URBANTECH®

FUNCTIONAL SERVICING REPORT

MILLCROFT GOLF CLUB – AREA E

CITY OF BURLINGTON

REGION OF HALTON

PREPARED FOR
MILLCROFT GREENS CORPORATION

Urbantech File No.: 17-526

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DRAWINGS

GP-E – General Plan
GR-E – Grading Plan
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EX-E – Existing Drainage Plan
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(as appended to Shoring Plans, Sections and Details as Drawings SHO-SH3 prepared by Terra Engineering & Structural Consulting Inc.)
RL-E – Dundas Street Property Requirement

1 EXECUTIVE SUMMARY

Millcroft Greens Corporation has retained Urbantech® Consulting to prepare a Functional Servicing Report (FSR) supporting the proposed development within the Millcroft Golf Club site in the City of Burlington, Region of Halton. The following summarizes our conclusions for the Area E development under consideration, hereafter referred to as the subject property.

1.1. SANITARY SERVICING

Area E will require an extension of a sanitary sewer along Dundas Street for connection to the existing Millcroft Park Drive sewer. The additional discharge flow from the development will not have a negative net impact on the existing system.

1.2. WATER SERVICING

Area E will require an extension of a watermain along Dundas Street to connect to the existing Millcroft Park Drive watermain. The hydrant flow tests reveal that the existing water infrastructure can support the proposed development.

1.3. STORM SERVICING AND STORMWATER MANAGEMENT

Area E 100-year post-development flows are controlled to pre-development 2-year flows and discharged directly to Appleby Creek via the hydro corridor. The stormwater outlet pipes have been sized in compliance with the City's guidelines.

1.4. GRADING

The proposed grading meets the City's requirements. Grades will be maintained along the property line abutting the 6.0m wide drainage easement, and grading accounts for the future Dundas Street widening requirements along the building frontage.

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2 INTRODUCTION

2.1. BACKGROUND

This report supports the residential development of Area E located at 4274 Dundas Street, within the Millcroft Golf Club site in the City of Burlington, Region of Halton, hereafter referred to as the subject property. This report fulfils the submission requirements and addresses preliminary comments related to grading, servicing, drainage, and stormwater management provided by the agencies and utilities. The servicing and development strategies presented in this report have been developed with the greater consulting team and should be considered in conjunction with their work. The following studies are included in the appendices:

- Geotechnical Investigation Report– DS Consultants Ltd. (DSCL, December 2020);
- Hydrogeological Assessment – R.J Burnside & Associates Ltd. (RJB, November 2020);
- Revised Water Balance Calculations - R.J Burnside & Associates Ltd. (RJB, March 2022);
- Foundation Weeping Tiles and Groundwater Quality Evaluation - R.J Burnside & Associates Ltd. (RJB, February 2022);
- Preliminary Water Distribution Modelling Report – Municipal Engineering Solutions (MES, March 2020);
- Noise & Vibration Feasibility Study – Howe Gastmeier Chapnik Limited (HGC, February 2022); and
- Arborist Report - Beacon Environmental (Beacon, March 2022)

In addition to the above, the findings of this study have been incorporated into the Benefit Analysis Report by Jennifer Lawrence & Associates (JLA, 2022) and Environmental Evaluation Report (EER) by Beacon Environmental (Beacon, 2022), both included under separate cover in this submission. This study presents the recommended stormwater management and municipal servicing scheme for the development of the subject property. This report is also applicable for any future revisions to the site plan, assuming the revisions are minor and in general conformance with the concepts outlined herein. The information presented in this report conforms to the following guidelines:

- City of Burlington (City) Standard Specifications (March 2020)
- City of Burlington Stormwater Management Design Guidelines (May 2020)
- Conservation Halton (CH) Guidelines for Stormwater Management Engineering Submissions (November 2021)
- Conservation Halton (CH) Policies and Guidelines for the Administration of Ontario Regulation 162/06 and Land Use Planning Policy Document (November 2020)
- Regional Municipality of Halton (Region) Water and Wastewater Linear Design Manual (October 2019)
- Ministry of the Environment, Conservation and Parks (MECP) Stormwater Management Planning and Design Manual (March 2003)

2.2. SUBJECT PROPERTY

The subject property, also known as Area E, is approximately 0.66 ha in size and currently consists of a maintenance facility for the golf course lands (Millcroft Golf Club). The subject property, located on the south side of Dundas Street between Westlock Common and Millcroft Park Drive, is shown in the Preliminary Development Concept by Gerrard Design (Gerrard) as Figure SK-74 under separate cover in this submission.

The subject property is generally bounded by:

- Dundas Street to the north; and,
- Millcroft Park Drive to the east; and,
- Existing residential via Westlock Commons to the west; and,
- Hydro Corridor lands to the south.

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3 DESIGN CRITERIA AND OBJECTIVES

3.1. SANITARY DESIGN CRITERIA

The sanitary sewer flows for the subject lands were calculated using the following criteria outlined in the Regional Municipality of Halton's Water and Wastewater Linear Design Manual (October 2019):

Design Flow (L/s) = Average Dry Weather Flow x M + Inflow/Infiltration Allowance Eq. [1]

Table 3-1 Residential Dry Weather Flow

Type of Development	Equivalent Population Density (people/ha)	Equivalent Population Density (People/Unit)	Average Dry Weather Flow (L/capita/d)
Apartments (over 6 stories high)	ee **6.2**	1.58	360

Due to the relatively small size of the development, the precise number of units is known. Based on 130 apartment units, a population of 205 was derived per the equivalent population density listed in **Table 3-1** as calculated by MES in **Appendix E** (March 2020). This value has been conservatively applied to sanitary flow estimates.

- Infiltration / Inflow – 0.286 L/s/ha (minimum for all land use types)
- Average Domestic Flow = 275 L/c/day
- Minimum Velocity = 0.60 m/s
- Maximum Velocity = 3.00 m/s
- Factor of Safety = 15%

Residential Peak Wastewater Flow Factor (M): M = 1 + 14 / (4 + P1/2)

Where:

- M = Harmon peaking factor Eq. [2]
  - Minimum factor = 2.00
  - Maximum factor = 4.50
- P = Population in thousands

3.2. WATER DESIGN CRITERIA

The watermain distribution for each of the development phases will be calculated using the Regional Municipality of Halton's Water and Wastewater Linear Design Manual (October 2019)

Table 3-2 Average Daily Consumption Rates for each Land Use

Type of Development	Equivalent Population Density (people/ha)	Equivalent Population Density (People/Unit)	Average Dry Weather Flow (L/capita/d)
Apartments (over 6 stories high)	see **7.2**	1.58	265

Water Supply System Pressures:

- Maximum sustaining operating pressure – 700 kPa
- Minimum pressure under simultaneous maximum day and fire flow demands – 140 kPa
- Minimum pressure under normal operating conditions – 275 kPa

If the static pressure exceeds 690 kPa, a pressure-reducing valve must be installed to limit the maximum static pressure so it does not exceed 690 kPa and areas that may be occupied. Further, according to Ontario Building Code (OBC) 7.6.3.3 and where the static pressure at the fixtures may exceed 550 kPa, a pressure reducing valve conforming to OBC 7.2.10.12 shall be installed to limit the maximum static pressure at the fixtures to 550 kPa.

3.3. STORM DESIGN CRITERIA

Storm sewers are to be designed using the criteria outlined by the City of Burlington Stormwater Management Design Guidelines (May 2020):

Determining Return Period Storm Event Flow (Q):

$$Q = K \times C \times I \times A$$

Where:

A = Contributing Drainage Area (ha) Eq. [3]
Q = Return Period Storm Event Flow (m3/s)
K = Conversion Factor (0.00278)
C = Runoff Coefficient
I = Rainfall intensity (mm/hour)

Determining Rainfall Intensity (I):

$$I = A / (t_d + B)^C$$

To be calculated as per the City of Burlington's approved IDF equation where:

Eq. [4]

t_d = time duration (minutes)

*Refer to **Table 3-4** for all A, B & C constants.*

Runoff Coefficient (C):

- In urban areas, the runoff coefficient will be increased for high magnitude storms
- Runoff coefficients should be multiplied by the Antecedent Precipitation Index (Ca) for the 25, 50 and 100-year storms (maximum C x Ca is 1.00):
    - 25-year storm = 1.10
    - 50-year storm = 1.20
    - 100-year storm = 1.25

In accordance with the City standards, the minimum Time to Concentration (Tc) of 10 minutes shall be used. The actual expected time of concentration is to be calculated based on the contributing drainage area to the point of interest. Runoff coefficients for the City of Burlington are listed in **Table 3-3** below.

Table 3-3 Runoff Coefficients (City of Burlington[1])

Area Type	Runoff Coefficient (C)
Where Impervious/Pervious Areas are directly measured:	
Impervious Areas (Asphalt, Concrete Rooftop, and Water Surfaces)	0.95
Gravel Surfaces	0.80
Permeable Pavement	0.80[1]
Pervious Areas (Grass, Meadow, Forest)	0.25[2]
For Use in Design Without Detailed Site Plans/Plot Plans:	
Parks	0.35
Commercial	0.90
Industrial	0.90
Institutional (Schools and Churches)	0.75
Greenfield Residential:	
Single Family (under 30 ft width)	0.66
Single Family (between 30 and 50 ft width)	0.60
Single Family (greater than 50 ft width)	Consult City Staff
Semi-Detached	0.70
Row Housing, Town Houses	0.75
Apartments	0.85
Infill Residential	Calculated from proposed plans

[1]City of Burlington Stormwater Management Design Guidelines (May 2020)
[2]May vary depending on the type of application; to be reviewed and confirmed with the City of Burlington

In accordance with the City guidelines, IDF values and intensities (assuming a 10-minute time of concentration) are listed in **Table 3-4** below.

Table 3-4 IDF Values for City of Burlington

Variable	Type	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
a =	Constant =	681.52	802.04	918.28	1065.95	1172.34	1281.34
b =	Constant =	6	5	5	5	5	5
c =	Constant =	0.780	0.764	0.763	0.762	0.761	0.761
t =	Time of Concentration (min) =	10	10	10	10	10	10
I =	Intensity (mm/hr)	78.39	101.31	116.31	135.38	149.30	163.18

3.4. STORMWATER MANAGEMENT DESIGN CRITERIA

Area E will have 100-year post-development to 2-year pre-development peak flow control provided via an on-site underground SWM facility on-site. This level of quantity control can be accomplished by using a pump, as detailed in **Section 9.3**. Note, this criterion (i.e. 100-year post to 2-year pre) exceeds the **City SWM Guidelines** wherein the guidelines state that proposed development lands discharging to a watercourse system (i.e. Appleby Creek) are to provide post-development to pre-development peak flow control. As such, if **City SWM Guidelines** can be met with the "post to pre" flow control through the use of a variable discharge pump, then the requisite storage volumes would be lowered relative to the storage volume listed in **Section 9.3**.

In accordance with the latest Conservation Halton Stormwater Management SWM Guidelines (**CH SWM Guidelines,** November 2021), this SWM strategy targets achieving an Enhanced standard of water quality treatment as defined by the MECP's SWMPDM. This proposed development adherence to this water quality target is discussed further in **Section 9.2**. For erosion control, 24-hour detention of the 25mm storm event will be evaluated further at detailed design. Due to the size of the Appleby Creek watershed at this location (approximately 400 ha), provision of erosion control for a site of this size will have no impact on downstream erosion thresholds. Retention / reuse of the first 5mm of precipitation is recommended in lieu of additional quantity controls.

Site recharge/water balance considerations have been considered in the Hydrogeological Assessment by RJB included in **Appendix B** as detailed in **Section 4.4**.

3.5. GRADING DESIGN OBJECTIVES

In general, grading shall be completed to safely direct surface water flows towards safe outlets. Safe outlets may consist of surface drainage features (i.e. overland flow routes, storm sewers, etc.) or creek systems. The following outlines the requirements from the latest City of Burlington Stormwater Management Design Guidelines, prepared by Wood (May 2020):

- *All developments (excluding single family residential) shall design site grading to provide an overland flow route to an acceptable receiver, generally the roadway right-of-way. All grading and drainage shall consider the City of Burlington By-Law 52-2018 (A by-law to regulate the altering of grades or drainage on Low Density Residential Lands). Reference is also made to City Standards S-118 (Lot Grading Standards, Exclusive of Current Subdivision) and S-119 (Lot Grading Standards for Subdivision Lots). Outside grades shall be a minimum of 0.15 m below the top of the foundation wall.*

- *Site grading is to be completed to facilitate a positive slope away from buildings and other features that may be at risk of damage caused by flooding. Lot grading shall be completed to provide grades between 2% - 5% away from the building foundation for a minimum apron length of 5 m. Reduced lot grades (i.e. less than 2%) may be considered by the City of Burlington as part of an overall stormwater management (SWM) system in order to slow overland flows and promote infiltration. Steeper lot grades may be considered by the City of Burlington where constrained, to a maximum slope of 3H:1V.*

- *Lot grading for development sites shall be self-contained and prevent spills onto adjacent properties, while also blending into existing topography and grades surrounding the site. Where external areas drain through a subject property, the proponent shall be required to design on site grading and drainage systems to safely convey these flows (up to the 100-year post development condition) and prevent ponding or negative impacts to the adjacent properties.*

- *Driveways must slope away from the building with positive drainage towards the roadway right-of-way, with slopes of between 1% (minimum) and 5% (maximum). Reverse sloped driveways are strongly discouraged, unless no other feasible grading solution exists. Where a reverse sloped driveway is proposed, a complete hydraulic grade line (HGL) analysis will be required by a qualified Professional Engineer (P.Eng.) to demonstrate no negative effects for all storm events up to and including the 100-year storm.*

- *Upon completion of the development works, the owner shall supply the City of Burlington with an as-built grading plan, stamped by a qualified Civil Engineer (P.Eng.), certifying that the grading conforms to the approved grading plans and that there are no adverse impacts on neighbouring properties.*

4 EXISTING CONDITIONS

4.1. LAND USE & TOPOGRAPHY

The site is currently being used as the maintenance and operations grounds/facility for the Millcroft Golf Club. The golf course maintenance building will be relocated to Country Club Drive, beside the Club House, to accommodate the proposed development. Currently, the site is covered with a gravel parking area and a maintenance building.

R-PE Ltd. completed topographical surveys of the subject lands in September 2019.

The site generally falls from the northeast to the southwest.

***Drawing EX-E** illustrates the existing site features, topography, and drainage patterns.*

4.2. SOIL CONDITIONS

Millcroft Greens Corporation retained DS Consultants Ltd. to undertake the preliminary geotechnical investigation for the proposed development.

The geotechnical report indicates the following subsurface conditions:

- Topsoil – 100 mm to 125 mm thick surficial layer of topsoil
- Fill material – ranging from 2.3 m to 4.6 m below grade consisting mainly of clayey silt, sandy silt till and silty clay.
- Upper soils – Clayey silt to sandy silt till
- Lower soils – Clayey silt till

DS Consultants Ltd. preliminary investigation indicated that the soil stratigraphy of the subject property consists of fill underlain by native deposits of clayey silt, sandy silt till, clayey silt till, and a shale complex overlying shale bedrock. This report also establishes that no groundwater was found in the boreholes during drilling or upon completion of drilling. The stabilized groundwater levels observed in the monitoring wells installed in the boreholes range from 0.6m (BH19-2) to 2.6m (BH19-1).

Highly weathered shale bedrock of the Queenston Formation was encountered below depths ranging from 1.5 to 6.1m; however, it was not proven through core drilling. Methane gas is anticipated in the bedrock, and appropriate care and monitoring are essential in all confined bedrock excavations. For the purposes of this investigation, it is assumed that any remediation work which may be required to deal with potential contamination will be completed before earthworks and servicing.

The complete study in **Appendix A** provides a detailed discussion of geotechnical site conditions. The report further discusses recommendations pertaining to site alteration procedures as well as the construction of roads, sewers, foundations, and drainage systems based on the subsoil conditions.

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4.3. GEOTECHNICAL RECOMMENDATIONS

The geotechnical report recommended the following minimum pavement makeup for all internal site roads based on the assumed residential minor local or local traffic usage conditions:

- 40 mm HL3 Asphaltic Concrete
- 50 mm HL8 Asphaltic Concrete
- 150 mm Granular 'A'
- 350 mm Granular' B'

The Area E proposed finished floor elevation of the building is at Elevation 155.1m. Assuming basement depth of 3m, the basement floor will be at about Elev. 152m. Bedrock was not encountered in the boreholes drilled to Elev 145.2 to 148.6m as per the geotechnical report prepared by DS Consultants Ltd in **Appendix A**. Gas venting system not required for the Area E building.

*Refer to **Appendix A** for the Geotechnical Report for Area E as completed by DSCL (December 2020).*

4.4. HYDROGEOLOGY RECOMMENDATIONS

A hydrogeological report investigation was completed in November 2020 by RJB and has been included in **Appendix B**.

The field and laboratory work included the installation of three monitoring wells across the subject property in November 2019. Groundwater levels across Area E have been monitored monthly from December 2019 through to November 2021 and will continue to be monitored quarterly thereafter.

A review of the groundwater level data suggests the following:

- Groundwater levels in monitoring wells ranged from a high of 0.4 mbgs to a low of 1.3 mbgs.
- Shallow groundwater levels typically exhibit seasonal fluctuations, with the highest elevations generally observed in the spring and the lowest in the summer months. To date, seasonal high levels were observed in January 2020 due to the mild winter conditions.

*Refer to **Appendix B** for the Hydrogeological Report Investigation completed by RJB (November 2020).*

Foundation weeping tiles along the underside of the underground parking structure will address seasonal high groundwater and discharge to grade via a sump pump. Ultimately, these groundwater flows will be combined with attenuated stormwater outflows from the underground tank and discharge to Appleby Creek. Groundwater quality was comprehensively assessed in accordance with Halton Sewer Discharge By-Law – Sanitary & Combined Sewer Criteria, City of Burlington Storm Sewer By-Law Discharge and the Provincial Water Quality Objectives with results & conclusions detailed in the technical memorandum entitled "*Foundation Weeping Tiles and Groundwater Quality* Evaluation" by RJB provided in **Appendix B**. As the groundwater flows are proposed to ultimately discharge directly to Appleby Creek, evaluating groundwater flow impacts to either the sanitary or storm sewer system is not applicable. It is anticipated that groundwater quality will improve through infiltration, evapotranspiration and interception as groundwater discharge is proposed to traverse through vegetation as surface flow before it enters Appleby Creek as referenced in **Appendix B**.

*Refer to **Appendix B** for the Foundation Weeping Tiles and Groundwater Quality Evaluation completed by RJB (February 2022).*

4.5. EXISTING MINOR SYSTEM DRAINAGE

There is currently no storm sewer infrastructure along Dundas Street. However, existing drainage outlets to a grass swale exist south of the site, ultimately discharging to Appleby Creek. An overland flow route immediately west of the site conveys emergency flows from Dundas Street to a tributary of Appleby Creek. Refer to **Drawing EX-E** for details.

4.6. EXISTING MAJOR SYSTEM DRAINAGE

Existing drainage from Area E generally drains from the northeast to southwest with an average slope of approximately 1.0%. Area E has been divided into three (3) existing drainage sub-catchments and associated with one (1) external existing drainage area as depicted in **Drawing EX-E**, summarized in **Table 4-1** and further discussed below.

Table 4-1 Existing Drainage Areas - Area E

Area D			External to Area D		
Area ID	Area (ha)	RC (-)*	Area ID	Area (ha)	RC (-)
S01-E	0.32	0.50	E01-E	1.65	0.77
S02-E	0.31	0.50			
S03-E	0.03	0.50			
Total	0.66	0.50	Total	1.65	0.77

*Runoff coefficients are assigned based on City of Burlington criteria for specifying a maximum imperviousness of 36% (runoff coefficient of 0.50). As discretized between the sub-catchments listed in Table 7-1, the actual runoff coefficients may be above or below the average runoff coefficient of 0.50.

- Catchment S01-E currently sheet drains overland to a grassed swale south of the site (within the hydro corridor), ultimately discharging to Appleby Creek.
- Catchment S02-E currently sheet drains overland to the hydro corridor, ultimately discharging to Appleby Creek
- Catchment S03-E currently sheet drains overland to the Dundas Street right-of-way, ultimately discharging to West Sheldon Creek.

The total existing drainage from Area E is 0.66 ha, with an average runoff coefficient of approximately 0.61 based on a detailed land-use coverage analysis. However, City criteria specify a maximum imperviousness of 36% (or runoff coefficient of approximately 0.50) to assign re-developments such as Area E.

A single external drainage sub-catchment is conveyed through Area E:

- Sub-catchment, E01-E, is a section of Dundas Street ROW that sheet drains to an existing overland flow swale along the Area E west limit, which flows to the grass swale within the hydro corridor, ultimately discharging to Appleby Creek.

The total external drainage from Dundas Street being conveyed through Area E is 1.65 ha, with an average runoff coefficient of 0.77. Note, the implementation of these external works on Dundas Street is discussed further in **Section 10**.

*Please refer to existing site drainage for Area E as depicted in **Drawing EX-E** and stormwater calculations in **Appendix G**.*

5 DEVELOPMENT CONCEPT

5.1. LAND USE

Area E shows the potential for a six (6) storey condominium with one (1) level of underground parking as shown in Site Plan dA1.2 within the Proposed Residential Development package by Kirkor Architects and Planners as submitted under separate cover with this submission. Refer to the general plan as illustrated in **Drawing GP-E**. Note, the privacy feature in the form of a landscape buffer is proposed between existing residential and proposed condominium interface as illustrated in plan view by NAK Design Strategies as part of the DWG L1 – Landscape Concept Plan submitted under separate cover with this submission. As shown in Arborist Report Figure TP-5 by Beacon included in **Appendix I**, trees are preserved wherever possible. For details on ownership and condition ratings, refer to Arborist Report TP-5.

*Refer to **Drawing GP-E** for the Area E general plan and **Appendix I** for the Arborist Report for Area E.*

5.2. GRADING

In accordance with grading design objectives listed in **Section 3.5**, the proposed conceptual grading for the development will be designed following City of Burlington standards. The existing boundary conditions generally govern the proposed grading design. Site grading has also been designed to maintain adequate cover over proposed services, and no external grading works are proposed.

A preliminary grading concept plan has been prepared for the subject lands based on the following engineering constraints:

- Storm outlet elevations
- Major system drainage paths
- Provision of minimum cover over services
- Proposed road patterns and land use
- Elevations along boundary roads and property lines
- Application of the City of Burlington standards

The grading plan, **Drawing GR-E**, is consistent with the City standards. In general, grading of the site blocks adjacent to the surrounding development, hydro corridor, and Dundas Street matches the existing and ultimate (with respect to Dundas Street) anticipated grades at the property line, as appropriate. Beacon's recommendation for tree preservation and associated protection fencing is not applicable for **Drawing GR-E** as per Drawing TP-5 included in **Appendix L**.

*Refer to **Drawing GR-E** for the grading plan for Area E.*

6 SANITARY SERVICING

The sanitary servicing criteria for Area E are in accordance with the Regional Municipality of Halton's Water and Wastewater Linear Design Manual (October 2019) as listed in **Table 6-1**.

Table 6-1 Sanitary Servicing Criteria - Area E

Parameter	Value	Parameter	Value
Average Domestic Flow	275 L/capita/day	Population (Condominium)	3.20 person per unit
Infiltration / Inflow	0.286 L/s/ha	Unit Count (#)	130
Peaking Factor (M)	Harmon Formula	Area (ha)	0.66
Minimum	4.50		
Maximum	2.00		

6.1. EXISTING

The nearest existing sanitary infrastructure to the subject property is a 600mm sewer on Millcroft Park Drive, which drains to the existing 675mm diameter sewer on Corporate Drive. Flows are then conveyed further south across the QEW to the South Service Road and Harvester Road sewers west to Walker's Line. Flows are conveyed southwest to the Skyway Wastewater Treatment Plant via an 1800mm diameter trunk sewer.

6.2. PROPOSED

Based on a review of the available as-constructed information (refer to **Appendix C**), the subject lands can be serviced by gravity sewers.

Wastewater infrastructure will be designed in accordance with the latest Region of Halton standards and specifications.

The proposed sanitary sewers that will service the subject lands will discharge to the existing 525 mm sanitary sewer on Millcroft Park Drive. Installation of a new 250 mm sanitary sewer along Dundas Street will be required to connect to the existing sanitary sewer on Millcroft Park Drive at the intersection of Dundas Street and Millcroft Park Drive.

Sanitary sewer design sheets have been prepared and used to size proposed sanitary sewers for the proposed development. The population is estimated using the equivalent population densities per the Halton Region standards.

Population Estimates and Sanitary Design Sheets can be found in **Appendix D**. See **Table 6-2** below for a summary of the sanitary servicing for Area E.

Table 6-2 Sanitary Servicing Summary - Area E

Area	Sanitary Area (ha)	# of Units	Population Equivalent Density (ppu)	Dry Weather Flow (L/s @ 0.286 L/c/d)	Infiltration / Inflow (L/s @ 0.286 L/s/ha)	Peaking Factor	Total Sanitary Flow (L/s)	Connecting Manhole
E	0.66	130	3.20	1.32	0.19	4.01	5.5	EX. MH. 4A

Based on the above criteria and the InfoSewer project report, it has been determined that there is ample capacity to service the subject lands. Note, the groundwater flows, as intercepted by the foundation drain

collectors, may outlet to the sanitary sewer system as proposed on Dundas Street, which impacts the percent full sewer capacity by a 1% increase as demonstrated in the sanitary design sheets included in **Appendix D**.

*Refer to **Drawing SAN-E** for the sanitary servicing plan for Area E*

7 WATER SERVICING

The water servicing criteria and flow demands for the proposed development are in accordance with the Regional Municipality of Halton's Water and Wastewater Linear Design Manual (October 2019), as listed in **Table 7-1**.

Table 7-1 Water Servicing and Flow Demands

Water Design Factors		Water Demand (L/s)[1]	
Average Daily Demand	265 L/capita/day	Average Day Demand	1.75
Maximum Daily Demand Peaking Factor	2.25	Maximum Day Demand	3.94
Peak Hourly Demand Peaking Factor	4.00	Peak Hour Demand	7.01

[1]Refer to the Preliminary Water Distribution Modelling by MES in **Appendix E** for water demands as calculated per equivalent population

7.1. EXISTING

Based on the service elevation range for the area, the subject site is located within Pressure Zone B3 in Halton Region's water distribution system. It should be noted that the Region is planning to alter the pressure districts in Halton; however, Zone B3 is not affected by this change. Existing water distribution infrastructure in the vicinity of the site includes:

- 300mm watermain on Millcroft Park Drive (approximately 300 m east of the site).

7.2. PROPOSED

MES was retained to conduct a detailed hydraulic analysis of the proposed development's impact on existing and proposed infrastructure. The analysis includes design years 2016 and 2031. The analysis was based on the Region of Halton Water and Wastewater Linear Design Manual, October 2019. The watermain to service the proposed development can achieve these hydraulic requirements according to the design criteria as summarized in **Table 7-2** and discussed below.

Table 7-2 Modelled Service Pressure and Fire Flows

	Modelled Scenarios	
	2016	2031
Minimum Service Pressure	416 kPa (60.4 psi)	379 kPa (54.9 psi)
Maximum Service Pressure	579 kPa (84.0 psi)	601 kPa (87.2 psi)
Maximum Day + Fire Flow	164 to 337 L/s @ 20 psi	167 to 330 L/s @ 20 psi

- The service pressures from the watermain are expected to range between 60.4 psi to 84.0 psi (416 kPa to 579kPa) under 2016 conditions and between 54.9 psi to 87.2 psi (379 kPa to 601 kPa) under 2031 conditions.

- Pressures will exceed the OBC pressure criteria of 80 psi (550 kPa), pressure reduction may be required.

- The available fire flow meets or exceeds the preliminary fire flow demands utilized for this assessment at the minimum pressure of 140 kPa based on the proposed watermain supply and assumptions made within this report but should be confirmed when additional information becomes available.

- The findings and recommendations in this report are considered preliminary. As more information is available on the watermain and building layout, all building assumptions and fire flow demands must be reviewed and updated to confirm adequate water supply.

A municipal watermain is proposed throughout the subject lands. The proposed site is expected to be serviced by a 250mm watermain connecting to the 300mm watermain on Millcroft Park Drive. Note that the installation of a 250mm watermain within the Dundas Street ROW is required to service Area E. These sizes will be confirmed at detailed design when building assumptions, and fire flow demands are reviewed and updated. The subject mains were designed to achieve service criteria during Average Day, Peak Hour and fire flow during Maximum Day demand. There is sufficient capacity to service the subject lands based on the above criteria.

Refer to the Preliminary Water Distribution Modelling Report (MES, March 2020) in ***Appendix E*** *and* ***Drawing WM-E*** *for the Water Distribution Plan for Area E.*

8 STORM SERVICING

8.1. PROPOSED MINOR SYSTEM

Storm servicing for the development will conform to City of Burlington standards. All 5-year storm event flows will be conveyed overland and intercepted via a double catchment basin manhole within the southwest corner of the parking lot prior to the ultimate discharge to Appleby Creek, as shown in **Drawing STM-E**. The minor system is then captured via an underground storage tank and discharged via a pump to the outlet at grade elevation. Refer to **Section 9.3** for quantity control details.

The runoff coefficients were based on the proposed land use and the City standard runoff coefficients. Note, the groundwater flows, as intercepted by the foundation drain collectors, may outlet to the storm outfall structure, which negligibly impacts the percent full capacity as demonstrated in the storm design sheets included in **Appendix F**.

*Refer to **Drawing STM-E** for the Storm Drainage Plan and **Appendix F** for the Storm Sewer Design Sheets.*

8.2. PROPOSED MAJOR SYSTEM

Up to the 100-year storm, the major system flows from Area E will be captured prior to discharge into the grassed swale within the hydro corridor. The major system is conveyed via a 100-year capture point, directed into an underground storage tank and then discharged via a pump to the outlet grade elevation. The major system overland flows are shown in **Drawing STM-E**. Note that the 100-year capture point accounts for a 50% blockage condition and will contain an overflow device should inflow exceed the capacity of the underground storage facility.

The overland flow swale, as located along the western boundary of Area E, is sized to convey/maintain the 100-year post-development flows from 1.65ha of anticipated Dundas Street widening drainage area as calculated in **Appendix F**. The swale has a 4.0m top width, 0.5m depth, 3:1 side slopes and is located within a 6.0m wide drainage easement along Area E's western boundary. At a flow depth of 0.40m, the swale has 0.708m^3/s of capacity to convey a 100-year post-development flow of 0.677m^3/s from its contributing drainage as calculated in **Appendix F**. The 100-year post-development flow, from the Dundas Street drainage area, is conveyed through this swale as modelled in **Appendix G**.

*Refer to **Appendix F** for the Overland Flow Route Calculations and **Appendix G** for stormwater management calculations.*

9 STORMWATER MANAGEMENT

9.1. DESIGN

As noted previously in **Section 3.3**, the Area E 100-year post-development flows will be controlled to 2-year pre-development flows via an on-site underground SWM facility. As such, quantity and quality control are required.

*Refer to **Drawing STM-E** for the stormwater management plan.*

9.2. QUALITY CONTROL

The proposed development discharges to a grassed swale within the hydro corridor, which ultimately outlets to Appleby Creek. The existing grassed swale located along the western boundary of Area E will be restored as an enhanced grassed swale to provide quality control as well as minor flows will be captured in an oil & grit separator (OG/S) prior to discharging into the hydro corridor.

9.3. QUANTITY CONTROL

As stated in **Section 3.4**, quantity control criteria involve 100-year post-development flows controlled to 2-year pre-development flows. The post-development 100-year to 2-year flows are intercepted by a proposed double-catchbasin manhole, as discussed in **Section 8.2**. Once intercepted, these post-development flows are attenuated based on storage volume provided via an underground facility with discharge pumped to the outlet grade elevation. The controlled discharge will enter an OG/S as discussed in **Section 9.2** and combine with Dundas Street major storm flows downstream as conveyed to Appleby Creek.

Both pre-and post-development flows were modelled in Visual OTTHYMO 6.2 to determine the requisite storage volume needed to attenuate flows as mentioned above. An underground storage facility will be situated below the 1-level underground parking garage underside of footing and discharge to the outlet grade elevation via a pump. Prior to the pump activating, the underground storage facility will provide the equivalent 5mm retention storage volume of approximately 31.0m^3 below this operating level. Once the pump is activated, it will discharge to grade at the 2-year pre-development flow rate of 0.049m^3/s up to the 100-year storm event, requiring a total storage volume of approximately 191m^3. The dimensions of the underground storage tank and operating elevations will be established at the detailed site plan design stage. Stormwater management calculations can be found in **Appendix G**.

A summary of the flows for Area E can be found in **Table 9-1** below:

Table 9-1 Stormwater Management Summary for Area E

	Location	Flow Rates (m^3/s)		
		25-mm	2-year	100-year
Existing*	Outlet 1E	0.038	0.049	0.136
Proposed* (Controlled)	Outlet 1E	0.048	0.048	0.049

*Based on 0.61ha of Area E drainage area excluding the 0.05ha emergency swale conveying major storm event discharge from Dundas Street

*The proposed SWM drainage areas and the storm servicing strategy is shown in **Drawing STM-E**.*

9.4. WATER BALANCE

RJB prepared revised detailed water balance calculations (March 2022) in a separate memo to the hydrogeology report (November 2020). Both the memo and report are provided in **Appendix B**.

Development of the Subject Property will reduce infiltration to the shallow groundwater flow system. The groundwater balance calculations suggest that, without mitigation, a potential reduction of 28% of the average annual groundwater infiltration could occur as per the memo (RJB, 2022) in **Appendix B**.

In order to promote infiltration while mitigating against high groundwater conditions, the proposed SWM strategy recommends directing a portion of available roof areas to rear yards (disconnection of roof leaders) and an increased topsoil depth of 300 mm. The revised water balance calculations suggest that implementing increased topsoil depth and downspout disconnection to direct roof runoff to pervious areas across the proposed development will effectively maintain pre-development infiltration volumes.

*Refer to **Appendix B** for the Hydrogeological Report Investigation by RJB (November 2020) and Revised Water Balance Calculations by RJB (March 2022).*

10 IMPLEMENTATION

Coordination with the Region of Halton is required for the sanitary and watermain service connections. Halton Region has the 60% design submission completed for the portion of Dundas Street adjacent to Area E. The 90% design submission is anticipated to be completed by 2023 Q4, with tendering to commence in 2024 Q1. In consultation with the Region's consultant, Hatch, the latest available information is reflected in this submission and Dundas Street property requirements are illustrated as **Drawing RL-E**.

The limit of excavation for external servicing works within the Dundas Street right-of-way to external services is depicted for Area E in the Construction Management and Mobility Plan as **Drawing CMMP-E**. As informed by shoring component details prepared by Terra Engineering & Structural Consulting Inc., the limits of underground parking are included on **Drawing CMMP-E** and associated offset dimensions to the property limit and proposed Dundas Street right-of-way limits. Also, **Drawing CMMP-E** illustrates the crane location and swing radius as prepared by 59 Project Management Inc. and associated construction feasibility discussion as included in **Appendix J**.

*Refer to **Drawing CMMP-E** for Area E's Construction Management and Mobility Plan as appended to Shoring Plans, Sections and Details as Drawings SHO-SH3 prepared by Terra Engineering & Structural Consulting Inc. The Area E Crane Review Letter, completed by 59 Project Management Inc., is included in **Appendix J**.*

11 NOISE AND VIBRATION FEASIBILITY STUDY

HGC completed a Noise and Vibration Feasibility Study for the proposed development. The study results indicate preliminary acoustic mitigation measures on potential outdoor living areas (OLA) for Area E. Acoustic mitigation measures will be provided as necessary upon confirmation of all OLA locations at the site plan design stage. It is noted that a potential OLA at the building's ground level includes an acoustic barrier and is reflected conceptually on the grading plan.

*Refer to **Appendix H** for the Noise and Vibration Feasibility Study completed by HGC (February 2022).*

11.1. SUMMARY

The proposed development can be adequately serviced through a combination of existing and proposed municipal infrastructure. In summary:

- Sanitary Servicing will be accomplished by constructing local sanitary sewers on Dundas Street, which will connect to the existing 600 mm diameter municipal sanitary sewer within Millcroft Park Drive.
- Water servicing for domestic potable and fire protection will be through connections along Dundas Street to the existing 250 mm diameter watermain within Millcroft Park Drive and the construction of local watermains.
- Stormwater drainage (controlled in a sub-surface tank) will discharge into the adjacent watercourse to the southwest via a grassed swale through the hydro corridor.
- Grading will be in accordance with City of Burlington requirements and minimize on-site earthworks to maximize the reuse of soils within the property and avoid the need for retaining walls.
- Erosion and Sediment Control measures will be designed following City of Burlington, MECP and CH requirements.
- The development of the site is feasible from a noise & vibration perspective.

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12 EROSION & SEDIMENT CONTROL

The erosion and sediment control (E&SC) plan for the site servicing program of the subject lands will be designed, approved, and implemented in conformance with the City of Burlington, CH and MECP recommendations.

Erosion and sediment control will be implemented for all construction activities, including topsoil stripping, foundation excavation, and material stockpiling. .

The following erosion and sediment control measures will be installed and maintained during construction:

- A temporary sediment control fence will be installed prior to grading along the perimeter of the proposed area of disturbance
- A construction plan will be implemented to limit the size of disturbed areas and to minimize non-essential clearing
- Sediment traps will be provided
- Gravel mud mats will be provided at construction vehicle access points to minimize off-site tracking of sediments
- All temporary erosion and sediment control measures will be routinely inspected and repaired during construction. Temporary controls will not be removed until the areas they serve are restored and stable.

Recognizing that erosion and sediment control is a dynamic process, a detailed set of staging plans/construction sequencing will be required for the various stages of creek work, earthworks, servicing, site plan construction, and stabilization, coupled with the proposed development phasing. Each Area may require unique E&SC measures. The E&SC plans will be prepared by a qualified professional (i.e., CISEC, CPESC or an approved equivalent).

13 CONCLUSION

The subject property can be adequately serviced through a combination of existing and proposed municipal infrastructure. In summary:

- Sanitary Servicing will be accomplished by constructing local sanitary sewers on Dundas Street, which will connect to the existing 600 mm diameter municipal sanitary sewer within Millcroft Park Drive.
- Water servicing for domestic potable and fire protection will be through connections along Dundas Street to the existing 250 mm diameter watermain within Millcroft Park Drive and the construction of local watermains.
- Storm drainage will discharge into the adjacent watercourse to the southwest via a grassed swale through the hydro corridor.
- Grading will be in accordance with City of Burlington requirements and minimize on-site earthworks to maximize the reuse of soils within the property and mitigate the need for retaining walls.
- Erosion and Sediment Control measures will be designed following City of Burlington, MECP and CH requirements.

Should you have any questions regarding the information provided in this report, please do not hesitate to contact the undersigned.

Report Prepared by:





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DRAWINGS

APPENDIX A

GEOTECHNICAL FEASIBILITY STUDY
(DS Consultants Ltd.)

APPENDIX B

HYDROGEOLOGICAL REPORT
FOUNDATION DRAIN ANALYSIS MEMO
(RJB)

APPENDIX C

AS-CONSTRUCTED DRAWINGS
(REGION OF HALTON)

APPENDIX D

SANITARY SEWER DESIGN SHEETS

APPENDIX E

PRELIMINARY WATER DISTRIBUTION MODELLING REPORT (MES)

APPENDIX F

STORM DESIGN CALCULATIONS

Storm Sewer Design Sheets & Overland Flow Capacity

APPENDIX G

SWM DESIGN CALCULATIONS

Visual OTTHYMO 6.2 Modelling Files, Output & Schematics

APPENDIX H

NOISE STUDY
(HGC)

APPENDIX I

ARBORIST REPORT
(BEACON)

APPENDIX J

CRANE REVIEW LETTER
(59 PROJECT MANAGEMENT INC.)