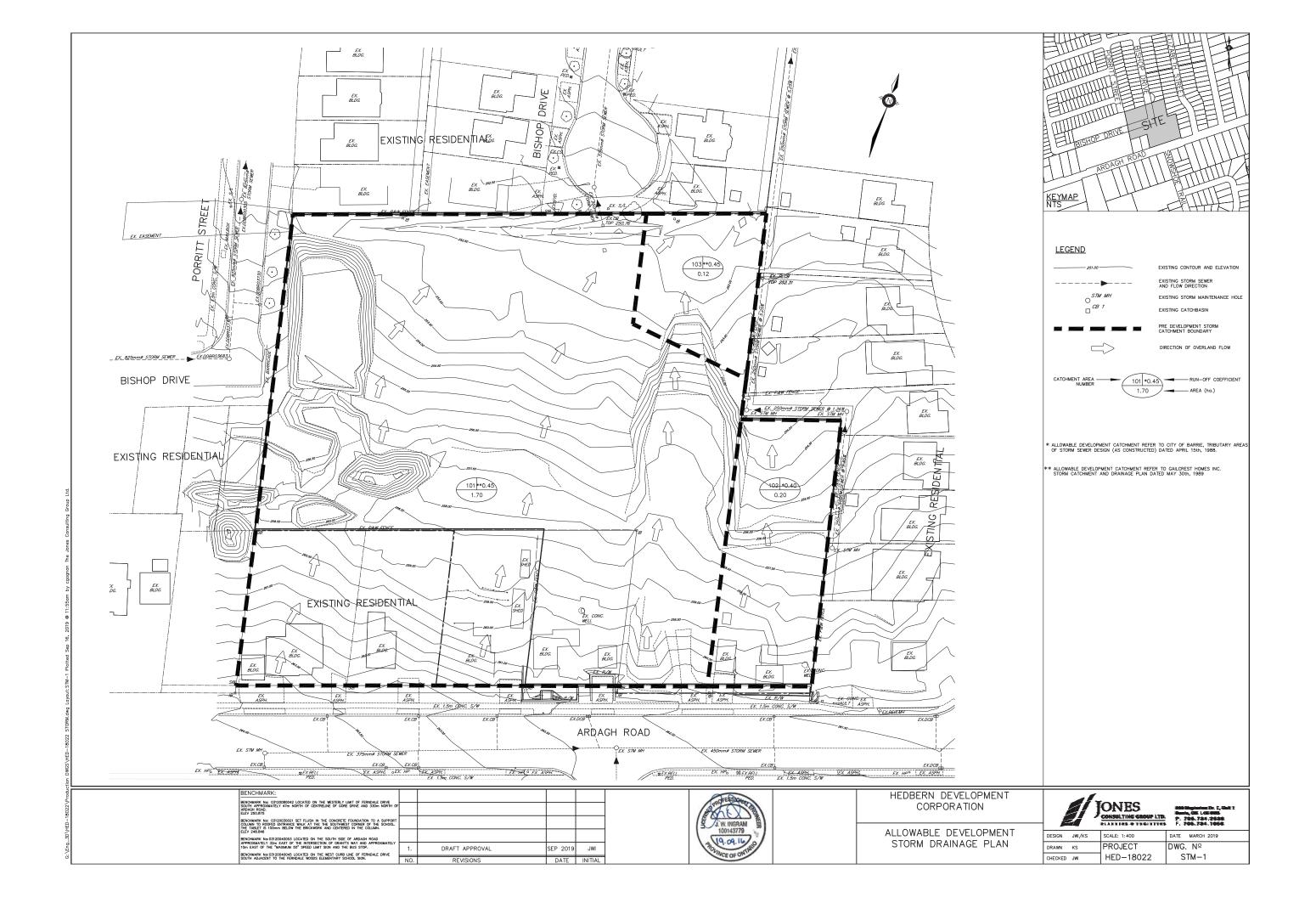


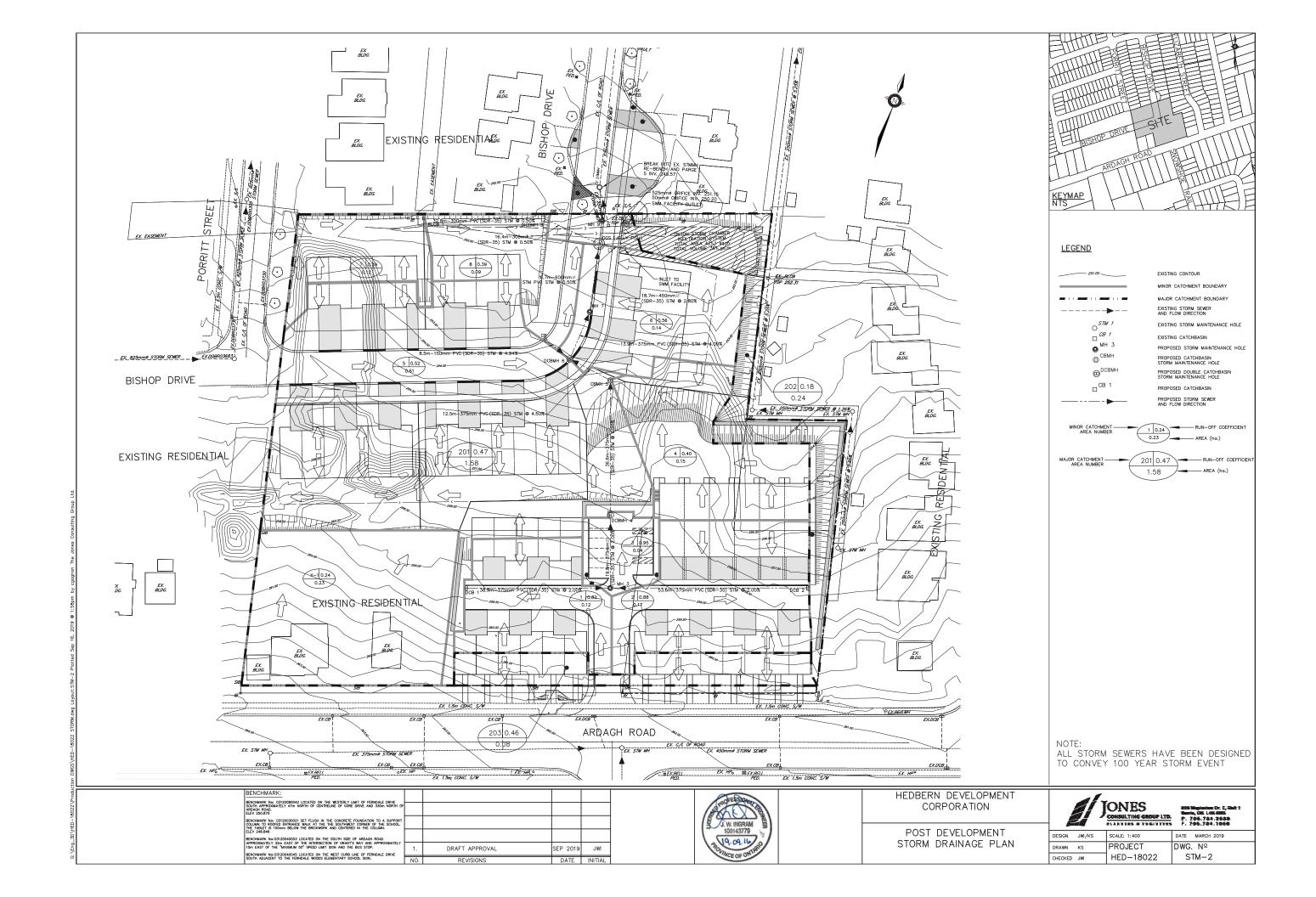
DESIGN JWI/KS

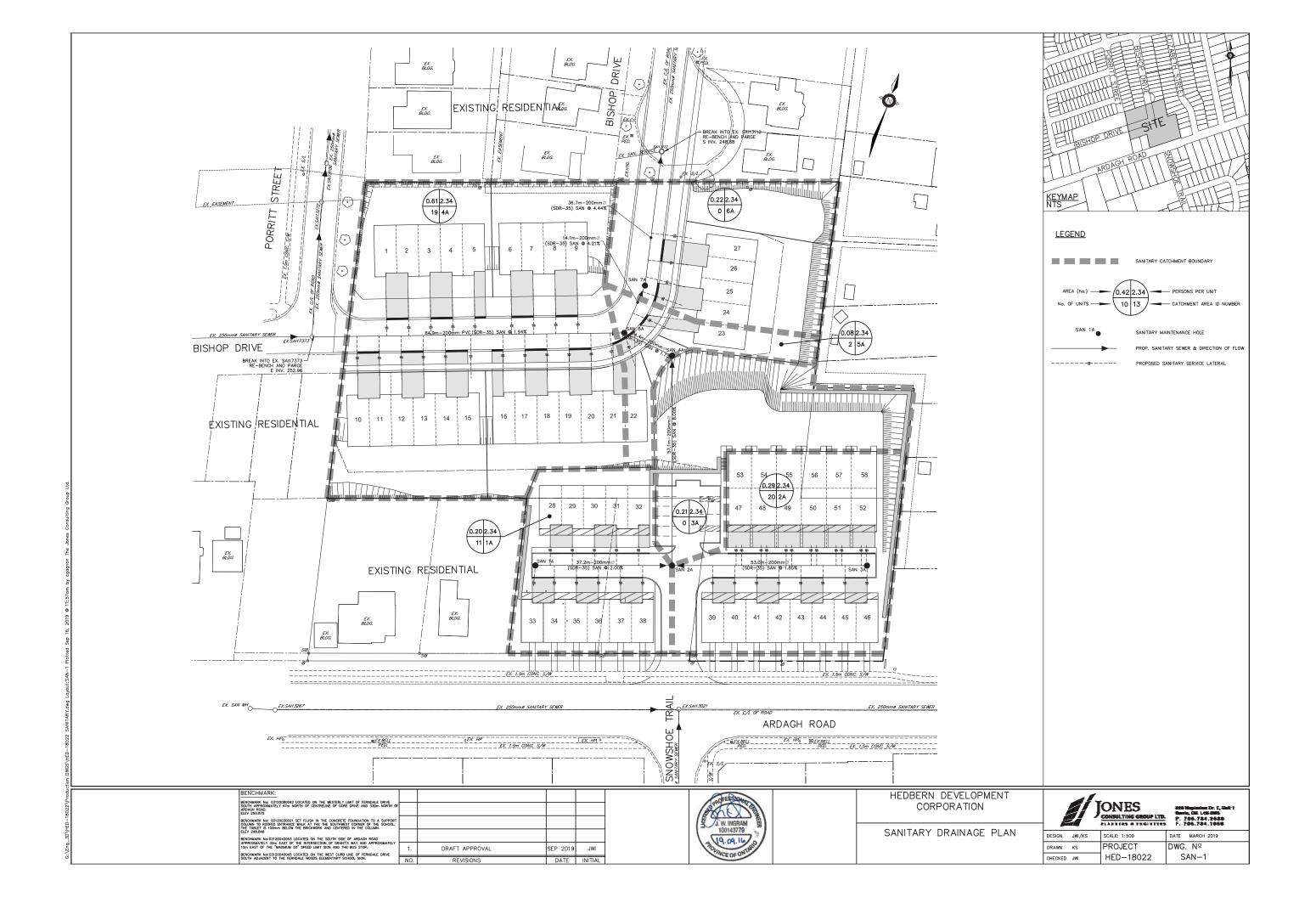
DRAWN KS

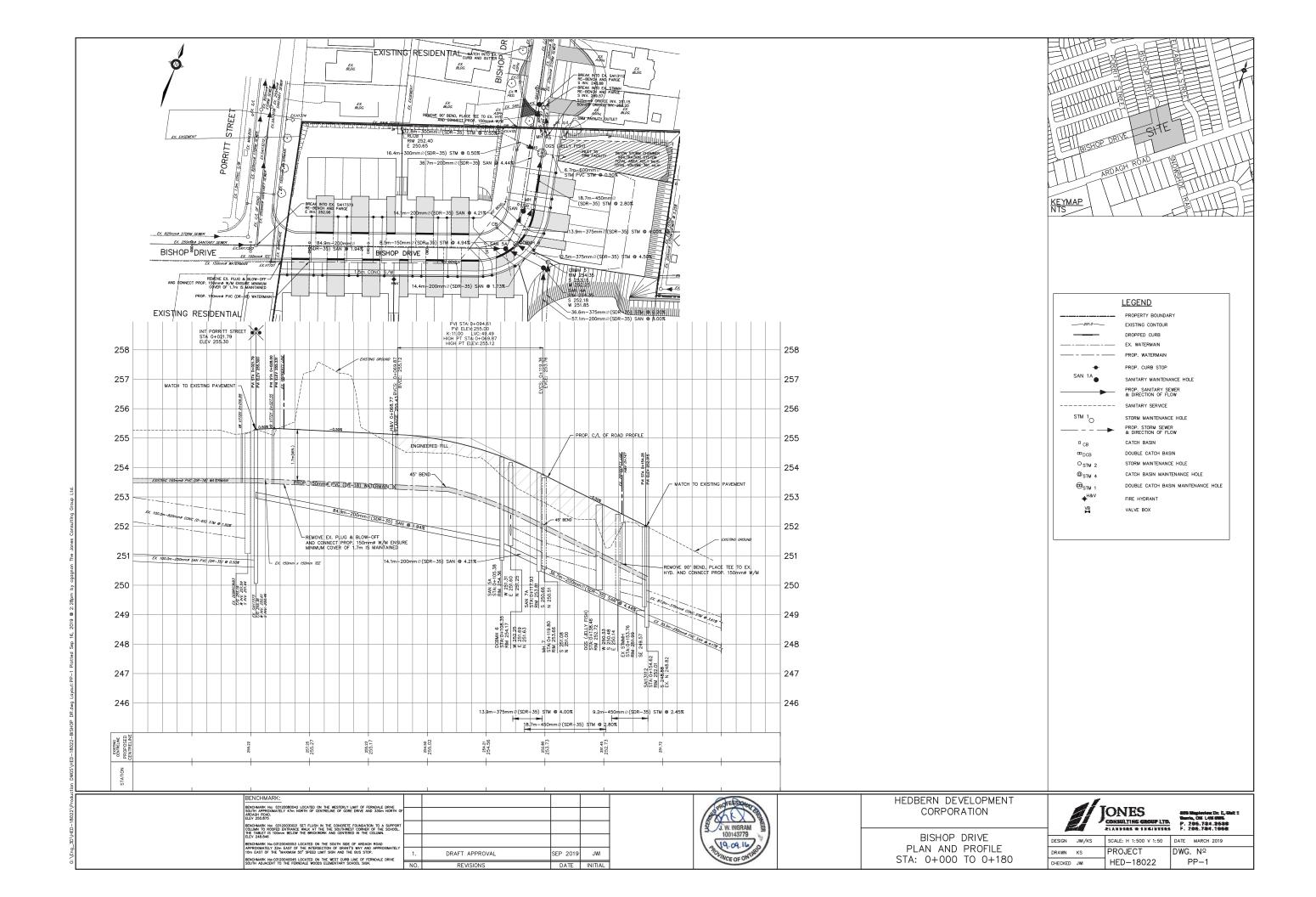


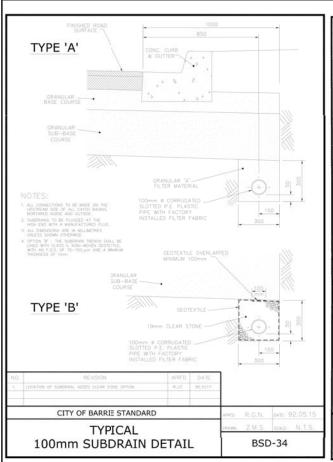


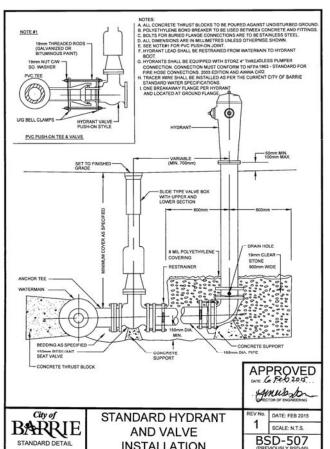




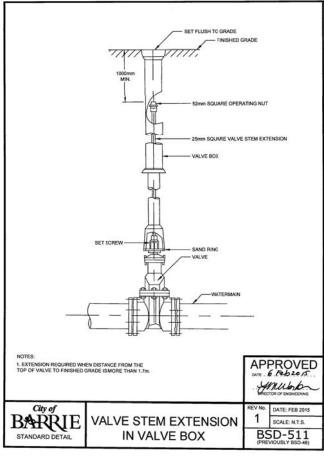


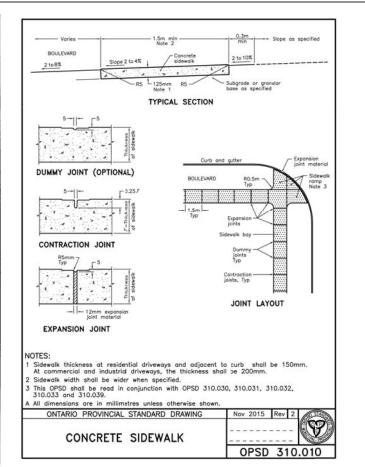


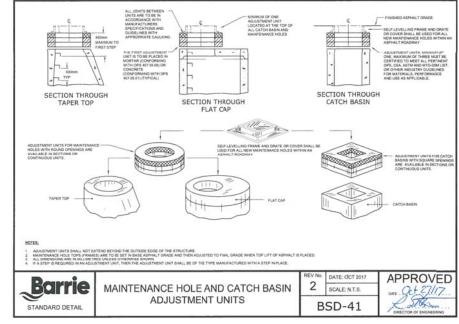


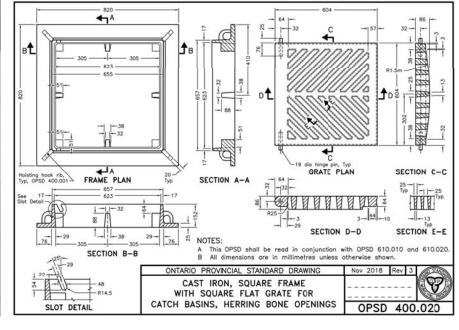


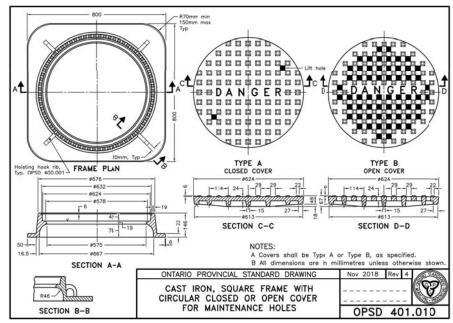
INSTALLATION

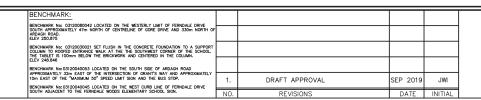




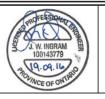








STANDARD DETAIL

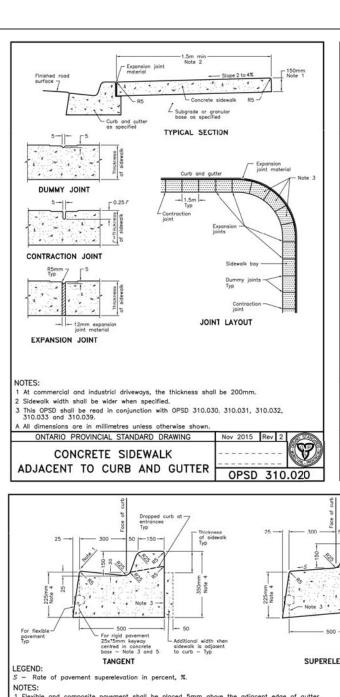


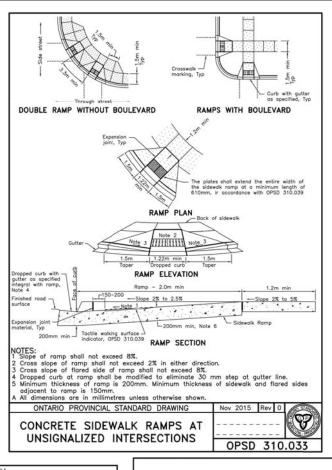
HEDBERN DEVELOPMENT CORPORATION

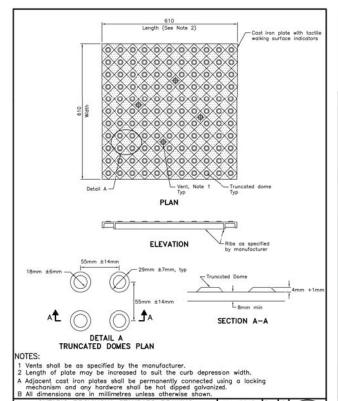
STANDARD DETAILS DESIGN JWI/KS

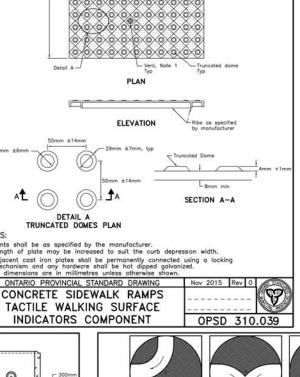
ONES	Ðan ₽.	rie Zi	plade ; ON: L41 96.784 96.784	2538
SCALE: NTS	DATE		MARCH	2019

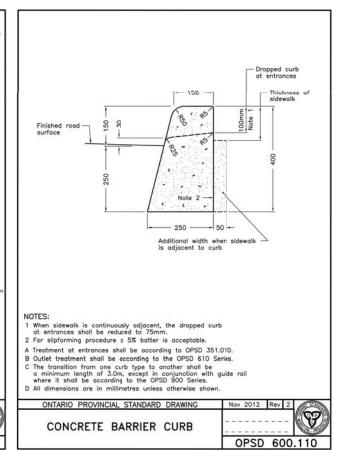
PROJECT DWG. Nº DRAWN KS HED-18022 DET-1

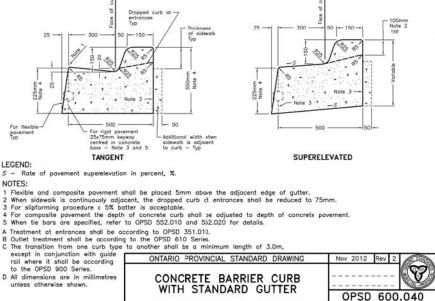


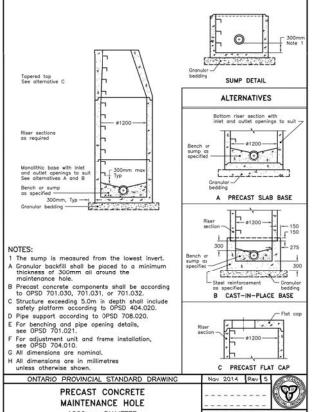




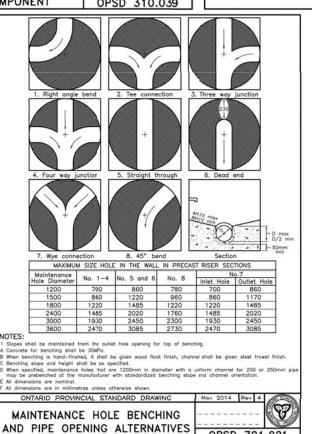


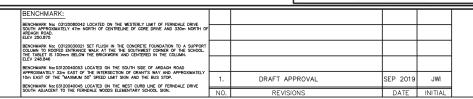






1200mm DIAMETER







OPSD 701.010

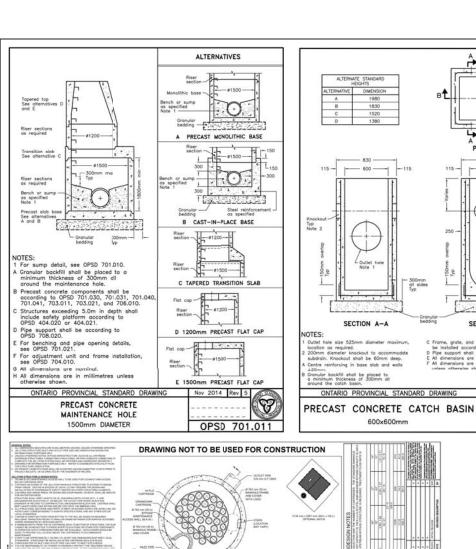
HEDBERN DEVELOPMENT CORPORATION

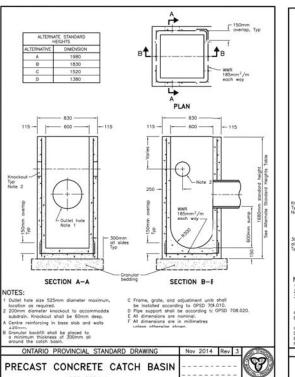
OPSD 701.021

STANDARD DETAILS

Á		JONES CONSULTING GROUP LTD.	200 200 21, F.	70 70
GN	JWL/KS	SCALE: NTS	DATE	-

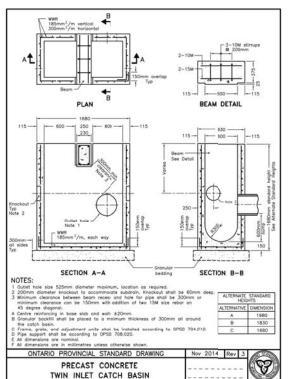
Explorion: Dr. E, Welt 1 t, CM. L4M-8006 96.784.2688 96.784.1966 MARCH 2019 DESIG PROJECT DWG. Nº DRAWN KS HED-18022 DET-2



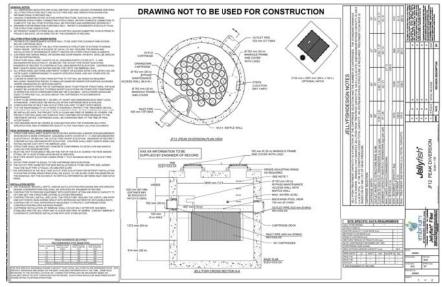


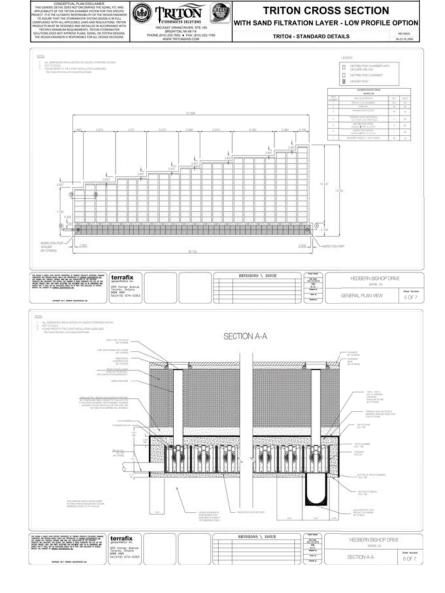
OPSD 705.010

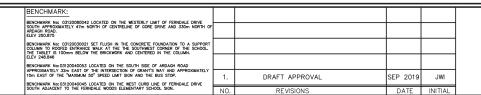
600x600mm

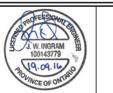


OPSD 705.020











STANDARD DETAILS



SCALE: NTS DATE MARCH 2019 DESIGN JWI/KS PROJECT DWG. Nº DRAWN KS CHECKED JWI HED-18022 DET-3

CHAMBER HDGHT (see table)