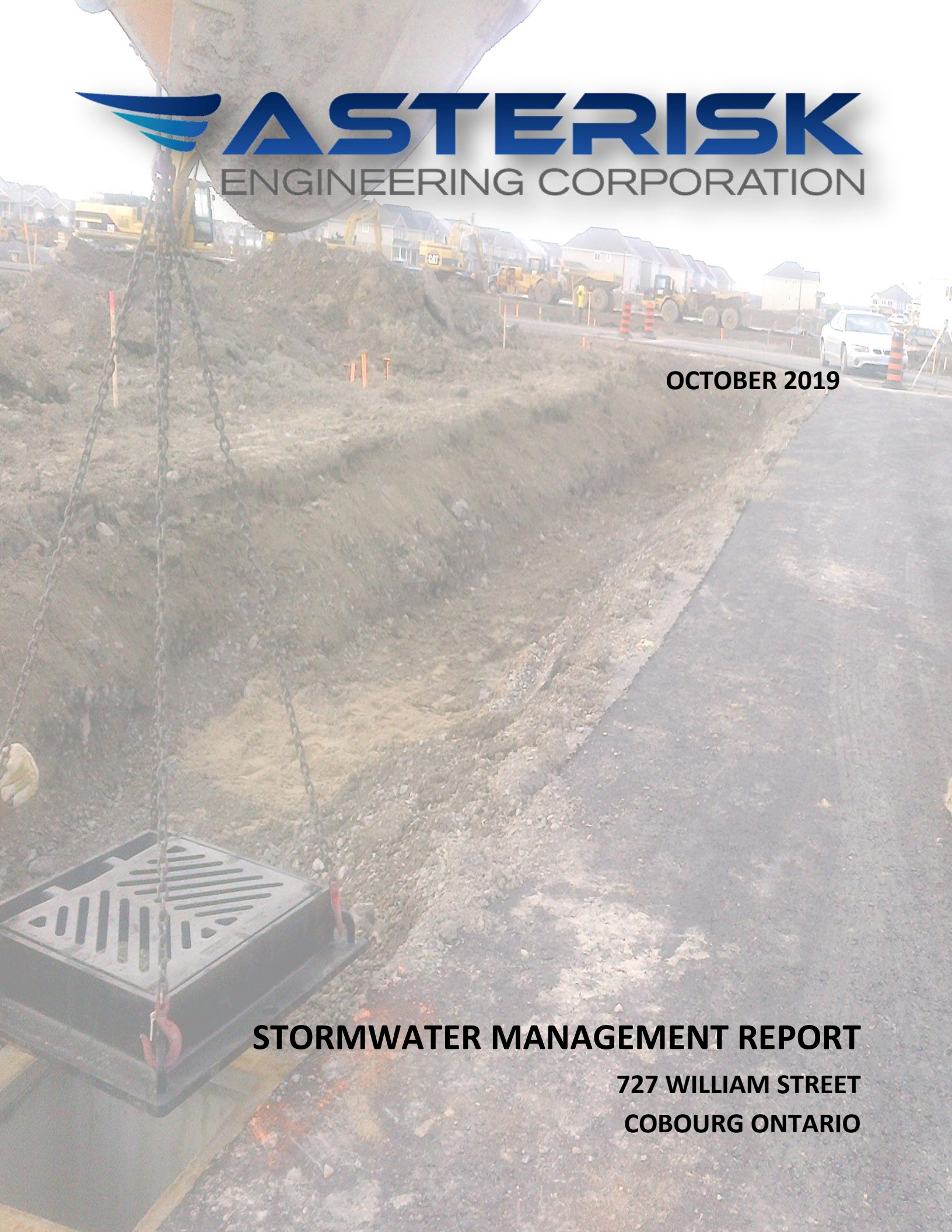

ASTERISK
ENGINEERING CORPORATION

OCTOBER 2019

STORMWATER MANAGEMENT REPORT

727 WILLIAM STREET
COBOURG ONTARIO

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1- INTRODUCTION

Asterisk Engineering Corporation (AEC) was retained by Mike Barry to upgrade the existing Stormwater Management Strategy of 727 William Street, located in Cobourg Ontario, in order to mitigate stormwater impacts associated with the proposed 368m.sq expansion of the existing single-storey Commercial Plaza.

(The Proposed Development location is identified in Appendix A - Figure 1: Key Plan)

This report will detail the internal servicing of the lands and will illustrate how this parcel can be accommodated with existing external City services such as sanitary sewers, storm sewers and water distribution system, as well as provide proposed property grades and demonstrates that the proposed development can be accommodated and can be readily constructed in accordance with the development standards of the City of Cobourg.

2- PROJECT BACKGROUND

The existing commercial plaza to be expanded is located at 727-737 William Street, within the city of Cobourg and has a current zoning of **District Commercial Exception 8** (DC-8) as per the Town of Cobourg Zoning By-Law No. #85-2003

The site is currently accessed via an access on William Street as well as two accesses located on Boulton Street. The lands are bound to the north, east, south and west by Big Boy Burger, William street, Boulton Street and an existing School Yard, respectively. See Appendix A - Figure 1: Key Plan for site location.

The existing property has an approximate area of 0.42Ha and is currently occupied by an single-storey Commercial Plaza with an approximate building footprint of 848sq.m located on the South East half of the property. The lands are currently comprised majorly of hard surfaces including the existing building, asphalt and concrete, with minimal landscaping along the property boundary.

The existing topography of the site slopes from north west to the south east directing overland flows south east to the existing catch basin located on the south east corner of the parking lot. See Figure 02 for Topographic Plan prepared by Gifford, Harris Surveying LTD.

Due to the particularly high existing elevations of the lands to the north west; currently occupied by Big boy Burger, the north west portion of the existing commercial plaza is currently bellow existing grade, similar to a walkout basement. In order to expand the existing commercial plaza, the lands northwest of the existing building will have to excavated, and due to the proximity of the property line/adjacent lands and buildings, a retaining wall will have to be installed along the north and west property lines to accommodate existing and proposed grades.

See appendix A- Figure 03 for proposed grades

3- OBJECTIVES

The objectives of this stormwater management plan and particularly this report is to provide a strategy to mitigate the stormwater impacts associated with the proposed expansion of the single-storey Commercial Plaza.

The main considerations of the proposed storm sewer system for this development are the major system flows, final discharge point as well as quality and quantity controls.

4- DESIGN CRITERIA

4.1- RATIONAL METHOD

In order to determine the amount of runoff generated by the development, the rational method was used along with the following parameters:

$$Q= 2.78 *C*I*A$$

C= Average Runoff Coefficient
I= Rainfall intensity
A= Drainage Area (m2)
Q= Peak Flow (l/s)

4.2- RAINFALL INTENSITY

Due to the sites close proximity to the City of Kingston and as per consultation with the City of Cobourg; the design of the municipal drainage services is to be in accordance with the recommended intensity duration frequency (IDF) relationship, as per the City of Kingston Guidelines:

$$I = 1778/(tc+13),$$

Where tc is the catchment time of concentration in minutes, and I is the intensity, in mm/hr

This relationship provides approximate 5 year design rainfall conditions. Design of the major system requires consideration of more extreme (100 year) design flows; Kingston Airport rainfall data will be used for these analyses. The City of Kingston rainfall intensity relationship produces a 1 hour rainfall

volume of 24.3 mm, while the Kingston Airport data indicates a 5 year 1 hour rainfall volume of 24.2 mm, suggesting that the airport data is consistent with the City`s minor system design criteria.

The Kingston Airport rainfall intensity duration frequency (IDF) relationship is defined as:

$$I = AT^B,$$

where T is the rainfall duration in hours, and coefficients A and B are defined per return period as per Table 4.1.

TABLE 4.1: KINGSTON AIRPORT IDF PARAMETERS

Return Period (yrs)	A	B
2	**18.0**	**-0.702**
5	**24.2**	**-0.714**
10	**28.2**	**-0.719**
25	**33.4**	**-0.724**
50	**37.1**	**-0.726**
100	**40.9**	**-0.728**

4.3- PRE-DEVELOPMENT CONDITIONS

The lands to be developed are comprised majorly of hard surfaces including the existing commercial plaza, located on the south east portion of the property and a mix of concrete and asphalt paving with minimal landscaping present along the property boundary.

Based on the existing topography of the site, completed by Gifford, Harris Surveying LTD, File No. 8-0191 drainage of the site is currently achieved via overland flow routes which direct overland flows from north west to south east, away from the existing building, towards the existing catch basin located in the south east corner of the existing parking lot, and ultimately into the Town of Cobourg's minor SWM system.

The pre-development flowrate parameters, determined from existing conditions, are as follows:

- Drainage area (Roof, Grassed, Paved) = 0.417ha
- Time of concentration = 15min
- Average Runoff coefficient = 0.79

- Intensity calculations (5yr-100yr -Kingston, Ontario – See Rainfall Data)

See Appendix A-Figure 3 for Grading-Post development Conditions. Detailed calculations are enclosed in Appendix B. The calculations indicate that the pre-development flow rate for the 5yr and 100yr storm events to be **58.20 l/s and 102.84 l/s**, respectively.

4.4- POST-DEVELOPMENT CONDITIONS

Following the excavation of lands/paved surfaces, north west of the existing building, the single-story commercial plaza, will be expanded north west towards the existing property line. The proposed expansion of the existing commercial plaza, will have an approximate building footprint of 368sq.m and will consist of one story.

Due to the subjects lands close proximity to existing stormwater infrastructure; The proposed drainage of the site will be achieved via existing overland flow routes. Overland flows from both the existing building as well as the proposed expansion, will freely discharge into the parking area and ultimately into the existing catchbasin located in the south east corner of the parking lot.

The post-development flowrate, determined from proposed conditions are as follows:

- Drainage area (Roof, Grassed, paved) = 0.417 ha
- Time of concentration = 15min
- Average Runoff coefficient = 0.79
- Intensity calculations (5yr-100yr – See Rainfall Data)

Detailed calculations are enclosed in Appendix B. The calculations indicate that the Post-development release rate for the 5yr and 100yr storm event is **58.20 l/s and 102.84 l/s**, respectively, equal to pre-development flows of **58.20 l/s and 102.84 l/s** .

(A breakdown of Pre-development vs Post-development flows has been illustrated in Appendix B: Pre vs Post Development Flows)

4.4- WATER QUALITY AND QUANTITY

Because the lands have been previously developed, the pre-development ratio of hard surfaces to landscaping is higher than what would be expected from an undeveloped lot. The existing property is primarily comprised of hard surfaces with minimal landscaping present along the site boundaries. That being said, post development conditions, including runoff coefficients and overland flow routes have been maintained as per pre-development conditions.

As pre-development conditions have been maintained post development, we have determined that no additional storm water management practices will be required to maintain existing quantity or quality standards, as there will be no changes to existing drainage patters, volume or decontamination/ contamination sources.

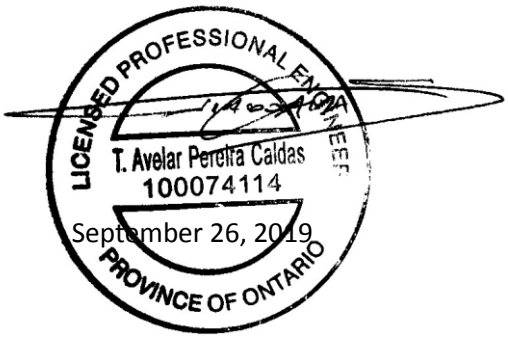
SEDIMENT AND ERROSION CONTROL

To reduce the possibility of sediment loads entering the storm sewer system during construction, sediment and erosion control measures must be implemented. Prior to site alteration, Silt Fencing, Straw Bale Barriers, and Filter cloth is to be installed in all proposed and existing Catch basins in the vicinity of the site. Straw bale barriers are to remain in place until vegetation is established after construction and all check dams are installed.

5- CONCLUSION

Based on the information provided, this brief presents a workable stormwater management strategy, which can accommodate the proposed development and maintain post development flows to pre-development levels respectively.

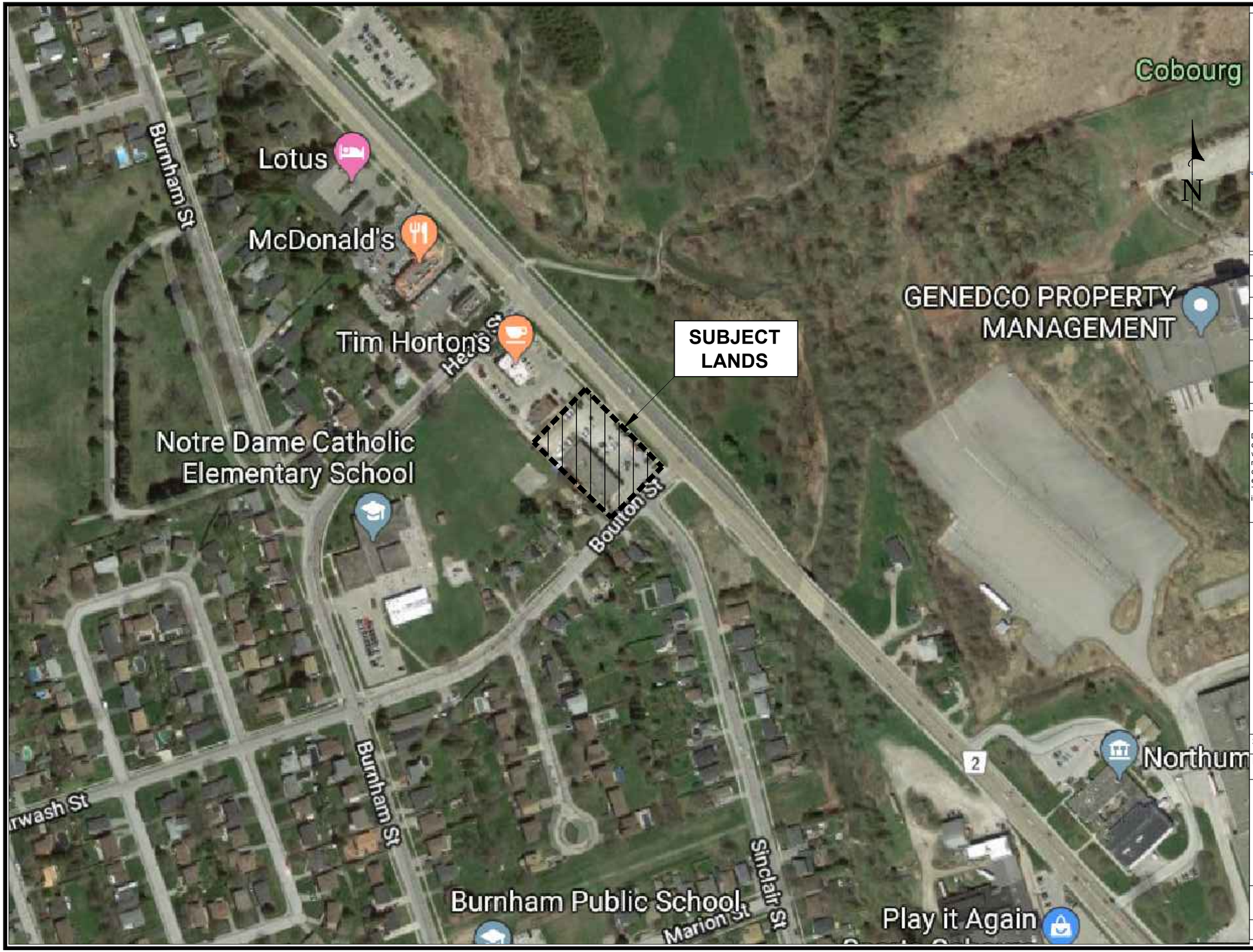
Prepared by



Tiago Caldas, P.Eng
Manager Municipal Engineering Services

APPENDIX A: GENERAL FIGURES

F-01 Key Plan
F-02 Survey – Pre-Development Conditions
F-03 Grading- Post-Development Conditions
F-04 Servicing Plan



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www.asteriskengineering.com

ISSUED FOR	REV	DATE
APPROVAL	0	Oct 24, '19

Do not scale drawings. Refer to Architectural drawings for dimensions. All elevations /dimensions shall be verified with Architectural drawings and any discrepancy shall be reported inmediately to consultant. Read this drawing in conjunction with ALL applicable Architectural, Mechanical, electrical and other disciplines involved.
This drawings are "design drawings" only and are not intended to be used as shop drawings.

LICENCED PROFESSIONAL ENGINEER
T. AVELAR PEREIRA CALDAS
100074114
Oct 24, 2019
PROVINCE OF ONTARIO

SCALE: 1:300 UNO	UNITS: mm, UNO	
DESIGNED: TC	CHECKED: TC	DRAWN: CR

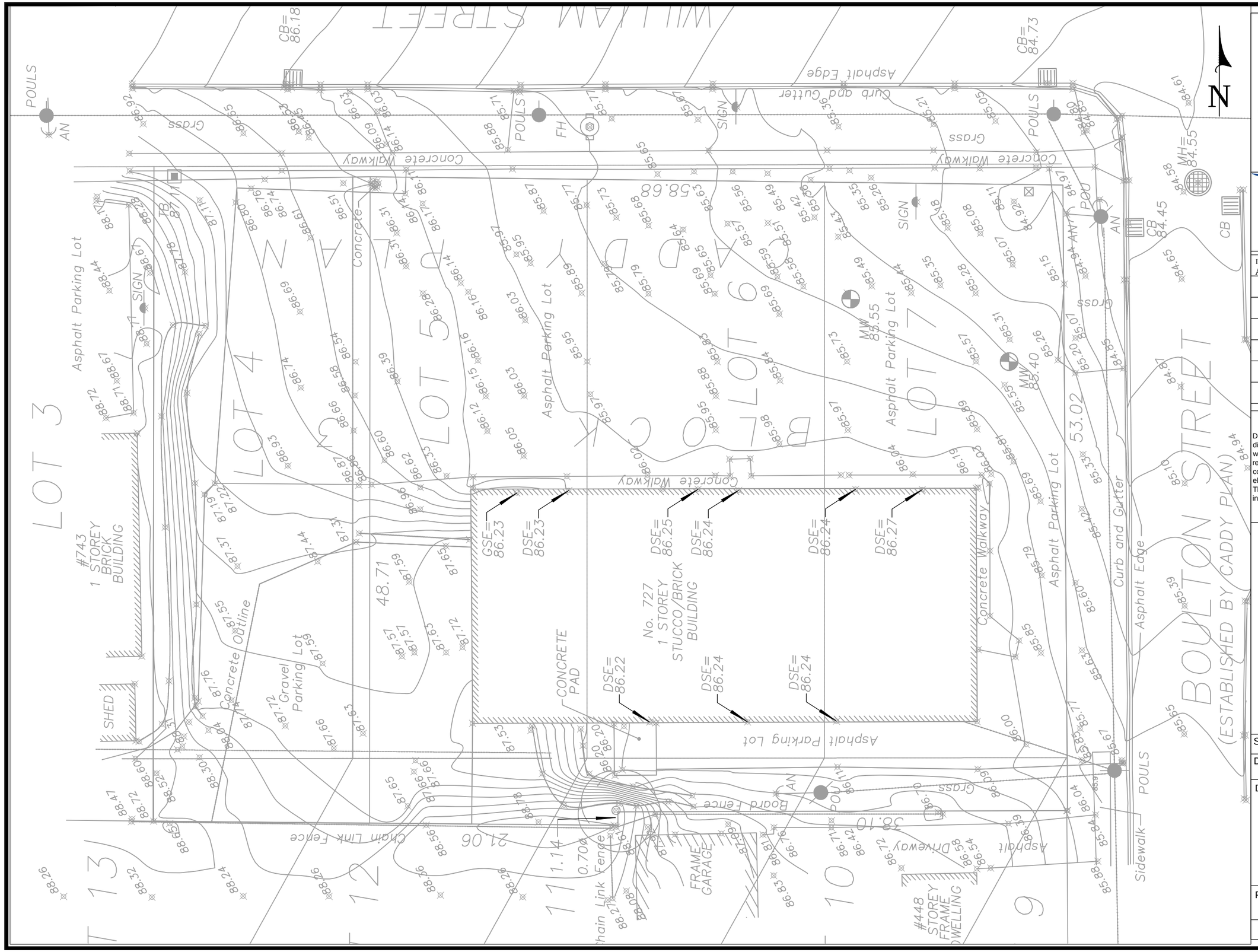
DRAWING TITLE

KEY PLAN

PROJECT-DWG Nos: 19-052

FIG-01

DATE: June, 2019



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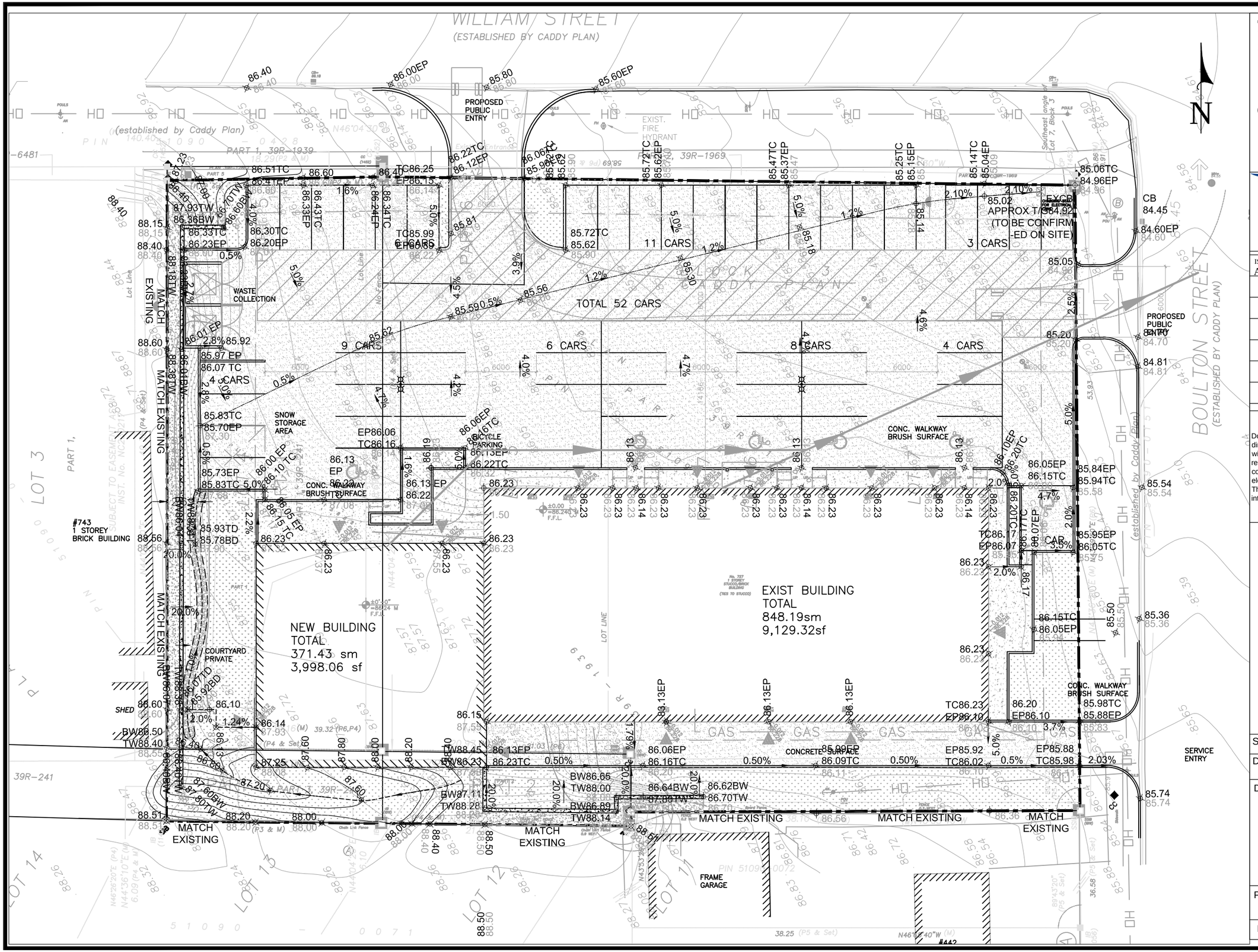
DRAWING TITLE

SURVEY
(PRE-DEVELOPMENT CONDITIONS)

PROJECT-DWG Nos: 19-052

FIG-02

DATE: June, 2019



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DESIGNED: TC	CHECKED: TC	DRAWN: CR

DRAWING TITLE

GRADING PLAN
(POST-DEVELOPMENT CONDITIONS)

PROJECT-DWG Nos: 19-052

FIG-03

DATE: June, 2019

WILLIAM STREET
(ESTABLISHED BY CADDY PLAN)

PROPOSED SANITARY SERVICE TO BE 125mm C/W 45° BEND.

PRIVATE TIE-IN VIA PROPOSED WYE CONNECTION

EXISTING SANITARY SERVICE. LOCATION SIZE AND SLOPE TO BE VERIFIED ON SITE.

WATER, GAS, HYDRO AND TELECOM TO BE SERVICED INTERNALY VIA THE EXISTING BUILDING

APPROXIMATE LOCATION OF EXISTING HYDRO-TELECOM. TO BE VERIFIED ON SITE

APPROXIMATE LOCATION OF EXISTING GAS SERVICE. TO BE VERIFIED ON SITE

PROPOSED PUBLIC ENTRY

EXIST. FIRE HYDRANT

APPROX T/364.92 (TO BE CONFIRM-ED ON SITE)

EXCEED DIMENSIONS FOR ELECTION

6 CARS

11 CARS

CARS

TOTAL 52 CARS

WASTE COLLECTION

4 CARS

8 CARS

4 CARS

SNOW STORAGE AREA

BICYCLE PARKING

CONC. WALKWAY BRUSH SURFACE

1 CAR

#743
1 STOREY
BRICK BUILDING

NEW BUILDING
TOTAL
371.43 sm
3,998.06 sf

COURTYARD PRIVATE

SHED

EXIST BUILDING
TOTAL
848.19sm
9,129.32sf

CONCRETE SURFACE

SERVICE ENTRY

FRAME GARAGE

BOULTON STREET
(ESTABLISHED BY CADDY PLAN)

N

727 WILLIAM STREET
COBOURG, ONTARIO.

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Oct 24, 2019
PROVINCE OF ONTARIO

SCALE: 1:300 UNO	UNITS: mm, UNO

DESIGNED:	CHECKED:	DRAWN:
TC	TC	CR

DRAWING TITLE

SERVICING PLAN

PROJECT-DWG Nos: 19-052

FIG-04

DATE: June, 2019

APPENDIX B: CALCULATIONS

1- Pre vs Post Development Flows

727/737 William Street
Job No.: 19-052_727 William St

727/737 William Street, Cobourg Ontario
PROPOSED BUILDING ADDITION
PRE vs POST DEVELOPMENT FLOWS

PRE-DEVELOPMENT FLOWS

5 Year Event - $Q_{Pre-5yr}$= 2.78*C*I*A

C_{pre}	A (Ha)	
0.25	0.051	Grassed
0.90	0.237	Conc. /Asphalt
0.85	0.045	Gravel
0.90	0.085	Ex Building

C_{Pre}= **0.79**
T_c= 15
i_{5Yr}= 63.5 mm/hr
A= 0.417 Ha

$Q_{Pre-5yr}$= 58.196 l/s*

100 Year Event - $Q_{Pre-100yr}$= 2.78*C*I*A

C_{pre}	A (Ha)	
0.25	0.051	Grassed
0.90	0.237	Conc. /Asphalt
0.85	0.045	Gravel
0.90	0.085	Ex Building

CP_{re}= 0.79
T_c= 15
i_{100Yr}= 112.2 mm/hr
A= 0.417 Ha

$Q_{Pre-100yr}$= 102.84 l/s*

POST-DEVELOPMENT FLOWS

5 Year Event - $Q_{Post-5yr}$= 2.78*C*I*A

C_{Post}	A (Ha)	
0.25	0.070	Grassed
0.90	0.226	Conc. /Asphalt
0.90	0.085	Ex Building
0.90	0.037	Prop Building

C_{Post}= **0.79**
T_c= 15
i_{5Yr}= 63.5 mm/hr
A= 0.417 Ha

$Q_{Post-5yr}$= 58.196 l/s*

100 Year Event - $Q_{Post-100yr}$= 2.78*C*I*A

C_{Post}	A (Ha)	
0.25	0.070	Grassed
0.90	0.226	Conc. /Asphalt
0.90	0.085	Ex Building
0.90	0.037	Prop Building

C_{Post}= 0.79
T_c= 15
i_{100Yr}= 112.2 mm/hr
A= 0.417 Ha

$Q_{Post-100yr}$= 102.84 l/s*

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