White Church Boundary Expansion Area

Functional Servicing Report

January 2025

Submitted by:

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Project Number: 2600

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Submission History

Submission	Date	In Support Of	Distributed To
1st	December 2023	OPA for Secondary Plan	City of Hamilton, NPCA
2nd	January 2025	OPA for Urban Boundary Expansion	City of Hamilton, NPCA

1.0 Introduction

SCS Consulting Group Ltd. has been retained by the Whitechurch Landowners Group Inc. to prepare a Functional Servicing Report in support of the White Church Road lands, located in the City of Hamilton.

1.1 Purpose of the Functional Servicing Report

The Functional Servicing Report (FSR) has been prepared in support of an Official Plan Amendment application to designate the subject lands part of the Urban Boundary. The Concept Plan is provided in **Appendix A**. The proposed development consists of the following land uses:

- residential,
- institutional,
- park/open space,
- commercial,
- stormwater management pond blocks,
- pipeline/trail network,
- natural heritage system, and
- proposed arterial and collector roads.

The purpose of this report is to demonstrate that the development can be graded and serviced in accordance with the City of Hamilton Draft Framework for Urban Boundary Expansion Applications, Hamilton Comprehensive Development Guidelines and Financial Policies Manual, the Niagara Peninsula Conservation Authority (NPCA), and the Ministry of Environment, Conservation and Parks (MECP) design criteria. This report will also evaluate if there is sufficient capacity in existing and planned stormwater, water, and wastewater infrastructure per Policy 2.3.2.1(b) of the Provincial Planning Statement (2024). Consideration of traffic infrastructure capacity will be addressed under separate cover.

1.2 Study Area

The Subject Lands comprise a grouping of parcels generally bounded by Upper James Street to the west, Airport Road East to the north, Miles Road to the east and White Church Road East to the south (refer to **Figure 1.1**). The study area is approximately 364 ha in size.

In the existing condition, the Subject Lands are primarily comprised of agricultural land, a golf course, rural residential, and open space areas. The Subject Lands are located within the Twenty Mile Creek and the Upper Welland River watersheds. Two existing pipelines, owned by Enbridge and Westover Express Pipeline Limited, traverse the Subject Lands from east to west.

1.3 Background Servicing Information

In preparation of the servicing strategies, the following design guidelines and standards were used:

- Ministry of Municipal Affairs and Housing Provincial Planning Statement, dated 2024;
- Hamilton Draft Framework for Processing and Evaluating Urban Boundary Expansion Applications, prepared by City of Hamilton, dated August 13, 2024;
- Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under an Environmental Compliance Approval, Ministry of Environment, Conservation and Parks v2.0, May 31, 2023;
- Hamilton Comprehensive Development Guidelines and Financial Policies Manual (2019); and
- Ministry of Environment (MOE) Design Criteria for Design Guidelines for Sewage Work (2008).

The servicing strategies in this report reference the following approved reports and approvals:

- City of Hamilton Wastewater Treatment Facilities Annual Report prepared by City of Hamilton, dated 2023;
- City of Hamilton Drinking Water Systems Annual Water Quality and Summary Report prepared by City of Hamilton, dated 2023;
- City of Hamilton – AEGD Sanitary Sewer Flow Calculation – Future Dickenson Rd and Centennial Pkwy Trunk Sewer prepared by City of Hamilton, dated 2019 (revised 2023);
- City of Hamilton Airport Employment Growth District-Phase 2 Water & Wastewater Servicing Master Plan Update, dated December 2016;
- White Church Road Drain, prepared by Spriet Associates Engineers & Architects; dated May 2010;
- Environmental Compliance Approval Number 9410-B65QRT for Woodward Avenue Wastewater Treatment Plan;
- City of Hamilton Water and Wastewater Master Plan Class Environmental Assessment Report, prepared by KMK Consultants Limited, dated November 22, 2006; and
- Environmental Compliance Approval Number 2967-5S4HV9 for Mount Hope Sewage Pumping Station.

Relevant excerpts and approvals are included in **Appendix B**.

The servicing strategies are also based on the following approved Engineering Drawings:

- Line 11 – NSP 508 & -1 from STA 282+84 to STA 326+83, prepared by Enbridge, dated September 2022;
- Dickenson Road East Sanitary Sewer Installation Issued for Tender Drawings, prepared by IBI Group, dated February 2022;
- Drawing Set 12-W-04 Homestead Drive Existing Conditions, prepared by the City of Hamilton, dated March 2012;
- Drawing White Church Road Field Book B-154, Job No. 208237 Plan and Profile, prepared by Spriet Associates London Limited, dated November 2009;
- Drawing 02-W-43 Sheet 1 Miles Road Proposed 200 Replacement Watermain, prepared by the City of Hamilton, dated January 2006;
- Proposed Sewage Pumping Station S-H27 Hwy 6 and Homestead Drive Site Plan, prepared by the Regional Municipality of Hamilton-Wentworth, dated March 1995;
- Drawing Set 95-W-66 Cayuga Water System Trunk Watermain (Mount Hope to Caledonia), prepared by Thorburn Penny Consulting Engineers, dated February 1994;
- Drawing Set 90-W-16 Sheets 1-6 Airport Road Proposed 300mm Watermain, prepared by the Regional Municipality of Hamilton-Wentworth, dated August 1990; and
- Project No.813-73 Drawing Set 88-S-16, Hwy No. 6, Homestead Drive and Airport Road Proposed Sanitary Sewer, prepared by the Regional Municipality of Hamilton-Wentworth, dated April 1988 and revised May 1989 and December 1989.

Report excerpts and engineering drawings are included in **Appendix B-3**.

A pre-consultation meeting with City of Hamilton was held on October 6, 2023 which confirmed the following (refer to **Appendix B-5**):

- Water and Wastewater Master Plan Terms of Reference Scope;
- Water servicing analysis for the Secondary Plan will build on the City's WaterCAD model, to be provided by the City of Hamilton, subject to a data sharing agreement (subsequently provided by the City of Hamilton on November 22, 2024);
- City of Hamilton recommends that the Landowner Group undertake hydrant testing;
- City of Hamilton tests all hydrants on a three year schedule and can provide these hydrant testing results;

- Water analysis should include water age, velocity, max day, peak hour, etc;
- City of Hamilton noted that the 500 mm diameter watermain on Upper James Street feeds Caledonia;
- The Dickenson Road trunk sanitary sewer has been designed to 60% capacity, therefore, there will likely be sufficient capacity for the White Church Lands, subject to confirmation through the White Church Water and Wastewater Master Plan work;
- The sanitary pumping stations on Upper James Street were upgraded within the last 3 years and may have some residual capacity to support a 1st Phase, to be explored through the White Church Water and Wastewater Master Plan; and
- City has a Mike Urban model of the existing sanitary sewer system which can be updated to analyze the downstream sanitary sewer system.

2.0 Topography and Grading

2.1 Existing Conditions

2.1.1 Topography

Under existing conditions, the southwest portion of the Subject Lands generally slopes south toward White Church Road East. The west portion of the Subject Lands generally slopes southwest toward Upper James Street. The northeast portion of the Subject Lands slopes east toward the intersection of Airport Road East and Miles Road. The existing topography has slopes up to 4.0%. The ground surface elevations through the study area range from approximately 220 m to approximately 232 m.

2.2 Proposed Conditions

2.2.1 Site Grading

In general, the proposed development will be graded in a manner which will satisfy the following goals:

- Satisfy the City of Hamilton lot and road grading criteria including:
    - Minimum Road Grade: 0.75%
    - Maximum Road Grade: 6.0% (5.0% for Major Collector)
    - Maximum Road Grade for Through Roads at Intersections: 3.5% (3.0% for Major Collector)
    - Maximum Road Grade for Stop Roads at Intersections: 2.5% (2% for Major Collector)
    - Maximum Lot Grade: 5%
- Provide continuous road grades for overland flow conveyance;
- Minimize the need for retaining walls;
- Minimize the volume of earth to be moved and minimize cut/fill differential;
- Minimize the need for rear lot catchbasins; and
- Achieve the stormwater management objectives required for the proposed development.

A preliminary grading plan is provided on **Figure 2.1**.

The proposed grades generally match to existing grades at the existing pipelines and the boundary roads.

At the detailed design stage, the preliminary grading shown on **Figure 2.1** will be subject to a more in-depth analysis in an attempt to balance the cut and fill volumes and minimize slopes and walls.

3.0 Storm Servicing

3.1 Existing Storm Servicing

As shown on the City of Hamilton engineering drawing plan and profile (refer to **Appendix B-4**) and topographic survey mapping completed by A.T. McLaren Limited (refer to **Appendix E**), the size and locations of the existing culverts adjacent to the site are listed below:

- Five (5) 1000 mm diameter culverts located on White Church Road East;
- One (1) 900 mm diameter culvert located on White Church Road East;
- Two (2) 750 mm diameter culverts located on White Church Road East;
- Two (2) 700 mm diameter culverts located on the White Church Road East;
- Three (3) 600 mm diameter culverts located on the White Church Road East;
- One (1) 500 mm diameter culvert located on White Church Road East;
- One (1) 400 mm diameter culvert located on White Church Road East;
- One (1) 900 mm diameter culvert located on the Airport Road;
- Two (2) 800 mm diameter culverts located on the Airport Road;
- Two (2) 600 mm diameter culverts located on the Airport Road;
- One (1) 900 mm diameter culvert located on the Miles Road;
- One (1) 700 mm diameter culvert located on the Miles Road;
- Two (2) 600 mm diameter culverts located on the Miles Road;
- One (1) 900 mm x 900 mm box open bottom concrete culvert located on Upper James Street; and
- One (1) 1200 mm x 1200 mm diameter box open bottom concrete culvert located on Upper James Street.

The Existing Storm Drainage Plan is shown on **Figure 3.1**.

Through the Upper Welland River Watershed Plan, a municipal drain (the White Church Road Drain, City of Hamilton By-Law No. 10-194) has been identified within the Subject Lands. Refer to **Appendix B-1** for the Upper Welland River Watershed Municipal Drains Report. Refer to **Appendix B-4** for the White Church Road Municipal Drain Engineer's Report, City of Hamilton By-Law No. 10-194, and the plan and profile drawing of the drain. The municipal drain will be further assessed at the Secondary Planning stage. The municipal drain and other stormwater outlets surrounding the site provide sufficient capacity to service the urban boundary expansion lands, as proposed stormwater management facilities will be designed to control post-development peak flows to existing peak runoff rates to each outlet as outlined in the Subwatershed Study (SWS) prepared by SCS Consulting Group Ltd. and Beacon Environmental, dated January 2025.

3.2 Proposed Storm Servicing

3.2.1 Minor System

The storm drainage system will be designed in accordance with the City of Hamilton and MECP guidelines, including the following:

- Piped system (minor system) to be sized to accommodate runoff from a 5 year storm event,
- Hydraulic gradeline analysis to be completed for the 100 year storm event, to confirm hydraulic gradeline is a minimum of 0.3 m below the basement floor elevation;
- Minimum Pipe Size: 300 mm diameter,
- Maximum Flow Velocity: 3.65 m/s,
- Minimum Flow Velocity: 0.8 m/s, and
- Minimum Pipe Depth: 3.3 m to obvert (unless justified in servicing report).

The storm sewer system will typically be designed with grades between 0.5% and 2%. Throughout the proposed development, the storm sewer will be constructed at a minimum depth of 2.75 m below the centerline of the proposed road elevation and 3.3 m for foundation drains. It is anticipated that storm sewers will be able to be designed with sufficient depth to service foundation drains by gravity through most of the development. However, due to shallow depth of the existing culverts under the boundary roads, it will not be possible to provide deep enough storm sewers to service foundation drains by gravity in some areas closer to the shallower storm outlets, therefore, sump pumps will be required. Specific boundaries of the areas requiring sump pumps will be confirmed at the Secondary Planning stage when detailed local road networks are available. The proposed storm sewer networks take into account the existing gas pipelines. Storm sewer crossing elevations and allowable grading criteria associated with the gas pipelines have been taken into consideration in establishing the proposed stormwater drainage plan. A detailed subsurface investigation of the pipeline elevation will be undertaken at the Secondary Planning stage.

The general storm system drainage routing has been shown on **Figure 3.2.**

The rainfall intensity will be calculated as follows, where ‘i’ is the rainfall intensity (mm/hour) and A, B, and C are as per **Table 3.1**:

$i = A / (T_c + B)^c$

Table 3.1: Rainfall Intensity Parameters

Return Period Storm	A	B	C
2 Year	646.0	6.0	0.781
5 Year	1049.5	8.0	0.803
10 Year	1343.7	9.0	0.814
25 Year	1719.5	10.0	0.823
50 Year	1954.8	10.0	0.826
100 Year	2317.4	11.0	0.836

3.2.2 Major System

The major system flow drainage (up to the 100 year storm event) will generally be conveyed overland along the road rights-of-way and easements. The depth of the 100 year storm event flows within the road-rights-of way will not exceed the crown of the road.

The proposed storm drainage plan and major system overland flow patterns are shown on **Figure 3.2**.

4.0 Sanitary Servicing

4.1 Existing Sanitary Sewer System

The Mount Hope community, located to the west of the Subject Lands, is serviced by a series of existing sanitary pumping stations, namely HC024 (Mount Hope), HC027 (Homestead), HC019 (English Church), and HC018 (Twenty Road). The Airport pumping station pumps sanitary flows to a gravity sewer on Provident Way which conveys flows to the Homestead pumping station. The Homestead pumping station pumps north to an existing 600 mm diameter sanitary sewer on Homestead Drive. Sanitary flows are conveyed north to the Mount Hope pumping station, which pumps north to an existing 675 mm diameter sanitary sewer on Upper James Street, north of English Church Road. The sanitary flows are pumped north again at the Twenty Road pumping station. Ultimately, the sanitary flows are conveyed to the Woodward Avenue Wastewater Treatment Plant via the Red Hill Creek Trunk Sanitary Sewer. Per the City of Hamilton Water and Wastewater Master Plan Class Environmental Assessment Report (2006), the Woodward Avenue Wastewater Treatment Plant has a rated capacity of 409 ML/d, which was demonstrated to be able to accommodate the anticipated growth to 2031 via a scoping study completed by CH2MHill. The existing sanitary sewer system is illustrated on **Figure 4.1**. The existing infrastructure north of Dickenson Road is illustrated on Figure 24 from the City's Integrated Water and Wastewater Master Plan, included in **Appendix B-2**, and also on the City's Water and Wastewater GIS mapping available online. The City of Hamilton's Wastewater Treatment Facilities Annual Report 2023 and ECA Number 2967-5S4HV9 (**Appendix B-6**) provide approved capacity ratings. Correspondence received from the City (**Appendix B-2**) included the following capacities as of December 2024:

- HC018 Twenty Road Wastewater Pumping Station: 590 L/s,
- HC019 English Church Wastewater Pumping Station: 285 L/s,
- HC027 Homestead Wastewater Pumping Station: 155 L/s, and
- HC024 Mount Hope Sewage Pumping Station: 67.3 L/s.

The construction of a 1500 mm diameter trunk sanitary sewer along Dickenson Road is currently underway by the City and scheduled to be completed late 2028. Upon completion of the Dickenson Road trunk sewer, flows from the existing sanitary sewer system on Upper James Street, south of Dickenson Road will be diverted to the Dickenson Road trunk sanitary sewer.

Consultation with the City confirmed that the Dickenson Road trunk sewer was designed to 60% capacity, therefore it is understood that the sewer has a residual capacity of approximately 1.02 m^3/s, based on a 1500 mm diameter sewer at 0.12% (full flow capacity of 2.56 m^3/s). The City also confirmed that a portion of the subject lands were assigned a wastewater capacity allocation under the "Residential or Employment to

2031+" designation within Rural Traffic Zone No. 5016. Refer to City of Hamilton – AEGD Sanitary Sewer Flow Calculation – Future Dickenson Rd and Centennial Pkwy Trunk Sewer figure and calculations in **Appendix B-2**.

Based on the diversion of the existing sanitary sewer south of Dickenson Road to the future Dickenson Road trunk sewer, it is likely that there will be residual capacity in the downstream sanitary sewer system on Upper James Street north of Dickenson Road. This will need to be reviewed further by an analysis of the City's sanitary sewer system model at the Secondary Planning stage.

4.2 Wastewater Treatment Plant

The existing sanitary sewer system on Homestead Drive and Upper James Street, as well as the future Dickenson Road trunks sanitary sewer ultimately discharge to the Woodward Avenue Wastewater Treatment Plant, where wastewater is treated and discharged to Lake Ontario. According to the City of Hamilton's Wastewater Treatment Facilities Annual Report 2023 (**Appendix B-2**), the Woodward Avenue Wastewater Treatment Plant has an average day rated capacity of 409 ML/d and in 2023 the plant treated an average of 322 ML/d. Several plant upgrades have been completed recently, including a tertiary treatment facility and secondary treatment expansion which was scheduled to be commissioned in 2024. After commissioning of the upgrades, the secondary and tertiary design capacity with all treatment trains in operation is 614 ML/d according to the ECA 9410-B65QRT (**Appendix B-6**). At the Secondary Planning stage, the reserve capacity of the treatment plant will be reviewed in consultation with the City of Hamilton.

4.3 Proposed Sanitary Sewer System

A sanitary pumping station is proposed in the northeast corner of the Subject Lands to service approximately 217.03 ha of the Subject Lands. The proposed sanitary pumping station will pump the sanitary flows north via a proposed forcemain on Miles Road to the Dickenson Road trunk sanitary sewer. Sanitary drainage cannot be conveyed to the Dickenson Road trunk sanitary sewer via a gravity sewer on Miles Road due to a conflict with the existing 2.67 m wide by 2.93 m high concrete box culvert crossing of Twenty Mile Creek, approximately 650 m south of Dickenson Road. Sanitary Drainage from approximately 103.82 ha is proposed to drain via gravity to the Homestead sanitary pumping station. Approximately 43.52 ha of the south west portion of the Subject Lands will be serviced by a proposed pumping station located approximately 600 m east of Upper James Street on the north side of White Church Road East. The proposed sanitary pumping station will pump the sewage north via a proposed forcemain to the proposed sanitary sewers approximately 350 m east of Upper James Street. Additional analysis is required to confirm the residual capacity in the Homestead sanitary pumping station and the downstream existing sanitary sewer system which will convey the sanitary flows to the Dickenson Road trunk sanitary sewer at Upper James Street. Potential upgrades to the existing sanitary pumping station and sanitary sewer system will be reviewed further at the Secondary Planning stage. If the Homestead sanitary pumping station does not have residual capacity, then upgrading the pumping station, or a new pumping station and forcemain may be required.

Overall required capacity to service the urban boundary expansion lands can be available through the identified potential upgrades to existing infrastructure or planning of new infrastructure through the City's typical Water and Wastewater Master Plan update and associated Development Charge By-Law update. The preliminary layout for the proposed sanitary sewer within the Subject Lands is provided on **Figure 4.1**.

The sanitary sewers within the proposed development will have slopes ranging between 0.5% and 2% (typically). The critical trunk sanitary sewer routes have proposed slopes of 0.35% to minimize the depth of the sanitary sewer and the pumping stations. The maximum depth of the trunk sanitary sewer will be approximately 15 m deep located approximately 400 m north of White Church Road East and 450 m west of Mile Road.

The sanitary sewer system will be designed in accordance with the City of Hamilton and MECP criteria, including but not limited to:

- Residential Sanitary Generation Rate: 360 l/c/d,
- Population Density:
    - Single detached: 60 ppha
    - Semi-detached: 75 ppha
    - Townhouses and Maisonettes: (30 upha) 110 ppha
    - Medium Density apartments: (60 upha) 250 ppha
    - High Density apartments (100 upha): varies (subject to detailed plans)
    - Parks: 12 to 25 ppha
    - Schools and Institutional Uses: 75 to 125 ppha
    - Commercial: varies 125 to 750 ppha
- Peaking Factor: Harmon (Min. 2.0 Max. 5.0),
- Infiltration Rate: 0.40 L/s/ha where the weeping tiles of the dwelling are designed to be drained by gravity, 0.6 L/s/ha where there are no storm sewers or shallow storm sewers,
- Sanitary sewers shall be designed to flow at maximum 75% full up to 450 mm diameter, maximum 60% full for 525 mm diameter and above;
- Minimum Pipe Size: 250 mm diameter (200 mm diameter may be permitted on the last run);
- Minimum Pipe Cover: 2.75 m,
- Minimum Full Flow Velocity: 0.75 m/s, and
- Maximum Velocity: 2.75 m/s.

Preliminary sanitary populations are calculated in **Appendix C**.

5.0 Water Supply and Distribution

5.1 Existing Water Distribution

Per the Hamilton Airport Employment Growth District - Phase 2 Water and Wastewater Master Plan (December 2016), the west portion of Pressure District 6 (PD6) is supplied by pumping station HD06A located at the south east corner of Stone Church Road and Garth Street and the east portion of PD6 is supplied by pumping station HD06B located at the south east corner of Stone Church Road and Turnbridge Crescent. Both stations are supplied treated drinking water from the Woodward Avenue Water Treatment Plant located on Woodward Avenue north in the City of Hamilton. Per City of Hamilton Drinking Water System Annual Water Quality and Summary Report (2023) Table 1-1, the Woodward Treatment Plant has a Municipal Drinking Water License Daily Rated Capacity of 926 ML/d and a Permit to Take Water (PTTW) Daily Limit of 909 ML/d. Per the City of Hamilton Water and Wastewater Master Plan Class Environmental Assessment Report (2006), the PTTW Daily Limit is sufficient to meet the water treatment needs for the 2031 growth scenario. Pumping stations HD06A and HD06B are served by a Highland Road Reservoir (HDR05) with an existing storage of 227 ML. Pumping Station HD06A has an existing firm capacity of 113.67 ML/d and an existing installed capacity of 161.41 ML/d. The required capacity is 66 ML/d. 40% of the Pumping Station HD06A capacity has been utilized in 2001 with a flow rate of 35.76 ML/d. City of Hamilton has projected population growth to 2031 and the pumping station HD06A is anticipated to have a 40% capacity utilized with an increasing of flow rate of 55.18 ML/d. Pumping Station HD06B has an existing firm capacity of 172.80 ML/d and an existing installed capacity of 259.20 ML/d. The required capacity is 99.0 ML/d. 60% of the Pumping Station HD06B capacity has been utilized in 2001 with a flow rate of 53.64 ML/d. The pumping station HD06B is anticipated to have a 60% capacity utilized with an increasing of flow rate of 82.77 ML/d in the 2031 population growth scenario.

PD6 consists of land between ground elevations of approximately 205 m and 240 m and is serviced by pumping station HD06A and HD06B. The Subject Lands are located within PD6, with existing ground elevations ranging from approximately 218 m to 230 m.

Adjacent to the proposed development, an existing 500 mm diameter watermain is located on Upper James Street, which feeds Caledonia to the south. Existing 400 mm diameter watermains are located on Homestead Drive north of Airport Road East and on Airport Road west of Homestead Drive. An existing 300 mm diameter watermain is located north of the Subject Lands on Airport Road East with a stub approximately 1300 m east of Upper James Street. An existing 300 mm diameter watermain is located on White Church Road West, west of Upper James Street. The existing watermain system is illustrated on **Figure 5.1**. Refer to **Appendix B-3** for water analysis excerpts.

5.2 Proposed Water System

The Subject Lands can be serviced via connections to the existing water distribution system on Upper James Street and Airport Road East. A hydraulic analysis will be completed at the Secondary Planning stage, after the lands are designated Urban, to review the water supply and storage of the existing and planned PD6 infrastructure to service the Subject Lands, or to identify any external infrastructure requirements. A watermain hydraulic analysis will be completed at the Secondary Planning stage to confirm that there are sufficient domestic and fire flows to service the development and to confirm watermain sizing.

Overall required capacity to service the urban boundary expansion lands can be available through the identified potential upgrades to existing infrastructure or planning of new infrastructure through the City's typical Water and Wastewater Master Plan update and associated Development Charge By-Law update. The preliminary layout for the proposed watermain system is provided on **Figure 5.1.**

The watermain system will be designed in accordance with the City of Hamilton and MECP criteria including:

- Domestic demand design flows shall conform to the latest edition of the Ontario Ministry of the Environment's "Guidelines for the Design of Water Storage Facilities, Water Distribution Systems, Sanitary Sewer Systems and Storm Sewers",
- Fire flows shall be determined in accordance with the Fire Underwriters Survey (FUS 1999),
- Maximum operating pressure shall not exceed 700 Kpa,
- Under simultaneous maximum day and fire flow demands, the pressure shall not drop below 140 Kpa,
- Minimum Residential Pipe Size: 150 mm diameter (50 mm dia copper around cul-de-sac),
- Minimum Employment Pipe Size: 200 mm,
- Minimum Pipe Depth: 1.6 m,
- Maximum Pipe Depth: 3.0 m, and
- Maximum Hydrant Spacing: Generally 150 m on streets with low density development, and 110 m on collector streets, high density residential streets, commercial and industrial streets. On cul-de-sacs, the fire hydrant shall be located within 75 m of the dwelling lot furthest from the street entrance.

The population was estimated based on the Concept Plan (refer to **Appendix A**). The anticipated water demand for the Subject Lands is summarized in **Table 5.1** below.

Table 5.1: Water Demand Summary

	Residential	Commercial	Institutional
Peak Hour Demand (L/s)	317.10	29.54	15.75
Fire Flow + Maximum Day Demand (L/s)	157.24	156.83	160.48

Refer to **Appendix D** for water demand calculations.

6.0 Cost Sharing

The cost of infrastructure which benefits multiple properties, such as trunk storm sewers, trunk sanitary sewers, sanitary pumping stations and forcemains, watermains, collector roads, and stormwater management facilities, should be shared by the benefiting landowners. It is recommended that the landowners within the Subject Lands enter into a cost sharing agreement to set out the principles by which these costs can be equitably shared. Alternatively, area-specific development charges can be used. It is further recommended that the Secondary Plan policies include a requirement for implementation of the Cost Sharing Agreement and measures to ensure all parties are in good standing with the Agreement prior to registration of any plans of subdivision or approval of any Site Plan Applications.

7.0 Utility Considerations

Local utility companies (electricity, natural gas, and telecommunications) have been contacted and circulated the proposed concept plan to consider the required service loads relative to existing and proposed future capacity.

8.0 Summary

This Functional Servicing Report has been prepared in support of the Official Plan Amendment application to designate the subject lands to be within the Urban Boundary in the City of Hamilton. This report outlines the means by which the proposed development can be graded and serviced in accordance with the City of Hamilton Draft Framework for Urban Boundary Expansion Applications, Hamilton Comprehensive Development Guidelines and Financial Policies Manual, the Niagara Peninsula Conservation Authority, and the Ministry of Environment, Conservation and Parks design criteria and policies.

General Information

- The existing land use is primarily agricultural and an existing golf course, rural residential, and open space areas.
- The proposed development is located in the Twenty Mile Creek and Upper Welland River watersheds.
- The proposed development consists of residential, park, natural open space, institutional (school), commercial, utility (SWM facility blocks), pipeline/trail network, and proposed arterial and collector roads.

Grading

- The proposed development grading has been developed to match to the existing surrounding grades, and provide conveyance of stormwater runoff.
- The site grading will be subject to further grading design at the detailed design stage.

Storm Servicing

- Storm runoff will be conveyed by storm sewers designed in accordance with Municipality and MECP criteria.
- Storm sewers will generally be designed for the 5 year storm event.
- Stormwater outlets surrounding the site provide sufficient existing capacity to service the urban boundary expansion lands, as proposed stormwater management facilities will be designed to control post-development peak flows to existing peak runoff rates to each outlet per the SWS.

Sanitary Servicing

- A sanitary pumping station is proposed in the northeast corner of the Subject Lands to service the eastern portion of the proposed development. The sanitary pumping station will pump the sanitary flows north via a proposed forcemain on Miles Road to the Dickenson Road trunk sanitary sewer.

- The northwest portion of the Subject Lands is proposed to drain via gravity to the Homestead sanitary pumping station, which will convey flows north to the Dickenson Road trunk sanitary sewer.
- A sanitary pumping station is proposed in the southwest corner of the Subject Lands to service the southwest portion of the proposed development. The sanitary pumping station will pump the sanitary flows north via a proposed forcemain to the proposed gravity sewers within the site, which will drain to the Homestead sanitary pumping station.
- The existing Woodward Avenue Wastewater Treatment provides treatment for the existing system on Homestead Drive and Upper James Street as well as the future Dickenson Road sanitary sewers ultimately discharge to Lake Ontario.
- Capacity to service the urban boundary expansion lands can be available through upgrades to existing infrastructure or planning of new infrastructure through the City’s typical Water and Wastewater Master Plan update and associated Development Charge By-Law update.

Water Supply and Distribution

- The proposed development will be serviced via connections to the existing watermains on Upper James Street and Airport Road East.
- A watermain hydraulic analysis will be completed at the Secondary Planning stage to confirm that there are sufficient domestic and fire flows to service the development, confirm watermain sizing and to identify any external infrastructure requirements.
- Capacity to service the urban boundary expansion lands can be available through upgrades to existing infrastructure or planning of new infrastructure through the City’s typical Water and Wastewater Master Plan update and associated Development Charge By-Law update.

Cost-Sharing

- It is recommended that the landowners within the White Church Urban Boundary Expansion Area enter into a cost sharing agreement.

Respectfully Submitted:

SCS Consulting Group Ltd.

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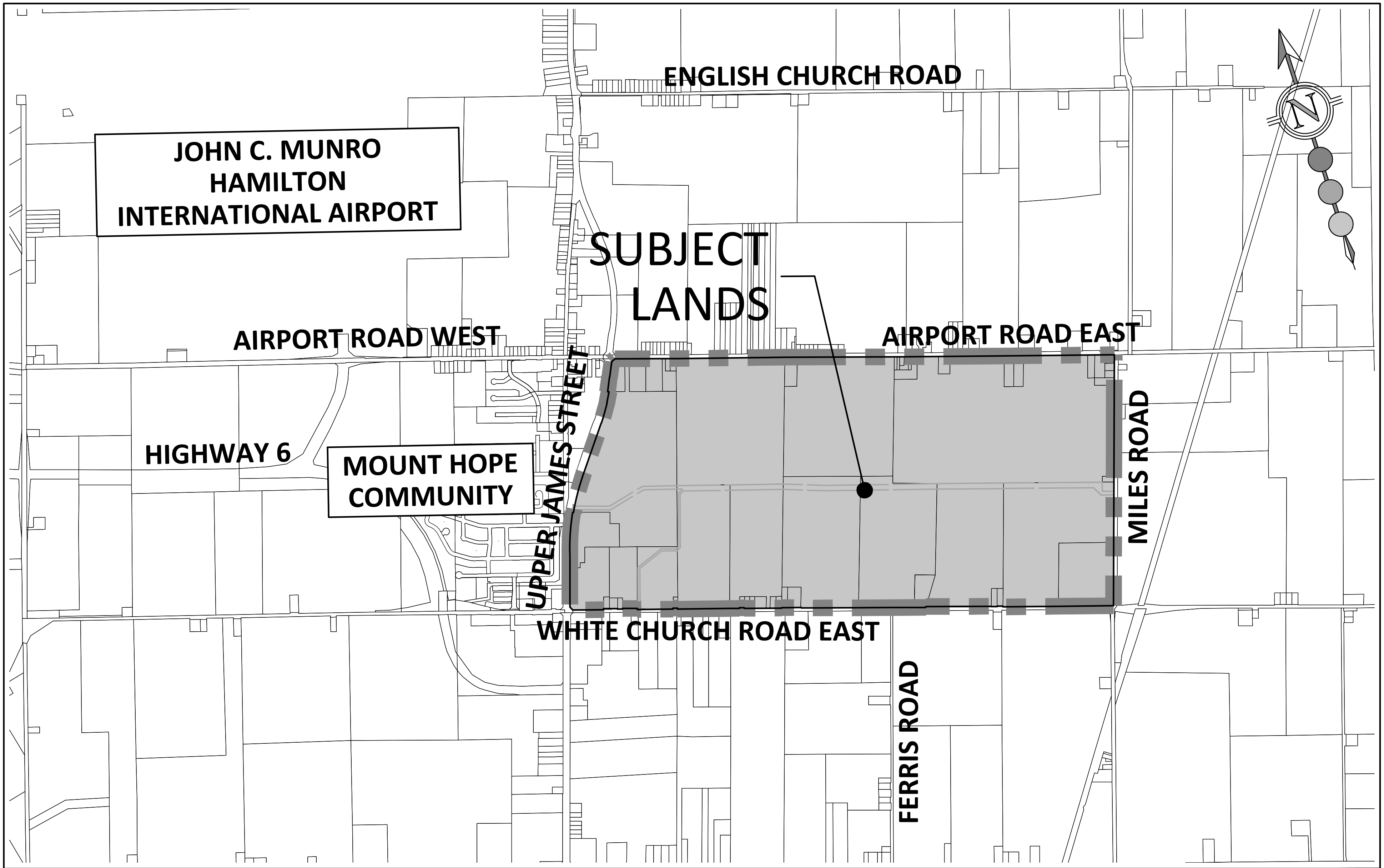
Figures



WHITECHURCH
LANDOWNERS GROUP INC.

WHITE CHURCH ROAD
FUNCTIONAL SERVICING REPORT

SITE LOCATION PLAN

SCS consulting group ltd

30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
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DESIGNED BY:	JAS	CHECKED BY:	ETCK
SCALE:	1:1000	DATE:	JANUARY 2025

PROJECT No:
2600

FIGURE No:
1.1

File: P:\2600 White Church Road Secondary Plan\Drawings\FSP\Fig\Report Figures\2600P-LOCT-1.1.dwg - Revised by <JZHANG> : Thu, Jan 09 2025 - 10:36am

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

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LEGEND:

▬ ▪ ▪ ▬	LIMIT OF STUDY AREA
× 194.98	PROPOSED ELEVATION
× 189.94EX	EXISTING ELEVATION
0.5% →	ROAD SLOPE
221.00	EXISTING CONTOUR
↗	PROPOSED HIGH POINT
↗	PROPOSED LOW POINT

WHITE CHURCH ROAD
FUNCTIONAL SERVICING REPORT

PRELIMINARY
GRADING PLAN

DESIGNED BY: JAS
CHECKED BY: ETCK
SCALE: 1:4000
DATE: JANUARY 2025
PROJECT No: 2600
FIGURE No: 2.1

File: P:\2600 White Church Road Secondary Plan\Drawings\FSP\Fig\Report Figures\2600P-GRAD-2.1.dwg - Revised by <JZHANG> : Thu, Jan 09 2025 - 10:32am

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

WHITECHURCH LANDOWNERS
GROUP INC.

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

LEGEND:

▬ ▬ ▬	LIMIT OF STUDY AREA
212.00	EXISTING CONTOUR AND ELEVATION
▬▬▬	EXISTING STORM DRAINAGE BOUNDARY
L=367m - - - -	TIME OF PEAK FLOW PATH AND LENGTH
17.87ha	DRAINAGE AREA (HECTARES)
13%	PERCENT (%) IMPERVIOUS
101	CATCHMENT ID
▥▥▥	SUBWATERSHED DIVIDE
⇨	MAJOR SYSTEM - OVERLAND FLOW
▬▬▬	POND OR POOLING (REFER TO PRELIMINARY HYDROGEOLOGICAL INVESTIGATION PREPARED BY LANDTEK CONSULTING ENGINEERS LTD.)
▬▬▬	WHITECHURCH ROAD DRAIN (FROM ONTARIO OPEN MAPS HYDRO NETWORK - WATERWAYS)

WHITE CHURCH ROAD
FUNCTIONAL SERVICING REPORT

EXISTING
STORM DRAINAGE PLAN

DESIGNED BY: JAS
CHECKED BY: ETCK
SCALE: 1:4000
DATE: JANUARY 2025
PROJECT No: 2600
FIGURE No: 3.1

File: P:\2600 White Church Road Secondary Plan\Drawings\FSP\Fig\Report Figures\2600P-STRM-EXST-3.1.dwg - Revised by <JZHANG> : Thu, Jan 09 2025 - 10:45am

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

WHITECHURCH LANDOWNERS
GROUP INC.

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

LEGEND:

▬ ▬ ▬	LIMIT OF STUDY AREA
▬	PROPOSED DRAINAGE BOUNDARY
―	WHITECHURCH ROAD DRAIN (FROM ONTARIO OPEN MAPS HYDRO NETWORK - WATERWAYS)
0.04ha	DRAINAGE AREA (Ha)
79%	PERCENT (%) IMPERVIOUS
104	CATCHMENT ID
221.00	EXISTING CONTOUR
AREA	EXTERNAL STORM DRAINAGE AREA (HECTARES)
%	PERCENT (%) IMPERVIOUS
ID	CATCHMENT ID
▬	EXTERNAL STORM DRAINAGE BOUNDARY
▬	ESTIMATED STORMWATER MANAGEMENT POND BOUNDARY
➡	PROPOSED FLOW DIRECTION OUT OF SWM POND
⇨	PROPOSED OVERLAND FLOW DIRECTION

WHITE CHURCH ROAD
FUNCTIONAL SERVICING REPORT

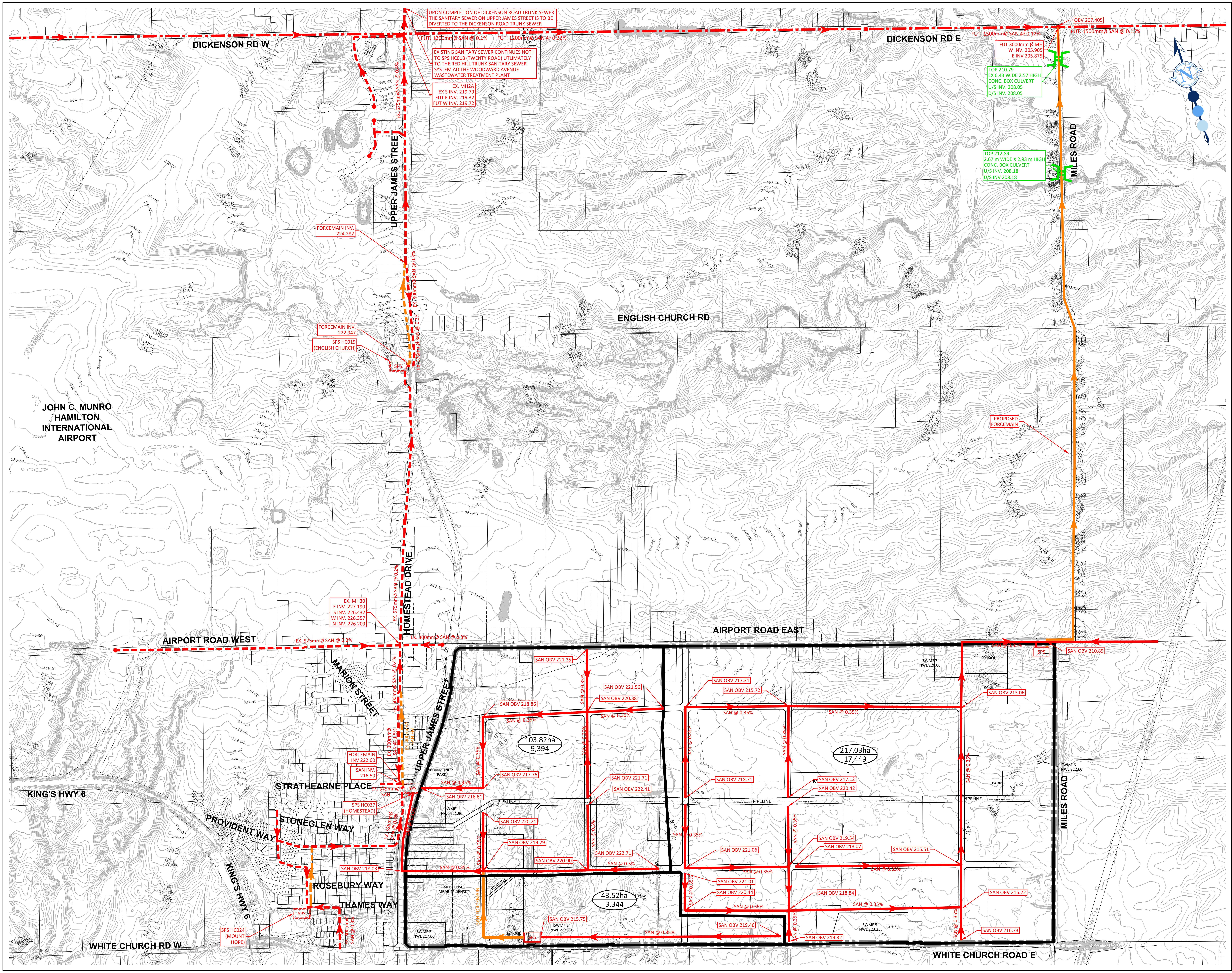
PRELIMINARY
PROPOSED DRAINAGE PLAN

DESIGNED BY:	JAS	CHECKED BY:	ETCK
SCALE:	1:4000	DATE:	JANUARY 2025

PROJECT No: 2600

FIGURE No: 3.2

File: P:\2600 White Church Road Secondary Plan\Drawings\FSP\Fig\Report Figures\2600P-STRM-PROP-3.2.dwg – Revised by <JZHANG> : Thu, Jan 09 2025 – 10:50am



LEGEND:

▬ ▪ ▪ ▬	LIMIT OF STUDY AREA
▬▬▬	SANITARY DRAINAGE BOUNDARY
─➤─●─	PROPOSED SANITARY SEWER AND MAINTENANCE HOLE
─·➤─●─·─	FUTURE SANITARY SEWER AND MAINTENANCE HOLE
- -➤-●- -	EXISTING SANITARY SEWER AND MAINTENANCE HOLE
SPS	PROPOSED SANITARY PUMPING STATION
SPS	EXISTING SANITARY PUMPING STATION
─➤─	PROPOSED SANITARY FORCEMAIN
- -➤- -	EXISTING SANITARY FORCEMAIN
0.20ha / 100	DRAINAGE AREA (HECTARES) / POPULATION
⌶	EXISTING CULVERT
221.00	EXISTING CONTOUR

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

SCS consulting group ltd

30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

WHITECHURCH LANDOWNERS GROUP INC.

WHITE CHURCH ROAD
FUNCTIONAL SERVICING REPORT

PROPOSED
SANITARY DRAINAGE PLAN

DESIGNED BY:	J.A.S.	CHECKED BY:	E.T.C.K.
SCALE:	1:7500	DATE:	JANUARY 2025
PROJECT No:	2600	FIGURE No:	4.1

File: P:\2600 White Church Road Secondary Plan\Drawings\FSP\Fig\Report Figures\2600P-SANI-PROP-4.1.dwg - Revised by <SGREEN> : Fri, Jan 03 2025 - 11:55am

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WHITECHURCH LANDOWNERS
GROUP INC.

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

LEGEND:

▬ ▪ ▪ ▬	LIMIT OF STUDY AREA
- - - -	300Ø EXISTING WATERMAIN
- - - -	400Ø EXISTING WATERMAIN
- - - -	500Ø EXISTING WATERMAIN
— · — ·	300Ø FUTURE WATERMAIN
——	PROPOSED WATERMAIN
221.00	EXISTING CONTOUR

WHITE CHURCH ROAD
FUNCTIONAL SERVICING REPORT

PROPOSED
WATER DISTRIBUTION PLAN

DESIGNED BY: JAS
CHECKED BY: ETCK
SCALE: 1:4000
DATE: JANUARY 2025
PROJECT No: 2600
FIGURE No: 5.1

File: P:\2600 White Church Road Secondary Plan\Drawings\FSP\Fig\Report Figures\2600P-WTRM-5.1.dwg - Revised by <JZHANG> : Thu, Jan 09 2025 - 10:26am

Appendix A Concept Plan

SCS consulting group ltd

WHITE CHURCH
BOUNDARY EXPANSION AREA

SCALE 1:9000

0 100 200 300 400 500

NOTES:

- Base information prepared by A.T. McLaren Limited
- Aerial Imagery: Google Earth 2023

LEGEND

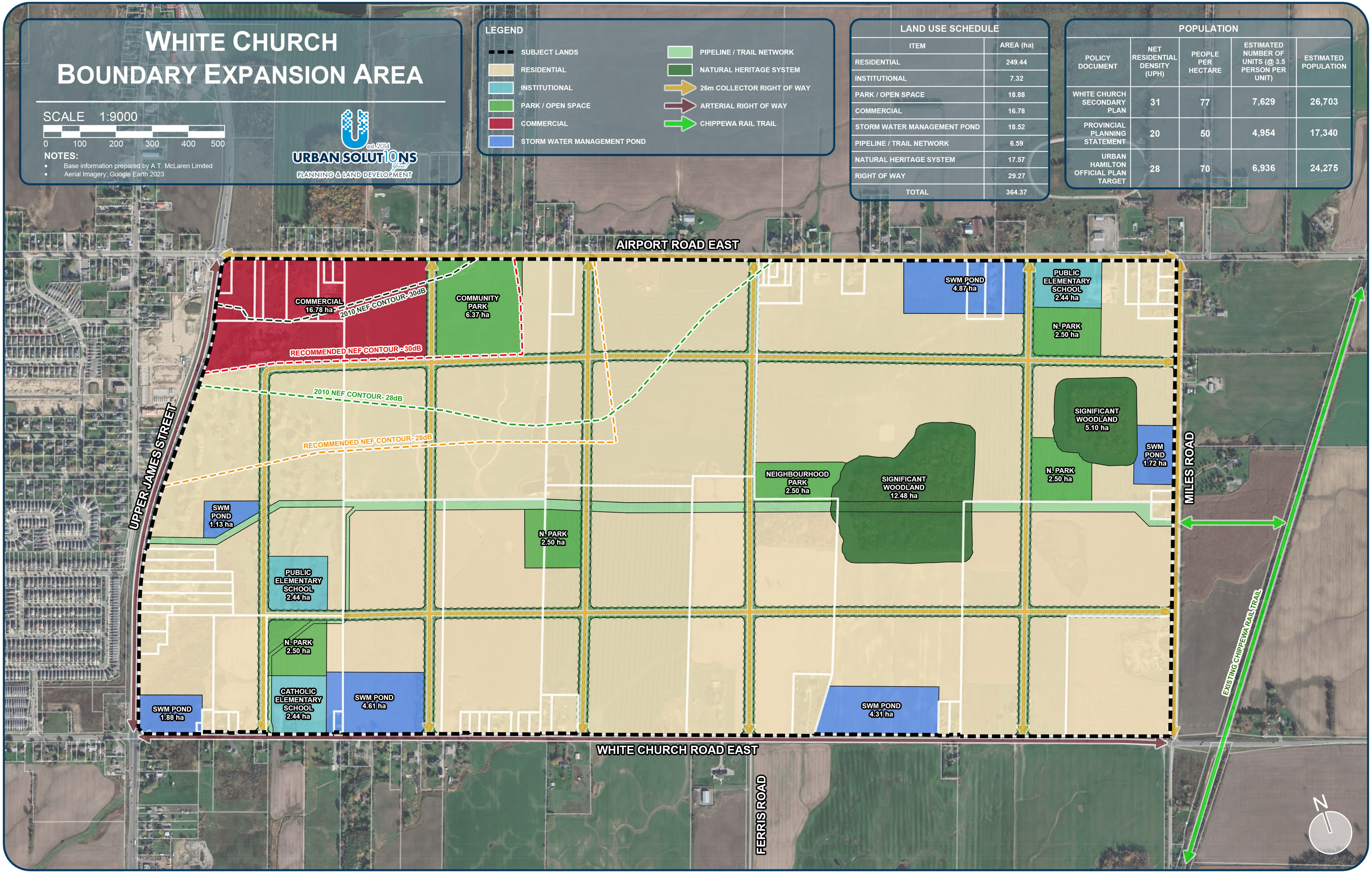
- SUBJECT LANDS
- RESIDENTIAL
- INSTITUTIONAL
- PARK / OPEN SPACE
- COMMERCIAL
- STORM WATER MANAGEMENT POND
- PIPELINE / TRAIL NETWORK
- NATURAL HERITAGE SYSTEM
- 26m COLLECTOR RIGHT OF WAY
- ARTERIAL RIGHT OF WAY
- CHIPPEWA RAIL TRAIL

LAND USE SCHEDULE

ITEM	AREA (ha)
RESIDENTIAL	249.44
INSTITUTIONAL	7.32
PARK / OPEN SPACE	18.88
COMMERCIAL	16.78
STORM WATER MANAGEMENT POND	18.52
PIPELINE / TRAIL NETWORK	6.59
NATURAL HERITAGE SYSTEM	17.57
RIGHT OF WAY	29.27
TOTAL	364.37

POPULATION

POLICY DOCUMENT	NET RESIDENTIAL DENSITY (UPH)	PEOPLE PER HECTARE	ESTIMATED NUMBER OF UNITS (@ 3.5 PERSON PER UNIT)	ESTIMATED POPULATION
WHITE CHURCH SECONDARY PLAN	31	77	7,629	26,703
PROVINCIAL PLANNING STATEMENT	20	50	4,954	17,340
URBAN HAMILTON OFFICIAL PLAN TARGET	28	70	6,936	24,275



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Appendix B Background Information

SCS consulting group ltd

Appendix B-1 Storm Servicing Relevant Excerpts

SCS consulting group ltd

NIAGARA PENINSULA
CONSERVATION
AUTHORITY

UPPER WELLAND RIVER
WATERSHED PLAN

DRAFT

MARCH 2011

NIAGARA PENINSULA CONSERVATION AUTHORITY
250 THOROLD ROAD WEST, 3RD FLOOR
WELLAND, ONTARIO L3C 3W2
(905) 788-3135
www.npca.ca

Municipal Drains

Under the Ontario Drainage Act (R.S.O. 1990, Chapter D.17) drainage works "*include a drain constructed by any means, including the improving of a natural watercourse, and includes works necessary to regulate the water table or water level within or on any lands or to regulate the level of the waters of a drain, reservoir, lake or pond, and includes a dam, embankment, wall, protective works or any combination thereof*."

Numerous municipal drains exist in the Upper Welland River watershed (Figure 14). Even though their purpose is to remove excess water from the land, municipal and agricultural drains do contain fish habitat. To better manage these drains, Fisheries and Oceans Canada has developed a classification system that identifies municipal drains as Types A through F using variables such as flow conditions, temperature, fish species present, and the length of time since the last clean out (Fisheries and Oceans Canada No Date). For example, a Class A drain has permanent flow with cold or cool water temperature and no presence of trout or salmon present. A Type C drain has a permanent flow with warm water temperatures and baitfish present in the drain. Type F drains are characterized by intermittent flow (Fisheries and Oceans Canada No Date). This classification system has been created for use by municipal drainage superintendents for the purpose of drain maintenance. Therefore, the classification assigned to a drain is subject to change frequently.

For a watercourses or pipe to become a municipal drain there must be a by-law adopting an engineer's report. Once the municipal drain has been constructed under the by-law, it becomes part of the infrastructure of the respective municipality. The local municipality is therefore responsible for repairing and maintaining the drain.

In the Upper Welland River watershed, almost 70 kilometres of watercourses have been classified as municipal drains. The drainage classifications are either a Class C or Class F; the majority have a Class F designation (Table 7).

Table 7: Municipal Drains in the Upper Welland River Watershed Plan Study Area

Class	Drain Name	Subwatershed
C	Carter Drain	Unamed Creek
F	Carter Drain	Unamed Creek
F	Brown Drain	Unamed Creek
F	Charles Angle Drain	Unamed Creek
F	Black Creek Drain	Unamed Creek
F	Corbett Drain	Unamed Creek
F	Bouch & Moyer	Unamed Creek
F	Whitechurch Road Drain	Welland River West
F	Puhringer Drain	Welland River West
F	Baker Drain	Oswego Creek
F	Sugar Creek Drain	Sugar Creek Drain
F	Siddal Drain	Sugar Creek Drain
F	Allen Drain	Sugar Creek Drain
F	Holtrop Drain	Sugar Creek Drain
F	Babiy Drain	Sugar Creek Drain
F	Barry Drain	Sugar Creek Drain
F	James Drain	James Drain
F	Waines Drain	James Drain
F	Chick-Harnett Drain	Chick Hartner Drain
F	Bouch & Moyer	Chick Hartner Drain
F	Michner Drain	Michner Drain

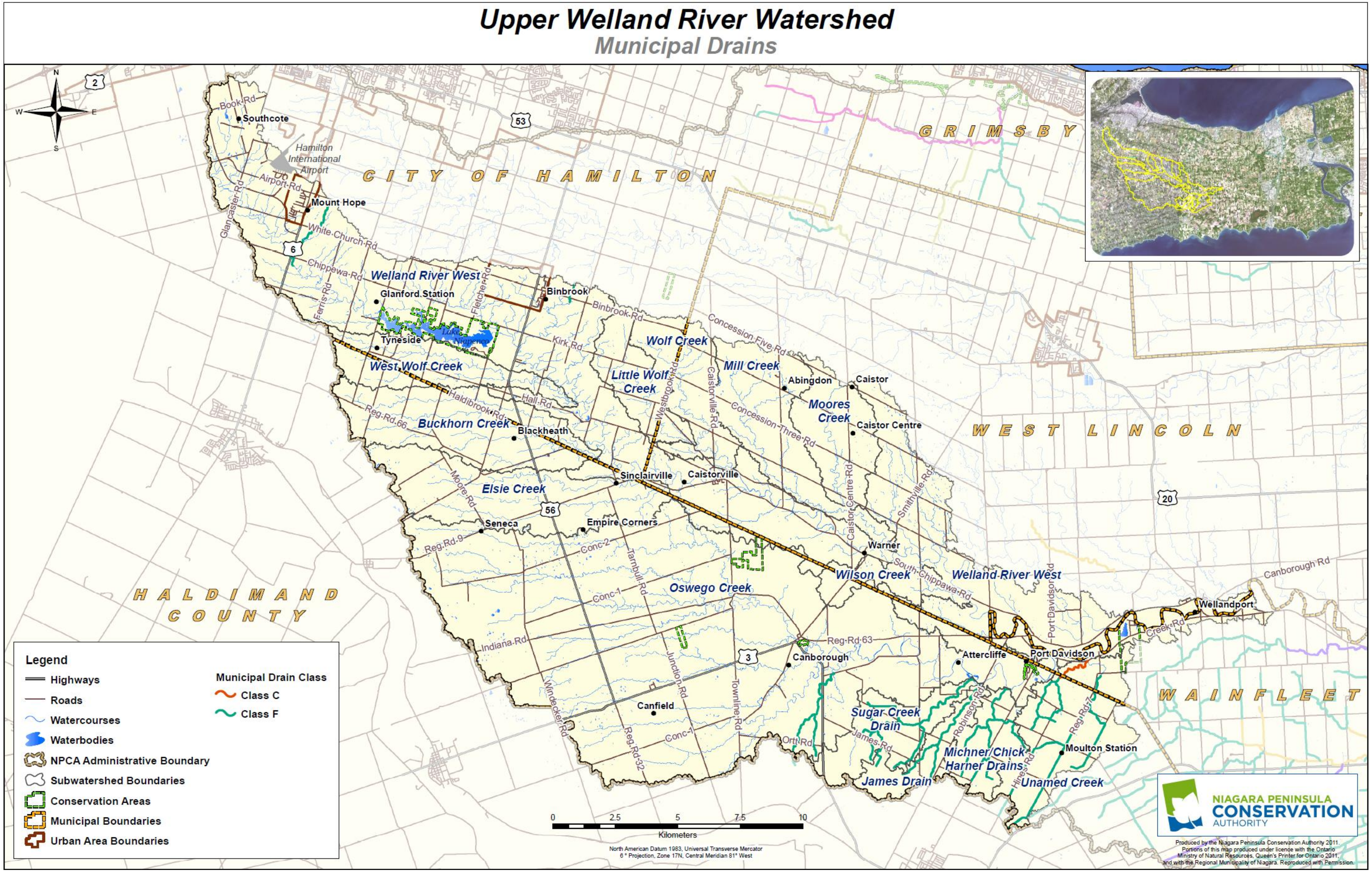

Figure 14: Municipal Drains

Authority: Item 12, Committee of the Whole
Report 10-022 (PW10076)
CM: August 12, 2010

Bill No. 194

CITY OF HAMILTON

BY-LAW NO. 10-194

Whitechurch Road Municipal Drain By-law, 2010

Being a by-law to provide for the maintenance and extension of the Whitechurch Road Municipal Drain in the City of Hamilton

WHEREAS the Council of the City of Hamilton in accordance with the provisions of the Drainage Act has received a request for the maintenance and extension of the Whitechurch Road Municipal Drain (the "drainage works") which comprises parts of Lots 6 and 7, Concessions 5 and 6 in the former Township of Glanbrook, now part of the City of Hamilton;

AND WHEREAS the Council of the City of Hamilton has procured an engineer's report prepared by Spriet Associates of London, Ontario, dated May 3, 2010 (the "engineer's report"), and the engineer's report is attached to and forms part of this By-law;

AND WHEREAS the estimated total cost of construction for the maintenance and extension of the drainage works is $21,600.00;

AND WHEREAS the Council of the City of Hamilton is of the opinion that the maintenance and extension of the drainage works is desirable;

THEREFORE, the Council of the City of Hamilton under the Drainage Act enacts as follows:

1. The engineer's report is hereby adopted, and the maintenance and extension of the drainage works as therein indicated and set forth are hereby authorized and shall be completed in accordance therewith.

2. A special annual rate sufficient to recover the costs of the maintenance and extension of the drainage works and associated interest costs shall be levied upon the lands within the drainage works area as set forth in the engineer's report, to be collected in the same manner and at the same time as other taxes are collected in each year for five years after the passing of this By-law.

3. This By-law comes into force on the passing thereof and may be cited as the "Whitechurch Road Municipal Drain By-law, 2010."

READ A FIRST AND SECOND TIME AND PROVISIONALLY ADOPTED THIS 12th day of August, 2010.

Fred Eisenberger
Mayor

Rose Caterini
City Clerk

READ A THIRD TIME AND PASSED THIS 15th day of December, 2010.

R. BRATINA
Mayor

Rose Caterini
City Clerk

WHITE CHURCH ROAD DRAIN

City of Hamilton

SPRIET
ASSOCIATES
ENGINEERS & ARCHITECTS
155 York Street
London, Ontario N6A 1A8
Tel. (519) 672-4100
Fax (519) 433-9351
E-mail MAIL@SPRIET.ON.CA

Job No. 208237

May 3, 2010

London, Ontario
May 3, 2010

WHITE CHURCH ROAD DRAIN

City of Hamilton

To the Mayor and Council
of the City of Hamilton

Mayor and Council:

We are pleased to present our report on the reconstruction of the White Church Road Municipal Drain serving parts of Lots 6 and 7, Concessions 5 and 6 in the geographical Township of Glanford which in now part of the City of Hamilton. The total watershed area contains approximately 80 hectares.

AUTHORIZATION

This report was prepared pursuant to Section 78 of the Drainage Act in accordance with instructions received from your Municipality with respect to a motion of Council in accordance with Section 8 of the Drainage Act.

The work on the existing Drain 'A' open portion was initiated by a request signed by an affected landowner, located at the end point of the works, which were constructed under the 1982 report and bylaw. This property is identified by roll no. 26-102-52 and is owned by L. Shalmi-Dolina. The request is for an extension of the existing municipal drain downstream and an improvement to the existing ditch to correct a flooding problem on the property.

HISTORY

The White Church Road Drain was originally constructed pursuant to a report submitted by J.K. Young, P. Eng., O.L.S. dated August 27,1982 and consisted of 664 meters of open Drains 'A' and 'B', to be constructed south of White Church Road. The drain was petitioned by the Regional Engineer for the Regional Municipality of Hamilton-Wentworth. The work also involved the construction of two new Regional road culverts one on each of drains 'A' and 'B'.

EXISTING DRAINAGE CONDITIONS

A site meeting was held with respect to the section 78 request on August 14, 2009 on the road allowance opposite 8421 White Church Road. The purpose of the meeting was to inform all property owners previously assessed in the 1982 report, of the request for improvements to Drain 'A' in the Shalmi-Dolina property. It was pointed out by this owner that flooding of the hay field at the south end of this property was an ongoing problem. In this area the municipal drain was too shallow and did not provide a sufficient outlet. A request was made to extend the municipal drain downstream, thereby correcting the flooding and resulting crop damages.

EXISTING DRAINAGE CONDITIONS (cont'd)

There were no other ratepayers in attendance that requested improvements to either drain 'A' or 'B' at this site meeting.

A field investigation and survey was made starting at Highway No. 6 culvert on the existing watercourse as shown on the attached plan. The watercourse passes through 4 properties south of the end point of drain 'A' of the 1982 drain at Sta.0+831. The total distance surveyed was 1034 meters. Drain 'A' originally ended 57 meters north of the south limit of the Shalmi-Dolina property. The elevation change in the waterway over the distance surveyed was 5.8 meters.

Further to the field survey, the watershed limits were field checked with respect to the proposed extension of Drain 'A' downstream to a sufficient outlet.

Preliminary design, cost estimates and assessments were prepared and an informal public meeting was held to review the findings and the proposed improvements. There were questions from many of ratepayers in attendance with respect to the municipal drain process, construction and assessments. The meeting concluded with a request to proceed with the final report.

RECOMMENDATIONS

We are therefore recommending the following:

- That the municipal Drain 'A' be constructed downstream from the 1982 end point for a distance of 346 meters.
- That the drain channel be deepened through the Shalmi-Dolina property for a distance of 250 meters to reduce flooding of the property.
- That a 3 meter wide buffer strip of existing vegetation between the top of the bank and the cultivated lands on both sides of the ditch shall be maintained as part of the open portion of the drain.
- That a farm crossing loss of access allowance be made to property roll no. 26-102-28 to cover part of the cost of a future farm crossing should one be required.
- That the above loss of access allowance be registered in accordance with Section 68 of The Drainage Act.

We are also recommending that the following erosion and sediment control measures be included as part of our construction proposal to help mitigate any potential adverse impacts of the proposed drainage works on water quality and fishery habitat:

- Timing of construction is to be only at times of low or no flow
- That two sediment basins are to be constructed along the course of the drain at the locations specified on the plan
- A temporary flow check of straw bales or silt fencing is to be installed for the duration of the construction at the end point of the ditching work.
- That exposed banks be seeded to revegetate the channel side slopes

SUMMARY OF PROPOSED WORK

The proposed work consists of approximately 551 lineal meters open ditch construction and reconstruction including bank seeding and sediment basins.

SCHEDULES

Four schedules are attached hereto and form part of this report, being Schedule 'A' - Allowances, Schedule 'B' - Cost Estimate, Schedule 'C' - Assessment for Construction and Schedule 'D' – Assessment for Maintenance.

Schedule 'A' - Allowances. In accordance with Sections 29, 30 and 33 of the Drainage Act, allowances are provided for right-of-way, damages to lands and crops along the route of the drain as defined below and loss of access.

Schedule 'B' - Cost Estimate. This schedule provides for a detailed cost estimate of the proposed work which is in the amount of $21,600.00. This estimate includes construction, allowances, interest, engineering and administrative costs associated with this project.

Schedule 'C' - Assessment for Construction. This schedule outlines the distribution of the total estimated cost of construction over the roads and lands which are involved.

Schedule 'D' – Assessment for Maintenance. In accordance with Section 38 of the Drainage Act, this schedule outlines the distribution of future repair and/or maintenance costs for this portion of Drain 'A'.

Drawing No. 1, Job No. 208237 and specifications form part of this report. They show and describe in detail the location and extent of the work to be done and the lands which are affected.

ALLOWANCES

DAMAGES: Section 30 of the Drainage Act provides for the compensation to landowners along the drain for damages to lands and crops caused by the construction of the drain. The amounts granted are based on the construction for open ditch work with excavated material levelled adjacent to drain ($2,480.00/ha.). This base rate is multiplied by the hectares derived from the working widths shown on the plans and the applicable lengths.

RIGHT-OF-WAY: Section 29 of the Drainage Act provides for an allowance to the owners whose land must be used for the construction, repair, or future maintenance of a drainage works. For open ditches, the allowance provides for the loss of land due to the construction provided for in the report. The amounts granted are based on the value of the land, and the rate used was $8,645.00/ha. When any buffer strip is incorporated and/or created, the allowance granted is for any land beyond a 1.8 meter width deemed to have always been part of the drain. For existing open ditches, the right-of-way to provide for the right to enter restriction imposed on those lands is deemed to have already been granted.

ASSESSMENT DEFINITIONS

In accordance with the Drainage Act, lands that make use of a drainage works are liable for assessment for part of the cost of constructing and maintaining the system. These assessments are known as benefit, outlet liability and special benefit as set out under Sections 22,23,24 and 26 of the Act.

> **BENEFIT** as defined in the Drainage Act means the advantages to any lands, roads, buildings or other structures from the construction, improvement, repair or maintenance of a drainage works such as will result in a higher market value or increased crop production or improved appearance or better control of surface water, or any other advantages relating to the betterment of lands, roads, buildings or other structures.
>
> **OUTLET** Liability is assessed to lands or roads that may make use of a drainage works as an outlet either directly or indirectly through the medium of any other drainage works or of a swale, ravine, creek or watercourse.

ASSESSMENT

A modified "Todgham Method" was used to calculate the assessments shown on Schedule 'C' – Assessment for Construction. This entailed breaking down the costs of the drain into sections along its route.

The benefit cost is distributed to those properties receiving benefit as defined under "Assessment Definitions", with such properties usually being located along or close to the route of the drain. The Outlet Costs are distributed to all properties within the watershed area of that section on an adjusted basis. The areas are adjusted for location along that section, and relative run-off rates. Due to their different relative run-off rates, forested lands have been assessed for outlet at lower rates than cleared lands. Also, roads and residential properties, have been assessed for outlet at higher rates that cleared farm lands.

The actual cost of the work involving this report is to be assessed on a pro-rata basis against the lands and roads liable for assessment for benefit and outlet as shown on Schedule 'C' - Assessment for Construction.

GRANTS

In accordance with the provisions of Section 85 of the Drainage Act, a grant **may** be available for assessments against privately owned parcels of land which are used for agricultural purposes and eligible for the Farm Property Class Tax rate. Section 88 of the Drainage Act directs the Municipality to make application for this grant upon certification of completion of this drain. The Municipality will then deduct the grant from the assessments prior to collecting the final assessments.

MAINTENANCE

Upon completion of construction, all owners are hereby made aware of Sections 80, 82 and 83 of the Drainage Act which forbid the obstruction of, damage or injury to, and pollution of a municipal drain.

After completion, this section of the White Church Road Drain 'A' shall be maintained by the City of Hamilton at the expense of all upstream lands and roads assessed in the Schedule 'D'- Assessment for Maintenance and in the same relative proportions, until such time as the assessment is changed under the Drainage Act.

Respectfully submitted,

SPRIET ASSOCIATES LONDON LIMITED

J R Spriet

J. R. Spriet, P. Eng.

sjs

SECTION A - GENERAL CONDITIONS

INDEX

SECTION A

GENERAL CONDITIONS

A.1 SCOPE

The work to be done under this specification consists of supplying all labour, materials and equipment to construct the work as outlined on the drawing(s). In some Municipalities, the Contractor shall supply all materials while in other Municipalities, he shall supply only certain materials. The form of Tender and Agreement lists which materials are to be supplied by the Contractor.

A.2 TENDERS

Tenders are to be submitted on a lump sum basis for the complete works or a portion thereof, as set out in the Form of Tender and Agreement.

A.3 DRAWINGS AND SPECIFICATIONS

The tenderer must satisfy himself that he understands the meaning and intent of the drawings and specifications before submission of his tender. The standard specifications have been separated into sections for reference purpose only. They shall be considered complementary and, where a project is controlled under one of the sections, the remaining sections will still apply for miscellaneous works. In case of any inconsistency or conflict in the Tender Documents, the following order of precedence shall apply:

- Contract Drawings
- Form of Tender and Agreement
- General Conditions
- Standard Specifications (Open Drain, Tile Drain, Specifications for Municipal Drain Crossing County Roads)
- Standard Drawings

A.4 PAYMENT

Progress payments equal to 87±% of the value of the work done and materials incorporated in the work will be made to the Contractor on the written request of the Contractor to the Engineer. An additional 10±% will be paid 45 days after the final acceptance by the Engineer. Before this payment is released, the Contractor shall provide the Municipality with a Statutory Declaration that all material and/or labour incorporated in the work has been fully paid for, along with a Certificate of Clearance from the Workplace Safety and Insurance Board stating that all compensation has been paid. The Municipality will reserve 3%± of the Contract Price for one year as warranty. After the completion of the work, any part of this reserve may be used to correct defects which may develop within that time from faulty workmanship or material or loose backfill, provided that notice shall first be given to the Contractor and that he may promptly make good such defects, if he desires.

A.5 SUPERINTENDENT

The word "Superintendent", as used hereinafter in these specifications, shall refer to a Drainage Superintendent, appointed by the Municipality. The Superintendent will act as the Engineer's representative. The Superintendent shall have the power to direct the execution of the work and to make any necessary minor adjustments. Adjustments in tile sizes or gradients shall not be made without the approval of the Engineer. Any instructions given by the Superintendent, which changes considerably the proposed work or with which the Contractor does not agree, shall be referred to the Engineer for his decision.

A.6 COMMENCEMENT AND COMPLETION OF WORK

The work must commence immediately after the Contractor is notified of the acceptance of his tender or at a later date, if set out as a condition of the tender. If weather creates poor ground or working conditions, the Contractor may be required, at the discretion of the Engineer, to postpone or halt work until conditions become acceptable.

The Contractor shall give the Engineer and Superintendent a minimum of forty-eight (48) hours notice before commencement of work on any municipal drain. As noted on the plan, he can then arrange for a meeting to be held on the site with the Contractor and affected owners attending to review in detail the construction scheduling and other details. The Contractor's costs for attending this meeting shall be included in his lump sum tender price. If the Contractor leaves the job site for a period of time after initiation of work, he shall give the Engineer and the Superintendent a minimum of twenty-four (24) hours notice prior to returning to the project.

The work must be proceeded with in such a manner as to ensure its completion at the earliest possible date and within the time limit set out in the tender or in the contract documents.

A.7 WORKING AREA AND ACCESS

The working area available to the Contractor to construct the drain and related works including an access route to the drain shall be as specified on the drawings.

Should the specified widths become inadequate due to unusual conditions, the Contractor shall notify the Engineer immediately in order that negotiations with the affected owners can take place.

Where a Contractor exceeds the specified widths due to the nature of his operations and without authorization he shall be held responsible for the costs of all additional damages and the amount shall be deducted from his contract price and paid to the affected owners by the Municipality.

A.8 SUPERVISION

The Contractor shall give the work his constant supervision and shall keep a competent foreman in charge at the site.

A.9 INSPECTION

Final inspection by the Engineer will be made within twenty days after he has received notice in writing from the Contractor that the work is complete.

Periodic inspections by the Engineer or Superintendent will be made during the performance of the work. These interim inspections are required to check such items as location of drainage course and structures, tile grades prior to backfilling, backfilling and miscellaneous work items.

A.10 ALTERATIONS AND ADDITIONS

The Engineer shall have the power to make alterations in the work shown or described in the drawings or specifications and the Contractor shall proceed to make such changes without causing delay. In every such case, the price agreed to be paid for the work under the contract shall be increased or decreased as the case may require according to a fair and reasonable valuation of the work added or deleted. The valuation shall be determined as a result of negotiations between the Superintendent, the Contractor, and the Engineer, but in all cases, the Engineer shall maintain the final responsibility for the decision. Such alterations and variations shall in no way render void the contract. No claim for variations or alterations in the increased or decreased price shall be valid unless done in pursuance of an order from the Engineer and/or Superintendent and notice of such claims made in writing before commencement of such work. In no case shall the Contractor commence work which he considers to be extra work before receiving the Engineer's and/or Superintendent's approval in writing.

A.11 MAINTENANCE

The Contractor shall repair and make good any damages or faults in the drain that may appear within one year after its completion (as dated on the final completion certificate) as the result of imperfect or defective work done or materials furnished by the Contractor. Nothing herein contained shall be construed as in any way restricting or limiting the liability of the Contractor under the laws of the Country, Province or Locality in which the work is being done.

A.12 INSURANCE

1) Bodily Injury Liability: The Contractor shall effect and maintain, a Comprehensive General Liability Policy or its equivalent, covering claims for bodily injury, including death arising from and during operations under his Contract whether performed by himself, by a sub-contractor or by anyone directly or indirectly employed by either of them in the sum of $ 2,000,000.00.
2) Property Damage: The Contractor shall effect and maintain Property Damage Liability Insurance to cover his and the sub-contractor's operations in the sum of $ 1,000,000.00.
3) Fire Insurance: The Contractor shall procure fire and extended coverage insurance on the work to 100% of the Contract Amount.
4) The following are to be named as co-insured:
   Successful Contractor
   Sub-Contractor
   Municipality
   Spriet Associates London Limited
5) Within 7 days of award of Contract and prior to commencing work, the successful Contractor shall file with the Municipality, a copy of each insurance policy and certificate required. All such insurance shall be maintained until final completion of the work including the making good of faulty work or materials; except that coverage of completed operations liability shall in any event be maintained for twelve (12) months from the date of final completion as certified by the Engineer.

A.13 LIMITATIONS OF OPERATIONS

Except for such work as may be required by the Engineer to maintain the works in a safe and satisfactory condition, the Contractor shall not carry on his operations under the contract on Sundays without permission in writing of the Municipality.

A.14 LOSSES

The Contractor shall take all risks from floods or casualties of any kind.

A.15 SUB-CONTRACTORS

The Contractor shall not sublet the whole or any part of the contract without the approval of the Engineer or Superintendent.

A.16 PERMITS, NOTICES, LAWS AND RULES

The Contractor shall ensure that all necessary permits or licences required for the execution of the work have been obtained (but this shall not include M.T.O. encroachment permits, County Road Permit, permanent easements or rights of servitude). The Contractor shall give all necessary notices and pay all fees required by law and comply with all laws, ordinances, rules and regulations (including the Occupational Health and Safety Act) relating to the work and to the preservation of the public's health and safety and if the specifications and drawings are at variance therewith, any resulting additional expenses incurred by the Contractor shall constitute an addition to the contract price.

A.17 ROAD CROSSINGS

.1 General

.1 Scope: These specifications apply to all road crossings - Municipal, County, Regional, or Highway Roads. Where the word "Authority" is used, it shall be deemed to apply to the appropriate owning authority. These specifications in no way limit the Authority's Specifications and Regulations governing the construction of drains on their Road Allowance. The Authority will supply no labour, equipment or materials for the construction of the road crossing unless otherwise noted on the drawings.

.2 Road Occupancy Permit: Where applicable the Contractor must submit an Application for a Road Occupancy Permit to the Authority and allow a minimum of 5 working days (exclusive of holidays) for its review and issuance.

.3 Road Closure Request and Construction Notification: The Contractor shall submit written notification of construction and request for road closure (if applicable) to the Road Authority/Public Works Manager and the Drainage Engineer or Superintendent for review and approval a minimum of five (5) working days (exclusive of holidays) prior to proceeding with any work on road allowance. It shall be the Road Authority's responsibility to notify all the applicable emergency services, schools, etc. of the road closure or construction taking place.

.4 Traffic Control: Where the Contractor is permitted to close the road to through traffic, the Contractor shall provide for and adequately sign the detour route to the satisfaction of the Road Authority. Otherwise, the Contractor shall keep the road open to traffic at all times. The Contractor shall provide, for the supply, erection and maintenance, suitable warning signs and/or flagmen in accordance with the Manual of Uniform Traffic Control Devices and to the satisfaction of the Road Authority to notify the motorists of work on the road ahead.

.5 Site Meeting/Inspection: A site meeting shall be held with the affected parties to review in detail the crossing and/or its related works. The Authority's Inspector and/or the Drainage Engineer will inspect the work while in progress to ensure that the work is done in strict accordance with the specifications.

.6 Weather: No construction shall take place during inclement weather or periods of poor visibility.

.7 Equipment: No construction material and/or equipment is to be left within 3 meters of the edge of pavement overnight or during periods of inclement weather.

.2 Jacking and Boring

.1 Material: The bore pipe shall consist of new, smooth wall steel pipe, meeting the requirements of H20 loading for road crossings and E80 loading for railway crossings. The minimum size, wall thickness and length shall be as shown on the drawings. Where welding is required, the entire circumference of any joint shall be welded using currently accepted welding practices.

.2 Site Preparation and Excavation: Where necessary, fences shall be carefully taken down as specified in the General Conditions. Prior to any excavation taking place, all areas which will be disturbed shall be stripped of topsoil. The topsoil is to be stockpiled in locations away from the bore operation, off the line of future tile placement and out of existing water runs or ditches. The bore pit shall be located at the upstream end of the bore unless otherwise specified or approved. Bore pits shall be kept back at least 1 meter from the edge of pavement and where bore pits are made in any portion of the shoulder, the excavated material shall be disposed of off the road allowance and the pit backfilled with thoroughly compacted Granular "A" for its entire depth.

.3 Installation: The pipe shall be installed in specified line and grade by a combination of jacking and boring. Upon completion of the operations, both ends of the bore pipe shall be left uncovered until the elevation has been confirmed by the Engineer or Superintendent. The ends of the bore pipe shall be securely blocked off and the location marked by means of a stake extending from the pipe invert to 300mm above the surrounding ground surface.

.2 **Jacking and Boring** (cont'd)

.4 Unstable Soil or Rock:The Contractor shall contact the Engineer immediately should unstable soil be encountered or if boulders of sufficient size and number to warrant concern are encountered. Any bore pipe partially installed shall be left in place until alternative methods or techniques are determined by the Engineer after consultation with the Contractor, the Superintendent and the owning authority.

.5 Tile Connections: Prior to commencement of backfilling, all tile encountered in excavations shall be reconnected using material of a size comparable to the existing material. Where the excavation is below the tile grade, a compacted granular base is to be placed prior to laying the tile. Payment for each connection will be made at the rate outlined in the Form of Tender and Agreement.

.6 Backfill: Unless otherwise specified, the area below the proposed grade shall be backfilled with a crushed stone bedding. Bore pits and excavations outside of the shoulder area may be backfilled with native material compacted to a density of 95% Standard Proctor. All disturbed areas shall be neatly shaped, have the topsoil replaced and hand seeded. Surplus material from the boring operation shall be removed from the site at the Contractor's expense.

.7 Restoration: The entire affected area shall be shaped and graded to original lines and grades, the topsoil replaced, and the area seeded down at the rate of 85 kg/per ha. unless otherwise specified or in accordance with the M.T.O. Encroachment Permit. Fences shall be restored to their original condition in accordance with the General Conditions.

.8 Acceptance: All work undertaken by the Contractor shall be to the satisfaction of the Engineer.

.3 **Open Cut**

.1 Material: The culvert or sub-drain crossing pipe material shall be specified on the drawings.

.2 Site Preparation and Excavation: Where necessary, fences shall be carefully taken down as specified in the general conditions. Prior to any excavation taking place, the areas which will be disturbed shall be stripped of topsoil. The topsoil is to be stockpiled in locations away from the construction area.

.3 Installation: The pipe shall be installed using bedding and cover material in accordance with Standard Detailed Drawing No. 2 or detail provided on drawings.

.4 Unstable Soil or Rock:The Contractor shall contact the Engineer immediately should unstable soil be encountered or if boulders of sufficient size and number to warrant concern are encountered.

.5 Tile Connections: Prior to commencement of backfilling, all tiles encountered in excavations shall be reconnected using material of a size comparable to the existing material. Where the excavation is below the tile grade, a compacted granular base is to be placed prior to laying the tile. Payment for connections not shown on the drawings shall be an extra to the contract.

.6 Backfill: Backfill from the top of the cover material up to the under side of road base shall meet the requirements for M.T.O. Granular "B". The backfill shall be placed in lifts not exceeding 300mm in thickness and each lift shall be thoroughly compacted to produce a density of 98% Standard Proctor. Granular "B" road base for County Roads and Highways shall be placed to a 450mm thickness and Granular "A" shall be placed to a thickness of 200mm, both meeting M.T.O. requirements. Granular road base materials shall be thoroughly compacted to produce a density of 100% Standard Proctor.

Where the road surface is paved, the Contractor shall be responsible for placing an HL-4 Hot Mix Asphalt patch of the same thickness as the existing pavement. The asphalt patch shall be flush with the existing roadway on each side and not overlap. If specified, the asphalt patch shall not be placed immediately over the road base and the Granular "A" shall be brought up flush with the existing asphalt and a liberal amount of calcium chloride shall be spread on the gravel surface. The asphalt patch must be completed within the time period set out on the drawing.

.3 **Open Cut** (cont'd)

The excavated material from the trench beyond a point 1.25 meters from the travelled portion or beyond the outside edge of the gravel shoulder, may be used as backfill in the trench in the case of covered drains. This material should be compacted in layers not exceeding 600mm.

A.18 FENCES

No earth shall be placed against fences and all fences removed by the Contractor are to be replaced by him in as good condition as found. In general, the Contractor will not be allowed to cut existing fences but shall disconnect existing fences at the nearest anchor post or other such fixed joint and shall carefully roll it back out of the way. Where the distance to the closest anchor post or fixed joint exceeds 50 meters, the Contractor will be allowed to cut and splice in accordance with accepted methods and to the satisfaction of the owner and the Engineer or Superintendent. Where existing fences are deteriorated to the extent that existing materials are not salvageable for replacement, the Contractor shall notify the Engineer or the Superintendent prior to dismantling. Fences damaged beyond salvaging by the Contractor's negligence shall be replaced with new materials, similar to those existing, at the Contractor's expense. The replacement of the fences shall be done to the satisfaction of the owner and the Engineer or Superintendent. The site examination should indicate to the Contractor such work, if any, and an allowance should be made in the tendered price.

The Contractor shall not leave any fence open when he is not at work in the immediate vicinity.

A.19 LIVESTOCK

The Contractor shall provide each property owner with 48 hours notice prior to removing any fences along fields which could possibly contain livestock. Thereafter, the property owner shall be responsible to keep all livestock clear of the construction areas until further notified. Where necessary, the Contractor will be directed to erect temporary fences. The Contractor shall be held responsible for loss or injury to livestock or damage caused by livestock, where the injury or damage is caused by his failure to notify the property owner or through negligence or carelessness on the part of the Contractor.

The Contractor constructing a tile drain shall not be held responsible for damages or injury to livestock occasioned by leaving trenches open for inspection by the Engineer if he notifies the owner at least 48 hours prior to commencement of the work on that portion. The Contractor will be held liable for such damages or injury if the backfilling of such trenches is delayed more than 1 day after acceptance by the Engineer.

A.20 STANDING CROPS

The Contractor shall not be held responsible for damages to standing crops within the working area available and the access route provided if he notifies the owner thereof at least 48 hours prior to commencement of the work on that portion.

A.21 SURPLUS GRAVEL

If as a result of any work, gravel or crushed stone is required and not all the gravel or crushed stone is used in the construction of the works, the Contractor shall haul away such surplus gravel or stone unless otherwise approved.

A.22 RAILWAYS, HIGHWAYS, UTILITIES

A minimum of forty-eight (48) hours notice to Railways, Highways and Utilities, exclusive of Saturdays, Sundays and Holidays, shall be required by the Contractor prior to any work being performed and in the case of a pipe being installed by open cutting or boring under a Highway or Railway, a minimum of 72 hours notice is required.

A.23 UTILITIES

The attention of the Contractor is drawn to the presence of utilities along the course of the drain. The contractor will be responsible for determining the location of all utilities and will be held liable for any damage to all utilities caused by his operations. The Contractor shall co-operate with all authorities to ensure that all utilities are protected from damage during the performance of the work. The cost of any necessary relocation work shall be borne by the utility. No allowance or claims of any nature will be allowed on account for delays or inconveniences due to utilities relocation, or for inconveniences and delays caused by working around or with existing utilities not relocated.

A.24 TERMINATION OF CONTRACT BY THE MUNICIPALITY

If the Contractor should be adjudged bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if he should refuse or fail to supply enough properly skilled workmen or proper materials after having received seven (7) days notice in writing from the Engineer to supply additional workmen or materials, or if he should fail to make prompt payment to sub-contractors or for material or labour or persistently disregarding laws, ordinances, or the instruction of the Engineer, or otherwise being guilty of a substantial violation of the provisions of the contract, then the Municipality, upon the certification of the Engineer that sufficient cause exists to justify such action, may without prejudice to any other right or remedy, by giving the contractor written notice, terminate the employment of the contractor and take possession of the premises and of all materials, tools and appliances, thereon, and complete the work by whatever method the Engineer may deem expedient, but without undue delay or expense. In such case, the Contractor shall not be entitled to receive any further payment until the work is completed. If the unpaid balance of the contract price exceeds the expense of completing the work, including compensation to the Engineer for his additional services, such excess shall be paid to the Contractor. If such expense does not exceed such unpaid balance, the Contractor shall pay the difference to the Municipality. The expense incurred by the Municipality, as herein provided, shall be certified by the Engineer. Where a Contractor fails to commence work within seven (7) days of his commencement date as indicated by him on his Tender Form, and such extension of time as allowed due to poor weather or ground conditions, then the Municipality shall have the option, after providing the Contractor with seven (7) days notice of their intention to terminate the contract, award the contract to another Contractor at their discretion by retendering the project, inviting bids or by appointment. The additional costs of the above or retendering, and all other administration costs shall be deducted from the Contractor's bid deposit and the balance, if any, returned to him.

A.25 ERRORS AND UNUSUAL CONDITIONS

The Contractor shall notify the Engineer immediately of any error or unusual condition which may be found. Any attempt by the Contractor to make changes because of the error or unusual condition on his own shall be done at his own risk. Any additional cost incurred by the Contractor to remedy a wrong decision on his part shall be borne by the Contractor.

The Engineer shall make the alteration necessary to correct errors or to adjust for unusual conditions during which time it will be the Contractor's responsibility to keep his men and equipment gainfully employed elsewhere on the project. The contract amount shall be adjusted in accordance with a fair evaluation of the work added or deleted.

A.26 IRON BARS

The Contractor shall be held liable for the cost of an Ontario Land Surveyor to replace any iron bars destroyed during the course of construction.

A.27 STAKES

At the time of the survey, stakes are set along the course of the drain at intervals of 50 meters. The Contractor shall ensure that the stakes are not disturbed unless approval is obtained from the Engineer. Any stakes removed by the Contractor without the authority of the Engineer, shall be replaced at the expense of the Contractor. At the request of the Contractor, any stakes which are removed or disturbed by others or by livestock, shall be replaced at the expense of the drain.

A.28 RIP-RAP

Rip-rap shall be specified on the drawings and shall conform to the following:

.1 **Quarry Stone**: shall range in size from 150mm to 300mm evenly distributed and shall be placed to a 300mm thickness on a filter blanket at a 1.5 : 1 slope unless otherwise noted. Filter blanket to be Mirafi 160N or approved equal.

.2 **Broken Concrete**: may be used in areas outside of regular flows if first broken in maximum 450mm sized pieces and mixed to blend with quarry stone as above. No exposed reinforcing steel shall be permitted.

.3 **Shot Rock**: shall range in size from 150mm to 600mm placed to a depth of 450mm thickness on a filter blanket at a 1.5:1 slope unless otherwise noted. Filter blanket to be Mirafi 160N or approved equal.

A.29 GABION BASKETS

Supply and install gabion basket rip-rap protection as shown on the drawings.

Gabion baskets shall be as manufactured by Maccaferri Gabions of Canada Ltd. or approved equal and shall be assembled and installed in strict accordance with the manufacturer's recommendations.

The gabion fill material shall consist solely of fractured field stone or gabion stone graded in size from 100mm to 200mm (4" to 8") and shall be free of undersized fragments and unsuitable material.

A.30 RESTORATION OF LAWNS

.1 **General**: Areas noted on the drawings to be restored with seeding or sodding shall conform to this specification, and the contractor shall allow for all costs in his lump sum bid for the following works.

.2 **Topsoil**: Prior to excavation, the working area shall be stripped of existing topsoil. The topsoil stockpile shall be located so as to prevent contamination with material excavated from the trench. Upon completion of backfilling operations, topsoil shall be spread over the working area to a depth equal to that which previously existed but not less than the following:

Seeding and sodding - minimum depth of 100mm
Gardens - minimum depth of 300mm

In all cases where a shortfall of topsoil occurs, whether due to lack of sufficient original depth or rejection of stockpiled material due to contractors operations, imported topsoil from acceptable sources shall be imported at the contractors expense to provide the specified depths. Topsoil shall be uniformly spread, graded and cultivated prior to seeding or sodding. All clods or lumps shall be pulverized and any roots or foreign matter shall be raked up and removed as directed.

.3 Sodding

.1 **Materials**: Nursery sod to be supplied by the contractor shall meet the current requirements of the Ontario Sod Growers Association for No. 1 Bluegrass Fescue Sod.

.2 **Fertilizer**: Prior to sod placement, approved fertilizer shall be spread at the rate of 5kg/100m^2 of surface area and shall be incorporated into such surfaces by raking, discing or harrowing. All surfaces on which sod is to be placed shall be loose at the time of placing sod to a depth of 25mm.

.3 **Placing Sod**: Sod shall be laid lengthwise across the face of slopes with ends close together. Sod shall be counter sunk along the joints between the existing grade and the new sodding to allow for the free flow of water across the joint. Joints in adjacent rows shall be staggered and all joints shall be pounded and rolled to a uniform surface.

A.30 RESTORATION OF LAWNS (cont'd)

On slopes steeper than 3:1, and in unstable areas, the engineer may direct the contractor to stake sod and/or provide an approved mesh to prevent slippages. In all cases where such additional work is required, it will be deemed an extra to the contract and shall be paid for in accordance with the General Conditions.
No sod shall be laid when frozen nor upon frozen ground nor under any other condition not favourable to the growth of the sod. Upon completion of sod laying the contractor shall thoroughly soak the area with water to a depth of 50mm. Thereafter it will be the responsibility of the property owner to maintain the area in a manner so as to promote growth.

.4 **Seeding**: Seed to be supplied by the contractor shall be "high quality grass seed" harvested during the previous year, and shall be supplied to the project in the suppliers original bags on which a tag setting out the following information is affixed:

- Year or Harvest - recommended rate of application
- Type of Mixture - fertilizer requirements

Placement of seed shall be by means of an approved mechanical spreader. All areas on which seed is to be placed shall be loose at the time of placing seed, to a depth of 25mm. Seed and fertilizer shall be spread in accordance with the suppliers recommendations unless otherwise directed by the Engineer. Thereafter it will be the responsibility of the property owner to maintain the area in a manner so as to promote growth.

.5 **Settlement**: The contractor shall be responsible during the one year guarantee period for the necessary repair of restored areas due to trench settlement. Areas where settlement does not exceed 50mm may be repaired by top dressing with fine topsoil. In areas where settlement exceeds 50mm, the contractor will be required to backfill the area with topsoil and restore with seeding and/or sodding as originally specified.

A.31 RESTORATION OF ROADS AND LANEWAYS

.1 **Gravel**: Restoration shall be in accordance with the applicable standard detailed drawing or as shown on the drawings.

.2 **Asphalt and Tar and Chip**: Prior to restoration all joints shall be neatly sawcut. Restoration shall be as a in gravel above with the addition of the following:
.1 Roads shall have the finished grade of Granular 'A', allow two courses of hot-mix asphalt (M.T.O. 310), 80mm HL6 and 40mm HL3 or to such greater thickness as may be required to match the existing.
.2 Laneways shall have the finished grade of Granular 'A' allow one 50mm minimum course of hot-mix asphalt (HL3) or greater as may be required to match existing.

SECTION B - OPEN DRAIN

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SECTION B

OPEN DRAIN

B.1 PROFILE

The profile drawing shows the depth of cuts from the ground beside the stake to the final invert of the ditch in meters and decimals of a meter and also the approximate depth of cuts from the existing bottom of the ditch to the elevation of the ditch bottom. These cuts are established for the convenience of the Contractor; however, bench marks will govern the final elevation of the drain. Bench marks have been established along the course of the drain and their locations and elevations are noted on the profile drawing. A uniform grade shall be maintained between stakes in accordance with the profile drawing.

B.2 ALIGNMENT

The drain shall be constructed in a straight line and shall follow the course of the present drain or water run unless otherwise noted on the drawings. Where it is necessary to straighten any bends or irregularities in alignment not noted on the drawings, the Contractor shall contact the Engineer or Superintendent before commencing the work.

B.3 CLEARING AND GRUBBING

Prior to commencement of work, all trees, scrub, fallen timber and debris shall be removed from the side slopes of the ditch and for such a distance on the working side so as to eliminate any interference with the construction of the drain or the spreading of the spoil. The side slopes shall be neatly cut and cleared flush with slope whether or not they are affected directly by the excavation. With the exception of large stumps causing damage to the drain, the sideslope shall not be grubbed. All other cleared areas shall be grubbed and the stumps put into piles for disposal by the owner.

All trees or limbs 150mm (6") or larger, that it is necessary to remove, shall be considered as logs and shall be cut and trimmed, and left in the working width separte from the brush, for use or disposal by the owner. Trees or limbs less than 150mm in diameter shall be cut in lengths not greater than 5 meters and placed in separate piles with stumps spaced not less than 75 meters apart in the working width, for the use or disposal of the owner. In all cases, these piles shall be placed clear of excavated materials, and not be piled against standing trees. No windrowing will be permitted. The clearing and grubbing and construction of the drain are to be carried out in two separate operations and not simultaneously at the same location.

B.4 EXCAVATION

The bottom width and the side slopes of the ditch shall be those shown on the profile drawing.

Unless otherwise specified on the drawings, only the existing ditch bottom is to be cleaned out and the side slopes are not to be disturbed. Where existing side slopes become unstable because of construction, the Contractor shall immediately contact the Engineer or Superintendent. Alternative methods of construction and/or methods of protection will then be determined, prior to continuing the work.

Where an existing drain is being relocated or where a new drain is being constructed, the Contractor shall, unless otherwise specified, strip the topsoil for the full width of the drain, including the location of the spoil pile. Upon completion of levelling, the topsoil shall be spread to an even depth across the full width of the spoil.

B.5 EXCAVATED MATERIAL

Excavated material shall be deposited on either or both sides of the drain as indicated on the drawings or as directed by the Engineer or Superintendent. A buffer strip of not less than 3 meters in width through farmed lands and 2 meters in width through bush areas shall be left along the top edges of the drain. The buffer strip shall be seeded and/or incorporated as specified on the drawings. The material shall be deposited beyond the specified buffer strip.

No excavated material shall be placed in tributary drains, depressions, or low areas which direct water into the ditch so that water will be trapped behind the spoilbank. The excavated material shall be placed and levelled to a minimum width to depth ratio of 50:1 unless instructed otherwise. The edge of the spoilbank away from the ditch shall be feathered down to the existing ground; the edge of the spoilbank nearest the ditch shall have a maximum slope of 2 to 1. The material shall be levelled such that it may be cultivated with ordinary farm equipment without causing undue hardship on machinery and personnel. No excavated material shall cover any logs, scrub, debris, etc. of any kind.

Where it is necessary to straighten any unnecessary bends or irregularities in the alignment of the ditch, the excavated material from the new cut shall be used for backfilling the original ditch. Regardless of the distance between the new ditch and the old ditch no extra compensation will be allowed for this work and must be included in the Contractor's lump sum price for the open work.

Any stones 150mm or larger left exposed on top of the levelled excavated material shall be removed and disposed of as an extra to the contract unless otherwise noted on plans.

B.6 EXCAVATION THROUGH BRIDGES AND CULVERTS

The Contractor shall excavate the drain to the full specified depth and width under all bridges. Where the bridge or culvert pipe is located within a road allowance, the excavated material shall be levelled within the road allowance. Care shall be taken not to adversely affect existing drainage patterns. Temporary bridges may be carefully removed and left on the bank of the drain but shall be replaced by the Contractor when the excavation is completed unless otherwise specified. Permanent bridges must be left intact. All necessary care and precautions shall be taken to protect the structure. The Contractor shall notify the Engineer or Superintendent if excavation may cause the structure to undermine or collapse.

B.7 PIPE CULVERTS

Where specified on the drawings, the existing culvert shall be carefully removed, salvaged and either left at the site for the owner or reinstalled at a new grade or location. The value of any damage caused to the culvert due to the Contractor's negligence in salvage operation will be determined and deducted from the contract price.

All pipe culverts shall be installed in accordance with the standard detail drawings as noted on the drawings. If couplers are required, 5 corrugation couplers shall be used for up to and including 1200mm dia. pipe and 10 corrugation couplers for greater than 1200mm dia.

B.8 MOVING DRAINS OFF ROADS

Where an open drain is being removed from a road allowance, it must be reconstructed wholly on the adjacent lands with a minimum distance of 2.0 meters between the property line and the top of the bank, unless otherwise noted on the drawings. The excavated material shall be used to fill the existing open ditch and any excess excavated material shall be placed and levelled on the adjacent lands beyond the buffer strip, unless otherwise noted. Any work done on the road allowance, with respect to excavation, disposal of materials, installation of culverts, cleaning under bridges, etc., shall be to the satisfaction of the Road Authority and the Engineer.

B.9 TRIBUTARY OUTLETS

The Contractor shall guard against damaging the outlets of tributary drains. Prior to commencement of excavation on each property the Contractor shall contact the owner and request that all known outlet pipes be marked by the owner. All outlets so marked or visible or as noted on the profile, and subsequently damaged by the Contractor's operations will be repaired by the Contractor at his cost. All outlet pipes repaired by the Contractor under direction of the Drainage Superintendent or Engineer which were not part of the Contract shall be considered an extra to the contract price.

B.10 SEDIMENT BASINS AND TRAPS

The Contractor shall excavate sediment basins prior to commencement of upstream work as shown on the plan and profile. The dimension of the basin will be in a parabolic shape with a depth of 450mm below the proposed ditch bottom and the basin will extend along the drain for a minimum length of 15 meters.

A sediment trap 300mm deep and 5 meters long with silt fence placed across ditch bottom on the downstream end of the trap shall be constructed prior to and maintained during construction, to prevent silt from flushing downstream. The silt fence shall be removed and disposed of after construction.

B.11 SEEDING

.1 **Delivery**: The materials shall be delivered to the site in the original unopened containers which shall bear the vendor's guarantee of analysis and seed will have a tag showing the year of harvest.

.2 **Hydro Seeding**: Areas specified on drawings shall be hydro seeded and mulched upon completion of construction in accordance with O.P.S.S. 572 and with the following application rates:

Primary Seed (85 kg/ha.):	50% Creeping Red Fescue
	40% Perennial Ryegrass
	5% White Clover
Nurse Crop	Italian (Annual) Ryegrass at 25% of Total Weight
Fertilizer (300 kg/ha.)	8-32-16
Hydraulic Mulch (2000 kg/ha.)	Type "B"
Water (52,700 litres/ha.)	

Seeding shall not be completed after September 30.

.3 **Hand Seeding**: Hand seeding shall be completed daily with the seed mixture and fertilizer and application rate shown under "Hydro Seeding" above. Placement of the seed shall be by means of an approved mechanical spreader. Seeding shall not be completed after September 30.

SECTION C - TILE DRAIN

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SECTION C

TILE DRAIN

C.1 PIPE MATERIALS

.1 **Concrete Tile**: All tile installed under these specifications shall be sound and of first quality and shall meet all A.S.T.M. Specifications current at the time of tendering. Concrete tile shall conform to Designation C412 "Extra Quality" except that the minimum compression strengths shall be increased by 25%. Heavy Duty tile shall conform to Designation C412 "Heavy Duty Extra Quality".

.2 **Corrugated Steel Pipe**: Unless otherwise specified all metal pipe shall be corrugated, rivetted steel pipe or helical corrugated steel pipe with a minimum wall thickness of 1.6mm (16 gauge) and shall be fully galvanized.

.3 **Plastic Tubing**: The plans will specify the type of tubing or pipe, such as non-perforated or perforated (with or without filter material).

i) Corrugated Plastic Drainage Tubing shall conform to the current O.F.D.A. Standards
ii) Heavy Duty Corrugated Plastic Pipe shall be "Boss 1000" manufactured by the Big 'O' Drain Tile Co. Ltd. or approved equal

.4 **Concrete Sewer Pipe**: The Designations for concrete sewer pipe shall be C14 for concrete sewer pipe 450mm (18") diameter or less; and C76 for concrete sewer pipe greater than 450mm (18") diameter. Where closed joints are specified, joints shall conform to the A.S.T.M. Specification C443.

Where concrete sewer pipe "seconds" are permitted the pipe should exhibit no damages or cracks on the barrel section and shall be capable of satisfying the crushing strength requirements for No. 1, Pipe Specifications (C14 or C76). The pipe may contain cracks or chips in the bell or spigot which could be serious enough to prevent the use of rubber gaskets but which are not so severe that the joint could not be mortared conventionally.

.5 **Plastic Sewer Pipe**: The plans will specify the type of sewer pipe, such as non-perforated or perforated (with or without filter material). All plastic sewer pipe and fittings shall be "Boss Poly-Tite", ULTRA-RIB", "Challenger 3000" or approved equal with a minimum stiffness of 320 kpa at 5% deflection..

.6 **Plastic Fittings**: All plastic fittings shall be "Boss 2000" or "Challenger 2000" with split coupler joints or approved equal.

C.2 TESTING

The manufacturer shall provide specimens for testing if required. The random selection and testing procedures would follow the appropriate A.S.T.M. requirements for the material being supplied. The only variation is the number of tile tested: 200mm to 525mm dia. - 5 tile tested, 600mm to 900mm dia. - 3 tile tested. The drain will be responsible for all testing costs for successful test results. Where specimens fail to meet the minimum test requirements, the manufacturer will be responsible for the costs of the unsuccessful tests. Alternately, the Engineer may accept materials on the basis of visual inspections and the receipt in writing from the Manufacturer of the results of daily production testing carried out by the Manufacturer for the types and sizes of the material being supplied.

C.3 LINE

Prior to stringing the tile, the Contractor shall contact the Superintendent or the Engineer in order to establish the course of the drain.

Where an existing drain is to be removed and replaced in the same trench by the new drain or where the new drain is to be installed parallel to an existing drain, the Contractor shall excavate test holes to locate the existing drain (including repairing drainage tile) at intervals along the course of the drain as directed by the Engineer and/or the Superintendent. The costs for this work shall be included in the tender price.

C.3 LINE (cont'd)

Where an existing drain is to be removed and replaced in the same trench by the new drain, all existing tiles shall be destroyed and all broken tile shall be disposed of off site.

The drain shall run in as straight a line as possible throughout its length, except that at intersections of other water courses or at sharp corners, it shall run on a curve of at least a 15 meter radius. The new tile drain shall be constructed at an offset from and generally parallel with any ditch or defined watercourse in order that fresh backfill in the trench will not be eroded by the flow of surface water. The Contractor shall exercise care not to disturb any existing tile drain or drains which parallel the course of the new drain, particularly where the new and the existing tile act together to provide the necessary capacity.

C.4 CLEARING AND GRUBBING

Prior to commencement of drain construction, all trees, scrub, fallen timber and debris shall be cleared and grubbed from the working area. Unless otherwise specified, the minimum width to be cleared and grubbed shall be 20 meters in all hardwood areas and 30 meters in all softwood areas (willow, poplar, etc.), the width being centred on the line of the drain.

All trees or limbs 150mm (6") or larger, that it is necessary to remove, shall be considered as logs and shall be cut and trimmed, and left in the working width separte from the brush, for use or disposal by the owner. Trees or limbs less than 150mm in diameter shall be cut in lengths not greater than 5 meters and placed in separate piles with stumps spaced not less than 75 meters apart in the working width, for the use or disposal of the owner. In all cases, these piles shall be placed clear of excavated materials, and not be piled against standing trees. No windrowing will be permitted. The clearing and grubbing and construction of the drain are to be carried out in two separate operations and not simultaneously at the same location.

C.5 PROFILE

The profile drawing shows the depth of cuts from the ground beside the stake to the final invert of the drain in meters and decimals of a meter. These cuts are established for the convenience of the Contractor; however, bench marks will govern the final elevation of the drain. Bench marks have been established along the course of the drain and their locations and elevations are noted on the profile drawing.

C.6 GRADE

The Contractor shall provide and maintain in good working condition, an approved system of establishing a grade sight line to ensure the completed works conform to the profile drawing. In order to confirm the condition of his system and to eliminate the possibility of minor errors on the drawings, he shall ensure his grade sight line has been confirmed to be correct between a minimum of two control points (bench marks) and shall spot check the actual cuts and compare with the plan cuts prior to commencement of tile installation. He shall continue this procedure from control point to control point as construction of the drain progresses. When installing a drain towards a fixed point such as a bore pipe, the Contractor shall uncover the pipe and confirm the elevation, using the sight line, a sufficient distance away from the pipe in order to allow for any necessary minor grade adjustments to be made in order to conform to the as built elevation of the bore pipe. All tile improperly installed due to the Contractor not following these procedures shall be removed and replaced entirely at the Contractor's cost.

When following the procedures and a significant variation is found, the Contractor shall immediately cease operations and advise the Engineer.

C.7 EXCAVATION

.1 **Trench:** Unless otherwise specified, all trenching shall be done with a recognized farm tiling machine approved by the Engineer or Superintendent. The machine shall shape the bottom of the trench to conform to the outside diameter of the pipe for a minimum width of one-half of the outside diameter. The minimum trench width shall be equal to the outside diameter of the tile to be installed plus 100mm (4") on each side unless otherwise approved. The maximum trench width shall be equal to the outside diameter of the tile to be installed plus 250mm (10") on each side unless otherwise approved.

.2 **Scalping**: Where the depths of cuts in isolated areas along the course of the drain as shown on the profile exceed the capacity of the Contractor's tiling machine, he shall lower the surface grade in order that the tiling machine may trench to the correct depth. Topsoil is to be stripped over a sufficient width that no subsoil will be deposited on top of topsoil. Subsoil will then be removed to the required depth and piled separately. Upon completion of backfilling, the topsoil will then be replaced to an even depth over the disturbed area. The cost for this work shall be included in his tender price.

.3 **Excavator**: Where the Contractor's tiling machine consistently does not have the capacity to dig to the depths required or to excavate the minimum trench width required, he shall indicate in the appropriate place provided on the tender form his proposed methods of excavation.
Where the use of an excavator is either specified on the drawings or approved as evidenced by the acceptance of his tender on which he has indicated the proposed use of a backhoe he shall conform to the following requirements:

a) the topsoil shall be stripped and replaced in accordance with Section .2 "Scalping".
b) all tile shall be installed on a bed of 19mm crushed stone with a minimum depth of 150mm which has been shaped to conform to the lower segment of the tile.
c) the Contractor shall allow for the cost of the preceding requirements (including the supply of the crushed stone) in his lump sum tender price unless it is otherwise provided for in the contract documents.

.4 **Backfilling Ditch**: Where the contract includes for a closed drain to replace an open drain and the ditch is to be backfilled, the Contractor shall install the tile and backfill the trench prior to backfilling the ditch unless otherwise noted. The distance the trench shall be located away from the ditch shall be as noted on the drawings, (beyond area required for stockpiling topsoil and backfilling). After tile installation is complete topsoil (if present) shall be stripped and stockpiled within the above limits prior to backfilling of ditch. Only tracked equipment shall be permitted to cross backfilled tile trench and must be at 90 degrees to line of tile.

C.8 INSTALLATION

The tile is to be laid with close fitting joints and in regular grade and alignment in accordance with the plan and profile drawings. The tiles are to be bevelled, if necessary, to ensure close joints (in particular around curves). Where, in heavy clay soils, the width of a joint exceeds 10mm the joint shall be wrapped with filter cloth as below. Where the width of a joint exceeds 12mm the tile shall first be removed and the joint bevelled to reduce the gap. The maximum deflection of one tile joint shall be 15 degrees. Where a drain connects to standard or ditch inlet catchbasins or junction box structures, the Contractor shall include in his tender price for the supply and installation of compacted Granular 'A' bedding under areas backfilled from the underside of the pipe to undisturbed soil. The connections will then be grouted.

Where a tile drain passes through a bore pit, the Tile Contractor shall include in his tender price for the supply and placement of compacted Granular "A" bedding from the underside of the pipe down to undisturbed soil within the limits of the bore pit.

As above and where soil conditions warrant, the Engineer may require (or as specified on the drawings) that each tile joint be wrapped with synthetic filter cloth. The width of the filter cloth shall be 300mm wide for tile sizes of 150mm to 300mm and 400mm wide for sizes of 350mm to 750mm. The filter cloth shall cover the full perimeter of the tile and overlap a minimum of 100mm or as specified on the drawings. The type of cloth shall be Mirafi 140NL for loam soils and 150N for sandy soil. Any such work not shown on the drawings shall be considered as an addition to the contract price unless specified on the drawings.

C.9 ROAD AND LANEWAY SUB-SURFACE CROSSINGS

All road and laneway crossings may be made with an open cut in accordance with standard detailed drawings in the specifications or on the drawings. The exact location of the crossing shall be verified and approved by the Road Authority and the Engineer and/or superintendent.

C.10 BACKFILLING

As the laying of the tile progresses, blinding up to the springline including compaction by tamping (by hand) is to be made on both sides of the tile. No tile shall be backfilled until inspected by the Engineer or Drainage Superintendent unless otherwise approved by the Engineer.

The remainder of the trench shall be backfilled with special care being taken in backfilling up to a height approximately 150mm above the top of the tile to ensure that no tile breakage occurs. During the backfilling operation no equipment shall be operated in a way that would transfer loads onto the tile trench. Surplus material is to be mounded over the tile trench so that when settlement takes place the natural surface of the ground will be restored. Upon completion, a minimum cover of 600mm is required over all tile. Where stones larger than 150mm are present in the backfill material, they shall be separated from the material and disposed of by the Contractor.

Where a drain crosses a lawn area, the backfilling shall be carried out as above except that, unless otherwise specified, the backfill material shall be mechanically compacted to eliminate settlement.

C.11 UNSTABLE SOIL

The Contractor shall immediately contact the Engineer or Superintendent if quicksand is encountered, such that installation with a tiling machine is not possible. The Engineer shall, after consultation with the Superintendent and Contractor, determine the action necessary and a price for additions or deletions shall be agreed upon prior to further drain installation. Where directed by the Engineer, test holes are to be dug to determine the extent of the affected area. Cost of test holes shall be considered an addition to the contract price.

C.12 ROCKS

The Contractor shall immediately contact the Engineer or Superintendent if boulders of sufficient size and number are encountered such that the Contractor cannot continue trenching with a tiling machine. The Engineer or Superintendent may direct the Contractor to use some other method of excavating to install the drain. The basis of payment for this work shall be determined by the Engineer and Drainage Superintendent.

If only scattered large stones or boulders are removed on any project, the Contractor shall haul same to a nearby bush or fenceline, or such other convenient location as approved by the Landowners(s).

C.13 BROKEN, DAMAGED TILE OR EXCESS TILE

The Contractor shall remove and dispose of off-site all broken (existing or new), damaged or excess tile or tiles. If the tile is supplied by the Municipality, the Contractor shall stockpile all excess tile in readily accessible locations for pickup by the Municipality upon the completion of the job.

C.14 TRIBUTARY DRAINS

Any tributary tile encountered in the course of the drain shall be carefully taken up by the Contractor and placed clear of the excavated earth. If the tributary tile drains encountered are clean or reasonably clean, they shall be connected into the new drain. Where existing drains are full of sediment, or contain pollutants, the decision to connect those drains to the new drain shall be left to the Engineer or Superintendent. Each tributary tile connection made by the Contractor shall be located and marked with a stake and no backfilling shall take place until the connection has been approved by the Engineer or Superintendent.

C.14 TRIBUTARY DRAINS (cont'd)

For tributary drains 150mm dia. or smaller connected to new tiles 250mm dia. or larger, and for 200mm dia. connected to 350mm dia. or larger, the Contractor shall neatly cut a hole in the middle of a tile length. The connections shall be made using a pre-fabricated adaptor. All other connections shall be made with pre-fabricated wyes or tees conforming to Boss 2000 split coupler or approved equal.

Where an open drain is being replaced by a new tile drain, existing tile outlets entering the ditch from the side opposite the new drain shall be extended to the new drain. All existing metal outlet pipes shall be carefully removed, salvaged, and left for the owner. Where the grade of the connection passes through the newly placed backfill in the ditch, the backfill material below the connection shall be thoroughly compacted and metal pipe of a size compatible with the tile outlet shall be installed so that a minimum length of 2 meters at each end is extending into undisturbed soil.

Where locations of tiles are shown on the drawings the Contractor shall include in his tender price, all costs for connecting those tiles to the new drain regardless of length.

Where tiles not shown on the drawings are encountered in the course of the drain, and are to be connected to the new drain, the Contractor shall be paid for each connection at the rate outlined in the Form of Tender and Agreement.

C.15 OUTLET PIPES

Corrugated steel pipe shall be used to protect the tile at its outlet. It shall have a hinged metal grate with a maximum spacing between bars of 40mm. The corrugated steel pipe shall be bevelled at the end to generally conform to the slope of the ditch bank and shall be of sufficient size that the tile can be inserted into it to provide a solid connection. The connection will then be grouted immediately.

The installation of the outlet pipe and the required rip-rap protection shall conform to the standard detailed drawing as noted on the drawing.

C.16 CATCHBASINS AND JUNCTION BOXES

.1 **Catchbasins**: Unless otherwise noted or approved, catchbasins shall be in accordance with O.P.S.D. 705.010, 705.030. All catchbasins shall include two - 150mm riser sections for future adjustments. All ditch inlet catchbasins shall include one 150mm riser section for future adjustments. The catchbasin top shall be a "Bird Cage" type substantial steel grate, removable for cleaning and shall be inset into a recess provided around the top of the structure. The grate shall be fastened to the catchbasin with bolts into the concrete. Spacing of bars on grates for use on 600mmx600mm structures shall be 65mm centre to centre. Spacing of bars on grates for use on structures larger than 600mmx600mm shall be 90mm with a steel angle frame.

The exact location and elevation of catchbasins shall be approved by the Road Authority or the Engineer/Superintendent. Catchbasins offset from the drain shall have "Boss 2000" 200mm diameter leads or approved equal unless otherwise noted and the leads shall have a minimum of 600mm of cover. The leads shall be securely grouted at the structures and the drain.

.2 **Junction Boxes**: Junction boxes shall be the precast type unless otherwise approved. Dimensions for precast junction boxes shall conform to those for catchbasins. The inside dimensions of the box shall be a minimum of 100mm larger than the outside diameter of the largest pipe being connected. The minimum cover over the junction box shall be 600mm. Benching to spring line shall be supplied with all junction boxes.

.3 **Connections**: Catchbasins and junction boxes shall not be ordered until elevations of existing pipes being connected have been verified in the field as indicated on the drawings. All connections shall be securely grouted at both the inside and outside walls of the structure.

.4 **Installation**: Where the native material is clay, all catchbasins shall be backfilled with an approved granular material placed and compacted to a minimum width of 300mm on all sides with the following exception. Where the native material is sandy or granular in nature it may be used as backfill. Filter cloth shall be placed between the riser sections of all catchbasins.

C.16 CATCHBASINS AND JUNCTION BOXES (cont'd)

Where the Contractor has over excavated or where ground conditions warrant, the structure shall be installed on a compacted granular base.

The Contractor shall include in his tender price for the construction of a berm behind all ditch inlet structures. The berm shall be constructed of compacted clay keyed 300mm into undisturbed soil. Topsoil shall be distributed to a 65mm thickness and seeded unless otherwise specified. The Contractor shall also include for regrading, shaping and seeding of road ditches for a maximum of 15 meters each way from all catchbasins.

C.17 BLIND INLETS

Where specified, blind inlets shall be installed along the course of the drain. In accordance with details on the drawings.

C.18 GRASSED WATERWAY

Topsoil to be stripped from construction area and stockpiled prior to construction of waterway. Waterway to be graded into a parabolic shape to the width shown on the drawings. Topsoil to be relevelled over the waterway and other areas disturbed by construction.

Waterway to be prepared for seeding by harrowing and then seeded by drilling followed by rolling. Seeding rate to be 85 Kg/Ha with the following mixture:

30%	Canon Canada Bluegrass
25%	Koket Chewings Fescue
30%	Rebel Tall Fescue
15%	Diplomat Perennial Rye

Plus #125 Birdsfoot Trefoil (25% of Total Weight)

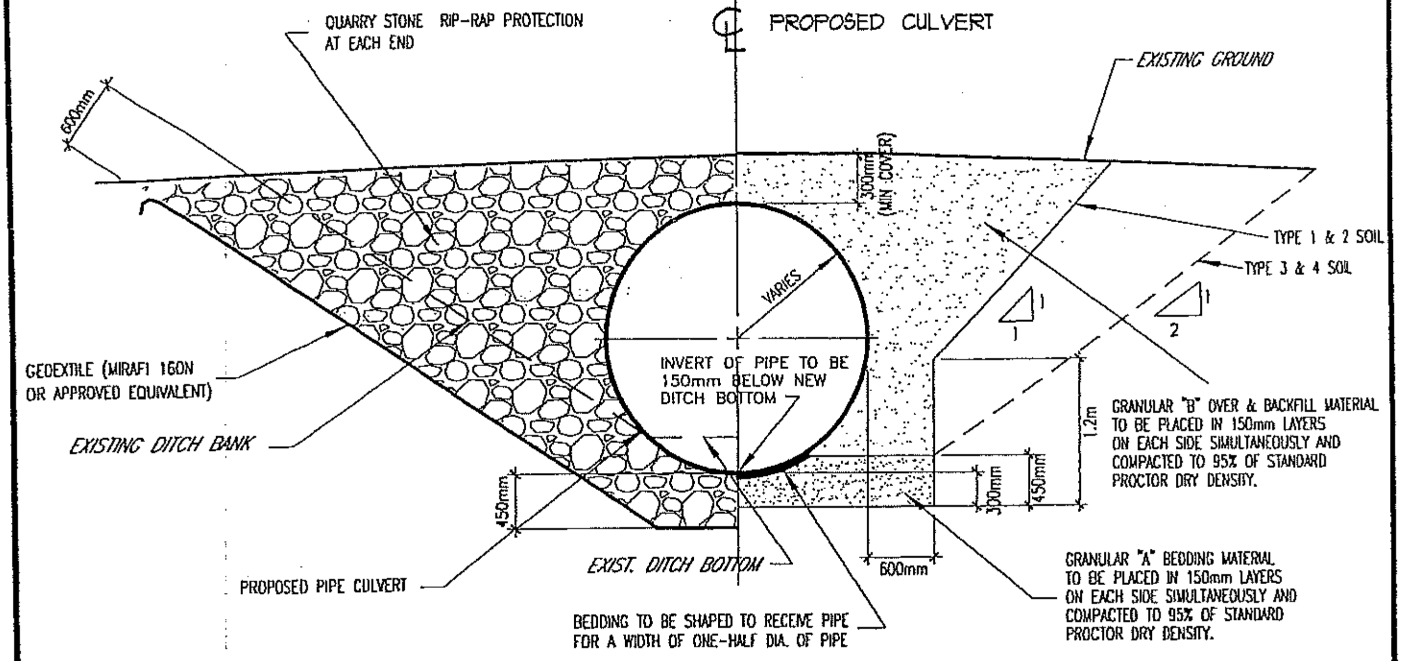
C.19 BACKFILLING EXISTING DITCHES

The Contractor shall backfill the ditch sufficiently for traversing by farm machinery. If sufficient material is not available from the old spoil banks to fill in the existing ditch, the topsoil shall be stripped and the subsoil shall be bulldozed into the ditch and the topsoil shall then be spread over the backfilled ditch unless otherwise specified on the contract drawings. The Contractor shall ensure sufficient compaction of the backfill and if required, repair excess settlement up to the end of the warranty period. The final grade of the backfilled ditch shall provide an outlet for surface water.

C.20 RECOMMENDED PRACTICE FOR CONSTRUCTION OF SUBSURFACE DRAINAGE SYSTEM

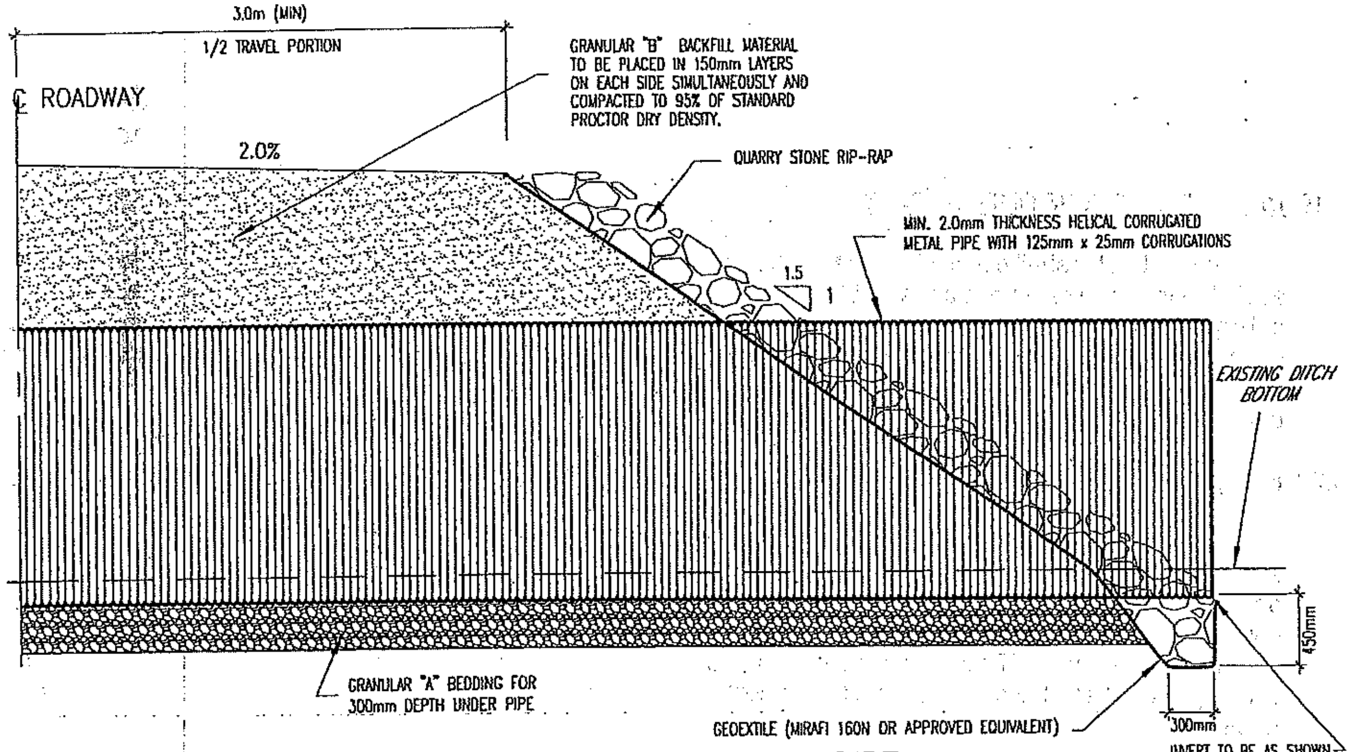
Drainage guide for Ontario, Ministry of Agriculture, Food and Rural Affairs Publication Number 29 and its amendments, dealing with the construction of Subsurface Drainage systems, shall be the guide to all methods and materials to be used in the construction of tile drains except where superseded by other specifications of this contract.

The requirements of licensing of operators, etc. which apply to the installation of closed drains under the Tile Drainage Act shall also be applicable to this contract in full unless approval otherwise is given in advance by the Engineer.



HALF ELEVATION

HALF SECTION



HALF SECTION THROUGH PIPE

NOTES

1) WHERE THE CULVERT IS TO BE INSTALLED IN POOR SOIL CONDITIONS, THE BEDDING MATERIAL SHALL BE 19mm CRUSHED STONE COMPLETELY WRAPPED IN GEOTEXTILE SUCH AS MIRAFI 160N OR APPROVED EQUIVALENT.

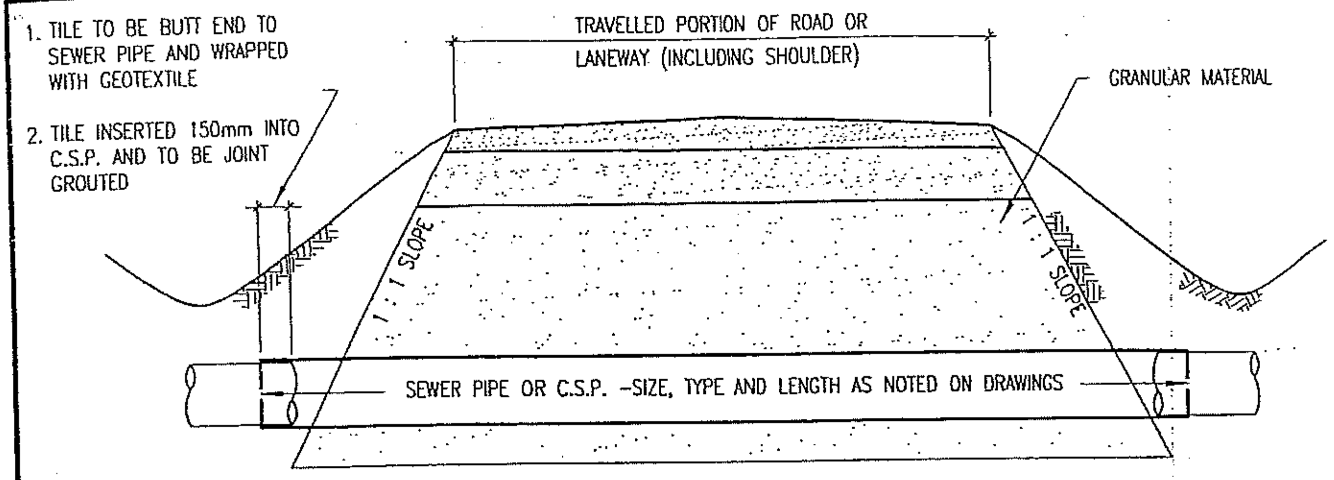
TYPICAL FARM CULVERT INSTALLATION DETAIL

Scale: N.T.S.	Approved by:	Date: January 1983
Drawn by: jk	M.P.D.	Revised: November 2000

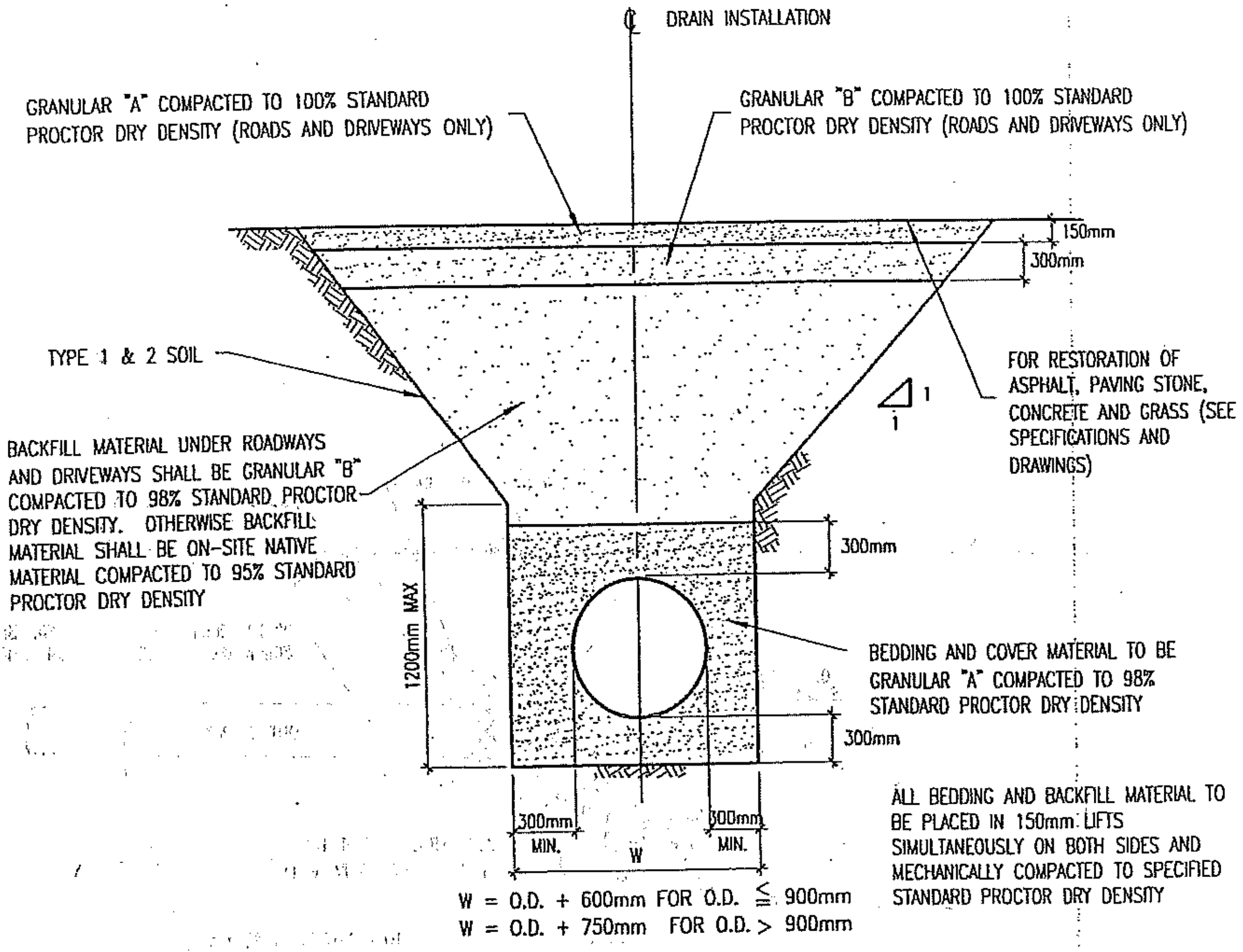
ELEVATION & SECTION

SPRIET ASSOCIATES LONDON LIMITED
CONSULTING ENGINEERS ARCHITECTS

STANDARD
DETAILED
DRAWING
No. 01



SECTION THROUGH PIPE



CROSS SECTION

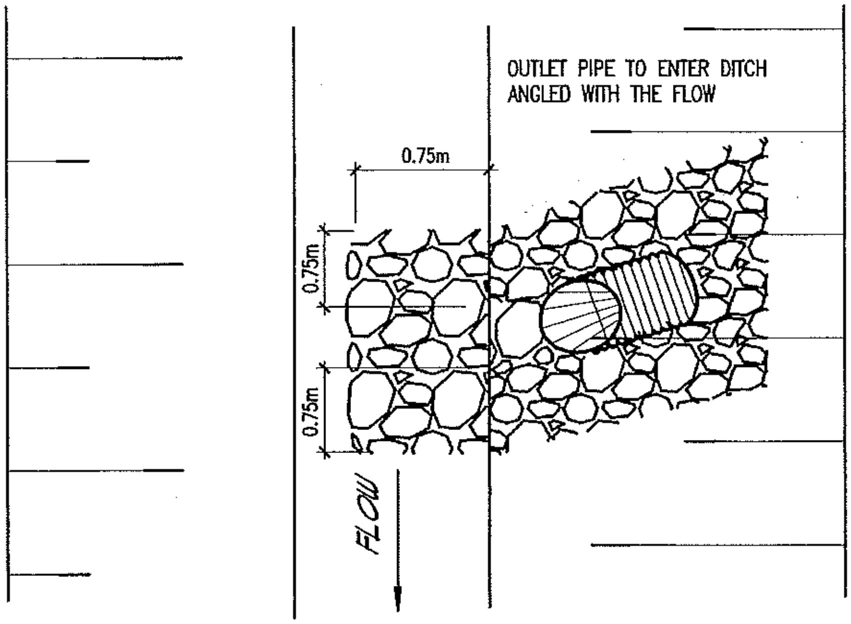
TYPICAL INSTALLATION DETAIL FOR FLEXIBLE PIPE

Scale: N.T.S.	Approved by:	Date: January 1983
Drawn by: jk	M.P.D.	Revised: November 2000

ELEVATION & SECTION

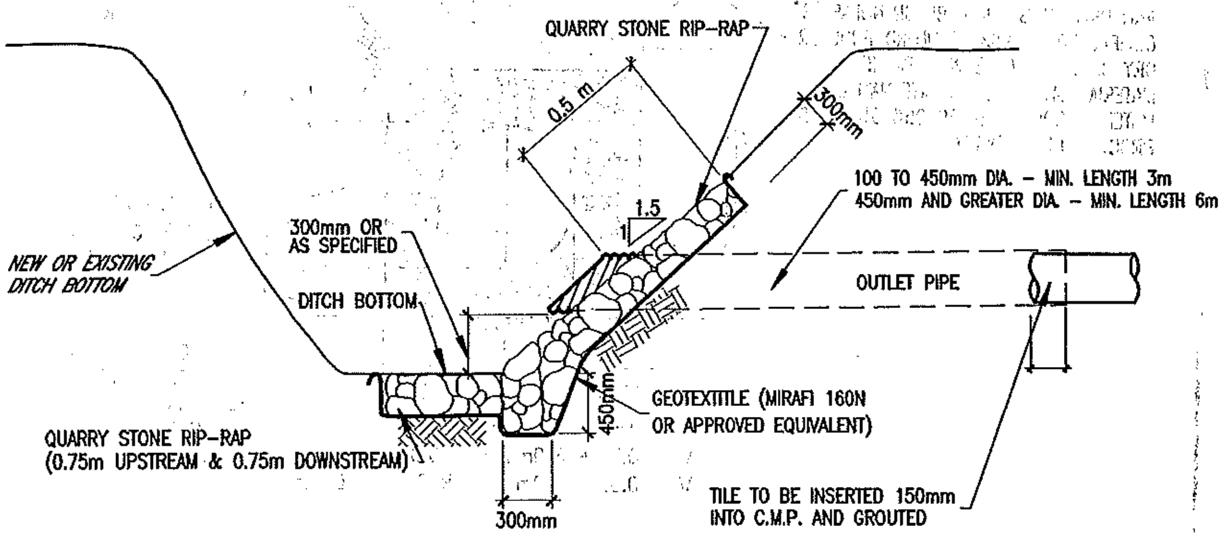
SPRIET ASSOCIATES LONDON LIMITED
CONSULTING ENGINEERS ARCHITECTS

STANDARD DETAILED DRAWING
No. 02



PLAN

NOTES
1. WHERE THE DISTURBED AREA EXCEEDS THE MIN. WIDTHS, RIP-RAP TO EXTEND TO A MIN. OF 600mm BEYOND THE DISTURBED AREA



TYPICAL OUTLET RIP-RAP

NOTES
1. RIP-RAP TO EXTEND UP THE SLOPE 0.5 METER ABOVE TOP OF OUTLET
2. WHERE SURFACE RUN ENTERS DITCH AT OUTLET PIPE, A ROCK CHUTE SHALL BE INSTALLED (SEE S.D.D. No. 05) AND PIPE SHALL BE INSTALLED ADJACENT TO ROCK CHUTE.
3. HINGED RODENT GATE TO BE AFFIXED TO END OF OUTLET PIPE.

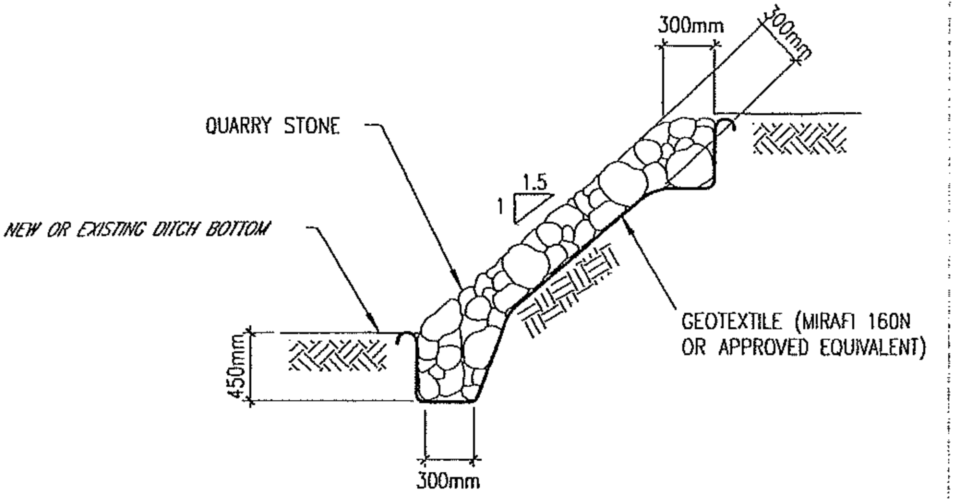
TYPICAL OUTLET RIP-RAP THROUGH
SIDE SLOPE OF DITCH

Scale: N.T.S.
Approved by: M.P.D.
Date: November 2000
Drawn by: jk
Revised: January 2009

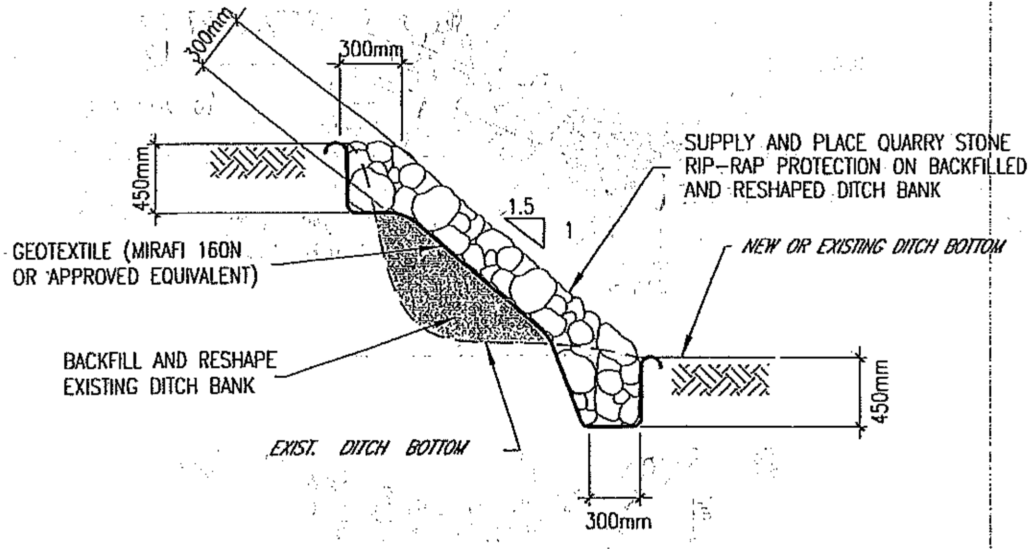
PLAN & SECTION

SPRIET ASSOCIATES LONDON LIMITED
CONSULTING ENGINEERS ARCHITECTS

STANDARD DETAILED DRAWING
No. 03



TYPICAL DITCH BANK RIP-RAP



TYPICAL DITCH BANK RIP-RAP
WITH BACKFILLING OF WASHOUT

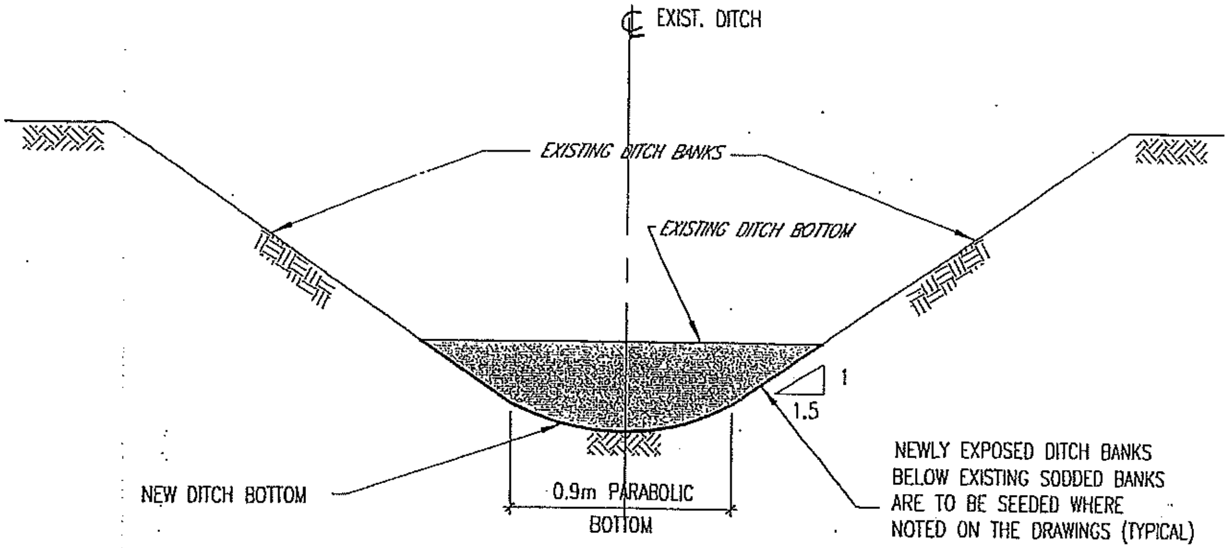
TYPICAL DITCH BANK RIP-RAP DETAILS

Scale: N.T.S.	Approved by:	Date: July 2000
Drawn by: jk	M.P.D.	Revised: November 2000

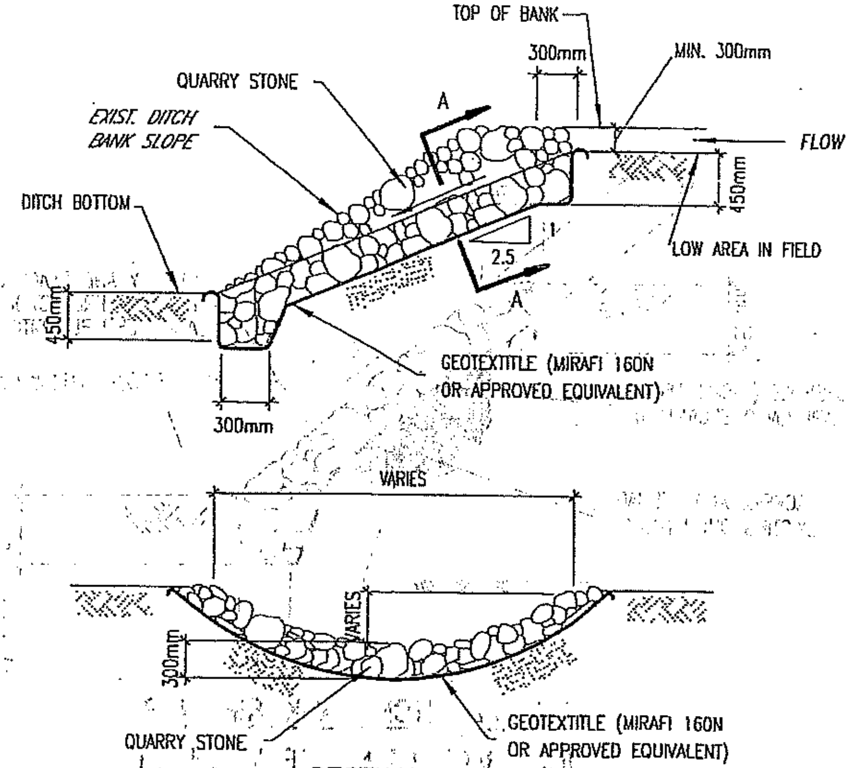
SECTIONS

STANDARD
DETAILED
DRAWING
No. 04

SPRIET ASSOCIATES LONDON LIMITED
CONSULTING ENGINEERS ARCHITECTS



TYPICAL DITCH BOTTOM CLEANOUT



SECTION A–A

TYPICAL ROCK CHUTE

TYPICAL DITCH BOTTOM CLEANOUT
TYPICAL ROCK CHUTE CONSTRUCTION

Scale: N.T.S.	Approved by:	Date: November 2000
Drawn by: jk	M.P.D.	Revised:

SECTIONS

SPRIET ASSOCIATES LONDON LIMITED
CONSULTING ENGINEERS ARCHITECTS

STANDARD DETAILED DRAWING
No. 05

SCHEDULE OF NET ASSESSMENT

WHITE CHURCH ROAD DRAIN

City of Hamilton

(FOR INFORMATION PURPOSES ONLY)

Job No. 208237

May 3, 2010

CODE	ROLL NUMBER (OWNER)	TOTAL ASSESSMENT	GRANT	ALLOWANCES	APPROX. NET
*	25-105-06 (J. Wanders)	$ 30.00	$	$	$ 30.00
	25-105-05 (F.&C. Cimino, C.&C. Pagliaro)	83.00	28.00		55.00
	25-105-04 (M. Isotti)	718.00	239.00		479.00
*	25-105-02 (W. Taylor)	30.00			30.00
	25-105-00 (D. Gavin)	2,613.00	871.00		1,742.00
	25-104-90 (J. Difederico)	902.00	301.00		601.00
	25-104-38 (T. Hickey)	3,496.00	1,165.00		2,331.00
*	26-102-44 (D. William)	31.00			31.00
*	26-102-50 (J. Banyard)	75.00			75.00
	26-102-51 (W. & W. Millar Est.)	256.00	85.00		171.00
*	26-102-5175 (P. Millar)	37.00			37.00
*	26-102-42 (B. Caltagirone)	30.00			30.00
*	26-102-40 (M. Winger)	30.00			30.00
*	26-102-38 (P. Stevanovic)	30.00			30.00
*	26-102-36 (N.W. Sweers)	30.00			30.00
	26-102-28 (S.G. Wojnar)	3,720.00	1,240.00	2,090.00	390.00
	26-102-22 (A. Faustini)	980.00	327.00	390.00	263.00
	26-102-52 (L. Shalmi-Dolina)	6,852.00	2,284.00	1,450.00	3,118.00
	26-102-54 (J. Legault)	692.00	231.00	60.00	401.00
*	26-102-56 (H. Hardmeier)	31.00			31.00
	26-102-58 (D. Robins)	221.00	74.00		147.00
	26-102-60 (R. Marshall)	30.00	10.00		20.00
	26-102-62 (T. Peck)	55.00	18.00		37.00
*	White Church Road	628.00			628.00
TOTALS		**$ 21,600.00**	**$ 6,873.00**	**$ 3,990.00**	**$ 10,737.00**

* = Non-agricultural

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Geotechnical Investigation
Proposed Development of the White Church Lands

White Church Road and Upper James Street
Hamilton, Ontario

Prepared for:

White Church Landowners Group Inc.
% SCS Consulting Group
30 Centurian Drive, #100
Markham, Ontario
L3R 8B8

Landtek File: 23354
November 20, 2024

■ GEOTECHNICAL INVESTIGATIONS ■ ENVIRONMENTAL SITE ASSESSMENTS & CLEANUP ■ GROUNDWATER STUDIES ■ SLOPE STABILITY STUDIES
■ ASPHALT TECHNOLOGY ■ ASPHALT MIX DESIGNS ■ PAVEMENT PERFORMANCE ANALYSIS ■ CONSTRUCTION MATERIALS TESTING & INSPECTION
■ ANALYSIS OF SOIL CORROSION POTENTIAL ■ PAVEMENT REHABILITATION & TENDER SPECIFICATIONS ■ CONCRETE QUALITY ASSURANCE TESTING
■ ROOF/STEEL INSPECTIONS ■ HYDROGEOLOGICAL ASSESSMENTS ■ FAILURE ANALYSES & EXPERT WITNESS SERVICES ■ AGGREGATE EVALUATION

EXECUTIVE SUMMARY

SCOPE OF SERVICES

Proposed Development	It is understood that any future development to be undertaken at the site is likely to comprise of single-detached, townhouse and residential condominium development for low density zones, low- to mid-rise towers and stacked townhouses in medium-density zones and high-rise towers in high-density zones. The development is also expected to include for community parks, institutional and community centre blocks, woodland lots and Storm Water Management ponds.
Report Deliverables	The Preliminary Geotechnical Investigation Report is required to provide an understanding of the subsurface conditions underlying the site and to provide preliminary design and construction recommendations for the proposed new residential development.

SITE DETAILS AND SETTING

Coordinates	589650, 4777630	**Geodetic Elevation**	220 m to 232 m

Site Description	The development area is situated along both White Church Road and Airport Road, is approximately 3,644,000 m^2 (364.4 hectares) in plan area and is semi-rectangular in shape. The site is of a generally agricultural use, with some small-scale commercial use and limited areas of rural, residential use also noted. The topography of the development area is generally of an undulating, glacial horizon.
Geology	Organic soil was encountered at the ground surface. Interbedded deposits of silt, clayey silt/silty clay and till deposits were encountered underlying the organic material in all boreholes and extends to the maximum dill depths of between 6.0 m and 12.6 m below the ground surface.
Groundwater	Groundwater or water seepages were not encountered during drilling, with all boreholes remaining open and dry to completion, though wet soils, particularly the silt till and deeper clayey silt till, were noted at variable depth across the development area. It should be noted that groundwater conditions are expected to vary according to the time of the year and seasonal precipitation levels.

GENERAL ENGINEERING CONSIDERATIONS

Foundations	Based on the ground conditions observed at the borehole locations and though there are no designs are available for the property at this time, it is considered by Landtek that the anticipated lightly and moderately loaded structures of low to moderate intensity development may be supported by the native soils underlying the site using conventional, concrete strip or pads foundations.
Settlements	The general limiting of the total settlement to 25 mm and the differential settlement to 19 mm by the recommended geotechnical reaction at the SLS is considered appropriate for foundations.
Earthquake Considerations	Based on the soil conditions encountered, and in accordance with Table 4.1.8.4.A. of the current Ontario Building Code (*OBC*), the site is considered to be a ‘D’ Site Class.
Damp Proofing and Waterproofing	Any future, at-grade will not require damp proofing or waterproofing, though any associated service or elevator pits should be damp proofed as a minimum. Where habitable basement or parking lot levels are proposed, the subsurface areas (i.e., basement walls and floor slabs etc.) should be damp proofed where above the groundwater levels provided by Landtek’s Hydrogeological Assessment, and appropriately waterproofed, where below groundwater. Municipal approval will be required for long-term (permanent) groundwater dewatering.

GENERAL CONSTRUCTION CONSIDERATIONS

Excavations	The subsurface soils to be encountered during excavation at the site are expected to behave as “Type 2” materials according to the OHSA classification in Part III. It should be possible to excavate the overburden soils with a hydraulic backhoe. Moist Type 2 soils are expected to remain stable for ‘short’ construction periods at battered slopes of 45°, per OHSA requirements.
Short-Term (Construction) Dewatering	Elements of the development are expected to include multiple levels of basement. As such, for short-term dewatering, groundwater is expected to be encountered within basement excavations, particularly where two or more basement levels are proposed. Considerations and parameters regarding construction dewatering, including the “*seasonally highest groundwater level*”, are provided by Landtek’s Hydrogeological Assessment for the site, as reported under separate cover.

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1.0 INTRODUCTION

Landtek Limited (herein "*Landtek*") is pleased to submit this Preliminary Geotechnical Investigation report for the proposed development located at the site identified as White Church Lands at White Church Road and Airport Road in Hamilton, Ontario. Authorization to proceed with the work was received from Mr. Nicholas McIntosh, P. Eng., of SCS Consulting Group Ltd. (herein "*SCS*") on August 28, 2023, acting on behalf of the White Church Landowners Group Inc.

At the time of issue of this report, Landtek understands that no designs are available for the development area other than the preliminary layout of low- medium- and high-density zoning. It is understood however, that any development to be undertaken at the site is likely to comprise of single-detached, townhouse and residential condominium development for low density zones, low- to mid-rise towers and stacked townhouses in medium-density zones and high-rise towers in high-density zones.

The development is also expected to include for community parks, institutional and community centre blocks, woodland lots and Storm Water Management (herein "*SWM*") ponds. New municipal and private road pavement structures and services are also anticipated.

Given the absence of concise development plan, this investigation is to be considered preliminary until such time that a development concept is available for each development parcel and an appropriate, more detailed investigation is completed to compliment the development plan. On this basis, the primary objectives of this investigation are:

- To provide an outline understanding of the subsurface soil and groundwater conditions for foundation design and construction;
- Provide outline and generalized design and construction recommendations with regards to building foundations, at-grade floor slabs, pavement structures, and subsurface drainage and utilities using trenched and trenchless excavation methodologies; and,
- Assess the characteristics, from a geotechnical perspective, of the soils to be excavated and their potential impact on excavatability, reuse and shoring systems.

This Geotechnical Investigation report has been prepared for the Client, the nominated engineers, designers, and project managers pertaining to the proposed development site identified as the "*White Church Lands*", located in Hamilton, Ontario. Reliance on this report is also extended to Municipalities and Regulatory Authorities but is limited to the intended purpose of the report only.

Any further dissemination of this report outside of those parties previously detailed is not permitted without Landtek's prior written approval. Further details of the limitations of this report are presented in Appendix A.

2.0 SITE SETTING

2.1 Site Location and Description

The development site is located in Hamilton, Ontario, and is centered at approximate grid reference 589650, 4777630 (UTM 17T coordinates). The Geodetic elevation of the ground surface at the site is approximately 220 m to 232 m.

The site location is shown in Figure 2.1.1 below.

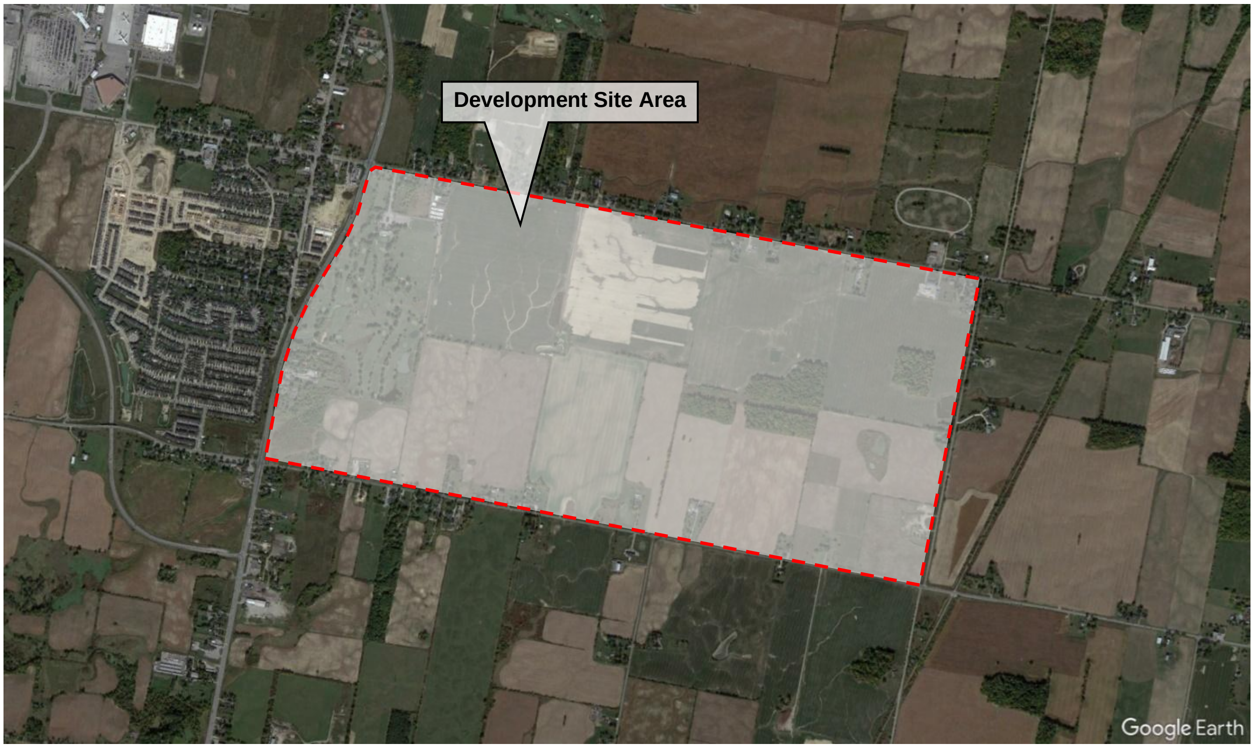


Figure 2.1.1: *Development Site Area and Surrounding*

The development area is broken into two parcels, is situated along both White Church Road and Airport Road, is approximately 3,644,000 m^2 (364.4 hectares) in plan area and is semi-rectangular in shape. The site is of a generally agricultural use, with some small-scale commercial use and limited areas of rural, residential use also noted.

The primary, larger Parcel A of the development area is situated to the north of White Church Road. This parcel is bound to the north by Airport Road, to the east by Miles Road, and to the west by Upper James Street. The secondary, smaller Parcel B is situated to the south of White Church Road and is bound to the east, south and west by agricultural and rural residential properties.

The topography of the development area is generally of an undulating, glacial horizon, with a range in Geodetic elevation between approximately 232 m in the north and 220 in the south. The general trend of slope in topography is towards south and southwest.

2.2 Published Geology

Based on previous geotechnical experience for the area and a review of the existing geological publications for the site area, Ontario Geological Survey (herein "*OGS*") Map P. 993 "*Quaternary Geology of the Grimsby Area*", the site is underlain by deposits of glaciolacustrine clay and silt, and clay and silt tills of the Halton Till formation.

The Ontario Department of Mines (herein "*ODM*") Map 2343 "*Paleozoic Geology of the Grimsby Area*" indicates that the superficial geology is underlain by brown or tan dolostone of the Guelph Formation.

Information provided by historical borehole records from within the vicinity of the site, and held by the OGS, generally confirms the anticipated geological conditions beneath the site. Based on the data from records for Borehole ID 853160, located approximately 1 km west of the site, the soil profile comprises of a veneer of clay and silt deposits to a depth of 23.3 m.

2.3 Published Hydrology and Hydrogeology

Based on publicly available information held by both Hamilton and Niagara Peninsula Conservation Authorities (herein "*HCA*" and "*NPCA*", respectively), the nearest surface water features are Three Mile Creek and Twenty Mile Creek, the tributaries of which are noted to transect the site. Localized ponds and wetlands are also noted within the development area.

According to the OGS, static groundwater levels in the vicinity of the site are generally associated with the deeper till deposits and strata of the Guelph Formation bedrock. Publicly available documentation for groundwater levels in the area report variable groundwater levels, but generally within the range of 10.6 m to 18.3 m below existing ground level.

The groundwater data is also supported by previous, intrusive investigations completed by Landtek and others in the vicinity of the property. Historical reporting identifies groundwater levels at approximately 2.5 m to 11.0 m depth and have been attributed to both locally perched groundwaters and site-wide groundwater regimes.

3.0 FIELDWORK AND INVESTIGATION METHODOLOGY

Fieldwork undertaken at the site by Landtek included clearance of underground services, borehole layout, borehole drilling and soil sampling, and field supervision. A total of eighteen boreholes (boreholes BH1 to BH20, excluding BH14 and BH15) were drilled in phases on March 11, and between July 4 and August 8, 2024. All boreholes were logged using those standard symbols and terms defined in Appendix B. The Exploratory Hole Location Plan, Drawing 23354-01, and associated borehole logs are provided in Appendix C.

The boreholes were drilled using a Dietrich D-50 track mounted drill rig equipped with continuous flight, solid stem augers to a maximum depth of between approximately 6.0 m and 12.1 m. Full time supervision of drilling and soil sampling operations was carried out by a representative of Landtek. Standard Penetration Tests (SPT's) and split spoon samples were taken during drilling at selected depths. Boreholes encountering ultimate auger refusal were extended from bedrock refusal using NQ-gauge, rotary coring methodologies.

Thirteen (13) boreholes were completed as monitoring wells and re-identified as boreholes BH/MW3S/D (nested), BH/MW4, BH/MW6, BH/MW8, BH/MW9, BH/MW10, BH/MW11, BH/MW12, BH/MW16, BH/MW17, BH/MW18, BH/MW19S/D (nested) and BH/MW20. The monitoring wells consisted of new/sealed 50 mm polyvinyl chloride (PVC) screen with No.10 slots threaded onto a matching riser. The screens and risers were pre-threaded including o-ring seals such that no glues or solvents were used to connect the pipe sections. The annular space between the PVC well and the borehole was backfilled to approximately 0.3 m above the top of the screen section with sand pack, and then with bentonite to existing ground level. A J-Plug lockable air-tight cap was installed on the riser. The monitoring well installation details are presented on the respective borehole logs.

All soil samples were transported to the Landtek’s in-house, Canadian Council of Independent Laboratories (CCIL) certified laboratory and visually examined to determine their textural classification. Moisture content testing was carried out on all samples. Twelve selected, composite soil samples were submitted to Paracel Laboratories (herein “*Paracel*”) for Soil Corrosivity parameter testing. No further chemical testing was proposed for the Geotechnical Investigation element.

The borehole locations were established by Landtek relative to site measurements and existing site features. All depth-related remarks relative to topographical survey information available for the site, drawing reference 365466-T, as completed by A. T. McLaren Ltd.

4.0 SUBSURFACE CONDITIONS

4.1 Overview

The borehole information is generally consistent with the geological data identified in Section 2.2, with the predominant soils comprising of glaciolacustrine clays, silts and tills.

The detailed borehole logs are presented in Appendix C, with the ground conditions encountered by the boreholes discussed in the following sections.

4.2 Organic Material

An approximately 50 mm to 200 mm thick layer of topsoil was encountered from ground surface in all boreholes.

Organic soil thicknesses may vary across the site, particularly in areas of wetland or agricultural land where ploughing has occurred. As such, the thicknesses measured at the borehole locations should be taken as indicative and may not be representative of the organic soil depth across the site in its entirety.

4.3 Silt

Silt deposits were encountered in borehole BH/MW6 and BH/MW8 underlying the clayey silt deposits at a depth of 1.5 m to 2.3 m below ground level. The silt deposits encountered are primarily brown in colour and include trace fractions of grey clay seams and iron staining.

An SPT ‘‘N’’ value of 25 were reported, indicating the silt to be of a loose to compact, but generally compact consistency. Moisture contents in the silt deposits were 20 %, which is representative of a moist to wet soil with silt as the primary constituent. The moisture content testing results are presented on the borehole logs in Appendix C.

4.4 Clayey Silt to Silty Clay

Clayey silt to silty clay deposits were encountered in all boreholes except borehole BH1 below the organic material, and range in depth between approximately 0.1 m to 4.5 m below the ground surface. The clayey silt to silty clay deposits encountered are primarily brown in colour, and includes variable fractions of gravel, iron staining, red shale fragments, grey clay seams, and sand.

SPT ‘‘N’’ values ranging from 4 to 55 were reported, indicating the clayey silt to silty clay to be of a soft to hard, but generally very stiff consistency. Moisture contents in the clayey silt to silty clay deposits range between 13 % and 37 %, which are representative of a moist to wet soil with silt and clay as primary constituents. The moisture content testing results are presented on the borehole logs in Appendix C.

4.5 Silt Till

Silt till deposits were encountered in boreholes BH1 and nested boreholes BH/MW3S/D underlying the clayey silt and clayey silt to silty clay till deposits, ranging in depth between approximately 0.7 m to the maximum drill depth of 6.0 m below ground level. The silt till deposits encountered are primarily grey in colour and include variable fractions of clay, iron staining and gravel.

SPT ‘‘N’’ values ranging from 14 to 42 were reported, indicating the silt till to be of a compact to dense, but generally compact consistency. Moisture contents in the silt till deposits range between 14 % and 19 %, which are representative of a moist to wet soil with silt as the primary constituent. The moisture content testing results are presented on the borehole logs in Appendix C.

4.6 Silty Clay to Clayey Silt Till

Silty clay to clayey silt till deposits were encountered in all boreholes below the silty clay to clayey silt deposits and organic material, and range in depth between approximately 0.7 m to the maximum drill depth of approximately 12.6 m below the ground surface. The till deposits encountered are primarily brown, and grey at depth in colour and include variable fractions of gravel, iron staining, cobbles, grey clay seams and red shale fragments.

SPT ‘‘N’’ values ranging from 10 to 54 were reported, indicating the till to be of a stiff to hard, but generally very stiff consistency. Moisture contents in the till deposits range between 13 % and 25 %, which are representative of a moist to wet soil with silt and clay as primary constituents. The moisture content testing results are presented on the borehole logs in Appendix C.

4.7 Bedrock

Bedrock was not encountered during this investigation.

4.8 Groundwater

Groundwater or water seepages were not encountered during drilling, with all boreholes remaining open and dry to completion though wet soils, particularly the silt till and deeper clayey silt till, were noted at variable depth across the development area.

At the time of authoring this report, four groundwater monitoring well visits had been completed at the site as part of Landtek’s ongoing Hydrogeological Investigation for the development area. The preliminary results of the groundwater monitoring are presented in Table 4.8.1 following.

Table 4.8.1: Summary of Water Level Measurements

MW ID	Monitoring Well Details			Groundwater Monitoring Results (m)							
	Surface Elevation	Screen Depth	Wet Soils	19-Jul-24		16-Aug-24		28-Aug-24		18-Sep-24	
				Depth	Elev.	Depth	Elev.	Depth	Elev.	Depth	Elev.
BH/MW3S	-	1.5 m – 3.0 m	2.5 m	0.89	-	1.06	-	1.28	-	2.42	-
BH/MW3D	-	3.0 m – 6.0 m	2.5 m	0.71	-	1.17	-	1.39	-	4.63	-
BH/MW4	-	3.0 m – 6.0 m	5.5 m	0.21	-	0.78	-	1.99	-	3.44	-
BH/MW6	-	3.0 m – 6.0 m	-	0.4	-	0.88	-	1.06	-	5.61	-
BH/MW8	-	3.0 m – 6.0 m	-	0.48	-	1.18	-	1.45	-	2.08	-
BH/MW9	-	6.0 m – 9.0 m	-	7.44	-	5.75	-	6.12	-	3.97	-
BH/MW10	-	3.0 m – 6.0 m	-	0.43	-	0.50	-	0.57	-	0.68	-
BH/MW11	-	3.0 m – 6.0 m	-	0.78	-	1.17	-	1.35	-	1.69	-
BH/MW12	-	3.0 m – 6.0 m	-	-	-	0.98	-	1.68	-	1.73	-
BH/MW16	-	3.0 m – 6.0 m	-	-	-	1.00	-	1.17	-	1.49	-
BH/MW17	-	3.0 m – 6.0 m	-	-	-	5.29	-	4.39	-	5.15	-
BH/MW18	-	5.4 m – 8.4 m	-	-	-	1.77	-	1.03	-	1.31	-
BH/MW19S	-	1.5 m – 3.0 m	2.8 m	-	-	1.31	-	1.44	-	1.67	-
BH/MW19D	-	3.0 m – 6.0 m	3.0 m	-	-	1.38	-	1.47	-	1.69	-
BH/MW20	-	3.0 m – 6.0 m	-	-	-	1.23	-	1.54	-	2.18	-

It should be noted that groundwater conditions and surface water flow conditions are expected to vary according to the time of the year and seasonal precipitation levels. Water seepage is also expected from soil fissures and fractures above the water table.

Further information pertaining to groundwater conditions is provided by Landtek's Hydrogeological Assessment for the site, as reported under separate cover.

5.0 FOUNDATION DESIGN CONSIDERATIONS

The recommended limit state bearing capacities provided in this report are based on the preliminary dataset compiled by this investigation paired with publicly available borehole data and Landtek's knowledge of the geotechnical and geological history of the area.

On this basis, the recommendations and considerations are provided on the understanding that more detailed investigations will be undertaken once specific development concepts and site layouts are developed.

5.1 Shallow Foundation Considerations

5.1.1 Foundations in Native Soils

Based on the ground conditions observed at the borehole locations and though there are no designs are available for the property at this time, it is considered by Landtek that the anticipated lightly and moderately loaded structures of low to moderate intensity development (i.e., townhomes, low- to mid-rise towers etc.) may be supported by the native soils underlying the site using conventional, concrete strip or pads foundations.

Table 5.1.1.1 summarizes preliminary, recommended geotechnical reactions at the Serviceability Limit State (herein "*SLS*") and factored geotechnical resistances at the Ultimate Limit State (herein "*ULS*") for the native soils expected to be encountered at founding depths. It should be noted that the design parameters have been determined by Landtek for the preliminary design stage only. It is also important to note that, where the bearing levels of the footings are at different design elevations, the footing base levels should be stepped along a line of 7V:10H, drawn upwards from the lowest footing, to avoid overlapping stresses.

In accordance with the Ontario Building Code (herein "*OBC*"), 9.12.2.2 (5), and based on local experience, the shallowing of exterior and interior footings to 0.9 m and 0.6 m depth below the basement finished floor level respectively, may be adopted for the development. Such shallowing of foundations is to be limited to only those areas where a minimum of one basement level is to be included.

Table 5.1.1.1: Preliminary Limit State Foundation Design Values

General Founding Depth Ranges	Founding Stratum	Foundation Design Value	
		SLS [1 2]	ULS [3 4]
1.5 m – 2.5 m	Clayey Silt/Silty Clay/Silt Till/Clayey Silt Till/Silty Clay Till	200 kPa	300 kPa
2.5 m – 6.0 m	Clayey Silt/Silty Clay/Silt Till/Clayey Silt Till/Silty Clay Till	200 kPa	300 kPa
6.0 m – 7.0 m	Clayey Silt Till/Silty Clay Till/ Silt Till	300 kPa	500 kPa

Notes:
1. The National Building Code general safety criterion for the serviceability limit states is: SLS resistance ≥ effect of service loads.
2. Recommended SLS bearing values conform to Estimated Values based on soil types given in Tables K-8 and K-9 of the National Building Codes User's Guide.
3. The ULS resistance factor for shallow foundations is 0.5, as given in Table K-1 of the National Building Code User's Guide.
4. The National Building Code general safety criterion for the ultimate limit states is: factored ULS resistance ≥ effect of factored loads.

Subsurface conditions can vary over relatively short distances, and the subsurface conditions revealed at the borehole locations may not be representative of subsurface conditions across the site. As such, a further, more detailed Geotechnical Investigation will be required once a development concept plan for the site has been established.

Design factors related to structural loads will determine the most cost-effective foundation system for the proposed development. The impact on foundation size and soil bearing pressure is illustrated in Figure 5.1.1.1 and emphasizes that foundation design sizes, bearing pressures, and bearing levels must be taken into account to avoid excessive consolidation settlements.

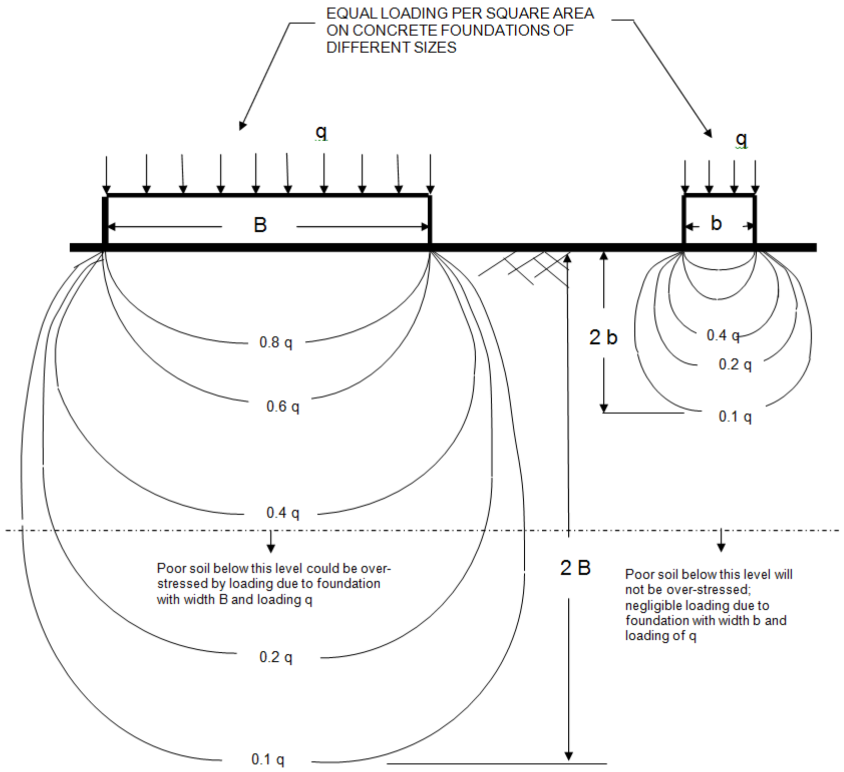


Figure 5.1.1.1: Illustration of Load Distribution below Variable Size Foundations with the Same Applied Loading

Footing foundations may be considered an appropriate option, though the acceptability of footings will depend upon design issues such as the elevation of the lowest floor level and the structural loading. If the footing design criteria provided in this report cannot be satisfied then an alternative solution may be considered, such as a piled solution, particularly if the proposed structures are of a generally high loading than anticipated.

5.1.2 Foundations on Engineered Fill

If engineered fill is required to support founding elements of the development, it is considered by Landtek that relatively lightly loaded structures can be adequately supported by conventional strip or pad footings founded on the engineered fill for a geotechnical reaction at the SLS of 100 kPa, and a factored geotechnical resistance at the ULS of 150 kPa.

It should be noted however, that this is very much dependent upon the nature and condition of the fill placed, the condition of the sub-grade upon which it is being placed, and the methods adopted for the placement and compaction of the fill materials. The engineered fill must be selected with care, then placed and compacted under strictly controlled conditions.

The following recommendations are provided to address the selection of fill material as well as the placement and compaction of engineered fill:

- Processed imported granular material or consistent quality imported clean earth fill, can be considered for engineered fill provided the soil moisture content is within about 2 % of the optimum value of the material. Imported fill should meet the environmental requirements established for the site;
- Engineered fill should only be placed in an area that has been satisfactorily prepared by stripping existing fill and organic soils, and proof rolling the native exposed soil with at least five passes of a minimum 10-ton static pad-foot steel drum type roller;
- Engineered fill should be placed in maximum 300 mm, loose lifts and compacted to a target value of 100 % Standard Proctor Maximum Dry Density (herein "*SPMDD*"). The placement and compaction of each lift should be monitored full time by Landtek, with in-place compaction determined using nuclear moisture/density testing equipment;
- Fill layers that do not meet the compaction requirements, or become wet or frozen, should not be approved for the placement of additional material;
- For engineered fill placement over large areas of varying elevation, the locations of quality control density tests should be recorded by total station survey; and,
- As a precautionary measure and to mitigate cracking, it is recommended that reinforcing steel be provided in footings on engineered fill, and at the top of poured concrete foundation walls. Two 15M bars (continuous) are recommended as a minimum for footing placement. The Structural Engineer should be consulted to confirm the design of such reinforcement.

5.2 Raft Foundation Considerations

For foundations for higher loaded structures than those detailed in Section 5.1, the soil conditions encountered indicate that a raft foundation may be considered an appropriate, shallow-founded alternative to strip or spread foundations.

Design values for the modulus of subgrade reaction generally decrease when the size of the loaded plate (or footing) is larger than 0.3 m by 0.3 m. For granular soils, if the loaded area on the soil is a width of b, the modulus of subgrade reaction can be taken as:

$$K_{\mathrm{vb}} = K_{\mathrm{v1}}\left(\frac{b+0.3}{2b}\right)^2$$

where:

k_{v1} = modulus of subgrade reaction for a loaded plate of dimensions 0.3 m x 0.3 m;
= 25 MPa/m, considered representative of the predominant soil bearing conditions at depth across the site;
b = raft foundation width in metres;
k_{vb} = modulus of subgrade reaction in MPa/m for actual foundation dimension b

For cohesive soils, if the loaded area on the soil is a width of b and a length (as a ratio to b) of mb, the modulus of subgrade reaction can be taken as:

$$K_{\mathrm{vb}} = \left(\frac{K_{\mathrm{v1}}}{b}\right)\left(\frac{m+0.15}{1.5m}\right)$$

where:

k_{v1} = modulus of subgrade reaction for a loaded plate of dimensions 0.3 m x 0.3 m;
= 30 MPa/m, considered representative of the predominant soil bearing conditions at depth across the site;
b = raft foundation width in metres;
m = ratio of foundation length to width where length, L, = mb
k_{vb} = modulus of subgrade reaction in MPa/m for actual foundation dimension b

The soil parameters to be used in the raft foundation design process include the modulus of subgrade reaction, corrected for the building footprint size, and the limiting average pressure at the underside of the raft foundation. The net average bearing pressure at the SLS acting on the underside of the raft is expected to be in the order of 150 kPa to 250 kPa for the native soils underlying the site at depths of approximately 3.0 m to 7.0 m below existing ground level.

5.3 Deep Foundation Considerations

5.3.1 Piled Foundations

If higher bearing capacities are required to support the building loads, then an alternative, deeper founding solution may be required, such as the following:

- "*Cast in Place*" concrete caissons, which could be constructed without any unexpected difficulties but based on the conditions of deeper groundwaters, should incorporate the use of liners. It is anticipated that a dewatering system will not be required provided that liners are used appropriately to control the piezometric water level conditions encountered at depth; or,
- Continuous Flight Auger (CFA) piles.

For piles seated within the silt and clay deposits, the point resistance at the bottom is expected to range between 200 kPa and 300 kPa at the SLS. The frictional resistance (skin friction) developed in the drilled shaft should be calculated as follows:

$$Q_s = 0.42 D_s \, [100 L_1]$$

where:

D_s = Diameter of drilled shaft
L_1 = Length of pile within the clayey silt to clay
Q_s = value in kN

Alternatively, the piles may be extended to bedrock, though the depths to bedrock are quite significant and in excess of this preliminary investigation. Based on publicly available information, dolostone bedrock is anticipated at depths of approximately 18 m to 25 m below ground level at its shallowest.

Based on generalised rock strength parameter testing, the dolostone bedrock underlying the site may be capable of supporting a factored geotechnical resistance of 2.0 MPa at the ULS as a minimum. This is on condition that any piled foundation is seated at a depth to provide a minimum 0.5 m rock socket (i.e., founded at a minimum of 0.5 m penetration depth into the weathered bedrock). This given however, the bedrock is expected to be capable of supporting more significant loads and further investigation will determine the site-specific rock strength parameters.

The following parameters may be applied for the bedrock when considering lateral pressures on loaded piles:

$$K_p = \text{Rankine passive pressure coefficient} = \tan^2(45 + \phi/2)$$

For the weathered dolostone:

- Internal angle of friction (ϕ) should be taken as 26°; and,
- Bulk unit weight (Υ) should be taken as 24 kN/m^3.

For the competent dolostone:

- Internal angle of friction (ϕ) should be taken as 26°; and,
- Bulk unit weight (Υ) should be taken as 26.5 kN/m^3.

This given however, that the bedrock is expected to be capable of supporting more significant loads and that further investigation will be required to determine the site-specific geotechnical resistances for the bedrock at depth.

In addition, the final design and seating depths for any piled foundation solution is to be based on the findings of the additional investigation required and specific pile-driving and pile load tests undertaken at the site prior to construction.

5.3.2 Settlement Considerations for Piled Foundations

For competent bedrock, the SLS condition will not govern the foundation design as the stress required to induce 25 mm of movement (typical settlement criteria for SLS) is anticipated to exceed the ULS. Therefore, any anticipated settlements for foundations seated within dolostone bedrock underlying the site should be considered negligible (i.e., less than 15 mm).

5.4 Piled Raft Foundation Considerations

If the option of a raft alone cannot be satisfied or a deeper founding solution is not viable, another alternative to consider is a "*piled raft foundation*". In the design, the piles act as "*settlement reducers*" and the reduction of the length of piles can be achieved as the raft resistance is also considered in the design.

Tables 5.4.1 and 5.4.2 below provide estimated ultimate load carrying capacities for drilled shafts with the base of the shaft seated within silt and clay till horizons. Pile displacement may be conservatively set at 20 mm for preliminary consideration, compared with the allowable foundation settlement of 25 mm.

Table 5.4.1: Estimate of Ultimate Load Capacity: 1.2 m Diameter Pile

Length of Drilled Shaft (m)	Estimated Ultimate Load Capacity (kN)
5	900
10	1,800
15	2,600
20	3,400
25	4,300

Table 5.4.2: Estimate of Ultimate Load Capacity: 1.6 m Diameter Pile

Length of Drilled Shaft (m)	Estimated Ultimate Load Capacity (kN)
5	1,500
10	2,800
15	4,000
20	5,200
25	6,500

5.5 Frost Susceptibility

The shallow soils encountered across the site are considered sensitive to water and frost, and their physical and mechanical properties are dependent on in-situ moisture content. As such, the founding soils at the site are considered to have a moderate to high frost susceptibility, being classified as Frost Group "*F4*" (Table 13.1 of the "*Canadian Foundation Engineering Manual*", 4th Edition). However, the indicative depths given for foundations in Sections 5.1.1 and 5.1.2 are considered below the maximum extents of influence from frost penetration in the Hamilton area.

Should any re-grading be proposed as part of the development and is situated adjacent to new or existing structures, it will be important to ensure that the associated exterior footings will have a minimum of 1.2 m of soil cover, or equivalent suitable insulation, for frost protection.

5.6 Settlement Considerations

Based on the outline information provided for the nature of the proposed redevelopment of the site, it is anticipated that the loads to be applied to the ground by any such structure will be generally low to moderate intensity.

As such, associated settlements are not expected to be large. Therefore, the general limiting of the total settlement to 25 mm and the differential settlement to 19 mm by the recommended geotechnical reaction at the SLS is considered appropriate.

5.7 Existing Building Demolition

It is expected that all existing structures and associated infrastructure, including pavements and services, will be removed prior to development. Excavations created by the demolition of existing structures will require backfilling with engineered fill prior to commencing development.

Material controls and placement requirements for such fill materials are provided in Sections 5.1.2 and 10.0 of this report.

5.8 Seismic Design Considerations

Based on the soil conditions encountered, and in accordance with Table 4.1.8.4.A. of the current Ontario Building Code (herein “*OBC*”), the site is generally indicated to be a ‘C’ Site Class. The acceleration and velocity-based site coefficients, F_a and F_v, should be determined from Tables 4.1.8.4.B. and 4.1.8.4.C. respectively of the OBC for the above recommended Site Class. The seismic design data given in Table 1.2 of Supplementary Standard SB-1 in Volume 2 of the OBC, for selected Municipal locations, should be used to complete the seismic analysis.

Should a higher classification be required (i.e., Class B or higher), then Shear Wave Velocity Testing should be undertaken for each specific development parcel using Multichannel Analysis of Surface Waves (MASW) methodologies. However, this assessment will not necessarily guarantee a change of classification, as it is wholly dependent on the ground conditions beneath the site being assessed.

5.9 Damp Proofing and Waterproofing Considerations

For any future structures that are to be constructed at-grade, no damp proofing or waterproofing to foundation walls is required. This given however, any subsurface areas such as service or elevator pits associated with the at-grade structure should be damp proofed as a minimum.

Where habitable basement or parking lot levels are proposed, the subsurface areas (i.e., basement walls and floor slabs etc.) above established groundwater levels should be damp proofed and comply with the OBC requirements. As a minimum it is recommended that the damp proofing system include a Delta Drainage Board or MiraDrain 2000 series product, or an approved alternative, along with an asphalt-based spray-on wall coating.

Should habitable basement or parking lot levels or any associated subsurface areas such as service or elevator pits be seated below the groundwater levels provided by Landtek’s

Hydrogeological Assessment, as reported under separate cover, then such structures are to be appropriately waterproofed. The waterproofing should include for the required buffer zone (nominally 1.0 m to 1.5 m) above the stabilized or highest recorded groundwater level.

6.0 FLOOR SLAB AND PERIMETER DRAINAGE CONSIDERATIONS

Based on the borehole soil conditions and information provided to Landtek, it should be possible to construct conventional, at-grade and basement floor slabs using slab-on-grade methods. The subgrade support conditions are anticipated to be clays, silts and tills, or a combination thereof, which should provide competent conditions for placing the vapour barrier material.

After the subgrade has been prepared to the underfloor design elevation it is recommended that the area be proof-rolled with a loaded tandem axle dump truck to delineate if there are soft or unstable ground conditions that require repair. This operation should be completed before the underfloor vapour barrier granular material is placed.

It is recommended that a minimum 200 mm layer of clear, 19 mm crushed quarried stone be used as the vapour barrier under the floor slab. The vapour barrier stone should meet the requirements of Ontario Provincial Standard Specifications (herein “*OPSS*”) 1004 for 19 mm Type II clear stone. If a graded crushed stone is substituted for clear stone, the material should be limited to a maximum of 5 % fines (passing the 0.075 mm sieve). The floor slab thickness should meet the specifications of the project based on anticipated floor loadings.

The finished exterior ground surface should be sloped away from the buildings at a grade in the order of 2 %.

The concrete properties should meet the requirements of OPSS 1350. Contraction and isolation jointing practices should be in accordance with current Portland Cement Association recommendations, as given in the engineering bulletin "*Concrete Floors on Ground*”, second edition, by R. E. Spears, and W. C. Panarese.

The design of concrete slabs on native soils may be made on the basis of a value of modulus of subgrade reaction of 25 MPa/m for native silt and clay subgrade soils.

Perimeter drainage should be provided around all subsurface floor areas where water may accumulate unless the proposed structures are to be waterproofed as prescribed in Section 5.9. This, however, is subject to the Municipal approval allowing for the discharge of groundwater into the Municipal storm system where the perimeter drainage is going to be installed at a depth below the established groundwater level.

Underfloor drains may be also required depending on the provision of waterproofing, or excavation and groundwater seepage conditions, particularly where below the groundwater level. Groundwater should be anticipated within excavation profiles for structures that include two or more levels of basement, though groundwater levels may be locally shallower.

Drainage systems should comply with the current OBC and associated amendments. Further details pertaining to perimeter and underfloor drainage systems are provided in Drawings 23354-02 and 23354-03 respectively, in Appendix D.

7.0 EARTH PRESSURE CONSIDERATIONS FOR SUBSURFACE WALLS

7.1 General Earth Pressure Considerations

The earth pressure, p, acting on subsurface walls at any depth, h, in metres below the ground surface assumes an equivalent triangular fluid pressure distribution and may be calculated using the expression below. It is assumed that granular material is used as backfill. Allowances for pressure due to compaction operations should be included in the earth pressure determinations and a value of 12 kPa is applicable for a vibratory compactor and granular material.

If the structure retaining soil can move slightly, the active earth pressure case can be used in determining the lateral earth pressure. For restrained structures and no yielding an "at rest" earth pressure condition should be used. The determination of the earth pressures should be based on the following expression:

$$P_1 = K (\delta h + q)$$

where:

P_1 = the pressure in kPa acting against any subsurface wall at depth, h, in metres (feet) below the ground surface;

K = the at rest earth pressure coefficient considered appropriate for subsurface walls; OPSS 1010 Granular B Type 1 (pit-run sand and gravel) material has an effective angle of friction estimated to be 32° with a corresponding at rest earth pressure coefficient, K_o, of 0.45; and,

δ = the moist bulk unit weight of the retained backfill; 21.5 kN/m^3.

and,

q = the value for any adjacent surcharge in kPa, which may be acting close to the wall; and,

h = the depth, in m, at which the pressure is calculated

Backfill materials required for behind the retaining structure is assumed to meet an OPSS 1010 Granular B Type 1 pit-run sand and gravel material or OPSS 1010 Granular A. The granular fill should be compacted to a minimum of 98 % of the material's SPMDD, or to the levels and backfilling procedures specified. Table 7.1 below provides those lateral earth pressure parameters for the predominant soils anticipated at the site.

Table 7.1: Recommended Lateral Pressure Parameters

Parameter	Site Soils (Generalized)	OPSS 1010 Granular A	OPSS 1010 Granular B Type I
Angle of Internal Friction, ϕ	38°	35°	32°
Unit Weight (KN/m^3)	19.5	23	22
Passive Earth Pressure Coefficient, K_p	4.20	3.70	3.25
At-Rest Earth Pressure Coefficient, K_o	0.38	0.43	0.47
Active Earth Pressure Coefficient, K_a	0.24	0.27	0.31

7.2 Hydrostatic Pressure Considerations

For waterproofed, subsurface walls below the established groundwater level, the pressure distribution on the wall should include the hydrostatic pressure. The determination of hydrostatic pressure should be based on the following expression:

$$P_2 = \delta_w h_w$$

where:

P_2 = hydrostatic pressure;

δ_w = unit weight of water; 9.8 kN/m^3; and,

h_w = depth of wall, below reported water level.

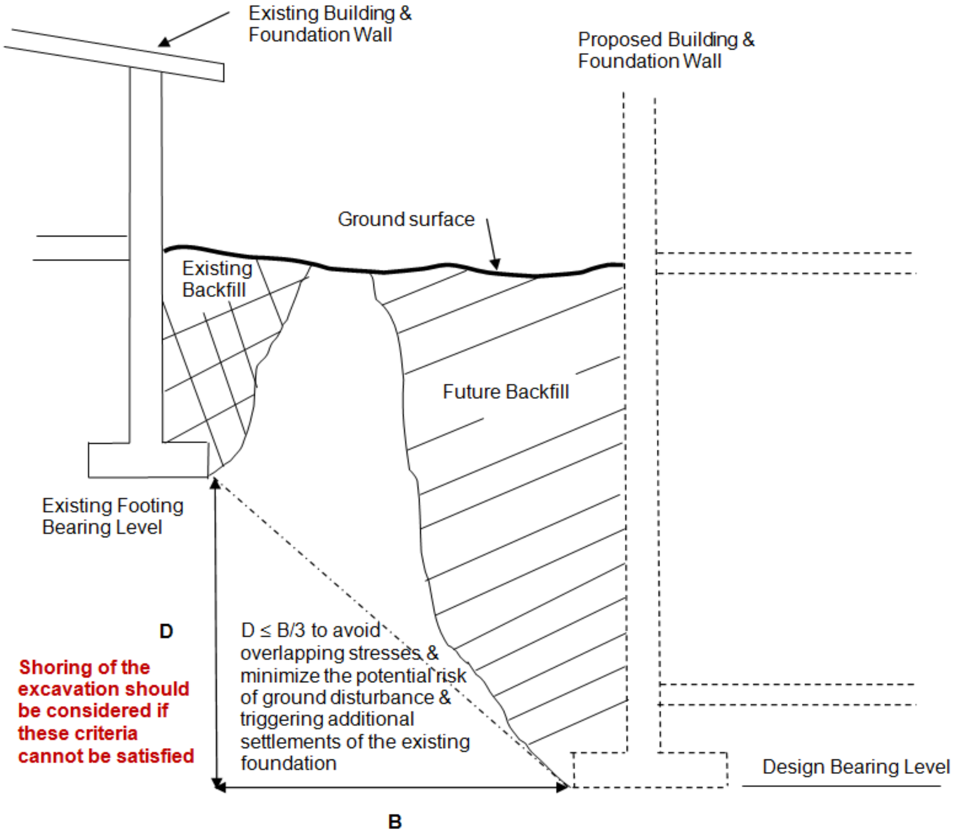
8.0 EXCAVATION AND BACKFILL CONSIDERATIONS FOR CONSTRUCTION

8.1 General Excavation Considerations for Soils

All temporary excavations and unbraced side slopes in the soils should conform to standards set out in the Occupational Health and Safety Act, Ontario Regulation 213/91 "*Construction Projects*" (herein "*OHSA*"). The subsurface soils to be encountered during excavation at the site are expected to behave as "*Type 2*" materials according to the OHSA classification in Part III. Type 2 soils are characteristic of the "*clayey silt to silty clay, silt till, and clayey silt to silty clay till*" deposits encountered beneath the site.

It should be possible to excavate the overburden soils with a hydraulic backhoe. Moist Type 2 soils are expected to be stable for short construction periods at slopes of approximately 45° to the horizontal (i.e., 1V:1H). According to the OHSA the excavation slope should be cut and shaped to meet the OHSA requirements for the soil with the highest classification number.

Excavations for new foundations will be required to satisfy the criteria given in the example shown in Figure 8.1.1. This is to avoid overlapping stresses and minimize the risk of undermining existing adjacent structures, including utilities, and/or triggering additional settlements of the existing structures due to soil disturbance.



Example: If the separation between existing and new proposed footings is 2 m the difference in bearing elevation should not exceed 0.67 m.

Figure 8.1.1: Criteria for Assessing Excavation Shoring Requirements (Not to Scale)

Consideration should be given to any existing trench excavations and associated backfill that may be present directly behind cut slopes within native soils that may appear to be stable on first excavation. In these circumstances, slopes can suddenly slough or collapse due to the effects of the adjacent backfill.

Consequently, for excavation conditions that cannot satisfy the OHSA requirements for unbraced 1H:1V side slopes, a trench box system should be used, or temporary shoring should be installed to maintain safe working conditions. Outline considerations for temporary shoring are provided in Section 8.4 of this report. In any event, the shoring design should be based on the procedures outlined in the latest edition of the "*Canadian Foundation Engineering Manual*".

8.2 Short-Term (Construction) Dewatering Considerations

Though no conceptual development plans have been provided at the time of issue of this report, elements of the site development are expected to include multiple levels of basement. As such, groundwater is expected to be encountered within basement excavations, particularly where two or more basement levels are proposed.

Considerations and parameters regarding dewatering, including the "*seasonally highest groundwater level*", are provided by Landtek's Hydrogeological Assessment for the White Church Road development, as reported under separate cover.

8.3 General Backfill Considerations

Backfill next to foundation walls should be selected to be compactable in narrow trench conditions. The native soils encountered at the site are expected to be reusable as trench backfill and backfill around the proposed structures on the site. Any variation in the moisture contents of the soils encountered may require selective separation of material to avoid the use of wet soil.

During inclement weather the native soils may become too wet to achieve satisfactory compaction. If construction is proposed for late in the year, a reduced level of trench compaction with a higher risk of future settlements is to be anticipated, and it is recommended that provisional contract quantities be established for the supply and placement of imported granular fill under such circumstances. The imported granular should meet the requirements of OPSS 1010 for Granular B Type I material as a minimum requirement.

8.4 Temporary Shoring Considerations

The installation of temporary shoring is also recommended to maintain safe working conditions and eliminate the possibility of loss of ground and damage to nearby structures and buried utilities on the adjacent road allowances during excavation for basement construction.

The requirement and application of shoring to support excavation side slopes will be dependent on the required excavation depth and the proximity of existing or newly constructed infrastructure adjacent to the excavation.

The preferred method of shoring for deeper excavation is expected to consist of a concrete caisson wall, though timber lagging may be considered for shallower basement excavations (i.e., one to two basement levels). This type of system is expected to provide the additional benefit of sealing the excavation from water penetration and loss of soil fines into the open excavation. Soldier piles and timber lagging may be considered as an option for a shoring system, though this type of system may require measures to prevent the loss of soil between the spaces of lagging boards where a wet or flowing soil layer may be present.

The shoring methods may provide lateral restraining force through the use of rakers or tieback anchors. Tieback anchors provide additional advantage since they do not protrude into the excavations as rakers would. However, the use of tieback anchors is also dependent upon whether permission is needed or whether it is physically possible to extend the anchors to the required distance into neighbouring properties.

Consideration should be also given to lateral and vertical movement of shoring systems being monitored during construction to ensure that movements are within the acceptable range.

It should be noted that the design of any temporary shoring system is the responsibility of the Contractor. Therefore, a specialist shoring contractor should be consulted to provide the most appropriate shoring type method and associated installation procedures. In any event, the shoring design should be based on the procedures outlined in the latest edition of the Canadian Foundation Engineering Manual. It is also recommended that lateral and vertical movement of the shoring system be monitored during construction to ensure that movements are within the acceptable range.

9.0 UTILITIES AND SERVICING CONSIDERATIONS

9.1 Service Installation Using Trenchless Methodologies

9.1.1 General Background

It is anticipated that deeper, truck services will be installed using trenchless methodologies. A brief summary of tunnelling methodology options is provided in Table 9.1.1.1, though it is anticipated that "*Jack and Bore*" (horizontal auger boring) methodologies will be the preferred. A specialist Tunneling Contractor should, however, be consulted to determine the most appropriate methodology.

Table 9.1.1.1: Summary of Tunneling Options

Method	Comments	Recommendations
Jack and Bore	• Dewatering may be required depending on the long-term groundwater conditions. • Requires installation of the launch and reception shafts and the thrust block. • No active control of ground loss at the face.	• May be a suitable option but does not allow active control of ground loss. • Boulders and cobbles pose considerable challenge for the method.
Horizontal Directional Drilling (HDD)	• Angle of entrance and exiting may be too steep, but not impossible.	• This method can be used for most ground conditions except for the presence of obstructions such as cobbles and boulders. • HDD may be deemed appropriate for poorer soil conditions, as per OPSS 450.
Pipe Ramming	• Dewatering may be required depending on long term groundwater condition.	• Minimizes the face ground loss but may cause unacceptable levels of vibrations.
Tunnel Boring Machine (TBM)	• Active control of face pressure and ground loss. • Requires installation of the launch and reception shafts and the thrust block. • Large cobbles may pose a challenge.	• May be a suitable option. Cost could be a consideration.
Pipe Jacking with TBM	• Considered uneconomical.	• May be objectionable based on cost.
Micro-Tunneling	• Active control of face pressure and ground loss. • Requires installation of the launch and reception shafts and the thrust block. • Remote control requires highly specialised contractor. • Large cobbles may pose a challenge.	• May be a suitable option. • Cost could be a consideration.

9.1.2 Subsurface Conditions along the Tunnel Alignments

Based on the profiles provided and the ground conditions encountered, the proposed tunnel at the site will be driven primarily through stiff and very stiff, silty clay and clayey silt deposits, though locally sandy deposits are also expected. The expected soil behaviour is such that excessive settlements during and post tunnelling are not anticipated (i.e., not greater than 5 mm).

The investigation identified groundwater within the screened native soils and therefore, groundwater within the tunnel alignment should be anticipated.

9.1.3 Tunnel Support

The design of any required waterproof primary liner will be the responsibility of the nominated

Contractor. In the selection of the type of support, consideration shall be given to the presence of water within the silty and clayey strata, the stabilized groundwater levels reported along the proposed tunnel alignment and the need to prevent the infiltration of any fines into the tunnel opening, as this may result in the loss of ground support and the eventual overstressing or even the collapse of the primary liner system.

The design of the flexible primary tunnel support is to consider the following loading conditions:

- Ring loads caused by uniformly distributed radial earth pressure assumed to be equal to the full vertical earth pressure at the spring line of the tunnel. A unit weight of 20.5 kN/m^3 is to be assumed for the native soils overlying the spring line. Below the groundwater table the submerged unit weight should be used but the full piezometric groundwater pressure should be added to the earth pressure. In addition, loads from any existing underground utilities and structures that may cause stresses on the tunnel liner should be included;
- Bending and shear stresses caused by the anticipated distortion of the flexible liner. A diametral distortion of not less than 0.5 % of the tunnel diameter is to be assumed, though this could be larger if the contact between the soil and tunnel support around the tunnel is not uniform. This may result from over excavation or the loss of lateral support, particularly where any variability in soil strength is exposed within the tunnel (i.e., locally limited sand or silt seams etc.); and,
- Adequate provision shall be made in the design to prevent buckling by assuring uniform filling and grouting of the annular space behind the liner.

The service being installed should be designed for the full vertical pressure measured at spring line and for a horizontal earth pressure equal to 75 % of the full vertical pressure.

9.1.4 Dewatering

It is anticipated that the primary liner of the tunnels will be watertight. Therefore, dewatering will not be required. However, if the tunnel liners are not to be watertight, then the dewatering requirements provided by the Hydrogeological Assessment report should be applied.

The external water head acting on the shield shall be taken to be equal to the difference between the groundwater elevation measured in the vicinity of the particular section of tunnel and the elevation of the tunnel invert.

9.1.5 Temporary Access Shafts

Anticipated Ground Conditions

Superficial deposits anticipated at shaft locations should be readily excavatable using a suitably sized, hydraulic excavator or a clam shell.

Groundwater conditions are expected to be variable, but generally in the order of approximately 4.0 m to 6.0 m below ground level. Limited piezometric groundwater conditions are also anticipated.

Material Stockpile Management

Exposed, excavated soil stockpiles that are to be re-used as fill on site, should be temporarily covered during wet weather to help maintain their original moisture content. Such stockpiles are prone to wet weather exposure and, as such, the increased moisture contents will make these materials too wet to achieve the required levels of compaction.

Shaft Backfill

Access and egress shafts may be backfilled with on site, native, inorganic materials which have moisture content within ±1 % above and ±2 % below the optimum and are environmentally acceptable. Alternatively, imported granular materials can be used. If long term settlements are to be avoided, then the backfill materials should be placed in maximum 300 mm loose lifts and compacted to a minimum 98 % SPMDD. As an alternative, high performance bedding stone (HBP) or unshrinkable fill (U-fill) could be used.

9.1.6 Construction Instrumentation and Monitoring

Settlement Monitoring

Ground movements and deformations of the existing ground surface within the zone of influence (i.e., settlement trough) of the service pipe should be closely monitored during construction by installing surface monitoring points at ground surface either on or immediately beside any existing structures or underground utilities. Settlement monitoring points should be also installed near the launching shaft in order to estimate from these the expected movements of the structures and/or existing service pipes ahead of undertaking the tunnelling work.

All monitoring points will require installation at a time such that monitoring can be completed for a period of at least seven days before any tunnelling work is commenced. The monitoring of the settlement points will require completion on a daily basis by an Ontario Licenced Surveyor and will be reported in writing to the Geotechnical Engineer within one hour of survey completion.

Monitoring is to continue throughout the duration of the tunnelling works and for a period of two weeks after installation completion, maintaining the same monitoring frequency. If little or no settlement is reported during the post-installation monitoring period then the monitoring frequency is to be reduced to once every four weeks for 12 weeks.

Suggested settlement limits and alert levels that may be applied are provided in Table 9.1.6.1 following.

Table 9.1.6.1: Limits of Tunnelling Settlements

Measured Level of Movement	Alert Level
Review (notify CA Project Manager immediately, proceed with caution, monitor hourly for 3 hours)	5 mm to 9 mm
lert (stop work, notify CA Project Manager immediately, determine resolution before recommencing work)	10 mm or greater

Vibration Monitoring

Full time vibration monitoring is recommended during the shaft and tunnel excavation to protect the existing service and road infrastructure, and adjacent residential properties from the adverse impacts of vibration.

The following 9.1.6.2 provides vibration criteria that are to be applied for any neighbouring structure only.

Table 9.1.6.2: Limits of Vibrations

Frequency (Hz)	Peak particle Velocity (PPV) (mm/s)
Less than 4	8
From 4 to 10	15
More than 10	25

The criteria for "*annoyance*" are more stringent than for those that may result in structural damage. The recommended cautionary vibration criteria are summarized in the following table, Table 9.1.6.3.

Table 9.1.6.3: Suggested Cautionary Vibration Criteria

Structure	Peak Particle Velocity (PPV) (mm/s)	Frequency (Hz)
Residential and Commercial Buildings	8	All frequencies
Buried Services	8	All frequencies

Additional Monitoring Requirements

In addition to the monitoring requirements described in the preceding sections, the following should also be monitored:

- Shaft wall deflection by the installation and monitoring of inclinometers and convergence points;
- Groundwater pumping rates and groundwater levels to prevent excessive groundwater drawdown;
- Removed soil volumes per meter of tunnel excavated and grout volumes to monitor over-excavation; and,
- The soil types encountered at the tunnel face.

9.2 Service Installation By Trench Excavation

All temporary, open-cut service excavations and unbraced side slopes in the soils should conform to standards set out in the Occupational Health and Safety Act (herein "*OHSA*"). The subsurface soils to be encountered during excavation at the site are expected to behave as "*Type 2*" materials according to the OHSA classification in Part III. Type 2 soils are characteristic of the "*clayey silt to silty clay, silt till, and clayey silt to silty clay till*" deposits encountered beneath the site.

It should be possible to excavate service trenches through the overburden soils using a hydraulic backhoe. Moist Type 2 and Type 3 soils are expected to be stable for short construction periods at slopes of approximately 45° to the horizontal (i.e., 1V:1H). However, there may be service trenches and backfill situated directly behind cut slopes that appear to be stable. In these cases, slopes can suddenly slough or collapse due to the adjacent backfill. Consequently, for trench conditions that cannot satisfy the OHSA requirements for unbraced 1H:1V side slopes, a trench box system should be used to maintain safe working conditions.

Based on the findings of each borehole location and the proposed service installation depths, significant ground vibrations resulting from open-trench, excavation works are not expected other than those associated with normal construction activities.

Considerations regarding trench excavation dewatering are provided in Landtek's Hydrogeological Assessment report for the site, as reported under separate cover.

As required by the Corporation of the City of Hamilton (herein “*City of Hamilton*”), the trench is to be backfilled with either selected, approved excavated native soil or OPSS 1010.MUNI Granular “A” or “B” Type II material, though maximising the re-use of excavated native soils is preferred and can be managed based on the findings of Landtek’s Soil Classification Report, as provided under separate cover.

The trench backfill should be uniformly compacted to a density that minimizes the risk of long-term settlements. The target compaction specification for trench backfill is 95 % Standard Proctor Maximum Dry Density (herein “*SPMDD*”).

The excavated native soil should generally be considered to be re-usable from a geotechnical perspective, though may subject to any required moisture conditioning. Where used, and during inclement weather, the excavated soils may become too wet to achieve satisfactory compaction. If construction is proposed for late in the year, a reduced level of compaction with a higher risk of future settlements is to be anticipated. Therefore, it is advised that the fill placement and compaction protocol be discussed and agreed upon at a preconstruction meeting to minimize the risk of settlements.

9.3 Municipal Sewer Pipe Installation

9.3.1 Pipe Installation Considerations

It is expected that new storm sewer infrastructure will be installed below the minimum cover depth of 1.2 m below existing pavement surface and new sanitary sewer infrastructure below the minimum cover depth of 2.75 m below existing pavement surface, as per City of Hamilton Engineering Standards requirements. The subgrade support conditions under the sewer pipes are anticipated to be primarily of native silty and clayey deposits. It is considered that the native soils generally present favorable support conditions for sewer installation.

Should soft or very loose soils be encountered during construction, such soft areas should be sub-excavated and replaced with suitably compacted, engineered fill and approved by a Geotechnical Engineer to redevelop the required subgrade. A Geotechnical Engineer should be engaged during construction to examine the exposed sub-soil quality and condition, and confirm the subsurface conditions are consistent with design assumptions. This is in compliance with field review requirements in the National Building Code, Volume 1, Clause 4.2.2.3.

9.3.2 Foundation Considerations for Associated Infrastructure

Founding Subgrade Considerations

It is expected that any proposed access or connection chambers associated with the proposed sewers installations, can be founded in the undisturbed, native soils for a geotechnical reaction of 100 kPa at the SLS, and for a factored geotechnical resistance of 150 kPa at the ULS.

Subsurface conditions can vary over relatively short distances, and the subsurface conditions revealed at the test locations may not be representative of subsurface conditions across the site. Therefore, a Geotechnical Engineer should be engaged during construction to examine the exposed sub-soil quality and condition, and confirm the subsurface conditions are consistent with design assumptions. This is in compliance with field review requirements in the National Building Code, Volume 1, Clause 4.2.2.3.

Settlement Considerations

It is anticipated that the loads to be applied to the ground by any such structures will be generally very low in intensity. As such, associated settlements are not expected to be large. Therefore, the general limiting of the total settlement to 25 mm and the differential settlement to 19 mm by the recommended geotechnical reaction at the SLS is considered appropriate.

Seismic Design Considerations

In accordance with Table 4.1.8.4.A. of the current Ontario Building Code (herein "*OBC*") the subject property is considered to be a "D" Site Class. The acceleration and velocity-based site coefficients, F_a and F_v, should be determined from Tables 4.1.8.4.B. and 4.1.8.4.C. respectively of the OBC for the above recommended Site Class. The seismic design data given in Table 1.2 of Supplementary Standard SB-1 in Volume 2 of the OBC, for selected Municipal locations, should be used to complete the seismic analysis.

9.3.3 Bedding Cover and Backfill

There is no indication that special pipe bedding materials or procedures are required for the installation of rigid sewer pipes. All bedding cover and backfill materials should be selected in accordance with OPSS 1010 Aggregates – Base, Subbase, Select Subgrade, and Backfill Material, or City of Hamilton requirements, whichever is more stringent.

The pipes should be placed with a minimum bedding thickness in conformance of OPSD 802.010 series (typical 150 mm for rigid pipes, OPSD 802.010, 802.013 and 802.014). The use of normal Class B type bedding is applicable for the pipe.

Bedding material shall be placed in layers not exceeding 300 mm in thickness, loose measurement, and compacted to 100 % of the SPMDD before a subsequent layer is placed. Bedding on each side of the pipe shall be completed simultaneously. At no time shall the fill levels on each side of the storm and sanitary sewer pipe differ by more than one, 300 mm uncompacted layer.

9.4 Municipal Watermain Installation

9.4.1 Watermain Installation Considerations

As is expected that new watermain will be installed such that the top of pipe will be at depths of greater than 1.6 m below existing pavement surface, per City of Hamilton Engineering Standards requirement. At this depth, it is expected that native silty and clayey soils will be encountered. It is considered that the native soils generally present favorable support conditions for watermain installation and thrust block design and construction. Where fill materials are encountered at subgrade levels, inspection and localized remediation works may be required to overcome any potential for differential settlements to the service installation.

When backfilling the trench excavation, consideration should be also given to the requirement of clay seals or "*water stops*", as defined by OPSD 802.095. Clay seals prevent erosive run-off velocities from developing in the trench and are typically constructed of geotextile socks filled with less pervious, organic-free soils (i.e., soil permeability $k< 10^{-8}$ m/s).

The spacing of clay seals is to be selected based on a detailed Hydraulic Assessment, but 50 m to 100 m spacing is generally used for preliminary design purposes. In general, clay seals may not be required for fall gradients of less than 0.5 %. It should be noted however, that clay seals are required at all watercourse crossings, regardless of the fall gradient. It should be also noted that clay seal design is beyond the scope of geotechnical design.

In addition to clay seals and for proposed watermain installations, concrete thrust blocks should be installed against competent native soils, as per the requirements of the OPSD 1101 Series. It is recommended that the thrust blocks bear against native undisturbed soils and be designed for an average allowable resistance bearing pressure of 75 kPa.

Disturbed soil is subject to compression upon loading and therefore does not present favourable bearing conditions to support the proposed watermain installation. Therefore, should localized fill or other previously disturbed soil conditions be encountered during installation, alternative pipe restraint methods should be used, such as a mechanical joint pipe. Any areas of softer soils that yield notable deflection should be sub-excavated and replaced with suitably compacted, engineered fill and approved by a Geotechnical Engineer.

9.4.2 Foundation Considerations for Associated Infrastructure

Founding Subgrade Considerations

Based on the findings of the investigation, it is considered by Landtek that any proposed access chambers or valve boxes associated with the proposed service installations, can be founded in the undisturbed, native soils for a geotechnical reaction of 100 kPa at the SLS, and for a factored geotechnical resistance of 150 kPa at the ULS.

Subsurface conditions can vary over relatively short distances and the subsurface conditions revealed at the test locations may not be representative of subsurface conditions across the site. Therefore, a Geotechnical Engineer should be engaged during construction to examine the exposed sub-soil quality and condition, and confirm the subsurface conditions are consistent with design assumptions. This is in compliance with field review requirements in the National Building Code, Volume 1, Clause 4.2.2.3.

Settlement Considerations

It is anticipated that the loads to be applied to the ground by any such structures will be generally very low in intensity. As such, associated settlements in soils are not expected to be large. Therefore, the general limiting of the total settlement to 25 mm and the differential settlement to 19 mm by the recommended geotechnical reaction at the SLS is considered appropriate.

Seismic Design Considerations

In accordance with Table 4.1.8.4.A. of the current OBC the subject property is considered to be a “*D*” Site Class. The acceleration and velocity-based site coefficients, F_a and F_v, should be determined from Tables 4.1.8.4.B. and 4.1.8.4.C. respectively of the OBC for the above recommended Site Class. The seismic design data given in Table 1.2 of Supplementary Standard SB-1 in Volume 2 of the OBC, for selected Municipal locations, should be used to complete the seismic analysis.

9.4.3 Watermain Bedding and Cover

Watermain bedding and cover material shall be placed in accordance with the City of Hamilton specification for the installation of watermains.

All bedding cover and backfill materials should be selected in accordance with OPSS.MUNI 1010 Aggregates – Base, Subbase, Select Sub-grade, and Backfill Material, with bedding consisting of Granular "A" material per City of Hamilton requirements. Bedding and cover for small diameter water services shall be Granular "D" material.

Bedding material shall be placed in layers not exceeding 300 mm in thickness, loose measurement, and compacted to 100 % of the SPMDD before a subsequent layer is placed. Bedding on each side of the pipe shall be completed simultaneously. At no time shall the fill levels on each side of the watermain pipe differ by more than one, 300 mm uncompacted layer.

9.5 Private Servicing Considerations

There is no indication that special pipe bedding materials or procedures are required for the installation of private services. All bedding cover and backfill materials should be selected in accordance with OPSS 1010 Aggregates – Base, Subbase, Select Subgrade, and Backfill Material.

Service pipes and conduits should be placed with a minimum bedding thickness in conformance of Ontario Provincial Standard Drawing (herein "*OPSD*") 802.010, 802.013 and 802.014 for flexible pipe and OPSD 802.030, 031, 032, 033 and 034 for rigid pipes. The type of bedding shall be selected to suit the applicable pipe strength and site conditions.

Bedding material shall be placed in layers not exceeding 300 mm in thickness, loose measurement, and compacted to 95 % of the SPMDD before a subsequent layer is placed. Site servicing trench backfill should be uniformly compacted to a density that minimizes the risk of long-term settlements. Bedding on each side of the pipe shall be completed simultaneously. At no time should the levels on each side differ by more than the 300 mm uncompacted layer. The remainder of the trench should be backfilled as per the requirements defined in Sections 5.1.2 and 8.0 of this report.

It is assumed all private services will have a minimum of 1.2 m of soil cover for frost protection. For services installed at shallower depths, suitable insulation for frost protection is recommended.

9.6 Stormwater Management Pond Considerations

At the time of issue of this report, it is understood that seven Storm Water Management (herein "*SWM*") ponds are proposed across the White Church Road development site area. It is expected that the pond designs will be of a pond with a permanent level of water retention and will be constructed by excavation into native soils.

In accordance with the City of Hamilton document "*City of Hamilton Criteria and Guidelines for Stormwater Infrastructure Design*", dated April 16, 2009, the requirements for new Stormwater Management Pond design include for the side slopes to be of an angle no greater than 4H:1V.

It is anticipated that outfalls of the ponds will be such that the ponds will be retaining water during rainfall or snow melt events and will be in the order of 1.5 m to 2.0 m above the pond base. The high-water (100-year ponding) level of the ponds will be in the order of 3.0 m to 3.5 m above the pond base. On this basis and based on the findings of the investigation completed at the site, particularly the absence of groundwater within the anticipated SWM pond profile, it is anticipated that the pond base will be above any static or piezometric groundwater regime beneath the site and thus will not require any considerations towards hydraulic uplift.

It is considered that pond construction will only require the inclusion of a 'standard' liner to reduce any potential communication between any deeper groundwater system and the stormwater retained by the pond. This is in accordance with the "*City of Hamilton Criteria and Guidelines for Stormwater Infrastructure Design*" and will be required for each SWM pond location. The following recommendations and general comments are provided for consideration for the SWM pond liner design:

- Clay liner materials required should be of high clay-containing soils of low permeability; in the order of 1 x 10^{-6} to 1 x 10^{-7} cm/s to prevent water permeation and maintain their nominal density. There is potential for such native materials to be available from within the development site area, particularly where silty clay non-till soils are present;
- A minimum clay liner thickness of 300 m is considered appropriate at this preliminary stage for pond liner structures, though may be increased if groundwater is present at shallow depths;
- A geo-synthetic liner may be considered as an alternative to the clay liner material if grading or excavation for the required pond liner subgrade presents any issues, groundwater is present at shallow depth, or to ensure total separation of the water retained in the pond from the local groundwater regime. If this alternative is considered then a Bentofix SNRWL Series product is recommended, specifically a Thermal Lock ® Geosynthetic Clay Liner (GCL), consisting of 90% montmorillonite clay as a minimum, with reinforced geotextile upper and lower layers; and,
- Pond side slopes of 4H:1V should be protected from erosion by an appropriate vegetative cover.

10.0 SOIL CORROSIVITY AND SUBSURFACE CONCRETE

10.1 Soil Corrosivity

Twelve selected, composite soil samples were obtained from the boreholes associated with the proposed development and submitted to Paracel Laboratories for analysis of pH, soil conductivity, resistivity and concentrations of sulphates, and chlorides (Soil Corrosivity).

The American Water Works Association (AWWA) document, "*Polyethylene Encasement for Ductile-Iron Pipe Systems*" *ANSI/AWWA C105/A21.5-18,* dated December 1, 2018, uses a 10-point scoring method to determine the soil corrosivity potential. For each given soil sample, points were assigned to the different parameters to evaluate their contribution towards the corrosivity of soil.

The test results are provided in Appendix E and are summarized in Table 10.1.1.

Table 10.1.1: Results of Soil Corrosivity Testing

Borehole and Sample ID	Chloride (µg/g)	Sulphate (µg/g)	pH (pH units)	Resistivity (ohm.cm)	Moisture (%)	Total ANSI/AWWA Points
BH1 - SS4 and SS5	<10	199	7.78	3530	18.1	1
BH3 - SS4 and SS5	<10	962	7.78	1270	23.5	3
BH4 - SS3 and SS5	<10	199	7.78	3530	18.1	1
BH6 - SS4 and SS5	<10	962	7.78	1270	23.5	3
BH8 - SS4 and SS5	<10	199	7.78	3530	18.1	1
BH9 - SS3 and SS5	<10	962	7.78	1270	23.5	3
BH10 - SS3 and SS5	<10	199	7.78	3530	18.1	1
BH11 - SS3 and SS5	<10	962	7.78	1270	23.5	3
BH13 - SS3 and SS5	<10	199	7.78	3530	18.1	1
BH16 - SS3 and SS5	<10	962	7.78	1270	23.5	3
BH17 - SS6 and SS7	<10	199	7.78	3530	18.1	1
BH20 - SS6 and SS7	<10	962	7.78	1270	23.5	3

Corrosion protection for buried ductile-iron pipes is recommended, when a score of 10 points or greater is reported. Based on the total ANSI/AWWA values above of 1 to 3, ductile-iron pipes used at the site will not require corrosion protective measures such as cathodic protection. It should be noted that the analytical results only provide an indication of the potential for corrosion.

The contribution of chloride ions to soil corrosivity towards buried metallic improvements or steel structures is very significant. According to the Corrosion Guidelines (Caltrans, January 2015, version 2.1), a site is considered corrosive if, "*chloride concentration is 500 ppm or greater, sulphate concentration is 2,000 ppm or greater, or the pH is 5.5 or less*. "

In addition, the Canadian Standards Association (CSA) A23.1-14 "*Concrete materials and methods of concrete construction*", Table 3, "*Additional requirements for concrete subjected to sulphate attack*", states that design requirements for sulphate resistant concrete are only necessary when the water-soluble sulphate content of the soil in which the concrete is to be embedded is greater than 0.1 % (1,000 µg/g).

The representative soil samples at the site are reported to contain chloride ion concentrations of <10 µg/g (<0.01 %), and sulphate concentrations between 199 µg/g (0.0199 %) and 962 µg/g (0.0962 %). These equate to an average of <10 µg/g and 581 µg/g, respectively, and indicate a very limited, local potential (i.e., "*low risk*") of sulphate attack on buried reinforced concrete structures.

10.2 Concrete Class Considerations

The requirements for subsurface concrete subject to a sulphate and chloride environment are presented in Canadian Standards Association specification, CSA A23.1-14 *"Concrete Materials and Methods of Concrete Construction, Tables 1-4"*. Experience in the area indicates that the native soils generally have a mild sulphate environment and a low chloride concentration. It is recommended that subsurface concrete at the site have the characteristics for normal (GU) Portland cement.

For parking garage decks and ramps where proposed, it is recommended that the concrete exposure class be C-1 and the concrete have the following minimum properties:

- minimum 56-day compressive strength: 35 MPa;
- maximum water to cement ratio: 0.40;
- chloride ion penetrability requirement: < 1500 coulombs (within 91 days)
- cementing materials: GU (general use hydraulic cement) or GUb (blended general use)
- air content: as per CSA A23.1-14 Table 4, air content category 1 (freeze-thaw environment)

The concrete should be placed without segregation and should be consolidated to achieve a uniform dense mass.

10.3 Methods for Specifying Concrete

Alternative methods of specifying concrete for a project are outlined in CSA A23.1-14 and allow for "*Performance*" or "*Prescription*" based methods. Each method attaches different levels of responsibility to the owner, the contractor, and the concrete supplier. The pros and cons of each method should be examined prior to completion of the specifications for the project.

11.0 SOIL MANAGEMENT CONSIDERATIONS

It is anticipated that the various parcels of development at the site will involve some element of cut and fill operations. From a geotechnical perspective, and in order to optimize the use of the on-site soils, a Soil Management Plan should be established in accordance with the requirements of Ontario Regulation (herein "*O. Reg.*") 406/19 for excess soils and O. Reg. 153/04 for soil stockpiles.

The plan objective should be to achieve a self-sustainable development with respect to excavated materials and control the placement of organic soils so that there is negligible impact on the settlement performance of the compacted fill material. The soil management criteria should be per the following sections, as a minimum:

11.1 Organic and Deleterious Materials

Surface vegetation, topsoil and organic soils should not be placed within the proposed roadways, below finished subgrade level for pavement construction or building limits. These materials should be placed in landscaped areas where settlements are not critical.

11.2 Materials Reuse Management

11.2.1 Fill Compaction Requirements

Excavated soils for structural fill in pavement areas and building floor slab areas, which do not have topsoil or organic matter and are compactable with moisture contents within 2 % to 3 % of the optimum value, should be placed and compacted to a target density of 97 % of the SPMDD with no individual test result below 95 % SPMDD.

If engineered fill is required to support building foundations:

- the engineered fill should be placed and compacted in lifts to a target density of 100 % SPMDD with no individual tests below 98 % SPMDD; and,
- the soil should be placed in a loose lift thickness not exceeding 250 mm and should be compacted using a large (10 ton or larger) pad-foot type roller with vibratory capability.

If engineered fill to support building foundations is being considered, it is recommended that a pre-construction meeting be scheduled to review the proposed fill materials, fill placement and compaction procedures, and the testing and inspection requirements.

Soils to be placed in landscaped areas where settlements are not critical should receive nominal compaction effort in order to achieve at least 90 % of the SPMDD.

11.2.2 Structural Fill Subgrades

Prior to the placement of any structural fill materials, the exposed subgrade soil should be inspected and proof-rolled using a loaded tandem axle truck and traversing the exposed subgrade for full coverage. The proof-rolling should be monitored by a geotechnical representative of this office to delineate any soft areas which may require repair.

12.0 PAVEMENT CONSIDERATIONS

12.1 Private At-Grade Asphalt Pavement Design Considerations

Though no design plans have been provided to Landtek at the time of issue of this report, the proposed development is anticipated to include both Municipally adopted and private pavement structures. Private pavements are expected to include new access routes, condominium road and deck pavements.

Recommended pavement structure layer thicknesses for private pavements are provided in Table 12.1.1. The recommended pavement design section considers the accepted design practice that the total pavement structure thickness should meet or exceed one-half the anticipated depth of frost penetration for the geographical area (i.e., approximately 1.2 m) or as close as practicable.

Table 12.1.1: Recommended Private Asphalt Pavement Structure Layer Thicknesses

Pavement Layer	Light Duty Pavement Areas	Access and Fire Routes
Surface Course Asphalt OPSS HL 3	40 mm	40 mm
Binder Course Asphalt OPSS HL 8	50 mm	60 mm
Granular Base OPSS Granular A	150 mm	150 mm
Granular Subbase OPSS Granular B, Type II	300 mm[1]	350 mm[1]
Total Thickness	540 mm	600 mm

Notes:

1. If construction proceeds late in the year (i.e., November and December), the design thickness of pavement granular materials may have to be increased to address potential problems with subgrade instability and facilitate construction vehicle and truck access.

12.2 Municipal At-Grade Asphalt Pavement Design Considerations

It is anticipated that Municipally adopted pavements to be constructed for the development will comprise primarily of ‘residential local’ or ‘residential collector’ road pavement classifications.

The full-depth pavement structure designs presented in Table 12.2.1 are the standard designs presented by the City of Hamilton’s document “*Pavement Design and Rehabilitation Criteria*”, dated 2023.

Table 12.2.1: Recommended Municipal Pavement Structure Layer Thicknesses

Pavement Layer	Pavement Material	City of Hamilton Pavement Class	
		Residential Local	Residential Collector
Surface Course	SP12.5 (Traffic Category C)	40	40
Binder Course	SP19.0 (Traffic Category C)	80	100
Base Course	OPSS Granular A	150	150
Subbase Course	OPSS Granular B Type II	300	300
	Total Thickness	±570 mm	±590 mm

12.3 Sub-grade Preparation and Drainage

The overall performance of the pavement structure will greatly depend upon the support provided by the developed subgrade. A number of factors should be considered at the construction stages to ensure that an acceptable subgrade condition is developed and maintained:

- Sub-drains should be installed and should be 100 mm diameter perforated plastic pipe, with outfalls to catch basins at a continuous and uniform grade. The sub-drains and associated connections are to be installed in accordance with the City of Hamilton's Engineering Standards or OPSD 216.01;
- Any soft areas of notable deflection to the subgrade should be sub-excavated and replaced with a suitable backfill material approved by a qualified Geotechnical Engineer and compacted to 98 % of its SPMDD;
- The subgrade should be properly shaped, crowned and then proof-rolled under the full-time observation of a geotechnical representative of this office to delineate any soft areas which may require repair before placing the granular materials; and,
- Surface water should not be allowed to pond on the surface of or adjacent to the outside edges of any developed subgrade.

Should pavements proposed for the development be constructed as a two-stage paving operation it will be important to ensure that the following is undertaken to develop the surface of the binder course being used as a "*temporary*" surface during the construction phase:

- The surface is thoroughly cleaned and power washed to remove all residual contaminants;
- All deficiencies are corrected to meet the required design specifications; and,
- A suitable tack coat is appropriately applied immediately prior to the placement of the upper asphaltic concrete course(s).

Such preparatory works are to be completed in accordance with the appropriate OPSS, as required.

12.4 Deck Pavement Design Considerations

It is understood that the proposed development will include for medium-and high-rise structures and are likely to include for multiple level of basement parking that cover the structure footprint in full. Pavements for such structured are anticipated to be deck structures rather than standalone or at-grade pavements.

Such deck pavements should comprise a minimum 50 mm cover of OPSS HL 3 asphalt. The bedding or grading material to be placed between the concrete deck and the asphalt pavement surface should comprise either blinding sand or OPSS Granular A material, depending on the thickness of the layer required.

12.5 Pavement Materials

12.5.1 Granular Base Course

If the option with granular base material is used, the granular base course material should meet OPSS Granular "A" specifications. Quarried 20 mm limestone crushed to Granular "A" gradation specifications is recommended.

12.5.2 Hot Mix Asphalt

The surface and binder course asphalt of private pavement structures should meet current specifications for HL 3 and HL 8, respectively, as prescribed by the City of Hamilton or, alternatively, OPSS 1150.

For Municipal pavement structures, the binder course and surface course asphalt should meet current specifications for SP19.0 Traffic Category C and SP12.5 Traffic Category C, respectively per the City of Hamilton's Engineering Standards Form 800.

The standard asphalt binder grade for the climate conditions in Hamilton is PG 58-28. Given the anticipated low volume of commercial truck traffic it is considered that there is no requirement for a bump up to a higher PG grade of asphalt cement.

12.5.3 Material Placement and Compaction

The placing, spreading and rolling of the asphalt should be in accordance with current provincial standards or the City of Hamilton's Engineering Standards Form 800.

Granular base course and subbase course fill material should be compacted to 100 % SPMDD. Hot mix asphalt should be compacted to the criteria set out by the City of Hamilton's Engineering Standards Form 800.

Connections and tie-ins to existing pavement structures should be completed in accordance with OPSS.MUNI.310.

12.6 Sidewalk Considerations

Sidewalk and Multi-Use Pavement Considerations

The design and construction of concrete sidewalks should be completed to the satisfaction of the City of Hamilton's Engineering Standards, and as detailed in Table 12.6.1. The concrete and aggregates should be produced and placed to meet those standards also stipulated by the City of Hamilton's Engineering Standards.

Table 12.6.1: Recommended Minimum Concrete Sidewalk Specifications

Materials	Compaction Requirements	Layer Thickness
Normal Portland GU (32 MPa) (CAN3-CSA A23.1) - Class C-2	N/A	125 mm
Granular "A" Base	95 % SPMDD*	150 mm

* Standard Proctor Maximum Dry Density

Construction joints in concrete sidewalks should be properly sealed (e.g., bitumen filler) to minimize the water migration

It should be noted that the concrete sidewalk design specified in Table 12.6.1 addresses a use by pedestrian traffic only and does not include for use by vehicular traffic. For multi-use sidewalk pavements (i.e., where both pedestrian and bicycle traffic is to be accommodated), the following Table 12.6.2 provides the recommended pavement structure design.

Table 12.6.2: Recommended Multi-Use Sidewalk Pavement Specifications

Pavement Layer	Pavement Material	Recommended Layer Thickness
Surface Course	SP12.5 (Traffic Category C)	80 mm
Granular Base	OPSS Granular "A"	400 mm

The subgrade conditions and bearing strength may be variable along the sidewalk section and some subgrade improvements should be anticipated. It is recommended that prior to the placement of pavement granular fill, the exposed subgrade soil should be inspected and proof-rolled using a loaded tandem axle truck to traverse the exposed subgrade and provide for full coverage. The proof-rolling should be monitored by a geotechnical representative of this office to delineate any soft areas which may require repair. Repairs should be undertaken to avoid creating "*bathtub*" conditions in the subgrade within the pavement structure.

Where finished sidewalks are on level ground, and to ensure that they remain free of ponding water, a final slope/gradient of the sidewalk surface of at least 2 % should be maintained.

13.0 CLOSURE

The Limitations of Report, as stated in Appendix A, are an integral part of this report.

Soil samples will be retained and stored by Landtek for a period of three months after the report is issued. The samples will be disposed of at the end of the three-month period unless a written request from the client to extend the storage period is received.

We trust this report will be of assistance with the design and construction of the proposed development. Should you have any questions, please do not hesitate to contact our office.

Yours sincerely,

LANDTEK LIMITED

....	....
James Dann, B. Eng. (Hons.) ACSM	Ralph Di Cienzo, P. Eng.
Manager, Geotechnical Projects	*Consulting Engineer*

APPENDIX A
LIMITATIONS OF REPORT

The conclusions and recommendations given in this report are based on information determined at the borehole locations. Subsurface and ground water conditions between and beyond the Boreholes may be different from those encountered at the borehole locations, and conditions may become apparent during construction that could not be detected or anticipated at the time of the geotechnical investigation. It is recommended practice that Landtek be retained during construction to confirm that the subsurface conditions throughout the site are consistent with the conditions encountered in the Boreholes.

The comments made in this report on potential construction problems and possible remedial methods are intended only for the guidance of the designer. The number of Boreholes may not be sufficient to determine all the factors that may influence construction methods and costs. For example, the thickness and quality of surficial topsoil or fill layers may vary markedly and unpredictably. Additionally, bedrock contact depths throughout the site may vary significantly from what was encountered at the exact borehole locations. Contractors bidding on the project, or undertaking construction on the site should make their own interpretation of the factual borehole information, and establish their own conclusions as to how the subsurface conditions may affect their work.

The survey elevations in the report were obtained by Landtek Limited or others, and are strictly for use by Landtek in the preparation of the geotechnical report. The elevations should not be used by any other parties for any other purpose.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Landtek Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

This report does not reflect environmental issues or concerns related to the property unless otherwise stated in the report. The design recommendations given in the report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known, it is recommended that Landtek Limited be retained during the final design stage to verify that the design is consistent with the report recommendations, and that the assumptions made in the report are still valid.

APPENDIX B
SYMBOLS AND TERMS USED IN THE REPORT

CLAY	SILT	SAND	GRAVEL	FILL	ORGANIC SOIL	PEAT	TILL	SHALE	LIMESTONE
▨	▨	▨	▨	▨	▨	▨	▨	▨	▨

RELATIVE PROPORTIONS

Term	Range
Trace	0 - 5%
A Little	5 – 15%
Some	15 – 30%
With	30 – 50%

CLASSIFICATION BY PARTICLE SIZE

Boulder -------------------- > 200 mm
Cobble --------------------- 80 mm – 200 mm
Gravel -
    Coarse ---------- 19 mm – 80 mm
    Fine ------------- 4.75 mm – 19 mm
Sand -
    Coarse ---------- 4.75 mm – 2 mm
    Medium -------- 2 mm – 0.425 mm
    Fine ------------- 0.425 mm – 0.75 mm
Silt ------------------------- 0.075 mm – 0.002 mm
Clay ------------------------ < 0.002 mm

DENSITY OF NON-COHESIVE SOILS

Descriptive Term	Relative Density	Standard Penetration Test
Very Loose	0 – 15%	0 – 4 Blows Per 300 mm Penetration
Loose	15 – 35%	4 – 10 Blows Per 300 mm Penetration
Compact	35 – 65%	10 – 30 Blows Per 300 mm Penetration
Dense	65 – 85%	30 – 50 Blows Per 300 mm Penetration
Very Dense	85 – 100%	Over 50 Blows Per 300 mm Penetration

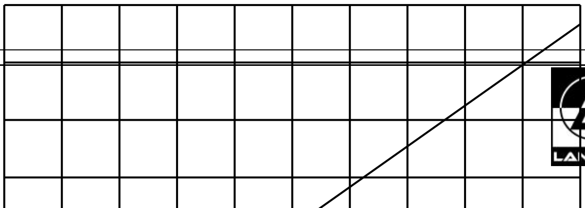
CONSISTENCY OF COHESIVE SOILS

Descriptive Term	Undrained Shear Strength kPa (psf)	N Value Standard Penetration Test	Remarks
Very Soft	< 12 (< 250)	< 2	Can penetrate with fist
Soft	12 – 25 (250 – 500)	2 – 4	Can indent with fist
Firm	25 – 50 (500 –1000)	4 – 8	Can penetrate with thumb
Stiff	50 – 100 (1000 – 2000)	8 – 15	Can indent with thumb
Very Stiff	100 – 200 (2000 – 4000)	15 – 30	Can indent with thumb-nail
Hard	> 200 (> 4000)	> 30	Can indent with thumb-nail

Notes: 1. Relative density determined by standard laboratory tests.
2. N value – blows/300 mm penetration of a 623 N (140 Lb.) hammer falling 760 mm (30 in.) on a 50 mm O.D. split spoon soil sampler. The split spoon sampler is driven 450 mm (18 in.) or 610 mm (24 in.). The “N” value is the Standard Penetration Test (SPT) value and is normally taken as the number of blows to advance the sampler the last 300 mm.

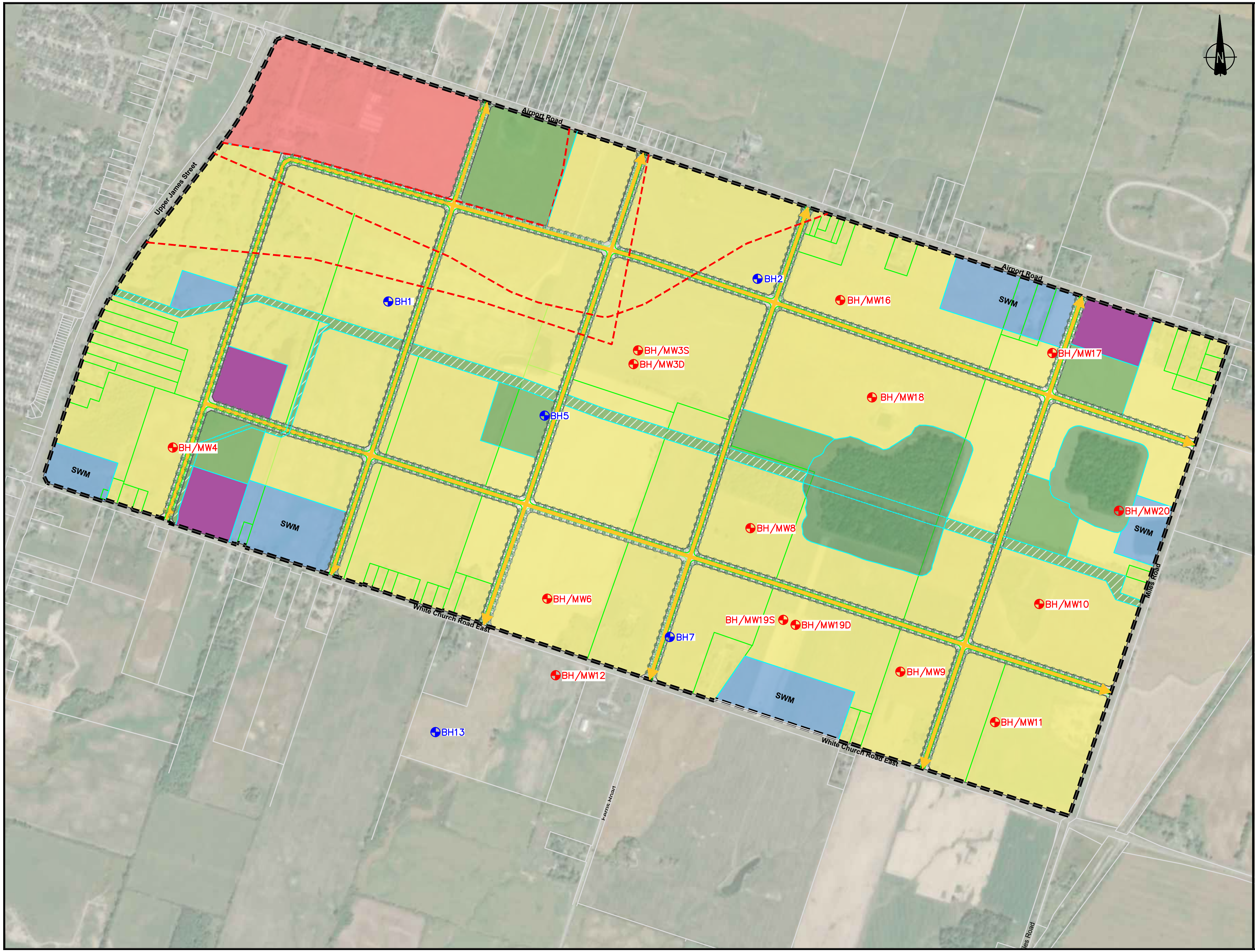
APPENDIX B CONTINUED
CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES
ASTM Designation: D 2487 - 69 AND D 2488 – 69
(Unified Soil Classification System)

Major Divisions			Group Symbols	Typical Names	Classification Criteria		
Coarse-grained soils More than 50% retained on No. 200 sieve *	Gravels 50% or more of coarse fraction retained on No. 4 sieve	Clean gravels	**GW**	Well-graded gravels and gravel-sand mixtures, little or no fines	Classification on basis of percentage of fines Less than 5% pass No. 200 sieve . . . . . . GW, GP, SW, SP More than 12% pass No. 200 sieve . . . . . GM, GC, SM, SC 5 to 12% pass No.200 sieve . . . . Borderline classifications requiring use of dual symbols	C_u=D60/D10 greater than 4; C_z = $(D30)^2/(D10xD60)$ between 1 and 3	
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines		Not meeting both criteria for GW	
		Gravels with fines	**GM**	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
	Sands More than 50% of coarse fraction passes No. 4 sieve	Clean Sands	**SW**	Well-graded sands and gravelly sands, little or no fines		C_u=D60/D10 greater than 6; C_z = $(D30)^2/$ (D10xD60) between 1 and 3	
			SP	Poorly graded sands and gravelly sands, little or no fines		Not meeting both criteria for SW	
		Sands with fines	**SM**	Silty sands, sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
Fine-grained soils 50% or more passes No. 200 sieve *	Silts and clays Liquid limit 50% or less		**ML**	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	Plasticity Chart For classification of fine-grained soils and fine fraction of coarse-grained soils. Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols. Equation of A-line: PI=0.73 (LL-20)		
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silts			
			OL	Organic silts and organic silts of low plasticity			
	Silts and clays Liquid limit greater than 50%		**MH**	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts			
			CH	Inorganic clays of high plasticity, fat clays			
			OH	Organic clays of medium to high plasticity			
	Highly organic soils		**Pt**	Peat, much and other highly organic soils	* Based on the material passing the 3 in. (76mm) sieve.		



APPENDIX C

DRAWING 23354-01 – EXPLORATORY HOLE LOCATION PLAN
BOREHOLE LOGS



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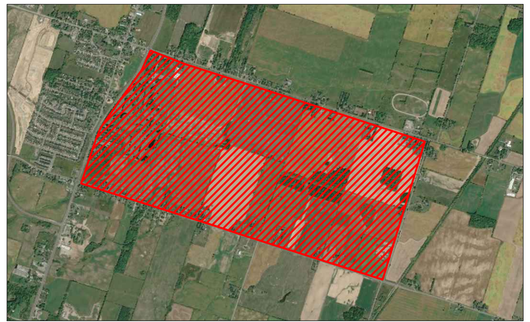
project location



Key plan an extract from Google Earth Pro©

Key:

●	Approximate location of boreholes drilled by Landtek Limited between 3 and 8 july 2024.
●	Approximate location of monitoring wells installed by Landtek Limited between 3 july and 8 august 2024.
🟨	Future Residential Development
🟥	Future Commercial Development
🟪	Future Institutional Development
🟩	Existing and Future Greenspace (Woodland, Parkland)

Notes:

Base plan taken from the drawing "*White Church Boundary Expansion Area*", as issued by Urban Solutions Planning & Land Development, with a background extract provided by A. T. McLaren and Aerial Imagery from Google Earth Pro©.

revisions/submissions

#	date	description
1	7 july 2024	issued for draft report
2	28 october 2024	updated property boundary
3	2 december 2024	updated property boundary

client
White Church Landowners
Group Inc.

municipality
The Corporation of the
City of Hamilton

project
Geotechnical Investigation
White Church Lands

sheet
Borehole and Monitoring Well
Location Plan

date: 7 july 2024
drawn: mdc
checked: jd
project #: 23354
scale: 1:10,000

23354-01

LOG OF BOREHOLE BH1

SHEET 1 of 1

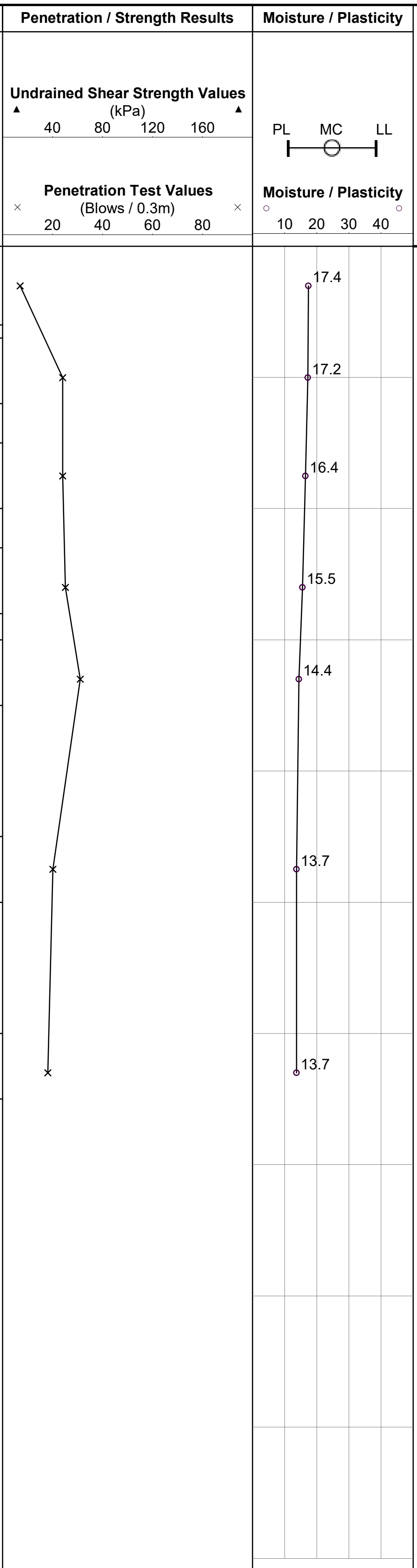
Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-03-11
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.149397
Easting: -79.908197
Ground Surface Elevation: 0

Subsurface Conditions: Description	Samples: Number	Type	Blow Counts/150 mm	N Value
Organic Material ~100 mm. Clayey silt, some organics. Brown, moist.	1	SS	1 1 6 7	7
Clayey Silt Till some grey clay seams, trace gravel. Firm, brown, moist.				
Silt Till some iron staining, trace gravel. Compact, brown, moist.	2	SS	7 9 15	24
	3	SS	8 10 14	24
Clayey Silt Till trace gravel, trace cobbles, trace iron staining. Very stiff, brown, moist.	4	SS	6 10 15	25
...with iron staining. Hard, brown and grey.	5	SS	16 15 16	31
...no cobbles, no iron staining, some gravel. Very stiff, grey.	6	SS	7 9 11	20
...trace gravel.	7	SS	6 8 10	18
End of Log				

Depth Scale (m): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10
Depth/Elevation (m): -1.0, -2.0, -3.0, -4.0, -5.0, -6.0, -7.0, -8.0, -9.0, -10.0



Well Details | Groundwater Conditions | Headspace / PID (ppm) [LEL(%)] / ppm | Comments

Additional Notes:
1. Borehole open to approximately 6.0 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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Hamilton, Ontario, L8W 2E1
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LOG OF BOREHOLE BH2

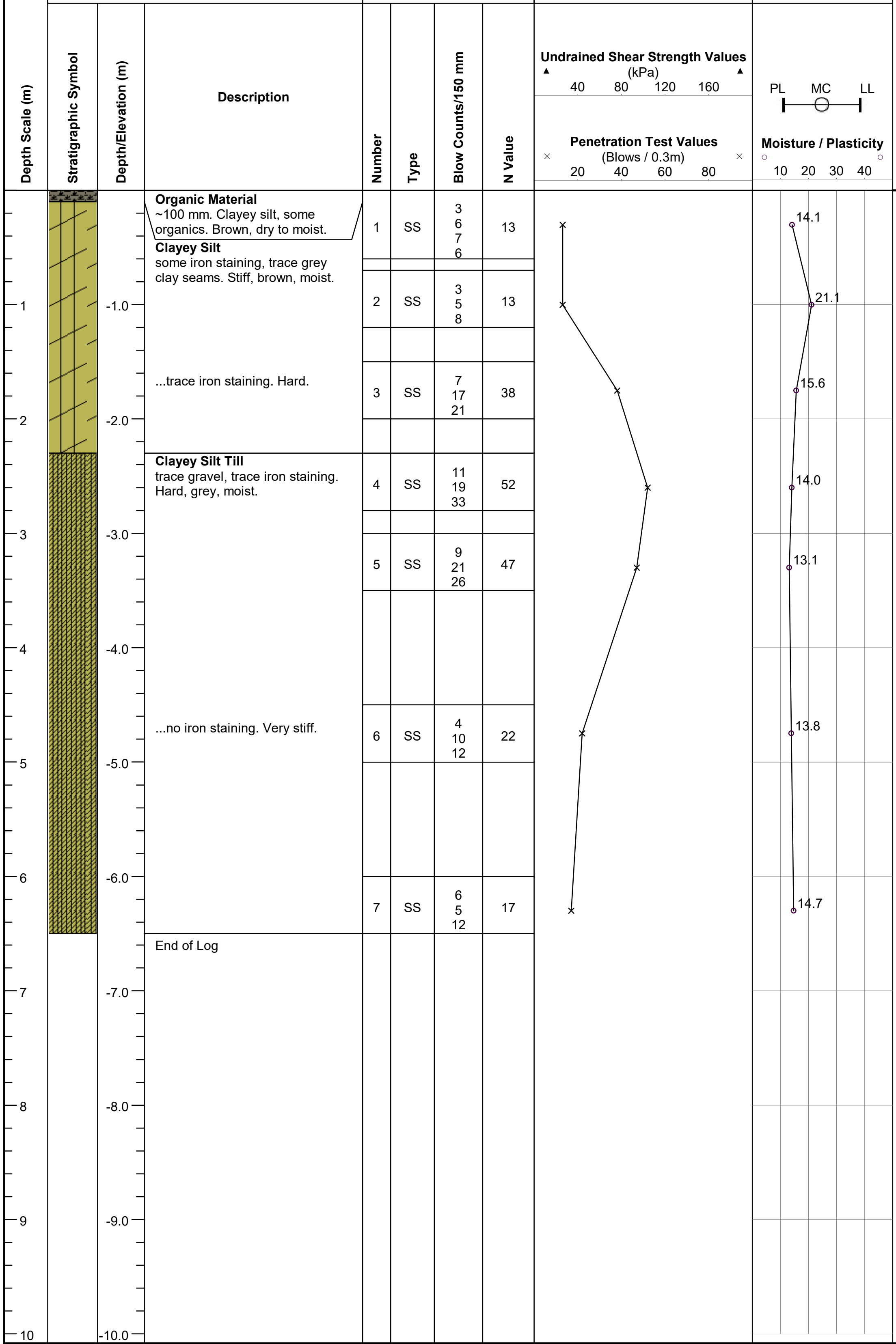
SHEET 1 of 1

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-07-04
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.149763
Easting: -79.896422
Ground Surface Elevation: 0

Depth/Elevation (m)	Description	Number	Type	Blow Counts/150 mm	N Value
0.0	**Organic Material** ~100 mm. Clayey silt, some organics. Brown, dry to moist.	1	SS	3 6 7 6	13
	Clayey Silt some iron staining, trace grey clay seams. Stiff, brown, moist.	2	SS	3 5 8	13
	...trace iron staining. Hard.	3	SS	7 17 21	38
	Clayey Silt Till trace gravel, trace iron staining. Hard, grey, moist.	4	SS	11 19 33	52
		5	SS	9 21 26	47
	...no iron staining. Very stiff.	6	SS	4 10 12	22
		7	SS	6 5 12	17
	End of Log				



Additional Notes:
1. Borehole open to approximately 6.0 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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LOG OF BOREHOLE BH3D

SHEET 1 of 1

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-07-04
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.148164
Easting: -79.900243
Ground Surface Elevation: 0

Subsurface Conditions

Organic Material
~100 mm. Clayey silt, some organics. Brown, dry to moist.

Clayey Silt
trace grey clay seams. Stiff, brown, moist.
...very stiff.

Clayey Silt Till
some grey clay seams, trace gravel. Very stiff, brown, moist.

...hard.

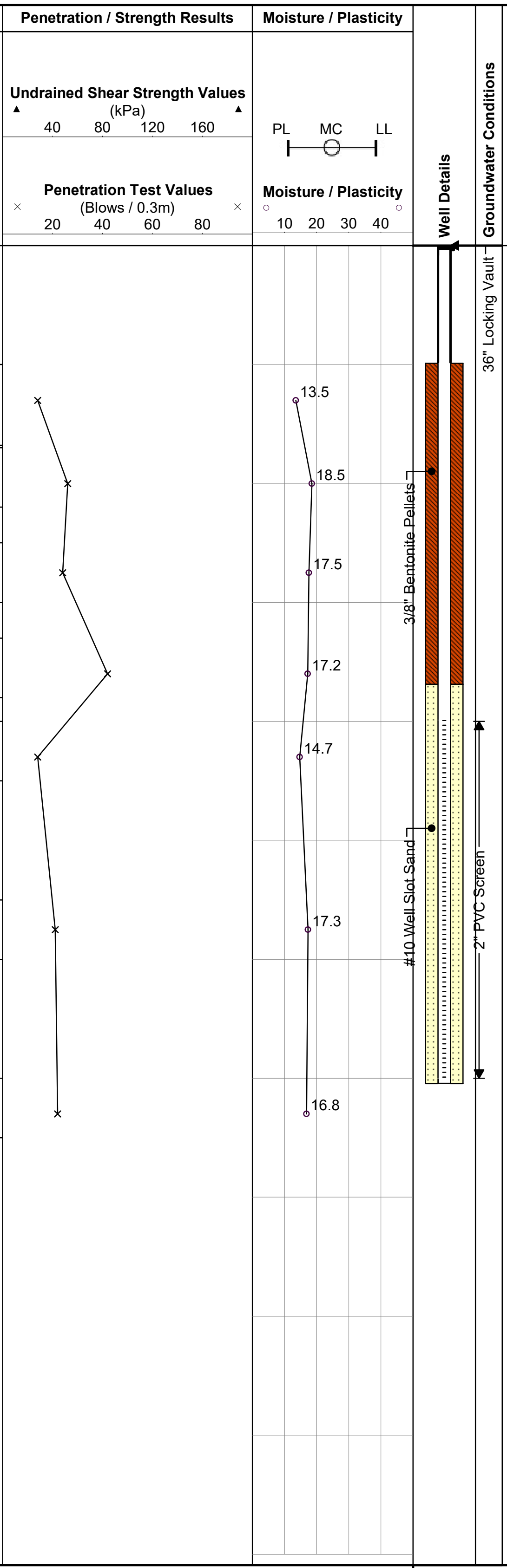
Silt Till
some clay, trace gravel. Dense, grey, wet.

...compact.

End of Log

Samples

Number	Type	Blow Counts/150 mm	N Value
1	SS	3 5 9 12	14
2	SS	5 9 17	26
3	SS	6 9 15	24
4	SS	7 17 25	42
5	SS	5 6 8	14
6	SS	6 10 11	21
7	SS	4 9 13	22



Headspace / PID (ppm) [LEL(%)] / ppm

Comments

Additional Notes:
1. Borehole open to approximately 6.0 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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LOG OF BOREHOLE BHMW3S

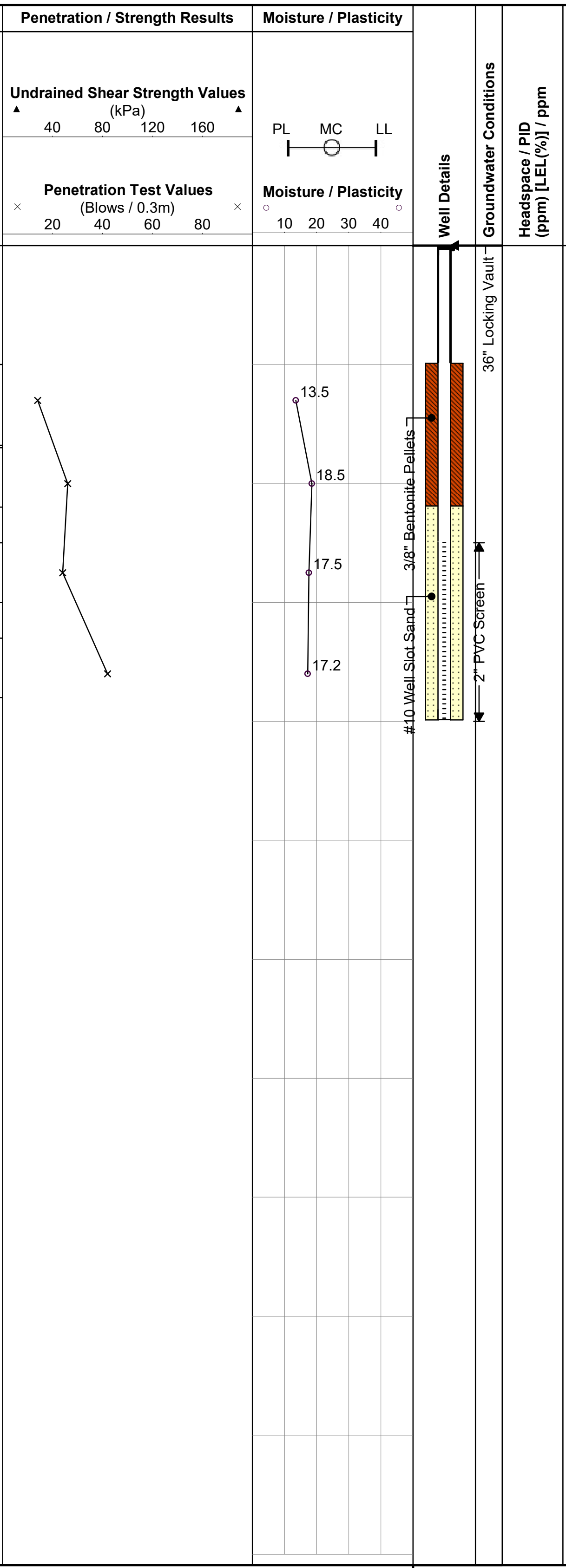
SHEET 1 of 1

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-07-04
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.148049
Easting: -79.900399
Ground Surface Elevation: 0

Depth Scale (m)	Depth/Elevation (m)	Description	Number	Type	Blow Counts/150 mm	N Value
0	0.0	**Organic Material** ~100 mm. Clayey silt, some organics. Brown, dry to moist. **Clayey Silt** trace grey clay seams. Stiff, brown, moist.	1	SS	3 5 9 12	14
1	-1.0	...very stiff.	2	SS	5 9 17	26
		Clayey Silt Till some grey clay seams, trace gravel. Very stiff, brown, moist.	3	SS	6 9 15	24
2	-2.0	...hard.				
		Silt Till some clay, trace gravel. Dense, grey, wet.	4	SS	7 17 25	42
3	-3.0	...compact. End of Log				
4	-4.0					
5	-5.0					
6	-6.0					
7	-7.0					
8	-8.0					
9	-9.0					
10	-10.0					



Comments

Additional Notes:
1. Borehole open to approximately 3.0 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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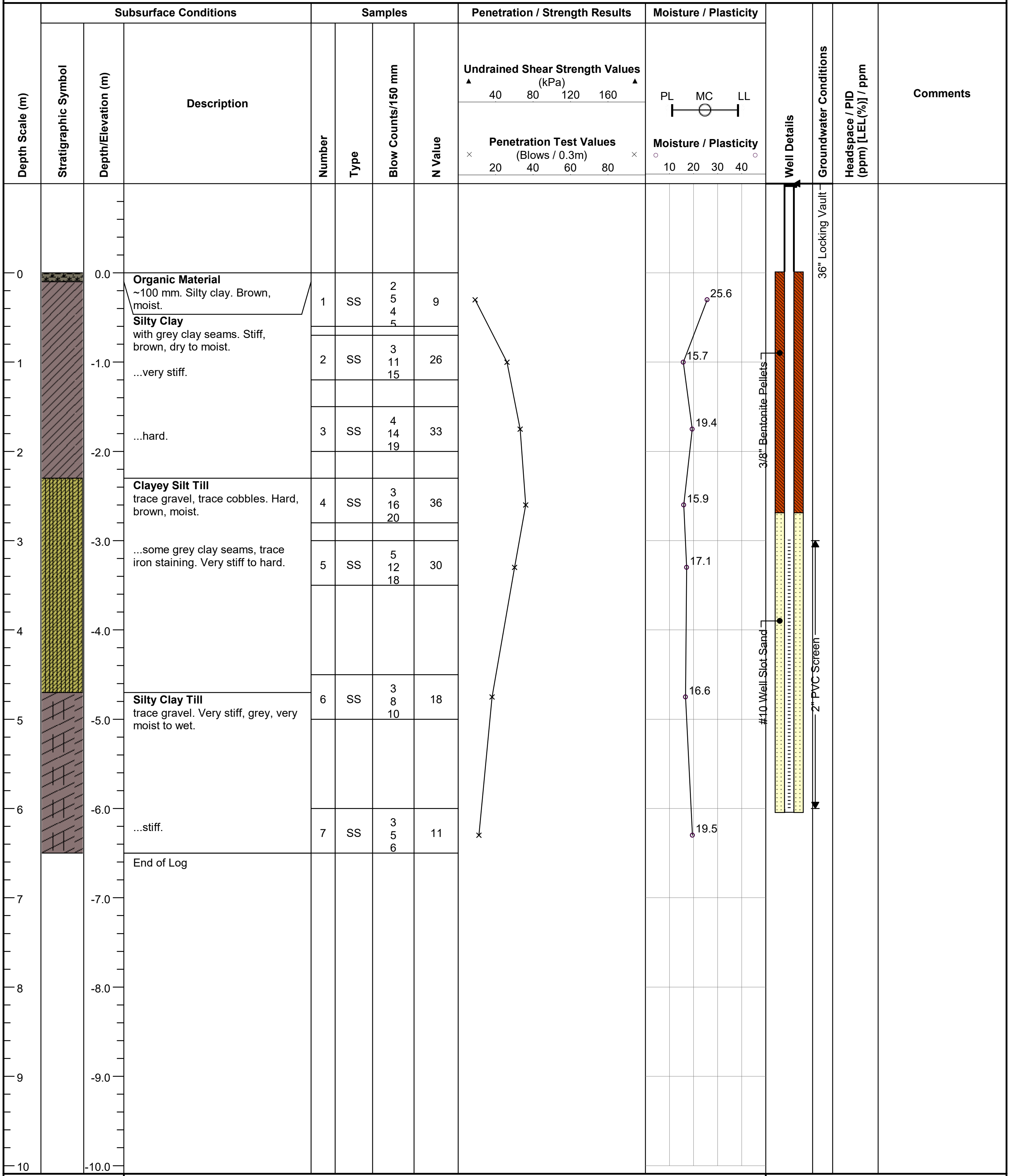
LOG OF BOREHOLE BHMW4

SHEET 1 of 1

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-07-09
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.145765
Easting: -79.915462
Ground Surface Elevation: 0



Depth/Elevation (m)	Description	Number	Type	Blow Counts/150 mm	N Value
0.0	**Organic Material** ~100 mm. Silty clay. Brown, moist. **Silty Clay** with grey clay seams. Stiff, brown, dry to moist.	1	SS	2 5 4 5	9
	...very stiff.	2	SS	3 11 15	26
	...hard.	3	SS	4 14 19	33
	Clayey Silt Till trace gravel, trace cobbles. Hard, brown, moist.	4	SS	3 16 20	36
	...some grey clay seams, trace iron staining. Very stiff to hard.	5	SS	5 12 18	30
	Silty Clay Till trace gravel. Very stiff, grey, very moist to wet.	6	SS	3 8 10	18
	...stiff.	7	SS	3 5 6	11
	End of Log				

Additional Notes:
1. Borehole open to approximately 6.0 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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LOG OF BOREHOLE BH5

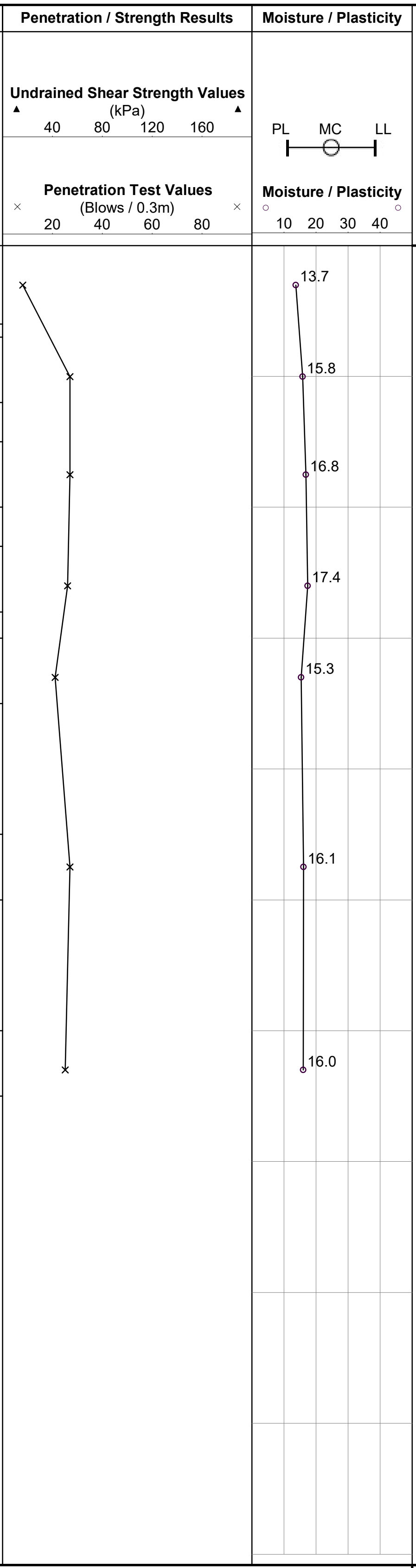
SHEET 1 of 1

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-07-04
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.146519
Easting: -79.903092
Ground Surface Elevation: 0

Depth Scale (m)	Depth/Elevation (m)	Description	Number	Type	Blow Counts/150 mm	N Value	Well Details	Groundwater Conditions	Headspace / PID (ppm) [LEL(%)] / ppm	Comments
		Organic Material ~50 mm. Clayey silt, trace organics. Brown, dry.	1	SS	3 4 4 5	8				
		Clayey Silt trace iron staining. Firm to stiff, brown, dry.								
1	-1.0	...very stiff.	2	SS	5 12 15	27				
		...moist.	3	SS	6 11 16	27				
2	-2.0									
		Clayey Silt Till trace gravel, trace iron staining. Very stiff, brownish grey, moist.	4	SS	5 10 16	26				
3	-3.0		5	SS	6 8 13	21				
4	-4.0									
		...grey, wet.	6	SS	5 12 15	27				
5	-5.0									
6	-6.0	...moist.	7	SS	4 8 17	25				
		End of Log								
7	-7.0									
8	-8.0									
9	-9.0									
10	-10.0									



Additional Notes:
1. Borehole open to approximately 6.0 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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LOG OF BOREHOLE BHMW6

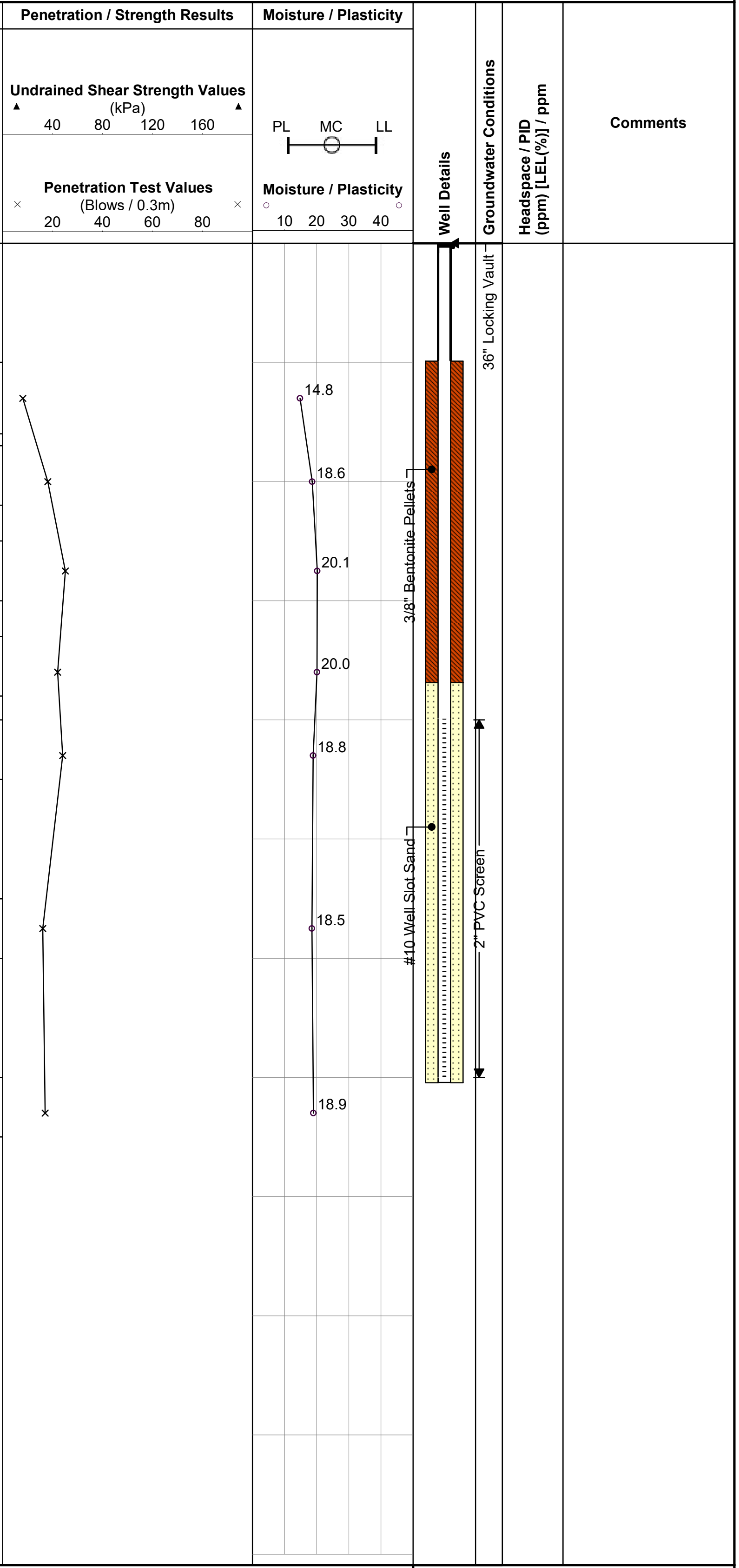
SHEET 1 of 1

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-07-04
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.141969
Easting: -79.903206
Ground Surface Elevation: 0

Depth/Elevation (m)	Description	Number	Type	Blow Counts/150 mm	N Value
0.0	**Organic Material** ~100 mm. Silty clay, trace organics. Brown, dry to moist.	1	SS	4 2 6 3	8
	Clayey Silt some iron staining, trace grey clay seams. Firm to stiff, brown, moist.	2	SS	3 8 10	18
	...very stiff.				
	Silt trace grey clay seams, trace iron staining. Compact, brown, moist.	3	SS	4 10 15	25
	Clayey Silt Till some gravel, some iron staining. Very stiff, grey, moist.	4	SS	6 10 12	22
		5	SS	5 10 14	24
	Silty Clay Till trace gravel. Very stiff, grey, moist.	6	SS	3 8 8	16
		7	SS	4 7 10	17
	End of Log				



Additional Notes:
1. Borehole open to approximately 6.0 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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LOG OF BOREHOLE BH7

SHEET 1 of 1

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-07-05
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.141126
Easting: -79.899115
Ground Surface Elevation: 0

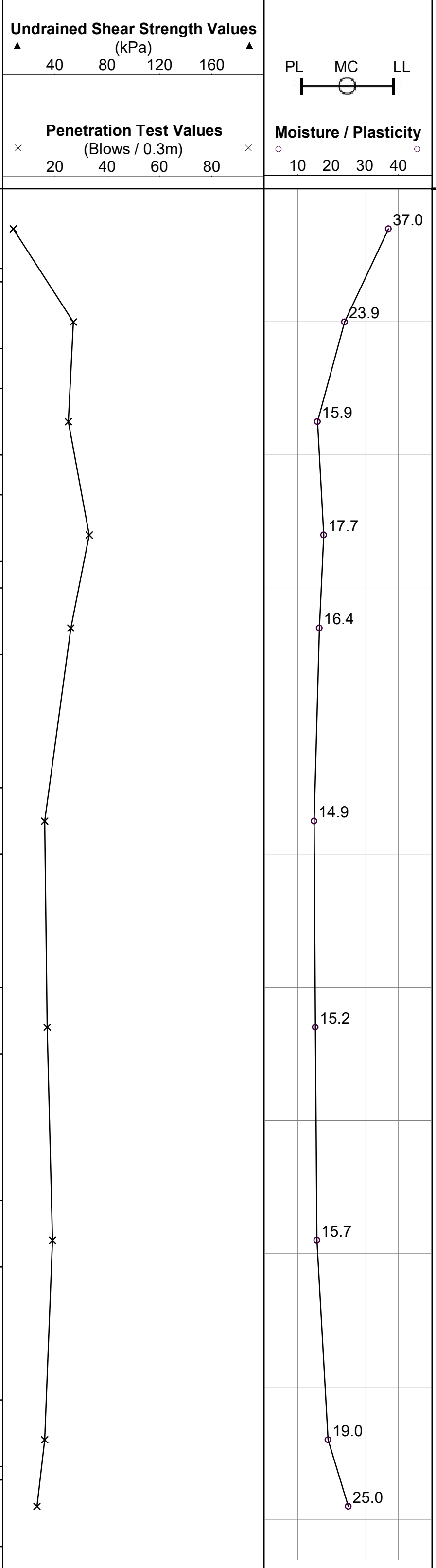
Subsurface Conditions

Depth/Elevation (m)	Description
0.0	**Organic Material** ~100 mm. Silty clay, some organics and wood debris. Brown, moist.
	Clayey Silt trace sand, trace gravel. Soft to firm, brown, dry to moist.
	...very stiff.
	...trace grey clay seams, trace red shale fragments.
-2.1	**Clayey Silt Till** trace gravel. Hard, brown, moist.
	...some iron staining. Very stiff.
	...grey.
	...very moist.
	...stiff, very moist to wet.
-10.2	End of Log

Samples

Number	Type	Blow Counts/150 mm	N Value
1	SS	1 2 2 3	4
2	SS	4 13 14	27
3	SS	5 10 15	25
4	SS	7 13 20	33
5	SS	5 12 14	26
6	SS	4 7 9	16
7	SS	5 7 10	17
8	SS	6 9 10	19
9	SS	3 6 10	16
10	SS	4 5 8	13

Penetration / Strength Results | **Moisture / Plasticity** | **Well Details** | **Groundwater Conditions** | **Headspace / PID (ppm) [LEL(%)] / ppm** | **Comments**



Additional Notes:
1. Borehole open to approximately 9.3 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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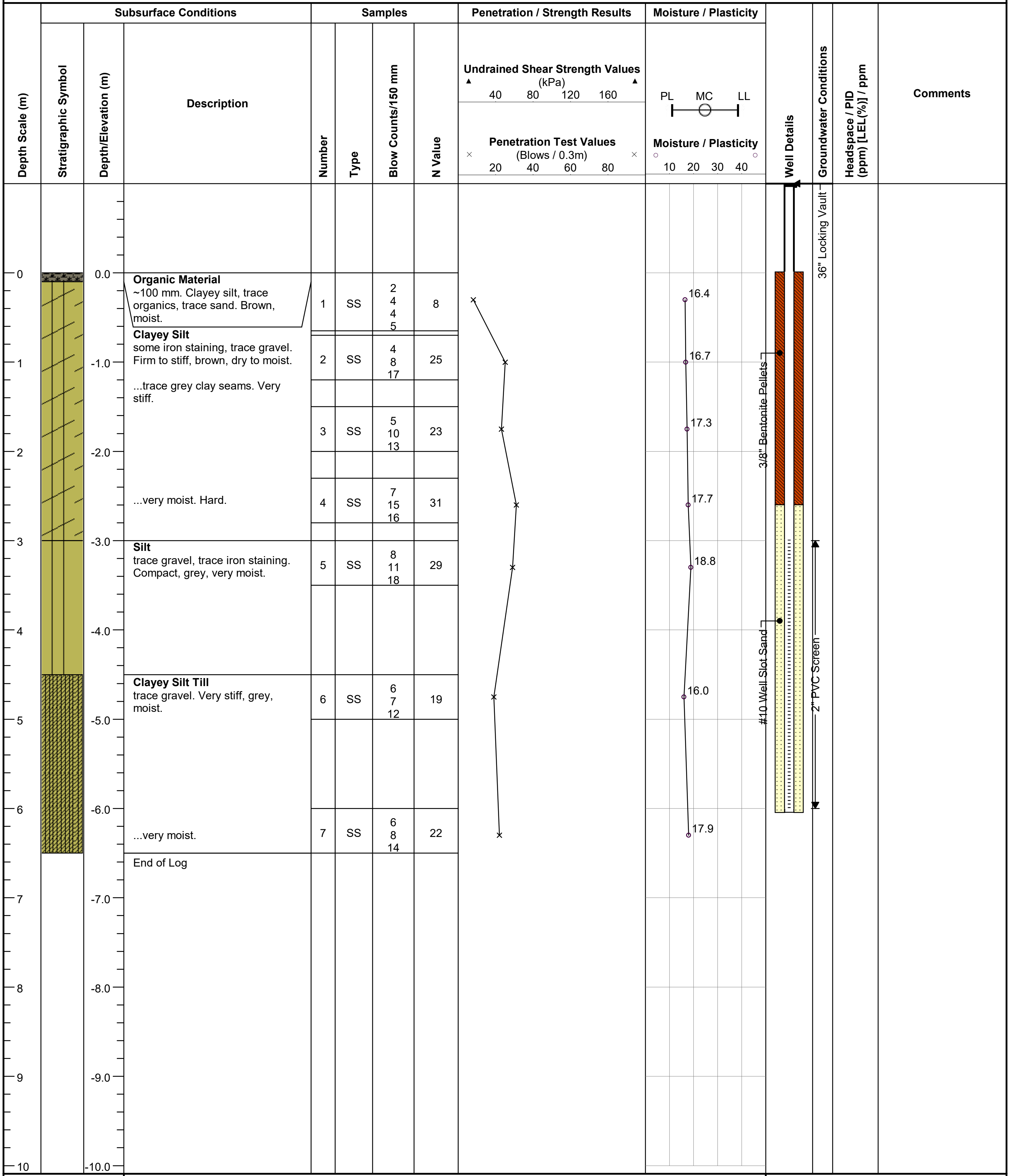
LOG OF BOREHOLE BHMW8

SHEET 1 of 1

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-07-05
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.143731
Easting: -79.896422
Ground Surface Elevation: 0



Description	Number	Type	Blow Counts/150 mm	N Value	Moisture
Organic Material ~100 mm. Clayey silt, trace organics, trace sand. Brown, moist.	1	SS	2 4 4 5	8	16.4
Clayey Silt some iron staining, trace gravel. Firm to stiff, brown, dry to moist.	2	SS	4 8 17	25	16.7
...trace grey clay seams. Very stiff.	3	SS	5 10 13	23	17.3
...very moist. Hard.	4	SS	7 15 16	31	17.7
Silt trace gravel, trace iron staining. Compact, grey, very moist.	5	SS	8 11 18	29	18.8
Clayey Silt Till trace gravel. Very stiff, grey, moist.	6	SS	6 7 12	19	16.0
...very moist.	7	SS	6 8 14	22	17.9
End of Log					

Additional Notes:
1. Borehole open to approximately 6.0 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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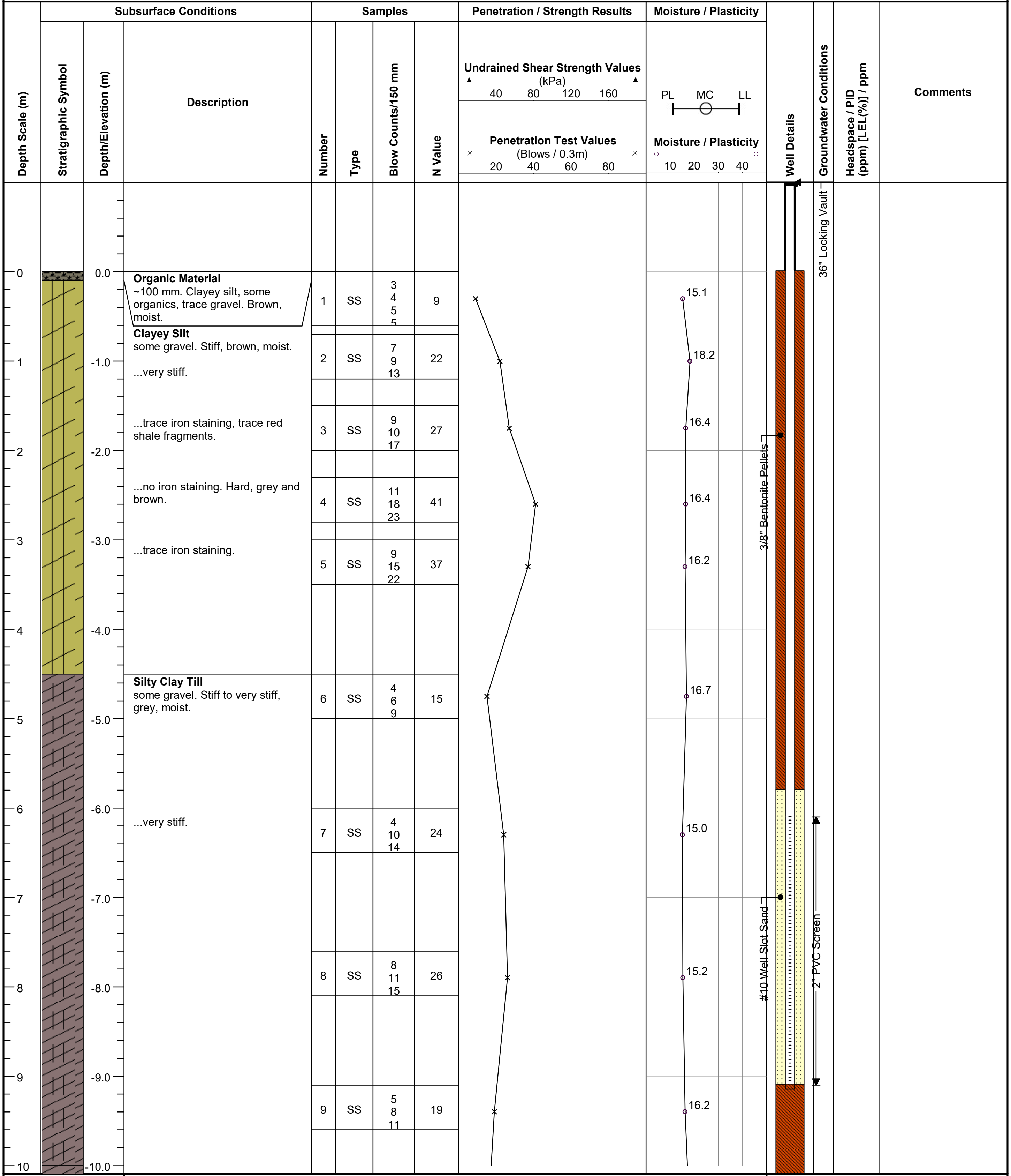
LOG OF BOREHOLE BHMW9

SHEET 1 of 2

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-07-08
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.139595
Easting: -79.892163
Ground Surface Elevation: 0



Description	Number	Type	Blow Counts/150 mm	N Value	Moisture / Plasticity
Organic Material ~100 mm. Clayey silt, some organics, trace gravel. Brown, moist.	1	SS	3 4 5 5	9	15.1
Clayey Silt some gravel. Stiff, brown, moist. ...very stiff.	2	SS	7 9 13	22	18.2
...trace iron staining, trace red shale fragments.	3	SS	9 10 17	27	16.4
...no iron staining. Hard, grey and brown.	4	SS	11 18 23	41	16.4
...trace iron staining.	5	SS	9 15 22	37	16.2
Silty Clay Till some gravel. Stiff to very stiff, grey, moist.	6	SS	4 6 9	15	16.7
...very stiff.	7	SS	4 10 14	24	15.0
	8	SS	8 11 15	26	15.2
	9	SS	5 8 11	19	16.2

Additional Notes:
1. Borehole open to approximately 12.1 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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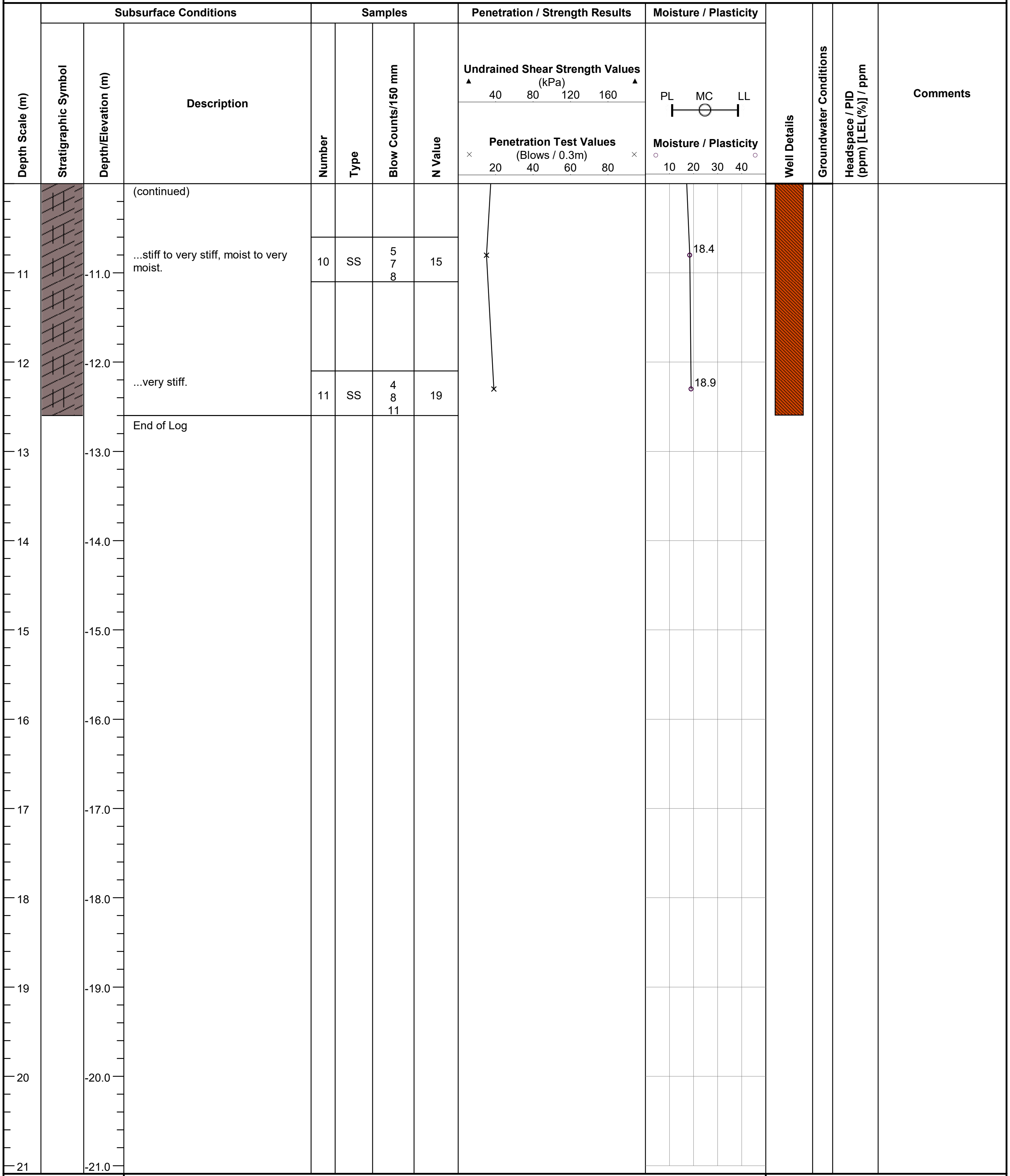
LOG OF BOREHOLE BHMW9

SHEET 2 of 2

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-07-08
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.139595
Easting: -79.892163
Ground Surface Elevation: 0



Description	Number	Type	Blow Counts/150 mm	N Value	Moisture (%)
(continued)					
...stiff to very stiff, moist to very moist.	10	SS	5 7 8	15	18.4
...very stiff.	11	SS	4 8 11	19	18.9
End of Log					

Additional Notes:
1. Borehole open to approximately 12.1 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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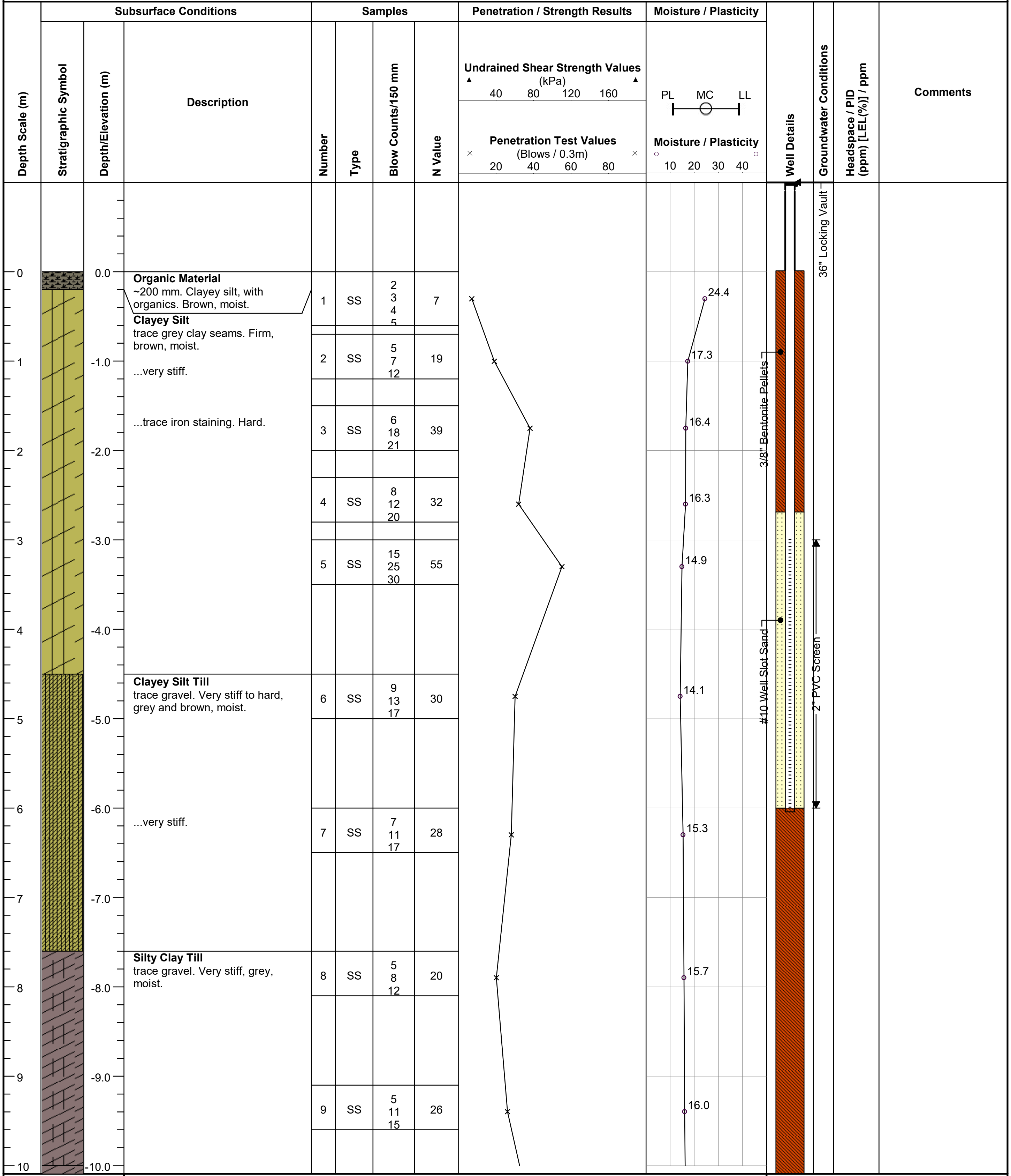
LOG OF BOREHOLE BHMW10

SHEET 1 of 2

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-07-08
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.142154
Easting: -79.886746
Ground Surface Elevation: 0



Depth/Elevation (m)	Description
0.0	**Organic Material** ~200 mm. Clayey silt, with organics. Brown, moist.
	Clayey Silt trace grey clay seams. Firm, brown, moist.
	...very stiff.
	...trace iron staining. Hard.
	Clayey Silt Till trace gravel. Very stiff to hard, grey and brown, moist.
	...very stiff.
	Silty Clay Till trace gravel. Very stiff, grey, moist.

Number	Type	Blow Counts/150 mm	N Value
1	SS	2 3 4 5	7
2	SS	5 7 12	19
3	SS	6 18 21	39
4	SS	8 12 20	32
5	SS	15 25 30	55
6	SS	9 13 17	30
7	SS	7 11 17	28
8	SS	5 8 12	20
9	SS	5 11 15	26

Additional Notes:
1. Borehole open to approximately 12.1 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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LOG OF BOREHOLE BHMW10

SHEET 2 of 2

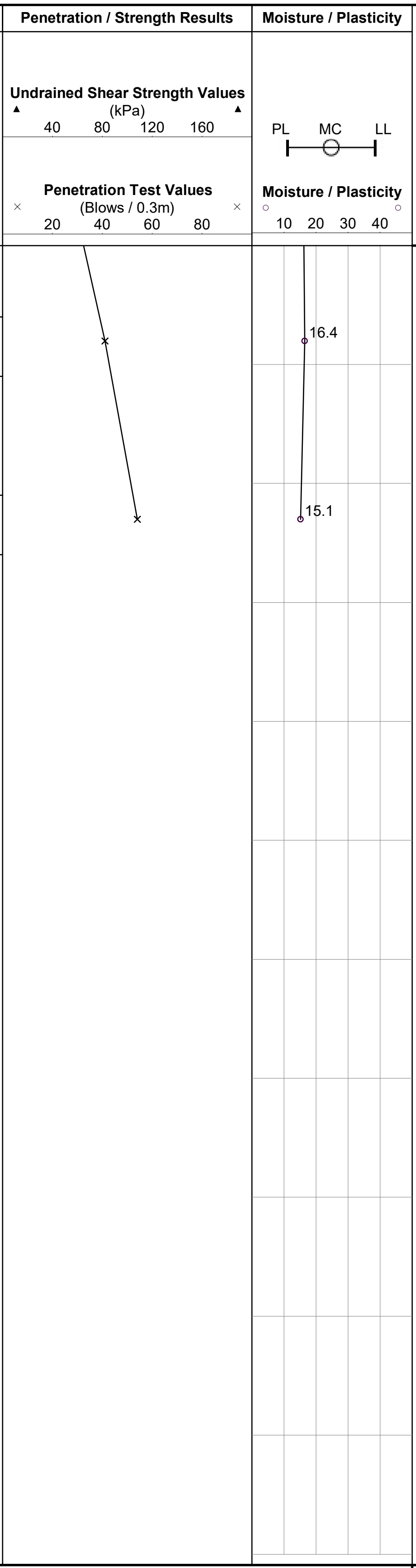
Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-07-08
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.142154
Easting: -79.886746
Ground Surface Elevation: 0

Description	Number	Type	Blow Counts/150 mm	N Value
(continued)				
...hard, moist to very moist.	10	SS	9 20 21	41
...very moist.	11	SS	16 26 28	54
End of Log				

Depth Scale (m)	Depth/Elevation (m)
11	-11.0
12	-12.0
13	-13.0
14	-14.0
15	-15.0
16	-16.0
17	-17.0
18	-18.0
19	-19.0
20	-20.0
21	-21.0



Well Details | Groundwater Conditions | Headspace / PID (ppm) [LEL(%)] / ppm | Comments

Additional Notes:
1. Borehole open to approximately 12.1 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

LOG OF BOREHOLE BHMW11

SHEET 1 of 1

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-07-08
Drilling Method: Solid Stem
Datum: Ground Surface

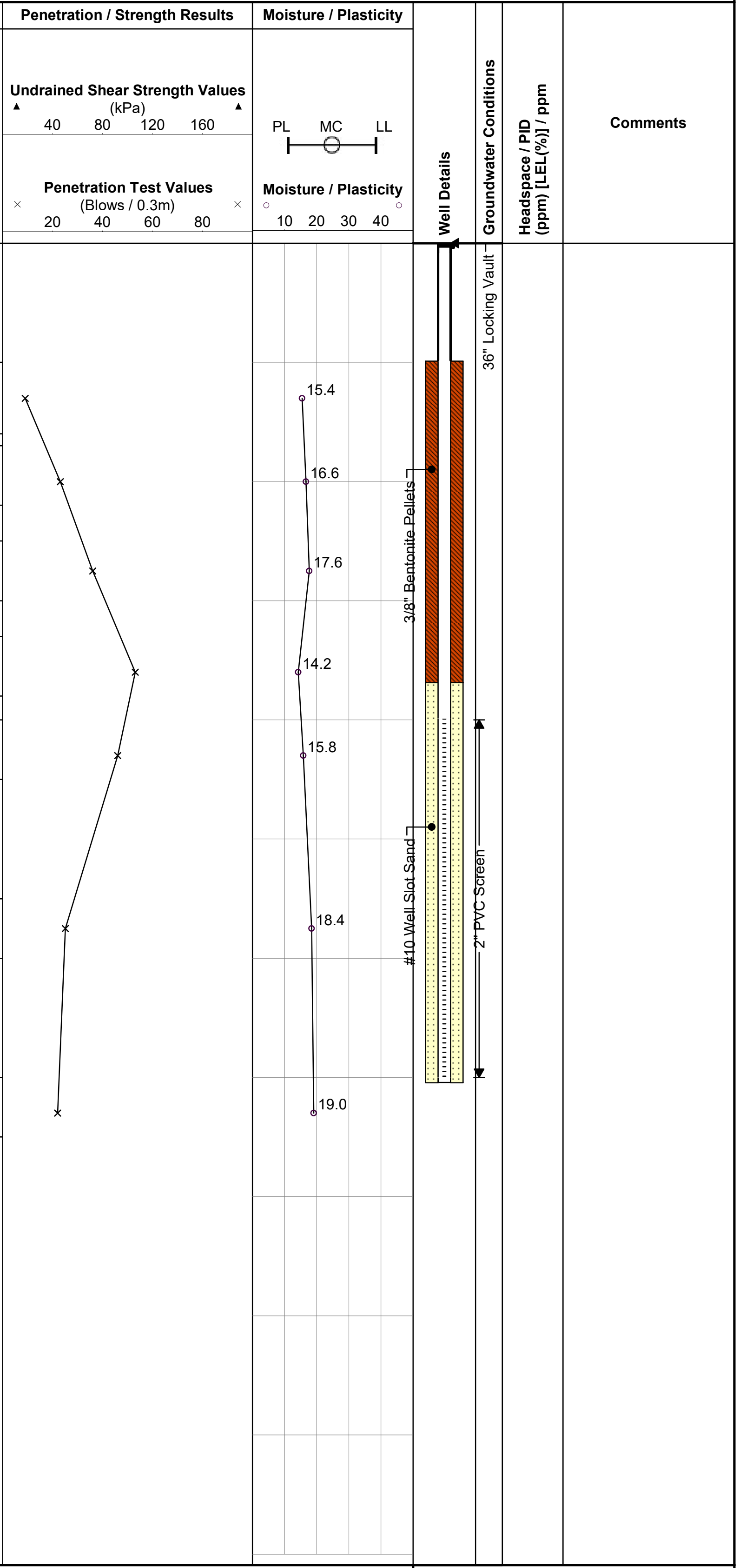
Northing: 43.13907
Easting: -79.888437
Ground Surface Elevation: 0

Subsurface Conditions

Depth/Elevation (m)	Description
0.0	**Organic Material** ~200 mm. Silty clay, some organics. Brown, dry.
	Clayey Silt some gravel, some grey clay seams, trace iron staining. Very stiff, brown, moist.
	Clayey Silt Till some iron staining, trace gravel. Hard, brown, moist.
	...grey.
	...very stiff, very moist.
	End of Log

Samples

Number	Type	Blow Counts/150 mm	N Value
1	SS	3 5 4 3	9
2	SS	5 8 15	23
3	SS	6 20 16	36
4	SS	8 22 31	53
5	SS	13 21 25	46
6	SS	9 10 15	25
7	SS	5 10 12	22



Additional Notes:
1. Borehole open to approximately 6.0 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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LOG OF BOREHOLE BHMW12

SHEET 1 of 1

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-07-05
Drilling Method: Solid Stem
Datum: Ground Surface

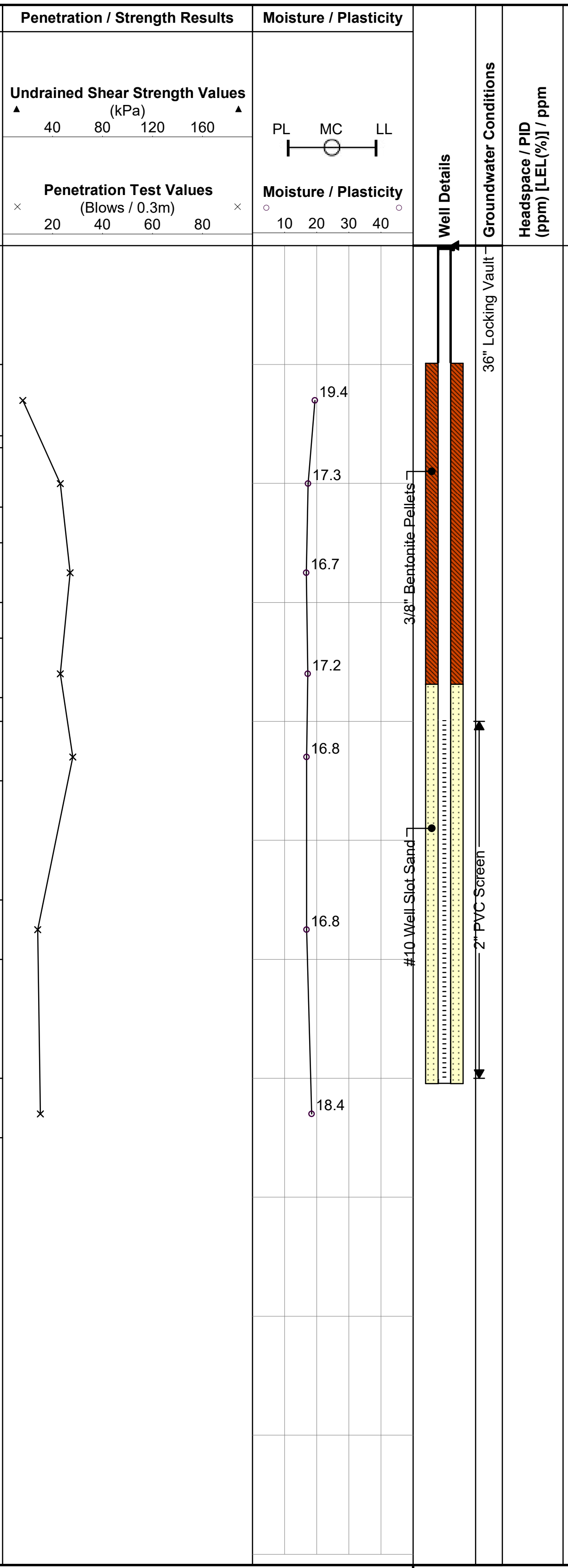
Northing: 43.140212
Easting: -79.902967
Ground Surface Elevation: 0

Subsurface Conditions

Depth/Elevation (m)	Description
0.0	**Organic Material** ~100 mm. Clayey silt, trace organics. Brown, moist.
	Clayey Silt trace iron staining, trace grey clay seams. Firm to stiff, brown, moist.
	...very stiff.
	...moist to very moist.
	Silty Clay Till
	...trace gravel. Stiff, grey, moist.
	...trace red shale fragments. Stiff to very stiff, very moist.
	End of Log

Samples

Number	Type	Blow Counts/150 mm	N Value
1	SS	2 4 4 5	8
2	SS	4 10 13	23
3	SS	6 12 15	27
4	SS	5 8 15	23
5	SS	5 11 17	28
6	SS	4 7 7	14
7	SS	4 6 9	15



Comments

Additional Notes:
1. Borehole open to approximately 6.0 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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LOG OF BOREHOLE BH13

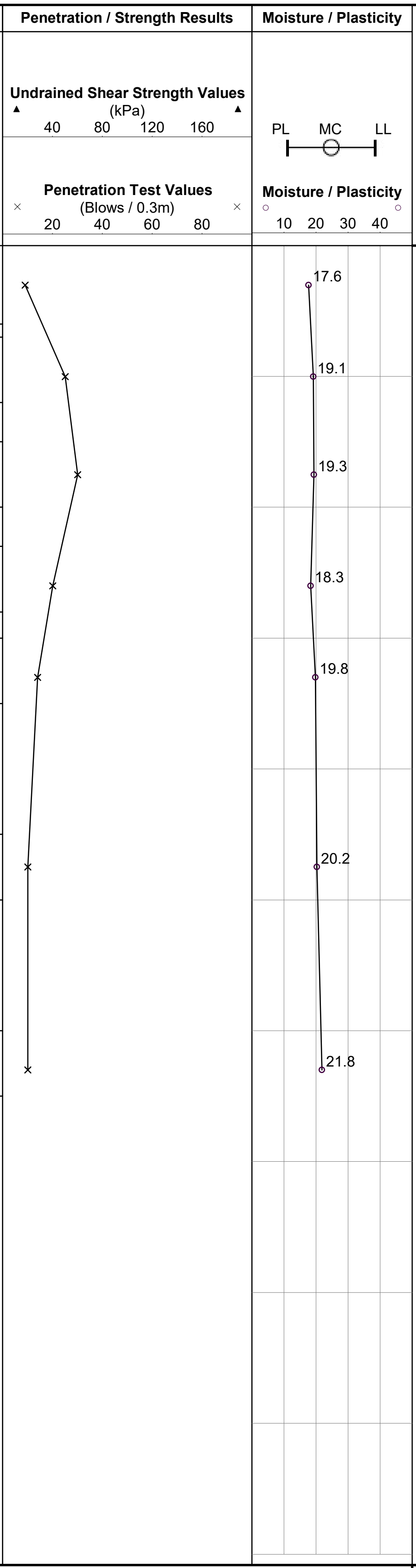
SHEET 1 of 1

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-07-04
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.138818
Easting: -79.90685
Ground Surface Elevation: 0

Depth/Elevation (m)	Description	Number	Type	Blow Counts/150 mm	N Value
	Organic Material ~50 mm. Silt, trace clay, trace organics. Brown, moist. **Clayey Silt** trace grey clay seams. Stiff, brown, moist.	1	SS	4 5 4 4	9
-1.0	...very stiff.	2	SS	4 7 18	25
	Clayey Silt Till trace gravel, trace iron staining. Very stiff to hard, grey, moist.	3	SS	5 10 20	30
	...no iron staining. Very stiff.	4	SS	4 8 12	20
-3.0	...stiff.	5	SS	3 6 8	14
		6	SS	2 5 5	10
-6.0	...very moist.	7	SS	2 4 6	10
	End of Log				



Well Details | Groundwater Conditions | Headspace / PID (ppm) [LEL(%)] / ppm | Comments

Additional Notes:
1. Borehole open to approximately 6.0 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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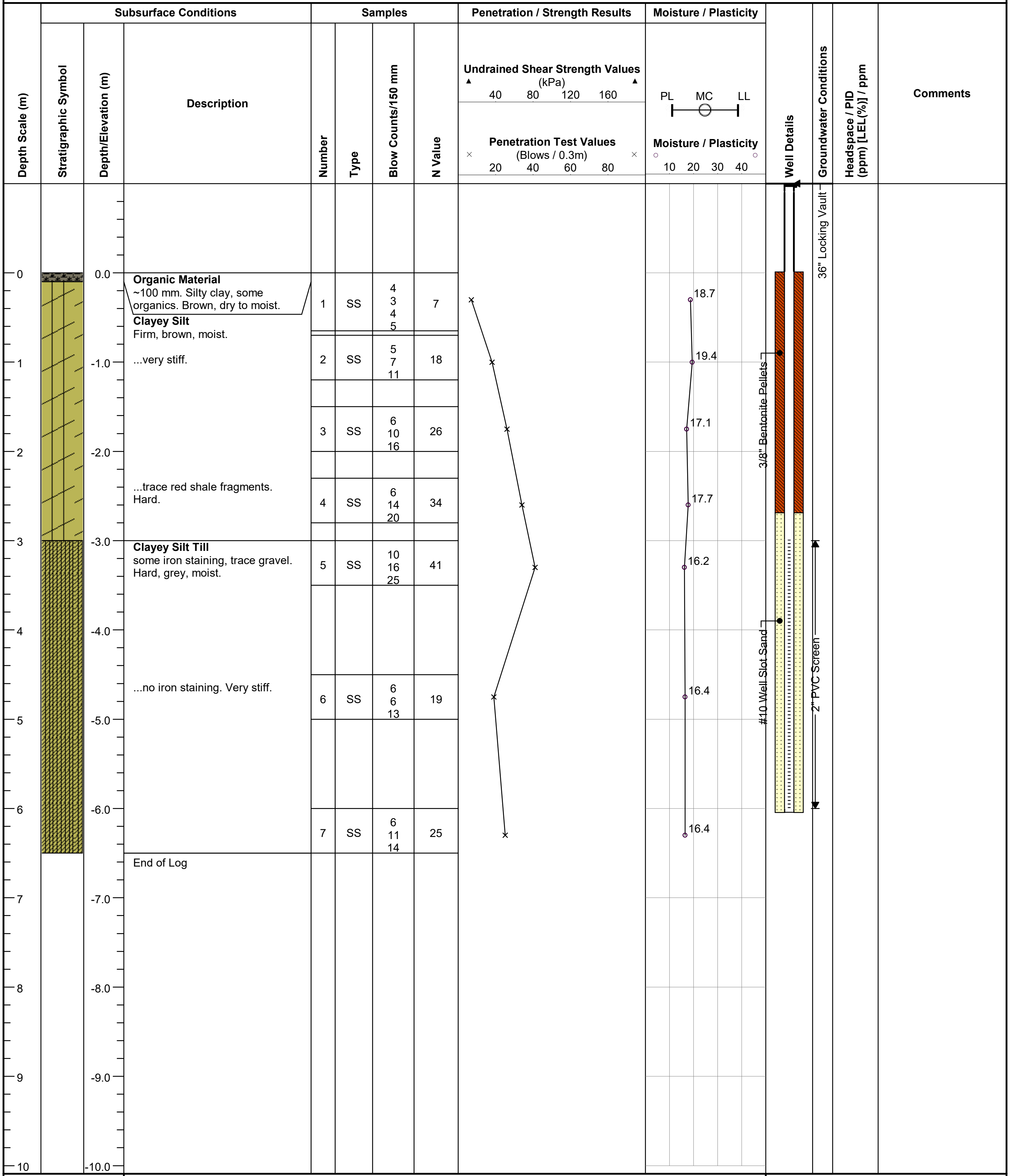
LOG OF BOREHOLE BHMW16

SHEET 1 of 1

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-08-06
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.14914
Easting: -79.893228
Ground Surface Elevation: 0



Depth/Elevation (m)	Description
0.0	**Organic Material** ~100 mm. Silty clay, some organics. Brown, dry to moist. **Clayey Silt** Firm, brown, moist. ...very stiff. ...trace red shale fragments. Hard.
-3.0	**Clayey Silt Till** some iron staining, trace gravel. Hard, grey, moist. ...no iron staining. Very stiff.
	End of Log
-1.0	
-2.0	
-4.0	
-5.0	
-6.0	
-7.0	
-8.0	
-9.0	
-10.0	

Number	Type	Blow Counts/150 mm	N Value	Moisture / Plasticity
1	SS	4 3 4 5	7	18.7
2	SS	5 7 11	18	19.4
3	SS	6 10 16	26	17.1
4	SS	6 14 20	34	17.7
5	SS	10 16 25	41	16.2
6	SS	6 6 13	19	16.4
7	SS	6 11 14	25	16.4

Additional Notes:
1. Borehole open to approximately 6.0 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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Hamilton, Ontario, L8W 2E1
Ph: (905) 383-3733

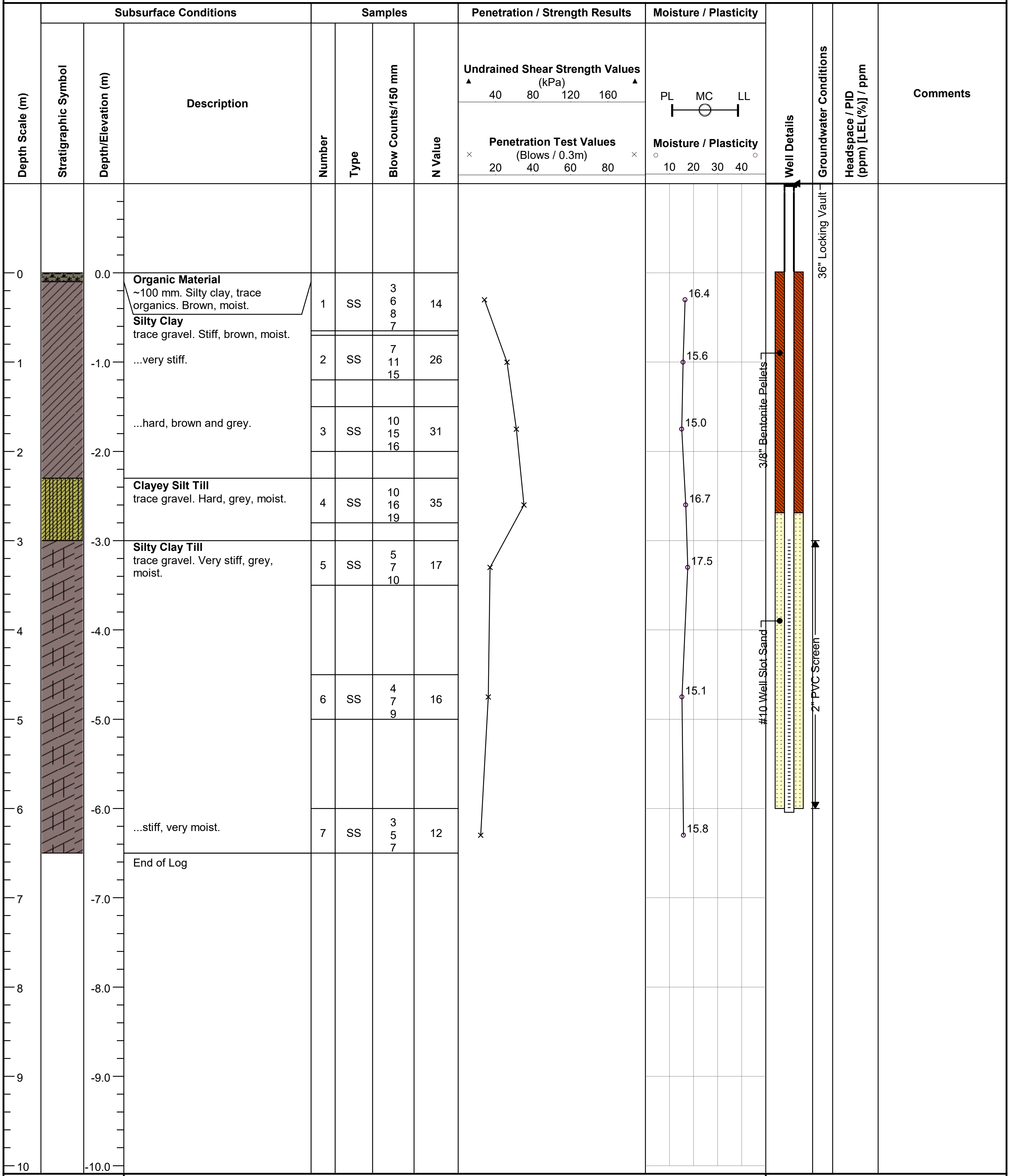
LOG OF BOREHOLE BHMW17

SHEET 1 of 1

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-08-06
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.147912
Easting: -79.886182
Ground Surface Elevation: 0



Description	Number	Type	Blow Counts/150 mm	N Value	Moisture / Plasticity
Organic Material ~100 mm. Silty clay, trace organics. Brown, moist. **Silty Clay** trace gravel. Stiff, brown, moist.	1	SS	3 6 8 7	14	16.4
...very stiff.	2	SS	7 11 15	26	15.6
...hard, brown and grey.	3	SS	10 15 16	31	15.0
Clayey Silt Till trace gravel. Hard, grey, moist.	4	SS	10 16 19	35	16.7
Silty Clay Till trace gravel. Very stiff, grey, moist.	5	SS	5 7 10	17	17.5
	6	SS	4 7 9	16	15.1
...stiff, very moist.	7	SS	3 5 7	12	15.8
End of Log					

Additional Notes:
1. Borehole open to approximately 6.0 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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LOG OF BOREHOLE BHMW18

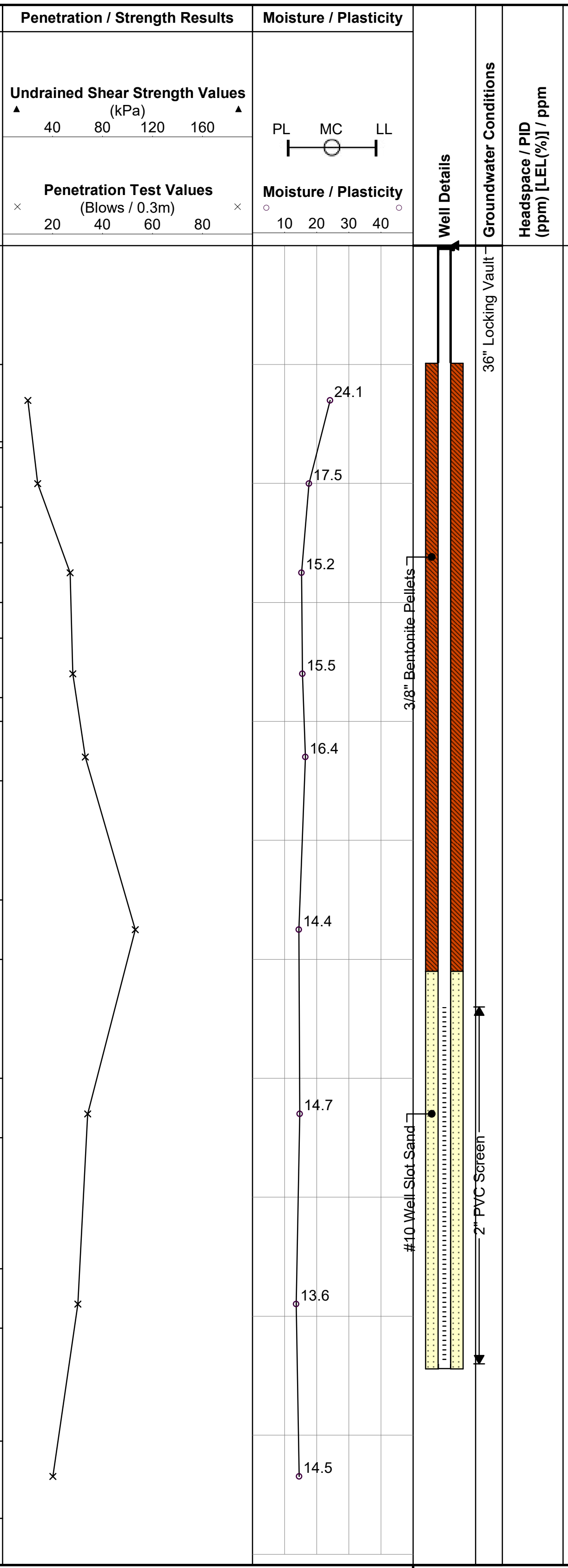
SHEET 1 of 1

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-08-08
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.147067
Easting: -79.892351
Ground Surface Elevation: 0

Depth/Elevation (m)	Description	Number	Type	Blow Counts/150 mm	N Value
0.0	**Organic Material** ~100 mm. Clayey silt, trace organics. Brown, moist.	1	SS	3 5 5 6	10
	Clayey Silt trace grey clay seams. Stiff, brown, moist.	2	SS	3 5 9	14
	...trace iron staining. Very stiff.	3	SS	6 12 15	27
	Clayey Silt Till trace gravel, trace iron staining. Very stiff, brown, moist.	4	SS	6 13 15	28
	...hard.	5	SS	6 14 19	33
	...no iron staining. Grey.	6	SS	12 21 32	53
		7	SS	7 12 22	34
	...very stiff to hard, very moist.	8	SS	8 12 18	30
	...very stiff.	9	SS	4 8 12 31	20
-10.0	End of Log				



Comments

Additional Notes:
1. Borehole open, with cave, to approximately 8.4 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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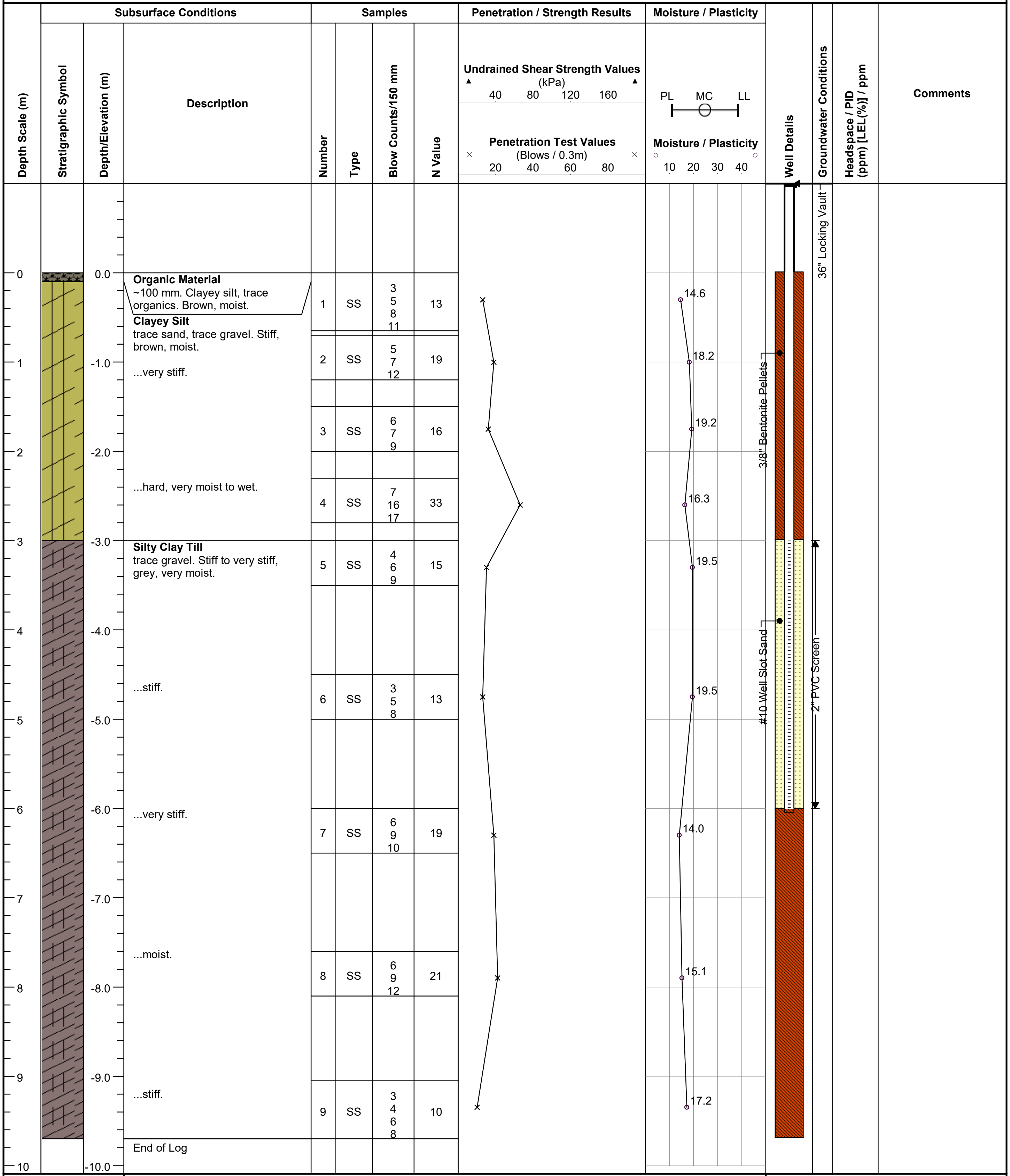
LOG OF BOREHOLE BHMW19D

SHEET 1 of 1

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-08-07
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.141857
Easting: -79.894982
Ground Surface Elevation: 0



Depth/Elevation (m)	Description	Number	Type	Blow Counts/150 mm	N Value	Moisture / Plasticity
0.0	**Organic Material** ~100 mm. Clayey silt, trace organics. Brown, moist. **Clayey Silt** trace sand, trace gravel. Stiff, brown, moist.	1	SS	3 5 8 11	13	14.6
-1.0	...very stiff.	2	SS	5 7 12	19	18.2
-2.0		3	SS	6 7 9	16	19.2
	...hard, very moist to wet.	4	SS	7 16 17	33	16.3
-3.0	**Silty Clay Till** trace gravel. Stiff to very stiff, grey, very moist.	5	SS	4 6 9	15	19.5
-4.0	...stiff.	6	SS	3 5 8	13	19.5
-6.0	...very stiff.	7	SS	6 9 10	19	14.0
-7.0	...moist.	8	SS	6 9 12	21	15.1
-9.0	...stiff.	9	SS	3 4 6 8	10	17.2
-10.0	End of Log					

Additional Notes:
1. Borehole open to approximately 9.1 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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LOG OF BOREHOLE BHMW19S

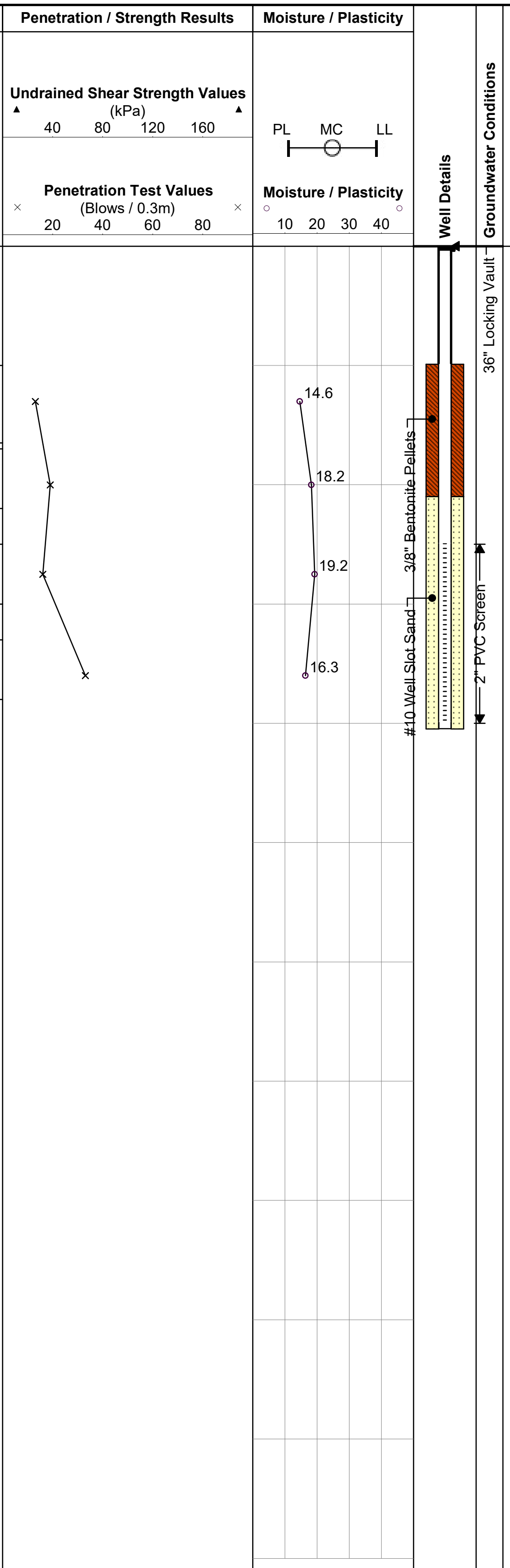
SHEET 1 of 1

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-08-07
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.141812
Easting: -79.894825
Ground Surface Elevation: 0

Depth/Elevation (m)	Description	Number	Type	Blow Counts/150 mm	N Value
0.0	**Organic Material** ~100 mm. Clayey silt, trace organics. Brown, moist.	1	SS	3 5 8 11	13
	Clayey Silt trace sand, trace gravel. Stiff, brown, moist.				
-1.0	...very stiff.	2	SS	5 7 12	19
-2.0		3	SS	6 7 9	16
	...hard, very moist to wet.	4	SS	7 16 17	33
-3.0	End of Log				



Comments

Additional Notes:
1. Borehole open to approximately 3.0 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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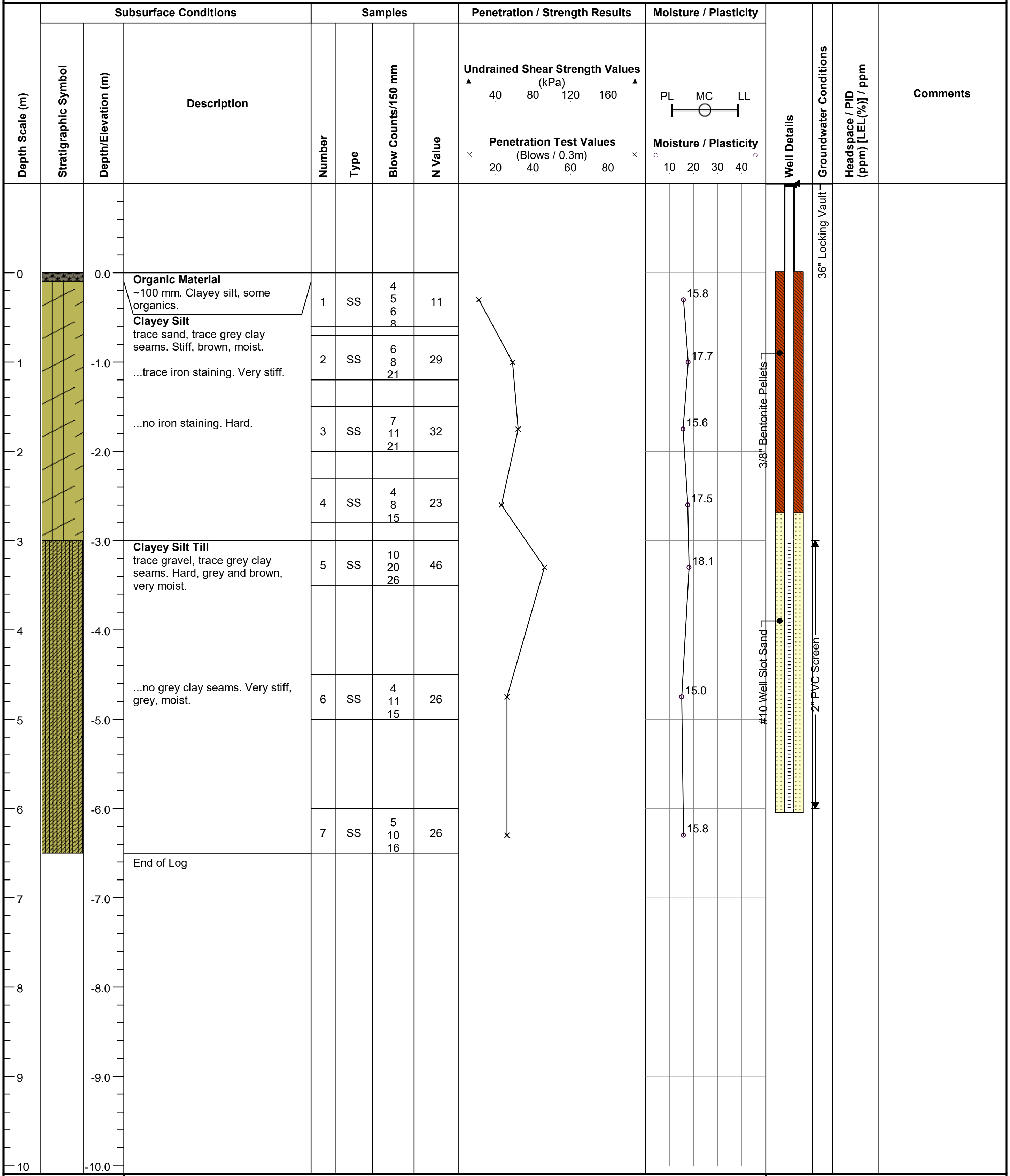
LOG OF BOREHOLE BHMW20

SHEET 1 of 1

Project No.: 23354
Project Name: White Church Lands
Location: White Church Rd. & Airport Rd., Hamilton

Drill Date: 2024-08-07
Drilling Method: Solid Stem
Datum: Ground Surface

Northing: 43.144462
Easting: -79.884115
Ground Surface Elevation: 0



Depth/Elevation (m)	Description
0.0	**Organic Material** ~100 mm. Clayey silt, some organics.
	Clayey Silt trace sand, trace grey clay seams. Stiff, brown, moist.
	...trace iron staining. Very stiff.
	...no iron staining. Hard.
-3.0	**Clayey Silt Till** trace gravel, trace grey clay seams. Hard, grey and brown, very moist.
	...no grey clay seams. Very stiff, grey, moist.
	End of Log

Number	Type	Blow Counts/150 mm	N Value	Moisture / Plasticity
1	SS	4 5 6 8	11	15.8
2	SS	6 8 21	29	17.7
3	SS	7 11 21	32	15.6
4	SS	4 8 15	23	17.5
5	SS	10 20 26	46	18.1
6	SS	4 11 15	26	15.0
7	SS	5 10 16	26	15.8

Additional Notes:
1. Borehole open to approximately 6.0 m depth on completion.
2. Groundwater or water seepage not encountered during drilling.
3.
4.

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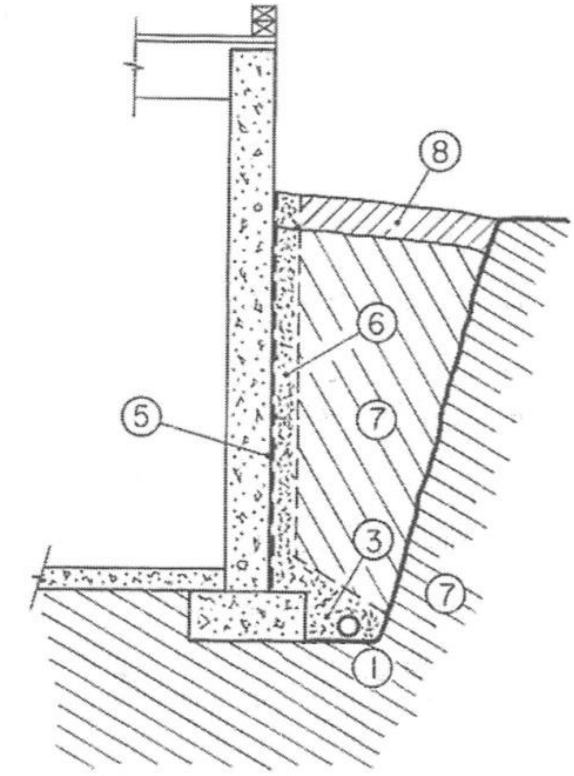
APPENDIX D

DRAWING 23354-02 - ENGINEERING COMMENTARIES – GENERAL REQUIREMENTS FOR DRAINAGE TO BASEMENT STRUCTURES

DRAWING 23354-03 - ENGINEERING COMMENTARIES – GENERAL REQUIREMENTS FOR UNDERFLOOR DRAINAGE SYSTEMS



① 100 mm, perforated or slotted pipe placed below the upper level of the floor slab.;

③ Filter material that is compatible with the grain size characteristics of the fine grained foundation and backfill soils, as well as with the perforations of the pipe;

④ Filter material continuously or intermittently placed next to the foundation wall to intercept water draining from window wells, down exterior walls and from low areas near the building;

⑤ Damp-proofing on wall – optional depending on the quality of the concrete wall;

⑥ Optional use of sheet drain, or synthetic fire blanket, next to the foundation wall to replace the soil filter according to ④;

⑦ Foundation and backfill soils, which may contain fine grained and erosion-susceptible materials;

⑧ "*Topping off*" material is to be graded such that it slopes outwards to lead surface water away from the building. It is usually desirable to use low permeability topsoil to reduce the risk of overloading the drainage pipe.

Based on Figure 12.1, Canadian Foundation Engineers Manual, Fourth Edition, 2006.

Additional Notes:

1. The perforated or slotted drainage pipe is to lead to a positive drainage sump or outlet. The invert of the pipe is to be a minimum of 150 mm below the underside of the proposed floor slab.
2. Backfill materials to the interior of the foundation walls may be clean, organic-free soils that can be compacted to the specified density within in a confined space.
3. Heavy, vibratory compaction equipment should not be used within 450 mm of the foundation wall. Fill is not to be placed or compacted within 1.8 m of the wall unless fill is being placed simultaneously on both sides of the wall.
4. The moisture barrier beneath the floor slab is to comprise at least 200 mm of compacted19mm clear stone or an equivalent free-draining material.
5. Should the 19 mm clear stone require surface blinding then 6mm stone chips are to be used.
6. The slab on grade should not be structurally connected to the foundation wall or footing.

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engineering@landteklimited.com
www.landteklimited.com

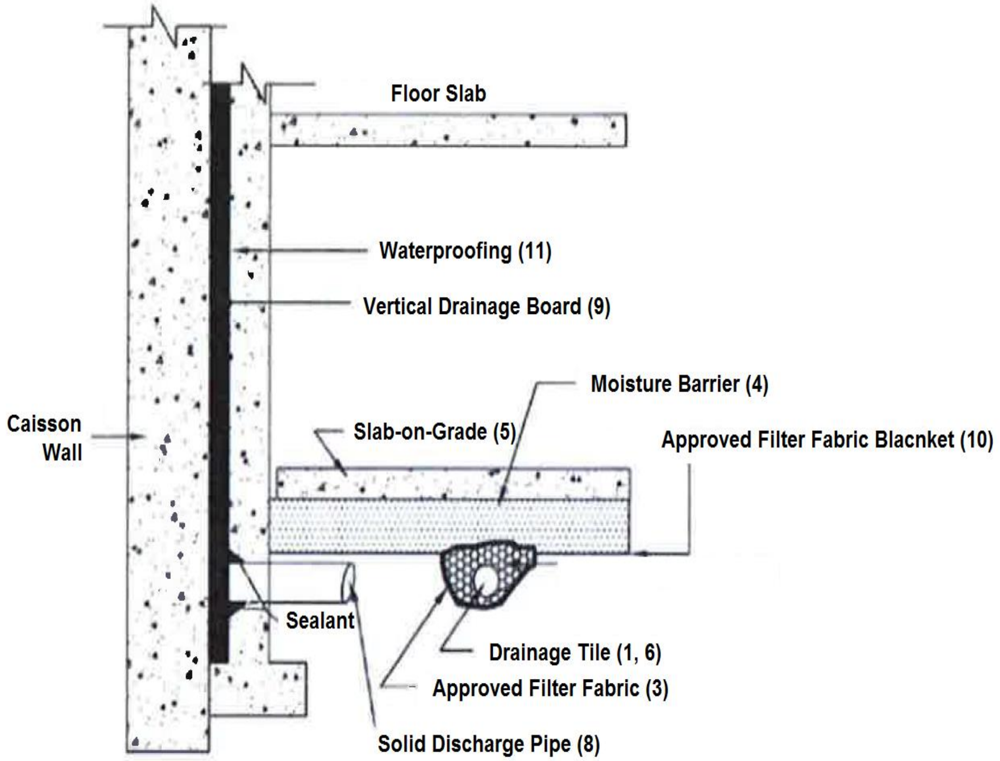
General Requirements for Drainage to Basement Structures

client **White Church Landowners Group Inc.**

project White Church Lands, Hamilton, Ontario

project # 23354

drawing # 23354-02



Notes:

1. Drainage tile, if required for permanent dewatering, to consist of 100 mm diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet, spaced between columns;
2. 19 mm clear stone – 150 mm top and side of drain. If the drain is not on the footing then place 100 mm of 19 mm clear stone below the drain;
3. Wrap the clear stone with an approved filter fabric (e.g., Terrafix 270R or equivalent);
4. Moisture barrier to be at least 200 mm of compacted, 19 mm clear stone or equivalent (and approved), free-draining material. A vapour barrier may be required for specialty floor coverings;
5. Typically, the slab-on-grade is not structurally connected to the wall or footing. However, if it is connected to the walls it should be designed accordingly;
6. Underfloor drain invert, where to be installed, to be at least 300 mm below underside of floor slab. Drainage tile should be placed in parallel rows 6 m to 8 m centres one way. Place drains on 100 mm of 19 mm clear stone and 150 mm of 19 mm clear stone on top and sides. Enclose clear stone with filter fabric as prescribed in Note (3);
7. Do not connect any underfloor drainage to perimeter drainage. The two systems are to remain separate.
8. Locate solid discharge at the middle of each bay between soldier piles;
9. Vertical drainage board (e.g., MiraDrain 6000 or equivalent) with filter cloth should be continuous from bottom to 1.2 m below exterior finished grade;
10. The entire subgrade is to be sealed with an approved filter fabric as in Note (3) where non-cohesive (silty/sandy/granular) soils are encountered below the groundwater table;
11. Where no permanent dewatering is proposed, the basement walls must be waterproofed below the seasonally highest groundwater level (plus 1.0 m to 1.5 m buffer) using bentonite or an equivalent waterproofing system;
12. The Geotechnical Report should be reviewed for site-specific details. Final detail must be approved before system is considered acceptable.

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engineering@landteklimited.com
www.landteklimited.com

General Requirements for Underfloor Drainage Systems

client **White Church Landowners Group Inc.**

project White Church Lands, Hamilton, Ontario

project # 23354

drawing # 23354-03

APPENDIX E

CHEMICAL LABORATORY TESTING RESULTS

PARACEL
LABORATORIES LTD.
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RESPONSIVE.
RELIABLE.

351 Nash Road North, unit 9B
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1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Landtek Limited
205 Nebo Road, Unit 3
Hamilton, ON L8W 2E1
Attn: Marco Di Cienzo

Report Date: 30-Aug-2024
Order Date: 28-Aug-2024

Client PO: 23354
Project: 23354
Custody: 73194

Order #: 2435247

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2435247-01	BH1-SS4 & SS5
2435247-02	BH3-SS4 & SS5
2435247-03	BH4-SS3 & SS5
2435247-04	BH6- SS4 & SS5
2435247-05	BH8- SS4 & SS5
2435247-06	BH9- SS3 & SS5
2435247-07	BH10- SS3 & SS5
2435247-08	BH11- SS3 & SS5
2435247-09	BH13- SS3 & SS5
2435247-10	BH16- SS3 & SS5
2435247-11	BH17- SS6 & SS7
2435247-12	BH20-SS6 & SS7

Approved By:

Alex Enfield, MSc

Lab Manager

Certificate of Analysis

Report Date: 30-Aug-2024

Client: **Landtek Limited**

Order Date: 28-Aug-2024

Client PO: 23354

Project Description: 23354

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC, water extraction	29-Aug-24	29-Aug-24
Conductivity	MOE E3138 - probe @25 °C, water ext	29-Aug-24	29-Aug-24
Moisture, %	CWS Tier 1 - Gravimetric	28-Aug-24	29-Aug-24
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	28-Aug-24	29-Aug-24
Resistivity	EPA 120.1 - probe, water extraction	29-Aug-24	29-Aug-24
Solids, %	CWS Tier 1 - Gravimetric	28-Aug-24	29-Aug-24

Certificate of Analysis

Report Date: 30-Aug-2024

Client: **Landtek Limited**

Order Date: 28-Aug-2024

Client PO: 23354

Project Description: 23354

Client ID:		BH1-SS4 & SS5	BH3-SS4 & SS5	BH4-SS3 & SS5	BH6- SS4 & SS5	-	-
Sample Date:		27-Aug-24 11:00	27-Aug-24 11:00	27-Aug-24 11:00	27-Aug-24 11:00		
Sample ID:		2435247-01	2435247-02	2435247-03	2435247-04		
Matrix:		Soil	Soil	Soil	Soil		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	87.3	86.5	85.5	84.6	-	-
% Moisture	0.1 % by Wt.	12.7	13.5	14.5	15.4	-	-
General Inorganics							
Conductivity	5 uS/cm	507	143	217	129	-	-
pH	0.05 pH Units	7.71	7.81	7.81	7.77	-	-
Resistivity	0.10 Ohm.m	19.7	69.9	46.0	77.5	-	-
Anions							
Chloride	5 ug/g	<5	10	<5	11	-	-
Sulphate	5 ug/g	616	63	149	109	-	-

Certificate of Analysis

Report Date: 30-Aug-2024

Client: **Landtek Limited**

Order Date: 28-Aug-2024

Client PO: **23354**

Project Description: 23354

	Client ID:	BH8- SS4 & SS5	BH9- SS3 & SS5	BH10- SS3 & SS5	BH11- SS3 & SS5	-	-
	Sample Date:	27-Aug-24 11:00	27-Aug-24 11:00	27-Aug-24 11:00	27-Aug-24 11:00		
	Sample ID:	2435247-05	2435247-06	2435247-07	2435247-08		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	85.9	86.7	86.6	87.0	-	-
% Moisture	0.1 % by Wt.	14.1	13.3	13.4	13.0	-	-
General Inorganics							
Conductivity	5 uS/cm	639	165	127	549	-	-
pH	0.05 pH Units	7.80	7.82	7.84	7.87	-	-
Resistivity	0.10 Ohm.m	15.7	60.5	78.6	18.2	-	-
Anions							
Chloride	5 ug/g	<5	<5	<5	<5	-	-
Sulphate	5 ug/g	934	42	29	770	-	-

Order #: 2435247

Certificate of Analysis

Report Date: 30-Aug-2024

Client: **Landtek Limited**

Order Date: 28-Aug-2024

Client PO: 23354

Project Description: 23354

	Client ID:	BH13- SS3 & SS5	BH16- SS3 & SS5	BH17- SS6 & SS7	BH20-SS6 & SS7	-	-
	Sample Date:	27-Aug-24 11:00	27-Aug-24 11:00	27-Aug-24 11:00	27-Aug-24 11:00		
	Sample ID:	2435247-09	2435247-10	2435247-11	2435247-12		
	Matrix:	Soil	Soil	Soil	Soil		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	85.5	85.4	86.9	87.2	-	-
% Moisture	0.1 % by Wt.	14.5	14.6	13.1	12.8	-	-
General Inorganics							
Conductivity	5 uS/cm	387	151	483	340	-	-
pH	0.05 pH Units	7.87	7.84	7.88	7.89	-	-
Resistivity	0.10 Ohm.m	25.9	66.3	20.7	29.4	-	-
Anions							
Chloride	5 ug/g	<5	6	<5	<5	-	-
Sulphate	5 ug/g	479	116	672	428	-	-

Method Quality Control: Blank

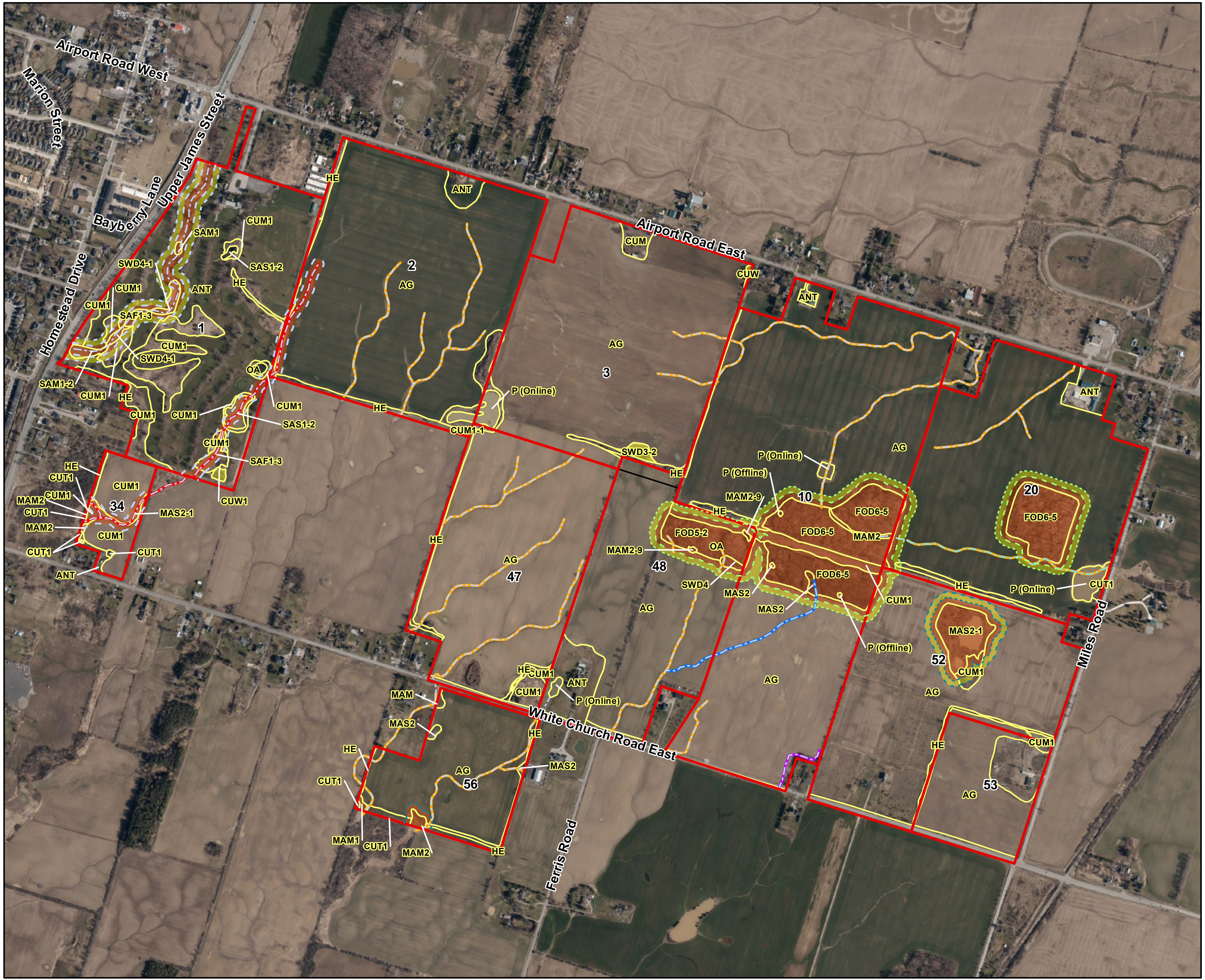
Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Chloride	ND	5	ug/g					
Sulphate	ND	5	ug/g					
General Inorganics								
Conductivity	ND	5	uS/cm					
Resistivity	ND	0.10	Ohm.m					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	5.01	5	ug/g	ND			NC	20	
Sulphate	627	5	ug/g	616			1.8	20	
General Inorganics									
Conductivity	526	5	uS/cm	507			3.7	5	
pH	7.44	0.05	pH Units	7.47			0.4	10	
Resistivity	19.0	0.10	Ohm.m	19.7			3.7	20	
Physical Characteristics									
% Moisture	11.2	0.1	% by Wt.	10.3			8.2	25	
% Solids	88.8	0.1	% by Wt.	89.7			1.0	25	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	11.4	5	ug/g	ND	109	80-120			
Sulphate	71.3	5	ug/g	61.6	97.7	80-120			



C:\ODB\OneDrive - Beacon Environmental\GeoSpatial\Geo Projects\2023\223152 Mount Hope Secondary Plan Extension Area EIS\MXD\2023-09-15_Figure03_ExistingConditions_223152.mxd

Existing Conditions - Terrestrial Resources

Figure 3

Whitechurch Secondary Plan
Area NHA

Legend

- 🟥 Study Area (310 ha)*
- ☐ Parcel Boundaries*
- ☐ Ecological Communities
- - - Tiled Drainage Feature
- - - Headwater Drainage Features
- - - Drainage Features + 15 m (City of Hamilton OP)
- - - Drainage Features + 30 m (Rural Hamilton OP)
- - - Wetlands + 15 m (City of Hamilton OP)
- - - Wetlands + 30 m (Rural Hamilton OP)
- - - Woodlands + 15 m (City of Hamiton OP)
- - - Woodlands + 30 m (Rural Hamilton OP)
- 🟨 Further Study
- 🟧 Constrained

HDFA Management Recommendations

- Conservation
- Mitigation
- Maintain Recharge
- No Management

Code	Wetland Communities
MAM2	Mineral Meadow Marsh
MAM	Meadow Marsh
MAM1	Bedrock Meadow Marsh
MAM2-9	Jewelweed Mineral Meadow Marsh
MAS2	Mineral Shallow Marsh
MAS2-1	Cattail Mineral Shallow Marsh
SWD4	Mineral Deciduous Swamp
SWD4-1	Willow Mineral Deciduous Swamp
	Aquatic Communities
OA	Open Water
P (Offline)	Pond
P (Online)	Pond
SA	Shallow Water
SAF1-3	Duckweed Floating-leaved Shallow Aquatic
SAM1	Mixed Shallow Aquatic
SAM1-2	Duckweed Mixed Shallow Aquatic
SAS1-2	Waterweed Submerged Shallow Aquatic
	Forest Communities
FOD6-5	Fresh-Moist Sugar Maple - Hardwood Deciduous Forest
FOD5-2	Dry - Fresh Sugar Maple - Beech Deciduous Forest
	Cultural Communities
CUM1	Mineral Cultural Meadow
CUM1-1	Dry - Moist Old Field Meadow
CUW1	Mineral Cultural Woodland
CUT	Cultural Thicket
CUT1	Mineral Cultural Thicket
CUM	Cultural Meadow
CUW	Cultural Woodland
	Other Communities
AG	Agricultural
ANT	Anthropogenic
HE	Hedgerow

*Boundaries are approximate

BEACON ENVIRONMENTAL

Project: 223152
Last Revised: October 2024

Client: Whitechurch Landowners Group Inc.

Prepared by: BD
Checked by: SA

DRAFT

N

1:10,000

0 210 420 m

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Appendix B-2 Sanitary Servicing Relevant Excerpts

City of Hamilton
Water and Wastewater Master Plan Class Environmental Assessment Report

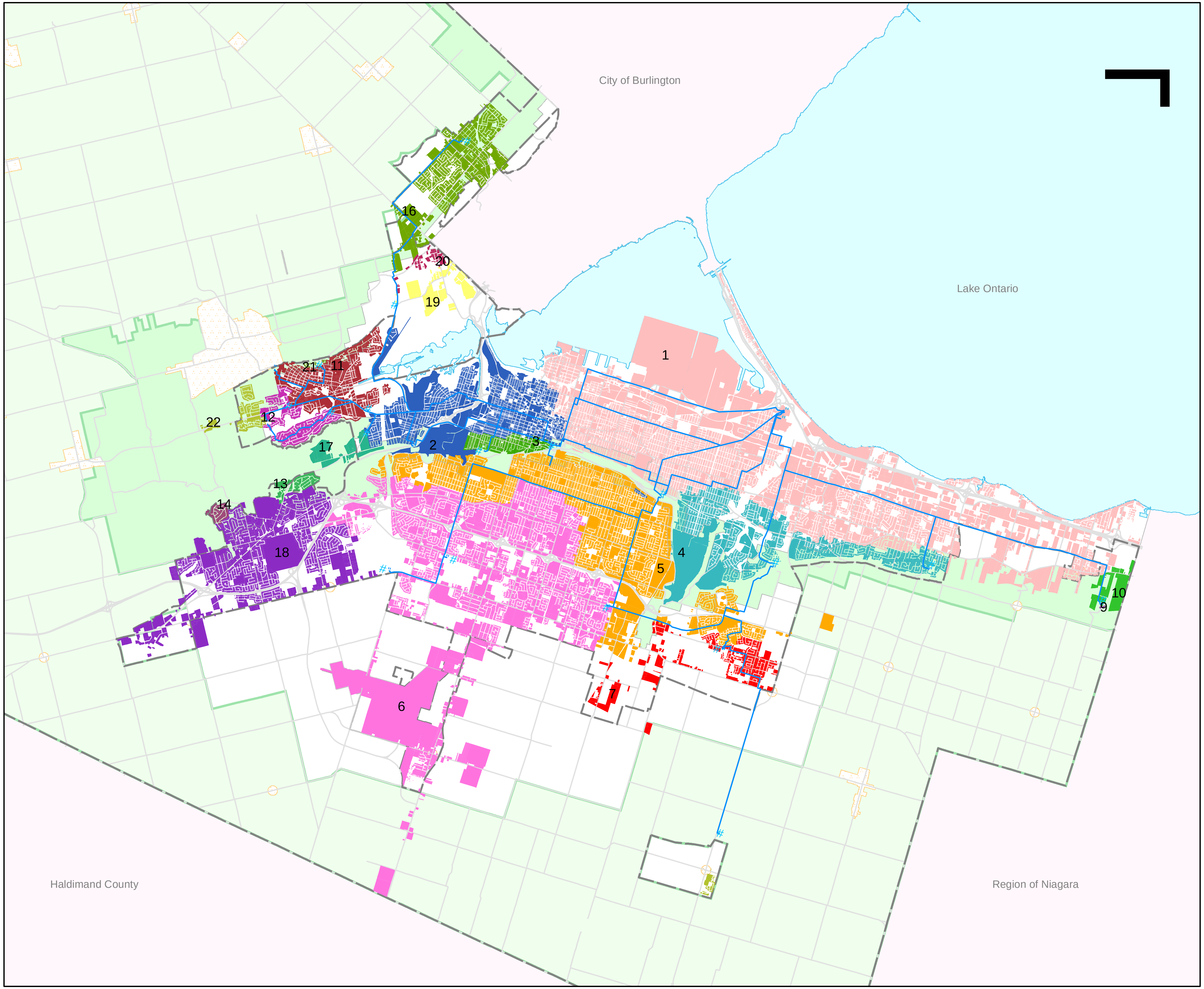
Prepared by:

KMK Consultants Limited
220 Advance Blvd.
Brampton, ON, L6T 4J5

Telephone: 905-459-4780
Fax: 905-459-7869

November 22, 2006

KMK Project No. 2590.01



Legend

#	Pump
"	Reservoir
"	Plant
—	Watermain
▨	Rural Settlement Area
🟥	Intensification Area
🟩	Niagara Escarpment
☐	Greenbelt
☐	Urban Boundary

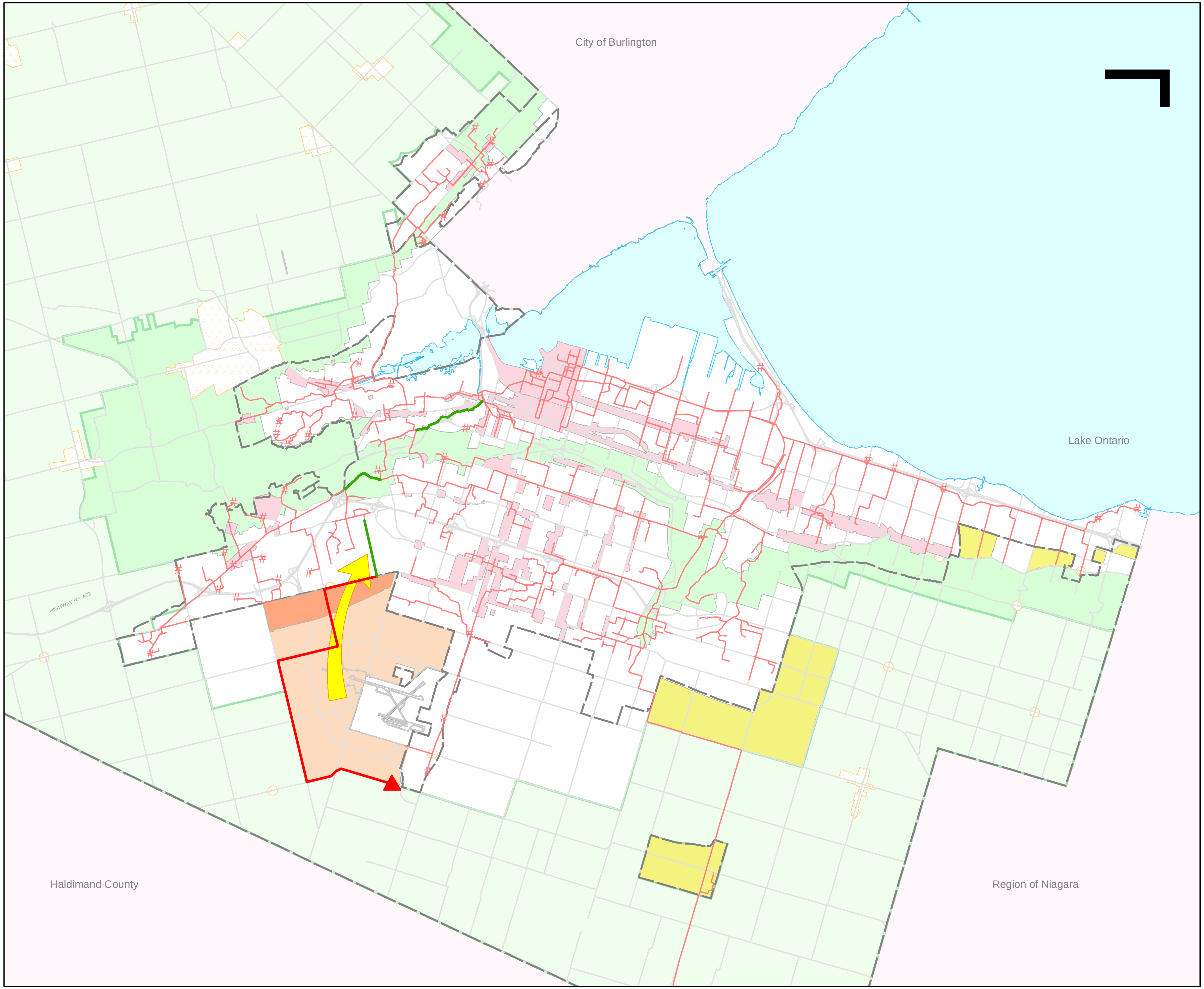
Hamilton

Integrated Water & Wastewater Master Plan

Water Servicing

Water Distribution System

Nov 22, 2006
1:125,000
2590-D-77



Legend

Pumping Station
― Existing Sewer
― Upgrades Required
▨ Rural Settlement Area
▭ Expansion to Airport
🟨 Potential Urban Boundary Expansion
🟧 Gravity flow to Ancaster
▭ Gravity flow to new SPS
▭ Intensification Area
🟩 Niagara Escarpment
▭ Greenbelt
⬚ Urban Boundary

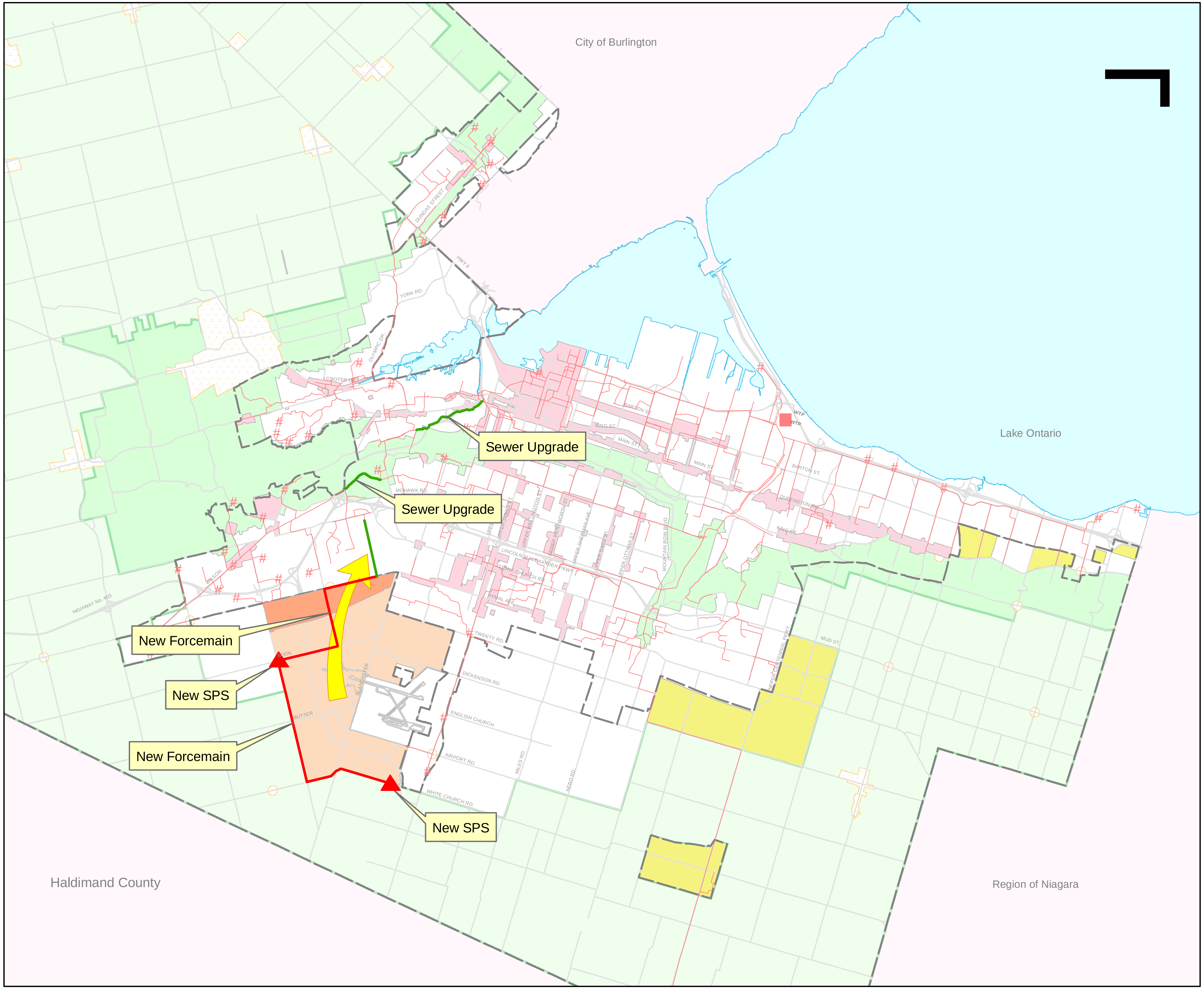
Hamilton

Integrated Water & Wastewater Master Plan

Airport Lands Wastewater Servicing

Alternative 1a

Nov 22, 2006
1:125,000
2590-D-60



Legend

\# Pumping Station

Existing Sewer

Upgrades Required

Rural Settlement Area

Expansion to Airport

Potential Urban Boundary Expansion

Gravity flow to Ancaster

Gravity flow to new SPS

Intensification Area

Niagara Escarpment

Greenbelt

Urban Boundary

Hamilton

Integrated Water & Wastewater Master Plan

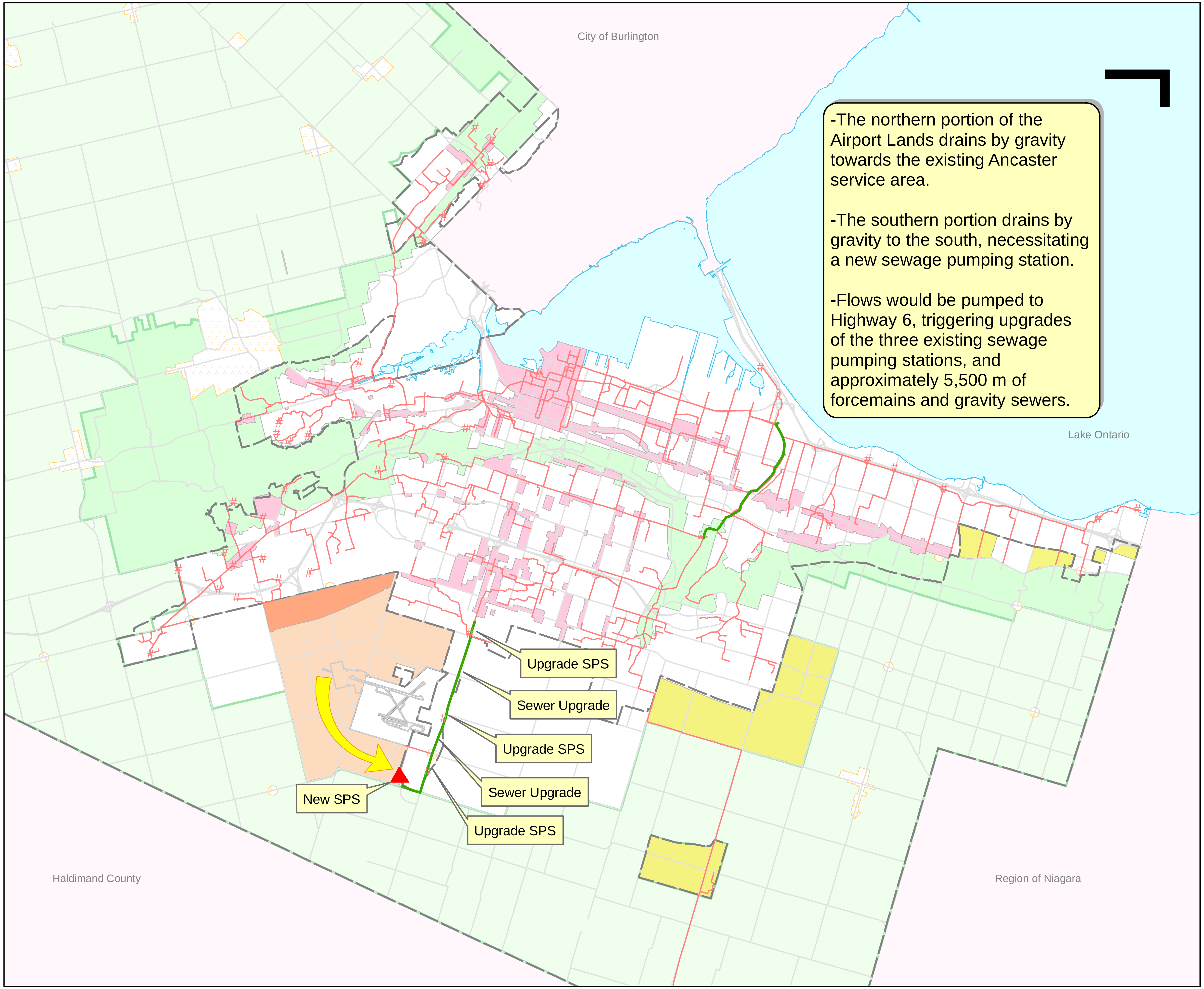
Airport Lands
Wastewater Servicing

Alternative 1b

KMK
Consultants
Limited

Figure 19

Nov 22, 2006
1:125,000
2590-D-68



-The northern portion of the Airport Lands drains by gravity towards the existing Ancaster service area.

-The southern portion drains by gravity to the south, necessitating a new sewage pumping station.

-Flows would be pumped to Highway 6, triggering upgrades of the three existing sewage pumping stations, and approximately 5,500 m of forcemains and gravity sewers.

Legend

Pumping Station
— Existing Sewer
— Upgrades Required
▨ Rural Settlement Area
■ Expansion to Airport
■ Potential Urban Boundary Expansion
■ Gravity flow to Ancaster
■ Gravity flow to new SPS
■ Intensification Area
■ Niagara Escarpment
☐ Greenbelt
☐ Urban Boundary

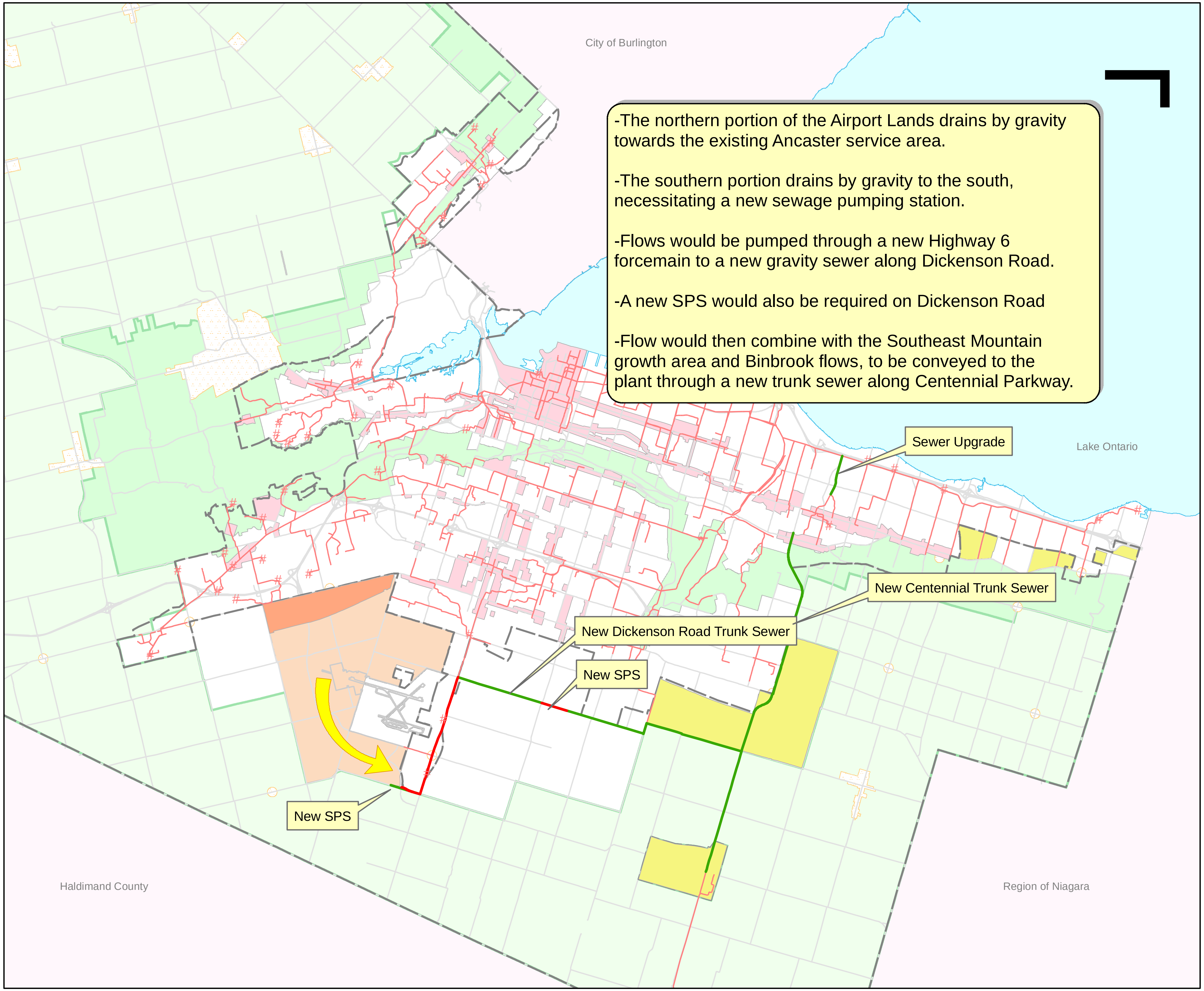
Hamilton

Integrated Water & Wastewater Master Plan

Airport Lands
Wastewater Servicing

Alternative 2

Nov 22, 2006
1:125,000
2590-D-57



-The northern portion of the Airport Lands drains by gravity towards the existing Ancaster service area.

-The southern portion drains by gravity to the south, necessitating a new sewage pumping station.

-Flows would be pumped through a new Highway 6 forcemain to a new gravity sewer along Dickenson Road.

-A new SPS would also be required on Dickenson Road

-Flow would then combine with the Southeast Mountain growth area and Binbrook flows, to be conveyed to the plant through a new trunk sewer along Centennial Parkway.

Legend

#	Pumping Station
—	Existing Sewer
—	Upgrades Required
▨	Rural Settlement Area
🟨	Potential Urban Boundary Expansion
▨	Gravity flow to new SPS
🟧	Gravity flow to Ancaster
▨	Intensification Area
🟩	Niagara Escarpment
▢	Greenbelt
▢	Urban Boundary

Integrated Water & Wastewater Master Plan

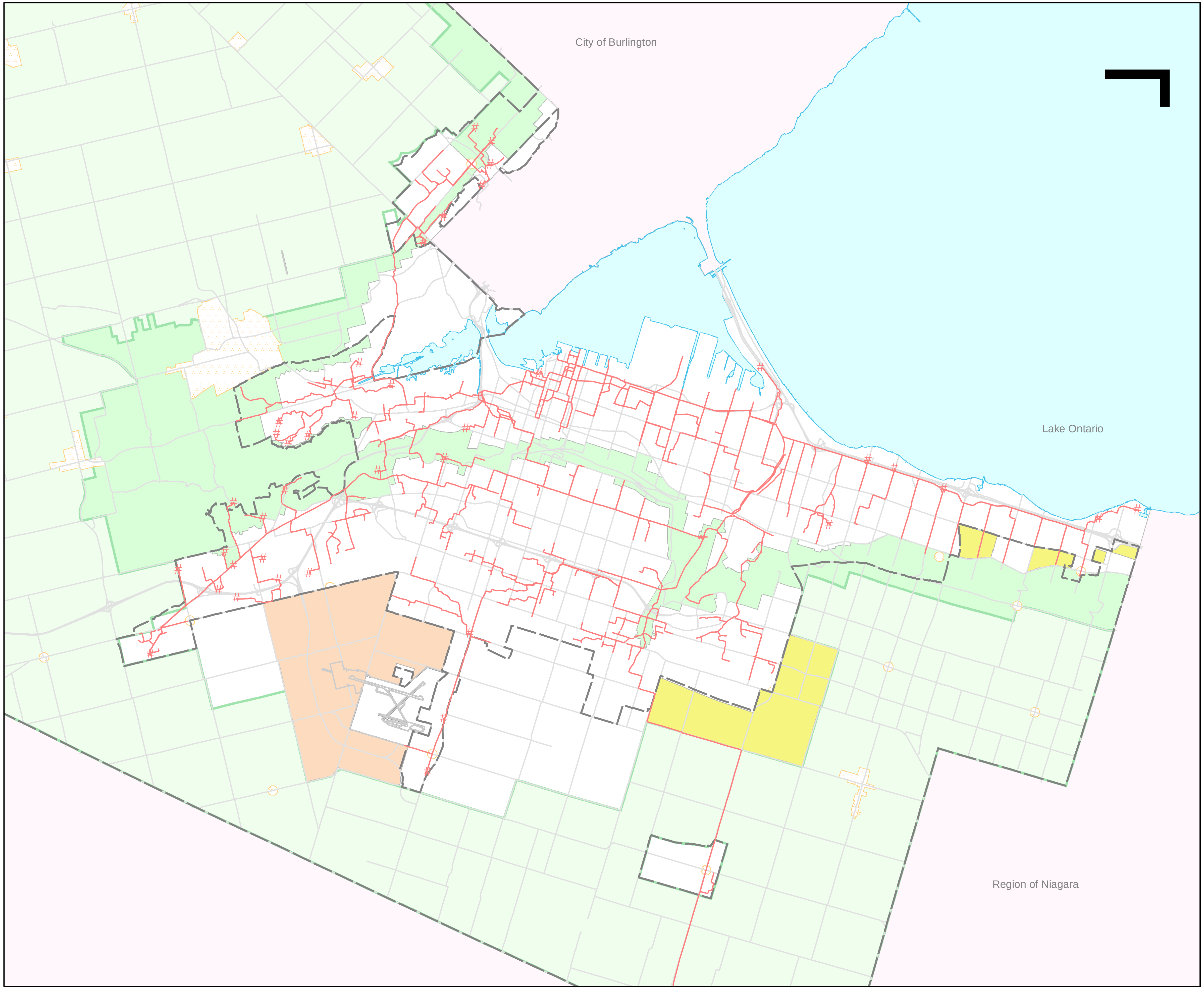
Airport Lands Wastewater Servicing

Alternative 3

KMK Consultants Limited

Figure 21

Nov 22, 2006
1:125,000
2590-D-62



Legend

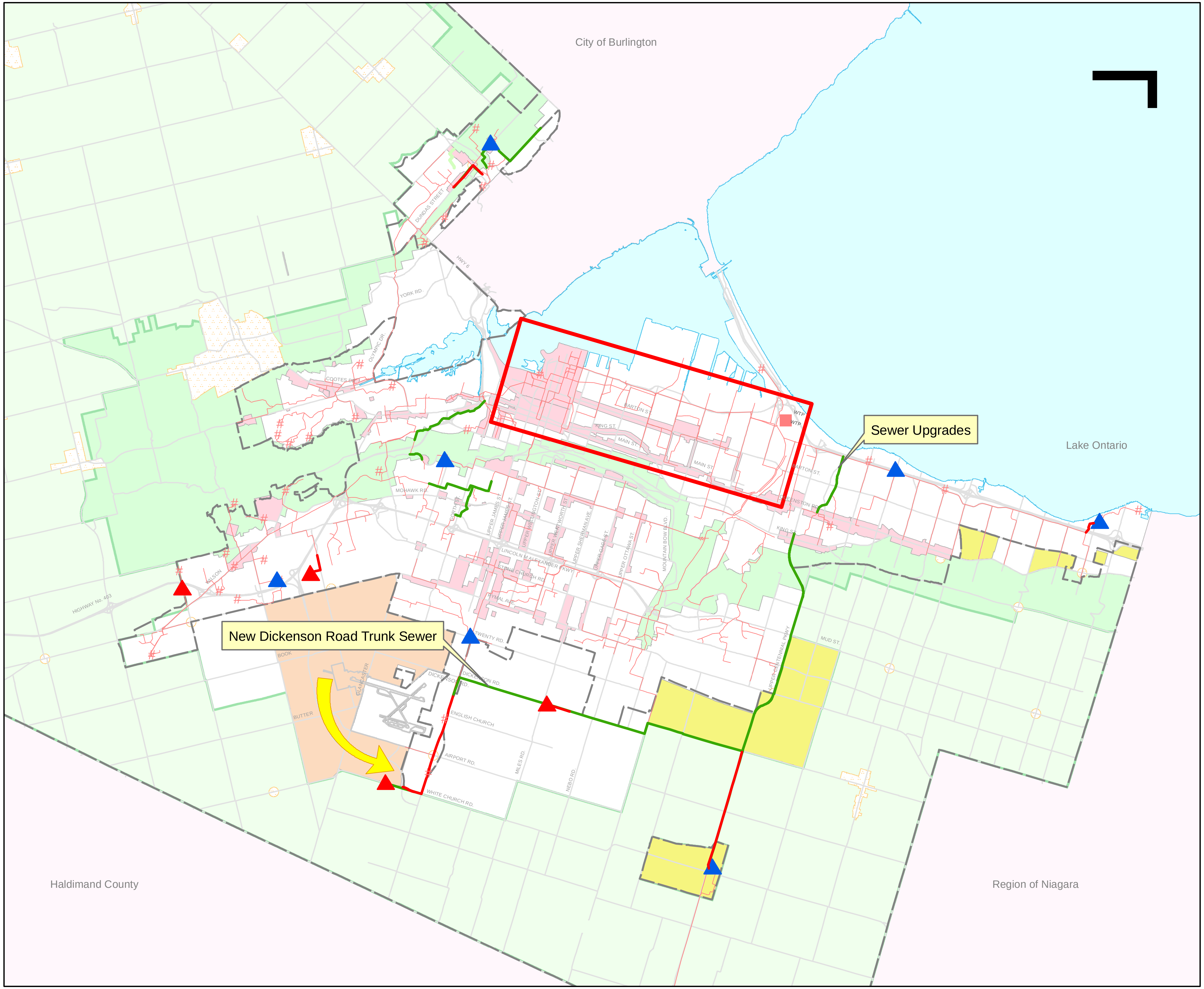
- # Pumping Station
- — Existing Sewer
- ▨ Rural Settlement Area
- ▭ Expansion to Airport
- 🟨 Potential Urban Boundary Expansion
- 🟧 Potential New Business Park
- 🟩 Niagara Escarpment
- ▭ Greenbelt
- ⬚ Urban Boundary

Hamilton

Integrated Water & Wastewater
Master Plan

CSO Control Recommendation

Nov 22, 2006
1:125,000
2590-D-78



Legend

- # Pumping Station
- ▲ New SPS
- ▲ SPS Upgrades Required
- — Existing Sewer
- — New or Upgraded Gravity Sewer
- — New or Upgraded Forcemain
- ▨ Rural Settlement Area
- 🟨 Potential Urban Boundary Expansion
- 🟧 Potential New Business Park
- ▨ Intensification Area
- 🟩 Niagara Escarpment
- 🟩 Greenbelt
- ☐ Urban Boundary

Hamilton

Integrated Water & Wastewater Master Plan

Wastewater Servicing

Recommended Preferred Solution

KMK
Consultants
Limited

Figure 24

Nov 22, 2006
1:125,000
2590-D-69

City of Hamilton
Airport Employment Growth District - Phase 2

Water & Wastewater Servicing Master Plan

UPDATE

December 2016

DILLON CONSULTING

GM BluePlan

Aquafor Beech

4.0 Wastewater Strategy Update

Similar to the Water strategy, updates to the wastewater infrastructure plan was required due to the Land Use update. The Preferred Wastewater Servicing Option for the AEGD remains Option C. This strategy consists of the following key elements:

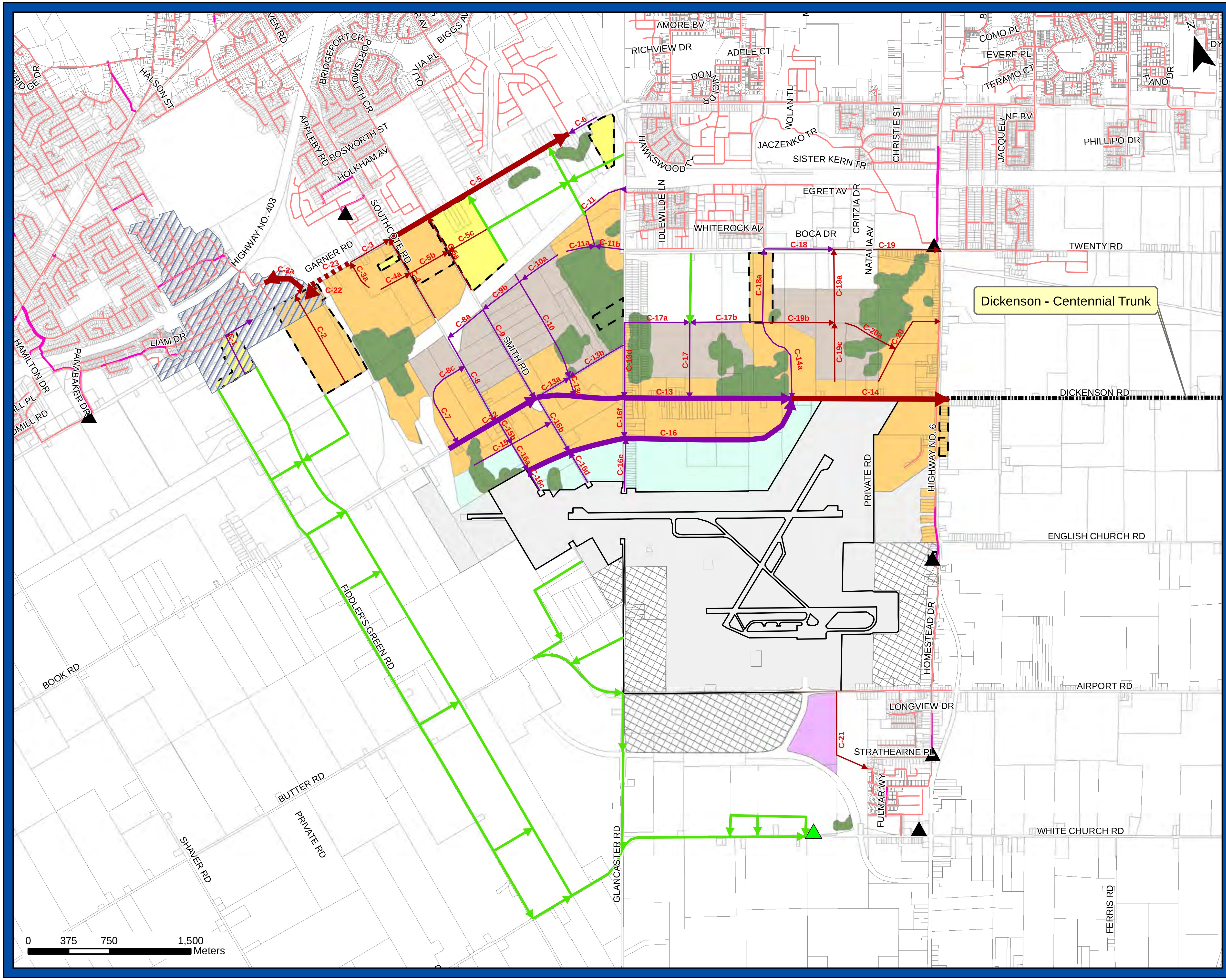
- Lands within northwest AEGD adjacent to Garner Rd draining into the Ancaster Meadowlands sanitary sewer network via the Raymond Rd Sewer.
    - Lands southwest of Hwy 6 and Garner Rd have been added into Phase I of growth. Wastewater servicing for this area will require additional analysis, found in Section 4.2
- Central areas within the AEGD, south of the Hydro Corridor and along Book Rd draining to the new Dickenson Trunk sewer (at Upper James St & Dickenson Rd) via Book Rd & Dickenson Rd Trunk Sewer
- Northeast AEGD draining to the Twenty Rd SPS via internal local sewers

Refer to the 2011 AEGD Master Plan Report for full outline of the existing infrastructure and evaluation of servicing options. The following sections outline the updates to the proposed wastewater network. The updated Wastewater Strategy and Capital Plan is shown in Figure 4 and Table 5, respectively.

4.1 Wastewater Infrastructure Update

The wastewater infrastructure plan has undergone minor changes due to the land use update as well as the transportation/road network update. Some sewer alignments have been slightly modified in order to follow the updated road alignments.

The areas adjacent to Southcote Rd, south of Book Rd will be serviced by local sewers that flow to the 450 mm sewer parallel to Dickenson Rd, and ultimately to the Dickenson Rd trunk sewer. These areas are proposed to be serviced within Phase 2 of AEGD growth. Additionally, areas southwest of Garner Rd and Hwy 6 have been included in the pre-2031 growth area; servicing of these lands is outlined in Section 4.2.



Hamilton

Hamilton AEGD Study

Preferred Wastewater Servicing - Update

Legend

Existing Wastewater Infrastructure

- ▲ Sewage Pumping Station
- — Forcemain
- — Sanitary Sewer

Wastewater Infrastructure 2016

- → Sub-Trunk- Phase 1
- → Sub-Trunk- Phase 2
- ➡ Trunk- Phase 1
- ➡ Trunk- Phase 2
- → Sewer Post 2031
- - → Forcemain, Post 2031
- ▲ Proposed SPS
- ▪▪▪ Proposed Forcemain
- ▨ Original Planned Catchment Area Boundary

AEGD Land Use

- ▨ Airport Boundary
- ▨ Airport Light Industrial
- ▨ Airport Prestige Industrial
- ▨ Airport Related Business
- ▨ Airport Reserve
- ▨ Airside Industrial
- ▨ Institutional
- ☐ Parcel Fabric
- ▨ Natural Open Space
- ⬚ Site Specific Policy

BluePlan ENGINEERING

715013-3-WW
December 2016
Data Source: City of Hamilton
Scale: 1:34,000 | NAD 1983 UTM Zone 17N

TABLE 5 - WASTEWATER CAPITAL PROGRAM

Project ID	Servicing Phase	EA Sch	Size	Length	Unit Cost	Base Cost	Additional Cost	Engineering / Contingency (25%)	Total Cost
			(mm)	(m)	(2016 $/m)	(2016 $/m)	(2016 $)	(2016 $)	(2016 $)
C-1	2	B*	375	685	505	$ 346,000	$ -	$ 87,000	$ 433,000
C-2	1	A+	375	1017	505	$ 514,000	$ -	$ 129,000	$ 643,000
C-2a	1	B*	600	388	609	$ 236,000	$ -	$ 59,000	$ 295,000
C-3	1	A+	375	417	505	$ 211,000	$ -	$ 53,000	$ 264,000
C-3a	1	B*	375	298	505	$ 150,000	$ -	$ 38,000	$ 188,000
C-4	1	A+	450	838	519	$ 435,000	$ -	$ 109,000	$ 544,000
C-4a	1	B*	375	313	505	$ 158,000	$ -	$ 40,000	$ 198,000
C-5	1	A+	600	1917	2233	$ 4,282,000	$ -	$ 1,071,000	$ 5,353,000
C-5a	1	B*	450	783	519	$ 407,000	$ -	$ 102,000	$ 509,000
C-5b	1	B*	375	404	505	$ 204,000	$ -	$ 51,000	$ 255,000
C-5c	1	B*	375	515	505	$ 260,000	$ -	$ 65,000	$ 325,000
C-6	2	A+	375	297	505	$ 150,000	$ -	$ 38,000	$ 188,000
C-7	2	B*	375	590	505	$ 298,000	$ -	$ 75,000	$ 373,000
C-8	2	A+	450	893	519	$ 464,000	$ -	$ 116,000	$ 580,000
C-8a	2	B*	375	412	505	$ 208,000	$ -	$ 52,000	$ 260,000
C-8c	2	B*	375	324	505	$ 164,000	$ -	$ 41,000	$ 205,000
C-9	2	A+	450	947	519	$ 492,000	$ -	$ 123,000	$ 615,000
C-9b	2	B*	375	455	505	$ 230,000	$ -	$ 58,000	$ 288,000
C-10	2	B*	450	1088	519	$ 565,000	$ -	$ 141,000	$ 706,000
C-10a	2	B*	375	406	505	$ 205,000	$ -	$ 51,000	$ 256,000
C-11	2	B*	375	801	505	$ 405,000	$ -	$ 101,000	$ 506,000
C-11a	2	B*	375	275	505	$ 139,000	$ -	$ 35,000	$ 174,000
C-11b	2	B*	375	266	505	$ 135,000	$ -	$ 34,000	$ 169,000
C-12	2	A+	525	938	554	$ 519,000	$ -	$ 130,000	$ 649,000
C-13	2	A+	600	2356	2233	$ 5,263,000	$ -	$ 1,316,000	$ 6,579,000
C-13a	2	A+	375	349	505	$ 177,000	$ -	$ 44,000	$ 221,000
C-13b	2	A+	375	588	505	$ 297,000	$ -	$ 74,000	$ 371,000
C-13c	2	B*	450	178	519	$ 92,000	$ -	$ 23,000	$ 115,000
C-13d	2	A+	375	693	505	$ 350,000	$ -	$ 88,000	$ 438,000
C-14	2	A+	750	1445	2593	$ 3,746,000	$ -	$ 937,000	$ 4,683,000
C-14a	2	B*	375	824	505	$ 417,000	$ -	$ 104,000	$ 521,000
C-15	2	B*	450	814	519	$ 423,000	$ -	$ 106,000	$ 529,000
C-15b	2	A+	375	250	505	$ 126,000	$ -	$ 32,000	$ 158,000
C-16	2	B*	525	2700	1990	$ 5,374,000	$ -	$ 1,344,000	$ 6,718,000
C-16a	2	A+	375	286	505	$ 145,000	$ -	$ 36,000	$ 181,000
C-16b	2	A+	375	586	505	$ 296,000	$ -	$ 74,000	$ 370,000
C-16c	2	A+	375	216	505	$ 109,000	$ -	$ 27,000	$ 136,000
C-16d	2	A+	375	333	505	$ 168,000	$ -	$ 42,000	$ 210,000
C-16e	2	A+	450	498	519	$ 258,000	$ -	$ 65,000	$ 323,000
C-16f	2	A+	375	370	505	$ 187,000	$ -	$ 47,000	$ 234,000
C-17	2	B*	450	698	519	$ 362,000	$ -	$ 91,000	$ 453,000
C-17a	2	B*	375	605	505	$ 306,000	$ -	$ 77,000	$ 383,000
C-17b	2	B*	375	671	505	$ 339,000	$ -	$ 85,000	$ 424,000
C-18	2	A+	450	674	519	$ 350,000	$ -	$ 88,000	$ 438,000
C-18a	2	B*	375	670	505	$ 339,000	$ -	$ 85,000	$ 424,000
C-19	1	A+	450	979	519	$ 509,000	$ -	$ 127,000	$ 636,000
C-19a	1	B*	375	677	505	$ 342,000	$ -	$ 86,000	$ 428,000
C-19b	1	B*	375	661	505	$ 334,000	$ -	$ 84,000	$ 418,000
C-19c	1	B*	375	542	505	$ 274,000	$ -	$ 69,000	$ 343,000
C-20	1	B*	375	847	505	$ 428,000	$ -	$ 107,000	$ 535,000
C-20a	1	B*	375	526	505	$ 266,000	$ -	$ 67,000	$ 333,000
C-21	1	B*	300	897	485	$ 435,000	$ -	$ 109,000	$ 544,000
Twenty Rd SPS Upgrade	1	A+			590 l/s	$ 763,000	$ -	$ 191,000	$ 954,000
C-22 Garner SPS	1	B**			30 l/s	$ 1,208,265		$ 302,000	$ 1,510,265
C-23 Forcemain	1	B**	150	440	208	$ 92,000	$ 200,000	$ 73,000	$ 365,000
SUBTOTALS - SECONDARY PLAN AREA						**$ 34,952,265**	**$ 200,000**	**$ 8,799,000**	**$ 43,951,265**

Notes:

- EA Schedule Schedule B projects were previously approved under 2006 City Wide Water and Wastewater Master Plan
- B* projects will be on future road alignments and will be re-classified as A+ once road right-of-ways are established.
- B** projects are new proejcts and are still to be satisfied

- Wastewater main diameters are preliminary and are subject to further detailed analysis and sizing during the detailed design stage mm watermains. The AEGD is divided into two different pressure districts; Pressure District 18 (PD18) lies in the northwest between ground elevations of approximately 220m and 260m and is serviced by pumping station HD018 and reservoir HDR18. Pressure District 6 (PD6) consists of land between ground elevations of approximately 205m and 240m and is serviced by pumping station HD06A and HD06B.

There is currently an existing water distribution network surrounding the AEGD which consists of watermains ranging from 200mm to 750mm. There is also an existing 600 mm watermain that runs along Glancaster Rd beneath Runways 12-30 connecting to a 400 mm watermain on Airport Rd.

10. Development and Evaluation of Water Servicing Alternatives

The preferred Water Servicing Strategy outlined in the 2006 City Wide Water and Wastewater Master Plan was used as the basis for the development of Water Servicing Options for the AEGD. These options present a more refined and detailed strategy that incorporates the previously approved plan while making the necessary modifications due to changes in the Land Use Plan. Overall, three water servicing options were developed and evaluated based on a triple bottom line approach taking into consideration technical, economic, legal, environmental and socio-economic factors.

- Water Servicing Option A maximizes the Pressure District 18 service area and minimizes the area serviced by Pressure District 6
- Water Servicing Option B maximizes the Pressure District 6 service area and minimizes the area serviced by Pressure District 18
- Water Servicing Option C proposes a slightly larger Pressure District 18 and slightly smaller Pressure District 6 than Servicing Option B

The preferred Water Servicing Option that was selected was Option B. The overall strategy for this option is to maximize the Pressure District 6 service area. Under Option B, the PD6 area will consist of lands east of Glancaster Rd and south of Book Rd between elevations of approximately 220 m to 240 m. PD18 areas will lie north of Book Rd and west of Glancaster Rd and have elevations between approximately 240 m and 250 m. PD6 currently has flexibility for development within the AEGD due to the existing PD6 watermains throughout the AEGD and along the AEGD boundary as well as excess capacity in the HD06A pumping station.

11. Wastewater System

Wastewater is currently treated at the Woodward Ave Wastewater Treatment Plant (WWTP). Flow reaches the plant by way of several trunk sewers throughout the City of Hamilton. Flows from areas surrounding the AEGD make their way to the WWTP through the existing Ancaster and Upper James/Hamilton Mountain wastewater infrastructure.

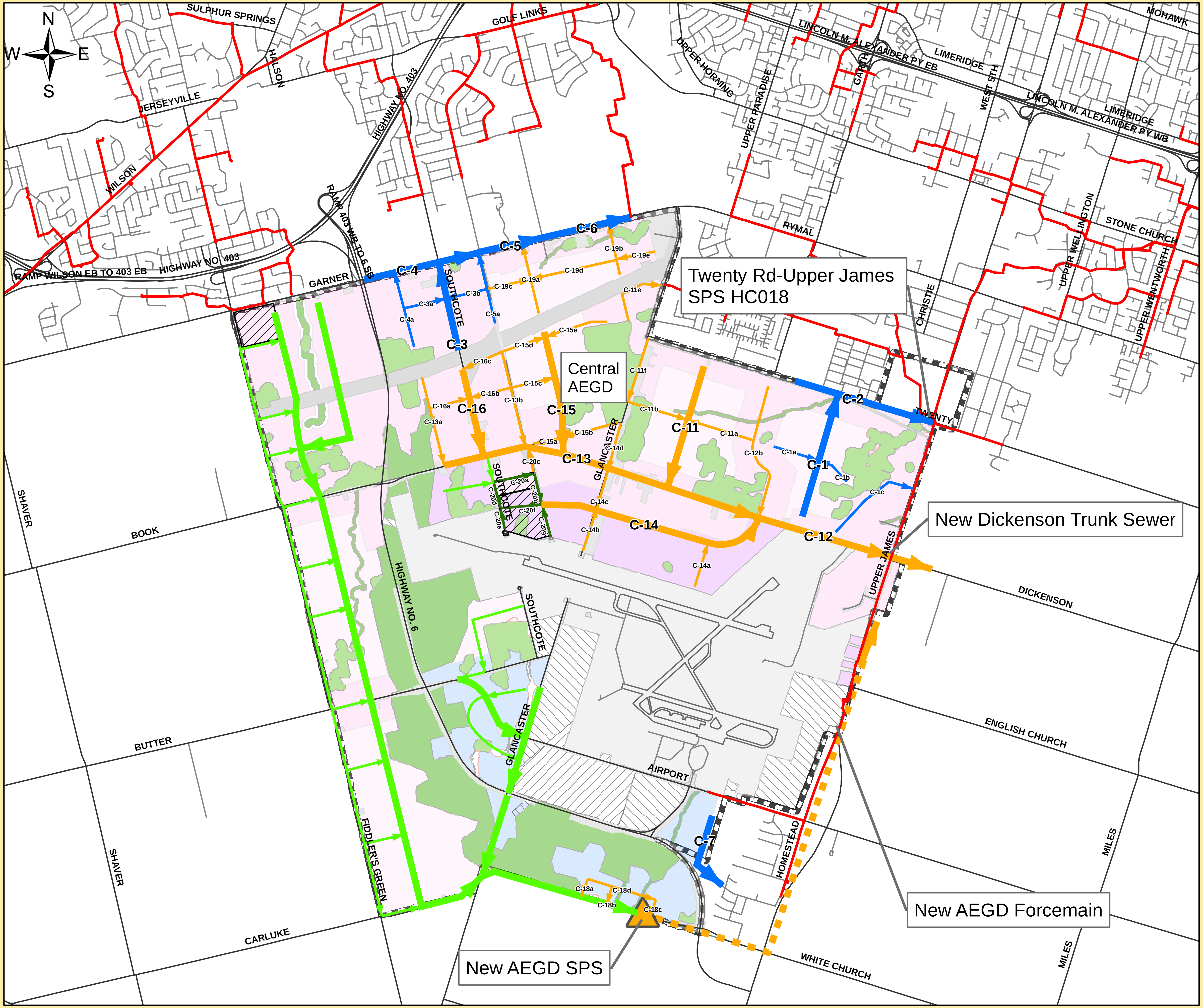
The existing Upper James infrastructure consists of a series of sewage pumping stations (SPS), forcemains (FM) and gravity sewers that move flow northerly to the Twenty Rd SPS before discharging to the existing Hamilton Mountain trunk sewer system.

The existing Ancaster/Meadowlands sewer system consists of various smaller diameter sewers discharging to the Ancaster/Fennell Trunk sewer. There is also a proposed 825 mm sewer which will run from Garner Rd on the future Raymond Rd alignment to the existing Ancaster system.

12. Development and Evaluation of Wastewater Servicing Alternatives

The preferred Wastewater Servicing Strategy outlined in the 2006 City Wide Water and Wastewater Master Plan was used as the basis for the development of Wastewater Servicing Options for the AEGD. These options present a more refined and detailed strategy that incorporates the previously approved plan while making the necessary modifications due to changes in the Land Use Plan. Overall, three wastewater servicing options were developed and evaluated based on a triple bottom line approach taking into consideration technical, economic, legal, environmental and socio-economic factors.

- Wastewater Servicing Option A utilizes capacity within existing infrastructure in the northwest, northeast and south and splits the flows from the central portion of the AEGD to either the Twenty Rd SPS or a new Dickenson Rd/Book Rd Trunk sewer.



Hamilton

Hamilton AEGD Study

Figure 14

Preferred Wastewater Servicing Option

Legend

- Existing Trunk Sewers

Proposed Sewers

- Trunk Sewers - Servicing Phase 1
- Sub-Trunk Sewers - Servicing Phase 1
- Trunk Sewers - Servicing Phase 2
- Sub-Trunk Sewers - Servicing Phase 2
- Trunk Sewers - Additional Study Area
- Sub-Trunk Sewers Additional Study Area
- Sewers - Smith Farm
- Roads
- ▨ Council Directed Additional Lands

AECOM

Map Created By: MZ
Map Checked By: CH
Date Created: Sept 22, 2009
Date Modified: Feb 2, 2011

Hamilton

CITY OF HAMILTON
WASTEWATER TREATMENT FACILITIES

ANNUAL REPORT
2023

3.1.7 HCS08: ROYAL COMBINED SEWER OVERFLOW TANK

The Royal Avenue Combined Sewer Overflow Tank is located in Stroud Park, on the southwest corner of Royal Avenue and Stroud Road. The tank volume is 15,000 m³. It was completed in late 2007 and was designed to reduce the frequency of combined sewer overflows entering Chedoke Creek from the Royal Avenue Combined Sewer System.

3.1.8 HCS09: MCMASTER COMBINED SEWER OVERFLOW TANK

The McMaster Combined Sewer Overflow Tank is located at McMaster University in the Zone 6 parking lot. The tank was completed in April 2012. The storage volume of 5,935 m³ was designed to reduce combined sewer overflows to Coldwater Creek which discharges into Cootes Paradise.

3.1.9 HC011: CALVIN STREET WASTEWATER PUMPING STATION

The Calvin Street Wastewater Pumping Station is located at 170 Calvin Street. The facility is a single-storey building with an adjacent subsurface wet well. The station collects wastewater in a wet well and automatically pumps it to the Woodward Avenue Wastewater Treatment Plant. There are two sewage lift pumps (one duty and one standby), each with a rated capacity of 59 L/s. The station is equipped with an overflow to protect the sewer catchment from surcharging. Should the pumps fail to operate or when sewage inflows are greater than the pump capacity ratings, there is a possibility that the station will overflow into Ancaster Creek before basement flooding occurs.

3.1.10 HC018: TWENTY ROAD WASTEWATER PUMPING STATION

The Twenty Road Wastewater Pumping Station is located at 1980 Upper James Street. The station is a single-storey building laid out in a dry well/wet well configuration. The dry well contains the sewage lift pumps, piping, and process instrumentation. The site has an outdoor pad-mounted generator with a noise abatement enclosure. The wet well is a single cell with three pumps (two duty, one standby), each with a rated capacity of 320 L/s. Should the pumps fail to operate or when sewage inflows are greater than the pump capacity ratings, there is a possibility that the station will overflow into final receiver Twenty Mile Creek.

3.1.11 HC019: ENGLISH CHURCH WASTEWATER PUMPING STATION

The English Church Wastewater Pumping Station is located at 2844 Upper James Street. The station is a single-storey building with an adjacent subsurface wet well. The station collects wastewater in a wet well and automatically pumps it to the Woodward Avenue Wastewater Treatment Plant. There are three sewage lift pumps (two duty, one standby), each with a rated capacity of 210 L/s. There are no overflow provisions at this facility.

3.1.12 HC027: HOMESTEAD WASTEWATER PUMPING STATION

The Homestead Wastewater Pumping Station is located at 3359 Homestead Drive. The station is a single-storey building with an adjacent subsurface wet well. The station collects wastewater in 2 wet wells and automatically pumps it to the Woodward Avenue Wastewater Treatment Plant. There are three sewage lift pumps (two duty, one standby), each with a rated capacity of 91 L/s. There are no overflow provisions at this facility.

3.1.13 HC058: BINBROOK WASTEWATER PUMPING STATION

The Regional Road 56 Binbrook Wastewater Pumping Station is located at 3255 Regional Road 56 in Binbrook. The station is a single-storey building with an adjacent subsurface wet well. The station collects wastewater in a wet well and automatically pumps it to the Woodward Avenue Wastewater Treatment Plant. There are three sewage lift pumps (two duty, one standby), each with a rated capacity of 257 L/s. The station is rated for an initial period peak flow of 231 L/s and an ultimate peak flow of 507 L/s. There is a wet weather valve between the two discharge forcemains. During high flow conditions (two pumps are running), the valve will open to allow sewage to flow through both forcemains. There are no overflow provisions at this facility.

Salvucci, Justin

From:	Bainbridge, Mark <Mark.Bainbridge@hamilton.ca>
Sent:	Friday, December 20, 2024 5:05 PM
To:	Knechtel, Erich; Steven Silverberg
Cc:	Sergio Manchia; Winters, Nick; Salvucci, Justin
Subject:	FW: information required from the City - Whitechurch Landowners Group
Attachments:	AEGD Land Use Plan.pdf; 005-W601_Hamilton-CS-CLI-ECA.pdf; 717010 231121 AEGD SPS Development Tracker for Dickenson and Centennial TrunkV4.pdf; Stormwater CLI ECA 005-S701 - COH comments, October 22, 2024.pdf

Hi Erich,

The FSR process has been developed and is facilitated by staff in the Planning Department, we have forwarded your message to them for coordination and response.

Hi Steven,

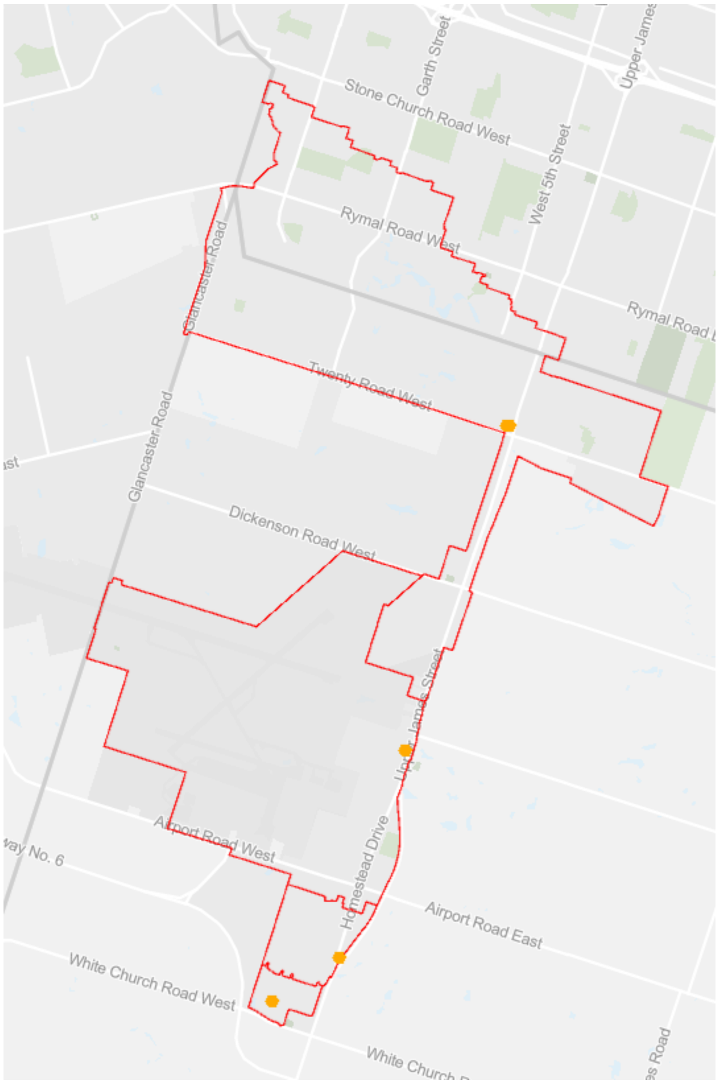
Thank you for clarifying your information request. Unfortunately I do not have the ability to provide the Hydraulic modelling data as this is not our current practice at this time. We have previously indicated this perspective through discussion and as part of written comments provided on November 18, 2024 to Justin Salvucci.

This message will provide you with other sources of information in response to your request including the draft CLI ECAs for the City's wastewater and stormwater systems. We are confident that this information is adequate to support your application process.

Please note the following disclaimers regarding the data and information:

The data and information provided is a courtesy and the accuracy of the data and information is not warranted in any way. The Recipient accepts that the data and information may contain significant errors to the extent that it is not useful for any purpose, that no level of correctness or accuracy of the data and information is either explicitly or implicitly represented to exist, and that the City shall have no responsibility for any losses or damages experienced by the Recipient in connection with its use of the data and information. Please also note that the ECA documentation is still in a draft form and under ongoing negotiations with the Ministry of Environment Conservation and Parks.

Assets in the vicinity of the Whitechurch area include Twenty Road, English Church, Homestead, and Thames Way sewage pumping stations. Catchment areas for these assets are shown below:



- The firm capacity of the Twenty Road SPS is 590 l/s.
- The firm capacity of the English Church SPS is 285 l/s
- The firm capacity of the Homestead SPS is 155 l/s
- The peak flow capacity of the Thames Way SPS is 67.3 l/s this needs a future update to identify a firm capacity.
- There is no residual capacity in the Pump Stations noted above at this time.
- Once the Dickenson trunk is online, capacity details will be reassessed in the system.
- The current timeline for completion of the Dickenson Road Trunk sewer is 2028 but is subject to future project schedule adjustments based on field progress.

The attached maps show the land use designations for the AEGD in 2010, which was updated in 2015, and the wastewater capacity allocated to a portion of the subject lands.

We have also attached the Dickenson Trunk sewer Flow calculation for reference.

I trust that this information is helpful.

Mark Bainbridge (He/Him)
Director - Water & Wastewater Planning & Capital
Public Works
Hamilton Water, City of Hamilton

(905) 546-2424 Ext.5929

City of Hamilton - AEGD Sanitary Sewer Flow Calculation - Future Dickenson Rd and Centennial Pkwy Trunk Sewer

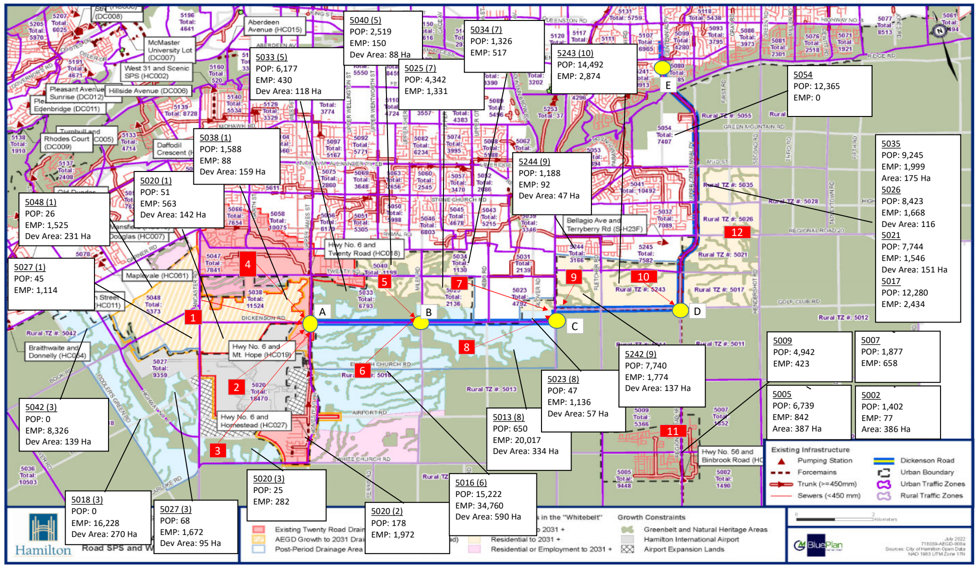
Design Criteria				Net Developable Area - Ex Urb Bdry	0.80
Average Day DWF	Res	360.00	L/cap/day		
	Emp	360.00	L/emp/day		
Peak Extraneous Flow		0.40	L/s/ha	M = 5/(P/1000)0.2	2≤M≤5

PROJECT NO: 718039 / 717010
DATE: 11-Nov-19
Revised to Include Centennial TSZs Jul-20
Revised Area & Population 21-Nov-23

<u>Assumptions</u>

1 Residential and Employment design criteria from City's Comprehensive Design Guidelines: 360 L/cap/d
2 Peak Extraneous Flow: 0.4 L/s/ha - applicable to net developable area
3 Babbitt Peaking factor used for sum of equivalent population - does not account for peaking from pumping stations
4 For Traffic Survey Zones (TSZs) all or partially within the Urban Boundary, draft 2051 population and employment was assumed. TSZ projections received from City - May 4, 2022 (Scenario1_AmbitiousDensityAEGDadjust)
5 For TSZs designated "Rural", 60 people+jobs/net developable hectare was assumed.
6 Net developable area was calculated on a TSZ by TSZ basis. Most Urban Area TSZs such as 5048 assumed 80% net developable area, Most Rural TSZs accounted for natural features shapefile received from City Sept 30, 2019
7 Pop/Emp flow was assumed to be assigned to theoretical MH's along Dickenson Trunk. This is a theoretical and simplified manhole allocation for calculation of potential total flow. Some areas within the TSZs may be allocated differently as development details are refined

User Input								Traffic Survey Zone Total			Adjusted			Cumulative Adjusted								
Location	Growth Area ID / Traffic Survey Zone	Flow into Dickenson	Population / Emp Source		Sewer	% of TZ (Pop & Jobs)	% of Total TSZ (Area)	Population	Employees	Area (Ha)	Population	Employees	Area (Ha)	Population	Employees	Area (Ha)	Average Day DWF (L/s)	Total Equiv Pop	Peaking Factor (M)	Peak Ext. Flow (L/s)	Peak DWF (L/s)	Peak WWF (L/s)
Area 1 Traffic Survey Zones	5020	Yes	GRIDS2 - 2051		Dickenson Trunk	20%	15%	254	2,817	1,186	51	563	142	51	563	142	3	614	5.00	57	13	70
Area 1 Traffic Survey Zones	5027	Yes	GRIDS2 - 2051		Dickenson Trunk	40%	30%	113	2,786	475	45	1,114	114	96	1,678	256	7	1,774	4.46	103	33	135
Area 1 Traffic Survey Zones	5038	Yes	GRIDS2 - 2051		Dickenson Trunk	50%	50%	3,176	176	399	1,588	88	159	1,684	1,766	416	14	3,450	3.90	166	56	222
Area 1 Traffic Survey Zones	5048	Yes	GRIDS2 - 2051		Dickenson Trunk	50%	50%	51	3,050	577	26	1,525	231	1,710	3,291	646	21	5,000	3.62	259	76	334
Area 2 Traffic Survey Zones	5020	Yes	GRIDS2 - 2051		Dickenson Trunk	70%	40%	254	2,817	1,186	178	1,972	379	1,887	5,263	1,026	30	7,150	3.37	410	101	511
Area 3 Traffic Survey Zones	5018	Yes	Calc'd - 60ppj/ha		Dickenson Trunk	100%	100%	0	16,228	270	-	16,228	270	1,887	21,491	1,296	97	23,378	2.66	518	259	778
Area 3 Traffic Survey Zones	5020	Yes	GRIDS2 - 2051		Dickenson Trunk	10%	5%	254	2,817	1,186	25	282	59	1,913	21,773	1,355	99	23,685	2.66	542	262	804
Area 3 Traffic Survey Zones	5027	Yes	GRIDS2 - 2051		Dickenson Trunk	60%	20%	113	2,786	475	68	1,672	95	1,981	23,444	1,451	106	25,425	2.62	580	277	858
Area 3 Traffic Survey Zones	5042	Yes	Calc'd - 60ppj/ha		Dickenson Trunk	60%	60%	0	8,326	139	-	4,996	83	1,981	28,440	1,534	127	30,421	2.53	614	320	934
Total Flow at Point A (Area 1 - 4) - A-B														1,981	28,440	1,534	127	30,421	2.53	614	320	934
Area 5 Traffic Survey Zones	5033	Yes	GRIDS2 - 2051		Dickenson Trunk	90%	30%	6,863	478	392	6,177	430	118	8,157	28,870	1,651	154	37,028	2.43	661	375	1,035
Area 5 Traffic Survey Zones	5040	Yes	GRIDS2 - 2051		Dickenson Trunk	50%	40%	5,037	300	220	2,519	150	88	10,676	29,020	1,739	165	39,696	2.39	696	396	1,092
Area 6 Traffic Survey Zones	5016	Yes	Calc'd - 60ppj/ha		Dickenson Trunk	100%	100%	15,222	34,760	590	15,222	34,760	590	25,897	63,780	2,329	374	89,678	2.03	932	760	1,692
Total Flow at Point B (Area 1 - 6) B-C														25,897	63,780	2,329	374	89,678	2.03	932	760	1,692
Area 7 Traffic Survey Zones	5034	Yes	GRIDS2 - 2051		Dickenson Trunk	50%	30%	2,651	1,033	145	1,326	517	43	27,223	64,297	2,373	381	91,520	2.03	949	773	1,722
Area 7 Traffic Survey Zones	5025	Yes	GRIDS2 - 2051		Dickenson Trunk	75%	60%	5,789	1,775	231	4,342	1,331	139	31,565	65,628	2,512	405	97,193	2.00	1,005	811	1,815
Area 8 Traffic Survey Zones	5013	Yes	Calc'd - 60ppj/ha		Dickenson Trunk	100%	100%	650	20,017	334	650	20,017	334	32,215	85,645	2,845	491	117,860	2.00	1,138	982	2,120
Area 8 Traffic Survey Zones	5023	Yes	GRIDS2 - 2051		Dickenson Trunk	25%	25%	186	4,542	229	47	1,136	57	32,261	86,780	2,903	496	119,042	2.00	1,161	992	2,153
Area 9 Traffic Survey Zones	5242	Yes	GRIDS2 - 2051		Dickenson Trunk	100%	100%	7,740	1,774	137	7,740	1,774	137	40,001	88,554	3,039	536	128,556	2.00	1,216	1,071	2,287
Area 9 Traffic Survey Zones	5244	Yes	GRIDS2 - 2051		Dickenson Trunk	40%	40%	2,971	229	116	1,188	92	47	41,190	88,646	3,086	541	129,836	2.00	1,234	1,082	2,316
Total Flow at Point C (Area 1 - 9) C-D														41,190	88,646	3,086	541	129,836	2.00	1,234	1,082	2,316
Area 10 Traffic Survey Zones	5243	Yes	GRIDS2 - 2051		Dickenson Trunk	100%	100%	14,492	2,874	229	14,492	2,874	229	55,682	91,520	3,314	613	147,202	2.00	1,326	1,227	2,552
		Yes	GRIDS2 - 2051					0	0	0	-	-	-	55,682	91,520	3,314	613	147,202	2.00	1,326	1,227	2,552
		Yes	GRIDS2 - 2051					0	0	0	-	-	-	55,682	91,520	3,314	613	147,202	2.00	1,326	1,227	2,552
Total Flow at Point D (Area 1 - 10)														55,682	91,520	3,314	613	147,202	2.00	1,326	1,227	2,552
Binbrook Traffic Survey Zones	5009	Yes	GRIDS2 - 2051		Centennial Trunk	100%	40%	4,942	423	425	4,942	423	170	60,624	91,943	3,484	636	152,567	2.00	1,394	1,271	2,665
Binbrook Traffic Survey Zones	5007	Yes	GRIDS2 - 2051		Centennial Trunk	100%	15%	1,877	658	431	1,877	658	65	62,501	92,601	3,549	646	155,102	2.00	1,420	1,293	2,712
Binbrook Traffic Survey Zones	5002	Yes	GRIDS2 - 2051		Centennial Trunk	100%	10%	1,402	77	386	1,402	77	39	63,903	92,678	3,588	652	156,581	2.00	1,435	1,305	2,740
Binbrook Traffic Survey Zones	5005	Yes	GRIDS2 - 2051		Centennial Trunk	100%	40%	6,739	842	387	6,739	842	155	70,642	93,520	3,742	684	164,162	2.00	1,497	1,368	2,865
Elfrida Traffic Survey Zones	5017	Yes	GRIDS2 - 2051		Centennial Trunk	100%	75%	12,280	2,434	209	12,280	2,434	157	82,922	95,954	3,899	745	178,876	2.00	1,560	1,491	3,050
Elfrida Traffic Survey Zones	5021	Yes	GRIDS2 - 2051		Centennial Trunk	100%	75%	7,744	1,546	201	7,744	1,546	151	90,666	97,500	4,050	784	188,166	2.00	1,620	1,568	3,188
Elfrida Traffic Survey Zones	5026	Yes	GRIDS2 - 2051		Centennial Trunk	100%	75%	8,423	1,668	155	8,423	1,668	116	99,089	99,168	4,166	826	198,257	2.00	1,667	1,652	3,319
Elfrida Traffic Survey Zones	5035	Yes	GRIDS2 - 2051		Centennial Trunk	100%	75%	9,245	1,999	175	9,245	1,999	131	108,334	101,167	4,297	873	209,501	2.00	1,719	1,746	3,465
Green Mountain	5054	Yes	GRIDS2 - 2051		Centennial Trunk	100%	50%	7,913	0	308	7,913	-	154	116,247	101,167	4,452	906	217,414	2.00	1,781	1,812	3,592
Total Flow at Point E (Area 1 - 12)														116,247	101,167	4,452	906	217,414	2.00	1,781	1,812	3,592



NOTES:

1. The calculated flow shown in the table is preliminary only and is intended to to be used for an approximate estimate of the long term Peak Wet Weathr Flow potential at point 'E' for confirming sizing of the Lower Centennial Sewer. This flow does not account for potential diversion of flows from other locations such as the Twenty Rd SPS Catchment or the existing Battlefield Trunk Sewer to the new proposed Centennial Sewer.

2. The Population and Employment projections for these areas are either from the preliminary 2051 GRIDS 2 **Ambitious Density** TSZ data or from an assumed density of 60 pop+jobs/net developable hectare. The No Urban Boundary Planning Scenario would result in significantly lower flow at Point E.

3. Areas that are included beyond the urban boundary (Blue Areas) are intended to represent a theoretical potential urban boundary expansion that could drain to the Dickenson Trunk Sewer by gravity and/or pumping.

4. The calculations assume Development Guidelines Criteria of 360 L/cap/d and 360 L/emp/d along with 0.4 L/s/ha Extraneous Flow.

Appendix B-3 Water Analysis Relevant Excerpts

City of Hamilton
Water and Wastewater Master Plan Class Environmental Assessment Report

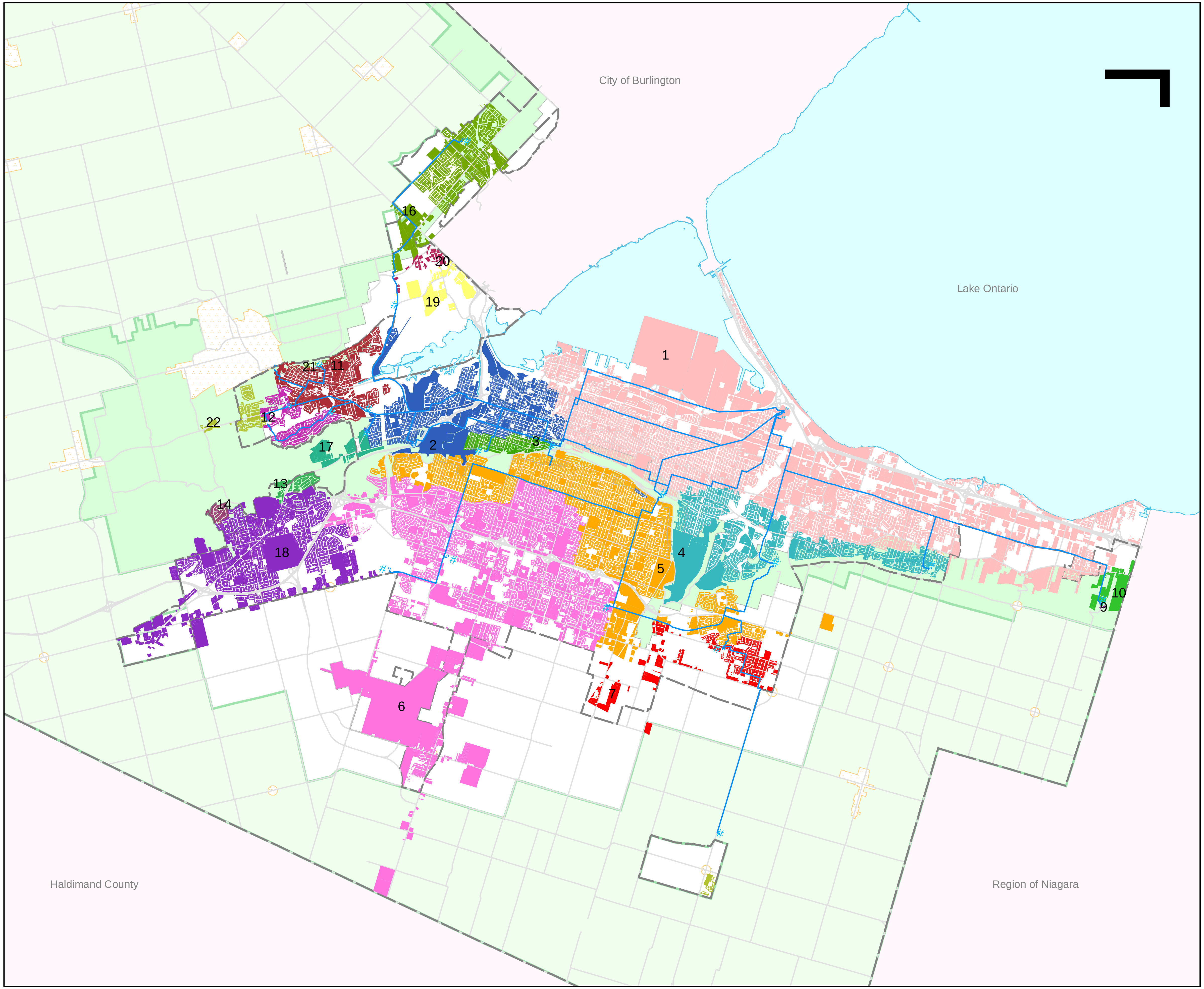
Prepared by:

KMK Consultants Limited
220 Advance Blvd.
Brampton, ON, L6T 4J5

Telephone: 905-459-4780
Fax: 905-459-7869

November 22, 2006

KMK Project No. 2590.01



Legend

\# Pump
" Reservoir
" Plant
— Watermain
▨ Rural Settlement Area
🟪 Intensification Area
🟩 Niagara Escarpment
🟩 Greenbelt
▭ Urban Boundary

Hamilton

Integrated Water & Wastewater Master Plan

Water Servicing

Water Distribution System

Nov 22, 2006
1:125,000
2590-D-77

system maintained. Currently, there is elevated storage in Pressure District 10, though with limited capacity.

Dundas

Dundas is serviced through Pressure Districts 11 and 12, and is adjacent to and supplied through Pressure District 2. The storage located in Pressure District 11 is sufficient for both Pressure Districts.

Pressure District 12 is supplied from Pressure District 11 through Pumping Station HD12A. This district is also supplied through Pressure District 22, which receives its supply through a PRV from District 18. The elevated tank within Pressure District 12 provides equalization but has limited capacity to provide security in an event of an emergency.

The properties located south of the Spring Creek Conservation Area are fed by a single 300 mm diameter watermain located on Bridlewood Drive. In the event that this supply is interrupted, pumping station HD012 can be used to service this area from Pressure District 11. Station HD012 has to be operated manually, and it does not have sufficient capacity to supply the required fire flows.

Pressure District 22, which services the higher lands in north west Dundas, is supplied through a single connection from Pressure District 18. The elevated tank within Pressure District 22 provides equalization but has limited capacity to provide security in an event of an emergency.

Waterdown

Waterdown is located within Pressure District 16, which has an elevation range from 210 m to 250 m. District 16 is supplied through Pressure District 2. The Pleasantview neighbourhood is serviced through pressure-relief valves from District 16.

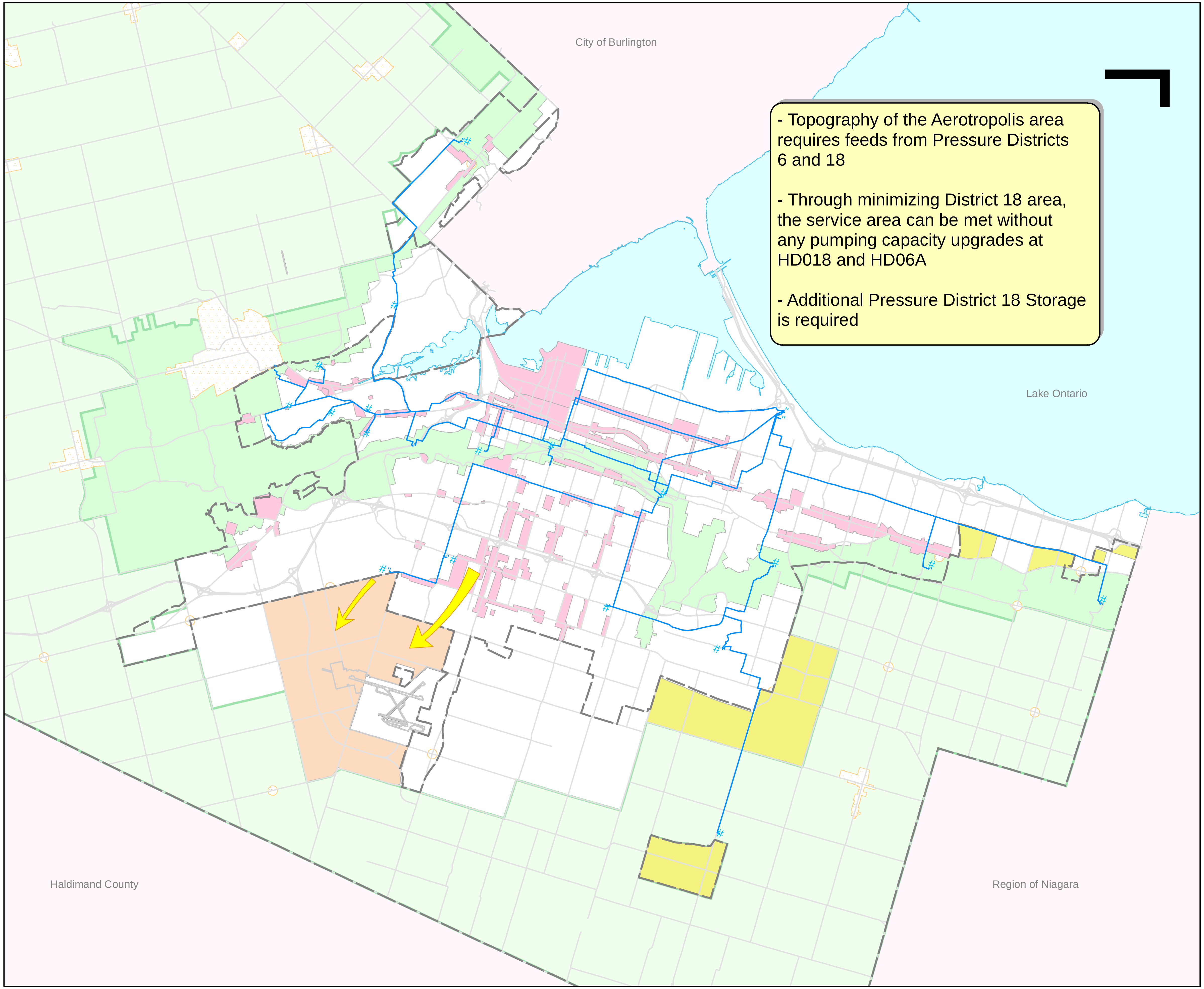
Local pressure for the Waterdown area is provided by Pumping Station HD016 located below the escarpment at York and Valley Road in Dundas. Water is distributed from Pump Station HD016 up the escarpment through a single 600 mm trunk watermain. There is limited storage capacity within Waterdown, and there is some limited capacity for an emergency supply through a maintained interconnection with the Region of Halton.

Mountain

The Mountain area is located above the Niagara Escarpment, within Pressure Districts 5 and 6. Pressure District 5 is fed from Pressure District 1 through two pumping stations, HD005 and HD05A. Pressure District 6 is in turn fed from District 5 through two additional pumping stations, HD006 and HD06A.

Currently, there are two supply feedermains up the Escarpment, and approximately half of the City's population resides on the Mountain.

There is sufficient pumped storage for the area, and operational equalization is provided from the reservoir located in Pressure District 18.



- Topography of the Aerotropolis area requires feeds from Pressure Districts 6 and 18

- Through minimizing District 18 area, the service area can be met without any pumping capacity upgrades at HD018 and HD06A

- Additional Pressure District 18 Storage is required

Legend

\# Pump
" Reservoir
" Plant
— Existing Watermain
▨ Rural Settlement Area
🟨 Potential Urban Boundary Expansion
🟥 Intensification Area
🟩 Niagara Escarpment
🟩 Greenbelt
☐ Urban Boundary

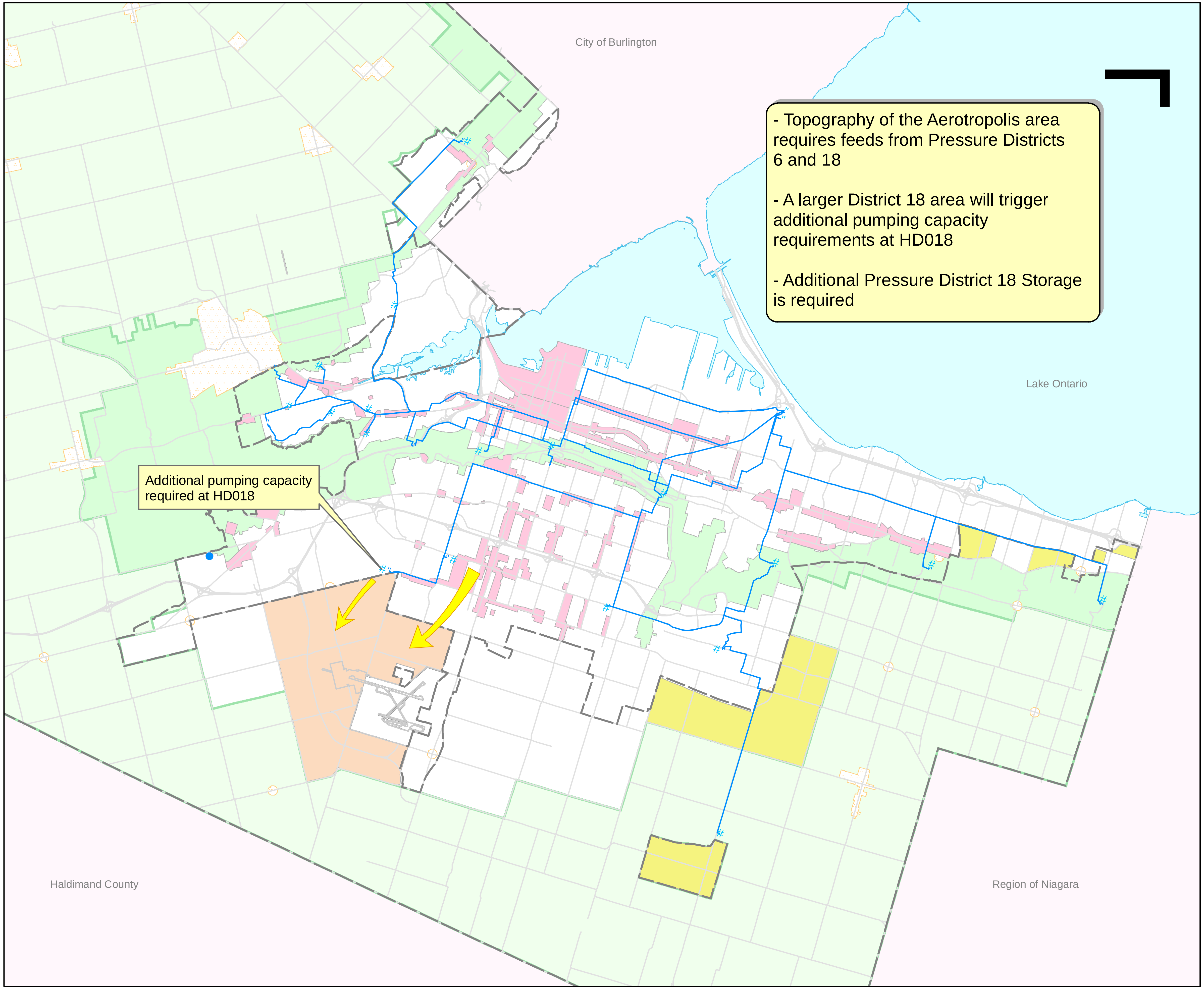
Hamilton

Integrated Water & Wastewater Master Plan

Airport Lands Water Servicing

Alternative 1

Nov 22, 2006
1:125,000
2590-D-63



- Topography of the Aerotropolis area requires feeds from Pressure Districts 6 and 18

- A larger District 18 area will trigger additional pumping capacity requirements at HD018

- Additional Pressure District 18 Storage is required

Additional pumping capacity required at HD018

Legend

\# Pump
" Reservoir
" Plant
— Watermain
▨ Rural Settlement Area
🟨 Potential Urban Boundary Expansion
🟪 Intensification Area
🟩 Niagara Escarpment
☐ Greenbelt
☐ Urban Boundary

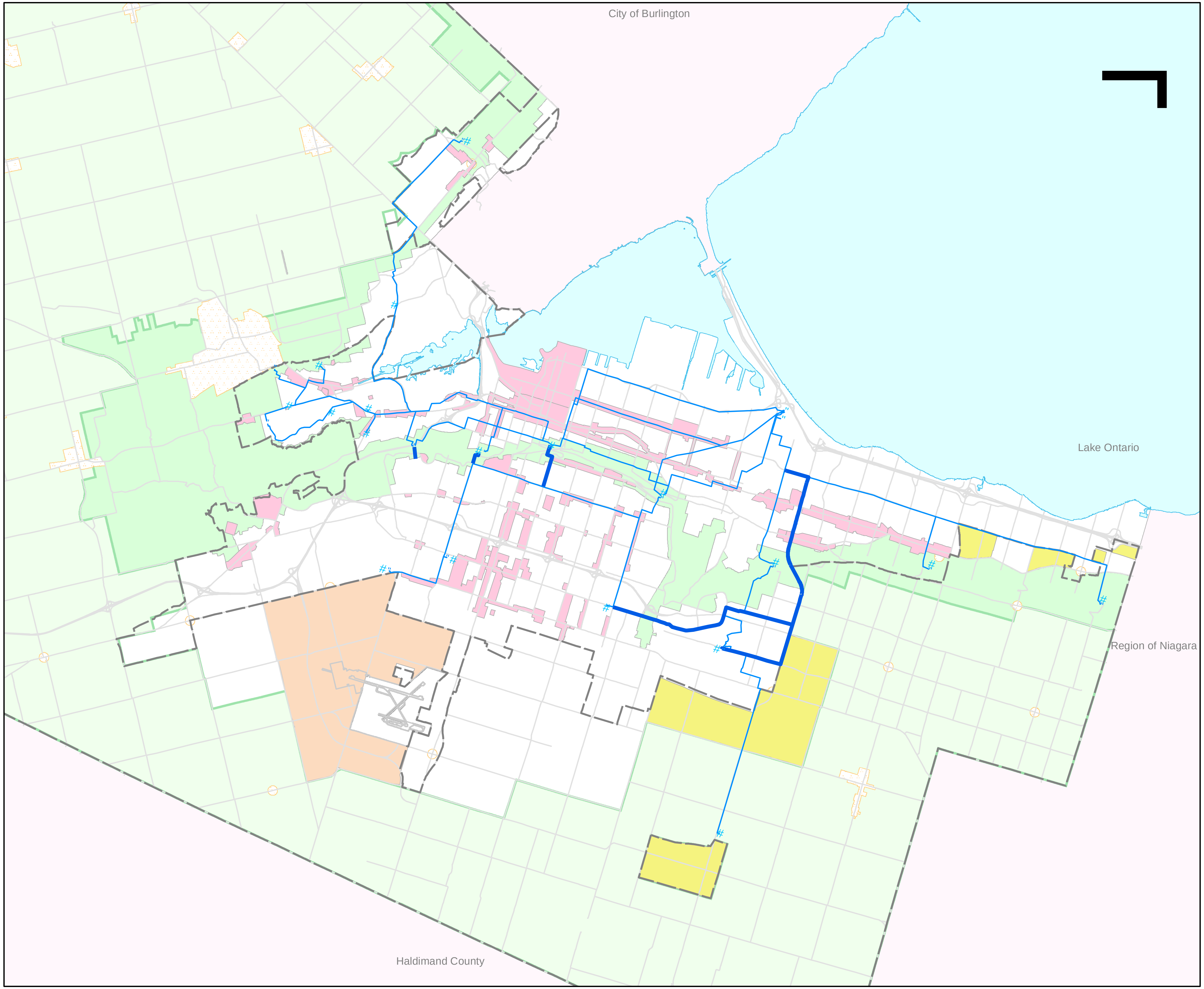
Hamilton

Integrated Water & Wastewater Master Plan

Airport Lands Water Servicing

Alternative 2

Nov 22, 2006
1:125,000
2590-D-67



Legend

- # Pump
- " Reservoir
- " Plant
- ─ Watermain
- ━ Watermain Options
- ▨ Rural Settlement Area
- 🟨 Potential Urban Boundary Expansion
- 🟧 Potential New Business Park
- 🟪 Intensification Area
- 🟩 Niagara Escarpment
- ▢ Greenbelt
- ⬚ Urban Boundary

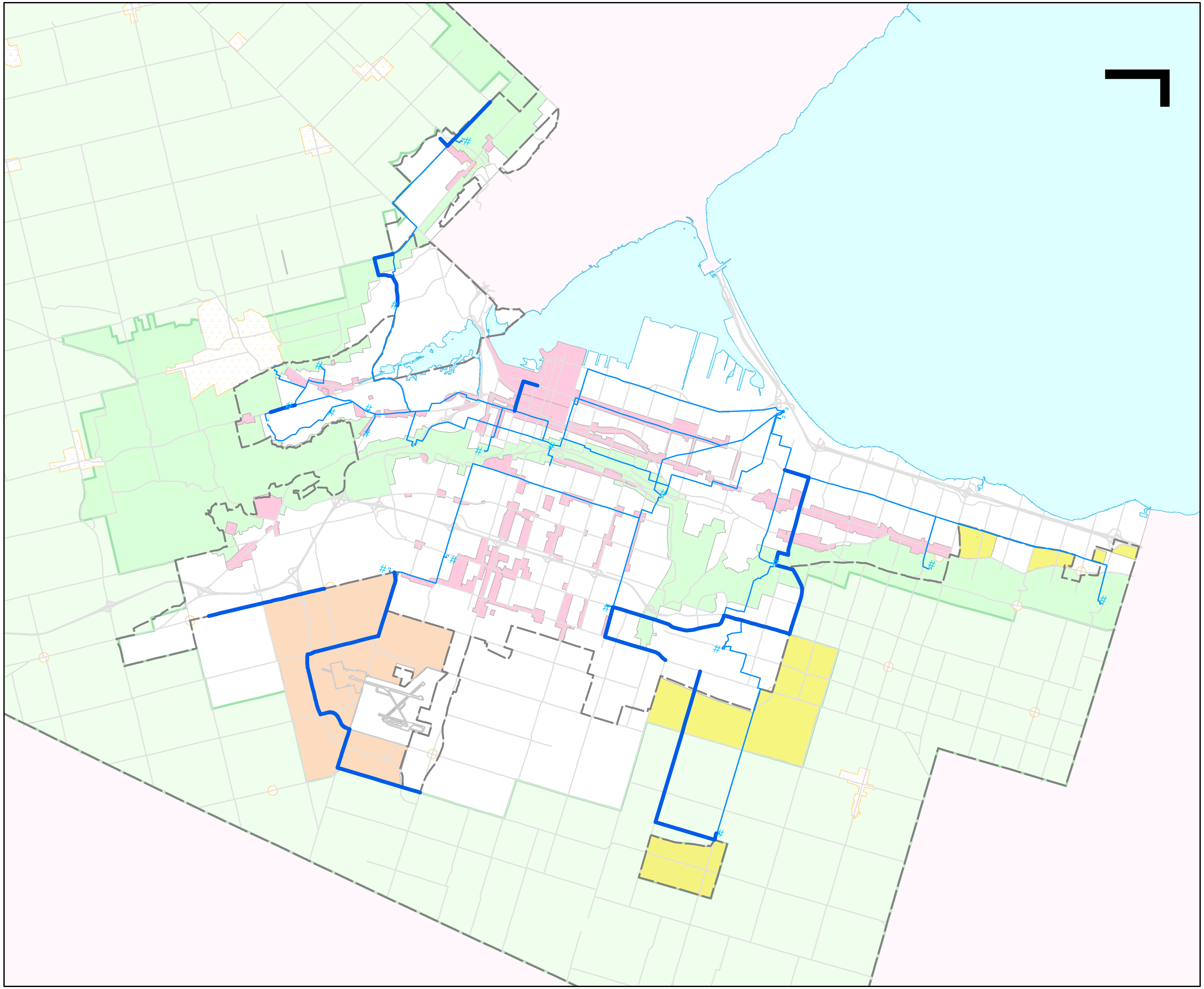
Hamilton

Integrated Water & Wastewater Master Plan

Escarpment Water Servicing

Alternatives

Nov 22, 2006
1:125,000
2590-D-58



Legend

#	Pump
"	Reservoir
"	Plant
—	Watermain
━	Watermain Upgrades

Hamilton

Integrated Water & Wastewater Master Plan

Water Servicing

Preferred Water Servicing Alternatives

KMK
Consultants
Limited

Nov 22, 2006
1:125,000
2590-D-73

City of Hamilton
Airport Employment Growth District - Phase 2

Water & Wastewater Servicing Master Plan

UPDATE

December 2016

GM BluePlan
Aquafor Beech

2.0 Phasing Update

The proposed phasing of growth is similar to that of the 2011 AEGD report, with three main areas that recommended to be suitable for initial development, due to the proximity of existing servicing. These three areas are:

- Southeast and southwest corner of Garner Rd and Hwy 6. Land use changes since 2011 have accelerated the lands southwest of Garner Rd and Hwy 6
- Lands between Airport Rd W and Hwy 6, just south of the airport
- Northeast portion of the AEGD adjacent to Upper James St and Twenty Rd.

These areas are anticipated to develop first, with employment growth developing towards the center of the AEGD over time. This general phasing plan is in line with the planned extensions to the AEGD water and wastewater infrastructure.

3.0 Water Strategy Update

As a result of land use changes, update to the water infrastructure plan was required. The Preferred Water Servicing Option for the AEGD remains Option B, which maximizes the Pressure District 6 service area. This option resulted in the PD6 / PD 18 boundary along Book Rd and Glancaster Rd, within PD 18 to north and PD6 to the south and east. Refer to the 2011 AEGD Master Plan Report for full outline of the existing infrastructure and evaluation of servicing options.

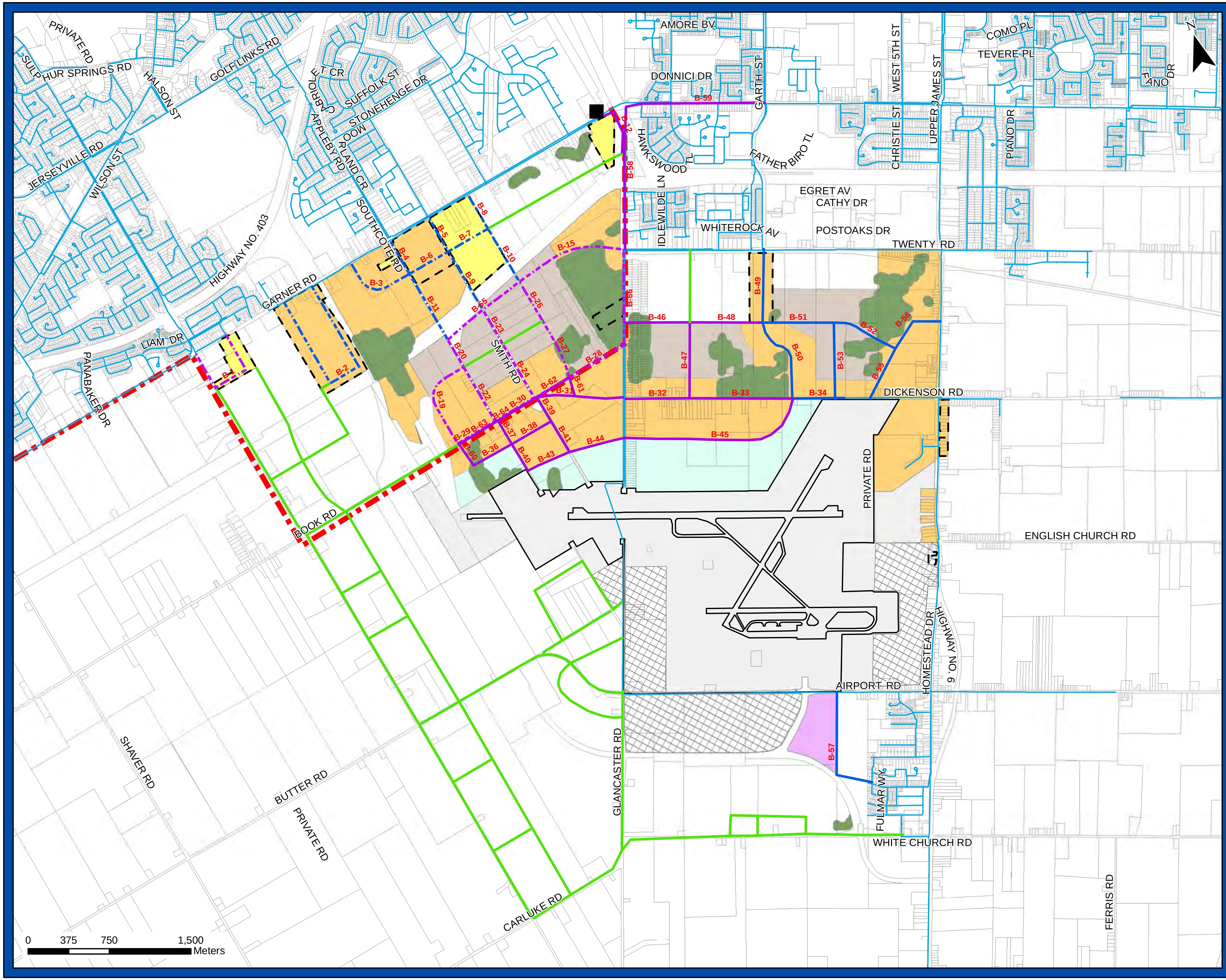
The following sections outline the updates to the proposed water network. The updated Water Strategy and Capital Plan is shown in Figure 3 and Table 3, respectively.

3.1 Water Infrastructure Update

Addition of lands west of Hwy 6, south of Garner Rd requires connection to the PD18 system from Ancaster. The larger area at the southwest corner of Hwy 6 and Garner Rd is proposed to be serviced within Phase 1 of AEGD growth and will require looped 300 mm watermains connecting to the 400 mm watermain on Garner Rd. The area southeast of Garner Rd and Fiddlers Green Rd is proposed to be serviced as part of Phase 2 and will require a local 150 mm connection to the existing local 150 mm at Anson Rd and connecting back to the 150 mm watermain at Garner Rd and Fiddlers Green Rd

The areas adjacent to Southcote Rd, south of Book Rd will be serviced by looped PD6 extensions of 300 mm watermains from Southcote Rd and Smith Rd. These areas are proposed to be serviced within Phase 2 of AEGD growth. Several areas that are no longer within the 2031 growth plan will have previously recommended watermains deferred to post 2031. These areas are located south of Garner Rd east of Springbrook Rd, along Twenty Rd between Glancaster and Sunibel Dr and between Hwy 6 and White Church Rd

Based on review of updated land use and road network, the following projects shown in Table 2 have been updated or modified:



Hamilton

Hamilton AEGD Study

Preferred Water Servicing - Update

Legend

Existing Infrastructure

- ■ Reservoir & Pumping Station

Water Infrastructure 2016

- PD 18 Servicing Phase 1
- PD 6 Servicing Phase 1
- PD 18 Servicing Phase 2
- PD 6 Servicing Phase 2
- Post 2031 Water Servicing
- Existing Watermain
- Water Pressure District

AEGD Land Use

- Airport Boundary
- Airport Light Industrial
- Airport Prestige Industrial
- Airport Related Business
- ▨ Airport Reserve
- Airside Industrial
- Institutional
- Parcel Fabric
- Natural Open Space
- Site Specific Policy

BluePlan ENGINEERING

715013-5-W
December 2016
Data Source: City of Hamilton
Scale: 1:34,000 | NAD 1983 UTM Zone 17N

TABLE 3 - WATER CAPITAL PROGRAM

Project ID	Servicing Phase	PD	EA Sch.	Size	Length	Unit Cost	Base Cost	Additional Cost	Engineering / Contingency (25%)	Total Cost
				(mm)	(m)	(2016 $/m)	(2016 $)	(2016 $/m)	(2016 $/m)	(2016 $/m)
B-1	2	18	B*	150	1058	208	$ 220,000	$ -	$ 55,000	$ 275,000
B-2	1	18	B*	300	2094	415	$ 870,000	$ -	$ 218,000	$ 1,088,000
B-3	1	18	B*	300	717	415	$ 298,000	$ -	$ 75,000	$ 373,000
B-4	1	18	A+	400	367	692	$ 254,000	$ -	$ 64,000	$ 318,000
B-5	1	18	A+	300	371	415	$ 154,000	$ -	$ 39,000	$ 193,000
B-6	1	18	B*	400	404	692	$ 280,000	$ -	$ 70,000	$ 350,000
B-7	1	18	B*	400	420	692	$ 291,000	$ -	$ 73,000	$ 364,000
B-8	1	18	B*	300	368	415	$ 153,000	$ -	$ 38,000	$ 191,000
B-9	1	18	B*	300	624	415	$ 259,000	$ -	$ 65,000	$ 324,000
B-10	1	18	B*	300	595	415	$ 247,000	$ -	$ 62,000	$ 309,000
B-11	1	18	A+	400	703	692	$ 487,000	$ -	$ 122,000	$ 609,000
B-12	2	6	B*	400	526	692	$ 364,000	$ -	$ 91,000	$ 455,000
B-13	2	18	B	7 ML			$ 5,576,000	$ -	$ 1,394,000	$ 6,970,000
B-15	2	18	B*	300	1051	415	$ 436,000	$ -	$ 109,000	$ 545,000
B-19	2	18	B*	300	923	415	$ 383,000	$ -	$ 96,000	$ 479,000
B-20	2	18	A+	400	287	692	$ 199,000	$ -	$ 50,000	$ 249,000
B-22	2	18	A+	400	590	692	$ 408,000	$ -	$ 102,000	$ 510,000
B-23	2	18	A+	300	366	415	$ 152,000	$ -	$ 38,000	$ 190,000
B-24	2	18	A+	300	581	415	$ 241,000	$ -	$ 60,000	$ 301,000
B-26	2	18	B*	300	391	415	$ 162,000	$ -	$ 41,000	$ 203,000
B-27	2	18	B*	300	581	415	$ 242,000	$ -	$ 61,000	$ 303,000
B-28	2	18	B	400	588	692	$ 407,000	$ -	$ 102,000	$ 509,000
B-29	2	18	A+	300	418	415	$ 174,000	$ -	$ 44,000	$ 218,000
B-30	2	18	A+	300	419	415	$ 174,000	$ -	$ 44,000	$ 218,000
B-31	2	6	B*	400	796	692	$ 551,000	$ -	$ 138,000	$ 689,000
B-32	2	6	A+	300	588	415	$ 244,000	$ -	$ 61,000	$ 305,000
B-33	2	6	A+	300	939	415	$ 390,000	$ -	$ 98,000	$ 488,000
B-34	1	6	A+	400	485	692	$ 336,000	$ -	$ 84,000	$ 420,000
B-36	2	6	B*	300	405	415	$ 168,000	$ -	$ 42,000	$ 210,000
B-37	2	6	A+	300	250	415	$ 104,000	$ -	$ 26,000	$ 130,000
B-38	2	6	B*	300	418	415	$ 174,000	$ -	$ 44,000	$ 218,000
B-39	2	6	A+	400	259	692	$ 179,000	$ -	$ 45,000	$ 224,000
B-40	2	6	A+	300	286	415	$ 119,000	$ -	$ 30,000	$ 149,000
B-41	2	6	A+	400	327	692	$ 227,000	$ -	$ 57,000	$ 284,000
B-43	2	6	B*	400	420	692	$ 291,000	$ -	$ 73,000	$ 364,000
B-44	2	6	B*	400	521	692	$ 361,000	$ -	$ 90,000	$ 451,000
B-45	2	6	B	400	1765	692	$ 1,222,000	$ -	$ 306,000	$ 1,528,000
B-46	2	6	B*	300	606	415	$ 252,000	$ -	$ 63,000	$ 315,000
B-47	2	6	B*	300	698	415	$ 290,000	$ -	$ 73,000	$ 363,000
B-48	2	6	B*	300	671	415	$ 279,000	$ -	$ 70,000	$ 349,000
B-49	1	6	B	400	678	692	$ 470,000	$ -	$ 118,000	$ 588,000
B-50	1	6	B	400	824	692	$ 571,000	$ -	$ 143,000	$ 714,000
B-51	1	6	B*	300	656	415	$ 273,000	$ -	$ 68,000	$ 341,000
B-52	1	6	B*	300	622	415	$ 258,000	$ -	$ 65,000	$ 323,000
B-53	1	6	B*	300	696	415	$ 289,000	$ -	$ 72,000	$ 361,000
B-55	1	6	B*	300	513	415	$ 213,000	$ -	$ 53,000	$ 266,000
B-56	1	6	B*	300	550	415	$ 229,000	$ -	$ 57,000	$ 286,000
B-57	1	6	B*	300	1091	415	$ 453,000	$ -	$ 113,000	$ 566,000
B-58	2	6	B	400	1464	692	$ 1,013,000	$ -	$ 253,000	$ 1,266,000
B-59	1	6	B	600	1133	1066	$ 1,208,000	$ -	$ 302,000	$ 1,510,000
B-60	2	6	A+	300	238	415	$ 99,000	$ -	$ 25,000	$ 124,000
B-61	2	6	A+	400	523	692	$ 362,000	$ -	$ 91,000	$ 453,000
B-62	2	18	A+	300	374	415	$ 155,000	$ -	$ 39,000	$ 194,000
B-63	2	6	B	400	421	692	$ 291,000	$ -	$ 73,000	$ 364,000
B-64	2	6	B	400	421	692	$ 291,000	$ -	$ 73,000	$ 364,000
B-65	2	18	B*	300	856	415	$ 356,000	$ -	$ 89,000	$ 445,000
B-66	2	6	B	400	901	692	$ 624,000	$ -	$ 156,000	$ 780,000
SUBTOTAL - SECONDARY PLAN AREA					**35,837**		**$ 24,773,000**	**$ -**	**$ 6,203,000**	**$ 30,976,000**

Note: EA Schedule B* projects will be on future road alignments and will be re-classified as A+ once road right-of-ways are established.
Schedule B projects were previously approved under 2006 City Wide Water and Wastewater Master Plan

mm watermains. The AEGD is divided into two different pressure districts; Pressure District 18 (PD18) lies in the northwest between ground elevations of approximately 220m and 260m and is serviced by pumping station HD018 and reservoir HDR18. Pressure District 6 (PD6) consists of land between ground elevations of approximately 205m and 240m and is serviced by pumping station HD06A and HD06B.

There is currently an existing water distribution network surrounding the AEGD which consists of watermains ranging from 200mm to 750mm. There is also an existing 600 mm watermain that runs along Glancaster Rd beneath Runways 12-30 connecting to a 400 mm watermain on Airport Rd.

10. Development and Evaluation of Water Servicing Alternatives

The preferred Water Servicing Strategy outlined in the 2006 City Wide Water and Wastewater Master Plan was used as the basis for the development of Water Servicing Options for the AEGD. These options present a more refined and detailed strategy that incorporates the previously approved plan while making the necessary modifications due to changes in the Land Use Plan. Overall, three water servicing options were developed and evaluated based on a triple bottom line approach taking into consideration technical, economic, legal, environmental and socio-economic factors.

- Water Servicing Option A maximizes the Pressure District 18 service area and minimizes the area serviced by Pressure District 6
- Water Servicing Option B maximizes the Pressure District 6 service area and minimizes the area serviced by Pressure District 18
- Water Servicing Option C proposes a slightly larger Pressure District 18 and slightly smaller Pressure District 6 than Servicing Option B

The preferred Water Servicing Option that was selected was Option B. The overall strategy for this option is to maximize the Pressure District 6 service area. Under Option B, the PD6 area will consist of lands east of Glancaster Rd and south of Book Rd between elevations of approximately 220 m to 240 m. PD18 areas will lie north of Book Rd and west of Glancaster Rd and have elevations between approximately 240 m and 250 m. PD6 currently has flexibility for

8.0 Existing Water System

Drinking water is currently treated at the Woodward Ave Water Treatment Plant located on Woodward Ave North in the City of Hamilton. Treated water is supplied to the AEGD and Hamilton Mountain by being pumped up the escarpment by two trunk feedermains; a 1,050 mm pipe near Upper Ottawa St and a 1,500 / 1,200 mm pipe near Greenhill Ave. Servicing for the AEGD area is provided by two different pressure districts; Pressure District 18 (PD18) and Pressure District 6 (PD6). Additional water system details can be found in the Water and Wastewater Infrastructure Phase 1 report in Appendix A

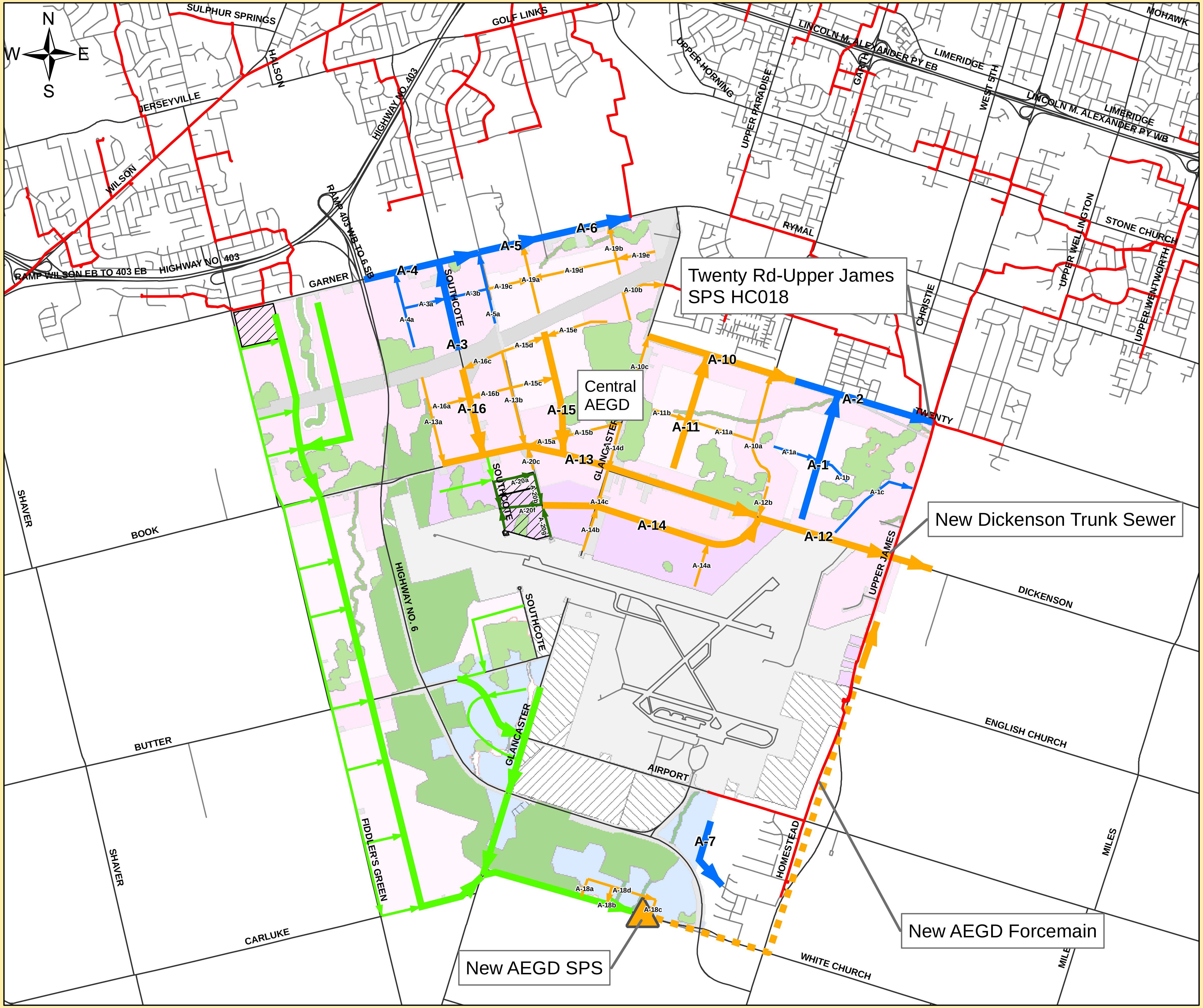
8.1 Pressure District PD18

Pressure District 18 is generally made up of the former Town of Ancaster and services areas within the ground elevations of approximately 220 m and 260 m. This pressure district is fed via separate 400 mm and 750 mm pipes on Garner Rd via Pumping Station HD018 and Reservoir HDR18 located near the intersection of Garner Rd and Glancaster Rd. These watermains on Garner Rd are the main feeds for the northwest PD 18 area within the AEGD.

8.2 Pressure District PD6

Pressure District 6 consists of areas within the south Hamilton Mountain, the Hamilton International Airport itself and Haldimand County with ground elevations ranging from approximately 205 m to 240 m.

PD6 is serviced by pumping station HD06A in the west on Stone Church Rd and Garth St and HD06B in the east located at Stone Church Rd and Turnbridge Cres. These stations operate together to provide servicing for the Pressure District. There are several existing PD6 watermains that surround and traverse the AEGD and provide servicing for the area. A 600 mm watermain runs along Glancaster Rd from Twenty Rd, under runway 12-30, and continues along Glancaster Rd to Airport Rd where it connects to a 500 mm watermain. This 500 mm watermain runs east on Airport Rd to the Airport entrance where it joins a 400 mm pipe that continues east to Upper James St and north on Homestead Dr / Upper James St to Twenty Rd. An existing 300 mm watermain runs from Twenty Rd to Sunibel Dr then increases to a 400 mm to Garth St. From Garth St, a 300 mm and 600 mm watermain continue to Glancaster Rd. Along Glancaster Rd a 200 mm watermain runs from the Airport boundary to Rymal Rd. At the southern end of the AEGD, a 500 mm watermain travels on Homestead Dr / Upper James St from Airport Rd to Haldibrook Rd with a parallel 300 mm watermain from Airport Rd to White Church Rd.



Hamilton

Hamilton AEGD Study

Figure 10
Wastewater Servicing
Option A

Legend

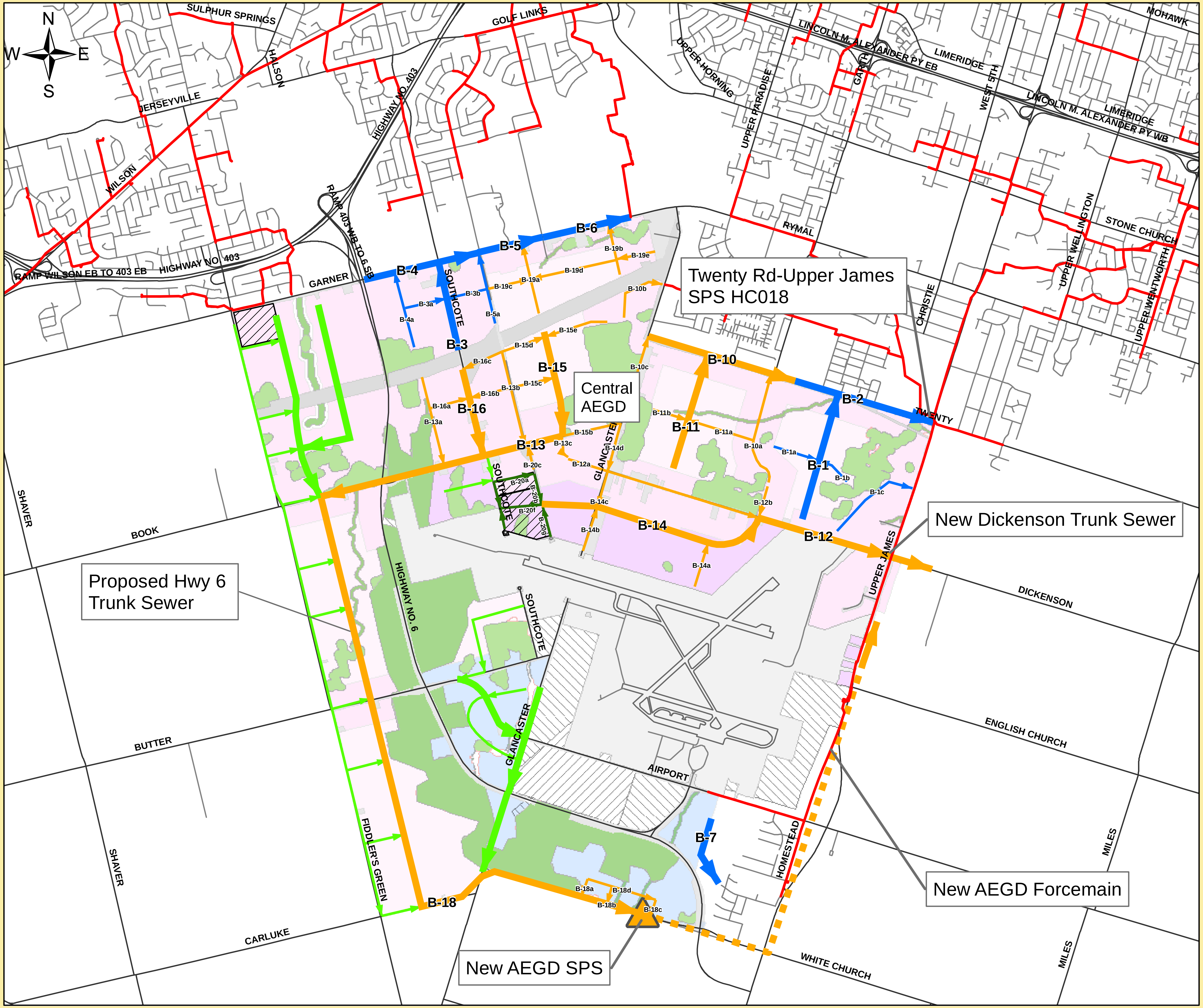
🟥 Existing Trunk Sewers

Proposed Sewers

➡	Trunk Sewers - Servicing Phase 1
→	Sub-Trunk Sewers - Servicing Phase 1
➡	Trunk Sewers - Servicing Phase 2
→	Sub-Trunk Sewers - Servicing Phase 2
➡	Trunk Sewers - Additional Study Area
→	Sub-Trunk Sewers - Additional Study Area
→	Sewers - Smith Farm
—	Roads
▨	Council Directed Additional Lands

AECOM

Map Created By: MZ
Map Checked By: CH
Date Created: Sept 22, 2009
Date Modified: Feb 2, 2011



Hamilton

Hamilton AEGD Study

Figure 11
Wastewater Servicing
Option B

Legend

🟥	Existing Trunk Sewers
Proposed Sewers	
➡	Trunk Sewers - Servicing Phase 1
→	Sub-Trunk Sewers - Servicing Phase 1
➡	Trunk Sewers - Servicing Phase 2
→	Sub-Trunk Sewers - Servicing Phase 2
➡	Trunk Sewers - Additional Study Area
→	Sub-Trunk Sewers - Additional Study Area
→	Sewers - Smith Farm
—	Roads
▨	Council Directed Additional Lands

AECOM

Map Created By: MZ
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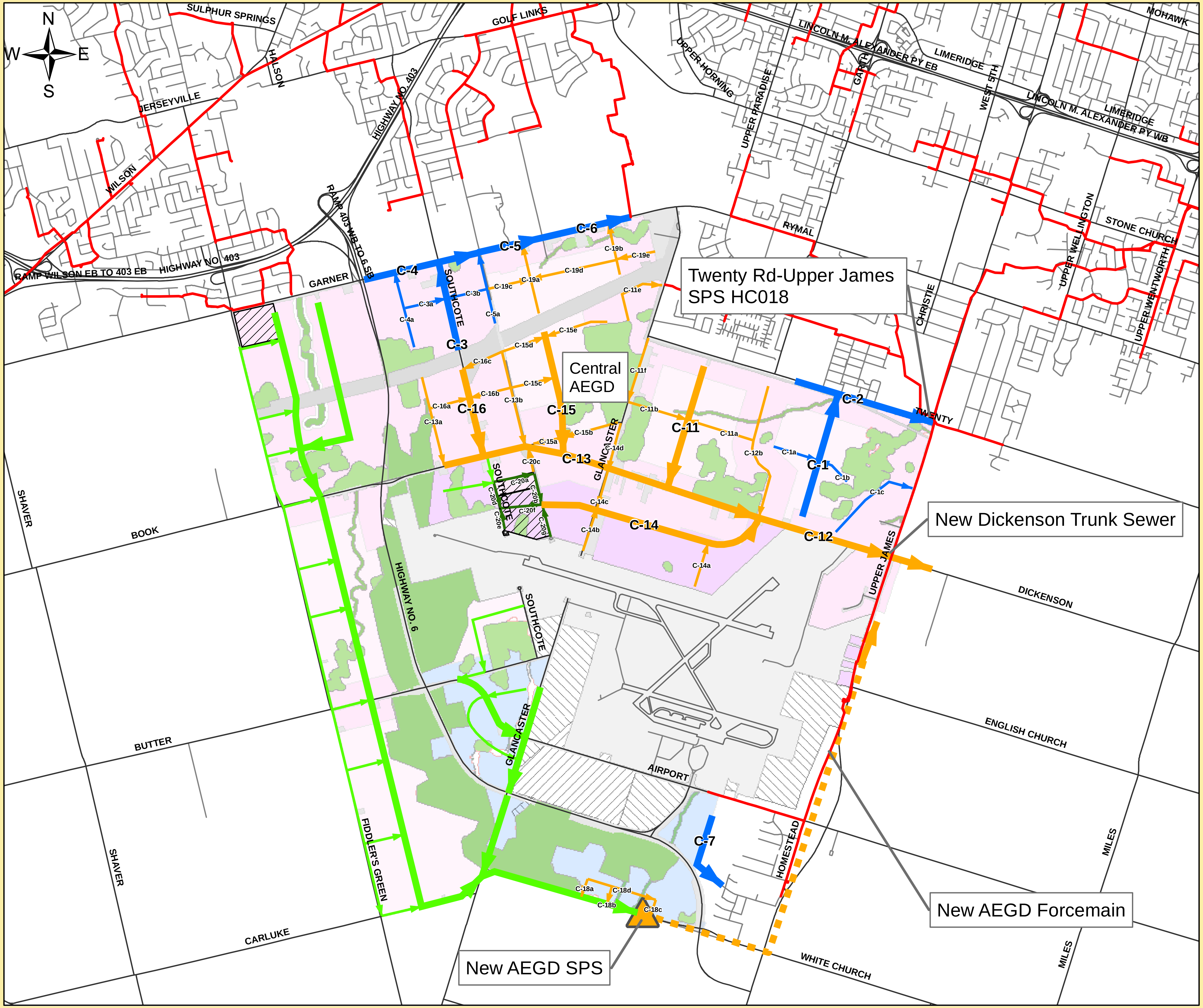


Hamilton

Hamilton AEGD Study

Figure 12
Wastewater Servicing
Option C

Legend

— Existing Trunk Sewers

Proposed Sewers

➡ Trunk Sewers - Servicing Phase 1
➡ Sub-Trunk Sewers - Servicing Phase 1
➡ Trunk Sewers - Servicing Phase 2
➡ Sub-Trunk Sewers - Servicing Phase 2
➡ Trunk Sewers - Additional Study Area
➡ Sub-Trunk Sewers - Additional Study Area
➡ Sewers - Smith Farm
— Roads
▨ Council Directed Additional Lands

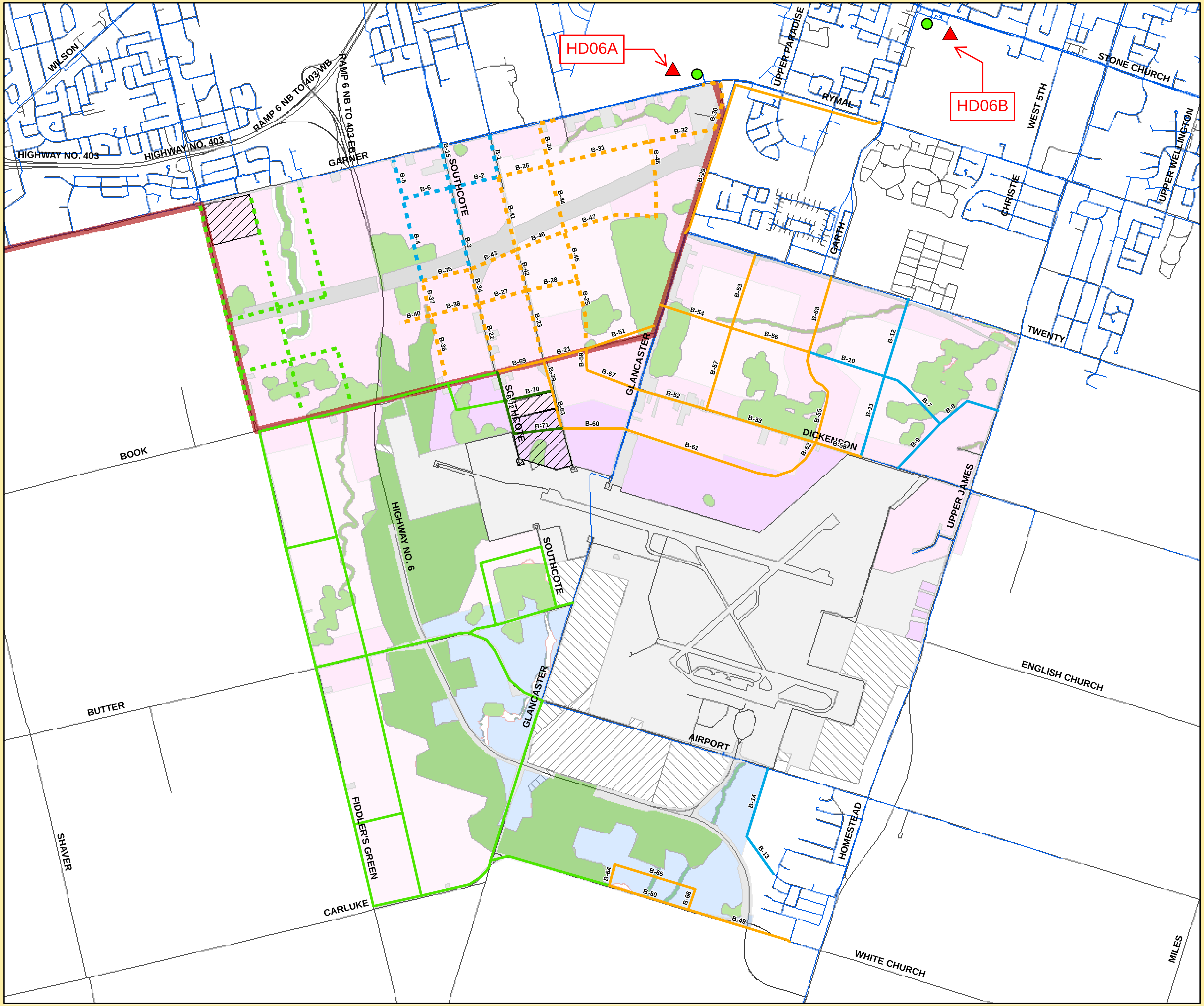
AECOM

Map Created By: MZ
Map Checked By: CH
Date Created: Sept 22, 2009
Date Modified: Feb 2, 2011

TABLE 7 - WATER CAPITAL PROGRAM

Project ID	Servicing Phase	PD	EA SCH.	Size	Length	Unit Cost	Base Cost	Additional Cost	Engineering / Contingency (25%)	Total Cost	Direct Developer Cont.	Development Charges	Post Period Benefit	Oversizing	Benefit to Existing	Comments
				(mm)	(m)	(2009 $/m)	(2009 $)	(2009 $)	(2009 $)	(2009 $)	(2009 $)	(2009 $)	(2009 $)	(2009 $)	(2009 $)	
B-1	1	18	A+	300	389	398	$ 155,000	$ -	$ 39,000	$ 194,000	$ -	$ 194,000	$ -	$ -	$ -	Existing Rd Allowance - 100% DC
B-2	1	18	B	400	417	664	$ 277,000	$ -	$ 69,000	$ 346,000	$ 207,564	$ 138,436	$ -	$ -	$ -	
B-3	1	18	A+	400	700	664	$ 465,000	$ -	$ 116,000	$ 581,000	$ -	$ 581,000	$ -	$ -	$ -	Existing Rd Allowance - 100% DC
B-4	1	18	B	300	705	398	$ 281,000	$ -	$ 70,000	$ 351,000	$ 351,000	$ -	$ -	$ -	$ -	
B-5	1	18	B	300	358	398	$ 143,000	$ -	$ 36,000	$ 179,000	$ 179,000	$ -	$ -	$ -	$ -	
B-6	1	18	B	300	420	398	$ 167,000	$ -	$ 42,000	$ 209,000	$ 209,000	$ -	$ -	$ -	$ -	
B-7	1	6	B	300	621	398	$ 247,000	$ -	$ 62,000	$ 309,000	$ 309,000	$ -	$ -	$ -	$ -	
B-8	1	6	B	300	565	398	$ 225,000	$ -	$ 56,000	$ 281,000	$ 281,000	$ -	$ -	$ -	$ -	
B-9	1	6	B	300	512	398	$ 204,000	$ -	$ 51,000	$ 255,000	$ 255,000	$ -	$ -	$ -	$ -	
B-10	1	6	B	300	659	398	$ 262,000	$ -	$ 66,000	$ 328,000	$ 328,000	$ -	$ -	$ -	$ -	
B-11	1	6	B	300	700	398	$ 279,000	$ -	$ 70,000	$ 349,000	$ 349,000	$ -	$ -	$ -	$ -	
B-12	1	6	B	300	675	398	$ 269,000	$ -	$ 67,000	$ 336,000	$ 336,000	$ -	$ -	$ -	$ -	
B-13	1	6	B	300	856	398	$ 341,000	$ -	$ 85,000	$ 426,000	$ -	$ 426,000	$ -	$ -	$ -	Existing Rd Allowance - 100% DC
B-14	1	6	B	300	594	398	$ 236,000	$ -	$ 59,000	$ 295,000	$ 295,000	$ -	$ -	$ -	$ -	
B-15	1	18	A+	400	383	664	$ 254,000	$ -	$ 64,000	$ 318,000	$ -	$ 318,000	$ -	$ -	$ -	Existing Rd Allowance - 100% DC
B-20	2	18	B*	7 ML				$ -	$ -	$ 6,265,820	$ -	$ 3,132,910	$ -	$ -	$ 3,132,910	El. Tank split 50/50 with ex. Z18
B-21	2	6	B*	400	372	664	$ 247,000	$ -	$ 62,000	$ 309,000	$ -	$ 185,179	$ 123,821	$ -	$ -	Zone 6 Trunk - DC with PP Benefit
B-22	2	18	A+	300	590	398	$ 235,000	$ -	$ 59,000	$ 294,000	$ -	$ 294,000	$ -	$ -	$ -	Existing Rd Allowance - 100% DC
B-23	2	18	A+	300	603	398	$ 240,000	$ -	$ 60,000	$ 300,000	$ -	$ 300,000	$ -	$ -	$ -	Existing Rd Allowance - 100% DC
B-24	2	18	B	300	354	398	$ 141,000	$ -	$ 35,000	$ 176,000	$ 176,000	$ -	$ -	$ -	$ -	
B-25	2	18	B	300	579	398	$ 231,000	$ -	$ 58,000	$ 289,000	$ 289,000	$ -	$ -	$ -	$ -	
B-26	2	18	B	400	421	664	$ 280,000	$ -	$ 70,000	$ 350,000	$ 209,744	$ 140,256	$ -	$ -	$ -	
B-27	2	18	B	300	418	398	$ 166,000	$ -	$ 42,000	$ 208,000	$ 208,000	$ -	$ -	$ -	$ -	
B-28	2	18	B	300	436	398	$ 174,000	$ -	$ 44,000	$ 218,000	$ 218,000	$ -	$ -	$ -	$ -	
B-29	2	6	B*	400	2559	664	$ 1,698,000	$ -	$ 425,000	$ 2,123,000	$ -	$ 2,123,000	$ -	$ -	$ -	Zone 6 Trunk - 100% DC
B-30	2	18	B	400	568	664	$ 377,000	$ -	$ 94,000	$ 471,000	$ 282,677	$ 188,323	$ -	$ -	$ -	
B-31	2	18	B	400	863	664	$ 573,000	$ -	$ 143,000	$ 716,000	$ 429,594	$ 286,406	$ -	$ -	$ -	
B-32	2	18	B	400	552	664	$ 366,000	$ -	$ 92,000	$ 458,000	$ 274,781	$ 183,219	$ -	$ -	$ -	
B-33	2	6	A+	300	953	398	$ 380,000	$ -	$ 95,000	$ 475,000	$ -	$ 475,000	$ -	$ -	$ -	Existing Rd Allowance - 100% DC
B-34	2	18	A+	400	293	664	$ 195,000	$ -	$ 49,000	$ 244,000	$ 146,025	$ 97,975	$ -	$ -	$ -	
B-35	2	18	B	300	416	398	$ 166,000	$ -	$ 42,000	$ 208,000	$ 208,000	$ -	$ -	$ -	$ -	
B-36	2	18	B	300	586	398	$ 233,000	$ -	$ 58,000	$ 291,000	$ 291,000	$ -	$ -	$ -	$ -	
B-37	2	18	B	300	295	398	$ 117,000	$ -	$ 29,000	$ 146,000	$ 146,000	$ -	$ -	$ -	$ -	
B-38	2	18	B	300	412	398	$ 164,000	$ -	$ 41,000	$ 205,000	$ 205,000	$ -	$ -	$ -	$ -	
B-39	2	6	A+	300	259	398	$ 103,000	$ -	$ 26,000	$ 129,000	$ -	$ 129,000	$ -	$ -	$ -	Existing Rd Allowance - 100% DC
B-40	2	18	B	300	268	398	$ 107,000	$ -	$ 27,000	$ 134,000	$ 134,000	$ -	$ -	$ -	$ -	
B-41	2	18	A+	300	627	398	$ 250,000	$ -	$ 63,000	$ 313,000	$ -	$ 313,000	$ -	$ -	$ -	Existing Rd Allowance - 100% DC
B-42	2	18	A+	300	350	398	$ 139,000	$ -	$ 35,000	$ 174,000	$ -	$ 174,000	$ -	$ -	$ -	Existing Rd Allowance - 100% DC
B-43	2	18	A+	300	416	398	$ 166,000	$ -	$ 42,000	$ 208,000	$ 208,000	$ -	$ -	$ -	$ -	Existing Rd Allowance - 100% DC
B-44	2	18	B	300	569	398	$ 227,000	$ -	$ 57,000	$ 284,000	$ 284,000	$ -	$ -	$ -	$ -	
B-45	2	18	B	300	416	398	$ 166,000	$ -	$ 42,000	$ 208,000	$ 208,000	$ -	$ -	$ -	$ -	
B-46	2	18	B	300	432	398	$ 172,000	$ -	$ 43,000	$ 215,000	$ 215,000	$ -	$ -	$ -	$ -	
B-47	2	18	B	300	784	398	$ 312,000	$ -	$ 78,000	$ 390,000	$ 390,000	$ -	$ -	$ -	$ -	
B-48	2	18	B	300	645	398	$ 257,000	$ -	$ 64,000	$ 321,000	$ 321,000	$ -	$ -	$ -	$ -	
B-49	2	6	A+	300	886	398	$ 353,000	$ -	$ 88,000	$ 441,000	$ -	$ 441,000	$ -	$ -	$ -	Existing Rd Allowance - 100% DC
B-50	2	6	A+	300	687	398	$ 274,000	$ -	$ 69,000	$ 343,000	$ -	$ 343,000	$ -	$ -	$ -	Existing Rd Allowance - 100% DC
B-51	2	6	B*	400	595	664	$ 395,000	$ -	$ 99,000	$ 494,000	$ -	$ 296,186	$ 197,814	$ -	$ -	Zone 6 Trunk - DC with PP Benefit
B-52	2	6	A+	300	598	398	$ 238,000	$ -	$ 60,000	$ 298,000	$ -	$ 298,000	$ -	$ -	$ -	Existing Rd Allowance - 100% DC
B-53	2	6	B	300	636	398	$ 253,000	$ -	$ 63,000	$ 316,000	$ 316,000	$ -	$ -	$ -	$ -	
B-54	2	6	B	300	624	398	$ 248,000	$ -	$ 62,000	$ 310,000	$ 310,000	$ -	$ -	$ -	$ -	
B-55	2	6	B*	400	837	664	$ 556,000	$ -	$ 139,000	$ 695,000	$ -	$ 695,000	$ -	$ -	$ -	Zone 6 Trunk - 100% DC
B-56	2	6	B	300	680	398	$ 271,000	$ -	$ 68,000	$ 339,000	$ 339,000	$ -	$ -	$ -	$ -	
B-57	2	6	B	300	709	398	$ 282,000	$ -	$ 71,000	$ 353,000	$ 353,000	$ -	$ -	$ -	$ -	
B-58	2	6	A+	300	870	398	$ 346,000	$ -	$ 87,000	$ 433,000	$ -	$ 433,000	$ -	$ -	$ -	Existing Rd Allowance - 100% DC
B-59	2	6	B	300	177	398	$ 70,000	$ -	$ 18,000	$ 88,000	$ 88,000	$ -	$ -	$ -	$ -	
B-60	2	6	B	300	514	398	$ 205,000	$ -	$ 51,000	$ 256,000	$ 256,000	$ -	$ -	$ -	$ -	
B-61	2	6	B*	400	1181	664	$ 784,000	$ -	$ 196,000	$ 980,000	$ -	$ 980,000	$ -	$ -	$ -	Zone 6 Trunk - 100% DC
B-62	2	6	B*	400	607	664	$ 403,000	$ -	$ 101,000	$ 504,000	$ -	$ 504,000	$ -	$ -	$ -	Zone 6 Trunk - 100% DC
B-63	2	6	A+	300	322	398	$ 128,000	$ -	$ 32,000	$ 160,000	$ -	$ 160,000	$ -	$ -	$ -	Existing Rd Allowance - 100% DC
B-64	2	6	B	300	180	398	$ 72,000	$ -	$ 18,000	$ 90,000	$ 90,000	$ -	$ -	$ -	$ -	
B-65	2	6	B	300	700	398	$ 279,000	$ -	$ 70,000	$ 349,000	$ 349,000	$ -	$ -	$ -	$ -	
B-66	2	6	B	300	180	398	$ 72,000	$ -	$ 18,000	$ 90,000	$ 90,000	$ -	$ -	$ -	$ -	
B-67	2	6	B	300	450	398	$ 179,000	$ -	$ 45,000	$ 224,000	$ 224,000	$ -	$ -	$ -	$ -	
B-68	2	6	B*	400	662	664	$ 439,000	$ -	$ 110,000	$ 549,000	$ -	$ 549,000	$ -	$ -	$ -	Zone 6 Trunk - 100% DC
B-69	2	6	B*	400	397	664	$ 263,000	$ -	$ 66,000	$ 329,000	$ -	$ 197,623	$ 131,377	$ -	$ -	Zone 6 Trunk - DC with PP Benefit
SUBTOTAL - SECONDARY PLAN AREA					**37,083**		**$ 17,797,000**	**$ -**	**$ 4,458,000**	**$ 28,520,820**	**$ 10,358,385**	**$ 14,576,513**	**$ 453,012**	**$ -**	**$ 3,132,910**	
B-67	-	6	B	300	400	398	$ 159,000	$ -	$ 40,000	$ 199,000	$ 199,000	$ -	$ -	$ -	$ -	
B-68	-	6	B	300	530	398	$ 211,000	$ -	$ 53,000	$ 264,000	$ 264,000		$ -	$ -	$ -	
B-69	-	6	A+	300	400	398	$ 159,000	$ -	$ 40,000	$ 199,000	$ -	$ 199,000	$ -	$ -	$ -	Existing Rd Allowance - 100% DC
SUBTOTAL - SMITH PROPERTY					**1,330**		**$ 529,000**	**$ -**	**$ 133,000**	**$ 662,000**	**$ 463,000**	**$ 199,000**	**$ -**	**$ -**	**$ -**	
TOTAL					**38,413**		**$ 18,326,000**	**$ -**	**$ 4,591,000**	**$ 29,182,820**	**$ 10,821,385**	**$ 14,775,513**	**$ 453,012**	**$ -**	**$ 3,132,910**	

Note: EA Schedule B projects will be on future road alignments and will be re-classified as A+ once road right-of-ways are established. Schedule B* projects were previously approved under 2006 City Wide Water and Wastewater Master Plan



Hamilton

Hamilton AEGD Study

Figure 13
Preferred Water Servicing Option

Legend

- ● Existing Reservoir
- ▲ Existing Pump

Proposed Watermains

- PD 18 Servicing Phase 1
- PD 18 Servicing Phase 2
- PD 18 Additional Study Area
- PD 6 Servicing Phase 1
- PD 6 Servicing Phase 2
- PD 6 Additional Study Area
- PD 6 Smith Farm
- Proposed Pressure District 6/18 Boundary
- Existing Watermains
- Roads
- ▨ Council Directed Additional Lands

AECOM

Map Created By: MZ
Map Checked By: CH
Date Created: Sept 10, 2009
Date Modified: Feb 2, 2011

Hamilton

BUILDING A STRONG FOUNDATION
HAMILTON

KMK Consultants Limited

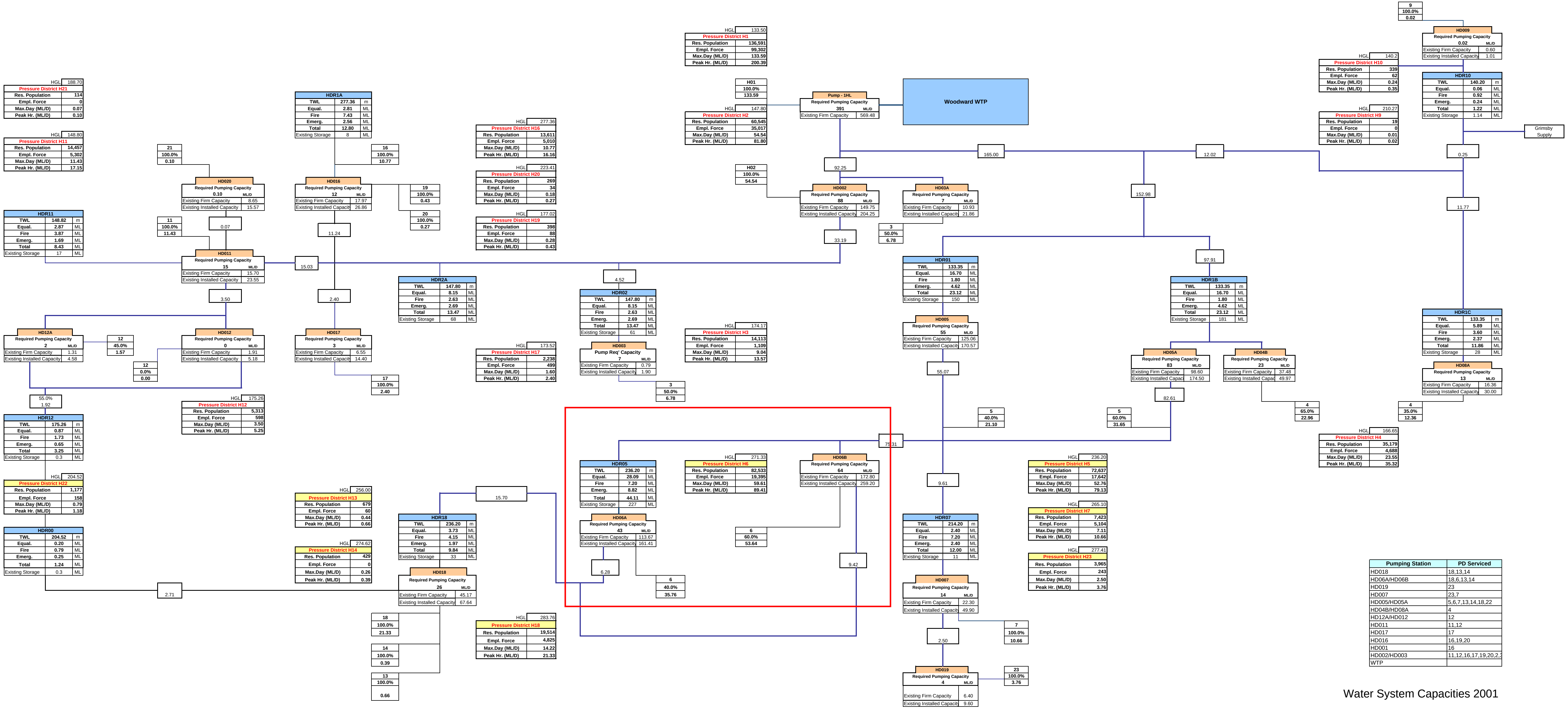
City of Hamilton Water and Wastewater Master Plan

Report III - Master Plan Class EA Report

Appendix A-1 (03)

Water System Capacities

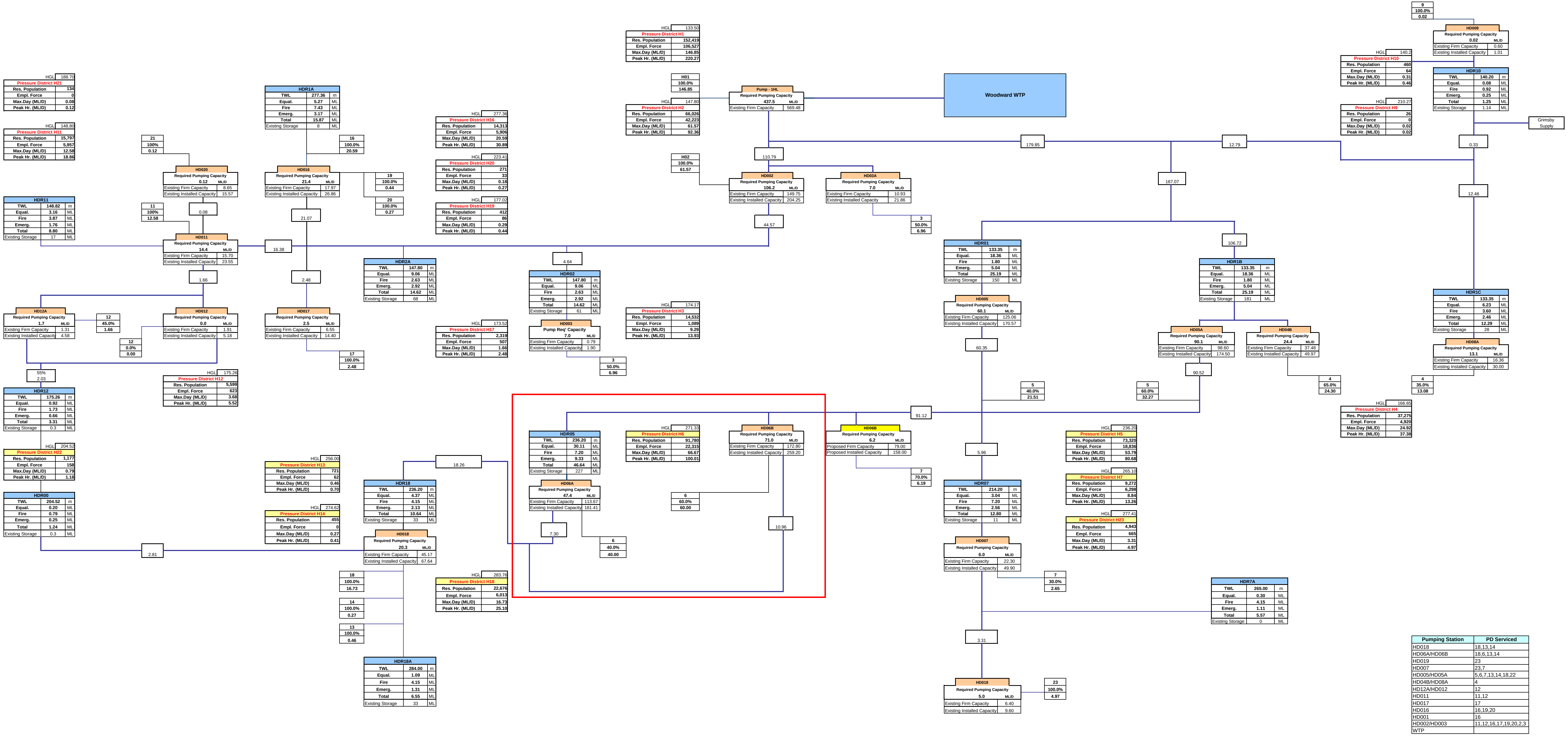
HAMILTON WATER AND WASTEWATER MASTER PLAN
WATER SYSTEM CAPACITIES 2001



Pumping Station	PD Serviced
HD018	18,13,14
HD06A/HD06B	18,6,13,14
HD019	23
HD007	23,7
HD005/HD05A	5,6,7,13,14,18,22
HD04B/HD08A	4
HD12A/HD012	12
HD011	11,12
HD017	17
HD016	16,19,20
HD001	16
HD002/HD003	11,12,16,17,19,20,2,
WTP	

Water System Capacities 2001

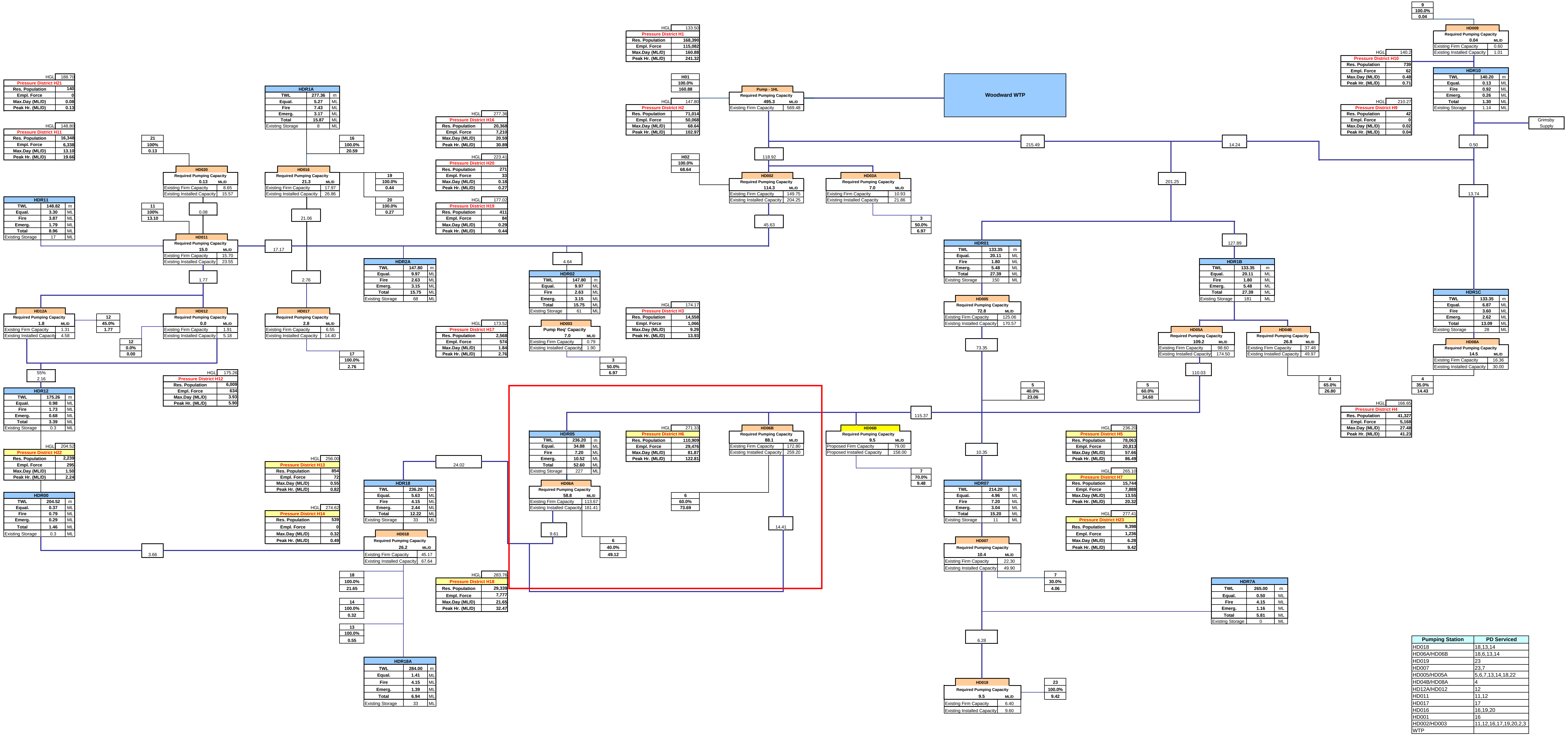
HAMILTON WATER AND WASTEWATER MASTER PLAN
PROPOSED WATER SYSTEM CAPACITIES 2011



Pumping Station	PD Serviced
HD018	18,13,14
HD06A/HD06B	18,6,13,14
HD019	23
HD007	23,7
HD005/HD05A	5,6,7,13,14,18,22
HD04B/HD08A	4
HD12A/HD012	12
HD011	11,12
HD017	17
HD016	16,19,20
HD001	16
HD002/HD003	11,12,16,17,19,20,2,3
WTP	

Water System Capacities 2011

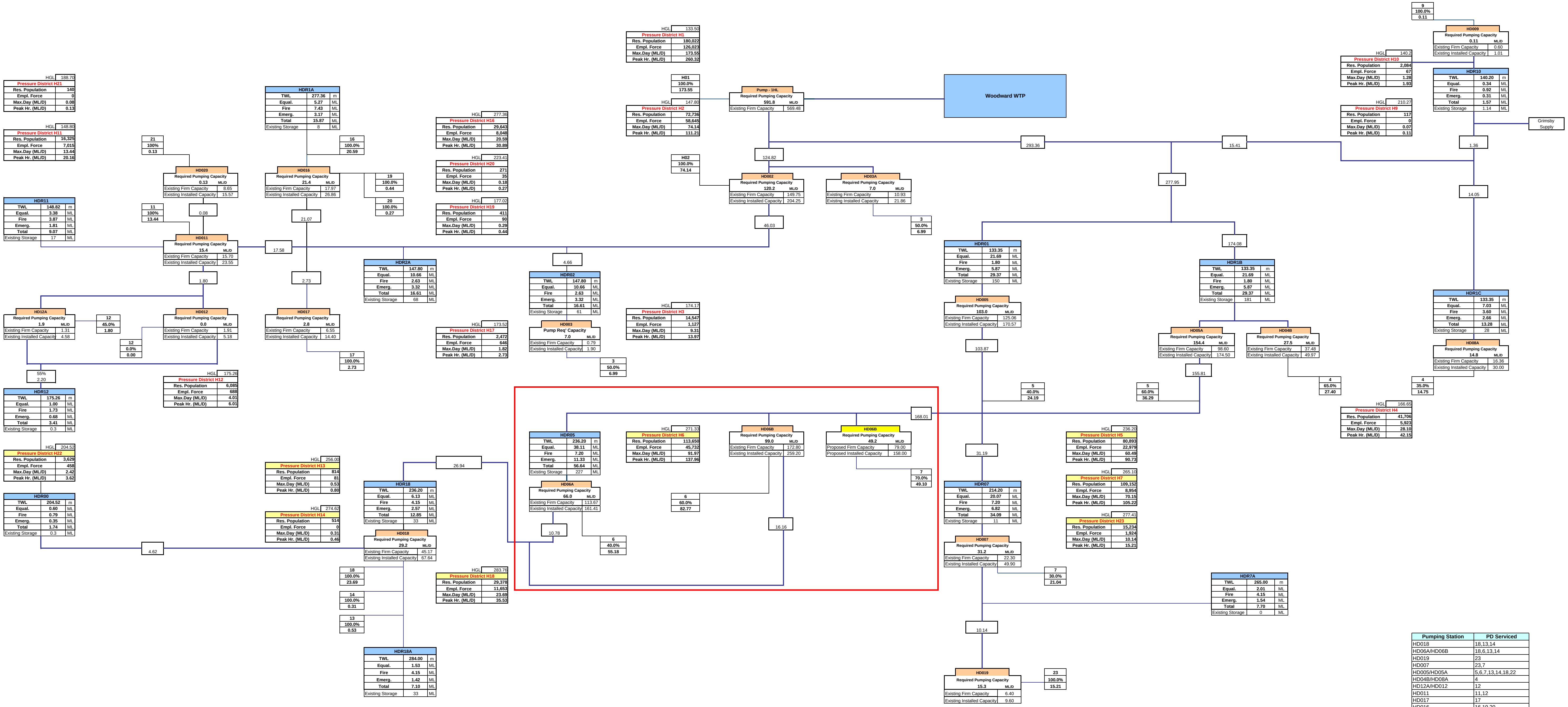
HAMILTON WATER AND WASTEWATER MASTER PLAN
PROPOSED WATER SYSTEM CAPACITIES 2021



Pumping Station	PD Serviced
HD018	18,13,14
HD06A/HD06B	18,6,13,14
HD019	23
HD007	23,7
HD005/HD05A	5,6,7,13,14,18,22
HD04B/HD08A	4
HD12A/HD012	12
HD011	11,12
HD017	17
HD016	16,19,20
HD001	16
HD002/HD003	11,12,16,17,19,20,2,3
WTP	

Water System Capacities 2021

HAMILTON WATER AND WASTEWATER MASTER PLAN
PROPOSED WATER SYSTEM CAPACITIES 2031



Pumping Station	PD Serviced
HD018	18,13,14
HD06A/HD06B	18,6,13,14
HD019	23
HD007	23,7
HD005/HD05A	5,6,7,13,14,18,22
HD04B/HD08A	4
HD12A/HD012	12
HD011	11,12
HD017	17
HD016	16,19,20
HD001	16
HD002/HD003	11,12,16,17,19,20,2,3
WTP	

Water System Capacities 2031

DRINKING WATER SYSTEMS ANNUAL WATER QUALITY AND SUMMARY REPORT

Ontario Regulation 170/03 Section 11 & Schedule 22

2023

Hamilton

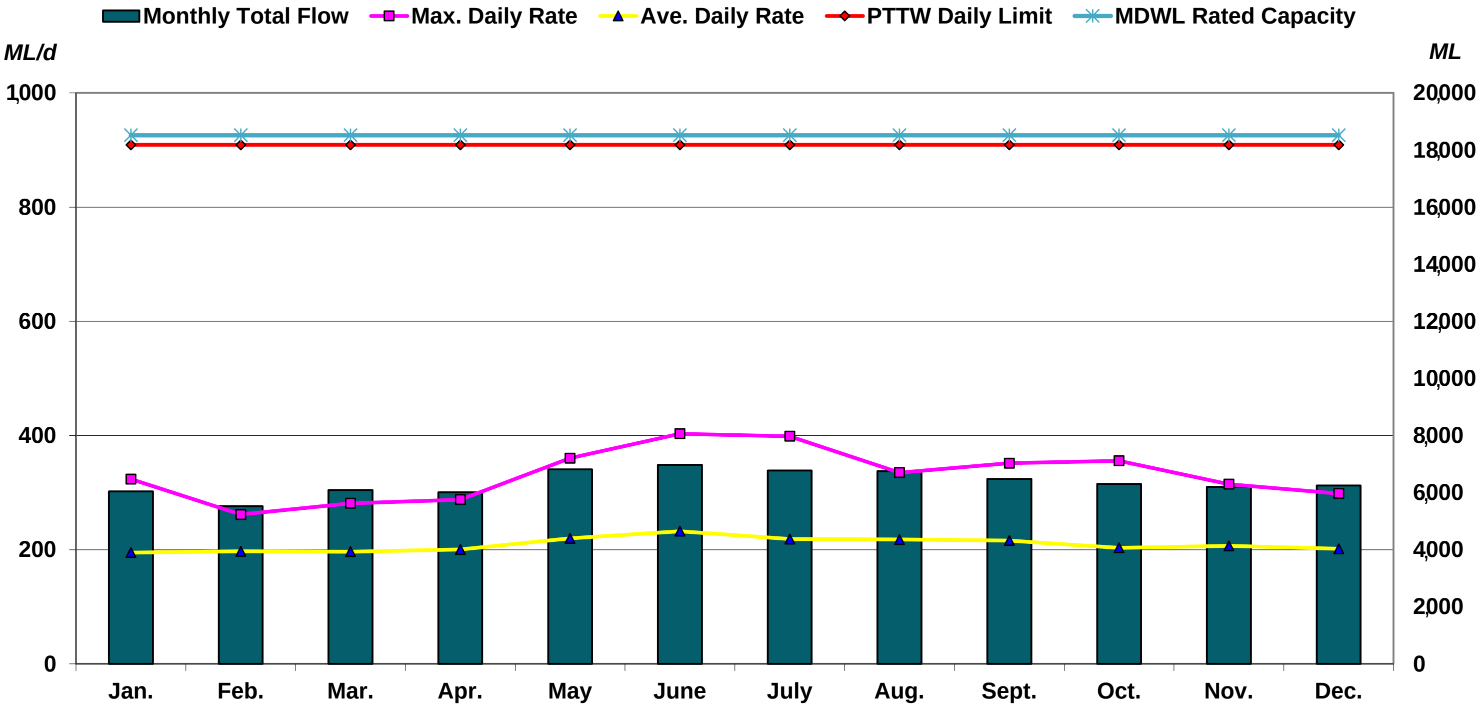
WATER PRODUCTION REPORTS - SUMMARY

The following provides a summary of daily flow rates and instantaneous peak flow rates in comparison to the capacity of the water works as identified in the Permit to Take Water (PTTW) and Municipal Drinking Water Licence (MDWL). This information is tabulated in the accompanying tables.

TABLE 1-1: WOODWARD TREATMENT PLANT - 2023 MONTHLY PRODUCTION (SUMMARY)

Parameter	Units	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Monthly Total Flow	ML	6,043	5,523	6,094	6,010	6,815	6,974	6,778	6,752	6,484	6,304	6,203	6,252
Average Daily Rate	ML/d	195	197	197	200	220	232	219	218	216	203	207	202
Maximum Daily Rate	ML/d	324	262	281	288	360	403	399	335	351	356	315	299
PTTW Daily Limit	ML/d	909	909	909	909	909	909	909	909	909	909	909	909
MDWL Daily Rated Capacity	ML/d	926	926	926	926	926	926	926	926	926	926	926	926

FIGURE 1-1: WOODWARD TREATMENT PLANT - 2023 MONTHLY PRODUCTION (SUMMARY)

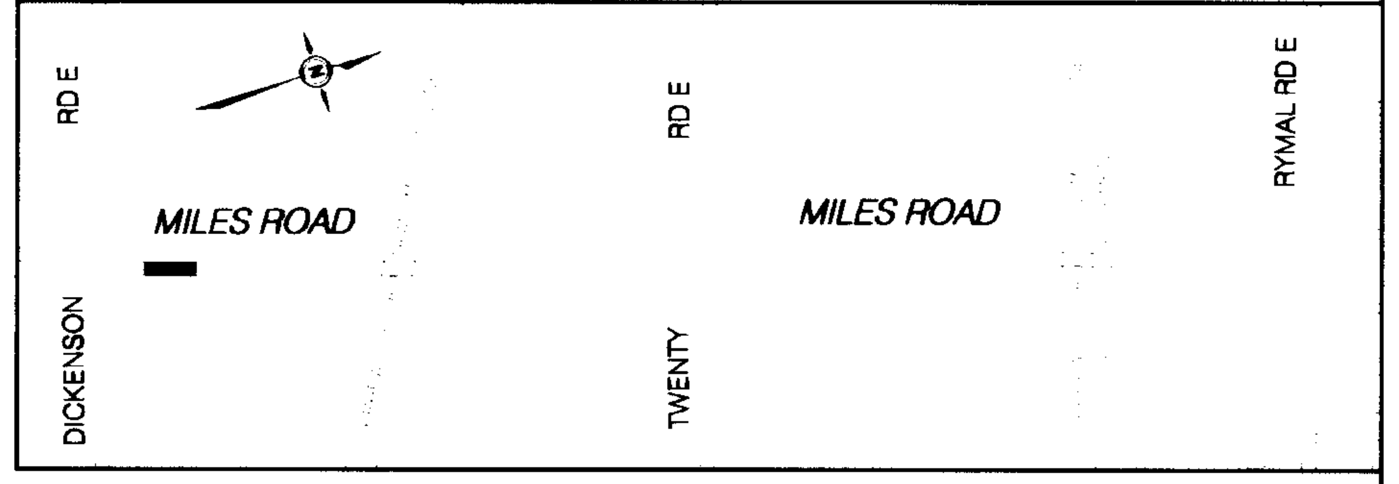


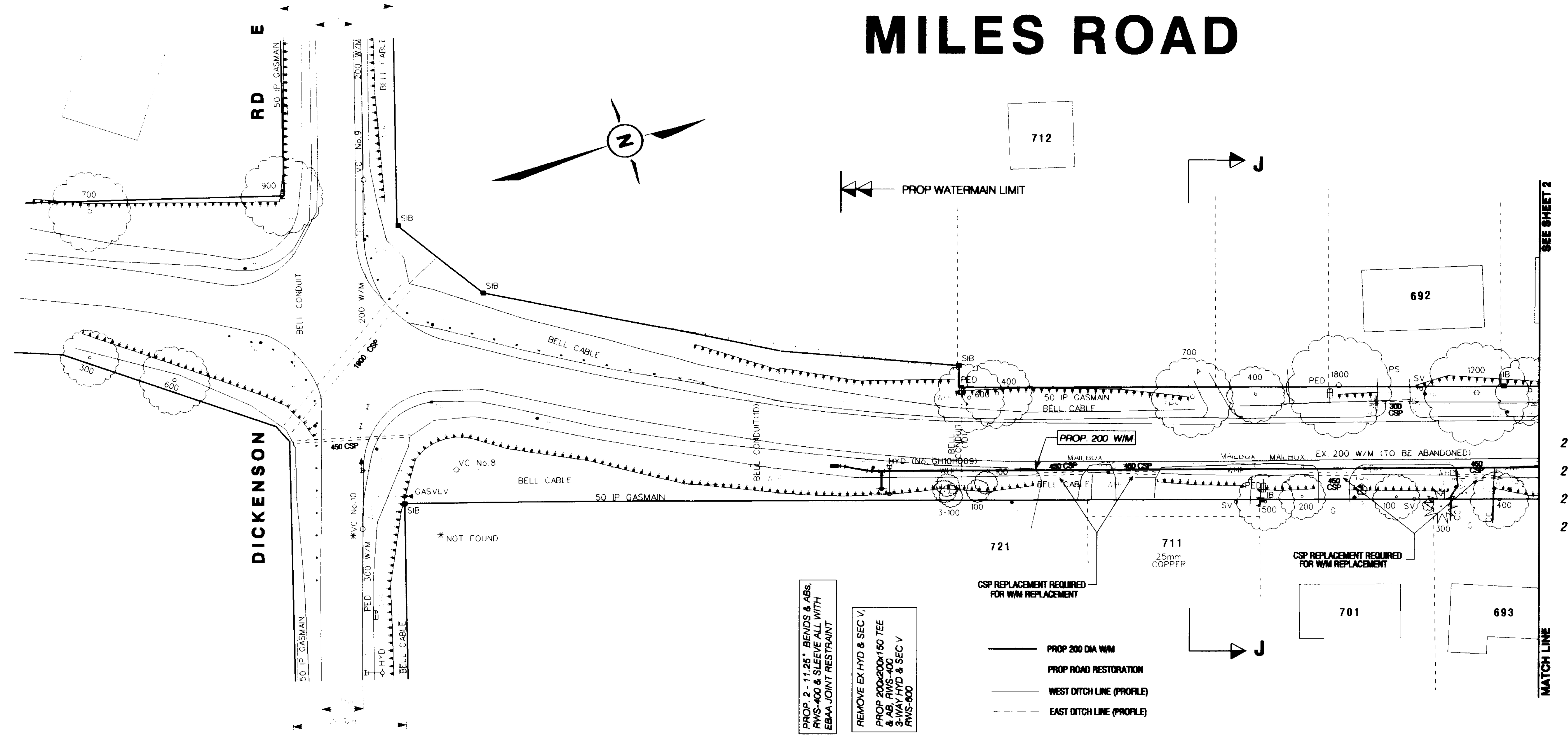
Appendix B-4 Engineering Drawings

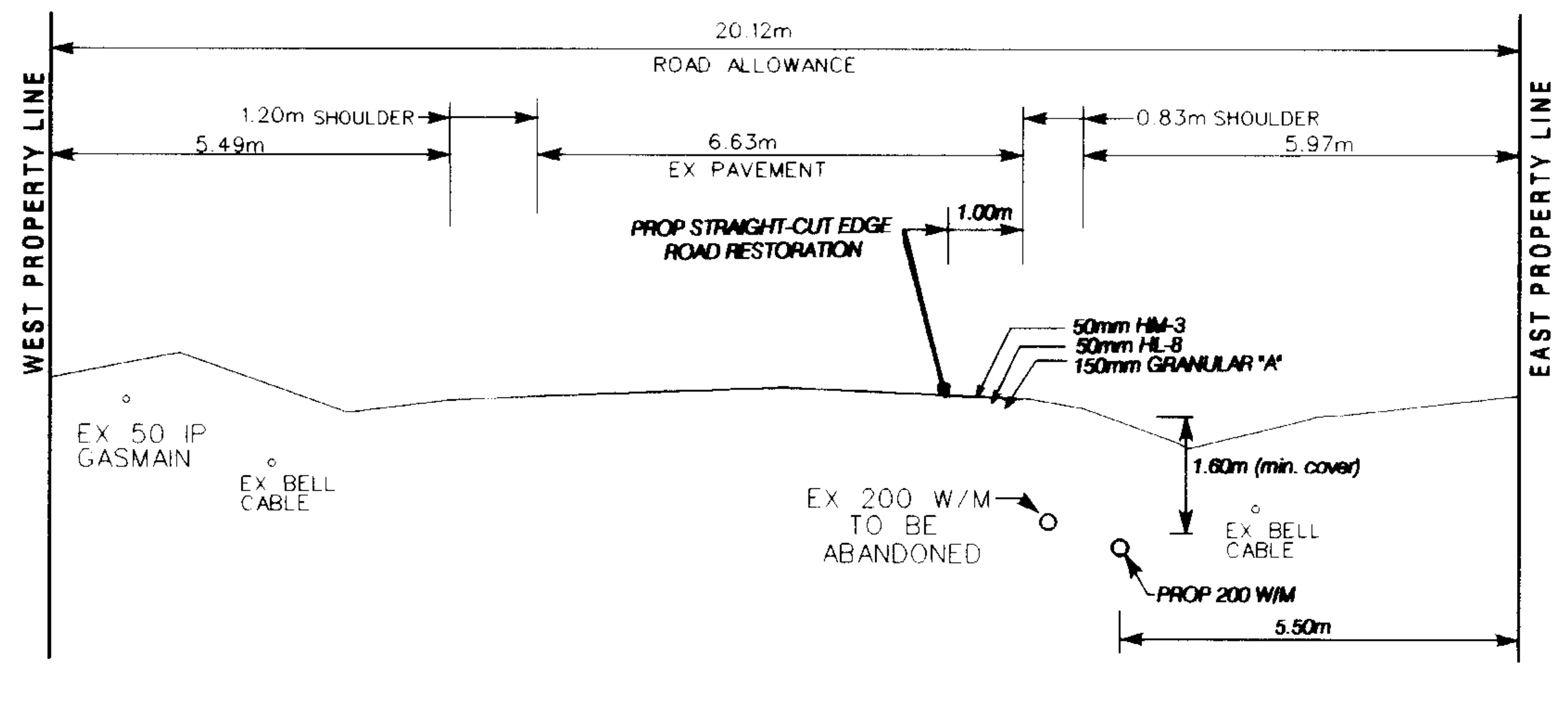
MILES ROAD

FILE No.	CONTRACT No. TOE 03 - 02(W) DRAWING No. 02-W-43	SHEET No. 1 OF 15

DIMENSIONS SHOWN ON THIS PLAN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED

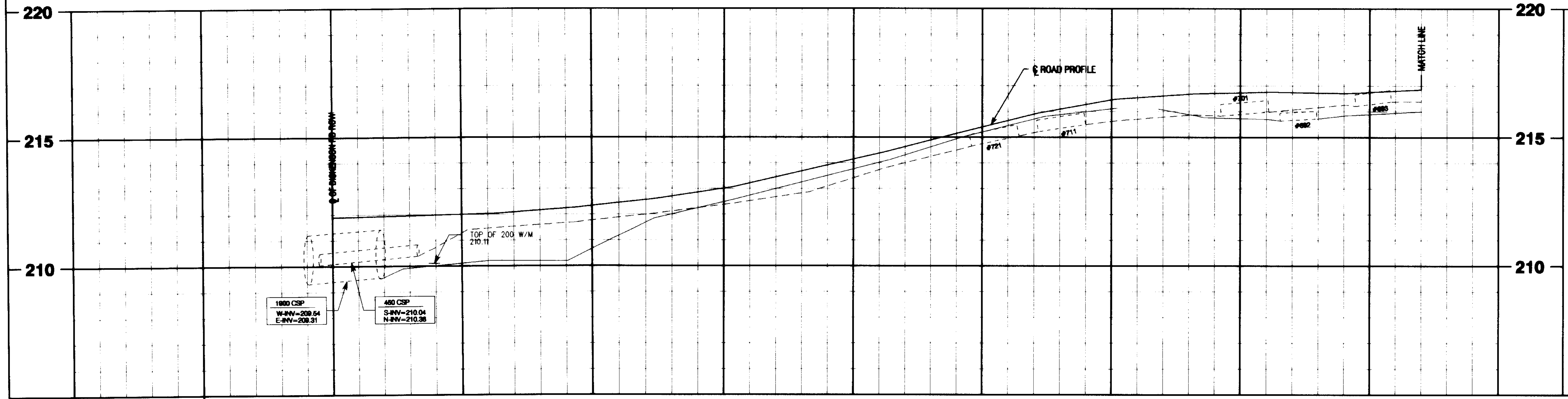






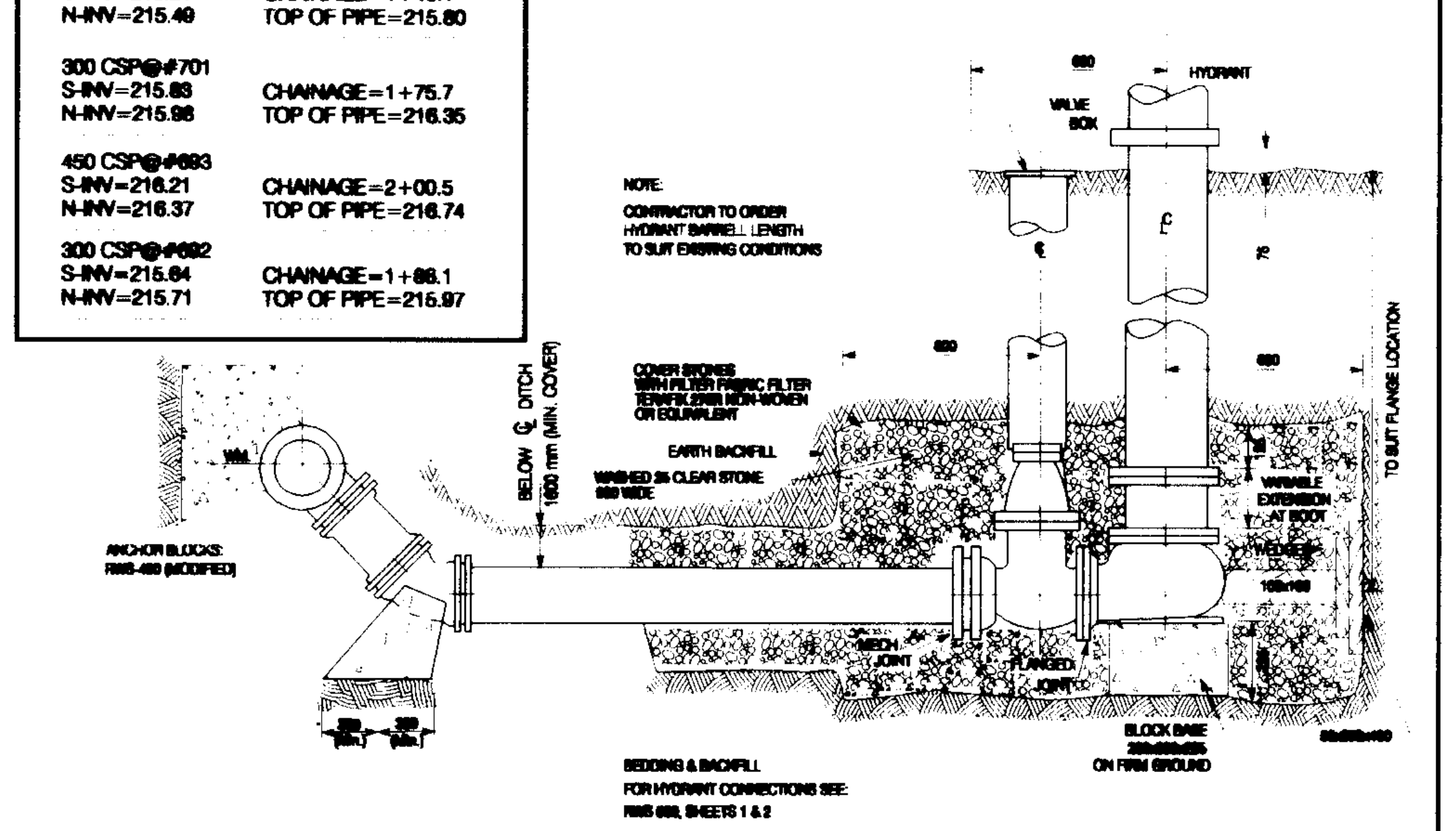
ROADWAY CROSS-SECTION

ORIGINAL ℄ EL =216.46
STA =1+50
SECTION 'J-J'
SCALE 1:100



EXISTING CULVERTS	
450 CSP@#721 S-INV=214.65 N-INV=215.04	CHAINAGE=1+27.1 TOP OF PIPE=215.28
450 CSP@#711 S-INV=215.21 N-INV=215.49	CHAINAGE=1+40.1 TOP OF PIPE=215.80
300 CSP@#701 S-INV=215.83 N-INV=215.98	CHAINAGE=1+75.7 TOP OF PIPE=216.35
450 CSP@#693 S-INV=216.21 N-INV=216.37	CHAINAGE=2+00.5 TOP OF PIPE=216.74
300 CSP@#692 S-INV=215.64 N-INV=215.71	CHAINAGE=1+86.1 TOP OF PIPE=215.97

"TYPICAL" INSTALLATION
FOR HYDRANTS AT DITCH
(N.T.S.)



PROPOSED WATERMAIN INVERTS															
PROPOSED WATERMAIN CHAINAGE															
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	211.89	211.96	212.03	212.23	212.56	213.01	213.68	214.37	215.15	215.89	216.46	216.67	216.76	216.71	216.85
EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE	0+00	0+15	0+30	0+45	0+60	0+75	0+90	1+05	1+20	1+35	1+50	1+65	1+80	1+95	2+10

No.	REVISIONS	INITIAL	DATE

DRAWN BY: RCP/EM
DATE: JANUARY 30, 2008

REFERENCE MATERIAL:
Regional Surveyor : E. Bettencourt
Sewer Plans :
Water Sheets : GLAN H-9, GLAN H-10, D-34
Water Plans : 76-W-920, 80-W-28, 81-W-23, 82-W-18
Road Plans:

Geodetic Bench Mark Index No. 25-04
Elevation= 221.081m

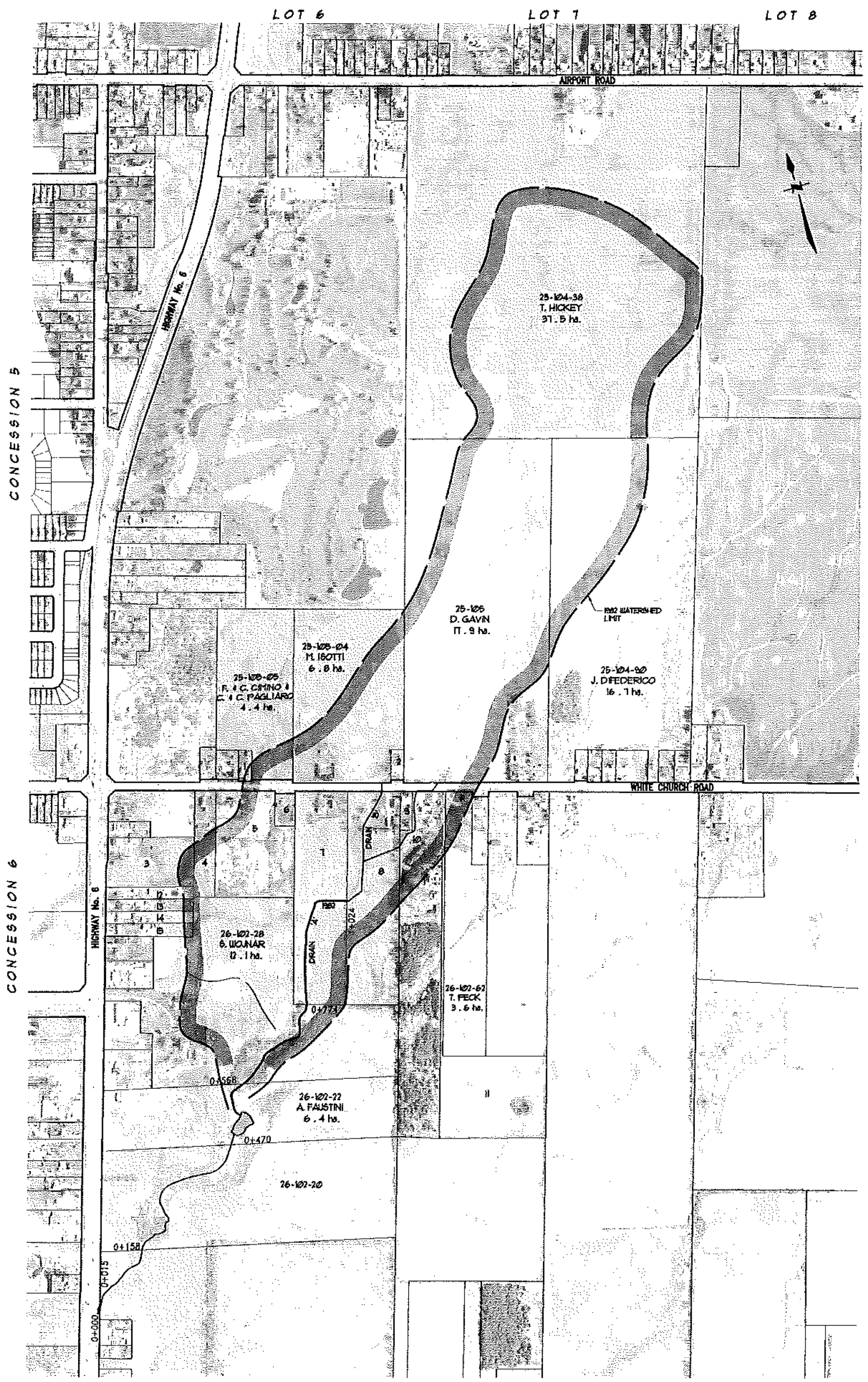
SCALES
0 5m 10m 20m
HORIZONTAL 1:500
0 1m 2m 4m
VERTICAL 1:100

Director, Design and Construction
Doug Onishi, P. Eng.

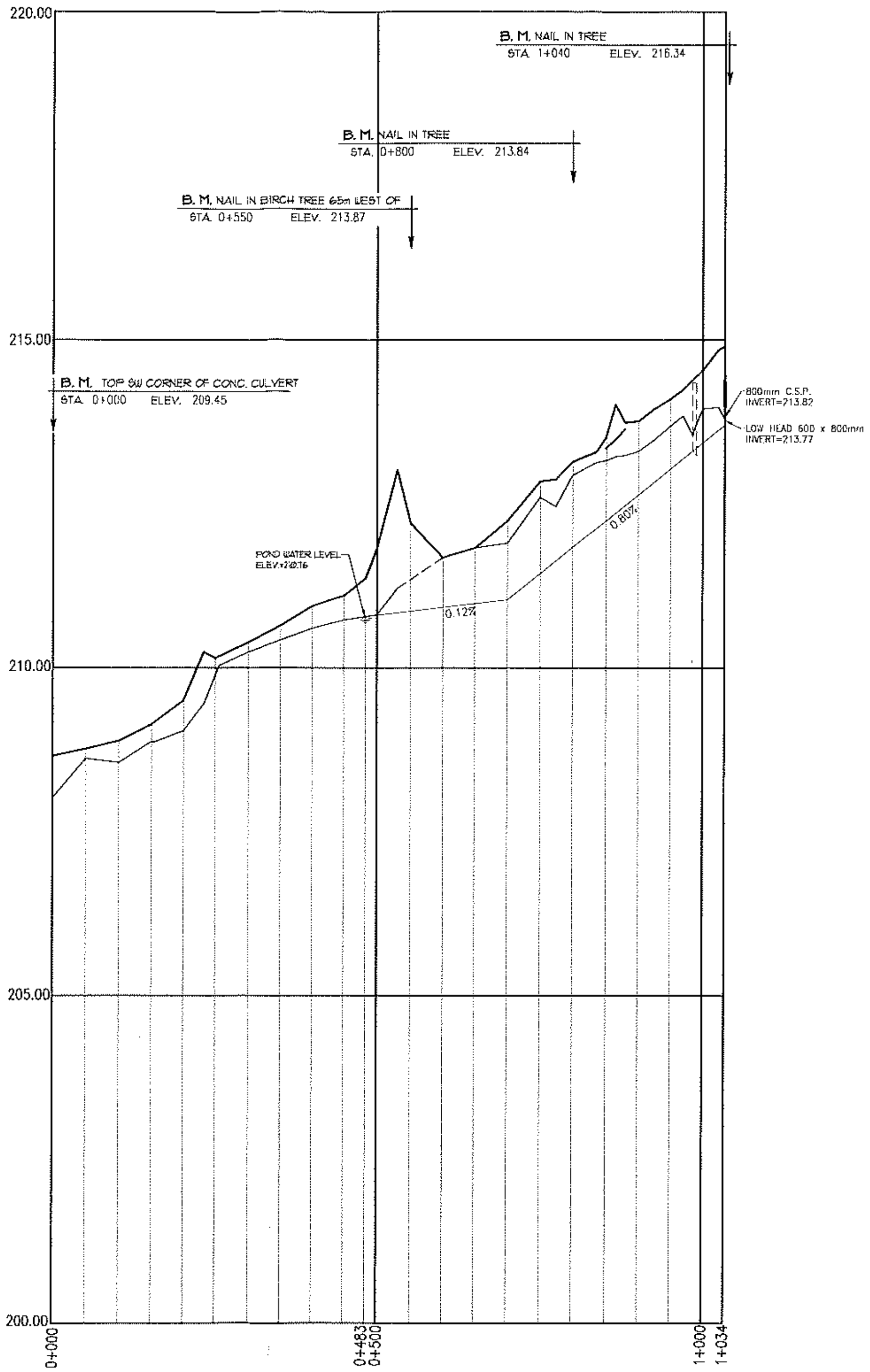
Manager of Design
Gary Moore, P. Eng.

CITY OF HAMILTON
Transportation, Operations and Environment Department

MILES ROAD
Proposed 200 Replacement Watermain
From : Approx. 87m North of Dickenson Road
To : Trans Canada Pipeline Easement



PLAN SCALE 1: 5,000



PROFILES

SCALE : HOR. 1 : 5,000
VERT. 1 : 50

LOT LEGEND

	ROLL NO.	OWNERSHIP	HECTARES OWNED
1)	25-102-06	J. WANDERS	0.15
2)	25-105-02	W. TAYLOR	0.14
3)	26-102-44	D. WILLIAM	1.50
4)	26-102-50	J. BANYARD	0.80
5)	26-102-51	W. & W. MILLAR ESTATE	2.78
6)	26-102-5175	P. MILLAR	0.23
7)	26-102-52	L. SHALMI-DOLINA	4.00
8)	26-102-54	J. LEGAULT	4.00
9)	26-102-56	H. HARDMEIER	0.17
10)	26-102-58	D. ROBBINS	5.10
11)	26-102-60	R. MARSHALL	3.40
12)	26-102-42	B. CALTAGIRONE	0.38
13)	26-102-40	M. WINGER	0.38
14)	26-102-38	P. STEVANOVIC	0.38
15)	26-102-36	N. SWEERS	0.41

PLAN LEGEND

▨	LIMIT OF WATERSHED AREA
━━━	PROPOSED DRAINAGE WORKS
— — —	EXTERIOR OR INTERIOR WATERSHED
- - - -	EXIST. DRAIN TO BE INCLUDED
◄━━	EXIST. MUNICIPAL DRAIN
←----	PRIVATE TILE OR SURFACE WATER RUN
∿∿∿	EXIST. WATERCOURSE OR PRIVATE DITCH
10-009 J. SMITH 40.5 ha.	ASSESSMENT ROLL NUMBER OWNERS NAME HECTARES OWNED

WHITE CHURCH ROAD DRAIN

CITY OF HAMILTON

Hamilton

Drainage Superintendent:
BOB PAUL
(905) 546-2424 EXT. 7641

No.	REVISIONS	DATE

Drawn By: AH	Field Book	JOB No.	Drawing No.
Date: NOV, 2009	B-154	208237	1 of 1

PLAN & PROFILE

SPRIET ASSOCIATES
LONDON LIMITED

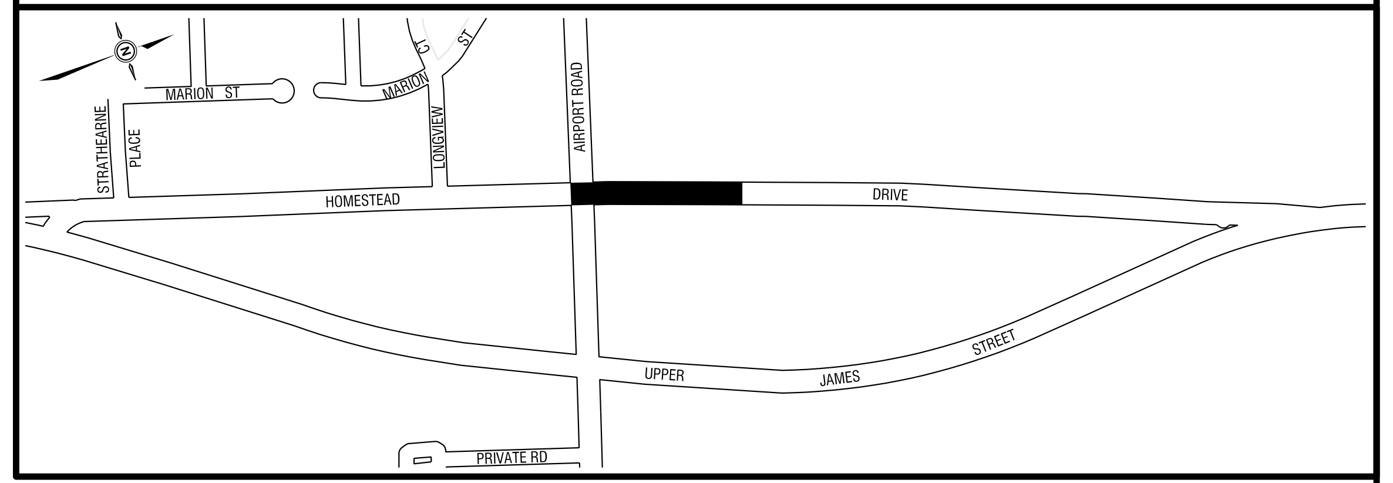
HOMESTEAD DRIVE

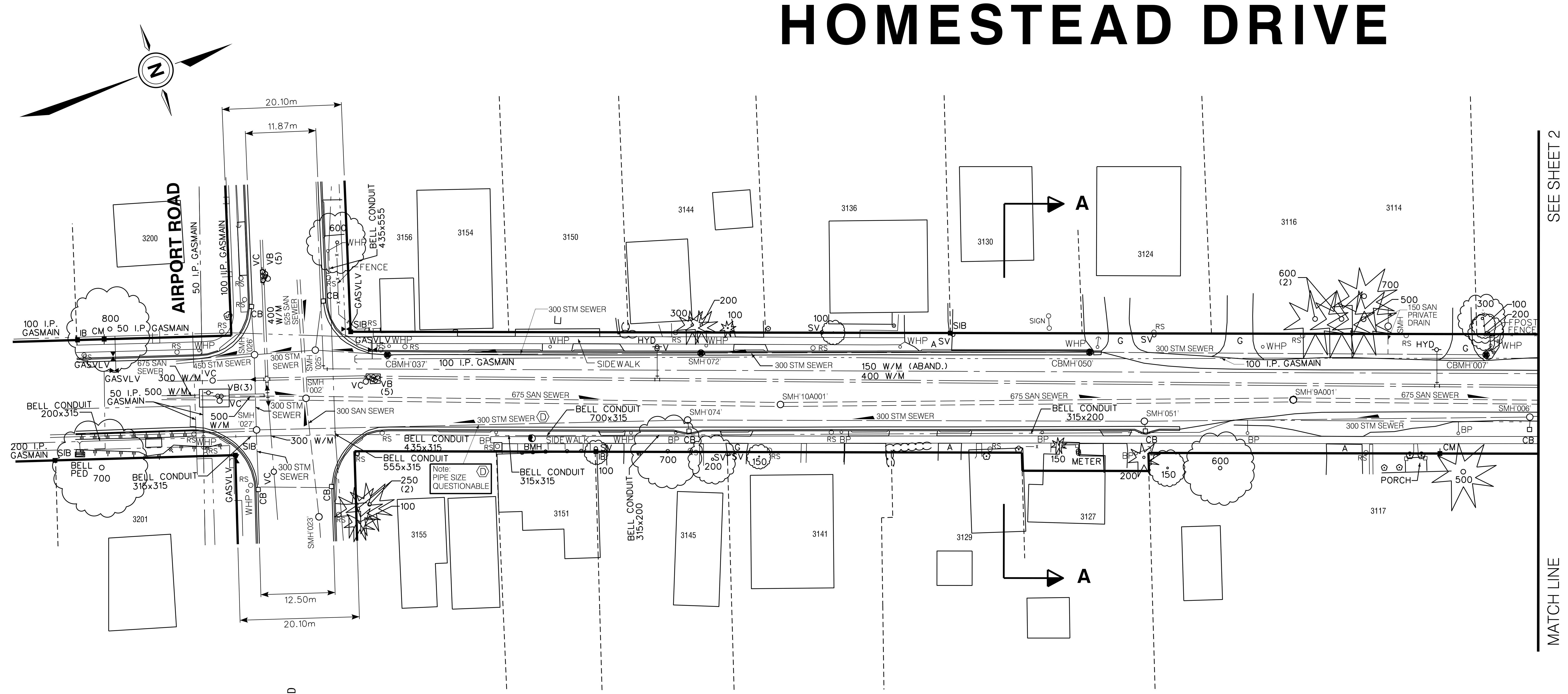
12-W-04 (1)

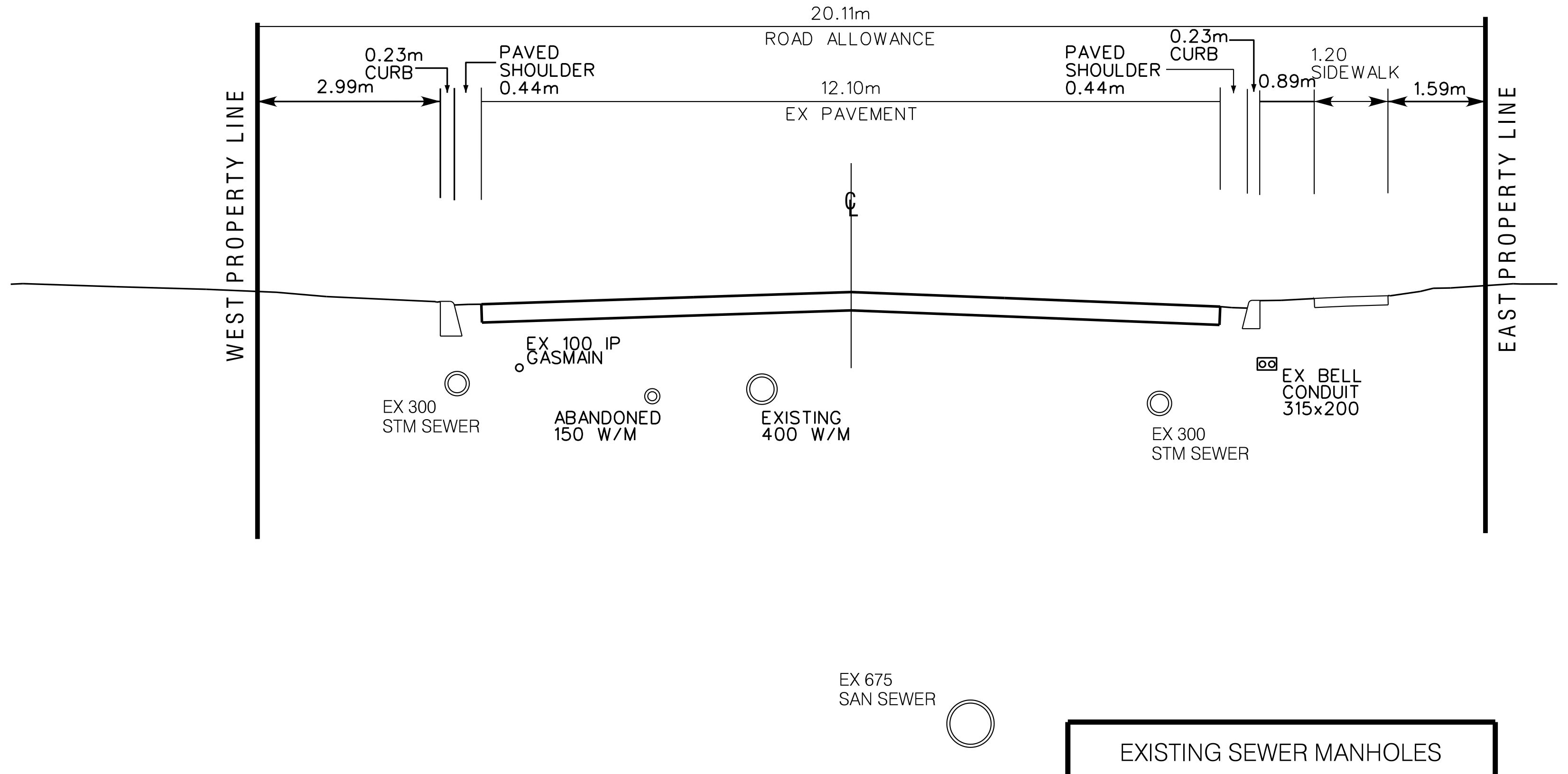
HOMESTEAD DRIVE

FILE No.	CONTRACT No. PW-08-00 (HSW) DRAWING No. 12-W-04 (1)	SHEET No. 1 OF 4

DIMENSIONS SHOWN ON THIS PLAN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED

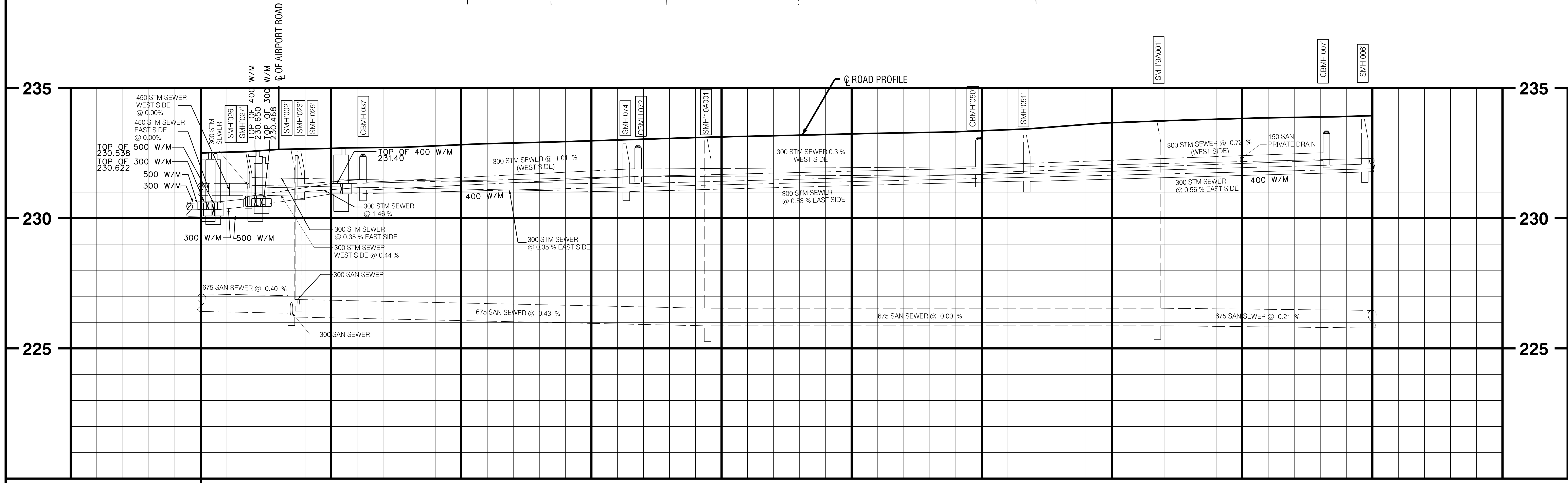






ROADWAY CROSS-SECTION

SECTION 'A-A'
SCALE 1:100



SEWER REPAIRS and OVERFLOWS
C.B. REMOVALS/REPLACEMENTS

EXISTING SEWER MANHOLES	
SMH'026' N-INV=230.853 S-INV=230.862 W-INV=230.953 E-INV=230.987	GD10B026 CHAINAGE=-0+06.265 TOP OF GRATE=232.496
SMH'027' W-INV=231.003 E-INV=231.036 N-INV=231.258 S-INV=231.036	GD10B027 CHAINAGE=-0+05.866 TOP OF GRATE=232.498
SMH'002' S-INV=226.350 N-INV=226.203 E-INV=226.578 W-INV=226.357	GD10A002 CHAINAGE=0+02.380 TOP OF GRATE=232.629
SMH'023' W-INV=226.634	GD10A023 CHAINAGE=0+03.761 TOP OF GRATE=232.401
SMH'025' S-INV=230.893 N-INV=230.016 W-INV=230.982	GD10B025 CHAINAGE=0+04.267 TOP OF GRATE=232.574
CBMH'037' N-INV=231.077 S-INV=231.176 W-INV=231.737	GD10B037 CHAINAGE=0+16.152 TOP OF GRATE=232.468
SMH'074' N-INV=231.022 S-INV=231.006 E-INV=231.579	GD10B074 CHAINAGE=0+66.703 TOP OF GRATE=232.854
SMH'072' N-INV=231.588 S-INV=231.598	GD10B072 CHAINAGE=0+68.999 TOP OF GRATE=232.806
SMH'10A001' N-INV=225.867 S-INV=225.867	GD10A001 CHAINAGE=0+82.330 TOP OF GRATE=233.037
CBMH'050' N-INV=231.814 S-INV=231.845 W-INV=231.787	GD10B050 CHAINAGE=1+34.423 TOP OF GRATE=233.104
SMH'051' N-INV=231.409 S-INV=231.423 E-INV=231.791	GD10B051 CHAINAGE=1+43.630 TOP OF GRATE=233.191
SMH'9A001' N-INV=225.867 S-INV=225.867	GD09A001 CHAINAGE=1+68.716 TOP OF GRATE=233.708
CBMH'007' N-INV=232.221 S-INV=232.211	GD09B007 CHAINAGE=2+01.196 TOP OF GRATE=233.351
SMH'006' N-INV=231.780 S-INV=231.767 E-INV=232.039	GD09B006 CHAINAGE=2+08.548 TOP OF GRATE=233.800

PROPOSED SANITARY SEWER																		*PROPOSED SANITARY SEWER*
PROPOSED STORM SEWER																		*PROPOSED STORM SEWER*
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	232.50	232.64	232.70	232.78	232.89	232.97	233.06	233.14	233.21	233.27	233.36	233.52	233.70	233.80	233.87	233.93		EXISTING ℄ OF ROAD PROFILE ELEVATIONS
EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE	-0+15	0+00	0+15	0+30	0+45	0+60	0+75	0+90	1+05	1+20	1+35	1+50	1+65	1+80	1+95	2+10		EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE

No.	REVISIONS	INITIAL	DATE

DRAWN BY:LC
DATE: Tuesday March 13, 2012

REFERENCE MATERIAL:
Surveyed By : E. Bettencourt
Sewer Plans : 03-H-39,88-S-16_7,88-S-16_8AB,88-S-16_9AB, 88-S-16_10AB,91-S-29,95-S-42_7,
Water Plans : 82-W-13_11AB, 84-W-12_AB, 90-W-16_1AB,95-W-66_G36,
Inspector's Report : IR06851

Geodetic Bench Mark Index No. 75U160 Elevation=233.040m
Borehole Report -

SCALES
0 5m 10m 20m
HORIZONTAL 1:500
0 1m 2m 4m
VERTICAL 1:100

Project Manager (Design)
NAME
Manager of Design
Susan Jacob, P. Eng.

CITY OF HAMILTON
Public Works Department

HOMESTEAD DRIVE

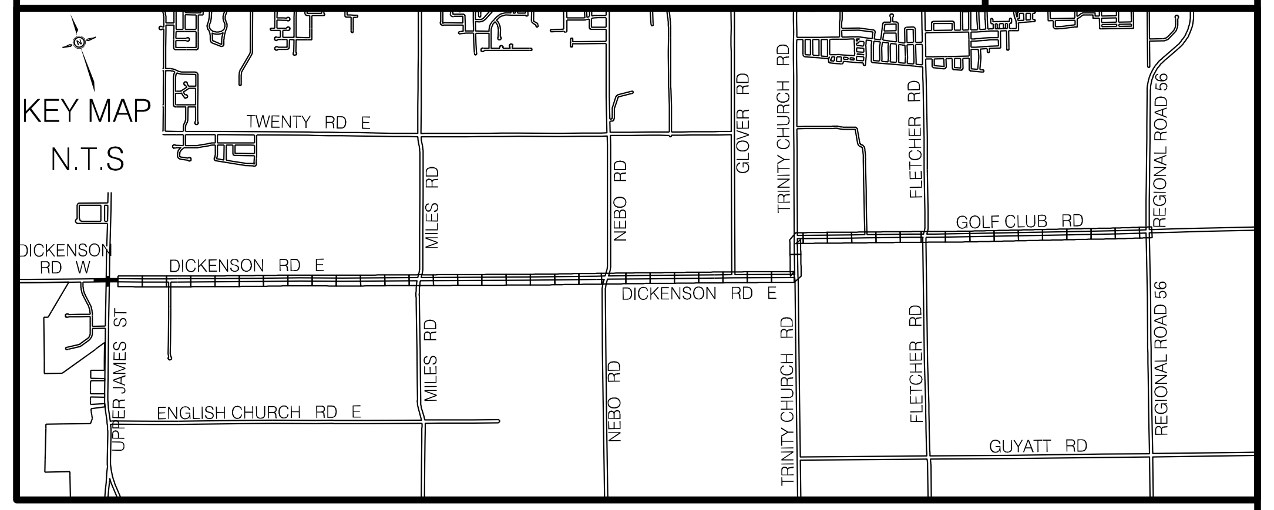
Existing Conditions

From : Airport Road
To : Upper James Street

DICKENSON ROAD EAST

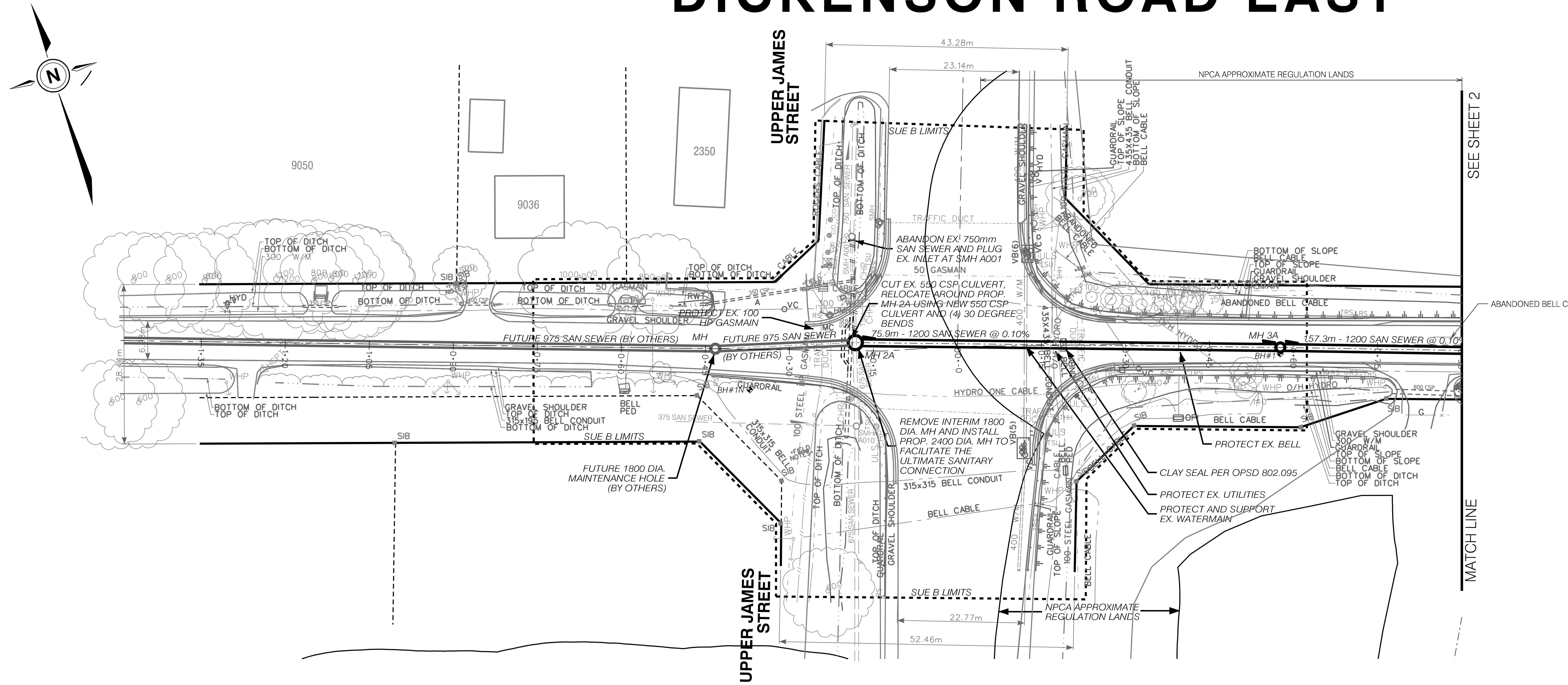
DICKENSON ROAD EAST

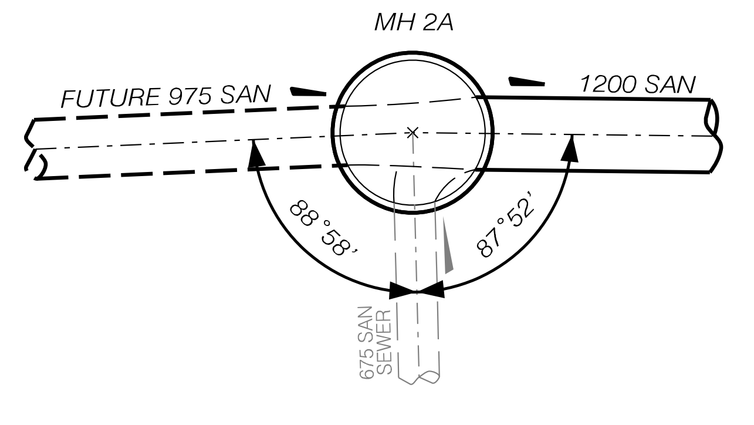
CONTRACT No.	C15-11-22 (HSW)	SHEET No.
DRAWING No.	18-H-01	1 OF 108



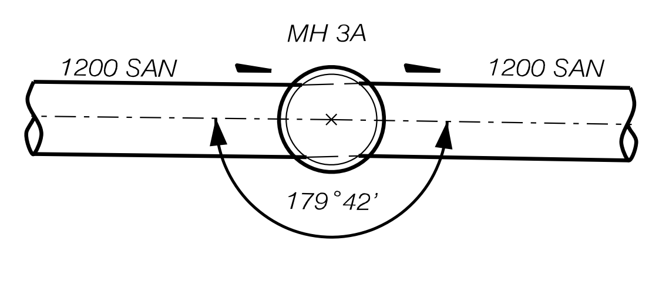
LEGEND

▭ SUE B LIMITS





MH2A SCHEMATIC



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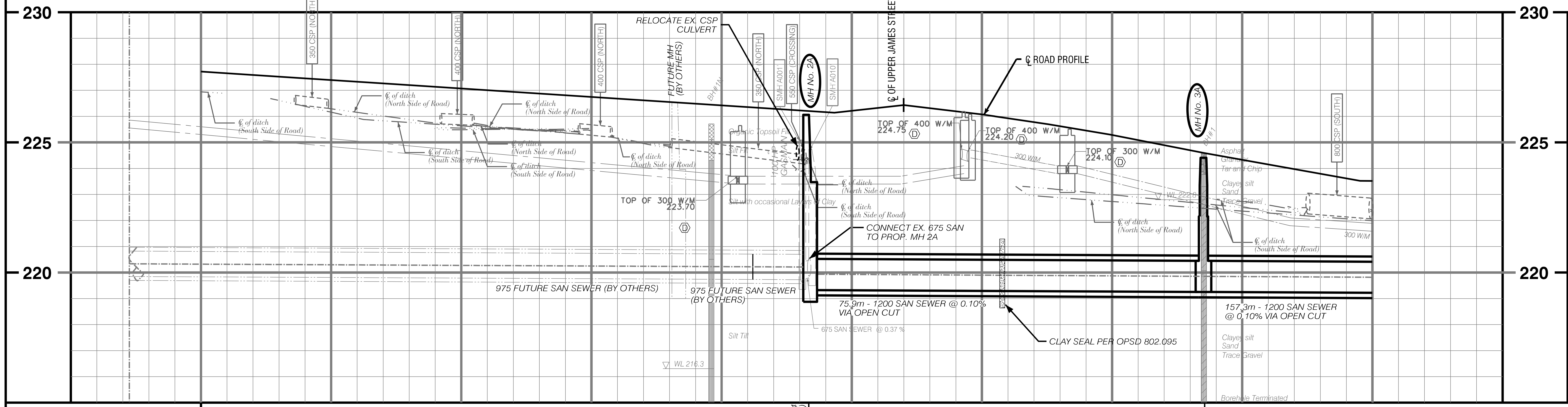


C.B. REMOVALS/REPLACEMENTS

EXISTING SEWER MANHOLES		
Ⓐ	SMH'A001' S-INV=219.72 N-INV=219.62 SW-INV=223.63	GD04A001 CHAINAGE=-0+19.450 TOP OF GRATE=225.084
Ⓐ	SMH'A010' S-INV=219.80 N-INV=219.84 SW-INV=220.26	GD04A010 CHAINAGE=-0+17.562 TOP OF GRATE=224.740

PROPOSED SANITARY SEWER: 2400mm DIA. MH FUT. W 219.724 (CALCULATED) E 219.325 EX. S 219.79 (CALCU-LATED); TEE MH 1500 DIA. W 219.249 E 219.249 — PROPOSED SANITARY SEWER

EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE	EXISTING ℄ OF ROAD PROFILE ELEVATIONS
-1+35	227.72
-1+20	227.52
-1+05	227.33
-0+90	227.14
-0+75	226.94
-0+60	226.75
-0+45	226.55
-0+30	226.36
-0+15	226.16
00+-0	226.43
0+15	226.07
0+30	225.62
0+45	225.09
0+60	224.51
0+75	223.97
0+90	223.52

No.	REVISIONS	INITIAL	DATE
	Issued for Tender	F.S.	03/02/22

REFERENCE MATERIAL

Road Plan : 99-H-39, 00-H-40
Sewer Plans : 07-S-41, 14-S-11
Water Plans : 80-W-28, 80-W-38, 82-W-5, 82-W-13, 82-W-18, 83-W-19, 88-W-3, 89-W-17

Geodetic Bench Mark Index No. 65U161 Elevation=222.640m
Borehole Report - GTR_1932

ACTIVITIES	
Surveyed By:	J.P./D.O.
Survey Date:	13-03-18
Drawn By:	O.S.
Drawn Date:	09-04-18
Design By:	F.S.
Design Date:	22-07-19

Q/C IN ACCORDANCE WITH ASCE STANDARD 38-02
All Utilities depicted are at Ⓒ unless otherwise noted.
Ⓓ information derived from existing records
Ⓒ information obtained from field survey combined with Ⓓ information
Ⓑ information obtained in field and indicates horizontal position of subsurface utility
Ⓐ precise horizontal and vertical location of utility obtained by exposure and measurement

SCALES
0 5m 10m 20m
HORIZONTAL 1:500
0 1m 2m 4m
VERTICAL 1:100
Dimensions shown on this plan are in millimetres unless otherwise noted

IBI

LICENSED PROFESSIONAL ENGINEER
F. SHWEIHAT
100073055
Feb. 03, 2022
PROVINCE OF ONTARIO

Project Manager (Design)
Feb 9, 2022
Taufeek Ameer, P. Eng.
Manager of Design
Susan Korah
Susan Jacob, P. Eng.

Hamilton
Public Works Department

DICKENSON ROAD EAST

Sanitary Sewer Installation
From STA. -0+20 to STA. 0+90
From : Upper James Street
To : Trinity Church Road

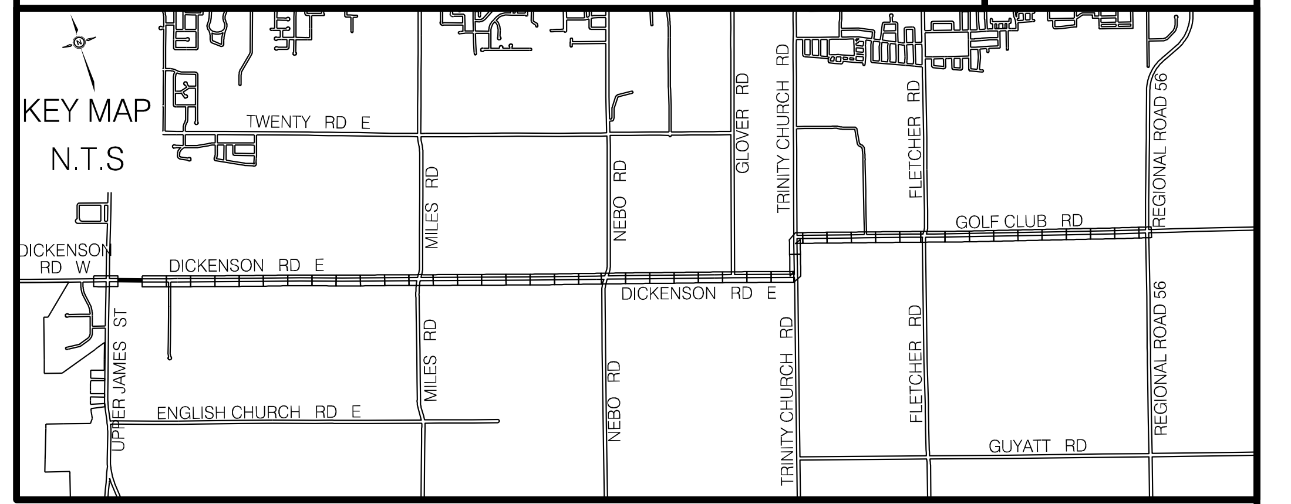
18-H-01

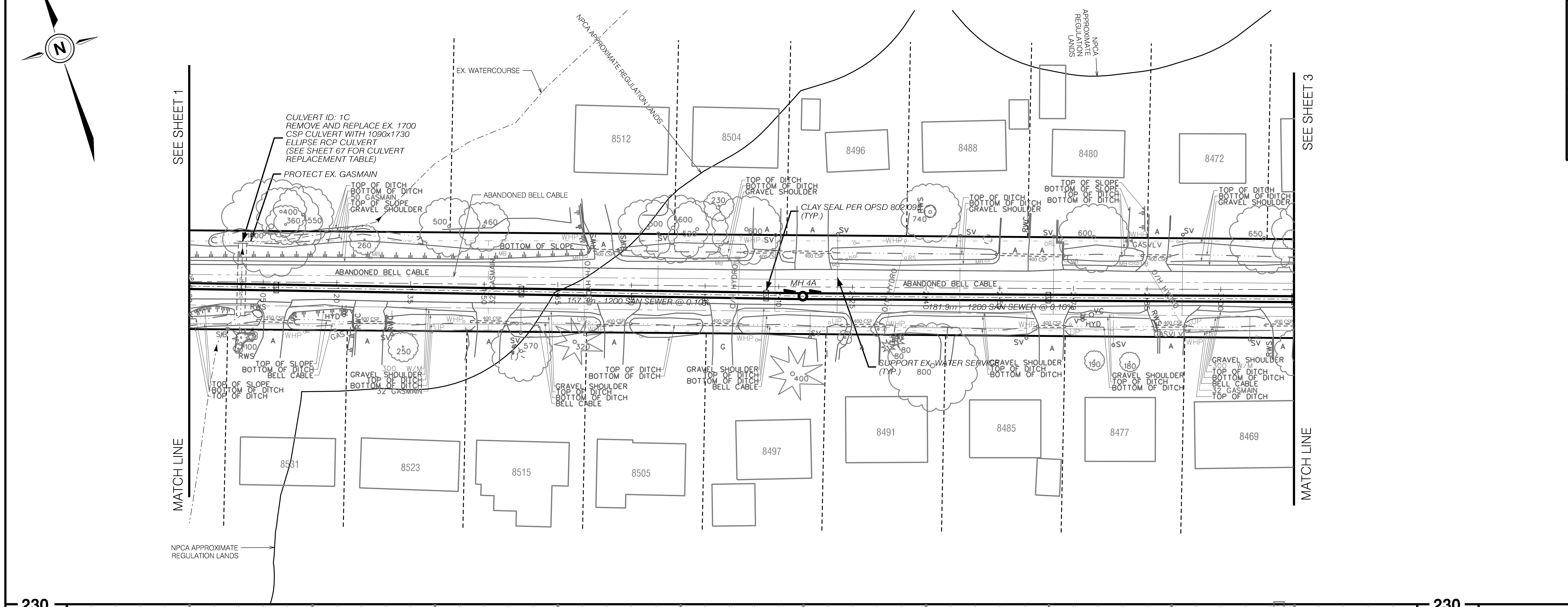
DICKENSON ROAD EAST

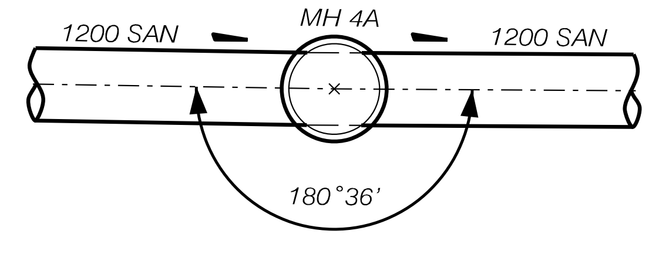
DICKENSON ROAD EAST

CONTRACT No. C15-11-22 (HSW)
DRAWING No. 18-H-01

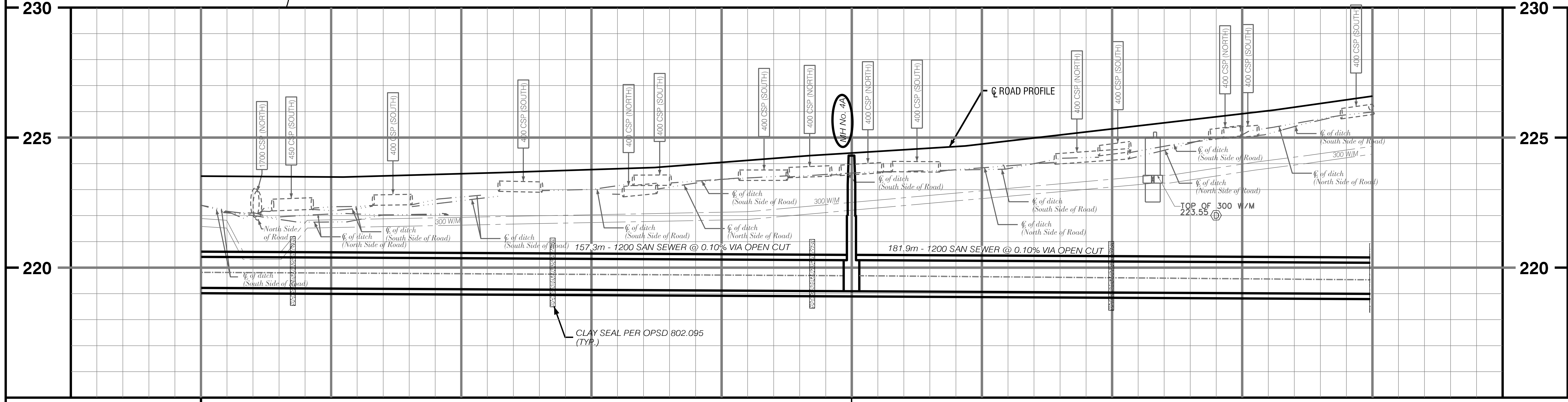
SHEET No.
2 OF 108







MH 4A SCHEMATIC



C.B. REMOVALS/REPLACEMENTS

EXISTING SEWER MANHOLES

PROPOSED SANITARY SEWER									TEE MH 1500 DIA. W 219.092 E 219.092								PROPOSED SANITARY SEWER
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	223.52	223.50	223.50	223.58	223.67	223.77	223.89	224.12	224.35	224.53	224.75	225.10	225.45	225.80	226.17	226.60	EXISTING ℄ OF ROAD PROFILE ELEVATIONS
EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE	0+90	1+05	1+20	1+35	1+50	1+65	1+80	1+95	2+10	2+25	2+40	2+55	2+70	2+85	3+00	3+15	EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE

No.	REVISIONS	INITIAL	DATE
	Issued for Tender	F.S.	03/02/22

REFERENCE MATERIAL

Road Plan : 99-H-39, 00-H-40
Sewer Plans : 07-S-41, 14-S-11
Water Plans : 80-W-28, 80-W-38, 82-W-5, 82-W-13, 82-W-18, 83-W-19, 88-W-3, 89-W-17

Geodetic Bench Mark Index No. 65U161 Elevation=222.640m
Borehole Report - GTR_1932

ACTIVITIES	
Surveyed By:	J.P./D.O.
Survey Date:	13-03-18
Drawn By:	O.S.
Drawn Date:	09-04-18
Design By:	F.S.
Design Date:	22-07-19

Q/C IN ACCORDANCE WITH ASCE STANDARD 38-02
All Utilities depicted are at Ⓒ unless otherwise noted.
Ⓓ information derived from existing records
Ⓒ information obtained from field survey combined with Ⓓ information
Ⓑ information obtained in field and indicates horizontal position of subsurface utility
Ⓐ precise horizontal and vertical location of utility obtained by exposure and measurement

SCALES
0 5m 10m 20m
HORIZONTAL 1:500
0 1m 2m 4m
VERTICAL 1:100
Dimensions shown on this plan are in millimetres unless otherwise noted

IBI

F. SHWEIHAT
100073055
Feb. 03, 2022

Project Manager (Design)
Feb 9, 2022
Taufeek Ameer, P. Eng.
Manager of Design
Susan Korch
Susan Jacob, P. Eng.

Hamilton
Public Works Department

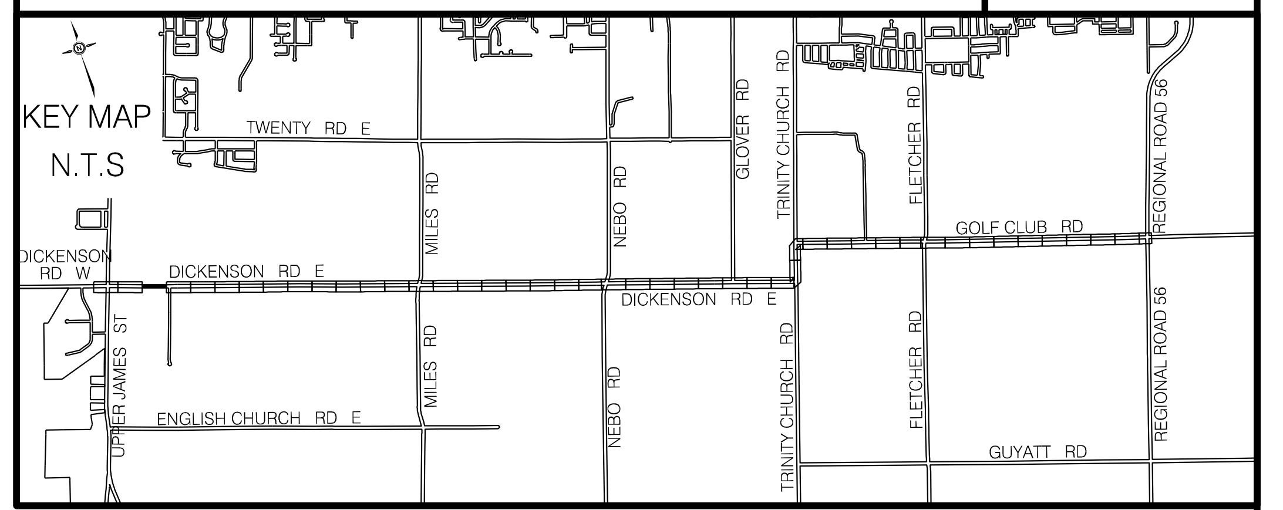
DICKENSON ROAD EAST

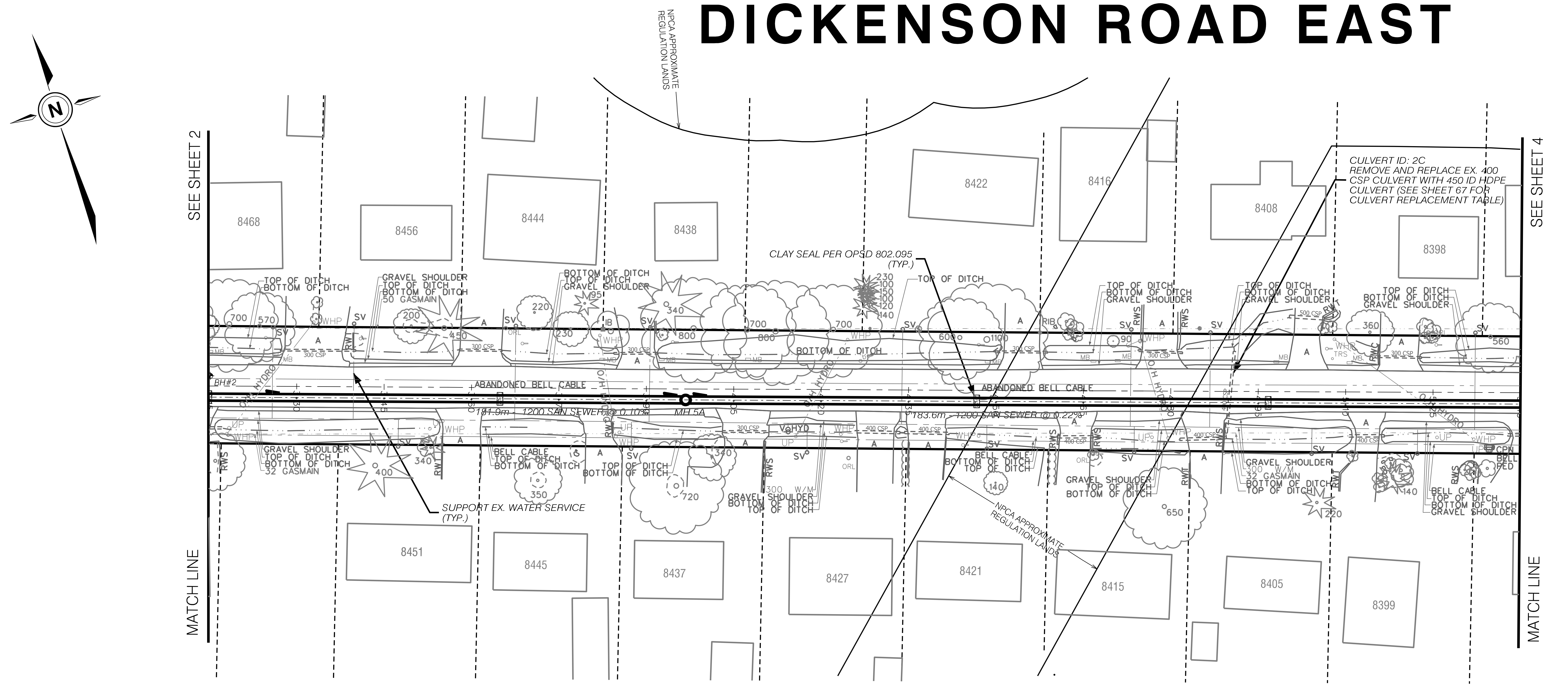
Sanitary Sewer Installation
From STA. 0+90 to STA. 3+15
From : Upper James Street
To : Trinity Church Road

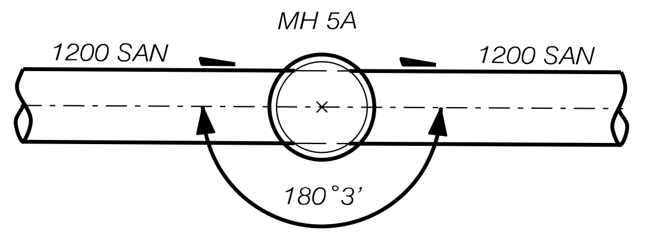
18-H-01

DICKENSON ROAD EAST

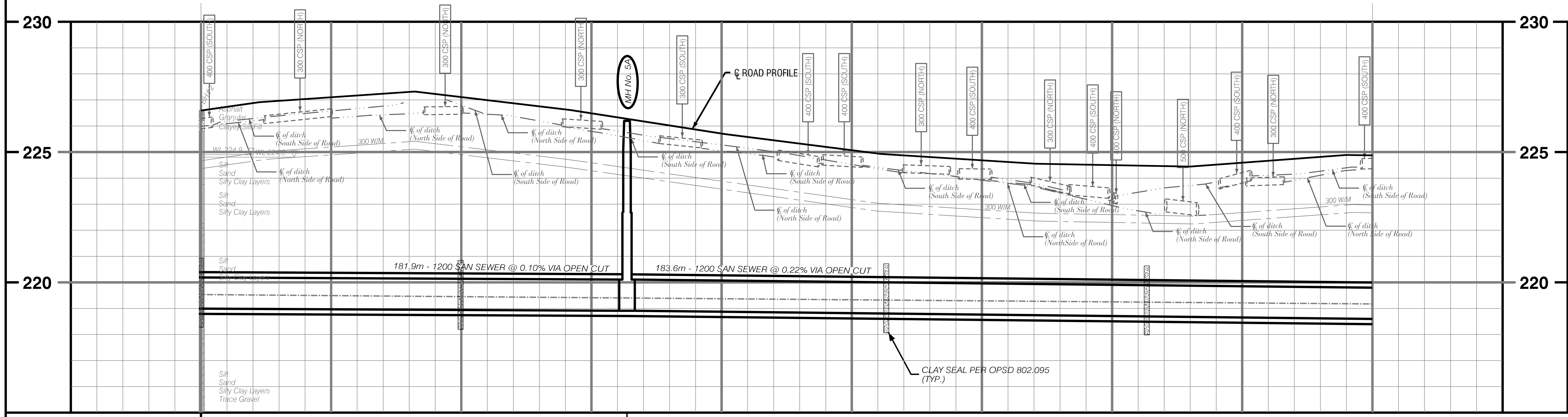
CONTRACT No. C15-11-22 (HSW)	SHEET No.
DRAWING No. 18-H-01	3 OF 108







MH 5A SCHEMATIC



C.B. REMOVALS/REPLACEMENTS

EXISTING SEWER MANHOLES

PROPOSED SANITARY SEWER						TEE MH 1500 DIA. W 218.910 E 218.910										PROPOSED SANITARY SEWER
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	226.60	226.97	227.17	227.23	226.87	226.48	226.02	225.58	225.20	224.87	224.68	224.54	224.48	224.52	224.74	224.87	EXISTING ℄ OF ROAD PROFILE ELEVATIONS
EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE	3+15	3+30	3+45	3+60	3+75	3+90	4+05	4+20	4+35	4+50	4+65	4+80	4+95	5+10	5+25	5+40	EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE

No.	REVISIONS	INITIAL	DATE
	Issued for Tender	F.S.	03/02/22

REFERENCE MATERIAL

Road Plan : 99-H-39, 00-H-40
Sewer Plans : 07-S-41, 14-S-11
Water Plans : 80-W-28, 80-W-38, 82-W-5, 82-W-13, 82-W-18, 83-W-19, 88-W-3, 89-W-17

Geodetic Bench Mark Index No. 65U161 Elevation=222.640m
Borehole Report - GTR_1932

ACTIVITIES	
Surveyed By:	J.P./D.O.
Survey Date:	13-03-18
Drawn By:	O.S.
Drawn Date:	09-04-18
Design By:	F.S.
Design Date:	22-07-19

Q/C IN ACCORDANCE WITH ASCE STANDARD 38-02
All Utilities depicted are at Ⓒ unless otherwise noted.
Ⓓ information derived from existing records
Ⓒ information obtained from field survey combined with Ⓓ information
Ⓑ information obtained in field and indicates horizontal position of subsurface utility
Ⓐ precise horizontal and vertical location of utility obtained by exposure and measurement

SCALES
0 5m 10m 20m
HORIZONTAL 1:500
0 1m 2m 4m
VERTICAL 1:100
Dimensions shown on this plan are in millimetres unless otherwise noted

IBI

F. SHWEIHAT
100073055
Feb. 03, 2022

Project Manager (Design)
Feb 9, 2022
Taufeek Ameer, P. Eng.

Manager of Design
Susan Jacob, P. Eng.

Hamilton
Public Works Department

DICKENSON ROAD EAST

Sanitary Sewer Installation
From STA. 3+15 to STA. 5+40
From : Upper James Street
To : Trinity Church Road

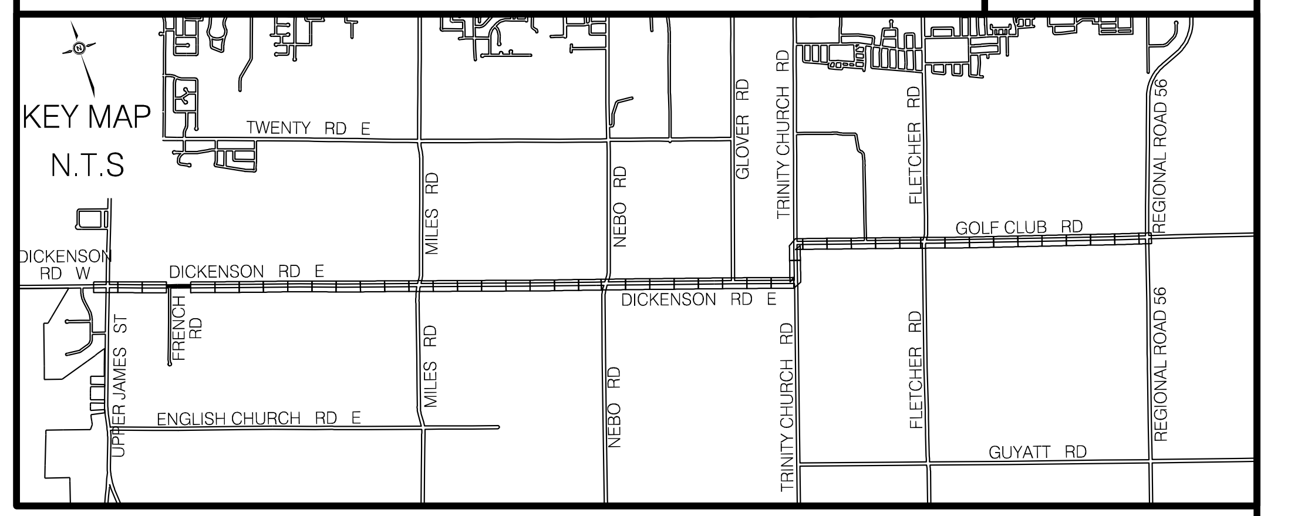
DICKENSON ROAD EAST

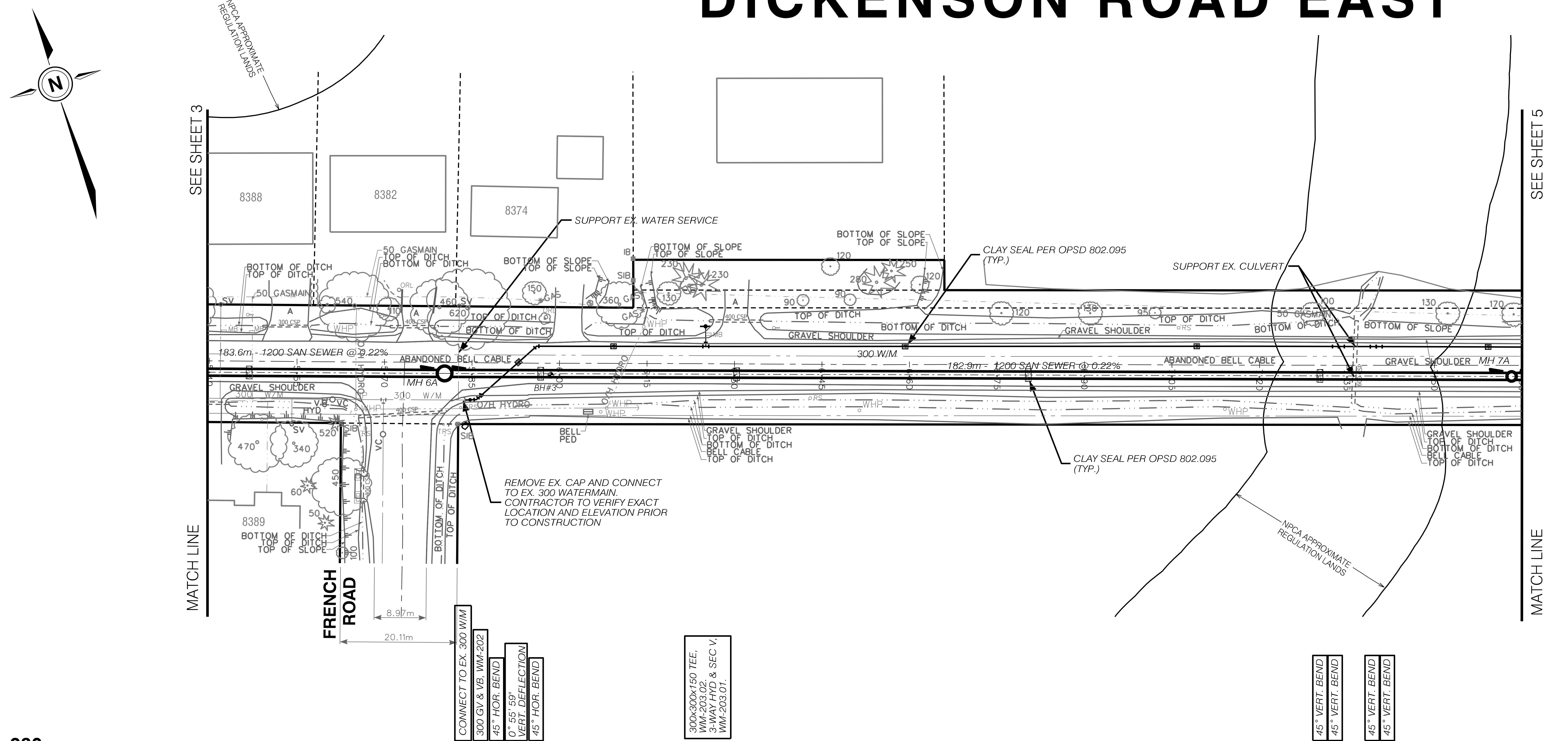
18-H-01

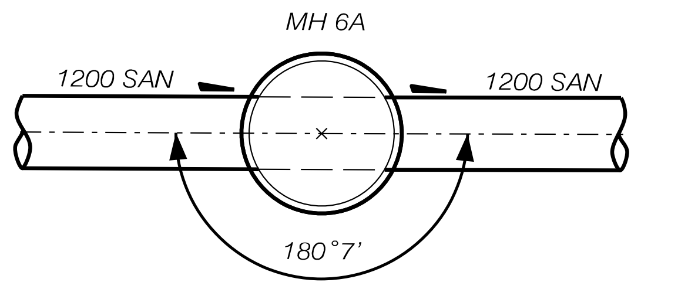
DICKENSON ROAD EAST

CONTRACT No. C15-11-22 (HSW)
DRAWING No. 18-H-01

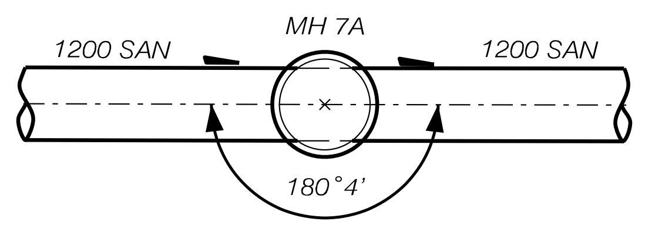
SHEET No.
4 OF 108



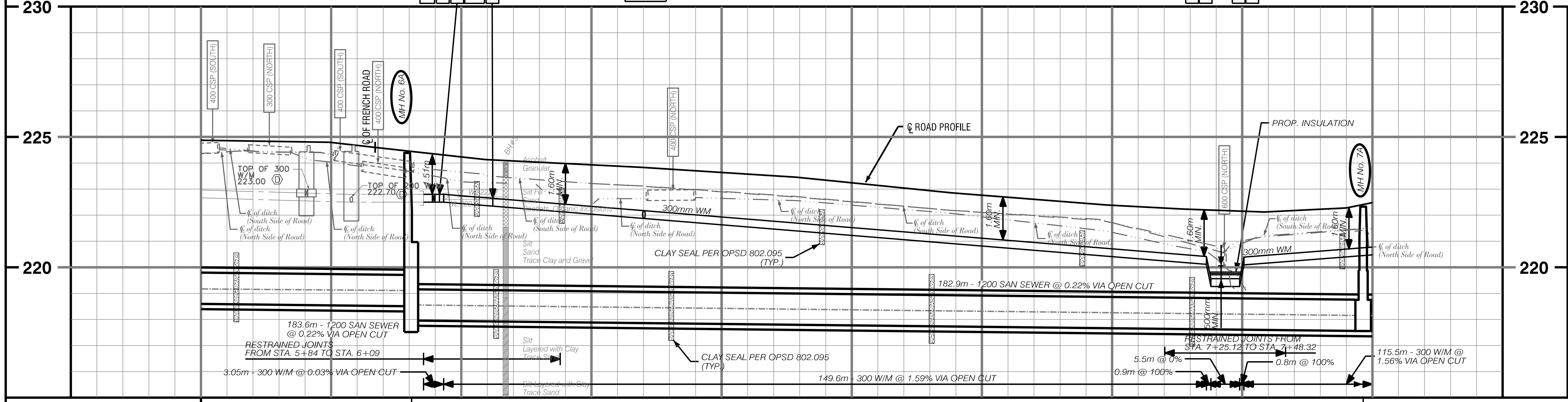




MH 6A SCHEMATIC



MH 7A SCHEMATIC



C.B. REMOVALS/REPLACEMENTS

EXISTING SEWER MANHOLES

PROPOSED SANITARY SEWER				2400mm DIA. MH W 218.506 E 217.958	5+84.70 222.499											TEE MH 1500 DIA. W 217.556 E 217.556		PROPOSED SANITARY SEWER
PROPOSED 300mm WATERMAIN INVERTS				5+83.84 222.499	5+86.61 222.499		6+25.10 221.872							7+33.12 220.113 7+33.97 219.265	7+39.49 219.265 7+40.32 220.094			PROPOSED 300mm WATERMAIN INVERTS
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	224.87	224.83	224.68	224.34	224.08	223.93	223.77	223.58	223.34	223.04	222.77	222.53	222.40	222.43	222.45	222.48		EXISTING ℄ OF ROAD PROFILE ELEVATIONS
EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE	5+40	5+55	5+70	5+85	6+00	6+15	6+30	6+45	6+60	6+75	6+90	7+05	7+20	7+35	7+50	7+65		EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE

No.	REVISIONS	INITIAL	DATE
	Issued for Tender	F.S.	03/02/22

REFERENCE MATERIAL

Road Plan : 99-H-39, 00-H-40
Sewer Plans : 07-S-41, 14-S-11
Water Plans : 80-W-28, 80-W-38, 82-W-5, 82-W-13, 82-W-18, 83-W-19, 88-W-3, 89-W-17

Geodetic Bench Mark Index No. 65U161 Elevation=222.640m
Borehole Report - GTR_1932

ACTIVITIES	
Surveyed By:	J.P./D.O.
Survey Date:	13-03-18
Drawn By:	O.S.
Drawn Date:	09-04-18
Design By:	F.S.
Design Date:	22-07-19

Q/C IN ACCORDANCE WITH ASCE STANDARD 38-02
All Utilities depicted are at Ⓒ unless otherwise noted.
Ⓓ information derived from existing records
Ⓒ information obtained from field survey combined with Ⓓ information
Ⓑ information obtained in field and indicates horizontal position of subsurface utility
Ⓐ precise horizontal and vertical location of utility obtained by exposure and measurement

SCALES
0 5m 10m 20m
HORIZONTAL 1:500
0 1m 2m 4m
VERTICAL 1:100
Dimensions shown on this plan are in millimetres unless otherwise noted

IBI

LICENSED PROFESSIONAL ENGINEER
F. SHWEIHAT
100073055
Feb. 03, 2022
PROVINCE OF ONTARIO

Project Manager (Design)
Feb 9, 2022
Taufeek Ameer, P. Eng.

Manager of Design
Susan Koreh
Susan Jacob, P. Eng.

Hamilton
Public Works Department

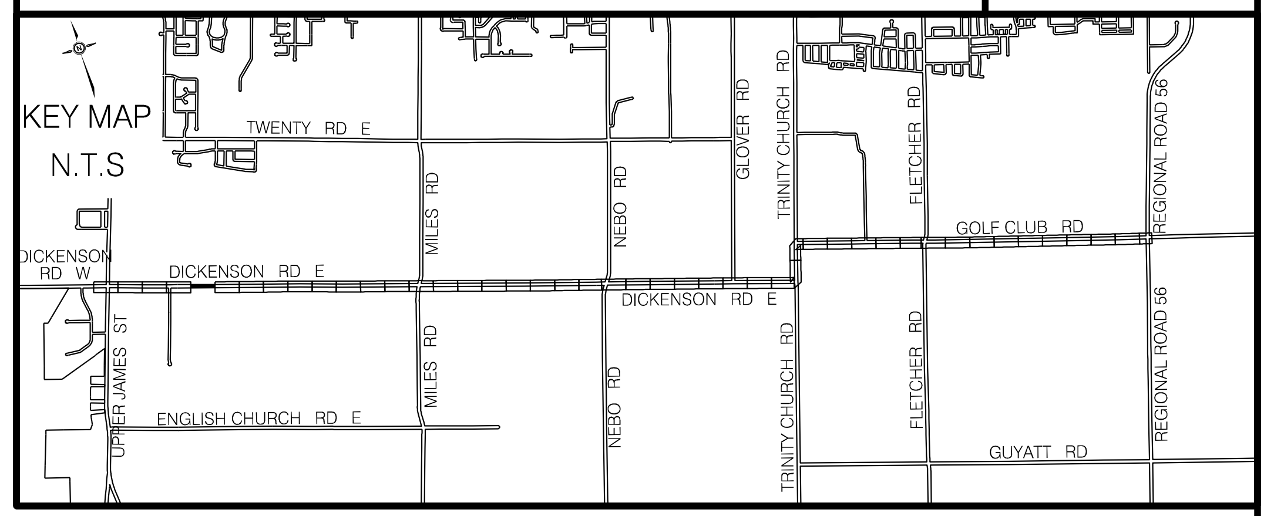
DICKENSON ROAD EAST

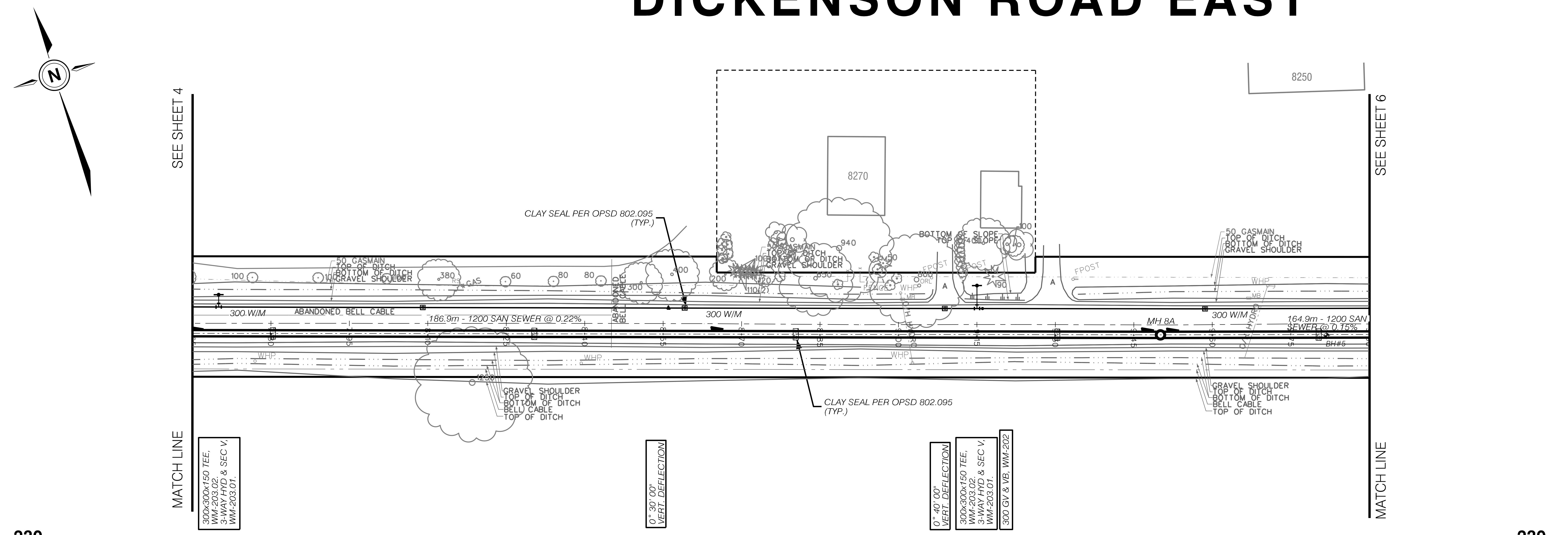
Sanitary Sewer Installation
From STA. 5+40 to STA. 7+65
From : Upper James Street
To : Trinity Church Road

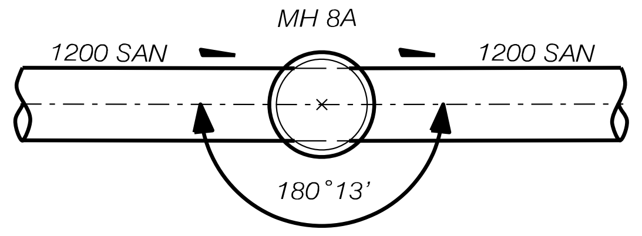
DICKENSON ROAD EAST

CONTRACT No. C15-11-22 (HSW)
DRAWING No. 18-H-01

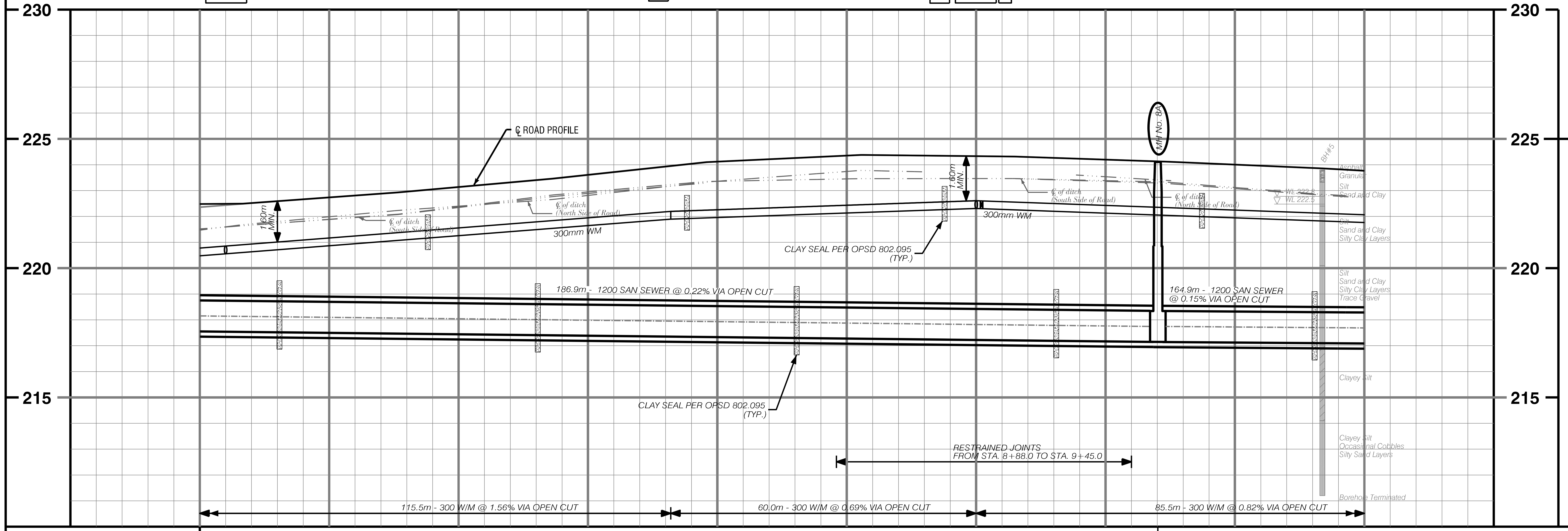
SHEET No.
5 OF 108







MH 8A SCHEMATIC



C.B. REMOVALS/REPLACEMENTS

EXISTING SEWER MANHOLES

PROPOSED SANITARY SEWER: TEE MH 1500 DIA. W 217.144 E 217.144

PROPOSED 300mm WATERMAIN INVERTS: 7+70.00 220.556; 8+56.00 221.895; 9+16.00 222.308; 9+17.06 222.300

EXISTING ℄ OF ROAD PROFILE ELEVATIONS	222.48	222.59	222.81	223.05	223.32	223.61	223.93	224.17	224.31	224.36	224.33	224.27	224.16	224.05	223.92	223.77	EXISTING ℄ OF ROAD PROFILE ELEVATIONS
EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE	7+65	7+80	7+95	8+10	8+25	8+40	8+55	8+70	8+85	9+00	9+15	9+30	9+45	9+60	9+75	9+90	EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE

No.	REVISIONS	INITIAL	DATE
	Issued for Tender	F.S.	03/02/22

REFERENCE MATERIAL

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Sewer Plans : 07-S-41, 14-S-11
Water Plans : 80-W-28, 80-W-38, 82-W-5, 82-W-13, 82-W-18, 83-W-19, 88-W-3, 89-W-17

Geodetic Bench Mark Index No. 65U161 Elevation=222.640m
Borehole Report - GTR_1932

ACTIVITIES	
Surveyed By:	J.P./D.O.
Survey Date:	13-03-18
Drawn By:	O.S.
Drawn Date:	09-04-18
Design By:	F.S.
Design Date:	22-07-19

Q/C IN ACCORDANCE WITH ASCE STANDARD 38-02
All Utilities depicted are at Ⓒ unless otherwise noted.
Ⓓ information derived from existing records
Ⓒ information obtained from field survey combined with Ⓓ information
Ⓑ information obtained in field and indicates horizontal position of subsurface utility
Ⓐ precise horizontal and vertical location of utility obtained by exposure and measurement

SCALES
HORIZONTAL 1:500 (0 5m 10m 20m)
VERTICAL 1:100 (0 1m 2m 4m)
Dimensions shown on this plan are in millimetres unless otherwise noted

IBI

F. SHWEIHAT
100073055
Feb. 03, 2022

Project Manager (Design)
Feb 9, 2022
Taufeek Ameer, P. Eng.

Manager of Design
Susan Jacob, P. Eng.

Hamilton
Public Works Department

DICKENSON ROAD EAST

Sanitary Sewer Installation
From STA. 7+65 to STA. 9+90
From : Upper James Street
To : Trinity Church Road

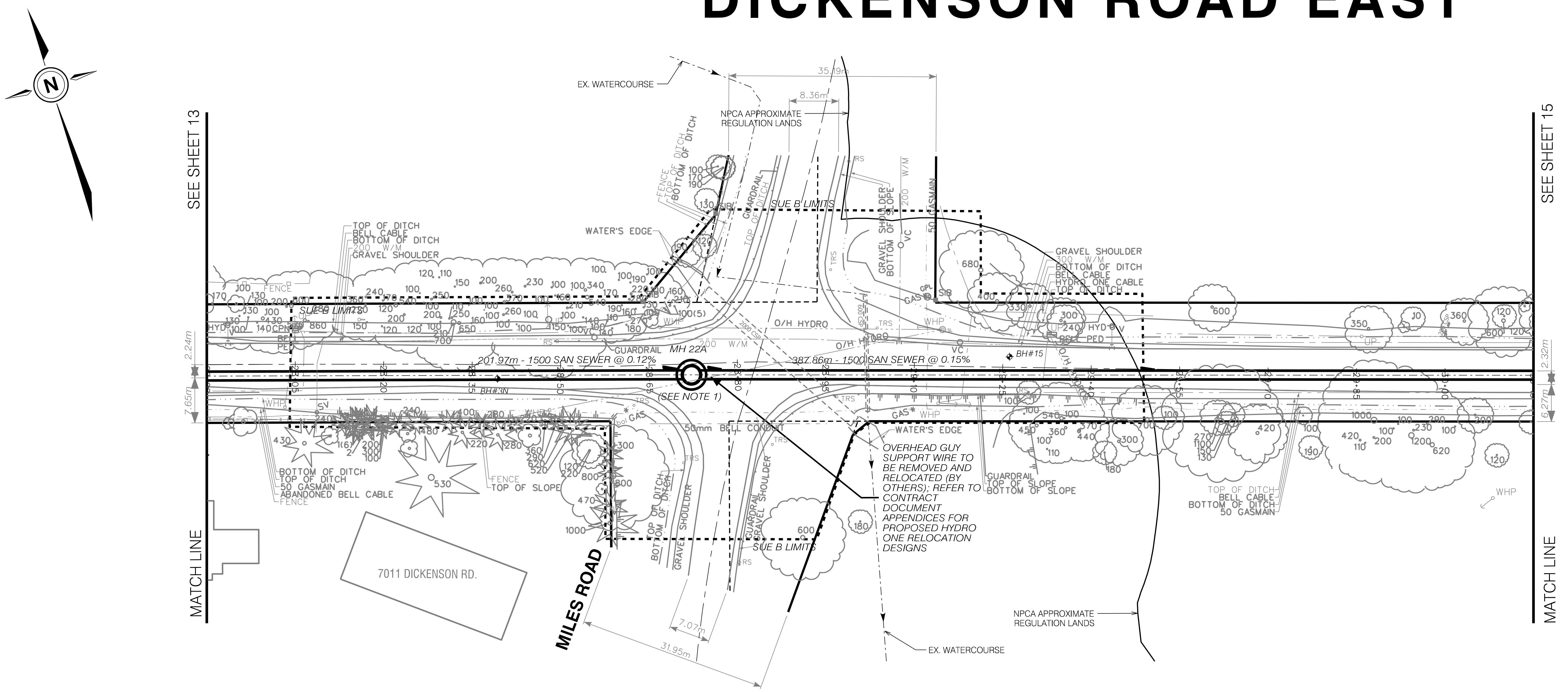
DICKENSON ROAD EAST

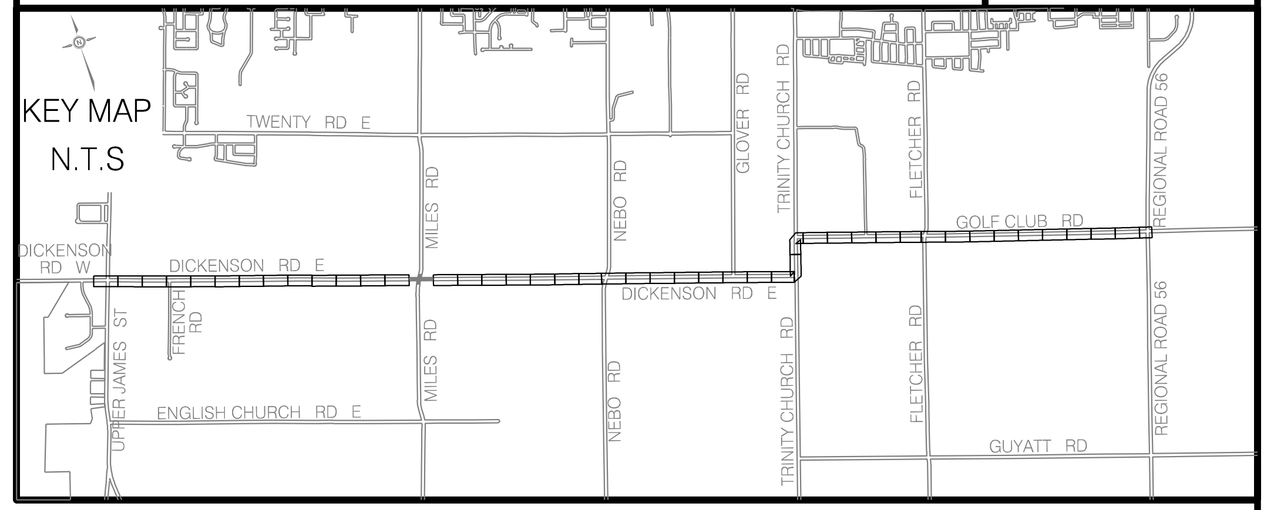
18-H-01

DICKENSON ROAD EAST

CONTRACT No. C15-11-22 (HSW)
DRAWING No. 18-H-01

SHEET No.
14 OF 108



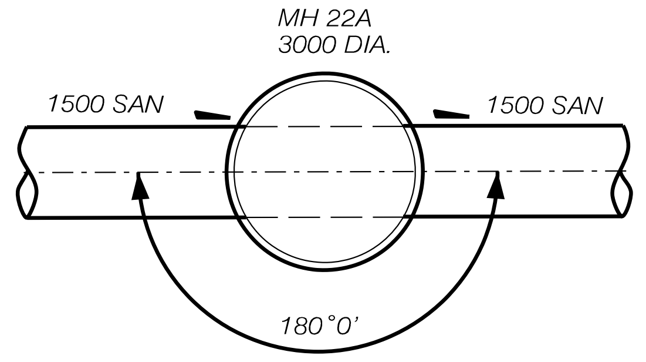


LEGEND

▭ SUE B LIMITS

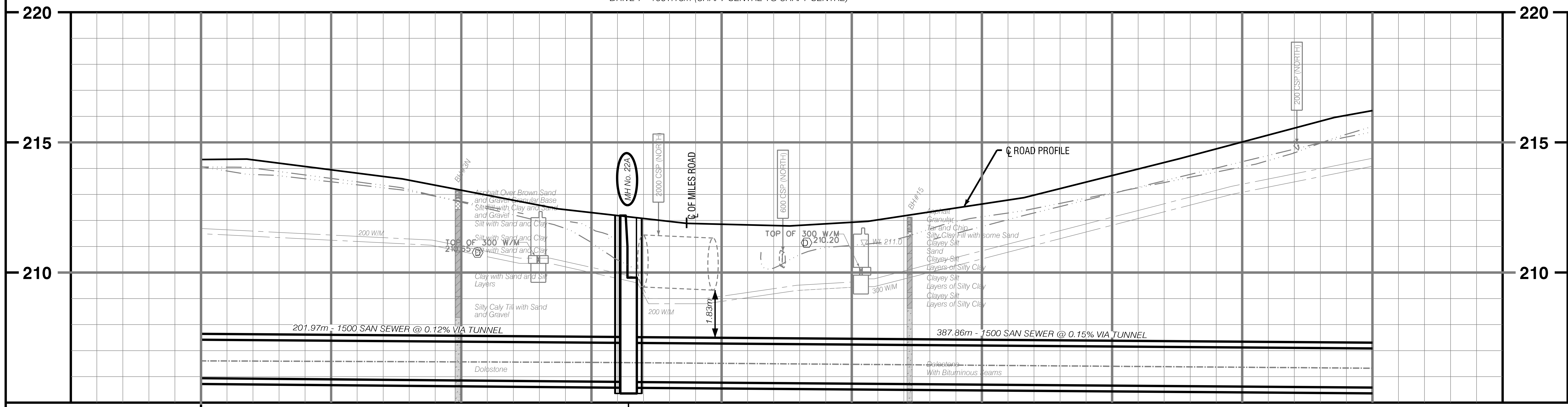
NOTE:

1. CONTRACTOR TO MAINTAIN VEHICLE ACCESS TO AND FROM 7011 DICKENSON RD TO MILES ROAD AT ALL TIMES.



MH 22A SCHEMATIC

TRENCHLESS INSTALLATION
DRIVE 7 - 1051.13m (SHAFT CENTRE TO SHAFT CENTRE)



C.B. REMOVALS/REPLACEMENTS

EXISTING SEWER MANHOLES

PROPOSED SANITARY SEWER							3000mm DIA MH W 206.905 E 205.875										PROPOSED SANITARY SEWER
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	214.34	214.20	213.82	213.36	212.78	212.30	211.96	211.83	211.87	212.18	212.63	213.23	213.98	214.75	215.55	216.22	EXISTING ℄ OF ROAD PROFILE ELEVATIONS
EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE	27+90	28+05	28+20	28+35	28+50	28+65	28+80	28+95	29+10	29+25	29+40	29+55	29+70	29+85	30+00	30+15	EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE

No.	REVISIONS	INITIAL	DATE
	Issued for Tender	F.S.	03/02/22

REFERENCE MATERIAL

Road Plan : 99-H-39, 00-H-40
Sewer Plans : 07-S-41, 14-S-11
Water Plans : 80-W-28, 80-W-38, 82-W-5, 82-W-13, 82-W-18, 83-W-19, 88-W-3, 89-W-17

Geodetic Bench Mark Index No. 65U161 Elevation=222.640m
Borehole Report - GTR_1932

ACTIVITIES	
Surveyed By:	J.P./D.O.
Survey Date:	13-03-18
Drawn By:	O.S.
Drawn Date:	09-04-18
Design By:	F.S.
Design Date:	22-07-19

Q/C IN ACCORDANCE WITH ASCE STANDARD 38-02
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SCALES
0 5m 10m 20m
HORIZONTAL 1:500
0 1m 2m 4m
VERTICAL 1:100
Dimensions shown on this plan are in millimetres unless otherwise noted

IBI

LICENSED PROFESSIONAL ENGINEER
F. SHWEIHAT
100073055
Feb. 03, 2022
PROVINCE OF ONTARIO

Project Manager (Design)
Feb 9, 2022
Taufeek Ameer, P. Eng.

Manager of Design
Susan Jacob, P. Eng.

Hamilton
Public Works Department

DICKENSON ROAD EAST

Sanitary Sewer Installation
From STA. 27+90 to STA. 30+15

From : Upper James Street
To : Trinity Church Road

HIGHWAY Nº 6

CERTIFICATE OF COMPLETION

This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

MAY 1997 — Date

T EVANS — Project Manager

Note:

Work as constructed : shown in green
Constructed by :
Date completed :
Inspector :
Pipe material :
Class of Pipe :
Plotted by : R.HONCHARENKO
Elevations by : N/A

No.	REVISIONS	DATE	INITIAL
1	EX. 300mmØ WATERMAIN ON DICKENSON ROAD ADDED	89/03/14	CMC
2	ADDED AS CONSTRUCTED	DEC 4/89	F.W.

NOTES BENCH MARK - INDEX Nº 75-U-165 (GLANBROOK)

SCALES
HORIZ. 1:500
VERT. 1:100

DIRECTOR

APPROVED
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

HIGHWAY Nº 6
PROPOSED SANITARY SEWERS
FROM : ± 1100 m SOUTH OF TWENTY ROAD
TO : 85 m SOUTH OF DICKENSON ROAD

DATE: 88 - 04 - 30
PROJECT No. 813 - 73
DRAWING No. 88 - S - 16
SHEET 2 OF

88 S 16

13

88 S 16

HIGHWAY Nº 6

No.	REVISIONS	DATE	INITIAL
1	ADDED AS CONSTRUCTED	DEC 9/89	FW

NOTES: BENCH MARK - INDEX Nº 75-U-164 (GLANBROOK)

SCALES
HORIZ. 1:500
VERT. 1:100

DIRECTOR

APPROVED
S. SPENCER
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

DATE: 88-04-30
PROJECT No. 813-73

HIGHWAY Nº 6
PROPOSED SANITARY SEWERS
FROM: 85 m SOUTH OF DICKENSON ROAD
TO 560 m SOUTH OF DICKENSON ROAD

DRAWING No. 88-S-16
SHEET 3 OF

64

88 S 16

HIGHWAY Nº 6

CERTIFICATE OF COMPLETION

This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

MAY 1997
Date

Project Manager

Note:
Work as constructed : shown in green
Constructed by :
Date completed :
Inspector :
Pipe material :
Class of Pipe :
Plotted by : R. HONCHARENKO
Elevations by : N/A

No.	REVISIONS	DATE	INITIAL
1	ADDED AS CONSTRUCTED	DEC. 4/89	FW

NOTES: BENCH MARK - INDEX Nº 75-U-164 (GLANBROOK)

SCALES
HORIZ. 1:500
VERT. 1:100

DIRECTOR

APPROVED
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

HIGHWAY Nº 6
PROP. 300 mm. Ø - 450 mm. Ø SANITARY SEWER
FROM: 1630 METRES SOUTH OF DICKENSON ROAD
TO: 300 METRES SOUTH OF ENGLISH CHURCH ROAD

DATE: 89-05-29
PROJECT No. 813-73
DRAWING No. 88-S-16
SHEET 6A OF

88 S 16 6

HIGHWAY N° 6

CERTIFICATE OF COMPLETION

This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

MAY 1997
Date

Project Manager

Note:
Work as constructed : shown in green
Constructed by :
Date completed :
Inspector : 2740
Pipe material :
Class of Pipe :
Plotted by : R. HONCHARENKO
Elevations by : N/A

NOTE:
1. WATERTIGHT MANHOLE FRAME AND COVER FOR M.H. 17 SEE DETAIL 'A'
2. CONTRACTOR TO MAINTAIN EXISTING CREEK FLOW AT ALL TIMES DURING CONSTRUCTION.

SILTATION CONTROL NOTES

1. SILTATION PROTECTION SHALL CONSIST OF FILTER CLOTH (TEXEL 7607 OR APPROVED EQUAL) BURIED 300 IN THE GROUND, 900 HIGH & SESURED TO SNOW FENCE WITH STEEL 'T' POSTS AT 2400 CENTRES, AND STRAW BALES.
2. CONTRACTOR SHALL MAINTAIN ALL SILTATION CONTROL MEASURES DURING CONSTRUCTION AND UNTIL THE FINAL RESTORATION IS COMPLETED
THE CONTRACTOR SHALL PERIODICALLY REPLACE FILTER CLOTH AND/OR STRAW BALES AS DIRECTED BY THE ENGINEER.
3. WIDTH AND LOCATION OF THE SILTATION CONTROL FENCE SHALL BE AS DIRECTED BY THE ENGINEER.

No.	REVISIONS	DATE	INITIAL
	AS-BUILT SEWER AND JUNCTION CHAINAGES	97-02-11	R.T.
⚠	LENGTH BETWEEN M.H.18 & M.H.19 ON PLAN	89-03-22	T. HO

NOTES: BENCH MARK-INDEX N° 75-U-164 (GLANBROOK)

SCALES
HORIZ. 1:500
VERT. 1:100

DIRECTOR

APPROVED
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

DATE: 88-04-30
PROJECT No. 813-73

HIGHWAY N° 6
PROP. SANITARY SEWER & SAN. FORCEMAIN
FROM: 1630 METRES SOUTH OF DICKENSON ROAD
TO: 300 METRES SOUTH OF ENGLISH CHURCH ROAD

DRAWING No. 88-S-16 ⚠ SHEET 6

NOTES: BENCH MARK-INDEX Nº 75-U-164(GLANBROOK)

SCALES
HORIZ. 1:500
VERT. 1:100

No.	REVISIONS	DATE	INITIAL
	AS-BUILT SEWER, JUNCTION CHAINAGES	97-02-05	R.T.
⚠	CHAINAGES	89-03-22	T. HO
⚠	EX. U/G BELL DUCTS SHOWN AS FIELD CHECKED	"	"

DIRECTOR

APPROVED

COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH

DEPARTMENT OF ENGINEERING

DATE: 88-04-30

PROJECT No. 813-73

HOMESTEAD DRIVE

PROPOSED SANITARY SEWERS

FROM: 355 METRES NORTH OF AIRPORT ROAD
TO: AIRPORT ROAD

DRAWING No. 88-S-16

⚠ SHEET 9 OF

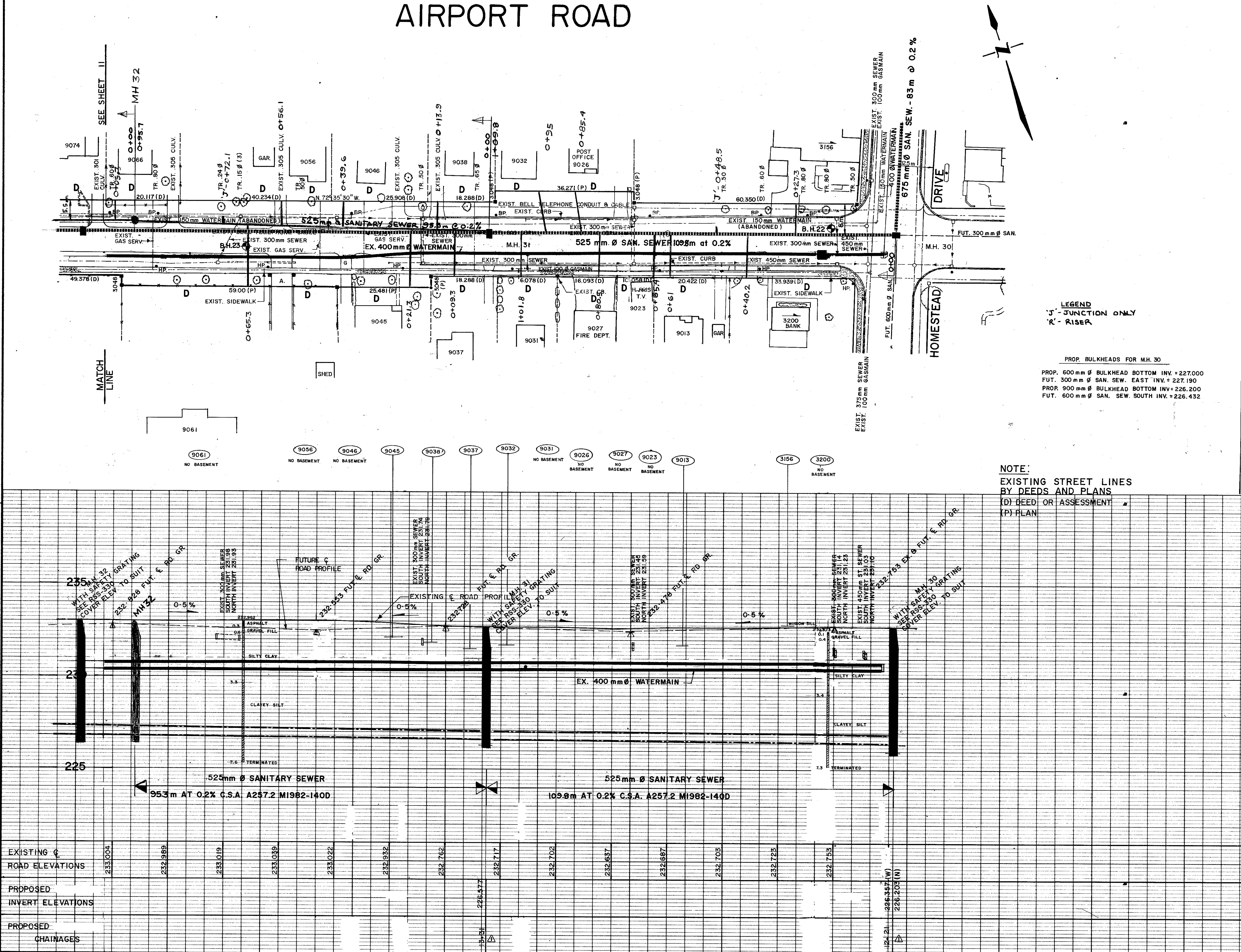
88 5 16

9

10

16 S

AIRPORT ROAD



LEGEND
'J' - JUNCTION ONLY
'R' - RISER

PROP. BULKHEADS FOR M.H. 30

PROP. 600 mm Ø BULKHEAD BOTTOM INV. = 227.000
FUT. 300 mm Ø SAN. SEW. EAST INV. = 227.190
PROP. 900 mm Ø BULKHEAD BOTTOM INV = 226.200
FUT. 600 mm Ø SAN. SEW. SOUTH INV. = 226.432

NOTE:
EXISTING STREET LINES BY DEEDS AND PLANS
(D) DEED OR ASSESSMENT
(P) PLAN

CERTIFICATE OF COMPLETION

This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

Date: MAY 1997
Project Manager:

Note:

Work as constructed :	shown in green	Pipe material :	
Constructed by :		Class of Pipe :	
Date completed :		Plotted by :	R. HONCHARENKO
Inspector :		Elevations by :	N/A

NOTES: BENCH MARK - INDEX Nº 75-U-159 & INDEX Nº 75-U-160 (GLANBROOK)
ALL JUNCTIONS AND SERVICES ARE 150mm DIA. UNLESS OTHERWISE NOTED

No.	REVISIONS	DATE	INITIAL
	AS-BUILT SEWER AND JUNCTION CHAINAGES	97-02-07	R.T.
⚠	CHAINAGES	89-03-22	T. HO

SCALES
HORIZONTAL 0m 10m 20m
VERTICAL 0m 2m 4m

DIRECTOR

APPROVED
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

AIRPORT ROAD
PROPOSED SANITARY SEWERS
FROM: HOMESTEAD DRIVE
TO. 210 m WEST OF HOMESTEAD DRIVE

DATE: 88 - 04 - 30
PROJECT No. 813-73
DRAWING No. 88 - S - 16 ⚠
SHEET 10 OF

90 W 16 AIRPORT RD.

AIRPORT ROAD

CERTIFICATE OF COMPLETION

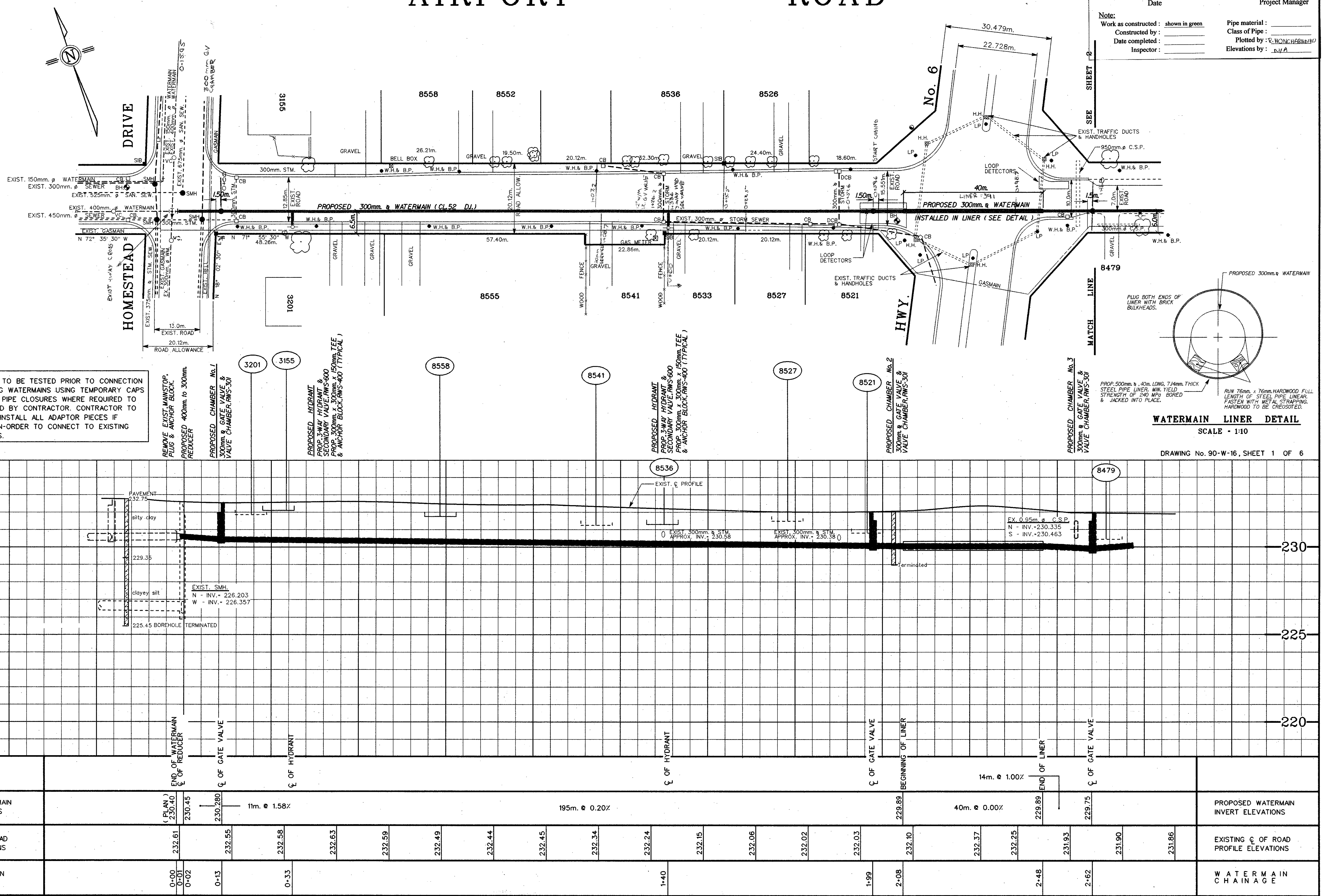
This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

MAY 1997
Date

Project Manager

Note:
Work as constructed : shown in green
Constructed by :
Date completed :
Inspector :
Pipe material :
Class of Pipe :
Plotted by : R. HONCHARENKO
Elevations by : N/A

NOTE: WATERMAIN TO BE TESTED PRIOR TO CONNECTION TO EXISTING WATERMAINS USING TEMPORARY CAPS OR PLUGS. PIPE CLOSURES WHERE REQUIRED TO BE SUPPLIED BY CONTRACTOR. CONTRACTOR TO SUPPLY & INSTALL ALL ADAPTOR PIECES IF REQUIRED IN-ORDER TO CONNECT TO EXISTING WATERMAINS.



PROPOSED WATERMAIN INVERT ELEVATIONS	(PLAN) 230.40	230.45	230.280														229.89		229.89	229.75		
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	232.61		232.55	232.58	232.63	232.59	232.49	232.44	232.45	232.34	232.24	232.15	232.06	232.02	232.03		232.10	232.37	232.25	231.93	231.90	231.86
WATERMAIN CHAINAGE	0+00	0+01 0+02	0+13	0+33							1+40				1+99		2+08		2+48	2+62		

No.	REVISIONS	DATE	INITIAL
	AS CONSTRUCTED	5/28/97	

CHECKED BY
DRAWN BY J. PIDSADNY
SCALES HORIZONTAL 1:500 VERTICAL 1:100
DIRECTOR
APPROVED Ted Gill
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING
DATE : AUGUST 23, 1990
PROJECT No. 801-80

AIRPORT ROAD
PROPOSED 300mm. ø WATERMAIN
FROM : HOMESTEAD DRIVE
TO : APPROX. 1320m.+/- EAST OF HWY. No. 6
DRAWING No. 90-W-16
SHEET 1 OF 6

90 W 16 2 AIRPORT RD.

AIRPORT ROAD

CERTIFICATE OF COMPLETION

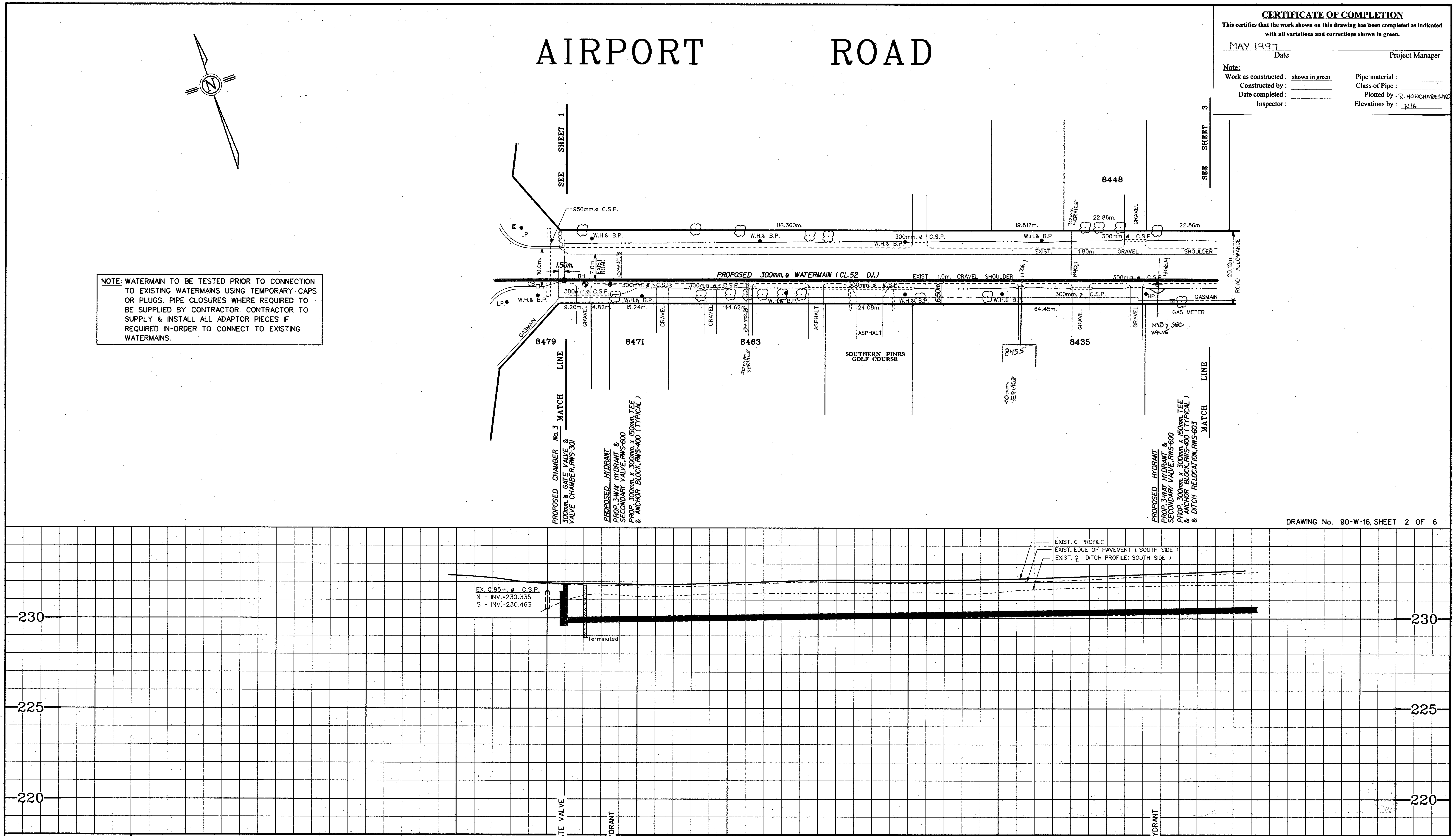
This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

MAY 1997
Date

Project Manager

Note:
Work as constructed : shown in green
Constructed by :
Date completed :
Inspector :
Pipe material :
Class of Pipe :
Plotted by : R. HONCHARENKO
Elevations by : N/A

NOTE: WATERMAIN TO BE TESTED PRIOR TO CONNECTION TO EXISTING WATERMAINS USING TEMPORARY CAPS OR PLUGS. PIPE CLOSURES WHERE REQUIRED TO BE SUPPLIED BY CONTRACTOR. CONTRACTOR TO SUPPLY & INSTALL ALL ADAPTOR PIECES IF REQUIRED IN-ORDER TO CONNECT TO EXISTING WATERMAINS.



DRAWING No. 90-W-16, SHEET 2 OF 6

PROPOSED WATERMAIN INVERT ELEVATIONS	229.75 — 161m. @ 0.30% — 230.233
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	232.37 232.25 231.93 231.90 231.86 231.91 232.00 232.10 232.11 232.14 232.21 232.42 232.65
WATERMAIN CHAINAGE	2+62 2+75 4+23 4+26

No.	REVISIONS	DATE	INITIAL
1	AS CONSTRUCTED	5/28/97	R.H

CHECKED BY

DRAWN BY
J. PIDSADNY

SCALES
VERTICAL 1:100
HORIZONTAL 1:500

DIRECTOR

APPROVED
Ted Gill
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

DATE : AUGUST 23,1990
PROJECT No. 801-80

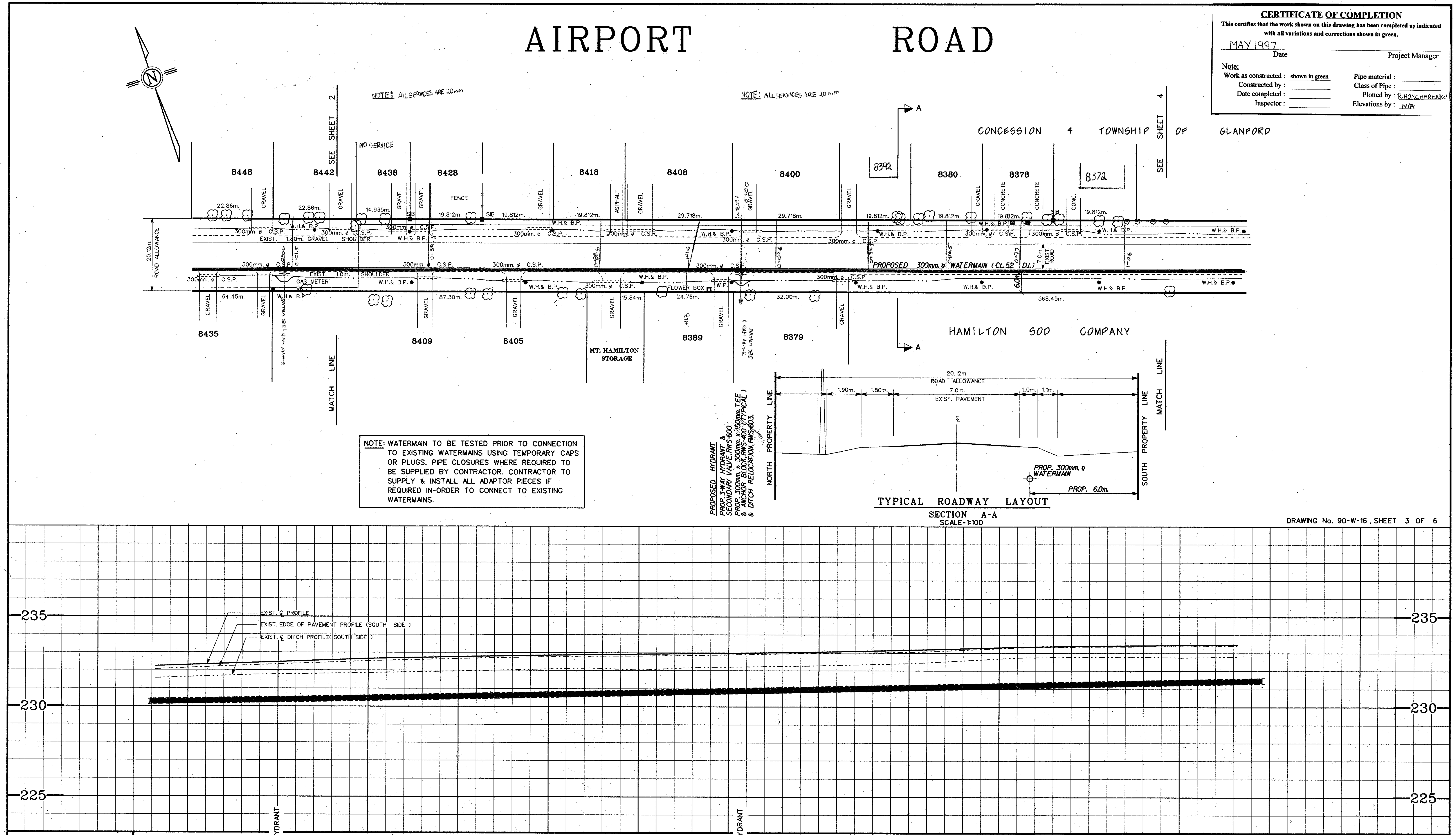
AIRPORT ROAD
PROPOSED 300mm. ø WATERMAIN
FROM : HOMESTEAD DRIVE
TO : APPROX. 1320m.+/- EAST OF HWY. No. 6.

DRAWING No. 90-W-16
SHEET 2 OF 6

AIRPORT RD 3

90 W 16

AIRPORT ROAD



CERTIFICATE OF COMPLETION

This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

MAY 1997
Date

Project Manager

Note:

Work as constructed : shown in green
Constructed by :
Date completed :
Inspector :
Pipe material :
Class of Pipe :
Plotted by : R.HONCHARENKO
Elevations by : N/A

NOTE: WATERMAIN TO BE TESTED PRIOR TO CONNECTION TO EXISTING WATERMAINS USING TEMPORARY CAPS OR PLUGS. PIPE CLOSURES WHERE REQUIRED TO BE SUPPLIED BY CONTRACTOR. CONTRACTOR TO SUPPLY & INSTALL ALL ADAPTOR PIECES IF REQUIRED IN-ORDER TO CONNECT TO EXISTING WATERMAINS.

DRAWING No. 90-W-16 , SHEET 3 OF 6

PROPOSED WATERMAIN INVERT ELEVATIONS	230.233 — 275m. @ 0.40% — 231.333
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	232.21, 232.42, 232.65, 232.78, 232.88, 232.91, 232.94, 233.01, 233.15, 233.32, 233.40, 233.44, 233.46
WATERMAIN CHAINAGE	4+23, 4+26, 5+52, 6+98

No.	REVISIONS	DATE	INITIAL
0	AS CONSTRUCTED	5/28/97	R.H.

CHECKED BY

DRAWN BY
J. PIDSADNY

SCALES
0 5m 10m 20m HORIZONTAL 1:500
0 1m 2m 4m VERTICAL 1:100

DIRECTOR

APPROVED
Ted Gill
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

DATE : AUGUST 23, 1990
PROJECT No. 801-80

AIRPORT ROAD
PROPOSED 300mm. ø WATERMAIN
FROM : HOMESTEAD DRIVE
TO : APPROX. 1320m.+/- EAST OF HWY No. 6

DRAWING No. 90-W-16
SHEET 3 OF 6

AIRPORT RD.
4
90 W 16

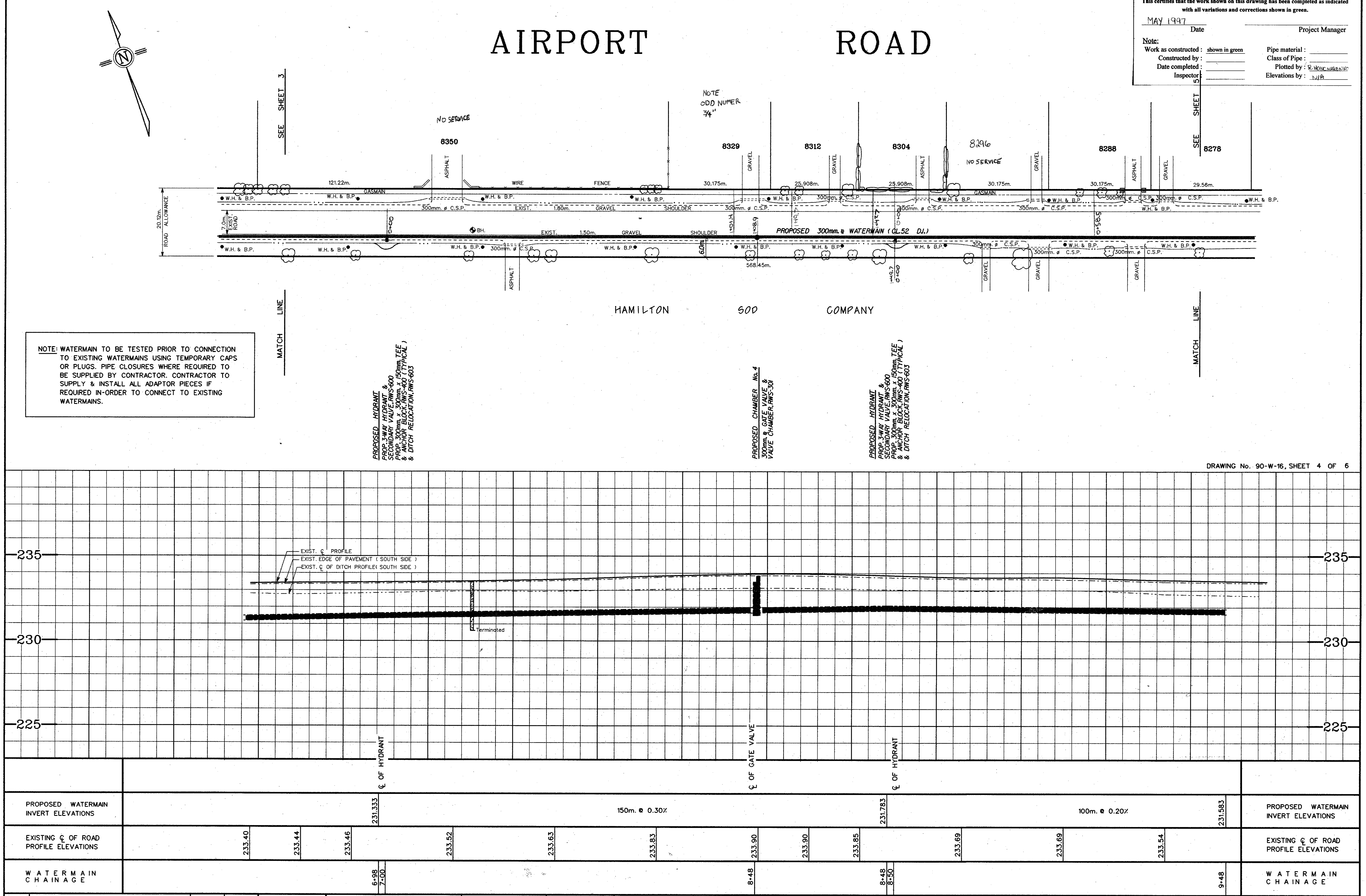
CERTIFICATE OF COMPLETION

This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

MAY 1997 Date
Project Manager

Note:
Work as constructed : shown in green
Constructed by :
Date completed :
Inspector :
Pipe material :
Class of Pipe :
Plotted by : R. HONCHARENKO
Elevations by : N/A

AIRPORT ROAD



NOTE: WATERMAIN TO BE TESTED PRIOR TO CONNECTION TO EXISTING WATERMAINS USING TEMPORARY CAPS OR PLUGS. PIPE CLOSURES WHERE REQUIRED TO BE SUPPLIED BY CONTRACTOR. CONTRACTOR TO SUPPLY & INSTALL ALL ADAPTOR PIECES IF REQUIRED IN-ORDER TO CONNECT TO EXISTING WATERMAINS.

No.	REVISIONS	DATE	INITIAL
	AS CONSTRUCTED	5/28/97	R.H

CHECKED BY

DRAWN BY
J. PIDSADNY

SCALES
0 5m 10m 20m HORIZONTAL 1:500
0 1m 2m 4m VERTICAL 1:100

DIRECTOR

APPROVED
Ted Gill
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

DATE : AUGUST 23, 1990
PROJECT No. 801-80

AIRPORT ROAD
PROPOSED 300mm. ø WATERMAIN
FROM : HOMESTEAD DRIVE
TO : APPROX. 1320m. +/- EAST OF HWY. No. 6

DRAWING No. 90-W-16
SHEET 4 OF 6

90 W 16 5 AIRPORT RD.

AIRPORT ROAD

CERTIFICATE OF COMPLETION

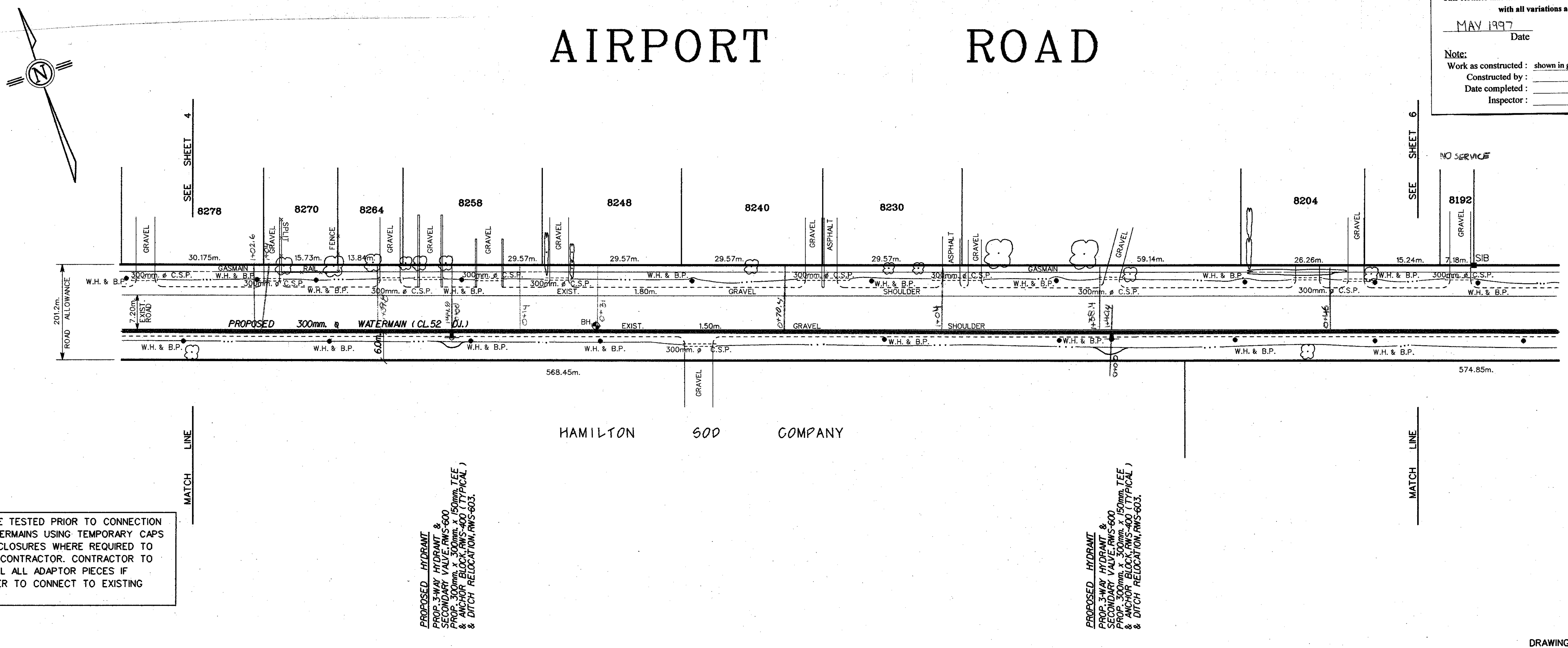
This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

MAY 1997 Date

Project Manager

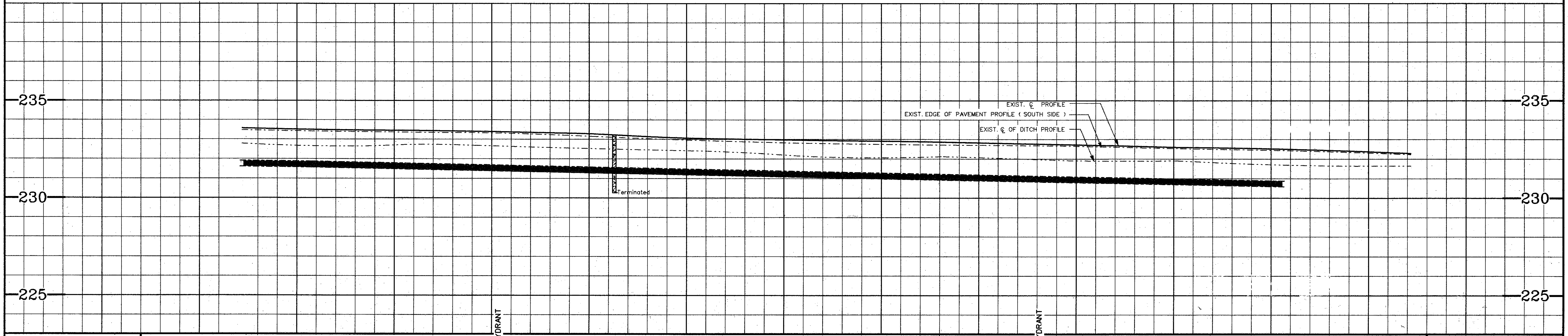
Note:

Work as constructed : shown in green
Constructed by :
Date completed :
Inspector :
Pipe material :
Class of Pipe :
Plotted by : R. HONCHARENKO
Elevations by : N/A



NOTE: WATERMAIN TO BE TESTED PRIOR TO CONNECTION TO EXISTING WATERMAINS USING TEMPORARY CAPS OR PLUGS. PIPE CLOSURES WHERE REQUIRED TO BE SUPPLIED BY CONTRACTOR. CONTRACTOR TO SUPPLY & INSTALL ALL ADAPTOR PIECES IF REQUIRED IN-ORDER TO CONNECT TO EXISTING WATERMAINS.

DRAWING No. 90-W-16, SHEET 5 OF 6



						℄ OF HYDRANT							℄ OF HYDRANT						
PROPOSED WATERMAIN INVERT ELEVATIONS		231.583							275m. @ 0.40%							230.583			PROPOSED WATERMAIN INVERT ELEVATIONS
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	233.54		233.44	233.42	233.38		233.26	233.01		232.92	232.84	232.78		232.72	232.60		232.50	232.29	EXISTING ℄ OF ROAD PROFILE ELEVATIONS
WATERMAIN CHAINAGE		9+48				9+95							11+35			11+98			WATERMAIN CHAINAGE

No.	REVISIONS	DATE	INITIAL
1	AS CONSTRUCTED	5/28/97	R.H

CHECKED BY

DRAWN BY
J. PIDSADNY

SCALES
0 5m 10m 20m HORIZONTAL 1:500
0 1m 2m 4m VERTICAL 1:100

DIRECTOR

APPROVED
Ted Gill
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

DATE : AUGUST 23, 1990
PROJECT No. 801-80

AIRPORT ROAD
PROPOSED 300mm. ø WATERMAIN
FROM : HOMESTEAD DRIVE
TO : APPROX. 1320m.+/- EAST OF HWY. No.6

DRAWING No. 90-W-16
SHEET 5 OF 6

90 W 16 AIRPORT RD. 6

CERTIFICATE OF COMPLETION

This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

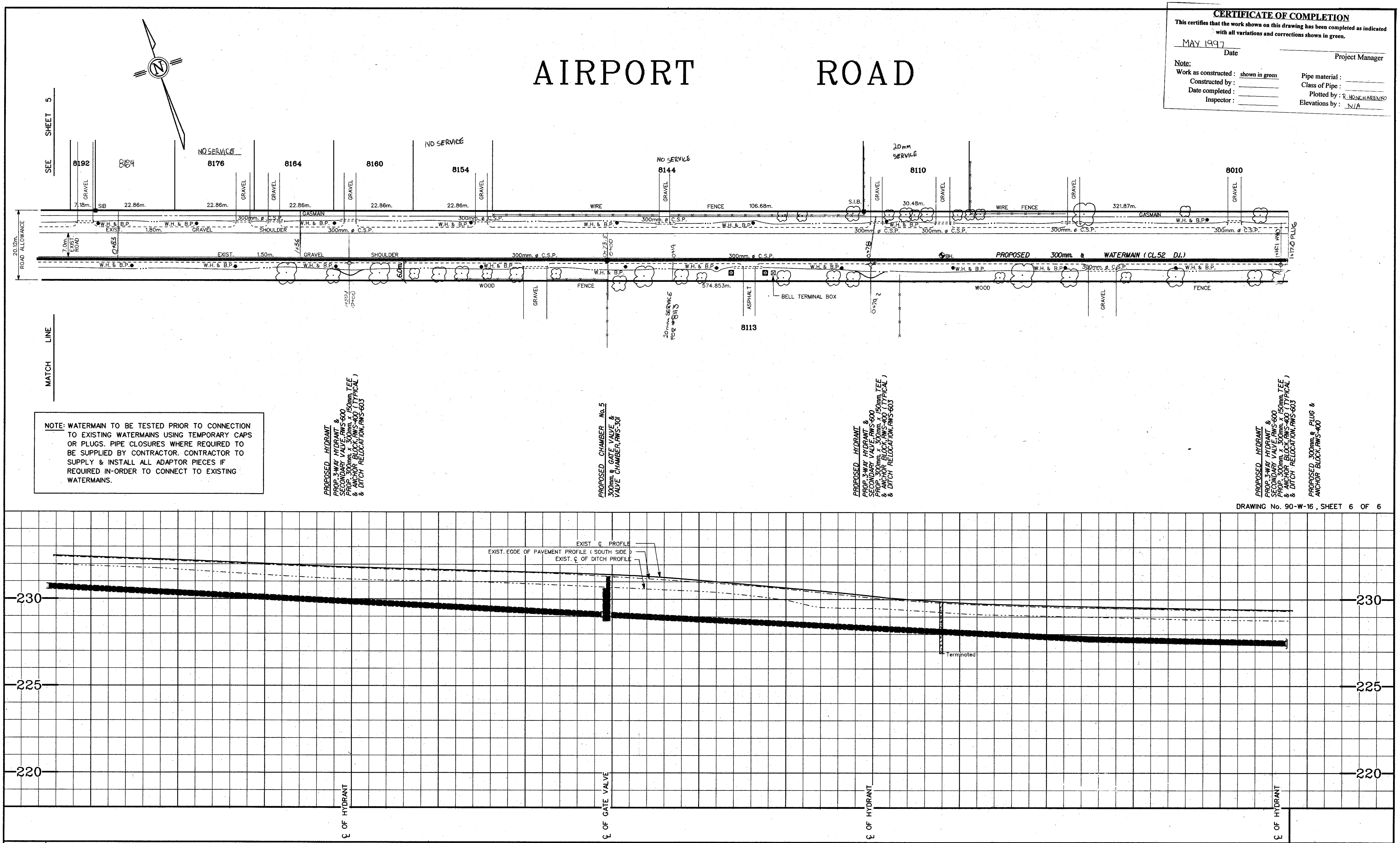
MAY 1997
Date

Project Manager

Note:
Work as constructed : shown in green
Constructed by :
Date completed :
Inspector :

Pipe material :
Class of Pipe :
Plotted by : R. HONCHARENKO
Elevations by : N/A

AIRPORT ROAD



NOTE: WATERMAIN TO BE TESTED PRIOR TO CONNECTION TO EXISTING WATERMAINS USING TEMPORARY CAPS OR PLUGS. PIPE CLOSURES WHERE REQUIRED TO BE SUPPLIED BY CONTRACTOR. CONTRACTOR TO SUPPLY & INSTALL ALL ADAPTOR PIECES IF REQUIRED IN-ORDER TO CONNECT TO EXISTING WATERMAINS.

DRAWING No. 90-W-16 , SHEET 6 OF 6

PROPOSED WATERMAIN INVERT ELEVATIONS: 230.583 — 300m. @ 1.0% — 227.583 — 57m. @ 0.40% — 227.355

EXISTING ℄ OF ROAD PROFILE ELEVATIONS: 232.29, 232.05, 231.82, 231.66, 231.50, 231.20, 230.68, 230.49, 230.10, 229.73, 229.58, 229.45

WATERMAIN CHAINAGE: 11+98, 12+85, 13+59, 14+35, 14+98, 15+53, 15+55

No.	REVISIONS	DATE	INITIAL
D	AS CONSTRUCTED	5/28/97	R.H

CHECKED BY

DRAWN BY
J. PIDSADNY

SCALES
HORIZONTAL 1:500
VERTICAL 1:100

DIRECTOR

APPROVED
Ted Gill
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

DATE : AUGUST 23, 1990
PROJECT No. 801-80

AIRPORT ROAD
PROPOSED 300mm. ø WATERMAIN
FROM : HOMESTEAD DRIVE
TO : APPROX. 1320m.+/- EAST OF HWY. No. 6

DRAWING No. 90-W-16
SHEET 6 OF 6

GROUND ELEVATION	222.10	CASING	220.31			CASING	CHAMBER	45° BEND	45° BEND	223.00	224.45	226.44	226.18	226.60	226.96
TOP OF WATERMAIN	220.39	216.70	216.70			216.70	216.70	216.70	217.42	218.38	222.39	225.67	224.22	224.76	225.26
CHAINAGE	12+500.0	12+543.5	12+550.0	12+568.2	12+571.5	12+577.0	12+580.0	12+585.0	12+591.5	12+600.0	12+650.0	12+700.0	12+750.0	12+800.0	12+850.0

NOTES:

* INDICATES OFFSET FROM PROPERTY LINE

No.	DATE	REVISION	BY
5	SEPT/95	RECORD DRAWING	
4	JULY/94	REVISED AS PER MTO COMMENTS	
3	JUNE/94	REVISED AS PER RMHW COMMENTS	
2	MAY/94	ISSUED FOR TENDER	
1	APR./94	ISSUED FOR REVIEW	

THORBURN PENNY
Consulting Engineers
Milton, Ontario

R. SMITH

D.C. PAYNTER
Oct 3/95

REGIONAL MUNICIPALITY OF
HALDIMAND–NORFOLK
ENGINEERING DEPARTMENT

TITLE:
CAYUGA WATER SYSTEM
TRUNK WATERMAIN
(MOUNT HOPE TO CALEDONIA)
STATION 12+500.0 – 12+850.0

DRAWN BY: A.F./J.C.
SCALE: AS NOTED
DATE: FEBRUARY 1994
REV:
C'KD BY: D.C./D.P.
DRAWING No. G34
CONTRACT 3

130.17D03440 10/31/95

95-W-66

GROUND ELEVATION	226.96	227.27	227.66	228.26	229.05	229.86	230.67	231.34
TOP OF WATERMAIN	225.26	225.56	225.96	226.54	227.33	228.10	228.83	229.44
CHAINAGE	12+850.0	12+900.0	12+950.0	13+000.0	13+050.0	13+100.0	13+150.0	13+200.0

NOTES:

No.	DATE	REVISION	BY
4	SEPT/95	RECORD DRAWING	
3	JUNE/94	REVISED AS PER RMHW COMMENTS	
2	MAY/94	ISSUED FOR TENDER	
1	APR./94	ISSUED FOR REVIEW	

THORBURN PENNY
Consulting Engineers
Milton, Ontario

LICENSED PROFESSIONAL ENGINEER
R.L. SMITH
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
D.C. PAYNTER
PROVINCE OF ONTARIO

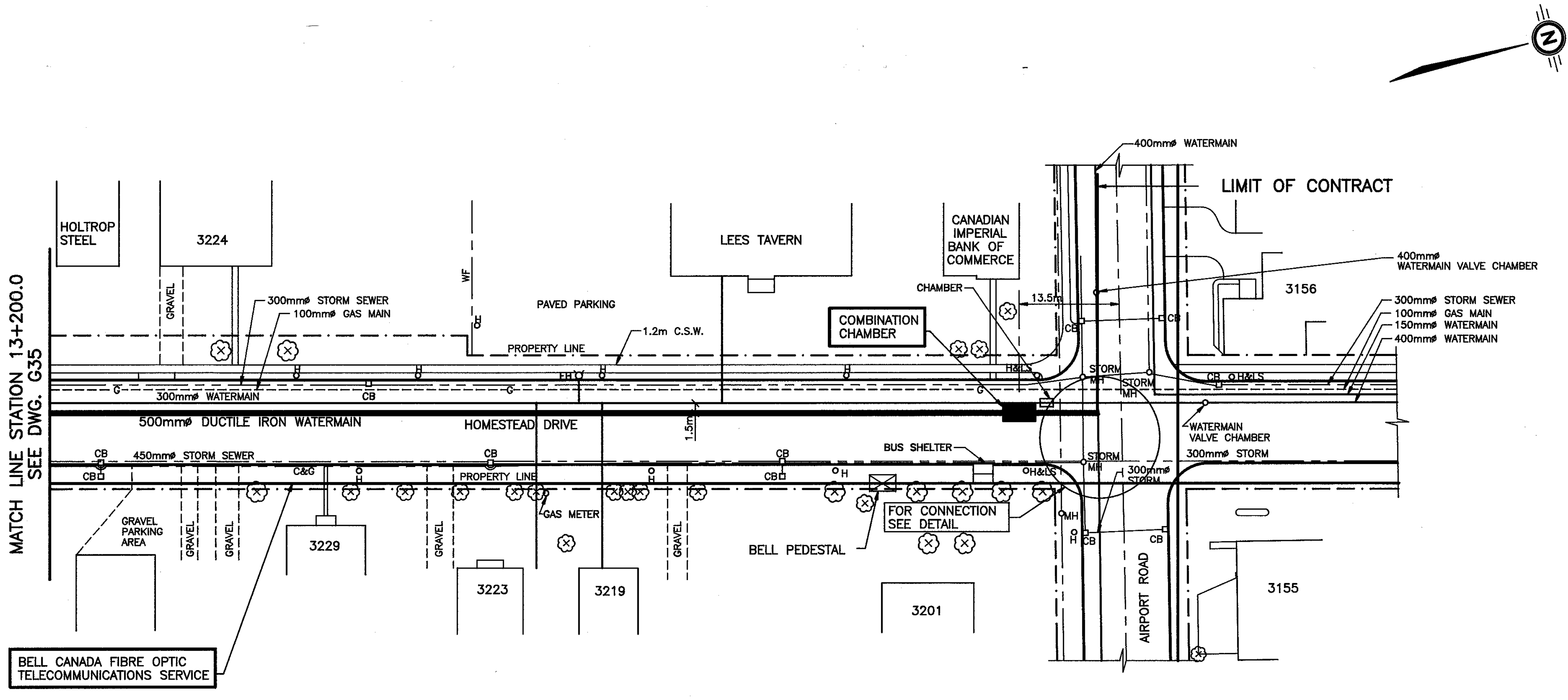
REGIONAL MUNICIPALITY OF
HALDIMAND–NORFOLK
ENGINEERING DEPARTMENT

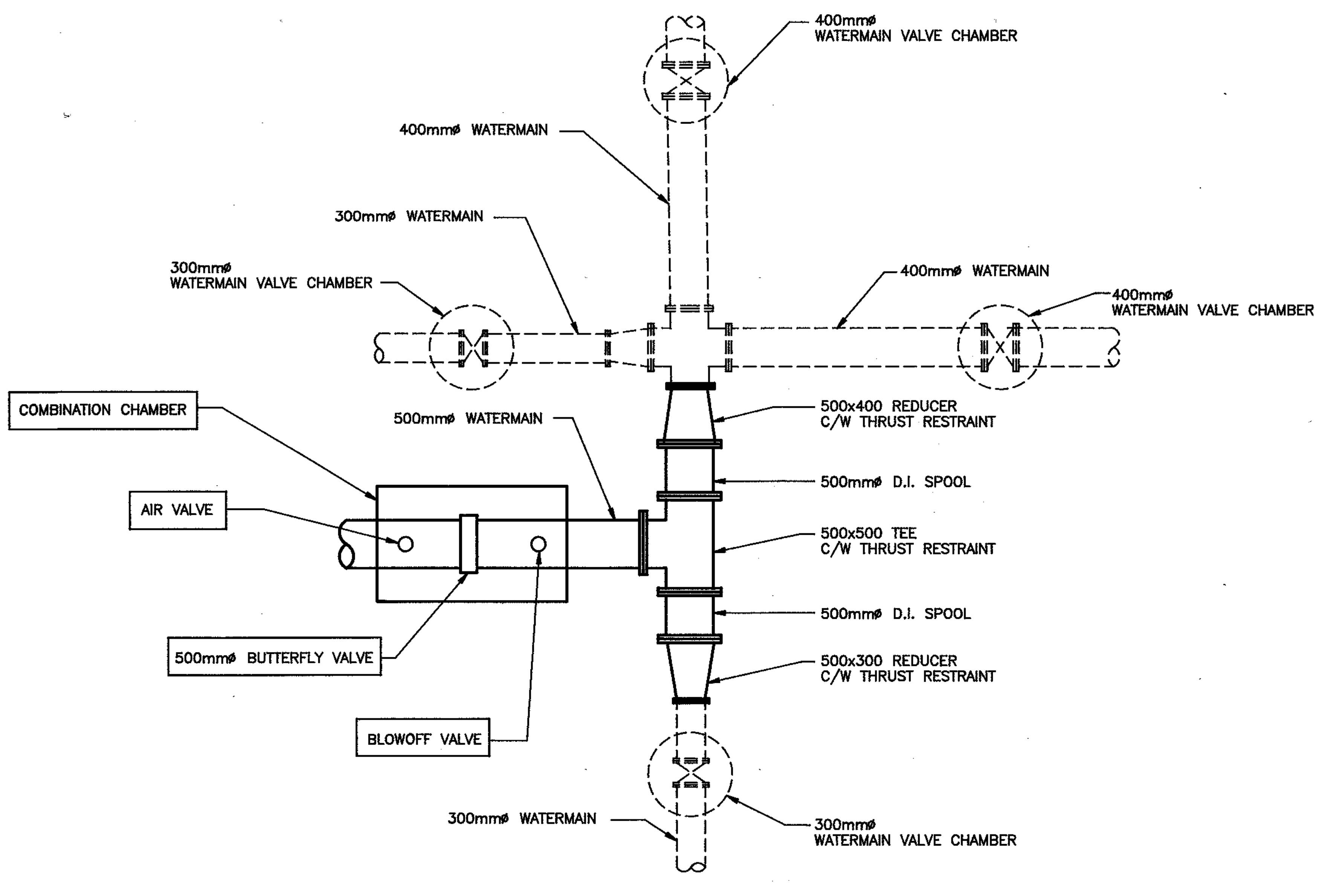
TITLE:
CAYUGA WATER SYSTEM
TRUNK WATERMAIN
(MOUNT HOPE TO CALEDONIA)
STATION 12+850.0 – 13+200.0

DRAWN BY: A.F./J.C.
SCALE: AS NOTED
DATE: FEBRUARY 1994
REV:
C'KD BY: D.C./D.P.
DRAWING No. G35
CONTRACT 3

130.17D03441 09/20/95

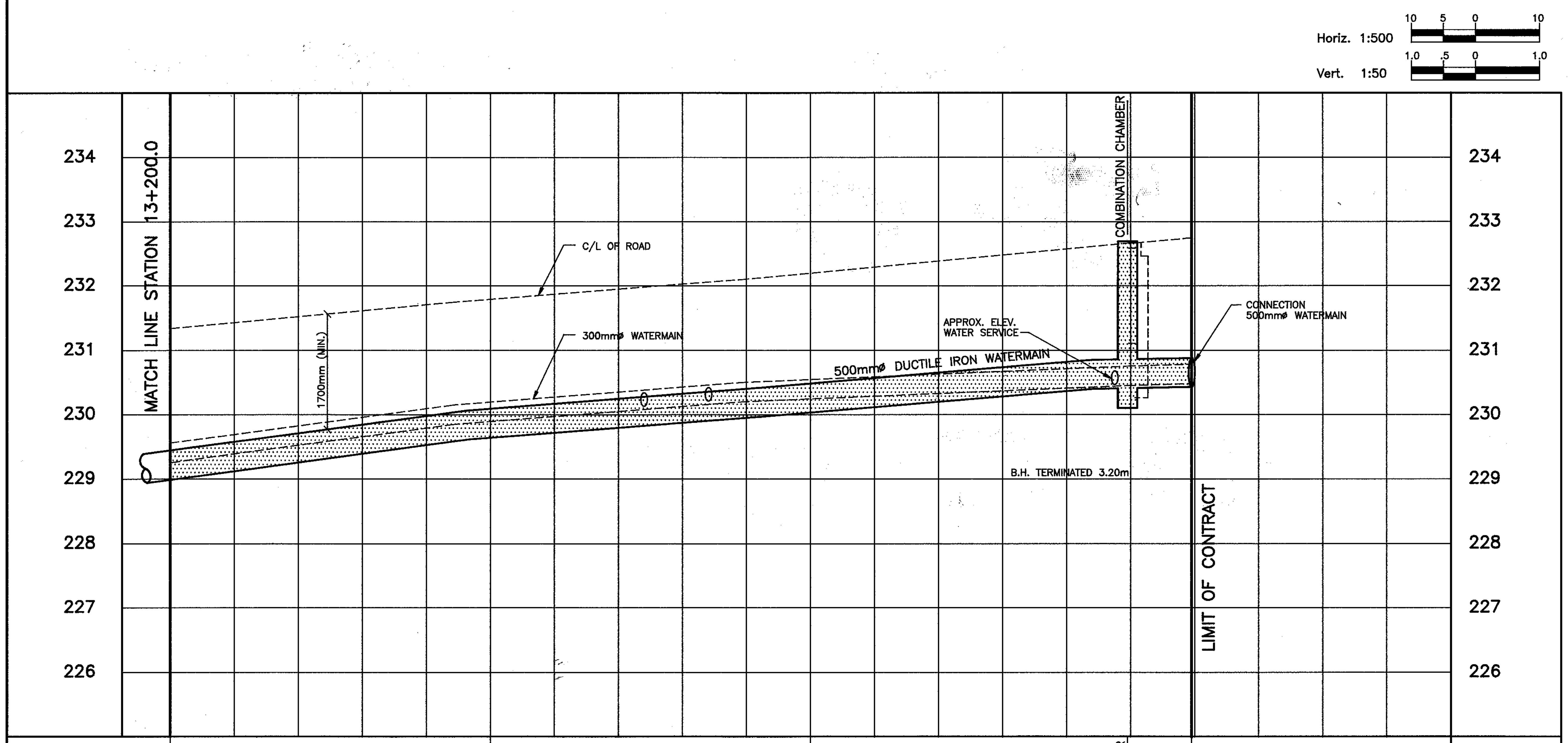
95-W-66



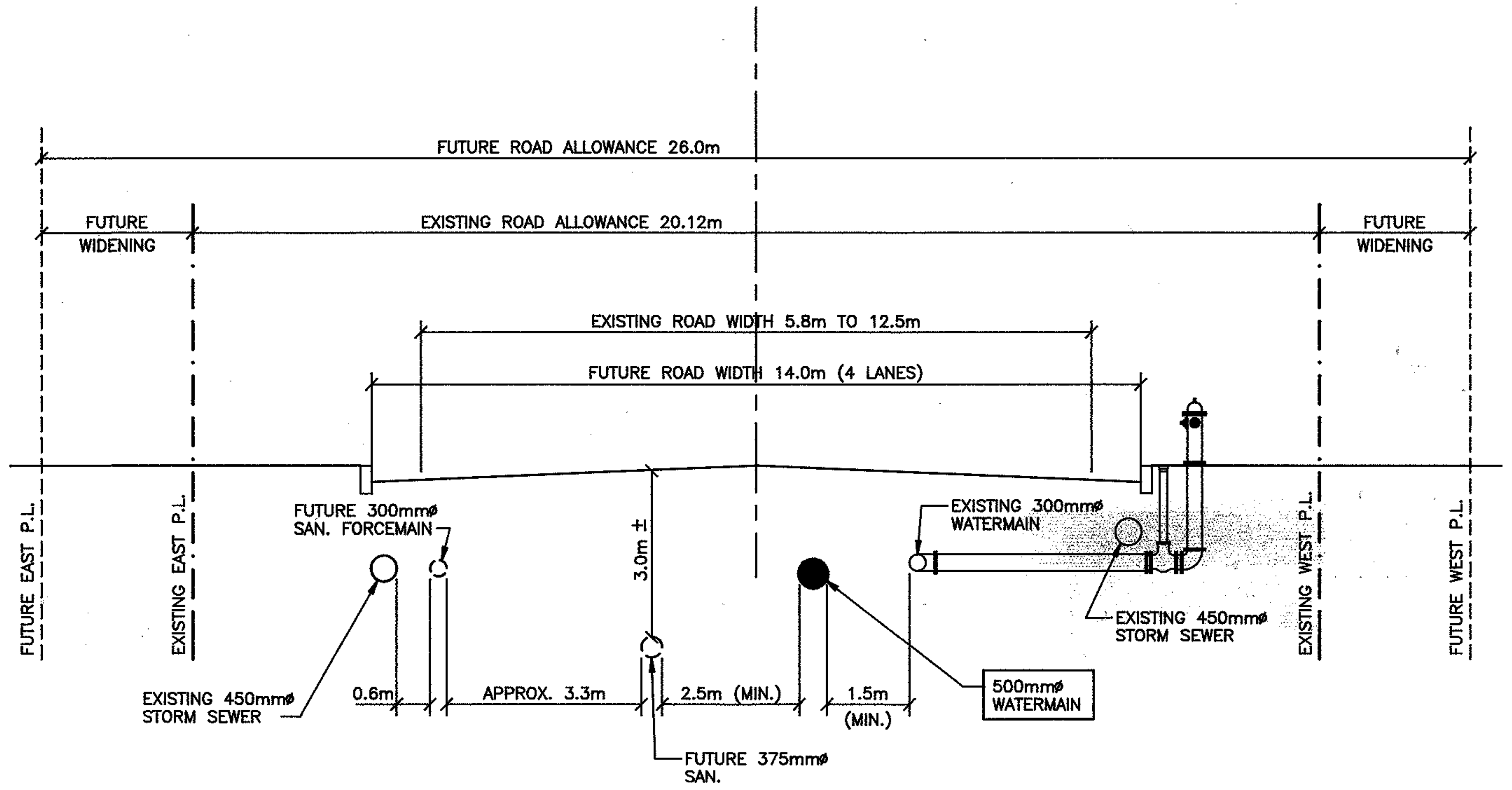


CONNECTION DETAIL

NTS



GROUND ELEVATION	231.34	231.79	232.20	CHAMBER 232.68	232.75 500x500 TEE
TOP OF WATERMAIN	229.44	230.09	230.47	230.85	
CHAINAGE	13+200.0	13+250.0	13+300.0	13+349.5	13+359.5



ROADWAY SECTION

SCALE 1:100

NOTE:

ROAD RESTORATION (FULL LANE WIDTH)
40mm HM3 ASPHALT
75mm HL8 ASPHALT
450mm GRANULAR 'A'

NOTES:

No.	DATE	REVISION	BY
4	SEPT/95	RECORD DRAWING	
3	JUNE/94	REVISED AS PER RMHW COMMENTS	
2	MAY/94	ISSUED FOR TENDER	
1	APR./94	ISSUED FOR REVIEW	

THORBURN PENNY
Consulting Engineers
Milton, Ontario

R.L. SMITH

D.C. PAYNTER

REGIONAL MUNICIPALITY OF
HALDIMAND–NORFOLK
ENGINEERING DEPARTMENT

TITLE:
CAYUGA WATER SYSTEM
TRUNK WATERMAIN
(MOUNT HOPE TO CALEDONIA)
STATION 13+200.0 – 13+359.5

DRAWN BY: A.F./J.C.	SCALE: AS NOTED	DATE: FEBRUARY 1994	REV:
C'KD BY: D.C./D.P.	DRAWING No. G36		CONTRACT 3

130.17D03442 09/20/95

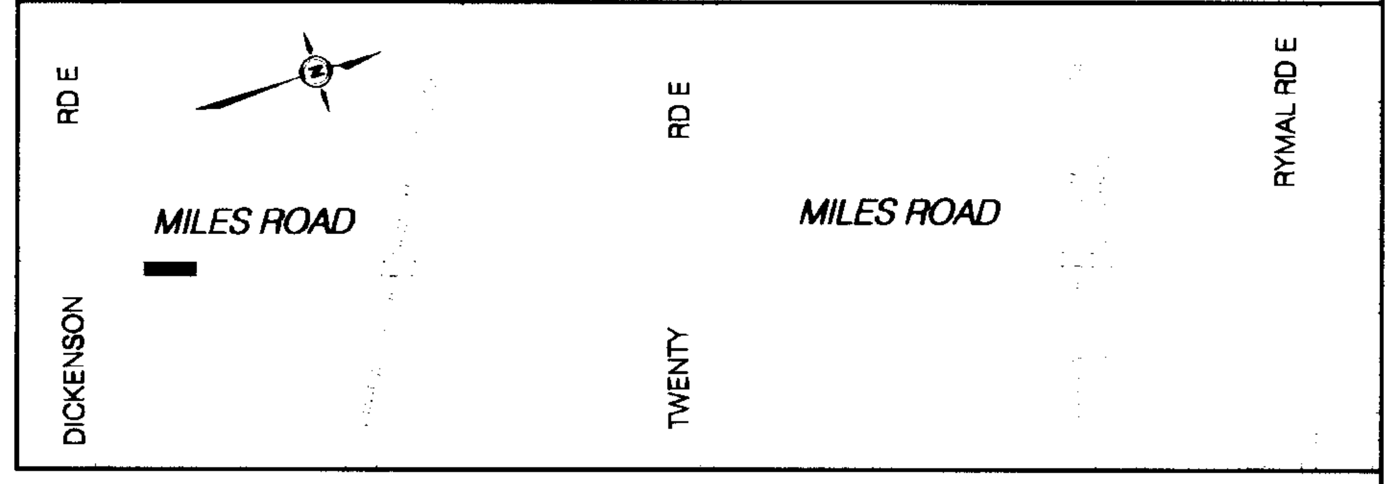
MILES ROAD

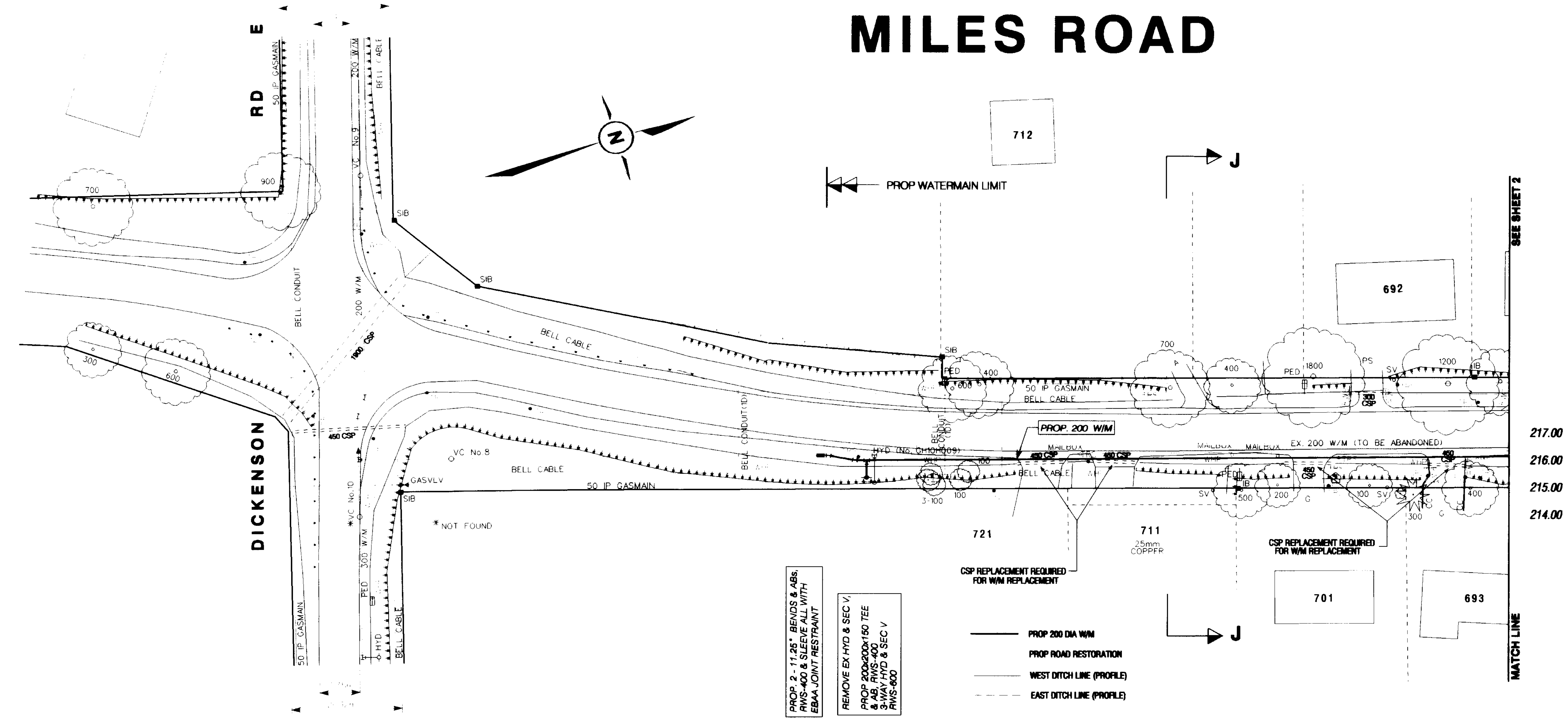
02-W-43 (1)

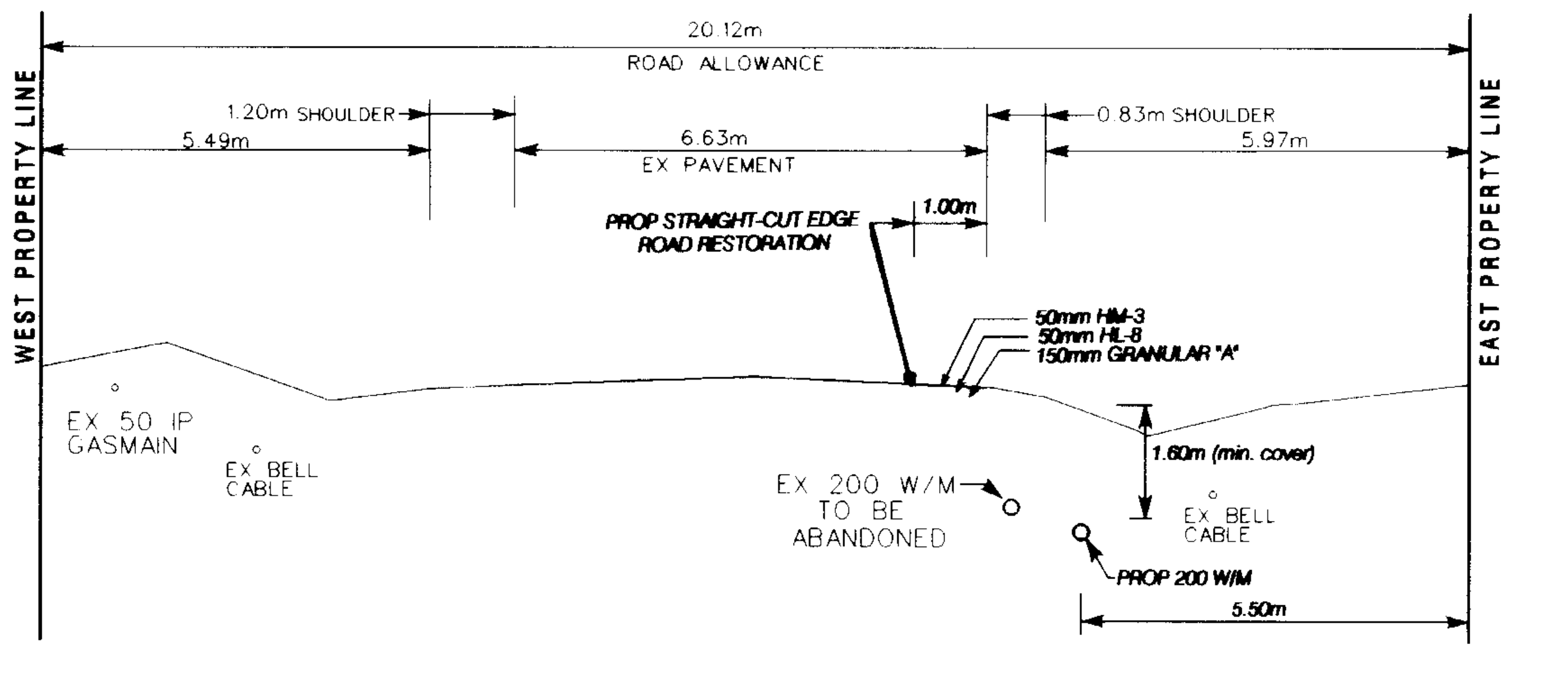
MILES ROAD

FILE No.	CONTRACT No. TOE 03 - 02(W) DRAWING No. 02-W-43	SHEET No. 1 OF 15

DIMENSIONS SHOWN ON THIS PLAN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED

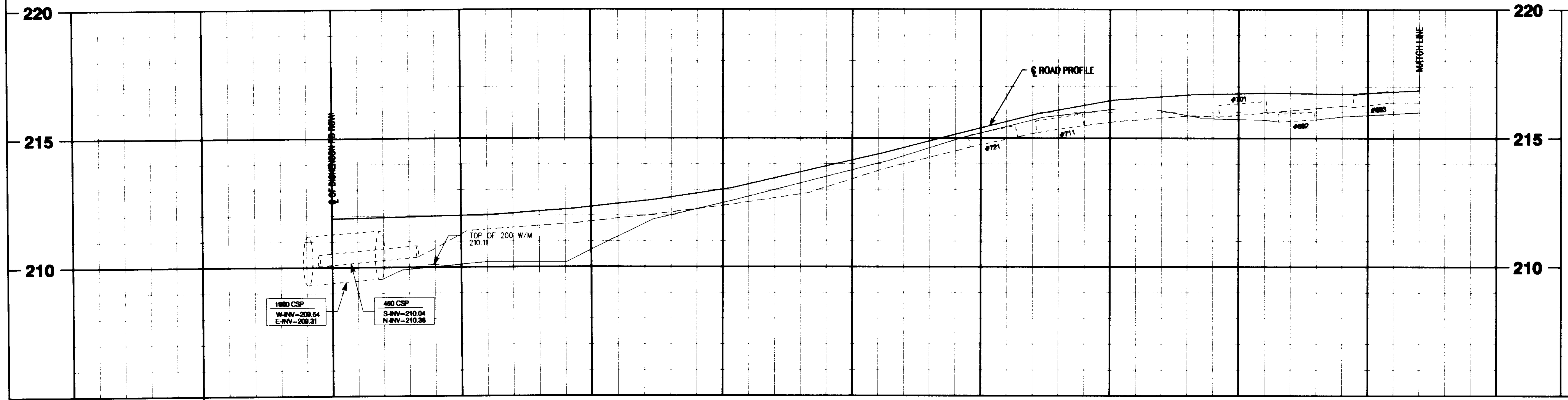






ROADWAY CROSS-SECTION

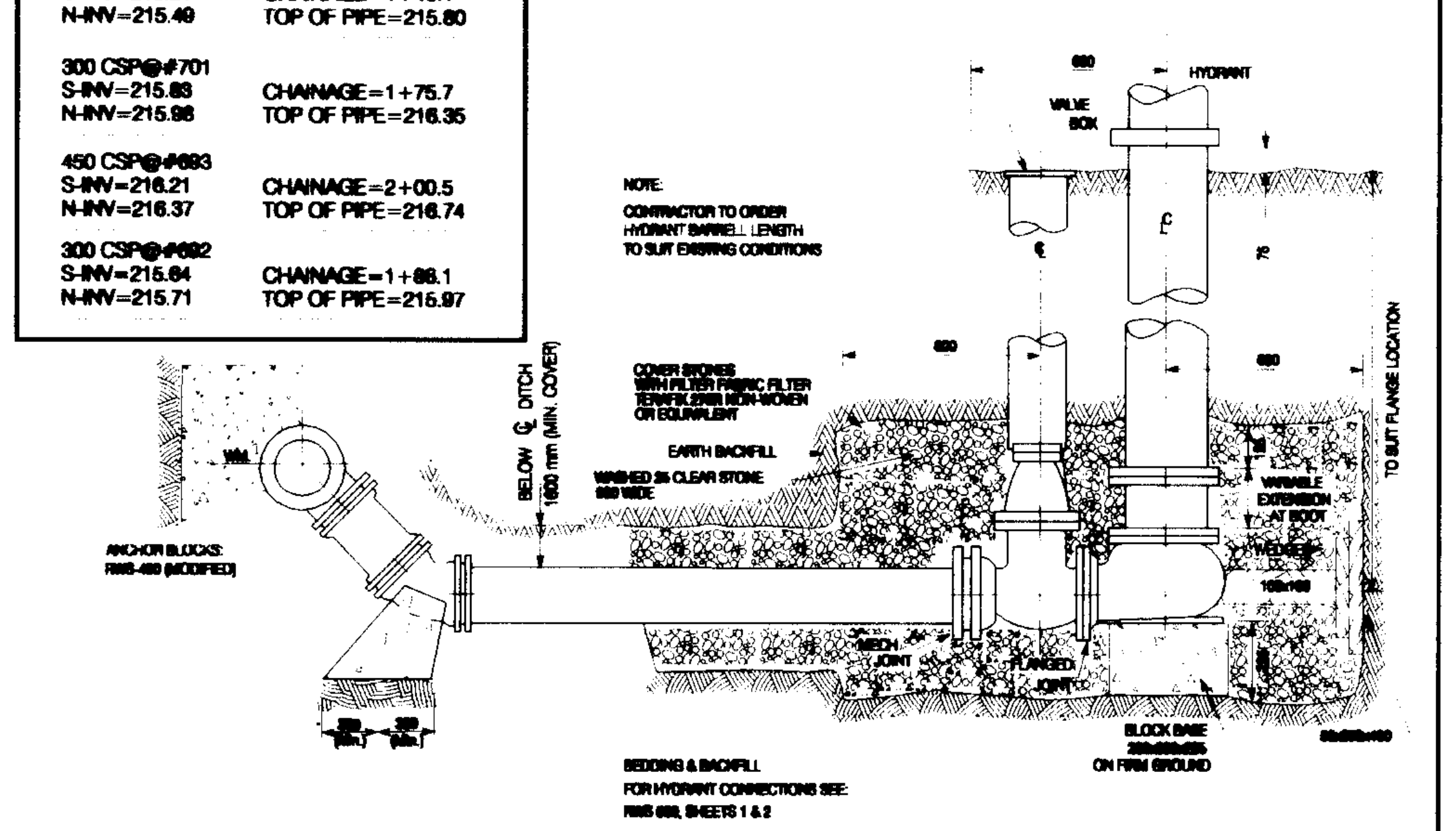
ORIGINAL ℄ EL =216.46
STA =1+50
SECTION 'J-J'
SCALE 1:100



EXISTING CULVERTS

450 CSP@#721 S-INV=214.65 N-INV=215.04	CHAINAGE=1+27.1 TOP OF PIPE=215.28
450 CSP@#711 S-INV=215.21 N-INV=215.49	CHAINAGE=1+40.1 TOP OF PIPE=215.80
300 CSP@#701 S-INV=215.83 N-INV=215.98	CHAINAGE=1+75.7 TOP OF PIPE=216.35
450 CSP@#693 S-INV=216.21 N-INV=216.37	CHAINAGE=2+00.5 TOP OF PIPE=216.74
300 CSP@#692 S-INV=215.64 N-INV=215.71	CHAINAGE=1+86.1 TOP OF PIPE=215.97

"TYPICAL" INSTALLATION FOR HYDRANTS AT DITCH (N.T.S.)



PROPOSED WATERMAIN INVERTS																PROPOSED WATERMAIN INVERTS
PROPOSED WATERMAIN CHAINAGE																PROPOSED WATERMAIN CHAINAGE
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	211.89	211.96	212.03	212.23	212.56	213.01	213.68	214.37	215.15	215.89	216.46	216.67	216.76	216.71	216.85	EXISTING ℄ OF ROAD PROFILE ELEVATIONS
EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE	0+00	0+15	0+30	0+45	0+60	0+75	0+90	1+05	1+20	1+35	1+50	1+65	1+80	1+95	2+10	EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE

No.	REVISIONS	INITIAL	DATE

DRAWN BY: RCP/EM
DATE: JANUARY 30, 2008

REFERENCE MATERIAL:
Regional Surveyor : E. Bettencourt
Sewer Plans :
Water Sheets : GLAN H-9, GLAN H-10, D-34
Water Plans : 76-W-620, 80-W-28, 81-W-23, 82-W-18
Road Plans:

Geodetic Bench Mark Index No. 25-04
Elevation= 221.081m

SCALES
0 5m 10m 20m
HORIZONTAL 1:500
0 1m 2m 4m
VERTICAL 1:100

Director, Design and Construction
Doug Oniehi, P. Eng.

Manager of Design
Gary Moore, P. Eng.

CITY OF
HAMILTON
Transportation, Operations and
Environment Department

MILES ROAD
Proposed 200 Replacement Watermain
From : Approx. 87m North of Dickenson Road
To : Trans Canada Pipeline Easement

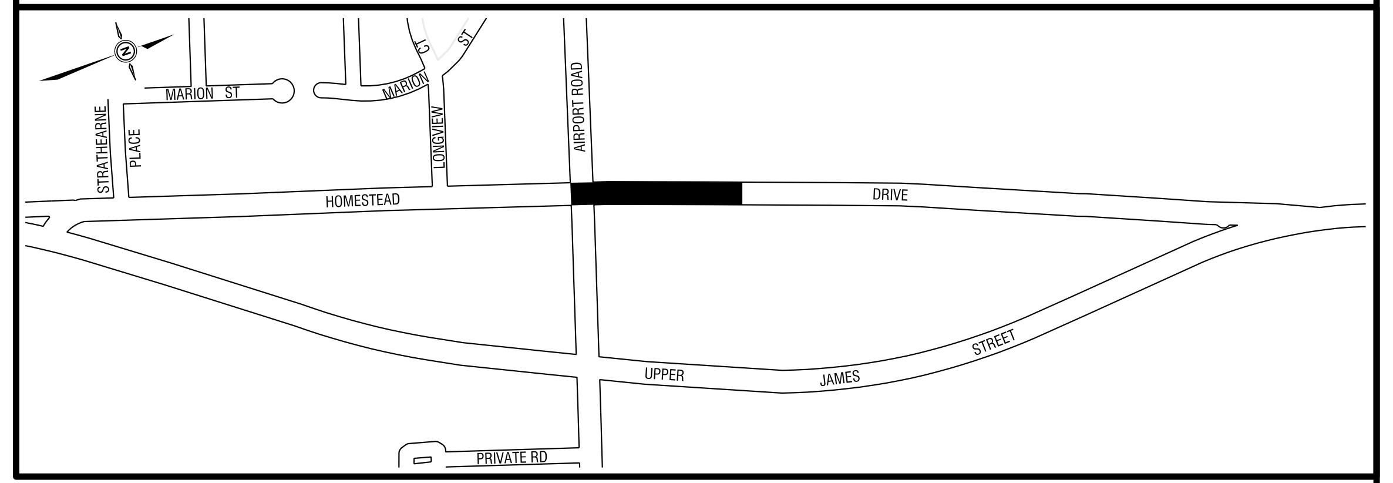
HOMESTEAD DRIVE

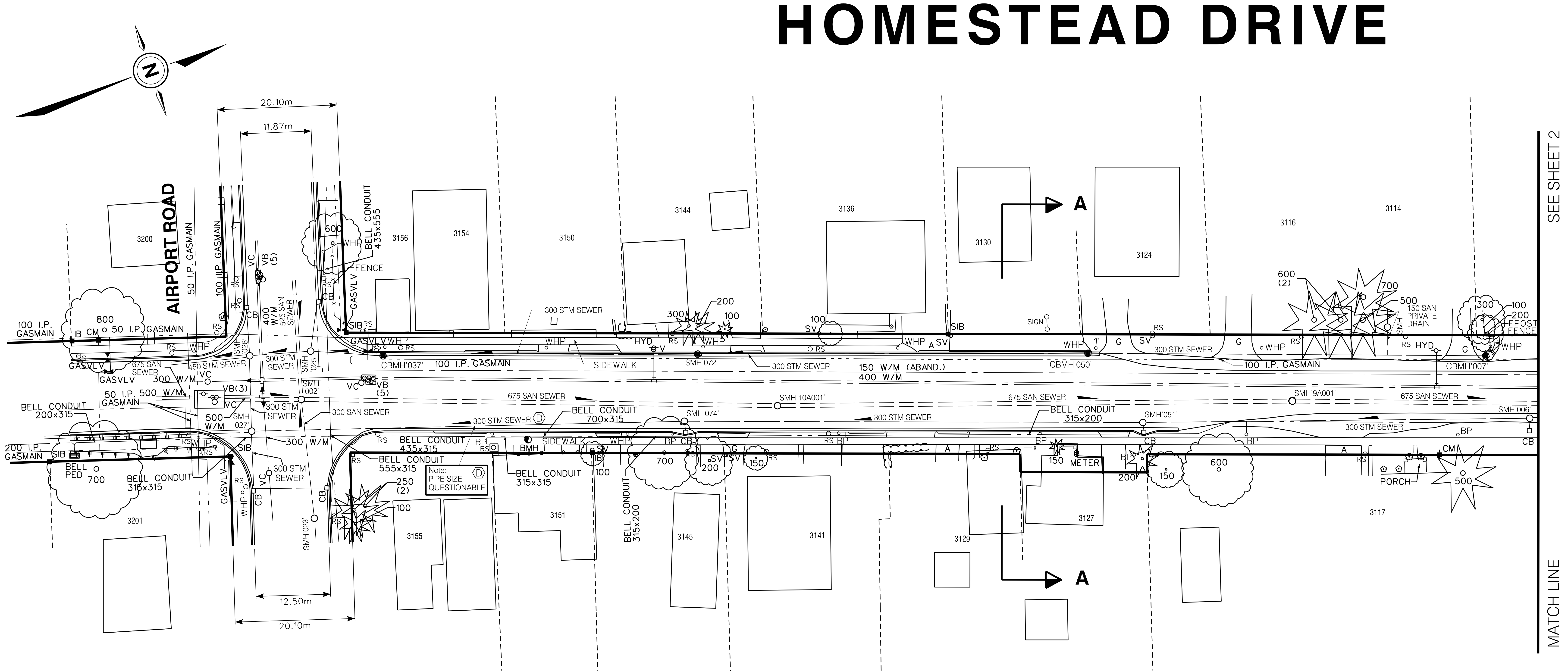
12-W-04 (1)

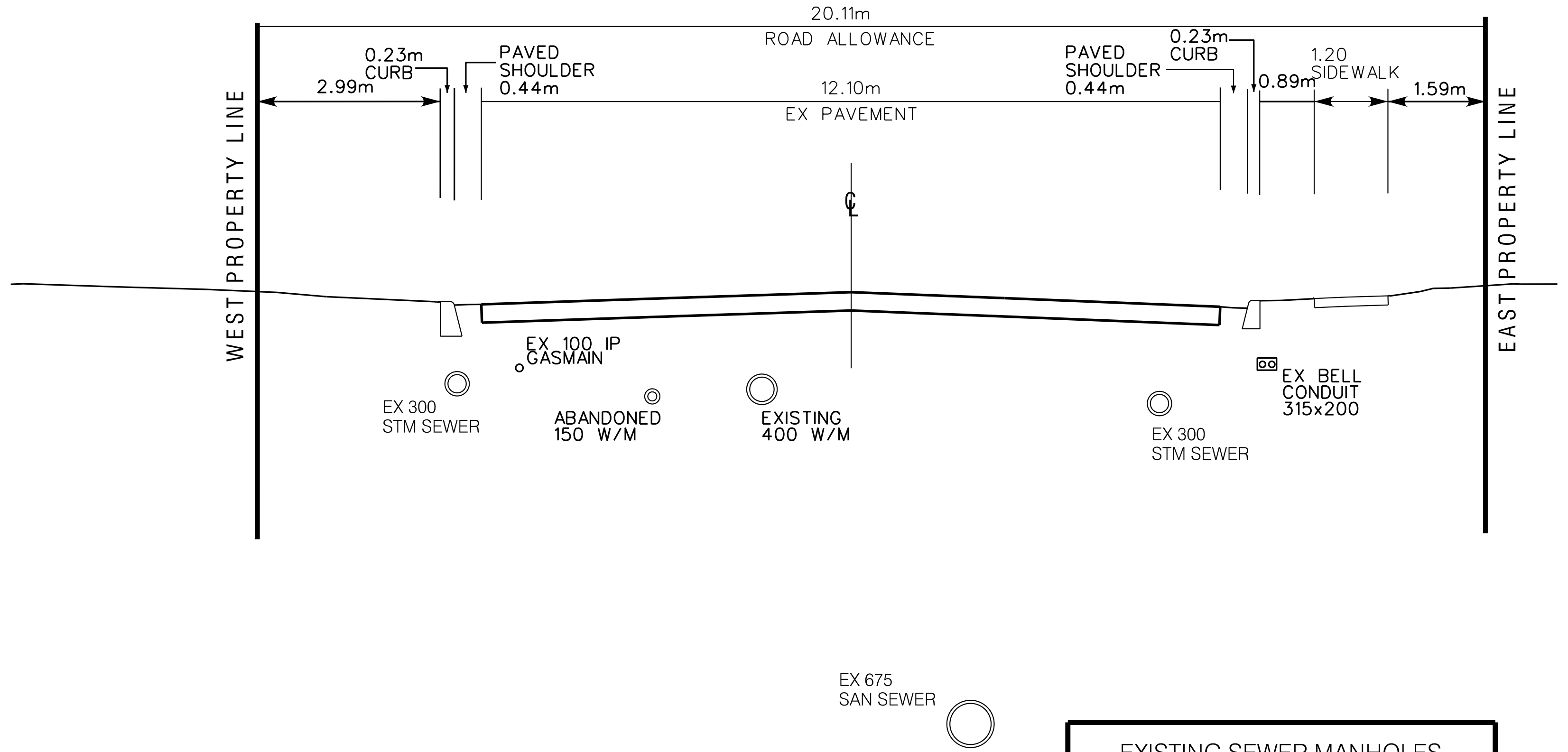
HOMESTEAD DRIVE

FILE No.	CONTRACT No. PW-08-00 (HSW) DRAWING No. 12-W-04 (1)	SHEET No. 1 OF 4

DIMENSIONS SHOWN ON THIS PLAN ARE IN MILLIMETRES UNLESS OTHERWISE NOTED

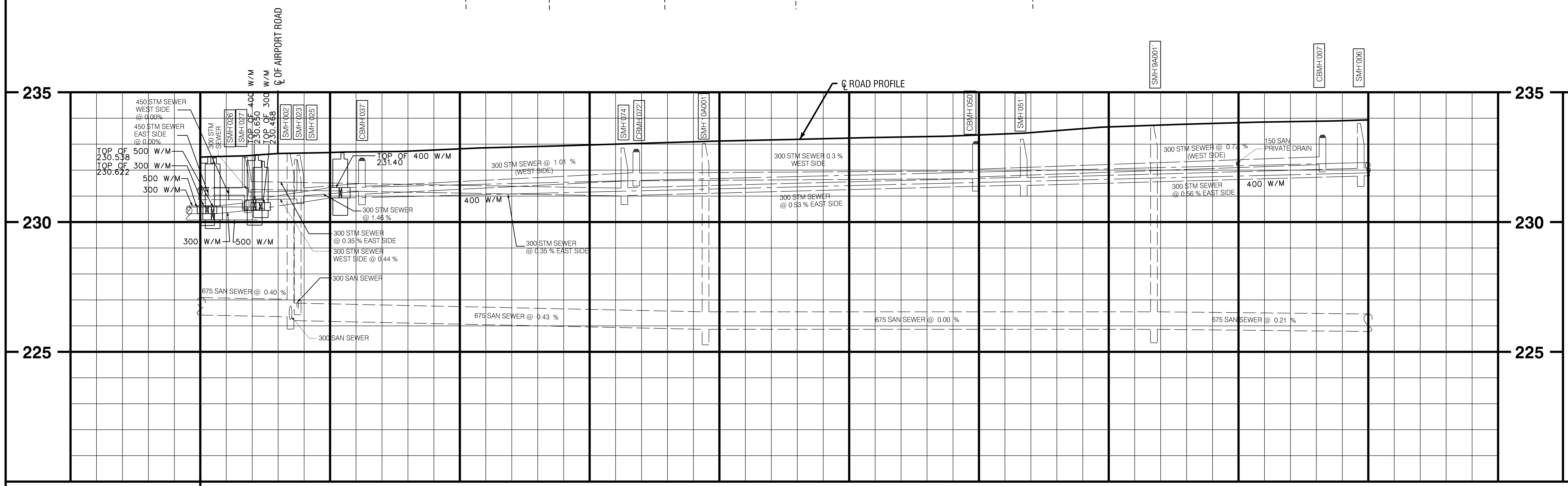






ROADWAY CROSS-SECTION

SECTION 'A-A'
SCALE 1:100



SEWER REPAIRS and OVERFLOWS

C.B. REMOVALS/REPLACEMENTS

EXISTING SEWER MANHOLES	
SMH'026' N-INV=230.853 S-INV=230.862 W-INV=230.953 E-INV=230.987	GD10B026 CHAINAGE=-0+06.265 TOP OF GRATE=232.496
SMH'027' W-INV=231.003 E-INV=231.036 N-INV=231.258 S-INV=231.036	GD10B027 CHAINAGE=-0+05.866 TOP OF GRATE=232.498
SMH'002' S-INV=226.350 N-INV=226.203 E-INV=226.578 W-INV=226.357	GD10A002 CHAINAGE=0+02.380 TOP OF GRATE=232.629
SMH'023' W-INV=226.634	GD10A023 CHAINAGE=0+03.761 TOP OF GRATE=232.401
SMH'025' S-INV=230.893 N-INV=230.016 W-INV=230.982	GD10B025 CHAINAGE=0+04.267 TOP OF GRATE=232.574
CBMH'037' N-INV=231.077 S-INV=231.176 W-INV=231.737	GD10B037 CHAINAGE=0+16.152 TOP OF GRATE=232.468
SMH'074' N-INV=231.022 S-INV=231.006 E-INV=231.579	GD10B074 CHAINAGE=0+66.703 TOP OF GRATE=232.854
SMH'072' N-INV=231.588 S-INV=231.598	GD10B072 CHAINAGE=0+68.999 TOP OF GRATE=232.806
SMH'10A001' N-INV=225.867 S-INV=225.867	GD10A001 CHAINAGE=0+82.330 TOP OF GRATE=233.037
CBMH'050' N-INV=231.814 S-INV=231.845 W-INV=231.787	GD10B050 CHAINAGE=1+34.423 TOP OF GRATE=233.104
SMH'051' N-INV=231.409 S-INV=231.423 E-INV=231.791	GD10B051 CHAINAGE=1+43.630 TOP OF GRATE=233.191
SMH'9A001' N-INV=225.867 S-INV=225.867	GD09A001 CHAINAGE=1+68.716 TOP OF GRATE=233.708
CBMH'007' N-INV=232.221 S-INV=232.211	GD09B007 CHAINAGE=2+01.196 TOP OF GRATE=233.351
SMH'006' N-INV=231.780 S-INV=231.767 E-INV=232.039	GD09B006 CHAINAGE=2+08.548 TOP OF GRATE=233.800

PROPOSED SANITARY SEWER																		*PROPOSED SANITARY SEWER*
PROPOSED STORM SEWER																		*PROPOSED STORM SEWER*
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	232.50	232.64	232.70	232.78	232.89	232.97	233.06	233.14	233.21	233.27	233.36	233.52	233.70	233.80	233.87	233.93		EXISTING ℄ OF ROAD PROFILE ELEVATIONS
EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE	-0+15	0+00	0+15	0+30	0+45	0+60	0+75	0+90	1+05	1+20	1+35	1+50	1+65	1+80	1+95	2+10		EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE

No.	REVISIONS	INITIAL	DATE

DRAWN BY:LC
DATE: Tuesday March 13, 2012

REFERENCE MATERIAL:
Surveyed By : E. Bettencourt
Sewer Plans : 03-H-39,88-S-16_7,88-S-16_8AB,88-S-16_9AB, 88-S-16_10AB,91-S-29,95-S-42_7,
Water Plans : 82-W-13_11AB, 84-W-12_AB, 90-W-16_1AB,95-W-66_G36,
Inspector's Report : IR06851

Geodetic Bench Mark Index No. 75U160 Elevation=233.040m
Borehole Report -

SCALES
0 5m 10m 20m
HORIZONTAL 1:500
0 1m 2m 4m
VERTICAL 1:100

Project Manager (Design)
NAME
Manager of Design
Susan Jacob, P. Eng.

CITY OF HAMILTON
Public Works Department

HOMESTEAD DRIVE

Existing Conditions

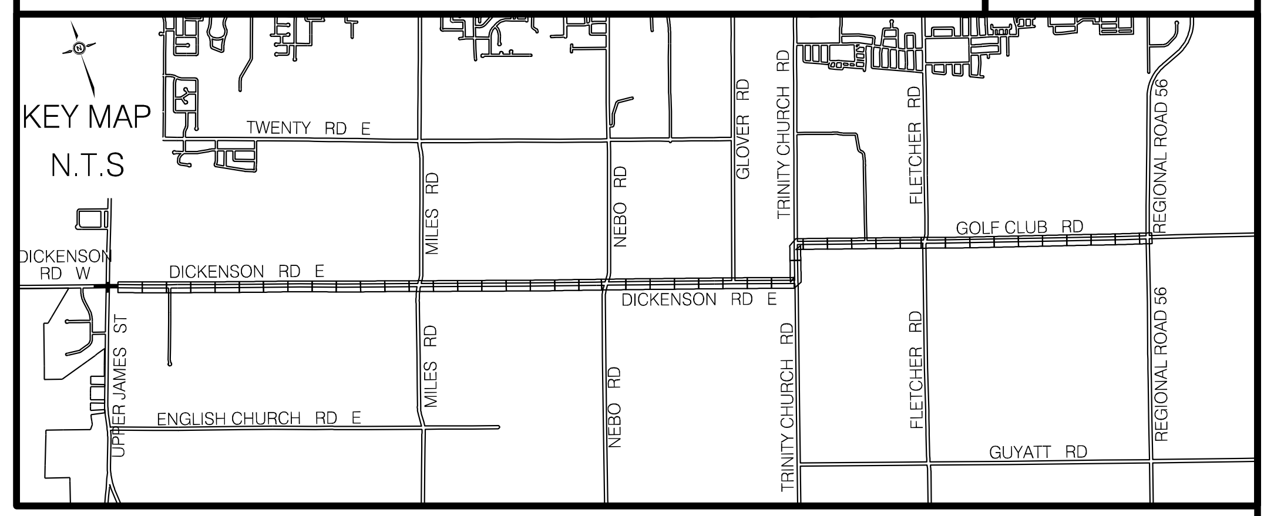
From : Airport Road
To : Upper James Street

DICKENSON ROAD EAST

18-H-01

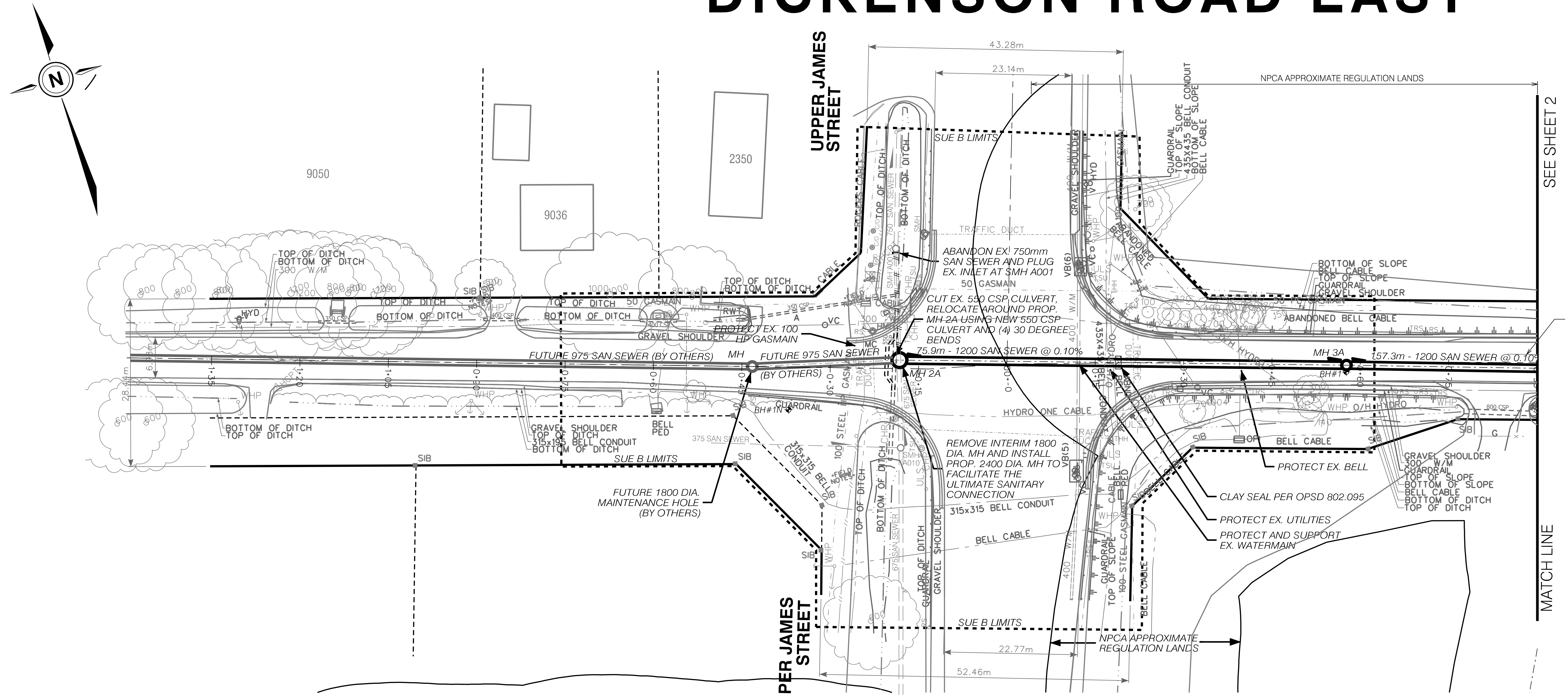
DICKENSON ROAD EAST

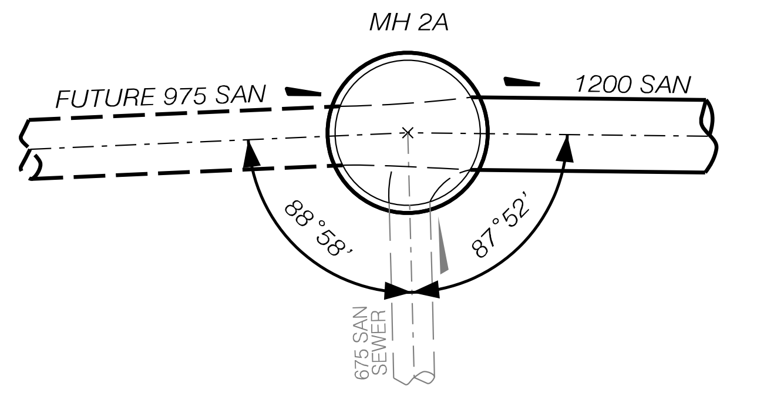
CONTRACT No. C15-11-22 (HSW) DRAWING No. 18-H-01	SHEET No. 1 OF 108



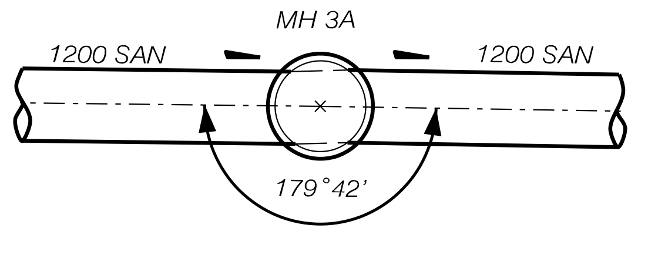
LEGEND

▭ SUE B LIMITS

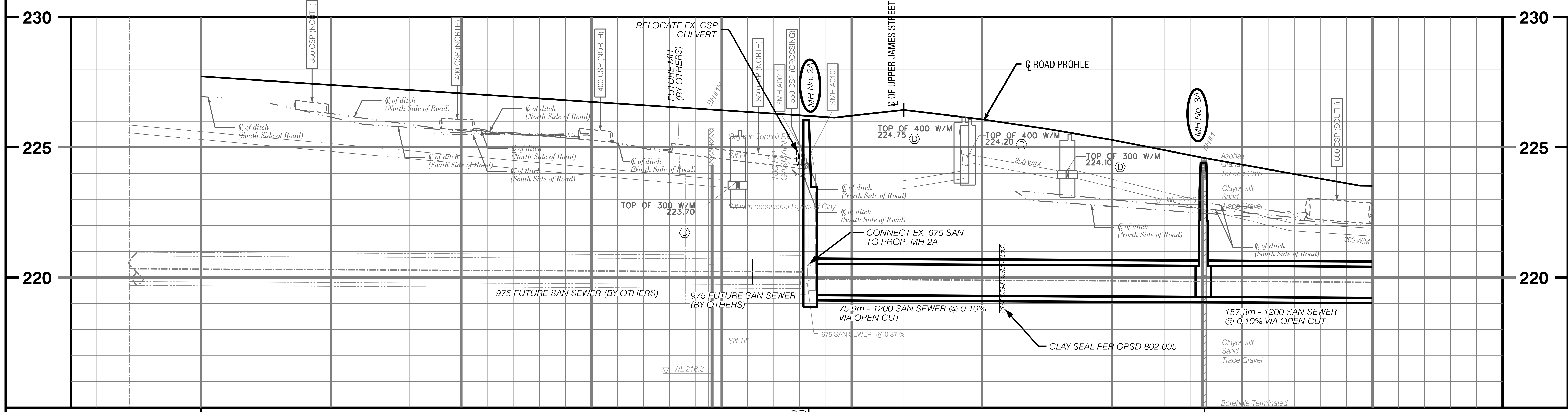




MH2A SCHEMATIC



MH3A SCHEMATIC



C.B. REMOVALS/REPLACEMENTS

EXISTING SEWER MANHOLES	
Ⓐ SMH'A001' S-INV=219.72 N-INV=219.62 SW-INV=223.63	GD04A001 CHAINAGE=-0+19.450 TOP OF GRATE=225.084
Ⓐ SMH'A010' S-INV=219.80 N-INV=219.84 SW-INV=220.26	GD04A010 CHAINAGE=-0+17.562 TOP OF GRATE=224.740

PROPOSED SANITARY SEWER									2400mm DIA. MH FUT. W 219.724 (CALCULATED) E 219.325 EX. S 219.79 (CALCULATED)					TEE MH 1500 DIA. W 219.249 E 219.249			PROPOSED SANITARY SEWER
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	227.72	227.52	227.33	227.14	226.94	226.75	226.55	226.36	226.16	226.43	226.07	225.62	225.09	224.51	223.97	223.52	EXISTING ℄ OF ROAD PROFILE ELEVATIONS
EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE	-1+35	-1+20	-1+05	-0+90	-0+75	-0+60	-0+45	-0+30	-0+15	00+-0	0+15	0+30	0+45	0+60	0+75	0+90	EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE

No.	REVISIONS	INITIAL	DATE
	Issued for Tender	F.S.	03/02/22

REFERENCE MATERIAL

Road Plan : 99-H-39, 00-H-40
Sewer Plans : 07-S-41, 14-S-11
Water Plans : 80-W-28, 80-W-38, 82-W-5, 82-W-13, 82-W-18, 83-W-19, 88-W-3, 89-W-17

Geodetic Bench Mark Index No. 65U161 Elevation=222.640m
Borehole Report - GTR_1932

ACTIVITIES	
Surveyed By:	J.P./D.O.
Survey Date:	13-03-18
Drawn By:	O.S.
Drawn Date:	09-04-18
Design By:	F.S.
Design Date:	22-07-19

Q/C IN ACCORDANCE WITH ASCE STANDARD 38-02
All Utilities depicted are at Ⓒ unless otherwise noted.
Ⓓ information derived from existing records
Ⓒ information obtained from field survey combined with Ⓓ information
Ⓑ information obtained in field and indicates horizontal position of subsurface utility
Ⓐ precise horizontal and vertical location of utility obtained by exposure and measurement

SCALES
0 5m 10m 20m
HORIZONTAL 1:500
0 1m 2m 4m
VERTICAL 1:100
Dimensions shown on this plan are in millimetres unless otherwise noted

IBI

LICENSED PROFESSIONAL ENGINEER
F. SHWEIHAT
100073055
Feb. 03, 2022
PROVINCE OF ONTARIO

Project Manager (Design)
Feb 9, 2022
Taufeek Ameer, P. Eng.

Manager of Design
Susan Korah
Susan Jacob, P. Eng.

Hamilton
Public Works Department

DICKENSON ROAD EAST

Sanitary Sewer Installation
From STA. -0+20 to STA. 0+90
From : Upper James Street
To : Trinity Church Road

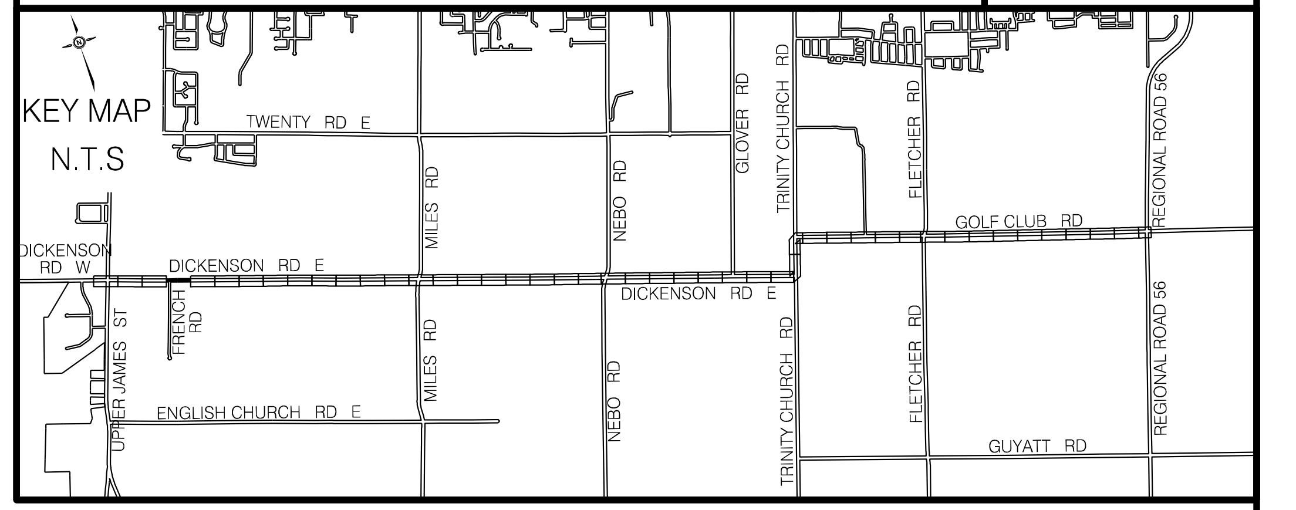
DICKENSON ROAD EAST

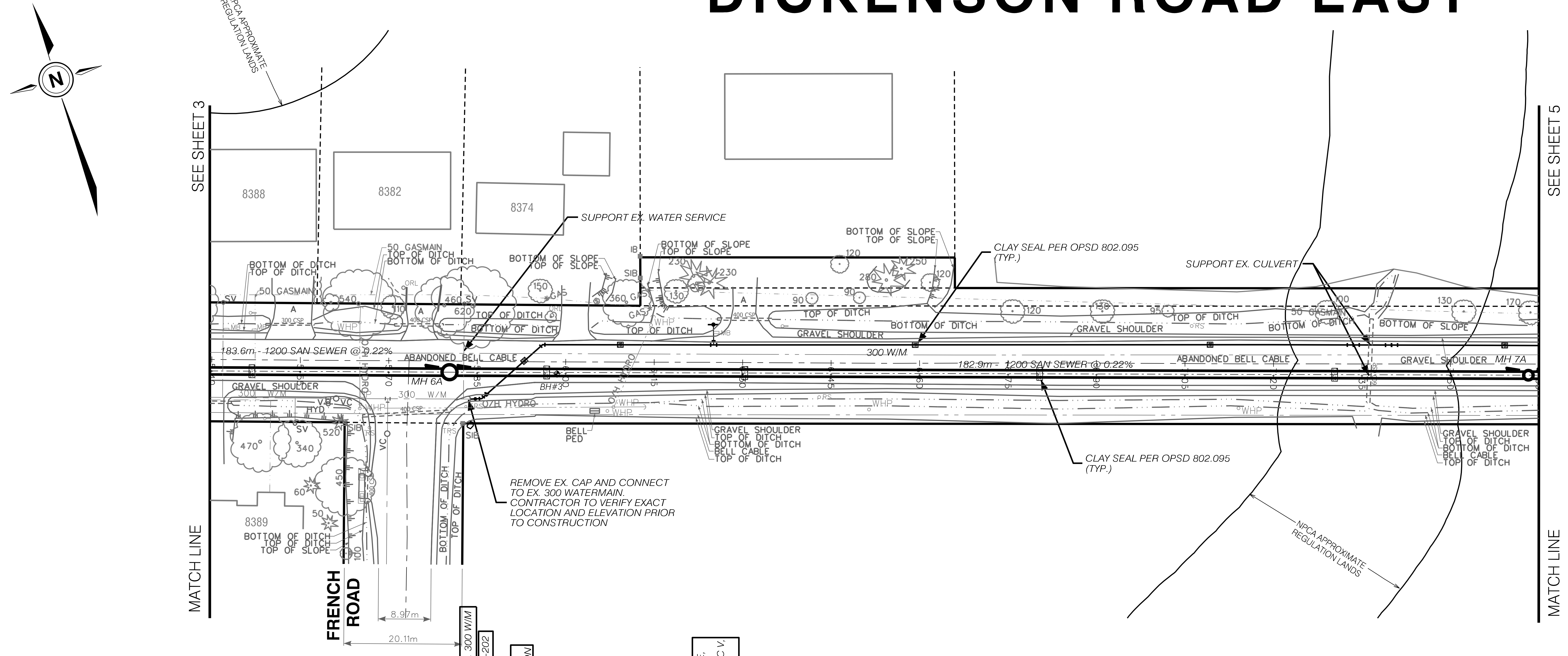
18-H-01

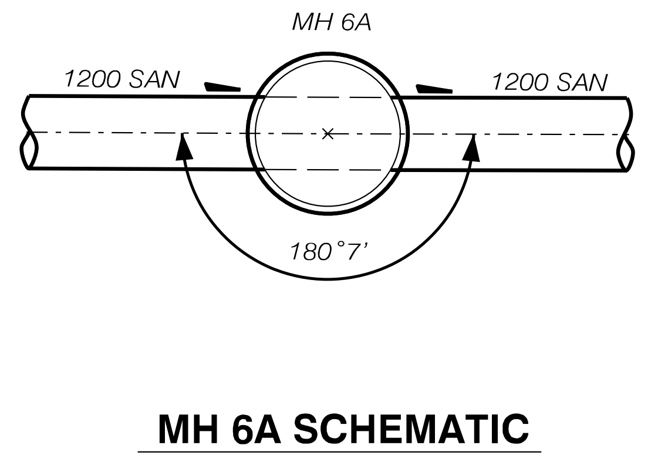
DICKENSON ROAD EAST

CONTRACT No. C15-11-22 (HSW)
DRAWING No. 18-H-01

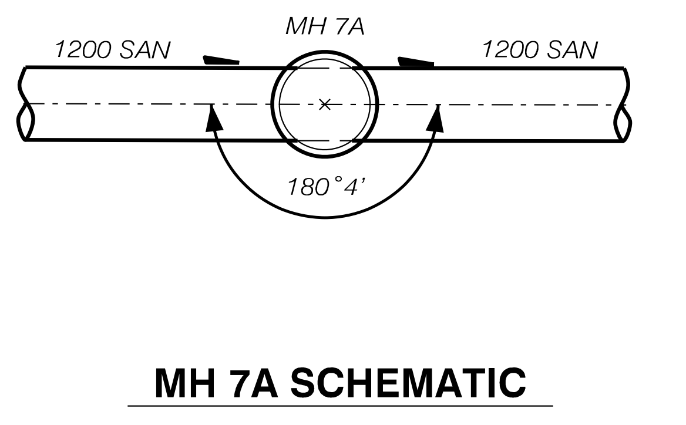
SHEET No.
4 OF 108



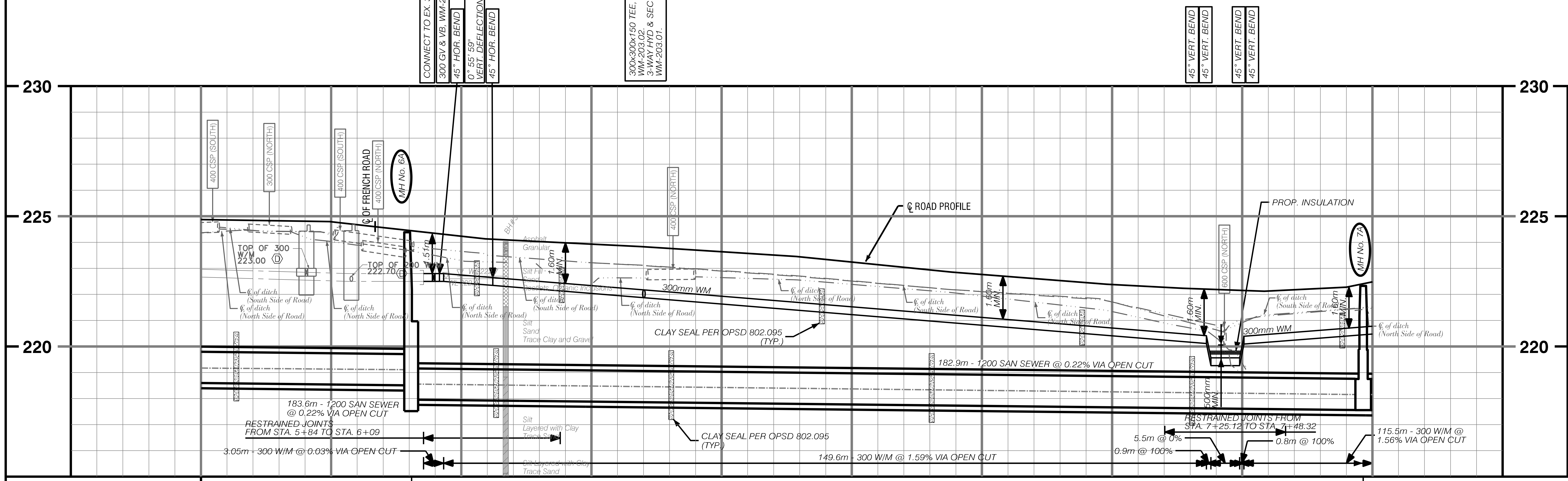




MH 6A SCHEMATIC



MH 7A SCHEMATIC



C.B. REMOVALS/REPLACEMENTS

EXISTING SEWER MANHOLES

PROPOSED SANITARY SEWER
2400mm DIA. MH W 218.506 E 217.958
5+84.70 222.499
TEE MH 1500 DIA. W 217.556 E 217.556

PROPOSED 300mm WATERMAIN INVERTS
5+83.84 222.499
5+86.61 222.499
6+25.10 221.872
7+33.12 220.113
7+33.97 219.265
7+39.49 219.265
7+40.32 220.094

EXISTING ℄ OF ROAD PROFILE ELEVATIONS	224.87	224.83	224.68	224.34	224.08	223.93	223.77	223.58	223.34	223.04	222.77	222.53	222.40	222.43	222.45	222.48
EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE	5+40	5+55	5+70	5+85	6+00	6+15	6+30	6+45	6+60	6+75	6+90	7+05	7+20	7+35	7+50	7+65

PROPOSED SANITARY SEWER
PROPOSED 300mm WATERMAIN INVERTS
EXISTING ℄ OF ROAD PROFILE ELEVATIONS
EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE

No.	REVISIONS	INITIAL	DATE
	Issued for Tender	F.S.	03/02/22

REFERENCE MATERIAL
Road Plan : 99-H-39, 00-H-40
Sewer Plans : 07-S-41, 14-S-11
Water Plans : 80-W-28, 80-W-38, 82-W-5, 82-W-13, 82-W-18, 83-W-19, 88-W-3, 89-W-17
Geodetic Bench Mark Index No. 65U161 Elevation=222.640m
Borehole Report - GTR_1932

ACTIVITIES	
Surveyed By:	J.P./D.O.
Survey Date:	13-03-18
Drawn By:	O.S.
Drawn Date:	09-04-18
Design By:	F.S.
Design Date:	22-07-19

Q/C IN ACCORDANCE WITH ASCE STANDARD 38-02
All Utilities depicted are at Ⓒ unless otherwise noted.
Ⓓ information derived from existing records
Ⓒ information obtained from field survey combined with Ⓓ information
Ⓑ information obtained in field and indicates horizontal position of subsurface utility
Ⓐ precise horizontal and vertical location of utility obtained by exposure and measurement

SCALES
0 5m 10m 20m
HORIZONTAL 1:500
0 1m 2m 4m
VERTICAL 1:100
Dimensions shown on this plan are in millimetres unless otherwise noted

IBI

LICENSED PROFESSIONAL ENGINEER
F. SHWEIHAT
100073055
Feb. 03, 2022
PROVINCE OF ONTARIO

Project Manager (Design)
Feb 9, 2022
Taufeek Ameer, P. Eng.
Manager of Design
Susan Jacob
Susan Jacob, P. Eng.

Hamilton
Public Works Department

DICKENSON ROAD EAST

Sanitary Sewer Installation
From STA. 5+40 to STA. 7+65
From : Upper James Street
To : Trinity Church Road

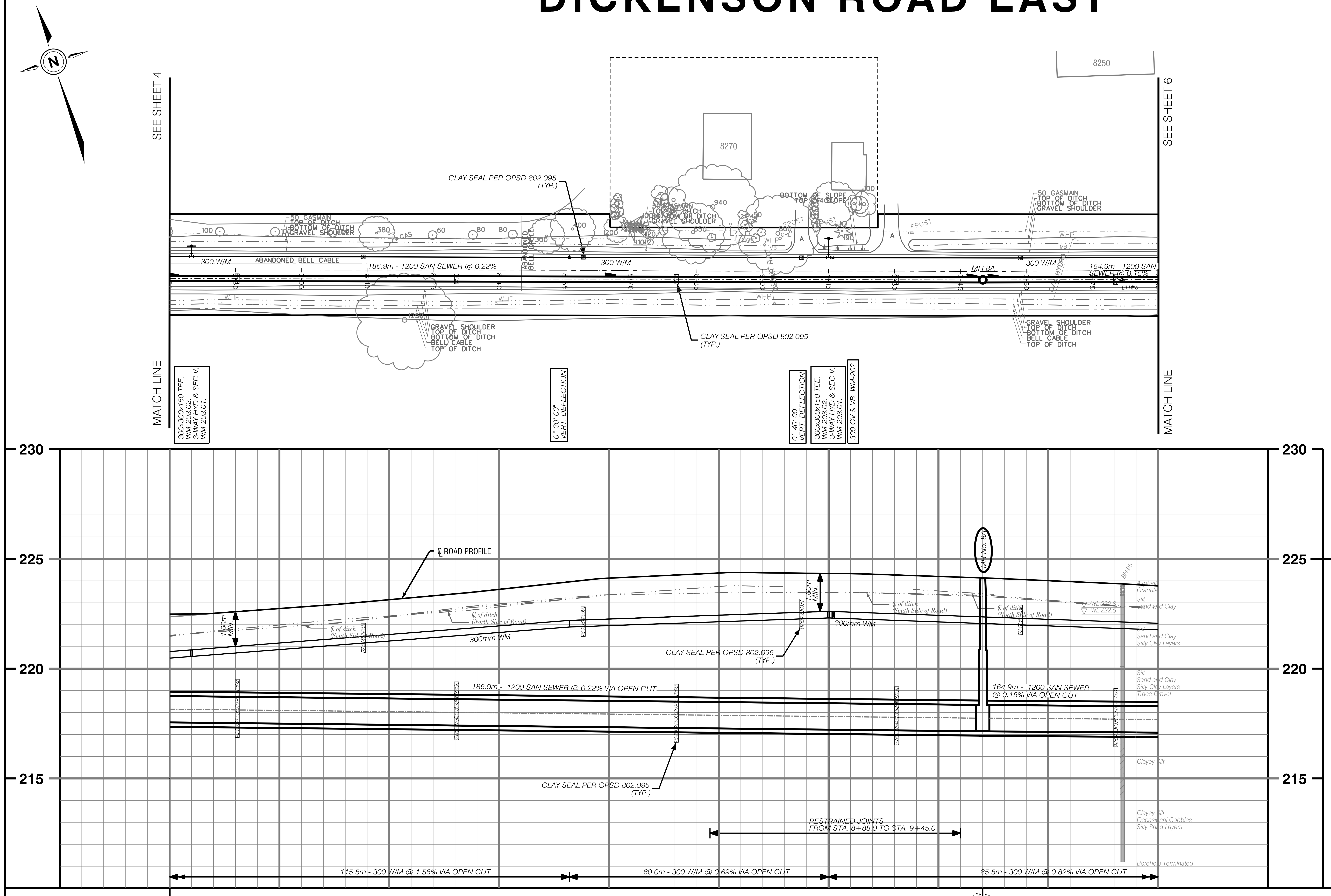
DICKENSON ROAD EAST

18-H-01

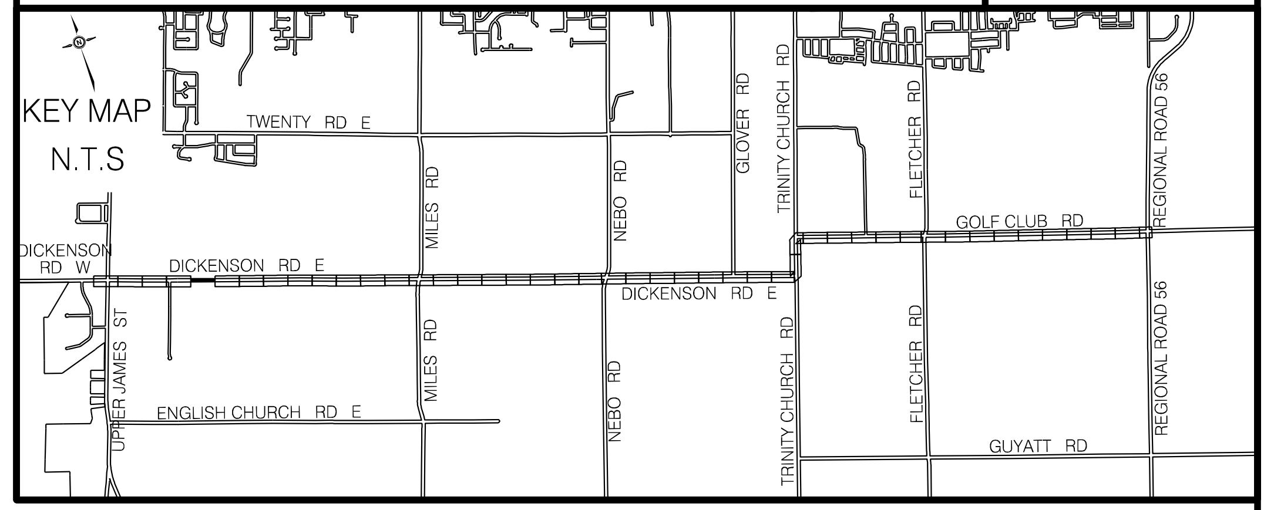
DICKENSON ROAD EAST

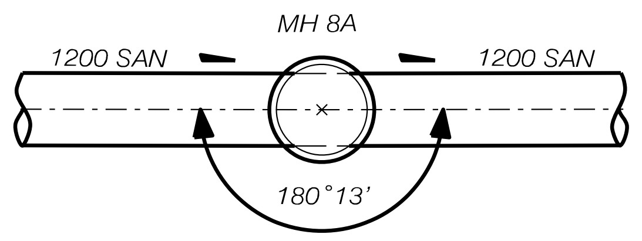
CONTRACT No. C15-11-22 (HSW)
DRAWING No. 18-H-01

SHEET No.
5 OF 108



KEY MAP
N.T.S





MH 8A SCHEMATIC

C.B. REMOVALS/REPLACEMENTS

EXISTING SEWER MANHOLES

PROPOSED SANITARY SEWER																	PROPOSED SANITARY SEWER
												TEE MH 1500 DIA. W 217.144 E 217.144					
PROPOSED 300mm WATERMAIN INVERTS	7+70.00 220.556						8+56.00 221.895			9+16.00 222.308 9+17.06 222.300							PROPOSED 300mm WATERMAIN INVERTS
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	222.48	222.59	222.81	223.05	223.32	223.61	223.93	224.17	224.31	224.36	224.33	224.27	224.16	224.05	223.92	223.77	EXISTING ℄ OF ROAD PROFILE ELEVATIONS
EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE	7+65	7+80	7+95	8+10	8+25	8+40	8+55	8+70	8+85	9+00	9+15	9+30	9+45	9+60	9+75	9+90	EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE

No.	REVISIONS	INITIAL	DATE
	Issued for Tender	F.S.	03/02/22

REFERENCE MATERIAL
Road Plan : 99-H-39, 00-H-40
Sewer Plans : 07-S-41, 14-S-11
Water Plans : 80-W-28, 80-W-38, 82-W-5, 82-W-13, 82-W-18, 83-W-19, 88-W-3, 89-W-17

Geodetic Bench Mark Index No. 65U161 Elevation=222.640m
Borehole Report - GTR_1932

ACTIVITIES	
Surveyed By:	J.P./D.O.
Survey Date:	13-03-18
Drawn By:	O.S.
Drawn Date:	09-04-18
Design By:	F.S.
Design Date:	22-07-19

Q/C IN ACCORDANCE WITH ASCE STANDARD 38-02
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Ⓒ information obtained from field survey combined with Ⓓ information
Ⓑ information obtained in field and indicates horizontal position of subsurface utility
Ⓐ precise horizontal and vertical location of utility obtained by exposure and measurement

SCALES
0 5m 10m 20m
HORIZONTAL 1:500
0 1m 2m 4m
VERTICAL 1:100
Dimensions shown on this plan are in millimetres unless otherwise noted

IBI

LICENSED PROFESSIONAL ENGINEER
F. SHWEIHAT
100073055
Feb. 03, 2022
PROVINCE OF ONTARIO

Project Manager (Design)
Feb 9, 2022
Taufeek Ameer, P. Eng.
Manager of Design
Susan Jacob, P. Eng.

Hamilton
Public Works Department

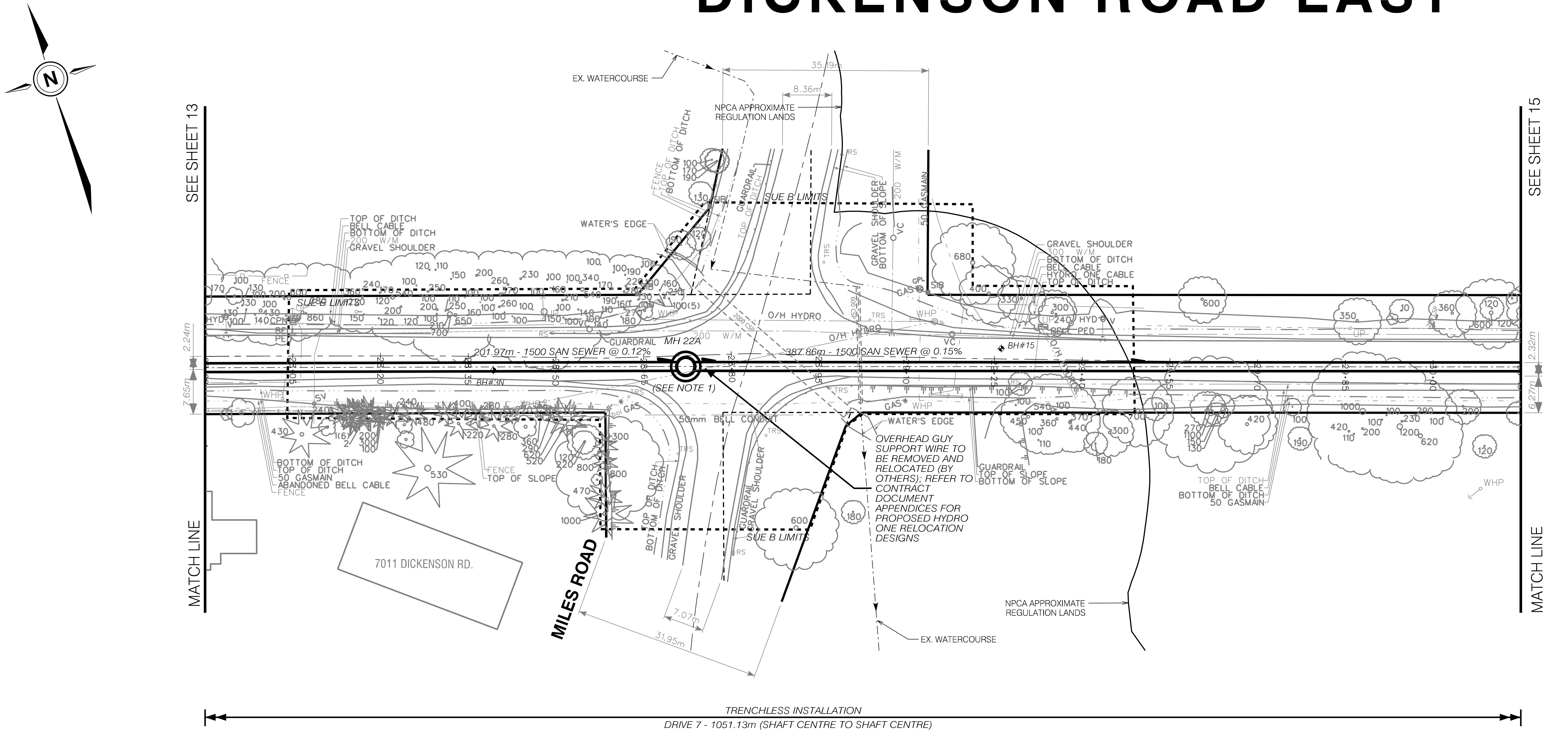
DICKENSON ROAD EAST
Sanitary Sewer Installation
From STA. 7+65 to STA. 9+90
From : Upper James Street
To : Trinity Church Road

DICKENSON ROAD EAST

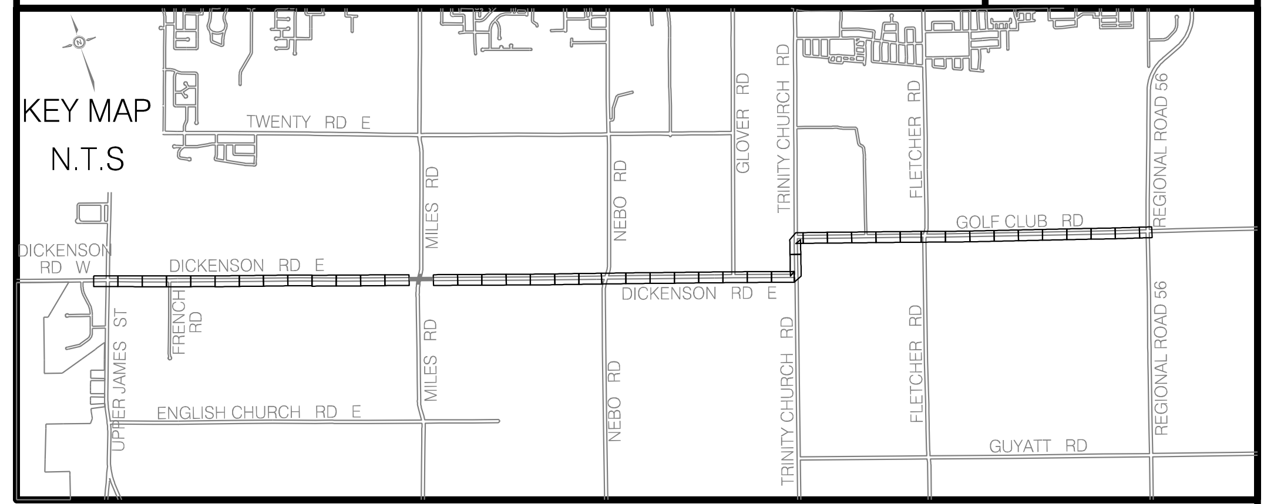
DICKENSON ROAD EAST

CONTRACT No. C15-11-22 (HSW)
DRAWING No. 18-H-01

SHEET No.
14 OF 108



TRENCHLESS INSTALLATION
DRIVE 7 - 1051.13m (SHAFT CENTRE TO SHAFT CENTRE)

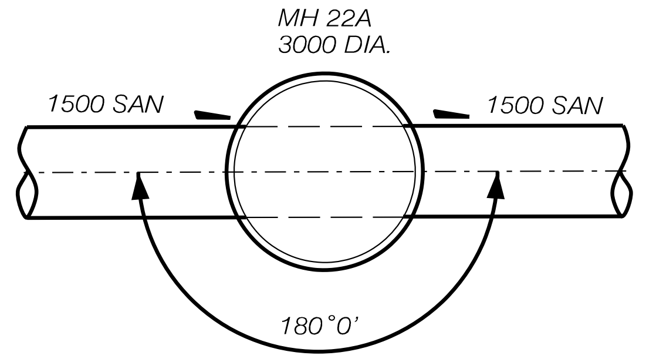


LEGEND

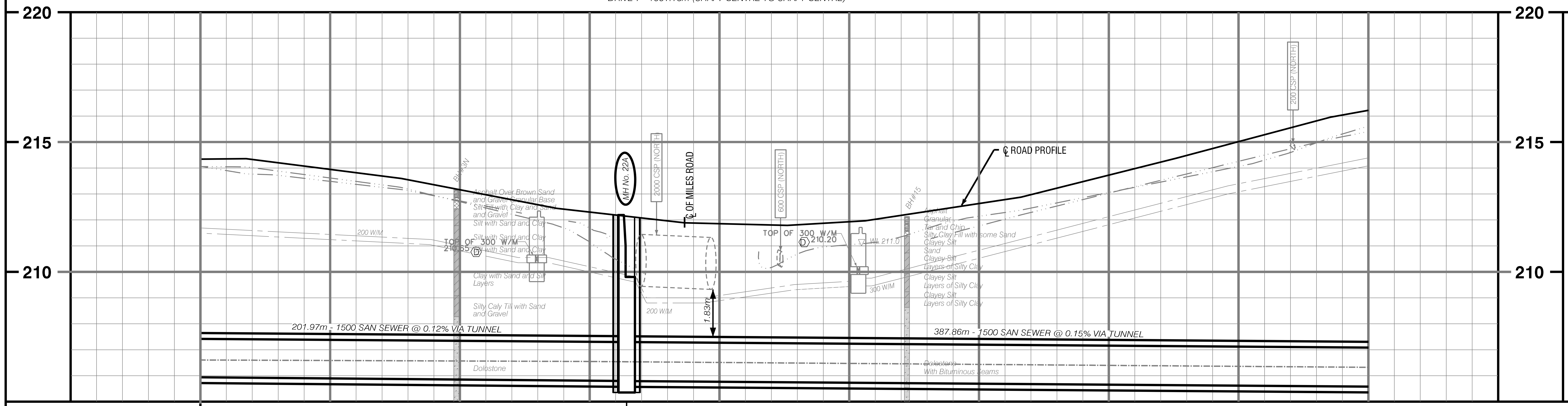
▭ *SUE B LIMITS*

NOTE:

1. CONTRACTOR TO MAINTAIN VEHICLE ACCESS TO AND FROM 7011 DICKENSON RD TO MILES ROAD AT ALL TIMES.



MH 22A SCHEMATIC



C.B. REMOVALS/REPLACEMENTS

EXISTING SEWER MANHOLES

PROPOSED SANITARY SEWER							3000mm DIA MH W 206.905 E 205.875											PROPOSED SANITARY SEWER
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	214.34	214.20	213.82	213.36	212.78	212.30	211.96	211.83	211.87	212.18	212.63	213.23	213.98	214.75	215.55	216.22		EXISTING ℄ OF ROAD PROFILE ELEVATIONS
EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE	27+90	28+05	28+20	28+35	28+50	28+65	28+80	28+95	29+10	29+25	29+40	29+55	29+70	29+85	30+00	30+15		EXISTING ℄ OF ROAD ALLOWANCE CHAINAGE

No.	REVISIONS	INITIAL	DATE
	Issued for Tender	F.S.	03/02/22

REFERENCE MATERIAL
Road Plan : 99-H-39, 00-H-40
Sewer Plans : 07-S-41, 14-S-11
Water Plans : 80-W-28, 80-W-38, 82-W-5, 82-W-13, 82-W-18, 83-W-19, 88-W-3, 89-W-17

Geodetic Bench Mark Index No. 65U161 Elevation=222.640m
Borehole Report - GTR_1932

ACTIVITIES	
Surveyed By:	J.P./D.O.
Survey Date:	13-03-18
Drawn By:	O.S.
Drawn Date:	09-04-18
Design By:	F.S.
Design Date:	22-07-19

Q/C IN ACCORDANCE WITH ASCE STANDARD 38-02
All Utilities depicted are at Ⓒ unless otherwise noted.
Ⓓ information derived from existing records
Ⓒ information obtained from field survey combined with Ⓓ information
Ⓑ information obtained in field and indicates horizontal position of subsurface utility
Ⓐ precise horizontal and vertical location of utility obtained by exposure and measurement

SCALES
0 5m 10m 20m
HORIZONTAL 1:500
0 1m 2m 4m
VERTICAL 1:100
Dimensions shown on this plan are in millimetres unless otherwise noted

IBI

LICENSED PROFESSIONAL ENGINEER
F. SHWEIHAT
100073055
Feb. 03, 2022
PROVINCE OF ONTARIO

Project Manager (Design)
Feb 9, 2022
Taufeek Ameer, P. Eng.
Manager of Design
Susan Jacob
Susan Jacob, P. Eng.

Hamilton
Public Works Department

DICKENSON ROAD EAST

Sanitary Sewer Installation
From STA. 27+90 to STA. 30+15
From : Upper James Street
To : Trinity Church Road

18-H-01

HIGHWAY Nº 6

CERTIFICATE OF COMPLETION

This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

MAY 1997
Date

T EVANS
Project Manager

Note:

Work as constructed : shown in green
Constructed by :
Date completed :
Inspector :
Pipe material :
Class of Pipe :
Plotted by : R. HONCHARENKO
Elevations by : N/A

No.	REVISIONS	DATE	INITIAL
1	EX. 300mmØ WATERMAIN ON DICKENSON ROAD ADDED	89/03/14	CMC
2	ADDED AS CONSTRUCTED	DEC 4/89	F.W.

NOTES BENCH MARK-INDEX Nº 75-U-165 (GLANBROOK)

SCALES
HORIZ. 1:500
VERT. 1:100

DIRECTOR

APPROVED
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

HIGHWAY Nº 6
PROPOSED SANITARY SEWERS
FROM : ± 1100 m SOUTH OF TWENTY ROAD
TO : 85 m SOUTH OF DICKENSON ROAD

DATE: 88 - 04 - 30
PROJECT No. 813 - 73
DRAWING No. 88 - S - 16
SHEET 2 OF

88 S 16

HIGHWAY Nº 6

1	ADDED AS CONSTRUCTED	DEC 4/89	FW
No.	REVISIONS	DATE	INITIAL

NOTES: BENCH MARK - INDEX Nº 75-U-164 (GLANBROOK)

S. Sligetz

SCALES
HORIZ. 1:500
VERT. 1:100

DIRECTOR

APPROVED
S. SPENCER

COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

HIGHWAY Nº 6
PROPOSED SANITARY SEWERS
FROM : 85 m SOUTH OF DICKENSON ROAD
TO 560 m SOUTH OF DICKENSON ROAD

DATE: 88 - 04 - 30
PROJECT No. 813 - 73
DRAWING No. 88 - S - 16
SHEET 3 OF

88 S 16
13

HIGHWAY Nº 6

CERTIFICATE OF COMPLETION

This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

MAY 1997 Date

Project Manager

Note:

Work as constructed : shown in green
Constructed by :
Date completed :
Inspector :
Pipe material :
Class of Pipe :
Plotted by : R. HONCHARENKO
Elevations by : N/A

No.	REVISIONS	DATE	INITIAL
1	ADDED AS CONSTRUCTED	DEC. 4/89	FW

NOTES: BENCH MARK-INDEX Nº 75-U-164 (GLANBROOK)

SCALES
HORIZ. 1:500
VERT. 1:100

DIRECTOR

APPROVED
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

HIGHWAY Nº 6
PROP. 300mm. Ø - 450mm. Ø SANITARY SEWER
FROM: 1630 METRES SOUTH OF DICKENSON ROAD
TO: 300 METRES SOUTH OF ENGLISH CHURCH ROAD

DATE: 89-05-29
PROJECT No. 813-73
DRAWING No. 88-S-16
SHEET 6A OF

HIGHWAY Nº 6

CERTIFICATE OF COMPLETION

This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

MAY 1997
Date

Project Manager

Note:

Work as constructed :	shown in green	Pipe material :	
Constructed by :		Class of Pipe :	
Date completed :		Plotted by :	R. HONCHARENKO
Inspector :	2740	Elevations by :	N/A

NOTE :

1. WATERTIGHT MANHOLE FRAME AND COVER FOR M.H. 17 SEE DETAIL 'A'
2. CONTRACTOR TO MAINTAIN EXISTING CREEK FLOW AT ALL TIMES DURING CONSTRUCTION.

SILTATION CONTROL NOTES

1. SILTATION PROTECTION SHALL CONSIST OF FILTER CLOTH (TEXEL 7607 OR APPROVED EQUAL) BURIED 300 IN THE GROUND, 900 HIGH & SESURED TO SNOW FENCE WITH STEEL 'T' POSTS AT 2400 CENTRES, AND STRAW BALES.
2. CONTRACTOR SHALL MAINTAIN ALL SILTATION CONTROL MEASURES DURING CONSTRUCTION AND UNTIL THE FINAL RESTORATION IS COMPLETED
THE CONTRACTOR SHALL PERIODICALLY REPLACE FILTER CLOTH AND/OR STRAW BALES AS DIRECTED BY THE ENGINEER.
3. WIDTH AND LOCATION OF THE SILTATION CONTROL FENCE SHALL BE AS DIRECTED BY THE ENGINEER.

No.	REVISIONS	DATE	INITIAL
	AS-BUILT SEWER AND JUNCTION CHAINAGES	97-02-11	R.T.
⚠	LENGTH BETWEEN M.H. 18 & M.H. 19 ON PLAN	89-03-22	T. HO

NOTES: BENCH MARK-INDEX Nº 75-U-164 (GLANBROOK)

SCALES
HORIZ. 1:500
VERT. 1:100

DIRECTOR

APPROVED
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

DATE: 88-04-30
PROJECT No. 813-73

HIGHWAY Nº 6
PROP. SANITARY SEWER & SAN. FORCEMAIN
FROM: 1630 METRES SOUTH OF DICKENSON ROAD
TO: 300 METRES SOUTH OF ENGLISH CHURCH ROAD

DRAWING No. 88-S-16
⚠ SHEET 6

88 S 16

88 5 16 9

HOMESTEAD DRIVE

(REGIONAL ROAD N° 652)

EXISTING WEST EDGE OF PAVEMENT ELEVATIONS	232.743	232.68	232.84	232.98	233.50	233.53		233.79	234.00	234.08	234.10		234.35	234.67	234.79	EX. WEST EDGE OF PAVEMENT ELEVATIONS
PROPOSED INVERT ELEVATIONS	226.203 (N) 226.357 (W)			226.037			225.867					225.647				PROPOSED INVERT ELEVATIONS
PROPOSED CHAINAGE	12+21			11+38			10+53					9+43				PROPOSED CHAINAGE

NOTES: BENCH MARK-INDEX N° 75-U-164 (GLANBROOK)

No.	REVISIONS	DATE	INITIAL
	AS-BUILT SEWER, JUNCTION CHAINAGES	97-02-05	R.T.
⚠	CHAINAGES	89-03-22	T. HO
⚠	EX. U/G BELL DUCTS SHOWN AS FIELD CHECKED	"	"

SCALES
HORIZ. 1:500
VERT. 1:100

J. Srigets

DIRECTOR

APPROVED

COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH

DEPARTMENT OF ENGINEERING

DATE: 88-04-30

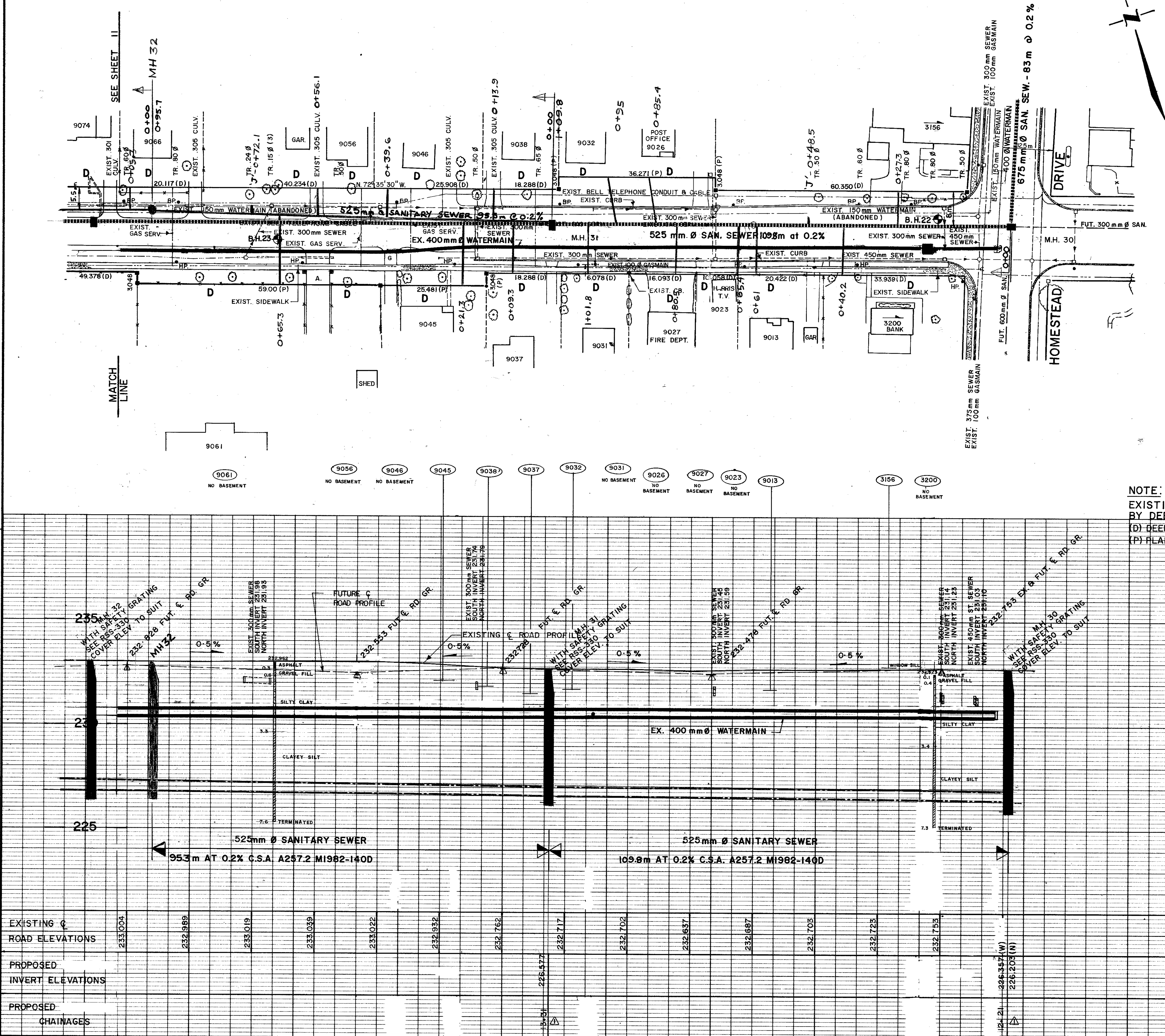
PROJECT No. 813-73.

HOMESTEAD DRIVE
PROPOSED SANITARY SEWERS
FROM: 355 METRES NORTH OF AIRPORT ROAD
TO: AIRPORT ROAD

DRAWING No. 88-S-16

⚠ SHEET 9 OF

AIRPORT ROAD



LEGEND
'J' - JUNCTION ONLY
'R' - RISER

PROP. BULKHEADS FOR M.H. 30

PROP. 600 mm Ø BULKHEAD BOTTOM INV. = 227.000
FUT. 300 mm Ø SAN. SEW. EAST INV. = 227.190
PROP. 900 mm Ø BULKHEAD BOTTOM INV = 226.200
FUT. 600 mm Ø SAN. SEW. SOUTH INV. = 226.432

NOTE:
EXISTING STREET LINES
BY DEEDS AND PLANS
(D) DEED OR ASSESSMENT
(P) PLAN

CERTIFICATE OF COMPLETION

This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

MAY 1997
Date

Project Manager

Note:
Work as constructed : shown in green
Constructed by :
Date completed :
Inspector :
Pipe material :
Class of Pipe :
Plotted by : R. HONCHARENKO
Elevations by : N/A

NOTES: BENCH MARK - INDEX Nº 75-U-159 & INDEX Nº 75-U-160 (GLANBROOK)
ALL JUNCTIONS AND SERVICES ARE 150mm DIA. UNLESS OTHERWISE NOTED

No.	REVISIONS	DATE	INITIAL
	AS-BUILT SEWER AND JUNCTION CHAINAGES	97-02-07	R.T.
⚠	CHAINAGES	89-03-22	T. HO

SCALES
HORIZONTAL: 0m 10m 20m
VERTICAL: 0m 2m 4m

DIRECTOR

APPROVED
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH

DEPARTMENT OF ENGINEERING

AIRPORT ROAD
PROPOSED SANITARY SEWERS
FROM: HOMESTEAD DRIVE
TO. 210 m WEST OF HOMESTEAD DRIVE

DATE: 88 - 04 - 30
PROJECT No. 813-73
DRAWING No. 88 - S - 16
⚠ SHEET 10 OF

AIRPORT RD.

90 W 16

AIRPORT ROAD

CERTIFICATE OF COMPLETION

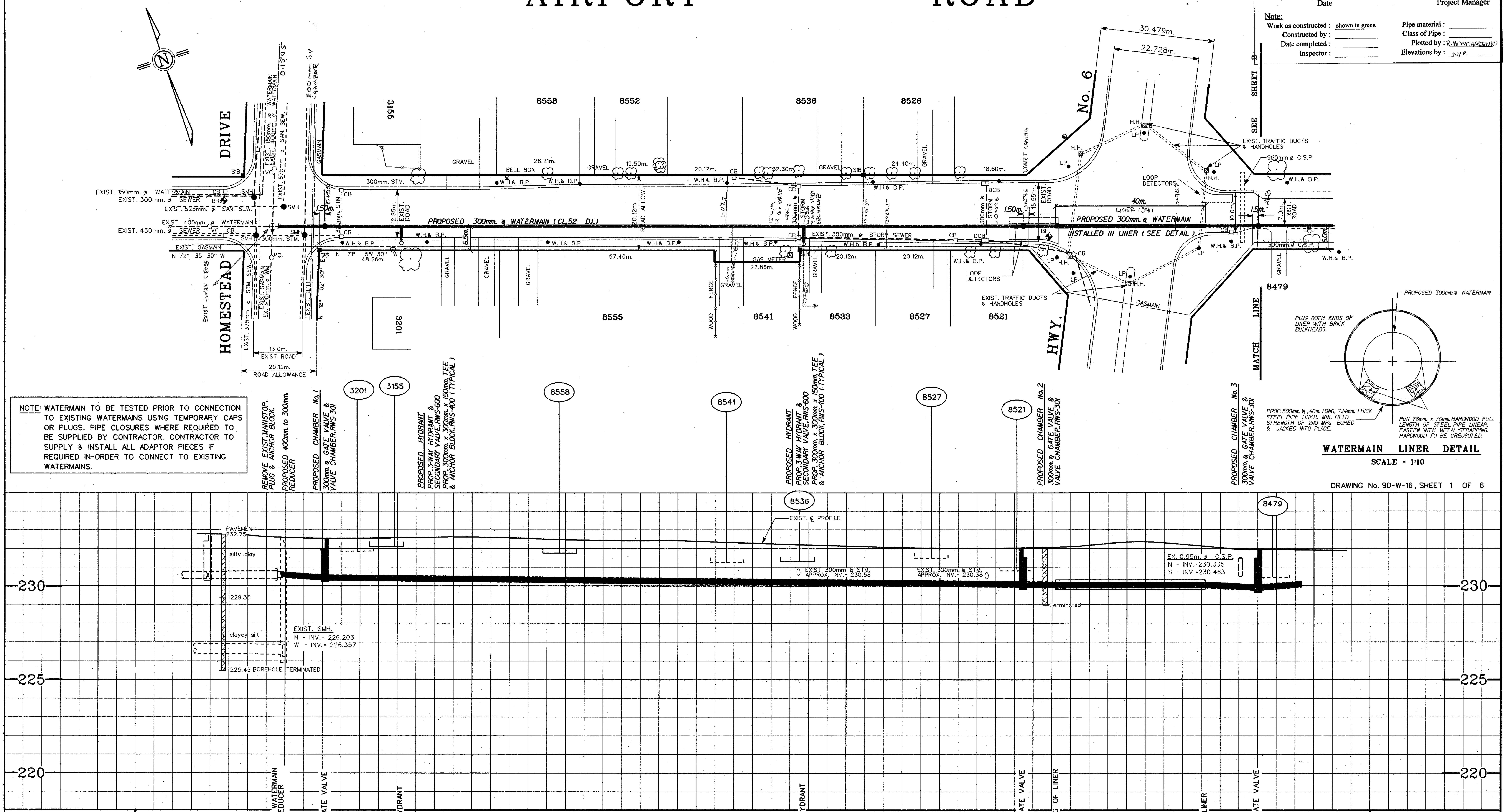
This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

MAY 1997 Date

Project Manager

Note:

Work as constructed :	shown in green	Pipe material :	
Constructed by :		Class of Pipe :	
Date completed :		Plotted by :	R. HONCHARENKO
Inspector :		Elevations by :	N/A



NOTE: WATERMAIN TO BE TESTED PRIOR TO CONNECTION TO EXISTING WATERMAINS USING TEMPORARY CAPS OR PLUGS. PIPE CLOSURES WHERE REQUIRED TO BE SUPPLIED BY CONTRACTOR. CONTRACTOR TO SUPPLY & INSTALL ALL ADAPTOR PIECES IF REQUIRED IN-ORDER TO CONNECT TO EXISTING WATERMAINS.

PROPOSED 300mm. ø WATERMAIN

PLUG BOTH ENDS OF LINER WITH BRICK BULKHEADS.

PROP. 500mm. ø, 40m. LONG, 7.14mm. THICK STEEL PIPE LINER, MIN. YIELD STRENGTH OF 240 MPa BORED & JACKED INTO PLACE.

RUN 76mm. x 76mm. HARDWOOD FULL LENGTH OF STEEL PIPE LINER. FASTEN WITH METAL STRAPPING. HARDWOOD TO BE CREOSOTED.

WATERMAIN LINER DETAIL

SCALE - 1:10

DRAWING No. 90-W-16, SHEET 1 OF 6

	END OF WATERMAIN ℄ OF REDUCER; ℄ OF GATE VALVE; ℄ OF HYDRANT; ℄ OF HYDRANT; ℄ OF GATE VALVE; BEGINNING OF LINER; 14m. @ 1.00%; END OF LINER; ℄ OF GATE VALVE
PROPOSED WATERMAIN INVERT ELEVATIONS	(PLAN) 230.40; 230.45; 230.280; 11m. @ 1.58%; 195m. @ 0.20%; 229.89; 40m. @ 0.00%; 229.89; 229.75
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	232.61; 232.55; 232.58; 232.63; 232.59; 232.49; 232.44; 232.45; 232.34; 232.24; 232.15; 232.06; 232.02; 232.03; 232.10; 232.37; 232.25; 231.93; 231.90; 231.86
WATERMAIN CHAINAGE	0+00; 0+01; 0+02; 0+13; 0+33; 1+40; 1+99; 2+08; 2+48; 2+62

No.	REVISIONS	DATE	INITIAL
	AS CONSTRUCTED	5/28/97	

CHECKED BY

DRAWN BY J. PIDSADNY

SCALES
0 5m 10m 20m HORIZONTAL 1:500
0 1m 2m 4m VERTICAL 1:100

DIRECTOR

APPROVED
Ted Gill
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

DATE : AUGUST 23, 1990
PROJECT No. 801-80

AIRPORT ROAD
PROPOSED 300mm. ø WATERMAIN
FROM : HOMESTEAD DRIVE
TO : APPROX. 1320m.+/- EAST OF HWY. No. 6

DRAWING No. 90-W-16
SHEET 1 OF 6

AIRPORT RD. 2

90 W 16

AIRPORT ROAD

CERTIFICATE OF COMPLETION

This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

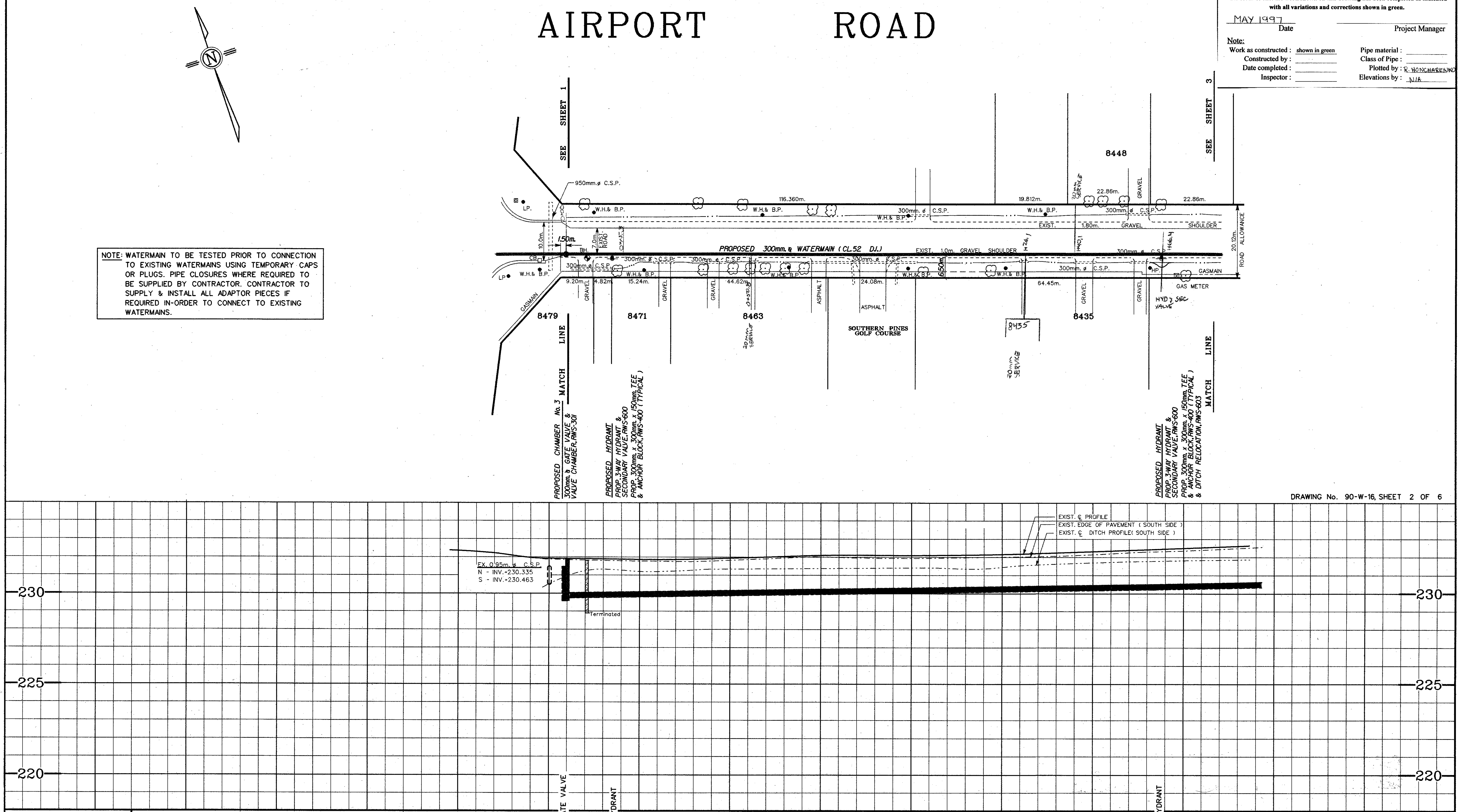
MAY 1997 Date

Project Manager

Note:

Work as constructed : shown in green
Constructed by :
Date completed :
Inspector :
Pipe material :
Class of Pipe :
Plotted by : R. HONCHARENKO
Elevations by : N/A

NOTE: WATERMAIN TO BE TESTED PRIOR TO CONNECTION TO EXISTING WATERMAINS USING TEMPORARY CAPS OR PLUGS. PIPE CLOSURES WHERE REQUIRED TO BE SUPPLIED BY CONTRACTOR. CONTRACTOR TO SUPPLY & INSTALL ALL ADAPTOR PIECES IF REQUIRED IN-ORDER TO CONNECT TO EXISTING WATERMAINS.



PROPOSED WATERMAIN INVERT ELEVATIONS	229.75 161m. @ 0.30% 230.233
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	232.37 232.25 231.93 231.90 231.86 231.91 232.00 232.10 232.11 232.14 232.21 232.42 232.65
WATERMAIN CHAINAGE	2+62 2+75 4+23 4+26

No.	REVISIONS	DATE	INITIAL
1	AS CONSTRUCTED	5/28/97	R.H

CHECKED BY

DRAWN BY
J. PIDSADNY

SCALES
0 1m 2m 4m
VERTICAL 1:100
0 5m 10m 20m
HORIZONTAL 1:500

DIRECTOR

APPROVED
Ted Gill
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

DATE : AUGUST 23,1990
PROJECT No. 801-80

AIRPORT ROAD
PROPOSED 300mm. ø WATERMAIN
FROM : HOMESTEAD DRIVE
TO : APPROX. 1320m.+/- EAST OF HWY. No. 6.

DRAWING No. 90-W-16
SHEET 2 OF 6

AIRPORT RD 3

90 W 16

AIRPORT ROAD

CERTIFICATE OF COMPLETION

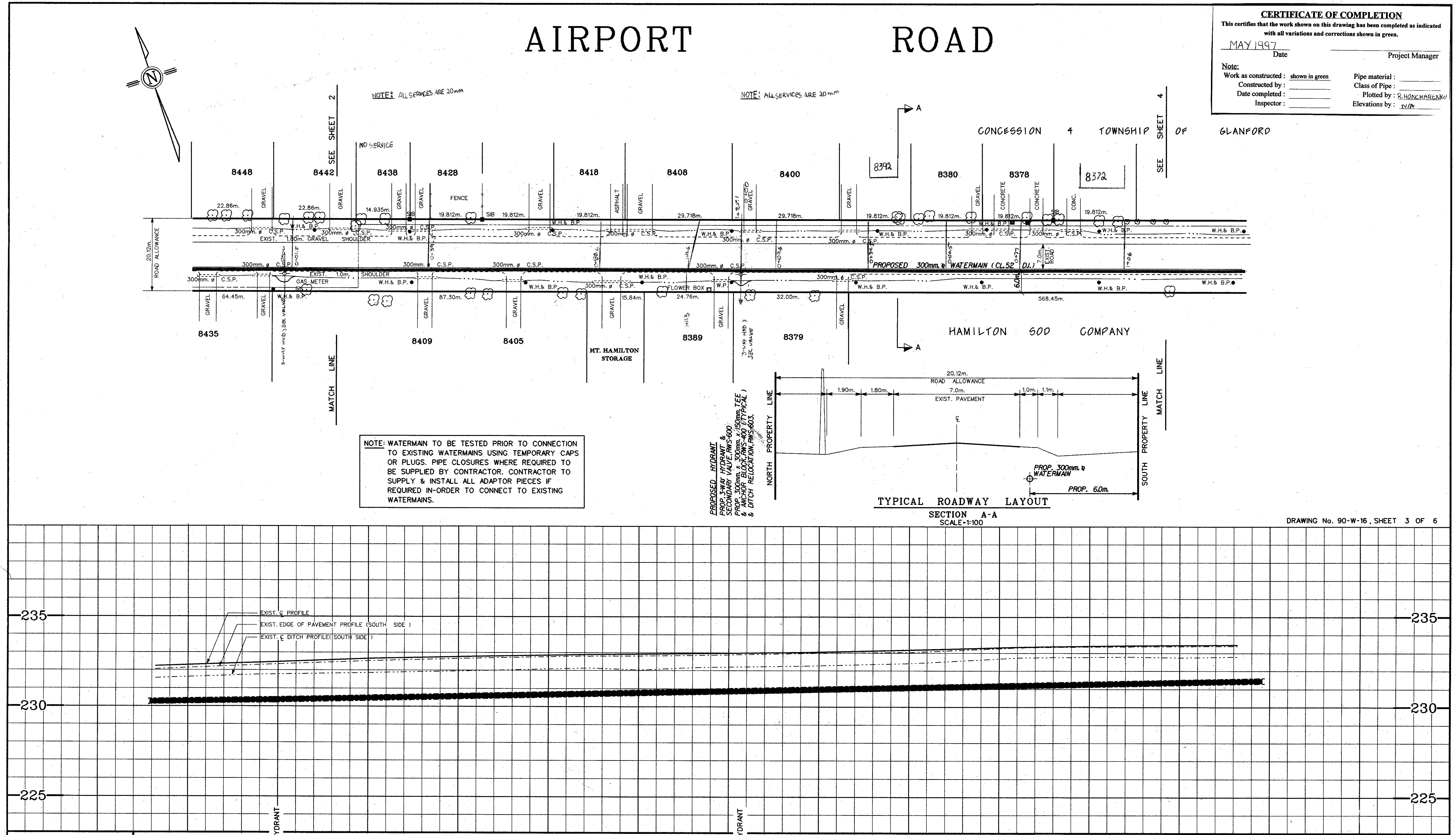
This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

MAY 1997
Date

Project Manager

Note:

Work as constructed : shown in green
Constructed by :
Date completed :
Inspector :
Pipe material :
Class of Pipe :
Plotted by : R.HONCHARENKO
Elevations by : N/A



NOTE: WATERMAIN TO BE TESTED PRIOR TO CONNECTION TO EXISTING WATERMAINS USING TEMPORARY CAPS OR PLUGS. PIPE CLOSURES WHERE REQUIRED TO BE SUPPLIED BY CONTRACTOR. CONTRACTOR TO SUPPLY & INSTALL ALL ADAPTOR PIECES IF REQUIRED IN-ORDER TO CONNECT TO EXISTING WATERMAINS.

DRAWING No. 90-W-16, SHEET 3 OF 6

PROPOSED WATERMAIN INVERT ELEVATIONS		230.233			275m. @ 0.40%								231.333	PROPOSED WATERMAIN INVERT ELEVATIONS
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	232.21	232.42	232.65	232.78	232.88	232.91	232.94	233.01	233.15	233.32	233.40	233.44	233.46	EXISTING ℄ OF ROAD PROFILE ELEVATIONS
WATERMAIN CHAINAGE		4+23 4+26					5+52						6+98	WATERMAIN CHAINAGE

No.	REVISIONS	DATE	INITIAL
0	AS CONSTRUCTED	5/28/97	R.H.

CHECKED BY

DRAWN BY
J. PIDSADNY

SCALES
HORIZONTAL 1:500 (0, 5m, 10m, 20m)
VERTICAL 1:100 (0, 1m, 2m, 4m)

DIRECTOR

APPROVED
Ted Gill
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

DATE : AUGUST 23, 1990
PROJECT No. 801-80

AIRPORT ROAD
PROPOSED 300mm. ø WATERMAIN
FROM : HOMESTEAD DRIVE
TO : APPROX. 1320m.+/- EAST OF HWY No. 6

DRAWING No. 90-W-16
SHEET 3 OF 6

90 W 16

AIRPORT RD. 4

AIRPORT ROAD

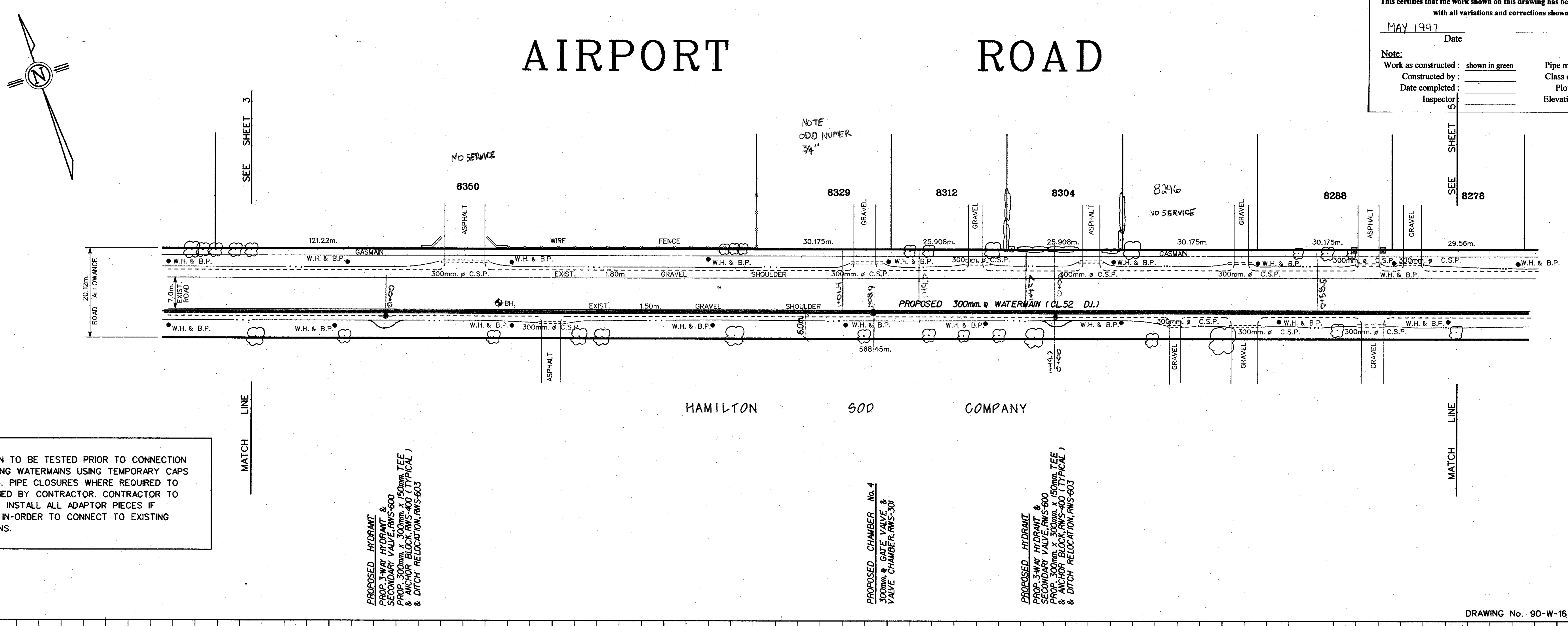
CERTIFICATE OF COMPLETION

This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

MAY 1997
Date

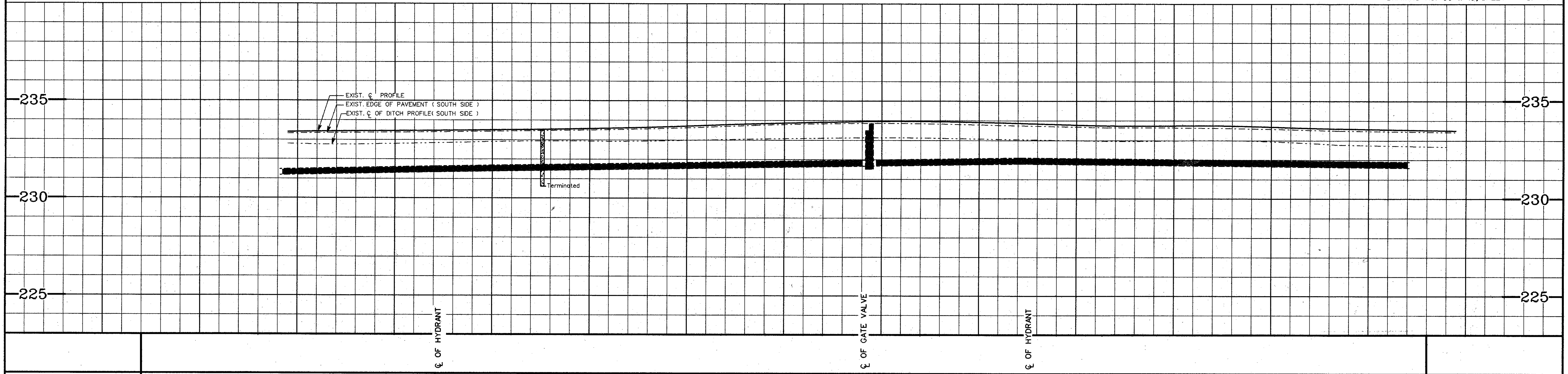
Project Manager

Note:
Work as constructed : shown in green
Constructed by :
Date completed :
Inspector :
Pipe material :
Class of Pipe :
Plotted by : R. HONCHARENKO
Elevations by : N/A



NOTE: WATERMAIN TO BE TESTED PRIOR TO CONNECTION TO EXISTING WATERMAINS USING TEMPORARY CAPS OR PLUGS. PIPE CLOSURES WHERE REQUIRED TO BE SUPPLIED BY CONTRACTOR. CONTRACTOR TO SUPPLY & INSTALL ALL ADAPTOR PIECES IF REQUIRED IN-ORDER TO CONNECT TO EXISTING WATERMAINS.

DRAWING No. 90-W-16, SHEET 4 OF 6



PROPOSED WATERMAIN INVERT ELEVATIONS	231.333 — 150m. @ 0.30% — 231.783 — 100m. @ 0.20% — 231.583
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	233.40, 233.44, 233.46, 233.52, 233.63, 233.83, 233.90, 233.90, 233.85, 233.69, 233.69, 233.54
WATERMAIN CHAINAGE	6+98, 7+00, 8+48, 8+48, 8+50, 9+48

No.	REVISIONS	DATE	INITIAL
	AS CONSTRUCTED	5/28/97	R.H

CHECKED BY

DRAWN BY
J. PIDSADNY

SCALES
0 5m 10m 20m
HORIZONTAL 1:500
0 1m 2m 4m
VERTICAL 1:100

DIRECTOR

APPROVED
Ted Gill
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

AIRPORT ROAD
PROPOSED 300mm. ø WATERMAIN
FROM : HOMESTEAD DRIVE
TO : APPROX. 1320m. +/- EAST OF HWY. No. 6

DATE : AUGUST 23, 1990
PROJECT No. 801-80
DRAWING No. 90-W-16
SHEET 4 OF 6

90 W 16 5 AIRPORT RD.

CERTIFICATE OF COMPLETION

This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

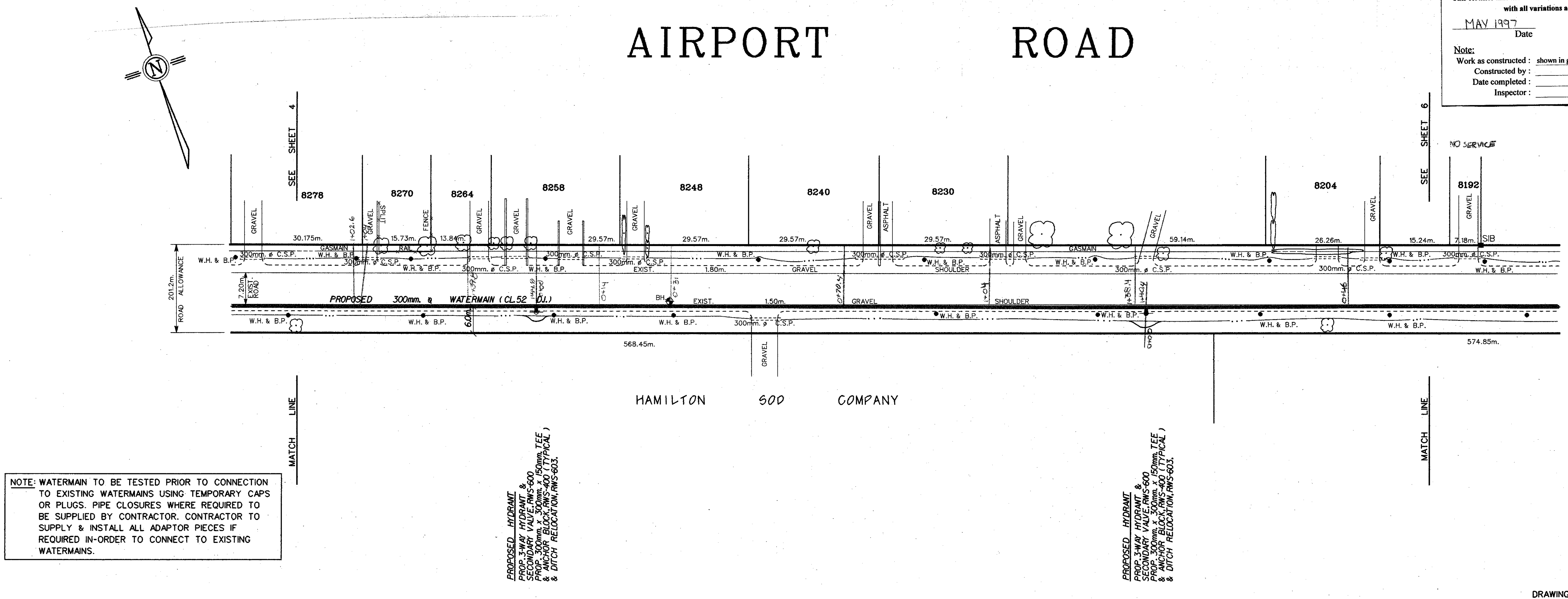
MAY 1997 Date

Project Manager

Note:

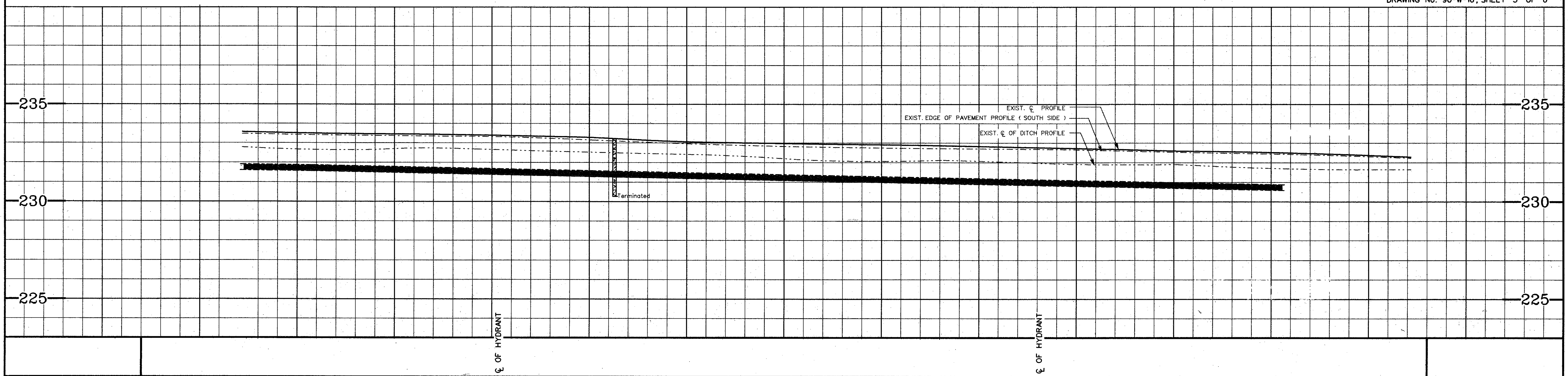
Work as constructed : shown in green
Constructed by :
Date completed :
Inspector :
Pipe material :
Class of Pipe :
Plotted by : R. HONCHARENKO
Elevations by : N/A

AIRPORT ROAD



NOTE: WATERMAIN TO BE TESTED PRIOR TO CONNECTION TO EXISTING WATERMAINS USING TEMPORARY CAPS OR PLUGS. PIPE CLOSURES WHERE REQUIRED TO BE SUPPLIED BY CONTRACTOR. CONTRACTOR TO SUPPLY & INSTALL ALL ADAPTOR PIECES IF REQUIRED IN-ORDER TO CONNECT TO EXISTING WATERMAINS.

DRAWING No. 90-W-16, SHEET 5 OF 6



PROPOSED WATERMAIN INVERT ELEVATIONS	231.583 275m. @ 0.40% 230.583
EXISTING ℄ OF ROAD PROFILE ELEVATIONS	233.54 233.44 233.42 233.38 233.26 233.01 232.92 232.84 232.78 232.72 232.60 232.50 232.29
WATERMAIN CHAINAGE	9+48 9+95 11+35 11+98

No.	REVISIONS	DATE	INITIAL
1	AS CONSTRUCTED	5/28/97	R.H

CHECKED BY

DRAWN BY J. PIDSADNY

SCALES
HORIZONTAL 1:500 (0 5m 10m 20m)
VERTICAL 1:100 (0 1m 2m 4m)

DIRECTOR

APPROVED
Ted Gill
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

DATE : AUGUST 23, 1990
PROJECT No. 801-80

AIRPORT ROAD
PROPOSED 300mm. ø WATERMAIN
FROM : HOMESTEAD DRIVE
TO : APPROX. 1320m.+/- EAST OF HWY. No.6

DRAWING No. 90-W-16
SHEET 5 OF 6

90 W 16 AIRPORT RD. 6

AIRPORT ROAD

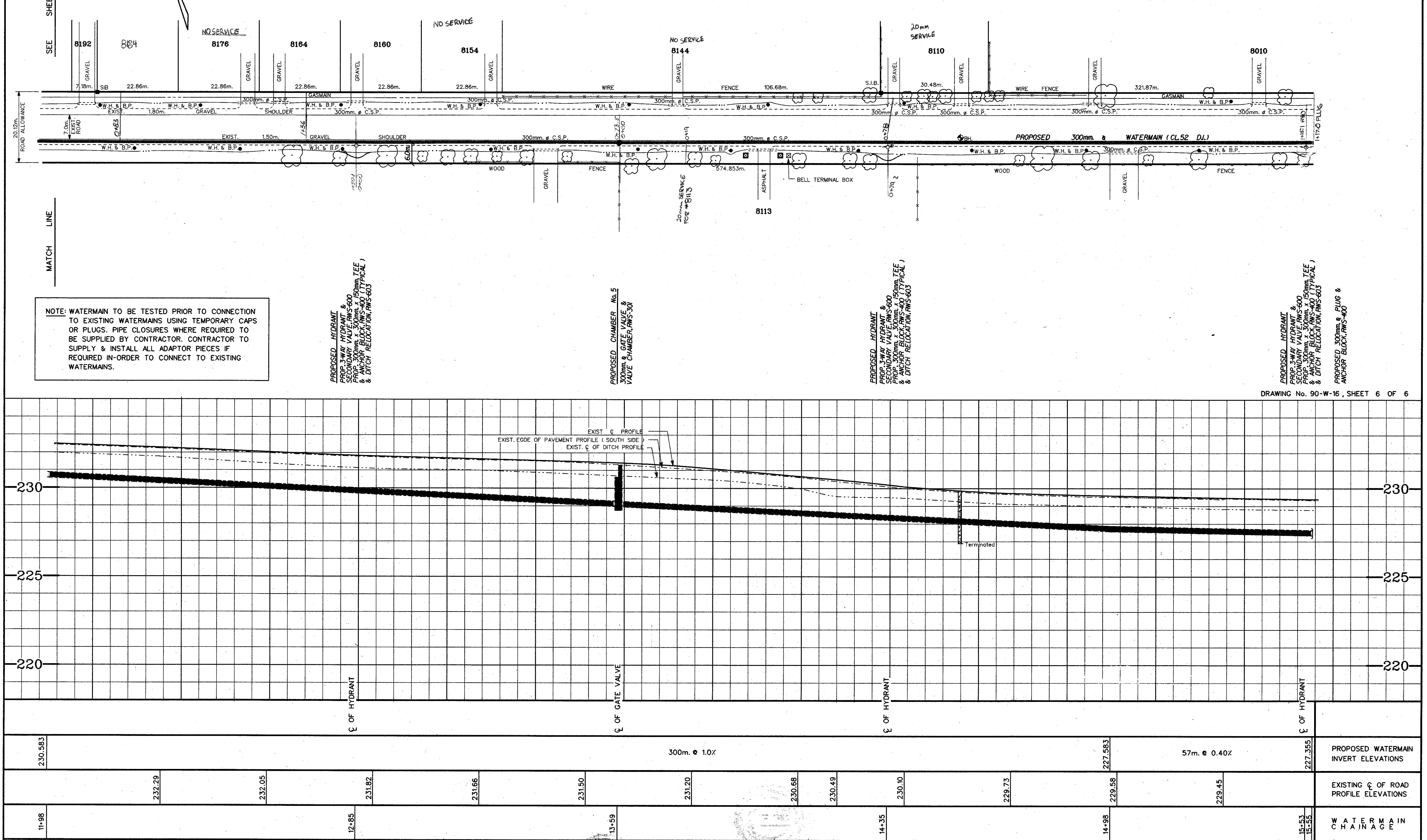
CERTIFICATE OF COMPLETION

This certifies that the work shown on this drawing has been completed as indicated with all variations and corrections shown in green.

MAY 1997
Date

Project Manager

Note:
Work as constructed : shown in green
Constructed by :
Date completed :
Inspector :
Pipe material :
Class of Pipe :
Plotted by : R. HONCHARENKO
Elevations by : N/A



NOTE: WATERMAIN TO BE TESTED PRIOR TO CONNECTION TO EXISTING WATERMAINS USING TEMPORARY CAPS OR PLUGS. PIPE CLOSURES WHERE REQUIRED TO BE SUPPLIED BY CONTRACTOR. CONTRACTOR TO SUPPLY & INSTALL ALL ADAPTOR PIECES IF REQUIRED IN-ORDER TO CONNECT TO EXISTING WATERMAINS.

No.	REVISIONS	DATE	INITIAL
D	AS CONSTRUCTED	5/28/97	R.H

CHECKED BY
R.H.

DRAWN BY
J. PIDSADNY

SCALES
HORIZONTAL 1:500
VERTICAL 1:100

DIRECTOR

APPROVED
Ted Gill
COMMISSIONER OF ENGINEERING

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
DEPARTMENT OF ENGINEERING

DATE : AUGUST 23, 1990
PROJECT No. 801-80

AIRPORT ROAD
PROPOSED 300mm. ø WATERMAIN
FROM : HOMESTEAD DRIVE
TO : APPROX. 1320m.+/- EAST OF HWY. No. 6

DRAWING No. 90-W-16
SHEET 6 OF 6

NOTES:

* INDICATES OFFSET FROM PROPERTY LINE

No.	DATE	REVISION	BY
5	SEPT/95	RECORD DRAWING	
4	JULY/94	REVISED AS PER MTO COMMENTS	
3	JUNE/94	REVISED AS PER RMHW COMMENTS	
2	MAY/94	ISSUED FOR TENDER	
1	APR./94	ISSUED FOR REVIEW	

THORBURN PENNY
Consulting Engineers
Milton, Ontario

R.L. SMITH

D.C. PAYNTER

REGIONAL MUNICIPALITY OF HALDIMAND–NORFOLK
ENGINEERING DEPARTMENT

TITLE:
CAYUGA WATER SYSTEM
TRUNK WATERMAIN
(MOUNT HOPE TO CALEDONIA)
STATION 12+500.0 – 12+850.0

DRAWN BY:	SCALE:	DATE:	REV:
A.F./J.C.	AS NOTED	FEBRUARY 1994	
C'KD BY: D.C./D.P.	DRAWING No. G34		CONTRACT 3

130.17D03440 10/31/95

95-W-66

GROUND ELEVATION	226.96	227.27	227.66	228.26	229.05	229.86	230.67	231.34
TOP OF WATERMAIN	225.26	225.56	225.96	226.54	227.33	228.10	228.83	229.44
CHAINAGE	12+850.0	12+900.0	12+950.0	13+000.0	13+050.0	13+100.0	13+150.0	13+200.0

NOTES:

No.	DATE	REVISION	BY
4	SEPT/95	RECORD DRAWING	
3	JUNE/94	REVISED AS PER RMHW COMMENTS	
2	MAY/94	ISSUED FOR TENDER	
1	APR./94	ISSUED FOR REVIEW	

THORBURN PENNY
Consulting Engineers
Milton, Ontario

R.L. SMITH

D.C. PAYNTER
Dec 31/97

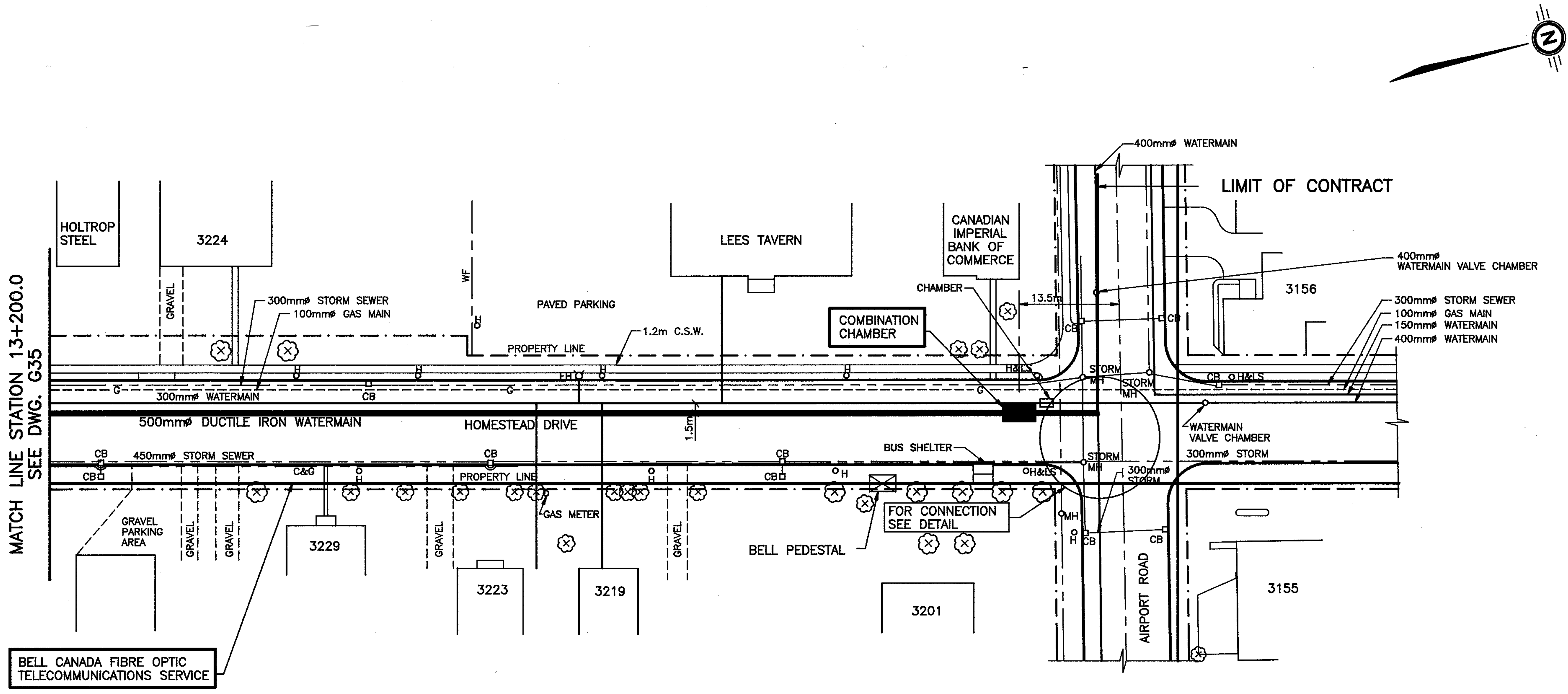
REGIONAL MUNICIPALITY OF
HALDIMAND–NORFOLK
ENGINEERING DEPARTMENT

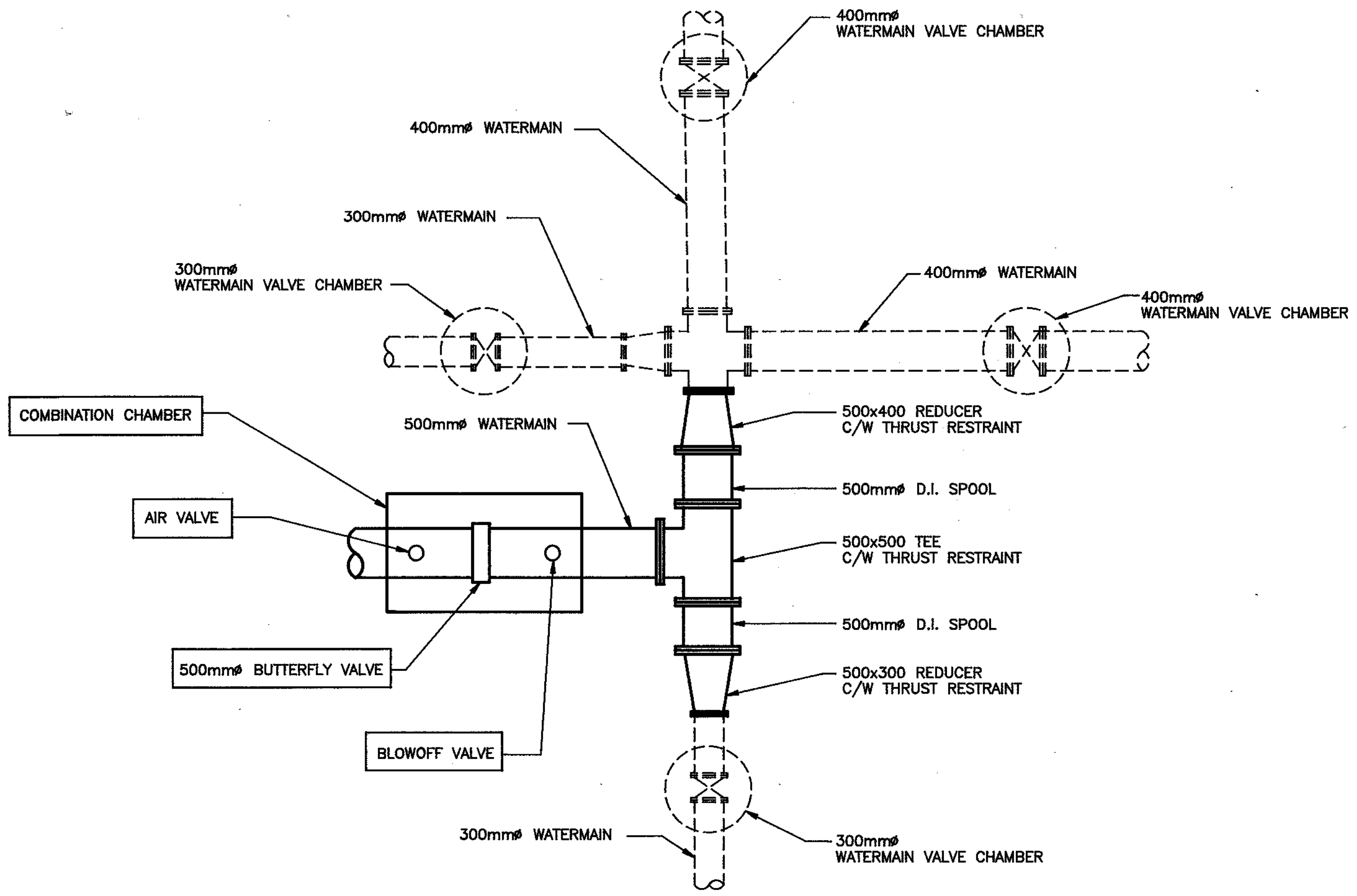
TITLE:
CAYUGA WATER SYSTEM
TRUNK WATERMAIN
(MOUNT HOPE TO CALEDONIA)
STATION 12+850.0 – 13+200.0

DRAWN BY: A.F./J.C.
SCALE: AS NOTED
DATE: FEBRUARY 1994
REV:
C'KD BY: D.C./D.P.
DRAWING No. G35
CONTRACT 3

130.17D03441 09/20/95

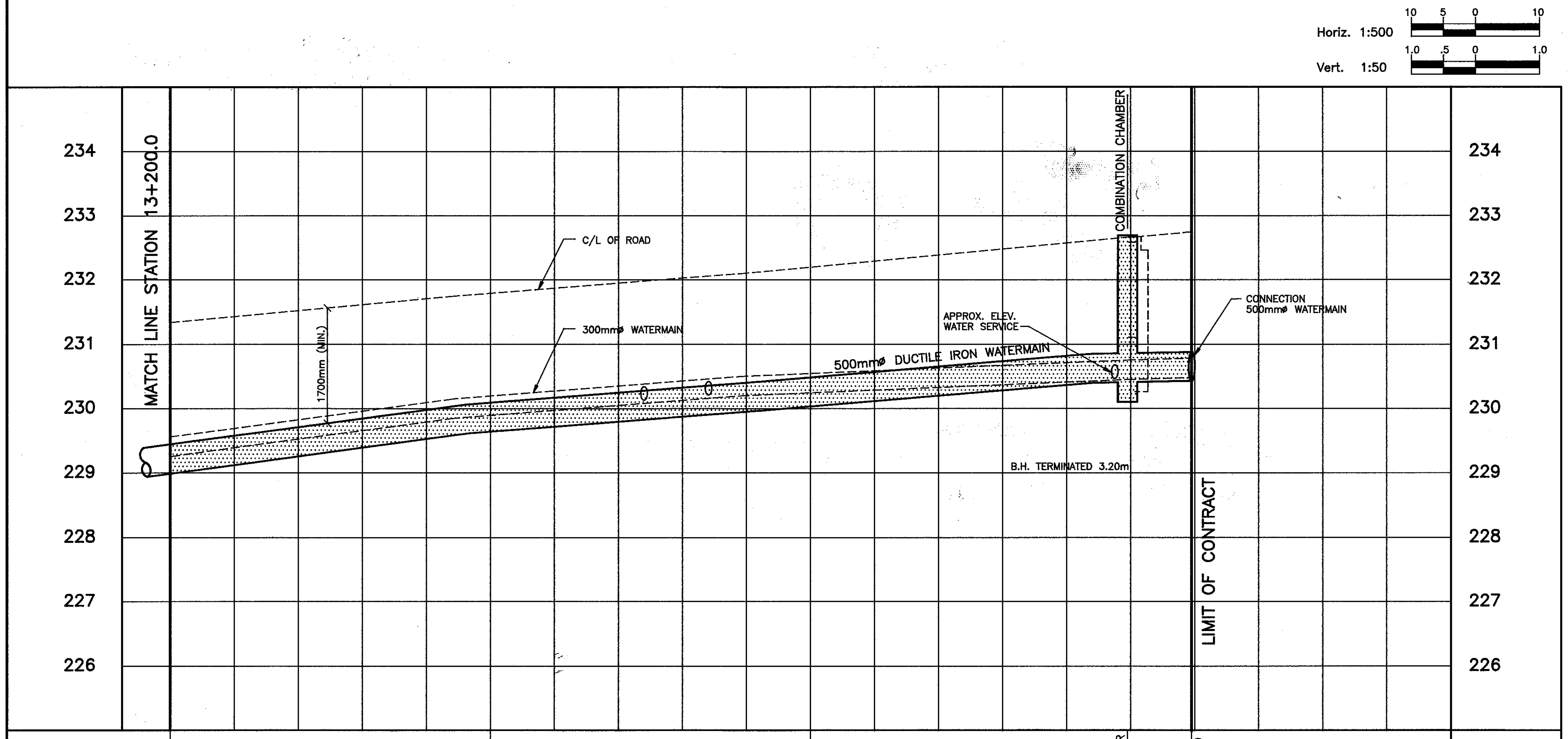
95-W-66



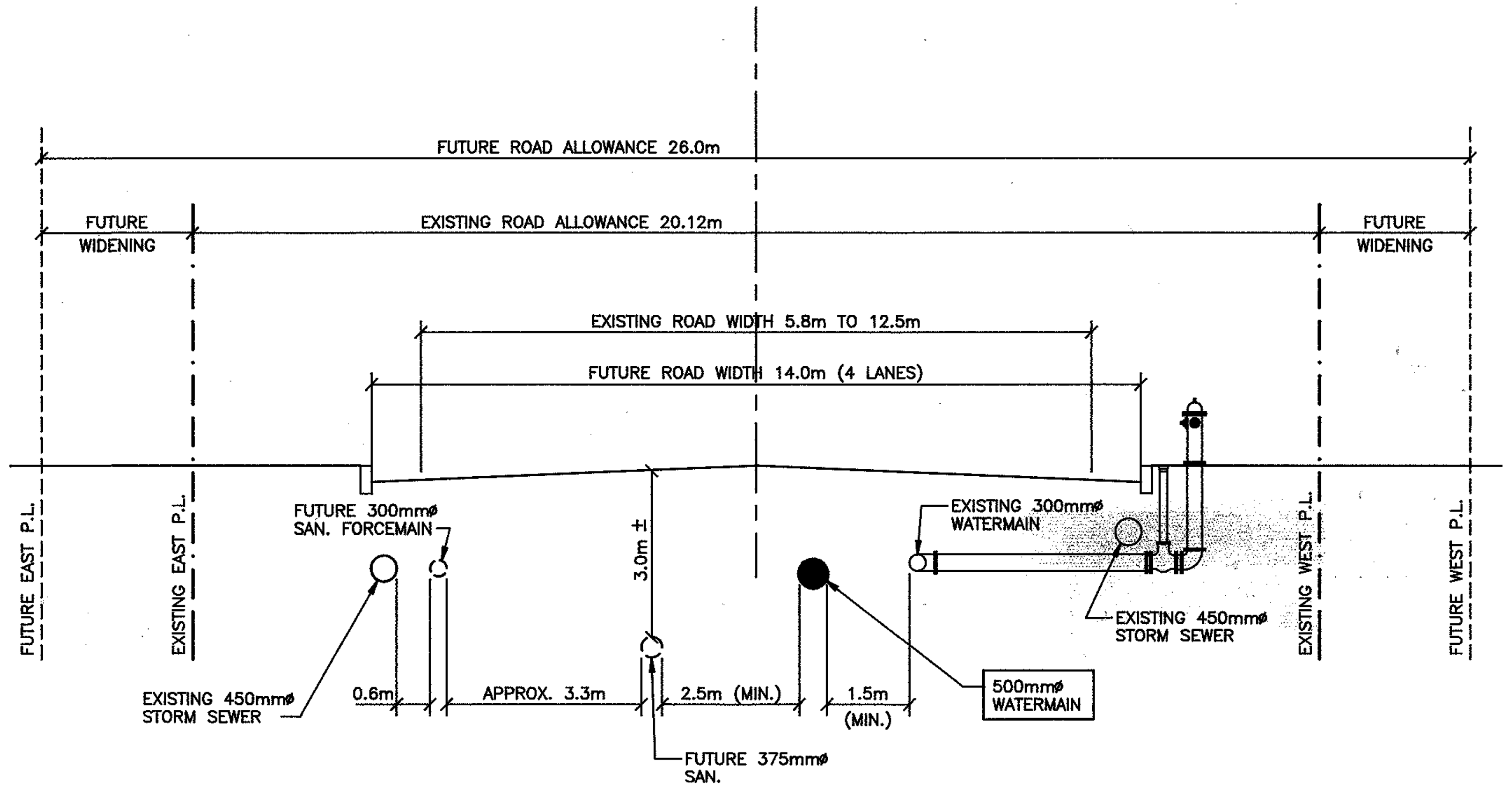


CONNECTION DETAIL

NTS



231.34	231.79	232.20	CHAMBER 232.68	232.75 500x500 TEE	GROUND ELEVATION
229.44	230.09	230.47	230.85		TOP OF WATERMAIN
13+200.0	13+250.0	13+300.0	13+349.5	13+359.5	CHAINAGE



ROADWAY SECTION

SCALE 1:100

NOTE:

ROAD RESTORATION (FULL LANE WIDTH)
40mm HM3 ASPHALT
75mm HL8 ASPHALT
450mm GRANULAR 'A'

NOTES:

No.	DATE	REVISION	BY
4	SEPT/95	RECORD DRAWING	
3	JUNE/94	REVISED AS PER RMHW COMMENTS	
2	MAY/94	ISSUED FOR TENDER	
1	APR./94	ISSUED FOR REVIEW	

THORBURN PENNY
Consulting Engineers
Milton, Ontario

R.L. SMITH

D.C. PAYNTER
02.31/94

REGIONAL MUNICIPALITY OF HALDIMAND–NORFOLK
ENGINEERING DEPARTMENT

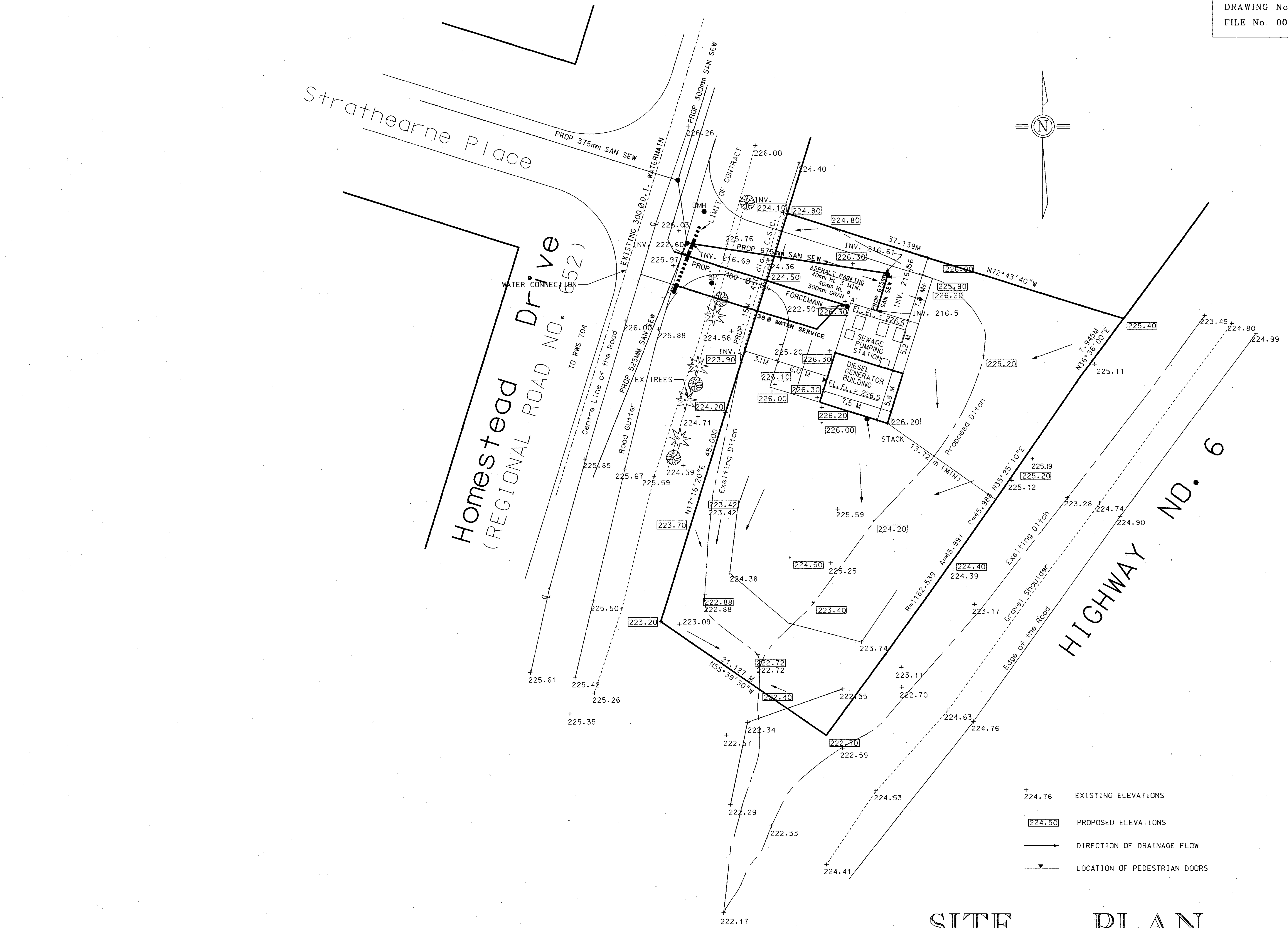
TITLE:
CAYUGA WATER SYSTEM
TRUNK WATERMAIN
(MOUNT HOPE TO CALEDONIA)
STATION 13+200.0 – 13+359.5

DRAWN BY: A.F./J.C.	SCALE: AS NOTED	DATE: FEBRUARY 1994	REV:
C'KD BY: D.C./D.P.	DRAWING No. G36		CONTRACT 3

130.17D03442 09/20/95

CONTRACT No. RHW-95-20 (S)
DRAWING No. 95-S-45
FILE No. 000-00

SHEET No.
1 of 10



SITE PLAN

1 : 200

No.	REVISIONS	INITIAL	DATE

DRAWN BY: T. HO
DATE: MARCH, 1995
REFERENCE MATERIAL:

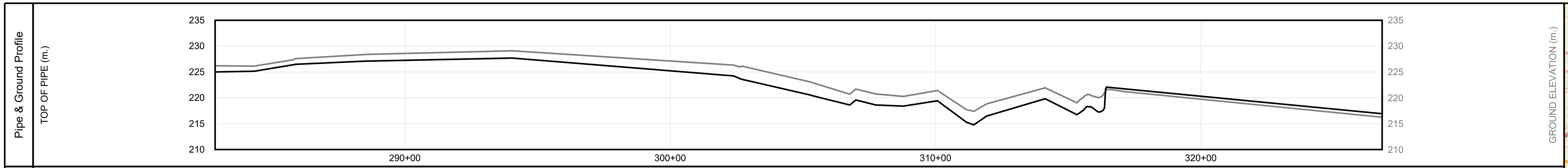
DIRECTOR

Ted Giri
COMMISSIONER OF TRANSPORTATION AND ENVIRONMENTAL SERVICES

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
TRANSPORTATION AND ENVIRONMENTAL SERVICES GROUP

PROP SEWAGE PUMPING STATION S-H27
HWY.6 & HOMESTEAD DRIVE
SITE PLAN

Pipe & Ground Profile



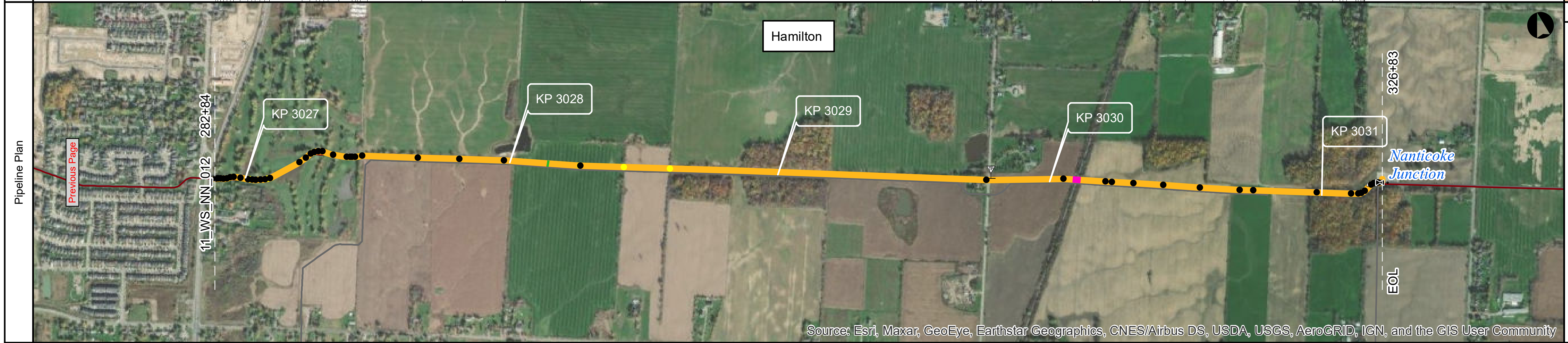
Crossings
Assumed Centerline of Crossing

284+13 TILE DRAIN
284+80 chain link fence fence installed west of Trafalgar Road
296+60 Fence
298+21 Fence
299+90 Fence

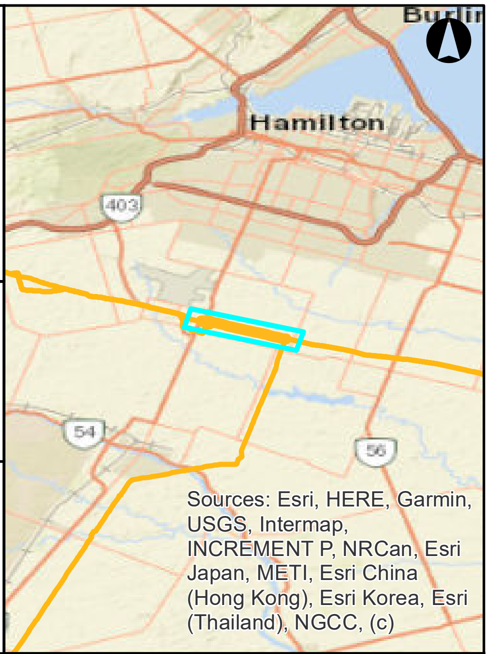
Pipe Components
Not to Scale

282+87 BEND LEFT-SAG 10°
282+94 BEND RIGHT-SAG 8°
283+05 BEND SAG
283+16 BEND LEFT-OVER 6°
283+29 BEND LEFT-SAG 12°
283+42 BEND RIGHT-OVER 11°
283+54 BEND RIGHT 13°
283+79 BEND RIGHT-SAG 4°
284+08 BEND SAG
284+22 BEND LEFT-OVER 8°
284+35 BEND LEFT 3°
284+53 BEND LEFT 3°
284+71 BEND LEFT-OVER 9°
284+89 BEND LEFT 13°
286+12 BEND LEFT 6°
286+41 BEND LEFT 5°
286+65 BEND RIGHT-SAG 14°
286+79 BEND RIGHT-OVER 15°
286+94 BEND RIGHT 13°
287+10 BEND RIGHT 13°
287+50 BEND LEFT-SAG 8°
288+01 BEND LEFT-OVER 5°
288+13 BEND SAG
288+20 BEND SAG
288+32 BEND LEFT-OVER 9°
288+58 BEND RIGHT-SAG 11°
290+63 BEND SAG
292+16 BEND RIGHT-SAG 1°
293+80 BEND RIGHT 2°
296+61 BEND LEFT 2°
311+54 BEND LEFT 3°
311+71 Test Point
314+38 BEND RIGHT 3°
315+92 BEND SAG
316+16 BEND OVER
316+95 BEND SAG
318+05 BEND SAG
319+41 BEND OVER
320+86 BEND SAG
321+37 BEND LEFT-OVER 1°
323+70 BEND OVER
324+97 BEND SAG
325+24 BEND LEFT-SAG 17°
325+35 BEND LEFT-OVER 16°
325+49 BEND LEFT-SAG 14°
325+83 BEND RIGHT-SAG 18°
325+88 Tee 508 x 406.4
325+95 BEND RIGHT-SAG 16°
326+02 BEND RIGHT-OVER 14°
326+07 BEND RIGHT-SAG 1°
326+13 BEND LEFT-OVER 1°
326+16 Tee 508 x 304.8
326+17 Flange
326+18 Valve GV,N1883.52-11-V-1

Pipeline Plan



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

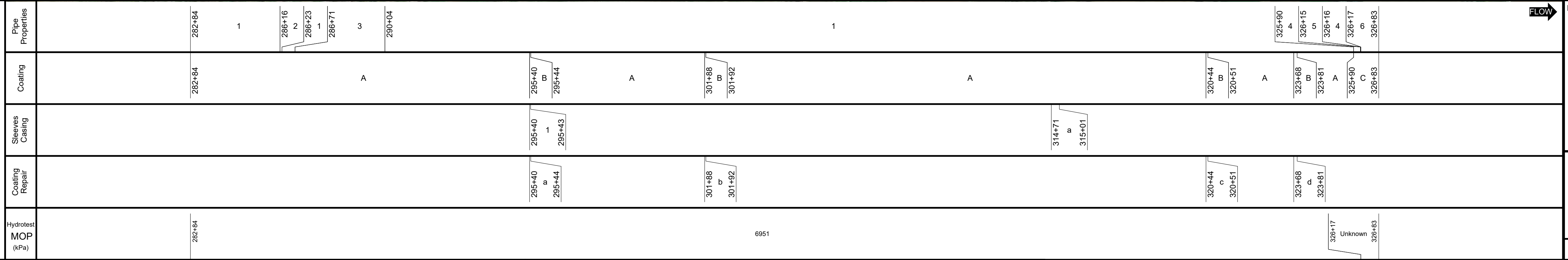


Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)

Plan View Legend

⋈	MAINLINE VALVE	⬚	ENB FACILITY
⧅	CHECK VAVLE	—	ACTIVE LINE
▶	REDUCER	—	INACTIVE LINE
⊥	TEE	—	IDLE LINE
↑	AERIAL MARKER	—	ABANDONED
MP	MILE/KILOMETRE POST		DEACTIVATED LINE
★	STATION EQUATION		
●	PIPE BEND		
●	CROSSING		
▽	RECTIFIER		
▽	TEST POINT		
▽	GALVANIC ANODE		
▽	RECTIFIER ANODE		
⬚	LAND PARCELS		
☐	PROVINCIAL LINE		
—	CASING		
—	SLEEVE		
—	OTHER ENB LINE		

Pipeline Schematic
Not to Scale



Notes:
1. Station values are based on 3D slack chainage.
2. This Drawing is provided for information only. All pipelines, facilities, appurtenances, easements, and other relevant physical features of the pipeline system depicted on this drawing are based on the best available sources at time of preparation and require field verification to determine accuracy of placement.
3. Normal valve operating position is open unless otherwise indicated.
4. The drawings should never be used as a substitute for field locates.
5. The drawings might not show every crossing.
   For additional crossing details please contact Land Services.
6. MOP is the Maximum Operating Pressure as per the Hydrotest results.
7. All crossing points assumed to represent the centerline of the crossing.
8. Pipeline Plan to scale when printed on 11"x17" paper.

Drawing produced with the most current information available to Enbridge Engineering Information Managment at time of production.
Data courtesy of Enbridge Inc. and Esri Online Data Partners
To report any issues or omissions or to request additional copies, please contact GeomaticsServices@Enbridge.com

MapScale	Generation Date	Produced By	Image Date
1:5000	8-Sep-2022	Geonamic	4/2017

Material Table

Casing

Index	Crossing Type	Length (m)
a	Unknown	30

Coating Repair

Index	Project/AFE	Date Applied
a	AFE: 1541187A31 / eDig ID: 17382	2015
b	AFE: 1341187A10 / eDig ID: 8458	2013
c	AFE: 1541187A31 / eDig ID: 17383	2015
d	AFE: 1141187A12 / eDig ID: 7902	2012

External Coating

Index	Material	Length (m)
A	Polyethylene Tape	4277
B	Epoxy/Polyurethane	28
C	Unknown	93

Pipe Properties

Index	Install	Seam	Manufacturer	WT (mm)	Grade	OD (mm)
1	1971	DSAWL	Stelco	6.35 mm	359	508
2	1971	DSAWL	Stelco	Unknown	359	508
3	1971	DSAWH	IPSCO	7.14 mm	359	508
4	Unknown	Unknown	Unknown	9.53 mm	359	508
5	Unknown	Unknown	Unknown	Unknown	359	508
6	Unknown	Unknown	Unknown	Unknown	Unknown	-1

Sleeves

Index	Type	Length (m)
1	Pressure Vessel Containment Sleeve with OS	4

Valves

Station	Valve ID	Latitude	Longitude	Type
326+18	N1883.52-11-V-1	43.13897	-79.866458	GV

FOR REFERENCE ONLY

DISCLAIMER: The information provided herein is for general information purposes only. Enbridge does not guarantee the accuracy of the information and Enbridge is not responsible for any errors, omissions or the results from the use of or reliance upon the information. Parties relying on the information herein do so entirely at their own risk. The location and depth of cover of Enbridge facilities must be positively confirmed prior to any ground disturbance.

ENBRIDGE

LINE 11 - NPS 508 & -1
FROM STA 282+84 TO STA 326+83
VALVE SECTION(S): 11VS0150, 11VS0200
CURRENT OPERATING STATUS: Operating
LINE FUNCTION: Mainline Trunk
Hamilton
Ontario

Drawing Number	Sheet
11_WS_NN_013	013

CONTRACT No. RHW-95-20 (S)
DRAWING No. 95-S-45
FILE No. 000-00

SHEET No.
1 of 10

SITE PLAN

1 : 200

No.	REVISIONS	INITIAL	DATE

DRAWN BY: T. HO
DATE: MARCH, 1995
REFERENCE MATERIAL:

DIRECTOR

COMMISSIONER OF TRANSPORTATION AND ENVIRONMENTAL SERVICES

THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH
TRANSPORTATION AND ENVIRONMENTAL SERVICES GROUP

PROP SEWAGE PUMPING STATION S-H27
HWY.6 & HOMESTEAD DRIVE
SITE PLAN

Appendix B-5 Pre-Consultation Summary

SCS consulting group ltd

MEETING MINUTES

File #: **2600**
Date: **October 12, 2023**

Project:	**White Church Secondary Plan**
Purpose:	**Water and Wastewater Master Plan Terms of Reference**
Date/Time of Meeting:	**October 6, 2023**
Location:	**Zoom**
Next Meeting:	**TBD**

	Recipient(s):	Email:
Attendees:	Mr. Mark Kehler, Hamilton	Mark.Kehler@hamilton.ca
	Mr. Gavin Norman, Hamilton	Gavin.Norman@hamilton.ca
	Ms. Melanie Pham, Hamilton	Melanie.Pham@hamilton.ca
	Mr. Timothy Winterton	Timothy.Winterton@hamilton.ca
	Mr. Matt Johnson, Urban Solutions	mjohnston@urbansolutions.info
	Mr. Scott Beedie, Urban Solutions	sbeedie@urbansolutions.info
	Ms. Lindsay Moore, SCS Consulting Group	lmoore@scsconsultinggroup.com
Absentees:	Mr. Binu Korah, Hamilton	Binu.Korah@hamilton.ca
cc:		

The following is considered to be a true and accurate record of the items discussed. Any errors or omissions in these minutes should be provided in writing to the author immediately.

Item:	**Action:**
1.0 Water and Wastewater Master Plan Terms of Reference Scope	
- Water and Wastewater Master Plan will be one combined document - Ongoing Water and Wasterwater Master Plan work which is being completed for the City does not consider the White Church Secondary Plan lands or any of the Urban Expansion lands - City is not including the Urban Expansion lands in the 2024 DC Update - Populations for the Urban Expansion areas are not yet available	Info
2.0 Water Servicing	

Item:	**Action:**
→ White Church Secondary Plan lands are located within PD6 → Water servicing analysis for the Secondary Plan will build on the City's WaterCAD model, to be provided by the City, subject to a data sharing agreement → City recommends that the Landowner Group undertake hydrant testing → City tests all hydrants on a three year schedule and can provide these hydrant testing results → City noted that water analysis should include water age, velocity, max day, peak hour, etc. → City noted that the 500 mm dia. watermain on Upper James feeds Caledonia	Info
Item:	**Action:**
3.0 Sanitary Servicing	
→ City noted that the Dickenson trunk sanitary sewer has been designed to 60% capacity, therefore, there will likely be sufficient capacity for the White Church Lands, subject to confirmation through the White Church Water and Wastewater Master Plan work → City noted that the sanitary pump stations on Upper James Street were upgraded within the last 3 years and may have some residual capacity to support a 1st Phase, to be explored through the White Church Water and Wastewater Master Plan → City has Mike Urban model of the existing sanitary sewer system which can be updated to analyze the downstream sanitary sewer system	Info

SCS Consulting Group Ltd.

Lindsay Moore, P.Eng.
Associate
lmoore@scsconsultinggroup.com

P:\2600 White Church Road Secondary Plan\Correspondence\Meetings\2023 10(Oct) 06 - Servicing.docx

Appendix B-6 ECAs

SCS consulting group ltd

Ministry
of the
Environment

Ministère
de
l'Environnement

Ontario

CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 2967-5S4HV9

1536708 Ontario Inc.
1070 Stone Church Road East, No. 41
Hamilton, Ontario
L8W 3K8

Site Location: Mount Hope Sewage Pumping Station
Lot 5, Concession 5
Hamilton City, Ontario

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

sanitary sewer, sanitary forcemain, and a sewage pumping station, in the City of Hamilton, consisting of the following:

SANITARY SEWER

to be constructed from MH 28A across Thames Way to pumping station;

SANITARY FORCEMAIN

to be constructed on Park Block 201 to Fumar Way; and

SEWAGE PUMPING STATION

a sanitary sewage pumping station located on Park block 201, having a design peak flow of 67.3 litres per second, consisting of a 3.0 metre diameter wet well equipped with two (2) submersible pumps (one duty, one standby), each pump capable of handling 67.3 litres per second against a total dynamic head of 15.2 metres, complete with float control system including a low water level and a high water level alarm, two (2) 150 millimetre diameter vents with bird screen and an electrical control panel (above surface) with an electrical connection to an emergency natural gas generator rated 80 kilowatts, including a station by-pass piping, discharging via a 250 millimetre diameter forcemain to manhole 12A located on Provident Lane, and all other items necessary to have a complete and operable pumping station;

all in accordance with the application dated July 22, 2003, signed by George A. Aldworth, P.Eng., including design brief, additional information provided by George Aldworth dated October 8, 2003, final plans and specifications and other supporting documents prepared by Aldworth Engineering Inc.

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

1. "*Act*" means the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended;

2. "*Certificate*" means this entire certificate of approval document, issued in accordance with Section 53 of the *Act*, and includes any schedules;

3. "*Director*" means any *Ministry* employee appointed by the Minister pursuant to section 5 of the *Act*;

4. "*District Manager*" means the District Manager of the Hamilton District Office of the Ministry;

5. "*Ministry*" means the Ontario Ministry of the Environment;

6. "*Owner*" means 1536708 Ontario Inc. and includes its successors and assignees;

7. "*Regional Director*" means the Regional Director of the West Central Region of the Ministry;

8. "*Substantial Completion*" has the same meaning as *"substantial performance*" in the Construction Lien Act; and

9. "*Works*" means the sewage works described in the *Owner*'s application, this *Certificate* and in the supporting documentation referred to herein, to the extent approved by this *Certificate*.

You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL CONDITIONS

1.1 The *Owner* shall ensure that any person authorized to carry out work on or operate any aspect of the *Works* is notified of this *Certificate* and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

1.2 Except as otherwise provided by these Conditions, the *Owner* shall design, build, install, operate and maintain the *Works* in accordance with the description given in this *Certificate*, the application for approval of the works and the submitted supporting documents and plans and specifications as listed in this *Certificate*.

1.3 Where there is a conflict between a provision of any submitted document referred to in this *Certificate* and the Conditions of this *Certificate*, the Conditions in this *Certificate* shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

1.4 Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

1.5 The requirements of this *Certificate* are severable. If any requirement of this *Certificate*, or the application of any requirement of this *Certificate* to any circumstance, is held invalid or unenforceable, the application of such requirement to other circumstances and the remainder of this certificate shall not be affected thereby.

2. EXPIRY OF APPROVAL

2.1 The approval issued by this *Certificate* will cease to apply to those parts of the *Works* which have not been constructed within five (5) years of the date of this *Certificate*.

3. UPON THE SUBSTANTIAL COMPLETION OF THE WORKS

3.1 Upon the *Substantial Completion* of the *Works*, the Owner shall prepare a statement, certified by a Professional Engineer, that the works are constructed in accordance with this *Certificate*, and upon request, shall make the written statement available for inspection by Ministry personnel.

3.2 Within one year of the *Substantial Completion* of the *Works*, a set of as-built drawings showing the works "as constructed" shall be prepared. These drawings shall be kept up to date through revisions undertaken from time to time and a copy shall be retained at the *Works* for the operational life of the *Works*.

4. OPERATION AND MAINTENANCE

4.1 The *Owner* shall exercise due diligence in ensuring that, at all times, the *Works* and the related equipment and appurtenances used to achieve compliance with this *Certificate* are properly operated and maintained. Proper operation and maintenance shall include effective performance, adequate funding, adequate operator staffing and training, including training in all procedures and other requirements of this *Certificate* and the *Act* and regulations, adequate laboratory facilities, process controls and alarms and the use of process chemicals and other substances used in the *Works*.

4.2 The *Owner* shall prepare an operations manual within six (6) months of *Substantial Completion* of the *Works*, that includes, but not necessarily limited to, the following information:

(a) operating procedures for routine operation of the *Works*;

(b) inspection programs, including frequency of inspection, for the *Works* and the methods or tests employed to detect when maintenance is necessary;

(c) repair and maintenance programs, including the frequency of repair and maintenance for the *Works*;

(d) procedures for the inspection and calibration of monitoring equipment;

(e) a spill prevention control and countermeasures plan, consisting of contingency plans and procedures for dealing with equipment breakdowns, potential spills and any other abnormal situations, including notification of the *District Manager*; and

(f) procedures for receiving, responding and recording public complaints, including recording any follow-up actions taken.

4.3 The *Owner* shall maintain the operations manual current and retain a copy at the location of the *Works* for the operational life of the *Works*. Upon request, the *Owner* shall make the manual available to *Ministry* staff.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the *Works* are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the *Certificate* and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review. The condition also advises the *Owners* their responsibility to notify any person they authorized to carry out work pursuant to this *Certificate* the existence of this *Certificate*.

2. Condition 2 is included to ensure that, when the *Works* are constructed, the *Works* will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment.

3. Condition 3 is included to ensure that the *Works* are constructed in accordance with the approval and that record drawings of the *Works* “as constructed” are maintained for future references.

4. Condition 4 is included to require that the *Works* be properly operated, maintained, funded, staffed and equipped such that the environment is protected and deterioration, loss, injury or damage to any person or property is prevented. As well, the inclusion of a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the *Owner* and made available to the *Ministry*. Such a manual is an integral part of the operation of the *Works*. Its compilation and use should assist the *Owner* in staff training, in proper plant operation and in identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for *Ministry* staff when reviewing the *Owner*'s operation of the *Works*.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;

6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
2300 Yonge St., 12th Floor
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

The Director
Section 53, *Ontario Water Resources Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 10th day of October, 2003

Aziz Ahmed, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

TT/
c: District Manager, MOE Hamilton - District Office
George Aldworth, Aldworth Engineering Inc.

Ministry of the Environment, Conservation and Parks
Ministère de l’Environnement, de la Protection de la nature et des Parcs

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 2627-BSEQB2
Issue Date: September 11, 2020

City of Hamilton
77 James Street North, No. 400
Hamilton, Ontario
L8R 2K3

Site Location: Homestead Sewage Pumping Station (HC027)
3359 Homestead Drive
City of Hamilton

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act , R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

alteration, usage and operation of an existing municipal sewage works, for the transmission of sanitary sewage via pumping station ultimately discharging to Woodward Wastewater Treatment Plant for treatment and disposal as follows:

Classification of Collection System: Separate Sewer Systems

Sanitary Sewage Pumping Stations
Homestead Sewage Pumping Station (HC027)

- designed for a firm capacity of 155 litres per second, consisting of a 7.5 metres x 5.8 metres rectangular concrete two (2) wet wells type sewage pumping station, equipped with three (3) submersible pumps, each rated at 91 litres per second at a Total Dynamic Head (TDH) of 16.3 metres;

including all other mechanical system, electrical system, instrumentation and control system, standby power system, piping, pumps, valves and appurtenances essential for the proper, safe and reliable operation of the Works in accordance with this Approval, in the context of process performance and general principles of wastewater engineering only;
all in accordance with the submitted supporting documents listed in Schedule A.

For the purpose of this environmental compliance approval, the following definitions apply:

1. "Approval" means this environmental compliance approval and any schedules attached to it, and the application;

2. "BOD5" (also known as TBOD5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demands;

3. "Director" means a person appointed by the Minister pursuant to section 5 of the EPA for the purposes of Part II.1 of the EPA;

4. "District Manager" means the District Manager of the appropriate local district office of the Ministry where the Works are geographically located;

5. "EPA" means the *Environmental Protection Act*, R.S.O. 1990, c.E.19, as amended;

6. "Equivalent Equipment" means alternate piece(s) of equipment that meets the design requirements and performance specifications of the piece(s) of equipment to be substituted;

7. "Event" means an action or occurrence, at a given location within the Works that causes a Overflow. An Event ends when there is no recurrence of an Overflow in the 12-hour period following the last Overflow;

8. "Existing Works" means those portions of the Works included in the Approval that have been constructed previously;

9. "Limited Operational Flexibility" (LOF) means the conditions that the Owner shall follow in order to undertake any modification that is pre-authorized as part of this Approval;

10. "Ministry" means the ministry of the government of Ontario responsible for the EPA and OWRA and includes all officials, employees or other persons acting on its behalf;

11. "Normal Operating Condition" means the condition when a pumping station is operating within its design capacity;

12. "Operating Agency" means the Owner or the entity that is authorized by the Owner for the management, operation, maintenance, or alteration of the Works in accordance with this Approval;

13. "Overflow" means a discharge of untreated sewage to the environment at designed locations from the Works;

14. "Owner" means City of Hamilton and its successors and assignees;

15. "OWRA" means the *Ontario Water Resources Act*, R.S.O. 1990, c. O.40, as

amended;

16. "Professional Engineer” means a person entitled to practice as a Professional Engineer in the Province of Ontario under a licence issued under the Professional Engineers Act;

17. "Proposed Works" means those portions of the Works included in the Approval that are under construction or to be constructed;

18. "Sanitary Sewers" means pipes that collect and convey wastewater from residential, commercial, institutional and industrial buildings, and some infiltration and inflow from extraneous sources such as groundwater and surface runoff through means other than stormwater catch basins;

19. "Separate Sewer Systems" means wastewater collection systems that comprised of Sanitary Sewers while runoff from precipitation and snowmelt are separately collected in Storm Sewers;

20. "Storm Sewers" means pipes that collect and convey runoff resulting from precipitation and snowmelt (including infiltration and inflow);

21. "Works" means the approved sewage works, and includes Proposed Works, Existing Works and modifications made under Limited Operational Flexibility.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. **GENERAL PROVISIONS**
    1. The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works is notified of this Approval and the terms and conditions herein and shall take all reasonable measures to ensure any such person complies with the same.
    2. The Owner shall design, construct, operate and maintain the Works in accordance with the conditions of this Approval.
    3. Where there is a conflict between a provision of any document referred to in this Approval and the conditions of this Approval, the conditions in this Approval shall take precedence.

2. **CHANGE OF OWNER AND OPERATING AGENCY**
    1. The Owner shall notify the District Manager and the Director, in writing, of any of the following changes within thirty (30) days of the change occurring:
        a. change of address of Owner;
        b. change of Owner, including address of new owner;
        c. change of partners where the Owner is or at any time becomes a partnership, and a copy of the most recent declaration filed under the *Business Names Act, R.S.O. 1990, c. B.17*, as amended, shall be included in the notification;
        d. change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current information filed under the *Corporations Information Act, R.S.O. 1990, c. C.39*, as amended, shall be included in the notification.
    2. The Owner shall notify the District Manager, in writing, of any of the following changes within thirty (30) days of the change occurring:
        a. change of address of Operating Agency;
        b. change of Operating Agency, including address of new Operating Agency.
    3. In the event of any change in ownership of the Works, the Owner shall notify the succeeding owner in writing, of the existence of this Approval, and forward a copy of the notice to the District Manager.
    4. The Owner shall ensure that all communications made pursuant to this condition refer to the environmental compliance approval number.
3. **CONSTRUCTION OF PROPOSED WORKS**
    1. All Proposed Works in this Approval shall be constructed and installed and must commence operation within five (5) years of issuance of this Approval, after which time the Approval ceases to apply in respect of any portions of the Works not in operation. In the event that the construction, installation and/or operation of any portion of the Proposed Works is anticipated to be delayed beyond the time period stipulated, the Owner shall submit to the Director an application to amend the Approval to extend this time period, at least six (6) months prior to the end of the period. The amendment application shall include the reason(s) for the delay and whether there is any design change(s).
    2. Within thirty (30) days of commencement of construction, the Owner shall prepare and submit to the District Manager a schedule for the completion of construction and commissioning operation of the Proposed Works. The

Owner shall notify the District Manager within thirty (30) days of the commissioning operation of any Proposed Works. Upon completion of construction of the Proposed Works, the Owner shall prepare and submit a statement to the District Manager, certified by a Professional Engineer, that the Proposed Works is constructed in accordance with this Approval.

3. Within one (1) year of completion of construction of the Proposed Works, a set of record drawings of the Works shall be prepared or updated. These drawings shall be kept up to date through revisions undertaken from time to time and a copy shall be readily accessible for reference at the Works.

4. **OVERFLOWS**
    1. Any Overflow is prohibited, except:
        a. an emergency Overflow in an emergency situation when a structural, mechanical or electrical failure causes a temporary reduction in the capacity of the Works or when an unforeseen flow condition exceeds the design capacity of the Works that is likely to result in personal injury, loss of life, health hazard, basement flooding, severe property damage, equipment damage if a portion of the flow is not overflowed;
        b. a planned Overflow that is a direct and unavoidable result of a planned repair and maintenance procedure or other circumstance(s), the Owner having notified the District Manager in writing at least fifteen (15) days prior to the occurrence of Overflow, including an estimated quantity and duration of the Overflow, an assessment of the impact on the environment and the mitigation measures if necessary, and the District Manager has given written consent of the Overflow;
    2. Notwithstanding the exceptions given in Paragraph 1, the Operating Agency shall undertake everything practicable to maximize the flow through the downstream Sewage Works prior to overflowing.
    3. At the beginning of an Overflow Event, the Owner shall immediately notify the Spills Action Centre (SAC) and the local Medical Officer of Health. This notice shall include, at a minimum, the following information:
        a. the type of the Overflow as indicated in Paragraph 1 and the reason(s) for the Overflow;
        b. the date and time of the beginning of the Overflow;
        c. the point of the Overflow from the Works and the receiver.
        d. the effort(s) done to maximize the flow through the downstream sanitary sewage system and the reason(s) why the Overflow was not avoided.
    4. Upon confirmation of the end of an Overflow Event, the Owner shall

immediately notify the Spills Action Centre (SAC) and the local Medical Officer of Health. This notice shall include, at a minimum, the following information:
   a. the date and time of the end of the Overflow;
   b. the estimated or measured volume of the Overflow.

5. For any Overflow Event at a sewage pumping station in the collection system, the Owner shall collect at least one (1) grab sample representative of the Overflow Event and have it analyzed for BOD5, total suspended solids, total phosphorus and total Kjeldahl nitrogen.
6. The Owner shall submit a summary report of the Overflow Event(s) to the District Manager on a quarterly basis, no later than each of the following dates for each calendar year: February 15, May 15, August 15, and November 15. The summary report shall contain, at a minimum, the types of information set out in Paragraphs (3), (4) and (5). If there is no Overflow Event during a quarter, a statement of no occurrence of Overflow is deemed sufficient.
7. The Owner shall develop a notification procedure in consultation with the District Manager and SAC and notify the public and downstream water users that may be adversely impacted by any Overflow Event.

5. OPERATION AND MAINTENANCE

1. The Owner shall ensure that, at all times, the Works and the related equipment and appurtenances used to achieve compliance with this Approval are properly operated and maintained. Proper operation and maintenance shall include effective performance, adequate funding, adequate staffing and training, including training in all procedures and other requirements of this Approval and the OWRA and regulations, adequate laboratory facilities, process controls and alarms and the use of process chemicals and other substances used in the Works.
2. The Owner shall prepare/update/maintain the operations manual for the Works within six (6) months of completion of construction of the Proposed Works, that includes, but not necessarily limited to, the following information:
   a. operating procedures for the Works under Normal Operating Conditions;
   b. inspection programs, including frequency of inspection, for the Works and the methods or tests employed to detect when maintenance is necessary;
   c. repair and maintenance programs, including the frequency of repair and maintenance for the Works;

    d. procedures for the inspection and calibration of monitoring equipment;
    e. operating procedures for the Works to handle situations outside Normal Operating Conditions and emergency situations such as a structural, mechanical or electrical failure, or an unforeseen flow condition, including procedures to minimize Overflows;
    f. a spill prevention and contingency plan, consisting of procedures and contingency plans, including notification to the District Manager, to reduce the risk of spills of pollutants and prevent, eliminate or ameliorate any adverse effects that result or may result from spills of pollutants;
    g. procedures for receiving, responding and recording public complaints, including recording any followup actions taken.
  3. The Owner shall maintain the operations manual up-to-date and make the manual readily accessible for reference at the Works.
  4. The Owner shall ensure that the Operating Agency fulfills the requirements under O. Reg. 129/04, as amended for the Works, including the classification of facilities, licensing of operators and operating standards.

6. **MONITORING AND RECORDING**
  1. The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following documents and all analysis shall be conducted by an accredited laboratory or as directed by the District Manager:
    a. the Ministry's Procedure F-10-1, “Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only), as amended;
    b. the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater Version 2.0" (January 2016), PIBS 2724e02, as amended;
    c. the publication "Standard Methods for the Examination of Water and Wastewater", as amended.

7. **LIMITED OPERATIONAL FLEXIBILITY**
  1. The Owner may make pre-authorized modifications to the sewage pumping stations in Works in accordance with the document “Limited Operational Flexibility - Protocol for Pre-Authorized Modifications to Municipal Sewage Works” Pumping Stations (Schedule B), as amended, subject to the following:
    a. the scope and technical aspects of the modifications are in line with

        those delineated in Schedule B and conform with the Ministry's publication "Design Guidelines for Sewage Works 2008", as amended, Ministry's regulations, policies, guidelines, and industry engineering standards;
    b. where the pre-authorized modification requires notification, a "Notice of Modifications to Sewage Works" (Schedule B), as amended shall be completed with declarations from a Professional Engineer and the Owner and retained on-site prior to the scheduled implementation date. All supporting information including technical memorandum, engineering plans and specifications, as applicable and appropriate to support the declarations that the modifications conform with LOF shall remain on-site for future inspection.
2. The following modifications are not pre-authorized under Limited Operational Flexibility:
    a. Modifications that involve an increase in capacity of the pumping station;
    b. Modifications that require changes to be made to the emergency response, spill prevention and contingency plan; or
    c. Modifications that are required pursuant to an order issued by the Ministry.

8. **REPORTING**
    1. The Owner shall, within fifteen (15) days of occurrence of a spill within the meaning of Part X of the EPA, submit a full written report of the occurrence to the District Manager describing the cause and discovery of the spill, clean-up and recovery measures taken, preventative measures to be taken and schedule of implementation, in addition to fulfilling the requirements under the EPA and O. Reg. 675/98 "Classification and Exemption of Spills and Reporting of Discharges".
    2. The Owner shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to Ministry staff.
    3. The Owner shall prepare performance reports on a calendar year basis and submit to the District Manager by March 31 of the calendar year following the period being reported upon. The reports shall contain, but shall not be limited to, the following information pertaining to the reporting period:
        a. a summary of all operating issues encountered and corrective actions taken;
        b. a summary of all normal and emergency repairs and maintenance activities carried out on any major structure, equipment, apparatus or

mechanism forming part of the Works;

c. a summary of the calibration and maintenance carried out on all monitoring equipment;

d. a summary of any complaints received and any steps taken to address the complaints;

e. a summary of Overflows, other situations outside Normal Operating Conditions and spills within the meaning of Part X of EPA and abnormal discharge events;

f. a summary of all Notice of Modifications to Sewage Works completed under Paragraph 1.b. of Condition 7, including a report on status of implementation of all modifications.

g. a summary of efforts made to achieve conformance with Procedure F-5-1 including but not limited to projects undertaken and completed in the sanitary sewer system that result in overall Overflow elimination including expenditures and proposed projects to eliminate Overflows with estimated budget forecast for the year following that for which the report is submitted.

9. **RECORD KEEPING**
    1. The Owner shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the operation, maintenance and monitoring activities required by this Approval.

Schedule A

1. Application for Environmental Compliance Approval, March 14, 2020 and received on May 6, 2020, submitted by City of Hamilton, including design report, final plans and specifications;.

Schedule B

Limited Operational Flexibility

Protocol for Pre-Authorized Modifications to Municipal Sewage Works -

Pumping Station

1. General
    1. Pre-authorized modifications are permitted only where Limited Operational

    Flexibility has already been granted in the Approval and only permitted to be made at the pumping stations in the Works, subject to the conditions of the Approval.

    2. Where there is a conflict between the types and scope of pre-authorized modifications listed in this document, and the Approval where Limited Operational Flexibility has been granted, the Approval shall take precedence.
    3. The Owner shall consult the District Manager on any proposed modifications that may fall within the scope and intention of the Limited Operational Flexibility but is not listed explicitly or included as an example in this document.
    4. The Owner shall ensure that any pre-authorized modifications will not:
        1. adversely affect the hydraulic profile of the sanitary sewage system;
        2. result in new Overflow locations, or any potential increase in frequency or quantity of Overflow.

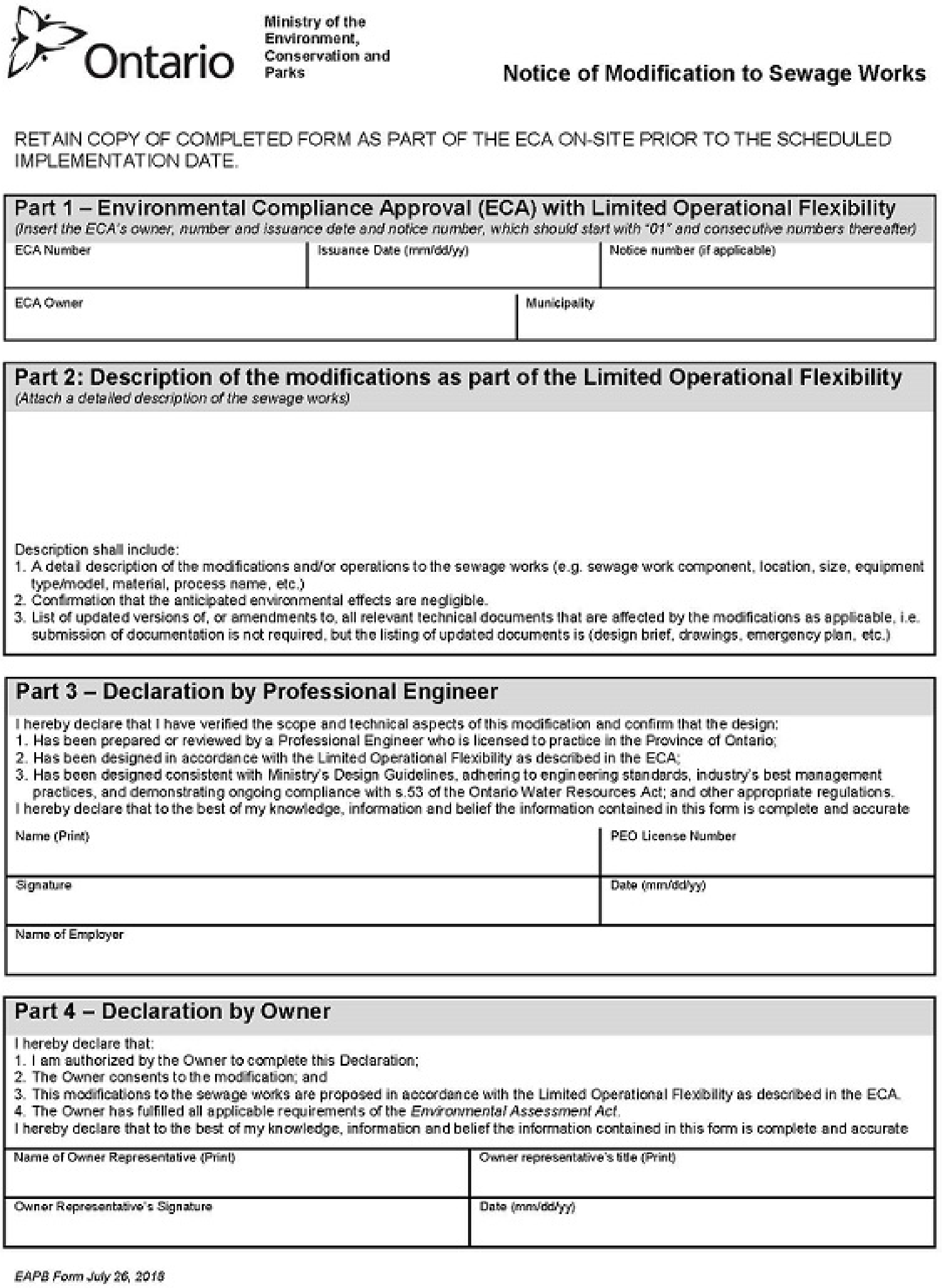
2. Modifications that do not require pre-authorization:
    1. Sewage works that are exempt from Ministry approval requirements;
    2. Modifications to the electrical system, instrumentation and control system.
3. Pre-authorized modifications that do not require preparation of “Notice of Modification to Sewage Works”
    1. Normal or emergency maintenance activities, such as repairs, renovations, refurbishments and replacements with Equivalent Equipment, or other improvements to an existing approved piece of equipment of a treatment process do not require pre-authorization. Examples of these activities are:
        - a. Repairing a piece of equipment and putting it back into operation, including replacement of minor components such as belts, gear boxes, seals, bearings;
        - b. Repairing a piece of equipment by replacing a major component of the equipment such as motor, with the same make and model or another with the same or very close power rating but the capacity of the pump or blower will still be essentially the same as originally designed and approved;
        - c. Replacing the entire piece of equipment with Equivalent Equipment.
    2. Improvements to equipment efficiency or treatment do not require pre-authorization. Examples of these activities are:
        - a. Adding variable frequency drive to pumps;
        - b. Adding flow measurement or other control device.

4. Pre-Authorized Modifications that require preparation of “Notice of Modification to Sewage Works”
    1. Pumping Stations
        a. Replacement, realignment of existing sewers including manholes, valves, gates, weirs and associated appurtenances provided that the modifications will not add new influent source(s) or result in an increase in flow from existing sources as originally approved.
        b. Extension or partition of wetwell to increase retention time for emergency response and improve station maintenance and pump operation;
        c. Replacement or installation of inlet screens to the wetwell;
        d. Replacement or installation of flowmeters, construction of station bypass;
        e. Replacement, reconfiguration or addition of pumps and modifications to pump suctions and discharge pipings provided that the modifications will not result in a reduction in the firm pumping capacity or discharge head or an increase in the peak pumping rate of the pumping station as originally designed;
        f. Replacement, realignment of existing forcemain(s) including valves, gates, and associated appurtenances provided that the modifications will not reduce the flow capacity or increase the total dynamic head and transient in the forcemain.
    2. Chemical Systems in Pumping Stations
        a. Replacement and relocation of chemical storage tanks for existing chemical systems only, provided that the tanks are sited with effective spill containment;
        b. Replacement of existing chemical dosing pumps provided that the modifications will not result in a reduction in the firm capacity that the dosing pumps are originally designed to handle.
        c. Use of an alternate chemical provided that it is a non-proprietary product and is a commonly used alternative to the chemical approved in the Works, provided that the existing chemical storage tanks, chemical dosing pumps, feed pipes and controls are also upgraded, as necessary.
    3. Standby Power System
        a. Replacement or installation of standby power system, including feed from alternate power grid, emergency power generator, fuel supply and

storage systems, provided that the existing standby power generation capacity is not reduced.

1.

This page contains an image of the form entitled "Notice of Modification to Sewage Works". A digital copy can be obtained from the District Manager.



Ministry of the Environment, Conservation and Parks

Notice of Modification to Sewage Works

RETAIN COPY OF COMPLETED FORM AS PART OF THE ECA ON-SITE PRIOR TO THE SCHEDULED IMPLEMENTATION DATE.

Part 1 – Environmental Compliance Approval (ECA) with Limited Operational Flexibility

(Insert the ECA's owner, number and issuance date and notice number, which should start with "01" and consecutive numbers thereafter)

ECA Number

Issuance Date (mm/dd/yy)

Notice number (if applicable)

ECA Owner

Municipality

Part 2: Description of the modifications as part of the Limited Operational Flexibility

(Attach a detailed description of the sewage works)

Description shall include:

1. A detail description of the modifications and/or operations to the sewage works (e.g. sewage work component, location, size, equipment type/model, material, process name, etc.)
2. Confirmation that the anticipated environmental effects are negligible.
3. List of updated versions of, or amendments to, all relevant technical documents that are affected by the modifications as applicable, i.e. submission of documentation is not required, but the listing of updated documents is (design brief, drawings, emergency plan, etc.)

Part 3 – Declaration by Professional Engineer

I hereby declare that I have verified the scope and technical aspects of this modification and confirm that the design:

1. Has been prepared or reviewed by a Professional Engineer who is licensed to practice in the Province of Ontario;
2. Has been designed in accordance with the Limited Operational Flexibility as described in the ECA;
3. Has been designed consistent with Ministry's Design Guidelines, adhering to engineering standards, industry's best management practices, and demonstrating ongoing compliance with s.53 of the Ontario Water Resources Act; and other appropriate regulations.

I hereby declare that to the best of my knowledge, information and belief the information contained in this form is complete and accurate

Name (Print)

PEO License Number

Signature

Date (mm/dd/yy)

Name of Employer

Part 4 – Declaration by Owner

I hereby declare that:

1. I am authorized by the Owner to complete this Declaration;
2. The Owner consents to the modification; and
3. This modifications to the sewage works are proposed in accordance with the Limited Operational Flexibility as described in the ECA.
4. The Owner has fulfilled all applicable requirements of the *Environmental Assessment Act*.

I hereby declare that to the best of my knowledge, information and belief the information contained in this form is complete and accurate

Name of Owner Representative (Print)

Owner representative's title (Print)

Owner Representative's Signature

Date (mm/dd/yy)

EAPB Form July 26, 2018

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 regarding general provisions is imposed to ensure that the Works are constructed and operated in the manner in which they were described and upon which approval was granted.

2. Condition 2 regarding change of Owner and Operating Agency is included to ensure that the Ministry records are kept accurate and current with respect to ownership and Operating Agency of the Works and to ensure that subsequent owners of the Works are made aware of the Approval and continue to operate the Works in compliance with it.

3. Condition 3 regarding construction of Proposed Works is included to ensure that the Works are constructed in accordance with the Approval and that record drawings of the Works "as constructed" are updated and maintained for future references.

4. Condition 4 regarding Overflows is included to indicate that Overflow of untreated or partially treated sewage to the receiver is prohibited, except in circumstances where the failure to Overflow could result in greater damage to the environment than the Overflow itself. The notification and documentation requirements allow the Ministry to take action in an informed manner and will ensure the Owner is aware of the extent and frequency of Overflow Events.

5. Condition 5 regarding operation and maintenance is included to require that the Works be properly operated, maintained, funded, staffed and equipped such that the environment is protected and deterioration, loss, injury or damage to any person or property is prevented. As well, the inclusion of a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the Owner. Such a manual is an integral part of the operation of the Works. Its compilation and use should assist the Owner in staff training, in proper plant operation and in identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for Ministry staff when reviewing the Owner's operation of the Works.

6. Condition 6 regarding monitoring and recording is included to enable the Owner to evaluate and demonstrate the performance of the Works, on a continual basis, so that the Works are properly operated and maintained.

7. Condition 7 regarding Limited Operational Flexibility is included to ensure that the Works are constructed, maintained and operated in accordance with the Approval, and that any pre-approved modification will not negatively impact on the performance of the Works.

8. Condition 8 regarding reporting is included to provide a performance record for future references, to ensure that the Ministry is made aware of problems as they arise, and to provide a compliance record for this Approval.

9. Condition 9 regarding record keeping is included to require that all records are required for a sufficient time period to adequately evaluate the long-term operation and maintenance of the Works.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 3-0580-95-006 issued on June 9, 1995

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

a. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
b. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or** www.ert.gov.on.ca

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 11th day of September, 2020

Aziz Ahmed, P.Eng.
Director
appointed for the purposes of Part II.1 of the *Environmental Protection Act*

RU/
c: District Manager, DWECD, MECP Hamilton - District
Zhiping Qiu, AECOM

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 9410-B65QRT
Issue Date: May 14, 2019

City of Hamilton
700 Woodward Avenue
Hamilton, Ontario
L8H 6P4

Site Location: Woodward Avenue Wastewater Treatment Plant (WWTP)
700 Woodward Avenue
Hamilton, Ontario
L8H 6P4

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act , R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

alteration, usage and operation of existing municipal sewage works, for the treatment of sanitary sewage and disposal of effluent to Red Hill Creek via a Sewage Treatment Plant (Woodward Avenue Wastewater Treatment Plant) and Final Effluent disposal facilities as follows:

Classification of Collection System: Partially Separated Sewer System

Classification of Sewage Treatment Plant:

Prior to Completion of Construction of Post-Secondary Treatment System: Secondary

Upon Completion of Construction of Post-Secondary Treatment System: Tertiary

Design Capacity of Sewage Treatment Plant

Design Capacity with All Treatment Trains in Operation	Prior to Completion of Construction of All Proposed Works	Upon Completion of Construction of All Proposed Works
Rated Capacity	409,000 m^3/d	409,000 m^3/d
Primary Treatment Capacity	1,300,000 m^3/d	1,300,000 m^3/d
Secondary Treatment Capacity	614,000 m^3/d (25,583 m^3/h)	614,000 m^3/d (25,583 m^3/h)
Post-Secondary Treatment Capacity	-	614,000 m^3/d (25,583 m^3/h)

Influent, Imported Sewage and Processed Organic Waste

Receiving Location	Types
In Collection System	Sanitary Sewage/Septage/Holding Tank Waste/Portable Toilet Waste/Leachate/Industrial & Commercial Wastewater
At Sewage Treatment Plant	Septage/Holding Tank Waste/sewerage maintenance cleaning materials Sludge from Dundas Wastewater Treatment Plant

Proposed Works:

Woodward Avenue Wastewater Treatment Plant

Contracts 1 and 2 (construction in progress)

Raw Sewage Pumping Station

- a 3,000 mm diameter inlet channel from the existing inlet chamber to a 22 m diameter x 25 m deep wetwell with two connected and isolatable cells;
- eight (8) constant speed pumps and four (4) variable speed pumps in the dry well, each rated at 1,967.6 L/s (170,000 m^3/d) at 20.7 m TDH;
- demolition of the existing raw sewage pumping station following commissioning of the new pumping station;

Influent Flow Measuring and Sampling Point

- flow measurement device(s) in the new raw sewage pumping station;
- automatic composite sampler located at the new raw sewage pumping station headworks conveyance channels;

Preliminary Treatment Systems

- decommissioning of the existing inlet channel flowmeters;

Contract 3 (construction to be commenced)

Secondary Treatment Systems

- **Plant Blowers**
  - one (1) additional aeration blower rated at 633.3 m^3/min, for both North and South Plants;
- **North Plant** (average daily flow 245,000 m^3/d)
  - no modification

- **South Plant** (average daily flow 164,000 m^3/d)
  - Biological Treatment
    - extensions and conversion of existing aeration tanks into two (2) 84.9 m x49.4 m x 4.9 m SWD (side water depth) aeration tanks, each equipped with fine bubble aeration system, reconfigured for operation in either plug flow or step feed mode, with the ability to provide an anoxic selector in the inlet cell;
  - Secondary Sedimentation
    - construction of two (2) additional 73.2 m x 16.6 m x 3.7 m SWD secondary clarifiers equipped with sludge and scum removal mechanisms;

Secondary Effluent Sampling Point

- decommissioning of automatic composite sampler at outlet of existing Secondary Effluent channel upon completion of construction of all Proposed Works under Contract 3;

Post-Secondary Treatment System

- five (5) coagulant tanks and dosing systems, each feeding two flocculation/filter train;
- ten (10) flocculation tanks each with three mixing zones, discharging via gravity to a dedicated cloth filter;
- ten (10) cloth disk filter trains, each with a Peak Hourly Flow Rate of 2,842 m^3/h;
- two (2) 126,000 L coagulant storage tanks and seven (7) chemical injection pumps (two standby);
- one (1) 35,000 L polymer emulsion storage tank, one (1) polymer makeup system to operate dry or liquid polymer, two (2) 10,000L mixing/makedown tanks and ten (10) metering pumps;

Disinfection System

- Chlorination
  - one (1) 99.4 m x 31.7 m x 5.1 m SWD new Final Effluent contact tank;
  - existing contact tank retained for Overflows;
- Dechlorination
  - two (2) new sodium bisulphite chemical pumps (one standby) dechlorination

  of disinfected effluent at the outlet of the new Final Effluent contact tank, each with a capacity range of 12 - 96 L/h;
  - two (2) new sodium bisulphite chemical pumps (one standby) for disinfection of Overflows at the outlet of the existing contact tank, each with a capacity range of 25 - 887 L/h;

Secondary Effluent Sampling Point

- to be decommissioned;

Final Effluent Sampling

- two (2) automatic samplers (one standby), located downstream of new Final Effluent contact tank;

Sludge Management System

- **Sludge Dewatering**
  - decommissioning of holding bins and screw conveyor system to the biosolids truck loading facility upon completion of the new biosolids management facility;
- **Biosolids Truck Loading Facility**
  - decommissioning of the biosolids truck loading facility upon completion of the new biosolids management facility;

Final Effluent Disposal Facilities

Contract 3 (construction to be commenced)

a new twin 2.0 m x 2.7 m outfall sewer for Final Effluent discharging to the Red Hill Creek upstream of the existing outfall;

existing primary outfall to be retained for Overflows;

decommissioning of the existing maintenance/emergency outfall;

Existing Works:

Woodward Avenue Wastewater Treatment Plant

Inlet Chamber

- one (1) inlet chamber receiving sewage from the 2,250 mm diameter sanitary trunk sewer (western interceptor) and the 2,590 mm diameter sanitary trunk sewer (eastern interceptor), and discharging to the raw sewage pumping station wetwell;

Imported Sewage Receiving Station

- two (2) bays for receiving septic sewage hauler trucks, with two (2) 45.4 m^3 septic holding tanks each with automatically controlled sluice gate;
- one (1) dump trailer bay for receiving cleanings from sewer maintenance;
- a wet well equipped with two (2) submersible sewage grinder pumps (one standby), each rated at 31.5 L/s at 9.14 m TDH and forcemain discharging to the inlet sewer to the Sewage Treatment Plant;

Raw Sewage Pumping Station (to be decommissioned)

- one (1) 12 m diameter x 23 m deep wetwell;
- five (5) constant speed pumps and three (3) variable speed pumps, each rated at 220,000 m^3/d at 24 m TDH;

Influent Flow Measuring and Sampling Point (to be decommissioned)

- flowmeters in each of the inlet channels to the preliminary treatment systems;
- automatic composite sampler located in the raw sewage pumping station;

Preliminary Treatment Systems

- overflow pipe prior to screening, discharging to the existing outfall pipe downstream of the existing contact tank before the existing Final Effluent sampling point;
- Screening
  - four (4) mechanically cleaned screens, each with a Peak Instantaneous Flow Rate of 5,208 L/s (450,000 m^3/d);
- Grit Removal
  - six (6) vortex grit separators, each with a Peak Instantaneous Flow Rate of 11,042 m^3/h (265,000 m^3/d);
  - grit and screenings collection and compaction system;
- overflow pipe after grit removal, discharging to the existing outfall pipe downstream of the existing contact tank before the existing Final Effluent sampling point;

Primary Treatment System

- overflow pipe prior to primary treatment, discharging to the existing contact tank;
- fourteen (14) 76.2 m x 12.5 m x 3.4 m SWD primary clarifiers each with a Peak Daily Flow Rate of 108,333 m^3/d and equipped with sludge and scum collection systems;
- eight (8) primary sludge pumps with grinders;
- coarse bubble aeration system in the inlet channels to the primary clarifiers;
- two (2) channel aeration blowers, each with a capacity of 75 m^3/min;
- overflow pipe after primary treatment, discharging to the existing contact tank;

Secondary Treatment System

- **Plant Blowers**
  - three (3) air blowers, each rated at 637 m^3/min, for both North and South Plants;
- **North Plant** (average daily flow 273,000 m^3/d)
  - Biological Treatment
    - eight (8) 109.8 m x 18.3 m x 4.7 m SWD aeration tanks, each having six cells equipped with fine bubble aeration system, configured for plug flow or step feed, with the ability to provide an anoxic selector in the first cell;
  - Secondary Sedimentation
    - eight (8) 36.6 m x 36.6 m x 3 m SWD secondary clarifiers equipped with sludge removal mechanism;
    - four (4) return activated sludge (RAS) pumps, each rated at 68,000 m^3/d;
- **South Plant** (average daily flow 136,000 m^3/d)
  - Biological Treatment
    - four (4) 33.5 m x 33.5 m x 4.9 m SWD aeration tanks, each equipped with fine bubble aeration system, configured for complete mix with center feed, with the ability to provide an anoxic selector in the feed well;
  - Secondary Sedimentation
    - four (4) 73.2 m x 16.6 m x 3.7 m SWD secondary clarifiers equipped with sludge and scum removal mechanisms;
    - two (2) return activated sludge (RAS) pumps, each rated at 68,000 m^3/d;

Secondary Effluent Sampling (to be decommissioned)

- automatic composite sampler at outlet of Secondary Effluent channel;

Supplementary Treatment Systems

- Phosphorus Removal
  - three (3) 126 m^3 phosphorus removal chemical storage tanks in spill containment and six (6) chemical feed pumps with a capacity of 602 L/h and chemical dosing points in the preliminary treatment inlet channels and post aeration tanks;

- Chemically Enhanced Primary Treatment System
  - a polymer make system, two (2) 20 m^3 capacity polymer mix tanks in spill containment and six (6) polymer feed pumps with a capacity of 22 L/min - 220 L/min feeding polymer to the primary clarifier influent channels;

Disinfection System

- Chlorination
  - one (1) 25.2 m x 76.8 m x 5.0 m SWD, 8,200 m^3 contact tank;
  - chlorinators located in the Woodward Water Treatment Plant, including chlorine gas supply pipes from the water treatment plant to the Sewage Treatment Plant:
    - two (2) 4,500 kg/d chlorinators for chlorine dosage to the existing contact tank;
    - one (1) 1,350 kg/d chlorinator for chlorine dosage to the new post-secondary treatment system for cleaning and maintenance;
    - two (1) 1,350 kg/d chlorinator for chlorine dosage to the new Final Effluent contact tank and for RAS sludge bulking control;

- Dechlorination
  - two (2) 50 m^3 sodium bisulphite chemical storage tanks in spill containment
  - two (2) sodium bisulphite pumps (to be replaced), each with capacity of 174 L/h, for dechlorination of disinfected effluent from the existing contact tank;

Final Effluent Sampling

- automatic sampler located downstream of existing contact tank (to be decommissioned);

Sludge Management System

- **Imported Waste Station**
  - one (1) 8.0 m x 4.0 m x 4.25 m SWD holding tank to accept waste imported from Dundas Wastewater Treatment Plant;
  - two (2) pumps with grinders for transfer to the anaerobic digesters;
- **Primary Sludge and Waste Activated Sludge Thickening Facility**
  - one (1) 700 m^3 primary sludge equalization tank with two cells equipped with intermittent aeration mixing system;
  - two (2) gravity belt thickener feed pumps for primary sludge (one standby) equipped with VFD;
  - one (1) 700 m^3 waste activated sludge equalization tank with two cells (currently not in use);
  - one (1) 128 m^3 thickened sludge blend tank with intermittent aeration mixing system;
  - two (2) polymer make-up systems for primary sludge (one standby) capable of operating with dry polymer or liquid polymer and three (3) polymer feed pumps (one standby) equipped with VFD;
  - three (3) blowers (1 standby) for the intermittent mixing systems in the primary sludge equalization tank and thickened sludge blend tank;
  - four (4) digester feed pumps for blended thickened sludge (one standby) equipped with VFD;
- **Old Waste Activated Sludge Thickening Facility**
  - two (2) waste activated sludge holding tanks;
  - four (4) waste activated sludge pumps with VFD;
  - one (1) polymer makeup system to operate dry polymer or liquid polymer, two (2) polymer holding tanks and four (4) polymer dosage pumps with VFD;
  - three (3) gravity belt thickeners, each rated at 3,715 m3/d
  - four (4) digester feed pumps for thickened waste activated sludge;
- **Anaerobic Sludge Digestion**
  - North Digesters
    - three (3) 32 m diameter, 7,705 m^3 primary digesters;
    - one (1) 32 m diameter, 8,363 m^3 secondary digester;
  - South Digesters
    - two (2) 32 m diameter, 7,705 m^3 primary digesters;

    - two (2) 32 m diameter, 8,363 m^3 secondary digesters;

- **Sludge Dewatering**
    - four (4) centrifuge feed pumps (one standby) each rated at 80 m^3/h;
    - four (4) centrifuges (one standby) each rated at 70 m^3/h;
    - four (4) polymer feed pumps (one standby) each rated at 4.5 m^3/h;
    - two (2) cake pumps (one standby) each rated at 22.7 m^3/h;
    - dewatered cake screw conveyor system;
    - sludge transfer to loading area including holding bins and screw conveyor system to the Biosolids Truck Loading Facility (to be decommissioned);
- **Bioaugmentation Process**
    - a 2.4 m diameter wetwell centrate pump station equipped with two (2) submersible pumps (one standby), each pump rated at 26 L/s at 6 m TDH, discharging to the centrate bioaugmentation tank;
    - a centrate bioaugmentation tank equipped with fine bubble aeration system and two (2) submersible pumps, each pump rated at 46 L/s at 4 m TDH conveying the centrate bioaugmentation tank effluent to the primary clarifiers effluent channel;
    - an optional chemical feed system comprising of a chemical storage tank and a chemical metering pump to add ethanol, soda ash or an alternate alkalinity source to improve the bioaugmentation process;
    - an optional recycle pumping system to recycle effluent from centrate bioaugmentation tank to the first cell of the tank;
- **Biosolids Truck Loading Facility** (to be decommissioned)
    - an enclosed truck loading facility for dewatered biosolids cake;

Final Effluent Disposal Facilities

634 m long, 2.44 m wide and 1.83 m deep box culvert followed by 378 m long, 3.66 m wide and 2.13 m deep box culvert discharging to the Red Hill Creek (to be retained for Overflows);

500 m long, 3 m wide and 3 m deep box culvert for maintenance/emergency situations discharging to the Red Hill Creek (to be decommissioned);

including all other mechanical system, electrical system, instrumentation and control system, standby power system, piping, pumps, valves and appurtenances essential for the proper, safe and reliable operation of the Works in accordance with this Approval, in the context of process performance and general principles of wastewater engineering only;

all in accordance with the submitted supporting documents listed in Schedule A.

For the purpose of this environmental compliance approval, the following definitions apply:

1. "Annual Average Effluent Concentration" is the mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar year, calculated and reported as per the methodology specified in Schedule F;

2. "Annual Average Daily Effluent Flow" means the cumulative total Final Effluent discharged during a calendar year divided by the number of days during which Final Effluent was discharged that year;

3. "Annual Average Daily Effluent Loading" means the value obtained by multiplying the Annual Average Effluent Concentration of a contaminant by the Annual Average Daily Effluent Flow over the same calendar year;

4. "Annual Average Daily Influent Flow" means the cumulative total sewage flow of Influent to the Sewage Treatment Plant during a calendar year divided by the number of days during which sewage was flowing to the Sewage Treatment Plant that year;

5. "Approval" means this environmental compliance approval and any schedules attached to it, and the application;

6. "BOD5" (also known as TBOD5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demands;

7. "Bypass" means diversion of sewage around one or more treatment processes, excluding Preliminary Treatment System, within the Sewage Treatment Plant with the diverted sewage flows being returned to the Sewage Treatment Plant treatment train upstream of the Final Effluent sampling point(s) and discharged via the approved effluent disposal facilities;

8. "CBOD5" means five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample;

9. "Combined Sewers" means pipes that collect and convey both wastewater from

residential, commercial, institutional and industrial buildings and facilities (including infiltration and inflow) and stormwater runoff through a single-pipe system;

10. "Combined Sewer Overflow" (CSO) means a discharge to the environment from a Combined Sewer System that usually occurs as a result of a precipitation event when the capacity of the Combined Sewer is exceeded. An intervening time of twelve hours or greater separating a CSO from the last prior CSO at the same location is considered to separate one overflow event from another;

11. "Combined Sewer Systems" means collection systems that contains Combined Sewers and includes Combined Sewer Overflow structures if any, and also includes Partially Separated Sewer Systems in which roof leaders or foundation drains still contribute stormwater inflow to the sewer system conveying sanitary flows;

12. "Director" means a person appointed by the Minister pursuant to section 5 of the EPA for the purposes of Part II.1 of the EPA;

13. "District Manager" means the District Manager of the appropriate local district office of the Ministry where the Works is geographically located;

14. "*E. coli*" refers to the thermally tolerant forms of Escherichia that can survive at 44.5 degrees Celsius;

15. "EPA" means the *Environmental Protection Act*, R.S.O. 1990, c.E.19, as amended;

16. "Equivalent Equipment" means alternate piece(s) of equipment that meets the design requirements and performance specifications of the piece(s) of equipment to be substituted;

17. "Event" means an action or occurrence, at a given location within the Works that causes a Bypass or Overflow. An Event ends when there is no recurrence of Bypass or Overflow in the 12-hour period following the last Bypass or Overflow. Overflows and Bypasses are separate Events even when they occur concurrently;

18. “Existing Works” means those portions of the Works included in the Approval that have been constructed previously;

19. "Final Effluent" means effluent that is discharged to the environment through the approved effluent disposal facilities, including all Bypasses, that are required to meet the compliance limits stipulated in the Approval for the Sewage Treatment Plant at the Final Effluent sampling point(s);

20. "Imported Sewage" means sewage hauled to the Sewage Treatment Plant by licensed waste management system operators of the types and quantities approved for co-treatment in the Sewage Treatment Plant, including hauled sewage and leachate within the meaning of R.R.O. 1990, Regulation 347: General – Waste Management, as amended;

21. "Influent" means flows to the Sewage Treatment Plant from the collection system and Imported Sewage;

22. "Limited Operational Flexibility" (LOF) means the conditions that the Owner shall follow in order to undertake any modification that is pre-authorized as part of this Approval;

23. "Ministry" means the ministry of the government of Ontario responsible for the EPA and OWRA and includes all officials, employees or other persons acting on its behalf;

24. "Monthly Average Effluent Concentration" is the mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar month, calculated and reported as per the methodology specified in Schedule F;

25. "Monthly Average Daily Effluent Flow" means the cumulative total Final Effluent discharged during a calendar month divided by the number of days during which Final Effluent was discharged that month;

26. "Monthly Average Daily Effluent Loading" means the value obtained by multiplying the Monthly Average Effluent Concentration of a contaminant by the Monthly Average Daily Effluent Flow over the same calendar month;

27. "Monthly Geometric Mean Density" is the mean of all Single Sample Results of *E.coli* measurement in the samples taken during a calendar month, calculated and reported as per the methodology specified in Schedule F;

28. “Normal Operating Condition” means the condition when all unit process(es), excluding Preliminary Treatment System, in a treatment train is operating within its design capacity;

29. “Operating Agency” means the Owner or the entity that is authorized by the Owner for the management, operation, maintenance, or alteration of the Works in accordance with this Approval;

30. "Overflow" means a discharge to the environment from the Works at designed

location(s) other than the approved effluent disposal facilities or via the effluent disposal facilities downstream of the Final Effluent sampling point;

31. "Owner" means City of Hamilton and its successors and assignees;

32. "OWRA" means the *Ontario Water Resources Act*, R.S.O. 1990, c. O.40, as amended;

33. "Partially Separated Sewer Systems" means wastewater collection systems that originally had Combined Sewers and where either only a portion of a system was retrofitted to separate sewers, or in which roof leaders or foundation drains still contribute stormwater inflow to the separated sewer conveying sanitary sewage, and/or a new development area served by separate sewers was added to an area served by Combined Sewers;

34. "Peak Daily Flow Rate" (also referred to as maximum daily flow or maximum day flow) means the largest volume of flow to be received during a one-day period for which the sewage treatment process unit or equipment is designed to handle;

35. "Peak Hourly Flow Rate" (also referred to as maximum hourly flow or maximum hour flow) means the largest volume of flow to be received during a one-hour period for which the sewage treatment process unit or equipment is designed to handle;

36. "Peak Instantaneous Flow Rate" means the instantaneous maximum flow rate as measured by a metering device for which the sewage treatment process unit or equipment is designed to handle;

37. “Preliminary Treatment System” means all facilities in the Sewage Treatment Plant associated with screening and grit removal;

38. “Primary Effluent” means the effluent from the Primary Treatment System;

39. “Primary Treatment System” means all facilities in the Sewage Treatment Plant associated with the primary sedimentation unit process and includes chemically enhanced primary treatment;

40. “Processed Organic Waste” means organic waste within the meaning of R.R.O. 1990, Regulation 347: General – Waste Management, as amended, that is hauled to the Sewage Treatment Plant of the types and quantities approved for co-processing in the sludge management system;

41. "Professional Engineer” means a person entitled to practice as a Professional

Engineer in the Province of Ontario under a licence issued under the Professional Engineers Act;

42. "Proposed Works" means those portions of the Works included in the Approval that are under construction or to be constructed;

43. "Rated Capacity" means the Annual Average Daily Influent Flow for which the Sewage Treatment Plant is designed to handle;

44. “Secondary Effluent” means the effluent from the Secondary Treatment System that are required to meet the compliance limits stipulated in the Approval for the Sewage Treatment Plant at the Secondary Effluent sampling point;

45. “Secondary Treatment System” means all facilities in the Sewage Treatment Plant associated with biological treatment, secondary sedimentation and phosphorus removal unit processes;

46. “Sewage Treatment Plant" means all the facilities related to sewage treatment within the sewage treatment plant site excluding the Final Effluent disposal facilities;

47. “Single Sample Result" means the test result of a parameter in the effluent discharged on any day, as measured by a probe, analyzer or in a composite or grab sample, as required;

48. "Works" means the approved sewage works, and includes Proposed Works, Existing Works and modifications made under Limited Operational Flexibility.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. **GENERAL PROVISIONS**

2. The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works is notified of this Approval and the terms and conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

3. The Owner shall design, construct, operate and maintain the Works in accordance with the conditions of this Approval.

4. Where there is a conflict between a provision of any document referred to in this Approval and the conditions of this Approval, the conditions in this Approval shall take precedence.

5. **CHANGE OF OWNER AND OPERATING AGENCY**

6. The Owner shall, within thirty (30) calendar days of issuance of this Approval, prepare/update and submit to the District Manager the Municipal and Local Services Board Wastewater System Profile Information Form, as amended (Schedule G) under any of the following situations:

   a. the form has not been previously submitted for the Works;
   b. this Approval is issued for extension, re-rating or process treatment upgrade of the Works;
   c. when a notification is provided to the District Manager in compliance with requirements of change of Owner or Operating Agency under this condition.

7. The Owner shall notify the District Manager and the Director, in writing, of any of the following changes within thirty (30) days of the change occurring:

   a. change of address of Owner;
   b. change of Owner, including address of new owner;
   c. change of partners where the Owner is or at any time becomes a partnership, and a copy of the most recent declaration filed under the *Business Names Act, R.S.O. 1990, c. B.17*, as amended, shall be included in the notification;
   d. change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current information filed under the *Corporations Information Act, R.S.O. 1990, c. C.39*, as amended, shall be included in the notification.

8. The Owner shall notify the District Manager, in writing, of any of the following changes within thirty (30) days of the change occurring:

   a. change of address of Operating Agency;
   b. change of Operating Agency, including address of new Operating Agency.

9. In the event of any change in ownership of the Works, the Owner shall notify the succeeding owner in writing, of the existence of this Approval, and forward a copy of the notice to the District Manager.

10. The Owner shall ensure that all communications made pursuant to this condition

refer to the environmental compliance approval number.

11. **CONSTRUCTION OF PROPOSED WORKS**

12. All Proposed Works for Contract 1 and 2 in this Approval shall be constructed and installed and must commence operation by September 9, 2021. All Proposed Works for Contract 3 in this Approval shall be constructed and installed and must commence operation by September 9, 2023, after which time the Approval ceases to apply in respect of any portions of the Works not in operation. In the event that the construction, installation and/or operation of any portion of the Proposed Works is anticipated to be delayed beyond the time period stipulated in paragraph 1 of this condition, the Owner shall submit to the Director an application to amend the Approval to extend this time period, at least six (6) months prior to the end of the period. The amendment application shall include the reason(s) for the delay and whether there is any design change(s).

13. Within thirty (30) days of commencement of construction, the Owner shall prepare and submit to the District Manager a schedule for the completion of construction and commissioning operation of the Proposed Works. The Owner shall notify the District Manager within thirty (30) days of the commissioning operation of any Proposed Works. Upon completion of construction of the Proposed Works, the Owner shall prepare and submit a statement to the District Manager, certified by a Professional Engineer, that the Proposed Works is constructed in accordance with this Approval.

14. Within one (1) year of completion of construction of the Proposed Works, a set of record drawings of the Works shall be prepared or updated. These drawings shall be kept up to date through revisions undertaken from time to time and a copy shall be readily accessible for reference at the Works.

15. **BYPASSES**

16. Any Bypass is prohibited, except:

a. an emergency Bypass when a structural, mechanical or electrical failure causes a temporary reduction in the capacity of a treatment process or when an unforeseen flow condition exceeds the design capacity of a treatment process that is likely to result in personal injury, loss of life, health hazard, basement flooding, severe property damage, equipment damage or treatment process upset, if a portion of the flow is not bypassed;

b. a planned Bypass that is a direct and unavoidable result of a planned repair and maintenance procedure or other circumstance(s), the Owner having notified the District Manager in writing at least fifteen (15) days prior to the occurrence of

Bypass, including an estimated quantity and duration of the Bypass, an assessment of the impact on the quality of the Final Effluent and the mitigation measures if necessary, and the District Manager has given written consent of the Bypass;

c. a designed Bypass under the following conditions:
   i. Bypass the Secondary Treatment System when the flow rate to this system exceeds 614,000 m^3/d (25,583 m^3/h) prior to completion of construction of Contract 3;
   ii. Bypass the Post-Secondary Treatment System when the flow rate to this system exceeds 614,000 m^3/d (25,583 m^3/h) upon completion of construction of Contract 3;

17. Notwithstanding the exceptions given in Paragraph 1, the Operating Agency shall undertake everything practicable to maximize the flow through the downstream treatment process(es) prior to bypassing.

18. At the beginning of a Bypass Event, the Owner shall immediately notify the Spills Action Centre (SAC) and the local Medical Officer of Health. This notice shall include, at a minimum, the following information:

a. the type of the Bypass as indicated in Paragraph 1 and the reason(s) for the Bypass;
b. the date and time of the beginning of the Bypass;
c. the treatment process(es) gone through prior to the Bypass and the treatment process(es) bypassed;
d. the effort(s) done to maximize the flow through the downstream treatment process(es) and the reason(s) why the Bypass was not avoided.

19. Upon confirmation of the end of a Bypass Event, the Owner shall immediately notify the Spills Action Centre (SAC) and the local Medical Officer of Health. This notice shall include, at a minimum, the following information:

a. the date and time of the end of the Bypass;
b. the estimated or measured volume of Bypass.

20. For any Bypass Event, the Owner shall collect daily sample(s) of the Final Effluent, inclusive of the Event and analyze for all effluent parameters outlined in Compliance Limits condition that require composite samples, following the same protocol specified in the Monitoring and Recording condition for the regular samples. The sample(s) shall be in addition to the regular Final Effluent samples required under the monitoring and recording condition. If the Event occurs on a scheduled monitoring day, the regular

sampling requirements prevail. If representative sample for the effluent parameter(s) that require grab sample cannot be obtained, they shall be collected after the Event at the earliest time when situation returns to normal.

21. The Owner shall submit a summary report of the Bypass Event(s) to the District Manager on a quarterly basis, no later than each of the following dates for each calendar year: February 15, May 15, August 15, and November 15. The summary reports shall contain, at a minimum, the types of information set out in Paragraphs (3), (4) and (5) and either a statement of compliance or a summary of the non-compliance notifications submitted as required under Paragraph 1 of Condition 11. If there is no Bypass Event during a quarter, a statement of no occurrence of Bypass is deemed sufficient.

22. The Owner shall develop a notification procedure in consultation with the District Manager and SAC and notify the public and downstream water users that may be adversely impacted by any Bypass Event.

23. OVERFLOWS

24. Any Overflow is prohibited, except:

a. an emergency Overflow in an emergency situation when a structural, mechanical or electrical failure causes a temporary reduction in the capacity of the Works or when an unforeseen flow condition exceeds the design capacity of the Works that is likely to result in personal injury, loss of life, health hazard, basement flooding, severe property damage, equipment damage or treatment process upset, if a portion of the flow is not overflowed;

b. a planned Overflow that is a direct and unavoidable result of a planned repair and maintenance procedure or other circumstance(s), the Owner having notified the District Manager in writing at least fifteen (15) days prior to the occurrence of Overflow, including an estimated quantity and duration of the Overflow, an assessment of the impact on the environment and the mitigation measures if necessary, and the District Manager has given written consent of the Overflow;

c. a designed Overflow under the following flow conditions:
   i. Overflow from the Preliminary Treatment System when flow rate to the Primary Treatment System exceeds 1,300,000 m^3/d;
   ii. Overflow from the Primary Treatment System when flow rate to the Secondary Treatment System exceeds 614,000 m^3/d (25,583 m^3/h) upon completion of construction of Contract 3;

25. Notwithstanding the exceptions given in Paragraph 1, the Operating Agency shall undertake everything practicable to maximize the flow through the downstream treatment process(es) and Bypass(es) prior to overflowing.

26. At the beginning of an Overflow Event, the Owner shall immediately notify the Spills Action Centre (SAC) and the local Medical Officer of Health. This notice shall include, at a minimum, the following information:

a. the type of the Overflow as indicated in Paragraph 1 and the reason(s) for the Overflow;

b. the date and time of the beginning of the Overflow;

c. the point of the Overflow from the Works, the treatment process(es) gone through prior to the Overflow, the disinfection status of the Overflow and whether the Overflow is discharged through the effluent disposal facilities or an alternate location;

d. the effort(s) done to maximize the flow through the downstream treatment process(es) and Bypass(es) and the reason(s) why the Overflow was not avoided.

27. Upon confirmation of the end of an Overflow Event, the Owner shall immediately notify the Spills Action Centre (SAC) and the local Medical Officer of Health. This notice shall include, at a minimum, the following information:

a. the date and time of the end of the Overflow;

b. the estimated or measured volume of the Overflow.

28. For any Overflow Event

a. in the Sewage Treatment Plant, the Owner shall collect grab sample(s) of the Overflow, one near the beginning of the Event and one every eight (8) hours for the duration of the Event, and have them analyzed at least for CBOD5, total suspended solids, total phosphorus, total ammonia nitrogen, nitrate as N, nitrite as N, total Kjeldahl nitrogen, *E. coli.*, total residual chlorine, except that raw sewage and primary effluent Overflow shall be only be analyzed for BOD5, total suspended solids, total phosphorus, total Kjeldahl nitrogen, and between May 15 - October 15, *E. coli.*and total residual chlorine also.

29. The Owner shall submit a summary report of the Overflow Event(s) to the District Manager on a quarterly basis, no later than each of the following dates for each calendar year: February 15, May 15, August 15, and November 15. The summary report shall contain, at a minimum, the types of information set out in Paragraphs (3), (4) and (5). If there is no Overflow Event during a quarter, a statement of no occurrence of Overflow is deemed sufficient.

30. The Owner shall develop a notification procedure in consultation with the District Manager and SAC and notify the public and downstream water users that may be

adversely impacted by any Overflow Event.

31. DESIGN OBJECTIVES

32. The Owner shall design and undertake everything practicable to operate the Sewage Treatment Plant in accordance with the following objectives:

a. Primary Effluent Overflow, Secondary Effluent and Final Effluent parameters design objectives listed in the table(s) included in Schedule B;
b. Final Effluent is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film or sheen or foam or discolouration on the receiving waters;
c. Total Residual Chlorine (TRC) in the Final Effluent shall be non-detectable as measured by a method with a sensitivity of at least 0.02 mg/L. Normal operation of de-chlorination equipment should provide for an excess of reagents to ensure that total chlorine residuals are not detected;
d. Annual Average Daily Influent Flow is within the Rated Capacity of the Sewage Treatment Plant.

33. COMPLIANCE LIMITS

1. The Owner shall operate and maintain the Sewage Treatment Plant such that compliance limits for the Secondary Effluent and Final Effluent parameters listed in the table(s) included in Schedule C are met.

2. The Owner shall operate and maintain the Sewage Treatment Plant such that the Primary Effluent Overflow and Final Effluent is continuously disinfected during the disinfection period from May 15 to October 15 of each year.

34.

OPERATION AND MAINTENANCE

1. The Owner shall ensure that, at all times, the Works and the related equipment and appurtenances used to achieve compliance with this Approval are properly operated and maintained. Proper operation and maintenance shall include effective performance, adequate funding, adequate staffing and training, including training in all procedures and other requirements of this Approval and the OWRA and regulations, adequate laboratory facilities, process controls and alarms and the use of process chemicals and other substances used in the Works.

2. The Owner shall prepare/update the operations manual for the Works within six (6) months of completion of construction of the Proposed Works, that includes, but not necessarily limited to, the following information:

a. operating procedures for the Works under Normal Operating Conditions;
b. inspection programs, including frequency of inspection, for the Works and the methods or tests employed to detect when maintenance is necessary;
c. repair and maintenance programs, including the frequency of repair and maintenance for the Works;
d. procedures for the inspection and calibration of monitoring equipment;
e. operating procedures for the Works to handle situations outside Normal Operating Conditions and emergency situations such as a structural, mechanical or electrical failure, or an unforeseen flow condition, including procedures to minimize Bypasses and Overflows;
f. a spill prevention and contingency plan, consisting of procedures and contingency plans, including notification to the District Manager, to reduce the risk of spills of pollutants and prevent, eliminate or ameliorate any adverse effects that result or may result from spills of pollutants;
g. procedures for receiving, responding and recording public complaints, including recording any followup actions taken.

3. The Owner shall maintain the operations manual up-to-date and make the manual readily accessible for reference at the Works.

4. The Owner shall ensure that the Operating Agency fulfills the requirements under O. Reg. 129/04, as amended for the Works, including the classification of facilities, licensing of operators and operating standards.

35. MONITORING AND RECORDING

36. The Owner shall, upon commencement of operation of the Works, carry out a scheduled monitoring program of collecting samples at the required sampling points, at the frequency specified or higher, by means of the specified sample type and analyzed for each parameter listed in the tables under the monitoring program included in Schedule D and record all results, as follows:

a. all samples and measurements are to be taken at a time and in a location characteristic of the quality and quantity of the sewage stream over the time period being monitored.
b. a schedule of the day of the week/month for the scheduled sampling shall be

created. The sampling schedule shall be revised and updated every year through rotation of the day of the week/month for the scheduled sampling program, except when the actual scheduled monitoring frequency is three (3) or more times per week.

c. definitions and preparation requirements for each sample type are included in document referenced in Paragraph 3.b.

d. definitions for frequency:
   i. Daily means once every day;
   ii. Weekly means once every week;
   iii. Monthly means once every month;
   iv. Quarterly means once every three months;
   v. Annually means once every year.

37. In addition to the scheduled monitoring program required in Paragraph 1, the Owner shall collect daily sample(s) of the Final Effluent, on any day when there is any situation outside Normal Operating Conditions, and analyze for all effluent parameters outlined in Compliance Limits condition that require composite samples, following the same protocol specified in this condition for the regular samples. If the Event occurs on a scheduled monitoring day, the regular sampling requirements prevail. If representative sample for the effluent parameter(s) that require grab sample cannot be obtained, they shall be collected after the Event at the earliest time when situation returns to normal.

38. The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following documents and all analysis shall be conducted by a laboratory accredited to the ISO/IEC:17025 standard or as directed by the District Manager:

a. the Ministry's Procedure F-10-1, “Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only), as amended;

b. the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater Version 2.0" (January 2016), PIBS 2724e02, as amended;

c. the publication "Standard Methods for the Examination of Water and Wastewater", as amended.

39. If the Owner monitors Bisulphite Residual as a surrogate to Total Residual Chlorine, then detected levels of Bisulphite Residual in the sample shall be deemed to confirm absence of Total Residual Chlorine.

40. The Owner shall monitor and record the flow rate and daily quantity using flow measuring devices or other methods of measurement as approved below calibrated to an accuracy within plus or minus 15 per cent (+/- 15%) of the actual flowrate of the following:

a. Influent flow to the Sewage Treatment Plant by continuous flow measuring devices and instrumentations;
b. Final Effluent discharged from the Sewage Treatment Plant by continuous flow measuring devices and instrumentations/pumping rates, or in lieu of an actual installation of equipment, adopt the flow measurements of the Influent for the purpose of estimating Final Effluent flows if the Influent and Final Effluent streams are considered not significantly different in flow rates and quantities;
c. each type of Imported Sewage received for co-treatment at the Sewage Treatment Plant by pumping rates or haul truck manifests.
d. Processed Organic Waste received for co-processing at the Sewage Treatment Plant by flow measuring devices/pumping rates/haul truck manifests.

41. The Owner shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this Approval.

42.

LIMITED OPERATIONAL FLEXIBILITY

1. The Owner may make pre-authorized modifications to the sewage pumping stations and Sewage Treatment Plant in Works in accordance with the document “Limited Operational Flexibility - Protocol for Pre-Authorized Modifications to Municipal Sewage Works” (Schedule E), as amended, subject to the following:

a. the modifications will not involve the addition of any new treatment process or the removal of an existing treatment process, including chemical systems, from the liquid or solids treatment trains as originally designed and approved.
b. the scope and technical aspects of the modifications are in line with those delineated in Schedule E and conform with the Ministry’s publication “Design Guidelines for Sewage Works 2008”, as amended, Ministry’s regulations, policies, guidelines, and industry engineering standards;
c. the modifications shall not negatively impact on the performance of any process or equipment in the Works or result in deterioration in the Final Effluent quality;
d. where the pre-authorized modification requires notification, a "Notice of

Modifications to Sewage Works" (Schedule E), as amended shall be completed with declarations from a Professional Engineer and the Owner and retained on-site prior to the scheduled implementation date. All supporting information including technical memorandum, engineering plans and specifications, as applicable and appropriate to support the declarations that the modifications conform with LOF shall remain on-site for future inspection.

2. The following modifications are not pre-authorized under Limited Operational Flexibility:

   a. Modifications that involve addition or extension of process structures, tankages or channels;
   b. Modifications that involve relocation of the Final Effluent outfall or any other discharge location or that may require reassessment of the impact to the receiver or environment;
   c. Modifications that involve addition of or change in technology of a treatment process or that may involve reassessment of the treatment train process design;
   d. Modifications that require changes to be made to the emergency response, spill prevention and contingency plan; or
   e. Modifications that are required pursuant to an order issued by the Ministry.

43. REPORTING

1. The Owner shall report to the District Manager orally as soon as possible any non-compliance with the compliance limits, and in writing within seven (7) days of non-compliance.

2. The Owner shall, within fifteen (15) days of occurrence of a spill within the meaning of Part X of the EPA, submit a full written report of the occurrence to the District Manager describing the cause and discovery of the spill, clean-up and recovery measures taken, preventative measures to be taken and schedule of implementation, in addition to fulfilling the requirements under the EPA and O. Reg. 675/98 "Classification and Exemption of Spills and Reporting of Discharges".

3. The Owner shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to Ministry staff.

4. The Owner shall prepare performance reports on a calendar year basis and submit to the District Manager by March 31 of the calendar year following the period being reported upon. The reports shall contain, but shall not be limited to, the following information pertaining to the reporting period:

a. a summary and interpretation of all Influent, Imported Sewage and Processed Organic Waste monitoring data, and a review of the historical trend of the sewage characteristics and flow rates;
b. a summary and interpretation of all Final Effluent monitoring data, including concentration, flow rates, loading and a comparison to the design objectives and compliance limits in this Approval, including an overview of the success and adequacy of the Works;
c. a summary of any deviation from the monitoring schedule and reasons for the current reporting year and a schedule for the next reporting year;
d. a summary of all operating issues encountered and corrective actions taken;
e. a summary of all normal and emergency repairs and maintenance activities carried out on any major structure, equipment, apparatus or mechanism forming part of the Works;
f. a summary of any effluent quality assurance or control measures undertaken;
g. a summary of the calibration and maintenance carried out on all Influent, Imported Sewage and Final Effluent monitoring equipment to ensure that the accuracy is within the tolerance of that equipment as required in this Approval or recommended by the manufacturer;
h. a summary of efforts made to achieve the design objectives in this Approval, including an assessment of the issues and recommendations for pro-active actions if any are required under the following situations:
    i. when any of the design objectives is not achieved more than 50% of the time in a year, or there is an increasing trend in deterioration of Final Effluent quality;
    ii. when the Annual Average Daily Influent Flow reaches 80% of the Rated Capacity;
i. a tabulation of the volume of sludge generated, an outline of anticipated volumes to be generated in the next reporting period and a summary of the locations to where the sludge was disposed;
j. a summary of any complaints received and any steps taken to address the complaints;
k. a summary of all Bypasses, Overflows, other situations outside Normal Operating Conditions and spills within the meaning of Part X of EPA and abnormal discharge events;
l. a summary of all Notice of Modifications to Sewage Works completed under Paragraph 1.d. of Condition 10, including a report on status of implementation of all modification.

m. a summary of efforts made to achieve conformance with Procedure F-5-1 including but not limited to projects undertaken and completed in the sanitary sewer system that result in overall Bypass/Overflow elimination including expenditures and proposed projects to eliminate Bypass/Overflows with estimated budget forecast for the year following that for which the report is submitted and a summary of efforts made to achieve conformance with Procedure F-5-5 and establish /maintain a Pollution Prevention and Control Plan (PPCP).

n. any changes or updates to the schedule for the completion of construction and commissioning operation of major process(es) / equipment groups in the Proposed Works.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 regarding general provisions is imposed to ensure that the Works are constructed and operated in the manner in which they were described and upon which approval was granted.

2. Condition 2 regarding change of Owner and Operating Agency is included to ensure that the Ministry records are kept accurate and current with respect to ownership and Operating Agency of the Works and to ensure that subsequent owners of the Works are made aware of the Approval and continue to operate the Works in compliance with it.

3. Condition 3 regarding construction of Proposed Works is included to ensure that the Works are constructed in a timely manner so that standards applicable at the time of Approval of the Works are still applicable at the time of construction to ensure the ongoing protection of the environment and also ensure that the Works are constructed in accordance with the Approval and that record drawings of the Works "as constructed" are updated and maintained for future references.

4. Condition 4 regarding Bypasses is included to indicate that Bypass is prohibited, except in circumstances where the failure to Bypass could result in greater damage to the environment than the Bypass itself. The notification and documentation requirements allow the Ministry to take action in an informed manner and will ensure the Owner is aware of the extent and frequency of Bypass Events.

5. Condition 5 regarding Overflows is included to indicate that Overflow of untreated or partially treated sewage to the receiver is prohibited, except in circumstances where the failure to Overflow could result in greater damage to the environment than the Overflow itself. The notification and documentation requirements allow the Ministry to take action in an informed manner and will ensure the Owner is aware of the extent and frequency

of Overflow Events.

6. Condition 6 regarding design objectives is imposed to establish non-enforceable design objectives to be used as a mechanism to trigger corrective action proactively and voluntarily before environmental impairment occurs.

7. Condition 7 regarding compliance limits is imposed to ensure that the Final Effluent discharged from the Works to the environment meets the Ministry's effluent quality requirements.

8. Condition 8 regarding operation and maintenance is included to require that the Works be properly operated, maintained, funded, staffed and equipped such that the environment is protected and deterioration, loss, injury or damage to any person or property is prevented. As well, the inclusion of a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the Owner. Such a manual is an integral part of the operation of the Works. Its compilation and use should assist the Owner in staff training, in proper plant operation and in identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for Ministry staff when reviewing the Owner's operation of the Works.

9. Condition 9 regarding monitoring and recording is included to enable the Owner to evaluate and demonstrate the performance of the Works, on a continual basis, so that the Works are properly operated and maintained at a level which is consistent with the design objectives and compliance limits.

10. Condition 10 regarding Limited Operational Flexibility is included to ensure that the Works are constructed, maintained and operated in accordance with the Approval, and that any pre-approved modification will not negatively impact on the performance of the Works.

11. Condition 11 regarding reporting is included to provide a performance record for future references, to ensure that the Ministry is made aware of problems as they arise, and to provide a compliance record for this Approval.

Schedule A

1. Application for Environmental Compliance Approval submitted by John Helka of City of Hamilton received on September 11, 2018 for the proposed Contract 3 Upgrades, including design brief, final plans and specifications prepared by CH2M and AECOM.

Schedule B

Primary Effluent Overflow Design Objectives

Prior to completion of construction of Contract 3 of Proposed Works

Effluent Parameter	Averaging Calculator	Objective
BOD5	Annual Average Removal Percentage*	30%
Total Suspended Solids	Annual Average Removal Percentage*	50%

Upon completion of construction of Contract 3 of Proposed Works

Effluent Parameter	Averaging Calculator	Objective
BOD5	Annual Average Removal Percentage	30%
Total Suspended Solids	Annual Average Removal Percentage	50%
E. coli	Monthly Geometric Mean Density	*<1,000 CFU per 100 mL (May 15 - Oct 15)
Total Residual Chlorine	Single Sample Result	Non-detectable

*If the MPN method is utilized for *E.coli* analysis the objective shall be <1,000 MPN per 100 mL

Secondary Effluent Design Objectives

Concentration Objectives prior to completion of construction of Contract 3 of Proposed Works

Final Effluent Parameter	Averaging Calculator	Objective
CBOD5	Monthly Average Effluent Concentration	15.0 mg/L
Total Suspended Solids	Monthly Average Effluent Concentration	15.0 mg/L
Total Phosphorus	Monthly Average Effluent Concentration	0.6 mg/L

Final Effluent Design Objectives

Concentration Objectives prior to completion of construction of Contract 3 of Proposed Works

Final Effluent Parameter	Averaging Calculator	Objective
E. coli	Monthly Geometric Mean Density	<200 organisms per 100

		mL (May 15 - Oct 15)
Total Residual Chlorine**	Single Sample Result	Non-detectable
pH	Single Sample Result	6.5 - 8.5 inclusive

Concentration Objectives upon completion of construction of Contract 3 of Proposed Works

Final Effluent Parameter	Averaging Calculator	Objective
CBOD5	Monthly Average Effluent Concentration	5.0 mg/L
Total Suspended Solids	Monthly Average Effluent Concentration	5.0 mg/L
Total Phosphorus	Monthly Average Effluent Concentration	0.18 mg/L
Total Ammonia Nitrogen	Monthly Average Effluent Concentration	2.0 mg/L (May 01 - Nov 30) 5.0 mg/L (Dec 01 - Apr 30)
E. coli	Monthly Geometric Mean Density	*100 CFU/100 mL (May 15 - Oct 15)
pH	Single Sample Result	6.5 - 8.5 inclusive
Total Residual Chlorine**	Single Sample Result	Non-detectable

*If the MPN method is utilized for *E.coli* analysis the objective shall be 100 MPN/100 mL

**Total Residual Chlorine shall be non-detectable as measured by a method with a sensitivity of at least 0.02 mg/L

Loading Objectives upon completion of construction of Contract 3 of Proposed Works

Final Effluent Parameter	Averaging Calculator	Objective
Total Suspended Solids	Annual Average Daily Effluent Loading	1,227 kg/d

Schedule C

Secondary Effluent Compliance Limits

Concentration Limits prior to completion of construction of Contract 3 of Proposed Works

Final Effluent	Averaging Calculator	Limit

Parameter		(maximum unless otherwise indicated)
CBOD5	Monthly Average Effluent Concentration	25.0 mg/L
Total Suspended Solids	Monthly Average Effluent Concentration	25.0 mg/L
Total Phosphorus	Monthly Average Effluent Concentration	0.8 mg/L

Loading Limits prior to completion of construction of Contract 3 of Proposed Works

Final Effluent Parameter	Averaging Calculator	Limit (maximum unless otherwise indicated)
CBOD5	Monthly Average Daily Effluent Loading	10,225 kg/d
Total Suspended Solids	Monthly Average Daily Effluent Loading	10,225 kg/d
Total Phosphorus	Monthly Average Daily Effluent Loading	327 kg/d

Final Effluent Compliance Limits

Concentration Limits prior to completion of construction of Contract 3 of Proposed Works

Final Effluent Parameter	Averaging Calculator	Limit (maximum unless otherwise indicated)
pH	Single Sample Result	between 6.0 - 9.5 inclusive
Total Residual Chlorine	Single Sample Result	0.02 mg/L

Concentration Limits upon completion of construction of Contract 3 of Proposed Works

Final Effluent Parameter	Averaging Calculator	Limit (maximum unless otherwise indicated)
CBOD5	Monthly Average Effluent Concentration	8.0 mg/L
Total Suspended Solids	Monthly Average Effluent Concentration	10.0 mg/L
Total Suspended Solids	Annual Average Effluent Concentration	6.0 mg/L

Total Phosphorus	Monthly Average Effluent Concentration	0.30 mg/L
Total Ammonia Nitrogen	Monthly Average Effluent Concentration	3.0 mg/L (May 01 - Nov 30) 7.0 mg/L (Dec 01 - Apr 30)
E. coli	Monthly Geometric Mean Density	*200 CFU/100 mL (May 15 - Oct 15)
pH	Single Sample Result	between 6.0 - 9.5 inclusive
Total Residual Chlorine	Single Sample Result	0.02 mg/L

*If the MPN method is utilized for *E.coli* analysis the limit shall be 200 MPN/100 mL

Loading Limits upon completion of construction of Contract 3 of Proposed Works

Final Effluent Parameter	Averaging Calculator	Limit (maximum unless otherwise indicated)
CBOD5	Monthly Average Daily Effluent Loading	3,272 kg/d
Total Suspended Solids	Monthly Average Daily Effluent Loading	4,090 kg/d
Total Phosphorus	Monthly Average Daily Effluent Loading	123 kg/d

Schedule D

Monitoring Program

Influent - sampling location as specified

Prior to completion of construction of Contract 3 Proposed Works - raw sewage pumping station headworks conveyance channels

Upon completion of construction of Contract 3 Proposed Works - new raw sewage pumping station headworks conveyance channels

Parameters	Sample Type	Minimum Frequency
BOD5	24 hour composite	Weekly
Total Suspended Solids	24 hour composite	Weekly
Total Phosphorus	24 hour composite	Weekly
Total Kjeldahl Nitrogen	24 hour composite	Weekly
pH	Grab/Probe	Weekly

Primary Effluent - Outlet of Primary Clarifiers

Prior to completion of construction of Contract 3 of Proposed Works

Parameters	Sample Type	Minimum Frequency
BOD5	24 hour composite	Weekly
Total Suspended Solids	24 hour composite	Weekly

Secondary Effluent - Outlet of Secondary Clarifiers

Prior to completion of construction of Contract 3 of Proposed Works

Parameters	Sample Type	Minimum Frequency
CBOD5	24 hour composite	Weekly
Total Suspended Solids	24 hour composite	Weekly
Total Phosphorus	24 hour composite	Weekly
Total Ammonia Nitrogen	24 hour composite	Weekly
(Nitrate + Nitrite) Nitrogen	24 hour composite	Weekly
Temperature	Grab/ Probe	Weekly
Dissolved Oxygen	Grab/ Probe	Weekly
Alkalinity	24 hour composite	Weekly

Final Effluent - sampling location as specified

Prior to completion of construction of Contract 3 of Proposed Works - Outlet of existing Contact Tank

Parameters	Sample Type	Minimum Frequency
E. coli	Grab	Weekly (May 15 - Oct 15)
Total Residual Chlorine	Grab/Analyzer	Daily (when Chlorine in use)
Dissolved Oxygen	Grab/Probe	Weekly
pH	Grab/Probe	Weekly

Upon completion of construction of Contract 3 of Proposed Works - Outlet of new Contact Tank

Parameters	Sample Type	Minimum Frequency
CBOD5	24 hour composite	Weekly
Total Suspended Solids	24 hour composite	Weekly
Total Phosphorus	24 hour composite	Weekly
Total Ammonia Nitrogen	24 hour composite	Weekly
Total Kjeldahl Nitrogen	24 hour composite	Weekly
Nitrate as Nitrogen	24 hour composite	Weekly

Nitrite as Nitrogen	24 hour composite	Weekly
E. coli	Grab	Weekly (May 15 to Oct 15)
Total Residual Chlorine / Bisulphite Residual	Grab/Analyzer	Daily (May 15 to Oct 15)
pH*	Grab/Probe/Analyzer	Weekly
Temperature*	Grab/Probe/Analyzer	Weekly
Un-ionized Ammonia**	As Calculated	Weekly

*pH and temperature of the Final Effluent shall be determined in the field at the time of sampling for Total Ammonia Nitrogen.

**The concentration of un-ionized ammonia shall be calculated using the total ammonia concentration, pH and temperature using the methodology stipulated in "Ontario's Provincial Water Quality Objectives" dated July 1994, as amended.

Sludge/Biosolids – downstream of centrifuges

Parameters	Sample Type	Minimum Frequency
Total Solids	Grab	Annually
Total Phosphorus	Grab	Annually
Total Ammonia Nitrogen	Grab	Annually
Nitrate as Nitrogen	Grab	Annually
Metal Scan - Arsenic - Cadmium - Cobalt - Chromium - Copper - Lead - Mercury - Molybdenum - Nickel - Potassium - Selenium - Zinc	Grab	Annually

Leachate Related - Final Effluent sampling point

Parameters	Sample Type	Minimum Frequency
Boron	Grab	Quarterly
Cobalt	Grab	Quarterly
Magnesium	Grab	Quarterly
Manganese	Grab	Quarterly
Potassium	Grab	Quarterly
Strontium	Grab	Quarterly
Bis (2-ethylhexyl)	Grab	Quarterly

Phthalate		

Schedule E

Limited Operational Flexibility

Protocol for Pre-Authorized Modifications to Municipal Sewage Works

1. **General**

2. Pre-authorized modifications are permitted only where Limited Operational Flexibility has already been granted in the Approval and only permitted to be made at the pumping stations and sewage treatment plant in the Works, subject to the conditions of the Approval.

3. Where there is a conflict between the types and scope of pre-authorized modifications listed in this document, and the Approval where Limited Operational Flexibility has been granted, the Approval shall take precedence.

4. The Owner shall consult the District Manager on any proposed modifications that may fall within the scope and intention of the Limited Operational Flexibility but is not listed explicitly or included as an example in this document.

5. The Owner shall ensure that any pre-authorized modifications will not:

f. adversely affect the hydraulic profile of the Sewage Treatment Plant or the performance of any upstream or downstream processes, both in terms of hydraulics and treatment performance;

g. result in new Overflow or Bypass locations, or any potential increase in frequency or quantity of Overflow(s) or Bypass(es).

h. result in a reduction in the required Peak Flow Rate of the treatment process or equipment as originally designed.

9. **Modifications that do not require pre-authorization:**

10. Sewage works that are exempt from Ministry approval requirements;

11. Modifications to the electrical system, instrumentation and control system.

12. **Pre-authorized modifications that do not require preparation of “Notice of**

Modification to Sewage Works"

13. Normal or emergency maintenance activities, such as repairs, renovations, refurbishments and replacements with Equivalent Equipment, or other improvements to an existing approved piece of equipment of a treatment process do not require pre-authorization. Examples of these activities are:

a. Repairing a piece of equipment and putting it back into operation, including replacement of minor components such as belts, gear boxes, seals, bearings;

b. Repairing a piece of equipment by replacing a major component of the equipment such as motor, with the same make and model or another with the same or very close power rating but the capacity of the pump or blower will still be essentially the same as originally designed and approved;

c. Replacing the entire piece of equipment with Equivalent Equipment.

14. Improvements to equipment efficiency or treatment process control do not require pre-authorization. Examples of these activities are:

a. Adding variable frequency drive to pumps;

b. Adding on-line analyzer, dissolved oxygen probe, ORP probe, flow measurement or other process control device.

15. **Pre-Authorized Modifications that require preparation of "Notice of Modification to Sewage Works"**

16. Pumping Stations

q. Replacement, realignment of existing sewers including manholes, valves, gates, weirs and associated appurtenances provided that the modifications will not add new influent source(s) or result in an increase in flow from existing sources as originally approved.

r. Extension or partition of wetwell to increase retention time for emergency response and improve station maintenance and pump operation;

s. Replacement or installation of inlet screens to the wetwell;

t. Replacement or installation of flowmeters, construction of station bypass;

u. Replacement, reconfiguration or addition of pumps and modifications to pump suctions and discharge pipings including valve, gates, motors, variable frequency drives and associated appurtenances to maintain firm pumping capacity or modulate the pump rate provided that the modifications will not result in a reduction in the firm pumping capacity or discharge head or an increase in the peak pumping rate of the pumping station as originally designed;

v. Replacement, realignment of existing forcemain(s) including valves, gates, and associated appurtenances provided that the modifications will not reduce the flow capacity or increase the total dynamic head and transient in the forcemain.

23. Sewage Treatment Plant

24. Sewers and appurtenances

    a. Replacement, realignment of existing sewers (including pipes and channels) or construction of new sewers, including manholes, valves, gates, weirs and associated appurtenances within the a sewage treatment plant, provided that the modifications will not add new influent source(s) or result in an increase in flow from existing sources as originally approved and that the modifications will remove hydraulic bottlenecks or improve the conveyance of sewage into and through the Works.

25. Flow Distribution Chambers/Splitters

    a. Replacement or modification of existing flow distribution chamber/splitters or construction of new flow distribution chamber/splitters, including replacements or installation of sluice gates, weirs, valves for distribution of flows to the downstream process trains, provided that the modifications will not result in a change in flow distribution ratio to the downstream process trains as originally designed.

26. Imported Sewage Receiving Facility

    a. Replacement, relocation or installation of loading bays, connect/disconnect hook-up systems and unloading/transferring systems;
    b. Replacement, relocation or installation of screens, grit removal units and compactors;
    c. Replacement, relocation or installation of pumps, such as dosing pumps and transfer pumps, valves, piping and appurtenances;
    d. Replacement, relocation or installation of storage tanks/chambers and spill containment systems;
    e. Replacement, relocation or installation of flow measurement and sampling

equipment;

f. Changes to the source(s) or quantity from each source, provided that changes will not result in an increase in the total quantity and waste loading of each type of Imported Sewage already approved for co-treatment.

27. Preliminary Treatment System

a. Replacement of existing screens and grit removal units with equipment of the same or higher process performance technology, including where necessary replacement or upgrading of existing screenings dewatering washing compactors, hydrocyclones, grit classifiers, grit pumps, air blowers conveyor system, disposal bins and other ancillary equipment to the screening and grit removal processes.

b. Replacement or installation of channel aeration systems, including air blowers, air supply main, air headers, air laterals, air distribution grids and diffusers.

28. Primary Treatment System

a. Replacement of existing sludge removal mechanism, including sludge chamber;

b. Replacement or installation of scum removal mechanism, including scum chamber;

c. Replacement or installation of primary sludge pumps, scum pumps, provided that:the modifications will not result in a reduction in the firm pumping capacity or discharge head that the primary sludge pump(s) and scum pump(s) are originally designed to handle.

29. Secondary Treatment System

1. Biological Treatment
    a. Conversion of complete mix aeration tank to plug-flow multi-pass aeration tank, including modifications to internal structural configuration;
    b. Addition of inlet gates in multi-pass aeration tank for step-feed operation mode;
    c. Partitioning of an anoxic/flip zone in the inlet of the aeration tank, including installation of submersible mixer(s);
    d. Replacement of aeration system including air blowers, air supply main, air headers, air laterals, air distribution grids and diffusers, provided that the modifications will not result in a reduction in the firm capacity or discharge pressure that the blowers are originally designed to supply or in the net oxygen transferred to the wastewater required for biological treatment as originally required.

2. Secondary Sedimentation
    a. Replacement of sludge removal mechanism, including sludge chamber;
    b. Replacement or installation of scum removal mechanism, including scum chamber;
    c. Replacement or installation of return activated sludge pump(s), waste activated sludge pump(s), scum pump(s), provided that the modifications will not result in a reduction in the firm pumping capacity or discharge head that the activated sludge pump(s) and scum pump(s) are originally designed to handle.

30. Post-Secondary Treatment System

    a. Replacement of filtration system with equipment of the same filtration technology, including feed pumps, backwash pumps, filter reject pumps, filtrate extract pumps, holding tanks associated with the pumping system, provided that the modifications will not result in a reduction in the capacity of the filtration system as originally designed.

31. Disinfection System

    1. UV Irradiation
        a. Replacement of UV irradiation system, provided that the modifications will not result in a reduction in the design capacity of the disinfection system or the radiation level as originally designed.
    2. Chlorination/Dechlorination and Ozonation Systems
        a. Extension and reconfiguration of contact tank to increase retention time for effective disinfection and reduce dead zones and minimize short-circuiting;
        b. Replacement or installation of chemical storage tanks, provided that the tanks are provided with effective spill containment.

32. Supplementary Treatment Systems

    1. Chemical systems
        a. Replacement, relocation or installation of chemical storage tanks for existing chemical systems only, provided that the tanks are sited with effective spill containment;
        b. Replacement or installation of chemical dosing pumps provided that the modifications will not result in a reduction in the firm capacity that the dosing pumps are originally designed to handle.

    c. Relocation and addition of chemical dosing point(s) including chemical feed pipes and valves and controls, to improve phosphorus removal efficiency;
    d. Use of an alternate chemical provided that it is a non-proprietary product and is a commonly used alternative to the chemical approved in the Works, provided that the chemical storage tanks, chemical dosing pumps, feed pipes and controls are also upgraded, as necessary..

33. Sludge Management System

  1. Sludge Holding and Thickening
     a. Replacement or installation of sludge holding tanks, sludge handling pumps, such as transfer pumps, feed pumps, recirculation pumps, provided that modifications will not result in reduction in the solids storage or handling capacities;
  2. Sludge Digestion
     a. Replacement or installation of digesters, sludge handling pumps, such as transfer pumps, feed pumps, recirculation pumps, provided that modifications will not result in reduction in the solids storage or handling capacities;
     b. replacement of sludge digester covers.
  3. Sludge Dewatering and Disposal
     a. Replacement of sludge dewatering equipment, sludge handling pumps, such as transfer pumps, feed pumps, cake pumps, loading pumps, provided that modifications will not result in reduction in solids storage or handling capacities.
  4. Processed Organic Waste
     a. Changes to the source(s) or quantity from each source, provided that changes will not result in an increase in the total quantity already approved for co-processing.

34. Standby Power System

  1. Replacement or installation of standby power system, including feed from alternate power grid, emergency power generator, fuel supply and storage systems, provided that the existing standby power generation capacity is not reduced.

35. Pilot Study

  1. Small side-stream pilot study for existing or new technologies, alternative

treatment process or chemical, provided:

  a. all effluent from the pilot system is hauled off-site for proper disposal or returned back to the sewage treatment plant for at a point no further than immediately downstream of the location from where the side-stream is drawn;
  b. no proprietary treatment process or propriety chemical is involved in the pilot study;
  c. the effluent from the pilot system returned to the sewage treatment plant does not significantly alter the composition/concentration of or add any new contaminant/inhibiting substances to the sewage to be treated in the downstream process;
  d. the pilot study will not have any negative impacts on the operation of the sewage treatment plant or cause a deterioration of effluent quality;
  e. the pilot study does not exceed a maximum of two years and a notification of completion shall be submitted to the District Manager within one month of completion of the pilot project.

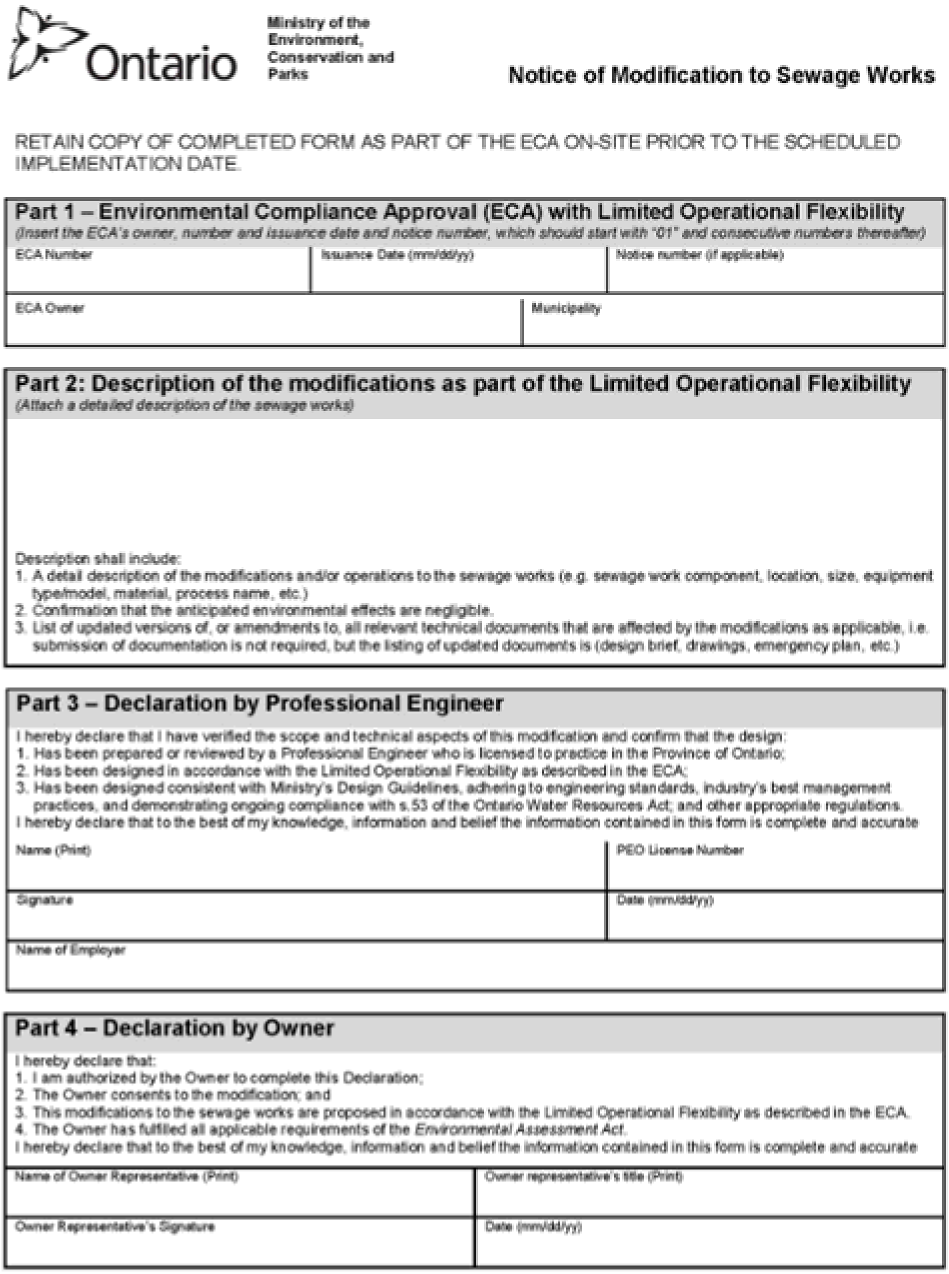
36. Lagoons

a. installing baffles in lagoon provided that the operating capacity of the lagoon system is not reduced;
b. raise top elevation of lagoon berms to increase free-board;
c. replace or install interconnecting pipes and chambers between cells, provided that the process design operating sequence is not changed;
d. replace or install mechanical aerators, or replace mechanical aerators with diffused aeration system provided that the mixing and aeration capacity are not reduced;
e. removal of accumulated sludge and disposal to an approved location offsite.

37. Final Effluent Disposal Facilities

al. Replacement or realignment of the Final Effluent channel, sewer or forcemain, including manholes, valves and appurtenances from the end of the treatment train to the discharge outfall section, provided that the sewer conveys only effluent discharged from the Sewage Treatment Plant and that the replacement or re-aligned sewer has similar dimensions and performance criteria and is in the same or approximately the same location and that the hydraulic capacity will not be reduced.

This page contains an image of the form entitled "Notice of Modification to Sewage Works". A digital copy can be obtained from the District Manager.



Ministry of the Environment, Conservation and Parks

Notice of Modification to Sewage Works

RETAIN COPY OF COMPLETED FORM AS PART OF THE ECA ON-SITE PRIOR TO THE SCHEDULED IMPLEMENTATION DATE.

Part 1 – Environmental Compliance Approval (ECA) with Limited Operational Flexibility

(Insert the ECA's owner, number and issuance date and notice number, which should start with "01" and consecutive numbers thereafter)

ECA Number	Issuance Date (mm/dd/yy)	Notice number (if applicable)

ECA Owner	Municipality

Part 2: Description of the modifications as part of the Limited Operational Flexibility

(Attach a detailed description of the sewage works)

Description shall include:

1. A detail description of the modifications and/or operations to the sewage works (e.g. sewage work component, location, size, equipment type/model, material, process name, etc.)
2. Confirmation that the anticipated environmental effects are negligible.
3. List of updated versions of, or amendments to, all relevant technical documents that are affected by the modifications as applicable, i.e. submission of documentation is not required, but the listing of updated documents is (design brief, drawings, emergency plan, etc.)

Part 3 – Declaration by Professional Engineer

I hereby declare that I have verified the scope and technical aspects of this modification and confirm that the design:

1. Has been prepared or reviewed by a Professional Engineer who is licensed to practice in the Province of Ontario;
2. Has been designed in accordance with the Limited Operational Flexibility as described in the ECA;
3. Has been designed consistent with Ministry's Design Guidelines, adhering to engineering standards, industry's best management practices, and demonstrating ongoing compliance with s.53 of the Ontario Water Resources Act; and other appropriate regulations.

I hereby declare that to the best of my knowledge, information and belief the information contained in this form is complete and accurate

Name (Print)	PEO License Number
Signature	Date (mm/dd/yy)
Name of Employer	

Part 4 – Declaration by Owner

I hereby declare that:

1. I am authorized by the Owner to complete this Declaration;
2. The Owner consents to the modification; and
3. This modifications to the sewage works are proposed in accordance with the Limited Operational Flexibility as described in the ECA.
4. The Owner has fulfilled all applicable requirements of the *Environmental Assessment Act*.

I hereby declare that to the best of my knowledge, information and belief the information contained in this form is complete and accurate

Name of Owner Representative (Print)	Owner representative's title (Print)
Owner Representative's Signature	Date (mm/dd/yy)

Schedule F

Methodology for Calculating and Reporting

Monthly Average Effluent Concentration, Annual Average Effluent Concentration and Monthly Geometric Mean Density

1. Monthly Average Effluent Concentration

Step 1: Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar month and proceed as follows depending on the result of the calculation:

a. If the arithmetic mean does not exceed the compliance limit for the contaminant, then report and use this arithmetic mean as the Monthly Average Effluent Concentration for this parameter where applicable in this Approval;

b. If the arithmetic mean exceeds the compliance limit for the contaminant and there was no Bypass Event during the calendar month, then report and use this arithmetic mean as the Monthly Average Effluent Concentration for this parameter where applicable in this Approval;

c. If the arithmetic mean exceeds the compliance limit for the contaminant and there was Bypass Event(s) during the calendar month, then proceed to Step 2;

d. If the arithmetic mean does not exceed the compliance limit for the contaminant and there was Bypass Event(s) during the calendar month, the Owner may still elect to proceed to Step 2 calculation of the flow-weighted arithmetic mean.

Step 2: Calculate the flow-weighted arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar month and proceed depending on the result of the calculation:

a. Group No Bypass Days (**NBPD**) data and Bypass Days (**BPD**) data during a calendar month separately;

b. Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured on all NBPD during a calendar month and record it as **Monthly Average NBPD Effluent Concentration**;

c. Obtain the "**Total Monthly NBPD Flow**" which is the total amount of Final Effluent discharged on all NBPD during the calendar month;

d. Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured on all BPD during a calendar month and record it as **Monthly Average BPD Effluent Concentration**;

e. Obtain the "**Total Monthly BPD Flow**" which is the total amount of Final Effluent discharged on all BPD during the calendar month;

f. Calculate the flow-weighted arithmetic mean using the following formula:

[(Monthly Average NBPD Effluent Concentration × Total Monthly NBPD Flow) + (Monthly Average BPD Effluent Concentration × Total Monthly BPD Flow)] ÷ (Total Monthly NBPD Flow + Total Monthly BPD Flow)

It should be noted that in this method, if there are no Bypass Event for the month, the calculated result would be the same as the non-flow-weighted arithmetic mean method;

g. Report and use the lesser of the flow-weighted arithmetic mean obtained in Step 2 and the arithmetic mean obtained in Step 1 as the Monthly Average Effluent Concentration for this parameter where applicable in this Approval.

2. Annual Average Effluent Concentration

Step 1: Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar year and proceed as follows depending on the result of the calculation:

a. If the arithmetic mean does not exceed the compliance limit for the contaminant, then report and use this arithmetic mean as the Annual Average Effluent Concentration for this parameter where applicable in this Approval;

b. If the arithmetic mean exceeds the compliance limit for the contaminant and there was no Bypass Event during the calendar year, then report and use this arithmetic mean as the Annual Average Effluent Concentration for this parameter where applicable in this Approval;

c. If the arithmetic mean exceeds the compliance limit for the contaminant and there was Bypass Event(s) during the calendar year, then proceed to Step 2;

d. If the arithmetic mean does not exceed the compliance limit for the contaminant and there was Bypass Event(s) during the calendar year, the

Owner may still elect to proceed to Step 2 calculation of the flow-weighted arithmetic mean.

Step 2: Calculate the flow-weighted arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar year and proceed depending on the result of the calculation:

a. Group No Bypass Days (**NBPD**) data and Bypass Days (**BPD**) data during a calendar year separately;

b. Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured on all NBPD during a calendar year and record it as **Annual Average NBPD Effluent Concentration**;

c. Obtain the "**Total Annual NBPD Flow**" which is the total amount of Final Effluent discharged on all NBPD during the calendar year;

d. Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured on all BPD during a calendar year and record it as **Annual Average BPD Effluent Concentration**;

e. Obtain the "**Total Annual BPD Flow**" which is the total amount of Final Effluent discharged on all BPD during the calendar year;

f. Calculate the flow-weighted arithmetic mean using the following formula:

[(Annual Average NBPD Effluent Concentration × Total Annual NBPD Flow) + (Annual Average BPD Effluent Concentration × Total Annual BPD Flow)] ÷ (Total Annual NBPD Flow + Total Annual BPD Flow)

It should be noted that in this method, if there are no Bypass Event for the calendar year, the calculated result would be the same as the non-flow-weighted arithmetic mean method;

g. Report and use the lesser of the flow-weighted arithmetic mean obtained in Step 2 and the arithmetic mean obtained in Step 1 as the Annual Average Effluent Concentration for this parameter where applicable in this Approval.

3. Monthly Geometric Mean Density

Geometric mean is defined as the n^{th} root of the product of n numbers. In the context of calculating Monthly Geometric Mean Density for *E.coli*, the following formula shall be used:

$$\sqrt[n]{x_1 x_2 x_3 \cdots x_n}$$

in which,

"n" is the number of samples collected during the calendar month; and

"x" is the value of each Single Sample Result.

For example, four weekly grab samples were collected and tested for *E.coli* during the calendar month. The *E.coli* densities in the Final Effluent were found below:

Sample Number	*E.coli* Densities* (CFU/100 mL)
1	10
2	100
3	300
4	50

The Geometric Mean Density for these data:

$$\sqrt[4]{10 \times 100 \times 300 \times 50} = 62$$

*If a particular result is zero (0), then a value of one (1) will be substituted into the calculation of the Monthly Geometric Mean Density. If the MPN method is utilized for E.coli analysis, values in the table shall be MPN/100 mL.

Schedule G

Municipal and Local Services Board Wastewater System

Profile Information Form

(For reference only, images of the form are attached on the next four pages. A digital copy can be obtained from the District Manger.)

Ontario

Ministry of the Environment, Conservation and Parks

Municipal and Local Services Board Wastewater System Profile Information Form

The information in this form is necessary to administer the Ministry's approvals, compliance and enforcement programs with respect to wastewater treatment and collection systems owned by municipalities and local services boards. These programs are authorized under the *Ontario Water Resources Act*, the *Environmental Protection Act*, the *Nutrient Management Act* and their respective regulations.

Email the completed form to: waterforms@ontario.ca
For any questions call 1-866-793-2588.

[A] SYSTEM PROFILE INFORMATION

Wastewater System Number *(if assigned)*
☐ New Profile
☐ Update Existing Profile

Name of System

Name of Municipality or Local Services Board

Level of Treatment (select one*)
☐ Primary
☐ Secondary
☐ Tertiary
☐ Secondary Equivalent
☐ Other (specify):
**See Terms and Concepts on page 4*

Population Served | Population (Design)

Type of System
☐ Treatment & Collection System ☐ Collection System Only

Design Rated Capacity (m^3/day) | Peak Flow Rate (m^3/day) | Current Environmental Compliance Approval (ECA) Number | Current ECA Issue Date (yyyy/mm/dd):

The treatment plant receives sewage from: (Check all that applies.* If you have checked more than one option below, indicate the approximate %)
☐ Sanitary Sewer ☐ Combined Sewer
☐ Nominally Separated Sewer ☐ Partially Separated Sewer **See Terms and Concepts on page 4*

[B] OWNER INFORMATION

Legal Name of Municipality or Local Services Board

Unit No | Street No. | Street Name. | Street Type (St, Rd, etc) | Street Direction (N,S,E,W)

PO Box | City/Town | Postal Code

☐ Dr ☐ Miss ☐ Mr ☐ Mrs ☐ Ms | Owner Contact First Name | Owner Contact Last Name | Owner Contact Job Title

Tel. No. ( ) - ext. | Fax Number ( ) - | Email address

[C] OPERATING AUTHORITY ☐ Check if same as owner

Legal Name of Operator

Unit No | Street No. | Street Name. | Street Type (St, Rd, etc) | Street Direction (N,S,E,W)

PO Box | City/Town | Postal Code

☐ Dr ☐ Miss ☐ Mr ☐ Mrs ☐ Ms | Operator Contact First Name | Operator Contact Last Name | Operator Contact Job Title

Tel. No. ( ) - ext. | Fax Number ( ) - | Email address

[D] 24/7 CONTACT

☐ Dr ☐ Miss
☒ Mr ☐ Mrs
☐ Ms

First Name

Last Name

Job Title

Tel. No. ( ) - ext.

Fax Number ( ) -

Email address

[E] SYSTEM CIVIC LOCATION ADDRESS (I.E. ADDRESS OF TREATMENT PLANT)

Unit No

Street No.

Street Name.

Street Type (St, Rd, etc)

Street Direction (N,S,E,W)

PO Box

City/Town

Postal Code

If the Wastewater System has no street address

Geographical Township

Lot

Concession

Geographical Referencing (if known, enter the Geographical Reference Information for this Wastewater System)

Map Datum

Geo-Referencing Method

Accuracy Estimate

Location Reference

Latitude

Longitude

Zone

Easting

Northing

[F] TREATMENT PROCESS

Preliminary	Primary	Secondary	Secondary Equivalent	Post-Secondary	Additional Treatment
☐ Screening ☐ Shredding/ grinding ☐ Grit Removal ☐ Other(specify):	☐ Settling/sedimentation/ clarification ☐ Scum Removal ☐ Polymer Addition ☐ Other(specify):	☐ Conventional Activated Sludge (CAS) ☐ Extended Aeration ☐ Membrane Bioreactor (MBR) ☐ Sequencing Batch Reactor (SBR) ☐ Rotating Biological Contactor (RBC) ☐ Trickling Filter (TF) ☐ Biological Aerated Filter (BAF) ☐ Other(specify):	☐ Aerated Lagoon ☐ Facultative Lagoon ☐ Anaerobic Lagoon ☐ Aerobic Lagoon ☐ Other(specify):	☐ Filtration ☐ Clarification ☐ Intermittent Sand Filter (after lagoons) ☐ Polishing Wetlands ☐ Polishing Lagoons ☐ Other(specify):	☐ Phosphorous Removal ☐ Biological ☐ Chemical If chemical is used, specify: ☐ Nitrification ☐ Denitrification ☐ Other(specify):

[G] DISINFECTION

Method of Disinfection	Disinfection Period
☐ Chlorination If you chlorinate, do you practice de-chlorination? ☐ Yes ☐ No	☐ Continuous ☐ Seasonal
☐ Ultraviolet Irradiation	☐ Continuous ☐ Seasonal
☐ Other (specify):	☐ Continuous ☐ Seasonal

[H] SLUDGE

Sludge Stabilization Process	Method of Sludge Disposal/Utilization
☐ Aerobic Digestion	☐ Agricultural
☐ Anaerobic Digestion	☐ Landfill
☐ Drying & Pelletization	☐ Incineration
☐ Lime Treatment	☐ Other (specify):
☐ Composting	
☐ Other (specify):	

Available Sludge Storage Capacity (m^3):

[I] EFFLUENT

Effluent Disposal Method	Effluent Discharge Frequency
☐ Surface Water Receiving Water Body Name:	☐ Continuous ☐ Seasonal
☐ Subsurface	☐ Continuous ☐ Seasonal
☐ Other (specify):	☐ Continuous ☐ Seasonal

Is the effluent discharged in a vulnerable area identified in the local source protection assessment report approved under the Clean Water Act, 2006?
☐ Yes ☐ No

[J] INFLUENT

Does the plant receive sewage from another municipality or local services board either through an interconnected collection system or hauled sewage?
☐ Yes ☐ No
(if yes, name(s) of other municipality or local services board):

Plant receives:
☐ Leachate (approximate annual volume in m^3):
☐ Septage (approximate annual volume in m^3):
☐ Industrial input (approximate annual volume in m^3):
or (approximate volume in %):

Terms and Concepts

The following Terms and Concepts are provided to assist you when completing Wastewater System Profile Information Form.

In order to determine the level of treatment that applies to the wastewater system, the effluent quality objectives that the wastewater treatment plant was designed to meet must be considered. The process based approach often used in the past has led to confusion and is open to interpretation due to recent developments and practices in the wastewater treatment industry. For example, a plant with a high rate filter (often referred to as a tertiary filter) after its secondary treatment was considered a tertiary treatment in the past since the filter was designed and operated to produce a tertiary quality effluent. However, secondary plants are now being constructed with these filters as a safeguard against any potential secondary clarifier performance degradation and not for the purpose of ensuring tertiary treatment performance. Also, new technologies have evolved that can produce tertiary quality effluent without having these high rate filters (e.g., membrane bioreactors). Lagoons were considered in the past as being capable of providing only secondary equivalent treatment. However, with add-on treatment after the lagoons (e.g. intermittent sand filters), many lagoon treatment systems are capable of producing secondary or tertiary quality effluent.

During the establishment of sewage works, site-specific effluent limits (including averaging periods) are provided by the Ministry's Regional Technical Support Section, considering the assimilative capacity of the receivers and the minimum treatment requirements provided in Procedure F-5-1. The designer of the sewage works then selects objective values that are acceptable to the Ministry and are less (i.e. more stringent) than the effluent limits , in order to provide an adequate safety factor based on the designer's confidence/experience with the technology chosen and other site-specific conditions. The sewage works are then designed (and operated) to meet these design objectives in a reliable and consistent manner. Therefore, the values that are to be used in the determination of the level of treatment that applies to the sewage works must be based on the design objectives, and not the effluent limits.

Two common parameters used in almost all sewage works designs and performance evaluations are $CBOD_5$ (carbonaceous biochemical oxygen demand) (BOD_5 – biochemical oxygen demand - for primary sewage works) and total suspended solids (TSS). Therefore, it is logical that the **objective values** of these two parameters are used to determine the level of treatment at the sewage works.

Level of Treatment:

Primary:
Wastewater treatment plants that have only settling/sedimentation (with or without chemical addition) and providing 30% and 50% or better reduction of BOD_5 and TSS respectively are considered primary plants (MOE Procedures F-5-1 and F-5-5).

Secondary:
Wastewater treatment plants that have biological processes (e.g. activated sludge process and its variations, fixed film processes) or physical-chemical processes producing an effluent quality of $CBOD_5$ and TSS of 15 mg/L or better are considered secondary plants (MOE Design Guidelines for Sewage Works, 2008).

Secondary Equivalent:
Wastewater treatment plants producing an effluent quality of $CBOD_5$ of 25 mg/L and TSS of 30 mg/L or better are considered as secondary equivalent plants.

Note: Wastewater treatment plants that provide only primary settling of solids and the addition of chemicals to improve the removal of TSS (and phosphorus) are not considered as secondary treatment plants or secondary equivalent plants (MOE Design Guidelines for Sewage Works, 2008).

Tertiary:
Wastewater treatment plants that have biological processes (e.g. activated sludge process and its variations, fixed film processes) and/or physical-chemical processes producing an effluent quality of $CBOD_5$ and TSS of 5 mg/L or better are considered tertiary plants.

Note: Biological processes such as nitrification, denitrification and enhanced biological phosphorus removal can be part of either a secondary or tertiary treatment plant. They may be described as secondary treatment plant with nitrification, secondary treatment plant with enhanced biological phosphorus removal, tertiary treatment plant with nitrification etc.

Sewer System Type:

Sanitary Sewers:
Pipes that convey sanitary sewage flows made up of wastewater discharges from residential, commercial, institutional and industrial establishments plus extraneous flow components from such sources as groundwater and surface run off.

Combined Sewers:
Pipes that convey both sanitary sewage and stormwater runoff through a single-pipe system.

Partially Separated Sewers:
Exist when either a portion of the combined sewer area was retrofitted to separate (sanitary and storm) sewers and/or a service area with combined sewers has had a new development area with separate sewers added to the service area; whatever the case may be, the final flows will be combined sewage.

Nominally Separated Sewers:
These sewers are constructed as separate sewers, but the sanitary sewers accept stormwater from roof and foundation drains (i.e., these are separated sewers in name only).

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 0835-AM6LG2 issued on October 12, 2017.

In accordance with Section 139 of the Environmental Protection Act, you may by written

Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

a. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;

b. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*****
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or** www.ert.gov.on.ca

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 14th day of May, 2019

Youssouf Kalogo, P.Eng.
Director

appointed for the purposes of Part
II.1 of the *Environmental Protection*
Act

FL/
c: District Manager, DWECD, MECP Hamilton - District
Rekha Chetlur, Registration and Compliance Section, MOECC Drinking Water
Simon Wills, CH2M (Jacobs)

Appendix C Sanitary Population Calculation

Whitch Church Boundary Expansion Area
Project Number: 2600
Date: January 2025
Designer Initials: J.Z.

Sanitary Populations

Sanitary Design Flow = Average Dry Weather Flow x Peak Factor + Infiltration Allowance

Average Dry Weather Flow =	360 L/c/d
Peak Factor (Babbitt Formula) =	2.53
Infiltration Allowance =	0.4 L/s/ha

West Lands

Land Owner/Land Use	Land Use Area (ha)	Persons per Hectare	Units	Persons per Unit	Total Population (Persons)	Sanitary Generation (m^3/d)	Infiltration (m^3/d)	Total Sanitary Flow (m^3/d)
Residential	62.89	-	1924	3.5	6,733	2,424	2,174	11,628
Institutional	2.44	125	-	-	305	110	84	491
Park / Open Space	10.35	25	-	-	259	93	358	1,141
Commercial	16.78	125	-	-	2,098	755	580	3,377
SWM Facility Blocks	1.13	-	-	-	-	-	39	99
Pipeline / Trail Network	1.88	-	-	-	-	-	65	164
Natural Heritage System	0.00	-	-	-	-	-	-	-
Right of Way	8.34	-	-	-	-	-	288	729
Total =	**103.82**	**-**	**-**	**-**	**9,394**	**-**	**-**	**17,629**

East Lands

Land Owner/Land Use	Land Use Area (ha)	Persons per Hectare	Units	Persons per Unit	Total Population (Persons)	Sanitary Generation (m^3/d)	Infiltration (m^3/d)	Total Sanitary Flow (m^3/d)
Residential	158.74	-	4855	3.5	16,993	6,118	5,486	29,349
Institutional	2.44	125	-	-	305	110	84	491
Park / Open Space	6.03	25	-	-	151	54	208	664
Commercial	0.00	125	-	-	-	-	-	-
SWM Facility Blocks	10.90	-	-	-	-	-	377	953
Pipeline / Trail Network	3.92	-	-	-	-	-	136	343
Natural Heritage System	17.57	-	-	-	-	-	607	1,536
Right of Way	17.43	-	-	-	-	-	602	1,524
Total =	**217.03**				**17,449**			**34,860**

South Lands

Land Owner/Land Use	Land Use Area (ha)	Persons per Hectare	Units	Persons per Unit	Total Population (Persons)	Sanitary Generation (m^3/d)	Infiltration (m^3/d)	Total Sanitary Flow (m^3/d)
Residential	27.81	-	851	3.5	2,977	1,072	961	5,141
Institutional	2.44	125	-	-	305	110	84	491
Park / Open Space	2.50	25	-	-	63	23	86	275
Commercial	0.00	125	-	-	-	-	-	-
SWM Facility Blocks	6.49	-	-	-	-	-	224	567
Pipeline / Trail Network	0.79	-	-	-	-	-	27	69
Natural Heritage System	0.00	-	-	-	-	-	-	-
Right of Way	3.50	-	-	-	-	-	121	306
Total =	**43.52**				**3,344**			**6,781**

Appendix D Water Demand Calculation

White Church Boundary Expansion Area
Project Number: 2600
Date: January 2025
Designer Initials: J.Z.

Water Demand Calculation

Total Area of future development (ha)	364.37

Residential Peak Demand Parameters		
Estimated Number of Units	7629	
Persons per Unit	3.5	
q - Residential daily flow rate (L/cap/d)	360	
Peak hour demand factor	2.85	Per Design Guidelines for Drinking-Water Systems
Maximum day demand factor	1.90	Per Design Guidelines for Drinking-Water Systems
Fire flow demand (L/s)	150	Per City of Hamilton Watermain Hydraulic Analysis Report Form (2022)

P - Population	26703
Peak Hour Demand (L/s)	317.10
Fire Flow + Maximum Day Demand (L/s)	157.24

Commercial Peak Demand Parameters		
Commercial Population density (ppha)	125	
Commercial Area (ha)	16.78	
q - Commercial daily flow rate (L/cap/d)	360	
Commercial Population density (ppha)	125	
Peak hour demand factor	3.38	Per Design Guidelines for Drinking-Water Systems
Maximum day demand factor	2.25	Per Design Guidelines for Drinking-Water Systems
Fire flow demand (L/s)	150	Per City of Hamilton Watermain Hydraulic Analysis Report Form (2022)

P - Population	2098
Peak Hour Demand (L/s)	29.54
Fire Flow + Maximum Day Demand (L/s)	156.83

Institutional Peak Demand Parameters		
Institutional Area (ha)	7.32	
Institutional Population Density (ppha)	125	
q - Institutional daily flow rate (L/cap/d)	360	
Peak hour demand factor	4.13	Per Design Guidelines for Drinking-Water Systems
Maximum day demand factor	2.75	Per Design Guidelines for Drinking-Water Systems
Fire flow demand (L/s)	150	Per City of Hamilton Watermain Hydraulic Analysis Report Form (2022)

P - Population	915
Maximum Daily Demand (L/s)	15.75
Fire Flow + Maximum Day Demand (L/s)	160.48

Calculations per White Church Boundary Expansion Area Conceptual Plan and Hamilton Comprehensive Development Guidelines and Financial Manual (2019)

Appendix E Topographic Survey

TOPOGRAPHIC PLAN
OF PART OF
LOT 6 TO 10
CONCESSION 5
GEOGRAPHIC
TOWNSHIP OF GLANFORD
IN THE
CITY OF HAMILTON

SCALE 1:1000 METRIC
20 10 0 20 40 60 metres

R.A. McLAREN, O.L.S. – 2023

LEGEND:

☐	DENOTES	MONUMENT SET
■	"	MONUMENT FOUND
IB	"	IRON BAR
PB	"	PLASTIC BAR
CC	"	CUT CROSS
SIB	"	STANDARD IRON BAR
SSIB	"	SHORT STANDARD IRON BAR
824	"	A.T. McLAREN, O.L.S.
OU	"	ORIGIN UNKNOWN
Msd	"	MEASURED
P1	"	
LS	"	LIGHT STANDARD
LP	"	LIGHT POST
CV	"	CULVERT
INV	"	INVERT
AS	"	ASPHALT
GR	"	GRAVEL
MH	"	MANHOLE
BMH	"	BELL MANHOLE
PWF	"	POST & WIRE FENCE
CLF	"	CHAIN LINK FENCE
BF	"	BOARD FENCE
WF	"	WIRE FENCE
MF	"	METAL FENCE
WRW	"	WOOD RETAINING WALL
CRW	"	CONCRETE RETAINING WALL
CRB	"	CONCRETE CURB
ILS	"	INTER-LOCKING STONE
CONCHW	"	CONCRETE HEADWALL
HP	"	HYDRO POLE
GW	"	GUY WIRE
U	"	OVERHEAD UTILTIES
BBOX	"	BELL BOX
UB	"	UTILITY BOX
EB	"	ELECTRICAL BOX
FH	"	FIRE HYDRANT
WV	"	WATER VALVE
VC	"	VALVE CHAMBER
SS	"	STOP SIGN
MPS	"	MOVEABLE PLASTIC SHED
PIL	"	PILLAR
FMICV	"	FLUSH MOUNT IRRIGATION VALVE
WS	"	WOOD STAKE
WP	"	WOOD POST
LSA	"	LANDSCAPED AREA
GV	"	GAS VALVE
EVG	"	EVERGREEN
ø	"	DIAMETER
//	"	NOT TO SCALE

BENCHMARK:

MONUMENT 07720030064

ROUND IRON BAR WITH BRASS CAP

LOCATED IN THE NORTHEAST CORNER OF THE INTERSECTION OF AIRPORT ROAD EAST AND MILES ROAD 19.0m NORTH OF THE CENTRELINE OF AIRPORT ROAD EAST AND 9.0m EAST OF THE CENTRELINE OF MILES ROAD

ELEVATION: 220.014 metres CGVD-1928:1978

NOTE:

UNDERLINE ELEVATIONS WERE DERIVED FROM 20cm ORTHOPHOTO MAPPING

NOTE:

UNDERGROUND SERVICE AND UTILITY LOCATIONS MUST BE VERIFIED PRIOR TO CONSTRUCTION

INVERTS MUST BE VERIFIED PRIOR TO CONSTRUCTION

BEARING NOTE:

BEARINGS ARE UTM GRID, DERIVED FROM OBSERVED REFERENCE POINTS A AND B, BY REAL TIME NETWORK OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS) (2010.0)

NOTE:

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999665630

INTEGRATION DATA

OBSERVED REFERENCE POINTS (ORP's): UTM ZONE 17, NAD83 (CSRS) (2010.0).
COORDINATES TO URBAN ACCURACY PER SEC. 14(2) OF O.REG. 216/10

POINT ID	NORTHING	EASTING
ORP Ⓐ	4777899.510	591087.225
ORP Ⓑ	4776589.116	590723.591
ORP Ⓒ	4778704.028	588447.874
ORP Ⓓ	4777494.192	587828.981

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

SHEET 1

METRIC NOTE:

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

DATE

R.A. McLAREN, O.L.S.

A.T. McLaren Limited
LEGAL AND ENGINEERING SURVEYS
69 JOHN STREET SOUTH, SUITE 230
HAMILTON, ONTARIO, L8N 2B9
PHONE (905) 527-8559 FAX (905) 527-0032

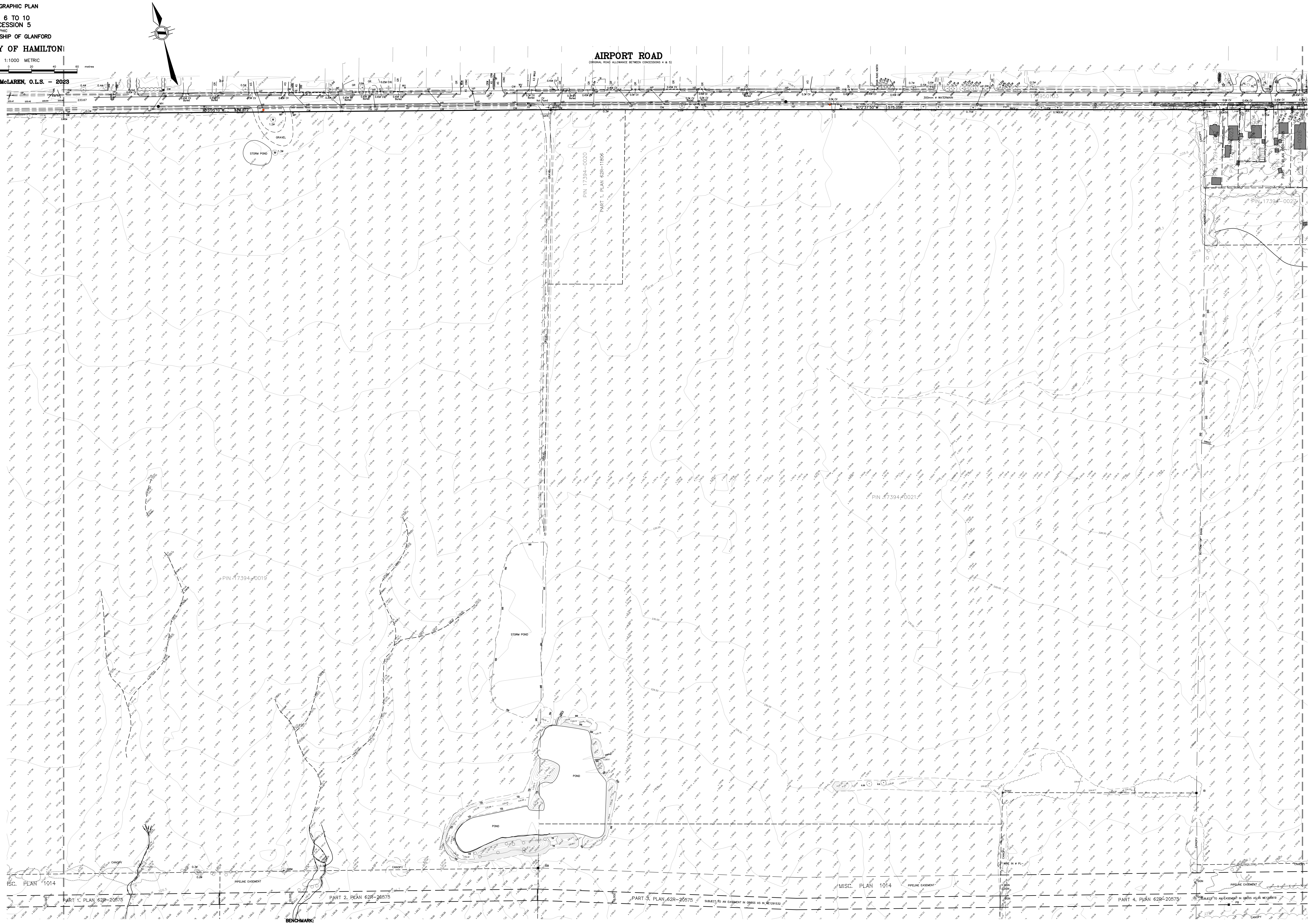
Drawn	Checked	Crew Chief	Scale	
JB	DG	MWjr	1:1000	Dwg.No. 37339-1

FILE NAME: 37339 Topo NAD83-Ground – Airport, White Church, Miles, Upper James.dwg LAYOUT: Sheet 1
LAST SAVED BY: David Gunstensen DATE: September 22, 2023

TOPOGRAPHIC PLAN
OF
LOTS 6 TO 10
CONCESSION 5
GEOGRAPHIC
TOWNSHIP OF GLANFORD
IN THE
CITY OF HAMILTON

SCALE 1:1000 METRIC

R.A. McLAREN, O.L.S. – 2023



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BENCHMARK:

MONUMENT 07720030064

ROUND IRON BAR WITH BRASS CAP

LOCATED IN THE NORTHEAST CORNER OF THE INTERSECTION OF AIRPORT ROAD EAST AND MILES ROAD 19.0m NORTH OF THE CENTRELINE OF AIRPORT ROAD EAST AND 9.0m EAST OF THE CENTRELINE OF MILES ROAD

ELEVATION: 220.014 metres CGVD–1928:1978

NOTE:

UNDERLINE ELEVATIONS WERE DERIVED FROM 20cm ORTHOPHOTO MAPPING

NOTE:

UNDERGROUND SERVICE AND UTILITY LOCATIONS MUST BE VERIFIED PRIOR TO CONSTRUCTION

INVERTS MUST BE VERIFIED PRIOR TO CONSTRUCTION

LEGEND:

□	DENOTES	MONUMENT SET	LS	"	LIGHT STANDARD	CRB	"	CONCRETE CURB	FMICV	"	FLUSH MOUNT IRRIGATION VALVE
■	"	MONUMENT FOUND	LP	"	LIGHT POST	ILS	"	INTER–LOCKING STONE	WS	"	WOOD STAKE
IB	"	IRON BAR	CV	"	CULVERT	CONCHW	"	CONCRETE HEADWALL	WP	"	WOOD POST
PB	"	PLASTIC BAR	INV	"	INVERT	HP	"	HYDRO POLE	LSA	"	LANDSCAPED AREA
CC	"	CUT CROSS	AS	"	ASPHALT	GW	"	GUY WIRE	GV	"	GAS VALVE
SIB	"	STANDARD IRON BAR	GR	"	GRAVEL	U	"	OVERHEAD UTILTIES	EVG	"	EVERGREEN
SSIB	"	SHORT STANDARD IRON BAR	MH	"	MANHOLE	BBOX	"	BELL BOX	ø	"	DIAMETER
824	"	A.T. McLAREN, O.L.S.	BMH	"	BELL MANHOLE	UB	"	UTILITY BOX	//	"	NOT TO SCALE
OU	"	ORIGIN UNKNOWN	PWF	"	POST & WIRE FENCE	EB	"	ELECTRICAL BOX			
Msd	"	MEASURED	CLF	"	CHAIN LINK FENCE	FH	"	FIRE HYDRANT			
P1	"		BF	"	BOARD FENCE	WV	"	WATER VALVE			
			WF	"	WIRE FENCE	VC	"	VALVE CHAMBER			
			MF	"	METAL FENCE	SS	"	STOP SIGN			
			WRW	"	WOOD RETAINING WALL	MPS	"	MOVEABLE PLASTIC SHED			
			CRW	"	CONCRETE RETAINING WALL	PIL	"	PILLAR			

METRIC NOTE:

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

SHEET 2

DATE

R.A. McLAREN, O.L.S.

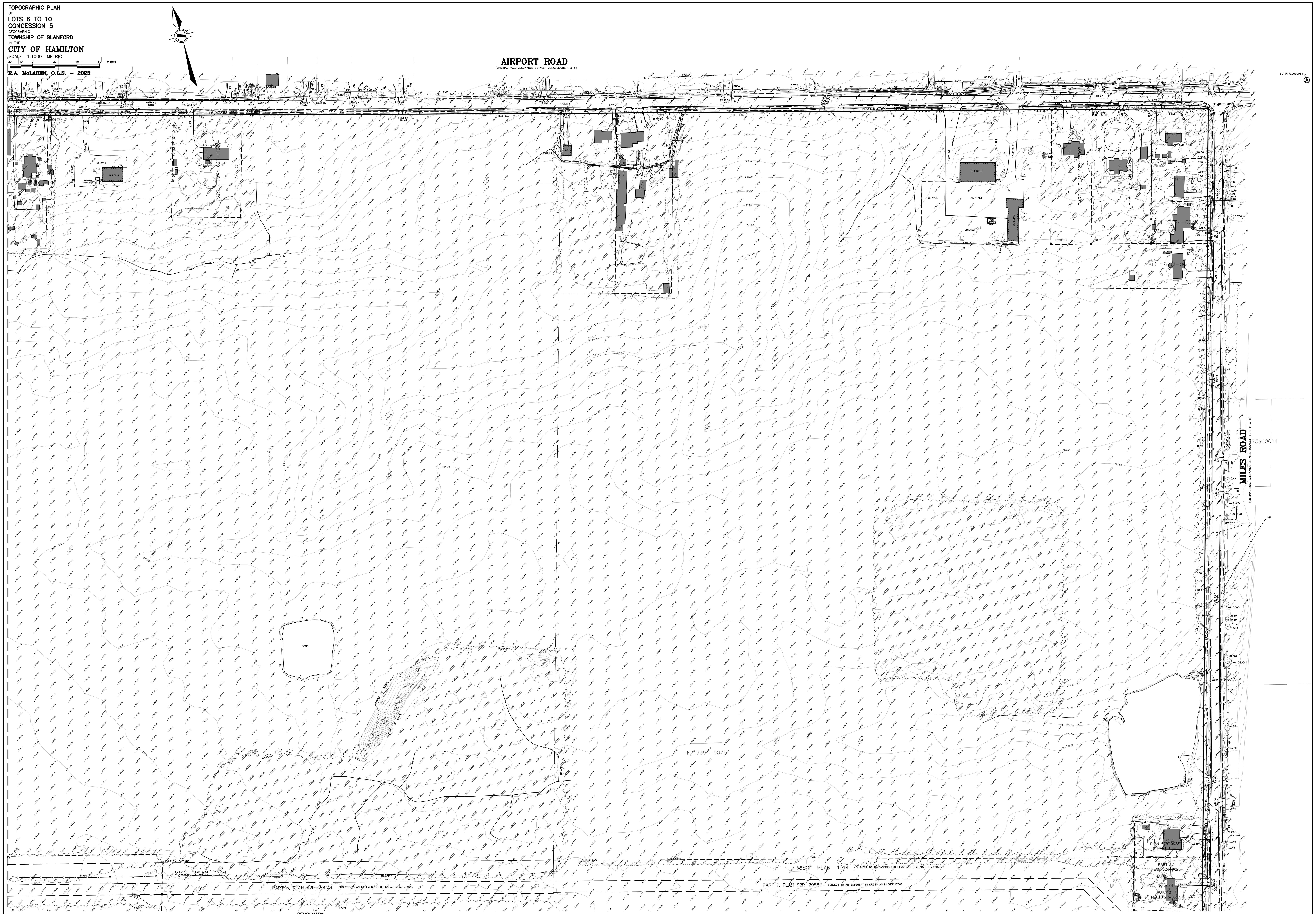
A.T. McLaren Limited
LEGAL AND ENGINEERING SURVEYS
69 JOHN STREET SOUTH, SUITE 230
HAMILTON, ONTARIO, L8N 2B9
PHONE (905) 527–8559 FAX (905) 527–0032

Drawn	Checked	Crew Chief	Scale	
JB	DG	MWjr	1:1000	Dwg.No. 37339–2

FILE NAME: 37339 Topo NAD83–Ground – Airport, White Church, Miles, Upper James.dwg LAYOUT: Sheet 2
LAST SAVED BY: David Gunstensen DATE: September 22, 2023

TOPOGRAPHIC PLAN
OF
LOTS 6 TO 10
CONCESSION 5
GEOGRAPHIC
TOWNSHIP OF GLANFORD
IN THE
CITY OF HAMILTON
SCALE 1:1000 METRIC

R.A. McLAREN, O.L.S. – 2023



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NOTE:

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999665630

INTEGRATION DATA

OBSERVED REFERENCE POINTS (ORP's): UTM ZONE 17, NAD83 (CSRS) (2010.0).
COORDINATES TO URBAN ACCURACY PER SEC. 14(2) OF O.REG. 216/10

POINT ID	NORTHING	EASTING
ORP Ⓐ	4777899.510	591087.225
ORP Ⓑ	4776589.116	590723.591
ORP Ⓒ	4778704.028	588447.874
ORP Ⓓ	4777494.192	587828.981

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

BENCHMARK:

MONUMENT 07720030064

ROUND IRON BAR WITH BRASS CAP

LOCATED IN THE NORTHEAST CORNER OF THE INTERSECTION OF AIRPORT ROAD EAST AND MILES ROAD 19.0m NORTH OF THE CENTRELINE OF AIRPORT ROAD EAST AND 9.0m EAST OF THE CENTRELINE OF MILES ROAD

ELEVATION: 220.014 metres CGVD–1928:1978

NOTE:

UNDERLINED ELEVATIONS WERE DERIVED FROM 20cm ORTHOPHOTO MAPPING

NOTE:

UNDERGROUND SERVICE AND UTILITY LOCATIONS MUST BE VERIFIED PRIOR TO CONSTRUCTION

INVERTS MUST BE VERIFIED PRIOR TO CONSTRUCTION

LEGEND:

☐	DENOTES	MONUMENT SET
■	"	MONUMENT FOUND
IB	"	IRON BAR
PB	"	PLASTIC BAR
CC	"	CUT CROSS
SIB	"	STANDARD IRON BAR
SSIB	"	SHORT STANDARD IRON BAR
824	"	A.T. McLAREN, O.L.S.
OU	"	ORIGIN UNKNOWN
Msd	"	MEASURED
P1	"	
LS	"	LIGHT STANDARD
LP	"	LIGHT POST
CV	"	CULVERT
INV	"	INVERT
AS	"	ASPHALT
GR	"	GRAVEL
MH	"	MANHOLE
BMH	"	BELL MANHOLE
PWF	"	POST & WIRE FENCE
CLF	"	CHAIN LINK FENCE
BF	"	BOARD FENCE
WF	"	WIRE FENCE
MF	"	METAL FENCE
WRW	"	WOOD RETAINING WALL
CRW	"	CONCRETE RETAINING WALL
CRB	"	CONCRETE CURB
ILS	"	INTER–LOCKING STONE
CONCHW	"	CONCRETE HEADWALL
HP	"	HYDRO POLE
GW	"	GUY WIRE
U	"	OVERHEAD UTILTIES
BBOX	"	BELL BOX
UB	"	UTILITY BOX
EB	"	ELECTRICAL BOX
FH	"	FIRE HYDRANT
WV	"	WATER VALVE
VC	"	VALVE CHAMBER
SS	"	STOP SIGN
MPS	"	MOVEABLE PLASTIC SHED
FMICV	"	FLUSH MOUNT IRRIGATION VALVE
WS	"	WOOD STAKE
WP	"	WOOD POST
LSA	"	LANDSCAPED AREA
GV	"	GAS VALVE
EVG	"	EVERGREEN
ø	"	DIAMETER

SHEET 3

METRIC NOTE:

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

DATE

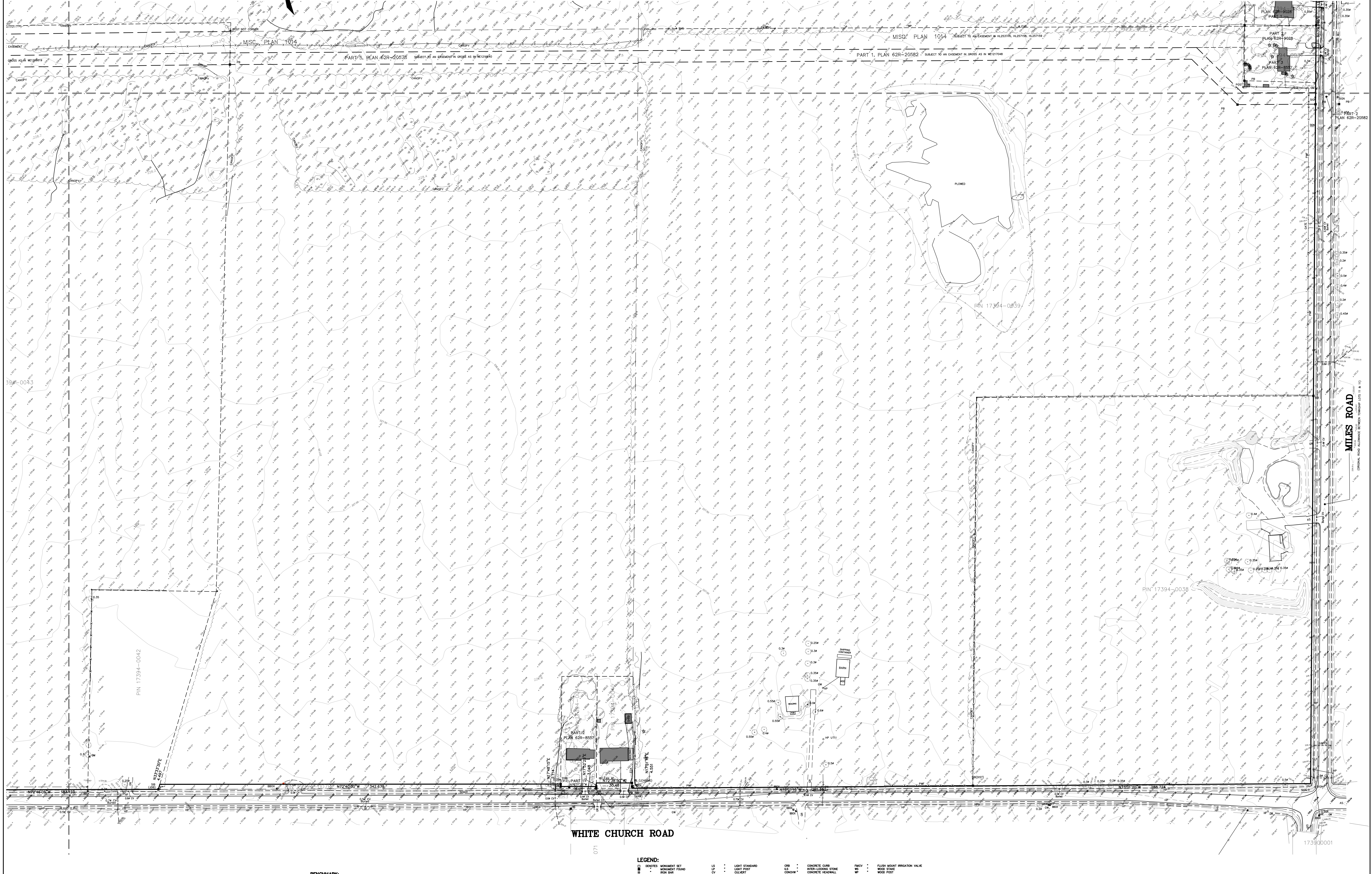
R.A. McLAREN, O.L.S.

A.T. McLaren Limited
LEGAL AND ENGINEERING SURVEYS
69 JOHN STREET SOUTH, SUITE 230
HAMILTON, ONTARIO, L8N 2B9
PHONE (905) 527–8559 FAX (905) 527–0032

Drawn	Checked	Crew Chief	Scale	Dwg.No. 37339–3
JB	DG	MWjr	1:1000	

FILE NAME: 37339 Topo NAD83–Ground – Airport, White Church, Miles

TOPOGRAPHIC PLAN
OF
LOTS 6 TO 10
CONCESSION 5
GEOGRAPHIC
TOWNSHIP OF GLANFORD
IN THE
CITY OF HAMILTON
SCALE 1:1000 METRIC
20 10 0 20 40 60 metres
R.A. McLAREN, O.L.S. – 2023



BEARING NOTE:
BEARINGS ARE UTM GRID, DERIVED FROM OBSERVED REFERENCE POINTS A AND B, BY REAL TIME NETWORK OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS) (2010.0)

NOTE:
DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999665630

INTEGRATION DATA

OBSERVED REFERENCE POINTS (ORP's): UTM ZONE 17, NAD83 (CSRS) (2010.0).
COORDINATES TO URBAN ACCURACY PER SEC. 14(2) OF O.REG. 216/10

POINT ID	NORTHING	EASTING
ORP Ⓐ	4777899.510	591087.225
ORP Ⓑ	4776589.116	590723.591
ORP Ⓒ	4778704.028	588447.874
ORP Ⓓ	4777494.192	587828.981

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

BENCHMARK:

MONUMENT 07720030064

ROUND IRON BAR WITH BRASS CAP

LOCATED IN THE NORTHEAST CORNER OF THE INTERSECTION OF AIRPORT ROAD EAST AND MILES ROAD 19.0m NORTH OF THE CENTRELINE OF AIRPORT ROAD EAST AND 9.0m EAST OF THE CENTRELINE OF MILES ROAD

ELEVATION: 220.014 metres CGVD–1928:1978

NOTE:

UNDERLINED ELEVATIONS WERE DERIVED FROM 20cm ORTHOPHOTO MAPPING

NOTE:

UNDERGROUND SERVICE AND UTILITY LOCATIONS MUST BE VERIFIED PRIOR TO CONSTRUCTION

INVERTS MUST BE VERIFIED PRIOR TO CONSTRUCTION

LEGEND:

☐	DENOTES	MONUMENT SET	LS	"	LIGHT STANDARD	CRB	"	CONCRETE CURB	FMICV	"	FLUSH MOUNT IRRIGATION VALVE
■	"	MONUMENT FOUND	LP	"	LIGHT POST	ILS	"	INTER–LOCKING STONE	WS	"	WOOD STAKE
IB	"	IRON BAR	CV	"	CULVERT	CONCHW	"	CONCRETE HEADWALL	WP	"	WOOD POST
PB	"	PLASTIC BAR	INV	"	INVERT	HP	"	HYDRO POLE	LSA	"	LANDSCAPED AREA
CC	"	CUT CROSS	AS	"	ASPHALT	GW	"	GUY WIRE	GV	"	GAS VALVE
SIB	"	STANDARD IRON BAR	GR	"	GRAVEL	U	"	OVERHEAD UTILTIES	EVG	"	EVERGREEN
SSIB	"	SHORT STANDARD IRON BAR	MH	"	MANHOLE	BBOX	"	BELL BOX	ø	"	DIAMETER
824	"	A.T. McLAREN, O.L.S.	BMH	"	BELL MANHOLE	UB	"	UTILITY BOX	//	"	NOT TO SCALE
OU	"	ORIGIN UNKNOWN	PWF	"	POST & WIRE FENCE	EB	"	ELECTRICAL BOX			
Msd	"	MEASURED	CLF	"	CHAIN LINK FENCE	FH	"	FIRE HYDRANT			
P1	"		BF	"	BOARD FENCE	WV	"	WATER VALVE			
			WF	"	WIRE FENCE	VC	"	VALVE CHAMBER			
			MF	"	METAL FENCE	SS	"	STOP SIGN			
			WRW	"	WOOD RETAINING WALL	MPS	"	MOVEABLE PLASTIC SHED			
			CRW	"	CONCRETE RETAINING WALL	PIL	"	PILLAR			

SHEET 4

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

DATE

R.A. McLAREN, O.L.S.

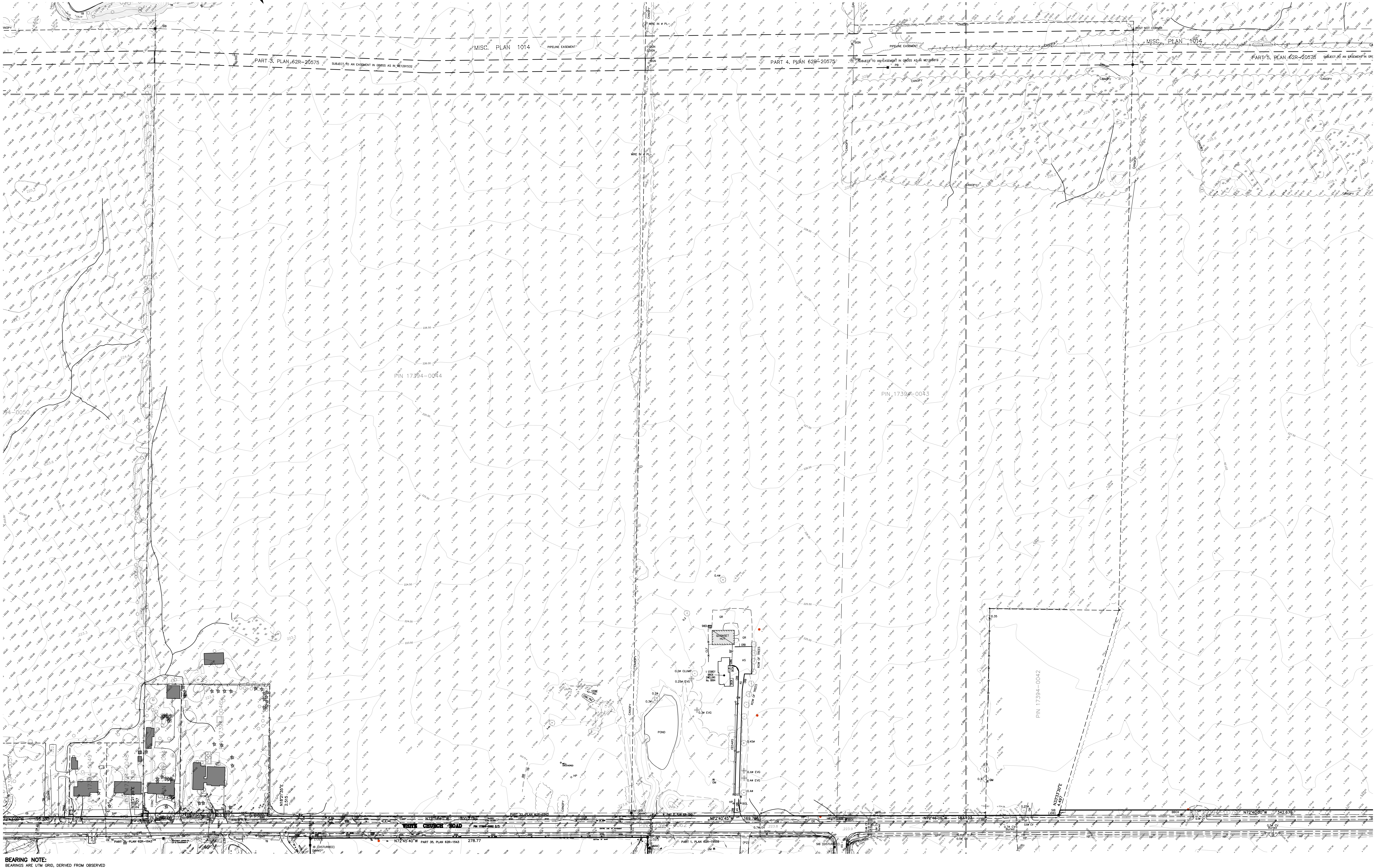
A.T. McLaren Limited
LEGAL AND ENGINEERING SURVEYS
69 JOHN STREET SOUTH, SUITE 230
HAMILTON, ONTARIO, L8N 2B9
PHONE (905) 527–8559 FAX (905) 527–0032

Drawn	Checked	Crew Chief	Scale	
JB	DG	MWjr	1:1000	Dwg.No. 37339–4

FILE NAME: 37339 Topo NAD83–Ground – Airport, White Church, Miles, Upper James.dwg LAYOUT: Sheet 4
LAST SAVED BY: David Gunstensen DATE: September 22, 2023

TOPOGRAPHIC PLAN
OF
LOTS 6 TO 10
CONCESSION 5
GEOGRAPHIC
TOWNSHIP OF GLANFORD
IN THE
CITY OF HAMILTON
SCALE 1:1000 METRIC
20 10 0 20 40 60 metres

S.D. McLAREN, O.L.S. – 2023



BEARING NOTE:

BEARINGS ARE UTM GRID, DERIVED FROM OBSERVED REFERENCE POINTS A AND B, BY REAL TIME NETWORK OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS) (2010.0)

NOTE:

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INTEGRATION DATA

OBSERVED REFERENCE POINTS (ORP's): UTM ZONE 17, NAD83 (CSRS) (2010.0).
COORDINATES TO URBAN ACCURACY PER SEC. 14(2) OF O.REG. 216/10

POINT ID	NORTHING	EASTING
ORP Ⓐ	4777899.510	591087.225
ORP Ⓑ	4776589.116	590723.591
ORP Ⓒ	4778704.028	588447.874
ORP Ⓓ	4777494.192	587828.981

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BENCHMARK:

MONUMENT 07720030064

ROUND IRON BAR WITH BRASS CAP

LOCATED IN THE NORTHEAST CORNER OF THE INTERSECTION OF AIRPORT ROAD EAST AND MILES ROAD 19.0m NORTH OF THE CENTRELINE OF AIRPORT ROAD EAST AND 9.0m EAST OF THE CENTRELINE OF MILES ROAD

ELEVATION: 220.014 metres CGVD-1928:1978

NOTE:

UNDERLINED ELEVATIONS WERE DERIVED FROM 20cm ORTHOPHOTO MAPPING

NOTE:

UNDERGROUND SERVICE AND UTILITY LOCATIONS MUST BE VERIFIED PRIOR TO CONSTRUCTION

INVERTS MUST BE VERIFIED PRIOR TO CONSTRUCTION

SHEET 5

METRIC NOTE:

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DATE

R.A. DAN McLAREN, O.L.S.

A.T. McLaren Limited
LEGAL AND ENGINEERING SURVEYS
69 JOHN STREET SOUTH, SUITE 230
HAMILTON, ONTARIO, L8N 2B9
PHONE (905) 527-8559 FAX (905) 527-0032

Drawn	Checked	Crew Chief	Scale	Dwg.No. 37339-5
JB	DG	MWjr	1:1000	

FILE NAME: 37339 Topo NAD83-Ground – Airport, White Church, Miles, Upper James.dwg LAYOUT: Sheet 5
LAST SAVED BY: David Gunstensen DATE: September 22, 2023

TOPOGRAPHIC PLAN
OF
LOTS 6 TO 10
CONCESSION 5
GEOGRAPHIC
TOWNSHIP OF GLANFORD
IN THE
CITY OF HAMILTON
SCALE 1:1000 METRIC
20 10 0 20 40 60 metres

R.A. McLAREN, O.L.S. – 2023

BEARING NOTE:

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INTEGRATION DATA

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POINT ID	NORTHING	EASTING
ORP Ⓐ	4777899.510	591087.225
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BENCHMARK:

MONUMENT 07720030064

ROUND IRON BAR WITH BRASS CAP

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ELEVATION: 220.014 metres CGVD–1928:1978

NOTE:

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■	"	MONUMENT FOUND
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CC	"	CUT CROSS
SIB	"	STANDARD IRON BAR
SSIB	"	SHORT STANDARD IRON BAR
824	"	A.T. McLAREN, O.L.S.
OU	"	ORIGIN UNKNOWN
Msd	"	MEASURED
P1	"	
LS	"	LIGHT STANDARD
LP	"	LIGHT POST
CV	"	CULVERT
INV	"	INVERT
AS	"	ASPHALT
GR	"	GRAVEL
MH	"	MANHOLE
BMH	"	BELL MANHOLE
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MF	"	METAL FENCE
WRW	"	WOOD RETAINING WALL
CRW	"	CONCRETE RETAINING WALL
CRB	"	CONCRETE CURB
ILS	"	INTER–LOCKING STONE
CONCHW	"	CONCRETE HEADWALL
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SS	"	STOP SIGN
MPS	"	MOVEABLE PLASTIC SHED
PIL	"	PILLAR
FMICV	"	FLUSH MOUNT IRRIGATION VALVE
WS	"	WOOD STAKE
WP	"	WOOD POST
LSA	"	LANDSCAPED AREA
GV	"	GAS VALVE
EVG	"	EVERGREEN
ø	"	DIAMETER
//	"	NOT TO SCALE

METRIC NOTE:

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DATE

R.A. McLAREN, O.L.S.

A.T. McLaren Limited
LEGAL AND ENGINEERING SURVEYS
69 JOHN STREET SOUTH, SUITE 230
HAMILTON, ONTARIO, L8N 2B9
PHONE (905) 527-8559 FAX (905) 527-0032

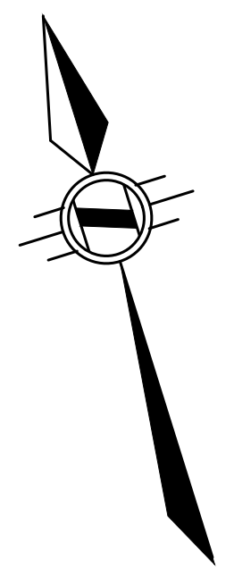
Drawn	Checked	Crew Chief	Scale	
JB	DG	MWjr	1:1000	Dwg.No. 37339–6

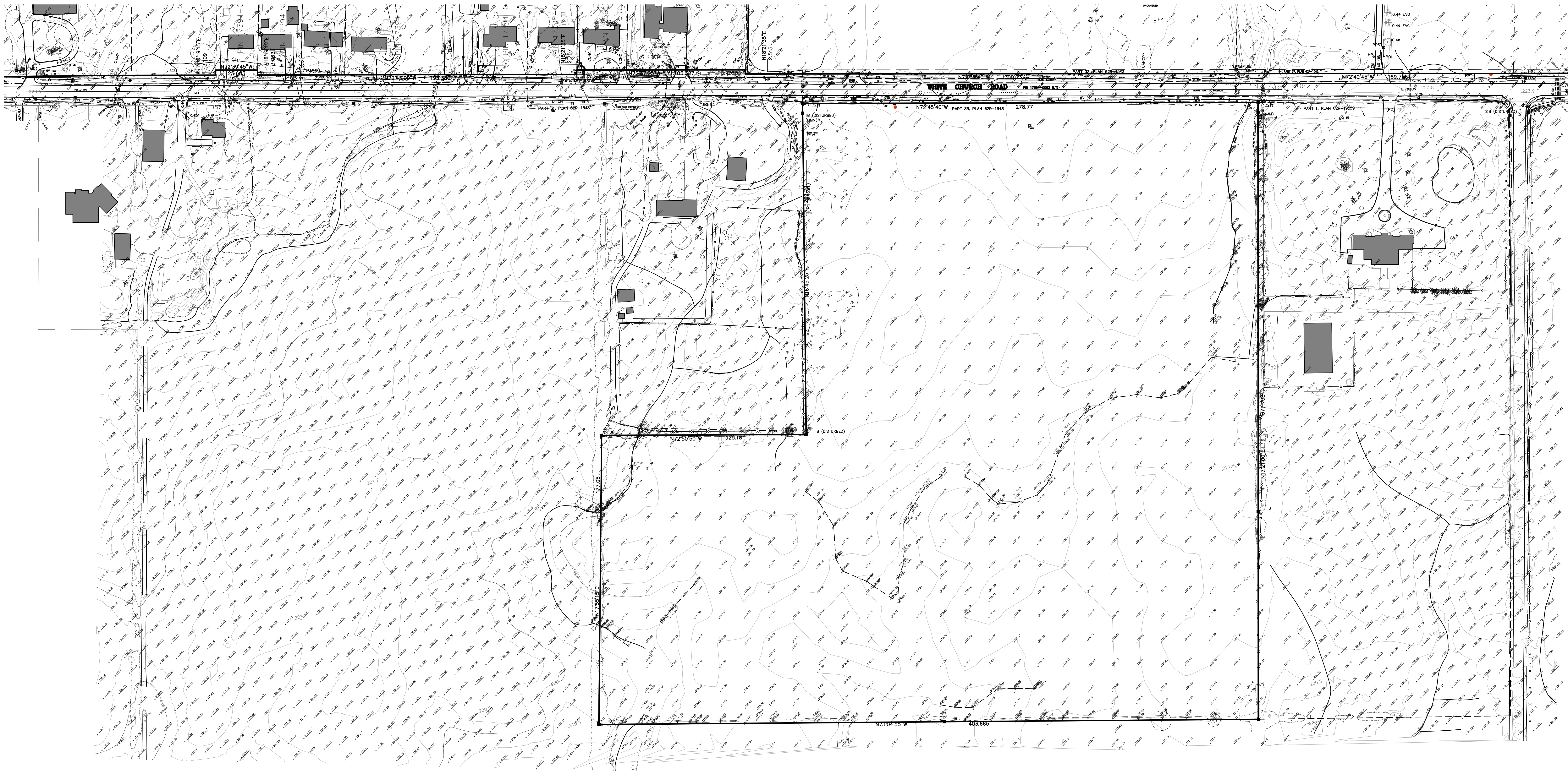
SHEET 6

FILE NAME: 37339 Topo NAD83–Ground – Airport, White Church, Miles, Upper James.dwg LAYOUT: Sheet 6
LAST SAVED BY: David Gunstensen DATE: September 22, 2023

TOPOGRAPHIC PLAN
OF
LOTS 6 TO 10
CONCESSION 5
GEOGRAPHIC
TOWNSHIP OF GLANFORD
IN THE
CITY OF HAMILTON
SCALE 1:1000 METRIC
20 10 0 20 40 60 metres

R.A. McLAREN, O.L.S. – 2023





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INTEGRATION DATA

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COORDINATES TO URBAN ACCURACY PER SEC. 14(2) OF O.REG. 216/10

POINT ID	NORTHING	EASTING
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BENCHMARK:

MONUMENT 07720030064

ROUND IRON BAR WITH BRASS CAP

LOCATED IN THE NORTHEAST CORNER OF THE INTERSECTION OF AIRPORT ROAD EAST AND MILES ROAD 19.0m NORTH OF THE CENTRELINE OF AIRPORT ROAD EAST AND 9.0m EAST OF THE CENTRELINE OF MILES ROAD

ELEVATION: 220.014 metres CGVD–1928:1978

NOTE:

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ø	"	DIAMETER
//	"	NOT TO SCALE

METRIC NOTE:
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SHEET 6

DATE

R.A. McLAREN, O.L.S.

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Drawn	Checked	Crew Chief	Scale	
JB	DG	MWjr	1:1000	Dwg.No. 37339-6

FILE NAME: 37339 Topo NAD83–Ground – Airport, White Church, Miles, Upper James.dwg LAYOUT: Sheet 7
LAST SAVED BY: David Gunstensen DATE: September 22, 2023

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