Lithos

August 2019

UD18-050

Functional Servicing and Stormwater Management Report



Project: 2093-2101 Old Lakeshore Road and 2096-2100 Lakeshore Road

Core FSC Lakeshore GP Inc. and Core FSC Lakeshore Limited

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Issues and Revisions Registry

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Executive Summary

Lithos Group Inc. (Lithos) was retained by Core FSC Lakeshore GP Inc. and Core FSC Lakeshore Limited (the "Owners") to prepare a Functional Servicing and Stormwater Management (FSR-SWM) Report in support of a Zoning Application for a proposed mixed-use development at 2093-2101 Old Lakeshore Road and 2096-2100 Lakeshore Road (L7R 4Z4), in the City of Burlington (the "City"). The following is a summary of our conclusions:

Storm Drainage

A more detailed Stormwater Management report will be prepared during the Site Plan Application. The property's existing drainage pattern is separated into two drainage areas (one flowing north towards Lakeshore Road and one flowing south towards Old Lakeshore Road). Following that fact, our analysis ensures that the drainage pattern is maintained under Post-development conditions. In addition, the site stormwater discharge will be controlled to the 2-year pre-development flows as specified by the City of Burlington comments provided in the pre-consultation meeting held on January 16, 2019. Proposed storm laterals will be connected to the existing 450 mm diameter storm sewer on Old Lakeshore Road and to the existing 850 mm diameter storm sewer on Lakeshore Road. In order to attain the target flows and meet the City's Wet Weather Flow Management Guidelines (WWFMG), quantity controls will be utilized and up to 36.4 m^3 and 23.2 m^3 of underground storages will be required for both areas flowing towards Old Lakeshore Road and Lakeshore Road, respectively. The stormwater management (SWM) system will be designed to provide enhanced level (Level 1) protection as specified by the Ministry of the Environment, Conservation and Parks (MECP). During Site Plan Application, a detailed analysis will be provided to assess the water quality on site and determine additional measures in order to achieve a minimum total suspended solids (TSS) removal of 80%.

Sanitary Sewers

The development will be connected to a proposed manhole, discharging into the 200mm sanitary sewer on Old Lakeshore Road. The additional net discharge flow from the proposed development (sanitary and groundwater), is anticipated at approximately 8.17 L/s.

Water Supply

Water supply for the site will be from the existing 450 mm diameter watermain on Lakeshore Road. It is anticipated that a total design flow of 64.53 L/s will be required to support the proposed development. The results of the hydrant flow test, prepared by Cole Engineering, dated November 28, 2018, reveal the existing water infrastructure can support the proposed development.

Site Grading

The proposed grades will improve the existing drainage conditions to meet the City's/Regional requirements. Grades will be maintained along the property line wherever feasible and emergency overland flow will be gravity driven to the adjacent right-of-way's (ROW).

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1.0 Introduction

Lithos Group Inc. (Lithos) was retained by Core FSC Lakeshore GP Inc. and Core FSC Lakeshore Limited (the "Owners") to prepare a Functional Servicing and Stormwater Management (FSR-SWM) Report in support of Zoning Application for a proposed mixed-use development at 2093-2101 Old Lakeshore Road and 2096-2100 Lakeshore Road (L7R 4Z4), in the City of Burlington (the "City").

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

We contacted the City's engineering department and Region of Halton to obtain existing information in preparation of this report. The following documents were available for our review:

- Plan and Profile drawings of Pearl Street, drawing No. B-5213, dated January 1984 and drawing No. N 38-9, dated November 1971;
- Plan and Profile drawings of Gore/Junction Street, drawing No. B-7327, dated June 1985 and drawing No. N 38-8, "as constructed" on October 1976;
- Plan and Profile drawings of Lakeshore Road, drawing No N 38-2, dated December 19
- Plan and Profile drawings of Old Lakeshore Road, drawing No N 38-3, dated December 1971;
- Site Statistics prepared by Studio JCI, drawing No. A0.00, dated August 22, 2019;
- Conceptual Site Plan prepared by Studio JCI, drawing No. A1.00, dated August 22, 2019;
- Topographic Survey prepared by Aksan Piller Corporation LTD, dated October 4, 2017; and
- Hydrogeological Site Assessment prepared by Fisher Environmental LTD, dated December 21, 2017.

2.0 Site Description

The existing site is approximately 0.336 hectares and is currently occupied by two (2) two-storey commercial buildings, one (1) two and a half-storey commercial building, one (1) two-storey residential dwelling and outdoor parking area, as indicated in the topographic survey in **Appendix B**. The site is bound by Old Lakeshore Road to the south, Lakeshore Road to the north and parking lots to the east and west. Refer to **Figures 1** and **2** following this report and site photographs in **Appendix A**.

3.0 Site Proposal

The proposed development will be a single 27-storey mixed-use building, with an additional mechanical penthouse level. The building will consist of 310 residential units and will be serviced by four (4) levels of underground parking. There will also be an existing heritage building that will be maintained in its present form. The development will include a total 22,741.8 m^2 of Gross Floor Area (GFA). In addition, an area of approximately 0.011 ha, along Lakeshore Road, will be dedicated to the City. Please refer to **Appendix B** for the proposed site plan and site statistics.

4.0 Terms of Reference and Methodology

4.1. Terms of Reference

The Terms of Reference used for the scope of this report was based on the Region of Halton Water and Wastewater Linear Design Manual (Halton Region, July 2017), the Ministry of Environment, Conversation and Parks (MECP) 2003, the TRCA /CVC Low Impact Development Stormwater Management Planning and Design Guide and local engineering standards provided by the City of Burlington.

4.2. Methodology: Stormwater Drainage and Management

This report provides an overview of the pre and post development conditions and comments on opportunities to reduce peak flows. A more detailed Stormwater Management (SWM) report will be prepared at the site plan application stage.

The proposed development will be designed to meet the City's Design Criteria and the standards of the Province of Ontario as set out in the Ministry of Environment, Conservation and Parks (MECP) 2003 Stormwater Management Planning and Design Manual (SWMPD). The following design criteria will be reviewed:

- Post-development peak flows for the 100-year storm event for both drainage areas (towards Lakeshore Road and towards Old Lakeshore Road) should be controlled to the 2-year target flows. This criteria is consistent with the City of Burlington comments provided in the pre-consultation meeting held on January 16, 2019;
- A safe overland flow will be provided for all flows in excess of the 100-year storm event.

4.3. Methodology: Sanitary Discharge

The sanitary sewage discharge from the site will be determined using the guidelines as set out in Water and Wastewater Linear Design Manual by the Region of Halton. The calculated values provide peak sanitary flow discharge that considers infiltration.

The estimated sanitary discharge flows from the proposed site will be calculated based on the criteria shown in **Table 4-1.**

Table 4-1 – Sanitary Flows

Usage	Design Flow	Units	Population Equivalent
Residential (Apartment over 6 stories)	285	persons/ ha	0.275 (m^3 per capita per day)
Commercial	90		78.375 (m^3 per hectare per day)

4.4. Methodology: Water Usage

The domestic water usage was calculated based on the City's design criteria outlined in **Table 4-2**.

Table 4-2 – Water Usage

Usage	Water Demand	Units
Apartments (over 6 stories high)	275	Litres / capita
Commercial		

Pressure and flow tests have been conducted on the existing hydrants located near the site along Lakeshore Road, to obtain existing flows, residual and static pressure.

5.0 Stormwater Management and Drainage

5.1. Existing Conditions

The subject lands are located in the Burlington's Urban Creeks drainage shed.

The existing site is approximately 0.336 hectares and is currently occupied by two (2) two-storey commercial buildings, one (1) two and a half-storey commercial building, one (1) two-storey residential dwelling and outdoor parking area. The site drains partially towards Old Lakeshore Road and partially towards Lakeshore Road. Moreover, no external areas drain towards subject property.

According to available records, there are three (3) storm sewers abutting the subject property. More specifically:

- A 760mm diameter storm sewer on Lakeshore Road flowing north;
- A 850mm diameter storm sewer on Lakeshore Road flowing east; and
- A 450mm diameter storm sewer on Old Lakeshore Road flowing west.

Two (2) internal drainage areas were identified in the existing site:

1. A1 Pre – Storm runoff from the south portion of the site, which incorporates the runoff from the outdoor parking areas, the driveway and the existing buildings' rooftops, being discharged into the City's storm network along Old Lakeshore Road;

2. A2 Pre – Storm runoff from the north portion of the site, which incorporates the runoff from the outdoor parking areas, the driveway and existing buildings' rooftops, discharged into the City's storm network along Lakeshore Road. For details, please refer to **STM-1** in **Appendix C.**

The existing site is primarily covered by impermeable areas, thus, there is no significant infiltration onsite. Although the existing run-off coefficients for the areas draining towards Old Lakeshore Road and Lakeshore Road are estimated at 0.82 and 0.80, respectively, the WWFMG requires target flow calculations based on a run-off coefficient of 0.50. The input parameters are summarized in **Table 5-1** and are illustrated on **Figure STM1**, located in **Appendix C**.

Table 5-1 – Input Parameters

Catchment	Drainage Area (ha)	Actual "C"	Design "C"	Tc (min.)
A1 Pre – Draining Towards Old Lakeshore Road	0.200	0.82	0.50	10
A2 Pre (Old Lakeshore Road)	0.125	0.80	0.50	10

Peak flows calculated for the existing conditions are shown in **Table 5-2** below. Detailed calculations are in **Appendix C**.

Table 5-2 – Target Peak Flows

Catchment	Peak Flow Rational Method (L/s)		
	2-year	5-year	100-year
A1 Pre (Old Lakeshore Road)	18.9	24.5	39.4
A2 Pre (Lakeshore Road)	11.9	15.3	24.7

As shown in **Table 5-2**, the post-development flows will need to be controlled to the target flow of 18.9 L/s and 11.9 L/s for the areas draining towards Old Lakeshore Road and Lakeshore Road, respectively.

5.2. Stormwater Management

In order to meet the WWFMG criteria, the development flow rates for the areas draining towards Old Lakeshore Road and Lakeshore Road are to be controlled to the two (2) year target flows established in **Section 5.1**.

The site consists of four (4) internal drainage areas:

1. A1 Post – Storm runoff from rooftops, terraces and outdoor amenity area controlled in the underground storage tank-2;
2. A2 Post – Uncontrolled runoff draining towards Old Lakeshore Road;
3. A3 Post – Storm runoff from the north side of the rooftops, terraces and outdoor amenity space, controlled in the underground storage tank-1; and,
4. A4 Post – Uncontrolled runoff draining towards Lakeshore Road.

The pre and post-development drainage areas and runoff coefficients are summarized in **Table 5-3** below.

Table 5-3 – Post-development Input Parameters

Drainage Area	Drainage Area (ha)	"C"	Tc (min.)
A1 Post (Roofs / Terraces / Outdoor Amenity Area - Controlled)	0.210	0.90	10
A2 Post (Uncontrolled)	0.002	0.90	10
A3 Post (Amenity space - Controlled)	0.109	0.90	10
A4 Post (Uncontrolled)	0.004	0.90	10

The pre and post-development drainage areas and runoff coefficients are indicated on **Figure STM1**, located in **Appendix C**.

5.2.1. Quantity Controls

Using the City's intensity-duration-frequency (IDF) data, modified rational method calculations were undertaken to determine the maximum storage required during each storm event. Results for the 2, 5 and 100-year storm events are provided in **Table 5-4**. The detailed post-development quantity control calculations are provided in **Appendix C.**

5.2.1.1 Area draining towards Old Lakeshore Road

Table 5-4 – Post-development Quantity Control towards Old Lakeshore Road as per City Requirements

Storm Event	Target Flow (L/s)	Required Storage Tank Volume (m^3)	Total Site Release Rate (L/s)
2-year	18.9	14.7	17.6
5-year		20.1	
100-year		36.4	

As shown in **Table 5-4,** in order to control post-development flows to the 2-year pre-development conditions, a target flow of 18.9 L/s is to be satisfied. The required on-site storage is accommodated by the underground storage tank-2 located at P1 Level.

The stormwater flow from the rooftops / terraces and from a small portion of amenity space, located at the south side of the property (Drainage Area A1 Post), will be gravity driven into the proposed underground storage tank-2.

Storm runoff from the underground storage tank will be controlled by a 75 mm diameter orifice tube with a maximum release rate of 16.6 L/s achieved and will be ultimately directed through gravity towards the existing 450 mm storm sewer on Old Lakeshore Road. Detailed calculations are provided in **Appendix C**.

The maximum post-development stormwater release rate from the underground storage tank-2 and the uncontrolled area during a 100-year storm event, is estimated at 17.6 L/s, which is less than the target flow of 18.9 L/s.

Consequently, the proposed SWM plan in conjunction with the proposed grading and servicing, retains enough runoff volume to reduce the post-development peak flows for each storm event to the required target flow.

5.2.1.2 Area draining towards Lakeshore Road

Table 5-5 – Post-development Quantity Control towards Lakeshore Road as per City Requirements

Storm Event	Target Flow (L/s)	Required Storage Tank Volume (m^3)	Total Site Release Rate (L/s)
2-year	11.9	9.6	11.9
5-year		13.2	
100-year		23.2	

As shown in **Table 5-5** in order to control post-development flows to the 2-year pre-development conditions, a target flow of 11.9 L/s is to be satisfied. The required on-site storage is accommodated by the underground storage tank-1 located at P1 Level.

The stormwater flow from a small portion of the rooftops'/terraces' north side, as well as, from the outdoor amenity space (Drainage Area A3 Post), will be gravity driven into the proposed underground storage tank-1.

Storm runoff from the underground storage tank will be controlled by a 75 mm diameter orifice tube with a maximum release rate of 10.5 L/s achieved, and will be ultimately directed through gravity towards the existing 850 mm storm sewer on Lakeshore Road. Detailed calculations are provided in **Appendix C**.

The maximum post-development stormwater release rate from the underground storage tank-1 and the uncontrolled area, during a 100-year storm event, is estimated at 11.9 L/s, which is equal to the target flow of 11.9 L/s.

Consequently, the proposed SWM plan in conjunction with the proposed grading and servicing, retains enough runoff volume to meet the post-development peak flow for 100-year storm event to the required target flow and reduce the post-development peak flows for 2 and 5-year storm events to the required target flow.

5.2.2. Quality Controls

Stormwater treatment must meet Enhanced Protection criteria as defined by the MECP 2003 SWMPD Manual, including the removal of at least 80% total suspended solids (TSS). Quality control and the need of additional measures is required, details of which will be discussed during Site Plan Application.

5.3. Proposed Storm Connection

The proposed development will have two (2) storm connections, towards Old Lakeshore Road and towards Lakeshore Road.

Proposed storm connection towards Old Lakeshore Road

The proposed development will connect to the existing 450mm diameter storm sewer along Old Lakeshore Road, via a 150 mm storm sewer service connection, with a minimum grade of 2.00% (or equivalent pipe design).

Proposed storm connection towards Lakeshore Road

The proposed development will connect to the existing 850 mm diameter storm sewer along Lakeshore Road, via a 150 mm storm sewer service connection, with a minimum grade of 2.00% (or equivalent pipe design).

Orifice controls for the areas draining towards Old Lakeshore Road and Lakeshore Road, will be designed to meet the allowable release rates to the municipal system and will be defined at the detailed design stage. Refer to engineering drawing "**SS-01**" (submitted separately) indicating the stormwater service connection.

6.0 Groundwater Conditions

According to the Hydrogeological Investigation prepared by Fisher Environmental LTD., dated December, 2017, water table ranges from 75.52 to 80.39m asl.. In addition, the proposed development will be serviced by four (4) basement levels and the lowest level will be approximately from 70.45m asl, therefore, long-term and short-term groundwater discharge will be required.

The results of groundwater sampling on site reveal that groundwater exceeds the City's limits of total suspended solids for discharging into the storm sewer network, however, it is within the City's limits for discharging into the sanitary sewer network. Thus, groundwater can be discharged into the sanitary sewer network without treatment. The results of the Hydrogeological Site Assessment can be found in **Appendix B**.

6.1. Long-Term Dewatering

Given that the underground construction will be partially submerged into the existing groundwater table, long-term groundwater discharge, along with the installation of a permanent dewatering system, will be required. Groundwater flow rate of 15,000 L/day is estimated to be discharged on a permanent basis. Assuming that the pump will run for approximately 12 hours per day, long-term groundwater rate will be at 0.35 L/sec (groundwater peak flow rate). As mentioned above, groundwater is in compliance with the City of Burlington sanitary and combined sewer limits, therefore, it will be collected by the building's sub-drain system and will be pumped into the City's sanitary sewer network, along Old Lakeshore Road, without treatment. More specifically, groundwater flow will be pumped into the proposed sanitary manhole, before finally being discharged into the City's 200mm diameter sanitary sewer along Old Lakeshore Road, via a proposed sanitary manhole. Groundwater will have a sampling access point for the City's access and inspection. Details and section for the groundwater sampling access point will be provided during Site Plan Application Stage. Since daily groundwater volume is less than 50,000 litres, neither an application for Permit to Take Water ("PTTW") nor an application for Environment Activity and Sector Registry ("EASR") is necessary.

6.2. Short-Term Dewatering

Short-term groundwater discharge (during construction) is estimated at 15,000 L/day. Assuming that the temporary groundwater pump will run for approximately 12 hours per day, peak groundwater discharge rate will be at 0.35 L/s. Groundwater will be discharged into the City's 200mm diameter sanitary sewer along Old Lakeshore Road without treatment. Same as long-term groundwater discharge, the applicant will not require to obtain a PTTW or EASR application during construction.

7.0 Sanitary Drainage System

7.1. Existing Sanitary Drainage System

According to available records, there are two (2) sanitary sewers, abutting the subject property. More specifically:

- A 450mm diameter sanitary sewer along Lakeshore Road flowing east; and
- A 200mm diameter sanitary sewer along Old Lakeshore Road flowing east.

The sanitary flow generated by the proposed development at 2093-2101 Old Lakeshore Road and 2096-2100 Lakeshore Road was compared to the existing flow in order to quantify the net increase in the combined sewer network.

7.2. Existing Flows

Using the design criteria outlined in **Section 4.3** and existing site information, the sanitary discharge flow from the existing building is estimated at 0.11 L/s. Detailed calculations can be found in **Appendix D**.

7.3. Proposed Sanitary Flows

Using the design criteria outlined in **Section 4.3** and proposed site statistics, the new building will discharge 8.29 L/s (7.94 L/s sanitary flow and 0.35 L/s groundwater flow) into the City's infrastructure.

7.4. Proposed Sanitary Connection

The proposed development will connect to a proposed manhole discharging on the existing 200mm diameter sanitary sewer on Old Lakeshore Road, via a proposed 200mm diameter lateral at a minimum grade of 2.00% (or equivalent pipe design). Refer to engineering drawing "**SS-01**" (submitted separately) for details.

8.0 Water Supply System

8.1. Existing System

According to available records, there are two (2) watermains, abutting the subject property. More specifically:

- A 450mm diameter watermain along Lakeshore Road; and
- A 300mm diameter watermain along Old Lakeshore Road.

Hydrant flow tests were carried out by Cole Engineering on November 28, 2018 along Lakeshore Road, to determine the flow and pressure in the existing 450 mm watermain sewer.

The results of the test indicate the existing static pressure is 483 KPa (70 psi) and 94.24 L/sec (1462 USPGM) of water is available with a residual pressure of 441 KPa (64 psi). The full detailed report is included in **Appendix E**.

8.2. Proposed Water Supply Requirements

The estimated water consumption was calculated based on the occupancy rates shown on **Table 4-2**, according to the Region's watermain design criteria, revised in July 2017. It is anticipated that an average consumption of approximately 2.01 L/s (173,664 L/day), a maximum daily consumption of 4.53 L/s (391,392 L/day), a peak hourly demand for residential use of 8.06 L/s (29,016 L/hr) and a peak hourly demand for commercial use of 4.53 L/s (16,308 L/hr) will be required to service this development with domestic water. Detailed calculations are found in **Appendix E**.

The fire flow requirements were estimated using the method prescribed by the Fire Underwriters Survey (FUS) be undertaken to assess the minimum requirement for fire suppression. The fire flow calculations is normally conducted for the largest storey, by area, and for the two immediately adjacent storeys.

We have selected the equally greatest Levels 02, 03 and 04, which result to the greatest fire flow required for this development. **Table 8-1** illustrates the input parameters used for the FUS calculations. According to our calculations, a minimum fire suppression flow of approximately 63.75 L/s (1,010 USGPM) will be required. Refer to detailed calculations found in **Appendix E**.

Table 8-1 – Fire Flow Input Parameter

Parameter	Frame used for Building	Combustibility of Contents	Presence of Sprinklers	Separation Distance			
				North	East	South	West
Value according to FUS options	Fire-Resistive Construction	Combustible	Yes	Road	20.1m-30.0m	Road	Parking
Surcharge/reduction from base flow	0.6	25%	30%	0%	10%	0%	0%

In summary, the required design flow is the sum of 'the minimum fire suppression flow' and 'maximum daily demand' (60.00 + 4.53 = 64.53 L/s, 1,023 USGPM).

The results of the hydrant flow test carried out by Cole Engineering on November 28, 2018 along Lakeshore Road, reveal that the existing water infrastructure has 4,713 USGPM at 20psi and will support the proposed development. The hydrant flow test can be found in **Appendix E**.

8.3. Proposed Watermain Connection

The proposed development will be serviced by a 150mm diameter fire and a 100mm diameter domestic water. According to Region's standard drawing RH-409.01, the 150 mm water service will be split two (2) meters from the property line and valve and boxes will be installed on each service at the property line.

The proposed water service will be connected to the existing 300 mm diameter watermain on Lakeshore Road. Refer to engineering drawing "**SS-01**" (submitted separately) indicating the water service connection.

9.0 Erosion and Sediment Control during construction

Erosion and sediment control measures will be designed and will include sediment fencing, a construction access driveway, check dams and temporary sediment control facilities where required. These measures will be designed and constructed as per the "Erosion and Sediment Control Guideline for Urban Construction" document (December 2006). The detailed erosion and sediment control plan will be approved by the Town and Region prior to any site alteration being undertaken. All reasonable measures will be taken to ensure sediment loading to the adjacent properties and storm sewers is minimized both during and following construction.

10.0 Site Grading

10.1. Existing Grades

The existing site is approximately 0.336 hectares and is currently occupied by two (2) two-storey commercial buildings, one (1) two and a half-storey commercial building, one (1) two-storey residential dwelling and outdoor parking area. Moreover, it is located between Old Lakeshore Road and Lakeshore Road, in the City of Burlington. The site generally drains to the existing stormwater system inside the property and by overland towards the adjacent right of ways (ROW).

10.2. Proposed Grades

The proposed grades will improve the existing drainage conditions to meet the City's requirements. The existing grades will be maintained along the property line and emergency overland flow will be directed to adjacent right of ways.

11.0 Conclusions and Recommendations

Based on our investigations, we conclude the following:

Storm Drainage

A more detailed Stormwater Management report will be prepared at the Site Plan Application. The property's existing drainage pattern is separated into two drainage areas (one flowing north towards Lakeshore Road and one flowing south towards Old Lakeshore Road). Following that fact, our analysis assumes that the drainage pattern is maintained under Post-development conditions.

Therefore, the site stormwater discharge will be controlled to the 2-year pre-development flows as specified by the City of Burlington comments provided in the pre-consultation meeting held on January 16, 2019. Proposed storm laterals will be connected to the existing 450 mm diameter storm sewer on Old Lakeshore Road and to the existing 850 mm diameter storm sewer on Lakeshore Road. In order to attain the target flows and meet the City's Wet Weather Flow Management Guidelines (WWFMG), quantity controls will be utilized and up to 36.4 m^3 and 23.2 m^3 of underground storages will be required for both areas flowing towards Old Lakeshore Road and Lakeshore Road, respectively.

The stormwater management (SWM) system will be designed to provide enhanced level (Level 1) protection as specified by the Ministry of the Environment, Conservation and Parks (MECP). During Site Plan Application, a detailed analysis will be provided to assess the water quality on site and determine additional measures in order to achieve a minimum total suspended solids (TSS) removal of 80%.

Sanitary Sewers

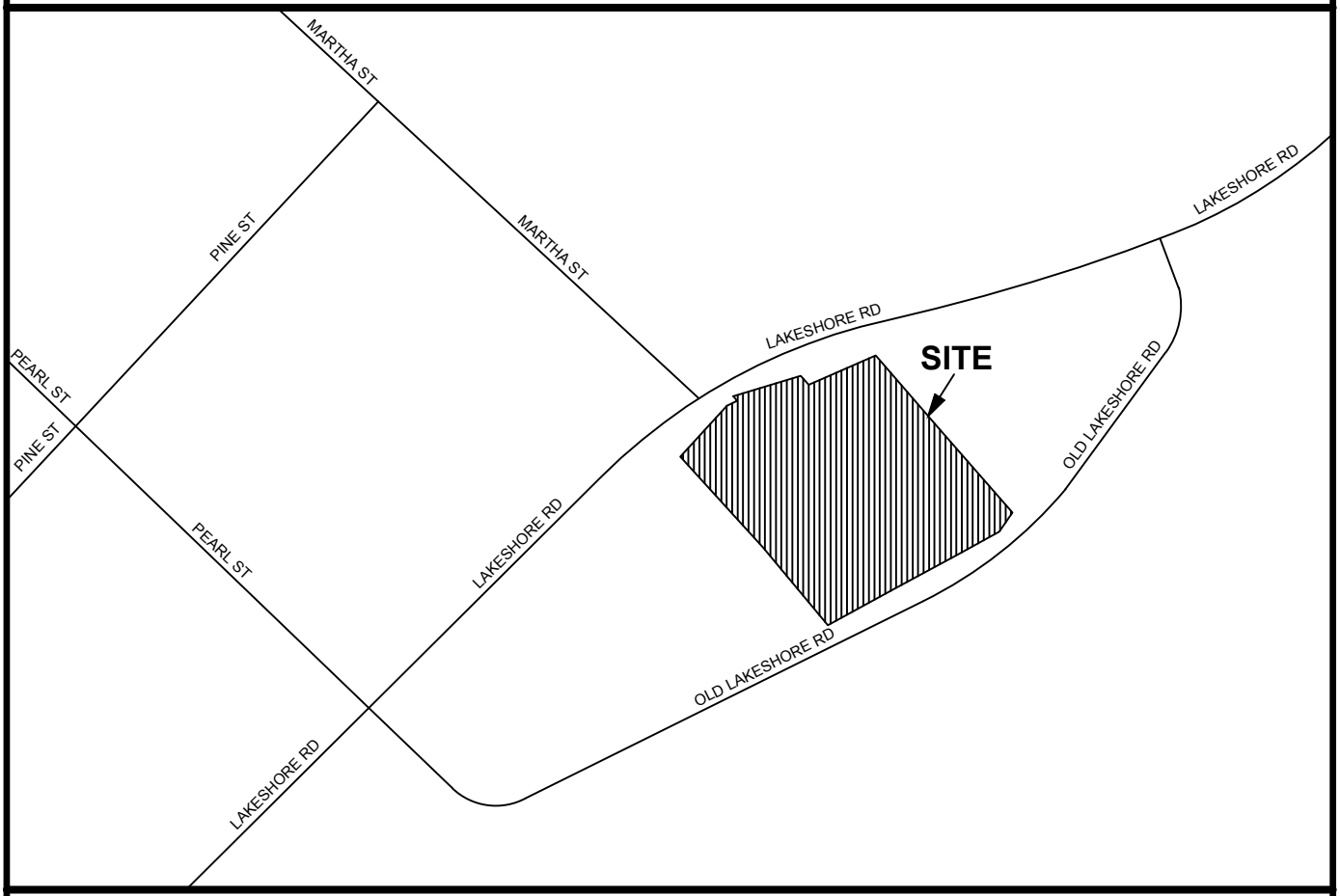
The development will be connected to a proposed manhole discharging into the 200mm sanitary sewer on Old Lakeshore Road. The additional net discharge flow from the proposed development (sanitary and groundwater), is anticipated at approximately 8.17 L/s.

Water Supply

Water supply for the site will be from the existing 450 mm diameter watermain on Lakeshore Road. It is anticipated that a total design flow of 64.53 L/s will be required to support the proposed development. The results of the hydrant flow test, prepared by Cole Engineering, dated November 28, 2018, reveal the existing water infrastructure can support the proposed development.

Site Grading

The proposed grades will improve the existing drainage conditions to meet the City's/Regional requirements. Grades will be maintained along the property line wherever feasible and emergency overland flow will be gravity driven to the adjacent right-of-way's (ROW).



Lithos

150 Bermondsey Road, North York, Ontario M4A 1Y1

LOCATION PLAN

MIXED USE DEVELOPMENT
2093-2101 OLD LAKESHORE ROAD AND 2096-2100 LAKESHORE ROAD
BURLINGTON, ONTARIO

DATE:	AUGUST 2019	PROJECT No:	UD18-050
SCALE:	N.T.S.	FIGURE No:	FIG 1



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150 Bermondsey Road, North York, Ontario M4A 1Y1

AERIAL PLAN

MIXED USE DEVELOPMENT
2093-2101 OLD LAKESHORE ROAD AND 2096-2100 LAKESHORE ROAD
BURLINGTON, ONTARIO

DATE:	AUGUST 2019	PROJECT No:	UD18-050
SCALE:	N.T.S.	FIGURE No:	FIG 2

APPENDIX A
Site Photographs



North West Corner of Property – Facing East towards Old Lakeshore Road



North-East Corner of Property – Facing West towards Old Lakeshore Road



South-East Corner of Property – Facing West towards Lakeshore Road



South West- Corner of Property – Facing East towards Old Lakeshore Road

APPENDIX B
Background Information

SURVEYOR'S REAL PROPERTY REPORT

PART 1:

PLAN OF PART OF LOTS 6 & 10, LOT 7, 8 & 9, BLOCK Q REGISTERED PLAN 92 CITY OF BURLINGTON

SCALE 1 : 200

0 1 2 3 4 5 10 20m

AKSAN PILLER CORPORATION LTD.

PART 2:

PREPARED FOR CORE DEVELOPMENT GROUP Ltd.

LOCATION OF THE BUILDING:	WHOLLY ON THE PROPERTY,
EAVES:	CLEAR,
UTILITY BUILDINGS:	AS SHOWN ON PART 1,
DECKS:	AS SHOWN ON PART 1,
SWIMMING POOLS:	NONE,
EXISTING FENCES:	GENERALLY ALONG THE PROPERTY LINES, WITH DEVIATIONS AS SHOWN ON PART 1,
EASEMENTS:	NONE REQITED IN THE LAST REGISTERED INSTRUMENT,
DRIVEWAY:	AS SHOWN ON PART 1.

LEGEND:

■	DENOTES	SURVEY MONUMENT FOUND
□	DENOTES	SURVEY MONUMENT PLANTED
IB	DENOTES	IRON BAR
SIB	DENOTES	STANDARD IRON BAR
SSIB	DENOTES	SHORT STANDARD IRON BAR
CC	DENOTES	CUT CROSS
CP	DENOTES	CONCRETE PIN
WIT	DENOTES	WITNESS MONUMENT
O/U	DENOTES	ORIGIN UNKNOWN
N	DENOTES	NORTH
S	DENOTES	SOUTH
E	DENOTES	EAST
W	DENOTES	WEST
Fc.	DENOTES	FENCE
CLF	DENOTES	CHAIN LINK FENCE
BF	DENOTES	BOARD FENCE
P & W	DENOTES	POST AND WIRE FENCE
D1	DENOTES	INST. No.
D2	DENOTES	INST. No.
D3	DENOTES	INST. No.
PLAN	DENOTES	REGISTERED PLAN 92
P1	DENOTES	PLAN 20R-14079
P2	DENOTES	PLAN 20R-5044
P3	DENOTES	PLAN 20R-15858
CBX	DENOTES	CABLE BOX
UP	DENOTES	UTILITY POLE
MH	DENOTES	MAN HOLE
CB	DENOTES	CATCH BASIN
LP	DENOTES	LAMP POST
CONC	DENOTES	CONCRETE
WW	DENOTES	WALKWAY
CR/W	DENOTES	CONCRETE RETAINING WALL
646	DENOTES	R.G. SEWELL, O.L.S.
MMP	DENOTES	CONCRETE RETAINING WALL

Ø0.50 DENOTES TREE TRUNK DIAMETER

ASSOCIATION OF ONTARIO LAND SURVEYORS
PLAN SUBMISSION FORM
2029259

THIS PLAN IS NOT VALID UNLESS IT IS AN EMBOSSED ORIGINAL COPY ISSUED BY THE SURVEYOR. In accordance with Regulation 1026, Section 29(3)

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

BEARING NOTE:
BEARINGS ARE REFERRED TO THE SOUTHER LIMIT OF LAKESHORE ROAD AS SHOWN ON PLAN 20R-15858 HAVING AN ASTRONOMIC BEARING OF N75°25'18"E.

ELEVATIONS NOTE:
ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE DERIVED FROM THE CITY OF BURLINGTON BENCH MARK 914001, ELEVATION = 77.901 m.

CAUTION:
TREE CALIPERS ARE NOT TO ARBORIST STANDARDS AND ARE DEFINED AT 1.4m ABOVE GRADE AT TREE FOR ARBORIST CALIPER REFER TO ARBORIST REPORT.

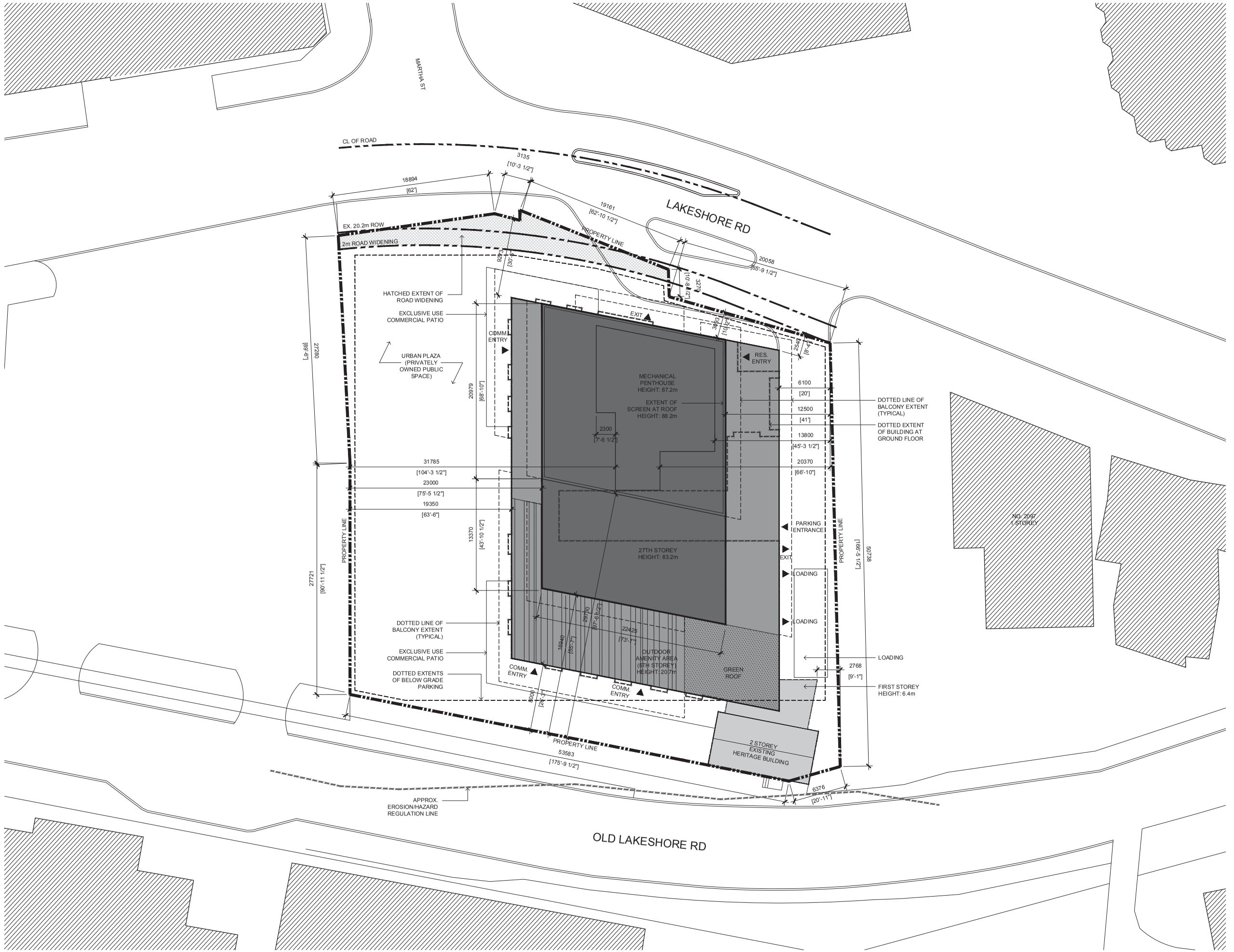
SURVEYOR'S CERTIFICATE:
I CERTIFY THAT:
1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 26th DAY OF SEPTEMBER, 2017

OCTOBER 4, 2017
DATE

HELMUT PILLER
Ontario Land Surveyor

AKSAN PILLER CORPORATION LTD
ONTARIO LAND SURVEYORS
943 MT PLEASANT ROAD, TORONTO, ONTARIO, M4P 2L7
(T) 416-488-1174 (F) 416-488-7843 (E) ap@apsurveys.ca www.apsurveys.ca

CALC.: MU DRAWN: LF CHECKED: HP
reference number: 17-24-12787-00



Revisions:

DESCRIPTION:	DATE:
Issued for OPA / ZBA	August 22, 2019

General Notes:

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2. Drawings are not to be scaled for construction. Contractor to verify all existing conditions and dimensions required to perform the Work and report any discrepancies with the Contract Documents to the Architect before commencing work.

3. Positions of exposed or finished mechanical or electrical devices, fittings, and fixtures are indicated on the Architectural drawings. The locations shown on the Architectural drawings govern over the Mechanical and Electrical drawings. Those items not clearly located will be located as directed by the Architect.

ARCHITECT:

STUDIO JCI

20 De Boers Drive suite 525
Toronto ON M3H 0H1
t. 416.901.6528 f. 416.901.8962
www.studiojci.com

STRUCTURAL:

READ JONES CHRISTOFFERSEN LTD.

100 University Ave, North Tower, Suite 400
Toronto ON M5J 1V6
t. 416.977.5335

MECHANICAL:

THE MITCHELL PARTNERSHIP INC.

285 Yorkland Blvd,
North York, ON M2J 1S5
t. 416 499.8000

ELECTRICAL:

MULVEY & BANANI INTERNATIONAL INC.

44 Mobile Drive, Toronto, Ontario
M4A 2P2
t. 416.751.2520

LANDSCAPE:

STUDIO TLA

20 Champlain Blvd,
North York, ON M3H 2Z1
t. 416.638.4911

CIVIL:

LITHOS GROUP INC.

150 Bermondsey Rd, Unit # 200
North York, Ontario M4A 1Y1
t. 416.750.7769

BURLINGTON MIXED-USE BUILDING

ADDRESS:
2096 - 2100 Lakeshore Rd, Burlington

CONCEPTUAL SITE PLAN

PROJECT NO.: 1816
SCALE: 1:200
DATE: AUGUST 22, 2019
DRAWN BY:

DRAWING NO.:

A1.00

PROPOSED MIXED USE DEVELOPMENT
2096-2100 LAKESHORE ROAD, BURLINGTON

AREA SUMMARY

Lot Area (existing):	**3,357.2 m2**	**36,137 sf**
Lot Area (minus widening)	**3,250.2 m2**	**34,985 sf**
Total Residential GFA:	**22,034.7 m2**	**237,180 sf**
Total Commercial GFA:	**707.1 m2**	**7,611 sf**
Total Building GFA:	**22,741.8 m2**	**244,791 sf**
Floor Area Ratio:	**7.64**	(based on Gross Building Floor Area)

	COMMON AREA/ CIRCULATION		VEHICLE PARKING		RESIDENTIAL		COMMERCIAL		RESIDENTIAL INDOOR AMENITY		RESIDENTIAL STORAGE		CONSTRUCTION AREA (GCA)		EFFICIENCY
	m2	*sf*	*m2*	*sf*	*m2*	*sf*	*m2*	*sf*	*m2*	*sf*	*m2*	*sf*	*m2*	*sf*	
P-4	121.3	1,306	2,608.6	28,079	0	0	0	0	0	0	81.2	874	**2,811.1**	**30,258**	
P-3	202.5	2,180	2,608.6	28,079	0	0	0	0	0	0	0	0	**2,811.1**	**30,258**	
P-2	202.5	2,180	2,608.6	28,079	0	0	0	0	0	0	0	0	**2,811.1**	**30,258**	
P-1	202.5	2,180	2,608.6	28,079	0	0	0	0	0	0	0	0	**2,811.1**	**30,258**	
Ground Floor	540.3	5,816	0	0	0	0	628.3	6,763	120.5	1,297	0	0	**1,289.1**	**13,876**	*49%*
2	140.1	1,508	0	0	1,097.4	11,812	78.8	848	97.9	1,054	49.1	529	**1,463.3**	**15,751**	*78%*
3	140.1	1,508	0	0	1,097.4	11,812	0	0	129.7	1,396	17.3	186	**1,384.5**	**14,903**	*81%*
4	140.1	1,508	0	0	1,097.4	11,812	0	0	129.7	1,396	17.3	186	**1,384.5**	**14,903**	*81%*
5	169.6	1,826	0	0	1,115.3	12,005	0	0	0	0	99.6	1,072	**1,384.5**	**14,903**	*88%*
6	169.6	1,826	0	0	1,115.3	12,005	0	0	0	0	99.6	1,072	**1,384.5**	**14,903**	*88%*
7	88.7	955	0	0	518.7	5,583	0	0	142.6	1,535	0	0	**750.0**	**8,073**	*69%*
8	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
9	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
10	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
11	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
12	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
13	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
14	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
15	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
16	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
17	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
18	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
19	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
20	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
21	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
22	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
23	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
24	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
25	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
26	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
27	88.7	955	0	0	661.3	7,118	0	0	0	0	0	0	**750.0**	**8,073**	*88%*
Mechanical PH	197.7	2,128	0	0	0	0	0	0	0	0	0	0	**197.7**	**2,128**	
Total	**4,089.0**	**44,014**	**10,434.4**	**112,315**	**19,267.5**	**207,394**	**707.1**	**7,611**	**620.4**	**6,678**	**364.1**	**3,919**	**35,482.5**	**381,930**	**84%**
					Note: not including balcony area		Note: includes 157.6m2 of existing comm. area in heritage building								

	GFA EXCLUSIONS		GROSS FLOOR AREA PER BYLAW 2020 PART 16		GFA EXCLUSIONS		GROSS BUILDING FLOOR AREA PER BYLAW 2020 PART 16	
	m2	*sf*	*m2*	*sf*	*m2*	*sf*	*m2*	*sf*
P-4	2,817.1	30,323	-6	-65	2611.6	28,111	199.5	2,147
P-3	2,817.1	30,323	-6	-65	2611.6	28,111	199.5	2,147
P-2	2,817.1	30,323	-6	-65	2611.6	28,111	199.5	2,147
P-1	2,817.1	30,323	-6	-65	2611.6	28,111	199.5	2,147
Ground Floor	414.0	4,456	875.1	9,419	0	0	1,289.1	13,876
2	79.4	855	1,383.9	14,896	0	0	1,463.3	15,751
3	79.4	855	1,305.1	14,048	0	0	1,384.5	14,903
4	79.4	855	1,305.1	14,048	0	0	1,384.5	14,903
5	118.0	1,270	1,266.5	13,632	0	0	1,384.5	14,903
6	118.0	1,270	1,266.5	13,632	0	0	1,384.5	14,908
7	18.4	198	731.6	7,875	0	0	750.0	8,073
8	18.4	198	731.6	7,875	0	0	750.0	8,073
9	18.4	198	731.6	7,875	0	0	750.0	8,073
10	18.4	198	731.6	7,875	0	0	750.0	8,073
11	18.4	198	731.6	7,875	0	0	750.0	8,073
12	18.4	198	731.6	7,875	0	0	750.0	8,073
13	18.4	198	731.6	7,875	0	0	750.0	8,073
14	18.4	198	731.6	7,875	0	0	750.0	8,073
15	18.4	198	731.6	7,875	0	0	750.0	8,073
16	18.4	198	731.6	7,875	0	0	750.0	8,073
17	18.4	198	731.6	7,875	0	0	750.0	8,073
18	18.4	198	731.6	7,875	0	0	750.0	8,073
19	18.4	198	731.6	7,875	0	0	750.0	8,073
20	18.4	198	731.6	7,875	0	0	750.0	8,073
21	18.4	198	731.6	7,875	0	0	750.0	8,073
22	18.4	198	731.6	7,875	0	0	750.0	8,073
23	18.4	198	731.6	7,875	0	0	750.0	8,073
24	18.4	198	731.6	7,875	0	0	750.0	8,073
25	18.4	198	731.6	7,875	0	0	750.0	8,073
26	18.4	198	731.6	7,875	0	0	750.0	8,073
27	18.4	198	731.6	7,875	0	0	750.0	8,073
Mechanical PH	197.7	2,128	0	0	197.7	2,128	0	0
Total	**12,740.7**	**137,140**	**22,741.8**	**244,791**	**10,446.4**	**112,444**	**24,838.4**	**267,358**

UNITS SUMMARY

Level	RESIDENTIAL UNITS					
	1B	*1B+D*	*2B*	*2B+D*	*3B*	**total**
1						0
2	5	1	8	2	1	17
3	5	1	8	2	1	17
4	5	1	8	2	1	17
5	5	1	8	2	1	17
6	5	1	8	2	1	17
7	4	2	2	1		9
8	4	3	2	1	1	11
9	4	3	2	1	1	11
10	4	3	2	1	1	11
11	4	3	2	1	1	11
12	4	3	2	1	1	11
13	4	3	2	1	1	11
14	4	3	2	1	1	11
15	4	3	2	1	1	11
16	4	3	2	1	1	11
17	4	3	2	1	1	11
18	4	3	2	1	1	11
19	4	3	2	1	1	11
20	4	3	2	1	1	11
21	4	3	2	1	1	11
22	4	3	2	1	1	11
23	4	3	2	1	1	11
24	4	3	2	1	1	11
25	4	3	2	1	1	11
26	3	2	2		2	9
27	3	2	2		2	9
Total	**107**	**65**	**82**	**29**	**27**	**310**
	35%	**21%**	**26%**	**9%**	**9%**	**100%**
Avg. size (sf)	512	597	725	895	1,075	

Avg. Size (building): 669 sf

Proposed Vehicle Parking

Use	Units	Required Parking Rate	Proposed Parking Rate	Proposed Supply
Resident Parking	310	1.00	1.00	294 + 4 car share
Visitor Parking		0.25	0.10	30
Total Parking			**1.10**	**340** *

* plus 5 compact spaces

Proposed Bicycle Parking

Land Use	Type	Units/ GFA (m2)	Min. Parking Rate	Min. Required Spaces	Proposed Supply
Residential	Short-Term	310	0.05	16	16
	Long-Term		0.5	155	156
Retail	Short-Term	707.0	3 plus 1 / 1000 m^2	4	8
	Long-Term		2 plus 1 / 1000 m^2	3	0
			Total Short-Term	**20**	**24**
			Total Long-Term	**158**	**156**
			TOTAL BICYCLE PARKING	**178**	**180**

Proposed Amenity Space

	Indoor (m2)	Outdoor (m2)	Total / unit
Residential	620.4		
Residential		322.2	
Residential (private balconies)		4,961.3	
POPS (at grade)		1,098.4	
Total Proposed	**620.4**	**6,381.9**	**7,002.3**
Total per unit	**2.0**	**20.6**	**22.6**
Zoning requirement			20.0

Storage Lockers	105

Revisions:

Issued for OPA / ZBA August 22, 2019

DESCRIPTION: DATE:

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BURLINGTON MIXED-USE BUILDING

ADDRESS:
2096 - 2100 Lakeshore Rd, Burlington

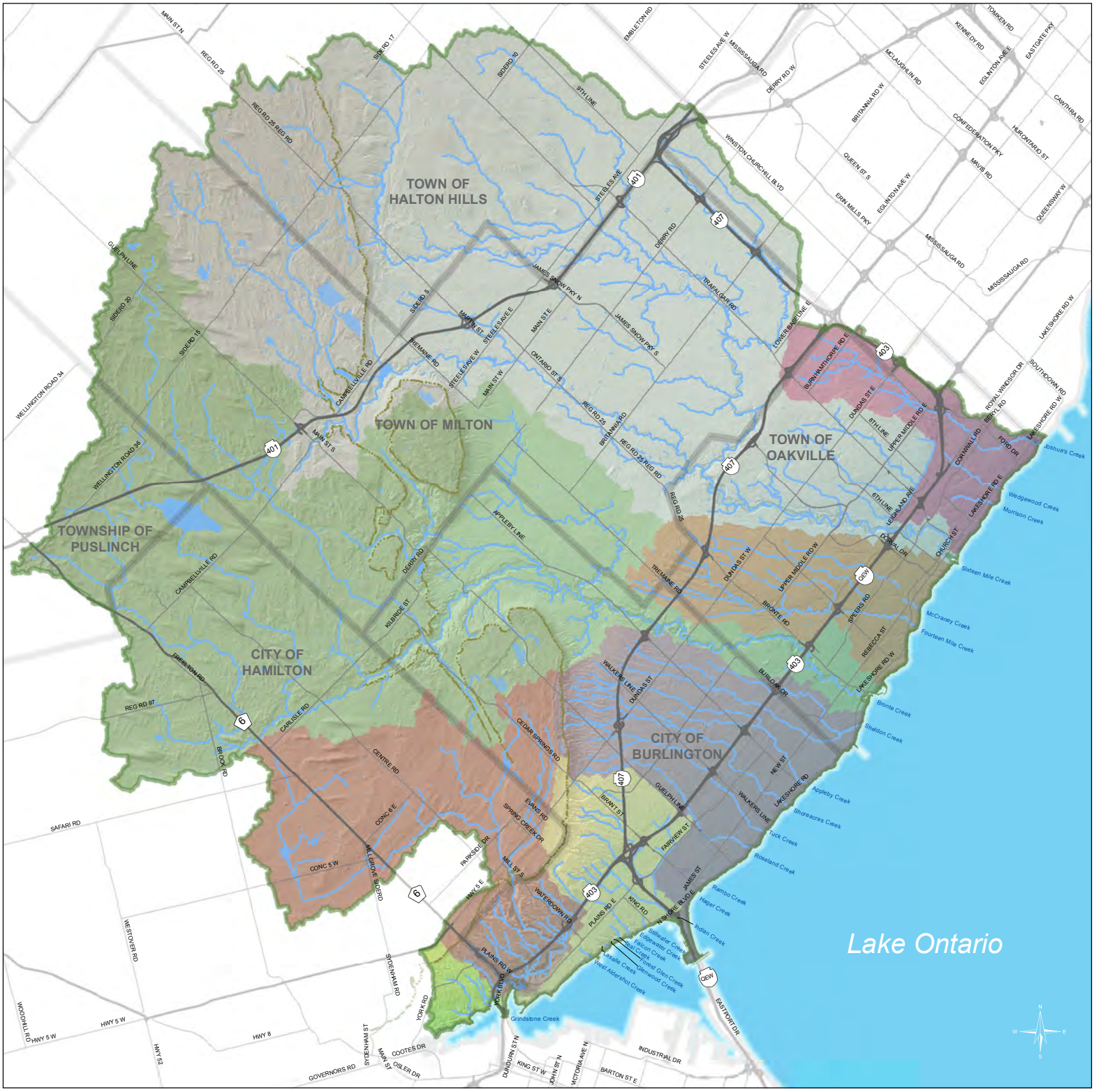
PROJECT STATISTICS

PROJECT NO.: 1816
SCALE: N/A
DATE: AUGUST 22, 2019
DRAWN BY:

DRAWING NO.:

A0.00

Conservation Halton Watersheds



Legend

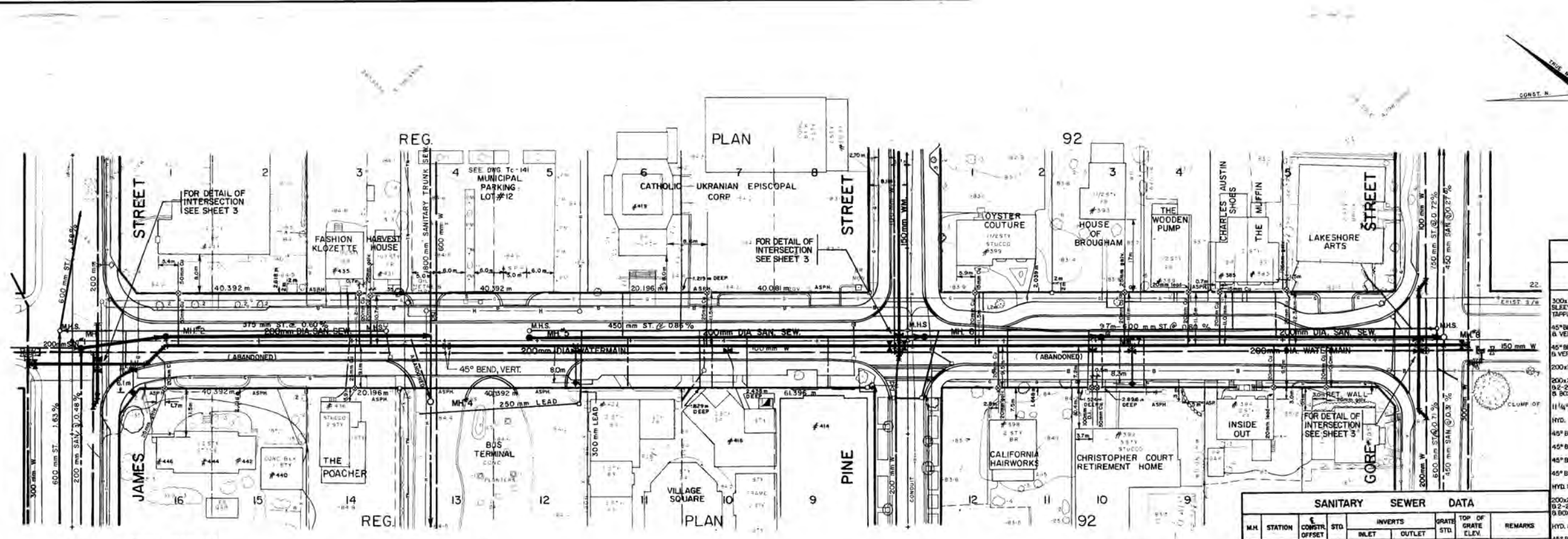
- Expressway / Highway
- Arterial Roads
- Creeks & Waterbodies
- Niagara Escarpment
- Municipal Boundaries

Watersheds

- Bronte Creek
- Burlington Urban Creeks
- Grindstone Creek
- North Cootes Paradise
- North Shore
- Oakville East Urban Creeks
- Oakville West Urban Creeks
- Sixteen Mile Creek

0 1 2 4 6 8 10 Kilometres

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1929 DATUM

GEOD. B.M. CITY HALL, AT SOUTHWEST SIDE OF BRANT STREET, 0.32 km NORTHWEST OF LAKESHORE RD., IMMEDIATELY NORTHWEST OF AND OPPOSITE JAMES STREET. TABLET IN NORTHWEST CONC. FOUNDATION WALL, 1.6 m NORTHEAST OF CURVED PORTION AT REAR OF BUILDING, 0.3048 m BELOW METAL SIDING. ELEV. 86.565

GEOD. B.M. B.M. SET ON HORIZONTAL GEODETIC CONTROL MONUMENT 650013 IN THE CITY OF BURLINGTON, LOCATED ON THE SIDE OF MARTHA STREET AT THE INTERSECTION OF MARTHA STREET AND NEW STREET. 4.328 m WEST OF FACE OF CURB, 5.15 m NORTH OF NEW STREET CENTRE LINE. ELEV. 84.989

WATERMAIN DATA

ITEM	STATION	℄ CONSTR. OFFSET	STD.	INVERT ELEV.	REMARKS
300x200mm TAPPING SLEEVE & 200mm TAPPING VALVE & BOX	0+009.7	5.0m Rt	405	83.252	
45° BEND, HORIZ & VERT.	0+004.0	14.4 m Rt	421	83.666	
45° BEND, HORIZ. & VERT.	0+005.0	13.1 m Rt	421	82.731	
200x100mm REDUCER	0+005.0	12.0 m Rt	–	——	
200x200mm FL. CROSS & 2-200mm FL. G.V. & BOX	0+005.0	5.0m Rt	405	82.731	
11¼° BEND, VERT.	0+005.0	4.0 m Lt	421	82.942	
HYD. & ANCHOR TEE	0+013.0	11.46 Rt	441	82.786	WITH SEC. G.V. & BOX
45° BEND, HORIZ.	0+016	5.0m Rt	421	82.786	
45° BEND, HORIZ.	0+019.7	1.0m Rt	421	82.804	
45° BEND, VERT.	0+080	1.0m Rt	421	81.156	
45° BEND, VERT.	0+081	1.0m Rt	421	81.985	
HYD. & ANCHOR TEE	0+108	9.0m Rt	441	81.446	WITH SEC. G.V. & BOX
200x200mm FL. CROSS & 2-200mm FL. G.V. & BOX	0+177.7	1.0m Rt	405	81.468	
HYD. & ANCHOR TEE	0+228	9.3m Rt	441		WITH SEC. G.V. & BOX
45° BEND, HORIZ. & VERT.	0+289.5	16.0 mRt	421	—	
200x200mm FL. CROSS & 2-200mm FL. G.V. & BOX	0+289.5	1.0m Rt	405	81.468	
200x100mm REDUCER	0+289.5	10.0 mLt	–	——	45° ELBOW
45° BEND, HORIZ. & VERT.	0+289.5	11.5 m Lt	421	—	PLUG NE. INV.
45° BEND, HORIZ. & VERT.	0+291	15.5 mRt	421	81.767	
45° BEND, HORIZ. & VERT.	0+291	13.0m Lt	421	81.888	
300x200mm TAPPING SLEEVE & 200mm TAPPING VALVE & BOX	0+300	1.0m Rt	405	81.473	

SANITARY SEWER DATA

M.H.	STATION	℄ CONSTR. OFFSET	STD.	INVERTS INLET	INVERTS OUTLET	GRATE STD.	TOP OF GRATE ELEV.	REMARKS
1	0+002.1	1.5m Rt	322	EX.N. 82.025 EX.W. 82.041	S. 81.600	331	84.549	
2	0+020	1.0m Lt	322	N. 81.491	S. 81.419	331	84.601	
	0+076.44	1.0m Lt			SW 81.080			45° ELBOW
EX.4	0+077.4	13.05mRt		EX.NE. 81.416 EX.E. 79.166	EX.W. 79.166		84.296	PLUG NE. INV.
5	0+098.5	1.0m Lt	322		S. 81.194	331	84.121	
6	0+183	1.0m Lt	322	N. 80.568	S. 80.518	331	83.685	
7	0+221.4	1.0m Lt	322	N. 80.326 EX.W. 80.754	S. 80.326	331	83.531	
EX.8	0+294.3	0.4m Lt		N. 80.034 EX.W. 76.923	EX.E. 76.911		83.161	DROP 77.178 N.

NO	DATE	BY	REVISIONS
3	JULY/86	M.P.S.	AS CONSTRUCTED - WATER
2	JUNE/84	D. MIS	EXIST. W/M TO BE REMOVED 3 m EITHER SIDE OF T.M.H.
1	MAY/84	D. MIS	SAN. SEWER RAISED FROM JAMES ST. TO 1800 mm SANITARY TRUNK SEWER

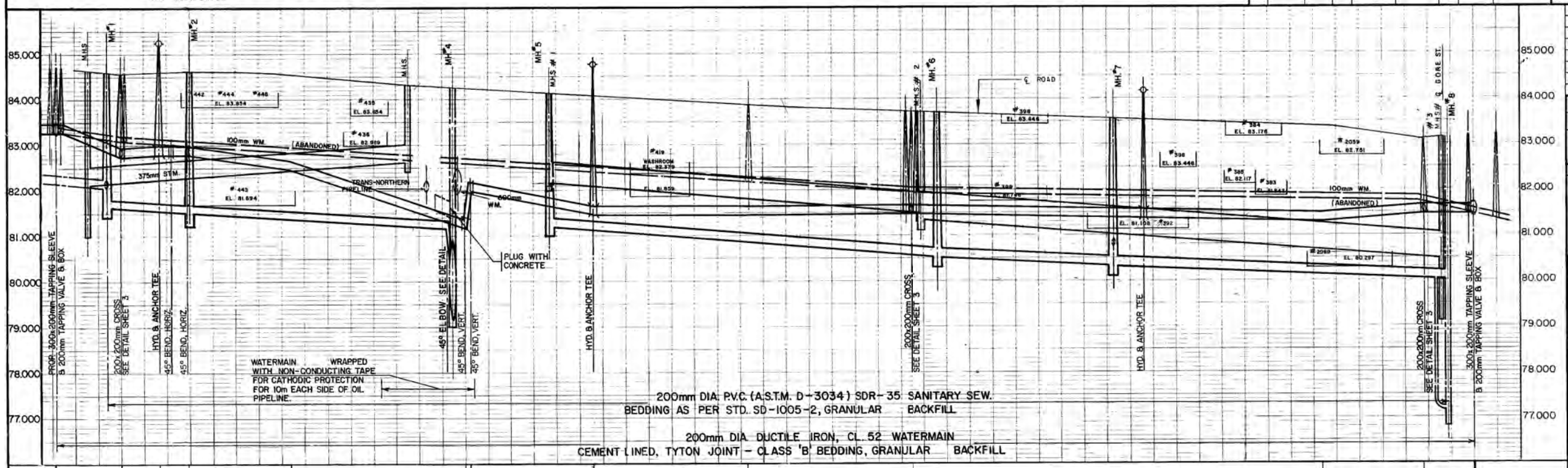
DESIGN M.P.S. CHECKED
DRAWN M.P.S. CHECKED
DATE JAN. 1984
SCALE 1:500 HORIZ. 5m 0 5m 10m 15m; 0.5m 0 0.5m 1.0m 1.5m 1:50 VERT.

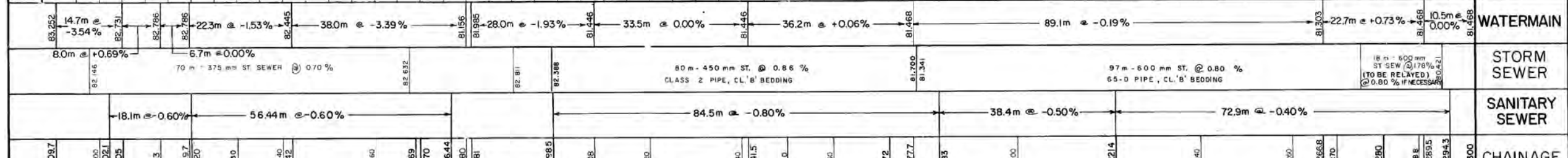
APPROVALS
Municipal
DIRECTOR OF PUBLIC WORKS
DATE
Regional
DIRECTOR OF PUBLIC WORKS
MANAGER OF DESIGN & CONSTRUCTION
86 06 17

REFERENCES
5-04-20-C
5-04-06-C

FIELD NOTES

STAMP





CITY OF BURLINGTON

JOINT CONTRACT

REGIONAL MUNICIPALITY OF HALTON PUBLIC WORKS DEPARTMENT

200mm WM. & 200mm SAN. SEW.

PEARL STREET

CITY OF BURLINGTON

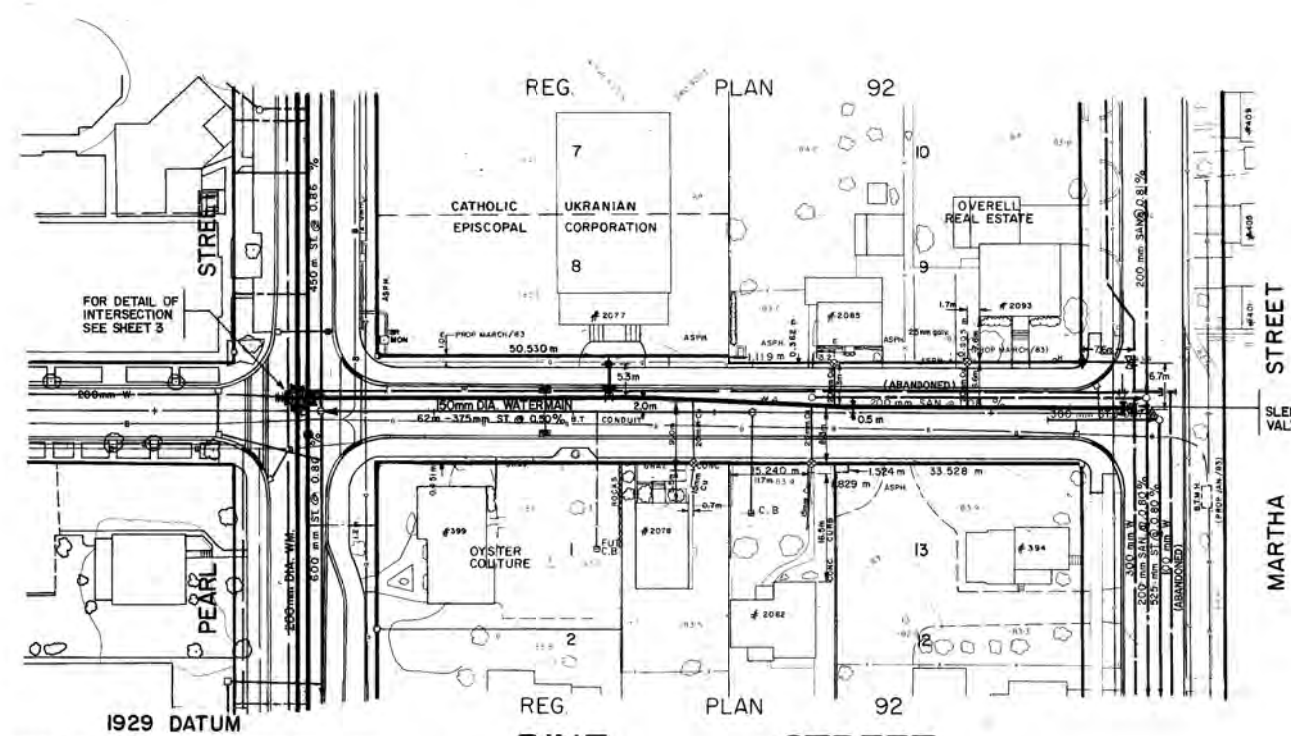
JAMES ST. TO GORE ST.

MUNICIPAL DRAWING NO. MP - 9R

REGIONAL DRAWING NO. B-5213

CONTRACT N° 84-8 / PR-732

SHEET 1 OF 3

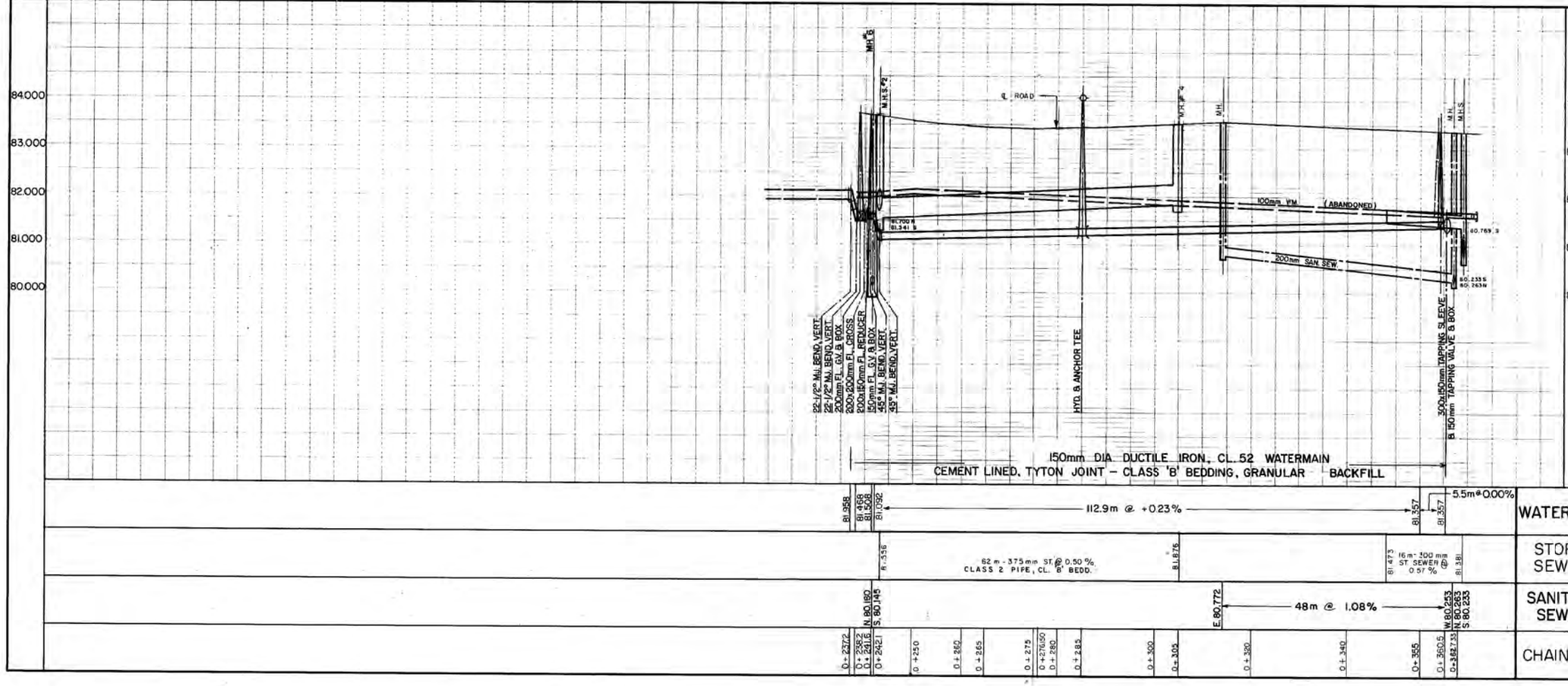




GEOD. B.M. CITY HALL, AT SOUTHWEST SIDE OF BRANT STREET, 0.32 km NORTHWEST OF LAKESHORE RD., IMMEDIATELY NORTHWEST OF AND OPPOSITE JAMES STREET; TABLET IN NORTHWEST CONC. FOUNDATION WALL, 1.6 m NORTHEAST OF CURVED PORTION AT REAR OF BUILDING, 0.3048 m BELOW METAL SIDING. ELEV. 86.565

GEOD. B.M. B.M. SET ON HORIZONTAL GEODETIC CONTROL MONUMENT 650013 IN THE CITY OF BURLINGTON, LOCATED ON THE SIDE OF MARTHA STREET AT THE INTERSECTION OF MARTHA STREET AND NEW STREET, 4.328 m WEST OF FACE OF CURB, 5.15 m NORTH OF NEW STREET CENTRE LINE. ELEV. 84.989

WATERMAIN DATA					
ITEM	STATION	℄ CONSTR. OFFSET	STD.	INVERT ELEV.	REMARKS
22 ½° BEND, VERT.	0+237.2	2.0m Lt.	421	81.956	
22 ½° BEND, VERT.	0+238.2	2.0m Lt.	421	81.468	
200mm FL. G.V. & BOX	0+239.7	2.0m Lt.	405	81.468	
200x200mm FL. CROSS	0+240.2	2.0m Lt.		81.468	
200x150mm FL. REDUCER	0+240.52	2.0m Lt.	—	—	
150mm FL. G.V. & BOX	0+240.75	2.0m Lt.	405	81.508	
45° BEND, VERT.	0+241.6	2.0m Lt.	421	81.508	
45° BEND, VERT.	0+242.1	2.0m Lt.	421	81.092	
HYD. & ANCHOR TEE	0+2.35	7.3m Lt.	441	81.119	WITH SEC. G.V. & BOX
HYDRANT	0+3.53	7.4m Lt.	441	—	
300x150mm TAPPING SLEEVE & 150mm TAPPING VALVE & BOX	0+360.5	0.5m Lt.	405	81.357	



NO	DATE	BY	REVISIONS
1	JULY/86	M.P.S.	AS CONSTRUCTED - WATER

DESIGN M.P.S. CHECKED
DRAWN M.P.S. CHECKED
DATE JAN. 1984
SCALE 1:500 HORZ. 1:50 VERT

APPROVALS

Municipal
DIRECTOR OF PUBLIC WORKS
DATE

Regional
DIRECTOR OF PUBLIC WORKS
MANAGER OF DESIGN & CONSTRUCTION
DATE

CITY OF BURLINGTON

JOINT CONTRACT

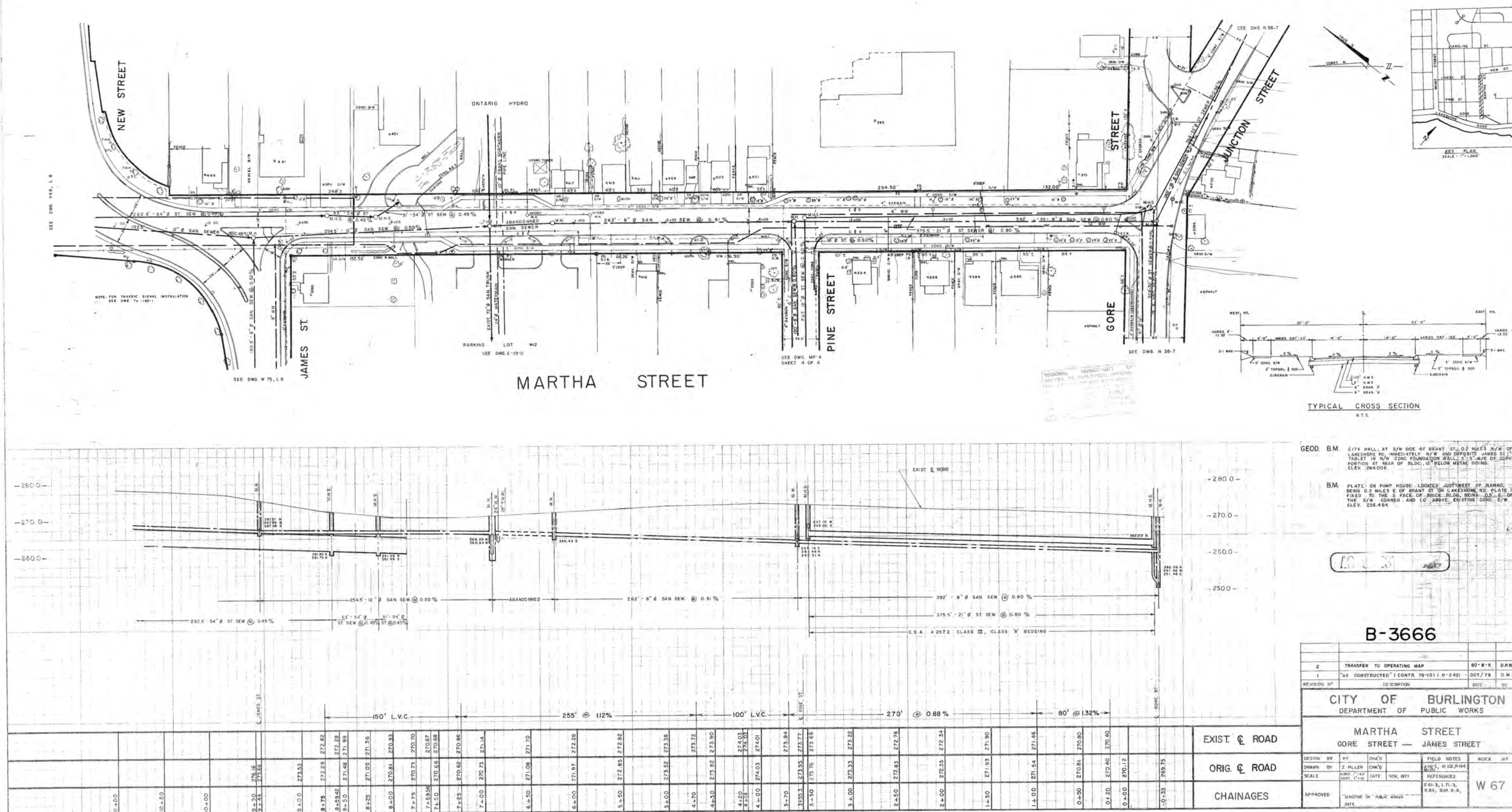
REGIONAL MUNICIPALITY OF HALTON PUBLIC WORKS DEPARTMENT

150mm DIA. WATERMAIN
PINE STREET
CITY OF BURLINGTON
PEARL ST. TO MARTHA ST.

MUNICIPAL DRAWING NO. MP-4 R
REGIONAL DRAWING NO. B-5214
CONTRACT No. 84-8 / PR-732
SHEET 2 OF 3

B-5214
PR-732 2 of 3

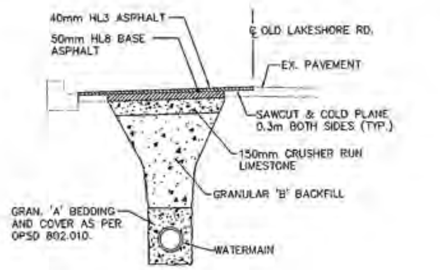
B-3666



PR-326-78

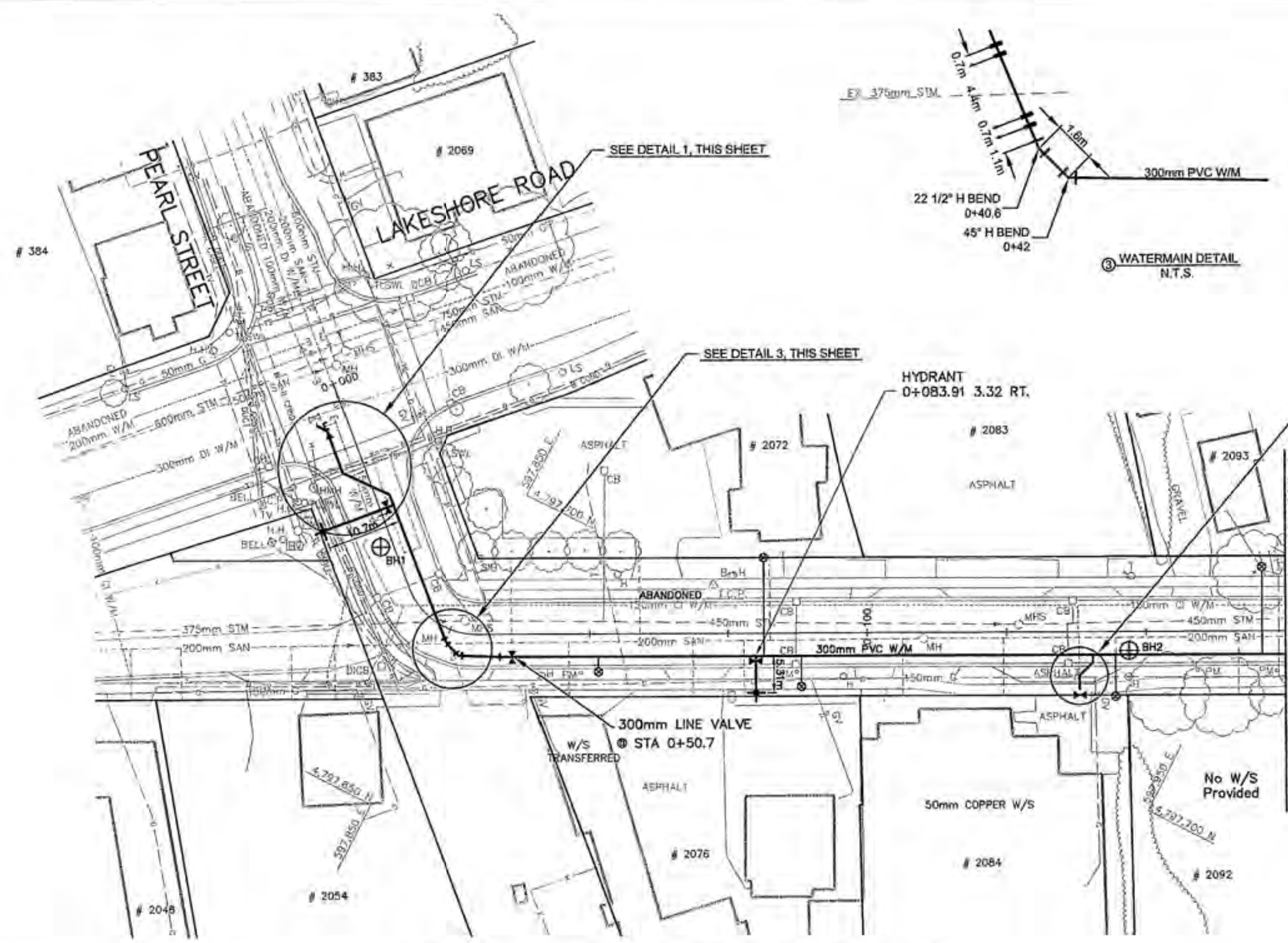
GENERAL NOTES

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SPECIFIED.
2. ALL WATERMAIN AND SANITARY SEWER INSTALLATION SHALL CONFORM TO THE LATEST REVISIONS OF THE ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS) AS AMENDED BY THE REGIONAL MUNICIPALITY OF HALTON.
3. THE LOCATION OF ALL EXISTING WATERMAIN, SANITARY SEWER, UTILITIES AND SERVICES ARE APPROXIMATE. THE CONTRACTOR MUST VERIFY THE LOCATION, VERIFY SIZE AND ELEVATION IN THE FIELD PRIOR TO CONSTRUCTION.
4. DRIVEWAY MATERIAL IS ASPHALT UNLESS OTHERWISE SPECIFIED.
5. WATERMAIN MATERIAL IS TO BE EITHER DUCTILE IRON PRESSURE CLASS 350 AS PER AWWA C-150 OR PVC SDR-18 CL-150 AS PER AWWA C-900.
6. UNLESS OTHERWISE NOTED, ALL EXISTING WATER SERVICES ARE TO BE REPLACED WITH A MIN. 19mm DIA. COPPER FOR RESIDENTIAL DWELLINGS AND 25mm DIA. COPPER FOR INDUSTRIAL AND COMMERCIAL PREMISES AS PER OPSD 1104.010. UNLESS OTHERWISE NOTED, SERVICES ARE TO BE REPLACED FROM THE MAIN TO THE PROPERTY LINE WITH A NEW CURB STOP AND SERVICE BOX AT THE PROPERTY LINE.
7. THE CONTRACTOR SHALL PROVIDE ALL TEMPORARY CAPS, PLUGS AND BLOW OFFS REQUIRED FOR TESTING THE NEW WATERMAIN.
8. MAXIMUM ALLOWABLE PIPE JOINT DEFLECTION OF THE WATERMAIN SHALL BE 70% OF THE MANUFACTURER'S SPECIFICATIONS. PIPE BARREL DEFLECTION IS STRICTLY PROHIBITED.
9. CORROSION PROTECTION IS REQUIRED FOR ALL METALLIC PIPE, VALVES, FITTINGS SERVICES AND HYDRANTS. CATHODIC PROTECTION (ZINC ANODE) AS PER THE DETAILS IN THE REGIONAL DESIGN SPECIFICATIONS OR 8 MIL MEDIUM DENSITY POLYETHYLENE ENCASEMENT AS PER AWWA C-105 SHALL BE USED.
10. AFTER REMOVING VALVE BOXES AND HYDRANTS, BACKFILL WITH COMPACTED GRANULAR 'A'. WHERE EXISTING VALVE CHAMBERS ARE TO BE ABANDONED, ALL VALVES WITHIN THE CHAMBER ARE TO BE LEFT IN PLACE AND THE CHAMBER IS TO BE BROKEN DOWN TO 1.0m BELOW FINAL GRADE AND BACKFILLED WITH NON-SHRINK BACKFILL TO SUBGRADE. THE AFFECTED AREA SHALL BE COMPLETELY RESTORED. ALL HYDRANTS SHOWN FOR REMOVAL SHALL BE RETURNED TO REGIONAL STORES AT 1179 BRONTE RD., OAKVILLE. UNLESS OTHERWISE NOTED, ALL VALVES WHICH ARE SHOWN FOR REMOVAL SHALL BE DISPOSED OF BY CONTRACTOR.
11. EXISTING WATERMAIN IS TO BE EITHER REMOVED OR PLUGGED AND ABANDONED AS REQUIRED.
12. HYDRANTS ARE TO BE INSTALLED SUCH THAT THE LOWER ROD/STEM LENGTH SHALL NOT EXCEED 1.7m MEASURED FROM THE BREAK-OFF FLANGE.
13. REGIONAL MUNICIPALITY OF HALTON APPROVED MECHANICAL RESTRAINTS ARE TO BE USED ON ALL STANDARD BENDS, VALVES, FITTINGS AND HYDRANTS. REFER TO TABLE.



ROAD RESTORATION DETAIL
N.T.S.

NOTE: ASPHALT DRIVEWAY RESTORATION IS TO BE FULL WIDTH OF DRIVEWAY WITH 50mm HL3A.



OLD LAKESHORE ROAD

③ WATERMAIN DETAIL
N.T.S.

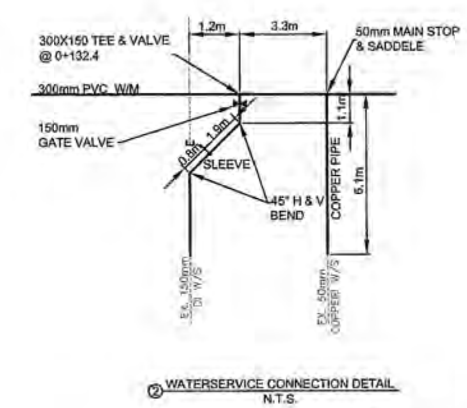
LEGEND

- BH1 — BOREHOLES - REFER TO PETO MACCULLUM LTD. GEO-TECHNICAL REPORT # 93HF095 REGION FILE: FS 364 (1993)
- WATER BOXES
- EX. HYDRANT REMOVAL
- EX. VALVE BOX REMOVAL
- EX. WVC OR EX. MH REMOVAL
- PLUG

NOTE: USED 25mm COPPER PIPE FOR ALL NEW WATER SERVICES EXCEPT # 2084 (USED 50mm COPPER PIPES)

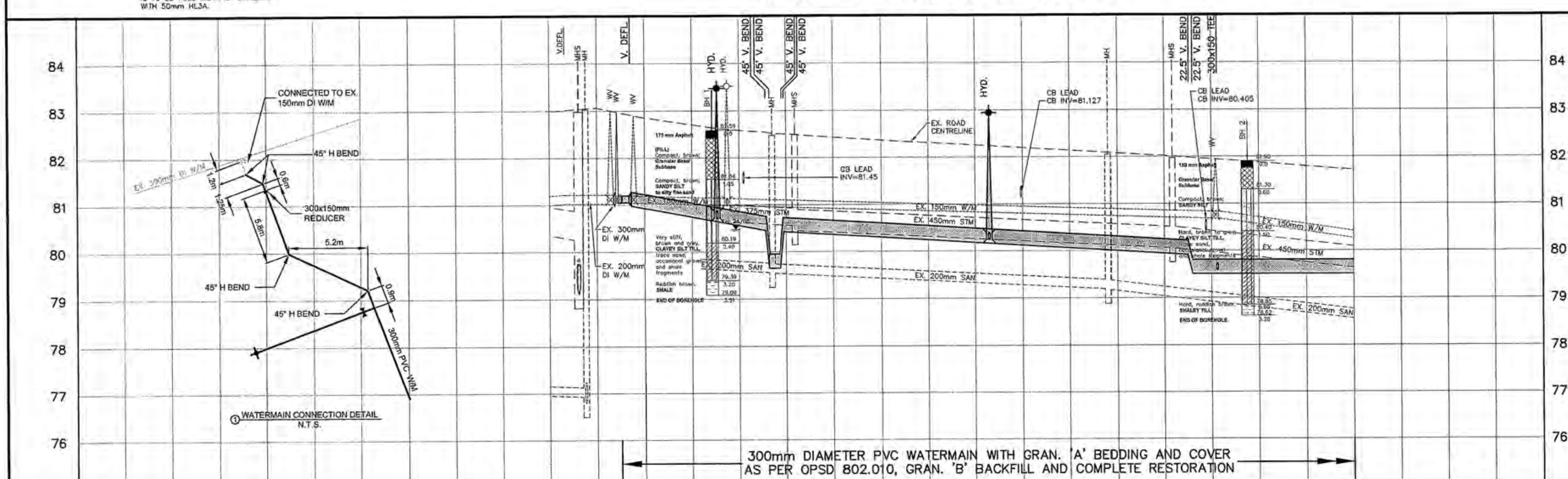


KEYPLAN
N.T.S.



② WATERSERVICE CONNECTION DETAIL
N.T.S.

REGIONAL MUNICIPALITY OF HALTON, ITS EMPLOYEES, OFFICERS AND AGENTS ARE NOT RESPONSIBLE FOR ANY ERRORS, OMISSIONS OR INACCURACIES, WHETHER DUE TO THEIR NEGLIGENCE OR OTHERWISE. ALL INFORMATION SHOULD BE VERIFIED.



℄ ELEVATIONS	83.06	82.85	82.71	82.59	82.51	82.43	82.37	82.31	82.26	82.20	82.14	82.08	82.02	81.95	81.87	81.79	81.72
WATERMAIN ELEVATIONS	81.05± 81.05± 80.98±												79.91 79.50	61.79m @ 0.00%			
				0.70m @ 100% 4.4m @ 0.00% 0.70m @ 100%									1.00m @ 41.42%				
CHAINAGE	0+000 0+005.26±		0+020	0+033.7 0+034.4 0+038.8 0+039.5		0+060		0+080		0+100		0+120	0+125.00 0+126.00	0+140		0+160	

Nº	Date	By	REVISIONS	MANU	CAD
2	MAY 19	KDH	As Constructed		X
1	NOV 08	E.A.H.	As Constructed		X

Design B.K. Ch'kd
Drawn C.S.J. Ch'kd
Date JANUARY 2005
Scale Horiz. 1:500 Vert. 1:50
References
APPROVALS
Municipal
Field Notes REGION BOOK
Stamp
Regional
Director, Engineering Services
Manager, Design Services

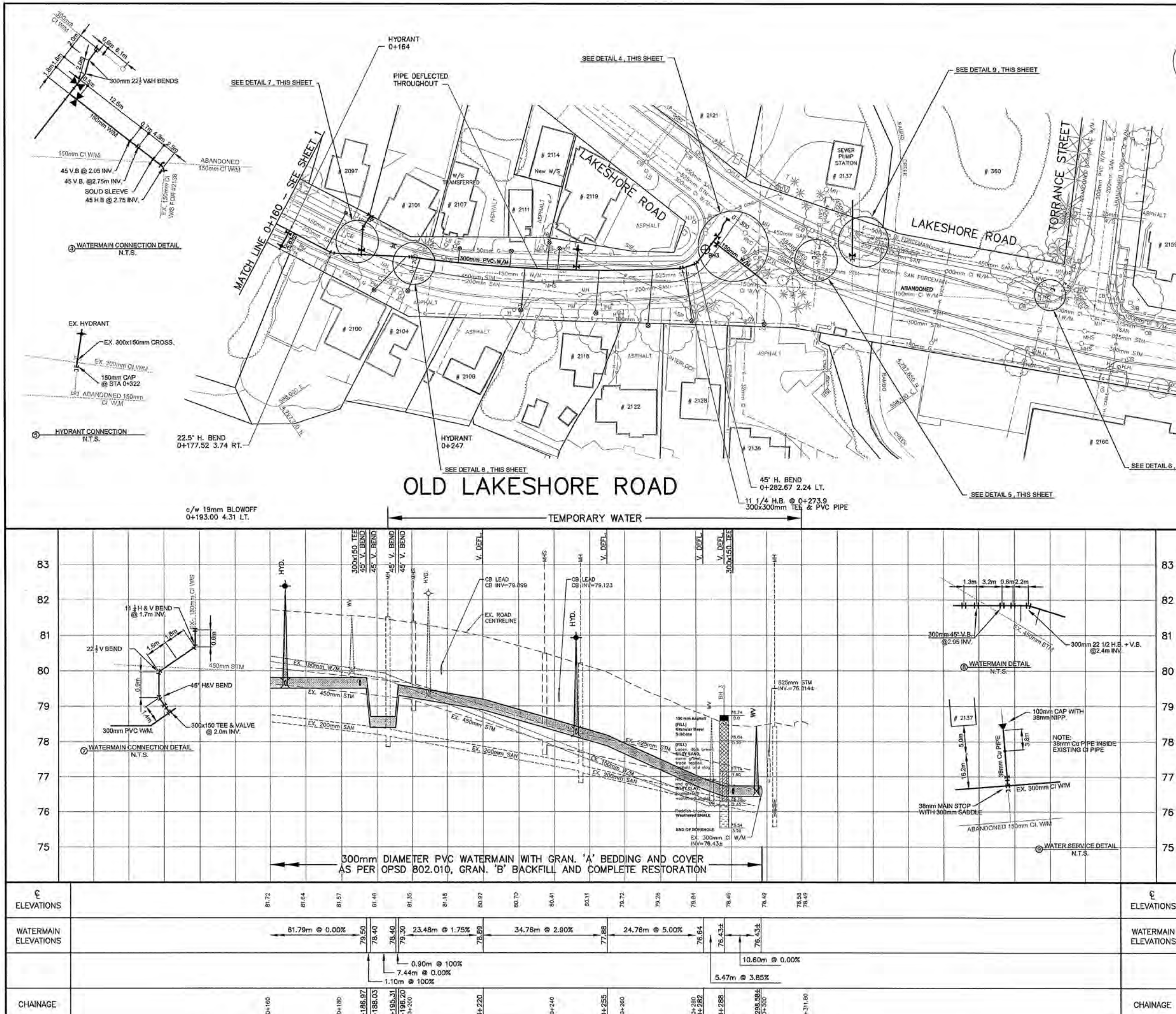
Halton

WATERMAIN REPLACEMENT ON
OLD LAKESHORE ROAD
FROM PEARL STREET TO
140m SOUTHWEST OF LAKESHORE ROAD
IN THE CITY OF BURLINGTON

Consultant File Nº
Ref B-12080
CONTRACT Nº W-2295-06
Drawing Nº SHEET 1 OF 2

B-12080

PR-2295-06 1 of 2



No	Date	By	REVISIONS	MANU	CAD
2	MAY 19	KDH	As Constructed		X
1	NOV 08	E.A.H.	As Constructed		X

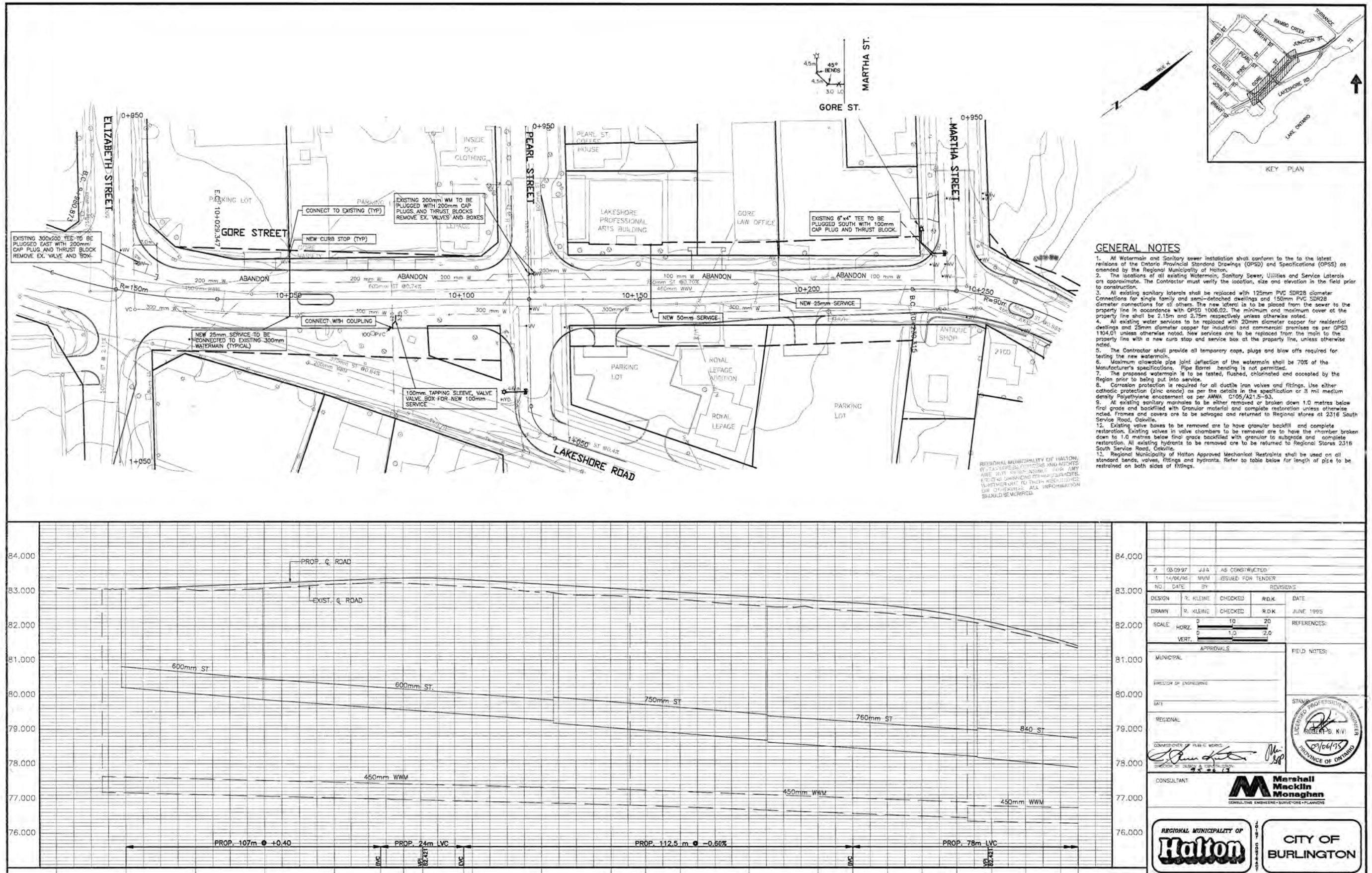
Design B.K. Ch'kd
Drawn C.S.J. Ch'kd
Date JANUARY 2005
Scale Horiz. 1:500 Vert. 1:50
References
APPROVALS
Municipal
Field Notes REGION BOOK
Stamp
Regional
Director, Engineering Services
Manager, Design Services

Halton

WATERMAIN REPLACEMENT ON
OLD LAKESHORE ROAD
FROM 140m SOUTHWEST OF LAKESHORE ROAD TO LAKESHORE ROAD
IN THE CITY OF BURLINGTON

Consultant File No
Re: B-12081
CONTRACT No W-2295-06
Drawing No SHEET 2 OF 2

REGIONAL MUNICIPALITY OF HALTON, ITS EMPLOYEES, OFFICERS AND AGENTS ARE NOT RESPONSIBLE FOR ANY ERRORS, OMISSIONS OR INACCURACIES, WHETHER DUE TO THEIR NEGLIGENCE OR OTHERWISE. ALL INFORMATION SHOULD BE VERIFIED



GENERAL NOTES

1. All Watermain and Sanitary sewer installation shall conform to the to the latest revisions of the Ontario Provincial Standard Drawings (OPSD) and Specifications (OPSS) as amended by the Regional Municipality of Halton.
2. The locations of all existing Watermain, Sanitary Sewer, Utilities and Service Laterals are approximate. The Contractor must verify the location, size and elevation in the field prior to construction.
3. All existing sanitary laterals shall be replaced with 125mm PVC SDR28 diameter Connections for single family and semi-detached dwellings and 150mm PVC SDR28 diameter connections for all others. The new lateral is to be placed from the sewer to the property line in accordance with OPSD 1006.02. The minimum and maximum cover at the property line shall be 2.15m and 2.75m respectively unless otherwise noted.
4. All existing water services to be replaced with 20mm diameter copper for residential dwellings and 25mm diameter copper for industrial and commercial premises as per OPSD 1104.01 unless otherwise noted. New services are to be replaced from the main to the property line with a new curb stop and service box at the property line, unless otherwise noted.
5. The Contractor shall provide all temporary caps, plugs and blow offs required for testing the new watermain.
6. Maximum allowable pipe joint deflection of the watermain shall be 70% of the Manufacturer's specifications. Pipe Barrel bending is not permitted.
7. The proposed watermain is to be tested, flushed, chlorinated and accepted by the Region prior to being put into service.
8. Corrosion protection is required for all ductile iron valves and fittings. Use either cathodic protection (zinc anode) as per the details in the specification or 3 mil medium density Polyethylene encasement as per AWWA C105/A21.5-93.
9. All existing sanitary manholes to be either removed or broken down 1.0 metres below final grade and backfilled with Granular material and complete restoration unless otherwise noted. Frames and covers are to be salvaged and returned to Regional stores at 2316 South Service Road, Oakville.
12. Existing valve boxes to be removed are to have granular backfill and complete restoration. Existing valves in valve chambers to be removed are to have the chamber broken down to 1.0 metres below final grade backfilled with granular to subgrade and complete restoration. All existing hydrants to be removed are to be returned to Regional Stores 2316 South Service Road, Oakville.
13. Regional Municipality of Halton Approved Mechanical Restraints shall be used on all standard bends, valves, fittings and hydrants. Refer to table below for length of pipe to be restrained on both sides of fittings.

REGIONAL MUNICIPALITY OF HALTON, ITS AGENTS, EMPLOYEES AND ASSIGNS ARE NOT RESPONSIBLE FOR ANY EXISTING UNKNOWN OR ABANDONED WATERMAIN NOT TO ENTER HEREIN OR OTHERWISE. ALL INFORMATION SHOULD BE VERIFIED.

NO	DATE	BY	REVISIONS
2	03.09.97	JJA	AS CONSTRUCTED
1	14/06/95	MMM	ISSUED FOR TENDER

DESIGN	R. KLEINE	CHECKED	R.D.K.	DATE	
DRAWN	R. KLEINE	CHECKED	R.D.K.	JUNE 1995	

SCALE: HORZ. 0 10 20; VERT. 0 1.0 2.0

REFERENCES:

APPROVALS

MUNICIPAL

DIRECTOR OF ENGINEERING

DATE

REGIONAL

COMMISSIONER OF PUBLIC WORKS

DIRECTOR OF DESIGN & CONSTRUCTION

FIELD NOTES:

STAMP: LICENSED PROFESSIONAL ENGINEER ROBERT D. KIVI 99/06/15 PROVINCE OF ONTARIO

CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

REGIONAL MUNICIPALITY OF Halton

CITY OF BURLINGTON

TITLE

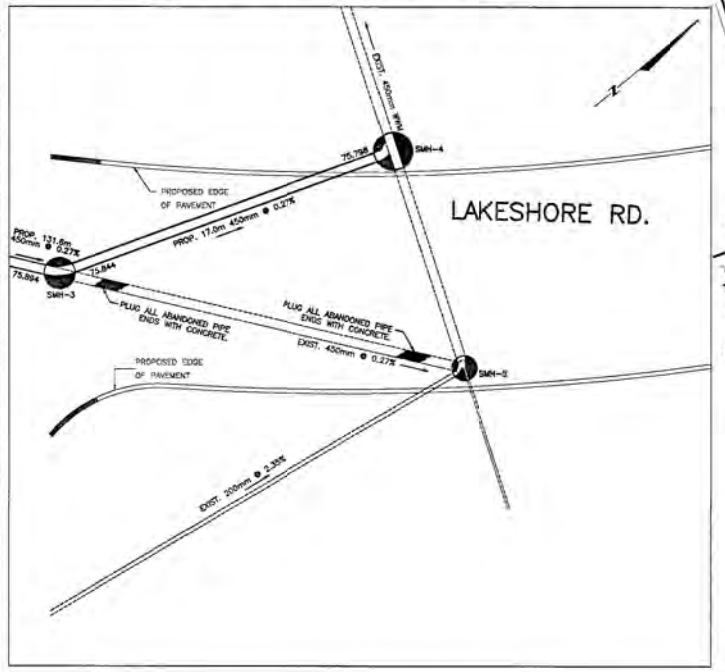
GORE/JUNCTION STREET

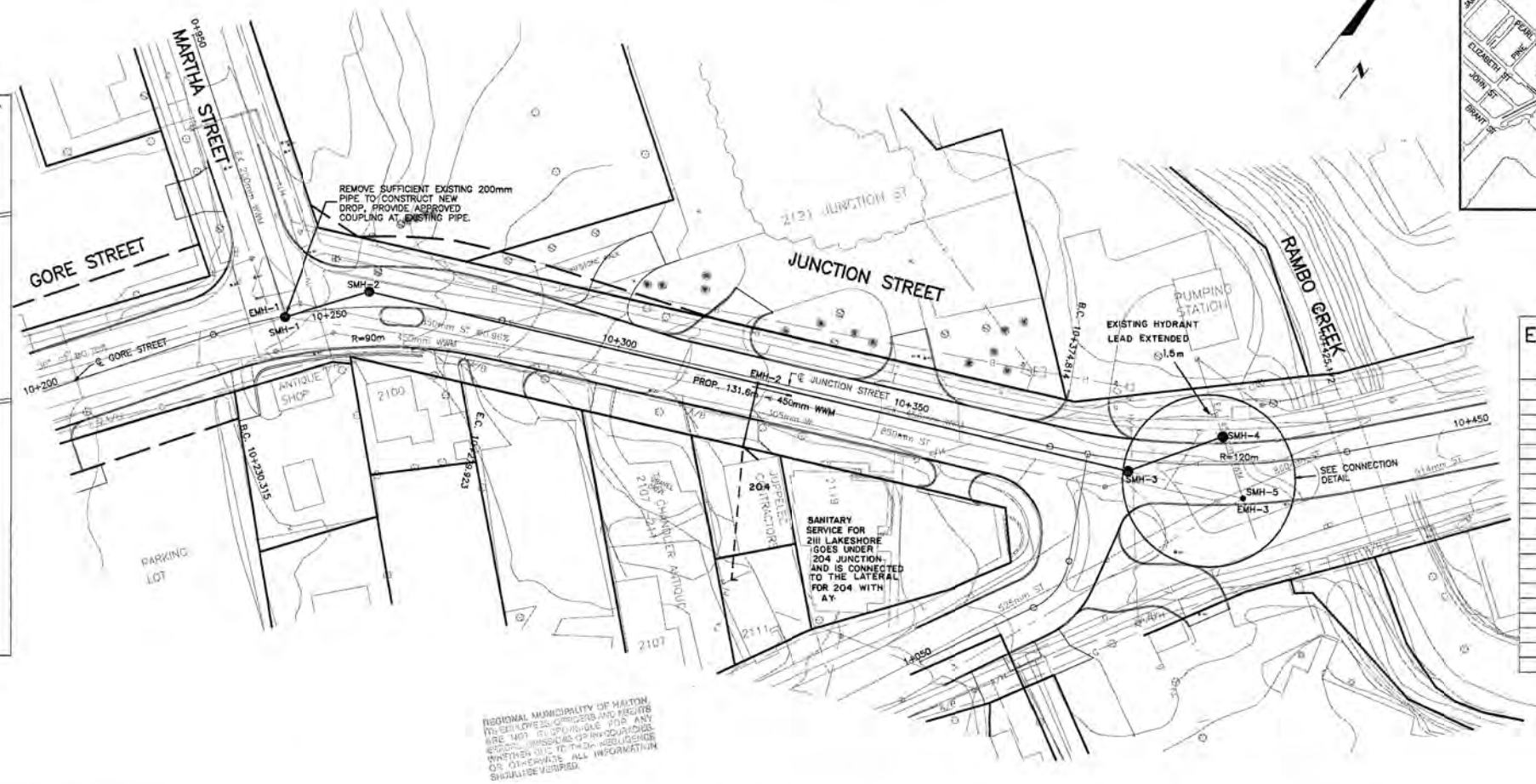
WATERMAIN ABANDONING
STA 9+975 TO STA 10+275

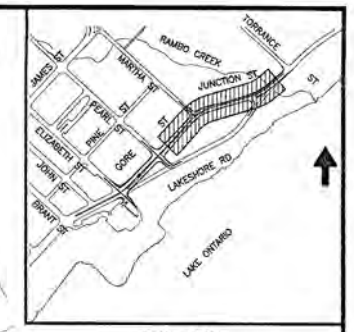
MUNICIPAL DRAWING NO.	REGIONAL DRAWING NO.
TL-22R	B - 7326
CONTRACT NO. PR-1603	
95-10	SHEET 1 OF 5

B - 7326

DOWNSTREAM WASTEWATER MAIN CONNECTIONS







KEY PLAN

EXISTING SERVICE CONNECTIONS

(PER VIDEO SURVEY NOV 25, 1995)

FROM EMH-1 TO EMH-2

DISTANCE	LOCATION
11.6	12 O'clock
13.8	12 O'clock
26.8	12 O'clock
43.8	12 O'clock
56.8	12 O'clock
64.2	12 O'clock
68.7	12 O'clock

FROM EMH-2 TO EMH-3

DISTANCE	LOCATION
8.4	12 O'clock
8.9	12 O'clock
11.8	12 O'clock
18.4	12 O'clock
18.4	1 O'clock
41.8	12 O'clock
41.8	2 O'clock
43.5	12 O'clock

NOTES:

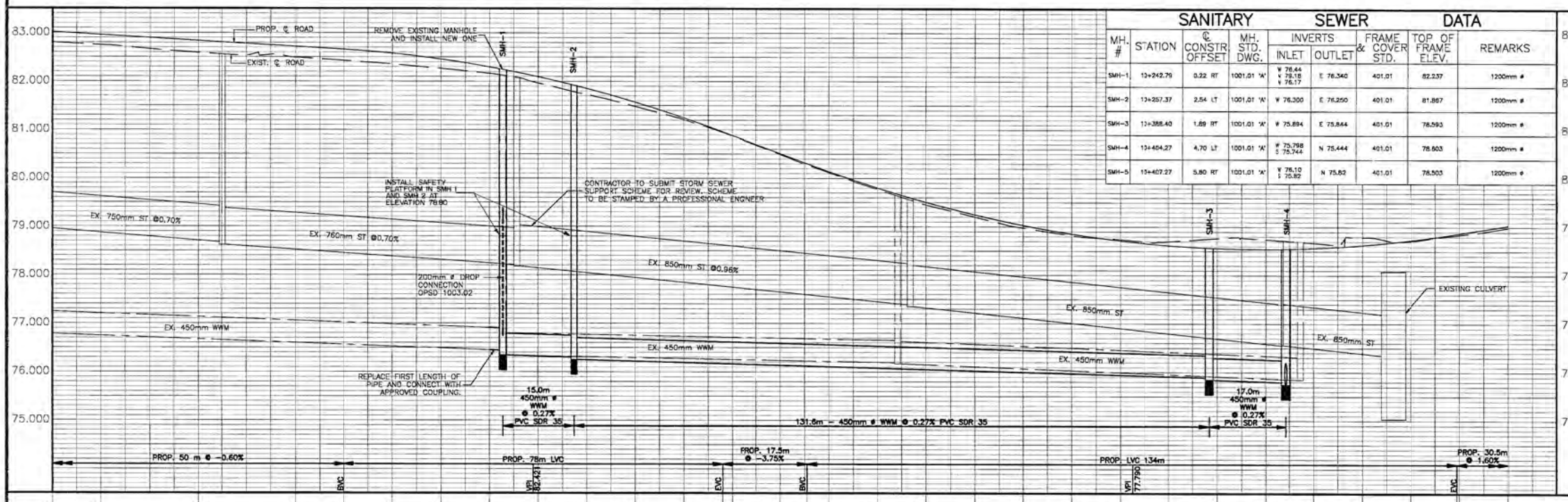
A. The existing sanitary sewer flows from buildings are to be maintained at all times during construction. Pumping aroune the construction area will be permitted subject to review of the contractor's construcion plan.

B. All benching to be according to OPSD 1004.01.

C. Contractor to locate and confirm all active sewer leads and provide new connections from the proposed main to the property line including approved coupling. Abandoned sewer leads shall not be reconstructed but are to be plugged with concrete at the edge of trench.

D. All excavations to be in vertical trench.

REGIONAL MUNICIPALITY OF HALTON. ITS CONSULTANTS, CONTRACTORS AND AGENTS ARE NOT RESPONSIBLE FOR ANY ERRORS, OMISSIONS OR INACCURACIES RESULTING FROM THE USE OF THIS INFORMATION WHETHER OR NOT THE SAME WAS CORRECTED OR UP-DATED. ALL INFORMATION SHOULD BE VERIFIED.



SANITARY SEWER DATA

MH. #	STATION	℄ CONSTR. OFFSET	MH. STD. DWG.	INVERTS INLET	INVERTS OUTLET	FRAME & COVER STD.	TOP OF FRAME ELEV.	REMARKS
SMH-1	13+242.79	0.22 RT	1001.01 'A'	W 76.44 N 79.18 E 76.17	E 76.340	401.01	82.237	1200mm ø
SMH-2	13+257.37	2.54 LT	1001.01 'A'	W 76.300	E 76.250	401.01	81.867	1200mm ø
SMH-3	13+388.40	1.89 RT	1001.01 'A'	W 75.894	E 75.844	401.01	78.593	1200mm ø
SMH-4	13+404.27	4.70 LT	1001.01 'A'	W 75.798 S 75.744	N 75.444	401.01	78.603	1200mm ø
SMH-5	13+407.27	5.80 RT	1001.01 'A'	W 76.10 S 75.82	N 75.82	401.01	78.503	1200mm ø

℄ ELEV'S	83.015	82.955	82.835	82.715	82.655	82.575	82.455	82.295	82.095	81.852	81.569	81.248	80.959	80.884	80.509	80.302	80.138	78.801	79.504	79.247	79.030	78.853	78.716	78.618	78.560	78.543	78.565	78.627	78.730	78.864	78.872	79.032
WASTEWATER MAIN																W 76.44 N 79.18 E 76.14	E 76.340			W 76.300 E 76.250					W 75.894 E 75.844			W 75.798 S 75.744	N 75.744			
CHAINAGE	10+150	10+160	10+180	10+200	10+210	10+220	10+230	10+240	10+242.8	10+249	10+250	10+257.4	10+260	10+270	10+280	10+288	10+290	10+300	10+305.5	10+310	10+320	10+330	10+340	10+350	10+360	10+370	10+372.5	10+380	10+388.4	10+390	10+400	10+404.3	10+410	10+420	10+430	10+439.5	10+440	10+450

2	03 09 97	JJA	AS CONSTRUCTED	
1	14/06/95	WMM	ISSUED FOR TENDER	
NO.	DATE	BY	REVISIONS	

DESIGN	R.KLEINE	CHECKED	R.D.K.	DATE: JUNE 1995
DRAWN	R.KLEINE	CHECKED	R.D.K.	

SCALE HORZ. ℄ 10 20
VERT. ℄ 1.0 2.0

REFERENCES:

APPROVALS

MUNICIPAL

DIRECTOR OF ENGINEERING

DATE

REGIONAL

COMMISSIONER OF PUBLIC WORKS

DIRECTOR OF DESIGN & CONSTRUCTION

FIELD NOTES:

STAMP: LICENSED PROFESSIONAL ENGINEER ROBERT D. KIVI 29/04/95 PROVINCE OF ONTARIO

CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

REGIONAL MUNICIPALITY OF Halton

CITY OF BURLINGTON

TITLE

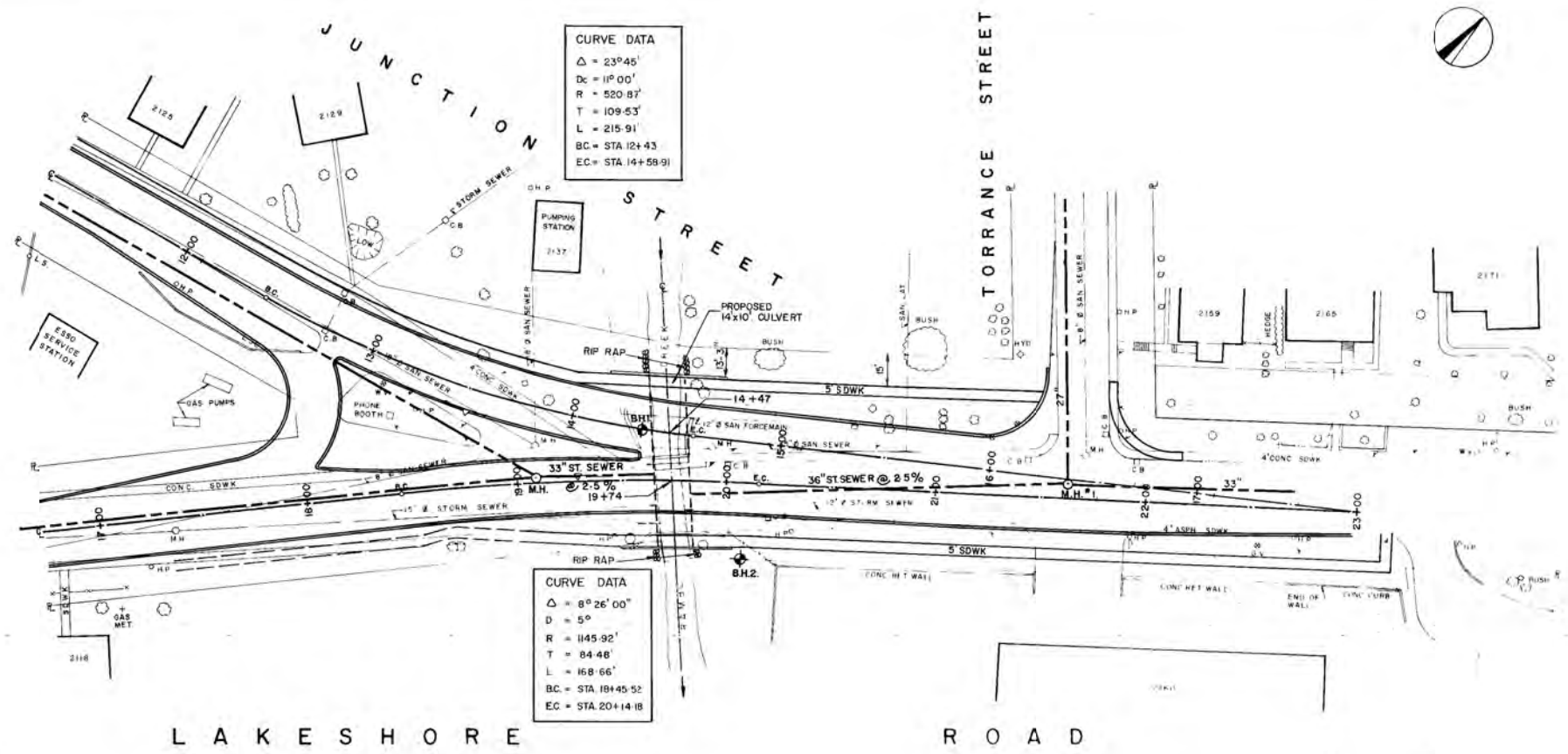
GORE/JUNCTION STREET

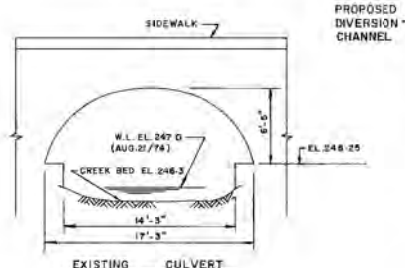
WASTEWATER MAIN REPLACEMENT
STA 10+150 TO STA 10+450

MUNICIPAL DRAWING NO.	REGIONAL DRAWING NO.
TL–22R	B - 7327
CONTRACT NO. PR–1603 95–10	SHEET 2 OF 5

B - 7327

PR. 1603 2/5



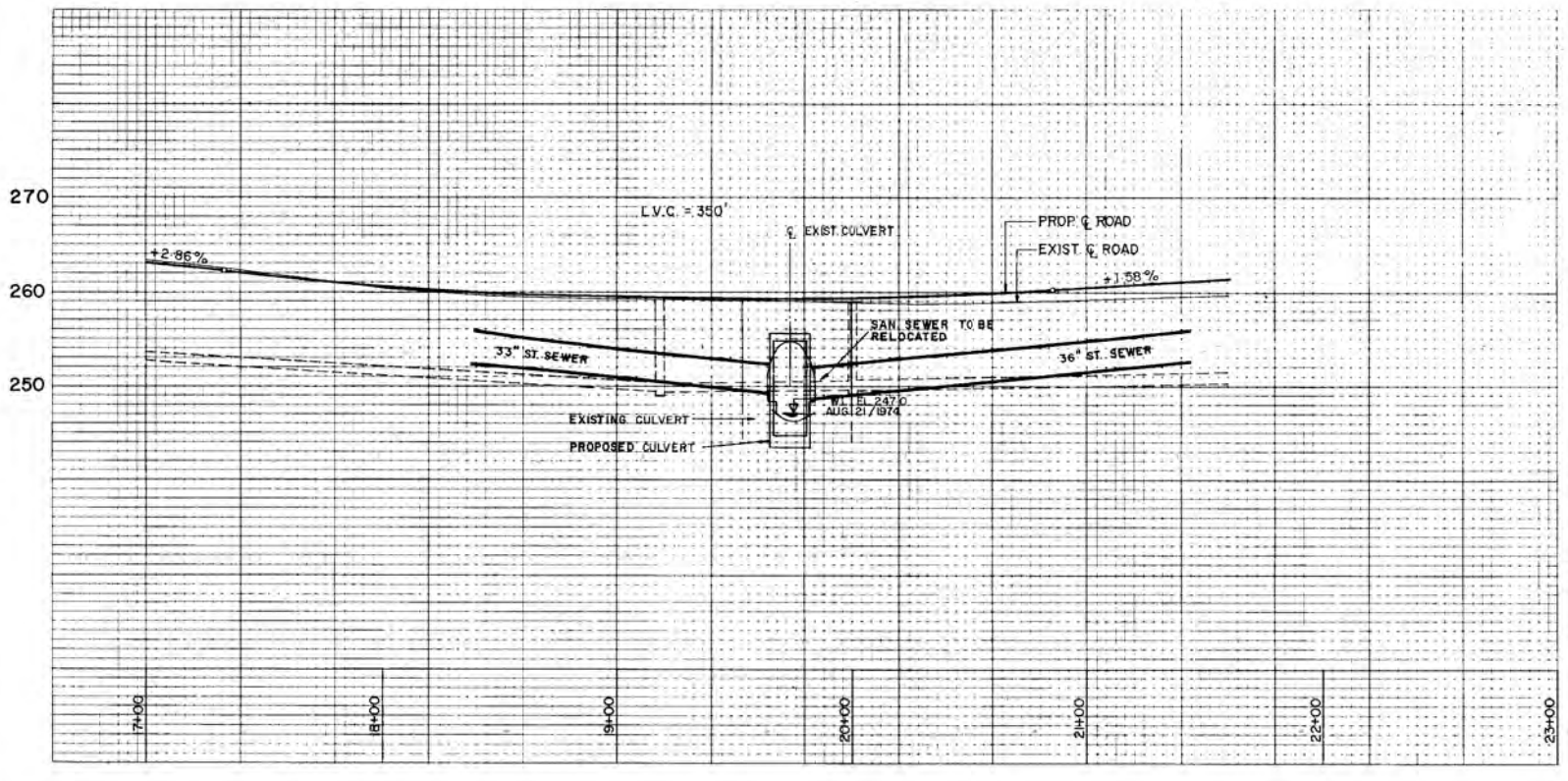




KEY PLAN
2·5"= 1 MILE

PLAN
SCALE : 1"= 40'-0"

B.M. EL. 259.95
NORTHEAST CORNER OF CONC. ABUTMENT
NORTH SIDE OF LAKESHORE ROAD
AT RAMBO CREEK BRIDGE



PROFILE
1" = 10'-0" VERT.
1" = 40'-0" HORIZ.

NOTES:

1 ELEVATION OF HWL BASED ON REGIONAL FLOOD ON REDUCED DRAINAGE AREA – ASSUMING FLOOD CONTROL CHANNEL IS CONSTRUCTED. IF FLOOD CONTROL CHANNEL IS NOT BUILD, NEW CULVERT WILL NOT ALTER THE REGIONAL FLOOD LINE OF 256 AS INDICATED IN THE MacLAREN REPORT (Oct. 1965)

SOILS INFORMATION

BOREHOLE NO. 1.

248.8 0·0	GROUND SURFACE	
247·8 1·0	VERY LOOSE BROWN SILTY SAND	
246.8 2·0	VERY LOOSE BLACK ORGANIC SANDY SILT	
243.8 5·0	SOFT TO FIRM RED BROWN CLAYEY SILT, SOME GRAVEL TRACE OF SAND (TILL)	
242.8 6·0	WEATHERED RED BROWN SHALE BEDROCK	
240.8 8·0	FAIRLY SOUND RED BROWN SHALE BEDROCK	
	END OF HOLE	
	PRACTICAL REFUSAL TO AUGERING	

BOREHOLE NO.2.

259·9 0·0	GROUND SURFACE	
247·9 12·0	STIFF RED BROWN CLAYEY SILT, SOME GRAVEL, OCCASIONAL LIMESTONE AND SHALE FRAGMENTS (FILL)	
244·9 15·0	STIFF MOTTLED BROWN CLAYEY SILT, TRACE OF SAND	
242·9 17·0	VERY LOOSE, BLACK ORGANIC SILT TRACE OF GRAVEL OCCASIONAL SAND LAYERS ½"THK.	
241·4 18·5	SOFT TO FIRM RED BROWN CLAYEY SILT SOME SAND AND GRAVEL (TILL)	
240·9 19·0	WEATHERED RED BROWN SHALE BEDROCK	
237·9 22·0	FAIRLY SOUND RED BROWN SHALE BEDROCK	
	END OF HOLE	
	PRACTICAL REFUSAL TO AUGERING	

AS CONSTRUCTED

1 WATERSHED AREA 0.88 SQUARE MILES OR 4.9 SQUARE MILES (730 cfs)

2 DESIGN FLOOD FREQUENCY REGIONAL FLOOD OR 8 YEAR FLOOD

3 SPECIAL FEATURES AT SITE (DAMS, DE. SCOUR, DRIFT, SLIDING BANKS ETC.) CHANNEL DIVERSION PROJECT EXPECTED TO PROCEED BY CONSERVATION AUTHORITY IN 1975

4 (A) EXISTING STRUCTURES AT SITE, UPSTREAM AND DOWNSTREAM (GIVE LOCATION, TOTAL SPAN, HEIGHT ABOVE NORMAL HIGH WATER, NET AREA FOR FLOW AT N.H.W., ESTIMATED AGE.)
- 1st UP STREAM (HYDRO RIGHT-OF-WAY) SPAN 18' HEIGHT ABOVE N.H.W.L. – 2 FEET (WORK WITH HEAD) NET AREA FOR FLOW AT H.W.L. = 63 SQ. FEET. AGE APPROX. 20 YEARS
- 2nd UP STREAM ON MARTHA ST. SPAN 10' HEIGHT 8·8' ARCH. AGE APPROX. 25 YEARS.

(B) REASON FOR CHANGE IN HEIGHT OR SPAN OF PROPOSED STRUCTURE FROM THAT OF EXISTING STRUCTURE NO SUBSTANTIAL CHANGE

5 INFORMATION ON EXTREME FLOODING AT SITE OBTAINED FROM JAMES F. MacLAREN LTD. FLOOD CONTROL REPORT AND REFLECTS HIGHEST WATER ELEVATION TO BE 253.7 SEE NOTE AND LOWEST WATER ELEVATION TO BE 247.0

6 IS IT LIKELY THAT STREAM BED WILL BE LOWERED NO

7 IS STRUCTURE ON A MUNICIPAL DRAIN NO

8 DESIGN LOADING H20 S16 PLUS NA INCHES ASPHALT

9 (A) NAVIGATION CLEARANCES REQUIRED, IF ANY NA

(B) RAILWAY CLEARANCES REQUIRED, IF ANY NA

(C) REQUIREMENTS OF OTHER AGENCIES HALTON REGION CONSERVATION AUTHORITY

FINAL SUBMISSION

10 HAS APPROVAL BEEN OBTAINED FROM FEDERAL MINISTRY OF TRANSPORT (N.W.P. ACT) NA CANADIAN TRANSPORT COMMISSION RAILWAY COMPANIES NA

11 APPROX VOLUME OF CONCRETE 272 CU. YD.
WEIGHT OF REINFORCEMENT 20 TONS
WEIGHT OF STRUCTURAL STEEL TONS
LENGTH OF PRESTRESSED BEAMS LIN. FT.
LENGTH OF PIPE CULVERT LIN. FT.

NO.	DATE	REVISION

RAMBO CREEK CULVERT
LAKESHORE ROAD

OWNER
CITY OF BURLINGTON

TWP. LOT CON.
CO. or REGION HALTON STRUCTURE SITE NO. MUN. DIST. 4

SITE PLAN

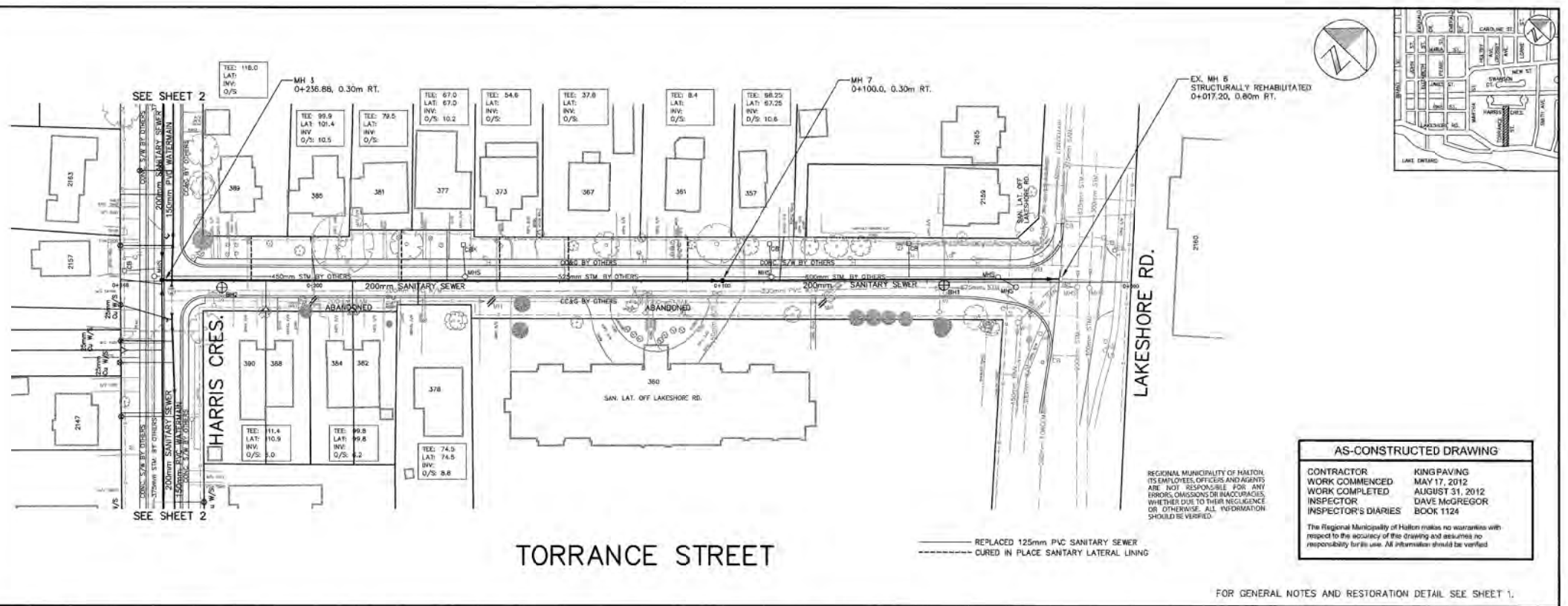
DESIGN ENGINEER D.J.S. TEFFT DATE NOVEMBER 1974
DESIGN G.T.
DRAWN E.U.
CHECK P.A.
74031B PROJECT NO.
DRAWING NO. 1

Philips Planning + Engineering Limited

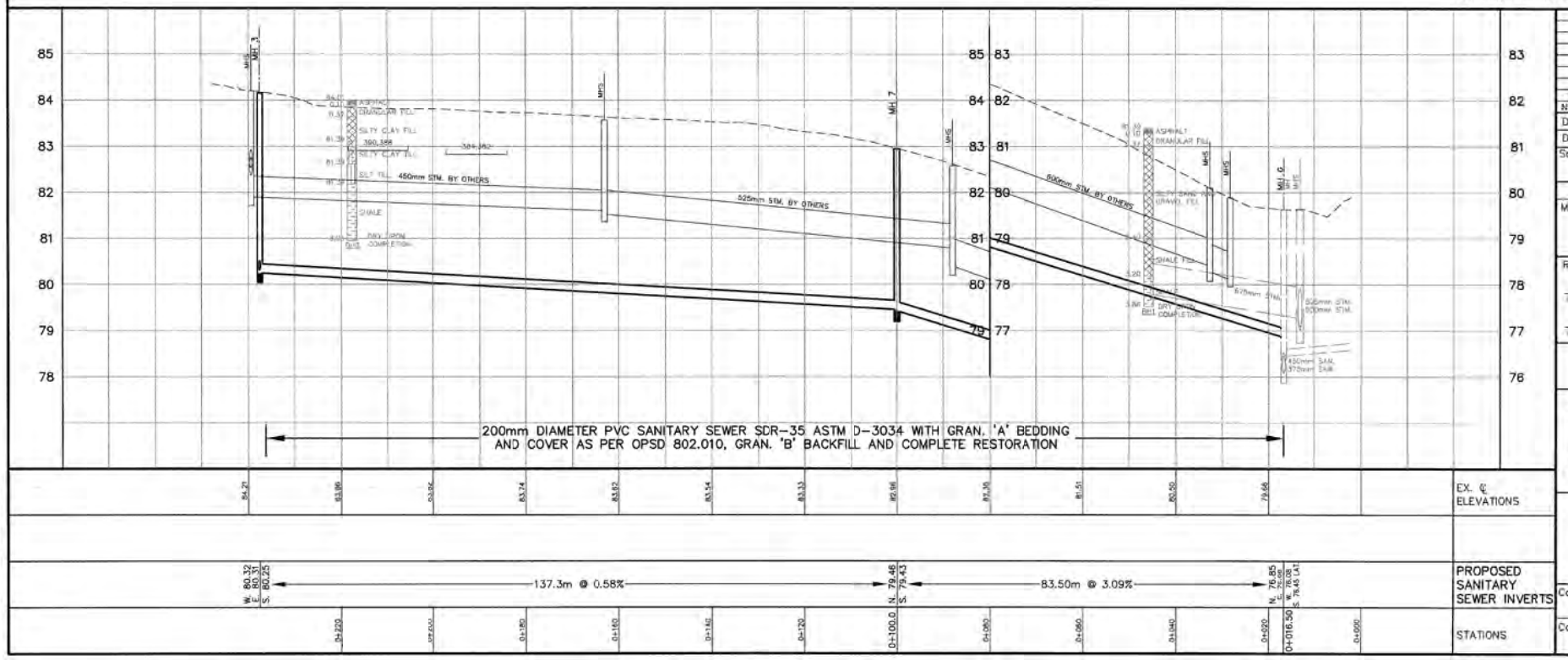
REGISTERED PROFESSIONAL ENGINEER PROVINCE OF ONTARIO
DONALD J.S. TEFFT

B-4413

B-4413



FOR GENERAL NOTES AND RESTORATION DETAIL SEE SHEET 1.



NR	Date	By	REVISION	Man.	CAD
1	JUNE 2014	E.W.S.	AS CONSTRUCTED		X

Design	S.A.S.	Ch'kd		Date MARCH 2012
Drawn	E.W.S.	Ch'kd		References
Scale 1:500 Horiz. 10 5 0 10				
1:50 Vert. 1 0.5 0 1				

APPROVALS

Municipal

Regional

Director, Wastewater Services

Manager, Wastewater Design & Construction

Field Notes

Stamp

Halton Region — CITY OF BURLINGTON

WATERMAIN AND SANITARY SEWER REPLACEMENT ON
TORRANCE STREET
IN THE CITY OF BURLINGTON
FROM LAKESHORE RD. E. HARRIS CRES.

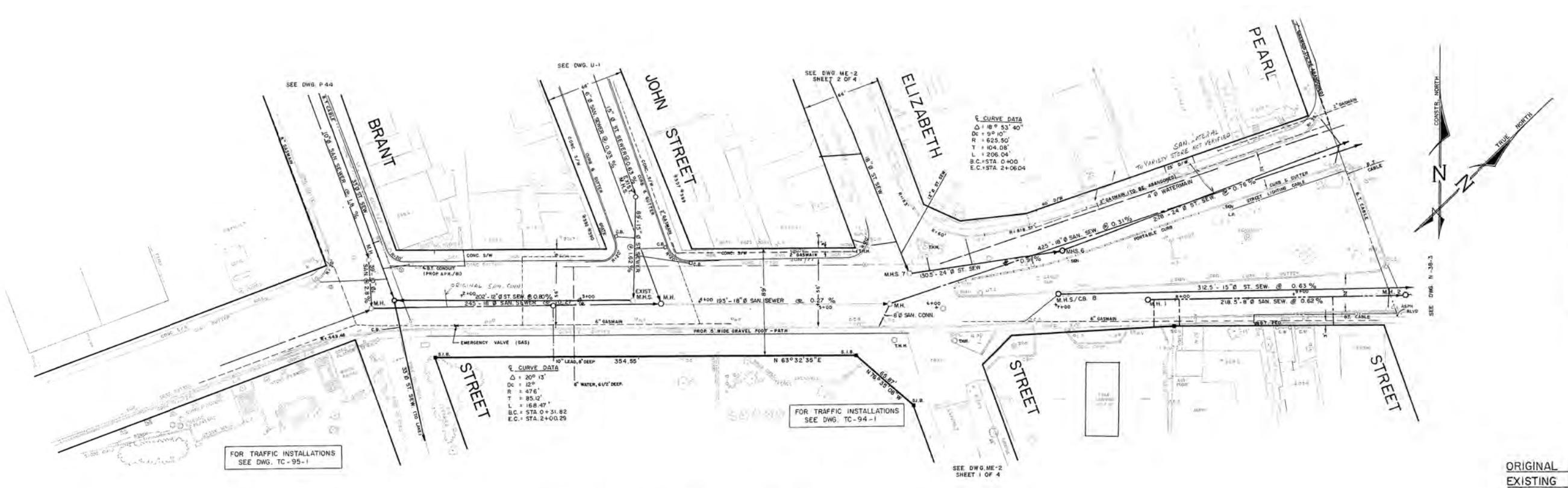
Consultant File No. B13771

Contract No. WS-2815-12

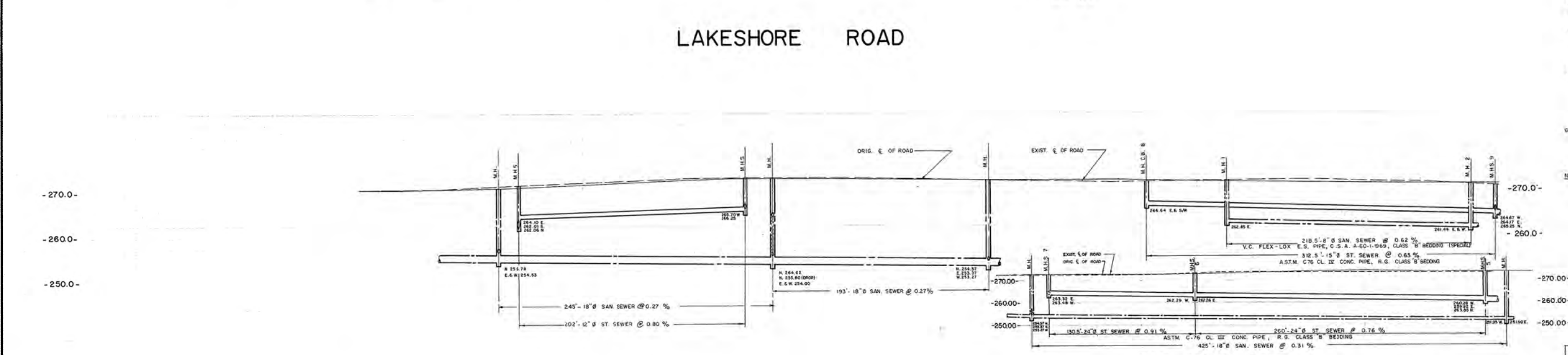
Drawing No. SHEET 3 OF 3

PR-2815-12 3 of 3

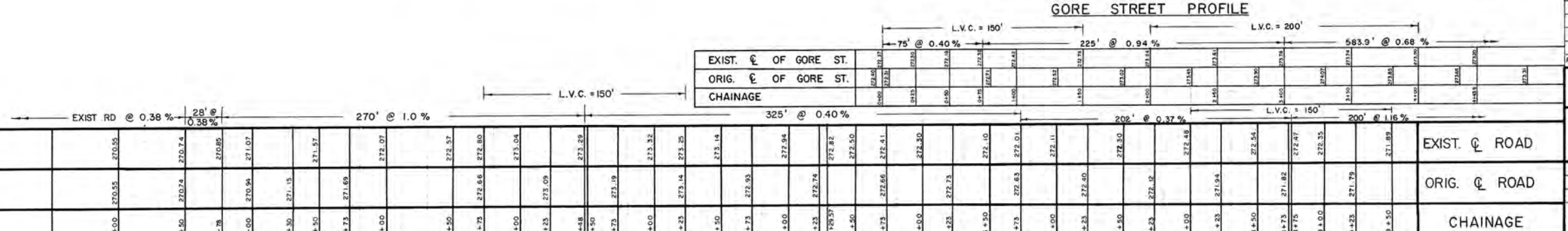
Drawing: N:\2014\PROJECTS\WS CONSTRUCTION\PR-2815 HARRIS TORRANCE ACLONG
Layout: 3 of 3
Date: 08/20/2014 Time: 03:33:34 PM



LAKESHORE ROAD



GORE STREET PROFILE



ORIGINAL ROAD BASE: CONCRETE (STA. 5+50-10+00)
EXISTING ROAD BASE:
15" GRAN. "B", 6" GRAN. "A", 4" H.M. 5, 1 1/2" H.M. 3.

YEAR CONSTRUCTED: 1974/75

ALL SAN. LATERALS SHOULD BE VERIFIED

BEDD. B.M. N°65001 — ELEV 274.00
CONCRETE MONUMENT IN ISLAND OF LAKESHORE, GORE, AND PEARL STREETS, TABLET LOCATED IN CONCRETE AT GROUND LEVEL.

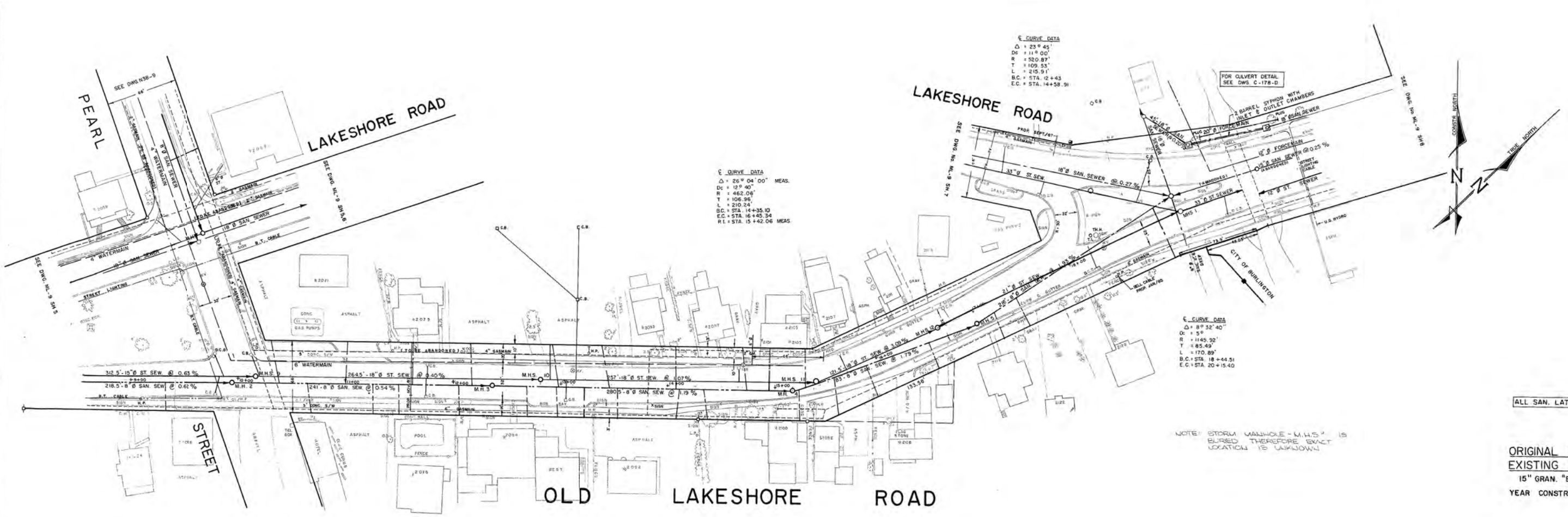
NOTE: OTHER MATERIAL MAY BE ACCEPTABLE, PROVIDED APPROVAL HAS FIRST BEEN OBTAINED FROM THE ENGINEER.

REVISION N°	DESCRIPTION	DATE	BY
1	"AS CONSTRUCTED" L-155, G-130, G-149	SEPT 21/76	LA

CITY OF BURLINGTON
ENGINEERING DEPARTMENT

LAKESHORE ROAD
300' W. OF BRANT ST. — 300' E. OF ELIZABETH ST.

DESIGN	S.S.M.	CHK'D		FIELD NOTES	INDEX N°
DRAWN BY	Z. PILLER	CHK'D		L.71-VII., L.71-IV.,	N 38-2
SCALE	HORIZ. 1"=40' VERT. 1"=10'	DATE	DEC. 1971	REFERENCES	
APPROVED	DIRECTOR OF PUBLIC WORKS	DATE		20R-3295	

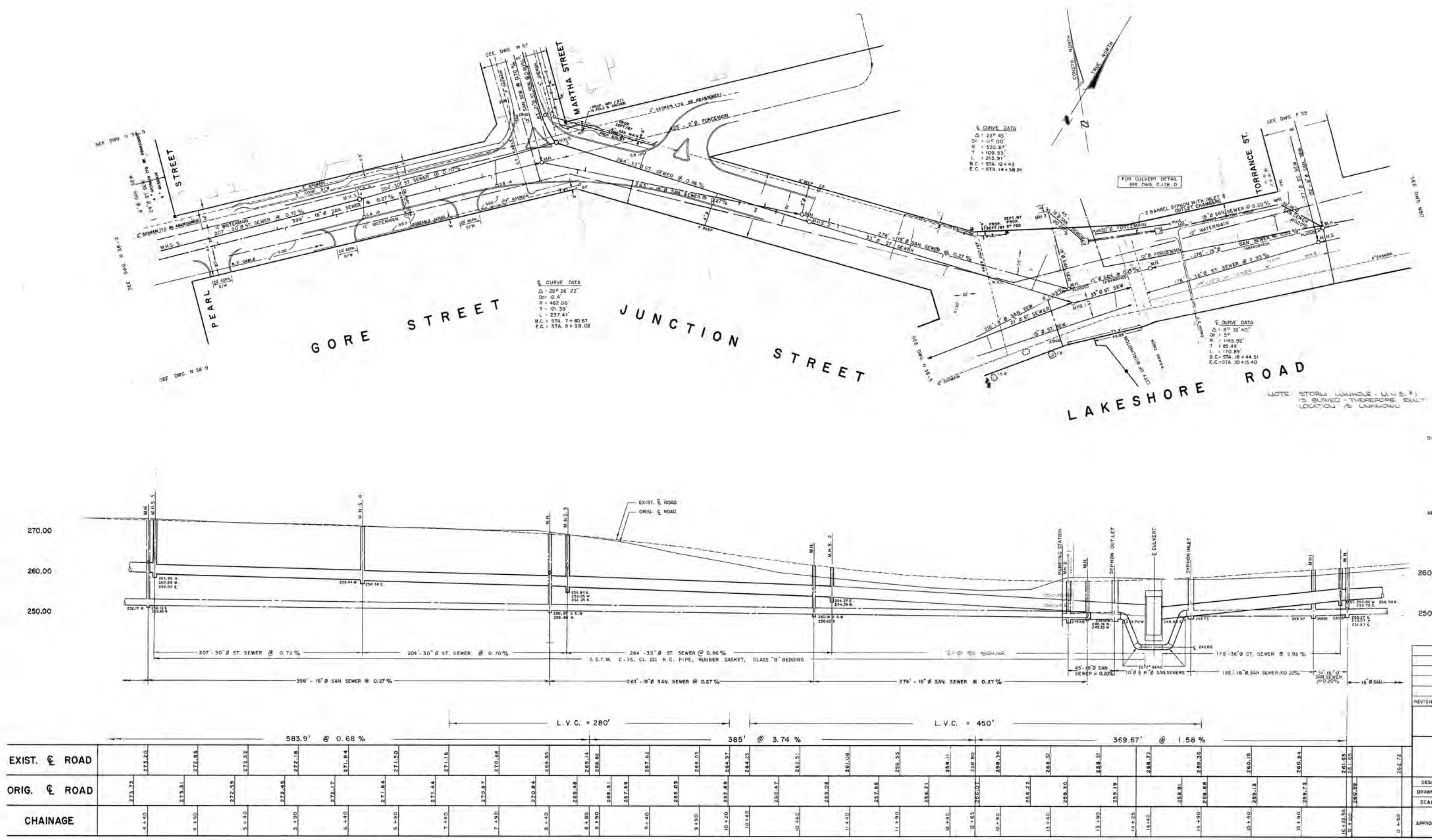


REVISION NR	DESCRIPTION	DATE	BY
1	"AS CONSTRUCTED" L-155, G-130, G-149	OCT. 22/76	L.A.

CITY OF BURLINGTON
ENGINEERING DEPARTMENT

OLD LAKESHORE ROAD
PEARL STREET — LAKESHORE ROAD

DESIGN	S.S.M. CHK'D	FIELD NOTES	INDEX NR
DRAWN BY	Z. PILLER CHK'D	L-71-155, L-71,	N 38-3
SCALE	HORIZ. 1"=40' VERT. 1"=10' DATE DEC, 1971	REFERENCES	
APPROVED	DIRECTOR OF PUBLIC WORKS DATE		WOR-9446





KEY PLAN
SCALE: 1"=1000'

ALL SAN. LATERALS SHOULD BE VERIFIED

EXISTING ROAD BASE

15" GRAN. "B", 6" GRAN. "A",
4" H.M. 5, 1 1/2" H.M. 3.

YEAR CONSTRUCTED : 1974-75

B.M.
1. GEOD. B.M. Nº 650011 (ELEV. 274.01)
CONC. MON. IN ISLAND FORMED BY INTERSECTION OF LAKESHORE RD., GORE ST. & PEARL ST. - 36' NORTH OF H.P. Nº P-52, 3' SOUTHEAST OF EDGE OF GORE ST., TABLET IN TOP OF CONC. AT GROUND ELEV.
2. TOPO. B.M. (ELEV. 260.33)
NORTHEAST CORNER OF CONC. ABUTMENT NORTH SIDE OF LAKESHORE RD. AT RAMBO CREEK BRIDGE.

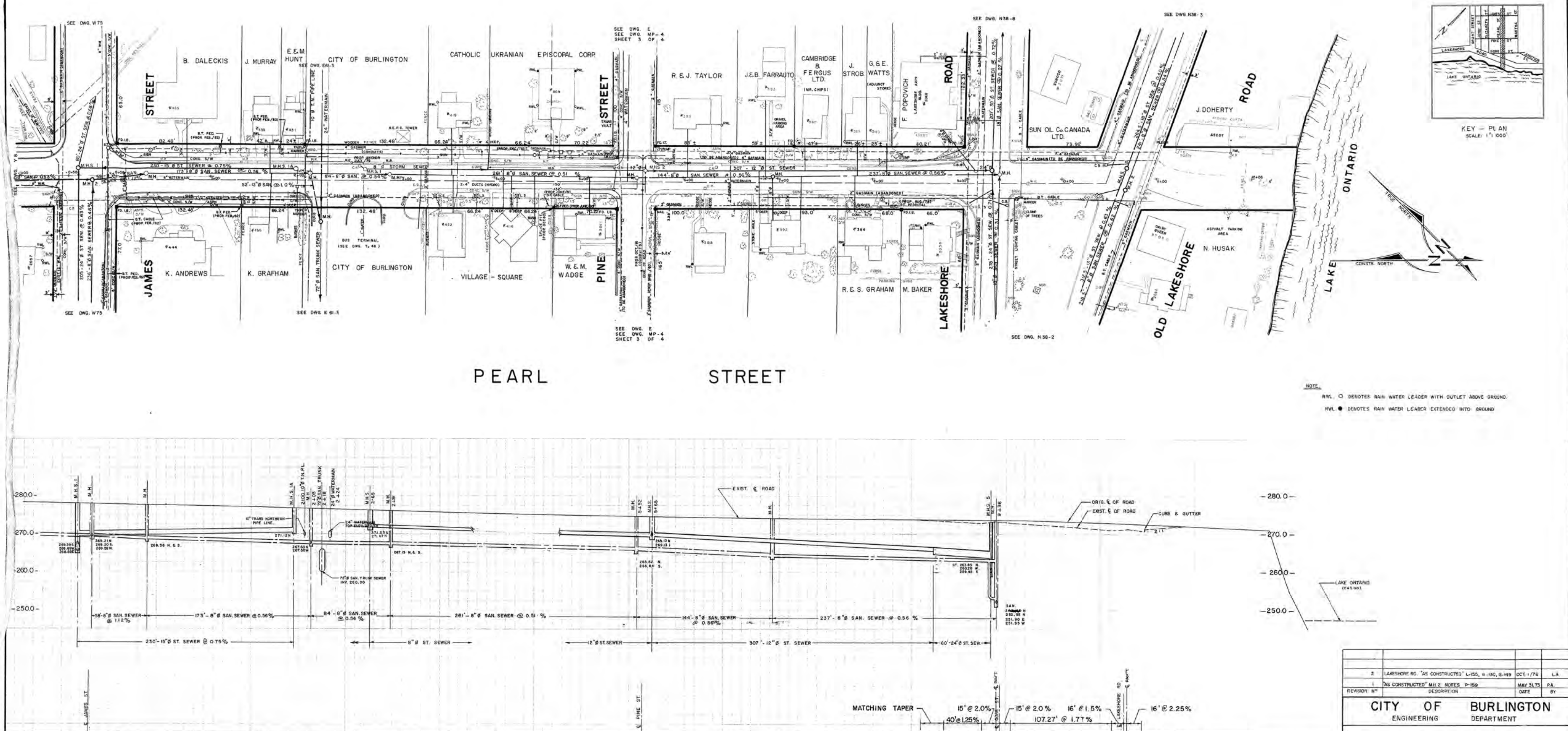
NOTES
1. OTHER MATERIALS MAY BE ACCEPTABLE PROVIDED APPROVAL HAS FIRST BEEN OBTAINED FROM THE ENGINEER.

REVISION Nº	DESCRIPTION	DATE	BY
1	"AS CONSTRUCTED" L-155, G-130	OCT. 26/76	L.A.

CITY OF BURLINGTON
ENGINEERING DEPARTMENT

LAKESHORE ROAD
~~GORE ST. & JUNCTION ST.~~
PEARL STREET - LAKESHORE ROAD

DESIGN	S.S.M.	CHK'D		FIELD NOTES	INDEX Nº
DRAWN BY	L.A.	CHK'D			N 38-8
SCALE	HORZ. 1"=40' VERT. 1"=10'	DATE		REFERENCES	
APPROVED	DIRECTOR OF PUBLIC WORKS DATE:				



PROP. ℄ ROAD																																							
PROP. ℄ ROAD																								273.72	273.40	273.09	272.90	273.20	272.90	272.82		271.94		271.00	271.24	270.88			
EXIST. ℄ ROAD	278.29	278.00		277.72	277.71	277.39	277.13	276.80	276.40	276.01	275.66	275.27	275.03	274.72	274.69		274.2	274.22	274.16	273.92	273.93	273.81		273.77			273.10	273.10	271.49			271.67		271.49	271.22
CHAINAGE	-1+00	-0+50	-0+4.33	0+00	0+50	1+00	1+50	2+00	2+50	3+00	3+50	4+00	4+50	5+00	5+50	5+53.70	6+00	6+50	7+00	7+50	8+00	8+50	8+75.43	9+00	9+15.43	9+30.43	9+45.43	9+50	10+00	10+50	10+62.7	10+68.7	10+84.7	11+00	11+25.7	11+50	12+00

REVISION Nº	DESCRIPTION	DATE	BY
2	LAKESHORE RD. "AS CONSTRUCTED" L-155, 8-130, 8-149	OCT. 1/76	L.A.
1	"AS CONSTRUCTED" M.H. 2 NOTES P-159	MAY 31, 73	P.A.

CITY OF BURLINGTON
ENGINEERING DEPARTMENT

PEARL STREET
JAMES STREET – LAKE ONTARIO

DESIGN	P.F.	CHK'D		FIELD NOTES	INDEX Nº
DRAWN BY	Z. PILLER	CHK'D		E-60, E80, H6-I & II	N 38-9
SCALE	HORIZ: 1" = 40' VERT: 1" = 10'	DATE	NOV. 1971	REFERENCES	
APPROVED	DIRECTOR OF PUBLIC WORKS			C65, H36, L71-3, E19, E61-3, SUR. 8-4, SUR. 8-6, R 84, E60 F.N.	

results were compared with **Table 1 - Limits for Sanitary and Combined Sewer Discharge**, based on the **Regional Municipality of Halton By-law No. 2-03.** The results, which are presented in Appendix G, revealed compliance with all parameters under Table 1 - Limits for Sanitary and Combined Sewer Discharge.

To further confirm the groundwater quality, it is recommended that re-sampling and re-testing of the groundwater be carried out prior to commencing construction works if Site dewatering is required.

8. DISCUSSION

In order to further verify and confirm the observed variations in groundwater levels, it is recommended that groundwater depths be monitored for the remaining period prior to the start of site construction.

Hydraulic conductivity values from the slug and pump tests vary between 9.72 x 10^{-9} m/s (0.00048 m/day) and 3.1 x 10^{-7} m/s (0.027 m/day). There were no changes in water levels measured in the observation wells during pumping from MW2 and MW6. Additionally, the relatively high flow rates observed from MW2 during the pump tests are not considered representative of the prevailing groundwater conditions on the entire Site but rather points to localized regions of weathered / fractured shale acting as water bearing media in the region surrounding MW2. This is also reflected in the rock quality designation, in which the rock core recovered from BH2 was rated as fair, indicating the presence of fractures and weathering of the shale bedrock. Hydraulic conductivity calculated from the D_{10} Grain size distribution shows that the silt and clay overburden can be considered to act as an aquitard with the underlying weathered shale comprising the upper aquifer.

For the purposes of construction dewatering, it is recommended that water be pumped from sump pits during excavation. Any weathered or fractured shale seams encountered should be cleaned as best as possible and the area grouted to reduce seepage into the excavation. Under current worse-case conditions from the slug and pump tests, the **average** construction groundwater discharge rate is approximately 10.7 m^3/day or 10,700 liters/day over the entire Site. A factored discharge rate of 15,000 L/day is recommended for construction dewatering design purposes. For permanent drainage, the **average** discharge rate is under 10 m^3/day with

a high of 17.93 m^3/day from MW2. A factored discharge rate of 15,000 L/day is recommended for permanent drainage design purposes. Neither an application for PTTW nor an application to be considered for EASR for water taking is necessary under the current conditions. These recommendations should however be revised after a period of continuous monitoring of the groundwater levels particularly throughout the wet season. For permanent drainage, sump pits with two pumps, each capable of extracting a minimum of 15,000 L/day is recommended.

The groundwater quality has met and is in compliance with all parameters under Table 1 - Limits for Sanitary and Combined Sewer Discharge, based on the Regional Municipality of Halton By-law No. 2-03. Re-sampling/re-testing of groundwater is recommended prior to construction.

9. GENERAL COMMENTS

This report is limited in scope to those items specifically referenced in the text. The discussions and recommendations presented in this report are intended only as guidance for the named client and design engineers. The information on which these recommendations are based is subject to confirmation by engineering personnel at the time of construction. Localized variations in the subsoil conditions may be present between and beyond the boreholes and should be verified during construction.

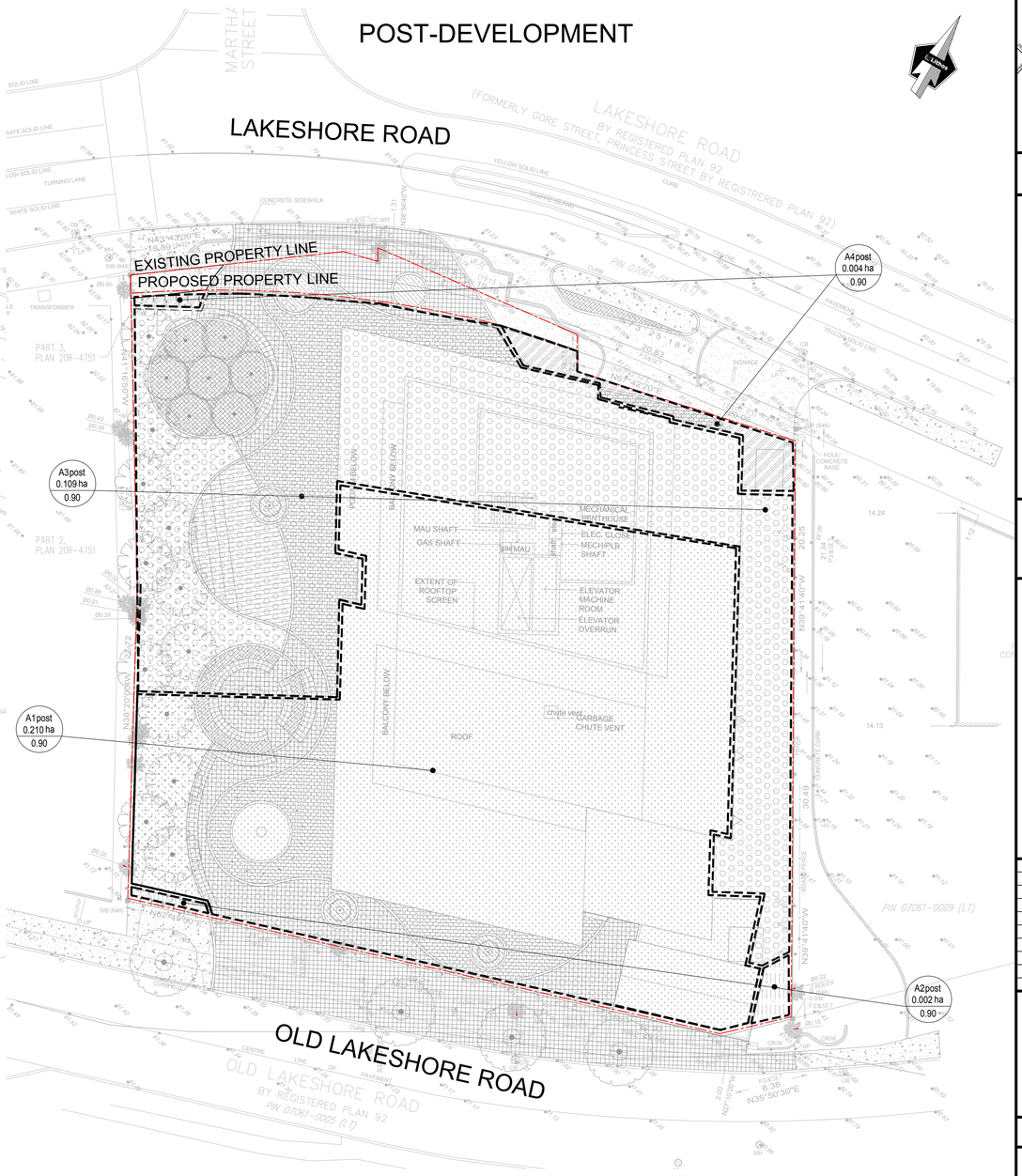
As more specific subsurface information becomes available during excavations on the Site, this report may be updated. Contractors bidding on or undertaking the work should decide on their own investigations, as well as their own interpretations of the factual borehole results. This concern specifically applies to the classification of the subsurface soil and the potential reuse of these soils on/off Site. The contractors must draw their own conclusions as to how the near surface and subsurface conditions may affect them.

APPENDIX C
Storm Analysis

PRE-DEVELOPMENT



POST-DEVELOPMENT



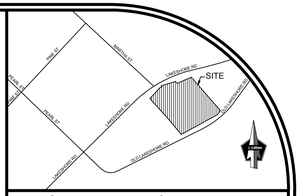
RUN-OFF COEFFICIENTS

DRAINAGE AREA	CONTROL	LAND USE	AREA (ha)	INITIAL COEFFICIENT	COMPOSITE COEFFICIENT	DESIGN COEFFICIENT
A1 PRE (TOWARDS OLD LAKESHORE ROAD)	GRAVITY DRIVEN INTO THE STORM CHAMBERS	HARDSCAPE	0.174	0.90	0.82	0.50
		LANDSCAPE	0.026	0.30		
A2 PRE (TOWARDS LAKESHORE ROAD)	GRAVITY DRIVEN INTO THE STORM CHAMBERS	HARDSCAPE	0.105	0.90	0.80	0.50
		LANDSCAPE	0.020	0.30		

RUN-OFF COEFFICIENTS

DRAINAGE AREA	CONTROL	AREA (ha)	COEFFICIENT
A1 POST (ROOFTOPS / TERRACES / OUTDOOR AMENITY AREA)	CONTROLLED IN TANK	0.210	0.90
A2 POST (UNCONTROLLED AREA)	TOWARDS OLD LAKESHORE ROAD	0.002	0.90
A3 POST (OUTDOOR AMENITY AREA)	CONTROLLED IN TANK	0.109	0.90
A4 POST (UNCONTROLLED AREA)	TOWARDS LAKESHORE ROAD	0.004	0.90

DRAINAGE AREA	LEGEND	AREA (ha)	TOTAL AREA (ha)
A1 POST		0.210	0.325
A2 POST		0.002	
A3 POST		0.109	
A4 POST		0.004	



© 2019 GOOGLE, MAP DATA © 2019 TELE ATLAS

LOCATION PLAN
NTS

LEGEND

PROPERTY LINE

DRAINAGE AREA

A1 pre / 0.200 ha / 0.50 — STORM DRAINAGE AREA NUMBER; DRAINAGE AREA (ha); COMPOSITE RUNOFF COEFFICIENT

A1post / 0.175 ha / 0.90 — STORM DRAINAGE AREA NUMBER; DRAINAGE AREA (ha); COMPOSITE RUNOFF COEFFICIENT

LIST OF DRAWINGS

SG-01 (PRELIMINARY SITE GRADING PLAN)
SS-01 (PRELIMINARY SITE SERVICING PLAN)
STM1 (PRE AND POST-STORM DRAINAGE PLAN)

SITE PLAN INFORMATION

STUDIO JCI
20 DE BOERS DR. SUITE 525, TORONTO, ONTARIO, M3J 0H1
T: (416) 901-6528 F: (416) 901-8962
www.studiojci.com

SURVEY INFORMATION

AKSAN PILLER CORPORATION LTD.
ONTARIO LAND SURVEYORS
943 MT PLEASANT ROAD, TORONTO, ON, M4P 2L7
T: (416) 488-1174 F: (416) 488-7843 E:ap@apsurveys.ca
www.apsurveys.ca

BENCHMARK

ELEVATIONS SHOWN HEREON ARE GEODETIC AND ARE DERIVED FROM THE CITY OF BURLINGTON BENCH MARK 914001, ELEVATION = 77.901 m.

NO	REVISION	DATE	BY
1.	ISSUED FOR ZONING APPLICATION	AUG. 22, 2019	NM

DRAFT

CITY OF BURLINGTON

PRE AND POST-STORM DRAINAGE PLAN

MIXED USE DEVELOPMENT
2093-2101 OLD LAKESHORE ROAD AND 2096-2100 LAKESHORE ROAD
BURLINGTON, ONTARIO

CITY OF Burlington

Manager,Development Engineering — Date

Lithos

150 Bermondsay Road, Toronto, Ontario M4A 1Y1

DESIGNED BY: AL	DATE: MAR 21, 2019	CHECKED BY: NM
DRAWN BY: AL	PROJECT No:	APPROVED BY:NM
SCALE: 1:300	UD18-050	DRAWING No: STM1

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Lithos

Prepared By: Anastasia Lazaridou, P.E., M.A.Sc.
Reviewed by: Nick Moutzouris, P.Eng., M.A.Sc.

Rational Method
Pre-Development Flow Calculation

2093-2101 Old Lakeshore Road and
2096-2100 Lakeshore Road
File No. UD18-050
City of Burlington
Date: August 2019

Pre-Development Storm flows towards Old Lakeshore Road

Area Number	Surface	Area (ha)	C
Hardscape area towards Old Lakeshore	Hardscape	0.174	0.90
Landscape area towards Old Lakeshore	Landscape	0.026	0.30
Total Area towards Old Lakeshore (A1 Pre)		0.200	0.82

Formula:	$I = A / (t + B)c$
A, B, C	Constants
t	time of duration
I	Rainfall intensity

Event 2-year
A = 592.60
B = 6
C = 0.78

IDF Data Set City of Burlington

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m^3/s)	Q (L/s)
Total Area towards Old Lakeshore (A1 Pre)	0.200	0.50	0.10	10	68.2	0.019	18.9

Event 5-year
A = 697.40
B = 5
C = 0.764

IDF Data Set City of Burlington

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m^3/s)	Q (L/s)
Total Area towards Old Lakeshore (A1 Pre)	0.200	0.50	0.10	10	88.1	0.024	24.5

Event 100-year
A = 1114.20
B = 5
C = 0.761

IDF Data Set City of Burlington

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m^3/s)	Q (L/s)
Total Area towards Old Lakeshore (A1 Pre)	0.200	0.50	0.10	10	141.9	0.039	39.4

Lithos

Rational Method
Pre-Development Flow Calculation

2093-2101 Old Lakeshore Road and
2096-2100 Lakeshore Road
File No. UD18-050

Prepared By: Anastasia Lazaridou, P.E., M.A.Sc.
Reviewed by: Nick Moutzouris, P.Eng., M.A.Sc.

City of Burlington
Date: August 2019

Pre-Development Storm flows towards Lakeshore Road

Area Number	Surface	Area (ha)	C
Hardscape area towards Lakeshore Road	Hardscape	0.105	0.90
Landscape area towards Lakeshore Road	Landscape	0.020	0.30
Total Area towards Lakeshore Road - A2 Pre		0.125	0.80

Formula:	**I = A / (t + B)c**
A, B, C	Constants
t	time of duration
I	Rainfall intensity

Event 2-year

A = 592.60
B = 6
C = 0.78

IDF Data Set City of Burlington

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m^3/s)	Q (L/s)
Total Area towards Lakeshore Road - A2 Pre	0.125	0.50	0.06	10	68.2	0.012	11.9

Event 5-year

A = 697.40
B = 5
C = 0.764

IDF Data Set City of Burlington

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m^3/s)	Q (L/s)
Total Area towards Lakeshore Road - A2 Pre	0.125	0.50	0.06	10	88.1	0.015	15.3

Event 100-year

A = 1114.20
B = 5
C = 0.761

IDF Data Set City of Burlington

Area Number	A (ha)	C	AC	Tc (min.)	I (mm/h)	Q (m^3/s)	Q (L/s)
Hardscape area towards Lakeshore Road	0.125	0.50	0.06	10	141.9	0.025	24.7

Modified Rational Method - Two Year Storm
Site Flow and Storage Summary - towards Old Lakeshore Road
2093-2101 Old Lakeshore Road and 2096-2100 Lakeshore Road
File No. UD18-050

Drainage Area A1 Post

Rooftops / Terraces / Outdoor Amenity Area-Controlled In Tank

Area (A1) = **0.210** ha
"C" = **0.90**
AC1 = **0.19**
Tc = **10** min
Time Increment = **5.0** min

Max. Release Rate = **35.8** L/s

Drainage Area A2 Post

Uncontrolled Site Area towards Old Lakeshore Road

Area (A2) = **0.002** ha
"C" = **0.90**
AC2= **0.002**
Tc = **10.0** min
Time Increment = **5.0** min

Max. Release Rate = **0.5** L/s

Total Site

Total Site = A1+A2

2-yr A1, A2 Pre-Development Site Release Rate = **18.9** L/s

Controlled Release Rate = **11.1** L/s

Uncontrolled Flow (A3) 0.5 L/s

Total Site Release Rate Achieved = **11.6** L/s

Max. Storage Main Tank Size = **16.1** m^3

Stor. Tank footpring Area = **33.91** m^2

2 Year Design Storm

a=	592.60
c=	0.780
B=	6
I=	a/((Tc+B)^c)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Time	**Rainfall Intensity**	**Storm Runoff (A1 Post)**	**Runoff Volume (A1 Post)**	**Storm Runoff (A2 Post)**	**Runoff Volume (A2 Post)**	**Total Storm Runoff Volume**	**Target Released Volume**	**Storage Volume**	**Storage Depth of Tank**
(min)	**(mm/hr)**	**(m^3/s)**	**(m^3)**	**(m^3/s)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	
10.0	68.2	0.036	21.47	0.000	0.20	21.47	6.66	14.8	0.44
15.0	55.1	0.029	26.05	0.000	0.25	26.05	9.98	16.1	0.47
20.0	46.7	0.025	29.41	0.000	0.56	29.41	13.31	16.1	0.47
25.0	40.7	0.021	32.04	0.000	0.61	32.04	16.64	15.4	0.45
30.0	36.2	0.019	34.22	0.000	0.65	34.22	19.97	14.3	0.42
35.0	32.7	0.017	36.07	0.000	0.69	36.07	23.30	12.8	0.38
40.0	29.9	0.016	37.69	0.000	0.72	37.69	26.63	11.1	0.33
45.0	27.6	0.014	39.12	0.000	0.75	39.12	29.95	9.2	0.27
50.0	25.7	0.013	40.41	0.000	0.77	40.41	33.28	7.1	0.21
55.0	24.0	0.013	41.58	0.000	0.79	41.58	36.61	5.0	0.15
60.0	22.6	0.012	42.66	0.000	0.81	42.66	39.94	2.7	0.08
65.0	21.3	0.011	43.65	0.000	0.83	43.65	43.27	0.4	0.01
70.0	20.2	0.011	44.58	0.000	0.85	44.58	46.59	0.0	0.00
75.0	19.2	0.010	45.45	0.000	0.87	45.45	49.92	0.0	0.00
80.0	18.4	0.010	46.27	0.000	0.88	46.27	53.25	0.0	0.00
85.0	17.6	0.009	47.04	0.000	0.90	47.04	56.58	0.0	0.00
90.0	16.8	0.009	47.77	0.000	0.91	47.77	59.91	0.0	0.00
95.0	16.2	0.009	48.46	0.000	0.92	48.46	63.24	0.0	0.00
100.0	15.6	0.008	49.13	0.000	0.94	49.13	66.56	0.0	0.00
105.0	15.0	0.008	49.76	0.000	0.95	49.76	69.89	0.0	0.00
110.0	14.5	0.008	50.37	0.000	0.96	50.37	73.22	0.0	0.00
115.0	14.1	0.007	50.96	0.000	0.97	50.96	76.55	0.0	0.00
120.0	13.6	0.007	51.52	0.000	0.98	51.52	79.88	0.0	0.00
125.0	13.2	0.007	52.06	0.000	0.99	52.06	83.21	0.0	0.00
130.0	12.8	0.007	52.58	0.000	1.00	52.58	86.53	0.0	0.00
135.0	12.5	0.007	53.09	0.000	1.01	53.09	89.86	0.0	0.00
140.0	12.1	0.006	53.58	0.000	1.02	53.58	93.19	0.0	0.00
145.0	11.8	0.006	54.06	0.000	1.03	54.06	96.52	0.0	0.00
150.0	11.5	0.006	54.52	0.000	1.04	54.52	99.85	0.0	0.00
155.0	11.3	0.006	54.96	0.000	1.05	54.96	103.17	0.0	0.00
160.0	11.0	0.006	55.40	0.000	1.06	55.40	106.50	0.0	0.00
165.0	10.7	0.006	55.82	0.000	1.06	55.82	109.83	0.0	0.00
170.0	10.5	0.006	56.24	0.000	1.07	56.24	113.16	0.0	0.00
175.0	10.3	0.005	56.64	0.000	1.08	56.64	116.49	0.0	0.00
180.0	10.1	0.005	57.03	0.000	1.09	57.03	119.82	0.0	0.00
185.0	9.9	0.005	57.42	0.000	1.09	57.42	123.14	0.0	0.00
190.0	9.7	0.005	57.79	0.000	1.10	57.79	126.47	0.0	0.00
195.0	9.5	0.005	58.16	0.000	1.11	58.16	129.80	0.0	0.00
200.0	9.3	0.005	58.52	0.000	1.11	58.52	133.13	0.0	0.00
205.0	9.1	0.005	58.87	0.000	1.12	58.87	136.46	0.0	0.00
210.0	9.0	0.005	59.21	0.000	1.13	59.21	139.78	0.0	0.00
215.0	8.8	0.005	59.55	0.000	1.13	59.55	143.11	0.0	0.00
220.0	8.6	0.005	59.88	0.000	1.14	59.88	146.44	0.0	0.00
225.0	8.5	0.004	60.21	0.000	1.15	60.21	149.77	0.0	0.00
230.0	8.4	0.004	60.52	0.000	1.15	60.52	153.10	0.0	0.00
235.0	8.2	0.004	60.84	0.000	1.16	60.84	156.43	0.0	0.00
240.0	8.1	0.004	61.14	0.000	1.16	61.14	159.75	0.0	0.00
245.0	8.0	0.004	61.45	0.000	1.17	61.45	163.08	0.0	0.00
250.0	7.8	0.004	61.74	0.000	1.18	61.74	166.41	0.0	0.00
255.0	7.7	0.004	62.03	0.000	1.18	62.03	169.74	0.0	0.00
260.0	7.6	0.004	62.32	0.000	1.19	62.32	173.07	0.0	0.00
265.0	7.5	0.004	62.60	0.000	1.19	62.60	176.40	0.0	0.00
270.0	7.4	0.004	62.88	0.000	1.20	62.88	179.72	0.0	0.00

Modified Rational Method - Five Year Storm
Site Flow and Storage Summary - towards Old Lakeshore Road
2093-2101 Old Lakeshore Road and 2096-2100 Lakeshore Road
File No. UD18-050

Drainage Area A1 Post

Rooftops / Terraces / Outdoor Amenity Area-Controlled In Tank

Area (A1) = **0.210** ha
"C" = **0.90**
AC1 = **0.19**
Tc = **10** min
Time Increment = **5.0** min

Max. Release Rate = **46.2** L/s

Drainage Area A2 Post

Uncontrolled Site Area towards Old Lakeshore Road

Area (A2) = **0.002** ha
"C" = **0.90**
AC2= **0.002**
Tc = **10.0** min
Time Increment = **5.0** min

Max. Release Rate = **0.6** L/s

Total Site

Total Site = A1+A2

2-yr A1, A2 Pre-Development Site Release Rate = **18.9** L/s

Controlled Release Rate = **13.0** L/s

Uncontrolled Flow (A3) 0.6 L/s

Total Site Release Rate Achieved = **13.6** L/s

Max. Storage Main Tank Size = **22.0** m^3

Stor. Tank footpring Area = **33.91** m^2

5 Year Design Storm

a=	697.40
c=	0.764
B=	5
I=	a/((Tc+B)^c)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Time	**Rainfall Intensity**	**Storm Runoff (A1 Post)**	**Runoff Volume (A1 Post)**	**Storm Runoff (A2 Post)**	**Runoff Volume (A2 Post)**	**Total Storm Runoff Volume**	**Target Released Volume**	**Storage Volume**	**Storage Depth of Tank**
(min)	**(mm/hr)**	**(m^3/s)**	**(m^3)**	**(m^3/s)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	
10.0	88.1	0.046	27.75	0.000	0.26	27.75	7.77	20.0	0.59
15.0	70.7	0.037	33.41	0.000	0.32	33.41	11.66	21.8	0.64
20.0	59.6	0.031	37.57	0.001	0.72	37.57	15.55	22.0	0.65
25.0	51.9	0.027	40.85	0.001	0.78	40.85	19.44	21.4	0.63
30.0	46.1	0.024	43.58	0.000	0.83	43.58	23.32	20.3	0.60
35.0	41.6	0.022	45.91	0.000	0.87	45.91	27.21	18.7	0.55
40.0	38.1	0.020	47.95	0.000	0.91	47.95	31.10	16.9	0.50
45.0	35.1	0.018	49.77	0.000	0.95	49.77	34.98	14.8	0.44
50.0	32.6	0.017	51.42	0.000	0.98	51.42	38.87	12.5	0.37
55.0	30.5	0.016	52.92	0.000	1.01	52.92	42.76	10.2	0.30
60.0	28.7	0.015	54.31	0.000	1.03	54.31	46.64	7.7	0.23
65.0	27.2	0.014	55.60	0.000	1.06	55.60	50.53	5.1	0.15
70.0	25.8	0.014	56.80	0.000	1.08	56.80	54.42	2.4	0.07
75.0	24.5	0.013	57.93	0.000	1.10	57.93	58.31	0.0	0.00
80.0	23.4	0.012	58.99	0.000	1.12	58.99	62.19	0.0	0.00
85.0	22.4	0.012	60.00	0.000	1.14	60.00	66.08	0.0	0.00
90.0	21.5	0.011	60.96	0.000	1.16	60.96	69.97	0.0	0.00
95.0	20.7	0.011	61.88	0.000	1.18	61.88	73.85	0.0	0.00
100.0	19.9	0.010	62.75	0.000	1.20	62.75	77.74	0.0	0.00
105.0	19.2	0.010	63.59	0.000	1.21	63.59	81.63	0.0	0.00
110.0	18.6	0.010	64.39	0.000	1.23	64.39	85.52	0.0	0.00
115.0	18.0	0.009	65.16	0.000	1.24	65.16	89.40	0.0	0.00
120.0	17.4	0.009	65.91	0.000	1.26	65.91	93.29	0.0	0.00
125.0	16.9	0.009	66.63	0.000	1.27	66.63	97.18	0.0	0.00
130.0	16.4	0.009	67.32	0.000	1.28	67.32	101.06	0.0	0.00
135.0	16.0	0.008	68.00	0.000	1.30	68.00	104.95	0.0	0.00
140.0	15.6	0.008	68.65	0.000	1.31	68.65	108.84	0.0	0.00
145.0	15.2	0.008	69.28	0.000	1.32	69.28	112.72	0.0	0.00
150.0	14.8	0.008	69.90	0.000	1.33	69.90	116.61	0.0	0.00
155.0	14.4	0.008	70.50	0.000	1.34	70.50	120.50	0.0	0.00
160.0	14.1	0.007	71.08	0.000	1.35	71.08	124.39	0.0	0.00
165.0	13.8	0.007	71.65	0.000	1.36	71.65	128.27	0.0	0.00
170.0	13.5	0.007	72.20	0.000	1.38	72.20	132.16	0.0	0.00
175.0	13.2	0.007	72.74	0.000	1.39	72.74	136.05	0.0	0.00
180.0	12.9	0.007	73.27	0.000	1.40	73.27	139.93	0.0	0.00
185.0	12.7	0.007	73.79	0.000	1.41	73.79	143.82	0.0	0.00
190.0	12.4	0.007	74.30	0.000	1.42	74.30	147.71	0.0	0.00
195.0	12.2	0.006	74.79	0.000	1.42	74.79	151.60	0.0	0.00
200.0	11.9	0.006	75.27	0.000	1.43	75.27	155.48	0.0	0.00
205.0	11.7	0.006	75.75	0.000	1.44	75.75	159.37	0.0	0.00
210.0	11.5	0.006	76.21	0.000	1.45	76.21	163.26	0.0	0.00
215.0	11.3	0.006	76.67	0.000	1.46	76.67	167.14	0.0	0.00
220.0	11.1	0.006	77.12	0.000	1.47	77.12	171.03	0.0	0.00
225.0	10.9	0.006	77.56	0.000	1.48	77.56	174.92	0.0	0.00
230.0	10.8	0.006	77.99	0.000	1.49	77.99	178.80	0.0	0.00
235.0	10.6	0.006	78.41	0.000	1.49	78.41	182.69	0.0	0.00
240.0	10.4	0.005	78.83	0.000	1.50	78.83	186.58	0.0	0.00
245.0	10.3	0.005	79.24	0.000	1.51	79.24	190.47	0.0	0.00
250.0	10.1	0.005	79.64	0.000	1.52	79.64	194.35	0.0	0.00
255.0	10.0	0.005	80.04	0.000	1.52	80.04	198.24	0.0	0.00
260.0	9.8	0.005	80.43	0.000	1.53	80.43	202.13	0.0	0.00
265.0	9.7	0.005	80.81	0.000	1.54	80.81	206.01	0.0	0.00
270.0	9.5	0.005	81.19	0.000	1.55	81.19	209.90	0.0	0.00

Modified Rational Method - Hundred Year Storm
Site Flow and Storage Summary - towards Old Lakeshore Road
2093-2101 Old Lakeshore Road and 2096-2100 Lakeshore Road
File No. UD18-050

Drainage Area A1 Post

Rooftops / Terraces / Outdoor Amenity Area-Controlled In Tank

Area (A1) =	**0.210**	ha
"C" =	**0.90**	
AC1 =	**0.19**	
Tc =	**10**	min
Time Increment =	**5.0**	min
Max. Release Rate =	**74.5**	L/s

Drainage Area A2 Post

Uncontrolled Site Area towards Old Lakeshore Road

Area (A2) =	**0.002**	ha
"C" =	**0.90**	
AC2=	**0.002**	
Tc =	**10.0**	min
Time Increment =	**5.0**	min
Max. Release Rate =	**1.0**	L/s

Total Site

Total Site = A1+A2

2-yr A1, A2 Pre-Development Site Release Rate =	**18.9**	L/s
Controlled Release Rate =	**17.4**	L/s
Uncontrolled Flow (A3)	1.0	L/s
Total Site Release Rate Achieved =	**18.4**	L/s
Max. Storage Main Tank Size =	**39.8**	m^3
Stor. Tank footpring Area =	**33.9**	m^2

100 Year Design Storm

a=	1114.20
c=	0.761
B=	5
I=	a/((Tc+B)^c)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Time	**Rainfall Intensity**	**Storm Runoff (A1 Post)**	**Runoff Volume (A1 Post)**	**Storm Runoff (A2 Post)**	**Runoff Volume (A2 Post)**	**Total Storm Runoff Volume**	**Target Released Volume**	**Storage Volume**	**Storage Depth of Tank**
(min)	**(mm/hr)**	**(m^3/s)**	**(m^3)**	**(m^3/s)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	
10.0	141.9	0.074	44.70	0.001	0.43	44.70	10.45	34.3	1.01
15.0	114.0	0.060	53.86	0.001	0.51	53.86	15.67	38.2	1.13
20.0	96.2	0.050	60.60	0.001	1.15	60.60	20.89	39.7	1.17
25.0	83.7	0.044	65.94	0.001	1.26	65.94	26.11	39.8	1.17
30.0	74.5	0.039	70.37	0.001	1.34	70.37	31.34	39.0	1.15
35.0	67.3	0.035	74.16	0.001	1.41	74.16	36.56	37.6	1.11
40.0	61.5	0.032	77.49	0.001	1.48	77.49	41.78	35.7	1.05
45.0	56.8	0.030	80.46	0.001	1.53	80.46	47.00	33.5	0.99
50.0	52.8	0.028	83.14	0.001	1.58	83.14	52.23	30.9	0.91
55.0	49.4	0.026	85.60	0.000	1.63	85.60	57.45	28.1	0.83
60.0	46.5	0.024	87.86	0.000	1.67	87.86	62.67	25.2	0.74
65.0	43.9	0.023	89.96	0.000	1.71	89.96	67.89	22.1	0.65
70.0	41.7	0.022	91.93	0.000	1.75	91.93	73.12	18.8	0.55
75.0	39.7	0.021	93.77	0.000	1.79	93.77	78.34	15.4	0.46
80.0	37.9	0.020	95.52	0.000	1.82	95.52	83.56	12.0	0.35
85.0	36.3	0.019	97.17	0.000	1.85	97.17	88.78	8.4	0.25
90.0	34.8	0.018	98.73	0.000	1.88	98.73	94.01	4.7	0.14
95.0	33.5	0.018	100.23	0.000	1.91	100.23	99.23	1.0	0.03
100.0	32.3	0.017	101.66	0.000	1.94	101.66	104.45	0.0	0.00
105.0	31.2	0.016	103.03	0.000	1.96	103.03	109.67	0.0	0.00
110.0	30.1	0.016	104.35	0.000	1.99	104.35	114.90	0.0	0.00
115.0	29.2	0.015	105.61	0.000	2.01	105.61	120.12	0.0	0.00
120.0	28.3	0.015	106.83	0.000	2.03	106.83	125.34	0.0	0.00
125.0	27.4	0.014	108.01	0.000	2.06	108.01	130.56	0.0	0.00
130.0	26.7	0.014	109.15	0.000	2.08	109.15	135.79	0.0	0.00
135.0	25.9	0.014	110.26	0.000	2.10	110.26	141.01	0.0	0.00
140.0	25.2	0.013	111.33	0.000	2.12	111.33	146.23	0.0	0.00
145.0	24.6	0.013	112.37	0.000	2.14	112.37	151.45	0.0	0.00
150.0	24.0	0.013	113.38	0.000	2.16	113.38	156.68	0.0	0.00
155.0	23.4	0.012	114.36	0.000	2.18	114.36	161.90	0.0	0.00
160.0	22.9	0.012	115.32	0.000	2.20	115.32	167.12	0.0	0.00
165.0	22.4	0.012	116.25	0.000	2.21	116.25	172.35	0.0	0.00
170.0	21.9	0.011	117.16	0.000	2.23	117.16	177.57	0.0	0.00
175.0	21.4	0.011	118.05	0.000	2.25	118.05	182.79	0.0	0.00
180.0	21.0	0.011	118.91	0.000	2.27	118.91	188.01	0.0	0.00
185.0	20.6	0.011	119.76	0.000	2.28	119.76	193.24	0.0	0.00
190.0	20.1	0.011	120.59	0.000	2.30	120.59	198.46	0.0	0.00
195.0	19.8	0.010	121.40	0.000	2.31	121.40	203.68	0.0	0.00
200.0	19.4	0.010	122.20	0.000	2.33	122.20	208.90	0.0	0.00
205.0	19.0	0.010	122.98	0.000	2.34	122.98	214.13	0.0	0.00
210.0	18.7	0.010	123.74	0.000	2.36	123.74	219.35	0.0	0.00
215.0	18.4	0.010	124.49	0.000	2.37	124.49	224.57	0.0	0.00
220.0	18.1	0.009	125.22	0.000	2.39	125.22	229.79	0.0	0.00
225.0	17.8	0.009	125.95	0.000	2.40	125.95	235.02	0.0	0.00
230.0	17.5	0.009	126.65	0.000	2.41	126.65	240.24	0.0	0.00
235.0	17.2	0.009	127.35	0.000	2.43	127.35	245.46	0.0	0.00
240.0	16.9	0.009	128.04	0.000	2.44	128.04	250.68	0.0	0.00
245.0	16.7	0.009	128.71	0.000	2.45	128.71	255.91	0.0	0.00
250.0	16.4	0.009	129.37	0.000	2.46	129.37	261.13	0.0	0.00
255.0	16.2	0.008	130.02	0.000	2.48	130.02	266.35	0.0	0.00
260.0	16.0	0.008	130.66	0.000	2.49	130.66	271.57	0.0	0.00
265.0	15.7	0.008	131.30	0.000	2.50	131.30	276.80	0.0	0.00
270.0	15.5	0.008	131.92	0.000	2.51	131.92	282.02	0.0	0.00

Lithos

Orifice Design

2093-2101 Old Lakeshore Road and 2096-2100 Lakeshore Road

File No. UD18-050

Date: August 2019

Prepared by: Anastasia Lazaridou, P.E., M.A.Sc.

Reviewed by: Nick Moutzouris, P.Eng., M.A.Sc.

Towards Old Lakeshore Road

Orifice Equation for 75 mm Tube

$$Q = C \times A \times \sqrt{2 \times g \times h}$$

100 yr event			**5 yr event**			**2 yr event**		
d=	75	mm	d=	75	mm	d=	75	mm
C=	0.82		C=	0.82		C=	0.82	
A=	0.004	m^2	A=	0.004	m^2	A=	0.004	m^2
g=	9.81	m/s^2	g=	9.81	m/s^2	g=	9.81	m/s^2
h=	1.18	m	h=	0.65	m	h=	0.48	m
Q=	**17.4**	**L/s**	**Q=**	**13.0**	**L/s**	**Q=**	**11.1**	**L/s**

Modified Rational Method - Two Year Storm
Site Flow and Storage Summary - towards Lakeshore Road
2093-2101 Old Lakeshore Road and 2096-2100 Lakeshore Road
File No. UD18-050

Drainage Area A3 Post

Outdoor Amenity Area / Rooftops - Controlled in Tank

Area (A2) = **0.109** ha
"C" = **0.90**
AC2= **0.10**
Tc = **10.0** min
Time Increment = **5.0** min

Max. Release Rate = **18.6** L/s

Drainage Area A4 Post

Uncontrolled Site Area towards Lakeshore Road

Area (A4) = **0.004** ha
"C" = **0.90**
AC4= **0.00**
Tc = **10.0** min
Time Increment = **5.0** min

Max. Release Rate = **0.7** L/s

Total Site

Total Site = A3+A4

2-yr A3 Pre-Development Site Release Rate = **11.9** L/s

Controlled Release Rate = **6.0** L/s

Uncontrolled Flow (A4) 0.7 L/s

Total Site Release Rate Achieved = **6.7** L/s

Max. Storage Main Tank Size = **8.1** m^3

Stor. Tank footpring Area = **59.64** m^2

2 Year Design Storm

a=	592.60
c=	0.780
B=	6
I=	a/((Tc+B)^c)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Time	**Rainfall Intensity**	**Storm Runoff (A3 Post)**	**Runoff Volume (A3 Post)**	**Storm Runoff (A4 Post)**	**Runoff Volume (A4 Post)**	**Total Storm Runoff Volume**	**Target Release Volume**	**Storage Volume**	**Storage Depth of Tank**
(min)	(mm/hr)	(m^3/s)	(m^3)	(m^3/s)	(m^3)	(m^3)	(m^3)	(m^3)	
10.0	68.2	0.019	11.14	0.001	0.41	11.14	3.60	7.5	0.13
15.0	55.1	0.015	13.52	0.001	0.50	13.52	5.40	8.1	0.14
20.0	46.7	0.013	15.26	0.000	0.56	15.26	7.20	8.1	0.14
25.0	40.7	0.011	16.63	0.000	0.61	16.63	9.01	7.6	0.13
30.0	36.2	0.010	17.76	0.000	0.65	17.76	10.81	7.0	0.12
35.0	32.7	0.009	18.72	0.000	0.69	18.72	12.61	6.1	0.10
40.0	29.9	0.008	19.56	0.000	0.72	19.56	14.41	5.2	0.09
45.0	27.6	0.008	20.30	0.000	0.75	20.30	16.21	4.1	0.07
50.0	25.7	0.007	20.97	0.000	0.77	20.97	18.01	3.0	0.05
55.0	24.0	0.007	21.58	0.000	0.79	21.58	19.81	1.8	0.03
60.0	22.6	0.006	22.14	0.000	0.81	22.14	21.61	0.5	0.01
65.0	21.3	0.006	22.66	0.000	0.83	22.66	23.42	0.0	0.00
70.0	20.2	0.006	23.14	0.000	0.85	23.14	25.22	0.0	0.00
75.0	19.2	0.005	23.59	0.000	0.87	23.59	27.02	0.0	0.00
80.0	18.4	0.005	24.01	0.000	0.88	24.01	28.82	0.0	0.00
85.0	17.6	0.005	24.41	0.000	0.90	24.41	30.62	0.0	0.00
90.0	16.8	0.005	24.79	0.000	0.91	24.79	32.42	0.0	0.00
95.0	16.2	0.004	25.16	0.000	0.92	25.16	34.22	0.0	0.00
100.0	15.6	0.004	25.50	0.000	0.94	25.50	36.02	0.0	0.00
105.0	15.0	0.004	25.83	0.000	0.95	25.83	37.83	0.0	0.00
110.0	14.5	0.004	26.15	0.000	0.96	26.15	39.63	0.0	0.00
115.0	14.1	0.004	26.45	0.000	0.97	26.45	41.43	0.0	0.00
120.0	13.6	0.004	26.74	0.000	0.98	26.74	43.23	0.0	0.00
125.0	13.2	0.004	27.02	0.000	0.99	27.02	45.03	0.0	0.00
130.0	12.8	0.003	27.29	0.000	1.00	27.29	46.83	0.0	0.00
135.0	12.5	0.003	27.56	0.000	1.01	27.56	48.63	0.0	0.00
140.0	12.1	0.003	27.81	0.000	1.02	27.81	50.43	0.0	0.00
145.0	11.8	0.003	28.06	0.000	1.03	28.06	52.23	0.0	0.00
150.0	11.5	0.003	28.30	0.000	1.04	28.30	54.04	0.0	0.00
155.0	11.3	0.003	28.53	0.000	1.05	28.53	55.84	0.0	0.00
160.0	11.0	0.003	28.76	0.000	1.06	28.76	57.64	0.0	0.00
165.0	10.7	0.003	28.98	0.000	1.06	28.98	59.44	0.0	0.00
170.0	10.5	0.003	29.19	0.000	1.07	29.19	61.24	0.0	0.00
175.0	10.3	0.003	29.40	0.000	1.08	29.40	63.04	0.0	0.00
180.0	10.1	0.003	29.60	0.000	1.09	29.60	64.84	0.0	0.00
185.0	9.9	0.003	29.80	0.000	1.09	29.80	66.64	0.0	0.00
190.0	9.7	0.003	30.00	0.000	1.10	30.00	68.45	0.0	0.00
195.0	9.5	0.003	30.19	0.000	1.11	30.19	70.25	0.0	0.00
200.0	9.3	0.003	30.37	0.000	1.11	30.37	72.05	0.0	0.00
205.0	9.1	0.002	30.56	0.000	1.12	30.56	73.85	0.0	0.00
210.0	9.0	0.002	30.73	0.000	1.13	30.73	75.65	0.0	0.00
215.0	8.8	0.002	30.91	0.000	1.13	30.91	77.45	0.0	0.00
220.0	8.6	0.002	31.08	0.000	1.14	31.08	79.25	0.0	0.00
225.0	8.5	0.002	31.25	0.000	1.15	31.25	81.05	0.0	0.00
230.0	8.4	0.002	31.41	0.000	1.15	31.41	82.86	0.0	0.00
235.0	8.2	0.002	31.58	0.000	1.16	31.58	84.66	0.0	0.00
240.0	8.1	0.002	31.74	0.000	1.16	31.74	86.46	0.0	0.00
245.0	8.0	0.002	31.89	0.000	1.17	31.89	88.26	0.0	0.00
250.0	7.8	0.002	32.05	0.000	1.18	32.05	90.06	0.0	0.00
255.0	7.7	0.002	32.20	0.000	1.18	32.20	91.86	0.0	0.00
260.0	7.6	0.002	32.35	0.000	1.19	32.35	93.66	0.0	0.00
265.0	7.5	0.002	32.49	0.000	1.19	32.49	95.46	0.0	0.00
270.0	7.4	0.002	32.64	0.000	1.20	32.64	97.26	0.0	0.00

Modified Rational Method - Five Year Storm
Site Flow and Storage Summary - towards Lakeshore Road
2093-2101 Old Lakeshore Road and 2096-2100 Lakeshore Road
File No. UD18-050

Drainage Area A3 Post

Outdoor Amenity Area / Rooftops - Controlled in Tank

Area (A2) =	**0.109**	ha
"C" =	**0.90**	
AC2=	**0.10**	
Tc =	**10.0**	min
Time Increment =	**5.0**	min
Max. Release Rate =	**24.0**	L/s

Drainage Area A4 Post

Uncontrolled Site Area towards Lakeshore Road

Area (A4) =	**0.004**	ha
"C" =	**0.90**	
AC4=	**0.00**	
Tc =	**10.0**	min
Time Increment =	**5.0**	min
Max. Release Rate =	**0.9**	L/s

Total Site

Total Site = A3+A4

2-yr A3 Pre-Development Site Release Rate =	**11.9**	L/s
Controlled Release Rate =	**7.0**	L/s
Uncontrolled Flow (A4)	0.9	L/s
Total Site Release Rate Achieved =	**7.9**	L/s
Max. Storage Main Tank Size =	**11.1**	m^3
Stor. Tank footpring Area =	**59.64**	m^2

5 Year Design Storm

a=	697.40
c=	0.764
B=	5
I=	a/((Tc+B)^c)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Time	**Rainfall Intensity**	**Storm Runoff (A3 Post)**	**Runoff Volume (A3 Post)**	**Storm Runoff (A4 Post)**	**Runoff Volume (A4 Post)**	**Total Storm Runoff Volume**	**Target Release Volume**	**Storage Volume**	**Storage Depth of Tank**
(min)	(mm/hr)	(m^3/s)	(m^3)	(m^3/s)	(m^3)	(m^3)	(m^3)	(m^3)	
10.0	88.1	0.024	14.40	0.001	0.53	14.40	4.21	10.2	0.17
15.0	70.7	0.019	17.34	0.001	0.64	17.34	6.31	11.0	0.18
20.0	59.6	0.016	19.50	0.001	0.72	19.50	8.42	11.1	0.19
25.0	51.9	0.014	21.20	0.001	0.78	21.20	10.52	10.7	0.18
30.0	46.1	0.013	22.62	0.000	0.83	22.62	12.62	10.0	0.17
35.0	41.6	0.011	23.83	0.000	0.87	23.83	14.73	9.1	0.15
40.0	38.1	0.010	24.89	0.000	0.91	24.89	16.83	8.1	0.14
45.0	35.1	0.010	25.83	0.000	0.95	25.83	18.93	6.9	0.12
50.0	32.6	0.009	26.69	0.000	0.98	26.69	21.04	5.7	0.09
55.0	30.5	0.008	27.47	0.000	1.01	27.47	23.14	4.3	0.07
60.0	28.7	0.008	28.19	0.000	1.03	28.19	25.25	2.9	0.05
65.0	27.2	0.007	28.86	0.000	1.06	28.86	27.35	1.5	0.03
70.0	25.8	0.007	29.48	0.000	1.08	29.48	29.45	0.0	0.00
75.0	24.5	0.007	30.07	0.000	1.10	30.07	31.56	0.0	0.00
80.0	23.4	0.006	30.62	0.000	1.12	30.62	33.66	0.0	0.00
85.0	22.4	0.006	31.14	0.000	1.14	31.14	35.77	0.0	0.00
90.0	21.5	0.006	31.64	0.000	1.16	31.64	37.87	0.0	0.00
95.0	20.7	0.006	32.12	0.000	1.18	32.12	39.97	0.0	0.00
100.0	19.9	0.005	32.57	0.000	1.20	32.57	42.08	0.0	0.00
105.0	19.2	0.005	33.00	0.000	1.21	33.00	44.18	0.0	0.00
110.0	18.6	0.005	33.42	0.000	1.23	33.42	46.28	0.0	0.00
115.0	18.0	0.005	33.82	0.000	1.24	33.82	48.39	0.0	0.00
120.0	17.4	0.005	34.21	0.000	1.26	34.21	50.49	0.0	0.00
125.0	16.9	0.005	34.58	0.000	1.27	34.58	52.60	0.0	0.00
130.0	16.4	0.004	34.94	0.000	1.28	34.94	54.70	0.0	0.00
135.0	16.0	0.004	35.29	0.000	1.30	35.29	56.80	0.0	0.00
140.0	15.6	0.004	35.63	0.000	1.31	35.63	58.91	0.0	0.00
145.0	15.2	0.004	35.96	0.000	1.32	35.96	61.01	0.0	0.00
150.0	14.8	0.004	36.28	0.000	1.33	36.28	63.12	0.0	0.00
155.0	14.4	0.004	36.59	0.000	1.34	36.59	65.22	0.0	0.00
160.0	14.1	0.004	36.89	0.000	1.35	36.89	67.32	0.0	0.00
165.0	13.8	0.004	37.19	0.000	1.36	37.19	69.43	0.0	0.00
170.0	13.5	0.004	37.48	0.000	1.38	37.48	71.53	0.0	0.00
175.0	13.2	0.004	37.76	0.000	1.39	37.76	73.63	0.0	0.00
180.0	12.9	0.004	38.03	0.000	1.40	38.03	75.74	0.0	0.00
185.0	12.7	0.003	38.30	0.000	1.41	38.30	77.84	0.0	0.00
190.0	12.4	0.003	38.56	0.000	1.42	38.56	79.95	0.0	0.00
195.0	12.2	0.003	38.82	0.000	1.42	38.82	82.05	0.0	0.00
200.0	11.9	0.003	39.07	0.000	1.43	39.07	84.15	0.0	0.00
205.0	11.7	0.003	39.32	0.000	1.44	39.32	86.26	0.0	0.00
210.0	11.5	0.003	39.56	0.000	1.45	39.56	88.36	0.0	0.00
215.0	11.3	0.003	39.79	0.000	1.46	39.79	90.47	0.0	0.00
220.0	11.1	0.003	40.03	0.000	1.47	40.03	92.57	0.0	0.00
225.0	10.9	0.003	40.26	0.000	1.48	40.26	94.67	0.0	0.00
230.0	10.8	0.003	40.48	0.000	1.49	40.48	96.78	0.0	0.00
235.0	10.6	0.003	40.70	0.000	1.49	40.70	98.88	0.0	0.00
240.0	10.4	0.003	40.92	0.000	1.50	40.92	100.98	0.0	0.00
245.0	10.3	0.003	41.13	0.000	1.51	41.13	103.09	0.0	0.00
250.0	10.1	0.003	41.34	0.000	1.52	41.34	105.19	0.0	0.00
255.0	10.0	0.003	41.54	0.000	1.52	41.54	107.30	0.0	0.00
260.0	9.8	0.003	41.75	0.000	1.53	41.75	109.40	0.0	0.00
265.0	9.7	0.003	41.95	0.000	1.54	41.95	111.50	0.0	0.00
270.0	9.5	0.003	42.14	0.000	1.55	42.14	113.61	0.0	0.00

Lithos

Modified Rational Method - Hundred Year Storm
Site Flow and Storage Summary - towards Lakeshore Road
2093-2101 Old Lakeshore Road and 2096-2100 Lakeshore Road
File No. UD18-050

Drainage Area A3 Post

Outdoor Amenity Area / Rooftops - Controlled in Tank

Area (A2) = **0.109** ha
"C" = **0.90**
AC2= **0.10**
Tc = **10.0** min
Time Increment = **5.0** min

Max. Release Rate = **38.7** L/s

Drainage Area A4 Post

Uncontrolled Site Area towards Lakeshore Road

Area (A4) = **0.004** ha
"C" = **0.90**
AC4= **0.00**
Tc = **10.0** min
Time Increment = **5.0** min

Max. Release Rate = **1.4** L/s

Total Site

Total Site = A3+A4

2-yr A3 Pre-Development Site Release Rate = **11.9** L/s

Controlled Release Rate = **9.6** L/s

Uncontrolled Flow (A4) 1.4 L/s

Total Site Release Rate Achieved = **11.0** L/s

Max. Storage Main Tank Size = **19.9** m^3

Stor. Tank footpring Area = **54.63** m^2

100 Year Design Storm

a=	1114.20
c=	0.761
B=	5
I=	a/((Tc+B)^c)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Time	**Rainfall Intensity**	**Storm Runoff (A3 Post)**	**Runoff Volume (A3 Post)**	**Storm Runoff (A4 Post)**	**Runoff Volume (A4 Post)**	**Total Storm Runoff Volume**	**rget Releas Volume**	**Storage Volume**	**Storage Depth of Tank**
(min)	(mm/hr)	(m^3/s)	(m^3)	(m^3/s)	(m^3)	(m^3)	(m^3)	(m^3)	
10.0	141.9	0.039	23.20	0.001	0.85	23.20	5.78	17.4	0.32
15.0	114.0	0.031	27.96	0.001	1.03	27.96	8.67	19.3	0.35
20.0	96.2	0.026	31.45	0.001	1.15	31.45	11.55	19.9	0.36
25.0	83.7	0.023	34.22	0.001	1.26	34.22	14.44	19.8	0.36
30.0	74.5	0.020	36.52	0.001	1.34	36.52	17.33	19.2	0.35
35.0	67.3	0.018	38.49	0.001	1.41	38.49	20.22	18.3	0.33
40.0	61.5	0.017	40.22	0.001	1.48	40.22	23.11	17.1	0.31
45.0	56.8	0.015	41.76	0.001	1.53	41.76	26.00	15.8	0.29
50.0	52.8	0.014	43.16	0.001	1.58	43.16	28.88	14.3	0.26
55.0	49.4	0.013	44.43	0.000	1.63	44.43	31.77	12.7	0.23
60.0	46.5	0.013	45.60	0.000	1.67	45.60	34.66	10.9	0.20
65.0	43.9	0.012	46.70	0.000	1.71	46.70	37.55	9.1	0.17
70.0	41.7	0.011	47.72	0.000	1.75	47.72	40.44	7.3	0.13
75.0	39.7	0.011	48.67	0.000	1.79	48.67	43.33	5.3	0.10
80.0	37.9	0.010	49.58	0.000	1.82	49.58	46.21	3.4	0.06
85.0	36.3	0.010	50.43	0.000	1.85	50.43	49.10	1.3	0.02
90.0	34.8	0.009	51.25	0.000	1.88	51.25	51.99	0.0	0.00
95.0	33.5	0.009	52.02	0.000	1.91	52.02	54.88	0.0	0.00
100.0	32.3	0.009	52.77	0.000	1.94	52.77	57.77	0.0	0.00
105.0	31.2	0.008	53.48	0.000	1.96	53.48	60.66	0.0	0.00
110.0	30.1	0.008	54.16	0.000	1.99	54.16	63.54	0.0	0.00
115.0	29.2	0.008	54.82	0.000	2.01	54.82	66.43	0.0	0.00
120.0	28.3	0.008	55.45	0.000	2.03	55.45	69.32	0.0	0.00
125.0	27.4	0.007	56.06	0.000	2.06	56.06	72.21	0.0	0.00
130.0	26.7	0.007	56.66	0.000	2.08	56.66	75.10	0.0	0.00
135.0	25.9	0.007	57.23	0.000	2.10	57.23	77.99	0.0	0.00
140.0	25.2	0.007	57.78	0.000	2.12	57.78	80.87	0.0	0.00
145.0	24.6	0.007	58.32	0.000	2.14	58.32	83.76	0.0	0.00
150.0	24.0	0.007	58.85	0.000	2.16	58.85	86.65	0.0	0.00
155.0	23.4	0.006	59.36	0.000	2.18	59.36	89.54	0.0	0.00
160.0	22.9	0.006	59.85	0.000	2.20	59.85	92.43	0.0	0.00
165.0	22.4	0.006	60.34	0.000	2.21	60.34	95.32	0.0	0.00
170.0	21.9	0.006	60.81	0.000	2.23	60.81	98.20	0.0	0.00
175.0	21.4	0.006	61.27	0.000	2.25	61.27	101.09	0.0	0.00
180.0	21.0	0.006	61.72	0.000	2.27	61.72	103.98	0.0	0.00
185.0	20.6	0.006	62.16	0.000	2.28	62.16	106.87	0.0	0.00
190.0	20.1	0.005	62.59	0.000	2.30	62.59	109.76	0.0	0.00
195.0	19.8	0.005	63.01	0.000	2.31	63.01	112.65	0.0	0.00
200.0	19.4	0.005	63.43	0.000	2.33	63.43	115.53	0.0	0.00
205.0	19.0	0.005	63.83	0.000	2.34	63.83	118.42	0.0	0.00
210.0	18.7	0.005	64.23	0.000	2.36	64.23	121.31	0.0	0.00
215.0	18.4	0.005	64.62	0.000	2.37	64.62	124.20	0.0	0.00
220.0	18.1	0.005	65.00	0.000	2.39	65.00	127.09	0.0	0.00
225.0	17.8	0.005	65.37	0.000	2.40	65.37	129.98	0.0	0.00
230.0	17.5	0.005	65.74	0.000	2.41	65.74	132.86	0.0	0.00
235.0	17.2	0.005	66.10	0.000	2.43	66.10	135.75	0.0	0.00
240.0	16.9	0.005	66.46	0.000	2.44	66.46	138.64	0.0	0.00
245.0	16.7	0.005	66.81	0.000	2.45	66.81	141.53	0.0	0.00
250.0	16.4	0.004	67.15	0.000	2.46	67.15	144.42	0.0	0.00
255.0	16.2	0.004	67.49	0.000	2.48	67.49	147.31	0.0	0.00
260.0	16.0	0.004	67.82	0.000	2.49	67.82	150.19	0.0	0.00
265.0	15.7	0.004	68.15	0.000	2.50	68.15	153.08	0.0	0.00
270.0	15.5	0.004	68.47	0.000	2.51	68.47	155.97	0.0	0.00

Lithos

Orifice Design

2093-2101 Old Lakeshore Road and 2096-2100 Lakeshore Road

File No. UD18-050

Date: August 2019

Prepared by: Anastasia Lazaridou, P.E., M.A.Sc.

Reviewed by: Nick Moutzouris, P.Eng., M.A.Sc.

Towards Lakeshore Road

Orifice Equation for 75 mm Tube

$$Q = C \times A \times \sqrt{2 \times g \times h}$$

100 yr event

d=	75	mm
C=	0.82	
A=	0.004	m^2
g=	9.81	m/s^2
h=	0.36	m
Q=	**9.6**	**L/s**

5 yr event

d=	75	mm
C=	0.82	
A=	0.004	m^2
g=	9.81	m/s^2
h=	0.19	m
Q=	**7.0**	**L/s**

2 yr event

d=	75	mm
C=	0.82	
A=	0.004	m^2
g=	9.81	m/s^2
h=	0.14	m
Q=	**6.0**	**L/s**

APPENDIX D
Sanitary Data Analysis

SANITARY SEWER DESIGN SHEET

2093-2101 Old Lakeshore Road and 2096-2100 Lakeshore Road

CITY OF BURLINGTON

LOCATION	RESIDENTIAL					COMMERCIAL		FLOW								SEWER DESIGN				
	SECTION AREA	NUMBER OF UNITS			SECTION POP.	COMM AREA	SECTION POP. @ 90 ppha	TOTAL ACCUM. POP.	AVERAGE RESIDENTIAL FLOW '@' 275 L/c/d	HARMON PEAKING FACTOR	RES. PEAK FLOW	AVERAGE RETAIL FLOW @ 247.5 L/c/d	TOTAL ACCUM. AREA	INFILT. @ 0.286 L/s/ha.	TOTAL DESIGN FLOW	PIPE LENGTH	PIPE DIA.	SLOPE	FULL FLOW CAPACITY n = 0.013	% of DESIG CAPACITY
		Single Fam. Dwell.	Semi-detached, duplex and 4-plex	Apartment (over 6 stories high)																
	(ha.)	@ 55 ppha	@ 100 ppha	@ 285 ppha	(persons)	(ha.)	(persons)	(persons)	(L/s)		(L/s)	(L/s)	(ha.)	(L/s)	(L/s)	(m)	(mm)	(%)	(L/sec)	(%)
column number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Existing Condition																				
Mixed-Use Development	0.325	0.009	0	0	0	0.055	5	5	0.00	4.48	0.01	0.014	0.325	0.093	**0.11**					
Proposed Condition																				
Mixed-Use Development	0.325	0	0	2.20	627	0.071	6	633	2.00	3.92	7.83	0.018	0.325	0.093	**7.94**	11.2	200	2.0%	46.38	18%
Groundwater															**0.35**					
													Total Net Flow		**8.17**					

Residential Flow Rate - 275 litres/capita/day
Retail Flow Rate - 247.5 litres/capita/day
Infiltration - 0.286 L/ha
Peaking Factor = $1 + [14 / (4 + P^{0.5})]$, P=Population in thousands
Site Area: 0.325 Ha

Lithos

Prepared by: Anastasia Lazaridou, P.E., M.A.Sc.
Reviewed by: Nick Moutzouris, P.Eng., M.A.Sc.
Date: August 2019

Project: 2093-2101 Old Lakeshore Road and 2096-2100 Lakeshore Road
Project: PUD18-050
City of Burlington

Sheet 1 OF 1

APPENDIX E
Water Data Analysis

WATER DEMAND

2093-2101 Old Lakeshore Road and 2096-2100 Lakeshore Road

File No: UD18-050

Date: August 2019

Prepared by: Anastasia Lazaridou, P.E., M.A.Sc.

Reviewed By: Nick Moutzouris, P.Eng., M.A.Sc.

Fire Flow Calculation

1 $F = 220\ C\ (A)^{1/2}$

Where F= Fire flow in Lpm

C= construction type coefficient

= 0.6 fire resistive construction

A = total floor area in sq.m. including basement (main use)

			Area Applied
Level 02=	1383.9	m^2	100%
Level 03=	1305.1	m^2	25%
Level 04=	1305.1	m^2	25%
=	2,036	sq.m.	

Note 1: The levels indicated, reference the floors with the largest areas (refer to building stats)

F = 5,956.77 L/min

F = 6,000 L/min Round to nearest 1000 l/min

2 Occupancy Reduction

25% reduction for limited-combustible occupancy

F = 4500 L/min

3 Sprinkler Reduction

30% Reduction for NFPA Sprinkler System

F = 3150 l/min

4 Separation Charge

0%	West	Parking
0%	North	Road
0%	South	Road
10%	East	20.1m to 30 m
10%	Total Separation Charge	450 L/min

F = 3,600.00 L/min

F = 4,000 L/min Round to nearest 1000 l/min

60.00 L/s

F = 951 US GPM

Domestic Flow Calculations

Residential Population = 627 from Sanitary Design Sheet

Commercial Population= 6 from Sanitary Design Sheet

Average Day Demand = 275 L/cap/day 1 US Gallon=3.785 L

= 2.01 L/s

= 32 US GPM 1 US GPM=15.852L/s

Max. Daily Demand Peaking Factor = 2.25

Max. Daily Demand = 4.53 L/s = 72 US GPM

or

Residential Max. Hourly Demand Peaking Factor = 4.00

Max. Hourly Demand = 8.06 L/s = 128 US GPM

Commercial Max. Hourly Demand Peaking Factor = 2.25

Max. Hourly Demand = 4.53 L/s

Max Daily Demand = 4.53 L/s

Fire Flow = 60.00 L/s

Required 'Design' Flow = 64.53 L/s

1023 US GPM

Note: Required 'Design' Flow is the maximum of either:

1) Fire Flow + Maximum Daily Demand
2) Maximum Hourly Demand

Lithos

WATER DEMAND

2093-2101 Old Lakeshore Road and 2096-2100 Lakeshore Road

File No: UD18-050

Date: August 2019

Prepared by: Anastasia Lazaridou, P.E., M.A.Sc.

Reviewed By: Nick Moutzouris, P.Eng., M.A.Sc.

Pressure Losses

Hazen-Williams Formula

$V = kCR_h^{0.63}xS^{0.54}$

k= 0.85 - conversion factor (0.849 for SI units and 1.318 for US customary units)

C= 140 - roughness coefficient (PVC : 140-150)

$S = h_f/L$

Rh= D/4 - hydraulic radius (D/4 for full flow, A/P_W for partially flow)

Fire Fighting and Domestic Head Loss

Flow Requirements=	64.53	L/s
Diameter=	150	mm
Area=	1.77E-02	
L=	6.5	m
V=	3.65	m/s
S=	7.29E-02	
R_h=	0.04	
H_f=	0.47	m
=	0.67	psi

Flow Test *(dated: November 28, 2018)*

when: Static Pressure =	70	psi	Flow = 0 gpm =	0	L/s	$Q_R = Q_F \times \frac{h_r^{0.54}}{h_f^{0.54}}$
Residual Pressure =	64	psi	Flow = 1462 gpm =	92.24	L/s	

Pressure (psi)	***Flow (L/s)***
70	0.0
64	92.2
66.9	*64.53*

Based on the Pressure/Flow relationship, we have to confirm that the flow requirement of 64.53 L/s can be provided at minimum pressure (20.3 psi + Losses) as set out by the FUS guidelines

Fire Flow is above minimum of 20.97 psi (20.3+Hf)

Since the flow of 64.53 L/s required for the proposed development is provided in the existing watermain at 66.9 psi (which is more than the minimum of 21.05 psi), the existing watermain infrastructure can support the proposed development.

Flow available at 20psi = 4713 gpm = 297.37 L/s

Q_{avail} @ 20psi = $Q_T ((P_S-P_A)/(P_S-P_R))^{0.54}$

= 1500 x ((70-20) / (70-64))$^{0.54}$

= 4713 gpm

HYDRANT FLOW TEST FORM

Project No: 2018-0574 **Date:** 2018-11-28

Site Location: 2100 Lakeshore Rd Burlington, ON **Hydrants Opened by:** Hulton Public works

Tested By: Glen.R, Mark.B

1) Required photos:

- [x] Site Id & Date
- [x] Location Overview
- [x] Other
- [x] Condition of Flow Hydrant
- [x] Condition of Residual Hydrant

2) Test Data

Time of Test: 10:05 am

Location of Test: (Flow) First hydrant East of 2100 Lakeshore Rd Burlington

(Residual) On grass at 2100 Lakeshore Rd. Burlington ON

Main Size: —

Static Pressure: 70PSI

	Number of Outlets & Orifice Size	Pitot Pressure	Flow (USGPM)	Residual Pressure
1	1 x 2.5"	20	750	66
2	2 x 2.5"	19	1462	64
3				
4				

3) Calculations

$Q = 29.83\ cd^2\sqrt{p}$

$Q = (29.83)(0.9)(2.5^2)\sqrt{20}$

$= 750.410$

$Q = \sim 750\ USGPM$

$Q_T = 2(29.83)(0.9)(2.5")^2\sqrt{19}$

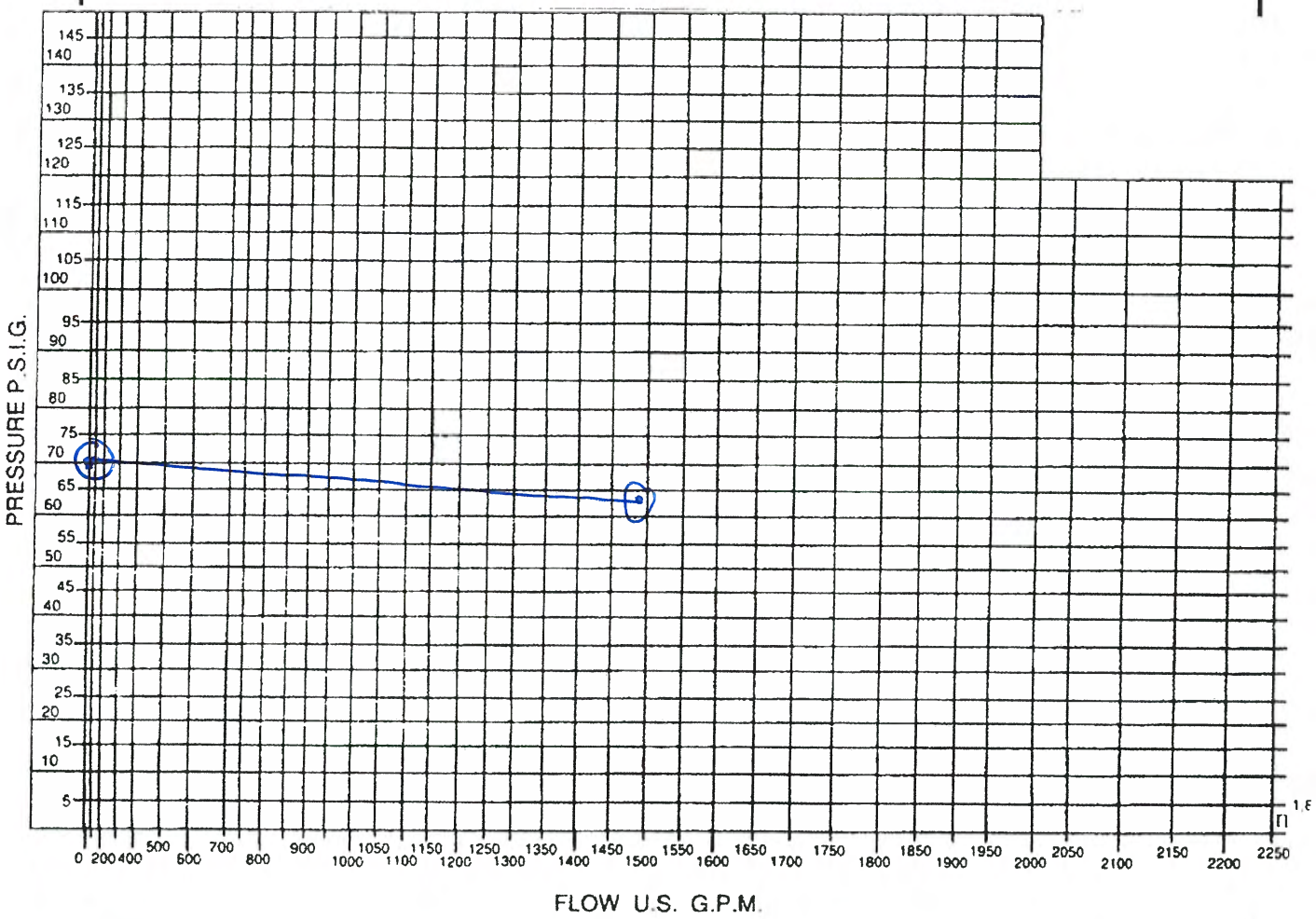
$= 1462.79$

$Q_T = \sim 1500\ USGPM$

Where c- cofficient of discharge (1 in smooth pipe)
d- pipe diameter (inches)
p- pitot reading (psi)
Q- flow (USGPM)

Note: Hydrants tested according to NFPA 291: Recommended Practice for Fire Flow Testing and Marking of Hydrants

4) Plot



5) Site sketch & Comments

