FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

DUNLOP DEVELOPMENTS (BARRIE) INC.

PROPOSED MIXED-USE HIGH-RISE DEVELOPMENT

149 DUNLOP STREET EAST
CITY OF BARRIE, SIMCOE COUNTY

CITY FILE: D28-011-2022

Project No.: 22-0017BA **March 2025**

Revision	*Date*	*Description*
0.	*April 2024*	*1st Functional Submission*
1.	*October 2024*	*2nd Functional Submission*
2.	*February 2025*	*3rd Functional Submission – Response to LSRCA Comments*
3.	*March 2025*	*4th Functional Submission*

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1.0 INTRODUCTION

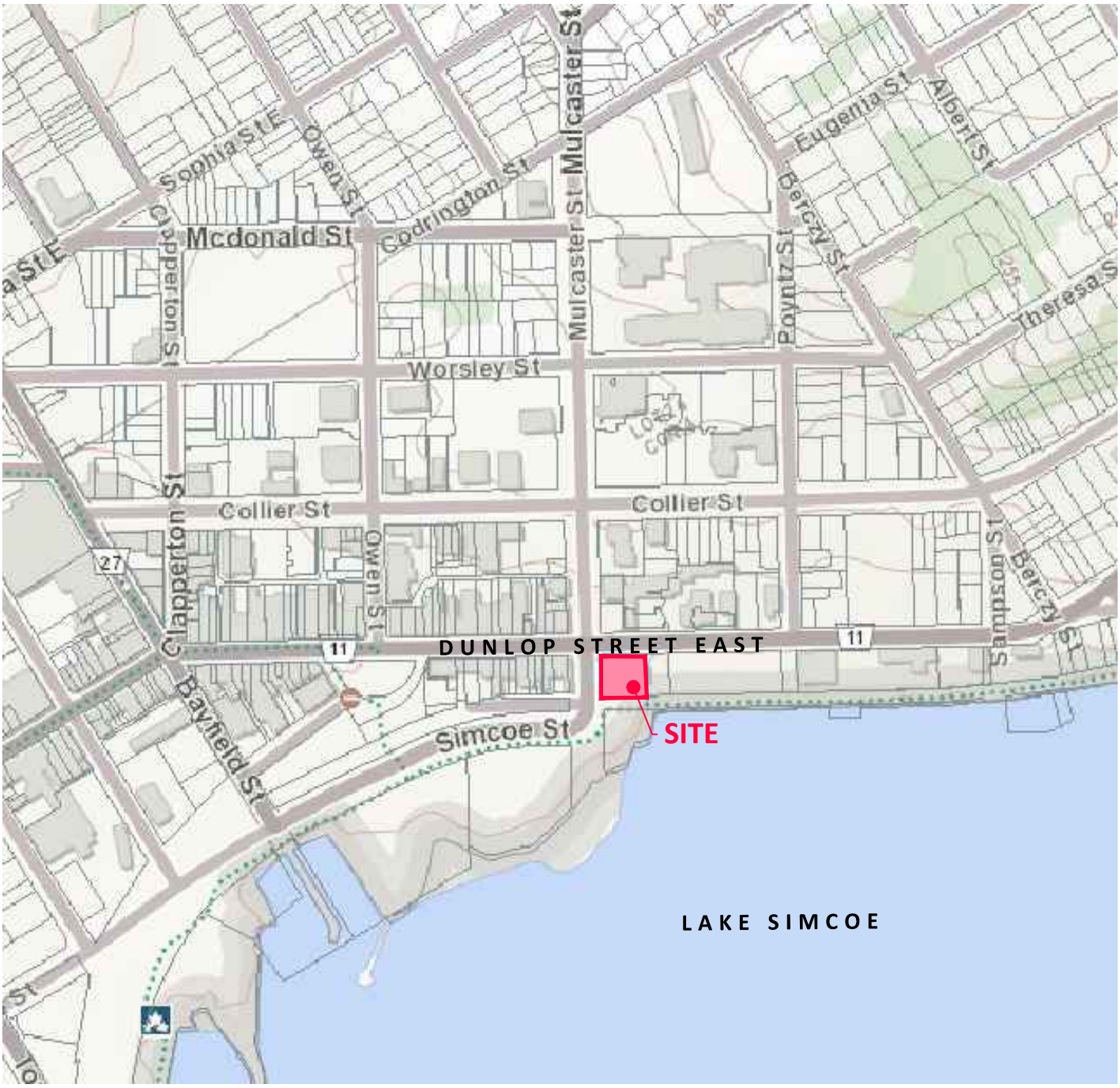
Urbanworks Engineering Corporation has been retained by Dunlop Developments (Barrie) Inc. to complete a Functional Servicing and Stormwater Management Report in support of a Zoning By-law Amendment (ZBA) application for a proposed mix-use high-rise project located at 149 Dunlop Street East, in the City of Barrie, Simcoe County. The property can be legally described as Water Lot 17 and 18, Plan 51R-32085, City of Barrie, Simcoe County.

As shown in Figure 1-1, the property is located within the boundaries of Bayfield Street to the west, Worsley Street to the north, Berczy Street to the east, and Lake Simcoe to the south. Adjacent the site is a park to the east and mix-use residential/commercial developments to the north and west.

The Site Plan for the property was prepared by Scott Shields Architects Inc. on March 27, 2024. The proposed development is comprised of a twenty-five (25) storey mixed-use residential/commercial building, with two levels of underground parking. The site area is approximately 0.15 ha. A copy of the proposed Site Plan and site statistics is provided in Appendix A.

The purpose of this report is to describe the proposed servicing strategy for the subject development. The recommended servicing plans have been prepared in accordance with design criteria and requirements of the City of Barrie (City), Simcoe County (County), and Lake Simcoe Region Conservation Authority (LSRCA).

The information in this report is intended to assist the municipality and other regulatory agencies in their review of the ZBA and future SPA applications for the proposed development.



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LEGEND

SITE BOUNDARY

FIGURE 1-1
SITE LOCATION PLAN

22-0017BA	MARCH 2025	N.T.S.

2.0 REFERENCES

The following material has been reviewed during the preparation of this report:

- **City of Barrie**, *"Sanitary Infrastructure Design Standard", S600* ,2024.
- **City of Barrie**, *"Low Impact Development Interim Guidance",* 2019.
- **City of Barrie**, *"Drinking Water Infrastructure Design Standard", W500A,* 2024.
- **City of Barrie**, *"Stormwater Infrastructure Design Standard", June* 2023.
- **LSRCA**, "*LSRCA Technical Guidelines for Stormwater Management Submissions"*, April 2022.
- **LSRCA, "**LSRCA Phosphorus Offsetting Policy", May 2023.
- **Ministry of Environment**, *"Stormwater Management Practices Planning and Design Manual",* March 2003.
- **Palmer Environmental**, *Preliminary Hydrogeological Investigation – 149 -153 Dunlop Street East, Barrie, Ontario*, September 29, 2023.
- **R-PE Surveying Ltd**, Topographic Survey, dated December 4, 2020.
- **Scott Shields Architects Inc.,** Site Plan, October 11, 2024
- **Fire Underwriters Survey,** "Water Supply for Public Fire Protection", 2020

3.0 PROPOSED DEVELOPMENT

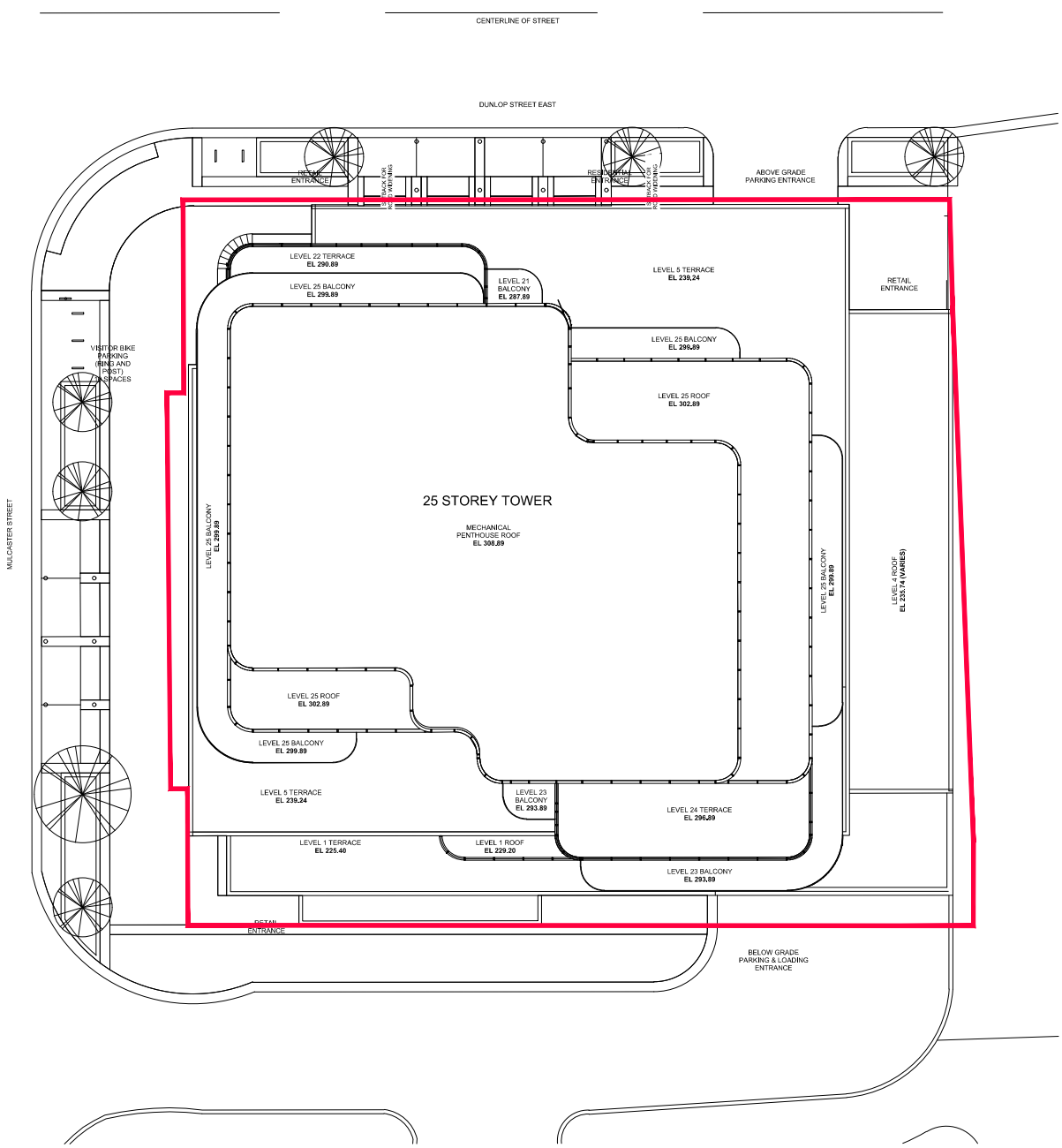
The layout of the proposed development plan is shown in Figure 3-1. The Site Plan for the property was prepared by Scott Shields Architects Inc. on October 11, 2024.

The proposed development will include a twenty-five-storey mixed-use building with retail space on the ground floor, two levels of underground parking. There are 160 residential units proposed with a variable number of bedrooms ranging from studio to 3 bedrooms + den. Based on these unit counts, a design population has been estimated and summarized in Table 3-1. Site Plan statistics are provided in Appendix A.

An above-grade parking entrance is provided on the north side of the site via Dunlop Street East. Entry to the underground parking levels, and a loading entrance, is provided on the south side of the site via an existing laneway. A copy of the Site Plan prepared by the architect is included in Appendix A.

Table 3-1: Summary of Design Population

Land Use	Units	Population Density	Population
High-Density Residential	160	1.67 persons/unit	267



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LEGEND

SITE BOUNDARY

FIGURE 3-1
PROPOSED SITE PLAN

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4.0 STORMWATER MANAGEMENT

The criteria and requirements applicable to the stormwater management plan for the site have been established based on a review of the pertinent documents listed in Section 2.0.

4.1 Stormwater Design Criteria

The following storm drainage criteria have been adopted for the stormwater management system within the proposed development.

City of Barrie:

- Local storm sewers to be designed using the Rational Method and based on a 5-year storm return frequency:

$$Q = C\,i\,A / 360$$

Where: Q = Flow Rate (m^3/s)
C = Runoff Coefficient
A = Drainage Area (ha)
i = Rainfall Intensity (mm/hr)

- Rainfall Intensity calculations for storm sewer design will be based on the City of Barrie standard IDF relationships, and will be calculated as follows:

$$i = A / (T + B)^C$$

Where: A, B, C are constants per Table 4-1 below

T = Time of Concentration (min.), with a minimum time of 10 min.

- Minimum storm sewer diameter is 300 mm.
- Acceptable flow velocities within storm sewer shall be between 0.75 m/s and 4.0 m/s for pipes flowing full.
- Peak flows from subject sites shall fall within the design capacity of any downstream municipal infrastructure (i.e. sewers).
- Minor municipal sewer system shall be sized to convey the 1 in 5-year storm event.

Table 4-1: Rainfall Intensity Equation Coefficients

Storm Event	Coefficients		
	A	B	C
2-year	675.586	4.681	0.780
5-year	843.019	4.582	0.763
10-year	976.898	4.745	0.760
25-year	1133.123	4.734	0.756
50-year	1251.473	4.847	0.753
100-year	1383.628	4.905	0.754

- Minimum runoff coefficients will be as specified in Table 3-1 of the City of Barrie Design Criteria (2023). For estimating flows larger than the 10-year return storm, the runoff coefficients should be increased to account for saturation of the catchment surface. Coefficients for larger storms are to be derived using the following equations:

  $C_{25} = 1.1 * C_5$

  $C_{50} = 1.2 * C_5$

  $C_{100} = 1.25 * C_5$

LSRCA Criteria:

As per the LSRCA criteria, and the Lake Simcoe Protection Plan (LSPP), the proposed development is classified as a “major development” as a building with ground floor area of 500 m^2 or more is proposed. The as per the LSRCA SWM guidelines the following criteria shall apply to major developments.

- Quantity Control – Post-development peak flows for the 1in 2-year through the 1 in 100-year storm design storm event shall not be exceeded in the post-development condition.
- Quality Control – An Enhanced (Level 1) water quality protection (80% TSS removal) shall be provided to site runoff.
- Volumetric Control – Volume controls apply for site works which result in the fully re-construction of 0.50 ha or more of impervious surface. Note that as the subject site is less than 0.50 ha the LSRCA volumetric control policy is considered not applicable.
- Water Balance – The site is located within a WHPA-Q2. As per this classification the site

is subject to the recharge management policy to maintain infiltration/recharge to the extent practical.

- Phosphorus Controls – As per the LSPP, the site shall provide a pre-to-post development phosphorus loading assessment and demonstrate how this loading will be minimized. In addition, a target on-site removal of 80% of the site's annual Total Phosphorus load should be achieved.

How the site is proposed to achieve the above-mentioned City of Barrie and LSRCA SWM requirements is further explored in the following sections.

4.2 Existing Conditions

4.2.1 Topography and Drainage

The subject site is located within the Lake Simcoe Watershed. Lake Simcoe is located approximately 50 m to the southeast of the site. In addition, the southeast portion of the site is in a LSRCA regulated area.

A review of existing site conditions on site was carried out using topographical information. Topographical information was obtained from a detailed survey completed by R-PE Surveying Ltd., on December 4, 2020. Based on the available topographic information the site drains in two directions.

The portion of the site fronting Dunlop Street East drains northerly towards the road, while the rear (south) side of the site drains southerly to a shared private driveway. This driveway slopes westward to Mulcaster Street, where site runoff is collected by roadside catch basins. There is a retaining wall along the east site boundary. There does not appear to be any external areas draining onto the site. Figure 4-1 illustrates the existing drainage boundaries.

Due to the small size of the site (less than 5.0 ha), existing flows were estimated using the Rational Method. Table 4-2 provides a summary of estimated pre-development flows. Although the site drains in different directions, the ultimate receiver of the flow is the same and therefore the site is treated as one catchment area. Calculations are provided in Appendix B.

Table 4-2: Summary of Pre-Development Flows (m^3/s)

Return Period	Flow
2	0.024
5	0.032
10	0.037
25	0.048
50	0.057
100	0.063

4.2.2 Existing Drainage Infrastructure

Evidence of existing drainage infrastructure or servicing on site was limited to topographic information and engineering drawings. The topographic drawing shows a catch basin on the north portion of the site. Based on the engineering drawings, existing infrastructure includes the

following:

- An existing 300 mm diameter storm sewer along Dunlop Street East.
- An existing 750 mm diameter storm sewer along Mulcaster Street.

Based on the available drawings, the 300 mm diameter storm sewer along Dunlop Street East conveys flow westerly towards the 750 mm diameter pipe along Mulcaster Street. Flow is then conveyed southerly along Mulcaster to Lake Simcoe via a 900 mm diameter sewer and outfall. Overland flows from these roads are conveyed to Lake Simcoe.

As per existing drainage plans (City Drawing 2008-05 Sheet STM-1), the site appears to be included in the design of the existing storm sewer system with a runoff coefficient of 0.70. Existing infrastructure is shown on Figure 4-1. References for the existing storm sewer system design have been provided in Appendix A.

4.2.3 Soil Conditions

Soil conditions on site were determined based on a hydrogeological investigation prepared by Palmer Environmental, dated September 29, 2023. Field work for the investigation included three boreholes. Boreholes 1 and 2 were advanced to a depth of 9 m below grade, and borehole 3 was advanced to a depth less than 1.0 m.

Based on this investigation, topsoil was only encountered in BH 3, with most of the site being asphalt covered. The topsoil consisted of trace sand, trace gravel and was moist. The asphalt had a thickness of 100 mm. Beneath the asphalt was a layer of fill ranging from 0.1 m to approximately 4.5 mbgs. Fill material consisted of a silty sand, with trace gravel and cobbles. Native material consisted of medium to coarse sand with trace gravel, cobbles, and organics.

Groundwater levels on site ranged between 1.96 to 6.65 mbgs (218.76 to 219.17 masl). Based on the measured water levels across the site, groundwater flows in a southwesterly direction towards Lake Simcoe. It is noted that groundwater levels can vary and are subject to seasonal fluctuations in response to weather events.

4.3 Proposed Stormwater Management Plan

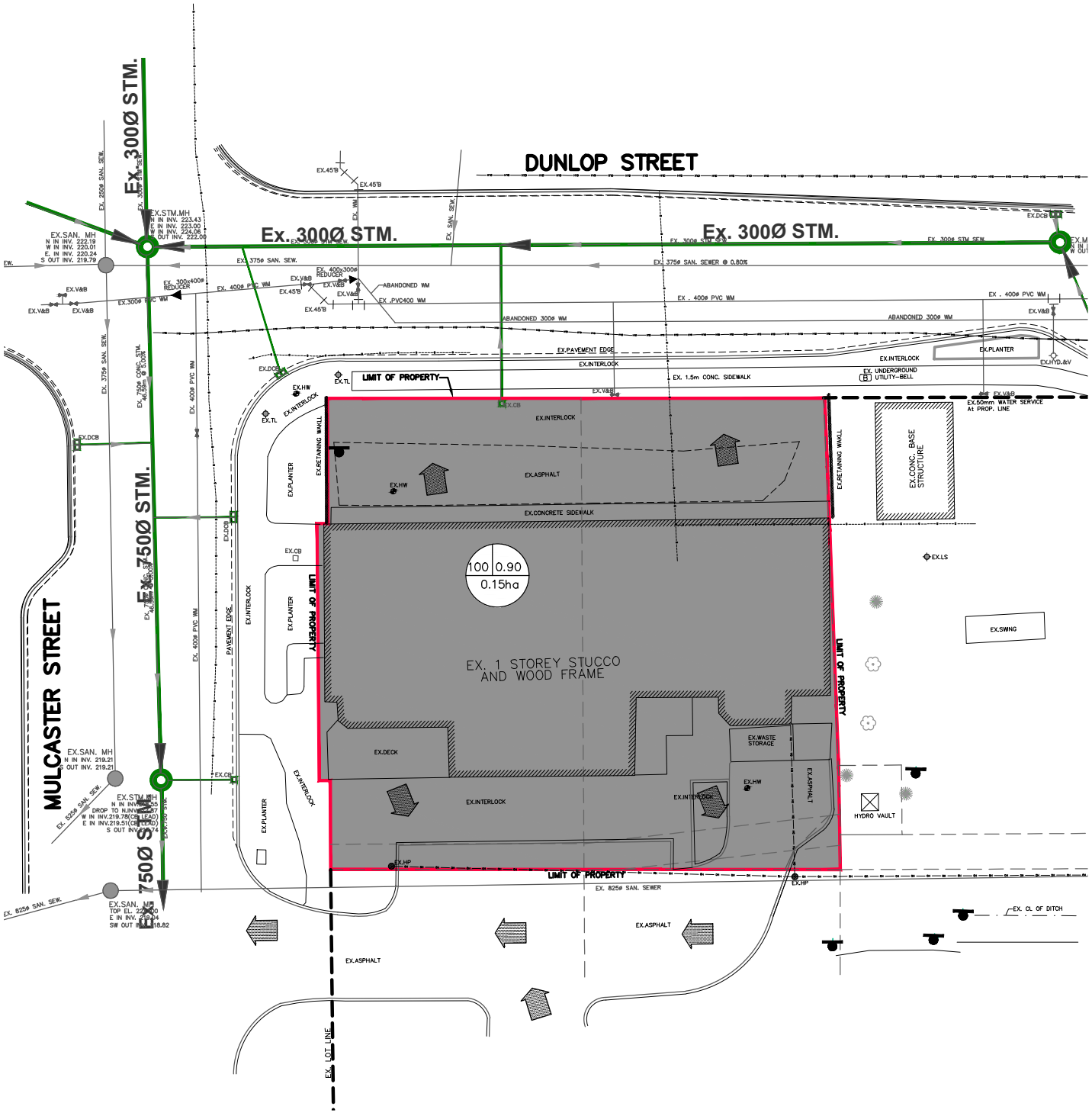
In general, it is proposed to collect and discharge runoff to the existing 750 mm diameter storm sewer along Mulcaster Street. On-site measures are proposed to provide quantity controls on site, prior to discharging runoff from the site. Quantity control is proposed via a flow restrictor (i.e.,

orifice plate) and on-site storage in the form of an underground tank and on the rooftop.

Quality control measures are not proposed as majority of the site (i.e., 82% by area) is covered with rooftop area. Rooftop runoff is generally considered clean, and free of pollutants which are present in driveable paved surfaces.

As per the LSRCA's design guidelines, developments which propose to fully re-construct less than 0.50 ha or more of impervious surface are not subject to volumetric control requirements, however some mitigation is still proposed.

The overall drainage plan for the development is shown schematically on Figure 4-2. Further description of the proposed SWM plan is provided below. Additional design details of the proposed drainage plan are provided in the Preliminary Engineering Drawings included in Appendix E.



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LEGEND

- EXISTING STORM SEWER
- SITE BOUNDARY
- EXISTING CONTOUR
- OVERLAND FLOW DIRECTION
- PERVIOUS AREA
- IMPERVIOUS AREA

FIGURE 4-1
EXISTING DRAINAGE PLAN

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4.3.1 Quantity Control and Storage Requirements

It is proposed to discharge runoff from the site at a reduced rate via on-site controls. Proposed on-site controls include rooftop storage and an underground storage tank with an end-of-pipe flow restrictor (orifice plate). One orifice plate is proposed to control flows to the estimated design flow of the existing storm sewer system.

The allowable release rate for the site was determined using the Rational Method. As shown with in the stormwater management calculations in Appendix B and per City Drawing 2008-05 Sheet STM-1 in Appendix A. The site was included in the existing storm sewer design with a runoff coefficient of 0.7. A minimum time of concentration of 10 minutes was used to determine the intensity. The proposed allowable release rate is as summarized in Table 4-3.

Table 4-3: Summary of Allowable Release Rate Calculation

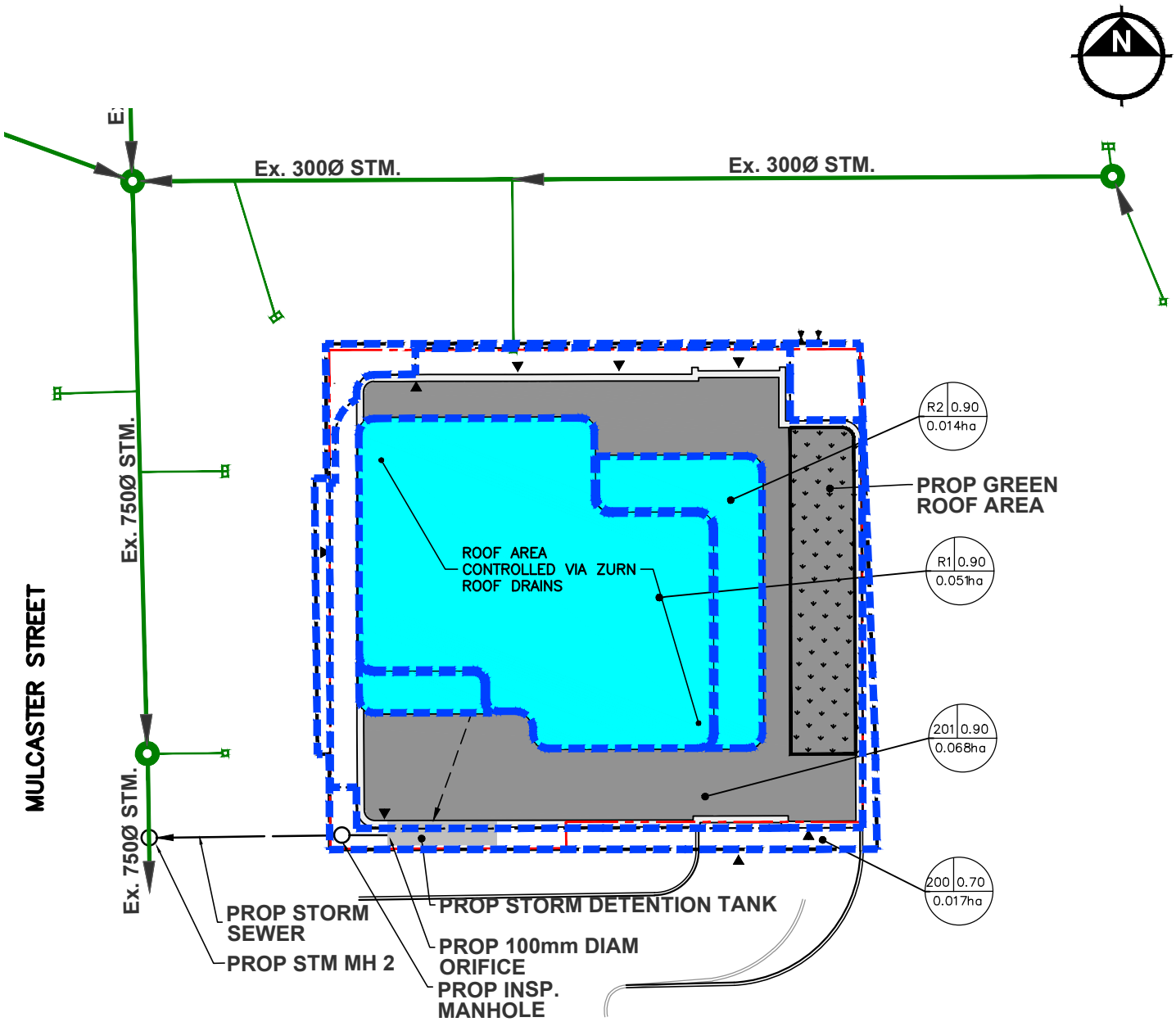
Storm Event	Area (ha)	Runoff Coefficient	Intensity (mm/hr)	Allowable Release Rate (m^3/s)
5-year	0.15	0.70	109.1	0.032

A small 0.02 ha portion of the site drains uncontrolled. The allowable release rates will be reduced to account for the 100-year discharge from the uncontrolled areas. The 100-year uncontrolled flow is estimated to be 0.007 m^3/s. Therefore, peak flows from the remainder of the site will be controlled to 0.025 m^3/s (0.032 – 0.007 m^3/s). Supporting release rate calculations are provided in Appendix B for reference.

Rooftop Storage

By applying the City of Barrie's IDF parameters to determine rainfall intensity, the rational method was used to estimate the quantity control storage volume required to achieve on-site quantity control objectives. Two roof areas are proposed to provide storage. Each location is shown on Figure 4-2. Both rooftop storage locations are proposed to be fitted with Zurn style drains (or equivalent). The final roof drain design will be confirmed by the site's mechanical consultant at the detailed design stage. Preliminary Rooftop storage calculations are provided in Appendix B.

Rooftop runoff will discharge into the proposed underground detention storage tank for further attenuation. Table 4-4 provides a summary of rooftop drain and storage requirements.



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LEGEND

- EXISTING STORM SEWER
- PROPOSED DRAINAGE AREA BOUNDARY
- 184.5 EXISTING CONTOUR
- PROPOSED ROOF AREA CONTROLLED WITH ZURN ROOF DRAINS

DRAINAGE AREA
AREA I.D. 100 | 0.50 (RUNOFF COEFF.) / 1.00ha (DRAINAGE AREA)

FIGURE 4-2
PROPOSED DRAINAGE PLAN

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Table 4-4: Summary of Roof Controls and Storage Requirements

Storage ID	Rooftop Area (m^2)	# of notches	Proposed Release Rate (L/s)	Storage Required (m^3)	Storage Provided (m^3)
Roof 1	508	2	3.7	13.1	63.2
Roof 2	138	1	1.9	3.0	17.2
Total	646	3	5.6	15.8	80.4

Underground Storage Tank

All controlled runoff from the site landscape and roof areas will be directed to the underground storage tank, except for uncontrolled areas. A portion of the rooftop flow will discharge into the tank at a controlled rate of 5.6 L/s, as shown in Table 4-4.

The required storage volume of the tank was calculated using the Rational Method. Controlled flow from the roof was treated as a constant flow, which is conservative. During a 100-year storm, it is estimated that a volume of approximately 10 m^3 will be required. Calculations are provided in Appendix B.

The proposed orifice will have an invert of 218.15 with a design 100-year high water level (HWL) of 219.15. A 100 mm diameter orifice tube is expected to be required to meet the allowable release rate at the prescribed 100-year HWL and will drain to the municipal sewer on Simcoe Street by gravity.

4.3.2 Water Quality Control

In general, the LSRCA and City of Barrie design guidelines require that 80% TSS removal be achieved prior to discharging runoff to the environment. The proposed development includes a building envelope that covers 82% of the site with rooftop area. Rooftops are generally considered clean as they do not include contaminants that would typically be associated with or found overtop of paved drivable area, including hydrocarbons, silts, or ice prevention/management agents (i.e. de-icing salts or sands).

As the area of the site which is clean surface area exceeds 80% of the total site area, it is anticipated that a minimum 80% of the site's runoff will not be laden with suspended solids or sediments. Furthermore, the practice of providing a centralized treatment device to treat all site flows would typically aim to remove 80% of TSS from 90% average annual flows. As clean flows are anticipated to make up no less than 80% of site runoff, the site is expected to passively

achieve the water quality objectives of the site. In this way it is anticipated that no additional water quality control measures are required for the site to achieve the water quality control criteria.

4.3.3 Volumetric Control

In accordance with the LSRCA requirements, on-site retention of runoff to address long-term erosion and runoff volume control is encouraged and required for new developments which fall within the category of a “major development” and where 0.50 ha or greater of existing impervious surface is reconstructed. As per the above definition, outlined in the LSRCA SWM guidelines, the proposed development is less than 0.50 ha (i.e. 0.15 ha) and therefore the volumetric control policy is not considered to apply for the site.

However, as a “major development” and as a best practice, the LSRCA’s retention requirements were considered when designing the site’s stormwater management system and is explored in the following sections.

4.3.3.1 Volumetric Criteria

As per the LSRCA stormwater management criteria, volumetric controls should consider the retention of the first 25 mm of rainfall across proposed impervious surfaces. However, on sites where restrictions or limitations exist, flexible treatment alternatives should be considered as an alternative. These limitations include:

1. Karst Geology;
2. Shallow Bedrock;
3. High Groundwater;
4. Hotspots or contaminated soils;
5. Areas with high chloride concentrations;
6. Significant Groundwater Recharge Area and WHPA or Intake Protection Zones or within 15 meters of a drilled drinking water well (within 30 meters of a dug well);
7. Zoning, setbacks, or other land use requirements;
8. Property or infrastructure restrictions;
9. Excessive cost;
10. Poor soils (infiltration rates that are low or too high, problematic urban soils, such as soils that are highly compacted or altered); and
11. Highly Vulnerable Aquifer;

Under the flexible treatment alternatives, the other alternative options include:

Alternative 1 – Retain runoff from a 12.5 mm event from all impervious surfaces.

Alternative 2 – Retain runoff from the maximum event possible (minimum 5mm) from all impervious surfaces.

Considering the above criterion, the subject development is limited by the proposed site layout and development requirements which limit the extent to which LID mitigation measures can be provided. In more detail the site's limitations include:

- Site parking requirements which require the implementation of two (2) levels of underground parking structure beneath most of the site area. This limits the area which can be utilized to provide infiltration-based LIDs as any ground level landscaped area will be underlain by concrete underground parking levels.

In light of the above restrictions, and as a best practice, any proposed mitigation measures for the proposed development would target Alternative 2 (retention of 5 mm of rainfall) as a result of the listed site restrictions

4.3.3.2 Mitigation Measures

Despite this, a green roof is proposed on a portion of the building's roof area. The green roof will provide some runoff retention through the capture of rainwater in its soil structure, as well as enhanced evapotranspiration versus a typical roof.

Assuming a standard green roof, with an equivalent abstraction value of 5.0 mm, the proposed green roof is estimated to provide a retention volume of ~0.62 m^3 (124 m^2 x 5mm ÷ 1000 = 0.62 m^3) through additional abstraction volume. This is an equivalent site retention of 0.41mm across the site area, which is 6.64 m^3 short of reaching the total 7.26 m^3 required to provide 5 mm retention over the site's impervious areas.

Therefore, the sum of all the site's retention mitigation measures is anticipated to provide a total 0.41 mm of retention across the site area, as a best effort. As the LSRCA volumetric control requirement is understood to not be applicable, due to the development's size, it is anticipated that the proposed development meets and exceeds volumetric control requirements.

Note that the potential for additional mitigation volume can be provided, if deemed necessary or desirable, through the implementation of other options including:

- Rainwater harvesting and re-use stored within an underground cistern, and utilized for on-site uses such as landscape irrigation, and grey water, and consumed in 72 hours.
- Permeable pavers on available landscaped areas.

The final mitigation measures and their associated design will be discussed and finalized at the detailed design stage. Retention volume mitigation calculations are provided in Appendix B.

4.3.4 Water Balance

As per the hydrogeologist report by Palmer, the site is located within a WHPA-Q2 and therefore, it is subject to the recharge management policy to maintain infiltration/recharge to the extent practical. A pre-to post-development water balance is typically completed to determine the percent (%) change in runoff and groundwater recharge from the proposed development to determine an infiltration volume target.

Currently, the entire site area is covered by impervious surface, with little to no recharge function. Furthermore, the proposed development will also be covered with impervious surfaces. As the change in impervious area from pre-to-post development conditions is minimal, there is no expected change in groundwater recharge from pre-development to post-development conditions, and therefore a formal pre-to-post development water balance assessment is not required.

Lastly, it is noted that due to the site's proposed green roof area, it is anticipated that site annual runoff volumes would be reduced via the increased abstraction and evapotranspiration provided by these new softscape areas. As such the proposed development is anticipated to provide an improvement in runoff mitigation over existing conditions.

4.3.5 Phosphorus Loading and Removal

Due to the high phosphorus levels in Lake Simcoe, the LSRCA guidelines have set a target of 'zero' increase in phosphorus loading from existing to post-development conditions.

The impact of the proposed development on phosphorus levels has been analysed using three scenarios: existing, post-development without mitigation, and post-development with mitigation. Loading values were obtained using Table 2 of the phosphorus budget tool in support of sustainable development prepared by the Ontario Ministry, provided in Appendix B.

Existing Conditions

Under existing conditions, the site is used for commercial purposes with a plaza and restaurant. Using Table 2 of the budgeting tool, the site is considered as "Commercial" with a loading rate of 1.82 kg/ha/yr. With a site area of 0.15 ha, the annual phosphorus loading is 0.27 kg/yr.

Post-Development Without Mitigation

Under post-development conditions, approximately 0.15 ha of residential area will be constructed. The post-development loading is as summarized in Table 4-5. Based on Table 4-5 the annual

phosphorus loading under post-development conditions, without mitigation, is 1.32 kg/yr, which equates to a site loading of 0.20 kg/yr. This is a 26% decrease from the existing condition.

Table 4-5: Post-Development Phosphorus Loading Without Mitigation

Land Use / Cover	Area (ha)	Loading Rate (kg/ha/yr)	Annual Phosphorus Loading (Kg/yr)
Residential	0.15	1.32	0.20

Post-Development with Mitigation Measures

Since the post-development annual phosphorus loading is estimated to be less than the existing condition, no mitigation measures are proposed.

5.0 SANITARY SERVICING

5.1 Existing Conditions

Based on available engineering drawings provided by the City, there are existing 375 mm diameter sanitary sewers along Dunlop Street East and Mulcaster Street. The sewers system conveys wastewater westerly along Dunlop Street East to Mulcaster Street. Wastewater is then conveyed southerly along Mulcaster Street to an existing 525 mm diameter sewer.

There is also an existing 825 mm diameter sanitary trunk sewer that runs adjacent along the southern property line. The existing 825 mm diameter sanitary sewer conveys wastewater along Lakeshore Drive and ultimately into the existing 975 mm diameter sanitary trunk sewer Along Simcoe Street

Based on the current land-use, the estimated existing flow is as summarized in Table 5-1.

Table 5-1: Anticipated Sanitary Flows in Existing Design

Land use	Area (ha)	Design Rate (m^3/day/ha)	Average Flow (L/s)	Extraneous Flow[1] (L/s)	Peak Flow[2] (L/s)	Total Flow (L/s)
Commercial	0.15	28	0.05	0.02	0.1	0.1

[1] Based on 0.1 L/s/ha
[2] Based on a peak factor of 2

The existing sanitary sewer system is shown on the Engineering Drawings in Appendix E.

5.2 Design Criteria

The sanitary flow calculations are based on the following City of Barrie's "Sanitary Sewage Collection System Policies and Design Guideline:

- Domestic sewage flow rate for residential areas is 225 L/cap/day.
- Sewage flow rate for commercial areas is 28 m^3/day/ha
- Extraneous Flow rate is 0.1 L/s/ha of gross area.
- Harmon Peaking Factor, K is $1 + 14/(4 + P^{0.5})$, where P is population in thousands.
- Population densities are as per Section 3.3.1.1 of the City's Design Guidelines.

5.3 Proposed Sanitary Servicing

The proposed sanitary servicing layout includes a system of internal sanitary sewers with a service connection for each unit. The network will convey wastewater southerly, towards the Lakeshore Drive sanitary trunk sewer system. Ultimately all internal building sanitary flows will be conveyed to a mechanical room within Level P2 where it will connect to a 200 mm diameter sanitary service lateral, flow into the Control Sanitary Manhole and then drain through a 1.3 m long 200 mm diameter sanitary sewer connecting to the existing 825 mm diameter Lakeshore Sanitary Trunk.

Through correspondence with the City, an HGL elevation equal to the top of grate elevation of the first downstream manhole (elev. 221.100) was provided. As such, the Sanitary Control manhole grate elevation is set to 221.100 and as a preventative measure, the sanitary service will come equipped with a backflow preventor. The proposed 200 mm diameter sanitary service will connect to the existing 825 mm Lakeshore Trunk through means of coring into the concrete pipe and utilization of an inserta-tee.

The proposed sanitary sewer system is illustrated on the Engineering Drawings, provided in Appendix E.

Based on the City of Barrie design guidelines and the area of the proposed development, the anticipated average and peak sanitary flows are summarized in Table 5-2. Calculations are provided in Appendix C.

Table 5-2: Summary of Average Sanitary Flows

Land use	Area or G.F.A.	Pop.	Average Flow[1] (L/s)	Peaking Factor	Peak Flow (L/s)	Extraneous (L/s) *	Total Flow (L/s)
High-Den Residential	0.15 ha	267	0.70	4.10	2.85	0.02	2.87
Commercial **	701 m^2	N.A.	0.02	2.00	0.04	-	0.04
Total	-	267	0.70	-	2.89	0.02	2.91

*Extraneous Infiltration flows based on total site area of 0.15 ha.
**Commercial flows determined based on Commercial GFA, as per the latest architectural plans, and demands generated using the City of Barrie's minimum commercial average flow rate of 28 m^3/ha/day for general applications.

6.0 WATER SUPPLY

6.1 Existing Water Supply Servicing

The vicinity of the site is well developed and therefore there are existing water supply infrastructure available. Based on engineering drawings provided by the City, the following watermains are present:

- Existing 400 mm diameter watermain along the south side of Dunlop Street East, east of Mulcaster Street
- Existing 30 mm diameter watermain along the south side of Dunlop Street East, west of Mulcaster Street
- Existing 400 mm diameter watermain on the east side of Mulcaster Street, south of Dunlop Street East

6.2 Design Criteria

The water demand used for main size selection should be equal to the Fire Flow Demand plus the Maximum Day Demand or the Maximum Hour Demand, whichever is greater. The following guidelines were used in the design calculations for water supply as per City of Barrie's design criteria.

Typical Water Demand Criteria:

- Residential - 225 L/cap/day
- Commercial – 28 m^3/ha/day

Peaking Factors – Based on MECP Design Guidelines for Drinking-Water Systems, 2008 (Table 3-1 and Table 3-3)

Fire Flow

- Refer to FUS Calculations

Pressure:

- Preferred pressure range for Average Day Maximum Day is 350 - 485 kPa
- Preferred pressure range for Minimum Hour and Peak Hour demand is 275 – 700 kPa
- Minimum pressure under any non-fire demand scenario is 275 kPa
- Minimum residual pressure during Maximum Day + Fire Flow is 140 kPa
- Maximum static pressure is 690 kPa

6.3 Proposed Water Supply Servicing

It is proposed to provide water to the site via connection to the existing 400 mm diameter watermain along Dunlop Street East. A 150 mm diameter watermain connection pipe is proposed at the northeast corner of the site.

Based on the City of Barrie design guidelines, the anticipated water demands are summarized in Table 6-1. Calculations are provided in Appendix D. Additional details are provided in the Functional Servicing Plan provided in Appendix E.

Table 6-1: Summary of Anticipated Water Demands

Expected Population (1)	Residential Avg. Flow (L/s)	Comm. Avg. Flow (L/s)	Total Average Day Demand (L/s)	Max. Day Demand (L/s)	Peak Hour Demand (L/s)	Fire Flow Demand (2) (L/s)	Fire Flow + Max Day (L/s)
267	0.70	0.02	0.72	2.80	4.17	133	135.80

Note:
(1) Based on Table 1-1
(2) Based on FUS calculations in Appendix D

The site's proposed watermain connections will include a 150 mm diameter PVC domestic line and a PVC 200 mm diameter fire fighting supply line. Each connection will be made independently to the existing 400 mm diameter municipal main. The site's fire connection sizing has been provided in accordance with the City of Barrie's 2024 Drinking Water Infrastructure Design Standard W500A, which states that a minimum 150 mm pipe size is required for systems designed for fire protection.

6.4 Proposed Service Connection Sizing

The Hazen-Williams equations were employed to check the appropriate sizing of the site's water service connections. The results of these calculations found that the proposed Fire Connection will need to be a minimum 200 mm diameter PVC pipe to remain within the maximum 5.0 L/s flow velocity required to provide the site's fire flow demand.

Similarly, a check on the domestic connection size found that a minimum 150 mm diameter PVC pipe will be required to ensure that the domestic service maintains a head-loss gradient of less than 2.5 m/km during normal operating conditions (i.e. Average and Max Day Flow Conditions) as per the City of Barrie design criteria for drinking water systems.

Lastly, a check was provided for the anticipated operating pressure at the proposed building face, for both the proposed domestic and fire service. By using fire hydrant testing results (further discussed in Section 6.6) to anticipate the municipal watermain pressure in both the max day and max day + fire scenario, the anticipated head loss across each of the site's service connections was estimated and used to determine the anticipated operating pressure at the building.

Based on the calculated operating pressures within the domestic and fire service, the provided water service sizes are adequate to ensure operating pressures remain above the minimum permissible operating pressure of 20 PSI (or 140 kPa). As such it is expected that the provided service connection sizes are appropriately sized for the proposed development.

Associated calculations are provided in Appendix D for reference.

6.5 FUS Calculation

Fire flow demand for high rise / downtown / mixed-use developments is required to be calculated using the Fire Underwriters Survey (FUS 2020) in accordance with City of Barrie criteria. It is our understanding that the proposed building will be constructed using:

- Non-combustible (Type I) Construction Type (C = 0.8), as verified by the letter of commitment by Scott Shields Architects dated March 7, 2025.
- Fully Supervised Sprinkler System, with a standard water supply connection; and
- Limited Combustible Occupancy (-15% factor).

Furthermore, as the building is to be constructed using a non-combustible building type, the site's FUS calculation will consider the floor area of the two (2) largest adjoining floors, plus 50% of the next eight (8) floors above it.

Note that a letter of commitment has been provided by the site architect (Scott Shields Architects) confirming that the proposed building will be constructed using non-combustible construction (Type II) for all structural elements (i.e. walls, arches, floors). These elements will provide a minimum 1-hour fire resistance rating using non-combustible materials. This letter of commitment has been provided in Appendix D for reference.

Based on the listed assumptions, the anticipated fire demand was calculated as 133 L/s, as reflected in the site water supply demand presented in Table 6-1. Associated calculations are provided in Appendix D for reference.

6.6 Hydrant Test

A hydrant test was completed by Flowmetrix dated July 4, 2023. The flow hydrant was located a few meters to the east of the site, which is the closest hydrant to the proposed connection point for the site's watermain system.

Based on the test results, with a residual pressure of 140 kPa (20 psi), there is an available flow of approximately 199 L/s (3,153 USGPM). A flow of 199 L/s is higher than the anticipated required maximum day + fire flow (135.80 L/s). Therefore, no capacity constraints are expected.

7.0 GRADING PLAN

A grading plan for the site has been prepared in conjunction with the storm and sanitary system design and with consideration of the grading of the adjacent roads and lots, as well as future development. The grading of the site has been designed to provide adequate cover for municipal services.

The grading design for the development is provided on Drawing SG-01 - Functional Site Grading Plan, included in Appendix E.

8.0 Erosion & Sediment Control Measures

During the construction and site preparation of the proposed development, different erosion and sediment control measures shall be employed to minimize impacts of sediment laden runoff on downstream infrastructure. All propose measures shall consider the December 2006 Erosion and Sediment Control Guidelines for Urban Construction (Greater Golden Horseshoe Conservation Authorities), City of Barrie, and LSRCA criteria.

The proposed erosion and sediment control works during construction will consist of, but not limited to:

- temporary silt fences;
- sediment traps;
- individual catch basin silt sacks:
- mud mats at the construction access point;
- cut-off swales;
- topsoil stockpiles, equipped with silt fencing;
- Siltsoxx or rock flow check dams:

An Erosion and Sediment Control plan will be provided at the detailed design stage. The final erosion and sediment control measures to be used, and their locations on-site, will be confirmed at the detailed design stage.

9.0 SUMMARY

This report outlines the proposed servicing scheme for 149 Dunlop Street East in the City of Barrie. The following is a summary of the conclusions of this report:

- Post-development peak flows are proposed to be controlled to the 5-year pre-development rates as per the design of the existing storm sewer. Flow control is proposed to be achieved using underground storage chambers with orifice plates and rooftop storage.
- Water quality control measures are not proposed as over 90% of the site is covered by rooftop area and considered clean.
- Due to the small size of the site, retention of rainfall on site for erosion, or volume control is not required.
- Sanitary servicing is proposed via connection to existing services along Lakeshore Drive at the southern property line of the site.
- Water supply servicing is proposed via connection to existing services along Dunlop Street.

This report is being submitted to the City of Barrie, LSRCA, and the County of Simcoe in support of Zoning By-law Amendment (ZBA) and future Site Plan Control (SPA) applications.

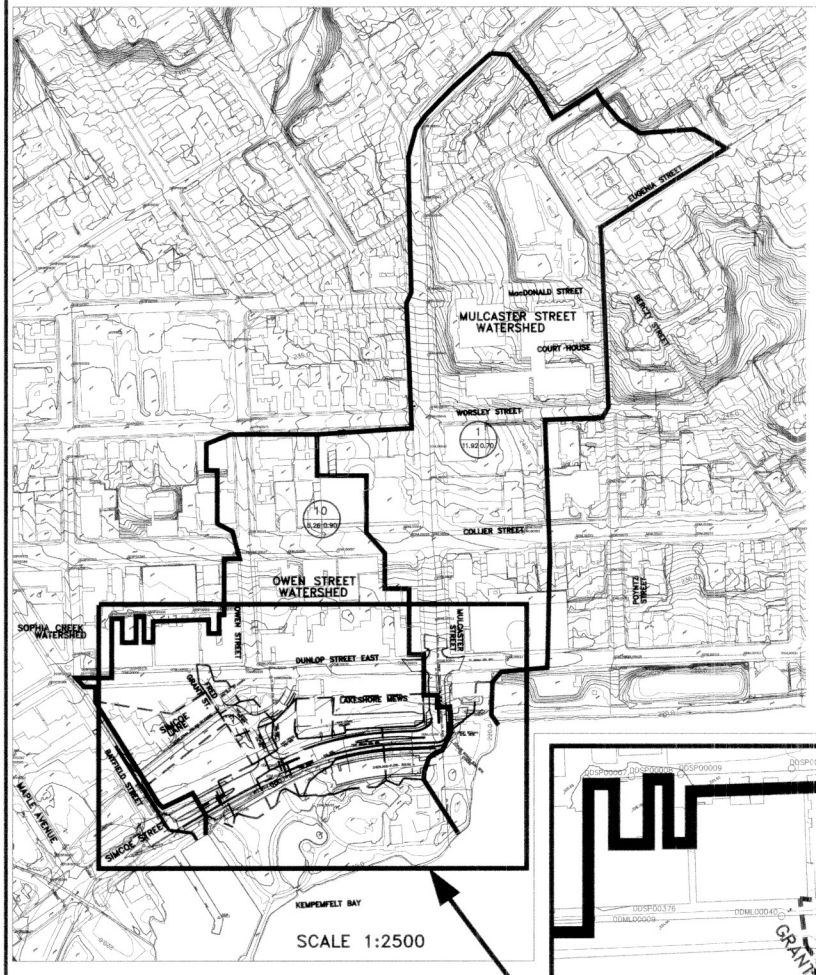
Respectfully Submitted,

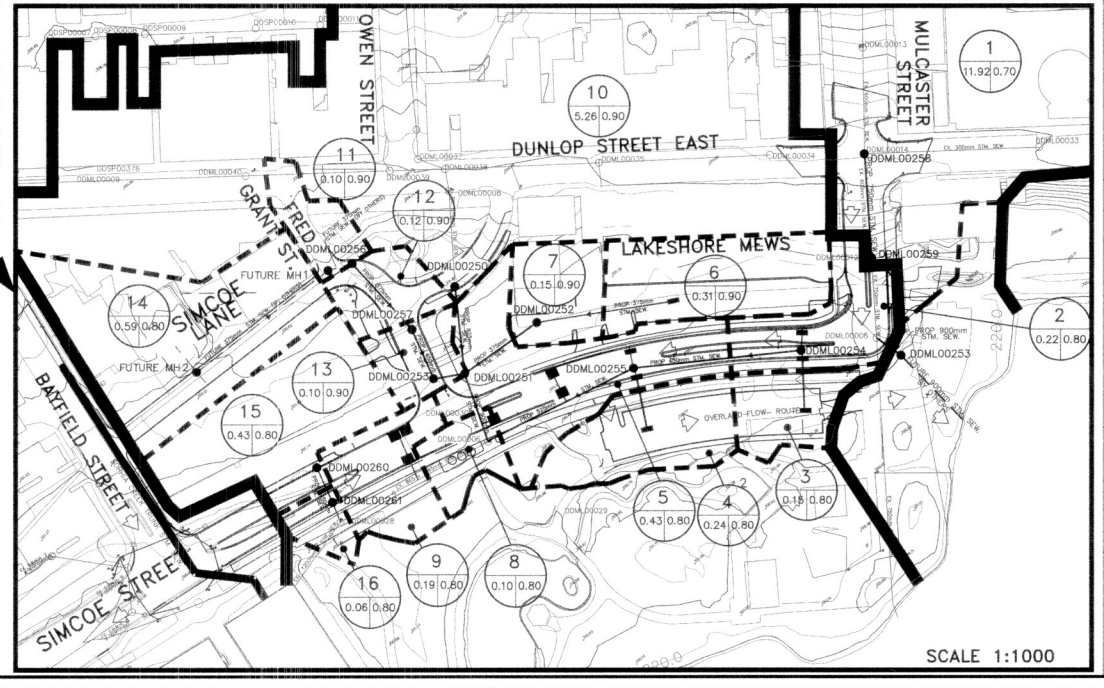
Urbanworks Engineering Corporation

Giancarlo Volpe, M.Eng., P.Eng.
Project Engineer

APPENDIX A

CITY REFERENCE DOCUMENT AND
PROPOSED SITE PLAN





STORM LEGEND

- DRAINAGE BOUNDARY
- SUB-CATCHMENT BOUNDARY
- MAJOR SYSTEM FLOW
- SUBCATCHMENT
- AREA (ha) / RUNOFF COEFFICIENT
- 375mmø PROPOSED STORM SEWER
- DDML00256 PROPOSED STORM MANHOLE
- PROPOSED CATCH BASIN
- FUTURE STORM SEWER (BY OTHERS)
- EXISTING STORM MANHOLE
- EXISTING CATCH BASIN
- EXISTING STORM SEWER

NO.	REVISIONS	DATE	APPROVED
	MINISTRY OF THE ENVIRONMENT SUBMISSION	2008.02.26	L.H.B.

CITY OF BARRIE
APPROVED
DATE: May 2/08
R. J. McArthur, P. Eng.
DIRECTOR OF ENGINEERING

LICENSED PROFESSIONAL ENGINEER
L.H. BORGDORFF
PROVINCE OF ONTARIO

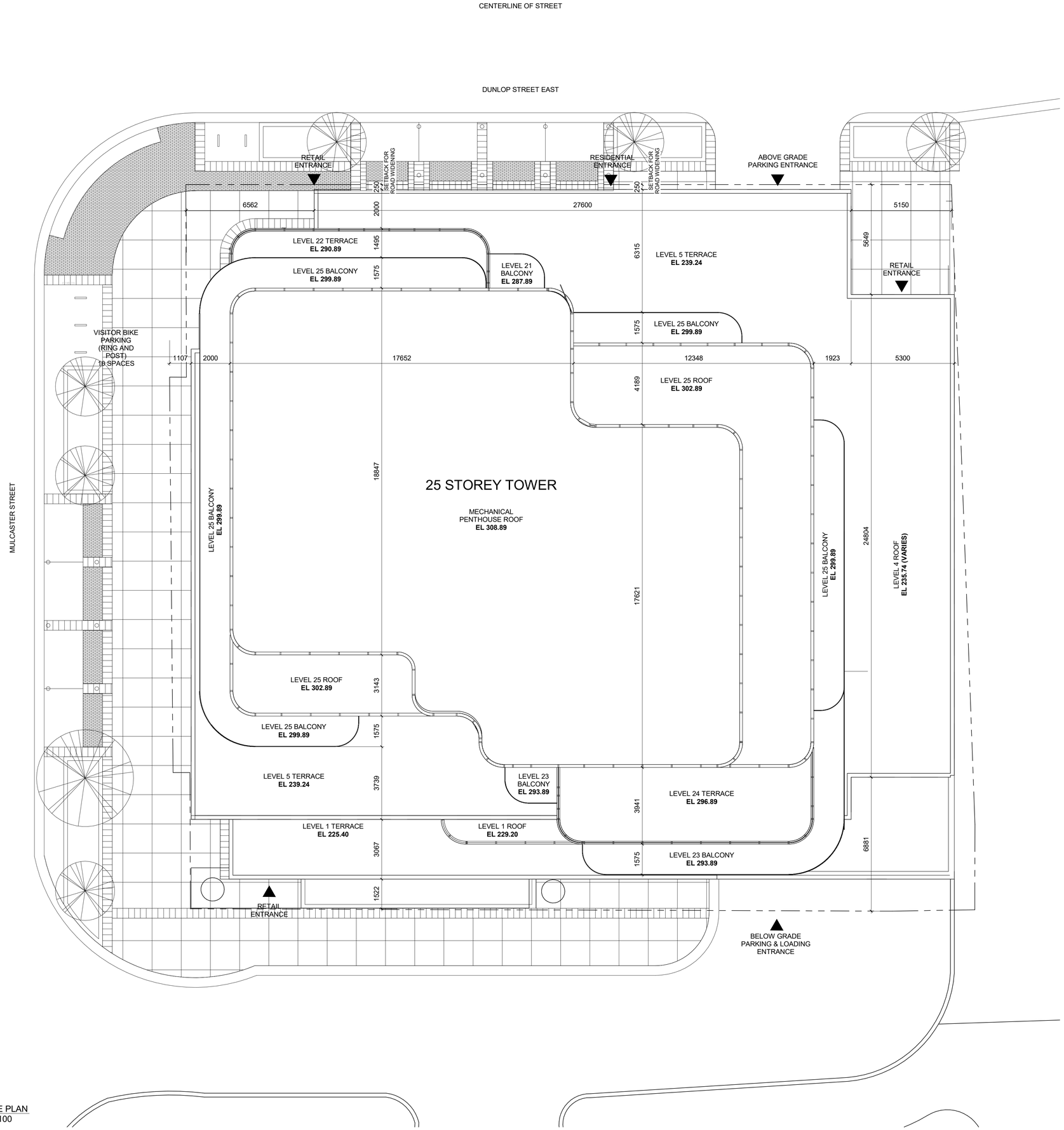
SIMCOE STREET RECONSTRUCTION BAYFIELD ST. TO MULCASTER ST.

STORM DRAINAGE PLAN

CITY of BARRIE
ENGINEERING DEPARTMENT

SCALE HOR.	AS SHOWN	VERT.	AS SHOWN	DRAWING NO.	2008-05
DESIGN	M.R.M.	DRAWN	M.R.M.	SHEET NO.	STM1
REVIEWED	L.H.B.	DATE	2008.04.30		

2008-005-002



1 SITE PLAN
1 : 100

General Notes

1. ALL DIMENSIONS IN MILLIMETRES.
2. VERIFY ALL DIMENSIONS.
3. DO NOT SCALE DRAWINGS.
4. CHECK DRAWINGS AGAINST SPECIFICATIONS.
5. USE THE LATEST REVISED DRAWINGS ONLY.
6. REPORT ANY DISCREPANCIES, DISCOVERED ERRORS, OR OMISSIONS, TO THE ARCHITECT BEFORE PROCEEDING.
7. DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF THE ARCHITECT, AND MUST BE RETURNED UPON COMPLETION OF WORK.

True North Project North

GENERAL NOTE:
ADEQUATE STOPPING SIGHT DISTANCE HAS BEEN PROVIDED USING THE APPLICABLE DESIGN SPEED FOR ALL PROPOSED ACCESS CONNECTIONS. ALL SIGHT LINES ARE FREE OF POTENTIAL OBSTRUCTIONS SUCH AS BUILDINGS, PARKING, SIGNS OR VEGETATION.

No.	Issue	Date
4	ISSUED FOR ZBLA	2024-10-11
3	ISSUED FOR ZBLA	2024-08-15
2	ISSUED FOR ZBLA	2024-03-27

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scottarch.ca

Project
149 Dunlop
149 Dunlop Street East, Barrie, ON.

Drawing
SITE PLAN

Project number	27301
Date	Issue Date
Drawn by	AH, YL, RC
Checked by	AS

A1.02

Scale

APPENDIX B

STORMWATER MANAGEMENT CALCULATIONS

PEAK FLOW CALCULATION: RATIONAL METHOD

PRE-DEVELOPMENT CONDITION

PROJECT: 149 Dunlop Street East
FILE No.: 22-0017BA
DATE: 2024-10-17
PREPARED BY: DV

IDF DATA SET:	City of Barrie - Table 3-1		
STORM	**COEFFICIENTS**		
EVENT	**A**	**B**	**C**
2 YR.	675.586	4.681	0.780
5 YR.	843.019	4.582	0.763
10 YR.	976.898	4.745	0.760
25 YR.	1133.123	4.734	0.756
50 YR.	1251.473	4.847	0.753
100 YR.	1383.628	4.905	0.754

Rainfall Intensity: $I = A / (B + tc)^C$
Peak Flow: $Q = 0.00278 * (C \cdot I \cdot A)$
Min. Inlet Time: $Tc = 10.0min.$

STORM	**AREA**	**AREA**	**C**	**A x C**	**Tc**	**I**	**Q**	**Q**
EVENT	**I.D.**	**(ha)**			**(min.)**	**(mm/hr)**	**(m^3/s)**	**(L/s)**
2 YR.	100	0.15	0.70	0.105	10.0	83.1	0.0242	24.2
5 YR.	100	0.15	0.70	0.105	10.0	109.1	0.0318	31.8
10 YR.	100	0.15	0.70*	0.105	10.0	126.4	0.0369	36.9
25 YR.	100	0.15	0.77*	0.116	10.0	148.3	0.0476	47.6
50 YR.	100	0.15	0.84*	0.126	10.0	164.1	0.0574	57.4
100 YR.	100	0.15	0.84*	0.126	10.0	180.4	0.0632	63.2

* *Adjusted runoff coefficients ,*
per City of Barrie Engineering Design Criteria:

$C_{25} = 1.1 * C5$
$C_{50} = 1.2 * C5$
$C_{100} = 1.25 * C5$

PEAK FLOW CALCULATION: RATIONAL METHOD
POST-DEVELOPMENT CONDITION

urbanworks ENGINEERING CORPORATION

PROJECT: 149 Dunlop Street East
FILE No.: 22-0017BA
DATE: 2024-10-17
PREPARED BY: DV

IDF DATA SET:	City of Barrie - Table 3-1		
STORM EVENT	COEFFICIENTS		
	A	B	C
2 YR.	675.586	4.681	0.780
5 YR.	843.019	4.582	0.763
10 YR.	976.898	4.745	0.760
25 YR.	1133.123	4.734	0.756
50 YR.	1251.473	4.847	0.753
100 YR.	1383.628	4.905	0.754

Rainfall Intensity: $I = A / (B + tc)^C$
Peak Flow: $Q = 0.00278 * (C \cdot I \cdot A)$
Min. Inlet Time: $Tc = 10.0min.$

STORM EVENT	AREA I.D.	AREA (ha)	C	A x C	Tc (min.)	I (mm/hr)	Q (m^3/s)	Q (L/s)
2 YR.	100	0.1500	0.90	0.135	10.0	83.1	0.0312	31.2
5 YR.	100	0.1500	0.90	0.135	10.0	109.1	0.0409	40.9
10 YR.	100	0.1500	0.90*	0.135	10.0	126.4	0.0474	47.4
25 YR.	100	0.1500	0.99*	0.149	10.0	148.3	0.0612	61.2
50 YR.	100	0.1500	1.00*	0.150	10.0	164.1	0.0684	68.4
100 YR.	100	0.1500	1.00*	0.150	10.0	180.4	0.0752	75.2

UNCONTROLLED FLOWS

STORM EVENT	AREA I.D.	AREA (ha)	C	A x C	Tc (min.)	I (mm/hr)	Q (m^3/s)	Q (L/s)
2 YR.	200	0.0170	0.70	0.012	10.0	83.1	0.0027	2.7
5 YR.	200	0.0170	0.70	0.012	10.0	109.1	0.0036	3.6
10 YR.	200	0.0170	0.70*	0.012	10.0	126.4	0.0042	4.2
25 YR.	200	0.0170	0.77*	0.013	10.0	148.3	0.0054	5.4
50 YR.	200	0.0170	0.84*	0.014	10.0	164.1	0.0065	6.5
100 YR.	200	0.0170	0.84*	0.014	10.0	180.4	0.0072	7.2

** Adjusted runoff coefficients ,*
per City of Barrie Engineering Design Criteria:

$C_{25} = 1.1 * C5$
$C_{50} = 1.2 * C5$
$C_{100} = 1.25 * C5$

ALLOWABLEL RELEASE RATE CALCULATION: RATIONAL METHOD

Uncontrolled Flow

PROJECT: 149 Dunlop Street East
FILE No.: 22-0017BA
DATE: 2024-10-17
PREPARED BY: DV

=Total Target Flow rate in proposed conditions

urbanworks
ENGINEERING CORPORATION

Allowable Release Rate

$Q = Q_{PRE} - Q_U$

Where: Q = Allowable Post-Development Release Rat (100-Year)
Q_{PRE} = Pre-Development Flow (5-Year)
Q_U = Post-Development Uncontrolled Flow (100-Year)

Pre-Development Flow (5-Year Q_{PRE} (L/s)	Post-Development Uncontrolled Flows Q_U (L/s)	Allowable Post-Dev. Release Rate Q (L/s)
31.8	7.2	24.7

Project # 22-0017BA
Date: April 24, 2024

ZURN CONTROL ROOF DRAINAGE SYSTEM (Phase III)

• Zurn Model Z105 Control-Flo Roof Drain with Parabolic Weir to be installed on all rooftops
Large Roof Area **508** m^2 = 0.0508 ha

REQUIRED NUMBER OF DRAINS:
Based on an estimated sloped roof design, and respecting the 15m max. distance to the edge of the rooftop and 30m max. distance between drains, approximately **2** drains are required for this building.

REQUIRED NUMBER OF NOTCHES:
Based on a 6" rise (152mm) with a notch flow rate of 1.858 L/s/notch at 124.5 mm depth, as per Zurn Control-Flo specifications
Using the corresponding notch rating area of 465 m^2/notch, number of notches required = 1.09
Therefore, this building requires **2** notches

Total Release Rate = (# notches) (1.858 L/s/notch) **= 3.72 L/s**

Roof Storage Provided = **63** **m^3**
Provided roof storage volume based on an estimated sloped roof design for the specific building

Coefficients for Storms Larger than a 5 Year Return:
100 Year Storm C = **1.00**

Area (ha) =	0.05
C =	1.00
Max. Release Rate (l/s) =	3.7

Design Storm =	City of Barrie 100-Year
A =	1383.628
B =	4.905
C =	0.754

	100 Year			Maximum Release Rate		Required
Time	Intensity	Rooftop	Runoff	Release	Release	Storage
(min)	100 year	Runoff	Volume	Runoff	Volume	Volume
	(mm/hr)	(l/s)	(m^3)	(l/s)	(m^3)	(m^3)
10	180.44	25.48	15.29	3.72	2.23	13.06
11	150.18	21.21	14.00	3.72	2.45	11.55
12	142.44	20.12	14.48	3.72	2.68	11.81
13	135.53	19.14	14.93	3.72	2.90	12.03
14	129.33	18.26	15.34	3.72	3.12	12.22
15	123.72	17.47	15.73	3.72	3.34	12.38
16	118.62	16.75	16.08	3.72	3.57	12.52
17	113.97	16.10	16.42	3.72	3.79	12.63
18	109.71	15.49	16.73	3.72	4.01	12.72
19	105.78	14.94	17.03	3.72	4.24	12.79
20	102.15	14.43	17.31	3.72	4.46	12.85
25	87.47	12.35	18.53	3.72	5.57	12.96
30	76.77	10.84	19.52	3.72	6.69	12.83
35	68.60	9.69	20.35	3.72	7.80	12.54
40	62.14	8.78	21.06	3.72	8.92	12.14
45	56.89	8.03	21.69	3.72	10.03	11.66
50	52.54	7.42	22.26	3.72	11.15	11.11
55	48.86	6.90	22.77	3.72	12.26	10.51
60	45.70	6.45	23.24	3.72	13.38	9.86
70	40.57	5.73	24.07	3.72	15.61	8.46
80	36.57	5.16	24.79	3.72	17.84	6.95
90	33.35	4.71	25.43	3.72	20.07	5.36
100	30.69	4.33	26.01	3.72	22.30	3.71
120	26.57	3.75	27.02	3.72	26.76	0.26
140	23.51	3.32	27.88	3.72	31.21	0.00

		Required Roof Storage (m^3):	**13.1**
Printed:	17-Oct-24	**Provided Roof Storage (m^3):**	**63.2**

Project No. 22-0017BA
Date: 2024-10-17

ZURN CONTROL ROOF DRAINAGE SYSTEM (Phase III)

• Zurn Model Z105 Control-Flo Roof Drain with Parabolic Weir to be installed on all rooftops
Small Roof Area **137.85** m^2 = 0.0138 ha

REQUIRED NUMBER OF DRAINS:
Based on an estimated sloped roof design, and respecting the 15m max. distance to the edge of the rooftop and 30m max. distance between drains, approximately **1** drains are required for this building.

REQUIRED NUMBER OF NOTCHES:
Based on a 6" rise (152mm) with a notch flow rate of 1.858 L/s/notch at 124.5 mm depth, as per Zurn Control-Flo specifications
Using the corresponding notch rating area of 465 m^2/notch, number of notches required = 0.30
Therefore, this building requires **1** notches

Total Release Rate = (# notches) (1.858 L/s/notch) **= 1.86 L/s**

Roof Storage Provided = 17 m^3
Provided roof storage volume based on an estimated sloped roof design for the specific building

Coefficients for Storms Larger than a 5 Year Return:
100 Year Storm C = **1.00**

Area (ha) =	0.01
C =	1.00
Max. Release Rate (l/s) =	1.9

Design Storm =	City of Barrie 100-Year
A =	1383.628
B =	4.905
C =	0.754

	100 Year			Maximum Release Rate		Required
Time	Intensity	Rooftop	Runoff	Release	Release	Storage
(min)	100 year	Runoff	Volume	Runoff	Volume	Volume
	(mm/hr)	(l/s)	(m^3)	(l/s)	(m^3)	(m^3)
10	180.44	6.91	4.15	1.86	1.11	3.03
11	150.18	5.76	3.80	1.86	1.23	2.57
12	142.44	5.46	3.93	1.86	1.34	2.59
13	135.53	5.19	4.05	1.86	1.45	2.60
14	129.33	4.96	4.16	1.86	1.56	2.60
15	123.72	4.74	4.27	1.86	1.67	2.59
16	118.62	4.55	4.36	1.86	1.78	2.58
17	113.97	4.37	4.46	1.86	1.90	2.56
18	109.71	4.20	4.54	1.86	2.01	2.53
19	105.78	4.05	4.62	1.86	2.12	2.50
20	102.15	3.91	4.70	1.86	2.23	2.47
25	87.47	3.35	5.03	1.86	2.79	2.24
30	76.77	2.94	5.30	1.86	3.34	1.95
35	68.60	2.63	5.52	1.86	3.90	1.62
40	62.14	2.38	5.72	1.86	4.46	1.26
45	56.89	2.18	5.89	1.86	5.02	0.87
50	52.54	2.01	6.04	1.86	5.57	0.47
55	48.86	1.87	6.18	1.86	6.13	0.05
60	45.70	1.75	6.31	1.86	6.69	0.00
70	40.57	1.55	6.53	1.86	7.80	0.00
80	36.57	1.40	6.73	1.86	8.92	0.00
90	33.35	1.28	6.90	1.86	10.03	0.00
100	30.69	1.18	7.06	1.86	11.15	0.00
120	26.57	1.02	7.33	1.86	13.38	0.00
140	23.51	0.90	7.57	1.86	15.61	0.00

		Required Roof Storage (m^3):	**3.0**
Printed:	17-Oct-24	**Provided Roof Storage (m^3):**	**17.2**

ORIFICE CONTROL SIZING CALCULATION

PROJECT: 149 Dunlop Street East
FILE No.: 22-0017BA
DATE: 2024-10-17
PREPARED BY: DV

urbanworks ENGINEERING CORPORATION

Orifice Control Equation

$$Q = C \bullet A \bullet (2gh)^{0.5}$$

Where: Q = Flow Rate
C = Discharge Coefficient
C (tube) = 0.80
C (plate) = 0.62
A = Orifice Area
g = Acceleration Due to Gravity = 9.81 m/s^2
h = Head

Orifice Diameter (mm)		100
High Water Elev. (m)		219.150
Orifice Invert Elev. (m)		218.150
Flow Rate (L/s)	Required	24.7
	Provided	21.0

Orifice Center Elev. (m)	*218.20*
Head (m)	*0.950*
C	*0.62*
Orifice Area (m^2)	*0.0079*

STORMWATER STORAGE & RELEASE CALCULATION

100-YEAR STORM

PROJECT: 149 Dunlop Street East
FILE No.: 22-0017BA
DATE: 2024-10-17
PREPARED BY: DV

urbanworks
ENGINEERING CORPORATION

DRAINAGE AREA I.D.	201		
DRAINAGE AREA (ha)	0.063		
RUNOFF COEFF. (C)	1.00		
A x C	0.063		
TOTAL A x C	0.063		
TIME OF CONCENTRATION	10.0	min.	
TIME STEP	1.0	min.	
CONTROLLED RELEASE RATE (Q_C)	0.0210	m^3/s	
MAX. STORAGE REQUIRED	9.68	m^3	

IDF DATA SET: City of Barrie - Table 3-1

STORM EVENT	COEFFICIENTS A	B	C
100 YR.	1383.628	4.905	0.754

Roof Flow 1	3.72	L/s
Roof Flow 2	1.86	L/s
	5.57	L/s

T	*I = A * B / (tc + C)*	*Q_R =(C·I·A)*0 .00278*	*$V_R = Q_R \cdot T \cdot 60$*	*$V_C = Q_C \cdot T \cdot 60$*	*$V = V_R - V_C$*
TIME (min.)	**RAINFALL INTENSITY (mm/hr)**	**RUNOFF (m^3/s)**	**RUNOFF VOL. (m^3)**	**CONTROLLED RELEASE VOL. (m^3)**	**STORAGE VOL. (m^3)**
10	180.4	0.037	22.29	12.61	9.68
11	171.8	0.036	23.52	13.88	9.65
12	164.1	0.034	24.69	15.14	9.55
13	157.1	0.033	25.80	16.40	9.40
14	150.8	0.032	26.85	17.66	9.19
15	145.1	0.031	27.87	18.92	8.95
16	139.8	0.030	28.84	20.18	8.66
17	135.0	0.029	29.78	21.44	8.33
18	130.5	0.028	30.69	22.70	7.98
19	126.4	0.028	31.56	23.97	7.60
20	122.5	0.027	32.42	25.23	7.19
21	118.9	0.026	33.25	26.49	6.76
22	115.6	0.026	34.06	27.75	6.31
23	112.5	0.025	34.85	29.01	5.84
24	109.5	0.025	35.62	30.27	5.35
25	106.7	0.024	36.38	31.53	4.84
26	104.1	0.024	37.12	32.80	4.32
27	101.7	0.023	37.85	34.06	3.79
28	99.3	0.023	38.56	35.32	3.24
29	97.1	0.023	39.26	36.58	2.68
30	95.0	0.022	39.96	37.84	2.11
31	93.0	0.022	40.64	39.10	1.53
32	91.1	0.022	41.31	40.36	0.94
33	89.3	0.021	41.97	41.63	0.34
34	87.5	0.021	42.62	42.89	0.00
35	85.9	0.021	43.26	44.15	0.00
36	84.3	0.020	43.90	45.41	0.00
37	82.8	0.020	44.53	46.67	0.00
38	81.3	0.020	45.15	47.93	0.00
39	79.9	0.020	45.76	49.19	0.00
40	78.6	0.019	46.37	50.45	0.00
41	77.3	0.019	46.97	51.72	0.00
42	76.0	0.019	47.57	52.98	0.00
43	74.8	0.019	48.16	54.24	0.00
44	73.7	0.018	48.75	55.50	0.00
45	72.5	0.018	49.33	56.76	0.00
46	71.5	0.018	49.90	58.02	0.00
47	70.4	0.018	50.48	59.28	0.00
48	69.4	0.018	51.04	60.55	0.00
49	68.4	0.018	51.60	61.81	0.00

PHOSPHORUS LOADING

PROJECT: 149 Dunlop St E
FILE No.: 22-0017BA
DATE: 2024-10-17
PREPARED BY: MP

PRE-DEVELOPMENT

Land Use/Coverage	Area (ha)	Phosphorus Unit Loading Rate (kg/ha/yr)	Annual Phosphorus Loading (kg/yr)
Commercial/Industrial	0.15	1.82	0.27

Post-Development Without Mitigation

Land Use/Coverage	Area (ha)	Phosphorus Unit Loading Rate (kg/ha/yr)	Annual Phosphorus Loading (kg/yr)
Residential	0.15	1.32	0.20
Total	0.15	1.32	0.20

Table 2. Land-Use Specific Phosphorus Export Coefficients (kg/ha/yr) for Lake Simcoe Subwatersheds

Subwatershed	Phosphorus Export (kg/ha/yr)											
				High Intensity Development								
	Cropland	Hay-Pasture	Sod Farm/Golf Course	Commercial /Industrial	Residential	Low Intensity Development	Quarry	Unpaved Road	Forest	Transition	Wetland	Open Water
Monitored Subwatersheds												
Beaver River	0.22	0.04	0.01	1.82	1.32	0.19	0.06	0.83	0.02	0.04	0.02	0.26
Black River	0.23	0.08	0.02	1.82	1.32	0.17	0.15	0.83	0.05	0.06	0.04	0.26
East Holland River	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26
Hawkestone Creek	0.19	0.10	0.06	1.82	1.32	0.09	0.10	0.83	0.03	0.04	0.03	0.26
Lovers Creek	0.16	0.07	0.17	1.82	1.32	0.07	0.06	0.83	0.06	0.06	0.05	0.26
Pefferlaw/Uxbridge Brook	0.11	0.06	0.02	1.82	1.32	0.13	0.04	0.83	0.03	0.04	0.04	0.26
Whites Creek	0.23	0.10	0.42	1.82	1.32	0.15	0.08	0.83	0.10	0.11	0.09	0.26
Unmonitored Subwatersheds												
Barrie Creeks	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
GeorginaCreeks	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26
Hewitts Creek	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Innisfil Creeks	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Maskinonge River	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Oro Creeks North	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26
Oro Creeks South	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Ramara Creeks	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Talbot/Upper Talbot River	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
West Holland River	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26

Module 2 – Estimates post-development phosphorus loads that are representative of the proposed changes in land use for the study site using the same data sources used in Module 1, but accounting for the change in land use that will occur with development.

Module 3 – Estimates efficiencies attributed to classes of BMPs that can be used to reduce stormwater phosphorus loads in the post-development scenario. These efficiencies are based on data that is sourced from relevant, regional studies. The Tool provides standardized phosphorus reduction efficiencies (with rationale) for specific BMPs, but also allows the user to enter their own efficiencies provided that the rationale is also documented and is acceptable to the MOE. The Tool also allows the user to use custom BMPs or to enter the net efficiency achieved using a Treatment Train approach, which would also require documentation in a rationale that is acceptable to the MOE. The BMP selection criteria and efficiencies are shown below as reproduced from Figure 5 and Table 3 of the report, as follows:

Phosphorus loads (kg/ha/year) are to be calculated based on the catchment area, the land use, level of control of the SWM facility where it exists, and the average load. Typical phosphorus reductions for various types of BMP's are as follows:

- Constructed Wetlands – 77%;
- Dry Detention Ponds – 10%;
- Perforated Pipe Infiltration / Exfiltration System – 87%;
- Sand or Media Filters – 45%;
- Infiltration Trenches – 60%;
- Sorbtive Media Interceptors – 79%;
- Vegetated Filter Strips / Stream Buffers – 65%; and
- Wet Detention Ponds – 63%.

These reduction estimates are based on data contained in the MOE's Lake Simcoe Phosphorus Loading Development Tool (2012). Subsequent versions of this tool should be used to obtain the latest MOE accepted removal rates.

Alternate BMP's or removal rates will be considered provided that the removal rates have been verified based on the results of acceptable third party field studies.

Phosphorus removal rates for oil/grit separators are assumed to be zero ("0") unless satisfactory field studies have been completed for the specific unit in accordance with the requirements of Appendix D and Section 2.3.2.

Loadings for existing and proposed land use can be based upon data contained within the MOE's Lake Simcoe Phosphorus Loading Development Tool (2012 or most recent version). Other methods can be used, subject to the approval of the LSRCA. LSRCA staff should be contacted prior to commencement of a phosphorus loading study for a specific site.

Retention Volume

urbanworks
ENGINEERING CORPORATION

PROJECT: 149 Dunlop St E
FILE No.: 22-0017BA
DATE: 2025-02-13
PREPARED BY: MP

Site Imperviousness and Mitigation Target

Catchment	Area	C	AxC
200	0.017	0.70	0.0119
201	0.068	0.90	0.0612
R1	0.051	0.90	0.0459
R2	0.014	0.90	0.0126
Total	0.150	0.88	0.1316

Site IMP %	97%		
5mm Retention Over Imp. Area	7.26	m^3	(Area x IMP. X 5mm x 10)

Green Roof Mitigation

Mitigation Area	0.0124	ha	
Mitigation Abstraction	5.00	mm	
Mitigation Volume (Vm)	0.62	m^3	(Area x 5mm x 10)
Equivalent Site Ret. Volume	0.41	mm	= Vm / Site Area (ha) / 10

Remaining 5mm Target Volume	6.64	m^3

APPENDIX C

SANITARY CALCULATIONS

SANITARY FLOW CALCULATION
ESTIMATED EXISTING SITE DISCHARGE

PROJECT: 149 Dunlop Street East
FILE No.: 22-0017BA
DATE: 2025-03-07
PREPARED BY: GV

Site Area	0.15	ha	
Infiltration Rate	0.10	L/s/ha *	
Sewage Generation Rate	225	L/cap/day *	Residential
Sewage Generation Rate	28	m^3/ha/day *	Commercial

* Per City of Barrie Criteria

EXISTING CONDITION

Land Use	Units	Area (ha)	Density (ppu or p/ha)	Population	Avg. Flow (L/s)	Peaking Factor	Peak Flow (L/s)	Infilt. (L/s)	Total Flow (L/s)
Commercial	na	0.15	NA	NA	0.05	2.00	0.10	0.02	0.11

SANITARY FLOW CALCULATION

ESTIMATED SITE DISCHARGE

PROJECT: 149 Dunlop Street East
FILE No.: 22-0017BA
DATE: 2025-03-07
PREPARED BY: GV

urbanworks
ENGINEERING CORPORATION

Total Site Area	0.15	ha	
Infiltration Rate	0.10	L/s/ha *	
Sewage Generation Rate	225	L/cap/day *	Residential
Sewage Generation Rate	28	m^3/ha/day *	Commercial

* Per City of Barrie Criteria

PROPOSED CONDITION

Land Use	Units	GFA (m^2)	Design Area (ha)	Density (ppu or p/ha)	Design Population	Avg. Flow (L/s)	Peaking Factor	Peak Flow (L/s)	Infilt. (L/s)†	Total Peak Flow (L/s)
Residential	160	-	0.15	1.67 p/unit	267	0.70	4.10	2.85	0.02	2.87
Commercial††	na	701.0	0.07	NA	NA	0.02	2.00	0.04	-	0.04
Total Site			0.15		267	0.72		2.89	0.02	2.91

†Total Site Area used in determining extraneous Inifltration based Flow Generation for the whole site and only applied once between the site's commercial and residential land uses (i.e. to ensure no double counting of flows for the same area).

††Commercial Sanitary Flows have been estimated as per City of Barrie Criteria's minimum average flow rate of 28 m^3/ha/day for general applications, based on the site area. Commercial Design Flow area based on the Site's Commercial GFA, listed above and as per the site's architectural design plans.

A general peaking factor of 2.0 has been applied as per City of Barrie Criteria.

APPENDIX D

WATER SUPPLY CALCULATIONS

WATER SUPPLY CALCULATION

PROJECT: 149 Dunlop Street East, Barrie
FILE No.: 22-0017BA
DATE: 2025-03-11
PREPARED BY: GV

Fire Flow (residential)	133 L/s
Demand (residential)	225 L/cap/day *
Demand (Commercial)	28 m^3/ha/day

* Per City of Barrie Criteria
**Fire Flow as per Site FUS Calculation

AVERAGE-DAY DEMAND

Land Use	Units or GFA	Area (ha)	Density (ppu or p/ha)	Population	Avg. Day Demand (L/s)
Residential	160	0.15	1.67 p/unit	267	0.70
Commercial*	701 m^2	-	-	-	0.02

*Demand calculated as per the City of Barrie Minimum Commercial Demand taken per proposed Commercial GFA.

MAXIMUM-DAY DEMAND + FIRE FLOW

Land Use	Avg. Day Demand (L/s)	Peak Hour Demand Factor*	Peak Hour Demand (L/s)	Max. Day Demand Factor*	Max. Day Demand (L/s)	Max. Day Demand + Fire Flow (L/s)
Total	0.72	5.80	4.17	3.90	2.80	**135.80**

* Per MECP Design Guidelines for Drinking –Water Systems, 2008 (Table 3-1 and 3-3)

FIRE FLOW CALCULATION

PROJECT: 149 Dunlop Street East, Barrie
FILE No.: 22-0017BA
DATE: 2025-03-07
PREPARED BY: GV

urbanworks ENGINEERING CORPORATION

Calculation of required fire flow is based on the Fire Underwriters Survey (FUS), Water Supply for Fire Protection publication, 2020

$$F = 220C\sqrt{A}$$

Where: F = Requied fire flow (L/min.)
C = Coefficient related to the type of construction

- 1.5 for wood frame construction (combustible)
- 1.0 for ordinary construction (Type III) - exterior masonry construction (or equivalent) with min. 1-hour Rating, and unprotected interior elements
- 0.8 for non-combustible construction (Type II) - all structural elements (i.e., walls, arches, floors) constructed to a min. 1-hour Fire Resistance Rating with non-combustible materials
- 0.6 for fire-resistive construction (Type I) - all structural elements (i.e., walls, arches, floors) constructed to a min. 2-hour Fire Resistance Rating and constructed with non-combustible materials

A = Total floor area (m^2)

* Includes all storeys, but excluding basements at least 50% below grade.

For buildings with Construction Coefficient (C) less than 1.0 :

* For fire-resistive buildings, consider the 2 largest adjoining floors plus 50% of each of any floors immediately above up to 8, when vertical openings are inadequately protected.
* If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the 2 immediately adjoining floors.

Adjustments to the calculated fire flow can be made based on occupancy, sprinkler protection and exposure to other structures. The table below summarizes the adjustments made to the basic fire flow demand.

Building	Area "A" (m^2)	C	1 Base Fire Flow (L/min)	1 Base Fire Flow (L/s)	2 Occupancy %	2 Occupancy Fire Flow Adjustment (L/min)	Adjusted Flow (L/min)	3 Sprinkler %*	3 Sprinkler Fire Flow Adjustment (L/min)	4 Exposure %	4 Exposure Fire Flow Adjustment (L/min)	Final Adjusted Fire Flow: Final Fire Flow (L/min)	Final Adjusted Fire Flow: Rounded Fire Flow (L/min)	Final Adjusted Fire Flow: (L/s)
Site	4246.1	0.8	11469	191.1	-15	-1720	9748	-40	-3899	20%	1950	7799	8000	133

Note - 2 largest adjoining floors are 707.74 + 707.74 = 1415.1, 50% of 8 floors above = 0.5 * 707.74 * 8 = 2831.0 m2. Total is 1415.1 + 2831.0 = 4,246.1
GFA estimated based on site plan prepared by SSA Inc., dated March 15, 2024
*Assumes the Automated Sprinkler system (30%) with additional credit (10%) for a standard water supply

(2) Occupancy	
Non-Combustible	-25%
Limited Combustible	**-15%**
Combustible	no change
Free Burning	15%
Rapid Burning	25%

(3) Spinkler

It is assumed that the building will have a sprinkler system (-30%)
Additional credit for standard water supply (-10%)

(4) Exposure*	Factor	QTY.	Qualifying Exposures Notes
0 to 3 m	25%	0	
3.1 to 10 m	20%	0	
10.1 to 20 m	15%	0	
20.1 to 30 m	10%	2	North & West Side
30.1 to 45 m	5%	0	
> 45 m	0%	2	East & West Side
Total	20%	4	

*Calculate for all sides and all buildings.

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149 DUNLOP STREET EAST, BARRIE, ON.

March 7th, 2025

Giancarlo Volpe, P.Eng., M.Eng.
Project Engineer
Urbanworks Engineering Corporation
1945 Dundas Street East, Unit 200
Mississauga, ON
L4X 2T8

Re: 149 Dunlop Street E. – Zoning By-Law Amendment Application
File Number D30-029-2024

This letter is to confirm that the proposed building will be constructed using non-combustible construction (Type II) - all structural elements (i.e., walls, arches, floors) constructed to a minimum 1-hour Fire Resistance Rating with non-combustible materials.

Yours sincerely,

Scott Shields Architects Inc.
Per

Andrew Shields OAA
Managing Principal

ONTARIO ASSOCIATION OF ARCHITECTS
ANDREW SHIELDS
LICENCE
7679

SCOTT SHIELDS ARCHTECTS

Fire Flow Testing Report

FLOWMETRIX INDU-TECH PROCESS

Residual Hydrant #	**HY4340**
NFPA Colour Code	**BLUE**

DATE	July 4, 2023
TIME	11:00 A.M
ADDRESS	149 Dunlop Street East
	Barrie, ON
	L4M 1B2
SIZE-inches/mm	400
MATERIAL	PVC

RESIDUAL HYDRANT INFO.

HYDRANT #	HY4340	
N.F.P.A. COLOUR CODE	BLUE	
STATIC PRESSURE	74.6	psi
RESIDUAL PRESSURE - ONE PORT OPEN	66.2	psi
RESIDUAL PRESSURE - TWO PORTS OPEN	57.0	psi
PRESSURE DROP	17.6	psi
% PRESSURE DROP	23.6	% psi

Flow on Water Main At Test Hydrant 20 psi 3154 USGPM

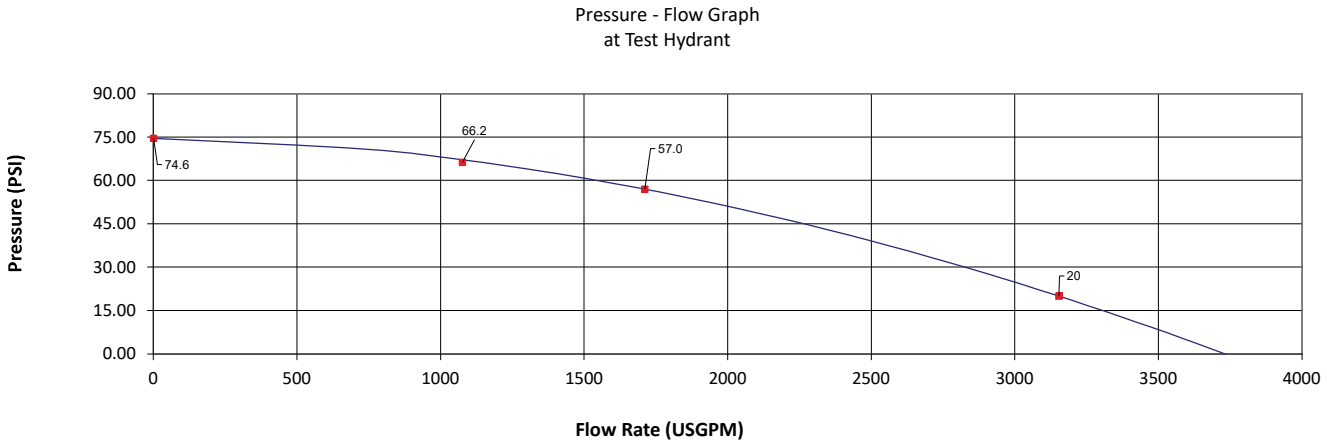
CONTACT INFO

Michael Paulo
Urbanworks Engineering Corporation
416-268-3174
mpaulo@urbanworkseng.com

FLOW HYDRANT(S) INFO.

HYDRANT ASSET ID	HYD. # PORTS	OUTLET DIAMETER (INCHES)	NOZZLE COEFFICIENT	DIFFUSER TYPE	DIFFUSER COEFFICIENT	PITOT READING (psi)	PITOT FLOW (USGPM)	FLOW METER (USGPM)
HY4688	1	2.5	Round	Swivel	0.90	**50.8**	1076	0
								0
HY4688	2	2.5	Round	Swivel	0.90	**36.9**	1711	0
		2.5	Round	Swivel	0.90	**27.7**		0

FIRE FLOW CHART



COMMENTS

OPERATOR	FMX	Noushin Ahanrobay
OPERATOR	FMX	Humzah Ahmed
OPERATOR		City of Barrie

WATERMAIN FLOW CAPACITY CALCULATION

Test on Dunlop Street E - Hydrant #HY4340

urbanworks ENGINEERING CORPORATION

PROJECT: 149 Dunlop Street E
FILE No.: 22-0017BA
DATE: 2024-10-17
PREPARED BY: DV

$$Q_R = Q_T \left(\frac{P_S - P_R}{(P_S - P_T)} \right)^{0.54}$$

Where: Q_R = Flow Rate at Desired Residual Pressure (GPM)
Q_T = Flow Rate Measured During Test (GPM)
P_S = Static Pressure (PSI)
P_R = Desired Residual Pressure (PSI)
P_T = Residual Pressure During Test (PSI)

Static Pressure (P_S)	74.6	PSI
Actual Residual Pressure (P_T)	57	PSI
Actual Flow (Q_T)	1711	GPM
Desired Pressure (P_R)	20	PSI
Flow Rate (Q_R)	3153	GPM
	199	**L/s**

WATER SUPPLY CALCULATION

Service Connection Sizing

PROJECT: 149 Dunlop Street East, Barrie
FILE No.: 22-0017BA
DATE: 2025-03-11
PREPARED BY: GV

urbanworks ENGINEERING CORPORATION

Target Demands

Average Day	0.72	L/s
Max Day	2.80	L/s
Max Day + Fire	135.80	L/s

Ex. Watermain Capacity (Hydrant Test Results)

Static Pressure (P_s)	74.6	PSI	514	kPa
Actual Residual P. (P_T)	57.0	PSI	393	kPa
Actual Flow (Q_T)	1711	GPM	107.9	L/s

*Results as per testing on Dunlop St. East (see attached Hydrant Flow test)

Hazen-Williams Equation:

$$h_f = \frac{10.67 \cdot L \cdot Q^{1.85}}{C^{1.85} \cdot d^{4.87}}$$

Where:
h_f = head loss (m)
L = pipe length (m)
Q = flow rate (m3/s)
C = Hazen Williams Roughness Coef.
d = Pipe Diameter (m)

Head Loss Computations

Pipe	Required Flow [L/s]	Proposed Pipe Diameter [mm]	C	Proposed Length [m]	Head Loss [m]*	Head Loss Per Km [m/km]	Velocity [m/s]**
Target	-	-	-	-	-	**< 2.5 Dom.**	**< 1.5 Dom. < 5.0 Fire**
Dom. Connection	2.80	150	100	10.8	**0.004**	**0.41**	**0.16**
Fire Connection	135.80	200	110	10.8	**1.200**	**111.08**	**4.32**

* As per Hazen-Williams Equation, with C-values selected as per City of Barrie Criteria (see below)
**Maximum Permissible Flow Velocity is 1.5 m/s and 5 m/s for normal operating, and Fire Flow conditions respectively as per City of Barrie Criteria.
***Maximum Headloss Gradient is 2.5m / km under normal operating conditions (Average and Max Day)

Watermain Pipe C-Factors

Pipe Diameter (mm)	"C" Factor
150	100
200-250	110
300-600	120
Over 600	130

Source: Drinking Water Infrastructure Design Standard (City of Barrie, 2024)

Pressure Computations

Pipe	Expected Pressure Drop (Head Drop x g) [kPa]	Desired Flow [L/s]	Expected Pressure at Main [PSI]*	Conversion to kPa	Expected Pressure at Building Face [kPa]***
Target		**(Site Requirement)**	**>20 PSI**	**> 140 kPa**	**> 140 kPa**
Dom. Connection	0.04	2.80	74.6	514.21	**514.17**
Fire Connection	11.77	135.80	47.7	328.72	**316.95**

*Expected pressure at main estimated based on latest hydrant test pressure and flow performance results at the required flow.
**Minimum operating pressure shall be 140 kPa (or 20 PSI) as per City Engineering Design Criteria.
***Expected Pressure at the Building Face = Expected Pressure at Main - Expected Pressure Drop

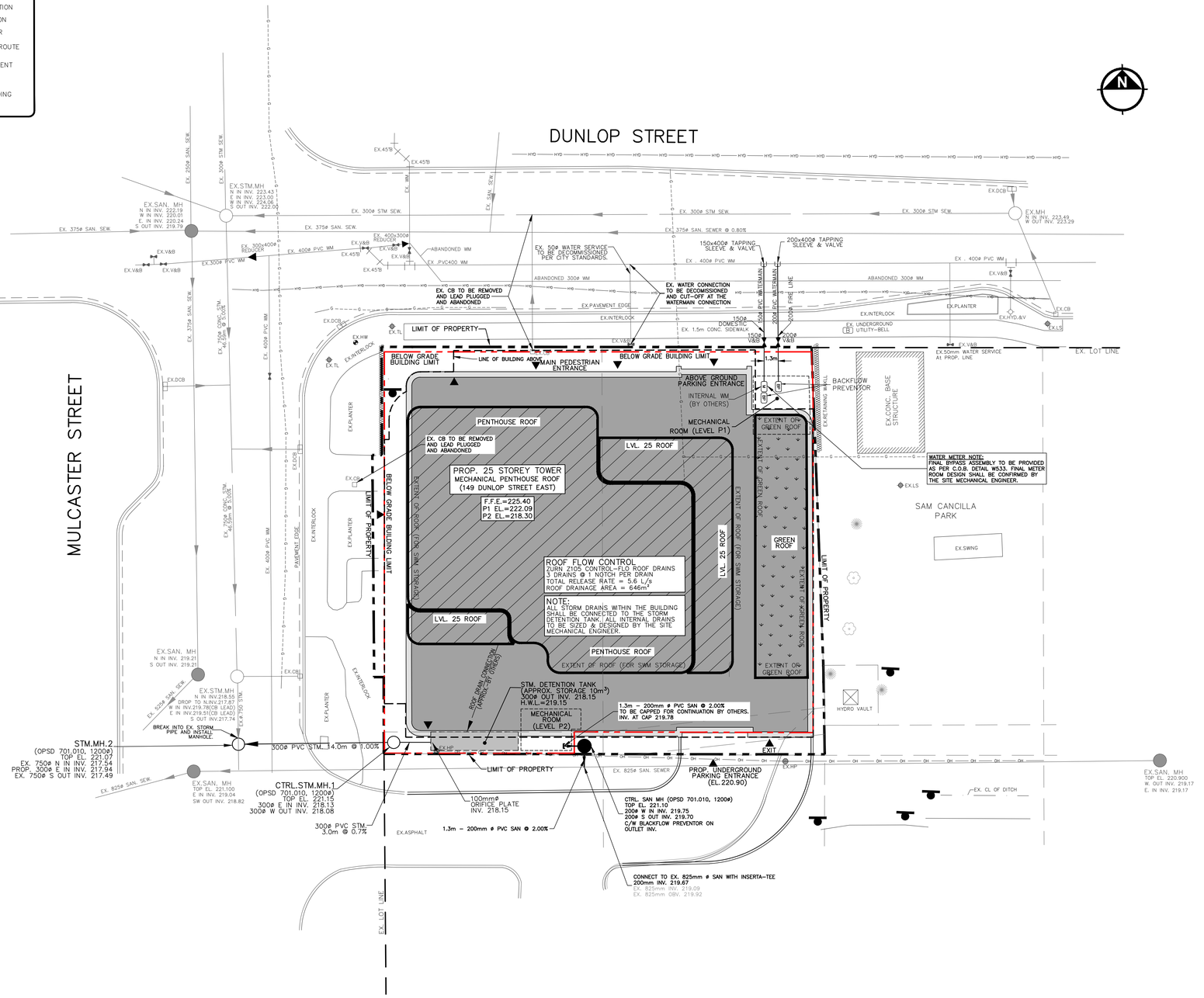
Desired Flow Equation:

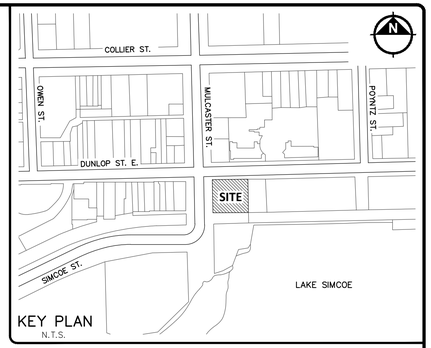
$$Q_R = Q_T \left(\frac{P_S - P_R}{(P_S - P_T)} \right)^{0.54}$$

Where: Q_R = Flow Rate at Desired Residual Pressure (GPM)
Q_T = Flow Rate Measured During Test (GPM)
P_S = Static Pressure (PSI)
P_R = Desired Residual Pressure (PSI) - (i.e. Pressure at Flow Required)
P_T = Residual Pressure During Test (PSI)

LEGEND

- DENOTES VALVE AND CHAMBER
- DENOTES VALVE AND BOX
- DENOTES HYDRANT
- CB — DENOTES SINGLE CATCHBASIN
- DCB — DENOTES DOUBLE CATCHBASIN
- DENOTES CATCHBASIN WITH HEAVY HONEYCOMB GRATE
- DENOTES SANITARY MANHOLE
- DENOTES STORM MANHOLE
- 189.52 DENOTES PROPOSED ELEVATION
- 190.14 DENOTES EXISTING ELEVATION
- DENOTES EXISTING CONTOUR
- DENOTES OVERLAND FLOW ROUTE
- DENOTES PROPOSED PAVEMENT
- DENOTES BELOW GRADE PARKING LIMIT
- DENOTES OUTLINE OF BUILDING ROOF ABOVE





SUBMISSION HISTORY

No.	ISSUED FOR	DATE
1.	ISSUED FOR 1st SUBMISSION IN SUPPORT OF ZBA APPROVAL	FEB. 8, 2024
2.	ISSUED FOR 2nd SUBMISSION IN SUPPORT OF ZBA APPROVAL	APR. 26, 2024
3.	ISSUED FOR 3rd SUBMISSION IN SUPPORT OF ZBA APPROVAL	OCT. 17, 2024
4.	ISSUED FOR 4th SUBMISSION IN SUPPORT OF ZBA APPROVAL	MAR. 20, 2025

REVISIONS

No.	DESCRIPTION	BY	DATE

BENCHMARK NOTE:
ELEVATIONS BASED ON LEGAL AND TOPOGRAPHIC SURVEY PREPARED BY R-PE SURVEYING LTD. ONTARIO LAND SURVEYORS, FILE No. 20-283, DATED DECEMBER 4, 2020

CONSULTANT

LICENSED PROFESSIONAL ENGINEER
G.A. VOLPE
100566848
MAR. 20, 2025
PROVINCE OF ONTARIO

MUNICIPAL APPROVAL

CITY OF BARRIE
APPROVED
DATE. . . . . .
. . . . . .

urbanworks
ENGINEERING CORPORATION
1945 Dundas Street E., Unit 200, Mississauga, ON, L4X 2T8
general@urbanworkseng.com | www.urbanworkseng.com | 905-901-0224

MIXED USE HIGH RISE DEVELOPMENT
149 DUNLOP STREET EAST

Barrie
ENGINEERING DEPARTMENT

SCALE 0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0 18.0 20.0m

FUNCTIONAL SERVICING PLAN

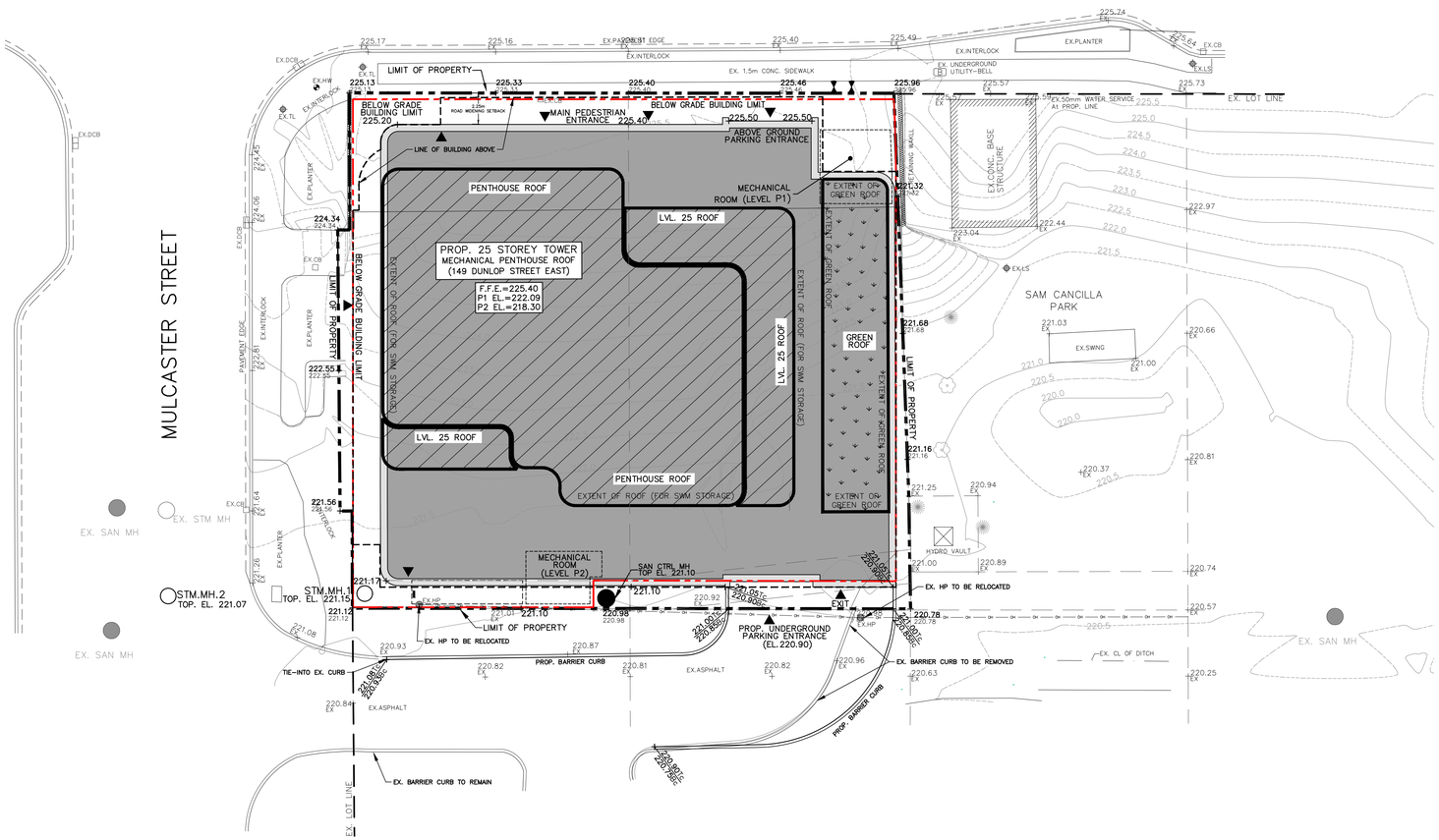
CITY FILE: D28-011-2022		PROJECT No.	22-0017BA
COUNTY FILE:			
DATE: MARCH 20, 2025	DESIGNED BY: M.M.	DWG. No.	SS-01
SCALE: 1:200	DRAWN BY: M.M.		
	CHECKED BY: T.D.		

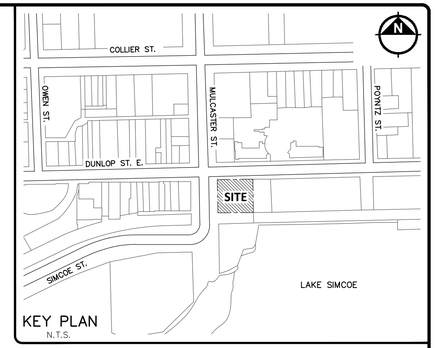
APPENDIX E

ENGINEERING DRAWINGS

LEGEND

- DENOTES VALVE AND CHAMBER
- DENOTES VALVE AND BOX
- DENOTES HYDRANT
- CB — DENOTES SINGLE CATCHBASIN
- DCB — DENOTES DOUBLE CATCHBASIN
- DENOTES CATCHBASIN WITH HEAVY HONEYCOMB GRATE
- DENOTES SANITARY MANHOLE
- DENOTES STORM MANHOLE
- 189.52 — DENOTES PROPOSED ELEVATION
- 190.14 — DENOTES EXISTING ELEVATION
- DENOTES EXISTING CONTOUR
- DENOTES OVERLAND FLOW ROUTE
- DENOTES PROPOSED PAVEMENT
- DENOTES BELOW GRADE PARKING LIMIT
- DENOTES OUTLINE OF BUILDING ROOF ABOVE





SUBMISSION HISTORY

No.	ISSUED FOR	DATE
1.	ISSUED FOR 1st SUBMISSION IN SUPPORT OF ZBA APPROVAL	FEB. 8, 2024
2.	ISSUED FOR 2nd SUBMISSION IN SUPPORT OF ZBA APPROVAL	APR. 26, 2024
3.	ISSUED FOR 3rd SUBMISSION IN SUPPORT OF ZBA APPROVAL	OCT. 17, 2024
4.	ISSUED FOR 4th SUBMISSION IN SUPPORT OF ZBA APPROVAL	MAR. 20, 2025

REVISIONS

No.	DESCRIPTION	BY	DATE

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FUNCTIONAL GRADING PLAN

CITY FILE: D28-011-2022		PROJECT No.	22-0017BA
COUNTY FILE:			
DATE: MARCH 20, 2025	DESIGNED BY: M.M.	DWG. No.	SG-01
SCALE: 1:200	DRAWN BY: M.M.		
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