Functional Servicing & Stormwater Management Report

Residential Development

1315 Silver Spear Road

City of Mississauga

10 October 2017

fabian papa & partners
A Division of FP&P HydraTek Inc.

216 Chrislea Road, Suite 204 | Vaughan, Ontario | L4L 8S5
Tel: 905-264-2420 | www.fabianpapa.com

CONTENTS

1.0 INTRODUCTION

We have been retained by Starlight Group Property Holdings Inc. to prepare this Functional Servicing & Stormwater Management Letter Report in support of a Re-Zoning Application for the above captioned development from a municipal servicing perspective. This report discusses the provision of municipal services for the development proposal, including the stormwater management servicing strategy.

Located at 1315 Silver Spear Road in the City of Mississauga, the overall site is approximately 8,404 m^2 (0.8 ha) in size, and is bounded by an existing apartment building to the west, Burnhamthorpe Road East to the north, an existing public library to the east, and Silver Spear Road to the south.

The subject property current contains an existing eight-storey residential apartment building (which is to remain) with an estimated 384 residential units, large areas of surface parking and large vegetated areas throughout. A key map and an aerial photograph of the subject site can be found in Appendix A. The development proposal contemplates the construction of an additional eight-storey residential building consisting of 159 residential units with two levels of underground parking.

It should be noted that the "area of development" is limited to the footprint of the new underground parking level (which includes the new building footprint) and is approximately 4,171 m^2 in size. Several architectural renderings of the proposed development can be found in Appendix A for reference.

Plan and profile drawings for both Silver Spear Road and Burnhamthorpe Road East were obtained from the City of Mississauga and the Region of Peel, and a subsurface investigation was performed by Multiview Inc. (Multiview). Pertinent information from the plan and profile drawings and the subsurface investigation have been incorporated into the servicing exhibit (refer to Appendix F). Excerpt copies of the profile drawings and the subsurface investigation can be found in Appendix B for reference.

2.0 WATER SUPPLY

In terms of existing municipal infrastructure adjacent to the property, Burnhamthorpe Road East hosts a 400 mm watermain within the north boulevard and an 1800 mm feedermain within the centerline of the roadway. Silver Spear Road hosts a 300 mm watermain on the north side, and a 150 mm watermain on the south side. An existing public hydrant is located adjacent to the subject site within the south boulevard of Silver Spear Road within 22 m of the existing building.

After careful review of the subsurface investigation and the available profile drawings, it can be reasonably concluded that the existing building is connected to the existing 300 mm municipal watermain within the Silver Spear Road right-of-way with a 150 mm water service.

An independent hydrant flow test was commissioned and performed at existing fire hydrants within close proximity to the subject site on Silver Spear Road on 05 October 2017. The results are as follows:

300mm Watermain within Silver Spear Road

Flow (usgpm)	Flow (L/s)	Pressure (psi)	Pressure (kPa)
0	0	82	565.4
338	21.3	81	558.5
803	50.7	78	537.8
1,339	84.5	64	441.3
2,367	149.3	50	344.7

A copy of these results can be found in Appendix C for reference.

2.1 Supply Demands

The domestic water demand for the subject site has been calculated using the Region of Peel design criteria which is summarized as follows:

Average Day Demand:	280 L/c·day
Max Day Peaking Factor:	2.0
Peak Hour Peaking Factor:	3.0
Population Density:	1.1 people/unit (1-Bedroom)
	2.1 people/unit (2-Bedroom)
	3.1 people/unit (3-Bedroom)

The detailed demand calculations, which can be found in Appendix C is summarized in the following table:

Building	Avg. Domestic Demand ADD (L/s)	Peak Hour Demand PHD (L/s)	Peak Day Demand MDD (L/s)
Proposed	0.7	2.2	1.5

The recommended fire flow demand for the proposed building has also been calculated using the criteria outlined in the Water Supply for Public Fire Protection Manual, 1999, by the Fire Underwriters Survey (FUS). The following FUS reductions and increases have been applied to the calculations as follows:

	8-Storey Building
Construction Coefficient	0.6 (fire resistive construction)
Building Occupancy	-15% (limited-combustible)
Fire Suppression System	-50% (sprinklered)
Exposure / Proximity	+40%

The area for the proposed building is calculated as follows:

8-Storey Building

A = Largest Area + 25% (floor area above + floor area below)

A = 1,545 m^2 + 25% (1,377 m^2 + 1,377 m^2)

A = 2,234 m^2

The corresponding fire flow for the proposed building is calculated as follows:

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

$F = [220 \cdot 0.6 \cdot (2{,}234\ m^2)^{0.5}] = 6{,}238$ L/min

F = 6,000 L/min *(rounded to nearest 1,000)*

F1 = F * 0.85 = 5,100 L/min

F2 = F * 0.50 = 2,550 L/min

F3 = F * 0.45 = 2,040 L/min

Fire Flow = F1-F2+F3 = 4,590 L/min

Fire Flow = 5,000 L/min (*rounded to nearest 1,000)*

Fire Flow = 83.3 L/s

The design flows applied in the design of the service connections to the proposed building are calculated as follows:

- Domestic Supply Line (PHD): 2.2 L/s
- Total Fire Flow (MDD + Fire): 1.5 L/s + 83.3 L/s = 84.8 L/s

2.2 Proposed Connections and Layout

Based on the above demands, a new 150 mm water connection shall be made to the existing 300 mm municipal watermain within Silver Spear Road. The proposed service shall be installed within the existing drive aisle and split to form a separate 100 mm domestic supply line prior to property line. Each line shall then be installed to the P1 level of the proposed building which will host the necessary meter and backflow device.

The Ontario Building Code requires that any building above 85 m in height shall be protected by two separate fire service connections separated by an isolation valve. Since the proposed building is under this threshold, one connection is sufficient.

It is proposed that the proposed building will be sprinklered, therefore a siamese connection will be required. The siamese connection shall be located on the south face of the building adjacent to the internal fire route. The exact final location of the siamese connection will be determined at the Building Permit stage.

The NFPA 14 considers any building greater than 23 m in height to be a high rise which requires two siamese connections for each zone. Since the proposed building is greater than 23 m in height, two siamese connections shall be provided.

The Ontario Building Code requires siamese connections to be within 45 m of a hydrant. Therefore an internal private hydrant is proposed to be connected to the internal plumbing system and shall be located in a planter in the southwest corner in order to service the proposed siamese connection. By strategically placing the proposed private hydrant and the proposed siamese connection in these aforementioned locations, the requirements of the Ontario Building Code with respect to fire protection have been satisfied. The location of the existing and proposed infrastructure is shown on the Site Grading & Servicing Exhibit.

Based on the available static pressure within the municipal system and using the Hazen-Williams formula to determine the head losses in the lines, the resulting residual pressure at the building face is as follows (refer to Appendix C for the detailed calculations):

Hazen Williams Formula: $Q = 0.278 \cdot C \cdot D^{2.63} \cdot (\frac{H_f}{L})^{0.54}$

Service Connection	Flow (L/s)	Head Loss (psi)	Head Loss (kPa)	Residual Pressures	
				At Connection (psi/kPa)	At Building (psi/kPa)
100mm Domestic (Peak Hour)	2.2	0.1	0.5	82.0/565.3	81.9/564.8
150mm Fire (Max Day + Fire)	84.8	9.7	66.5	63.9/440.8	54.3/374.2

The calculations above show that the residual pressures at the building face are well above the minimum acceptable pressures of 40 psi (275 kPa) for 'Peak Hour' and 20 psi (140 kPa) for 'Max-day + Fire' demand situations, therefore, the existing municipal water infrastructure and the proposed internal water network can support the proposed development.

3.0 SANITARY DRAINAGE

Local municipal sanitary infrastructure within Burnhamthorpe Road East consists of an existing 250 mm sanitary sewer on the north side of which flows in a southwesterly direction towards Hickory Drive. Silver Spear Road hosts two existing 250 mm sanitary sewers in the center of Silver Spear Road which flow in opposite directions (southwesterly and southeasterly).

As the subject site is located at a crest within Silver Spear Road, each 250 mm sanitary sewer represents the first (or top) segment of each sanitary sewer. Both sanitary sewers convey flows to the Region of Peel "East Trunk Sewer" which eventually connects to the G.E. Booth wastewater treatment plant. Please see excerpt mapping from the Region of Peel "2013 Water and Wastewater Master Plan for Lake-Based Systems" in Appendix D.

After careful review of the subsurface investigation and the available profile drawings, it can be reasonably concluded that the existing building is serviced by an existing 200 mm sanitary service which conveys flows to the easternmost 250 mm sanitary sewer within Silver Spear Road.

3.1 Sanitary Design Flow

The sanitary design flows for the "area of development" have been calculated using the Region of Peel's current design criteria for sewage flow rates. The relevant design criteria is summarized below.

Design Flow:	302.8 L/c·day (per Peel Region)
Infiltration Flow:	0.20 L/s/ha (per Peel Region)
Peaking Factor:	Calculated using the Harmon Formula
Pop. Density:	1.1 people/unit (1-Bedroom)
	2.1 people/unit (2-Bedroom)
	3.1 people/unit (3-Bedroom)

As a new connection is proposed, the pre-development sanitary sewer flow is taken a 0 L/s. The post-development sanitary sewer flow is calculated as follows:

$$Q_{SAN,POST} = \frac{(302.8\ Lpcd \times 226\ pers \times 4.13_{Peaking})}{86400 s/day} + 0.20\ L/s/ha \times 0.4171\ ha = 3.4\ \text{L/s}$$

The sanitary sewer flow for the overall development is increased by 3.4 L/s over the pre-development condition (3.4 L/s – 0.0 L/s). Please refer to Appendix D for the detailed sanitary sewer design sheet.

3.2 Receiving Sanitary Sewer Capacity

As previously mentioned, the subject development represents an increase of 3.4 L/s in sanitary sewer flow. The full flow capacity of the receiving 250 mm sanitary sewer within Silver Spear Road is calculated to be 134.3 L/s. The increase in flow represents only 2.5% of the full flow capacity, therefore it is deemed an appropriate conclusion that the proposed development from the subject site can proceed without any mitigation measures, and thus no sewer upgrades are required. The Region of Peel will be able to review the overall system model to confirm this conclusion.

3.3 Sanitary Service Connection

As previously mentioned, the subject site is currently serviced by an existing 200 mm sanitary service. It is proposed that the proposed building be connected to the existing service with a new 200 mm diameter sanitary service.

The following is a summary of the flow characteristics within the subject site:

Service	From	To	Design Flow (L/s)	Pipe Size (mm)	Slope	Full Flow Capacity (L/s)	Percent of Full Flow
Prop. 1	Bldg.	MH1A	3.4	200	2.0%	46.4	7.3%
Prop. 2	MH1A	MH2A	3.4	200	3.0%	56.8	6.0%

The proposed services will easily convey their respective post development sanitary flows operating at only 8.5% or less of full flow capacity. The proposed connection to the new building has adequate depth to service the ground floor (and above), however the underground parking levels will require a grinder pump to discharge to the connection. To prevent backup of sewage into the basement level, we recommend that the Mechanical Consultant adequately design the internal system to operate under and withstand the potential for a surcharged municipal system.

Based on the discussion in the previous sections, the proposed development has marginal impact on the existing sewer infrastructure and therefore can be adequately serviced from a sanitary sewerage perspective. The location of the existing and proposed infrastructure is shown on the Site Servicing and Grading Exhibit which can be found in Appendix F.

4.0 STORM DRAINAGE

Local exclusive storm infrastructure within Burnhamthorpe Road East consists of a 525 mm storm sewer on the south side of which flows in a westerly direction. Similarly to the sanitary sewers, Silver Spear Road hosts a 300 mm storm sewer and a 600 mm storm sewer on the south side of Silver Spear Road which flow in opposite directions (southwesterly and southeasterly).

Both of the storm sewers are eventually conveyed to "Little Etobicoke Creek" which falls within the limits and regulations of the Toronto and Region Conservation Authority (TRCA). An excerpt copy of the associated watershed map can be found in Appendix E for reference.

4.1 Design Criteria

The stormwater management servicing strategy proposed for the development has been prepared in conjunction with City design standards, the Ministry of the Environment and Climate Change (MOECC) Stormwater Management Practices Planning and Design Manual dated March 2003, and the TRCA Watershed Development Policies. The relevant criteria are summarized below:

<u>Stormwater Management (Quantity Control)</u>

- Storm sewer capacity constraints may govern.
- Stormwater runoff peak flow discharges must be controlled to a minimum of the pre-development levels for all design storm events (i.e. 1:2 year, 1:5 year, 1:10 year, 1:25 year, 1:50 year, and 1:100 year) using TRCA unit flow rates.
- It should be noted that TRCA unit flow rates are typically only applied to regional SWM facilities and / or development sites that directly outfall to a TRCA regulated areas. Therefore it has been concluded that TRCA unit flow rates do not apply to this small in-fill development. Accordingly, all post-development storm flows shall be controlled to pre-development levels per City IDF data.

<u>Stormwater Management (Quality Control)</u>

- Stormwater quality control is to be implemented in accordance with the applicable Master Drainage Plan or Subwatershed Plan, the City's Stormwater Quality Control Strategy prepared by R.E Winter dated January 1996 and MOECC's Stormwater Management Practices Planning and Design Manual.
- Pursuant to the City's design criteria, stormwater quality controls are required to be implemented on-site to achieve a minimum of 80% long-term total suspended solid (TSS) removal.

<u>Stormwater Management (Runoff Volume Reduction)</u>

- The first 5mm of runoff shall be retained on-site and managed by way of infiltration, evapotranspiration or re-use. This is a minimum requirement whereas applicable Master Drainage Plans or Subwatershed Plans may carry a higher minimum requirement. Methods to achieve this can include measures such as permeable pavements, infiltration systems, rainwater harvesting tanks, bioretention systems or green roofs.

4.2 Pre-Development and Post-Development Conditions

As previously mentioned, the subject site currently hosts an existing eight-storey building, a large asphalt parking surface, and large areas of landscaping throughout resulting in a pre-development runoff coefficient of 0.58. Refer to the aerial photograph in Appendix A for reference. Per City design criteria, the pre-development runoff coefficient shall be limited to 0.50 and thus governs.

The addition of the eight-storey building results in a modest increase in impervious area (for the developable portion of the subject property) with a post-development runoff coefficient calculated to be 0.75.

Per City design criteria, the following runoff coefficient adjustments have been applied:

Storm Return Period	Coefficient Adjustment
2-Year	1.0
5-Year	1.0
10-Year	1.0
25-Year	1.1
50-Year	1.2
100-Year	1.25

As previously mentioned, stormwater runoff peak flow discharges must be controlled to a minimum of the pre-development levels for all design storm events. The pre-development and post-development hydrologic conditions for the site were established using the City's IDF data, a recommended entry time of 15 minutes, and the following storm drainage run-off coefficients:

Site Area	Coefficient
Bare Roof	0.90
Landscaped Areas	0.25
Landscaped Areas (over parking garage)	0.45
Permeable Pavers	0.55
Hard Surfaces	0.90

The following is a summary of the subject site's peak discharge for each storm event under both pre-development and post-development conditions:

Storm Return Period	Rainfall Intensity (mm/hr)	Pre-Dev. Flow (L/s)	Post-Dev. Flow (L/s)	Allowable Flow[1] (L/s)
2-Year	59.9	39.9	51.9	34.7
5-Year	80.5	53.7	69.8	46.6
10-Year	99.2	66.1	85.9	57.4
25-Year	113.9	83.5	108.6	72.6
50-Year	127.1	101.7	132.2	88.4
100-Year	140.7	117.3	152.4	101.9

[1] Based on a pre-development runoff coefficient of 0.50 which governs

As shown above, the post-development discharge is greater than the allowable site discharge for each storm return period, thus on-site attenuation will be required. Typically, a combination of roof top, surface and/or underground storage can used to achieve the required volumes which is discussed in the following section. Please refer to the detailed storm sewer design sheet which can be found in Appendix E.

4.3 Stormwater Management (Quantity Control)

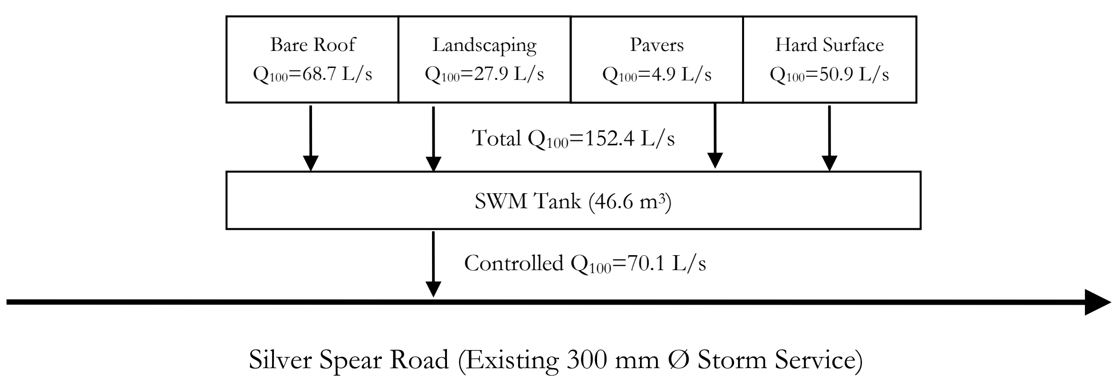
To attenuate flows from the site, an underground stormwater storage tank system, complete with a City approved orifice plate, is proposed in the within the underground P1 level. The following is a summary of the subject site's release rates using a 180 mm orifice control:

Storm Return Period	Allowable Flow[1] (L/s)	Attenuated Flow (L/s)	Depth of HGL in SWM Tank (m)
2-Year	34.7	28.2	0.26
5-Year	46.6	45.6	0.54
10-Year	57.4	53.8	0.72
25-Year	72.6	59.9	0.87
50-Year	88.4	65.0	1.0
100-Year	101.9	70.1	1.2

As shown above, the post-development flows have been reduced over the pre-development condition for each storm return period. The detailed stormwater storage volume calculations can be found in Appendix E, and the location of the stormwater management system is available on the Site Servicing and Grading Exhibit which can be found in Appendix F.

A schematic representation of the proposed stormwater management system for the 100-year storm return period is provided as follows:

Stormwater Management Plan



$$Q_{\text{SITE RELEASE}} \leq Q_{\text{ALLOWABLE DISCHARGE}}$$

(for each storm return period)

It is important to note that regular maintenance inspections of the stormwater management tank, storm sewers, and orifice control should be conducted to ensure that there are no blockages or other conditions which would prevent the proper functioning of this design element. The recommended minimum frequency of such inspections is annually.

By providing on-site storage via an underground granular storage bed, and by controlling the site's stormwater discharge with an orifice control, the subject site satisfies the City's stormwater management objectives for quantity control.

4.4 Stormwater Management (Quality Control)

As previously mentioned, stormwater quality controls are required to be implemented on-site to achieve a minimum of 80% long-term total suspended solid (TSS) removal. As a large asphalt surface is proposed, on-site treatment will be required. The following is a summary of the subject site's inferred TSS removal rate without and with treatment:

Site Characteristics			Without Treatment		With Treatment	
Site Area	Area (m2)	(% of total)	TSS	Overall	TSS	Overall
Bare Roof	1,563	(37.5%)	95%	35.6%	95%	35.6%
Pavers	183	(4.4%)	80%	3.5%	80%	3.5%
Landscaping	1,268	(30.4%)	100%	30.4%	100%	30.4%
Hard Surfaces	1,157	(27.7%)	0%	0.0%	50%[2]	13.9%
Total	4,171	(100%)		**69.5%**		**83.4%**

As shown above, the site will not achieve the City's requirement for 80% TSS removal if left untreated. Therefore, the installation of a Stormceptor® oil / grit separator (OGS) model STC 750 has been incorporated into the stormwater management approach in order to treat the stormwater runoff. The OGS unit is rated to exceed 80% TSS removal however it is noted that the TRCA only accepts a 50% TSS removal for these units.

By installing a Stormceptor® OGS, and due to the high percentage of roof and landscaped areas via a treatment train approach, the City requirements for quality control (i.e. minimum 80% TSS removal) have been satisfied.

4.5 Stormwater Management (Water Balance)

In order to promote preservation of the site's natural hydrological water balance, the City requires a minimum volume of 5 mm be re-used on-site. Based on the inferred initial abstraction rates for the various site surfaces, the total pre-development abstraction is calculated as follows:

Site Area	Area (m2)	(% of total)	Initial Abstraction (mm)	Total Abstraction (mm)
Bare Roof	1,563	(37.5%)	1 mm	0.37
Pavers	183	(4.4%)	5 mm	0.22
Landscaping	1,268	(30.4%)	5 mm	1.52
Hard Surfaces	1,157	(27.7%)	1 mm	0.28
Total	4,171	(100%)		**2.39**

Therefore an additional 2.61 mm of rainfall (i.e., 5.00 mm – 2.39 mm) needs to be collected and retained on the subject site.

[2] Implementing a Stormceptor® Oil-Grit Separator and conservatively using 50% TSS removal

The total water balance volume required for on-site re-use is calculated as follows:

$$Volume\ Required = Storage\ Depth \times Site\ Area$$
$$Volume\ Required = 2.61\ mm \times 4{,}171\ m2 = 10.9\ m^3$$

It is proposed that a sump be installed within the stormwater management tank in order to retain the required water balance volume and store it for irrigation of landscaped areas on the property. The volume available for rainwater harvesting is calculated as follows:

$$Volume\ Provided = Tank\ Area \times Depth\ of\ Sump$$
$$Volume\ Provided = 40.0\ m^2 \times 0.30\ m = 12.0\ m^3$$

As shown above, the sump within the stormwater management tank has more than sufficient volume to detain the required water balance volume thus satisfying the City's requirements for volume control (i.e. minimum 5 mm).

As rooftop and landscape area drains are considered clean, it is recommended that these areas be directed to a separate irrigation holding tank for irrigation usage. The specific details relating to the stormwater management and irrigation tanks shall be provided at the site plan application stage.

The specific details relating to the irrigation sump, and to the rainwater harvesting system shall be provided by the Mechanical Consultant and Landscape Architect during the detailed internal building design stage.

4.6 Storm Service Connection

All areas from the developable portion of the site will be directed to the stormwater management tank for on-site attenuation through an orifice control. Storm flows will then be conveyed to an OGS for on-site treatment, and then be conveyed through a series of 300 mm storm sewers which will connect to the existing 300 mm municipal storm sewer within Silver Spear Road.

The following is a summary of the capacity for each proposed on-site storm service:

	From	To	Pipe Size (mm)	Pipe Slope	Peak Flow[3] (L/s)	Capacity (L/s)	Percent of Full Flow
Storm Service 1	Tank	STC	300	1.0 %	53.8	96.7	56 %
Storm Service 2	STC	MH1	300	1.0 %	53.8	96.7	56 %
Storm Service 3	MH1	MH2	300	1.0 %	53.8	96.7	56 %

The proposed private storm sewers (and main service connection) can easily handle their attenuated post-development storm flow of 53.8 L/s, operating at only 56% of full flow capacity (96.7 L/s). The location of the existing and proposed infrastructure is shown on the Site Servicing and Grading Exhibit which can be found in Appendix F.

[3] Peak flows are based on 10-year attenuated (controlled) design flows

4.7 Emergency Overflow

Any downspouts shall outlet to the surrounding landscaped areas within the subject site and shall be directed away from the buildings. The proposed building should be provided with rooftop scuppers which will ensure a safe emergency overflow should the rooftop drains become blocked or clogged. The areas surrounding the building have been designed with positive drainage (away from the buildings). The maximum ponding depths through the subject site shall not exceed 0.25 m per City requirements.

To provide a relief point within the underground system, the stormwater management tank shall be fitted with an emergency overflow catchbasin (open grate) lid. Should the property experience a storm greater than the 100-year event or should the orifice become clogged, surplus water will overflow through the grate (elevation 97.85 m), and spill onto the Silver Spear Road right-of-way.

We recommend that all incoming pipes to the tank be fitted with one-way flap gate valves (i.e. backflow preventers) to prevent surcharging in the building's plumbing system. Details pertaining to the site grading and overland flow are shown on the Site Servicing and Grading Exhibit which can be found in Appendix F.

4.8 Sediment and Erosion Control

In accordance with the Erosion and Sediment Control Guidelines for Urban Construction, temporary erosion and sediment control measures are required for any development application. Due to the small size of the subject site, it is proposed that a sediment control fence be installed along the entire perimeter of the site per the City of Mississauga standards.

Any existing / adjacent catch basins shall be protected with a Terrafix 360R geotextile fabric (or approved equal). In lieu of a mud mat, the existing asphalt driveway shall be utilized to prevent any mud tracking onto the municipal roads.

5.0 CONCLUSIONS

This letter report illustrates that the proposed development is feasible from municipal servicing and stormwater management perspectives.

Proposed fire and domestic water demands are within acceptable ranges and can likely be accommodated by the existing municipal water supply infrastructure within Silver Spear Road.

The receiving sanitary sewer network within Silver Spear Road is marginally impacted from the proposed intensification, and should not require any mitigation measures (to be confirmed by the Region of Peel).

Furthermore, the proposed internal storm sewer network, on-site storage, and the controlled discharge release rate to the receiving exclusive storm sewer are at appropriate levels and therefore the proposed development satisfies the City's stormwater management objectives.

We trust that this satisfies your current needs. Should you have any questions, or require additional information, please do not hesitate to contact the undersigned.

Respectfully Submitted,

fabian papa & partners
A Division of FP&P HydraTek Inc.

LICENSED PROFESSIONAL ENGINEER
J. M. JENKINS
2017-10-10
PROVINCE OF ONTARIO

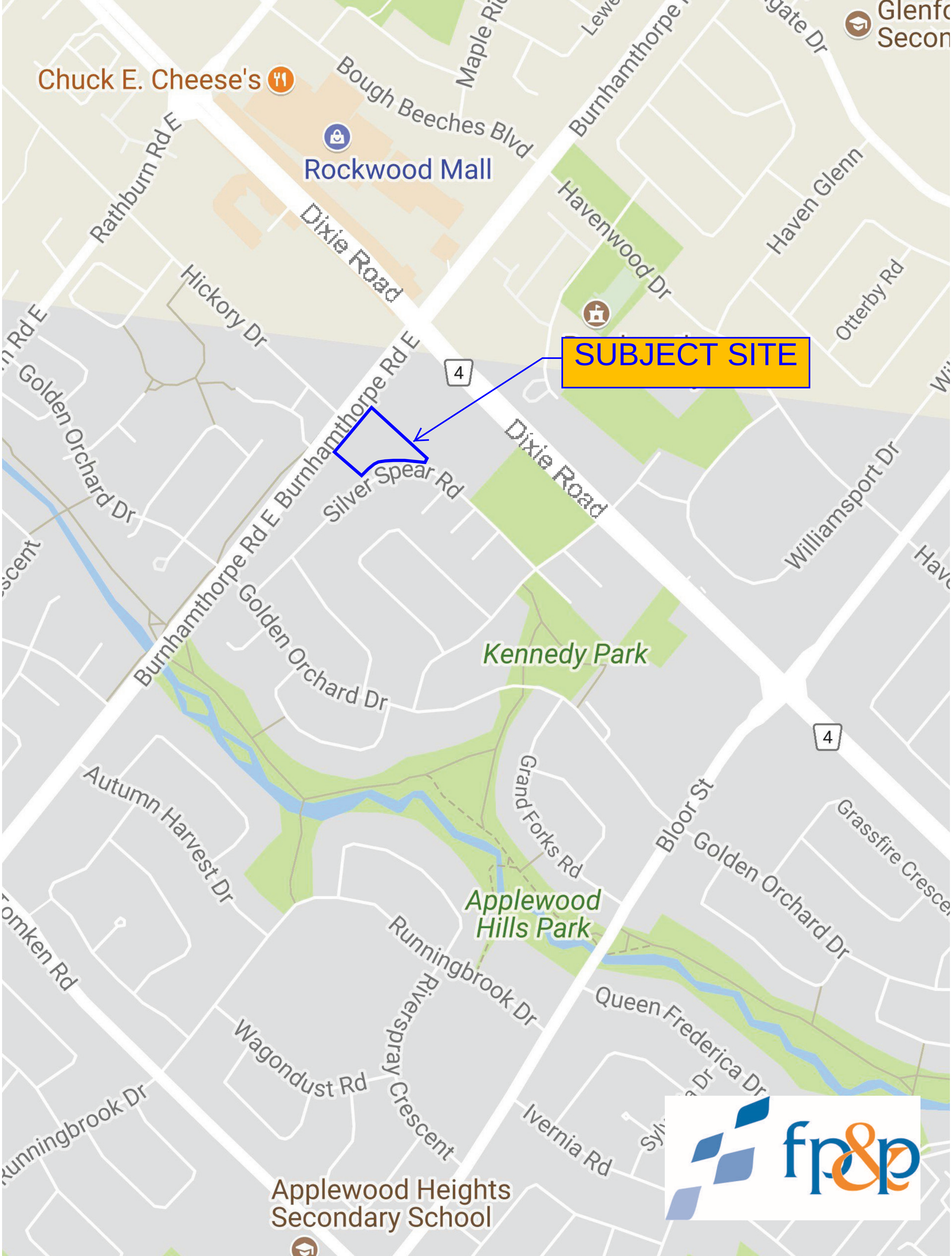
LICENSED PROFESSIONAL ENGINEER
P. F. ALBANESE
2017-10-10
PROVINCE OF ONTARIO

Jason Jenkins, P.Eng, P.E.
Project Manager

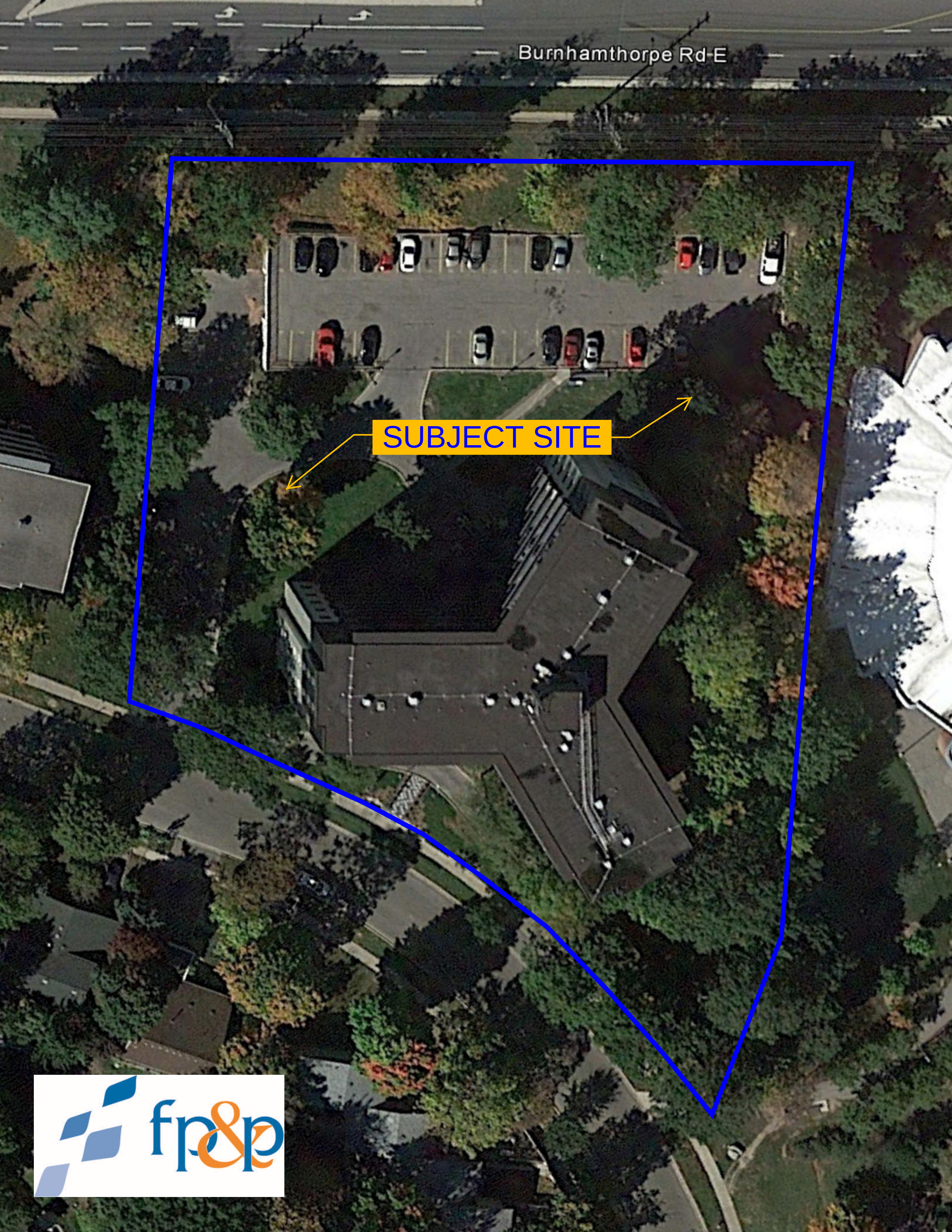
Paolo Albanese, P.Eng.
PEO Designated Consulting Engineer
Partner

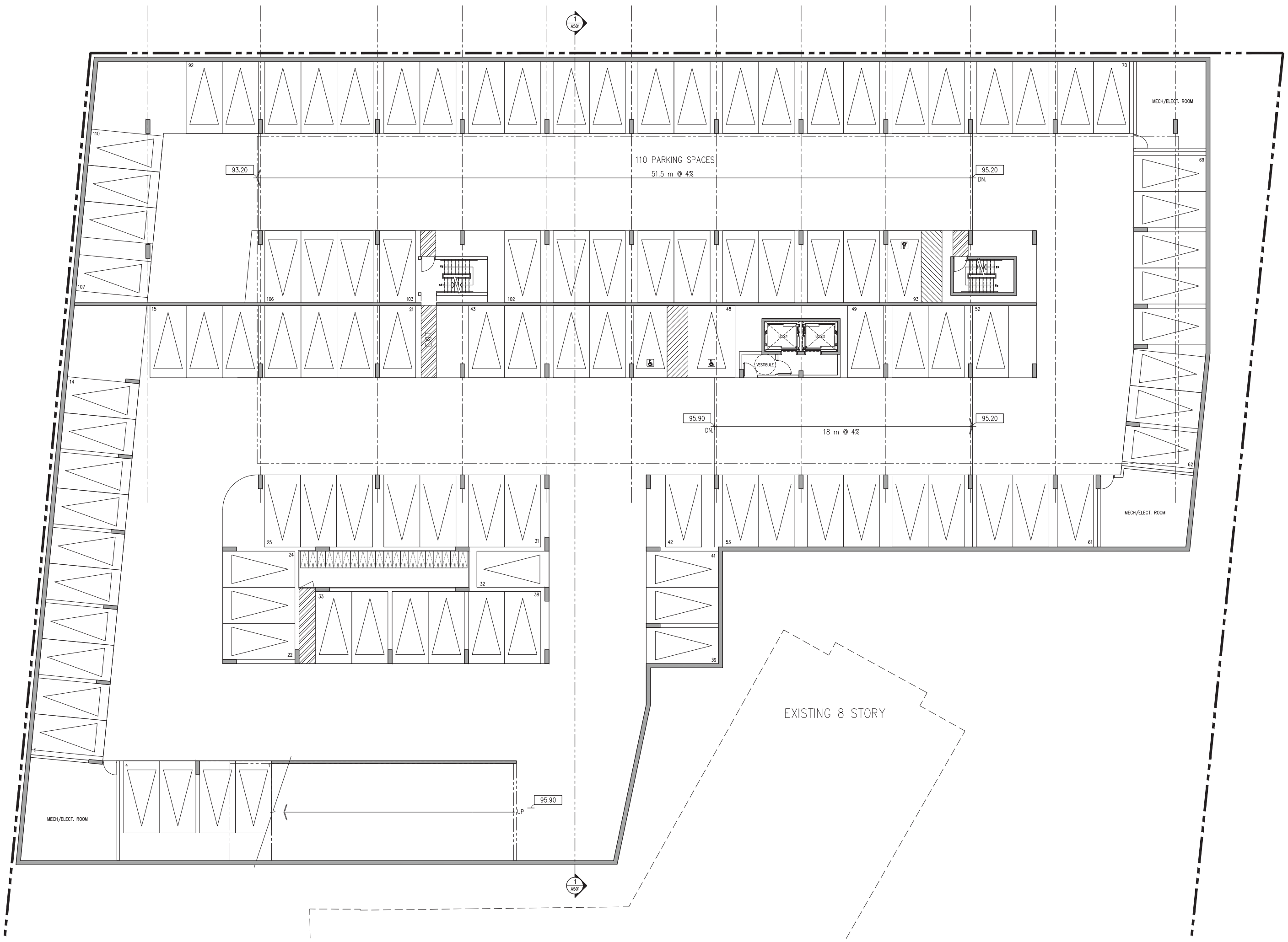
h:\fp&p hydratek\projects\2017\17073 - 1315 silver spear, mississauga\report\re-zoning\revision 0\17073 - fs and swm report (revision 0).docx

APPENDIX A



Chuck E. Cheese's
Rockwood Mall
Bough Beeches Blvd
Rathburn Rd E
Dixie Road
Hickory Dr
Havenwood Dr
Haven Glenn
Otterby Rd
SUBJECT SITE
4
Burnhamthorpe Rd E
Silver Spear Rd
Golden Orchard Dr
Dixie Road
Williamsport Dr
Kennedy Park
Grand Forks Rd
Bloor St
Autumn Harvest Dr
Applewood Hills Park
Runningbrook Dr
Riverspray Crescent
Queen Frederica Dr
Wagondust Rd
Ivernia Rd
Runningbrook Dr
Applewood Heights Secondary School
fp&p


Burnhamthorpe Rd E
SUBJECT SITE



architectureunfolded
219 dufferin street, suite 201b, toronto, on, m6k 1y9 tel: (416)601.5416 info@unfolded.ca

notes:

P1 FL.		
FLOOR AREA	3949.04 m2	42508.47 ft2
SALEABLE FLOOR AREA	0	0

6. issued for client review 05.11.17
5. issued for client review 10.27.16
4. pre-submission meeting 10.12.16
3. issued for client review 10.06.16
2. issued for client review 04.04.16
1. pre-submission meeting 06.25.15

revisions:

architectural team :

mark zwicker
morteza rasekhi

planning:
john d. rogers and associates inc.

structural:

electrical:

mechanical:

landscape:

site services:

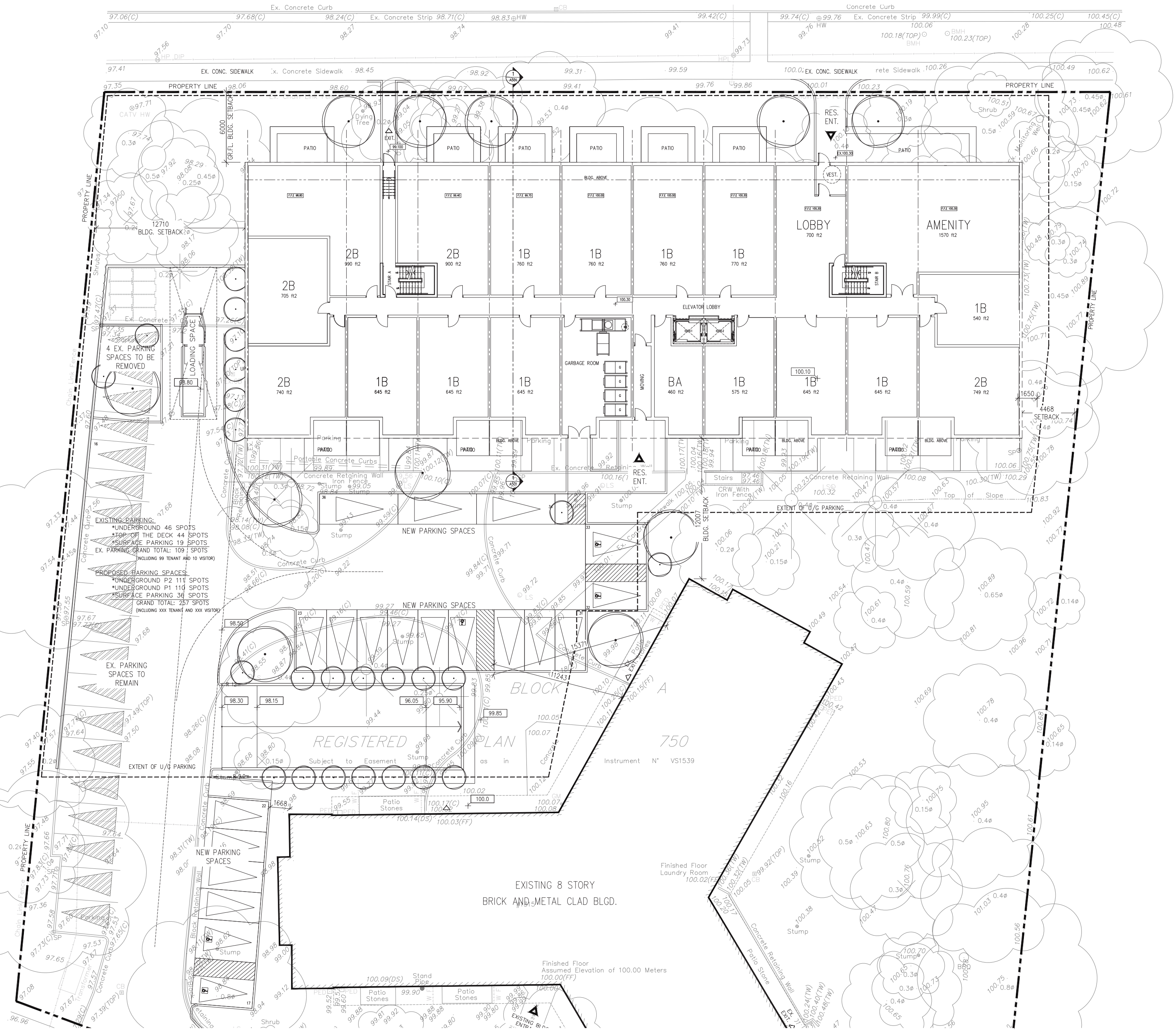
project:
1315 SILVER SPEAR RD.
mississauga, ontario

p1 plan

june 27.2017 date:
1:150 scale:
14-40 project:
mr drawn by:

north

drawing number:
A202



architectureunfolded

219 dufferin street, suite 201b, toronto, on. m6k 1y9 tel: (416)601.5416 info@unfolded.ca

notes:

GR. FL.		
FLOOR AREA	1544.89 m2	16629.06 ft2
AMENITY	146.09 m2	1572.49 ft2
LEASABLE FLOOR AREA	1094.12 m2	11777.01 ft2
PARKING AREA	0 m2	0 ft2

6. issued for client review	05.11.17
5. issued for client review	10.27.16
4. pre-submission meeting	10.12.16
3. issued for client review	10.06.16
2. issued for client review	04.04.16
1. pre-submission meeting	06.25.15

revisions:

architectural team :

mark zwicker
morteza rasekhi

planning:
john d. rogers and associates inc.

structural:

electrical:

mechanical:

landscape:

site services:

project:
1315 SILVER SPEAR RD.
mississauga, ontario

gr. fl. plan

june 27.2017 date:
1:150 scale:
14-40 project:
mr drawn by:

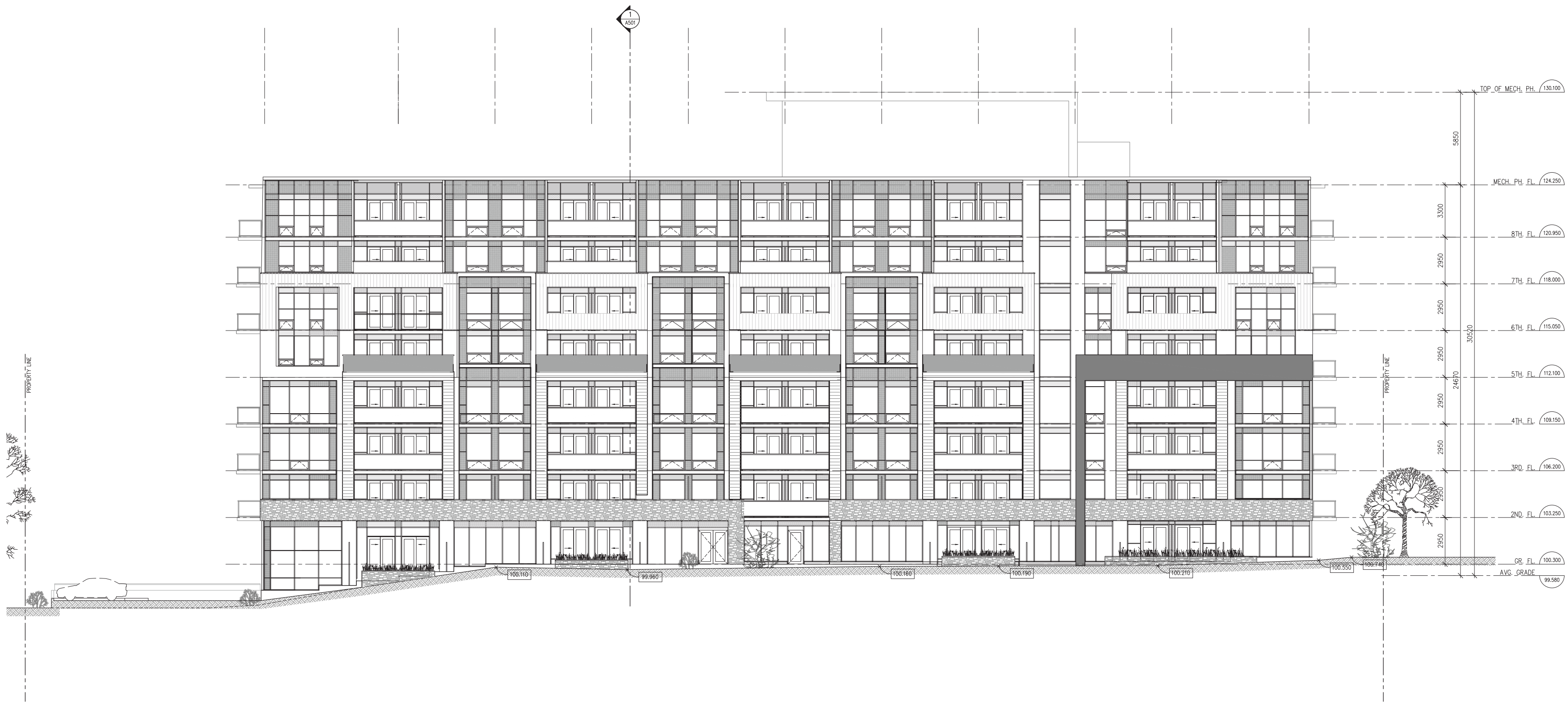
north

drawing number:
A301

notes:

architectureunfolded

219 dufferin street, suite 201b, toronto, on, m6k 1y9 tel: (416)601.5416 info@unfolded.ca



6. issued for client review 05.11.17
5. issued for client review 10.27.16
4. pre-submission meeting 10.12.16
3. issued for client review 10.06.16
2. issued for client review 04.04.16
1. pre-submission meeting 06.25.15

revisions:

architectural team :

mark zwicker
morteza rasekhi

planning:
john d. rogers and associates inc.

structural:

electrical:

mechanical:

landscape:

site services:

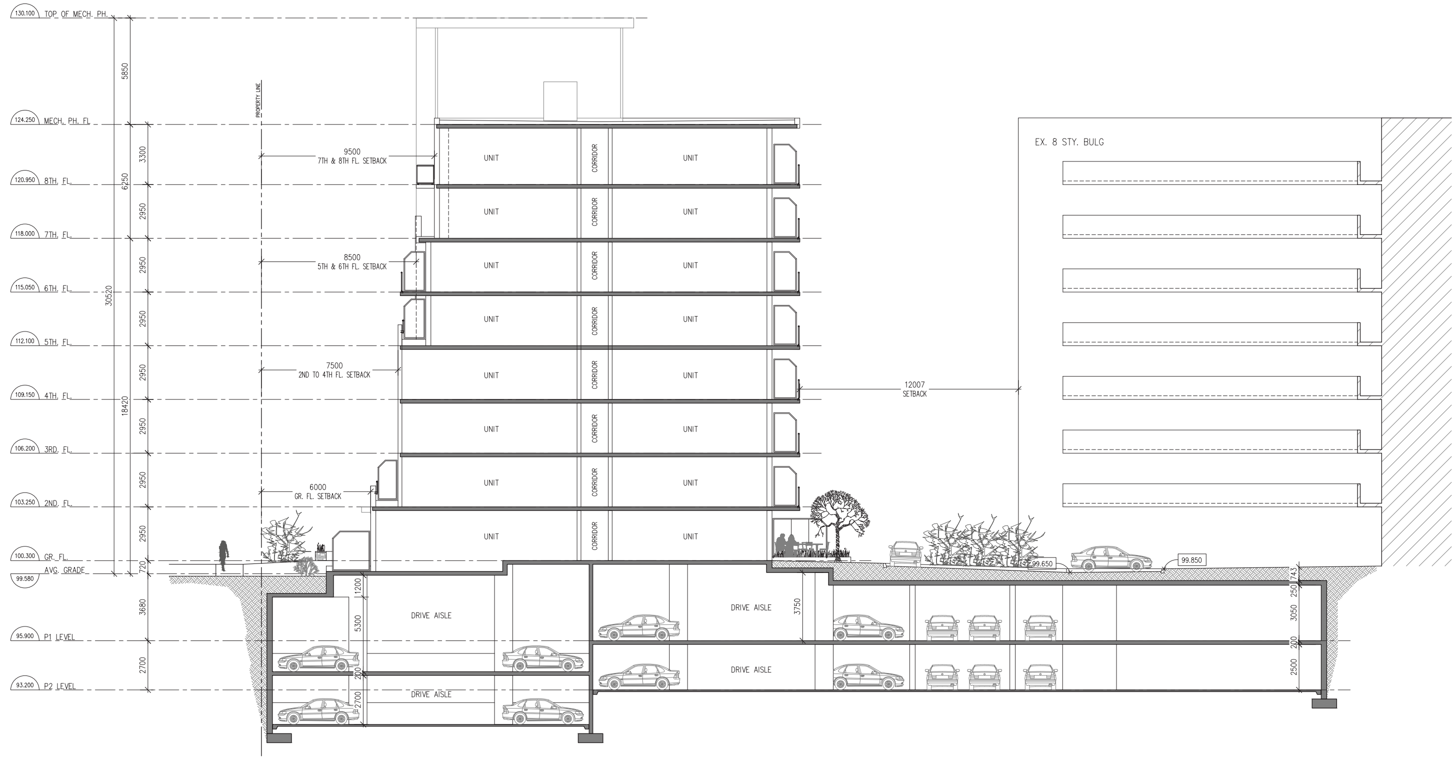
project:
1315 SILVER SPEAR RD.
mississauga, ontario

south elevation

june 27.2017	date:
1:125	scale:
14-40	project:
mr	drawn by:

drawing number:

A402



architectureunfolded

219 dufferin street, suite 201b, toronto, on, m6k 1y9 tel: (416)601.5416 info@unfolded.ca

notes:

6. issued for client review	05.11.17
5. issued for client review	10.27.16
4. pre-submission meeting	10.12.16
3. issued for client review	10.06.16
2. issued for client review	04.04.16
1. pre-submission meeting	06.25.15

revisions:

architectural team :

mark zwicker
morteza rasekhi

planning:
john d. rogers and associates inc.

structural:

electrical:

mechanical:

landscape:

site services:

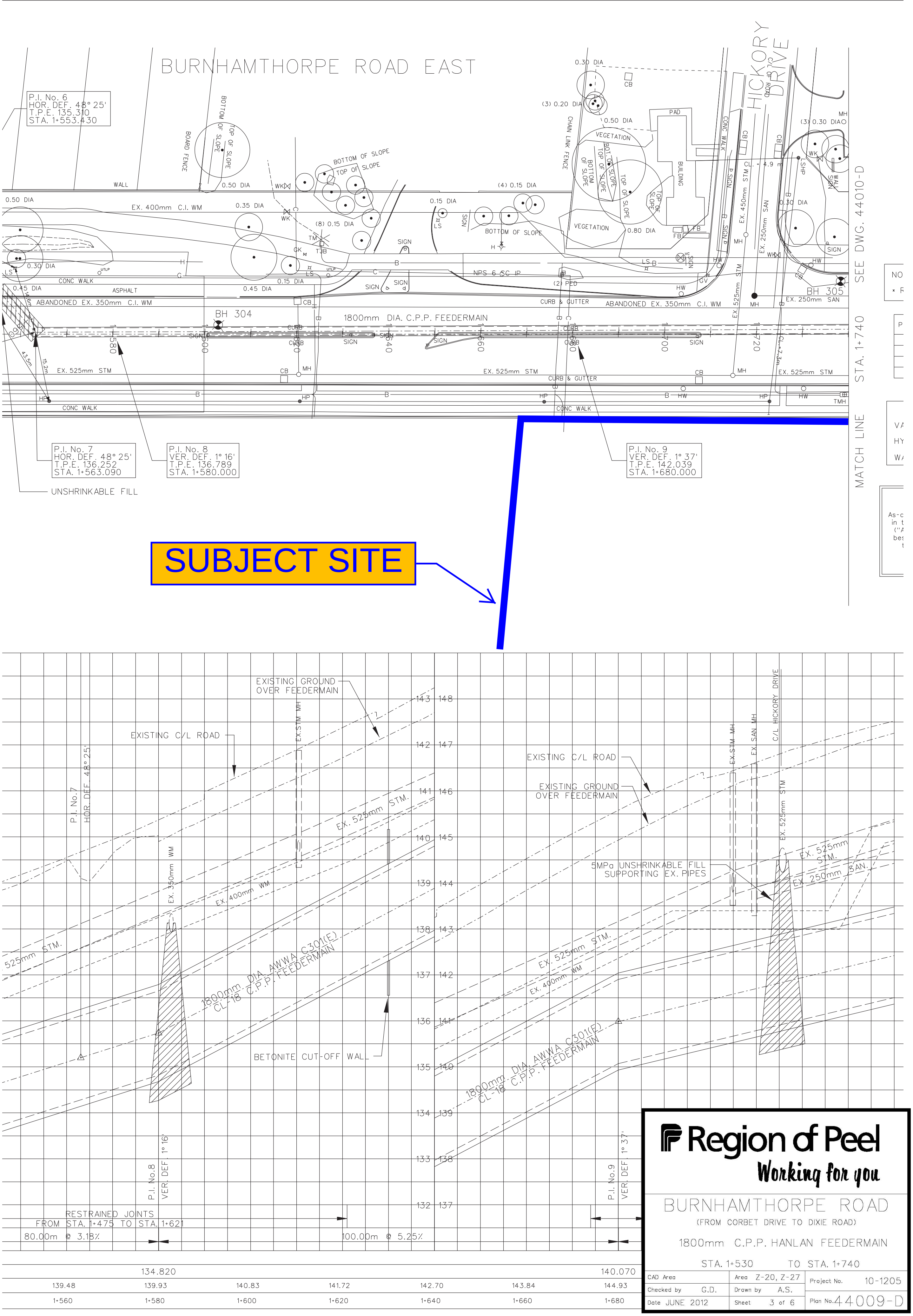
project:
1315 SILVER SPEAR RD.
mississauga, ontario

section

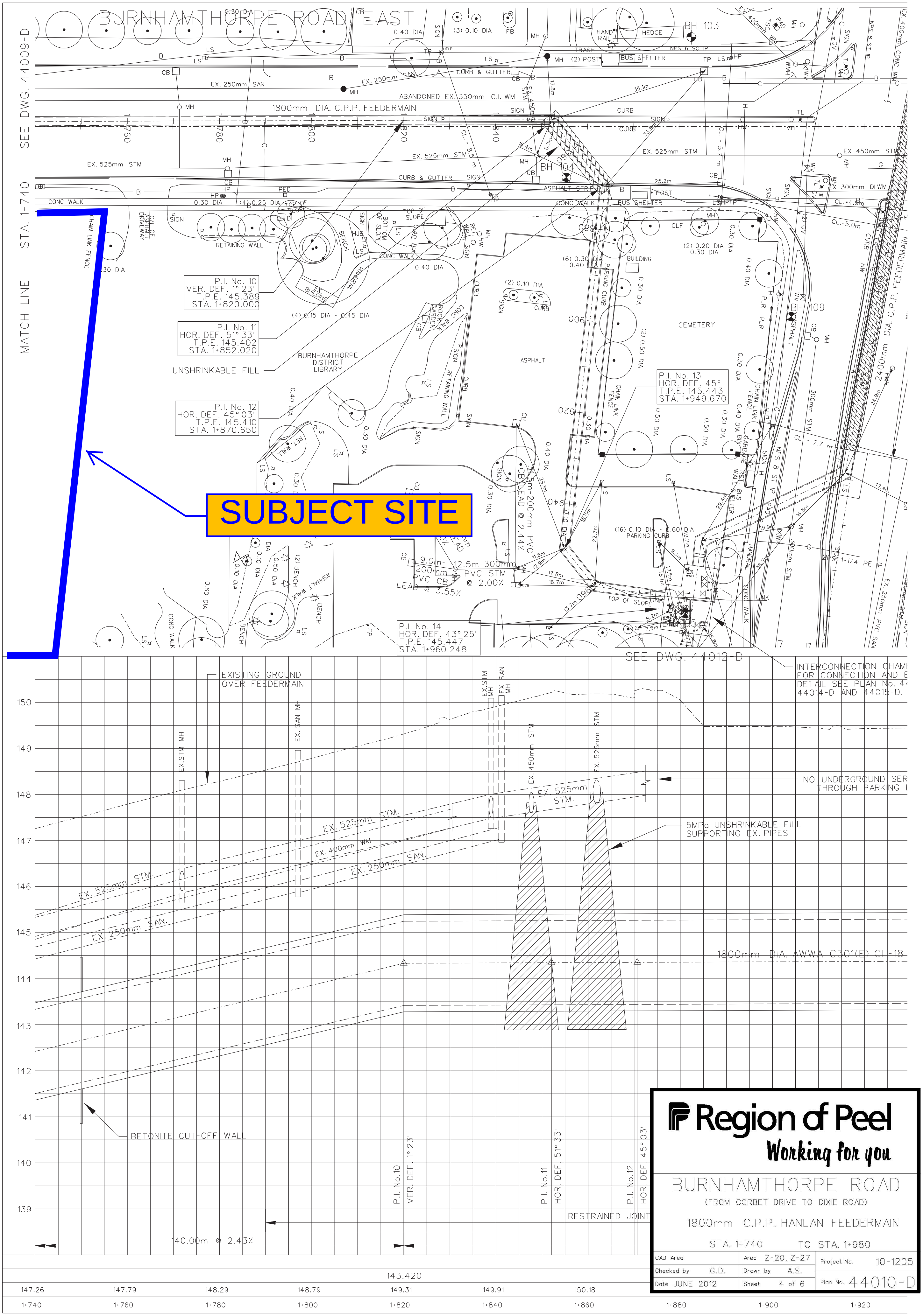
june 27.2017 date:
1:125 scale:
14-40 project:
mr drawn by:

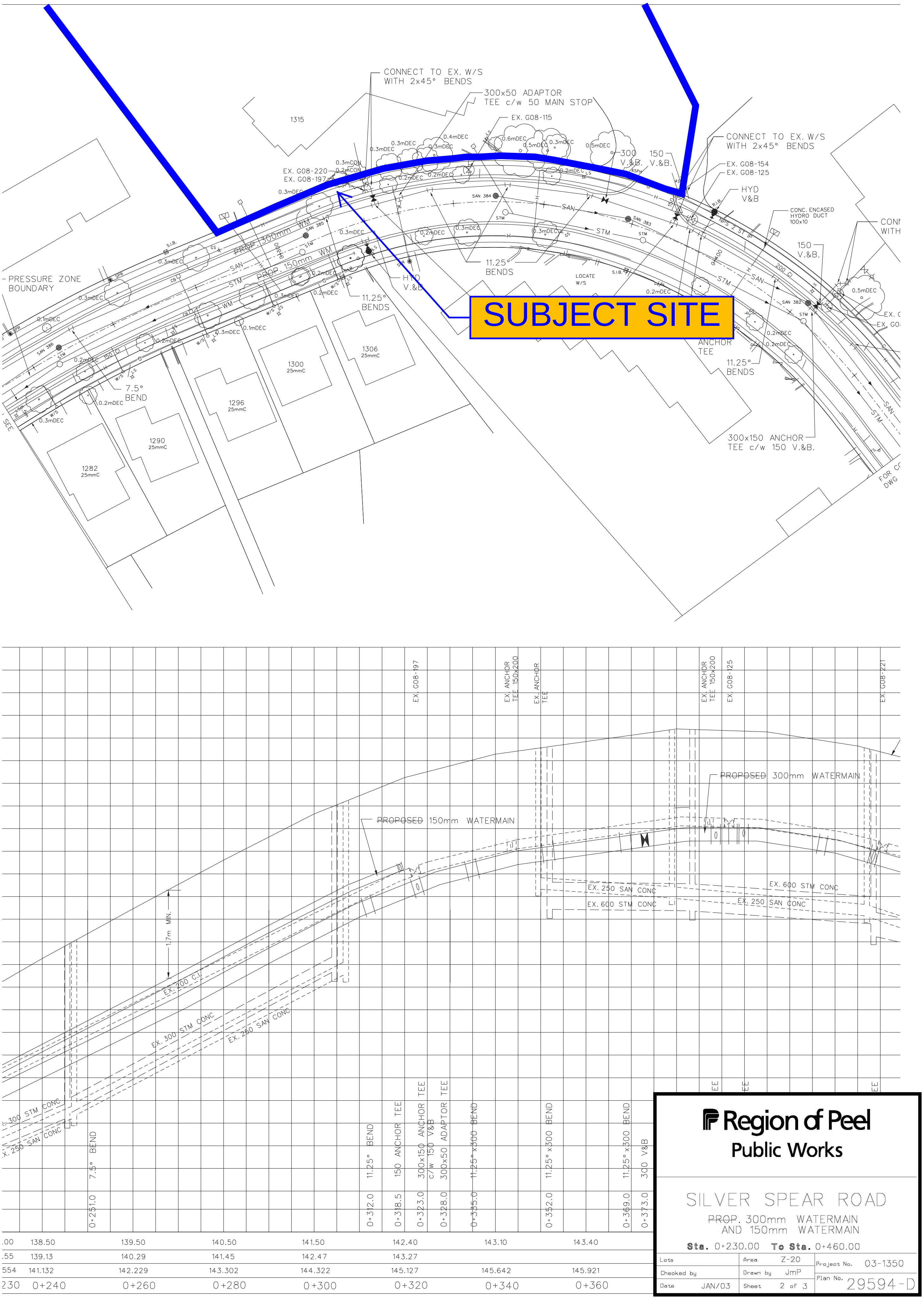
drawing number:
A501

APPENDIX B

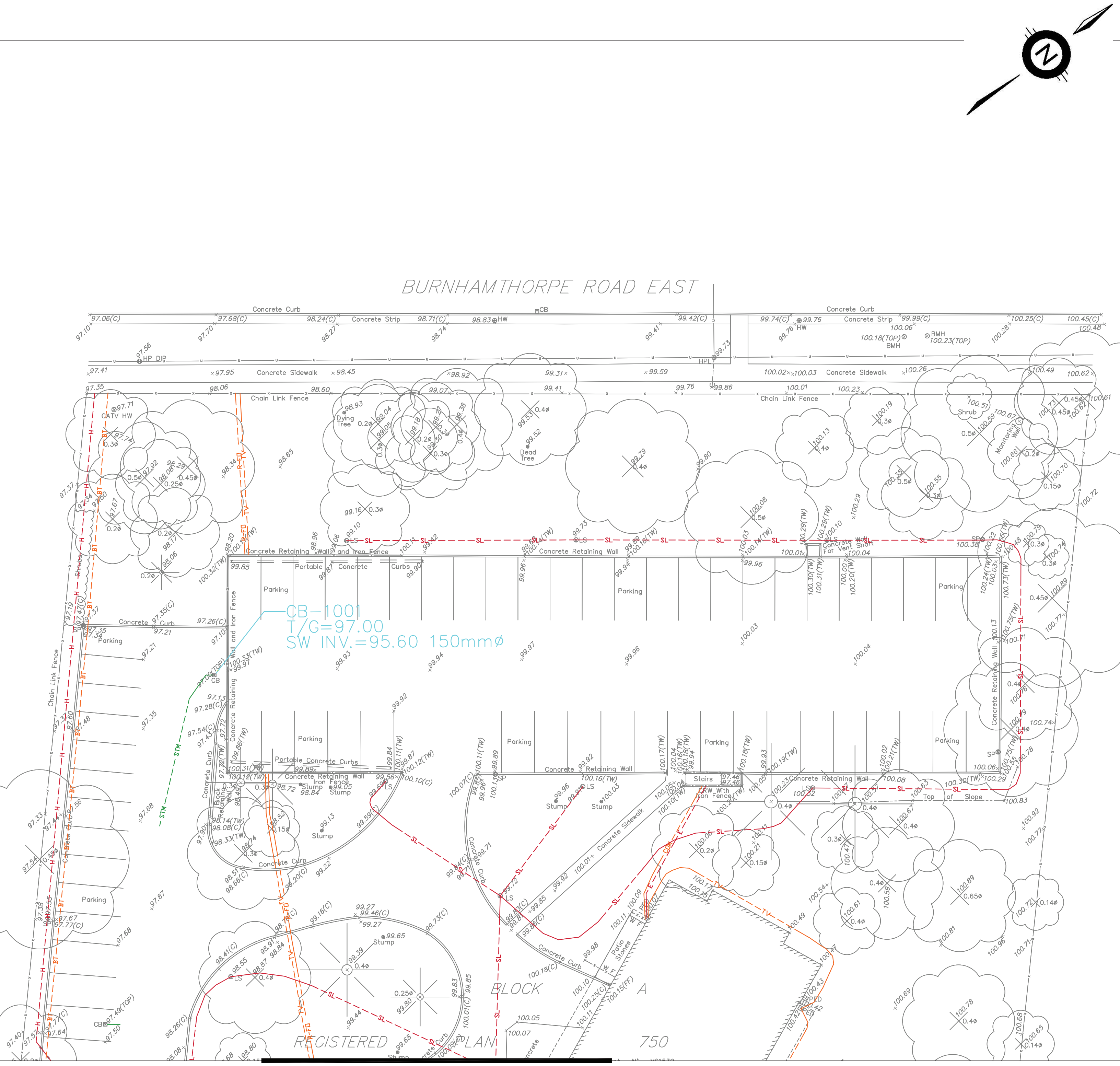


BURNHAMTHORPE ROAD EAST
HICKORY DRIVE
P.I. No. 6 HOR. DEF. 48° 25' T.P.E. 135.310 STA. 1+553.430
P.I. No. 7 HOR. DEF. 48° 25' T.P.E. 136.252 STA. 1+563.090
P.I. No. 8 VER. DEF. 1° 16' T.P.E. 136.789 STA. 1+580.000
P.I. No. 9 VER. DEF. 1° 37' T.P.E. 142.039 STA. 1+680.000
UNSHRINKABLE FILL
BH 304
BH 305
1800mm DIA. C.P.P. FEEDERMAIN
ABANDONED EX. 350mm C.I. WM
EX. 400mm C.I. WM
EX. 525mm STM
EX. 450mm STM
EX. 250mm SAN
CONC WALK
CURB & GUTTER
ASPHALT
BOTTOM OF SLOPE
TOP OF SLOPE
BOARD FENCE
CHAIN LINK FENCE
VEGETATION
BUILDING
PAD
NPS 6 SC IP
SEE DWG. 44010-D
MATCH LINE STA. 1+740
SUBJECT SITE
EXISTING GROUND OVER FEEDERMAIN
EXISTING C/L ROAD
EX. STM MH
EX. SAN MH
C/L HICKORY DRIVE
EX. 525mm STM.
EX. 400mm WM
EX. 350mm WM
EX. 250mm SAN.
5MPa UNSHRINKABLE FILL SUPPORTING EX. PIPES
1800mm DIA AWWA C301(E) CL-18 C.P.P. FEEDERMAIN
BETONITE CUT-OFF WALL
RESTRAINED JOINTS FROM STA. 1+475 TO STA. 1+621
80.00m @ 3.18%
100.00m @ 5.25%
134.820
140.070
139.48 139.93 140.83 141.72 142.70 143.84 144.93
1+560 1+580 1+600 1+620 1+640 1+660 1+680
Region of Peel
Working for you
BURNHAMTHORPE ROAD
(FROM CORBET DRIVE TO DIXIE ROAD)
1800mm C.P.P. HANLAN FEEDERMAIN
STA. 1+530 TO STA. 1+740
CAD Area
Area Z-20, Z-27
Project No. 10-1205
Checked by G.D.
Drawn by A.S.
Date JUNE 2012
Sheet 3 of 6
Plan No. 44009-D


BURNHAMTHORPE ROAD EAST
SEE DWG. 44009-D
MATCH LINE STA. 1+740
1800mm DIA. C.P.P. FEEDERMAIN
ABANDONED EX. 350mm C.I. WM
EX. 250mm SAN
EX. 525mm STM
EX. 450mm STM
BH 103
BH 104
BH 109
BUS SHELTER
CONC WALK
RETAINING WALL
CHAIN LINK FENCE
P.I. No. 10
VER. DEF. 1° 23'
T.P.E. 145.389
STA. 1+820.000
P.I. No. 11
HOR. DEF. 51° 33'
T.P.E. 145.402
STA. 1+852.020
UNSHRINKABLE FILL
BURNHAMTHORPE DISTRICT LIBRARY
P.I. No. 12
HOR. DEF. 45° 03'
T.P.E. 145.410
STA. 1+870.650
ASPHALT
CEMETERY
P.I. No. 13
HOR. DEF. 45°
T.P.E. 145.443
STA. 1+949.670
SUBJECT SITE
P.I. No. 14
HOR. DEF. 43° 25'
T.P.E. 145.447
STA. 1+960.248
SEE DWG. 44012-D
INTERCONNECTION CHAMBER FOR CONNECTION AND DETAIL SEE PLAN No. 44014-D AND 44015-D.
EXISTING GROUND OVER FEEDERMAIN
NO UNDERGROUND SERVICES THROUGH PARKING LOT
5MPa UNSHRINKABLE FILL SUPPORTING EX. PIPES
1800mm DIA. AWWA C301(E) CL-18
BETONITE CUT-OFF WALL
RESTRAINED JOINT
140.00m @ 2.43%
143.420
147.26 147.79 148.29 148.79 149.31 149.91 150.18
1+740 1+760 1+780 1+800 1+820 1+840 1+860 1+880 1+900 1+920
Region of Peel
Working for you
BURNHAMTHORPE ROAD
(FROM CORBET DRIVE TO DIXIE ROAD)
1800mm C.P.P. HANLAN FEEDERMAIN
STA. 1+740 TO STA. 1+980
CAD Area
Area Z-20, Z-27
Project No. 10-1205
Checked by G.D.
Drawn by A.S.
Date JUNE 2012
Sheet 4 of 6
Plan No. 44010-D



SUBJECT SITE
CONNECT TO EX. W/S WITH 2x45° BENDS
300x50 ADAPTOR TEE c/w 50 MAIN STOP
EX. G08-115
EX. G08-220
EX. G08-197
300 V.&B.
150 V.&B.
EX. G08-154
EX. G08-125
HYD V&B
CONC. ENCASED HYDRO DUCT 100x10
150 V.&B.
PROP. 300mm WM
PROP. 150mm WM
SAN
STM
WM
PRESSURE ZONE BOUNDARY
11.25° BENDS
HYD V.&B.
7.5° BEND
ANCHOR TEE
300x150 ANCHOR TEE c/w 150 V.&B.
LOCATE W/S
1315
1306
1300
1296
1290
1282
PROPOSED 300mm WATERMAIN
PROPOSED 150mm WATERMAIN
EX. 250 SAN CONC
EX. 600 STM CONC
EX. 200 C.I.
EX. 300 STM CONC
EX. 250 SAN CONC
1.7m MIN.
EX. G08-197
EX. ANCHOR TEE 150x200
EX. ANCHOR TEE
EX. G08-125
EX. G08-221
7.5° BEND
11.25° BEND
150 ANCHOR TEE
300x150 ANCHOR TEE c/w 150 V&B
300x50 ADAPTOR TEE
11.25° x300 BEND
11.25° x300 BEND
11.25° x300 BEND
300 V&B
0+251.0
0+312.0
0+318.5
0+323.0
0+328.0
0+335.0
0+352.0
0+369.0
0+373.0
138.50 139.50 140.50 141.50 142.40 143.10 143.40
139.13 140.29 141.45 142.47 143.27
141.132 142.229 143.302 144.322 145.127 145.642 145.921
0+240 0+260 0+280 0+300 0+320 0+340 0+360
Region of Peel
Public Works
SILVER SPEAR ROAD
PROP. 300mm WATERMAIN AND 150mm WATERMAIN
Sta. 0+230.00 To Sta. 0+460.00
Lots
Area Z-20
Project No. 03-1350
Checked by
Drawn by JmP
Plan No. 29594-D
Date JAN/03
Sheet 2 of 3



MATCHLINE
(SEE SHEET 1 OF 3)

multiVIEW®
Insight, not hindsight

THE LOCATION OF UNDERGROUND SERVICES SHOULD BE VERIFIED PRIOR TO EXCAVATION. UTILITY LOCATES ARE REQUIRED PRIOR TO ANY EXCAVATION ACTIVITY

SCALE 1:200

0 1 2 3 4 5 6 7

gineering ASCE 38-02 Quality Levels

of utility location and depth using
ds. i.e. Hydrovac.
g surface geophysical methods i.e.
ied or induced magnetic field using
te equipment or ground penetrating

g record information in conjunction with a
of utility furniture.
g record information only. This can
ection.

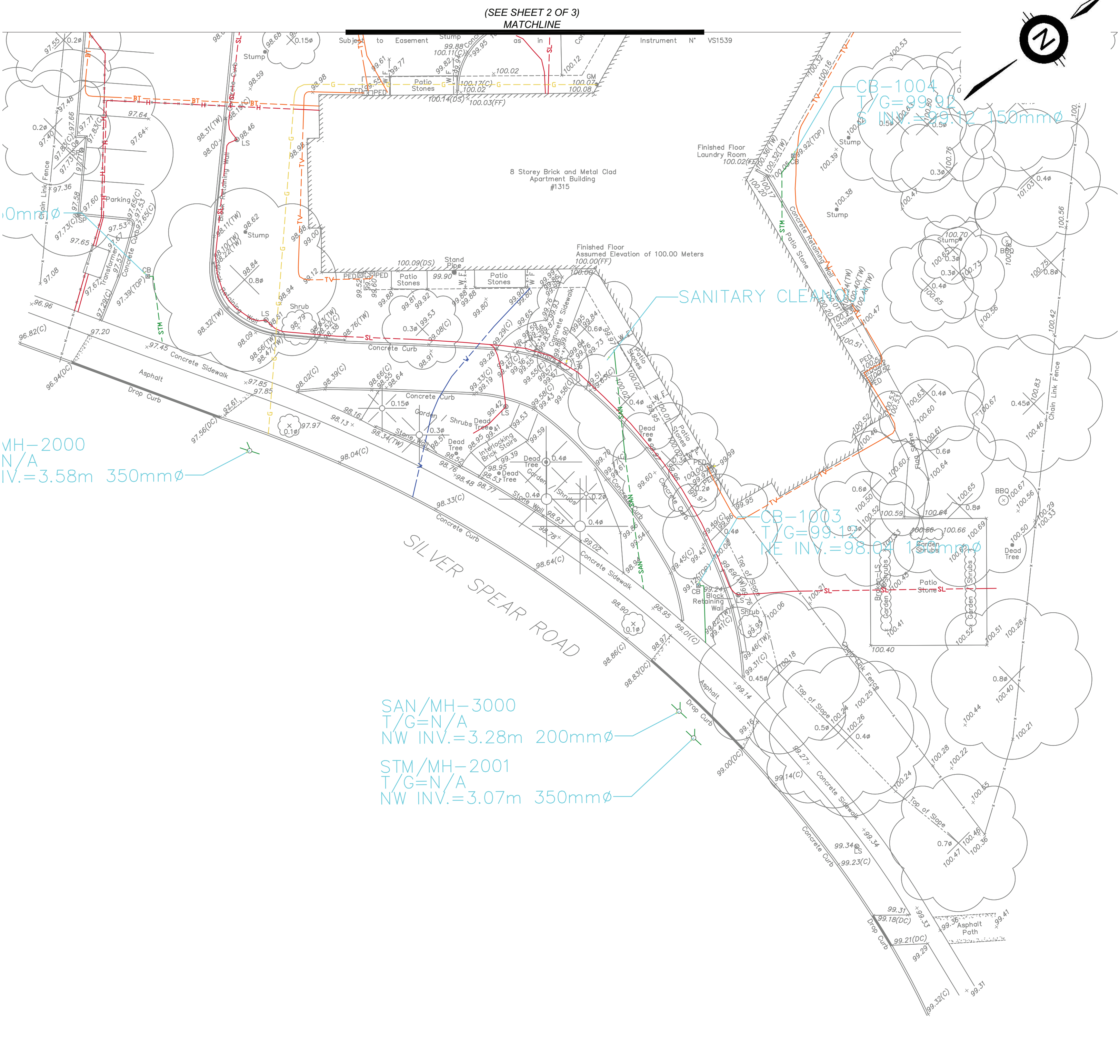
NOTES

1. This information is provided for design purposes only.
2. All inverts shown on this plan by multiVIEW Locates Inc.are in meters and were measured from the top of the manhole and/or catch basin lids.
3. Subsurface utility information shown on this drawing was obtained on a best effort, best practices basis, within the technical limitations of the instrumentation.
4. Utilities shown on this map by multiVIEW Locates Inc. were located using ASCE 38-02 Quality Level 'B' methods unless otherwise noted. All other information hereon has been supplied by others and is not certified.
5. Third party information provided on these drawings are for the convenience of use but do not constitute information obtained and delivered by multiVIEW Locates Inc. during the course of this project.
6. Elevations shown on this drawing are based from a topographic map completed by a third-party company and furnished by the Client.

UTILITY CODES

W	Watermain	COM	Communication Cable	SAN	Sanitary Sewer
G	Gasmain	H	Hydro Cable		
BT	Bell	E	Electrical Cable		
TV	TV Cable	SL	Streetlight Cable		
R-FO	Rogers FO	STM	Storm Sewer		

ALL UTILITIES ARE UNDERGROUND UNLESS OTHERWISE SPECIFIED



multiVIEW® *Insight, not hindsight*

THE LOCATION OF UNDERGROUND SERVICES SHOULD BE VERIFIED PRIOR TO EXCAVATION. UTILITY LOCATES ARE REQUIRED PRIOR TO ANY EXCAVATION ACTIVITY

SCALE 1:200

0 1 2

ıbsurface Utility Engineering ASCE 38-02 Quality Levels

L'A': Visual verification of utility location and depth using excavation methods. i.e. Hydrovac.

L'B': Utility located using surface geophysical methods i.e. electronically applied or induced magnetic field using specific utility locate equipment or ground penetrating radar.

L'C': Utility plotted using record information in conjunction with a visual field survey of utility furniture.

L'D': Utility plotted using record information only. This can include oral recollection.

NOTES

1. This information is provided for design purposes only.
2. All inverts shown on this plan by multiVIEW Locates Inc.are in meters and were measured from the top of the manhole and/or catch basin lids.
3. Subsurface utility information shown on this drawing was obtained on a best effort, best practices basis, within the technical limitations of the instrumentation.
4. Utilities shown on this map by multiVIEW Locates Inc. were located using ASCE 38-02 Quality Level 'B' methods unless otherwise noted. All other information hereon has been supplied by others and is not certified.
5. Third party information provided on these drawings are for the convenience of use but do not constitute information obtained and delivered by multiVIEW Locates Inc. during the course of this project.
6. Elevations shown on this drawing are based from a topographic map completed by a third-party company and furnished by the Client.

UTILITY CODES

— — V — —	Watermain	— COM — —	Communication Cable	— — SAN — —
— — G — —	Gasmain	— H — —	Hydro Cable	
— BT — —	Bell	— E — —	Electrical Cable	
— TV — —	TV Cable	— SL — —	Streetlight Cable	
— R-FO — —	Rogers FO	— STM — —	Storm Sewer	

ALL UTILITIES ARE UNDERGROUND UNLESS OTHERWISE SPECIFIED

APPENDIX C

corix®
Water Services

10 Estate Drive, Toronto, Ontario M1H 2Z1
Phone: 416.282.1665 Fax: 416.282.7702 Toll Free: 1.888.349.2493
www.corix.com

SITE NAME: Fabian Papa & Partners Inc. DATE: 10 / 5 / 2017

LOCATION: 1315 Silver Spear Rd.

TEST DATA TIME OF TEST: 1:00pm

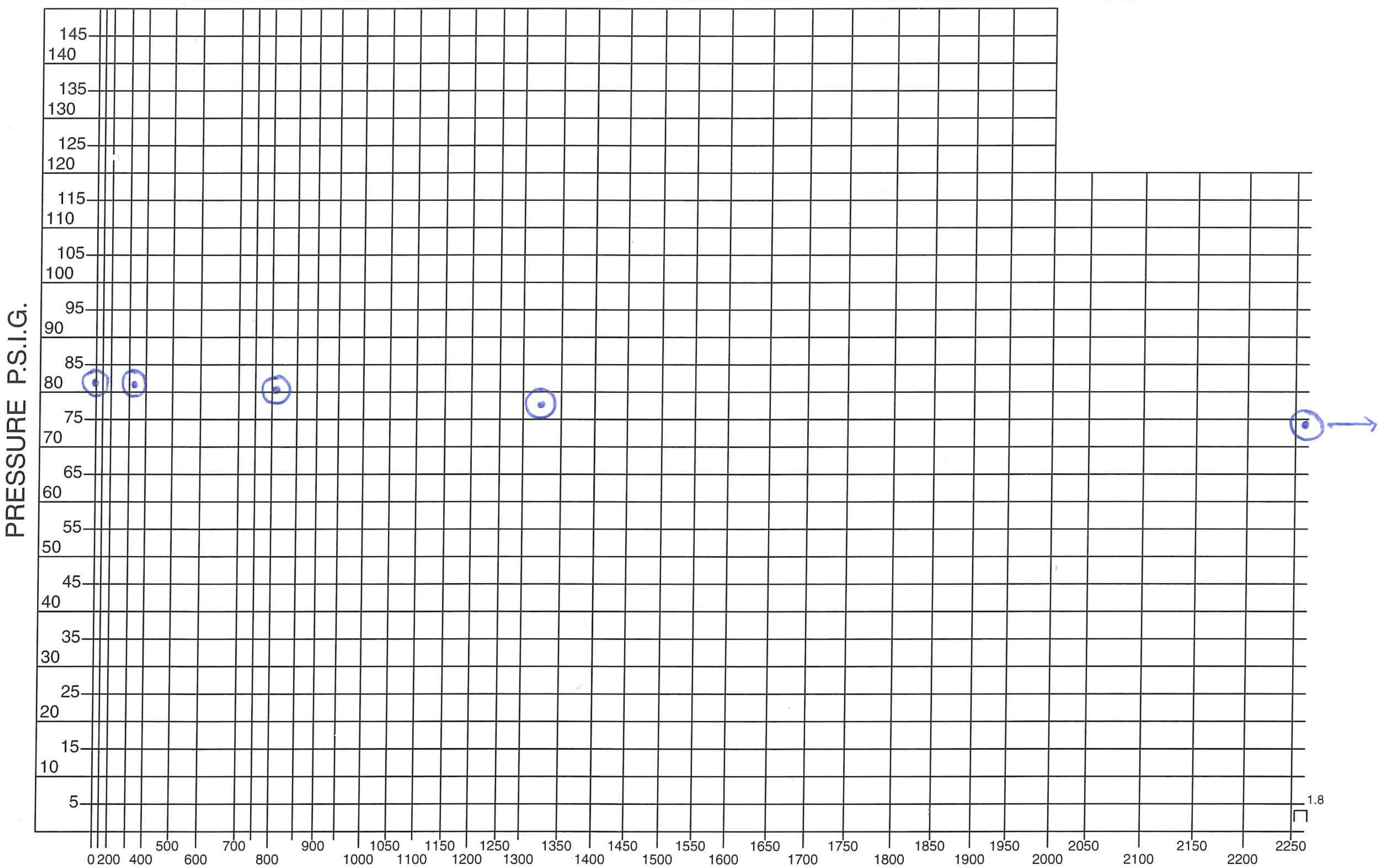
LOCATION OF TEST: (FLOW) 1st Hyd. S of 1355 Silver Spear Rd. - McAvity 3P

(RESIDUAL) 1st Hyd N of 1355 Silver Spear Rd. - McAvity 3P

MAIN SIZE: 300mm PVC

STATIC PRESSURE: 82

	NUMBER OF OUTLETS & ORIFICE SIZE	PITOT PRESSURE	FLOW (U.S. G.P.M.)	RESIDUAL PRESSURE
# 1	1 x 1 1/8	81	338	82
# 2	1 x 1 3/4	78	803	81
# 3	1 x 2 1/2	64	1339	78
# 4	2 x 2 1/2	50	2367	74



FLOW U.S. G.P.M.

COMMENTS: Performed one complete NFPA 291 flow test as requested.

Authorized Signature ______________________ Corix Water Services Signature [signature]

1315 Silver Spear Road
Water Demand Calculations

Designed By: Jason Jenkins, P.Eng., P.E.
Checked By: Paolo Albanese, P.Eng.
File No.: 17026
Date: September 29, 2017

Domestic Water Supply Demands:

Relavant Region of Peel Design Criteria:

- Residential Demand = **280 L/capita/day**
- Max day demand peaking factor = **2.0**
- Peak hour demand peaking factor = **3.0**
- Population for Apartments is **2.7 people / unit** or **475 pp/ha**
- Population for Townhomes is **3.5 people / unit**
- Peaking Factor per Harmon

Building	No. of Units	Density	Population	Ave. Day Flow	Peak Hour, ADxPH	Max. Day, ADxMD
			pers	(L/s)	(L/s)	(L/s)
Prop. Bldg.	159	varies	226	0.732	2.197	1.465

Proposed 8-Storey Building

Fire Protection Supply Demands:
Per Water Supply for Public Fire Protection Manual, 1999, by the Fire Underwriters Survey

STEP 1: Calculate Fire Flow

$$F = 220 \cdot C \cdot \sqrt{A} \cdot (\text{various adjustments})\ \text{L/min}$$

C = Coefficient related to type of construction:
= 1.5 for wood frame construction (Structure essentially all combustable)
= 1.0 for ordinary construction (brick or other masonry walls, combustable floor and interior)
= 0.8 for non combustable construction (unprotected metal structure components, masonry or metal walls)
= 0.6 for fire resistive construction (fully protected frame, floors, roof)

C =	0.6		
Floor Area (largest building) =	1,545.0	m2	
Floor Above =	1,377.0	m2	
Floor Below =	1,377.0	m2	
Area = (Largest Area + 25% of floor above and below) =	2,234	m2	
F =	6,238	L/min	
F =	6,000	L/min	Rounded to the nearest 1000

STEP 2: Adjust for building occupancy (Note: Number shall not be less then 2000 L/min)

= - 25% (Non-Combustable)
= - 15% (Limited Combustable) Factor = -0.15
= 0 (Combustable) F1 = F x Factor = 5,100 L/min
= + 15% (Free Burning)
= + 25% (Rapid Burning)

1315 Silver Spear Road
Water Demand Calculations

STEP 3: Decrease F1 if building contains fire supression system

= - 50% (Automatic Sprinklers)
= - 30% (Adequately Designed System)
= Additional -10% if the water supply is standard for the system and the fire department hose lines required
= Additional -10% if the system is fully supervised

Factor =	50%	
F2 = F1 x Factor =	2,550	L/min

STEP 4: Increase F1 due to exposure / close proximity to other buildings (Note: Total shall not exceed 75%)

= 25% (0m to 3m)	Distances =	12m / 12m / 22m / >45m	
= 20% (3.1m to 10m)	Factors =	15% + 15% + 10% + 0%	
= 15% (10.1m to 20m)			
= 10% (20.1m to 30.1m)	Factor =	40%	(max 75%)
= 5% (30.1m to 45m)	F3 = F1 x Factor =	2,040	L/min
= 0% (Greater then 45m)			

STEP 5: Calculate Fire Flow (Note: Fireflow shall not be less then 2000 L/min or greater then 45,000 L/min)

Fire Flow =	F1-F2+F3		
F1 =	5,100	L/min	
- F2 =	2,550	L/min	
+ F3 =	2,040	L/min	
Fire Flow =	4,590	L/min	
Fire Flow =	5,000	L/min	Rounded to the nearest 1000
Fire Flow =	83.3	L/s	

STEP 6: Calculate Total Water Demand (Max Day Demand + Fire Flow)

Recall Max Day Demand (from chart above) =	1.5	L/s
TOTAL Fire Demand =	84.8	L/s

1315 Silver Spear Road
Fire Flow Calculations

Designed By: Jason Jenkins, P.Eng., P.E.
Checked By: Paolo Albanese, P.Eng.
File No.: 17026
Date: September 29, 2017

Proposed 8-Storey Building

Recall Total Fire Demand = 84.8 L/s (Taken From Fire Flow Spreadsheet)

Hydrant Flow Test Results

Flow (gpm)	Flow (L/s)	Pressure (psi)	Pressure (kPa)
0	0.00	82	565.4
338	21.32	81	558.5
803	50.66	78	537.8
1339	84.48	64	441.3
2367	149.34	50	344.7
	84.80	63.9	440.8

$$Q_R = Q_F \times \frac{h_r^{0.54}}{h_f^{0.54}}$$

Hazen-Williams formula for watermain head loss:

$h_L = (10.675 * L * Q^{1.85}) / (C^{1.85} * D^{4.8655})$

where

h_L = *pressure drop (m)*
L = length of pipe (m)
Q = flow rate (m^3/s)
C = roughness coefficient
D = inside hydraulic diameter (m)

New 100 mm Domestic Line

L= 27.0 m
D= 100 mm
C= 100

Peak Hour Flow		Head Loss, h_L				Residual Pressure at Main [1]		Residual Pressure at Bldg.	
Q (L/s)	Q (m3/s)	(m)	(in)	(psi)	(kPa)	(psi)	(kPa)	(psi)	(kPa)
2.2	0.0	0.1	2.0	0.1	0.5	82.0	565.3	**81.9**	**564.8**

[1] Residual pressure taken from above

New 150 mm Fire Line

L= 30.0 m
D= 150 mm
C= 100

Total Fire Flow (Max Day + Fire Flow)		Head Loss, h_L				Residual Pressure at Main [1]		Residual Pressure at Bldg.	
Q (L/s)	Q (m3/s)	(m)	(in)	(psi)	(kPa)	(psi)	(kPa)	(psi)	(kPa)
84.8	0.1	6.8	267.2	9.7	66.5	63.9	440.8	**54.3**	**374.2**

[1] Residual pressure taken from above

APPENDIX D

1315 Silver Spear Road

City of Mississauga

SANITARY SEWER DESIGN SHEET

Relavant Region of Peel Design Criteria:

Post-development domestic sewage flow based upon a unit flow of **302.8 Lpcd**
Infiltration flow based upon a unit flow of **0.20 L/s/ha**
Population for Apartments is either **475 pp/ha** **OR** **2.7 people / unit**
Population for Commercial Properties is **50 pp/ha**

Minimum flow velocity for partial flow = **0.75 m/s.**
Maximum flow velocity for pipe full flow = **3.5 m/s**
Peaking Factor per Harmon Equation
Mannings = 0.013

Designed By: Jason Jenkins, P.Eng., P.E.
Checked By: Paolo Albanese, P.Eng.

File No.: 17073
Date: September 29, 2017

	from M.H.	to M.H.	DESIGN FLOW CALCULATIONS: Area (ha) or # of Units	Density (p/unit)	Population	Cumulative Area (ha)	Cumulative Population	Peaking Factor M	Sewage Flow (1) (L/s)	Infiltration Flow (2) (L/s)	Foundation Drain (3) (L/s)	Total Flow, Qd (1)+(2)+(3) (L/s)	SEWER DESIGN & ANALYSIS: Nominal Diameter (mm)	Pipe Slope (%)	Pipe Length (m)	Nominal Full Flow Capacity, Qf (L/s)	Nominal Full Flow Velocity (m/s)	Percent of Full Flow (Qd/Qf)	Actual Flow Velocity V (m/s)	Remarks
									(302.8 L/c/d)	0.20 L/s/ha										
Post-Development																				
Prop. Sewer 1	New Building	MH1A	0.4171		226	0.4171	226	4.13	3.268	0.083		3.4	200	2.00%		46.38	1.48	7.3%	0.86	
Prop. Sewer 2	MH1A	MH2A				0.4171	226	4.13	3.268	0.083		3.4	200	3.00%		56.81	1.81	6.0%	0.99	
Existing 250mm Sanitary Sewer (Silver Spear Road)																				
													250	5.10%		134.30	2.74	0.0%	#N/A	
										Percentage of Full Flow Capacity		2.5%		Full Flow Capacity						

PROPOSED Development Populations	No. of Units	Density	Population
Bachelor	1	1.1 pp/unit	1
1 Bedroom	113	1.1 pp/unit	124
1 Bedroom + Den	0	1.1 pp/unit	0
2 Bedroom	39	2.1 pp/unit	82
3 Bedroom	6	3.1 pp/unit	19
	159		226

14.UNIT SUMMARY

	UNIT TYPE					
FLOOR	**BA**	**1B**	**1B+D**	**2B**	**3B**	**TOTAL**
GRD	1	11	0	5	0	**17**
2ND TO 4TH	0	36	0	18	6	**60**
5TH AND 6TH	0	34	0	8	0	**42**
7TH TO 8TH	0	32	0	8	0	**40**
TOTAL	**1**	**113**	**0**	**39**	**6**	**159**
	0.6%	**71.1%**	**0.0%**	**24.5%**	**4%**	**100%**

EXCERPT REGION OF PEEL "2013 WATER AND WASTEWATER MASTER PLAN FOR LAKE-BASED SYSTEMS"

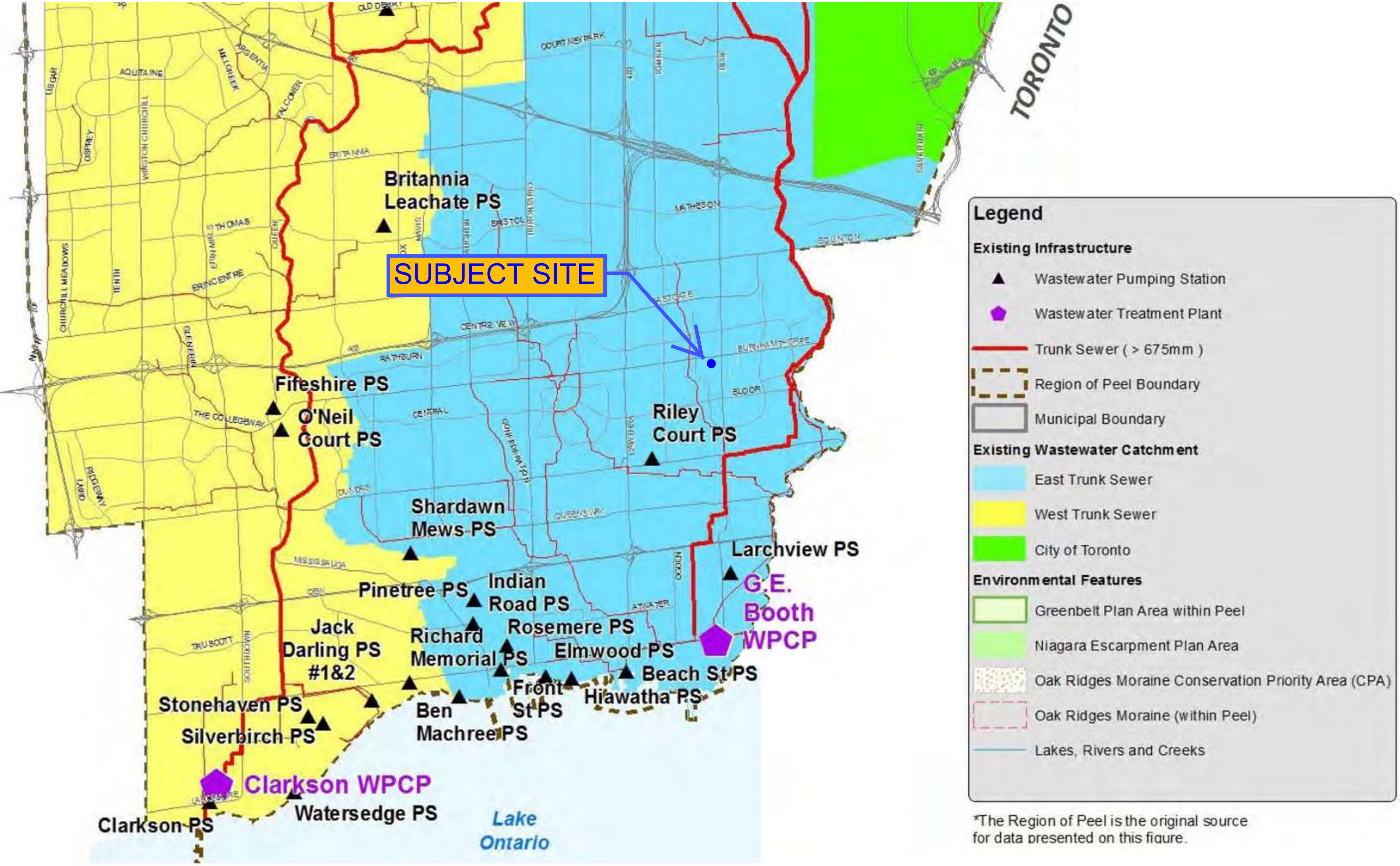
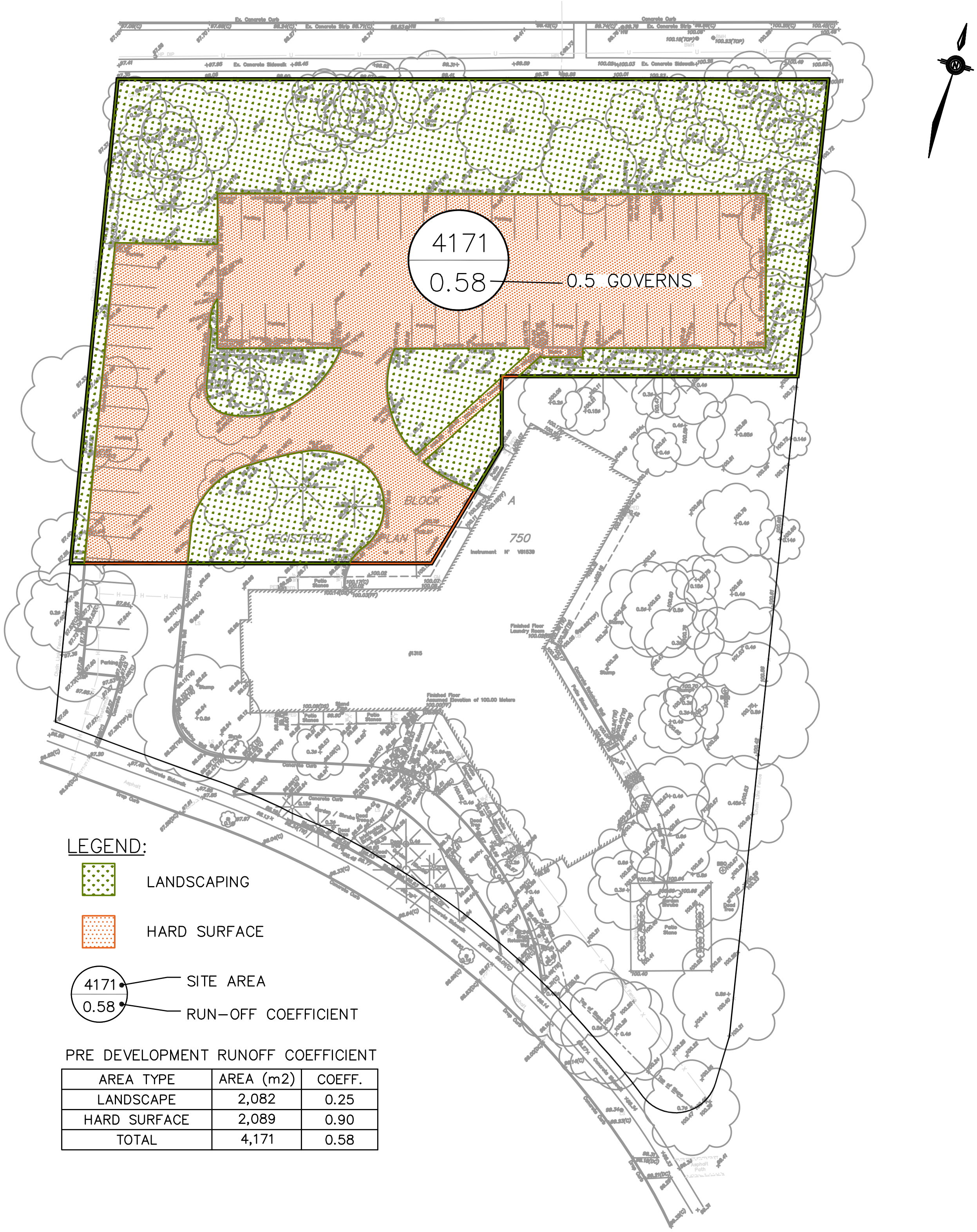


Figure 4.2 Existing Lake-Based Wastewater Collection System

APPENDIX E



LEGEND:

LANDSCAPING

HARD SURFACE

4171 SITE AREA

0.58 RUN–OFF COEFFICIENT

PRE DEVELOPMENT RUNOFF COEFFICIENT

AREA TYPE	AREA (m2)	COEFF.
LANDSCAPE	2,082	0.25
HARD SURFACE	2,089	0.90
TOTAL	4,171	0.58

fabian papa & partners
A Division of FP&P HydraTek Inc.
216 Chrislea Road, Suite 204
Vaughan, Ontario, L4L 8S5
t: 905-264-2420
www.fabianpapa.com

PROJECT NAME:

1315 SILVER SPEAR ROAD

RESIDENTIAL DEVELOPMENT

PROJECT NO:	DWG NO:	REV NO:
17073	PRE–SWM	0

PRE–DEVELOPMENT DRAINAGE AREA PLAN

LEGEND:

- ROOF
- LANDSCAPING
- PERMEABLE PAVERS
- HARD SURFACE

4171 — SITE AREA
0.75 — RUN-OFF COEFFICIENT

POST DEVELOPMENT RUNOFF COEFFICIENT

AREA TYPE	AREA (m2)	COEFF.
BARE ROOF	1,563	0.90
PERM PAVERS	183	0.55
LANDSCAPE	1,268	0.45
HARD SURFACE	1,157	0.90
TOTAL	4,171	0.75

fabian papa & partners
A Division of FP&P HydraTek Inc.
216 Chrislea Road, Suite 204
Vaughan, Ontario, L4L 8S5
t: 905-264-2420
www.fabianpapa.com

PROJECT NAME:

1315 SILVER SPEAR ROAD

RESIDENTIAL DEVELOPMENT

PROJECT NO:	DWG NO:	REV NO:
17073	POST-SWM	0

POST-DEVELOPMENT DRAINAGE AREA PLAN

H:\FP&P HydraTek\Projects\2017\17073 - 1315 Silver Spear, Mississauga\Drawings\Re-Zoning\Revision 0\17073 - Civil Engineering Plans (Revision 0).dwg (Oct 04, 2017 - 3:48pm)

1315 Silver Spear Road

City of Mississauga

STORM SEWER DESIGN SHEET

216 Chrislea Road, Suite 204, Vaughan, Ontario, Canada L4L 8S5
Tel: 905-264-2420 Fax: 905-264-2441 info@fabianpapa.com
www.fabianpapa.com

Relavant Design Criteria:

Minimum flow velocity = **0.75 m/s**
Maximum flow velocity = **4.0 m/s**
Storm Sewers to be designed to a 10-year storm
Mannings = 0.013

Designed By: Jason Jenkins, P.Eng., P.E.
Checked By: Paolo Albanese, P.Eng.
File No.: 17073
Date: September 29, 2017

Street	From MH	To MH	A (ha)	R	A x R	Accum. A x R	T_c (min)	I (mm/hr)	Q_{act} (l/s)	Size of Pipe (mm)	Slope (%)	Nominal Capacity Q_{cap} (L/s)	Full Flow Velocity (m/s)	Actual Flow Velocity (m/s)	Length (m)	Time in Sect. (min)	Total Time (min)	Q_{act}/Q_{cap}	Remarks
PRE DEVELOPMENT CONDITIONS																			
2-YEAR			0.4171	0.58	0.240	0.240	15.0	59.9	39.9										
5-YEAR			0.4171	0.58	0.240	0.240	15.0	80.5	53.7										
10-YEAR			0.4171	0.58	0.240	0.240	15.0	99.2	66.1										
25-YEAR			0.4171	0.63	0.264	0.264	15.0	113.9	83.5										
50-YEAR			0.4171	0.69	0.288	0.288	15.0	127.1	101.7										
100-YEAR			0.4171	0.72	0.300	0.300	15.0	140.7	117.3										
ALLOWABLE RELEASE RATES (MAX 0.50 RUNOFF COEFFICIENT)																			
2-YEAR			0.4171	0.50	0.209	0.209	15.0	59.9	34.7										
5-YEAR			0.4171	0.50	0.209	0.209	15.0	80.5	46.6										
10-YEAR			0.4171	0.50	0.209	0.209	15.0	99.2	57.4										
25-YEAR			0.4171	0.55	0.229	0.229	15.0	113.9	72.6										
50-YEAR			0.4171	0.60	0.250	0.250	15.0	127.1	88.4										
100-YEAR			0.4171	0.63	0.261	0.261	15.0	140.7	101.9										
POST DEVELOPMENT CONDITIONS **(No Attenuation)**																			
2-YEAR			0.4171	0.75	0.312	0.312	15.0	59.9	51.9										
5-YEAR			0.4171	0.75	0.312	0.312	15.0	80.5	69.8										
10-YEAR			0.4171	0.75	0.312	0.312	15.0	99.2	85.9										
25-YEAR			0.4171	0.82	0.343	0.343	15.0	113.9	108.6										
50-YEAR			0.4171	0.90	0.374	0.374	15.0	127.1	132.2										
100-YEAR			0.4171	0.93	0.390	0.390	15.0	140.7	152.4										
POST DEVELOPMENT CONDITIONS **(With Attenuation)**						Depth		Orifice											
2-YEAR					d=	0.2640	k=0.6	180	28.2										
5-YEAR					d=	0.5441	k=0.6	180	45.6										
10-YEAR					d=	0.7228	k=0.6	180	53.8										
25-YEAR					d=	0.8735	k=0.6	180	59.9										
50-YEAR					d=	1.0150	k=0.6	180	65.0										
100-YEAR					d=	1.1651	k=0.6	180	70.1										
STORM SERVICE DESIGN																			
Storm Service 1	Tank	STC	Controlled 10-year STM flow				→		53.8	300	1.00%	96.7	1.37	1.40	1.0	0.0	10.0	56%	
Storm Service 2	STC	MH1							53.8	300	1.00%	96.7	1.37	1.40	20.0	0.2	10.2	56%	
Storm Service 3	MH1	MH2							53.8	300	1.00%	96.7	1.37	1.40	11.7	0.1	10.1	56%	

$I_{2\text{-year}} = \frac{610}{(T+4.6)^{0.78}}$ = 59.89 mm/hr

$I_{5\text{-year}} = \frac{820}{(T+4.6)^{0.78}}$ = 80.51 mm/hr

$I_{10\text{-year}} = \frac{1010}{(T+4.6)^{0.78}}$ = 99.17 mm/hr

$I_{25\text{-year}} = \frac{1160}{(T+4.6)^{0.78}}$ = 113.89 mm/hr

$I_{50\text{-year}} = \frac{1300}{(T+4.7)^{0.78}}$ = 127.13 mm/hr

$I_{100\text{-year}} = \frac{1450}{(T+4.9)^{0.78}}$ = 140.69 mm/hr

1315 Silver Spear Road

Stormwater Management Storage Calculations using Rational Method

City of Mississauga

2-year Storm

$$I_{2\text{-}year} = \frac{610}{(T+4.6)^{0.78}} = 59.89 \text{ mm/hr}$$

Project No.	17073	Site Area (ha) =	0.4171
Analysis By:	Jason Jenkins	Weighed Runoff Coefficient =	0.576
Last Revised:	September 26, 2017	Peak Discharge (L/s) =	28.21

Time (min)	Intensity (mm/hr)	Q-100 (L/s)	Q-stored (L/s)	Storage Vol. (m^3)
0	0.0	0.000	0.000	0.000
15	59.9	39.938	11.731	10.558
20	50.2	33.452	5.245	6.294
30	38.4	25.637	0.000	0.000
40	31.5	21.031	0.000	0.000
50	26.9	17.961	0.000	0.000
60	23.6	15.753	0.000	0.000
70	21.1	14.080	0.000	0.000
80	19.1	12.764	0.000	0.000
90	17.5	11.699	0.000	0.000
100	16.2	10.817	0.000	0.000
110	15.1	10.074	0.000	0.000
120	14.2	9.437	0.000	0.000
130	13.3	8.886	0.000	0.000
140	12.6	8.403	0.000	0.000
150	12.0	7.976	0.000	0.000
160	11.4	7.595	0.000	0.000
170	10.9	7.254	0.000	0.000
180	10.4	6.945	0.000	0.000
190	10.0	6.665	0.000	0.000
200	9.6	6.410	0.000	0.000
210	9.3	6.176	0.000	0.000
220	8.9	5.960	0.000	0.000
230	8.6	5.761	0.000	0.000
240	8.4	5.576	0.000	0.000
250	8.1	5.405	0.000	0.000
260	7.9	5.245	0.000	0.000
270	7.6	5.095	0.000	0.000
280	7.4	4.955	0.000	0.000
290	7.2	4.823	0.000	0.000
300	7.0	4.699	0.000	0.000
310	6.9	4.582	0.000	0.000
320	6.7	4.472	0.000	0.000
330	6.5	4.367	0.000	0.000
340	6.4	4.268	0.000	0.000
350	6.3	4.174	0.000	0.000
360	6.1	4.084	0.000	0.000

Volume Required (cu.m) =	**10.6**
Volume Provided (cu.m) =	**10.6**
HGL Depth (m) =	0.26
Orifice Size (mm) =	180

1315 Silver Spear Road

Stormwater Management Storage Calculations using Rational Method
City of Mississauga

5-year Storm

$$I_{5\text{-year}} = \frac{820}{(T+4.6)^{0.78}} = 80.51 \text{ mm/hr}$$

Project No.	17073	Site Area (ha) =	0.4171
Analysis By:	Jason Jenkins	Weighed Runoff Coefficient =	0.748
Last Revised:	September 26, 2017	Peak Discharge (L/s) =	45.58

Time (min)	Intensity (mm/hr)	Q-100 (L/s)	Q-stored (L/s)	Storage Vol. (m^3)
0	0.0	0.000	0.000	0.000
15	80.5	69.759	24.184	21.766
20	67.4	58.429	12.854	15.425
30	51.7	44.780	0.000	0.000
40	42.4	36.735	0.000	0.000
50	36.2	31.373	0.000	0.000
60	31.8	27.516	0.000	0.000
70	28.4	24.594	0.000	0.000
80	25.7	22.295	0.000	0.000
90	23.6	20.435	0.000	0.000
100	21.8	18.894	0.000	0.000
110	20.3	17.595	0.000	0.000
120	19.0	16.484	0.000	0.000
130	17.9	15.521	0.000	0.000
140	16.9	14.677	0.000	0.000
150	16.1	13.931	0.000	0.000
160	15.3	13.266	0.000	0.000
170	14.6	12.670	0.000	0.000
180	14.0	12.131	0.000	0.000
190	13.4	11.642	0.000	0.000
200	12.9	11.196	0.000	0.000
210	12.4	10.787	0.000	0.000
220	12.0	10.410	0.000	0.000
230	11.6	10.062	0.000	0.000
240	11.2	9.740	0.000	0.000
250	10.9	9.440	0.000	0.000
260	10.6	9.161	0.000	0.000
270	10.3	8.900	0.000	0.000
280	10.0	8.655	0.000	0.000
290	9.7	8.425	0.000	0.000
300	9.5	8.208	0.000	0.000
310	9.2	8.004	0.000	0.000
320	9.0	7.811	0.000	0.000
330	8.8	7.628	0.000	0.000
340	8.6	7.455	0.000	0.000
350	8.4	7.291	0.000	0.000
360	8.2	7.134	0.000	0.000

Volume Required (cu.m) =	**21.8**
Volume Provided (cu.m) =	**21.8**
HGL Depth (m) =	0.54
Orifice Size (mm) =	180

1315 Silver Spear Road

Stormwater Management Storage Calculations using Rational Method

City of Mississauga

10-year Storm

$$I_{10\text{-year}} = \frac{1010}{(T+4.6)^{0.78}} = 59.89 \text{ mm/hr}$$

Project No.	17073	Site Area (ha) =	0.4171
Analysis By:	Jason Jenkins	Weighed Runoff Coefficient =	0.748
Last Revised:	September 26, 2017	Peak Discharge (L/s) =	53.80

Time (min)	Intensity (mm/hr)	Q-100 (L/s)	Q-stored (L/s)	Storage Vol. (m^3)
0	0.0	0.000	0.000	0.000
15	99.2	85.923	32.125	28.912
20	83.1	71.968	18.170	21.804
30	63.7	55.156	1.357	2.443
40	52.2	45.247	0.000	0.000
50	44.6	38.642	0.000	0.000
60	39.1	33.891	0.000	0.000
70	35.0	30.292	0.000	0.000
80	31.7	27.461	0.000	0.000
90	29.0	25.169	0.000	0.000
100	26.9	23.272	0.000	0.000
110	25.0	21.672	0.000	0.000
120	23.4	20.303	0.000	0.000
130	22.1	19.117	0.000	0.000
140	20.9	18.077	0.000	0.000
150	19.8	17.159	0.000	0.000
160	18.9	16.340	0.000	0.000
170	18.0	15.605	0.000	0.000
180	17.2	14.942	0.000	0.000
190	16.5	14.340	0.000	0.000
200	15.9	13.790	0.000	0.000
210	15.3	13.286	0.000	0.000
220	14.8	12.822	0.000	0.000
230	14.3	12.394	0.000	0.000
240	13.8	11.997	0.000	0.000
250	13.4	11.628	0.000	0.000
260	13.0	11.284	0.000	0.000
270	12.7	10.962	0.000	0.000
280	12.3	10.660	0.000	0.000
290	12.0	10.377	0.000	0.000
300	11.7	10.110	0.000	0.000
310	11.4	9.859	0.000	0.000
320	11.1	9.621	0.000	0.000
330	10.8	9.396	0.000	0.000
340	10.6	9.183	0.000	0.000
350	10.4	8.980	0.000	0.000
360	10.1	8.787	0.000	0.000

Volume Required (cu.m) =	**28.9**
Volume Provided (cu.m) =	**28.9**
HGL Depth (m) =	0.72
Orifice Size (mm) =	180

1315 Silver Spear Road

Stormwater Management Storage Calculations using Rational Method

City of Mississauga

25-year Storm

$$I_{25\text{-year}} = \frac{1160}{(T+4.6)^{0.78}} = 113.89 \text{ mm/hr}$$

Project No.	17073	Site Area (ha) =	0.4171
Analysis By:	Jason Jenkins	Weighed Runoff Coefficient =	0.748
Last Revised:	September 26, 2017	Peak Discharge (L/s) =	59.86

Time (min)	Intensity (mm/hr)	Q-100 (L/s)	Q-stored (L/s)	Storage Vol. (m^3)
0	0.0	0.000	0.000	0.000
15	113.9	98.684	38.822	34.940
20	95.4	82.656	22.794	27.353
30	73.1	63.347	3.485	6.273
40	60.0	51.967	0.000	0.000
50	51.2	44.381	0.000	0.000
60	44.9	38.925	0.000	0.000
70	40.2	34.791	0.000	0.000
80	36.4	31.540	0.000	0.000
90	33.4	28.908	0.000	0.000
100	30.8	26.728	0.000	0.000
110	28.7	24.891	0.000	0.000
120	26.9	23.319	0.000	0.000
130	25.3	21.956	0.000	0.000
140	24.0	20.762	0.000	0.000
150	22.7	19.707	0.000	0.000
160	21.7	18.767	0.000	0.000
170	20.7	17.923	0.000	0.000
180	19.8	17.161	0.000	0.000
190	19.0	16.469	0.000	0.000
200	18.3	15.838	0.000	0.000
210	17.6	15.259	0.000	0.000
220	17.0	14.727	0.000	0.000
230	16.4	14.235	0.000	0.000
240	15.9	13.779	0.000	0.000
250	15.4	13.355	0.000	0.000
260	15.0	12.959	0.000	0.000
270	14.5	12.590	0.000	0.000
280	14.1	12.243	0.000	0.000
290	13.8	11.918	0.000	0.000
300	13.4	11.612	0.000	0.000
310	13.1	11.323	0.000	0.000
320	12.8	11.050	0.000	0.000
330	12.5	10.791	0.000	0.000
340	12.2	10.546	0.000	0.000
350	11.9	10.314	0.000	0.000
360	11.6	10.092	0.000	0.000

Volume Required (cu.m) =	**34.9**
Volume Provided (cu.m) =	**34.9**
HGL Depth (m) =	0.87
Orifice Size (mm) =	180

1315 Silver Spear Road

Stormwater Management Storage Calculations using Rational Method
City of Mississauga

50-year Storm

$$I_{50\text{-year}} = \frac{1300}{(T+4.7)^{0.78}} = 127.13 \text{ mm/hr}$$

Project No.	17073	Site Area (ha) =	0.4171
Analysis By:	Jason Jenkins	Weighed Runoff Coefficient =	0.748
Last Revised:	September 26, 2017	Peak Discharge (L/s) =	65.04

Time (min)	Intensity (mm/hr)	Q-100 (L/s)	Q-stored (L/s)	Storage Vol. (m^3)
0	0.0	0.000	0.000	0.000
15	127.1	110.156	45.112	40.601
20	106.6	92.339	27.295	32.754
30	81.7	70.833	5.789	10.419
40	67.1	58.137	0.000	0.000
50	57.3	49.666	0.000	0.000
60	50.3	43.570	0.000	0.000
70	45.0	38.949	0.000	0.000
80	40.8	35.314	0.000	0.000
90	37.4	32.370	0.000	0.000
100	34.5	29.932	0.000	0.000
110	32.2	27.876	0.000	0.000
120	30.1	26.117	0.000	0.000
130	28.4	24.591	0.000	0.000
140	26.8	23.255	0.000	0.000
150	25.5	22.074	0.000	0.000
160	24.3	21.022	0.000	0.000
170	23.2	20.077	0.000	0.000
180	22.2	19.224	0.000	0.000
190	21.3	18.450	0.000	0.000
200	20.5	17.743	0.000	0.000
210	19.7	17.095	0.000	0.000
220	19.0	16.498	0.000	0.000
230	18.4	15.947	0.000	0.000
240	17.8	15.437	0.000	0.000
250	17.3	14.962	0.000	0.000
260	16.8	14.519	0.000	0.000
270	16.3	14.105	0.000	0.000
280	15.8	13.717	0.000	0.000
290	15.4	13.353	0.000	0.000
300	15.0	13.010	0.000	0.000
310	14.6	12.686	0.000	0.000
320	14.3	12.380	0.000	0.000
330	14.0	12.091	0.000	0.000
340	13.6	11.816	0.000	0.000
350	13.3	11.556	0.000	0.000
360	13.1	11.308	0.000	0.000

Volume Required (cu.m) =	**40.6**
Volume Provided (cu.m) =	**40.6**
HGL Depth (m) =	1.02
Orifice Size (mm) =	180

1315 Silver Spear Road

Stormwater Management Storage Calculations using Rational Method
City of Mississauga

100-year Storm

$$I_{100\text{-}year} = \frac{1450}{(T+4.9)^{0.78}} = 140.69 \text{ mm/hr}$$

Project No.	17073	Site Area (ha) =	0.4171
Analysis By:	Jason Jenkins	Weighed Runoff Coefficient =	0.748
Last Revised:	September 26, 2017	Peak Discharge (L/s) =	70.12

Time (min)	Intensity (mm/hr)	Q-100 (L/s)	Q-stored (L/s)	Storage Vol. (m^3)
0	0.0	0.000	0.000	0.000
15	140.7	121.902	51.780	46.602
20	118.1	102.348	32.227	38.672
30	90.8	78.652	8.531	15.356
40	74.6	64.619	0.000	0.000
50	63.8	55.239	0.000	0.000
60	56.0	48.480	0.000	0.000
70	50.0	43.353	0.000	0.000
80	45.4	39.316	0.000	0.000
90	41.6	36.045	0.000	0.000
100	38.5	33.336	0.000	0.000
110	35.8	31.050	0.000	0.000
120	33.6	29.094	0.000	0.000
130	31.6	27.397	0.000	0.000
140	29.9	25.911	0.000	0.000
150	28.4	24.597	0.000	0.000
160	27.0	23.425	0.000	0.000
170	25.8	22.374	0.000	0.000
180	24.7	21.424	0.000	0.000
190	23.7	20.562	0.000	0.000
200	22.8	19.775	0.000	0.000
210	22.0	19.053	0.000	0.000
220	21.2	18.389	0.000	0.000
230	20.5	17.776	0.000	0.000
240	19.9	17.207	0.000	0.000
250	19.2	16.678	0.000	0.000
260	18.7	16.185	0.000	0.000
270	18.1	15.724	0.000	0.000
280	17.6	15.292	0.000	0.000
290	17.2	14.886	0.000	0.000
300	16.7	14.504	0.000	0.000
310	16.3	14.143	0.000	0.000
320	15.9	13.802	0.000	0.000
330	15.6	13.480	0.000	0.000
340	15.2	13.174	0.000	0.000
350	14.9	12.883	0.000	0.000
360	14.6	12.607	0.000	0.000

Volume Required (cu.m) =	**46.6**
Volume Provided (cu.m) =	**46.6**
HGL Depth (m) =	1.17
Orifice Size (mm) =	180

1315 Silver Spear Drive

Runoff Coefficients, Water Quality, and Water Balance

City of Mississauga

Designed By: Jason Jenkins, P.Eng., P.E.
Checked By: Paolo Albanese, P.Eng.
File No.: 17026
Date: September 25, 2017

RUN-OFF COEFFICIENT (Post Development)

Bare Roof	1563.0	37.5%	0.90	0.34
Perm Pavers	183.0	4.4%	0.55	0.02
Landscaping	1268.0	30.4%	0.45	0.14
Hard Surface	1157.0	27.7%	0.90	0.25
	4171.0	100%		0.75

WATER QUALITY (Post Development) - NO TREATMENT

			% TSS	Overall
Bare Roof	1563.0	37.5%	95	35.6
Perm Pavers	183.0	4.4%	80	3.5
Landscaping	1268.0	30.4%	100	30.4
Hard Surface	1157.0	27.7%	0	0.0
	4171.0	100%		69.5

Does not not meet 80% TSS Removal without treatment.

WATER QUALITY (Post Development) - WITH TREATMENT

			% TSS	Overall
Bare Roof	1563.0	37.5%	95	35.6
Perm Pavers	183.0	4.4%	80	3.5
Landscaping	1268.0	30.4%	100	30.4
Hard Surface	1157.0	27.7%	50	13.9
	4171.0	100%		83.4

Meets 80% TSS Removal.

WATER BALANCE (Post Development)

Initial Abstraction			mm	Overall
Bare Roof	1563.0	37.5%	1	0.37
Perm Pavers	183.0	4.4%	5	0.22
Landscaping	1268.0	30.4%	5	1.52
Hard Surface	1157.0	27.7%	1	0.28
	4171.0	100%		2.39
Required Water Balance (mm)				5.00
Required Rain Harvesting in Tank (mm)				2.61
Required Rain Harvesting Tank (cu.m)				**10.9**

Area of SWM Tank =	40.0	m2
Depth of Storage (sump below orifice) =	0.30	m
Storage Volume Provided =	12.0	m3

Vprovided > Vrequired
OK

Detailed Stormceptor Sizing Report – Silver Spear Rd

Project Information & Location			
Project Name	Silver Spear Rd	**Project Number**	4621
City	Mississauga	**State/ Province**	Ontario
Country	Canada	**Date**	9/13/2017
Designer Information		**EOR Information (optional)**	
Name	HAL STRATFORD	**Name**	Jason J
Company	FORTERRA	**Company**	Fabian Papa
Phone #	226-220-3943	**Phone #**	
Email	hal.stratford@forterrabp.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	
Recommended Stormceptor Model	STC 750
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	83
PSD	Fine Distribution
Rainfall Station	TORONTO CENTRAL

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary		
Stormceptor Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**
STC 300	74	90
STC 750	83	96
STC 1000	84	96
STC 1500	85	96
STC 2000	87	98
STC 3000	89	98
STC 4000	91	99
STC 5000	92	99
STC 6000	93	100
STC 9000	95	100
STC 10000	95	100
STC 14000	96	100
StormceptorMAX	Custom	Custom

Stormceptor

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).
Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Ontario	**Total Number of Rainfall Events**	3329
Rainfall Station Name	TORONTO CENTRAL	**Total Rainfall (mm)**	13189.2
Station ID #	0100	**Average Annual Rainfall (mm)**	732.7
Coordinates	45°30'N, 90°30'W	**Total Evaporation (mm)**	1025.3
Elevation (ft)	328	**Total Infiltration (mm)**	2757.0
Years of Rainfall Data	18	**Total Rainfall that is Runoff (mm)**	9406.9

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area	
Total Area (ha)	0.417
Imperviousness %	79.0

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.000

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	90.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	0.00000

Design Details	
Stormceptor Inlet Invert Elev (m)	
Stormceptor Outlet Invert Elev (m)	
Stormceptor Rim Elev (m)	
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	

Site Details

Drainage Area	
Total Area (ha)	0.417
Imperviousness %	79.0

Surface Characteristics	
Width (m)	129.00
Slope %	2
Impervious Depression Storage (mm)	0.508
Pervious Depression Storage (mm)	5.08
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency	
Maintenance Frequency (months) >	12

Infiltration Parameters	
Horton's equation is used to estimate infiltration	
Max. Infiltration Rate (mm/hr)	61.98
Min. Infiltration Rate (mm/hr)	10.16
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation	
Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow	
Dry Weather Flow (lps)	0

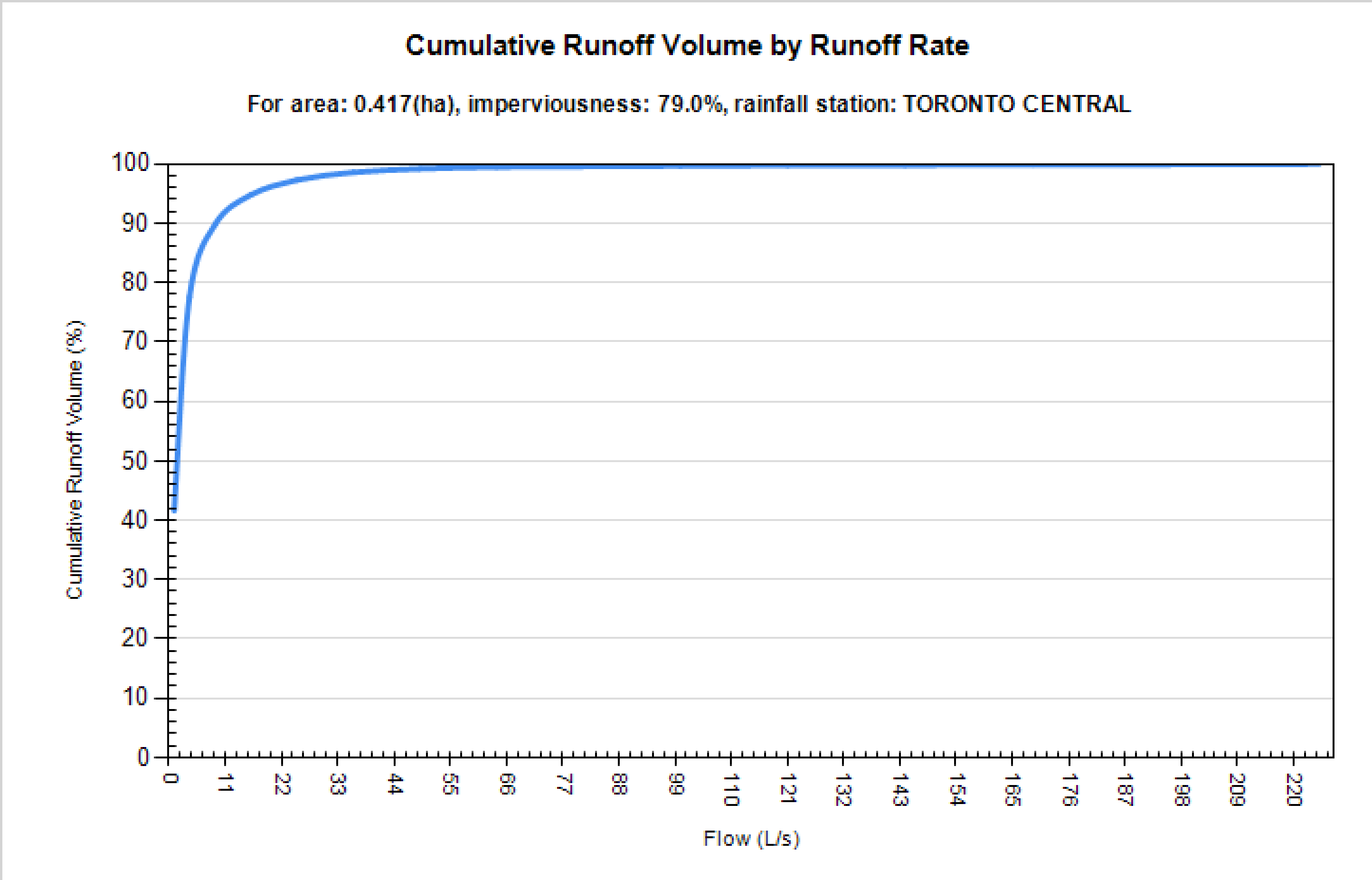
Winter Months	
Winter Infiltration	0

TSS Loading Parameters	
TSS Loading Function	Build Up/ Wash-off

Buildup/Wash-off Parameters	
Target Event Mean Conc. (EMC) mg/L	125
Exponential Buildup Power	0.40
Exponential Washoff Exponent	0.20

TSS Availability Parameters	
Availability Constant A	0.05
Availability Factor B	0.04
Availability Exponent C	1.10
Min. Particle Size Affected by Availability (micron)	400

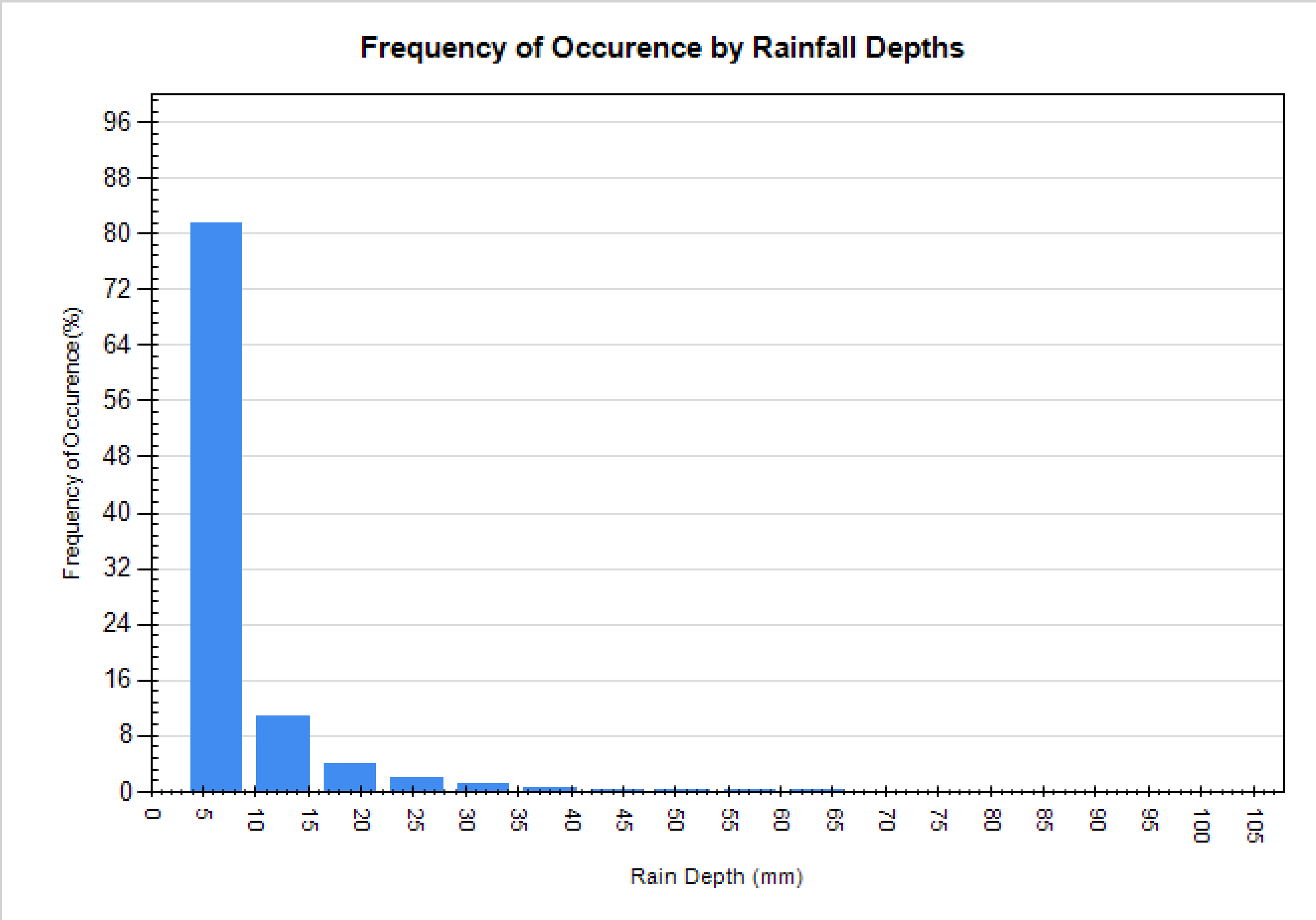
Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (L/s)	Runoff Volume (m^3)	Volume Over (m^3)	Cumulative Runoff Volume (%)
1	16456	23101	41.6
4	30712	8845	77.6
9	35524	4033	89.8
16	37487	2069	94.8
25	38480	1077	97.3
36	38989	567	98.6
49	39256	300	99.2
64	39363	193	99.5
81	39404	152	99.6
100	39437	120	99.7
121	39460	96	99.8
144	39481	75	99.8
169	39504	53	99.9
196	39528	28	99.9
225	39549	8	100.0


Cumulative Runoff Volume by Runoff Rate
For area: 0.417(ha), imperviousness: 79.0%, rainfall station: TORONTO CENTRAL
Cumulative Runoff Volume (%)
100
90
80
70
60
50
40
30
20
10
0
0
11
22
33
44
55
66
77
88
99
110
121
132
143
154
165
176
187
198
209
220
Flow (L/s)

Stormceptor®

FORTERRA™

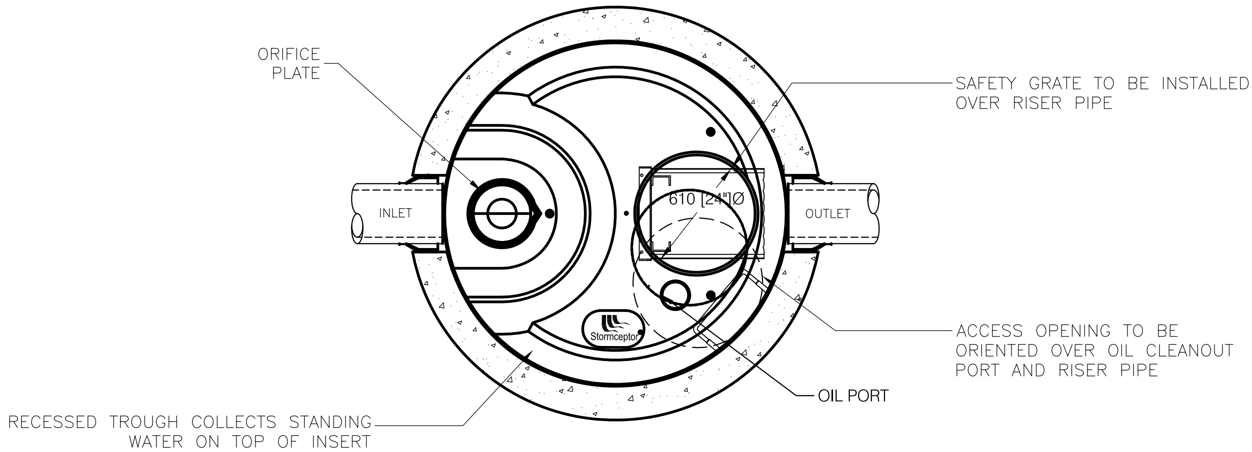
Rainfall Event Analysis				
Rainfall Depth (mm)	No. of Events	Percentage of Total Events (%)	Total Volume (mm)	Percentage of Annual Volume (%)
6.35	2711	81.4	3900	29.6
12.70	356	10.7	3266	24.8
19.05	127	3.8	1991	15.1
25.40	62	1.9	1346	10.2
31.75	32	1.0	905	6.9
38.10	16	0.5	541	4.1
44.45	8	0.2	334	2.5
50.80	11	0.3	519	3.9
57.15	2	0.1	106	0.8
63.50	2	0.1	120	0.9
69.85	0	0.0	0	0.0
76.20	0	0.0	0	0.0
82.55	1	0.0	77	0.6
88.90	1	0.0	85	0.6
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0



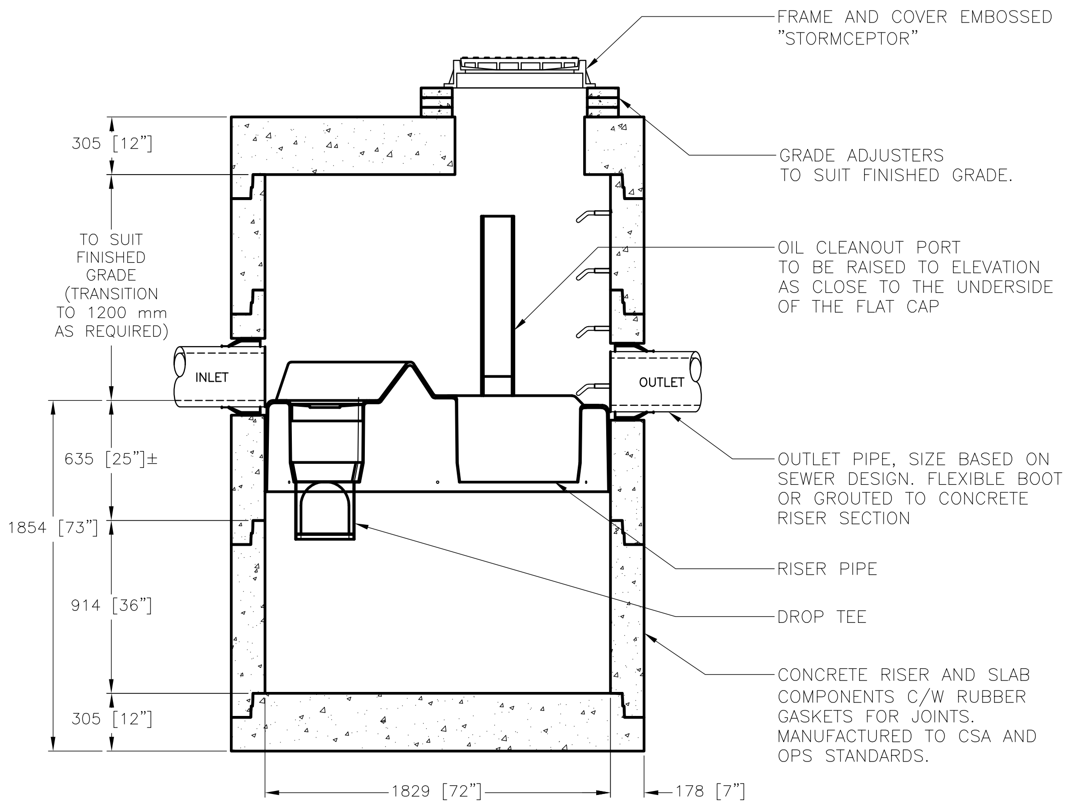
For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

DRAWING NOT TO BE USED FOR CONSTRUCTION

THE STORMCEPTOR SYSTEM IS PROTECTED BY ONE OR MORE OF THE FOLLOWING PATENTS:
United States Patent No. 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690 • 7,582,216 • 7,666,303 | Australia Patent No. 729,096 • 779,401 • 2008,279,378 • 2008,288,900 |
Canadian Patent No. 2,206,338 • 2,327,768 • 2,694,159 • 2,697,287 | European Paten No. EP 2,176,171 | Indonesian Patent No. 0,007,058 | Japan Patent No. 3,581,233 • 9-11476 • 5,555,160 |
Korea Patent No. 10-1451593 • 0519,212 | Malaysia Patent No. 118,987 | New Zealand Patent No. 314,646 • 583,583 • 583,008 | South African Patent No. 2010,00683 • 2010,01796 |



PLAN VIEW



SECTION VIEW

Stormceptor

imbrium
WWW.IMBRIUMSYSTEMS.COM
7037 RIDGE ROAD SUITE 350, HANOVER, MD 21076
USA 888-279-8826 CA 800-565-4801 INTL +1-416-960-9900

STC 750
STANDARD MODEL
####

REV #	DATE	REVISION DESCRIPTION	BY

SHEET NUMBER 1 OF 1

DATE:######## SCALE: 40 PROJECT No.: ##### DRAWN: ### CHECKED: ###

\AD.CONTECH-CPI.COM\ROOT\CORPORATE\MARKETING\IMBRIUM\CAD & PDF\STORMCEPTOR\CANADIAN\STC 750.DWG 8/8/2016 9:21 AM

A-1 - Watershed Boundaries

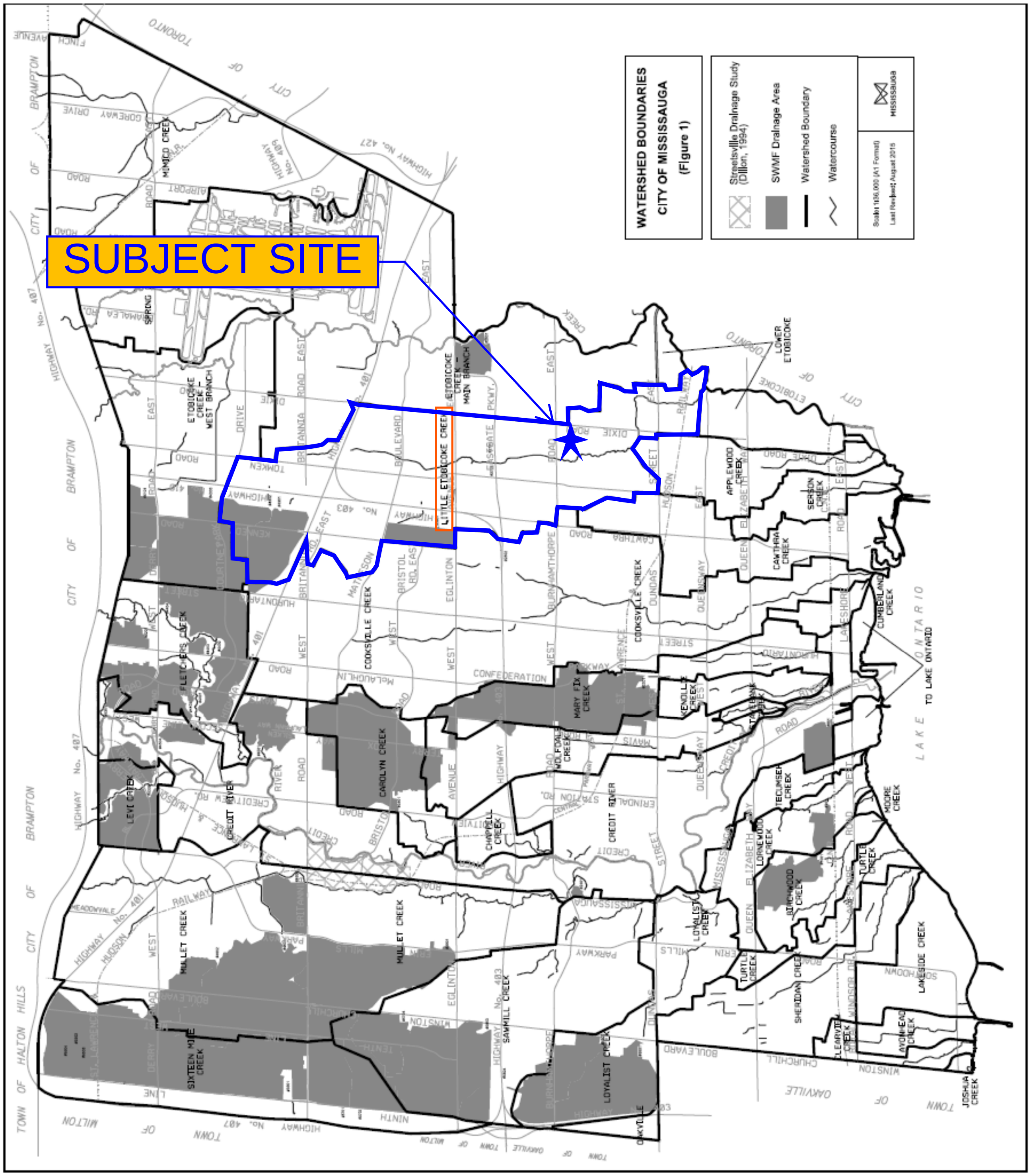


TABLE 2.01.03.03b: STORMWATER QUANTITY CONTROL REQUIREMENTS

Note 1: In all cases, the storm sewer capacity constraints may govern

Note 2: Where "pre-development" is listed as part of the requirement, it is implied as raw land for which the run-off co-efficient=0.25 but will not exceed 0.50 for a site that may already be developed

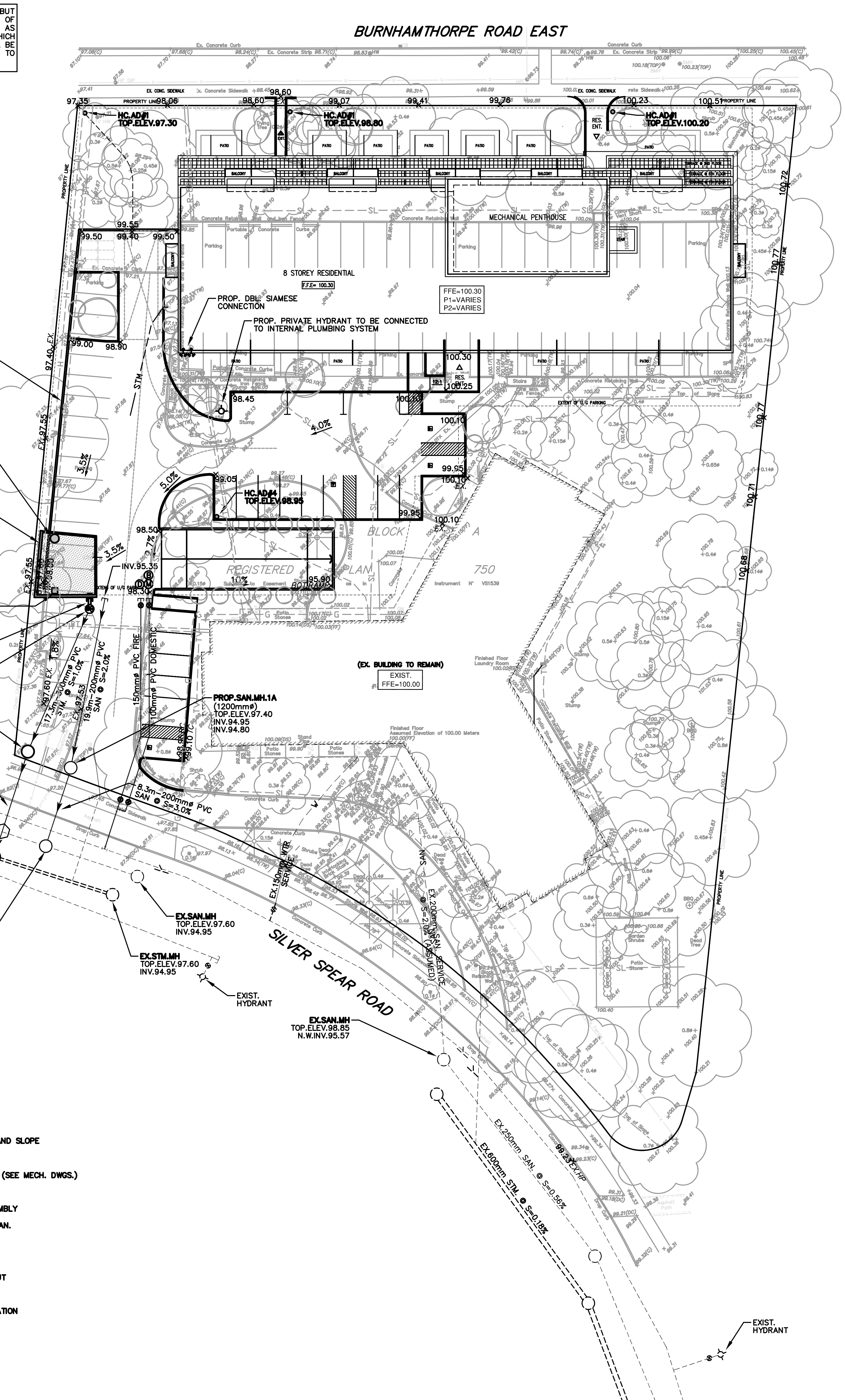
Note 3: CVC-Credit Valley Conservation, TRCA-Toronto Region Conservation Authority, CH-Conservation Halton

Subwatershed Name (Conservation Authority)	Quantity Control Criteria	References & Notes
Etobicoke Creek - West Branch (TRCA)	Provide post to pre control for all storms (i.e. 2,5,10,25,50 & 100 year) using unit rates	Hydrologic Model: VISUAL OTTHYMO-Return period peak flows based on the AES - 12 hour design storm Hydrology Study:Etobicoke Creek Hydrology Update (MMM Group, 2013)
Fletcher's Creek (CVC)	No control required in the City of Mississauga	Fletchers Creek Subwatershed Study Report (Paragon Engineering Limited, 1996) Subwatershed Management Strategy and Implementation Plan (AMEC Earth & Environmental, 2012)
Joshua Creek (CH)	100 Year Post to 2 Year Pre-development Control	Commentary from Conservation Halton in lieu of 1992 Watershed Plan
Kenollie Creek (CVC)	10 Year Post to 2 Year Pre-development Control	-
Lakeside Creek (CVC)	100 Year Post to 2 Year Pre-development Control	Southdown District Master Drainage Plan (Totten Sims Hubicki, 2000)
Levi Creek (CVC)	Provide post to pre control for all storms (i.e. 2,5,10,25,50 & 100 year) & Regional Storm	Hydrologic Model: GAWSER Model-Return period peak flows based on 24 hour SCS Type II distribution Gateway West Subwatershed Study (Gartner Lee Limited & Cosburn Patterson Mather, 1999) Gateway West Subwatershed Study Update by Kidd Consulting (Update in Progress)
Little Etobicoke Creek (TRCA)	Provide post to pre control for all storms (i.e. 2,5,10,25,50 & 100 year) using unit rates	Hydrologic Model: VISUAL OTTHYMO-Return period peak flows based on the AES - 12 hour design storm Hydrology Study:Etobicoke Creek Hydrology Update (MMM Group, 2013)
Lornewood Creek (CVC)	100 Year Post to 2 Year Pre-development Control	-

APPENDIX F

NOTE: LOCATIONS OF SITE SERVICING CONNECTIONS (WATER, SANITARY, AND STORM) ARE PRELIMINARY ONLY AND SUITED FOR THE RE-ZONING APPLICATION. THE EXACT LOCATIONS, INVERT ELEVATIONS, SIZES AND UTILITY CROSSING CONSTRAINTS WILL BE CONFIRMED DURING THE DETAILED DESIGN STAGE AND INDICATED ON THE ENGINEERING DRAWING FOR THE SUBSEQUENT SITE PLAN APPLICATION.

ELEVATIONS ARE NOT GEODETIC IN ORIGIN BUT RATHER BASED ON AN ASSUMED BENCHMARK OF 100 m USING THE EXISTING BUILDING AS REFERENCE. THE TOPOGRAPHIC SURVEY, WHICH WAS PREPARED BY LLOYD & PURCELL INC. WILL BE UPDATED AND TO A GEODETIC DATUM PRIOR TO THE NEXT SUBMISSION.



LEGEND:

203	EXISTING CONTOUR
x 203.70	EXISTING ELEVATION
x 203.70	PROPOSED ELEVATION
2.2%	DRAINAGE FLOW DIRECTION AND SLOPE
◯	SEWER MANHOLE
◯	HIGH CAPACITY AREA DRAIN (SEE MECH. DWGS.)
Ⓜ	WATER METER
Ⓓ	DOUBLE CHECK VALVE ASSEMBLY
Ⓖ	GRINDER SUMP PUMP FOR SAN.
	HYDRANT (AND VALVE)
⊗	VALVE & BOX
	PROPOSED CURB / CURB CUT
	PROPERTY LINE
FFF=100.00	FINISHED FIRST FLOOR ELEVATION
P1=97.00	FINISHED P1 ELEVATION
	PROPOSED OVERLAND FLOW
	WATER SERVICE
	SANITARY SERVICE
	STORM SERVICE

fabian papa & partners
A Division of FP&P HydraTek Inc.
216 Chrislea Road, Suite 204
Vaughan, Ontario, L4L 8S5
t: 905-264-2420
www.fabianpapa.com

PROJECT NAME: 1315 SILVER SPEAR ROAD RESIDENTIAL DEVELOPMENT	DWN. BY:	JMJ
	DESIGNED BY:	JMJ
	CHECKED BY:	PFA
DRAWING TITLE: SITE SERVICING AND GRADING EXHIBIT	SCALE:	1: 500
	DATE:	SEPT. 2017
	SHEET NO:	1 OF 1

PROJECT NO:	DWG NO:	REV NO:
17073	SSG-1	0