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FUNCTIONAL SERVICING & STORMWATER MANAGEMENT REPORT

5150 NINTH LINE

CITY OF MISSISSAUGA

REGION OF PEEL

PREPARED FOR
MATTAMY (5150 NINTH LINE) LIMITED

Urbantech File No.: 19-608

3RD SUBMISSION – NOVEMBER 2020

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1 INTRODUCTION

1.1. BACKGROUND

This report provides functional servicing design and stormwater management information in support of the site plan application for the proposed residential development located at 5150 Ninth Line, hereafter referred to as the subject property.

The development concepts contained in this report are an extension of the information contained within the following reports:

- Ninth Line South Urban Design Study by NAK Design Strategies (2019)
- Ninth Line Lands Scoped Subwatershed Study by Wood (2018)
- Ninth Line Lands: Servicing Strategy Report by Region of Peel (2016)

This study presents the recommended stormwater management and municipal servicing scheme for the development of the subject property. This report is also applicable for any future revisions to the site plan, assuming the revisions are minor and in general conformance with the concepts outlined herein.

The information presented in this report conforms to the following guidelines:

- City of Mississauga T&W Development Requirements
- Region of Peel Public Works Design, Specifications & Procedures Manual
- Stormwater Management Planning and Design Manual by the Ministry of Environment (MOE)

1.2. SUBJECT PROPERTY

The subject property is approximately 4.33 ha in size including the setback and MTO buffer, and 3.85 ha not including these features. The site currently consists mainly of agricultural land with a veterinary hospital and various residential properties. The site is bounded by an existing woodlot to the north, Ninth Line to the east, a holdout property to the south and Highway 407 ETR to the west.

1.3. LAND USE

The proposed land use consists of primarily low-rise residential (townhouses) with supporting roads and amenity spaces. A public right-of-way is proposed to connect to Ninth Line which will ultimately extend through the properties to the south. The western portion of the property is designated as a future transitway corridor. A City-owned buffer block is proposed along the existing woodlot at the northern limit of the property.

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2 GRADING & ROADS

The site grading design considers the following objectives and constraints:

- Conform to City of Mississauga grading criteria
- Match existing boundary conditions
- Minimize cut and fill operations and work towards a balanced site
- Provide overland flow conveyance for major storm conditions
- Provide minimum cover on proposed servicing

Refer to **Drawing 1**, "*Site Grading,*" and **Drawings 2A** and **2B** "*Grading Cross Sections*," for additional grading details.

2.1.1. RETAINING WALLS & NOISE BARRIERS

Where required, retaining walls are proposed limit of the adjacent holdout property, 5170 Ninth Line. This is unavoidable due to constraints with required grading of the public road and the maximum allowable grade difference across the proposed townhouse units in relation to the high existing ground on the adjacent property. A retaining wall is also proposed along the Heritage House property to the south to keep the site's drainage self-contained per City requirements.

Noise barriers are proposed for Blocks 4, 19 and 20, in accordance with recommendations prepared by YCA Engineering. Refer to the Acoustic Report for further information. In some cases, an acoustic fence on top of retaining wall is required to achieve the total barrier height.

2.1.2. WOODLOT BUFFER REGRADING & RESTORATION

It is proposed to regrade within the existing buffer at the northern limit of the development, adjacent to the existing woodlot. There are several existing man-made depressions in this area which have no positive drainage outlets resulting in small pool features. In general, the area is poorly graded which results in ponded areas. It is noted that the existing homeowner of 5170 Ninth Line has also identified problems with flooding on his lot.

As part of the development works, it is proposed to regrade within the buffer area to recreate and improve the existing pool features to provide a more suitable habitat for amphibian species. Due to grading and servicing constraints within the development, the proposed condo road in this area will be higher than the buffer, blocking incoming woodlot drainage from the north. As the external drainage is municipally owned, the drainage will be conveyed by a separate clean water sewer (refer to Section 3.3). Two ditch inlet catchbasins sized to capture flows from the 100-year storm event are proposed along the buffer to prevent the area from flooding during large storm events. This will also reduce or eliminate flooding issues on the adjacent holdout property. For emergency overflow situations (i.e. events larger than the 100-year storm) overland flow will be conveyed downstream via the proposed condo roads. Easements will be provided in favour of the City over these roads to ensure perpetual conveyance of overland flow.

Although the condo road runs parallel with the buffer block, all roadway and sidewalk drainage will be self-contained and no contaminated runoff from the road will be directed to the buffer block or

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proposed pool features. These will strictly be fed by incoming clean drainage from the woodlot, as well as a small 2.8m landscape buffer between the road and the buffer block.

Salt from future roadway deicing activities has been identified as a potential contaminant for the proposed features. As the condo road in this area is not a through-road and is expected to have minimal, low-speed traffic, spray is not anticipated to be an issue. If necessary, alternative methods of deicing can be implemented in this area which will be maintained by the condo corporation, not City forces. To reiterate, the sidewalk will drain towards the road so any contaminated water or snowmelt would drain back towards the roadway storm sewers.

2.1.3. ROADS

A public 20m right-of-way is proposed in accordance with City standard 2211.070 which will connect to Ninth Line. Prior to completion of the Ninth Line EA and road widening (estimated construction date of 2023), the public road will match into the existing pavement and curbs. The proposed public right-of-way will be extended south through the future developments west of Ninth Line.

Typical condo roads will feature 7m wide pavement and are sized sufficiently to accommodate proposed services and utilities, as well as to convey overland flow for major storm conditions. Where on street parking is required, wider pavement is proposed to accommodate two travel lanes in addition to a parking lane.

Refer to **Drawing 4**, "*ROW Cross Sections*," for additional details regarding rights-of-way and typical cross sections.

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3 STORM SERVICING AND STORMWATER MANAGEMENT

3.1. MODELLING APPROACH

A PC SWMM model was selected in place of the previously completed Visual OTTHYMO model to provide a better evaluation of the existing target flows, system performance and the impact of post-development conditions on the existing storm infrastructure on Ninth Line. The PC SWMM model can better assess the system hydraulics and major and minor system flows on the Ninth Line ROW.

PCSWMM includes several hydrology methods to simulate rainfall-runoff responses. The hydrology method selected for this study is the Rainfall/Runoff process simulation with dynamic flow routing for the hydraulic component (i.e. pipes / overland flow). The 4-hour Chicago design storm distribution with five-minute time steps was considered appropriate to use for the site since it will have a high peak and provide more conservative flows. The City of Mississauga intensity-duration-frequency (IDF) curves were used to develop the design storm time series. Refer to **Section 3.2** and **Section 3.3** for further information used in establishing existing and proposed subcatchment, major and minor system characteristics.

A dual drainage model was developed for subject lands, including the existing Ninth Line right-of-way and sewers. The interaction between the major and minor system flow was modelled by using catchbasin capture curves from *City of Toronto Infoworks CB Basement Flooding Model Studies Guidelines (October 2014)*. Capture curves represent the amount of flow captured into the minor system based on major system flow depths. Flat grade horizontal bar fishbone, gentle grade horizontal bar fishbone and sag horizontal bar fishbone curves were utilized where appropriate on the Ninth Line ROW and in the proposed development area. The catchbasin curves are multiplied by the number of catchbasins in each ROW segment to get the total captured flow to the minor system. Refer to **Appendix A** for additional information.

3.2. EXISTING STORM DRAINAGE

The site is within the Credit Valley Conservation Authority jurisdiction, within the Sawmill Creek Subwatershed. There are no regulated features on the subject lands, although the woodlot and wetlands to the north of the property are regulated features.

Existing drainage patterns for the subject property are shown on **Drawing 5A**, "*Existing Storm Drainage*." The majority of the property, as well as the woodlot to the north of the site drains to the existing storm sewers on Ninth Line via several existing culverts, street catchbasins and ditch inlet catchbasins. The Ninth Line storm sewers appear to be adequately sized to convey the 10-year storm event from the contributing areas. Included in the **Appendix A** are 10-year and 100-year HGL for the existing condition. The southwest portion of the subject property drains southwards overland to an existing storm sewer at Eglinton Avenue (total catchment area to Eglinton is approximately 8.5 ha).

As noted above, a PC SWMM model was created to simulate the various return period event flows from the site including the external areas and Ninth Line ROW. Since Ninth Line is the outfall for the subject lands (including the 750mm storm sewer immediately south of the subject property),

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the model includes a minor, major and total combined flow location for comparison purposes. The summary of flows was provided at three locations. Refer to **Appendix A** for PC SWMM Plan and MH locations.

Table 1: System Performance Nodes and Corresponding Existing Areas

Minor System		Major System		Location
Junction Name	**Existing Upstream Drainage Area (ha)**	**Junction Name**	**Existing Upstream Drainage Area (ha)**	
EX_STM_MH4	4.74	**EX_STM_MH4-S**	4.74	Upstream of proposed site
EX_MH1	15.36	**EX_MH1-S**	15.36	Proposed Site Storm Sewer Connection
EX_STM_MH5	17.83	**EX_STM_MH5-S**	17.83	Downstream of proposed site

The infiltration model used in the PC SWMM was the SCS curve number (CN) approach. Model parameters were based on available land use / soil information and measurements. Table 2 provides the PC SWMM model input for the existing conditions simulation.

In order to account for the increase in runoff due to saturation of the catchment surface that would occur for larger, less frequent storms, the adjustment factor was applied to the 100 year storm as per City of Mississauga Stormwater Management Manual. Runoff Coefficients and updated impervious areas are summarized in Table 3.

The results of the existing conditions model are illustrated graphically in Tables 4 and 5. Table 4 summarizes the major and minor system peak flows at each of the identified nodes; Table 5 summarizes the total flow (major plus minor) at the nodes.

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Table 2: Existing Conditions Model Parameters

Area Description	Area [ha]	Surface slope [%]	Soil Group	Land Use	Curve Number	Initial Abstractions Pervious/ impervious [mm]	Runoff Coefficient
External "east" woodlot area and portion of 5170 Ninth Line	2.51	1	C	20% Meadow / 80% Forest	74	5	0.20
External "west" woodlot and agricultural area on 5150 Ninth Line	10.25	2.5	C	20% Meadow / 80% Forest	74	5	0.20
Existing drainage on 5150 and 5104 Ninth Line	2.04	1.5	C	20% Meadow / 80% Forest	82	5	0.20
5170 Ninth Line frontage on Ninth Line	0.35	1.5	C	75% IMP	74	5 / 1	0.65
5150 Ninth Line frontage on Ninth Line	0.29	1.5	C	50% IMP	74	5 / 1	0.55
Ninth Line ROW to existing 750mm storm sewer	1.81	1.8	C	70% IMP	74	5 / 1	0.65

Table 3: Adjusted Runoff Coefficients

Area Description	Runoff Coefficient	Adjusted Runoff Coefficient (100-year Return Period)	Land Use
External "east" woodlot area and portion of 5170 Ninth Line	0.20	0.25	7% IMP
External "west" woodlot and agricultural area on 5150 Ninth Line	0.20	0.25	7% IMP
Existing drainage on 5150 and 5104 Ninth Line	0.20	0.25	7% IMP
5170 Ninth Line frontage on Ninth Line	0.65	0.80	85%
5150 Ninth Line frontage on Ninth Line	0.55	0.70	80%
Ninth Line ROW to existing 750mm storm sewer	0.65	0.80	85%

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Table 4: Existing Major and Minor System Flows

Design Event	Minor System Peak Flow [m^3/s]	Major System Peak Flow [m^3/s]	Minor System Peak Flow [m^3/s]	Major System Peak Flow [m^3/s]	Minor System Peak Flow [m^3/s]	Major System Peak Flow [m^3/s]
	EX_STM_MH4	EX_STM_MH4-S	EX_MH1	EX_MH1-S	EX_STM_MH5	EX_STM_MH5-S
25mm 4hr storm	0.08	0.12	0.11	0.2	0.26	0.23
(1) 2yr 4hr 5min Chicago	0.12	0.22	0.16	0.37	0.42	0.40
(2) 5yr 4hr 5min Chicago	0.16	0.32	0.21	0.54	0.61	0.59
(3) 10yr 4hr 5min Chicago	0.20	0.41	0.27	0.69	0.76	0.78
(4) 25yr 4hr 5min Chicago	0.23	0.50	0.32	0.83	0.89	0.93
(5) 50yr 4hr 5min Chicago	0.26	0.58	0.37	0.95	0.98	1.07
(6) 100yr 4hr 5min Chicago [1]	0.33	0.97	0.52	1.4	1.33	1.78

[1] 100-year storm impervious area was modelled based on adjusted runoff coefficients per City standard

Table 5: Total Existing System Flow

Design Event	Total System Peak Flow [m^3/s]	Total System Peak Flow [m^3/s]	Total System Peak Flow [m^3/s]
	EX_STM_MH4	EX_MH1	EX_STM_MH5
25 mm 4hr storm	0.2	0.31	0.49
(1) 2yr 4hr 5min Chicago	0.34	0.53	0.82
(2) 5yr 4hr 5min Chicago	0.48	0.75	1.2
(3) 10yr 4hr 5min Chicago	0.61	0.96	1.54
(4) 25yr 4hr 5min Chicago	0.73	1.15	1.82
(5) 50yr 4hr 5min Chicago	0.84	1.32	2.05
(6) 100yr 4hr 5min Chicago	1.33	1.92	3.11

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The validity of the existing conditions model was assessed through comparison to the existing studies for the subject lands. The Ninth Line Lands Scoped Subwatershed Study by Wood (2018) established the following criteria for new pre-development flow targets in the Sawmill Creek watershed (for the overall Ninth Line study area between Ninth Line and Highway 407). Please refer to the excerpt from the SWS below:

Table 2.2.2 Stormwater Management Facility Sizing Criteria for Flood Control – Sixteen Mile Creek Watershed		
Quantity Component	Cumulative Unitary Volume[1.] (m^3/impervious ha)	Unitary Discharge (m^3/s/ha)
Sawmill Creek Subwatershed		
5 Year	500	0.015
100 Year	800	0.050

While the subwatershed study flows are generally calculated using continuous modelling and frequency analysis (and are typically lower than event-based modelling), it was found that the existing conditions unit rates calculated based on the existing PC SWMM model were generally higher than the subwatershed study results. This is due to a more detailed subcatchment discretization (more, smaller catchments = lower time to peak = higher flows) compared to the typically generalized, larger catchments used in the SWS study model.

Total Existing 5 Year flow at EX_MH1= 0.75m^3/s
Total Area at EX_MH1= 15.36 ha
5 Year Unitary Discharge (PC SWMM) = **0.049 m^3/s/ha** (vs. 0.015 m^3/s/ha)

Total Existing 100 Year flow at EX_MH1= 1.92 m^3/s
Total Area at EX_MH1= 15.36 ha
5 Year Unitary Discharge (PC SWMM) = **0.125 m^3/s/ha** (vs. 0.050 m^3/s/ha)

A verification Analysis was conducted for the last existing MH that was modelled:

Total Existing 5 Year flow at EX_STM_MH7=0.60 m^3/s
Total Area at EX_STM_MH5= 26.87ha
5 Year Unitary Discharge (PC SWMM) = **0.022 m^3/s/ha** (vs. 0.015 m^3/s/ha)

Total Existing 100 Year flow at EX_STM_MH7= 1.28m^3/s
Total Area at EX_STM_MH5= 26.87 ha
5 Year Unitary Discharge (PC SWMM) = **0.048 m^3/s/ha** (vs. 0.050 m^3/s/ha)

A verification analysis will be conducted by the SWS consultant to demonstrate that the target flows downstream continue to be met through provision of post-to-pre control on the subject lands.

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3.3. PROPOSED STORM SERVICING

The storm drainage concept for the site has been designed to maintain flows and contributing drainage areas to the existing outlets on the site where possible and meet the existing targets established in the preceding section. Storm sewers for the subject lands have been sized according to the City of Mississauga sewer design criteria to convey flow for the 10-year storm, with the exception of the designated clean water sewer which is sized to convey flow for the 100-year storm.

3.3.1. EXTERNAL DRAINAGE

External storm drainage from the municipal woodlot area to the north of the development and the associated buffer block will be conveyed through a separate clean water storm sewer. No other flows from the private block will be directed to this sewer; it is strictly for external conveyance. Easements will be provided over the proposed condo roads in favour of the City for maintenance access to their infrastructure.

A small external area from the adjacent holdout property located at 5170 Ninth Line will drain to the proposed sewers. This is accounted for in the sewer design. No drainage from adjacent properties is blocked by the proposed grading / development.

3.3.2. PUBLIC VS PRIVATE DRAINAGE

The public and private storm drainage for the development will be separated. The private drainage will be self-contained and controlled by the proposed underground SWM tank within the proposed amenity space. The public ROW drainage will be controlled by a superpipe within the ROW itself. The superpipe does not provide any compensation for private drainage, only to control the ROW flow to predevelopment rates. The southeast site plan block is not able to drain to the tank due to grading and servicing constraints; however, this will be compensated by the private SWM tank in the western condo block.

Refer to **Drawing 5**, "*Storm Drainage,*" for additional details.

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3.4. STORM WATER MANAGEMENT

3.4.1. WATER BALANCE / RECHARGE

To meet the design criteria described in the T&W Developments Requirements Manual, the first 5mm of runoff should be retained on-site. An annual water balance was established to determine the runoff and infiltration volume under post development conditions with mitigation measures. Based on the 4.23 ha site area, approximately 212m^3 of runoff should be infiltrated / retained on site.

Table 6: Infiltration Targets

Property	Proposed Drainage Area (ha)	Target Infiltration (m^3)	Total Trench Length, L (m)	Total Proposed Infiltration Volume (m^3)[1]
Private Development	3.45	212	504	217
Public ROW – Street A	0.78			

[1]Based on detail on Drawing 403, trench dimensions are 1.2m (W) x 0.9m (H). Porosity of storage layer assumed to be 0.4; therefore, volume=(L)x(W)x(H)x(0.4)

Details on infiltration trenches can be found on **Drawing 1**, "Site Grading."

The infiltration galleries are approximately 504m long. The clear stone can vary in depth from 450mm to 650mm with native soil backfill depth from 400mm to 600mm. Calculations assumed infiltration depth of 0.9m. Based on the minimum trench size, the water balance targets can be met. Based on the results of the Hydrogeological Investigation by DS Consultants, and considering that the majority of the site is being filled above existing grade, there is sufficient depth to the water table for the relatively shallow infiltration galleries to function properly.

All roof leaders within the development area will be discharged to pervious areas; note that the water balance calculations do not account for any infiltration on topsoil which will further improve water balance for the site.

3.4.2. QUALITY CONTROL

Stormwater quality control for the development is required to control runoff to an "Enhanced" standard of treatment or the equivalent of 80% removal of TSS.

Filter (Separator Row) on Storage System

A filter (separator row) will be proposed on the stormwater storage system. Based on ETV test results for Cultec systems, typical TSS removal efficiency ranges from 65-80%. Additional details

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including storage configuration will be provided at part of the detailed subdivision design and future site plan applications.

Oil and Grit Separator (OGS)

Two OGSs will be provided at minimum – one for the subdivision / public portion of the site at the Street A outlet, and one for each of the southeast condominium block which discharges directly to Ninth line storm sewers. As the western condo block discharges to the tank, an additional OGS can be added if it is determined through detailed design that the separator row cannot provide adequate treatment to the satisfaction of the City. OGS sizing and specifications will be provided at detailed design of the subdivision and future site plan applications following coordination with manufacturers.

3.4.3. QUANTITY CONTROL

The Ninth Line Lands Scoped Subwatershed Study (SWS) by Wood (2018) established the following quantity control criteria for stormwater management of the subject lands. However, these targets represent a "total" flow rate and do not consider the capacity of the existing minor system on Ninth Line. Therefore, the proposed approach to matching the existing minor and major system targets based on the PC SWMM model is more appropriate in this case. The SWS also includes clear provisions allowing sites do develop with on-site storage.

Table 2.2.2 Stormwater Management Facility Sizing Criteria for Flood Control – Sixteen Mile Creek Watershed

Quantity Component	Cumulative Unitary Volume[1.] (m^3/impervious ha)	Unitary Discharge (m^3/s/ha)
Sawmill Creek Subwatershed		
5 Year	500	0.015
100 Year	800	0.050

The post-development model simulates the proposed drainage strategy including a storage tank, uncontrolled drainage areas, public ROW, and external woodlot drainage. The ultimate development (including Phase 2) has been considered in the model.

A verification Analysis was conducted for the last existing MH that was modelled:

Total Proposed 5 Year flow at EX_STM_MH7=0.53 m^3/s
Total Area at EX_STM_MH5= 26.87ha
5 Year Unitary Discharge (PC SWMM) = **0.019 m^3/s/ha** (vs. 0.015 m^3/s/ha)

Total Existing 100 Year flow at EX_STM_MH7= 1.36m^3/s
Total Area at EX_STM_MH5= 26.87 ha
5 Year Unitary Discharge (PC SWMM) = **0.05 m^3/s/ha** (vs. 0.050 m^3/s/ha)

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Table 7 describes the post-development model catchment parameters.

Table 8 describes the proposed runoff coefficients with adjustments for larger storms per City standards. Imperviousness was based on the runoff coefficient equivalent; the imperviousness was found to be conservative for this site when the pervious / impervious areas were measured digitally in CAD.

Tables 9 and 10 describe storage characteristics of the proposed underground tank and superpipe.

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Table 7: Proposed Conditions Model Parameters

Area Description	Area [ha]	Surface slope [%]	Soil Group	Land Use	Curve Number	Initial Abstractions Pervious/ impervious [mm]
External "east" woodlot area and portion of 5170 Ninth Line	2.51	1	C	20% Meadow / 80% Forest	74	5
External "west" woodlot area to Tank	6.45	2.5	C	20% Meadow / 80% Forest	74	5
5170 Ninth Line frontage on Ninth Line	0.35	1.5	C	75% IMP	74	5 / 1
Site area to Tank	3.16	1.5	C	65% IMP	74	5 / 1
Public ROW	0.54	1.5	C	65% IMP	74	5 / 1
South-east site plan area to major / minor system	0.38	1.5	C	65% IMP	74	5 / 1
South-east site plan area to Ninth Line major system	0.07	1.5	C	65% IMP	74	5 / 1
Ninth Line ROW to existing 750mm storm sewer	1.81	1.8	C	70% IMP	74	5 / 1

Table 8: Proposed and Adjusted Runoff Coefficients

Area Description	Proposed Runoff Coefficients	Adjusted Runoff Coefficient (100-year Return Period)	Land Use
External "east" woodlot area and portion of 5170 Ninth Line	0.20	0.25	7% IMP
External "west" woodlot area to Tank	0.20	0.25	7%IMP
5170 Ninth Line frontage on Ninth Line	0.75	0.90	95% IMP
Site area to Tank	0.65	0.80	80% IMP
Public ROW	0.65	0.80	80% IMP
South-east site plan area to major / minor system	0.65	0.80	80% IMP
South-east site plan area to Ninth Line major system	0.65	0.80	80% IMP
Ninth Line ROW to existing 750mm storm sewer	0.70	0.85	90%IMP

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Table 9: Underground Storage Tank

Discharge [m^3/s]	Elevation [m]	Volume [m^3]
0	186	0
0.01	186.1	100
0.01	189	1800

Table 10: Superpipe Storage

Discharge [m^3/s]	Elevation[1] [m]	Volume [m^3]
0	Invert (varies)	0
0.18	Obvert (varies)	136

[1] The superpipe is a 1200mm circular concrete sewer

Pumping

Discharge from the underground SWM tank will ultimately have to be pumped to the proposed sewers on Street A. To achieve the required storage volume, the footprint of the tank would need to be significantly larger to be shallow enough to discharge by gravity. Due to ownership (i.e. private vs public) issues, the tank must discharge to the Street A sewer which connects to the existing Ninth Line sewers at a much shallower elevation that the Ninth Line sewers further south. While pumping is not ideal from the City's perspective, this system will be owned and operated by the condo corporation, not City forces. Pump failure scenarios are discussed further on in this section.

Orifice Tube

City standards dictate that orifice tubes are preferred to orifice plates. Accordingly, the entire site is proposed to be controlled by a 250mm diameter circular pipe at the Street A outlet. This closely replicates the existing drainage conditions, since the vast majority of the existing property drains to a catchbasin and lead along the west side of Ninth Line. Regardless of the on-site flow conditions, the sewer discharge will ultimately be constrained to the capacity of this pipe.

Modelling Results

Tables 11 identifies the location of key nodes in the system. Tables 12 to 14 summarize the existing vs. proposed major and minor system flow at each of the identified key system nodes.

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Table 11: System Performance Nodes and Corresponding Existing Areas

Minor System		Major System		Location
Junction Name	**Existing Upstream Drainage Area (ha)**	**Junction Name**	**Existing Upstream Drainage Area (ha)**	
EX_STM_MH4	4.7	**EX_STM_MH4-S**	4.7	Upstream of proposed site
EX_MH1	15.76	**EX_MH1-S**	15.76	Proposed Site Storm Sewer Connection
EX_STM_MH5	17.68	**EX_STM_MH5-S**	17.68	Downstream of proposed site

Table 12: Existing & Proposed EX_STM_MH4 Summary

Design Event	Existing Minor System Peak Flow [m^3/s]	Existing HGL Elevation [m]	Proposed Minor System Peak Flow [m^3/s]	Proposed HGL Elevation [m]	Existing Major System Peak Flow [m^3/s]	Existing Major System Flow Depth [m]	Proposed Major System Peak Flow [m^3/s]	Proposed Major System Flow Depth [m]
(1) 2yr 4hr 5min Chicago	0.12	187.78	0.12	187.6	0.22	0.04	0.17	0.04
(2) 5yr 4hr 5min Chicago	0.16	187.81	0.16	187.79	0.32	0.04	0.25	0.04
(3) 10yr 4hr 5min Chicago	0.20	187.83	0.19	187.81	0.41	0.05	0.33	0.05
(4) 25yr 4hr 5min Chicago	0.23	187.85	0.23	187.83	0.50	0.05	0.41	0.05
(5) 50yr 4hr 5min Chicago	0.26	187.87	0.26	187.85	0.58	0.06	0.48	0.05
(6) 100yr 4hr 5min Chicago	0.33	187.91	0.34	187.95	0.41	0.07	0.83	0.07

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Table 13: Existing vs. Proposed EX_MH1 Summary

Design Event	Existing Minor System Peak Flow [m^3/s]	Existing HGL Elevation [m]	Proposed Minor System Peak Flow [m^3/s]	Proposed HGL Elevation [m]	Existing Major System Peak Flow [m^3/s]	Existing Major System Flow Depth [m]	Proposed Major System Peak Flow [m^3/s]	Proposed Major System Flow Depth [m]
(1) 2yr 4hr 5min Chicago	0.16	185.69	0.2	185.76	0.38	0.05	0.19	0.04
(2) 5yr 4hr 5min Chicago	0.21	185.73	0.27	185.8	0.54	0.06	0.30	0.05
(3) 10yr 4hr 5min Chicago	0.21	185.77	0.33	185.85	0.69	0.07	0.41	0.05
(4) 25yr 4hr 5min Chicago	0.32	185.8	0.38	185.88	0.83	0.08	0.51	0.06
(5) 50yr 4hr 5min Chicago	0.37	185.94	0.43	185.92	0.95	0.08	0.60	0.06
(6) 100yr 4hr 5min Chicago	0.52	188.61	0.60	187.53	1.4	0.09	1.02	0.08

Table 14: Existing vs. Proposed EX_STM_MH5 Summary

Design Event	Existing Minor System Peak Flow [m3/s]	Existing HGL Elevation [m]	Proposed Minor System Peak Flow [m3/s]	Proposed HGL Elevation [m]	Existing Major System Peak Flow [m3/s]	Existing Major System Flow Depth [m]	Proposed Major System Peak Flow [m3/s]	Proposed Major System Flow Depth [m]
(1) 2yr 4hr 5min Chicago	0.42	185.17	0.36	185.13	0.40	0.11	0.22	0.09
(2) 5yr 4hr 5min Chicago	0.60	185.28	0.53	185.23	0.59	0.13	0.34	0.11
(3) 10yr 4hr 5min Chicago	0.76	185.4	0.68	185.32	0.76	0.16	0.46	0.13
(4) 25yr 4hr 5min Chicago	0.89	185.9	0.81	185.42	0.93	0.19	0.57	0.15
(5) 50yr 4hr 5min Chicago	0.98	186.54	0.91	186.22	1.07	0.21	0.67	0.16
(6) 100yr 4hr 5min Chicago	1.33	187.95	1.34	187.50	1.78	0.3	1.40	0.30

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The proposed conditions modelling results indicate that the minor system flows are not exceeded upstream and downstream of the site, demonstrating that the proposed SWM systems can adequately match the prescribed post-to-predevelopment targets. There is a very minimal, localized increase in flows at EX_MH1. However, the results at the next downstream node indicate a significant decrease in both major and minor system flow. Overall, results demonstrate decreases in minor system flows / HGL and depth of surface flow for the proposed conditions, which ultimately provide a net benefit to the City's infrastructure capacity.

Pump Failure

As noted previously, the underground storage tank must incorporate a pump to discharge to the proposed Street A storm sewers. A backup pump will be proposed to account for the unlikely scenario when the primary pump is not functional. To demonstrate that there is no appreciable impact downstream, even in the extremely unlikely scenario where both pumps have failed during a 100-year storm event, a separate model scenario has been prepared. The results are summarized in Table 15.

Table 15: Flows at Ninth Line during Total Pump Failure

Design Event	Minor System Peak Flow [m^3/s]	Major System Peak Flow [m^3/s]	Minor System Peak Flow [m^3/s]	Major System Peak Flow [m^3/s]	Minor System Peak Flow [m^3/s]	Major System Peak Flow [m^3/s]
	EX_STM_MH4	EX_STM_MH4-S	EX_MH1	EX_MH1-S	EX_STM_MH5	EX_STM_MH5-S
100yr 4hr 5min Chicago	0.34	0.83	0.60	1.02	1.33	1.40

Because the proposed pumping rate is very low, there is a trivial difference in usable storage over the duration of the 100-year storm. Accordingly, there is a negligible downstream increase in flows as a potential result of pump failure. Note this model assumes that the tank is empty at the start of a 100-year storm, which is reasonable given that this entire scenario is highly improbably.

Erosion Control

The Ninth Line Lands Scoped Subwatershed Study by Wood (2018) established criteria for erosion control based on the 25mm 4-hour storm. The total volume of rainfall simulated is 25.34mm.

Table 2.6.1 Stormwater Management Facility Sizing Criteria for Erosion Control for Ninth Line Lands – Sawmill Creek Subwatershed

Quantity Component	Cumulative Unitary Volume (m^3/impervious ha)	Unitary Discharge ($m^3/s/ha$)
Erosion	275	0.002

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Similar to the approach for quantity control, the 25mm 4-hour storm was modeled at the key node locations, as summarized in Tables 16 and 17. As the flow differential is minimal and the downstream system is piped, there would be no observable downstream erosion impacts.

Table 16: Existing Flow during 25mm Storm

Design Event	Minor System Peak Flow [m^3/s]	Major System Peak Flow [m^3/s]	Minor System Peak Flow [m^3/s]	Major System Peak Flow [m^3/s]	Minor System Peak Flow [m^3/s]	Major System Peak Flow [m^3/s]
	EX_STM_MH4	EX_STM_MH4-S	EX_MH1	EX_MH1-S	EX_STM_MH5	EX_STM_MH5-S
25mm Storm	0.08	0.12	0.11	0.2	0.25	0.23

Table 17: Proposed Flow during 25mm Storm

Design Event	Minor System Peak Flow [m^3/s]	Major System Peak Flow [m^3/s]	Minor System Peak Flow [m^3/s]	Major System Peak Flow [m^3/s]	Minor System Peak Flow [m^3/s]	Major System Peak Flow [m^3/s]
	EX_STM_MH4	EX_STM_MH4-S	EX_MH1	EX_MH1-S	EX_STM_MH5	EX_STM_MH5-S
25mm Storm	0.081	0.10	0.14	0.11	0.22	0.13

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4 SANITARY SERVICING

4.1. EXISTING SANITARY SERVICING

The subject lands fall within Erin Centre and Motorway Sewersheds of the West Trunk System which ultimately discharges to the Clarkson Water Pollution Control Plant. Existing wastewater infrastructure in and around the subject lands is outlined below:

- 1050mm sanitary trunk sewer on Ninth Line from Erin Centre Boulevard north to Britannia Road West
- 900mm sanitary sewer on Erin Centre Boulevard
- No sanitary sewers on Ninth Line north of Saratoga Way or south of Erin Centre Boulevard
- Local sewers within subdivisions east of Ninth Line

As outlined in the Region's *Ninth Line Lands Servicing Strategy Report*, the Clarkson WPCP and the existing 900mm trunk sewer on Erin Centre Boulevard are adequately sized to handle projected flows from the proposed development area along Ninth Line, including the subject property. Therefore, it is assumed that there are no downstream sanitary capacity issues associated with the development of the subject property.

4.2. PROPOSED SANITARY SERVICING

A new 375mm sanitary trunk sewer on Ninth Line is proposed to provide an outlet from the subject lands to the existing 900mm sanitary sewer at Erin Centre Boulevard. The 375mm sanitary sewer will also be extended along Street A (through the proposed development) to provide a drainage outlet for future developments to the south.

Population densities of 3.50 people per unit for low-rise/townhouses and 2.70 people per unit for high-rise/apartments have been assumed based on marketing and demographic info for the area. Note these densities result in higher projected populations than the Region standard densities based on land area (175 people per hectare for townhouses and 475 people per hectare for apartments).

Refer to **Drawing 6**, "*Sanitary Drainage*," for further details. Sanitary design calculations are included in **Appendix A**.

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5 WATER DISTRIBUTION

5.1. EXISTING WATER SERVICING

A 400mm trunk watermain exists within the east boulevard Ninth Line that will supply the proposed development through the construction of new water infrastructure. This watermain is within Pressure Zone 4W of the Region's water distribution system servicing elevations between 166.3m and 198.1m. Pressure Zone 4W is supplied by the Streetsville High-Lift Pumping Station and the Meadowvale North Low-Lift Pumping Station.

As outlined in the Region's Ninth Line Lands Servicing Strategy Report, the need to expand existing water distribution infrastructure in the area of Ninth Line is currently under review.

5.2. PROPOSED WATER SERVICING

A 300mm watermain is proposed within the new public road west of Ninth Line. This watermain will connect to the existing Pressure Zone 4W 400mm watermain on Ninth Line. Local, looped watermains (200mm or smaller) are proposed within the private condo roads to service the development. All proposed units will be provided with individual water service connections in accordance with Region design criteria.

Hydrant testing, water demand, and fire flow calculations have been included in **Appendix C** for reference.

Refer to **Drawing 3**, "*Site Servicing*," for additional details.

6 EROSION AND SEDIMENT CONTROL

The erosion and sediment control plan for the site will be designed in conformance with the City of Mississauga guidelines and Credit Valley Conservation Authority. The following erosion and sediment control measures will be installed and maintained during construction:

- A temporary sediment control fence will be placed prior to grading
- Temporary sediment traps will be provided at each outlet
- Gravel mud mats will be provided at construction vehicle access points to minimize off-site tracking of sediments
- All temporary erosion and sediment control measures will be routinely inspected and repaired during construction. Temporary controls will not be removed until the areas they serve are restored and stable.

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7 CONCLUSION

The proposed residential development at 5150 Ninth Line can be adequately serviced via the existing storm, sanitary and water distribution infrastructure and does not adversely impact any of the surrounding infrastructure or properties.

Storm sewers will discharge to the existing sewers on Ninth Line, matching post-to-predevelopment flows. Quantity control for the private development is provided by an underground storage tank within the outdoor amenity space; quantity control for the public road is provided by a superpipe within the proposed right-of-way.

Water balance is achieved via infiltration trenches within the rear yards of the proposed townhouses, as well as by disconnecting downspouts and directing flows to pervious surfaces. Water quality control is provided via a filter on the proposed underground storage tank and oil and grit separators treating the private and public drainage areas.

Sanitary servicing is provided by a proposed 375mm trunk sewer on Ninth Line to the existing 900mm trunk sewer on Erin Centre Boulevard, ultimately draining to the Clarkson Water Pollution Control Plant.

Water servicing is provided by the existing Pressure Zone 4W 400mm watermain on Ninth Line.

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APPENDIX A

DESIGN CALCULATIONS

- Storm Sewer Design Sheet (10-Year)
- SWM Design Calculations & PC SWMM model results
- Sanitary Sewer Design Sheet

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APPENDIX B

DRAWINGS

- Drawing 1 – Site Grading
- Drawing 2A – Grading Cross Sections
- Drawing 2B – Grading Cross Sections
- Drawing 3 – Site Servicing
- Drawing 4 – ROW Cross Sections
- Drawing 5A – Existing Storm Drainage
- Drawing 5B – Storm Drainage
- Drawing 6 – Sanitary Drainage

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APPENDIX C

WATER & WASTEWATER CALCULATIONS (MES)

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