Western University
New Student Residence

Stormwater Management Report

Project Location:
Northwest Corner of University Drive and Richmond Street
London, Ontario

Prepared for:
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MTE File No.: 51732-200

Engineers, Scientists, Surveyors.

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1.0 INTRODUCTION

MTE Consultants Inc. was retained by Architects Tillmann Ruth Robinson to complete the stormwater management design for the proposed Western University student residence to be constructed at the northwest corner of the University Drive and Richmond Street intersection in the City of London.

The site is bounded to the north by existing residential dwellings and Tower Lane, to the east by Richmond Street, to the south by University Drive, and to the west by an existing student residence (Elgin Hall). For exact location of the site, refer to the key plan located on the engineering drawings.

The proposed development for the site is the construction of an eight-storey building with one level of basement for a portion of the building, driveway access to Tower Lane, and outdoor amenity areas.

This report addresses the stormwater management requirements set forth by the City of London and proposes a design which meets the requirements for the site. The site grading, servicing and stormwater management details for the site are illustrated on the appended MTE Engineering Drawings.

2.0 CRITERIA

The stormwater management design criteria for the subject site, as established by the City of London, are as follows:

i) The flow from the site must be discharged at a rate equal to or less than the existing condition flow.

ii) The discharge flow from the site must not exceed the capacity of the stormwater conveyance system.

iii) 'Normal' level water quality (70% TSS removal) is required as per the MECP guidelines and/or as per the EIS field information.

3.0 METHODOLOGY

In order to successfully complete the stormwater management design for this site, the following specific tasks were undertaken:

i) Delineated drainage areas for pre- and post-development conditions;

ii) Determined sub-catchment runoff characteristics;

iii) Determined allowable runoff for the development considering both the pre-development conditions and the capacity of the receiving storm sewer network;

iv) Calculated post-development runoff hydrographs using MIDUSS;

v) Revised the site design as necessary to attain the required storage for runoff control;

vi) Performed an iterative procedure of varying the detention basin stage-storage-discharge relationship until sufficient storage and control were provided;

vii) Included appropriate quality control measures in the site design; and,

viii) Incorporated erosion and sediment control measures in the design.

4.0 STORMWATER MANAGEMENT

4.1 Catchment Parameters

The following table summarizes the catchments used in the modelling of the site. The pre-development condition was modelled as one catchment area: the site area draining towards Tower Lane. The post-development condition was separated into six catchment areas: the roof area with flow control roof drains (FCRDs) draining to University Drive, the uncontrolled roof area draining to University Drive, the uncontrolled ground area draining to University Drive, the roof area with FCRDs draining to Tower Lane, the controlled area draining to Tower Lane, and the uncontrolled area draining to Tower Lane. Figure 1.0 illustrates the limits of the pre-development catchment area. Figure 2.0 illustrates the limits of the post-development catchment areas.

Table 4.1 – Catchment Parameters

#	Catchment	Area (m)	% Impervious	Pervious CN	Impervious CN	Slope (%)	Flow Length (m)
Pre-Development Catchment Area							
101	Site	0.962	8.5	69	98	2.5	42.5
Post-Development Catchment Area							
201	Roof with FCRDs to University Drive	0.142	100.0	69	98	2.0	7.5
202	Uncontrolled Roof to University Drive	0.014	100.0	69	98	2.0	7.5
203	Uncontrolled Area to University Drive	0.147	16.8	69	98	2.0	8.5
204	Roof with FCRDs to Tower Lane	0.178	100.0	69	98	2.0	7.5
205	Controlled Area to Tower Lane	0.201	98.3	69	98	2.5	12.0
206	Uncontrolled Area to Tower Lane	0.280	9.0	69	98	3.5	13.5

A geotechnical investigation was undertaken by MTE Consultants Inc. A draft geotechnical report dated August 31, 2023 was referenced in as part of the civil design. A complete copy of their report will be submitted to the City of London once it is finalized. The investigation revealed that the site is generally sandy loam underlain by silt loam. The pervious topographic land cover is a combination of grass and mature trees. Therefore, a pervious CN of 69 is appropriate.

One monitoring well was installed on site to facilitate the collection of groundwater samples and measurement of groundwater elevation. As per the water level measurements taken on January 9, 2024, it is observed that the groundwater elevation is 238.8masl. The groundwater elevation is subject to seasonal fluctuation.

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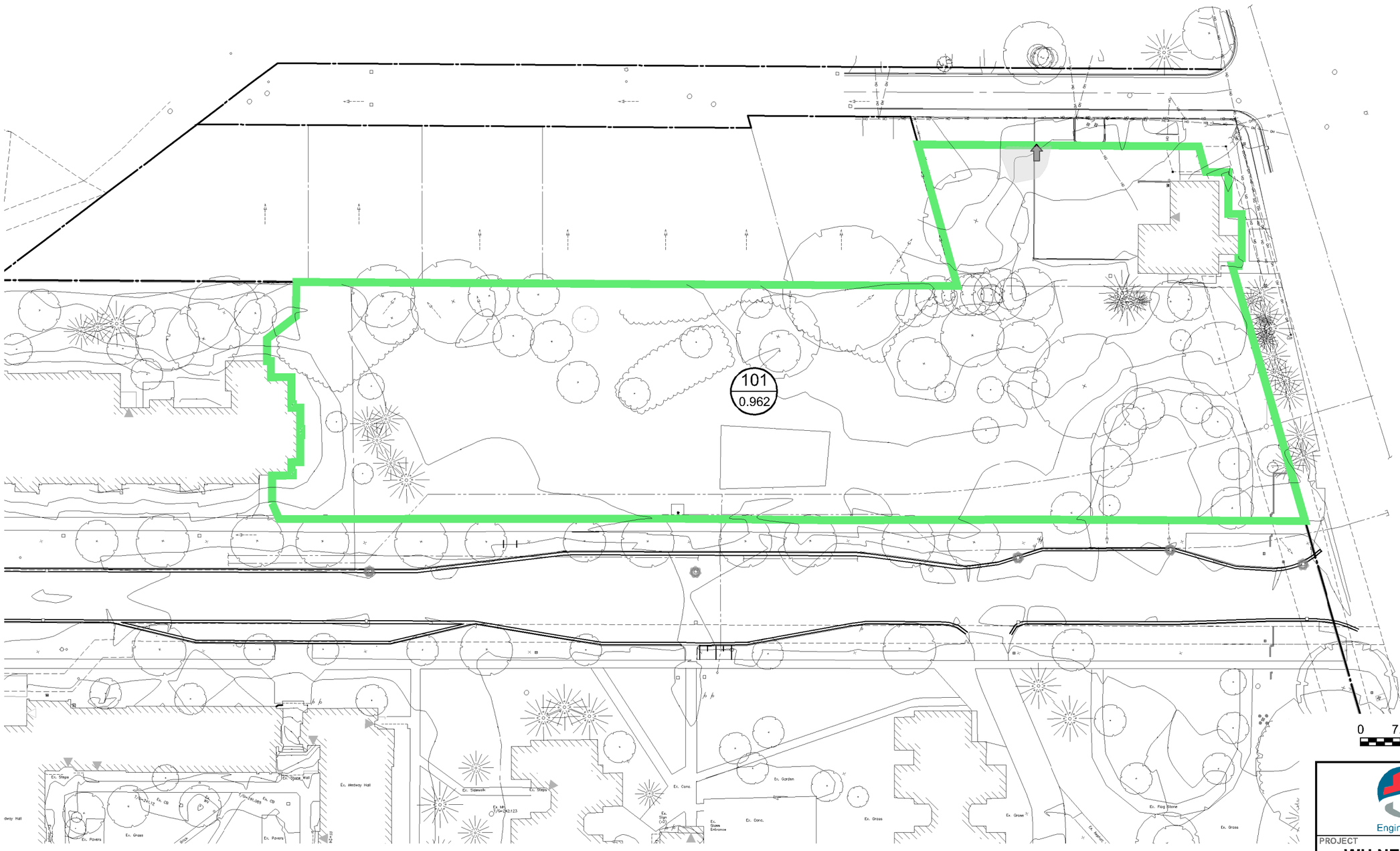
Plot Date: February 29, 2024 - 1:04 PM



0 7.5 15 22.5 30m

LEGEND

CATCHMENT 101

101 / 0.962 — SUB-CATCHMENT NUMBER / AREA (ha.)

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TITLE
PRE-DEVELOPMENT CATCHMENT AREA

Drawn: DAC	Scale: 1:750	Figure: **F1.0**
Checked: DXN	Project No.: 51732-200	
Date: 2023-10-13	Rev No.: 0	

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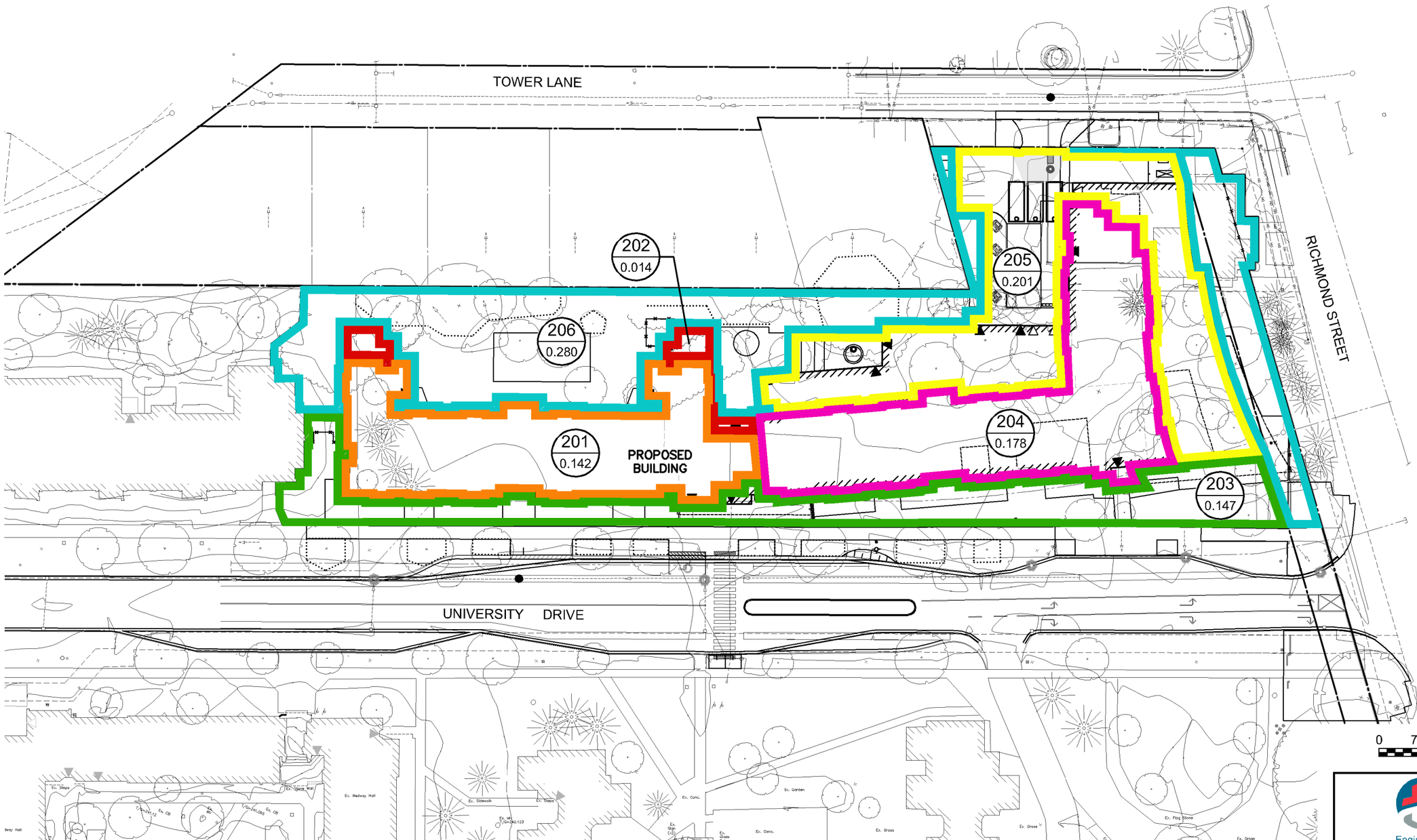

LEGEND

- CATCHMENT 201
- CATCHMENT 202
- CATCHMENT 203
- CATCHMENT 204
- CATCHMENT 205
- CATCHMENT 206

201 / 0.142 — SUB-CATCHMENT NUMBER / AREA (ha.)

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PROJECT
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TITLE
POST-DEVELOPMENT CATCHMENT AREAS

Drawn	Scale	Figure
DAC	1:750	**F2.0**
Checked: DXN	Project No.: 51732-200	
Date: 2023-10-13	Rev No.: 0	

4.2 Water Quantity – Modelling Results

In the existing condition, all runoff generated on the site is directed north towards Tower Lane. In the post-development condition, a portion of the runoff generated on-site will be directed towards Tower Lane and the remainder will be directed to University Drive which is a private road with private storm infrastructure. Post-development flow rates to both University Drive and Tower Lane were considering as part of this analysis.

In order to achieve the stormwater management requirements for the site, runoff generated from the building's roof will be considered under four catchments as mentioned above: the area with FCRDs draining to University Drive (Catchment 201), the area with no FCRDs draining to University Drive (Catchment 202), the area with FCRDs draining to Tower Lane (Catchment 204), and the area with no FCRDs which will be controlled prior to draining to Tower Lane (portion of Catchment 205). Catchment 201 will be equipped with eight single notch FCRDs and catchment 204 will be equipped with seven single notch FCRDs, for a total of fifteen single notch FCRDs on the level 8 roof of the proposed building.

Runoff generated from Catchment 204 and 205 will be directed to a series of underground storage tanks located underneath the asphalt drive aisle. The flow leaving the storage tanks will be controlled with the installation of a 75mm diameter on-line orifice plate on the northern outlet pipe of catchbasin manhole CBMH2 and a 7.2m wide weir at the driveway entrance to Tower Lane. The maximum depth of ponding before overflow occurs within the parking area by grading is 5.0cm.

The flow equations for the orifice and the weir are included in Appendix A. Refer to Appendix B for the MIDUSS NET output.

Table 4.2 illustrates the stage-storage-discharge relationship of the underground storm tank system.

Table 4.2 – Stage-Storage-Discharge Information

Elevation (m)	Head (m)	Orifice/Weir Flow (m^3/s)*	Volume (m^3)	Remarks
238.535	0.00	0.0000	0.00	75mm diameter orifice invert
238.585	0.05	0.0007	0.00	Bottom of storage tanks (inside)
238.910	0.38	0.0070	18.80	Contour
239.235	0.70	0.0099	37.59	Contour
239.560	1.03	0.0122	56.39	Contour
239.885	1.35	0.0141	75.18	Top of storage tanks (inside)
240.850	2.32	0.0186	76.39	Top of grate (CBMH2)
240.900	2.37	0.0188	77.39	7.2m wide weir
240.950	2.42	0.1425	77.50	Contour

*Refer to Appendix A for the orifice and weir equations

Table 4.3 summarizes the storage volume requirements of the tanks for the 2-year and 100-year storm events.

Table 4.3 – Proposed Conditions Active Storage Volume Requirements Summary

Storm Event	Active Storage Volume Required (m^3)*	Active Storage Volume Provided (m^3)
2-Year	45.51	77.5
100-Year	77.44	

*See MIDUSS output in Appendix B

With the addition of the 75mm diameter orifice plate and the 7.2m wide weir, the post-development runoff from the controlled portion of the site flowing to Tower Lane during the 2- and 100-year storm events is controlled to 0.011m^3/s and 0.052m^3/s, respectively. The maximum depth for the 2- and 100-year storm events is 239.372m and 240.922m, respectively, which represents 0.0cm of surface ponding during the 2-year storm event and 5.0cm of surface ponding during the 100-year storm event, with 2.2cm flowing over the weir. Table 4.4 below summarizes the total pre- and post-development flows directed towards Tower Lane. In both the 2- and 100-year storms, post-development flow rates to Tower Lane are lower than the pre-development flow rates. Ponding on the roof does not exceed 14cm during the 100-year storm event.

Table 4.4 – Summary of Flows

Modelling Condition	2-Year Storm Event to Tower Lane (m^3/s)	100-Year Storm Event to Tower Lane (m^3/s)
Pre-Development	0.017	0.090
Post-Development	0.014	0.089

Since no runoff from the site is conveyed towards University Drive in the existing condition, the private storm sewer system on University Drive was evaluated to determine whether the system has capacity to convey flows from the site, for storms up to and including the 100-year event. Refer to Figure 3.0 and the storm sewer design sheet in Appendix C for the analysis of the existing private storm sewer pipe capacity within University Drive, considering the post-development runoff from the site.

It is noted that only the rooftop runoff directly entering the University Drive storm sewer network has been considered in the design sheet in Appendix C. As seen in the design sheet, the existing private storm sewer system on University Drive has adequate capacity to accept rooftop runoff from the development for the 2-year storm event however, the pipes have not been sized to accommodate the 100-year storm under existing conditions. Thus, the additional rooftop runoff from the development for the 100-year storm event does not create further concerns for the existing private storm sewer network. When the private storm sewer network within University Drive reaches full capacity during the larger storm events, the proposed building will not be at risk as the connection to the storm sewer will be connecting to the roof only. Overland flow within University Drive will transport the excess runoff over the surface to the west as per existing conditions.

The proposed development will represent an improvement from a stormwater management perspective. In the existing condition, all runoff is conveyed north towards Tower Lane and the residential properties. Under the proposed condition, runoff for events up to and including the

100-year storm will be reduced and redirected away from the northern residential properties. For example, the total uncontrolled runoff north under existing conditions is 17L/s and 90L/s for the 2-year and 100-year storm events, respectively. Under post-development conditions, Catchment 206 will generate only 6L/s and 40L/s over the surface for the 2-year and 100-year storm events, respectively. Furthermore, existing mature trees along the northern property line will be maintained.

The floodline elevation of 241.30 (CGVD 1928) provided by UTRCA was converted CGVD 1928, 1978 Adjustment to match the datum of the topographic survey and illustrated on the civil drawings. The floodline limit is below the proposed finished floor elevation of 242.25. At the northern most overhead door, internal ramping will occur to transition from the exterior grade of 241.10 to the FFE of 242.25. There is no basement in the northern limit of the building as per the architectural floor plans. The floodline limit would not extend into the recessed courtyard near CBMH1.

4.3 Water Quality Control

Currently, the site has a 517.9m^2 asphalt parking lot which drains untreated to Tower Lane. In the post-development condition, the site will have a vehicular asphalt area of 490.1m^2 which is 27.8m^2 less than the existing condition. This reduction in vehicular area and number of parking stalls in post-development conditions will be an improvement to the existing condition. It is also noted that all runoff directed to University Drive is from the roof, landscaped, or pedestrian areas which is clean. Thus, no on-site quality control measures are proposed.

4.4 Erosion and Sediment Control

In order to minimize the effects of erosion during the grading of the site, sediment control fencing will be installed, as shown on the appended engineering drawing, around any stockpiles and around the catchbasins during construction. Any sediment that is tracked onto the roadway during the course of construction will be cleaned by the contractor. To help minimize the amount of mud being tracked onto the roadway, a mud mat will be installed at the primary construction entrance.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the foregoing analysis, it is concluded that:

i) the proposed stormwater management design provides adequate attenuation of the 2- and 100-year storm events when considering pre-development conditions as well as capacity of receiving storm infrastructure;

ii) the proposed stormwater management design satisfies the water quality control requirement; and,

iii) upon completion of construction, the site will conform to the design criteria specified by the City of London.

It is recommended that:

i) the site grading be undertaken according to the proposed elevations, details and erosion control measures shown on the enclosed engineering drawings;

ii) the stormwater management facilities be installed as detailed on the enclosed engineering drawings; and

iii) the stormwater management facilities be inspected by MTE Consultants Inc. during construction and certified to the City of London upon completion.

All of which is respectfully submitted,

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