PRELIMINARY STORMWATER MANAGEMENT REPORT

2170 GHENT AVENUE

CITY OF BURLINGTON
REGION OF HALTON

PREPARED FOR:

NORTHERN CARDINAL HOMES LTD.

PREPARED BY:

C.F. CROZIER & ASSOCIATES INC.
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NOVEMBER 2024

CFCA FILE NO. 912-7186

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CROZIER
CONSULTING ENGINEERS

Revision Number	Date	Comments
Rev. 0	November 8, 2024	Issued for 1st Submission ZBA

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1.0 Introduction

C.F. Crozier & Associates Inc. (Crozier) was retained by Northern Cardinal Homes to prepare a Preliminary Stormwater Management Report to support the Zoning By-Law Amendment (ZBA) application for the property located at 2170 Ghent Avenue (the Site) in the City of Burlington (the City) and Halton Region (the Region).

This report will demonstrate that the proposed development can be developed in accordance with the City of Burlington and Halton Region guidelines and standards from a stormwater management perspective.

The reports and design standards referenced during the preparation of this report includes:

- City of Burlington Pre-consultation Package (May 1, 2024)
- City of Burlington's Stormwater Management Design Guidelines (2020)
- Ministry of the Environment, Conservation and Parks Stormwater Management Planning and Design Manual (2003)
- Conservation Halton's Guidelines for Stormwater Management Engineering Submissions (2021)

2.0 Site Description

The Site encompasses an area of 0.40 ha and is currently designated as Residential Medium Density (Official Plan, 2020) and zoned as a Residential Medium Density (RM2).

Currently, the Site consists of low-lying vegetation and lawn. The Site, located in a developed residential area in south Burlington, is bounded by Ghent Avenue to the north, existing low-rise apartments to the west, and existing single-family residential dwellings to the south and east.

The Site is not located within a regulated flood hazard and no spill hazard has yet to be defined, therefore, no Conservation Halton permit is required as part of the development application. According to the Pre-consultation Package (May 1, 2024), Conservation Halton defers the stormwater management review to the City.

3.0 Proposed Development

The proposed development at 2170 Ghent Avenue includes:

- Twenty-one (21) 3-storey standard townhouse units.
- Associated parking and visitor parking.
- Amenity areas and green space

4.0 Drainage Conditions

The following sections outline the existing and proposed stormwater drainage conditions.

4.1 Existing Drainage

The Site is located within the Hager Creek Watershed and within Conservation Halton's jurisdiction, however, is not currently considered to be within a regulated area. The Site previously consisted of a detached single residential dwelling but this has been demolished and the site currently consists mainly of grassed areas with some gravel remains and concrete pads.

A review of the topographic survey indicates that the site is relatively flat but stormwater runoff generally drains south towards the residential lots at the rear of the Site. There does not appear to be any form of stormwater management infrastructure currently on the Site. Based on the Site topography and site reconnaissance, the Site accepts external rooftop and landscape drainage from the adjacent neighboring property to the west.

As the Site is relatively flat, drainage from the entire Site (0.40 ha), including the external drainage area (0.01 ha), is generally contained on site under existing conditions with overflows ultimately conveyed to the Ghent Avenue storm sewer. Therefore, the pre-development target flow was calculated based on the 0.41 ha drainage area contributing to the Ghent Avenue storm sewer. Pre-development target rates were established based on current site conditions, which considers more previous area compared to the historical, single family development on the site. Modified Rational method calculations can be found in **Appendix B**.

Table 1 summarizes the pre-development land areas and weighted runoff coefficients.

Table 1: Pre-Development Land Areas and Runoff Coefficients

Catchment ID	**Pervious Area** (ha)	**Impervious Area** (ha)	**Total Area** (ha)	**Runoff Coefficient**
Site (101)	0.40	0.01	0.40	0.26
External Area (EXT1)	0.007	0.006	0.01	0.55
Ghent Avenue Outlet	0.40	0.02	0.42	0.27

1. Impervious area has a runoff coefficient of 0.90 and pervious area has a runoff coefficient of 0.25.
2. Sum of areas may not necessarily add up to the total value due to rounding and significant digits.

Refer to the Pre-Development Drainage Plan (Figure 1) for a depiction of the existing drainage conditions.

4.2 Proposed Drainage

The proposed development will consist of twenty-one (21) residential townhome buildings, an internal access road and surface parking, and landscaped areas. External drainage will continue to enter the Site similar to existing conditions and will be accounted for in the stormwater management approach for the Site. Table 2 provides details of the catchment areas and runoff coefficients for the post-development conditions.

Table 2: Post-Development Land Areas and Runoff Coefficients

Catchment ID	**Pervious Area** (ha)	**Impervious Area** (ha)	**Total Area** (ha)	**Runoff Coefficient**
201	0.11	0.27	0.38	0.71
External Area (EXT1)	0.007	0.006	0.01	0.55
Ghent Avenue Outlet	0.40	0.02	0.39	0.66
202 (uncontrolled)	0.02	0.004	0.02	0.55

1. Impervious area has a runoff coefficient of 0.90 and pervious area has a runoff coefficient of 0.25.
2. Sum of areas may not necessarily add up to the total value due to rounding and significant digits.

Catchbasins are proposed at low points within the Site to capture stormwater runoff and convey it through storm sewers to an underground stormwater management system located near Ghent Avenue within the internal access road ROW. The stormwater management system is proposed to be a shallow design due to the relatively shallow municipal services in Ghent Avenue with captured flows being conveyed out of the tank via gravity at a controlled rate and discharged to the existing storm sewer on Ghent Avenue. An emergency overflow will be proposed during detailed design from the underground storage system allowing excess flows to outlet to the surface in the event of a blockage or failure.

There are proposed landscaped areas along the perimeter of the Site. Drainage within the landscaped areas will be captured by grassed swales and conveyed towards the catch basins in the impervious areas for both quality and quantity control.

Emergency overland (major system) flow routes are provided through the Site to direct runoff towards Ghent Avenue in the event of a large storm event or blockage. Refer to the Preliminary Site Grading Plan (Drawing C103) which illustrates the overland flow paths.

The Site Servicing and Site Grading Plans (Drawings C102 and C103) illustrate the proposed drainage of the Site, the location and design of the storm sewer, stormwater storage tank and all connections. Refer to the Post-Development Drainage Plan (Figure 1) for a depiction of the proposed drainage conditions.

5.0 Stormwater Management

Stormwater management for the proposed development has been designed to achieve the City of Burlington's Stormwater Management Design Guidelines (2020), Ministry of the Environment, Conservation and Parks Stormwater Management Planning and Design Manual (2003), with consideration given to Conservation Halton's Guidelines for Stormwater Management Engineering Submissions (2021) and City of Burlington's Sustainable Building and Development Guidelines (December 2021).

A pre-consultation for the Site was held with City of Burlington staff and a subsequent Pre-Consultation Package issued May 1, 2024.

The stormwater management criteria for the proposed development include:

Quantity Control

- Discharge to a storm sewer shall control the greater of the 100-year or Regional (Hurricane Hazel) storm event to the 5-Year pre-development peak flow rate.

Quality Control

- Provide Enhanced (Level 1) quality treatment (80% TSS Removal) for 90% of average annual rainfall volume.

Water Balance

- Best efforts to retain the first 5mm of rainfall via infiltration or re-use on-site.

5.1 Existing Storm Servicing

A review of City of Burlington as-constructed drawing MG-1 (dated 01, 1993) identifies the following storm infrastructure near the Site:

- A growing diameter (W to E) storm sewer from 525 mm to 600 mm beneath Ghent Avenue, outletting to a tributary of Rahmbo Creek approximately 200m west of the Site.

5.2 Stormwater Quantity Control

City of Burlington criteria requires post-development peak flow rates (greater of the 100-year or Regional storm event) to be controlled to the 5-year pre-development peak flow rate as the proposed development will discharge to the existing storm sewer on Ghent Avenue.

Pre-development flows were calculated based on the drainage conditions provided in the topographic survey prepared by Wahba Surveying (2024). The post-development flows were assessed based on the proposed Preliminary Servicing and Grading Plans (C102 and C103). Pre-development and post-development flow rates discharging to Ghent Avenue were calculated using the modified rational method and are provided in Table 3 for comparison.

Table 3: Peak Flow Summary (Ghent Avenue)

Peak Flow (Ghent Avenue), Q					
Return Period (year)	**Existing** (L/s)	**Proposed (uncontrolled)** (L/s)	**Target Release Rate** [1] (L/s)	**Required Storage** (m^3)	**Total Provided Storage** [2] (m^3)
5	31	73	31	62	62
100	52	123			

1. Provided storage can be a combination of lot-level controls, rooftop controls, and underground storage.

The target release rate for runoff discharging to Ghent Avenue is derived from the 5-year pre-development flow rate for the Site (31 L/s). The target release rate dictates the amount of storage required to control runoff from the 100-year design storm under post-development conditions discharging to Ghent Avenue. The total storage provided (62 m^3) can be a combination of lot-level and/or rooftop controls, depending on what is most feasible to support the development. An underground storage system is proposed to meet quantity control requirements. Modified rational method calculations can be found in **Appendix B**.

A 300 mm diameter PVC storm sewer lateral is proposed at 0.50% to convey stormwater from the SWM system to the existing storm sewer beneath Ghent Avenue. The storm sewer lateral will be installed between a property line maintenance hole to an existing maintenance hole in Ghent Avenue. An orifice plate is proposed to maintain the target release rate of 31 L/s. Details of the connection are shown in the Site Servicing Plan (Drawing C102).

5.3 Stormwater Quality Control

Stormwater quality controls for the Site must incorporate measures to provide an Enhanced Level of Protection (Level 1) according to the MOE (March, 2003) guidelines. Enhanced water quality protection is the long-term average removal of at least 80% of the total suspended solids (TSS) from 90% of the annual runoff volume.

Water quality control for the development will be provided using an ETV verified Jellyfish Filtration Unit. The Jellyfish, located downstream of the underground stormwater storage unit, will provide quality control for stormwater runoff before discharging into the existing Ghent Avenue storm sewer. Details of the Jellyfish unit will be confirmed during the detailed design stage of the project.

5.4 Water Balance

Best efforts to retain a 5 mm depth of rainfall via infiltration and/or re-use on the Site is encouraged. A 5 mm rainfall volume equates to 20 m^3 of volume for the 0.40 ha Site.

According to the Site Plan (Limberlost, 2024), approximately 1,200m^2 of landscaped area is proposed as part of the development. Assuming a 300mm depth of topsoil and a topsoil void ratio of 0.40, approximately 144m^3 of void is available in the pervious surfaces on site. This equates to approximately 36 mm of rainfall across the 0.40 ha Site. While this is a rudimentary calculation, it demonstrates that infiltration capabilities exist on the development. Additional water balance and water retention opportunities will be further explored during detailed design. We note that relatively high water level measurements have been encountered in the monitoring wells on-site through the geotechnical investigation which limits the potential for on-site infiltration. However, this will be further investigated through detailed design, following the approval of the zoning application.

5.5 Sustainable Building and Development Guidelines

The City of Burlington's Sustainable Building and Development Guidelines (December 2021) were considered throughout the functional servicing and stormwater management design. Table 11 presents the relevant sustainable guidelines and systems proposed for the development. The design of the sustainable systems and compliance with the guidelines will be further investigated in detailed design stages.

Table 4: Sustainable Building and Development Guidelines Checklist

Guideline	Description and Proposed Implementation
Enhanced Water Quality (4.1)	An oil/grit separator (OGS) is proposed for the development. This system will provide treatment on the Site that does not currently exist. Filtration systems could also be explored during detailed design, if required.
Water Conservation Systems (4.2)	Water conservation systems, such as low volume fixtures, could be included within the new buildings design, as specified by the mechanical engineer during detailed design.
Pervious Surfaces (4.3)	Approximately 1,200 m^2 of pervious surface is maintained in post-development conditions

6.0 Conclusions and Recommendations

The proposed development located at 2170 Ghent Avenue in the City of Burlington involves constructing twenty-one (21) 3-story standard townhouse units with an associated internal access road, parking, and amenity areas. The proposed development can be developed in accordance with the City of Burlington and Halton Region guidelines and standards from a fire and domestic water, wastewater, and stormwater management perspective based on the information contained in this report and the following conclusions:

- A flood hazard assessment and Conservation Halton permit is not required as part of the development application. The Site is not located within a regulated flood hazard and no spill hazard has yet to be defined.

- Post-development (100-year and Regional) flows will be controlled to the 5-year pre-development peak flow rates since the Site will discharge to the existing storm sewer on Ghent Avenue. Quantity controls will be provided by an underground SWM tank located beneath the internal access road, with detained flows released at a controlled rate discharging to the storm sewer on Ghent Avenue.

- A 300 mm diameter PVC storm sewer lateral is proposed at 0.50%, to convey stormwater from the SWM tank to the existing municipal storm sewer beneath Ghent Avenue.

- Quality treatment of stormwater runoff from the Site will be provided via a Jellyfish unit at the Site outlet. Additional sediment removal measures are recommended for the proposed catchbasins on site to reduce the amount of sediment entering the stormwater tank, prolonging maintenance frequency.

- Best efforts to retain a 5 mm rainfall event are proposed for the Site. It is anticipated that landscaped areas will retain approximately 144 m^3 of runoff on the Site. It is recommended that additional measures to retain rainfall to meet the 5 mm objective will be explored at the detailed design stage.

- Refer to the Water and Wastewater Functional Servicing Report (Crozier, 2024) for an assessment of servicing strategies for the proposed development.

Based on the above conclusions, we support the proposed development application from the perspective of stormwater management.

Respectfully submitted,

C.F. CROZIER & ASSOCIATES INC.

Matt Bowman,
Engineering Intern, Land Development

C.F. CROZIER & ASSOCIATES INC.




Trevor Fraser, P. Eng.
Project Manager, Land Development

MB/tc

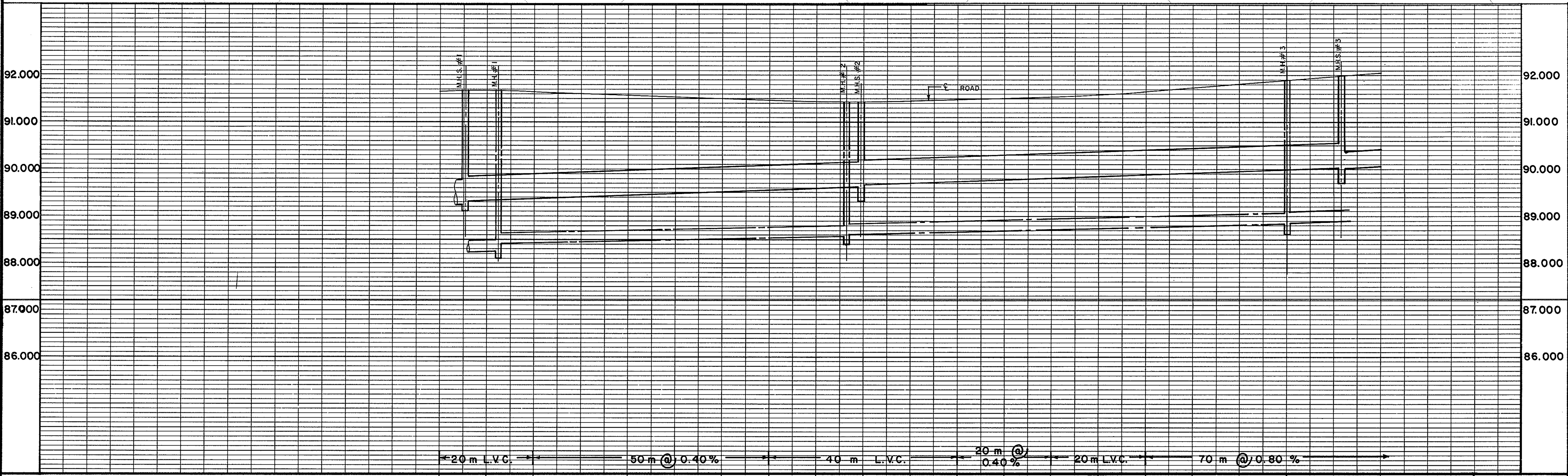
\\Crozier-Files\Projects\900\912-Argo Development Corp\7186 - 2170 Ghent Avenue\Reports\2024.11.08_(912-7186)_2170 Ghent Ave_SWM Report_final.docx

APPENDIX A

As-built Drawings



FOR TYPICAL SECTIONS SEE DWG. MMS-92-D
SHEET 2 OF 2



CHAINAGE	0+000	0+010	0+020	0+040	0+060	0+070	0+080	0+090	0+100	0+110	0+120	0+130	0+140	0+150	0+160	0+180	0+200
℄ ELEVS.	91.640	91.675	91.660	91.580	91.500	91.460	91.430	91.420	91.430	91.460	91.500	91.540	91.590	91.660	91.740	91.900	92.060

STORM SEWER: 89.261 / 89.336 — 83.63 m - 525 mm ST. SEW. @ 0.35 % CLASS 65-D PIPE, CLASS B-1 BEDDING — 89.632 / 89.674 — 102.44 m - 525 mm ST. SEW. @ 0.32 % CLASS 65-D PIPE, CLASS B-1 BEDDING — 90.001 / 90.211

SANITARY SEWER: 88.387 / 88.412 — 73.55 m - 250 mm SAN. SEW. @ 0.22 % — 88.575 / 88.611 — 93.63 m - 250 mm SAN. SEW. @ 0.24 % — 88.839 / 88.846

Nº	Date	By	Revisions
1	Feb./89	D. Mis	"As constructed" (Contr. 86-4)

Design. Chk'd.
Drawn. D. M. Chk'd.
Date. FEBRUARY 1989
Scale. horiz. vert.
References.
Field Notes.
Bell ☐ Hydro ☐ Gas ☐ Cable ☐
Stamp.

Approvals

Municipal.
DIRECTOR OF PUBLIC WORKS
DATE

Regional.
COMMISSIONER OF PUBLIC WORKS.
DIRECTOR OF DESIGN & CONSTRUCTION.

Consultant.

Municipality.

CITY OF BURLINGTON

DEPARTMENT OF PUBLIC WORKS

Title.

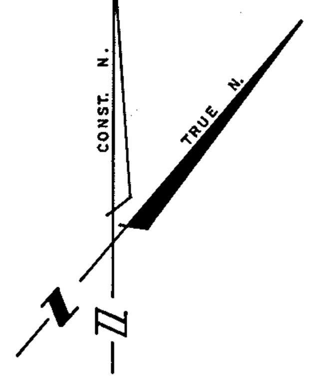
GHENT AVENUE

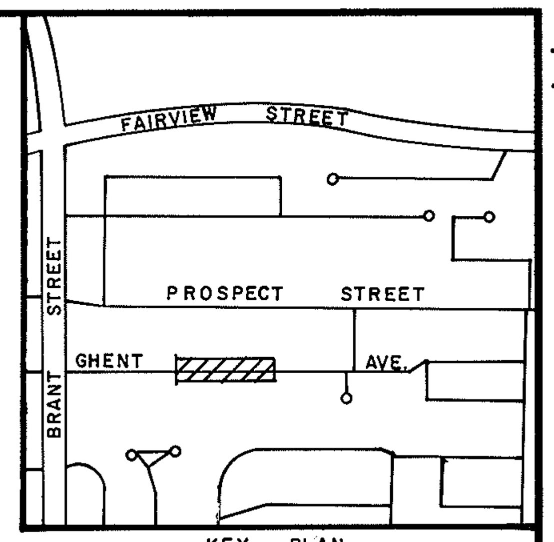
BRANT STREET - 200 m EAST

Municipal Dwg. Nº. MG-1
Regional Dwg. Nº
Contract Nº.
Sheet 1 of 4

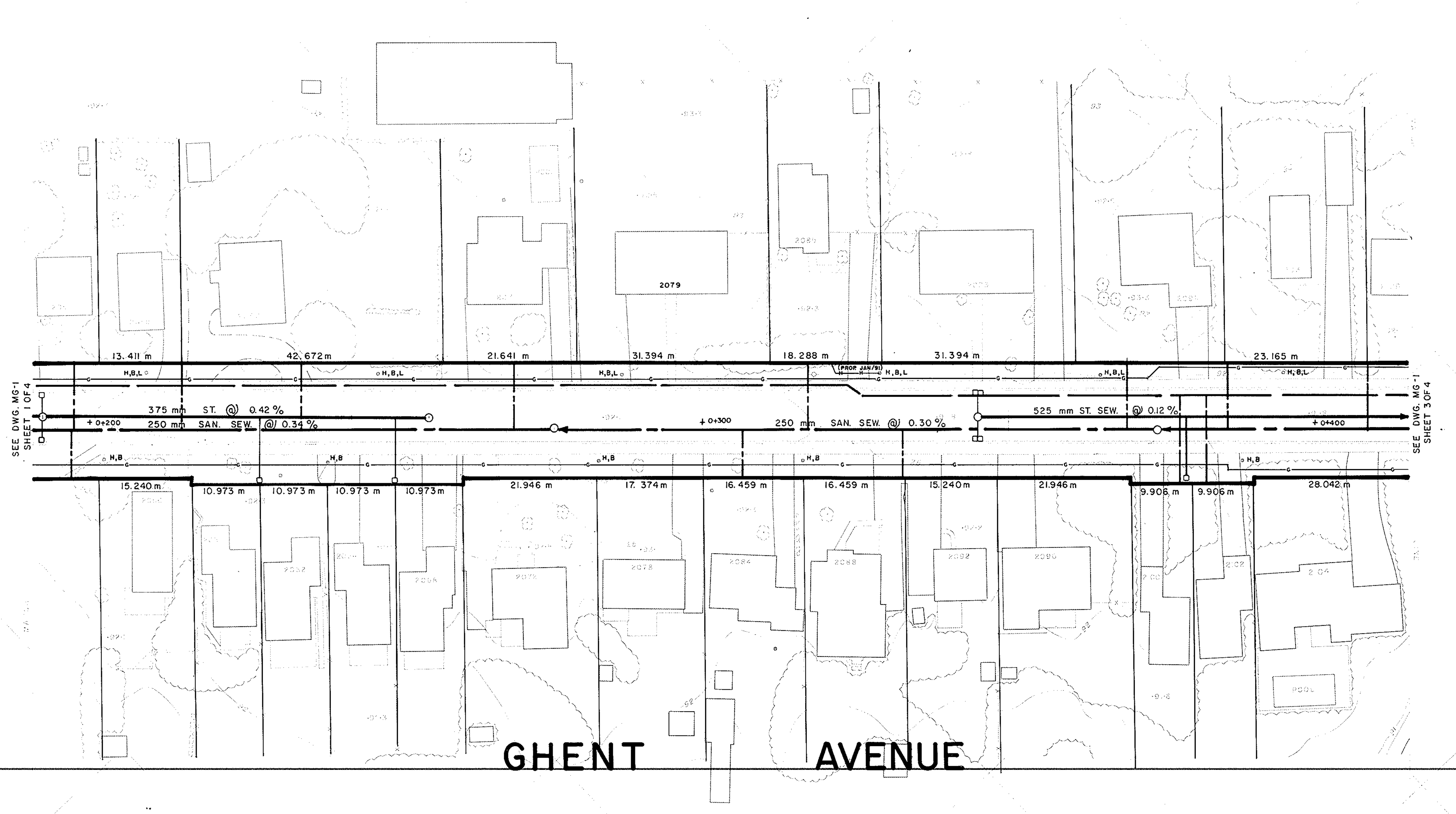
metric

Dimensions in millimetres unless otherwise noted.

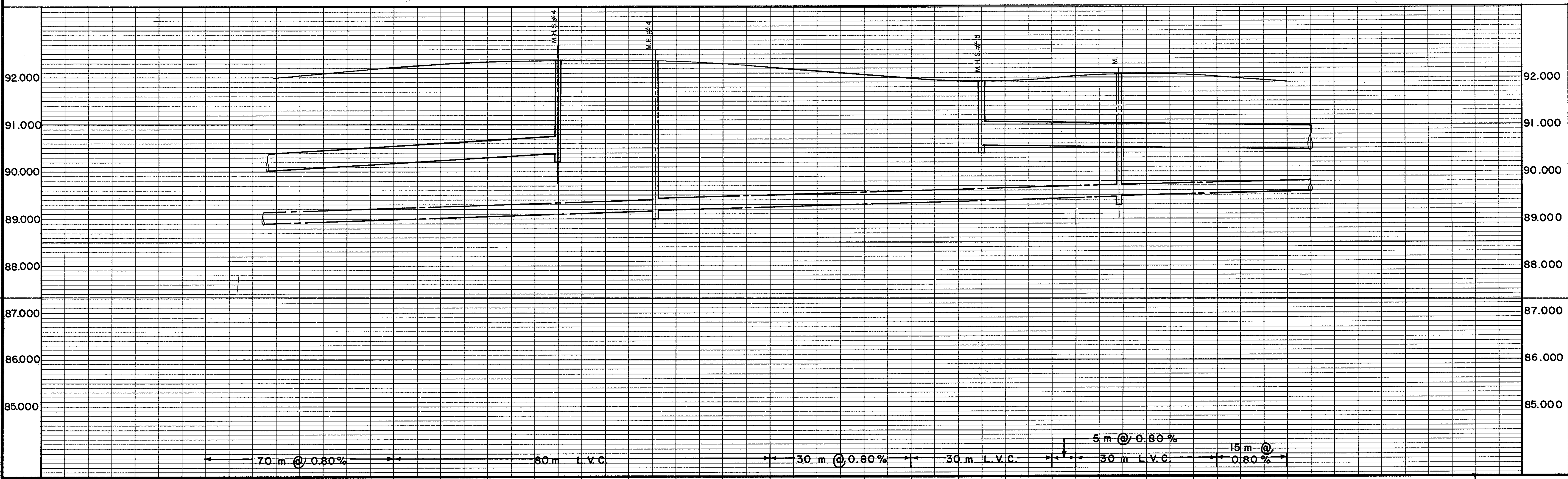




KEY PLAN



FOR TYPICAL SECTIONS SEE DWG. MMS-92-D
SHEET 2 OF 2



CHAINAGE	℄ ELEVS.
0+200	92.060
0+220	92.220
0+230	92.290
0+240	92.340
0+250	92.370
0+260	92.380
0+270	92.370
0+280	92.340
0+290	92.290
0+300	92.220
0+320	92.060
0+330	91.980
0+340	91.927
0+345	91.920
0+350	91.927
0+360	91.980
0+365	2.020
0+370	92.053
0+380	92.080
0+390	92.053
0+395	92.020
0+400	91.980
0+410	91.900

STORM SEWER: 63.12 m – 375 mm ST. SEW. @ 0.42 % | 90.387 | 90.559 | 79.94 m - 525 mm ST. SEW. @ 0.12 %

SANITARY SEWER: 95.76 m – 250 mm SAN. SEW. @ 0.34 % | 89.173 / 89.191 | 98.47 m – 250 mm SAN. SEW. @ 0.30 % | 89.488 / 89.489 | 94.94 m - 250 mm SAN. SEW. @ 0.35 %

Nº	Date	By	Revisions
1	Feb./89	D.Mis	"As constructed" (Contr. 86-4)

Design. Chk'd.
Drawn. D.M. Chk'd.
Scale. horiz. 0 vert. 0

Date. FEBRUARY 1989
References.
Field Notes.
Bell ☐ Hydro ☐
Gas ☐ Cable ☐
Stamp.

Approvals

Municipal.
DIRECTOR OF PUBLIC WORKS
DATE

Regional.
COMMISSIONER OF PUBLIC WORKS.
DIRECTOR OF DESIGN & CONSTRUCTION.

Consultant.

Municipality.

CITY OF BURLINGTON
DEPARTMENT OF PUBLIC WORKS

Title.

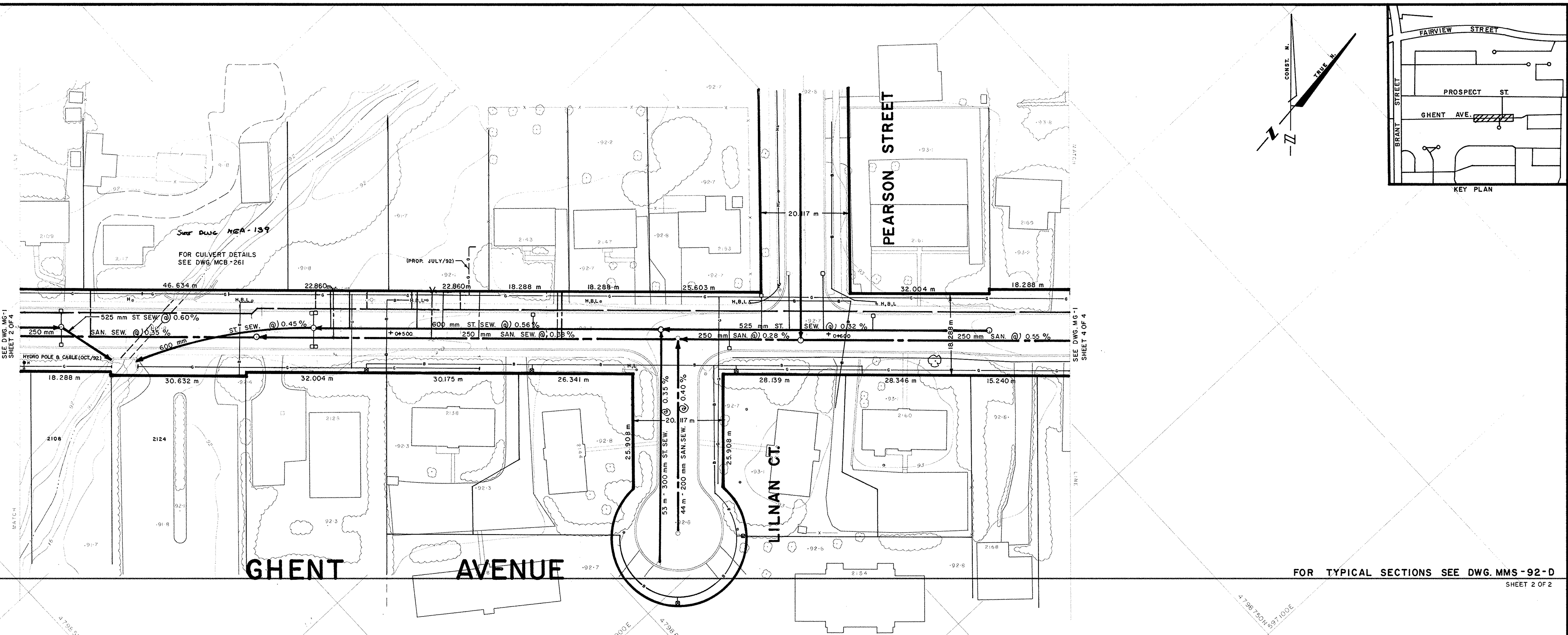
GHENT AVENUE

200 m - 420 m EAST OF BRANT STREET

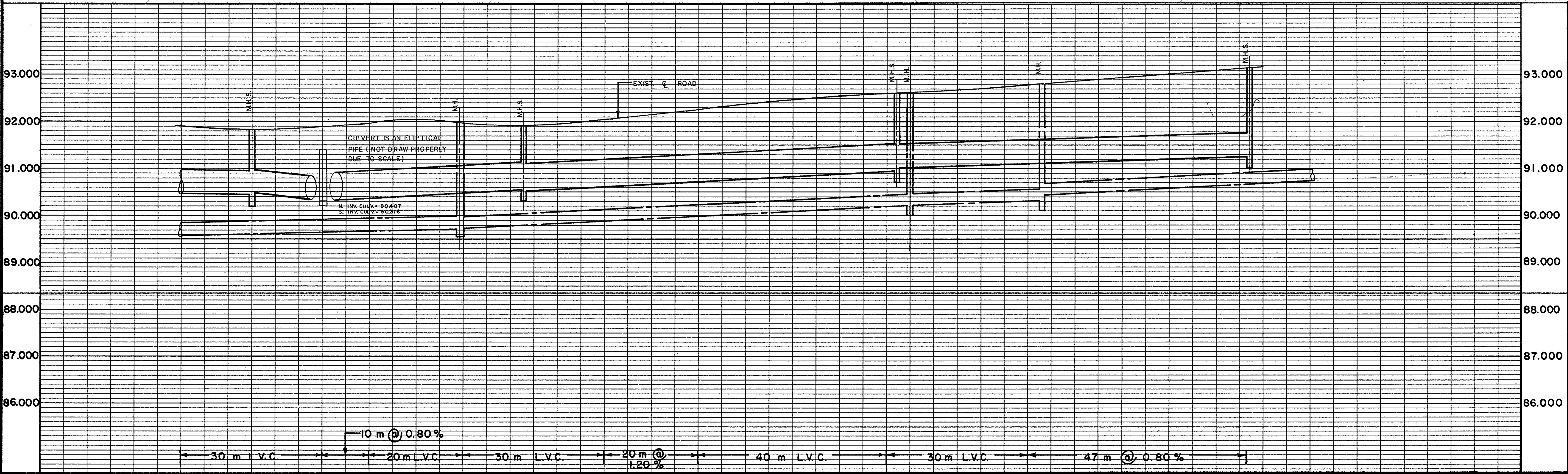
Municipal Dwg. Nº. MG-I
Regional Dwg. Nº
Contract Nº.
Sheet 2 of 4

Dimensions in millimetres unless otherwise noted.

metric



FOR TYPICAL SECTIONS SEE DWG. MMS-92-D
SHEET 2 OF 2



℄ ELEVS.: 91.900, 91.847, 91.840, 91.847, 91.900, 91.980, 92.020, 91.980, 91.933, 91.935, 91.953, 92.040, 92.160, 92.280, 92.390, 92.480, 92.550, 92.600, 92.647, 92.675, 92.707, 92.780, 92.819, 92.860, 92.940, 93.020, 93.100, 93.156, 93.180

STORM SEWER: 90.461 / 90.391 — 13.62 m - 525 mm ST. SEW. @ 0.60 % — 90.310 | 90.326 — 41.62 m – 600 mm ST. SEW. @ 0.45 % — 90.513 / 90.509 | 79.21 m - 600 mm ST. SEW. @ 0.56 % — CLASS 65-D PIPE, CLASS B-1 BEDDING, SELECT NATIVE BACKFILL — 90.949 | 91.026 — 74.82 m - 525 mm ST. SEW. @ 0.32 % — 91.268

SANITARY SEWER: 94.94 m - 250 mm SAN. SEW. @ 0.35 % — 89.824 / 89.837 — 96.08 m - 250 mm SAN. SEW. @ 0.38 % — 90.201 / 90.228 — 27.95 m - 250 mm SAN. SEW. @ 0.28 % — 90.307 / 90.420 — 89.85 m - 250 mm SAN. SEW. @ 0.55 %

10.914

CHAINAGE: 0+410, 0+420, 0+425, 0+430, 0+440, 0+450, 0+460, 0+470, 0+480, 0+485, 0+490, 0+500, 0+510, 0+520, 0+530, 0+540, 0+550, 0+560, 0+570, 0+575, 0+580, 0+590, 0+594.913, 0+600, 0+610, 0+620, 0+630, 0+637, 0+640

Nº	Date	By	Revisions
2	Feb./93	S	"As constructed" (Contr. 92-13)
1	Feb./89	D. Mis	"As constructed" (Contr. 86-4)

Design. Chk'd.
Drawn. D.M. Chk'd.
Date. FEBRUARY 1989
Scale. horiz. 0 vert. 0
References.

Approvals
Municipal.
DIRECTOR OF PUBLIC WORKS
DATE
Regional.
COMMISSIONER OF PUBLIC WORKS.
DIRECTOR OF DESIGN & CONSTRUCTION.

Field Notes.
Bell ☐ Hydro ☐
Gas ☐ Cable ☐
Stamp.

Consultant.

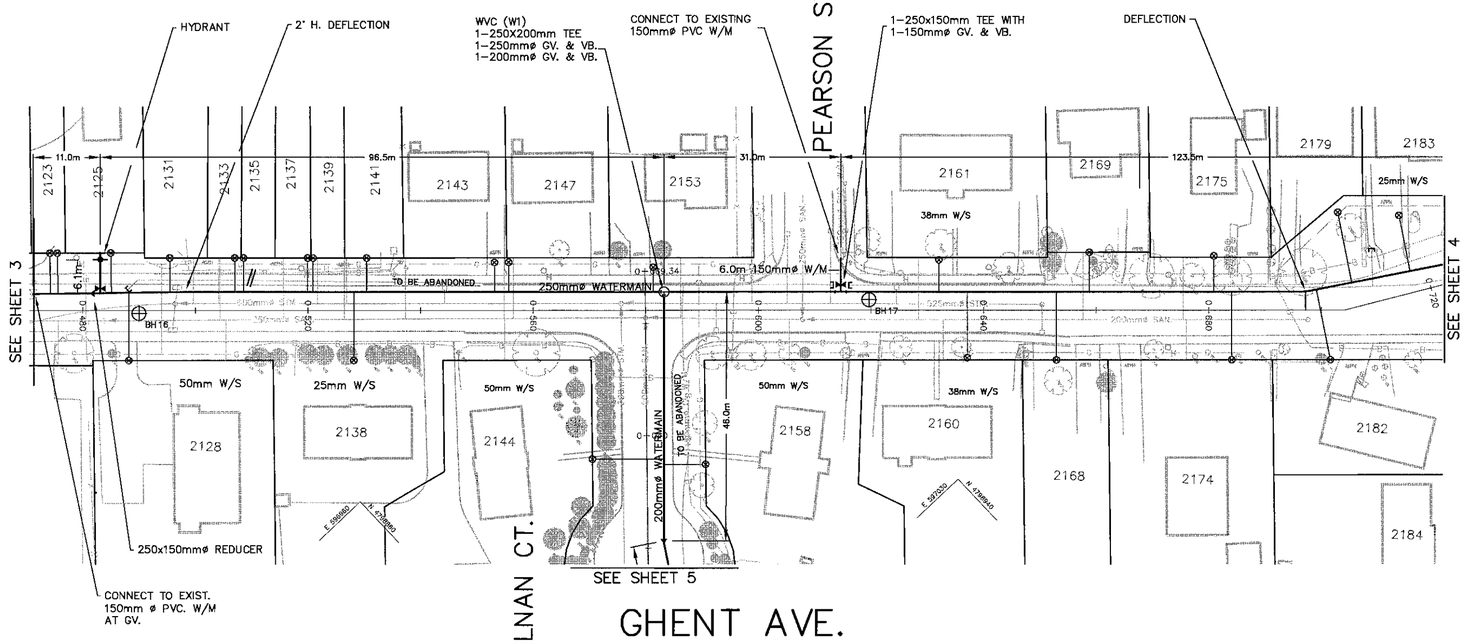
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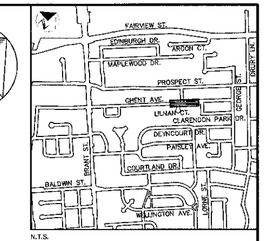
CITY OF BURLINGTON
DEPARTMENT OF PUBLIC WORKS

Title.
GHENT AVENUE
420 m E OF BRANT ST. – 90 m E OF LILNAN CT.

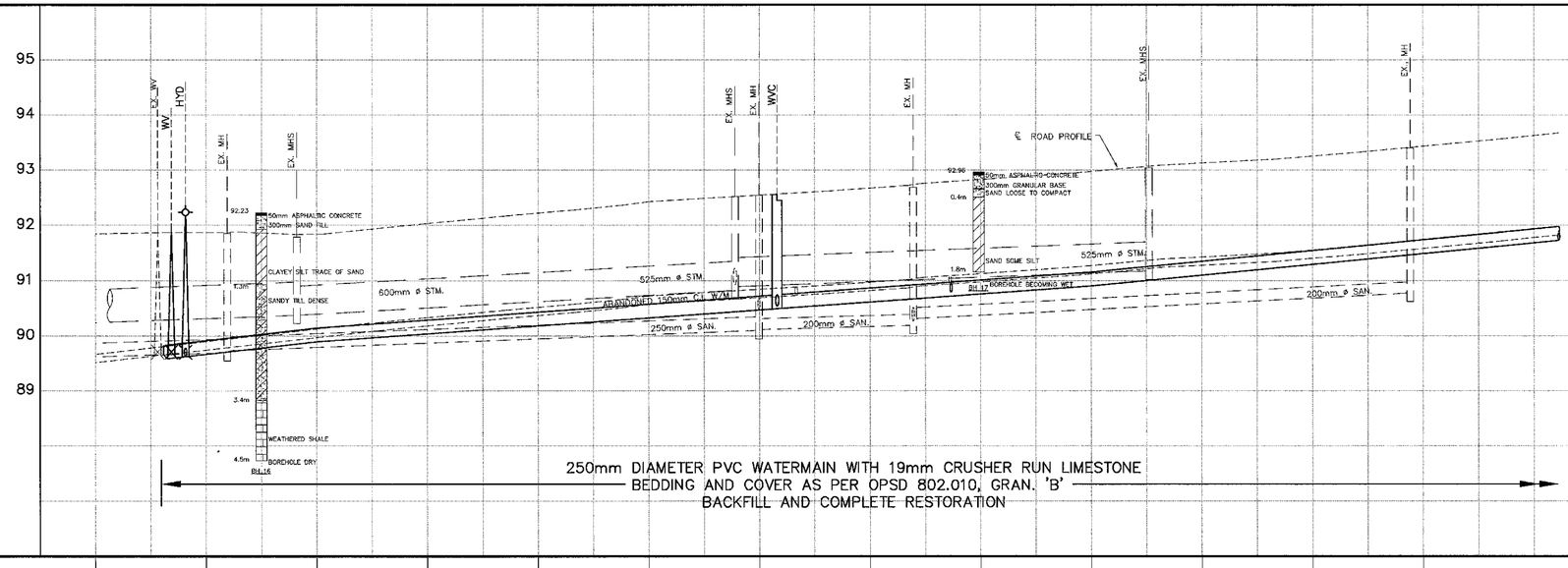
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Regional Dwg. Nº
Contract Nº.
Sheet 3 of 4

metric
Dimensions in millimetres unless otherwise noted.





FOR GENERAL NOTES AND RESTORATION DETAIL, SEE SHEET 1.



EX. ℄ ELEVATIONS	91.85	91.87	91.84	92.04	92.22	92.43	92.55	92.67	92.83	92.97	93.13	93.26	93.44	93.63
PROPOSED WATERMAIN INVERTS	89.65	27.7m @ 1.05%	89.94	140.0m @ 0.72%						90.95	99.2m @ 0.99%			
PROPOSED SANITARY SEWER INVERTS														
STATIONS	0+460	0+480	0+500	0+520	0+540	0+560	0+580	0+600	0+620	0+640	0+660	0+680	0+700	0+720

1	SEP. '01	DMS	"AS CONSTRUCTED"	X
NO	Date	By	REVISIONS	MANU CAD

Design	M.S.B.	Ch'kd	Date AUGUST, 1999
Drawn	N.G.	Ch'kd	

Scale 1:500 Horiz. 10 5 0 10
1:50 Vert. 1 0.5 0 1

References DIARY #715

Field Notes

APPROVALS

Municipal

Regional

Director, Engineering Services

Manager, Design Services

Stamp

AS CONSTRUCTED

Halton

TITLE
250mm ø WATERMAIN REPLACEMENT
GHENT AVENUE
CITY OF BURLINGTON
108m W. OF LILNAN CT. TO 111m E. OF PEARSON ST.

Consultant File NO	Regional Drawing NO B - 8452
CONTRACT NO WS-1884-2000	Drawing NO SHEET 3 OF 5

B - 8452
PR-1884-2000 3 of 5

10/23/2001 09:26:14

Ghent Ave



Legend

Water Control Valve
- System
- SystemDP
- Zone
- ZoneDP

Water Service Valve
- CurbStop
- PropertyLine
- Secondary
- TappingValve

Water Hydrant

Water Fitting
- Cap
- Cross
- HBend
- MainStop
- Reducer
- Sleeve
- TappingSleeve
- Tee
- VBend

Water Chamber
- Chamber

Notes:

59.4 0 29.70 59.4 Metres

1: 1,188

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Information Valid as of: 8/8/2024

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APPENDIX B

Stormwater Management
Supporting Calculations & Documentation

Project: 2170 Ghent Avenue
Project No.: 912-7186
Created By: MB
Checked By: TF
Date: 2024.10.24
Updated: 2024.11.08

Modified Rational Calculations - Input Parameters

Storm Data: City of Burlington

Time of Concentration: T_c = **10** **min** (per City of Burlington standards)

Return Period	A	B	C	I (mm/hr)
5 yr	802.04	5	0.780	97.0
10 yr	918.28	5	0.764	116.0
25 yr	1065.95	5	0.762	135.4
50 yr	1172.34	5	0.761	149.3
100 yr	1281.34	5	0.761	163.2

Pre-Development					
Catchment ID	**Pervious Area** (m^2) **RC=0.25**	**Impervious Area** (m^2) **RC=0.90**	**Total Area** (m^2)	**Runoff Coefficient**	
101	3954	90	4044	0.26	Retained on Site then to Ghent Ave
EXT1	72	60	132	0.55	from neighbor to site
Total Site Area			**4176**	**0.27**	

Post-Development					
Catchment ID	**Pervious Area** (m^2) **RC=0.25**	**Impervious Area** (m^2) **RC=0.90**	**Total Area** (m^2)	**Runoff Coefficient**	
201	1104	2695	3799	0.71	To Ghent Avenue
UC01	205	41	245	0.36	To rear of site
EXT1	72	60	132	0.55	From neighbor
Total Site Area			**4176**	**0.69**	

Equations:

Peak Flow

$$Q_{post} = 0.0028 \cdot C_{post} \cdot i(T_d) \cdot A$$

Intensity

$$i(T_d) = A / (Tc + B)^{\wedge}C$$

Project: 2170 Ghent
Project No.: 912-7186
Created By: MB
Checked By: TF
Date: 2024.10.24
Updated: 2024.11.08

Modified Rational Calculations - Peak Flow Summary

Peak Flows Towards Ghent Avenue (L/s) (Uncontrolled)						Difference Relative to Target Flows (L/s)
Return Period	Pre-dev Uncontrolled	Post-development Uncontrolled				
	$Q_{pre-101\&EXT1}$	$Q_{post-UC02}$	$Q_{post-201}$	$Q_{Groundwater}$	Total	
5 yr	31	-	73	0.0	-	-
100 yr	52	3	123		127	96

Difference Relative to Target Flows = Post-development Uncontrolled Brant Street Total - 5-year Pre-development 102

$Q_{Groundwater}$ to be confirmed by the Geotechnical Engineer under a future scope.

Peak Flows Towards Brant Street (L/s) Controlled				Difference Relative to Target Flows (L/s)	Active Storage Required (m^3)	Total Storage Provided (m^3)
5-year Pre-dev	100-year Post-dev					
$Q_{pre-101}$	$Q_{post-UC02}$	$Q_{post-201-Controlled}$	Q_{Total}			
31	3	123	123	-92.4	62	62

Difference Relative to Target Flows = Post-development Controlled Brant Street Total - Pre-development 102 (5-year)

The total storage provided includes active storage (90 m^3), water balance dead storage (31 m^3), and filter storage (9m^3).

CROZIER CONSULTING ENGINEERS

Project: 2170 Ghent Avenue
Project No.: 912-7186
Date: 2024.10.24

Designed By: BP
Checked By: MB
Revised: 2024-11-08

MODIFIED RATIONAL METHOD CALCULATIONS - 100 YEAR STORM EVENT - OUTLET TO BRANT STREET

Rainfall Intensity Equation:

$$I = \frac{A}{(T+b)^c}$$

City of Burlington IDF (100-Year)	
a=	1281.34
b=	5
c=	0.761

CONTROLLED AREA

Drainage Area ID = 201
Drainage Area = 0.38 ha
Runoff Coefficient = 0.71

Controlled Release Rate = 31 L/s

Max. Storage Volume Required = 62 m3
Storage Volume Provided = 60 m3

UNCONTROLLED AREA

Drainage Area ID = UNC2
Drainage Area = 0.01 ha
Runoff Coefficient = 0.55

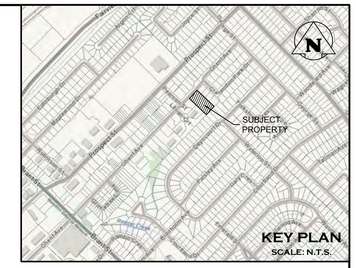
Uncontrolled Release Rate = 3 L/s

Target Site Release Rate = 31 L/s 5-year Pre-dev
Controlled Release Rate = 31 L/s 100-year Controlled
Total Uncontrolled Release Rate = 3 L/s 100-year UC02
Total Site Release Rate = 34 L/s

Time (minutes)	Rainfall Intensity (mm/hr)	Q_{Runoff} (L/s)	$Q_{Release}$ (L/s)	Storage Volume Required (m^3)	Q_{Runoff} (L/s)
10	163.2	122.5	31.0	54.9	3.3
15	**131.1**	**98.5**	**31.0**	**60.7**	**2.6**
20	110.6	83.1	31.0	62.5	2.2
25	96.3	72.3	31.0	61.9	1.9
30	85.6	64.3	31.0	59.9	1.7
35	77.4	58.1	31.0	56.9	1.5
40	70.7	53.1	31.0	53.0	1.4
45	65.3	49.0	31.0	48.6	1.3
50	60.7	45.6	31.0	43.7	1.2
55	56.8	42.7	31.0	38.4	1.1
60	53.5	40.2	31.0	32.9	1.1
65	50.5	37.9	31.0	27.0	1.0
70	47.9	36.0	31.0	20.9	1.0
75	45.6	34.3	31.0	14.7	0.9
80	43.6	32.7	31.0	8.2	0.9
85	41.7	31.3	31.0	1.6	0.8
90	40.1	30.1	30.1	0.0	0.8
95	38.5	28.9	28.9	0.0	0.8
100	37.1	27.9	27.9	0.0	0.7
105	35.8	26.9	26.9	0.0	0.7
110	34.6	26.0	26.0	0.0	0.7
115	33.5	25.2	25.2	0.0	0.7
120	32.5	24.4	24.4	0.0	0.7
125	31.5	23.7	23.7	0.0	0.6
130	30.7	23.0	23.0	0.0	0.6
135	29.8	22.4	22.4	0.0	0.6
140	29.0	21.8	21.8	0.0	0.6
145	28.3	21.2	21.2	0.0	0.6
150	27.6	20.7	20.7	0.0	0.6
155	26.9	20.2	20.2	0.0	0.5
160	26.3	19.8	19.8	0.0	0.5
165	25.7	19.3	19.3	0.0	0.5

Note: Q_{Runoff} = Post-development Uncontrolled 201 + Groundwater Discharge (1.7 L/s)

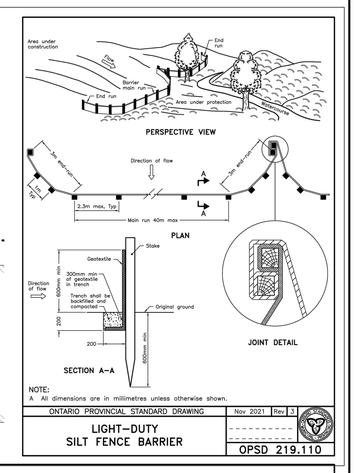
DRAWINGS



KEY PLAN
SCALE: N.T.S.

LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- x — x — x — EXISTING FENCE
- EXISTING GRADE
- 215.00 — EXISTING OVERLAND FLOW DIRECTION
- MUD-MAT; SEE DETAIL
- SF — SEDIMENT CONTROL FENCE; SEE DETAIL
- SILT SACK; SEE DETAIL

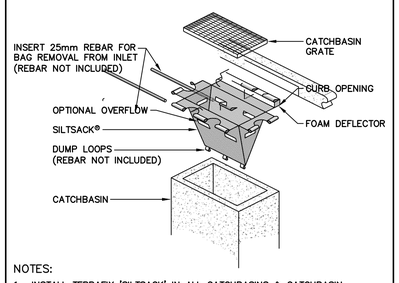


NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2021	Rev 3
LIGHT-DUTY SILT FENCE BARRIER		OPSD 219.110

'SILTSACK' DETAIL

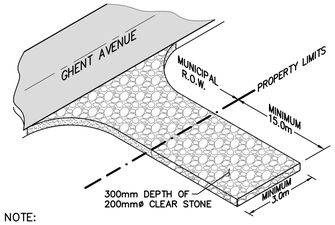
SCALE: N.T.S.



NOTES:
1. INSTALL TERRAFIX 'SILTSACK' IN ALL CATCHBASINS & CATCHBASIN MANHOLES AFFECTED BY CONSTRUCTION.
2. INSTALL TERRAFIX 'SILTSACK' IN ALL NEW CATCHBASINS & CATCHBASIN MANHOLES.

MUD MAT DETAIL

SCALE: N.T.S.



NOTE:
GEOTEXTILE (TERRAFIX 270R) TO BE PLACED AS SEPARATION BARRIER BETWEEN EXISTING GROUND AND CLEAR STONE.

EXISTING HYDRO POLE TO BE RELOCATED (BY OTHERS)

EXISTING TREE TO BE REMOVED (BY OTHERS)

PROPOSED TEMPORARY MUD MAT SEE DETAIL ON THIS SHEET

INSTALL SILT SACK IN EX. CATCHBASIN; SEE DETAIL ON THIS SHEET

CONCRETE PADS TO BE REMOVED AND DISPOSED OF OFF SITE (TYP.)

CONCRETE PADS TO BE REMOVED AND DISPOSED OF OFF SITE

CONCRETE PADS TO BE REMOVED AND DISPOSED OF OFF SITE

LIGHT DUTY SILT FENCE TO BE INSTALLED ON PROPERTY LINE AS PER OPSD 219.110

#2182 1 STOREY BRICK DWELLING

#2160 3 STOREY BRICK BUILDING

#2154 3 STOREY BRICK BUILDING

SHED

SCALE: 1:200

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TEMPORARY BENCHMARKS

ELEVATIONS ARE GEODETIC AND ARE REFERRED TO BENCHMARK No. 00819838007 HAVING AN ELEVATION OF 99.883m. LOCATED ON THE MOST SOUTHERLY OF TWO STEEL AND CONCRETE BRIDGES CARRYING THE CNR OVER BRANT ST. (THE MOST SOUTHERLY BRIDGE IS CARRYING A SPUR LINE). BENCHMARK IS SET VERTICALLY IN THE TOP OF THE S.E. ABUTMENT, 1.45m MOUTH OF THE MOST SOUTHERLY RAIL OF SPUR LINE, 14.85m WEST OF SIGNAL LIGHT #078, 10cm WEST OF EAST EDGE, 35cm NORTH OF HANDRAIL.
WAHBA SURVEYING, PROJECT No. 24-048 DATED JULY 30, 2024

Town: CITY OF Burlington

No.	ISSUE	DATE: YYYY/MM/DD
0	ISSUED FOR 1st SUBMISSION ZBA	2024/11/08

Engineer

FOR REVIEW
NOT TO BE USED FOR CONSTRUCTION

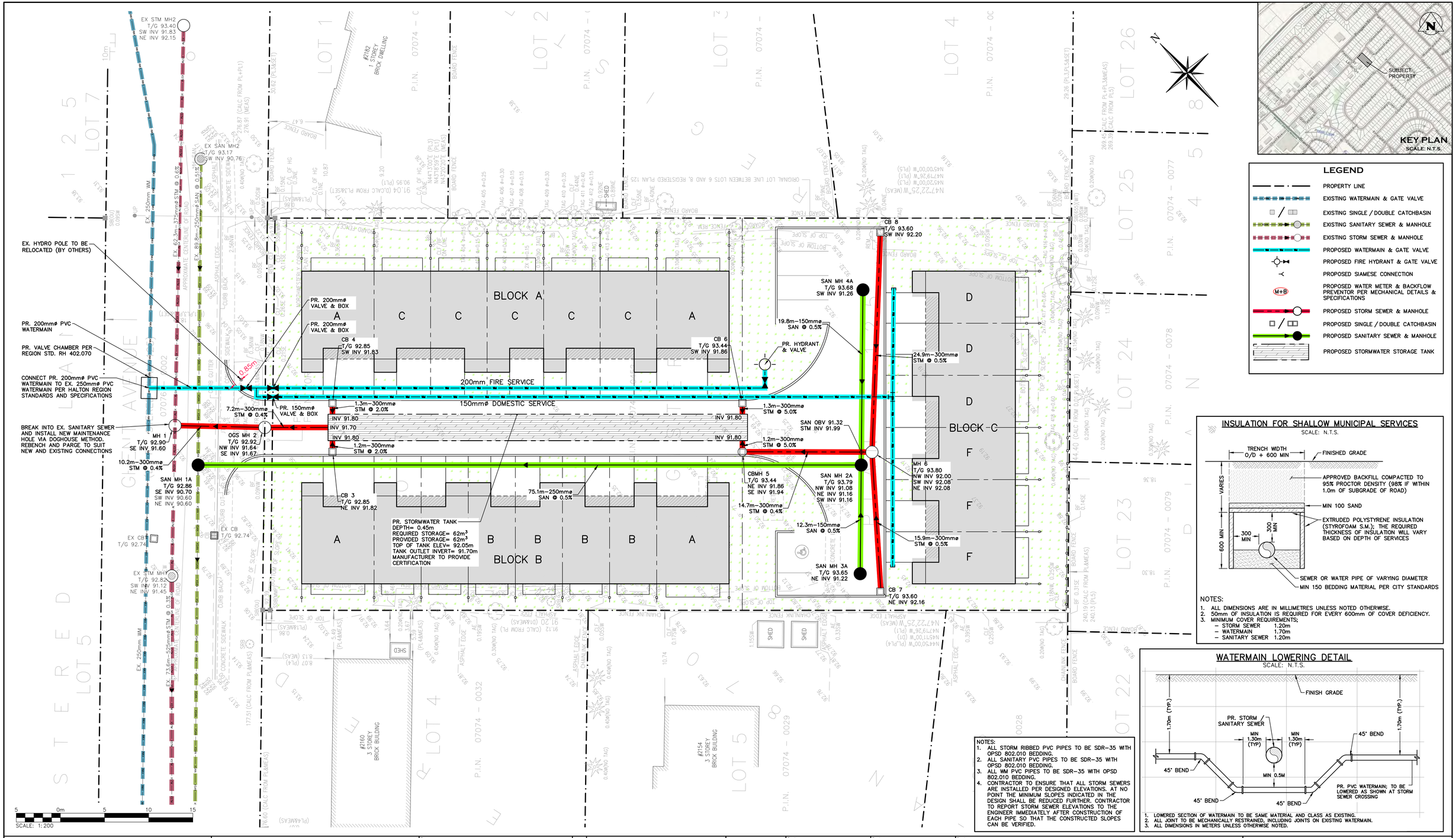
Engineer

Project: 2170 GHENT AVENUE BURLINGTON, ONTARO

Drawing: PRELIMINARY EROSION AND SEDIMENT CONTROL PLAN

CROZIER CONSULTING ENGINEERS

Drawn By	Design By	Project
S.C.	S.C./M.B.	912-7186
Check By	Check By	Drawing
M.B./T.F.	T.F.	C101



LEGEND

- PROPERTY LINE
- EXISTING WATERMAIN & GATE VALVE
- EXISTING SINGLE / DOUBLE CATCHBASIN
- EXISTING SANITARY SEWER & MANHOLE
- EXISTING STORM SEWER & MANHOLE
- PROPOSED WATERMAIN & GATE VALVE
- PROPOSED FIRE HYDRANT & GATE VALVE
- PROPOSED SIAMESE CONNECTION
- PROPOSED WATER METER & BACKFLOW PREVENTOR PER MECHANICAL DETAILS & SPECIFICATIONS
- PROPOSED STORM SEWER & MANHOLE
- PROPOSED SINGLE / DOUBLE CATCHBASIN
- PROPOSED SANITARY SEWER & MANHOLE
- PROPOSED STORMWATER STORAGE TANK

INSULATION FOR SHALLOW MUNICIPAL SERVICES

SCALE: N.T.S.

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. 50mm OF INSULATION IS REQUIRED FOR EVERY 600mm OF COVER DEFICIENCY.
3. MINIMUM COVER REQUIREMENTS;
   - STORM SEWER 1.20m
   - WATERMAIN 1.70m
   - SANITARY SEWER 1.20m

WATERMAIN LOWERING DETAIL

SCALE: N.T.S.

1. LOWERED SECTION OF WATERMAIN TO BE SAME MATERIAL AND CLASS AS EXISTING.
2. ALL JOINT TO BE MECHANICALLY RESTRAINED, INCLUDING JOINTS ON EXISTING WATERMAIN.
3. ALL DIMENSIONS IN METERS UNLESS OTHERWISE NOTED.

NOTES:
1. ALL STORM RIBBED PVC PIPES TO BE SDR-35 WITH OPSD 802.010 BEDDING.
2. ALL SANITARY PVC PIPES TO BE SDR-35 WITH OPSD 802.010 BEDDING.
3. ALL WM PVC PIPES TO BE SDR-35 WITH OPSD 802.010 BEDDING.
4. CONTRACTOR TO ENSURE THAT ALL STORM SEWERS ARE INSTALLED PER DESIGNED ELEVATIONS. AT NO POINT THE MINIMUM SLOPES INDICATED IN THE DESIGN SHALL BE REDUCED FURTHER. CONTRACTOR TO REPORT STORM SEWER ELEVATIONS TO THE ENGINEER IMMEDIATELY AFTER CONSTRUCTION OF EACH PIPE SO THAT THE CONSTRUCTED SLOPES CAN BE VERIFIED.

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TEMPORARY BENCHMARKS

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WAHBA SURVEYING, PROJECT No. 24-048 DATED JULY 30, 2024

Town: CITY OF Burlington

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Engineer

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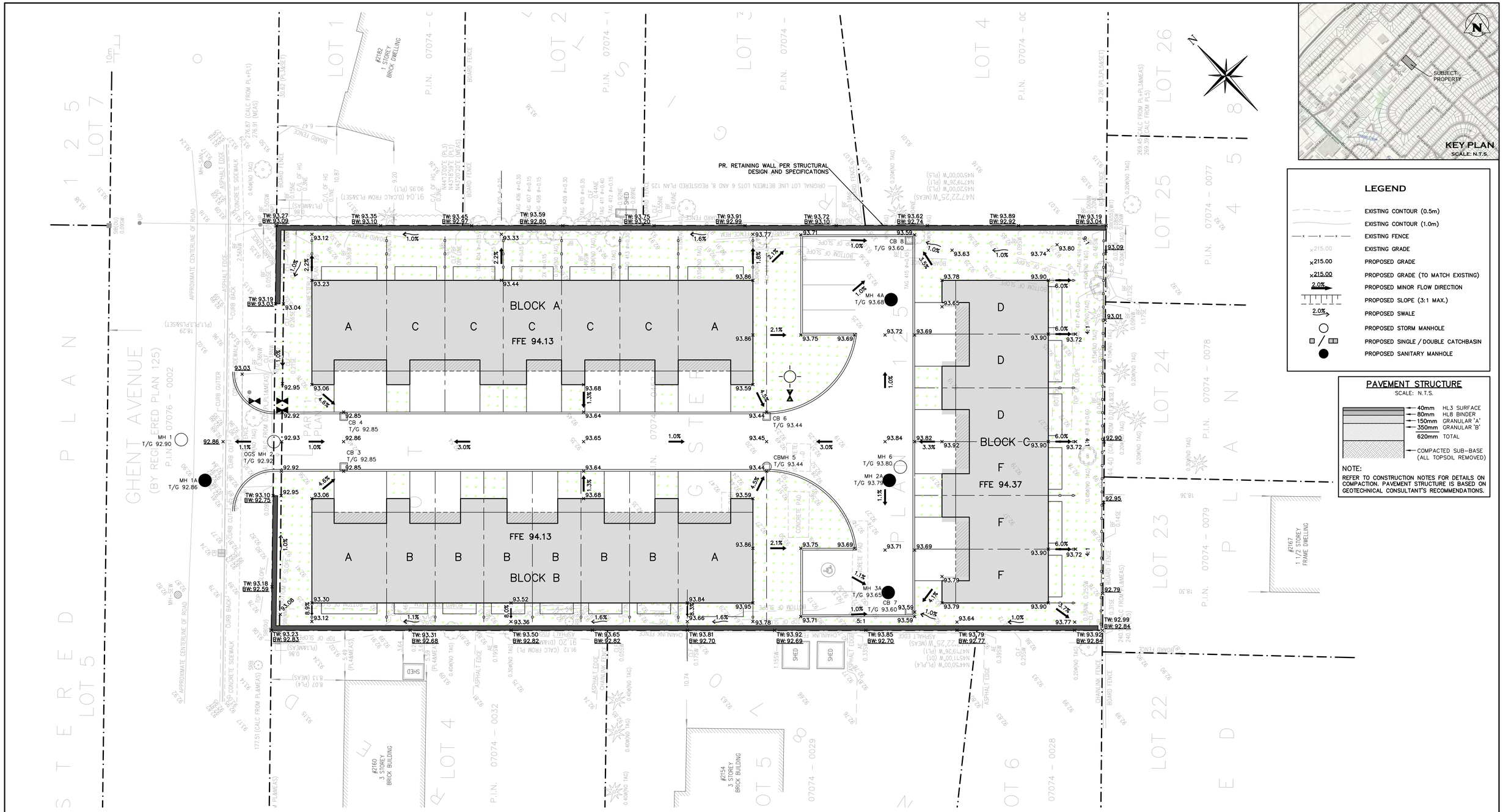
Engineer

Project: 2170 GHENT AVENUE
BURLINGTON, ONTARIO

Drawing: PRELIMINARY SITE SERVICING PLAN

CROZIER CONSULTING ENGINEERS

Drawn By	Design By	Project
S.C.	S.C./M.B.	912–7186
Check By	Check By	Drawing
M.B./T.F.	T.F.	C102



LEGEND

- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- EXISTING FENCE
- EXISTING GRADE
- PROPOSED GRADE
- PROPOSED GRADE (TO MATCH EXISTING)
- PROPOSED MINOR FLOW DIRECTION
- PROPOSED SLOPE (3:1 MAX.)
- PROPOSED SWALE
- PROPOSED STORM MANHOLE
- PROPOSED SINGLE / DOUBLE CATCHBASIN
- PROPOSED SANITARY MANHOLE

PAVEMENT STRUCTURE

SCALE: N.T.S.

40mm	HL3 SURFACE
80mm	HL8 BINDER
150mm	GRANULAR 'A'
350mm	GRANULAR 'B'
620mm	TOTAL
	COMPACTED SUB-BASE (ALL TOPSOIL REMOVED)

NOTE:
REFER TO CONSTRUCTION NOTES FOR DETAILS ON COMPACTION. PAVEMENT STRUCTURE IS BASED ON GEOTECHNICAL CONSULTANT'S RECOMMENDATIONS.

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Engineer

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Project: 2170 GHENT AVENUE
BURLINGTON, ONTARIO

Drawing: PRELIMINARY SITE GRADING PLAN

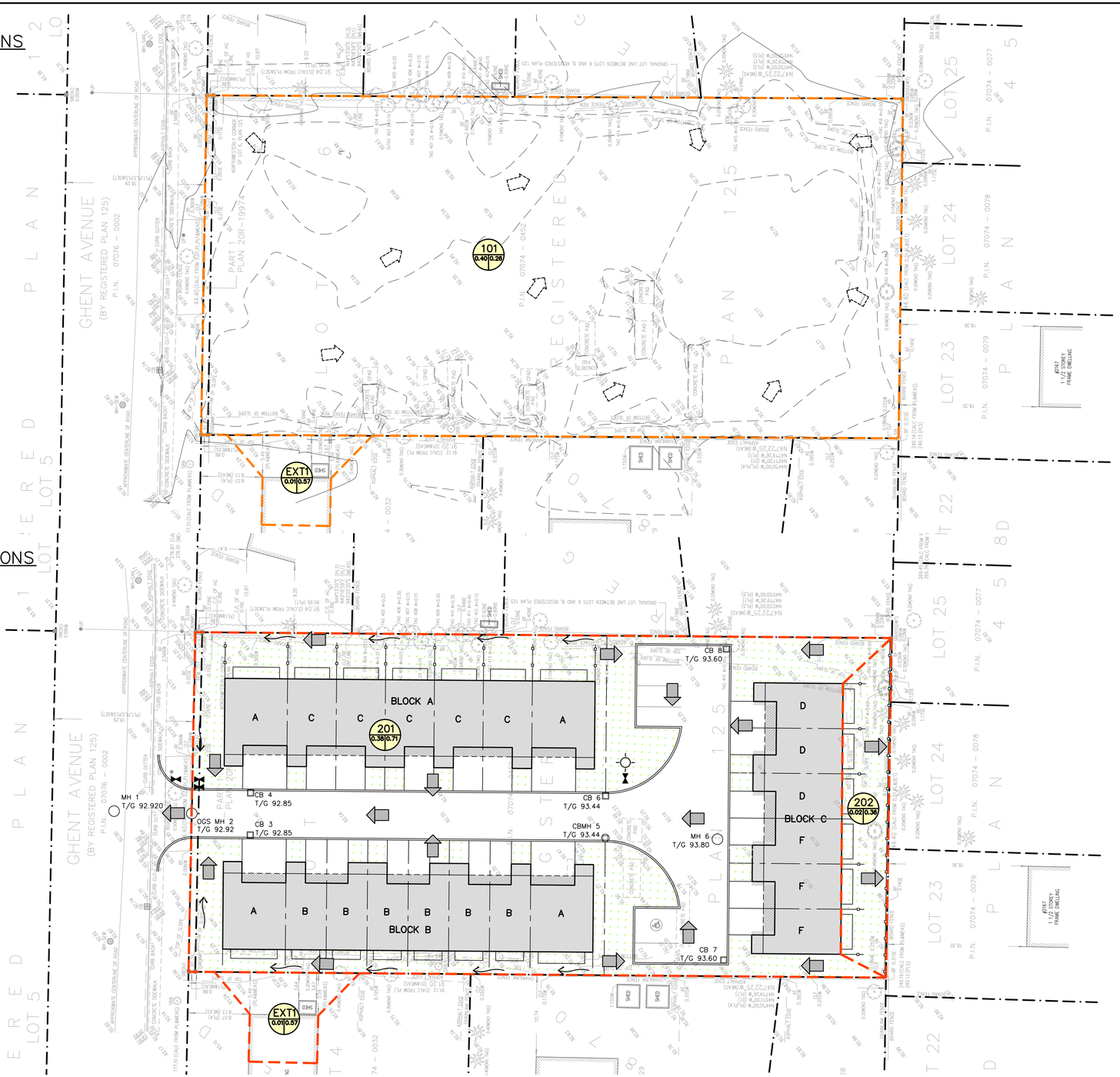
CROZIER CONSULTING ENGINEERS

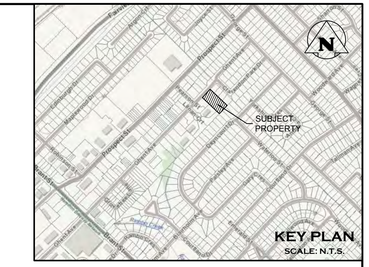
Drawn By: S.C.	Design By: S.C./M.B.	Project:	912-7186
Check By: M.B./T.F.	Check By: T.F.	Drawing:	C103

FIGURES

PRE-DEVELOPMENT CONDITIONS

POST-DEVELOPMENT CONDITIONS





LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- × 215.00 EXISTING GRADE
- PROPOSED SWALE
- PROPOSED OVERLAND FLOW DIRECTION
- EXISTING OVERLAND FLOW DIRECTION
- PRE-DEVELOPMENT DRAINAGE
- POST-DEVELOPMENT DRAINAGE
- ID / A | XX — STORM DRAINAGE CATCHMENT I.D. / AREA (ha) | RUNOFF COEFFICIENT

10 0m 10 20
SCALE: 1:300

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ELEVATIONS ARE GEODETIC AND ARE REFERRED TO BENCHMARK No. 008198380O7 HAVING AN ELEVATION OF 99.883m. LOCATED ON THE MOST SOUTHERLY OF TWO STEEL AND CONCRETE BRIDGES CARRYING THE CNR OVER BRANT ST. (THE MOST SOUTHERLY BRIDGE IS CARRYING A SPUR LINE). BENCHMARK IS SET VERTICALLY IN THE TOP OF THE S.E. ABUTMENT, 1.45m MOUTH OF THE MOST SOUTHERLY RAIL OF SPUR LINE, 14.85m WEST OF SIGNAL LIGHT #078, 10cm WEST OF EAST EDGE, 35cm NORTH OF HANDRAIL.
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Engineer

FOR REVIEW
NOT TO BE USED FOR CONSTRUCTION

Engineer

Project: 2170 GHENT AVENUE
BURLINGTON, ONTARIO

Drawing: PRELIMINARY PRE & POST STORM DRAINAGE PLANS

CROZIER CONSULTING ENGINEERS

Drawn By	Design By	Project
S.C.	S.C./M.B.	912-7186
Check By	Check By	Drawing
M.B./T.F.	T.F.	C104