

## **Introduction**

The Scarborough Subway Extension (SSE) project is a 7.8-kilometer extension of the Line 2 Bloor-Danforth from the existing Line 2 terminus Kennedy Station to a new terminus station at Sheppard Avenue East and McCowan Road intersection. A total of three new stations are proposed along the SSE line. The new stations are Lawrence East station, Scarborough Centre station and Sheppard East station. As part of the SSE project there is potential for a future development at the various station locations to include Transit Oriented Communities (TOCs). The proposed Lawrence East station TOC development consists of multiple high-rise buildings at southeast quadrant of the intersection of Lawrence Avenue East and McCowan Road. The proposed buildings are located just opposite to the new Lawrence East station facilities. The proposed TOC buildings are shown in Architectural Site Plan in **Attachment 1**.

This stormwater management (SWM) design brief addresses the potential impact of the proposed construction of TOC buildings on the existing drainage conditions and provides a conceptual level SWM design to ensure that the TOC building design is developed in accordance with applicable stormwater management design regulatory guidelines and standards.

## **SWM Design Criteria and Guidelines**

The SWM plan shall conform to all applicable criteria and were designed in accordance with following guidelines:

### **Water Quantity Control:**

- City of Toronto, “Wet Weather Flow Management Guidelines, November, 2006”
- City of Toronto, “Design Criteria for Sewers and Watermains, Second Edition, January, 2021”
- City of Toronto “Infoworks CS Basement Flooding Model Studies Guideline, October 2014”

### **Water Quality Control:**

- City of Toronto, “Wet Weather Flow Management Guidelines, November, 2006”
- Ministry of Environment, Conservation and Parks (MECP), “Stormwater Management Planning and Design Manual, March 2003”

### **Water Balance:**

- City of Toronto, “Wet Weather Flow Management Guidelines, November, 2006”
- Toronto Green Standard (TGS), Version 4

### **Erosion and Sediment Control:**

- TRCA “Erosion and Sediment Control Guide for Urban Construction, 2019”

## **Existing Land Use, Topography, Soil and Hydrogeology**

The proposed TOC buildings are located at the southeast quadrant of the intersection of Lawrence Avenue East and McCowan Road within two existing commercial properties. The commercial properties contain parking lot and building areas.

The existing topography demonstrates that the ground is sloping toward west for majority of the areas. A small portion of the area at northwest corner of the site is sloping toward north, Refer to **Dwg. No. ONT\_SE200\_EC** in **Attachment 2** that demonstrates the existing topography for the site areas.

The existing subsurface conditions generally consist of topsoil and fill materials underlaid by native deposits. Based on the available data from the boreholes, the following soil layers can be identified in the stratigraphic profile from grade to depth: Fill, Silty Sand/Clayey Silt/Sandy Silt Till, Silt/Clayey Silt intermix with Sand and Sandy Silt/Silty Sand, Silty Clay/Clay to Silty Clay Till. The stratigraphic profile shows an aquifer of sand that slopes down to the north. Interpretated groundwater levels from the monitoring wells indicates that the groundwater levels measured within the upper and lower aquifers are approximately at elevation 153 mAMSL at the south limit of the proposed Lawrence East station. The groundwater level of upper aquifer is sloped down in the North and North-East directions, reaching an approximate elevation of 148 mAMSL at the north end of the Lawrence East station.

### Existing SWM and Drainage

The TOC building site can be divided into two sub-catchments based on the minor system flows as shown in **Dwg. No. ONT\_SE200\_EC** in **Attachment 2**. The sub-catchment C3A (0.883 ha) is discharging to 600 mm municipal sewer under McCowan Road, while catchment C3B (0.155 ha) discharging to 750 mm sewer under Lawrence Avenue East.

### Pre-Development Hydrology

As mentioned previously, the TOC building areas are currently occupied with commercial buildings and parking lots. The runoff from majority of the site area is currently flowing toward the west and discharge to a storm sewer under McCowan Road. A small portion of the site area at the northwest corner is flowing to the north to the storm sewer under Lawrence Avenue East. The existing land use and drainage condition are illustrated in **Dwg. No. ONT\_SE200\_EC** in **Attachment 2**. The existing condition peak flows from the site and existing runoff coefficients have been calculated and are provided in **Table 1**, Detailed calculations are provided in **Attachment 3**.

**Table 1: Pre-development Runoff Coefficient and Peak Flow Rates**

Site	Existing Land Use	Area (ha)	Existing Runoff Coefficient (RC)	Runoff Coefficient as per City Criteria*	2-Year pre-development Flow (m <sup>3</sup> /s)		100-Year Pre-development Flow (m <sup>3</sup> /s)	
					Actual	As per City Criteria*	Actual	As per City Criteria*
<b>TOC Building</b>	Commercial Building and Parking Lots	1.038	0.88	0.50	0.224	0.127	0.635	0.361

\*Note: City of Toronto WWFMG: Pre-development Runoff Coefficient (R.C) = 0.5, or actual when C<0.5

## Proposed Development

The proposed site plan including the SWM and the surface drainage designs for TOC building site is presented in **Dwg. No. ONT\_ES200\_PC** in **Attachment 4**. The new developments at TOC building site will include construction of multiple high-rise buildings.

## Proposed Drainage and SWM

Under proposed conditions, the existing drainage pattern will largely be maintained. However, the post development flow up-to 100-year storm will be controlled to the 2-year pre-development level or the existing sewer capacity whichever is less by following the City’s WWFMG for TOC building site.

The minor flow (2-year) generated at the site will be captured by catchbasins and conveyed to the storm sewers with final discharge to the City’s sewer under McCowan Road.

## Post-development Hydrology

Based on the proposed land use, runoff coefficient was identified for TOC building site as summarized in **Table 2**. The proposed condition flows from the site are also provided in **Table 2**.

**Table 2: Post-development Runoff Coefficient and Peak Flow Rates**

Site	Area (ha)	Proposed Runoff Coefficient	Uncontrolled 2-year Post-development Flow (m <sup>3</sup> /s)	Uncontrolled 100-year Post-development Flow (m <sup>3</sup> /s)
TOC Building	1.039	0.70	0.178	0.506

## Stormwater Management Plans

### Water Quantity Control

The proposed TOC buildings will be built on existing commercial development and parking lots and therefore there will not be any significant change in imperviousness. Under existing condition, there are no stormwater quantity controls exist within the TOC building site. According to the City’s storm sewer design criteria, the post development flow up to 100-year storm must be controlled to the 2-year pre-development level or the existing sewer capacity whichever is less before discharging to the City’s sewer system. A storm sewer capacity assessment report, “Sanitary and Storm Capacity Assessment – Lawrence East Station” was prepared to demonstrate to the City that the proposed discharge from the Lawrence Station facilities will not adversely impact the operation of local sewer systems. The report concluded that the existing 750 mm storm sewer under Lawrence Avenue East has capacity to receive permanent servicing flows under existing wet weather (2-year design storm event) condition. Please note that this SWM design brief is for a conceptual level design and outlines a preliminary SWM design for the TOC building site.

To meet the City of Toronto requirement, the required storage volume for the site area was calculated using the Modified Rational Method as summarized in **Table 3**. City of Toronto’s IDF curve with 10 minutes inlet time was used for the purpose. Detailed calculations are provided in **Attachment 5**.

**Table 3: Post-development Quantity Control Storage Requirement**

Site	Area (ha)	Allowable Release Rate (m <sup>3</sup> /s)	Uncontrolled 100-year Post-Development Flow (m <sup>3</sup> /s)	Storage Requirement (m <sup>3</sup> )
TOC Building	1.039	0.127	0.506	227

Based on above, to control 100-year post development flow to the 2-year pre-development level, a storage of 227 m<sup>3</sup> is required for the TOC building site. Quantity control will be provided on-site by an underground storage tank. An orifice plate will be provided at outlet to control the flow before discharging to the City's sewer system. The location of the proposed storage chamber is shown on **Dwg. No. ONT\_ES200\_PC** in **Attachment 4**.

#### Water Quality Control

According to City of Toronto's quality control criteria, the long-term average removal of 80% of the Total Suspended Solids (TSS) on an annual basis is required from all runoff leaving the site. The TOC buildings have roof and roof runoff is clean and free of contaminants. The runoff from the associated driveway will be directed to an OGS unit for water quality treatment. The proposed park areas will provide further polishing of stormwater runoff by capturing of particulate and suspended solids. The proposed treatment train approach will provide enhanced level (level 1) of protection i.e., 80% TSS removal. Treated storm runoff will discharge to the underground storage tank before discharging via the orifice plate to the City's sewer under McCowan Road. The location of the proposed OGS unit and underground storage tank is shown on **Dwg. No. ONT\_ES200\_PC** in **Attachment 4**

#### Water Balance

Based on City of Toronto's WWFMG, 5 mm of rainfall events must be retained on-site through infiltration, water reuse and/or evapotranspiration. Accordingly, volumes of retaining water has been calculated as provided in **Table 4**.

**Table 4: Post-development Water Balance Storage Requirement**

Site	Area (ha)	Storage Required to Retain 5 mm Rainfall (m <sup>3</sup> )
TOC Building	1.039	52

The proposed green roof on top of different floor levels of the buildings at the TOC sites will provide the required storage to meet the water balance requirement for Lawrence East Station TOC site area.

## **Erosion and Sediment Control During Construction**

During site construction, it is recommended that all erosion and sediment control Best Management Practices (BMPs) shall be constructed and maintained in accordance with the TRCA's *Erosion and Sediment Control Guide for Urban Construction, 2019*.

## **Conclusions**

The TOC buildings are located just opposite to the proposed Lawrence East Station at southeast quadrant of the intersection of Lawrence Avenue East and McCowan Road.

The post development 100-year peak flow from TOC building site will be controlled to 2-year pre-development level before discharging to the City's sewer under McCowan Road.

The total required storage volumes to control the post development 100-year flow to 2-year pre-development level for TOC building site is 227 m<sup>3</sup>. The proposed underground storage tank will provide the required storage volumes. An orifice plate will be provided at outlet to control the flow before discharging to the City's sewer system.

TOC buildings have roof and roof runoff is clean and free of contaminants. The runoff from the associated driveway will be directed to an OGS unit for water quality treatment. The proposed park areas will provide further polishing of stormwater runoff by capturing of particulate and suspended solids. The proposed treatment train approach will provide enhanced level (level 1) of protection i.e., 80% TSS removal.

The proposed green roof on top of different floor levels of the buildings at the TOC sites will provide the required storage to meet the water balance requirement for Lawrence East Station TOC site area.

## **Attachments:**

**Attachment 1: Architectural Site Plan**

**Attachment 2: Existing Drainage Plan**

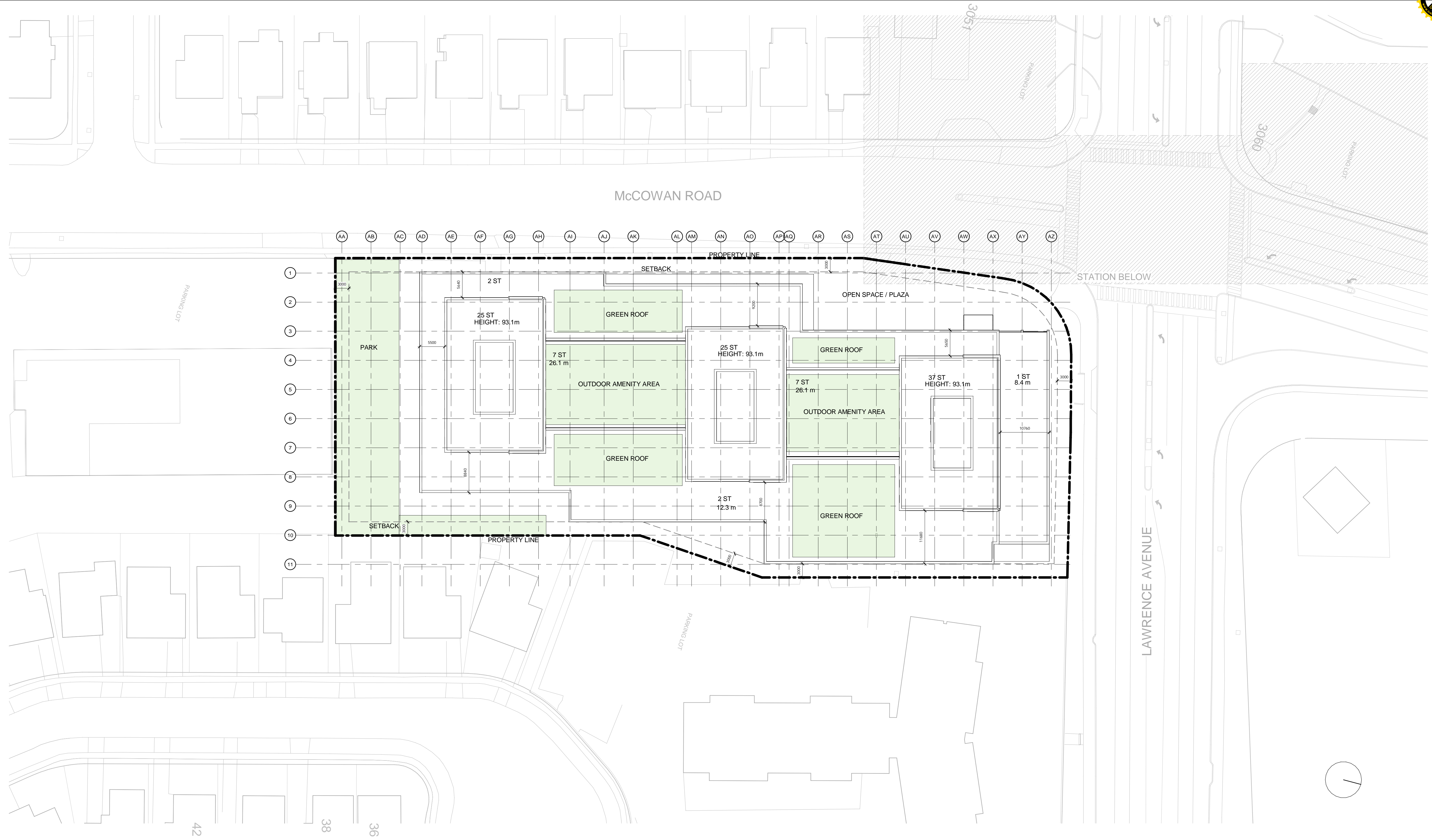
**Attachment 3: Pre-Development Peak Flow Calculations**

**Attachment 4: Proposed Condition Drainage Plan**

**Attachment 5: Post Development Peak Flow and Storage Requirement Calculations**

**Attachment 1**  
**Architectural Site Plan**





REVISIONS

**TOC CONCEPT OF DESIGN  
ISSUED FOR COORDINATION**

08/25/23

NOT FOR CONSTRUCTION



DRAWN Justin Jones

CHECKED TBC

CORRECT TBC

SCALE

1 : 400

Project:

SCARBOROUGH SUBWAY EXTENSION

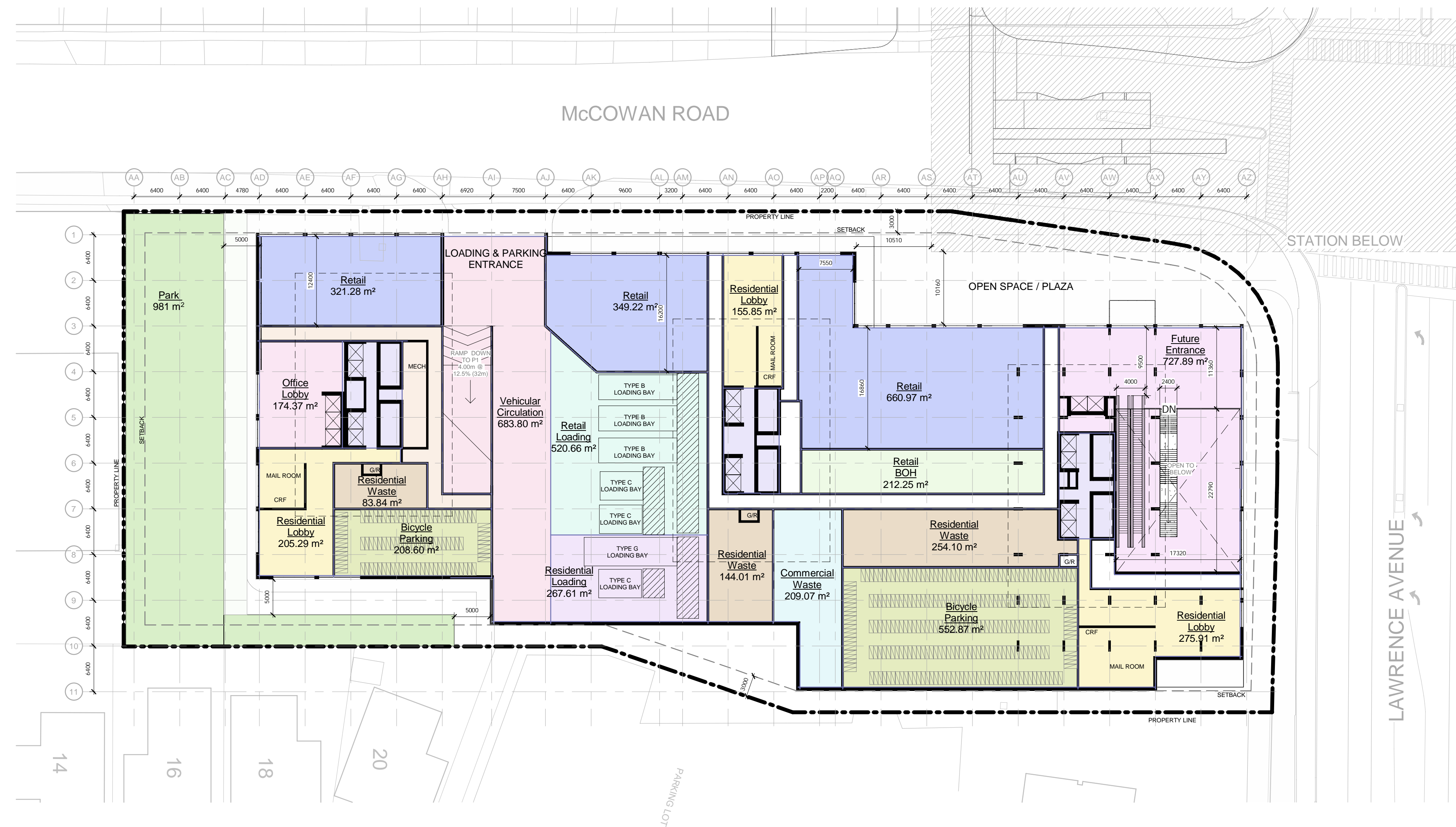
LES TOC

SITE PLAN

Contract: Package:

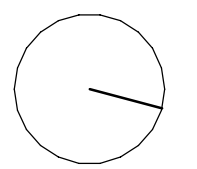


Dwg. No. Rev. No. Sheet No.  
ONT\_SE300\_TC2001



**AREA PLAN LEGEND**

- Bicycle Parking
- Circulation
- Commercial Waste
- Core
- Future Entrance
- Office Lobby
- Residential Loading
- Residential Lobby
- Residential Waste
- Retail
- Retail BOH
- Retail Loading
- Vehicular Circulation



REVISIONS

**TOC CONCEPT OF DESIGN  
ISSUED FOR COORDINATION**

08/25/23

NOT FOR CONSTRUCTION



DRAWN Justin Jones

CHECKED TBC

CORRECT TBC

SCALE

1 : 400

Project:

SCARBOROUGH SUBWAY EXTENSION

LES TOC

GROUND FLOOR

Contract: Package:

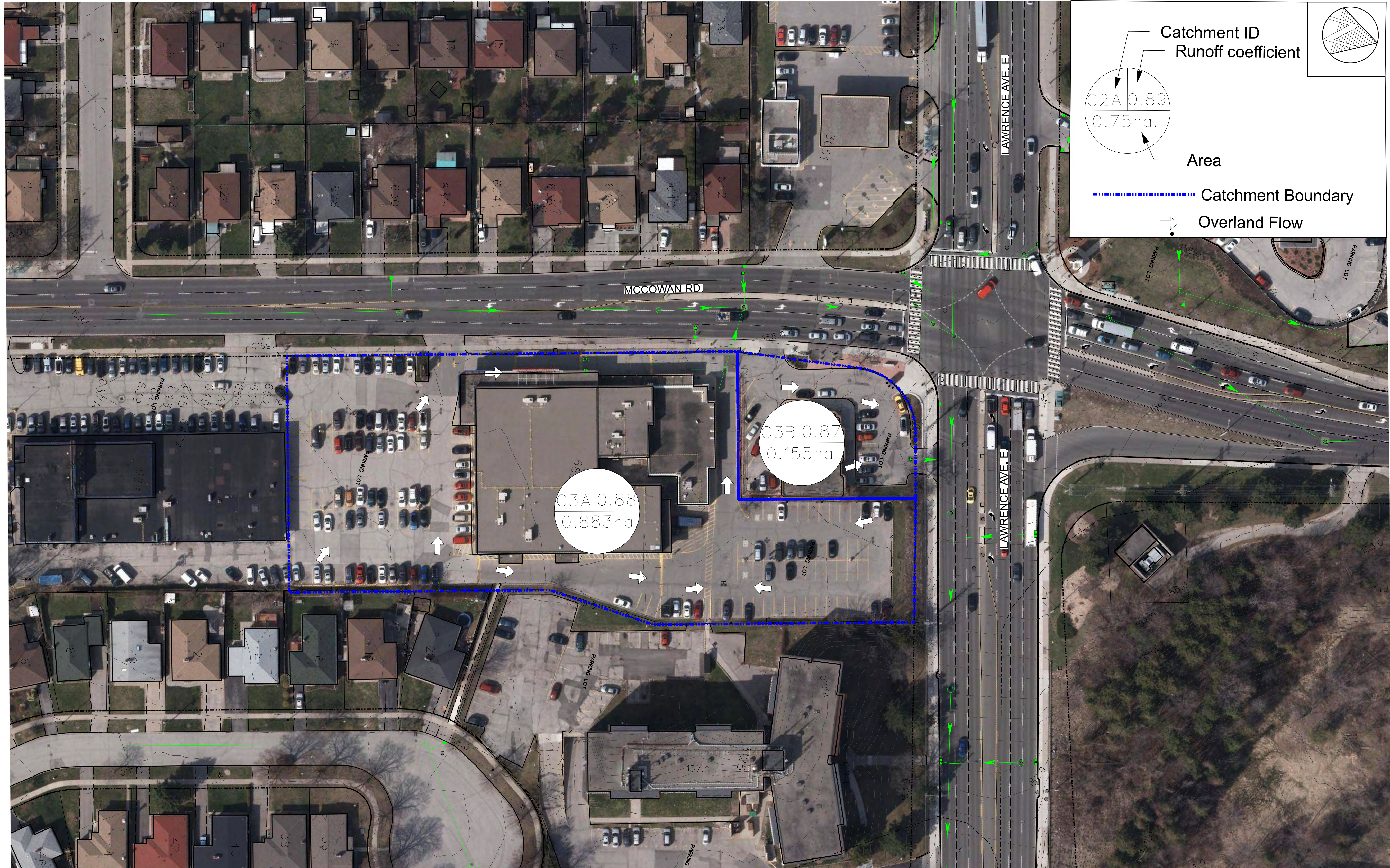


Dwg. No. Rev. No. Sheet No.  
ONT\_SE300\_TC2002



**Attachment 2:**  
**Existing Drainage Plan**





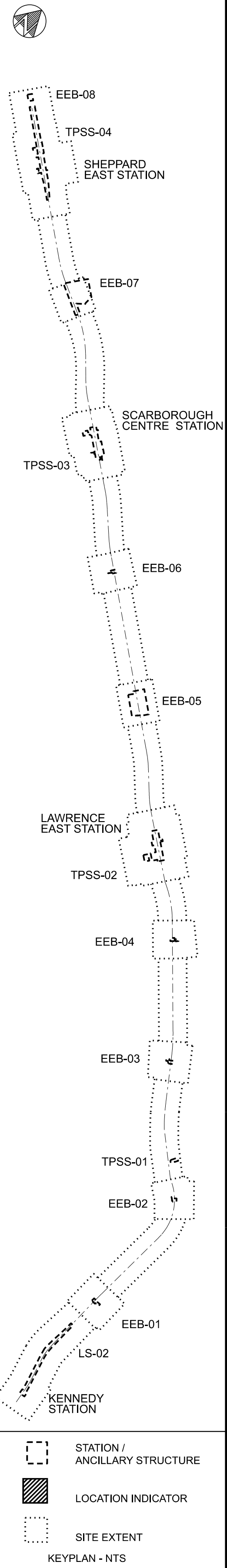
**Catchment ID**  
**Runoff coefficient**

C2A 0.89  
0.75ha.

**Area**

----- Catchment Boundary

→ Overland Flow



BLDG. REF. No.

FILE:

SHEET No.

DRAWING No.

REVISIONS	REVISIONS

**REFERENCE CONCEPT DESIGN**  
NOT FOR CONSTRUCTION



DESIGNED P.KARMACHARYA 2021/06/17  
DRAWN P.KARMACHARYA  
CHECKED N.CHOUDHURY  
APPROVED R.PANDEY

**SCARBOROUGH SUBWAY EXTENSION**  
**LAWRENCE EAST STATION TOC**  
EXISTING DRAINAGE AREA PLAN

Plot Date: 2021-06-17

Dwg. No. **ONT\_SE200\_EC** Sheet No.



**Attachment 3:**  
**Pre-Development Peak Flow Calculations**

**Calculations for Peak Flows**

**Station**      Lawrence East

TOC

**Pre-Development Condition**

**Rainfall data**

**100 year storm**

A= 59.7  
T= 10            minutes  
B= -0.8  
 $i_{100} = 250.32$     mm/hr  
Area = 1.038    ha  
R.C= 0.88  
 $Q_{100} = 0.635$

**2 year storm**

Area = 1.038    ha  
A= 21.8  
T= 10            minutes  
B= -0.78  
 $i_2 = 88.19$         mm/hr  
R.C = 0.88  
 $Q_2 = 0.224$       m<sup>3</sup>/s

**Calculations for Peak Flows**

**Station**      Lawrence East

TOC

**Pre-Development Condition (As per City Criteria, R.C. = 0.5)**

**Rainfall data**

**100 year storm**

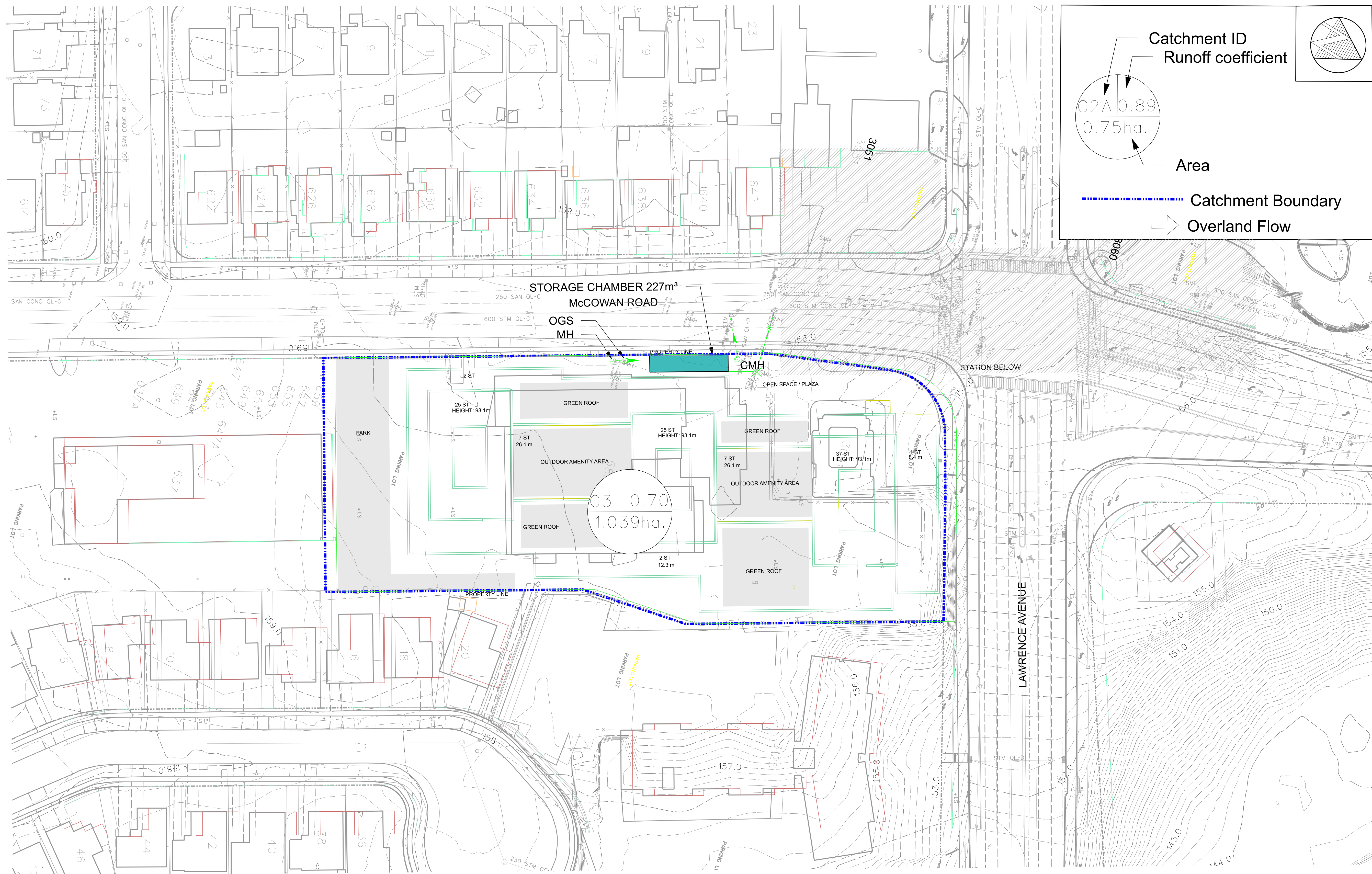
A= 59.7  
T= 10            minutes  
B= -0.8  
 $i_{100} = 250.32$     mm/hr  
Area = 1.04     ha  
R.C= 0.50      (By following CoT Guidelines)  
 $Q_{100} = 0.361$

**2 year storm**

Area = 1.04     ha  
A= 21.8  
T= 10            minutes  
B= -0.78  
 $i_2 = 88.19$         mm/hr  
R.C = 0.50      (By following CoT Guidelines)  
 $Q_2 = 0.127$       m<sup>3</sup>/s

**Attachment 4:**  
**Proposed Condition Drainage Plan**





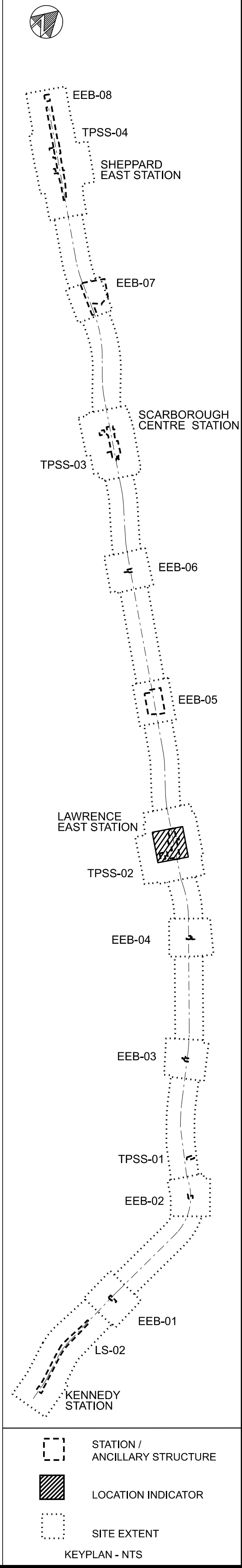
**Catchment ID**  
Runoff coefficient

**Area**

**Catchment Boundary**

**Overland Flow**

C2A 0.89  
0.75ha.



SHEET No. FILE: CPG\_ONT\_SE200\_PC\_V3.dgn BLDG. REF. No.

REVISIONS	REVISIONS

**REFERENCE CONCEPT DESIGN**  
NOT FOR CONSTRUCTION

SCALE(S)  
1:500

**One+**  
Gannett Fleming Canada ULC & IBI Group

DESIGNED	P.KARMACHARYA	2023/09/05
DRAWN	P.KARMACHARYA	2023/09/05
CHECKED	N.CHOUDHURY	2023/09/05
APPROVED	R.PANDEY	2023/09/05

**SCARBOROUGH SUBWAY EXTENSION**  
**LAWRENCE EAST STATION**  
TOC  
PROPOSED DRAINAGE AREA PLAN

Plot Date: 2023-09-05

Dwg. No. **ONT\_SE200\_PC** Sheet No.



**Attachment 5:**  
**Post Development Peak Flow and Storage Requirement  
Calculations**

**Calculations for storage for the 100 year storm**

**Station**      Lawrence East

TOC

**Proposed Condition**

**Rainfall data**

**100 year storm**

A= 59.7  
 T= 10            minutes  
 B= -0.8  
 $i_{100} = 250.32$     mm/hr  
 Area = 1.039    ha  
 R.C= 0.70  
 $Q_{100} = 0.506$

**Pre-Development Condition**

**2 year storm**

Area = 1.038    ha  
 A= 21.8  
 T= 10            minutes  
 B= -0.78  
 $i_2 = 88.19$         mm/hr  
 R.C = 0.50        (By following CoT Guidelines)  
 $Q_2 = 0.127$          $m^3/s$

$Q_{allow\ storm\ runoff} = 0.127$

$m^3/s$

Time (min)	Intensity (mm/hr)	Total Release ( $m^3/s$ )	Peak Flow ( $m^3/s$ )	Inflow Volume ( $m^3$ )	Outflow Volume ( $m^3$ )	Storage ( $m^3$ )
10.00	250.32	0.127	0.5057	303.43	76.28	227.15
11.00	231.94	0.127	0.4686	309.27	83.91	225.36
12.00	216.35	0.127	0.4371	314.70	91.54	223.16
13.00	202.93	0.127	0.4100	319.78	99.17	220.61
14.00	191.25	0.127	0.3864	324.55	106.80	217.75
15.00	180.98	0.127	0.3656	329.06	114.43	214.64
16.00	171.87	0.127	0.3472	333.34	122.05	211.28
17.00	163.73	0.127	0.3308	337.40	129.68	207.72
18.00	156.41	0.127	0.3160	341.28	137.31	203.97
19.00	149.79	0.127	0.3026	344.99	144.94	200.05
20.00	143.77	0.127	0.2905	348.55	152.57	195.98
21.00	138.27	0.127	0.2793	351.97	160.20	191.77

**Storage required to control 100 year post to 2 year pre-development = 227.15  $m^3$**