CROWN (BARRIE) DEVELOPMENTS INC.

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

1012 Yonge Street, City of Barrie

Project No. 2018-0390

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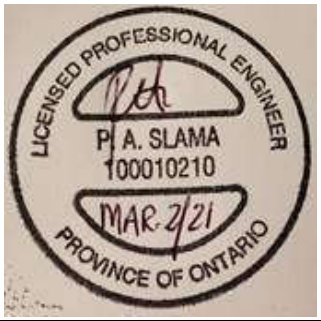

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Issues and Revisions Registry

Identification	Date	Description of Issued and/or Revision
Final Report	December 2018	Issued For Submission-Conformity Review
Final Report	November 2019	Issued for Submission-Conformity Review
Final Report	July 2020	Issued for Submission-ReZoning
Final Report	February 2021	Issued for Submission-ReZoning

Statement of Conditions

This Report / Study (the "Work") has been prepared at the request of, and for the exclusive use of, the Owner / Client, City of Barrie and its affiliates (the "Intended User"). No one other than the Intended User has the right to use and rely on the Work without first obtaining the written authorization of IBI Group, its Owner. IBI Group expressly excludes liability to any party except the Intended User for any use of, and/or reliance upon, the work.

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1 Introduction

1.1 Background

IBI Professional Services (Canada) Inc. (IBI) was retained by Crown (Barrie) Developments Inc. (the "Owner") to prepare a site specific Functional Servicing and Stormwater Management Report (FSR-SWM) for a proposed mixed-use development consisting of 1,029 residential units and 1,281.6 m^2 of commercial space on a 4.76 ha property (4.94 ha gross area) located at 1012 Yonge Street (the "Site"), in the City of Barrie (the "City"). This report has been prepared to support the requirements of the Re-Zoning Application Process within the Hewitt's Secondary Plan.

The purpose of this report is to provide site specific information for the City review with respect to infrastructure required to support the proposed development regarding storm drainage, water supply, and sanitary discharge.

More specifically, this report presents the following:

- Evaluate on a preliminary basis the Stormwater Management (SWM) opportunities and constraints, including:
    - Calculate the proposed storm flows;
    - Evaluate the capacity of the existing stormwater service connections or ultimate outlets; and,
    - Demonstrate that adequate capacity is or will be available within the receiving municipal sewers and downstream infrastructure to accommodate the additional stormwater flows from the proposed development.
- Identify sanitary servicing opportunities and constraints, including:
    - Calculate existing and proposed sanitary flows; and,
    - Determine the sanitary peak flow and proposed sanitary connection/outlet location.
- Evaluate the existing Municipal water system, including:
    - Calculate the proposed domestic water and firefighting supply needs; and,
    - Confirm that an adequate source of municipal water distribution is available to support the domestic and fire flow demands for the proposed development.

During the preparation of this report, COLE has contacted the City's Engineering Department to obtain existing information regarding available storm, sanitary and water services on Yonge Street and Lockhart Road.

The following documents were available for our review:

- Stormwater Management Planning and Design Manual by the Ministry of Environment, Conservation and Parks (MECP) 2003 [MECP SWMPD];
- Technical Guidelines for Stormwater Management Submissions by the Lake Simcoe Region Conservation Authority (LSRCA) 2016 [LSRCA SWM Guidelines];

- City of Barrie's Storm Drainage and Stormwater Management Policies and Design Guidelines 2017 [City SWM Guidelines];
- Barrie Creek, Lovers Creek, and Hewitt Creek Subwatershed Plan by the LSRCA 2012 [LSRCA Subwatershed Plan];
- Phosphorus Offsetting Policy by the LSRCA 2017 [LSRCA Phosphorus Offsetting Policy];
- Lake Simcoe Protection Plan 2009 [LSPP];
- Highlights of Draft Changes to LSRCA SWM Technical Guidelines by the LSRCA June 24, 2016 [LSRCA Draft SWM Technical Guidelines];
- Drainage & Stormwater Master for the City of Barrie, prepared by Amec, Drawing No. SA-283-R22, dated October 2013;
- Site Plan (Dwg. No. A100) prepared by SRN Architects, dated January 19, 2021;
- Hewitt's Secondary Plan Area Subwatershed Impact Study prepared by R.J. Burnside & Associates Limited, dated September 2016; and,
- Official Plan for the City of Barrie, Amendment No.39, dated 2014.

1.2 Existing Site Description

The subject site is currently agricultural land, occupied by an apple tree orchard and associated cluster of buildings centrally located within the site. The site is 4.76 ha in area (4.94 ha gross area) and is located on the west side of Yonge Street, north of Lockhart Road. The existing areas surrounding the proposed development consist of agricultural land to the north, west and south, with Yonge Street to the east. The legal description for the site is as follows: Part of Lot 15 Concession 11, the City of Barrie and County of Simcoe. Refer to **Figures FIG 1** and **FIG 2** following the report for the location plan and aerial map of the site location.

1.3 Existing Site Topography

Under existing conditions, the topography for the site generally falls from the north-west to south-east direction, draining easterly toward the roadside ditch along Yonge Street. The site exhibits an existing high point ridge elevation of approximately 271.80m in the north-west quadrant of the site and falls to a low point elevation of approximately 266.80m at the south-east corner, adjacent Yonge Street, with an existing ground gradient of approximately 2%. The existing ground topography was surveyed by Guido Papa Surveying, dated January 4, 2019. For reference, a 1:500 scale drawing of the existing topography is provided at the end of this report, **Drawing Topo: Part of Lot 15, Concession 11**.

1.4 Existing Soils Condition

A geotechnical investigation was completed by Soil Engineers Ltd. by extending boreholes across the site to examine subsurface soil conditions. The boreholes were completed in March 2020 and found the site contains a layer of Topsoil (approximately 0.30m thick), underlain by Sandy Silt Till of approximately 2m – 3m depth, on average, underlain by a thicker layer of Sand, found within all boreholes down to the limit of borehole investigation, down to 9m depth. For further details related to existing soils data, refer to the Soil Engineers Ltd. Geotechnical Investigation Report.

1.5 Existing Groundwater Condition

A hydrogeological investigation was completed by COLE Engineering Group Ltd. based upon the borehole investigation completed in March 2020, which included the installation of four groundwater monitoring wells. Groundwater level readings from the wells were monitored and recorded in March, April and May 2020 and found the average groundwater elevation to be approximately 264.00m, which indicates groundwater depths ranging between 4.5m to 7.5m below existing ground surface, at the monitoring well locations. The direction of groundwater flow is generally in the south-east direction. For further details related to the groundwater investigation, refer to the Hydrogeological Investigation Report.

1.6 Site Development Proposal

The proposed development will be composed of 1,029 residential units (1,019 Condo Apartment units and 10 3-Storey Condo Townhouses), 1,281.6 m^2 of commercial space facing Yonge Street and a 24.0m wide right-of-way municipal road (Street 'A') along the entire south perimeter of the site from Yonge Street, aligned in an east-west direction. Refer to **Appendix A – Background Information** for the Site Plan prepared by SRN Architects, revision dated February 26, 2021.

2 Terms of Reference

The Terms of Reference used for this report were based on the *City of Barrie's Development Manual* (2017), *Storm Drainage and Stormwater Management Policies and Design Guidelines* (2017), and the *Sanitary Sewage Collection System Policies and Design Guideline* (2017). Other documents that were used to establish the design criteria are noted in their appropriate section.

2.1 LSRCA Design Charrette

In accordance with the City of Barrie's requirements for Conformity Review prior to a Re-Zoning application being made, a virtual design charrette meeting was held with City and LSRCA staff on August 13, 2020 on the Microsoft Teams platform. The purpose of the design charrette was for the applicant to present the technical design parameters for the site proposal and demonstrate how the site shall adhere to LSRCA's technical guidelines for stormwater management submissions and allow discussion from the City and/or LSRCA to provide technical input, early in the design stage.

At the design charette, the civil consultant presented the existing topography, existing groundwater conditions and described the proposed site grading, water balance strategy, water quantity and quality control, volume control and phosphorus budget, all in accordance with LSRCA's Engineering Submission Checklist. The details presented at the design charette was based on the Functional Grading and Storm Drainage Plan, drawing no. DAP-2, found within this Report.

2.2 Methodology: Stormwater Management

The proposed development will be designed as per the criteria specified in the Subwatershed Impact Study (SIS) prepared by R.J. Burnside, and complied with the standards and guidelines of various review agencies including City of Barrie (the City), Lake Simcoe Region Conservation Authority (LSRCA) and Ministry of the Environment, Conservation and Parks (MECP).

The following design criteria will be applied:

- SWM Quantity control: Post-development peak flows for all storms, up to and including 100-year, from the subject site are to be controlled to meet the pre-development levels;

- SWM Quality Control: Stormwater is to be treated to Enhanced Protection levels, i.e., 80% TSS removal, as defined in the MECP 2003 SWMPD Manual;
- Phosphorus loadings will meet or be below existing conditions;
- Water Balance: Maintain the pre-development infiltration target to the extent feasible; and,
- The City's Intensity-Duration-Frequency (IDF) data to be used for analysis.

2.3 Methodology: Sanitary Discharge

The peak sanitary sewage discharge from the site will be determined using sanitary sewer design sheets that consider the land use and site statistics as shown on the Site Plan.

The estimated sanitary discharge rate from the proposed site will be calculated based on the criteria set out by the City's Sanitary Sewage Collection System Policies and Design Guidelines, as outlined in **Table 2.1** below.

Table 2.1 Sanitary Design Parameters

	Criteria	Criteria Source
Domestic Average Flow	225 L/Day/Person	Barrie Standard
Extraneous Flow	0.1 L/s/Ha (Infiltration)	Barrie Standard
Peaking Factor	$Harmon: M = 1 + \frac{14}{4 + P^{0.5}}$ (Where P is Population in Thousands) OR Babbit: $M = \frac{5}{P^{0.2}}$ (Where P is Population in Thousands)	Barrie Standard
Commercial/Institutional	28 m³/Day/Ha	Barrie Standard

2.4 Methodology: Water Usage

The domestic water usage will be calculated based on the MECP's Design Guidelines for Drinking Water Systems and City of Barrie's design guideline as outlined in **Table 2.2** below.

Table 2.2 Water Usage Design Parameters

	Criteria	Criteria Source
Domestic Average Flow	225 L/Day/Person	Barrie Standard
Population Count (High Density)	1.67 Persons/Unit	Barrie Standard
Population Count (Medium Density)	2.34 Persons/Unit	Barrie Standard
Maximum Day Factor	2.75	MECP Standard
Peak Hour Factor	4.13	MECP Standard
Minimum Hour Factor	0.40	MECP Standard

3 Stormwater Management and Drainage

3.1 Design Criteria

The proposed development will be designed as per the criteria specified in **Section 2.2** above.

3.2 Existing Internal Drainage System

Under existing conditions, the subject site (area of 4.76 ha; gross area of 4.94 ha) is currently operated as agricultural land, occupied by an apple orchard. Currently, there are no municipal storm sewers available near or adjacent the site. The surrounding roads and neighborhood are rural.

Under existing conditions, storm runoff from the majority of the site is conveyed overland, generally from the north-west to south-east direction, draining easterly toward the roadside ditch along Yonge Street. A small corner of the property in the north-west drains towards the north. The site exhibits an existing high point ridge elevation of approximately 271.80m in the north-west quadrant of the site and falls to a low point elevation of approximately 266.80m at the south-east corner, adjacent Yonge Street, with an existing ground gradient of approximately 2%. The existing drainage area plan is illustrated in **Figure DAP-1**.

3.3 External Drainage

The area-wide existing ground topography was presented within the SIS and indicates that the subject site does not receive any storm water drainage from external lands, nor does the property act as an important conduit for pass-through drainage. The area-wide topography has been corroborated with a site specific topographic survey (prepared by Guido Papa Surveying), which includes elevations shot at 20m beyond the property boundary, confirms that no external drainage is routed through the site under existing conditions.

3.4 Proposed Drainage Scheme

Based on the current Site Plan by SRN Architects, revision dated February 26, 2021, the site is proposed to be developed into a high density residential site, with 1,029 residential condominium units and 1,281.6 m^2 Commercial GFA and a 24.0m wide municipal right-of-way. As per the SIS study, the required SWM controls for this site were intended to be provided using end-of-pipe SWM facilities. The SIS proposed a drainage divide through the center of the site, whereby the western half of the subject site would drain westerly towards SWM Pond #3 (located within Lockhart Innisfill Investments Ltd. property) and the eastern half of the site would drain easterly towards SWM Pond #5 (located within Ballymore's property).

Storm sewers shall be constructed in the future, extending from the downstream SWM Ponds #3 and #5, through adjacent landowners as part of their respective development applications, up to the property limit of the subject site at both the east and west site boundaries to provide municipal storm connections.

Refer to **Appendix B** for a depiction of the storm drainage divide as per the SIS, Figures 9 & 10, Proposed Storm Sewer Plan.

Proposed grading of the site plan and collector road along the southern limit of the site will generally follow the drainage divide as noted within the SIS and divert storm runoff towards the two SWM facilities, except for the following proposed modification:

<u>Exception</u>

- Subsequent to the Conformity Review process, the proponent has made successful arrangements with the surrounding landowners to modify the post-development storm drainage boundary through the site, such that storm runoff from the entire private site plan component of the property is directed easterly towards SWM Pond #5. In addition, the majority of the proposed east-west collector road (approximately 2/3 of municipal ROW length) would also direct storm runoff easterly towards SWM Pond #5, while the remaining 1/3 length of the municipal ROW would direct runoff westerly towards SWM Pond #3. It has been confirmed by the design consultant for Ballymore Homes, SCS Consulting, that adequate capacity is provided within SWM Pond #5 to accommodate the proposal to direct additional storm drainage from the subject site to SWM Pond #5.

3.5 Preliminary SWMF #3 and #5

The Sub-watershed Impact Study prepared by R.J. Burnside outlined the proposed stormwater infrastructure and grading for Hewitt's Secondary Plan Area. The preliminary design for SWM Ponds #3 and SWM Pond #5 was completed based on Land Use Schedule 9C from the July 2015 OMB decision.

Significant design work has been completed for SWM Ponds #3 and #5 by the respective landowners design consultants, in terms of advancing the preliminary design for SWM Ponds #3 and #5 and any further modifications will be completed in conjunction with the contributing landowners, based on the development details and drainage areas for the surrounding subject sites as it progresses.

It is understood that SWM Ponds #3 and #5 shall be designed to meet all current City, MECP and LSRCA criteria in terms of quantity and quality control.

3.6 Site Stormwater Management Scheme

The development will incorporate a "dual" drainage system consisting of storm sewers and catch-basins (minor system) and the use of the roadway and overland flow routes (major system). The site can be divided into two components when discussing stormwater management: 1) the private site plan area and 2) the municipal collector road east-west ROW.

The private site plan area will contain to a large extent, an underground garage with a footprint covering most of the private development area. As a result, all storm runoff generated within the private site plan area, up to and including the 100-year storm event, will be captured from the rooftops and ground surfaces, directed into the underground parking garage and routed via underground storm piping in an easterly direction towards Yonge Street. Piped stormwater will exit the underground garage at a designated location and connected to the future municipal storm sewer at Street 'A' and Yonge Street intersection which will direct stormwater towards the easterly outlet (towards SWM Pond #5).

Stormwater drainage from the proposed municipal ROW (Street 'A') will be divided into two components; where the easterly two-thirds of the ROW drains to the east and the westerly one-third of the ROW drains to the west. All runoff up to the 100-year storm event from the ROW, between Yonge Street and a local high point approximately 220m west of Yonge Street, will be captured just prior to Yonge Street with sufficiently sized catchbasins and connected to the future storm sewer constructed by others that will be extended from the east, discharging into SWM Pond #5. West of the high point on Street 'A', the ROW drains to the west and the runoff will be captured by future storm sewers constructed by others ultimately discharging into SWM Pond #3.

Refer to **Drawing DAP-2**, 'Functional Grading and Storm Drainage Plan', for a depiction of the intended post-development stormwater routing.

3.7 SWM Controls and Storm Pipe Design

As mentioned in **Section 3.6**, the future storm sewer system flowing easterly will be sized for the total capture of the 100-year storm and convey the flow to SWMF #5 to achieve required SWM controls. The target flow to be conveyed to the pond block was calculated using the Rational Method with City's Intensity-Duration-Frequency (IDF) data. The runoff coefficient was calculated as per the City standard (see **Table 3.1** for details).

Table 3.1 Proposed Condition Drainage Parameters

Catchment	Drainage Area (ha)	Runoff Coefficient "C"	Tc (min)
Impervious Area	3.37	0.95	
Pervious Area	1.39	0.25	
Site Total	4.76 (total)	0.75 (weighted)*	10

**Note: A higher coefficient of 0.80 was utilized to allow for flexibility in perviousness*

The Rational Method calculation was performed using the City's Intensity-Duration-Frequency (IDF) data in order to determine the 100-year total capture rate resulting from post-development conditions that directs stormwater towards the easterly storm sewer system. The flow is determined to be 1,817.6 L/s (see **Table 3.2** for details). Detailed flow calculations are included in **Appendix B.**

Table 3.2 Target Peak Flows under Proposed Conditions

Catchment	Discharge Location	100-Year Total Capture Flow (L/s)
A1 Post (4.54 ha)	To the Storm Sewer System directed Easterly Under Yonge Street	**1,817.6**

3.8 Quality Control

SWM Ponds #3 and #5 are both proposed to provide the quality controls for the site. Since the SWM Ponds are both located on external landowners' properties, the design of the SWM Ponds will be prepared by the external landowners' consultants and the details about the quality control calculations can be found within such external consultants engineering reports. In accordance with the SIS, it can be expected that downstream SWM Ponds #3 and #5 shall be designed to achieve Enhanced Level of treatment, or a minimum of 80% TSS removal.

3.9 Low Impact Development (LID) Measures and Water Balance

As per the LSRCA guidelines, every attempt should be made to match post-development infiltration volumes to pre-development levels on an annual basis. An annual water budget analysis was completed to determine the infiltration deficit between pre-development conditions and post-development conditions without infiltration. The water balance calculations are provided in **Appendix B**. As per the water balance calculations, the pre- and post-development annual infiltration volumes are 5,930.4 m^3 and 1,737.5 m^3, respectively, resulting in an annual infiltration deficit of 4,192.9 m^3. **Table 3.3** provides the summary of the water balance calculations.

In order to mitigate this infiltration deficit, Low Impact Development measures in the form of Roof Water/Clean Surface Water Collector system piping and Underground Infiltration Chambers, are proposed to provide required infiltration to compensate the deficit resulting from the proposed development.

Based on the calculations, all rooftop areas totalling 1.53 ha are required to be captured and piped through the underground garage to the Underground Infiltration Chambers to achieve the target mitigation infiltration of 4,203.0 m^3 to meet the annual pre-development infiltration rate. The detailed calculations are provided in **Appendix B**.

Table 3.3 Water Balance Calculations

Conditions	Site Area (ha)	Site Infiltration Capacity (m^3)	Infiltration Trenches (m^3)	Annual Infiltration Capacity (m^3)
Pre-development (existing site)	4.76	5,930.4	0	***5,930.4***
Post-Development (without mitigation)	4.76	1,737.5	0	***1,737.5***
Post-Development (with mitigation)	4.76	1,737.5	4,203.0	***5,940.5***

Due to the sandy soils and generally deep groundwater table found on site, the underground infiltration chambers are proposed to be located under the private roadway along the northern limit of the site plan, in an area of deepest groundwater relative to finished grade (groundwater table approximately 7m deep) and outside the influence of the underground garage footprint.

Infiltration chambers are proposed using 110 StormTech SC-740 storm chambers with 150 mm clear stones under the chamber units with a total chamber footprint of 597 m^2 (238.7m length x 2.5m width). Given that only rooftop areas or (supplemented by amenity areas, if required), where the runoff generated can be considered as "clean" are conveyed into the chambers, no water quality pre-treatment is proposed. Alternatively, considering that much of the site consists of inherently 'clean' landscaped area such as walkways and amenity space, the total area of 1.53 ha required to be captured for water balance infiltration could also be achieved with a balance of rooftops and landscaped surfaces combined.

Based on the Hydrogeological investigation completed by COLE Engineering, the infiltration rate in Borehole #4, which is the closest borehole to the proposed trench location, is 6.5 * 10^{-6} m/s. Hence, the drawdown time calculated is approximately 45.6 hours. The preliminary infiltration chamber sizing and drawdown time calculations are provided in **Appendix B**.

At the detailed design stage, in-situ infiltration rates will be measured at the proposed LID locations and at the underside of chamber elevation using the Guelph permeameter methodology in support of final infiltration chamber sizing and design.

3.10 Volume Control

Based on LSRCA's definition of major development, the proposed site creates in excess of 0.5 hectares of new impervious surfaces and should attempt to meet the LSRCA criteria for Volume Control, which indicates that for sites without restrictions *"stormwater runoff volumes will be controlled and the post-construction runoff volume shall be captured and retained / treated on site from a 25mm rainfall event from the total impervious area."*

Various methods for stormwater volume reduction may be considered such as infiltration, reuse and rainwater harvesting, canopy interception or evapotranspiration. Although the site exhibits good soils and groundwater table to promote infiltration, the site development area is largely encumbered by either

a proposed underground garage or municipal ROW, both of which prohibit the use of infiltration galleries. The only area available for infiltration opportunity is under the private road aligned adjacent to the north property limit., to achieve the required water balance.

Due to horizontal spatial separation requirements, underground infiltration chambers should be placed a minimum of 5m away from foundations, which further limits the footprint of proposed infiltration chambers.

As a result of the site restrictions noted above, the site shall pursue Alternative #1 from the LSRCA's Technical Guidelines for Stormwater Management Submissions, Section 2.2.2.2 Flexible Treatment Alternative for Site with Restrictions: *"Retain runoff from a 12.5mm event from all impervious surfaces if the site is new development or from the new and/or fully reconstructed impervious surfaces for a redevelopment or linear development site."*

Based on the total impervious site area of 3.37 ha, the 12.5mm event (less 1mm initial abstraction) generates a total storage volume of 387.6 m^3 to be retained on site. Since the proposed infiltration chambers provided within the design to achieve water balance already provide 233.3 m^3 of storage ability, the remaining 154.3 m^3 of required storage will be supplemented with additional underground storage chambers, arranged under the private road along the northern portion of the property. Another 75 StormTech SC-740 chambers, for a total of 185 chambers will be required for volume control. Refer to **Appendix B** for the detailed calculation sheet.

3.11 Phosphorus Removal

In order to meet the required net zero phosphorus loading objective, a wet detention pond and underground infiltration are proposed to provide phosphorus removal for the proposed developed areas on site. The estimated Phosphorus removal rate is estimated as 94%, with 69% resulting from storm runoff being directed to downstream SWM Ponds #5 and #3 and 25% resulting from the use of underground infiltration chambers, which consists of 185 StormTech SC-740 storm chambers.

An analysis of annual phosphorus loading was completed using the MOECC Lake Simcoe Phosphorous Loading Development Tool for both the pre-development and post-development conditions. Pre-development conditions were analyzed using 'Cropland' as per the current land use – a tree farm, resulting in an annual phosphorus loading of 0.90 kg/year. Post-development conditions were modelled using 'High Intensity Residential' land use type, resulting in an annual phosphorus loading of 6.28 kg/year. The implementation of the above treatment provides a net reduction of phosphorus loading of 94%, resulting in an annual post-development loading of 0.38 kg/year. Though the proposed Best Management Practices (BMPs) significantly reduce the annual phosphorous loading in post-development, a net zero phosphorous release from the site is not achievable. Phosphorous offsetting opportunities will be discussed further during detailed design. Outputs from the MOECC Phosphorous Loading tool have been provided in **Appendix B**.

4 Sanitary Drainage System

4.1 Existing Sanitary Drainage System and Flows

According to available records, there is no existing sanitary sewer system in the area. The current apple orchard within the property operates through a septic system. Therefore, the existing site does not currently contribute any flows to the municipal sanitary sewer system.

4.2 Proposed Sanitary Flows

The SIS proposed a drainage divide approximately three-quarters through the site, whereby the western quarter of the subject site would discharge sanitary flow westerly towards a new sub-trunk sanitary sewer (outleting to Patrick Drive at the western limit of the Secondary Plan Area) and the eastern three-quarters of the site would discharge sanitary flow easterly towards a new sub-trunk sanitary sewer along future Kneeshaw Drive (outfall to Mapleview Drive).

Based on the nature of the development proposal (Condo site plan) and the reliance on an underground parking garage spanning the entire site, it is more feasible to direct sanitary discharge to a single outlet. Therefore, sanitary drainage from the western quarter of the site (approx. 1.20 ha) shall be diverted easterly and the entire site now proposes to direct all sanitary sewage towards the future 375mm diameter sanitary sub-trunk along Kneeshaw Drive. A depiction of the proposed sanitary diversion area is shown on the SIS Figure 14-Proposed Sanitary Sewer Plan, provided in **Appendix C**.

A total peak sanitary discharge flow of 20.8 L/s for the entire proposed development area was calculated based on the design parameters presented in **Table 2.1**. The proposed site plan contains a total of 1,029 residential units with an equivalent population of 1725 people.

The population per unit utilized for the proposed the condo apartment units is 1.67 persons/unit, which has been selected for High Density development land use, as confirmed with the City. Please refer to **Appendix C** for the email exchange between IBI (formerly Cole Engineering Group Ltd.) and City staff (Oct. 28/19) related to the applicable population rate factor and the Sanitary Flow Calculation Sheet for detailed flow generation calculations.

To ensure the recommended drainage area diversion and population estimates are acceptable in terms of capacity within the future downstream sanitary sewer infrastructure within the Secondary Plan Area, please refer to the email exchange in **Appendix C** between the Group Engineer (R.J. Burnside) and City staff on October 18 and 29, 2019. The email exchange references an increase to the capacity allowance to d/D ratio to 0.70 for the proposed downstream 375mm diameter sanitary sewer, which would support potential increases in density from the contributing lands, including the subject site.

4.3 Proposed Sanitary Connection

The sanitary servicing of this site shall be provided by an appropriately sized municipal sanitary sewer connection located at the site's frontage on Yonge Street. The sanitary sewer connection shall be directed easterly under Yonge Street and connect to a new sanitary sewer on Kneeshaw Drive, located within Ballymore's property, which directs drainage northerly towards Mapleview Drive.

5 Water Supply System

5.1 Existing System

According to our available records, the existing site is supplied via a local water well. Existing water infrastructure is currently not available in the area.

5.2 Proposed Water Supply Requirements

The estimated water consumption was calculated based on the City's Design Criteria and Standard Drawings as outlined in **Table 2.2**. The City requires that Water Supply for Public Fire Protection calculations, as provided by the Fire Underwriter Survey (FUS), be undertaken to demonstrate that the

existing flows and pressure are adequate to meet the minimum requirements for fire suppression outlined in the FUS. The calculations incorporated various parameters, including coefficient for fire resistive construction, a combustible occupancy factor, sprinkler system, and an exposure factor for neighboring building proximity.

Based on the land use, it is anticipated that an average domestic water consumption rate of 393,230 L/day (4.55 L/s), a maximum daily consumption of 510,559 L/day, a peak hour demand of 40,768 L/hr and a minimum hourly demand 13,763 L/hr will be required to service this development.

Based on the FUS, the governing building has an effective floor area is taken to be 7,389 sq.m. According to the calculations, a minimum fire suppression flow of approximately 15,000 L/min (3,970 USGPM) will be required from the nearest hydrant with at least 140 kPA (20 Psi) of pressure. Calculations are included in **Appendix D**.

5.3 Proposed Watermain Connection

According to the Hewitt's Secondary Plan Area Subwatershed Impact Study, refer to Figure 12-Proposed Water Distribution Plan in **Appendix D**, a future watermain is to be installed along Yonge Street, along the frontage of the site, connected to a trunk watermain along Mapleview Drive. The future watermain along Yonge Street will be constructed as part of the City's Yonge Street Re-Construction program (Phases 1 & 2) and will be sized in accordance with the City's Water Pressure Model, which is managed by an external consulting engineer on behalf of the City.

The proposed development is intended to connect to the proposed watermain along Yonge Street. The final connection point from the site to the new municipal local trunk watermain will be determined at the site plan application stage in coordination with the City.

The proposed water servicing of the site will comprise of a municipal watermain aligned along the proposed 24.0m wide municipal ROW to connect with future development to the west. A private water connection shall be made to provide fire protection and domestic water supply for the residential and commercial component of the subject site. Connection shall be in accordance with City standards and be monitored through a water meter equipped with back flow preventer.

Watermain sizing within the site to provide adequate flows and fire protection is to be determined and confirmed with the City during the detail design process, following the City's confirmation of their Water Pressure Model.

6 Site Grading

The proposed grades will match the intended drainage patterns as per the Subwatershed Impact Study, to the extent possible, recognizing the need to direct all storm and sanitary drainage easterly and recognizing the need to meet future perimeter grades along all boundaries.

Based on grading input from the adjacent subdivision development, Rainsong (by Great Gulf), a preliminary grading design has been prepared for the proposed site development site that ties in future grades along the west and south boundaries in accordance with Rainsong's subdivision. Due to the lack of intended grading design along the northern property boundary (adjacent Rainsong's future Recreation Center), the preliminary site plan grading is generally matching to existing grades along this interface. The streetline elevations at the eastern property limit are established upon the Yonge Street centreline profile and cross-sections proposed in the Phase 2 Public Information Centre drawings, prepared by the City of Barrie, dated January 16, 2018, in recognition of future boulevards and urbanization along the Yonge

Street corridor. The proposed Yonge Street transportation improvement drawings can be found in **Appendix A**.

Detailed perimeter and internal grading will be prepared at the site plan application stage of planning approvals. Emergency stormwater overland flow will be directed to approved outlet(s), such as existing municipal roads (Yonge Street) to the east or future subdivision roads (via Rainsong subdivision) to the west.

For preliminary grading design, refer to **Drawing DAP-2**, 'Functional Grading & Storm Drainage Plan', located after the report.

7 Erosion and Sediment Control

Prior to any disturbance on site, an Erosion and Sediment Control (ESC) Plan will be submitted to the municipality and LSRCA in support of a Site Alteration Permit. The ESC design will indicate how stormwater runoff from the site will be managed, detained and released to appropriate outlet locations during the various stages of construction, such as:

- Post-topsoil stripping stage;
- Pre and Post Earthworks; and,
- During Servicing and Road Construction.

The ESC design will include all calculations demonstrating appropriate sizing of stormwater control features such as Cut-Off Swales, Temporary Sediment Traps and/or Temporary Sediment Control Ponds.

Construction access for the site will be depicted on the ESC Plan and its location will be subject to City of Barrie approval.

8 Utilities

Utilities such as gas, cable, telephone and hydro are proposed to be available within the future right of way fronting the development site. As stated in Amendment No. 39 to the City's Official Plan, Section 9.6.6 "Prior to approval of development within the Hewitt's Secondary Plan Area, all interested telecommunications providers and required utilities providers shall work with the landowner(s) and the City to confirm their plans for services to support the proposed development. The City shall work with the providers to determine appropriate locations for large equipment or cluster sites."

9 Conclusions and Recommendations

Based on our investigations, we conclude the following:

Storm Water

Based on the above analysis, the majority of stormwater runoff from the site will be directed to SWM Pond #5, located to the east of Yonge Street, while a portion of the proposed municipal ROW, Street 'A' will be directed to the west to SWM Pond #3. Both ponds are currently under design by others and storm sewers will be extended to the site property line, by neighboring developments. Required quantity and quality control will be provided in SWM Ponds #3 and #5 pond blocks to achieve the minimum 80% TSS removal.

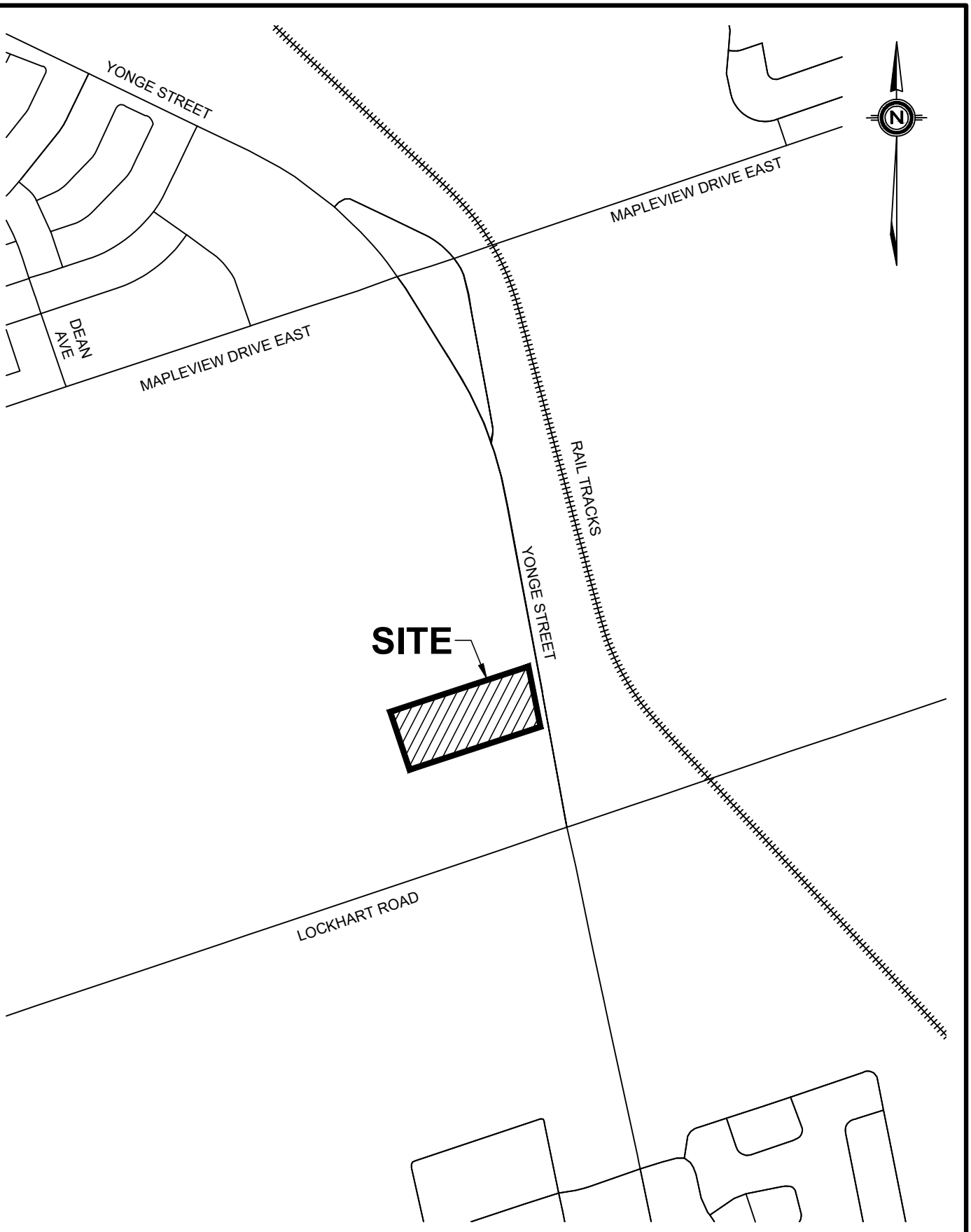
Post-development water balance will meet pre-development rates through the use of Roof Water Collector pipes and underground infiltration chambers. Storm runoff from the majority of rooftops across the site will be captured and directed to underground chambers along the northern portion of the property. Sandy soil and relatively deep groundwater table conditions are suitable for on-site infiltration measures. Phosphorus removal calculations show that up to 94% of phosphorus can be removed in the post-development condition using downstream SWM Ponds and underground infiltration facilities.

Sanitary Flows

The expected net increase in peak sanitary discharge flow from the site is approximately 20.8 L/s based on the proposed site plan. The entire site will be serviced by a sanitary connection at Yonge Street and all sewage directed east to the proposed sanitary sewer on Kneeshaw Drive, east of the proposed development. The principle of diverting sanitary drainage area and utilizing a single outlet has been reviewed by the Group Engineer.

Water Supply

A municipal water supply for the site will be provided by a connection made to the future watermain on Yonge Street, to be constructed as part of the City's Yonge Street Re-Construction program, (Phases 1 & 2). A new municipal watermain will extend along the proposed collector road, Street 'A', extending from Yonge Street to the western property boundary. The site requires a minimum flow rate of 15,000 L/min (3,970 USGPM) at a pressure of 140 kPa (20 PSI) to account for both fire and domestic flows. The final watermain sizing is to be determined at the detail design stage, following the City's update of the Water Pressure Model.



IBI GROUP
70 Valleywood Drive,
Markham, Ontario L3R 4T5
tel 416 987 6161 fax 905 940 6161
ibigroup.com

LOCATION PLAN

CROWN COMMUNITIES DEVELOPMENT INC
1012 YONGE STREET
CITY OF BARRIE

DATE:	FEBRUARY 2021	PROJECT No.:	2018-0390
SCALE:	N.T.S.	FIGURE No.:	FIG-1

P:\mrk\2018\2018-0390\400_Tchncl\70_Rprts\2021 02(Feb) FSRSWM Report-ReZoning\Figures\FSR Fig 1-2.dwg (Location Plan)

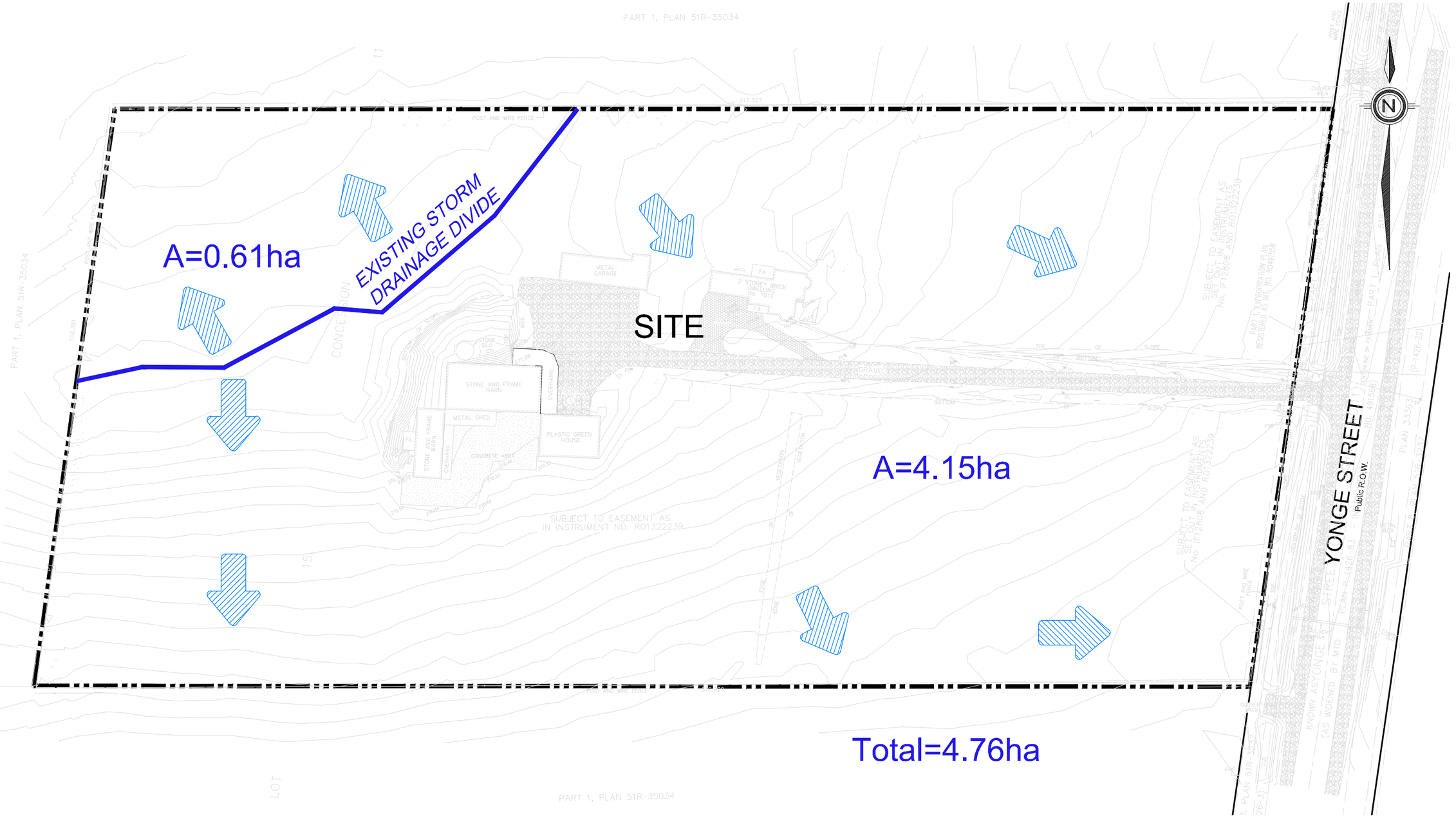
IBI GROUP
70 Valleywood Drive,
Markham, Ontario L3R 4T5
tel 416 987 6161 fax 905 940 6161
ibigroup.com

AERIAL PLAN

CROWN COMMUNITIES DEVELOPMENT INC
1012 YONGE STREET
CITY OF BARRIE

DATE:	FEBRUARY 2021	PROJECT No.:	2018-0390
SCALE:	N.T.S.	FIGURE No.:	FIG-2

P:\mrk\2018\2018-0390\400_Tchncl\70_Rprts\2021 02(Feb) FSRSWM Report-ReZoning\Figures\FSR Fig 1-2.dwg (Aerial Plan)



IBI GROUP
70 Valleywood Drive,
Markham, Ontario L3R 4T5
tel 416 987 6161 fax 905 940 6161
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LEGEND

PROPERTY LINE

OVERLAND FLOW DIRECTION

PRE-DEVELOPMENT DRAINAGE AREA PLAN

CROWN COMMUNITIES DEVELOPMENT
1012 YONGE STREET
CITY OF BARRIE

DATE:	FEBRUARY 2021	PROJECT No.:	2018-0390
SCALE:	1:1000	FIGURE No.:	DAP1

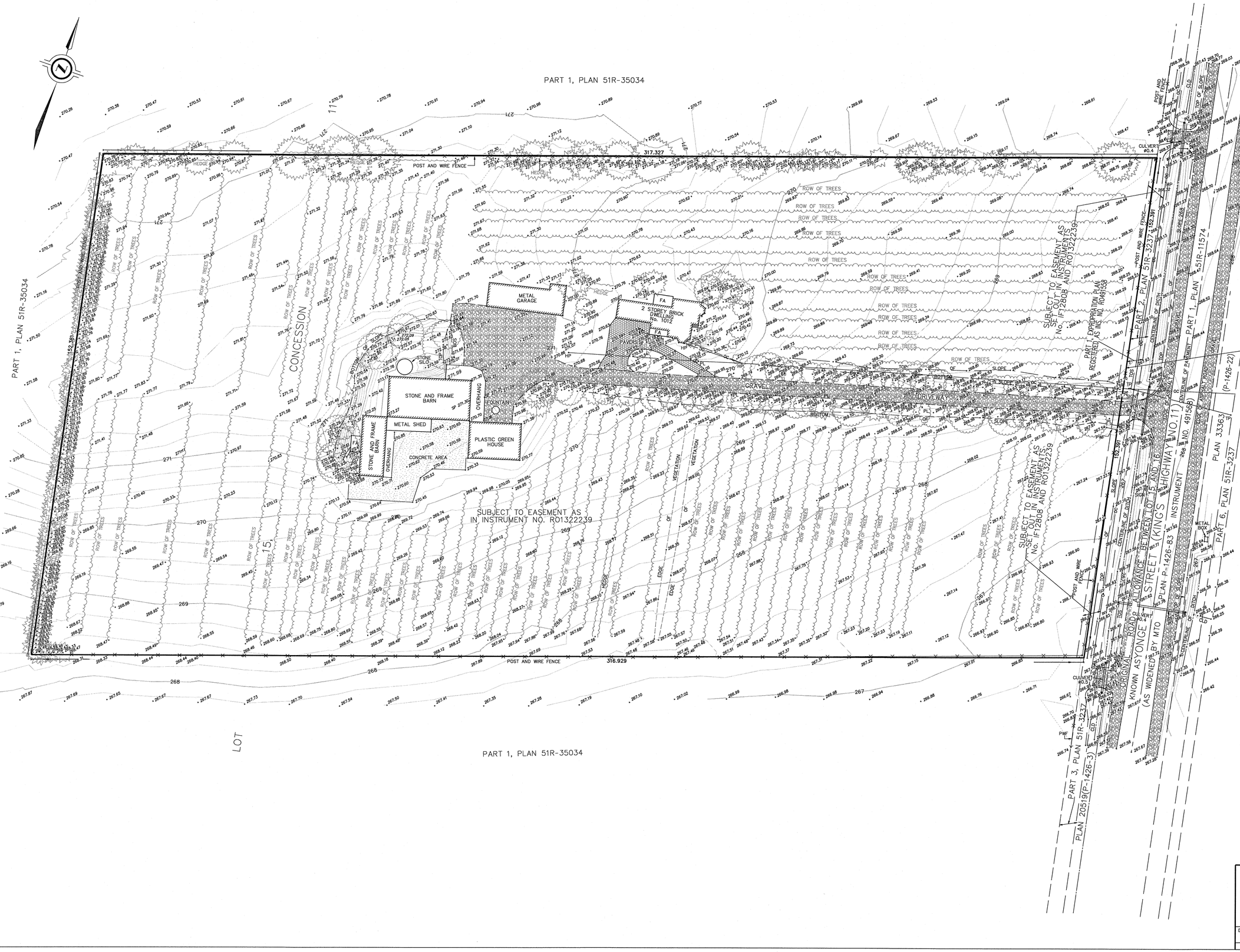
SKETCH SHOWING TOPOGRAPHY
FOR SITE DEVELOPMENT PURPOSES OF

PART OF LOT 15
CONCESSION 11
(GEOGRAPHIC TOWNSHIP OF INNISFIL)

TOWN OF INNISFIL
COUNTY OF SIMCOE

SCALE 1 : 500

10 0 10 20 30 metres



METRIC DISTANCES AND/OR COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

GEODETIC ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE DERIVED FROM STATION 03120110014 (COSINE) HAVING AN ELEVATION OF 268.681m AND VERIFIED BY STATION 03120110013, HAVING AN ELEVATION OF 252.807m.

LEGEND

TOP	DENOTES	TOP OF SLOPE
BOS	DENOTES	BOTTOM OF SLOPE
PL	DENOTES	LIGHT STANDARD
HP	DENOTES	HYDRO POLE
CLD	DENOTES	CENTERLINE OF DITCH
PWF	DENOTES	POST AND WIRE FENCE
FR	DENOTES	FRAME
PS	DENOTES	PORCH SILL
DS	DENOTES	DOOR SILL
GS	DENOTES	GARAGE SILL
-T-	DENOTES	TELE-OVERHEAD CABLE
-OC-	DENOTES	OVERHEAD CABLE
TP	DENOTES	TELEPHONE POLE
FA	DENOTES	FRAME ADDITION

BOUNDARY INFORMATION SHOWN HEREON ARE DERIVED FROM PLAN OF SURVEY PREPARED BY GUIDO PAPA SURVEYING LTD. REF. No. 18-18-059-00 AND IS SUBJECT TO A LEGAL SEARCH AND FINAL SURVEY.

THIS SKETCH IS NOT A PLAN OF SURVEY AND SHALL NOT BE USED EXCEPT FOR THE PURPOSE INDICATED IN THE TITLE BLOCK.

THIS SKETCH IS NOT TO BE USED FOR MORTGAGE OR TRANSACTION PURPOSES.

JANUARY 04, 2019
DATE

LAURENCE J. KUELLING
ONTARIO LAND SURVEYOR

GUIDO PAPA SURVEYING
A Division of J.D. Barnes Limited
SURVEYING MAPPING GIS
9135 KEELE ST., UNIT B7, VAUGHAN, ON L4K 0J4
T: (289) 553-5961 F: (289) 553-5986 www.jdbarnes.com

DRAWN BY:	CHECKED BY:	REFERENCE NO.:
FC	LJK	18-18-059-01
		DATED: 04/01/2019

FILE: G:\Jobs\2018\18-18-059-01 - 1012 Yonge Street, Innisfil, - Crown Communities\Drawing\18-18-059-01.dgn

RAINSONG SUBDIVISION
FUT. RECREATION CENTRE

ORIGINALLY PROPOSEDSTORM DRAINAGE DIVIDE AS PER HEWITT'S SECONDARY PLAN AREA SUBWATERSHED IMPACT STUDY, PREPARED BY RJ BURNSIDE

PRIVATE ROAD

100-YEAR CAPTURE
PROP. 2-195m LONG x 2.5m WIDE INFILTRATION CHAMBER

100-YEAR CAPTURE

A3
POST
0.09ha
0.80

A1
POST
4.54ha
0.80

A2
POST
0.25ha
0.80

AREA DIVERSION
1.78ha
0.80

FUTURE RAINSONG SUBDIVISION

EMERGENCY SPILL POINTS

STREET A - 24.0m WIDE ROW

100-YEAR STORM CAPTURED WITHIN PRIVATE SITE PLAN AREA TO OUTLET TO SINGLE STORM CONNECTION

EX. 400mmØ CULVERT

PROP. 1500mmØ STORM SEWER TO SWM POND No. 5

EX. 500mmØ CULVERT

100-YEAR CAPTURE

TO SWM POND No. 3

RAINSONG SUBDIVISION
FUT. SCHOOL BLOCK

YONGE STREET

NOTES:

- ALL STORM RUNOFF WITHIN PRIVATE PROPERTY UP TO 100-YEAR STORM TO BE CAPTURED AND DIRECTED INTO UNDERGROUND GARAGE
- TOTAL ROOFTOP AREA = 15,254m^2
- 100% OF ROOFTOPS TO BE DIVERTED TO INFILTRATION CHAMBERS AT NORTH END OF SITE = 15,254m^2

LEGEND

- A1 POST 0.39ha 0.25 — STORM DRAINAGE AREA ID / AREA (ha) / RUNOFF COEFFICIENT
- 264.7 — INTERPRETED SHALLOW GROUNDWATER CONTOUR (mASL)
- PROPOSED STORM SEWER
- PROPOSED STORM STORAGE SYSTEM
- PROPOSED UNDERGROUND GARAGE
- BH5 — BOREHOLE/MONITORING WELL DRILLED BY SOIL ENGINEERS LTD.
- PROPOSED INFILTRATION CHAMBER
- ORIGINALLY PROPOSED DRAINAGE DIVIDE AS PER SUBWATERSHED IMPACT STUDY BY RJ BURNSIDE
- ×271.39 — PROPOSED GRADE
- ×267.55FUT — FUT. YONGE STREET GRADE
- ×267.92EX — EXISTING GRADE
- 100-YEAR CAPTURE POINT
- EXISTING OVERLAND FLOW DIRECTION
- PROPOSED OVERLAND FLOW DIRECTION

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Markham, Ontario L3R 4T5
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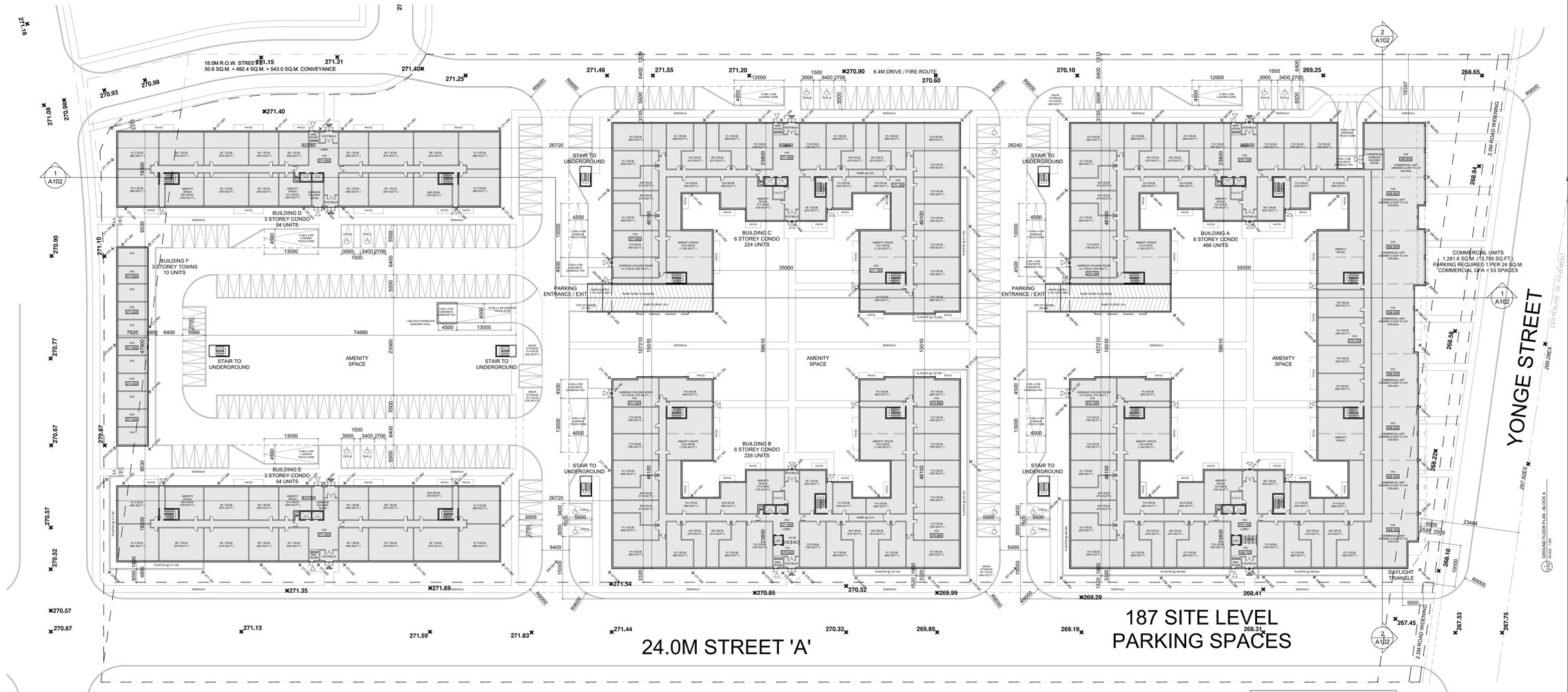
ibigroup.com

CROWN COMMUNITIES DEVELOPMENTS INC.
FUNCTIONAL GRADING AND STORM DRAINAGE PLAN
1012 YONGE STREET
CITY OF BARRIE

DATE:	FEBRUARY 2021	PROJECT No.:	2018-0390
SCALE:	1:600	FIGURE No.:	DAP-2

File : P:\mrk\2018\2018-0390\400_Technical\70_Rpts\2021 02(Feb) FSR\SWM Report-ReZoning\Figures\2018-0390 GRADING.dwg, Date : Feb 11, 2021 - 1:40pm

APPENDIX A
Background Information



1,029 RESIDENTIAL UNITS (10 TOWNHOUSE UNITS AND 1,019 CONDO UNITS)

80,906.5 SQ.M. (870,875 SQ.FT.) OF RESIDENTIAL GFA

1,281.6 SQ.M. (13,795 SQ.FT.) OF COMMERCIAL GFA

1 A100 SITE PLAN
SCALE: 1:400

BARRIER FREE PARKING STALLS TO BE SIGNED (Rb-93) AND MARKED IN ACCORDANCE WITH ONTARION TRAFFIC MANUAL BOOK 5 - REGULATORY SIGNS

	TYPE	AREA	UNITS
PARKING	UNDERGROUND GARAGE	35,283.5 SQ.M. (379,790 SQ.FT.)	1,033 SPACES
	SITE LEVEL PARKING		187 SPACES
	TOTAL PARKING (53 COMMERCIAL SPACES REQUIRED)		1,220 SPACES
	PARKING RATIO OF 1.13 SPACES PER UNIT		
	COMMERCIAL SPACE (OFF YONGE) (REQUIRES 53 PARKING SPACES)	1,281.6 SQ.M. (13,795 SQ.FT.)	N/A
BLOCK A (MIXED-USE) 6 STOREY CONDO	GROUND (RESIDENTIAL)	4,657.0 SQ.M. (50,125 SQ.FT.)	46 UNITS
	GROUND (COMMERCIAL)	1,281.6 SQ.M. (13,795 SQ.FT.)	
	TYPICAL (2ND TO 6TH)	6,116.3 SQ.M. (65,835 SQ.FT.)	83 UNITS
	TOTAL (GROUND TO 6TH)	36,520.1 SQ.M. (393,100 SQ.FT.)	461 UNITS
BLOCK B 6 STOREY CONDO	GROUND	2,884.1 SQ.M. (31,045 SQ.FT.)	31 UNITS
	TYPICAL (2ND TO 6TH)	2,884.1 SQ.M. (31,045 SQ.FT.)	39 UNITS
	TOTAL	17,304.6 SQ.M. (186,265 SQ.FT.)	226 UNITS
BLOCK C 6 STOREY CONDO	GROUND	2,715.7 SQ.M. (29,230 SQ.FT.)	29 UNITS
	TYPICAL (2ND TO 6TH)	2,884.1 SQ.M. (31,045 SQ.FT.)	39 UNITS
	TOTAL	17,136.2 SQ.M. (184,455 SQ.FT.)	224 UNITS
BLOCK D 3 STOREY CONDO	GROUND	1,688.7 SQ.M. (18,175 SQ.FT.)	16 UNITS
	TYPICAL (2ND TO 3RD)	1,688.7 SQ.M. (18,175 SQ.FT.)	19 UNITS
	TOTAL	5,066.1 SQ.M. (54,530 SQ.FT.)	54 UNITS
BLOCK E 3 STOREY CONDO	GROUND	1,688.7 SQ.M. (18,175 SQ.FT.)	16 UNITS
	TYPICAL (2ND TO 3RD)	1,688.7 SQ.M. (18,175 SQ.FT.)	19 UNITS
	TOTAL	5,066.1 SQ.M. (54,530 SQ.FT.)	54 UNITS
BLOCK F 3 STOREY TOWNS	GROUND	365.0 SQ.M. (3,930 SQ.FT.)	
	TYPICAL (2ND TO 3RD)	365.0 SQ.M. (3,930 SQ.FT.)	
	TOTAL	1,095.0 SQ.M. (11,785 SQ.FT.)	10 UNITS
TOTAL	RESIDENTIAL GFA	80,906.5 SQ.M. (870,875 SQ.FT.)	1,029 UNITS
	COMMERCIAL GFA	1,281.6 SQ.M. (13,795 SQ.FT.)	
	TOTAL GFA	82,188.1 SQ.M. (884,670 SQ.FT.)	

2 A100 BUILDING AND PROJECT STATISTCS
SCALE: 1:400

SITE STATISTICS:

SITE AREA	39,606.3 SQ.M. (426,320 SQ.FT.)
BUILDING COVERAGE	15,626.9 SQ.M. (168,205 SQ.FT.) OR 39.46%
FSI	2.08 (INCLUDING COMMERCIAL)
	2.04 (EXCLUDING COMMERCIAL)
UNDERGROUND GARAGE	35,283.5 SQ.M. (379,790 SQ.FT.)

SELLABLE AREA STATISTICS:		AREA (GFA)	SERVICE AREA	SELLABLE AREA (TSA)
BLOCK A (MIXED-USE) 6 STOREY CONDO	GROUND (RESIDENTIAL)	4,657.0 SQ.M.	1,668.4 SQ.M.	2,988.6 SQ.M.
	TYPICAL (2ND TO 6TH)	6,116.3 SQ.M.	532.3 SQ.M.	5,584.0 SQ.M.
	TOTAL (GROUND TO 6TH)	35,238.5 SQ.M.	4,329.9 SQ.M.	30,908.6 SQ.M. (87.7%)
"DOES NOT INCLUDE 1,281.6 SQ.M. (13,795 SQ.FT.) OF GROUND FLOOR COMMERCIAL				
BLOCK B 6 STOREY CONDO	GROUND	2,884.1 SQ.M.	829.5 SQ.M.	2,054.6 SQ.M.
	TYPICAL (2ND TO 6TH)	2,884.1 SQ.M.	245.6 SQ.M.	2,638.5 SQ.M.
	TOTAL	17,304.6 SQ.M.	2,057.5 SQ.M.	15,247.1 SQ.M. (88.1%)
BLOCK C 6 STOREY CONDO	GROUND	2,715.7 SQ.M.	808.1 SQ.M.	1,907.6 SQ.M.
	TYPICAL (2ND TO 6TH)	2,884.1 SQ.M.	245.6 SQ.M.	2,638.5 SQ.M.
	TOTAL	17,136.2 SQ.M.	2,036.1 SQ.M.	15,100.1 SQ.M. (88.1%)
BLOCK D 3 STOREY CONDO	GROUND	1,688.7 SQ.M.	405.9 SQ.M.	1,282.8 SQ.M.
	TYPICAL (2ND TO 3RD)	1,688.7 SQ.M.	159.9 SQ.M.	1,528.8 SQ.M.
	TOTAL	5,066.1 SQ.M.	725.7 SQ.M.	4,340.4 SQ.M. (85.7%)
BLOCK E 3 STOREY CONDO	GROUND	1,688.7 SQ.M.	405.9 SQ.M.	1,282.8 SQ.M.
	TYPICAL (2ND TO 3RD)	1,688.7 SQ.M.	159.9 SQ.M.	1,528.8 SQ.M.
	TOTAL	5,066.1 SQ.M.	725.7 SQ.M.	4,340.4 SQ.M. (85.7%)
BLOCK F 3 STOREY TOWNS	GROUND	365.0 SQ.M.	0 SQ.M.	365.0 SQ.M.
	TYPICAL (2ND TO 3RD)	365.0 SQ.M.	0 SQ.M.	730.0 SQ.M.
	TOTAL	1,095.0 SQ.M.	0 SQ.M.	1,095.0 SQ.M. (100%)
PROJECT TOTAL		80,906.5 SQ.M.	9,874.9 SQ.M.	71,031.6 SQ.M. (87.8%)

THESE DRAWINGS ARE NOT TO BE SCALED:
ALL DIMENSIONS MUST BE VERIFIED BY CONTRACTOR PRIOR TO COMMENCEMENT OF ANY WORK. ANY DISCREPANCIES MUST BE REPORTED DIRECTLY TO SRN ARCHITECTS INC.

NO:	DATE:	ISSUED FOR:
1	23/04/20	CLIENT REVIEW
2	02/05/20	CLIENT REVIEW
3	09/05/20	CLIENT REVIEW
4	23/05/20	CLIENT REVIEW
5	22/11/20	CLIENT REVIEW
6	14/12/20	CLIENT REVIEW
7	19/01/21	CLIENT REVIEW
8	26/02/21	CLIENT REVIEW

ADDITIONAL NOTES:

PRELIMINARY, NOT FOR CONSTRUCTION
ALL AREAS CALCULATIONS ARE PRELIMINARY

NO:	DATE:	REVISION COMMENT:

SRN ARCHITECTS
8395 JANE STREET, SUITE 203
VAUGHAN, ONTARIO. L4K 5Y2
PHONE: 905.417.5515 FAX: 905.417.5517

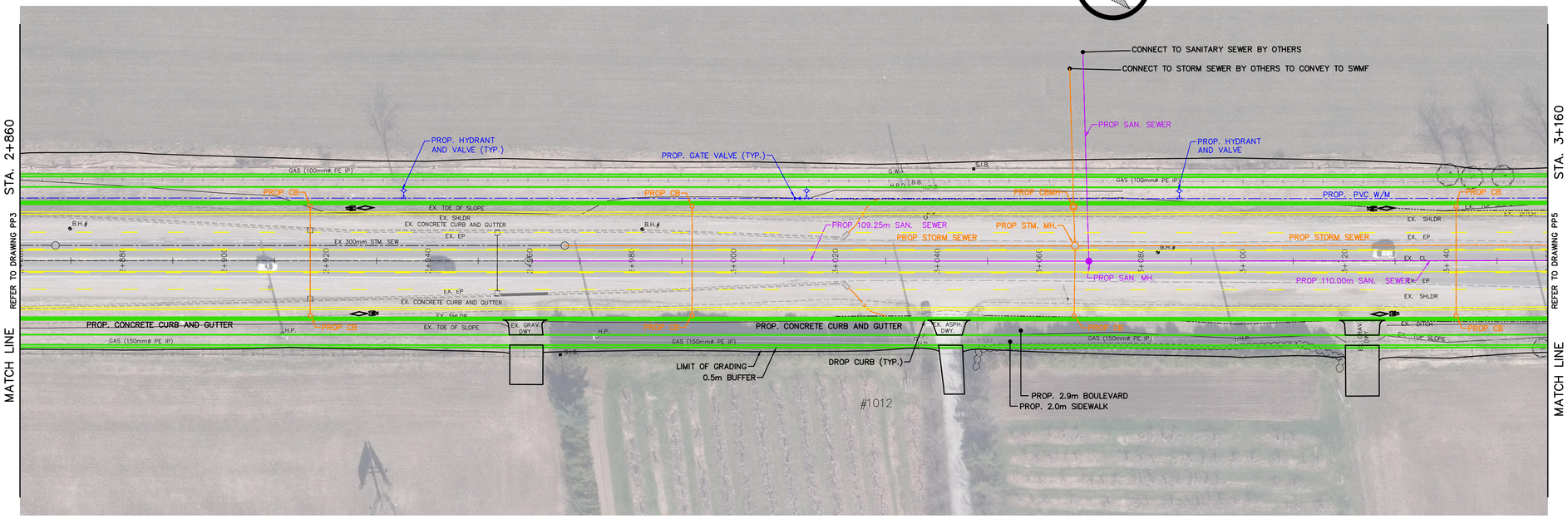
CLIENT:

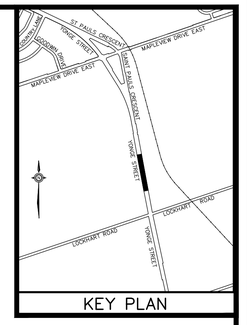
PROJECT:
BARRIE MIXED-USE
1012 YONGE STREET
BARRIE, ONTARIO.

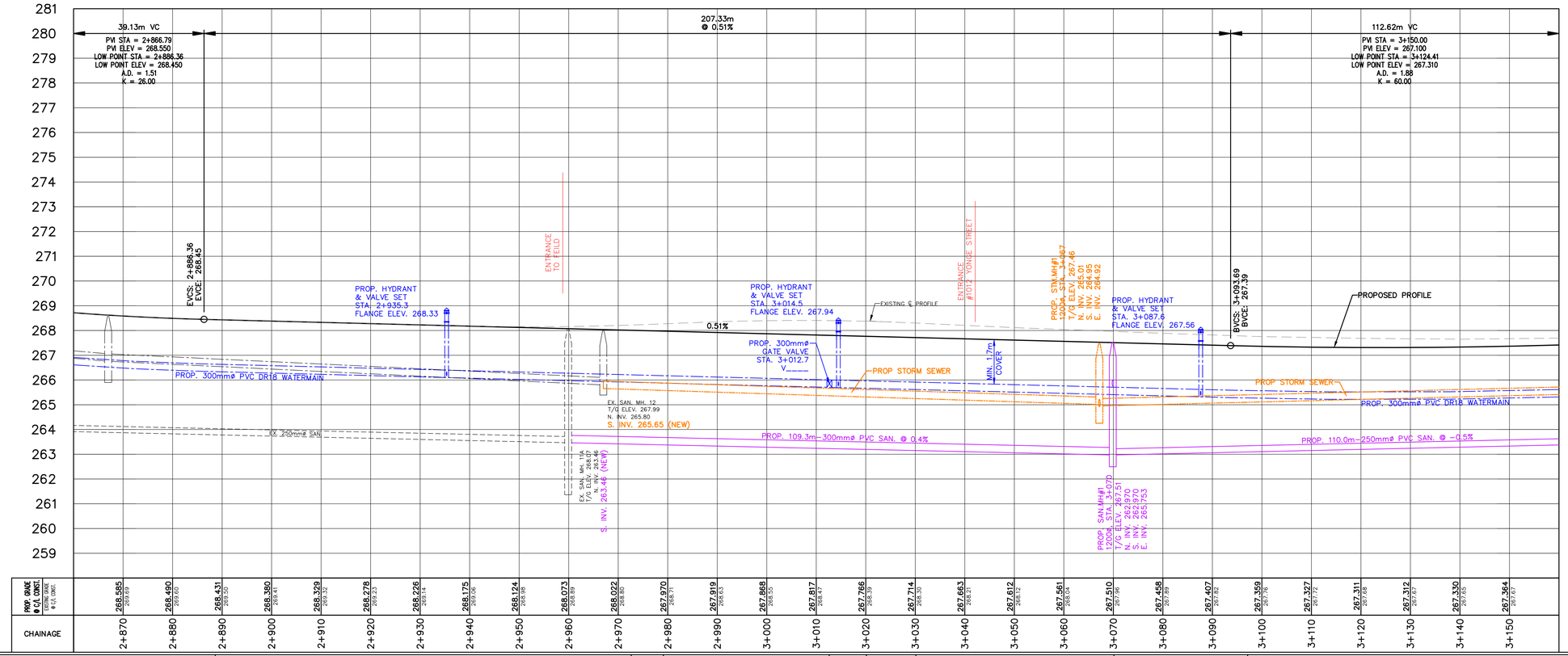
DRAWING TITTLE:
SITE PLAN,
STATS AND OBC MATRIX

DATE: 14/12/20 | SCALE: 1:400
DRAWN BY: G.P.R. | CHECKED BY: G.P.R.
PROJECT NUMBER: S19013 | DRAWING NUMBER: A100

YONGE STREET







GENERAL NOTES

REFER TO CURRENT CITY OF BARRIE STANDARDS FOR APPLICABLE GENERAL NOTES.

BENCH MARKS

NO.	REVISIONS	DATE	APPROVED
1.	30% DRAFT SUBMISSION	02/2018	RRW
2.	30% SUBMISSION	02/2018	RRW
3.	PUBLIC INFORMATION CENTRE	11/2018	TMK

CITY OF BARRIE
ACCEPTED
DATE. . . . . .
. . . . . .
DIRECTOR OF ENGINEERING

YONGE STREET IMPROVEMENTS

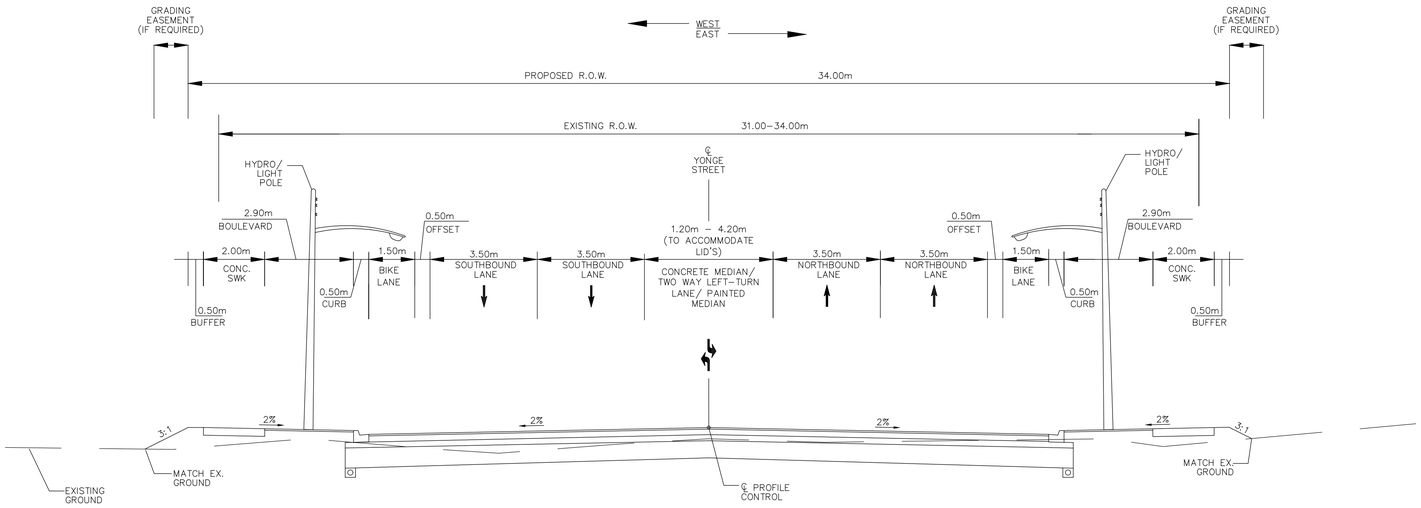
PLAN & PROFILE – YONGE STREET
STA. 2+860 TO 3+160

Barrie
ENGINEERING DEPARTMENT

SCALE HOR.	1:500	VERT.	1:100
DESIGN	C.J.	DRAWN	J.M.M.
REVIEWED	T.F.H.	DATE	2018.01.16

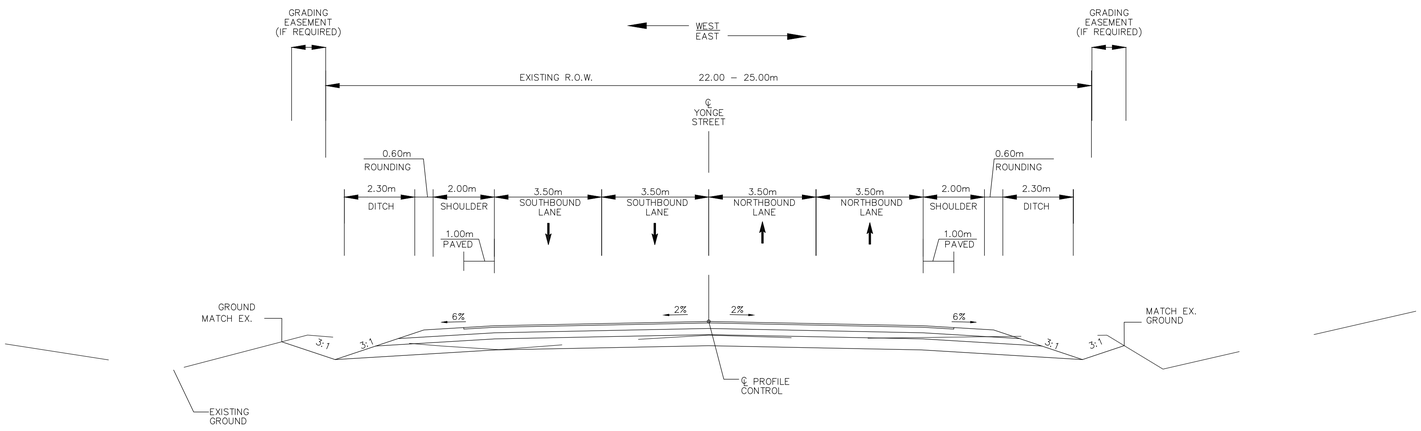
CONTRACT NO. 20__-__
SHEET NO. PP2

Plotted by: DSMITH on November 9, 2018 at 9:25am
File: V:\17121\Drawings\Public Information Centre\17121-Qplan-Yonge-Phase 2 (PIC).dwg Layout: PP2



YONGE STREET
TYPICAL CROSS–SECTION
5 LANES WITH RAISED MEDIAN
STA. 1+960.00 TO 3+436.92

N.T.S.



YONGE STREET
TYPICAL CROSS–SECTION
4 LANES WITH PAVED SHOULDERS
STA. 3+436.92 TO 3+369.67

N.T.S.

GENERAL NOTES

REFER TO CURRENT CITY OF BARRIE STANDARDS FOR APPLICABLE GENERAL NOTES.

BENCH MARKS

NO.	REVISIONS	DATE	APPROVED
1.	30% DRAFT SUBMISSION	02/2018	RRW
2.	30% SUBMISSION	02/2018	RRW
3.	PUBLIC INFORMATION CENTRE	11/2018	TMK

CITY OF BARRIE
ACCEPTED
DATE. . . . . .
. . . . . .
DIRECTOR OF ENGINEERING

YONGE STREET IMPROVEMENTS

TYPICAL CROSS SECTIONS

Barrie
ENGINEERING DEPARTMENT

SCALE HOR.	1:100	VERT.	N/A	CONTRACT NO. 20__–__
DESIGN	C.J.	DRAWN	J.M.M.	SHEET NO. D1
REVIEWED	T.F.H.	DATE	2018.01.16	

c) The provision of water and wastewater services shall also relate to the phasing of development as set out in Section 9.7.3.2 of this Plan and the Master Plans and Class EAs identified in Section 9.6.4 b).

9.6.5 STORMWATER MANAGEMENT

a) All new development shall comply with the recommendations of the Drainage and Stormwater Management Master Plan with respect to stormwater management, including the use of Low Impact Development Design Standards which will be encouraged. No amendments to the Secondary Plan shall be required to implement the directions in the Master Plan, for changes to the number or location of stormwater management facilities or where the Plan supports the realignment or other modifications to streams or changes in the locations of drainage facilities.

b) Subwatershed Impact Studies for Sub-watershed Impact Areas are a submission requirement for a complete application. The study areas can be modified or consolidated subject to the approval of the City, in consultation with the applicable conservation authority. The goal of the Subwatershed Impact Studies will be to achieve a greater level of detail in the integration of land use, servicing and stormwater management. The objectives of the studies will be:

i) identification of a final preferred servicing plan (including public/private utilities);
ii) identification of a final preferred road layout;
iii) integration of stormwater management facilities;
iv) exploration of opportunities to integrate recreation opportunities with stormwater management;
v) phasing and cost sharing in areas of multiple ownership;
vi) validation of fisheries mitigation and compensation; and,
vii) the survey of the boundary of the Natural Heritage System.

9.6.6 UTILITIES

a) Prior to approval of development within the Hewitt's Secondary Plan Area, all interested telecommunications providers and required utilities providers shall work with the landowner(s) and hte City to confirm their plans for services to support the proposed development. The City shall work with the providers to determine appropriate locations for large equipment or cluster sites.

b) All telecommunications services and utilities should be located within an initial common trench, whenever possible, to avoid unnecessary digging and disruption on municipal rights of way.

c) Consideration shall be given to the location of telecommunication facilities and utilities within public rights of way as well as on private property. Utilities and telecommunications facilities shall be grouped/clustered or combined where possible and feasible to maximize the use of land and, where applicable, to minimize visual impact. Utilities and telecommunications facilities shall be placed in such a manner so as to not visually detract from the streetscape. The City shall encourage utility and

Hewitt's Secondary Plan Area Subwatershed Impact Study Lover's, Hewitt's and Sandy Cove Creeks

Hewitt's Landowner's Group
c/o Bratty and Partners
7501 Keele Street, Suite 200
Vaughan ON L4K 1Y2

R.J. Burnside & Associates Limited
128 Wellington Street West, Suite 301
Barrie ON L4N 8J6 CANADA

in partnership with:

Azimuth Environmental Consulting Inc.
642 Welham Road
Barrie ON L4N 9A1 CANADA

September 2016
300032860.0000

REFER TO FIGURE 8
REFER TO FIGURE 6
REFER TO FIGURE 6
MAPLEVIEW DRIVE
LOCKHART ROAD
YONGE STREET
GO TRANSIT RAIL
EXISTING FLOOD LIMITS WITHIN SWMF#7 DUE TO EXISTING DITCH ELEVATION ON MAPLEVIEW DRIVE, WHICH WILL BE RECONSTRUCTED TO ELIMINATE FLOODLINE WITHIN SWMF
SWMF #10 NWL 248.11 TOP 251.11
SWMF #7 NWL 248.11 TOP 251.11
SWMF INLET LOCATION
PROVIDE INLET TO SWMF
SWMF #6 NWL 249.37 TOP 252.37
SWMF INLET LOCATION
SWMF #9 NWL 251.93 TOP 254.93
SWMF #INLET LOCATION
SWMF #11 NWL 253.21 TOP 255.51
PROVIDE INLET TO SWMF
SWMF #5 NWL 256.03 TOP 259.03
PROVIDE INLET TO SWMF
SWMF #8 NWL 252.88 TOP 255.88
SWMF #INLET LOCATION
PROPOSED REGIONAL FLOOD LINE
SPECIAL POLICY ARE #2 AS PER JULY 2015 OMB DESCISION
STORM BLOCK REQUIRED TO CONVEY OVERLAND FLOW AND 5YR PIPE
PROVIDE DRAINAGE ROUTE FOR RAIL CROSSING
HEWITT'S CREEK
HEWITT'S CREEK TRIBUTARY
HEWITT'S CREEK
PHASE 1
PHASE 2
PHASE 1
PHASE 3
PHASE 2
PHASE 3

LEGEND

- STAKED NHS LIMITS (2015)
- NHS BUFFER LIMITS
- CoB GENERATED BUFFER LIMITS (2013)
- 2031 BOUNDARY
- PROPOSED 100 YR FLOOD LIMITS
- PROPOSED REGIONAL FLOOD LIMITS

DASHED FLOOD LINES ARE APPROXIMATE ONLY, BASED ON INTERPOLATED DATA BETWEEN FINGERLAKES AND 1091369 ONTARIO INC. DETAILED TOPOGRAPHIC DATA. FLOODLINES ARE SUBJECT TO CHANGE BASED ON ADDITION OF DETAILED TOPOGRAPHIC SURVEY.

- 263.99 EXISTING ELEVATION
- 263.99 PROPOSED ELEVATION
- PROPOSED OVERLAND FLOW ROUTE

NOTE:
THE REGULATORY EVENT IS THE REGIONAL STORM EVENT

0 60 120 180 240
Metres

NOTE: "SCALE ONLY VALID FOR 24" x 36" SIZED PLOTS"

BURNSIDE

Client: HEWITT'S CREEK LANDOWNERS GROUP INC.

Figure Title: HEWITT'S SECONDARY PLAN AREA SUBWATERSHED IMPACT STUDY
PROPOSED CONDITION GRADING PLAN (2 OF 3)

Drawn	Checked	Date	Figure No.
AO	CC	17/09/14	FIG 7
Scale H 1:3,000		Project No. 300032860	

APPENDIX B
Stormwater Management Analysis

HERITAGE CT
MAPLEVIEW DRIVE
CRESCENT
DANIELLE
STUNDEN LANE
CATHERINE DRIVE
IRENE DRIVE
PATRICK DRIVE
SELINE CRESCENT
SELINE CRESCENT
NATHAN CRESCENT
MADELAINE DR
COURTNEY CRESCENT
DEAN AVENUE
GOODWIN DR
MAPLEVIEW DRIVE
MAPLEVIEW DRIVE
OUTLET L05
OUTLET L06
OUTLET L04
OUTLET L03
OUTLET L02
OUTLET L01
202
201
LOVER'S CREEK
THICKETWOOD AVENUE
MICHELLE DRIVE
BARTOR BOULEVARD
PRISCILLAS PLACE
LOCKHART ROAD
REFER TO FIGURE 10
REFER TO FIGURE 10
EXISTING DRA MAPLE
HEADWALL OBV: 249.14m
SWMF #4 NWL: 247.64m TOP: 249.94m
SWMF #2 NWL: 249.50m TOP: 251.90m
HEADWALL OBV: 251.00m
HEADWALL OBV: 249.14m
SWMF #4 NWL: 247.64m TOP: 249.84m
HEADWALL OBV: 254.03m
HEADWALL OBV: 254.83m
SWMF #1 NWL: 253.33m TOP: 255.13m
SWMF #3 NWL: 253.53m TOP: 254.83m
FLOW ROUTE REQUIRED FOR 5YR STORM PIPE AND OVERLAND FLOW
FLOW ROUTE REQUIRED FOR 5YR STORM PIPE AND OVERLAND FLOW
FLOW ROUTES REQUIRED FOR 5YR STORM PIPE AND OVERLAND FLOW
SCHOOL
PARK
PHASE 1
PHASE 2
SCHOOL
PARK
SCHOOL
SCHOOL
4
2
2a
1
1a
3
3a
7a
2-EXT
3-EXT
5.9ha OF EXISTING LOVER'S CREEK WATERSHED TO BE REGRADED TO DRAIN TO HEWITT'S CREEK
11.2ha OF EXISTING HEWITT'S CREEK WATERSHED TO BE REGRADED TO DRAIN TO LOVER'S CREEK
ORIGINAL DRAINAGE BOUNDARY BETWEEN LOVER'S CREEK AND HEWITT'S CREEK
NEW DRAINAGE BOUNDARY BETWEEN LOVER'S CREEK AND HEWITT'S CREEK
3.9ha OF EXISTING LOVER'S CREEK WATERSHED TO BE REGRADED TO DRAIN TO HEWITTS CREEK
SUBJECT PROPERTY

LEGEND

- NHS LIMITS
- NHS BUFFER LIMITS
- 100 YEAR CAPTURE AREA
- 2031 PHASE LIMITS
- EXISTING 100 YR FLOOD LIMITS
- EXISTING REGIONAL FLOOD LIMITS
- PROPOSED 100 YR FLOOD LIMITS
- PROPOSED REGIONAL FLOOD LIMITS
- PROPOSED DRAINAGE BOUNDARY
- ORIGINAL WATERSHED BOUNDARY

DASHED FLOOD LINES ARE APPROXIMATE ONLY, BASED ON INTERPOLATED DATA BETWEEN FINGERLAKES AND 1091369 ONTARIO INC. DETAILED TOPOGRAPHIC DATA. FLOODLINES ARE SUBJECT TO CHANGE BASED ON ADDITION OF DETAILED TOPOGRAPHIC SURVEY.

FLOW DIRECTION

STORM SEWER SYSTEM

- 100 YR CAPTURE SEWER, MANHOLE
- 100YR CONVEYANCE SYSTEM WITH 5YR CAPTURE
- 5 YR CAPTURE SEWER, MANHOLE
- EXISTING STORM SEWER, MANHOLE

0 60 120 180 240 Metres

NOTE: "SCALE ONLY VALID FOR 24" x 36" SIZED PLOTS"

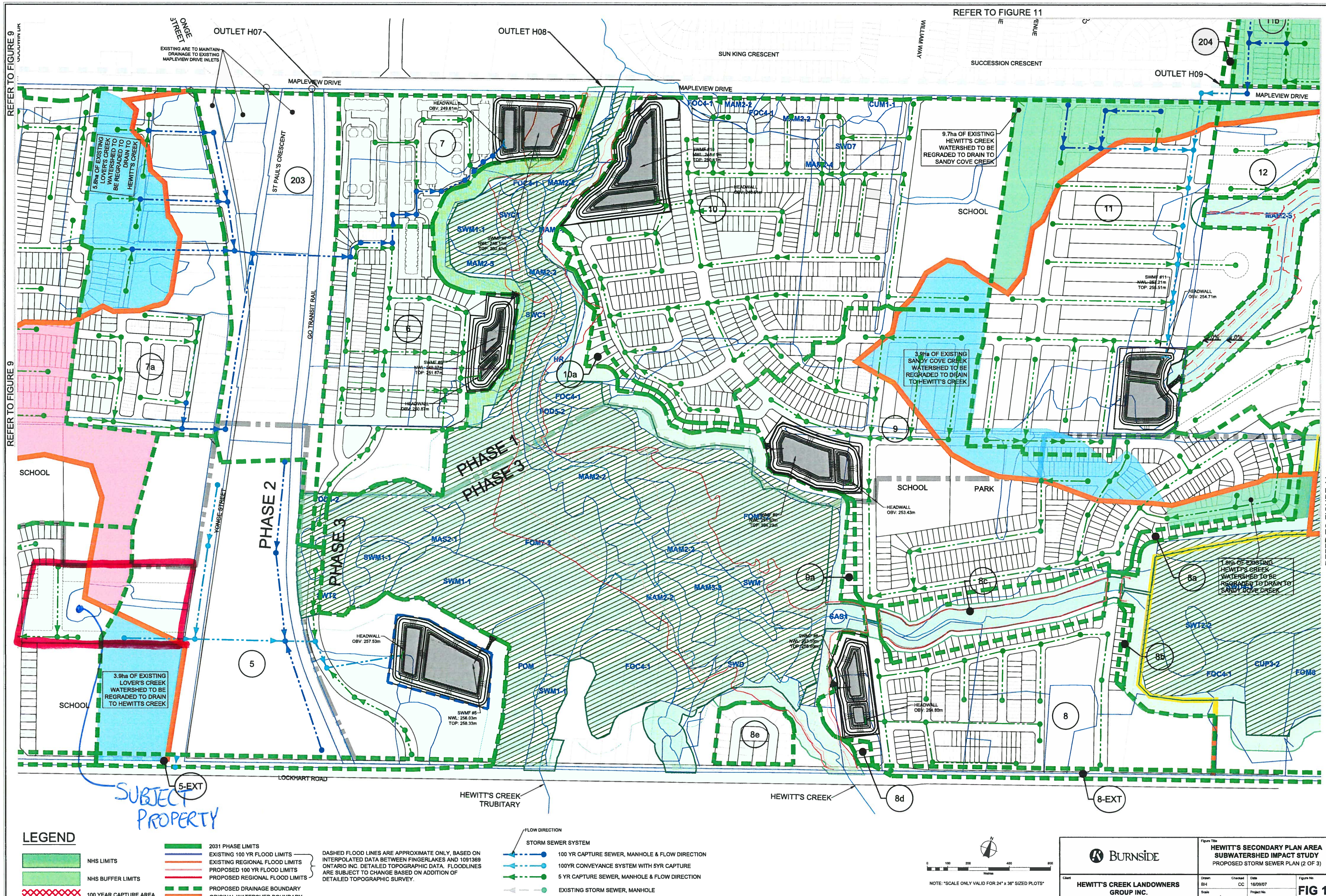
BURNSIDE

Client: HEWITT'S CREEK LANDOWNERS GROUP INC.

Figure Title: HEWITT'S SECONDARY PLAN AREA SUBWATERSHED IMPACT STUDY
PROPOSED STORM SEWER PLAN (1 OF 3)

Drawn	Checked	Date
BH	CC	16/09/07

Scale: H 1:3,000"
Project No.: 300032860
Figure No.: FIG 9


REFER TO FIGURE 11
REFER TO FIGURE 9
OUTLET H07
OUTLET H08
OUTLET H09
EXISTING ARE TO MAINTAIN DRAINAGE TO EXISTING MAPLEVIEW DRIVE INLETS
MAPLEVIEW DRIVE
SUN KING CRESCENT
SUCCESSION CRESCENT
ST PAUL'S CRESCENT
GO TRANSIT RAIL
YONGE STREET
LOCKHART ROAD
5.8ha OF EXISTING LOVER'S CREEK WATERSHED TO BE REGRADED TO DRAIN TO HEWITT'S CREEK
9.7ha OF EXISTING HEWITT'S CREEK WATERSHED TO BE REGRADED TO DRAIN TO SANDY COVE CREEK
3.9ha OF EXISTING SANDY COVE CREEK WATERSHED TO BE REGRADED TO DRAIN TO HEWITT'S CREEK
1.8ha OF EXISTING HEWITT'S CREEK WATERSHED TO BE REGRADED TO DRAIN TO SANDY COVE CREEK
3.9ha OF EXISTING LOVER'S CREEK WATERSHED TO BE REGRADED TO DRAIN TO HEWITTS CREEK
PHASE 1
PHASE 2
PHASE 3
SCHOOL
PARK
HEWITT'S CREEK TRUBITARY
HEWITT'S CREEK
SUBJECT PROPERTY
5-EXT
8-EXT
LEGEND
NHS LIMITS
NHS BUFFER LIMITS
100 YEAR CAPTURE AREA
2031 PHASE LIMITS
EXISTING 100 YR FLOOD LIMITS
EXISTING REGIONAL FLOOD LIMITS
PROPOSED 100 YR FLOOD LIMITS
PROPOSED REGIONAL FLOOD LIMITS
PROPOSED DRAINAGE BOUNDARY
ORIGINAL WATERSHED BOUNDARY
DASHED FLOOD LINES ARE APPROXIMATE ONLY, BASED ON INTERPOLATED DATA BETWEEN FINGERLAKES AND 1091369 ONTARIO INC. DETAILED TOPOGRAPHIC DATA. FLOODLINES ARE SUBJECT TO CHANGE BASED ON ADDITION OF DETAILED TOPOGRAPHIC SURVEY.
FLOW DIRECTION
STORM SEWER SYSTEM
100 YR CAPTURE SEWER, MANHOLE & FLOW DIRECTION
100YR CONVEYANCE SYSTEM WITH 5YR CAPTURE
5 YR CAPTURE SEWER, MANHOLE & FLOW DIRECTION
EXISTING STORM SEWER, MANHOLE
NOTE: "SCALE ONLY VALID FOR 24" x 36" SIZED PLOTS"
BURNSIDE
HEWITT'S CREEK LANDOWNERS GROUP INC.
HEWITT'S SECONDARY PLAN AREA SUBWATERSHED IMPACT STUDY
PROPOSED STORM SEWER PLAN (2 OF 3)
H 1:3,000
16/09/07
300032869
FIG 10

IBI

Prepared By: Chaodong Sheng

Post Development 100-Year Total Capture

Crown Community 1012 Yonge Street City of Barrie
File No. 2018-0390
Date: Feburary 2021

Input Parameters

Area Number	Area (ha)	Runoff Coefficient, C	Tc (min.)
A1 Post	4.54	0.80	10

Rational Method Calculations

IDF Data Set: City of Barrie
Event 100-Year
a = 1426.41
b = 5.27
c = -0.7590

Formula: $I = a(T+b)^c$

a,b,c	Constants
T	Time of concentration
I	Rainfall intensity

Formula: $Q = C*I*A/360$

100-Year Total Capture Calculations

Area Number	Intensity (mm/hr)	Q (m^3/s)	Q (L/s)
A1 Post	180.2	1.82	1817.6

IBI

Prepared by: C.Sheng, P.Eng.

Water Balance Summary Calculations

Crown Communities Developments, Barrie
File No. 2018-0390
Date: February 2021

Based on MOE Table 3.1

Pre-Development Site Data

Hydrologic Soil group: C (Sandy Silt Till)
Vegetation Cover: Pasture and Shrubs
Precipitation Data from Environment Canada (King Smoke Tree)

Pre-Development Infiltration Factor

Topography	0.1
Soils	0.2
Cover	0.1
Total	**0.4**

PRE-DEVELOPMENT WATER BALANCE

	Pervious Area	Impervious Area	Total
Area (ha)	4.76	0.00	4.76
Precipitation (mm)	857.6	857.6	
ET (mm)	546.0	86	
Surplus (mm)	311.6	772	
Infiltration (mm)	124.6	0	
Runoff (mm)	187.0	772	
ET (m^3)	25978.7	0	25978.7
Infiltration (m^3)	5930.4	0	**5930.4**
Runoff (m^3)	8895.6	0	8895.6

Post-Development Site Data

Hydrologic Soil group: C (Sandy Silt Till)
Vegetation Cover: Pasture and Shrubs
Precipitation Data from Environment Canada (King Smoke Tree)

Post-Development Infiltration Factor

Topography	0.1
Soils	0.2
Cover	0.1
Total	**0.4**

POST-DEVELOPMENT WATER BALANCE (NO MITIGATION)

	Pervious Area	Impervious Area	Total
Area (ha)	1.39	3.37	4.76
Precipitation (mm)	857.6	857.6	
ET (mm)	546.0	85.8	
Surplus (mm)	311.6	771.8	
Infiltration (mm)	125.0	0.0	
Runoff (mm)	187.0	771.8	
ET (m^3)	7589.4	2888.4	10477.8
Infiltration (m^3)	1737.5	0.0	**1737.5**
Runoff (m^3)	2599.3	25995.6	28594.9

POST-DEVELOPMENT WATER BALANCE (WITH MITIGATION)

Annual Infiltration Volume Deficit = **4192.9** m^3/year

Items	Infiltration Calcs
Total Rooftop Area (m^2)	15254
% of Participating Area (m^2)	100
Participating Rooftop Area (m^2)	15254.0
Precipitation under 15 mm (mm)	275.53
Total Infiltration Capacity	**4203.0**

SUMMARY

	ET	Infiltration	Runoff
	m^3		
Pre	25978.7	5930.4	8896
w/o Mitigation	10477.8 -0.6	1737.5 -71%	28595 221%
w/ Mitigation	10477.8 -0.6	5940.5 0%	28595 221%

IBI

Contribution to Infiltration Trench

Crown Communities Developments, Barrie
File No. 2018-0390
Date: February 2021

Volume Control Pipe System/Storm Chamber

Stormtech Chamber Installed Under the Private Drive

Contributing Rooftop Area =	15254.0	m²	
Depth (Storm Event) =	15.0	mm	
Infiltration Volume Required =	228.8	m³	
Number of Storm Chamber =	110.0		
Required Trench Length =	238.7	m	
Required Trench Width =	2.5	m	
Chamber Height with Stones Bottom =	1.067	m	
Infiltration Rate =	6.5×10^{-6}	m/s	As per BH4 of HydroG Report
Chamber Drawdown Time =	45.6	hr	

Project:

Chamber Model -	SC-740	
Units -	**Metric**	Click Here for Imperial
Number of chambers -	110	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	259.00	m
Amount of Stone Above Chambers -	152	mm
Amount of Stone Below Chambers -	152	mm

Include Perimeter Stone in Calculations

StormTech SC-740 Cumulative Storage Volumes

Height of System *(mm)*	Incremental Single Chamber *(cubic meters)*	Incremental Total Chamber *(cubic meters)*	Incremental Stone *(cubic meters)*	Incremental Ch & St *(cubic meters)*	Cumulative Chamber *(cubic meters)*	Elevation *(meters)*
1067	0.00	0.00	3.51	3.51	233.291	260.07
1041	0.00	0.00	3.51	3.51	229.781	260.04
1016	0.00	0.00	3.51	3.51	226.271	260.02
991	0.00	0.00	3.51	3.51	222.762	259.99
965	0.00	0.00	3.51	3.51	219.252	259.97
940	0.00	0.00	3.51	3.51	215.742	259.94
914	0.00	0.17	3.44	3.61	212.232	259.91
889	0.00	0.51	3.31	3.81	208.620	259.89
864	0.01	0.88	3.16	4.04	204.805	259.86
838	0.02	1.88	2.76	4.64	200.768	259.84
813	0.02	2.50	2.51	5.01	196.130	259.81
787	0.03	2.96	2.33	5.29	191.122	259.79
762	0.03	3.35	2.17	5.52	185.835	259.76
737	0.03	3.68	2.04	5.72	180.317	259.74
711	0.04	3.94	1.93	5.88	174.601	259.71
686	0.04	4.22	1.82	6.04	168.726	259.69
660	0.04	4.53	1.70	6.23	162.684	259.66
635	0.04	4.75	1.61	6.36	156.456	259.64
610	0.04	4.93	1.54	6.47	150.097	259.61
584	0.05	5.12	1.46	6.58	143.630	259.58
559	0.05	5.29	1.39	6.69	137.051	259.56
533	0.05	5.46	1.33	6.79	130.364	259.53
508	0.05	5.62	1.26	6.88	123.579	259.51
483	0.05	5.78	1.20	6.98	116.699	259.48
457	0.05	5.90	1.15	7.05	109.723	259.46
432	0.05	6.02	1.10	7.12	102.675	259.43
406	0.06	6.15	1.05	7.20	95.551	259.41
381	0.06	6.26	1.01	7.27	88.350	259.38
356	0.06	6.37	0.96	7.33	81.083	259.36
330	0.06	6.46	0.92	7.39	73.752	259.33
305	0.06	6.56	0.89	7.44	66.364	259.30
279	0.06	6.64	0.85	7.49	58.920	259.28
254	0.06	6.71	0.83	7.54	51.426	259.25
229	0.06	6.78	0.80	7.58	43.891	259.23
203	0.06	6.85	0.77	7.62	36.313	259.20
178	0.06	6.88	0.76	7.64	28.694	259.18
152	0.00	0.00	3.51	3.51	21.059	259.15
127	0.00	0.00	3.51	3.51	17.549	259.13
102	0.00	0.00	3.51	3.51	14.039	259.10
76	0.00	0.00	3.51	3.51	10.530	259.08
51	0.00	0.00	3.51	3.51	7.020	259.05
25	0.00	0.00	3.51	3.51	3.510	259.03

Volume Control Storage

Crown Communities Developments, Barrie
File No. 2018-0390
Date: February 2021

3rd Pipe System/Storm Chamber

Stormtech Chamber Installed Under the Private Drive

Site Area =	47600.0	m^2
Site Impervious Area	33700.0	m^2
Target Depth =	12.5	mm
Initial Abstraction =	1.0	mm
Storage Volume Required =	387.6	m^3
Number of Storm Chamber =	185.0	
Required Trench Length =	401.5	m
Required Trench Width =	2.5	m

Project:

Chamber Model -	SC-740	
Units -	**Metric**	Click Here for Imperial
Number of chambers -	185	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	259.00	m
Amount of Stone Above Chambers -	152	mm
Amount of Stone Below Chambers -	152	mm

Include Perimeter Stone in Calculations

StormTech SC-740 Cumulative Storage Volumes

Height of System *(mm)*	Incremental Single Chamber *(cubic meters)*	Incremental Total Chamber *(cubic meters)*	Incremental Stone *(cubic meters)*	Incremental Ch & St *(cubic meters)*	Cumulative Chamber *(cubic meters)*	Elevation *(meters)*
1067	0.00	0.00	5.90	5.90	392.353	260.07
1041	0.00	0.00	5.90	5.90	386.450	260.04
1016	0.00	0.00	5.90	5.90	380.547	260.02
991	0.00	0.00	5.90	5.90	374.645	259.99
965	0.00	0.00	5.90	5.90	368.742	259.97
940	0.00	0.00	5.90	5.90	362.839	259.94
914	0.00	0.29	5.79	6.08	356.936	259.91
889	0.00	0.85	5.56	6.41	350.860	259.89
864	0.01	1.48	5.31	6.79	344.445	259.86
838	0.02	3.16	4.64	7.80	337.656	259.84
813	0.02	4.20	4.22	8.42	329.855	259.81
787	0.03	4.98	3.91	8.89	321.432	259.79
762	0.03	5.63	3.65	9.28	312.541	259.76
737	0.03	6.18	3.43	9.61	303.261	259.74
711	0.04	6.63	3.25	9.88	293.647	259.71
686	0.04	7.10	3.06	10.16	283.766	259.69
660	0.04	7.62	2.86	10.47	273.604	259.66
635	0.04	7.99	2.71	10.70	263.131	259.64
610	0.04	8.29	2.59	10.88	252.435	259.61
584	0.05	8.60	2.46	11.06	241.559	259.58
559	0.05	8.90	2.34	11.24	230.494	259.56
533	0.05	9.18	2.23	11.41	219.249	259.53
508	0.05	9.44	2.13	11.57	207.837	259.51
483	0.05	9.72	2.02	11.73	196.267	259.48
457	0.05	9.92	1.94	11.85	184.534	259.46
432	0.05	10.13	1.85	11.98	172.681	259.43
406	0.06	10.35	1.76	12.11	160.699	259.41
381	0.06	10.53	1.69	12.22	148.588	259.38
356	0.06	10.71	1.62	12.33	136.368	259.36
330	0.06	10.87	1.55	12.42	124.037	259.33
305	0.06	11.03	1.49	12.52	111.612	259.30
279	0.06	11.17	1.44	12.60	99.093	259.28
254	0.06	11.28	1.39	12.67	86.490	259.25
229	0.06	11.40	1.34	12.75	73.817	259.23
203	0.06	11.52	1.30	12.81	61.071	259.20
178	0.06	11.56	1.28	12.84	48.258	259.18
152	0.00	0.00	5.90	5.90	35.417	259.15
127	0.00	0.00	5.90	5.90	29.515	259.13
102	0.00	0.00	5.90	5.90	23.612	259.10
76	0.00	0.00	5.90	5.90	17.709	259.08
51	0.00	0.00	5.90	5.90	11.806	259.05
25	0.00	0.00	5.90	5.90	5.903	259.03

IBI

Phosphorus Removal Calculations

Crown Communities Developments, Barrie
File No. 2018-0390
Date: February 2021

Subwatershed: Hewitts Creeks

Existing Phosphorus Loading Calculation

Area	Landuse	P Coef (kg/ha/yr)	P Load (kg/yr)	BMP	Efficiency (%)	BMP P (kg/yr)	Notes
4.76	Cropland	0.19	0.9044	None	0	0.90	
4.76						**0.90**	

IBI

Phosphorus Removal Calculations

Crown Communities Developments, Barrie
File No. 2018-0390
Date: February 2021

Subwatershed: Hewitts Creeks

Proposed Phosphorus Loading Calculation with BMP

Area	Landuse	P Coef (kg/ha/yr)	P Load (kg/yr)	BMP	Efficiency (%)	BMP P (kg/yr)	Notes
4.76	High Intensity Residential	1.32	6.28	SWM Pond and Underground Storage	94	0.38	
4.76						**0.38**	

Proposed Phosphorus Loading Calculation without BMP

Area	Landuse	P Coef (kg/ha/yr)	P Load (kg/yr)	BMP	Efficiency (%)	BMP P (kg/yr)	Notes
4.76	High Intensity Residential	1.32	6.28	None	0%	6.28	
4.76						**6.28**	

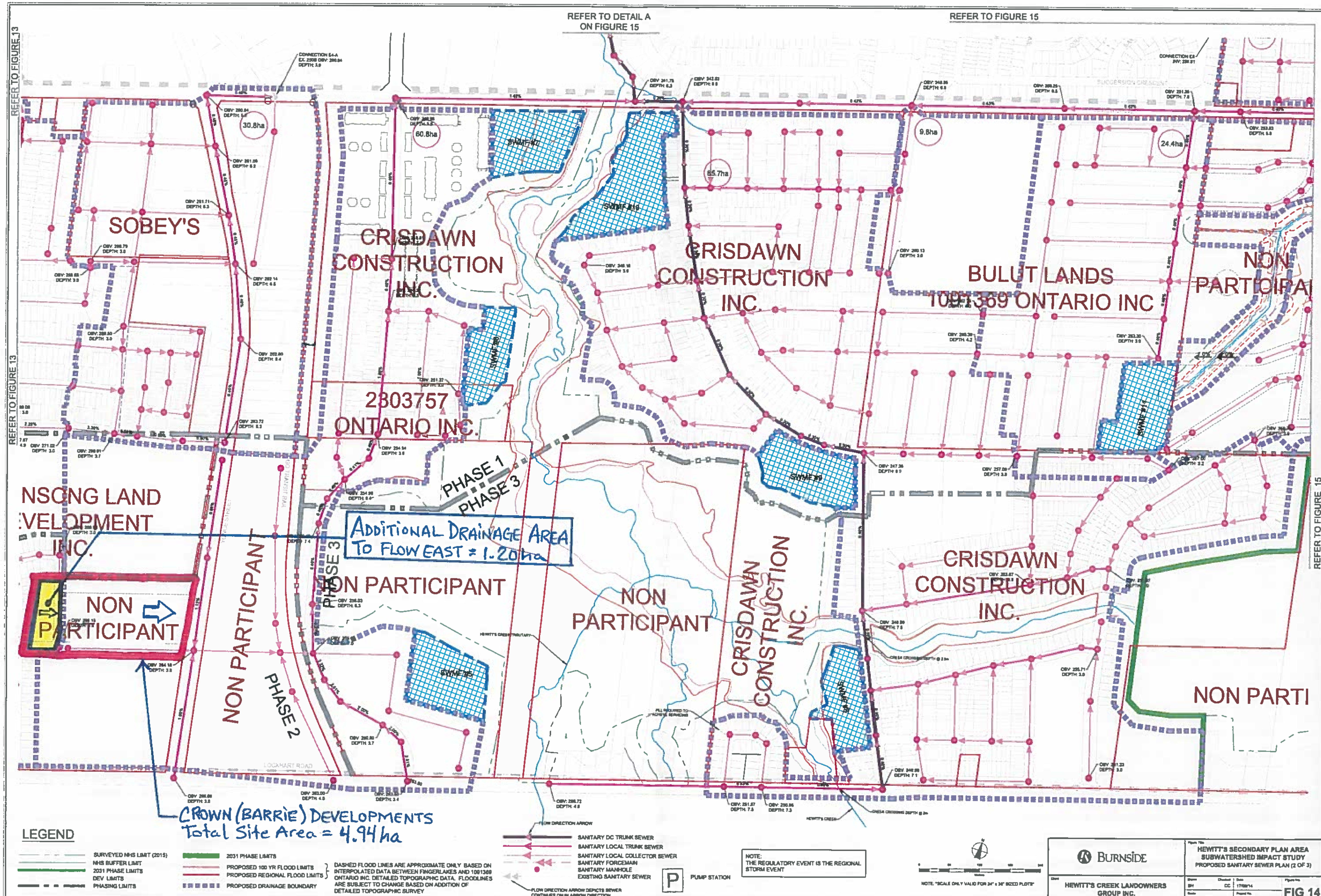
BMP TREATMENT TRAIN:

End-of-Pipe SWM Wet Pond	=	**69**	% Phosphorus Removal
Underground Storage	=	**25**	% Phosphorus Removal

Phosphorus Loading Summary		
Existing Conditions	0.90	kg/year
Proposed Conditions with no BMP	6.28	kg/year
Proposed Conditions with BMP	0.38	kg/year
Change (Proposed Conditions with BMP-Existing Condition	-0.53	kg/year
Change (Proposed Conditions with no BMP - Proposed Con	5.91	kg/year
Post Development % Phosphorus Removal	**94%**	

Table 3 Excerpt from Phosphorus Budget Tool in Support of Sustainable Development for the Lake Simcoe Watershed, prepared by Hutchinson Environmental Sciences Ltd. (October 31, 2014):

APPENDIX C
Sanitary Servicing Analysis


REFER TO DETAIL A ON FIGURE 15
REFER TO FIGURE 15
REFER TO FIGURE 13
REFER TO FIGURE 13
REFER TO FIGURE 15
SOBEY'S
CRISDAWN CONSTRUCTION INC.
CRISDAWN CONSTRUCTION INC.
BULUT LANDS
1091369 ONTARIO INC
NON PARTICIPANT
2303757 ONTARIO INC.
PHASE 1
PHASE 3
NSONG LAND DEVELOPMENT INC.
ADDITIONAL DRAINAGE AREA TO FLOW EAST = 1.20ha
NON PARTICIPANT
NON PARTICIPANT
PHASE 3
NON PARTICIPANT
PHASE 2
NON PARTICIPANT
NON PARTICIPANT
CRISDAWN CONSTRUCTION INC.
CRISDAWN CONSTRUCTION INC.
NON PARTI
30.8ha
60.8ha
65.7ha
9.8ha
24.4ha
CROWN (BARRIE) DEVELOPMENTS Total Site Area = 4.94 ha
LEGEND
SURVEYED NHS LIMIT (2015)
NHS BUFFER LIMIT
2031 PHASE LIMITS
DEV LIMITS
PHASING LIMITS
2031 PHASE LIMITS
PROPOSED 100 YR FLOOD LIMITS
PROPOSED REGIONAL FLOOD LIMITS
PROPOSED DRAINAGE BOUNDARY
DASHED FLOOD LINES ARE APPROXIMATE ONLY BASED ON INTERPOLATED DATA BETWEEN FINGERLAKES AND 1091369 ONTARIO INC. DETAILED TOPOGRAPHIC DATA. FLOODLINES ARE SUBJECT TO CHANGE BASED ON ADDITION OF DETAILED TOPOGRAPHIC SURVEY
SANITARY DC TRUNK SEWER
SANITARY LOCAL TRUNK SEWER
SANITARY LOCAL COLLECTOR SEWER
SANITARY FORCEMAIN
SANITARY MANHOLE
EXISTING SANITARY SEWER
FLOW DIRECTION ARROW
FLOW DIRECTION ARROW DEPICTS SEWER CONTINUES ON IN ARROW DIRECTION
PUMP STATION
NOTE: THE REGULATORY EVENT IS THE REGIONAL STORM EVENT
BURNSIDE
HEWITT'S SECONDARY PLAN AREA SUBWATERSHED IMPACT STUDY PROPOSED SANITARY SEWER PLAN (2 OF 3)
HEWITT'S CREEK LANDOWNERS GROUP INC.
FIG 14

Sanitary Flow Calculation

City of Barrie

Project:	1012 Yonge Street	Proj. #	2018-0390
Date:	February 2021		
Calc'ed by:	Daniel Ma		

Flow of Proposed Development

Population

Residential

Type	Units	Population Rate (persons/unit)	Population
Single and Semi Detached	0	3.13	0
Townhouses (Medium Density)	10	2.34	23
Townhouses (High Density)	1,019	1.67	1702
Total Number of Units	**1,029**		0.00
		Total Population	1725

Non-Residential

Type	Area (ha)	Design Rate (m3/day/ha)	Flow (L/s)
Commercial	0.12544	28	0.0407
General Industrial	0.00	35	0.00
Heavy Industrial	0.00	55	0.00
Mix General and Heavy	0.00	50	0.00
		Total Flow:	0.0407

Design Flow Rate of New Residential Developments (L/capita/day)
225

New Residential Development Average Flow (L/s)	
(Total Population) * (Design Flow Rate of New Residential Developments) =	4.49

New Development Total Average Flow (L/s)	
(Residential Development) + (Non-Residential Development) =	4.53

Harmon Peaking Factor (HPF)
3.63

Babbit Peaking Factor (BPF)
4.48

Site Area (ha) {includes 0.15ha adjacent lands owned by Others}
4.91

Infiltration L/s (0.1L/s/ha) (Site area)	
Site Area * 0.1 =	**0.49**

Sanitary Peak Flow (L/s)	
New Development Average Flow * HPF or BPF (whichever is higher) + I =	**20.81**

Luis Vieira

Subject: FW: Crown Communities, 1012 Yonge Street, City File No. D09-ANN

From: Nadine Rush [mailto:Nadine.Rush@barrie.ca]
Sent: October-28-19 8:58 AM
To: Peter Slama <pslama@coleengineering.ca>
Cc: Adam Taverna <adam@thecrowncommunities.com>; May Taverna <may@thecrowncommunities.com>; Darren Vella <dvella@ipsconsultinginc.com>
Subject: RE: Crown Communities, 1012 Yonge Street, City File No. D09-ANN

Hi Peter,

We recommend using the High Density ppu for your sanitary flow calculations as your site is considered high density.

Regards,

Nadine Rush, C.E.T.
Senior Development Services Technologist
Development Services
Engineering
The City of Barrie
Central Ontario's Premier Waterfront Community

Mailing Address:
P.O. Box 400, Barrie ON, L4M 4T5
Tel: 705-739-4220 ext. 5231

From: Peter Slama [mailto:pslama@coleengineering.ca]
Sent: October 25, 2019 2:41 PM
To: Nadine Rush <Nadine.Rush@barrie.ca>
Cc: Adam Taverna <adam@thecrowncommunities.com>; May Taverna <may@thecrowncommunities.com>; Darren Vella <dvella@ipsconsultinginc.com>
Subject: Crown Communities, 1012 Yonge Street, City File No. D09-ANN

Hello Nadine,

We are in receipt of the City's comments related to the Conformity Review process for the above referenced development project, in particular the Engineering Comments letter dated September 5, 2019.

As we prepare for a resubmission, we have a question related to calculating the sanitary peak flow generation rate.

The proposed site plan (attached for reference) is considered High Density, based on the Units/Hectare of 140UPH. The City of Barrie's Sanitary Design Population for High Density (Apartments) is 1.67 ppu.

However, the proposed built form of the development is Stacked Townhouses Back-To-Back, which more closely aligns with the Medium Density designation within the City's standards requiring a Sanitary Design Population of 2.34ppu.

We're kindly requesting confirmation from the City as to which Design Population rate (1.67ppu or 2.34ppu) is most appropriate and acceptable for the present site plan.

Thank you.

Peter Slama, P.Eng.
Project Manager, Urban Development

Cole Engineering Group Ltd.
70 Valleywood Drive, Markham, ON Canada L3R 4T5
T: 905-940-6161 Ext. 375 Tor. Line: 416-987-6161
F: 905-940-2064
E: pslama@ColeEngineering.ca
www.ColeEngineering.ca

Peter Slama

Subject: FW: 375mm Local Sanitary Sewer Mapleview / Kneeshaw

From: James Orr [mailto:James.Orr@rjburnside.com]
Sent: October-29-19 9:44 AM
To: Frank Palka <Frank.Palka@barrie.ca>; Bala Araniyasundaran <Bala.Araniyasundaran@barrie.ca>; Larry Klein <Larry.Klein@barrie.ca>
Cc: Ray Duhamel <RDuhamel@jonesconsulting.com>; jhermann0812@gmail.com <DRichardson@jonesconsulting.com>
Subject: RE: 375mm Local Sanitary Sewer Mapleview / Kneeshaw

Hi Frank,

Thanks for this response. I was out yesterday and just catching up on your e-mail.

I acknowledge that we'll need to assess each development in terms of how it compares to the design assumption, but the Group is just looking for assurance that this pipe can go to a d/D of 0.70, regardless of how the density distribution plays out amongst the various owners.

Based on density increases assumed on a proportional basis (which in reality will be variable, and must be negotiated among developers – the Group will manage allocation), the land owners are comfortable proceeding so long as they can have this assurance that the "full pipe" criteria will be based on d/D of 0.7 which is approximately 85% full, still allowing a buffer.

Could you acknowledge your understanding and acceptance of this – your response below is alluding to it but I just want to ensure we're 100% clear for the owners.

We have a group meeting today at 1:30 and I'm aware of a number of owners who are quite keen on ensuring this is resolved.

Thanks,

James

From: Frank Palka <Frank.Palka@barrie.ca>
Sent: Friday, October 25, 2019 4:42 PM
To: James Orr <James.Orr@rjburnside.com>; Bala Araniyasundaran <Bala.Araniyasundaran@barrie.ca>; Larry Klein <Larry.Klein@barrie.ca>
Cc: Ray Duhamel <RDuhamel@jonesconsulting.com>; jhermann0812@gmail.com <DRichardson@jonesconsulting.com>
Subject: RE: 375mm Local Sanitary Sewer Mapleview / Kneeshaw

Good afternoon James,

As previously discussed and messaged to the LOG the City would look at each individual project and assess the merits of any increase in pipe size were warranted on an individual basis. I believe the below assumption on theoretical flows provided enough background to allow this project to proceed towards construction as designed.

Through the master plans certain assumptions were made therefore resulting in appropriate sewer sizing based on the design criteria of the day. Through best practices we all agree it may be appropriate to increase certain pipes to allow for "potential increase in densities". You can appreciate that we do not have that mandate at this time, however, if individual or the landowners group wish upsize pipes beyond the local service requirement we would not be opposed but caution any expectation of DC credits for these works.

Regards

Frank E. Palka C.E.T.
Manager of Approvals
Engineering Department

Barrie

City of Barrie: City Hall, 70 Collier Street, P.O. Box 400, Barrie ON, L4M 4T5
Office: 705-739-4220 x4445
www.barrie.ca

From: James Orr
Sent: Friday, October 18, 2019 3:59 PM
To: bala.araniyasundaran@barrie.ca; 'Frank Palka' <Frank.Palka@barrie.ca>; Larry Klein <Larry.Klein@barrie.ca>
Cc: Ray Duhamel <RDuhamel@jonesconsulting.com>; jhermann0812@gmail.com <DRichardson@jonesconsulting.com>
Subject: 375mm Local Sanitary Sewer Mapleview / Kneeshaw
Importance: High

Good afternoon Bala,

As presented to you at the Working Group meeting yesterday, given the City's interest in promoting higher densities not only in existing Barrie but in Hewitt's secondary plan, I am formally requesting the following on behalf of the Hewitt's Landowners Group:

- ***That the 375mm DIA sanitary sewer branch west of the Hewitt's Trunk (running west along Mapleview Drive and south on future Kneeshaw to Lockhart) be approved at its current size (375mm), but also be considered as a trunk sewer (per the Local Servicing policy), such that the d/D standard for the sewer be set at 0.70, instead of 0.50.***

The City of Barrie's design guidelines for Trunk Sanitary Sewers speak to the 85% or 0.7 d/D as the maximum design criteria.

The City's acceptance of this request will allow the current, approved design of the infrastructure to remain unchanged, allowing construction to proceed imminently, while allowing for a significant increase in population to the contributing catchments that gives the landowners far more flexibility to propose higher densities, which is the City's vision for this area.

The approved Sanitary Drainage Plans and Design Sheet for the sewer (designed by Jones) are attached. This design was approved with a maximum d/D of 0.58, and this was based on previous discussions with the City about the fact that applying the new sanitary design standards would theoretically increase the pipe size to a 450mm DIA, which would be

DC eligible. Recall that the City's position was to grant an exception to the new standard rather than increase the pipe size.

The notion of this sewer being considered a trunk is supported by the fact that that it only has direct connections at the top end (within Ballymore), and has a considerably sized catchment and length, therefore not behaving nearly as "peaky" as a local sewer.

Technical Summary:

1. **Current Design – max 0.58 d/D**

   Sanitary Sewer Design Street "Sanitary Sewer Design – Trunk Sewer, Development Details Basis", dated 08-15-19
   Corresponding EX-SAN-1 and EX-SAN-2 sanitary sewer catchment plans, stamp dated 08-16-2019

   The above identifies the current design population allocation or peak flow allocation in the case of Institutional lands.

2. **Increased population to max 0.70 d/D**

   Sanitary Sewer Design Sheet "Sanitary Sewer Design – Trunk Sewer, Development Details Basis – d/D at 0.7", dated 10/16/2019

   Commentary: See "ADD POP. Max downstream d/D = 0.7" line highlighted in blue.

   The d/D of 0.7 in the downstream sewer is reached with an additional upstream population of approximately **4730** above the approved design.

From our meeting, we understood you were agreeable to this in principle, subject to seeing verification of the request, which I have provided herein.

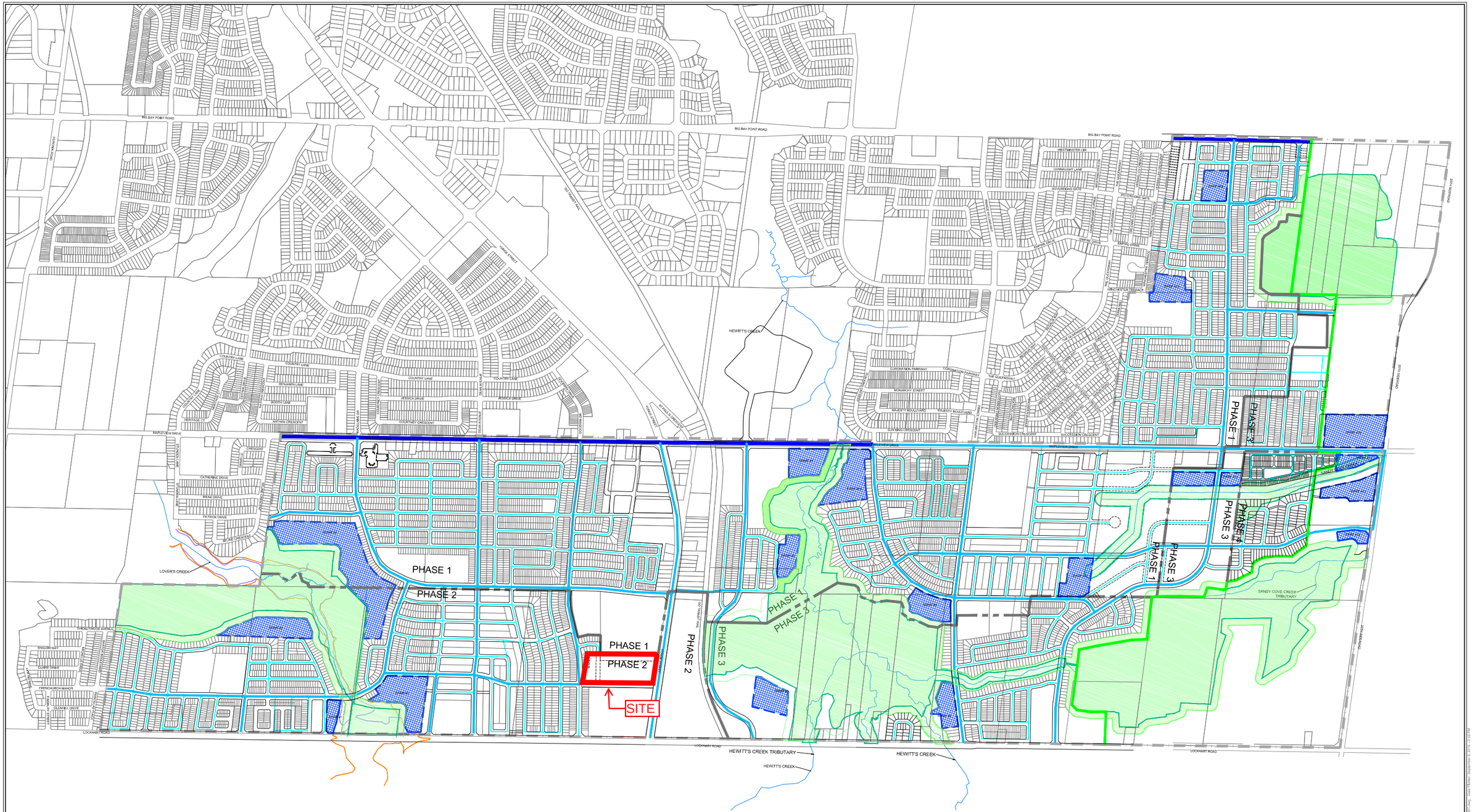
The Group has asked that the City of Barrie provide confirmation of your acceptance by Monday October 21st at 9 am, to ensure we do not have to make other arrangements for the imminent construction contract we are about to execute.

Thank you kindly, and we look forward to your confirmation.

Have a great weekend,

James

APPENDIX D
Water Demand Calculations



LEGEND

- DC TRUNK WATERMAIN
- LOCAL TRUNK WATERMAIN
- LOCAL WATERMAIN
- SURVEYED NHS LIMITS (2015)
- NHS BUFFER LIMITS
- 2031 PHASE LINE
- PHASING LIMITS
- LIMIT OF HEWITT'S CREEK SECONDARY PLAN
- STAKED 2015 NHS LIMITS
- NHS BUFFER LIMITS

0 100 200 400 600
Metres

NOTE: "SCALE ONLY VALID FOR 24" x 36" SIZED PLOTS"

BURNSIDE

Figure Title
HEWITT'S SECONDARY PLAN AREA SUBWATERSHED IMPACT STUDY
PROPOSED WATER DISTRIBUTION PLAN

Client
HEWITT'S CREEK LANDOWNERS GROUP INC.

Drawn	Checked	Date
AO	BH	16/01/28

Scale: H 1:4,000"
Project No.: 300032860
Figure No.: **FIG 12**

DOMESTIC WATER DEMAND

Project:	1012 Yonge Street	Proj. #	2018-0390
Date:	February 2021		
Calc'ed by:	Daniel Ma		

Note:
Based on the City of Barrie Standards and the Ontario Building Code, Part 8 "Sewage Systems", OBC Table 8.2.1.3.A and 8.2.1.3.B

	Site Component	Condo					
Residential Occupancy Data	Studio / 1 / bed units						
	People per unit						
	2 bed units / 2+D						
	People per unit						
	3 bed units	1024					
	People per unit	*1.67*					
	4 bed units						
	People per unit						
	Townhouse units	10					
	People per unit	*2.34*					
	Hotel Room						
	Person per room						
Commercial Occupancy Data	Retail GFA (m2)	1254.4 sq m					
	person / 100 m2						
	Office (m2)						
	person / 100 m2						
	blank						
	blank						

Unit Quantity by Site Component	Water Demand	Units	Equivalent Population (persons)					
Residential Occupancies								
Apartments, Condominiums, Other Multi-family Dwellings	225	L/person/day	1733	-	-	-	-	-
Hotels and Motels (excluding bars and restaurants), a) Regular		L/room/day	0.0	-	-	-	-	-
Not used	-	-	-	-	-	-	-	-
Other Occupancies			**Flow Rates (L/d)**					
Commercial or Retail	0.0370	L/sec	3197	-	-	-	-	-
Office Building		L/9.3m2 of floor area/day	-	-	-	-	-	-
Not used	-	-	-	-	-	-	-	-

Daily Flow Rate (L/d)								
Residential Occupancies								
Apartments, Condominiums, Other Multi-family Dwellings		390,033.00	390,033.00	0	0	0	0	0
Hotels and Motels (excluding bars and restaurants), a) Regular		0	0	0	0	0	0	0
Not used		0	0	0	0	0	0	0
Other Occupancies								
Commercial or Retail		3,196.80	3,196.80	0	0	0	0	0
Office Building		0	0	0	0	0	0	0
Not used		0	0	0	0	0	0	0
		Total Flow						
Average day (L/d)		**393,230**	393,230	0.00	0.00	0.00	0.00	0.00
Average day (L/s)		**4.55**	4.55	0.00	0.00	0.00	0.00	0.00
Max. day (L/d)		**510,559**	510,559	0.00	0.00	0.00	0.00	0.00
Min. hour (L/hr)		**13,763**	13,763	0.00	0.00	0.00	0.00	0.00
Peak hour (L/hr)		**40,788**	40,788	0.00	0.00	0.00	0.00	0.00
Peak hour (L/s)		**11.33**	11.33	0.00	0.00	0.00	0.00	0.00

Peaking Factors			
Land Use	Minimum Hour	Peak Hour	Maximum Day
Residential	0.84	2.50	1.30
Commercial / Retail	0.84	1.20	1.10

FIRE FLOW CALCULATION

Project:	1012 Yonge Street	Project #	2018-0390
Date:	February 2021		
Calc'ed by:	Daniel Ma		

Fire Resistive Construction:	YES	Site Component:	Building A	Building B	Building C	Building D	Building E	Building F
The following calculations are for the proposed development and are based on the largest floorplate area. The FUS requires that a minimum water supply source 'F' be provided at 150KPa. The minimum flow 'F' can be calculated as such:	**Total Floor Area**	Total GFA (m2)	5911	2884	2715	1689	1689	365
		Area Above (m2)	5911	2884	2815	1689	1689	365
		Area Below (m2)						365
		Total Floor Area (m2)	7389	3605	3419	2111	2111	1095
	Flow (F)	C (dimensionless)	1.0	1.0	1.0	1.0	1.0	1.0
		A (m2)	7389	3605	3419	2111	2111	1095
$F = 220C\sqrt{A}$		F (L/min)	19000	13000	13000	10000	10000	7000
	Reduction Factor	F (L/min)	19000	13000	13000	10000	10000	7000
F = Required fire flow L/min		f_1 (dimensionless)	0.85	0.85	0.85	0.85	0.85	0.85
C = Coefficient related to construction		F' = F x f_f (L/min)	16150	11050	11050	8500	8500	5950.0
A = Total area in m^2		*f_1 = occupancy factor; ie, Residential, f_1 = 0.85; for Retail or Commercial, f_1 = 1.00*						
	Sprinkler and Exposure Increase or Decrease	f_2 (sprinkler factor)	30%	30%	30%	30%	30%	0%
		North Side	5%	15%	0%	15%	20%	20%
		East Side	0%	10%	10%	10%	10%	0%
		South Side	5%	0%	15%	20%	5%	20%
'Calculations, formulas and factors are as per Fire Underwriter's Survey (FUS) Water Supply for Public Fire Protection		West Side	10%	10%	10%	15%	15%	10%
		f_3	20%	35%	35%	60%	50%	50%
		f_3 = Exposure factor not to exceed 75%, determined as per FUS Guide Item 4, page 18)						

F' (L/min)	**16150**	**11050**	**11050**	**8500**	**8500**	**5950**
S = F' * f_2 *(L/min)*	**4845**	**3315**	**3315**	**2550**	**2550**	**0**
E = F' * f_3 *(L/min)*	**3230**	**3867.5**	**3867.5**	**5100**	**4250**	**2975**

F''=F'-S+E (L/min) rounded to nearest 1,000	**15000**	**12000**	**12000**	**11000**	**10000**	**9000**
F''(L/s)	**250**	**200**	**200**	**183**	**167**	**150**
F''(USGPM)	**3970**	**3180**	**3180**	**2910**	**2650**	**2380**

Table 1

Sprinkler Reduction Factor (f_2)		
No Sprkinkler System	Sprinklered	Sprink. + Supervised
0%	30%	50%

Table 2

Construction Type "C" Factor			
Wood Frame	Ordinary Construction	Non-Combustible	Fire Resistive
1.5	1	0.80	0.60

Table 3

Occupancy Factor (f_1)				
Rapid Burning	Free Burning	Combustible	Limited Combustible	Non-Combust.
25%	15%	0%	-15%	-25%

Table 4

Exposure Charge					
0 to 3m	3.1 to 10m	10.1 to 20m	20.1 to 30m	30.1 to 45m	> 45m
25%	20%	15%	10%	5%	0

APPENDIX E
R.J. Burnside Confirmation Letter of Conformity

R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 CANADA
telephone (705) 446-0515 **fax** (705) 446-2399 **web** www.rjburnside.com

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

December 19, 2019

Via: e-mail (Andrew.Gameiro@barrie.ca)

Andrew Gameiro
Planner
City of Barrie
70 Collier Street
Barrie ON L4M 4T5

Dear Mr. Gameiro:

Re: Crown Communities Developments Inc. – 1012 Yonge Street
Hewitt's Secondary Plan, City of Barrie
SIS Conformity Clearance
RJB Project No.: 300032860.0000

In support of the Hewitt's Secondary Plan Conformity review being undertaken for the subject development, I confirm that based on my review of the submission materials prepared by SCS Consulting (revised December 13, 2019), and from direct consultation with Peter Slama, P.Eng. of Cole Engineering to review same, the submission is in general conformance with the Burnside SIS, in terms of servicing strategy and stormwater management.

Please contact the undersigned if you have any questions or require anything further to this effect.

Yours truly,

R.J. Burnside & Associates Limited

James Orr, P.Eng.
Hewitt's Creek Landowner's Group Engineer
JO:kd

cc: Nadine Rush, City of Barrie (Nadine.Rush@barrie.ca)
Adam Taverna, Crown Communities (adam@thecrowncommunities.com)
Peter Slama, Cole Engineering (pslama@coleengineering.ca)
Ray Duhamel, Hewitt's Creek Landowner's Group (rduhamel@jonesconsulting.com)

APPENDIX F
Statement of Limiting Conditions and Assumptions

Statement of Limiting Conditions and Assumptions

1. This Report/Study (the "Work") has been prepared at the request of, and for the exclusive use of, the Owner, and its affiliates (the "Intended Users"). No one other than the Intended Users has the right to use and rely on the Work without first obtaining the written authorization of Cole Engineering Group Ltd. (Cole Engineering) and its Owner.

2. Cole Engineering expressly excludes liability to any party except the Intended Users for any use of, and/or reliance upon, the Work.

3. Cole Engineering notes that the following assumptions were made in completing the Work:

   a) the land use description(s) supplied to us are correct;
   b) the surveys and data supplied to Cole Engineering by the Owner are accurate;
   c) market timing, approval delivery and secondary source information is within the control of Parties other than Cole Engineering; and
   d) there are no encroachments, leases, covenants, binding agreements, restrictions, pledges, charges, liens or special assessments outstanding, or encumbrances which would significantly affect the use or servicing.

   Investigations have not been carried out to verify these assumptions. Cole Engineering deems the sources of data and statistical information contained herein to be reliable, but we extend no guarantee of accuracy in these respects.

4. Cole Engineering accepts no responsibility for legal interpretations, questions of survey, opinion of title, hidden or inconspicuous conditions of the property, toxic wastes or contaminated materials, soil or sub-soil conditions, environmental, engineering or other factual and technical matters disclosed by the Owner, the Client, or any public agency, which by their nature, may change the outcome of the Work. Such factors, beyond the scope of this Work, could affect the findings, conclusions and opinions rendered in the Work. We have made disclosure of related potential problems that have come to our attention. Responsibility for diligence with respect to all matters of fact reported herein rests with the Intended Users.

5. Cole Engineering practices engineering in the general areas of infrastructure and transportation. It is not qualified to and is not providing legal or planning advice in this Work.

6. The legal description of the property and the area of the site were based upon surveys and data supplied to us by the Owner. The plans, photographs, and sketches contained in this report are included solely to aide in visualizing the location of the property, the configuration and boundaries of the site, and the relative position of the improvements on the said lands.

7. We have made investigations from secondary sources as documented in the Work, but we have not checked for compliance with by-laws, codes, agency and governmental regulations, etc., unless specifically noted in the Work.

8. Because conditions, including capacity, allocation, economic, social, and political factors change rapidly and, on occasion, without notice or warning, the findings of the Work expressed herein, are as of the date of the Work and cannot necessarily be relied upon as of any other date without subsequent advice from Cole Engineering.

9. The value of proposed improvements should be applied only with regard to the purpose and function of the Work, as outlined in the body of this Work. Any cost estimates set out in the Work are based on construction averages and subject to change.

10. Neither possession of the Work, nor a copy of it, carries the right of publication. All copyright in the Work is reserved to Cole Engineering. The Work shall not be disclosed, produced or reproduced, quoted from, or referred to, in whole or in part, or published in any manner, without the express written consent of Cole Engineering and the Owner.

11. The Work is only valid if it bears the professional engineer's seal and original signature of the author, and if considered in its entirety. Responsibility for unauthorized alteration to the Work is denied.