COUNTERPOINT LAND DEVELOPMENT BY | DILLON CONSULTING

J. RAUTI DEVELOPMENTS INC. AND 2601817 ONTARIO LIMITED

STORMWATER MANAGEMENT TECHNICAL DESIGN BRIEF

3694 – 3738 Howard Avenue

October 2025 – 24-8813

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

Dillon Consulting Limited (Dillon) was retained by J. Rauti Developments Inc. and 2601817 Ontario Limited to develop a stormwater management (SWM) strategy for the proposed 0.74 ha future development site at 3694-3738 Howard Avenue, Windsor, Ontario (the Site). The proposed Site development is to consist of a six storey Apartment building, parking lot and landscape area and sits within City of Windsor (the City) Howard Future Development Land area. The current site plan is provided in **Figure 1**.

The Site is currently occupied by a number of single detached dwellings and is bounded by the existing Orchards Subdivision Dry Pond to the east, Howards Avenue to the west, Holburn Street to the north and the Lily Mac Residential Development to the south.

This technical design brief has been developed to support the Zoning By-Law Amendment application for the Site.

1.1 BACKGROUND REVIEW

The following background documents and relevant design and servicing information were reviewed to support this assessment:

1. **Howard Avenue Future Development Area Storm and Sanitary Servicing Feasibility Study (Dillon Consulting Ltd, 2020)**
    - Review of the approved storm allowable release rate for the Howard Future Development Lands between Cabana Road and South Cameron Boulevard.
2. **Orchards Subdivision Stormwater Management Report (R.C. Spencer, June 2021):**
    - Review of the final SWM servicing strategy, Dry Pond and Pump Station design for the Orchards Subdivision.

1.2 STORMWATER MANAGEMENT DESIGN CRITERIA

The SWM Design criteria for the Site is to be based on the following reference documents:

- Stormwater Management Planning and Design Manual (Ministry of the Environment, 2003).
- Windsor/Essex Region Stormwater Management Manual (ERCA, June 2024) [WERSM].

1.2.1 Design Storms

The following design storm events, as recommended in the WERSM, are to be used for the purposes of the SWM analysis:

- 2-Year, 4-hour design storm using Chicago distribution with a 15-minute time interval and a total rainfall depth of 32 mm.
- 5-year, 4-hour design storm using the Chicago distribution with a 15-minute time interval and a total rainfall depth of 49.5 mm.

- 100-year, 4-hour design storm using the Chicago distribution with a 15-minute time interval with a total rainfall depth of 81.6 mm.
- 100-year, 24-hour design storm using the SCS Type-II distribution with a 2-hour time interval and a total rainfall depth of 108 mm.
- Urban Stress Test (UST) storm using the Chicago distribution with a 15-minute time interval with a uniform distribution of an additional 42 mm for a total rainfall depth of 150 mm.

1.2.2 Quantity Control

Based on approved Howard Avenue Future Development Area Storm and Sanitary Servicing Feasibility Study (Dillon, 2020) completed by the City, the Site sits within the East Development Land area. Post-development peak flows are to be restricted to a maximum release rate of 35 L/s/ha into the existing Howard Avenue storm sewer system.

Surface ponding within parking lots and roadways are to be maintained below 0.30 m during all storms, up to and including the governing 100-year event. During the UST event, ponding depths within parking lots are to be maintained below proposed building entrances and fully maintained on the Site.

It is proposed that the Site utilizes the existing Orchards Subdivision Dry Pond for water quantity control.

1.2.3 Quality Control

Post-development runoff is required to be treated to a “Normal” protection level, which is defined as the removal of 70% of total suspended solids (TSS) on an average annual basis. Water quality control design is to meet requirements set out within the WERSM for particle size distribution and rainfall intensity/rainfall volume relationships shown in Table 3.4.1.4 and Table 3.4.1.5 respectively.

On-site water quality controls are proposed for the Site to treat runoff prior to entering the existing Orchards Dry Pond.

1.2.4 Minor System Conveyance:

Storm sewers are to be designed to a 5-year level of service where the 5-year Hydraulic Grade Line (HGL) in the sewer system is to be 0.30 m below the lowest road elevation.

1.2.5 Major System Conveyance:

Major system overland flow depths are to be maintained below 0.30 m in depth during all storms, up to and including, the governing 100-year event. During the UST event, flow depths must be maintained below proposed building entrances and fully maintained on the Site.

2.0 ORCHARDS DEVELOPMENT SWM DESIGN

The adjacent Orchards Subdivision currently sites along the eastern boundary of the Site encompasses approximately 8.46 ha of land, and includes 86 family dwellings, associated roads, and Dry Pond. The SWM design was approved by the City of Windsor (City) and considered an additional 1.82 ha of development from the future Bragianis lands area to the north, for a total drainage area of 10.28 ha.

As noted in Section 1.2.2, the 3694-3738 Howard Development Site is proposing to utilize the existing Orchards Dry Pond for water quantity control.

As requested, A detailed existing conditions investigation analysis was completed for the Orchards Subdivision. A dual drainage existing condition PCSWMM model has been developed, and quasi calibration was completed to replicate the approved SWM design.

2.1 Original Dry Pond Design

Based on a review of the Howard Avenue Future Development Area Storm and Sanitary Servicing Feasibility Study (Dillon Consulting Ltd., 2020), the maximum allowable release rate for the East Howard Development lands is 35 L/s/ha. Review of the ultimate buildout area for the Orchards Dry Pond (Orchards Subdivision + Bragianis Lands) identifies a maximum allowable release rate of 360 L/s.

The existing Orchards Dry Pond is designed to provide water quantity control at a restricted pump out rate of 91 L/s into the existing Howard Avenue storm sewer, well below the allowable release rate of 360 L/s allocated for the 10.28 ha area. The approved Orchards Subdivision Dry Pond design, showing key design water surface elevations (WSEL), is provided in **Table 1**.

Table 1: Orchards Subdivision SWM Pond Summary - Approved Design

STORAGE EVENT	POND ELEVATION (M)	POND DEPTH (M)	STORAGE VOLUME (M^3)
Bottom of Pond	184.60	0.00	0
5-Year[1] WSEL	186.33	1.73	2,461
100-Year[2] WSEL	187.25	2.65	4,921
100-Year (Pump Failure) WSEL	187.51	2.91	5,768
Urban Stress Test[3] WSEL	187.61	3.01	6,111
Top of Pond	187.80	3.20	6,792

[1] 5-Year Design Storm (Chicago 4-Hour, 49.5mm Depth, 5 min. Time Step)
[2] 100-Year Design Storm (Chicago 4-Hour, 81.6mm Depth, 5 min. Time Step)
[3] Urban Stress Test (Chicago 100 -Year 24-Hours,150mm Depth, 15min. Time Step)

The approved hydraulic assessment for the Orchards Subdivision consisted of a dual drainage model to consider the proposed storm sewer system and roadway overland flow routing. Based on the review of the approved SWM report, during both the 100-year and Urban Stress Test (UST) events, a combination of surface and underground pipe storage was utilized. While the report did not provide specific details on the on-site surface and pipe storage volumes, it noted that storm sewers between MH-7 and MH-9, MH-4 and MH-6, and MH-1 and MH-3 were oversized to 1050 mm in diameter to accommodate future flows from the Bragianis lands.

Water quality control for the Orchards development is provided through an Oil and Grit Separator to achieve a normal level (70% TSS) of treatment.

The approved Orchards Subdivision SWM report is provided in **Appendix A**.

2.2 Orchards Subdivision SWM Model Development and Analysis

Dillon completed a detailed dual drainage model analysis for the existing Orchards Subdivision to replicate the original design conditions of the Orchards Dry Pond. To complete the quasi calibration, a dual drainage PCSWMM model was developed as follows:

- Sixteen (16) sub-catchment (Total area 8.46 ha) representing the existing Orchards Subdivision and Bragianis lands at the designed impervious value of 60%;
- Three (3) sub-catchment (Total area 1.82 ha) representing the future Bragianis lands at the designed impervious value of 60%;
- The storm sewer network (minor system) was developed based on as-constructed drawing provided in **Appendix A**;
- The roadway overland flow (major system) was developed using road grades and catchbasin locations based on as-constructed drawings. The following features were included in the model:
    - Roadway high points (HPs) to represent spillover grades from roadway low points.
    - Roadway low points to represent catchbasins (CBs) set at gutter grades and represented as either TCICB OR CICB's.
    - CICB leads were represented as 200 mm diameter orifices, and the TCICBs were represented as 250 mm diameter orifices.
    - 150 mm orifices added to the major system to replicate the rearyard CB leads originally built in the approved RC Spencer model.
- One (1) 56 m long, 2 m wide and 0.5 m deep trapezoidal swale with side slopes of 6:1 (H: V) representing the overland flow conveyance to the Dry Pond with a spillover elevation at 187.75 m.
- One (1) storage node representing the Orchards Dry Pond based on the stage-storage information provided in **Table 1**;
- One (1) hydraulic pump station Dry Pond outlet with a constant pumping rate of 91 L/sec; and
- One (1) outfall representing the Dry Pond pump outlet into the downstream 675mm diameter Howard Avenue storm sewer.

For the purposes of assessing existing conditions, only the existing Orchards Subdivision and Bragianis Lands have been considered. The model schematic for the for existing conditions is shown in **Appendix B.**

To replicate the approved design conditions of the Orchards Dry Pond, Dillon completed a quasi-calibration for the Orchards Subdivision and Bragianis Lands by adjusting various hydrologic modelling parameters to replicate the design WSELs in the Dry Pond for the 100-year and UST events. This included adjusting flowpath lengths, as well as pervious depression depths to consider rearyard storage originally simulated in the RC Spencer model.

A summary the existing condition model parameters considered are shown in **Table 2**.

Table 2: Existing Conditions Model Parameters

SITE	TOTAL DRAINAGE AREA (HA)	IMPERVIOUS VALUE (%)	SUB-CATCHMENT PARAMETERS
Existing Orchards Subdivision	8.46	60%	Flow Length = varies Slope = 0.5 % Impervious Depression Storage = 2.5 mm Pervious Depression Storage* = 7.5 – 22 mm Manning's N Impervious = 0.013 Manning's N Pervious = 0.24 <u>Green-Ampt Infiltration Parameters (Type D Soils):</u> Suction Head = 180 mm Conductivity = 0.50 mm/hr Initial Deficit (normal) = 0.10
Future Bragianis Lands	1.82	60%	Flow Length = varies Slope = 0.5 % Impervious Depression Storage = 2.5 mm Pervious Depression Storage = 7.5 mm Manning's N Impervious = 0.013 Manning's N Pervious = 0.24 <u>Green-Ampt Infiltration Parameters (Type D Soils):</u> Suction Head = 180 mm Conductivity = 0.50 mm/hr Initial Deficit (normal) =

** Quasi calibrated to represent rear yard storage as approved in the original design for Orchards Subdivision*

Based on Dillon's PCSWMM Dual drainage modelling analysis for the Orchards Subdivision, the following tables summarize the Approved Orchards SWM design with Dillon's model results.

Table 3: Orchards Subdivision Existing SWM Pond Summary – Approved Design vs 2025 Dillon Model

STORM EVENT	Approved Dry Pond Design WSEL (m)	2025 Dillon Model WSEL (m)	Approved Dry Pond Design Volume (m^3)	2025 Dillon Model Storage Volume (m^3)
Chicago 100-Year, 4-hour	187.25	187.25	4,921	4,908
UST	187.61	187.70	6,111	6,434

As shown, the UST WSEL and volumes are slightly above the approved design. However, the 2025 Dillon model shows that the WSEL during this event is still maintained in the Dry Pond.

Table 4: Orchards Subdivision Existing 100-Year Roadway Ponding Results

STREET	2025 Dillon Model 100-Year Max. Roadway Ponding Depth (m)
Oakridge Avenue	0.06
Farrow Avenue	0.22
Sutton Avenue	0.21
Holburn Street	0.19
Orchards Crescent	0.20

Based on the re-created dual drainage model of the Orchards Subdivision, the 100-year roadway ponding depths along each roadway are maintained to be at, or slightly above 0.21m. This is consistent with the approved SWM design.

3.0 PROPOSED DEVELOPMENT CONDITIONS

The Site is proposed to utilize the existing Orchards SWM Dry Pond for the purposes of water quantity control. To assess the feasibility of this SWM strategy, the Site was incorporated into the PCSWMM model originally developed to assess the approved design conditions of the Orchards Dry Pond. The proposed condition PCSWMM model schematic is provided in **Appendix B**.

Modelling parameters for the site under a developed condition are shown below.

Table 5: 3694-3738 Howard Development - Proposed Conditions Model Parameters

SITE	DRAINAGE AREA (HA)	IMPERVIOUS VALUE (%)	SUB-CATCHMENT PARAMETERS
3694-3738 Howard Avenue	0.74	80%	Flow Length = 120 m Slope = 1 % Impervious Depression Storage = 2.5 mm Pervious Depression Storage = 7.5 mm Manning's N Impervious = 0.013 *Manning's N Pervious = 0.15 <u>Green-Ampt Infiltration Parameters (Type D Soils):</u> Suction Head = 180 mm Conductivity = 0.50 mm/hr Initial Deficit (normal) = 0.10

** Manning's Roughness for pervious area reflective of well manicured urban lawn*

3.1 Stormwater Management Analysis Results

Provided below is a comparison of existing verses proposed WSEL's and storage volumes for the Orchards Dry Pond based on a pump out rate of 91 L/s.

Table 6: Orchards Subdivision SWM Pond Summary – Existing Design vs. Proposed Design

STORM EVENT	2025 Dillon Model Dry Pond WSEL (m)	Proposed Condition Dillon Model WSEL (m)	2025 Dillon Model Dry Pond Storage Volume (m^3)	Proposed 2025 Dillon Model Storage Volume (m^3)
Chicago 100-Year, 4-hour	187.25	187.42	4,908	5,450
Chicago 100-Year, 4-hour (Pump Failure)	187.60	187.71	5,768	6,454
UST	187.70	187.78	6,434	6,740

Based on the above, the increased WSEL's in the Dry Pond under proposed development conditions are maintained within the original design top of bank. Despite the increase in runoff from the proposed Site, the Dry Pond maintains a freeboard of 0.38 m, confirming that it can handle the additional volume without

overtopping. The UST WSEL is shown to be maintained below the Orchard Subdivision minimum lowest building opening of 188.30 m as shown in the approved Orchards Subdivision Grading Plan. The Dry Pond pump outlet of 91 L/s is still considered adequate under proposed design conditions and is well below the allowable release rate of 35 L/s/ha. The Dry Pond continues to maintain the design for a zero release condition under a pump failure scenario.

The Dry Pond under proposed conditions is therefore shown to still meet the requirements laid out in the WERSM and Approved design completed as part of the Orchards Subdivision.

Provided below are the updated maximum roadway depths due to the incorporation of the Site development. As shown, roadway ponding depths through the Orchards Subdivision are maintained below the permissible 0.30m during the 100-year event. This demonstrates that the proposed development has a minimal impact on roadway ponding, aligning with the approved design ponding depths for the Orchards Subdivision.

Table 7: Orchards Subdivision 100-Year Roading Ponding Impacts

STREET	2025 Dillon Model 100-Year Max. Roadway Ponding Depth (m)
Oakridge Avenue	0.06
Farrow Avenue	0.23
Sutton Avenue	0.21
Holburn Street	0.20
Orchards Crescent	0.20

3.1.1 Water Quality Control

As discussed in **Section 1.2.3**, to meet the water quality requirements of the site at a 'Normal' protection level water quality treatment (70% TSS removal) and requirements set out within he WERSM, on oil and grit separator (OGS) unit is proposed. The FD-5HC model supplied by ADS, or approved equivalent is recommended for this site which provides a TSS removal efficiency of 73.0%.

The details of this OGS sizing are provided in **Appendix B.**

3.1.2 Conveyance

The Site is proposed to convey flow into the existing Orchards Dry Pond through a combination of storm sewers and overland flow routes. A storm sewer outlet is proposed to convey flows during frequent storm events into the Dry Pond. During larger storm events up to and including the UST, curb cuts are proposed along the eastern edge of the Site development area to convey major system flow to the Dry Pond. Please refer to the Site servicing and grading plan prepared for this design submission. Storm Servicing and preliminary grading for the site is provided in **Figure 2** and **Figure 3**.

Further design of storm sewers design and overland flow routing for the Site is to be completed during detail design for Site Plan Control.

4.0 DEVELOPMENT FLOODPROOFING

According to the WERSMSM design requirements, the minimum building opening elevation should be the higher of the following:

- 0.30 m above the regulatory flood level for a neighboring watercourse.
- 0.30 m above the 100-Year water surface elevation (WSEL) on-site; or
- Climate Change stress test WSEL on-site.

Hence, for the subject's site, a minimum building opening elevation of 187.78m (UST Dry Pond WSEL of 187.78m) will be provided.

5.0 EROSION AND SEDIMENT CONTROL

Erosion and sediment control measures are to be implemented during construction in accordance with the "Guidelines on Erosion and Sediment Control for Urban Construction Sites" (Government of Ontario, May 1987) and "Construction Specification for Temporary Erosion and Sediment Control Measures" (OPSS 805)

6.0 CONCLUSIONS AND RECOMENDATIONS

The SWM design proposed for 3694-3738 Howard Avenue Development meets all regional and provincial requirements to satisfy the Zoning Bylaw application requirements at this time.

The proposed SWM design for the Site includes the following:

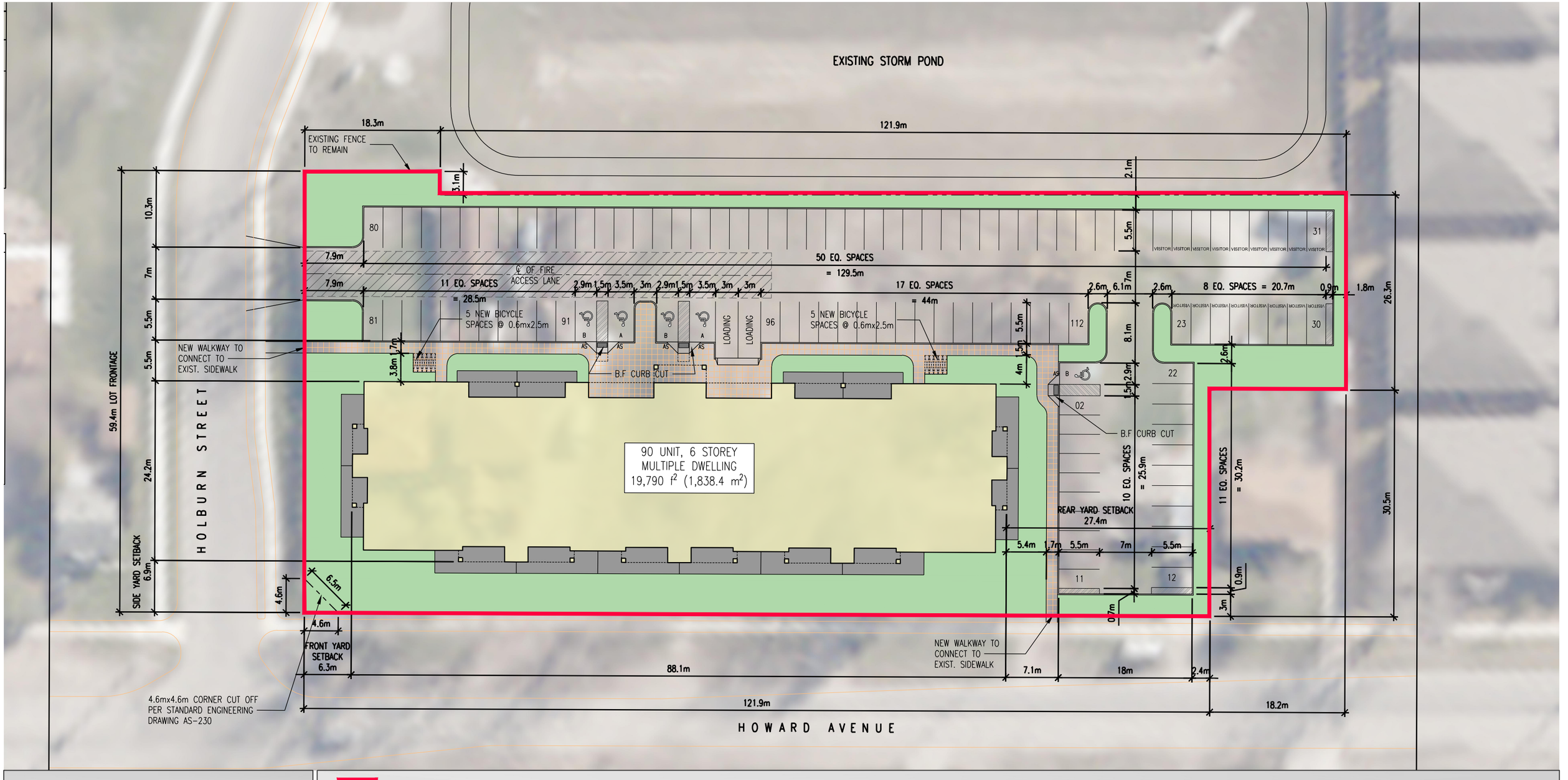
- Quantity Control to be provided through the use of the existing Orchards Subdivision Dry Pond;
- Dry Pond is shown to have sufficient capacity to accommodate quantity control for the Site for all storms, up to and including the 100-year and UST events, including during the zero release design condition during the 100-year event;
- Incorporation of the Site into the existing Dry Pond does not adversely impact existing roadway ponding through the Orchards Subdivision;
- Dry Pond pump station capacity of 91 L/s is to be maintained;
- Water quality control will be achieved on the Site using the OGS Unit FD-5HC sized to achieve a Normal (70% TSS) Level of Treatment.
- A minimum building opening elevation of 187.78m is to be considered during detailed design.

This report is respectfully submitted for review and approval. Should you have any questions, we would be pleased to discuss the results of our evaluation in further detail.

DILLON CONSULTING LIMITED

Ryan Langlois, P.Eng.
Water Resources Engineer

FIGURES



J. RAUTI DEVELOPMENTS INC. & 2601817 ONTARIO LIMITED
3694-3738 Howard Avenue
WINDSOR ONTARIO

CONCEPT PLAN
FIGURE 1.0

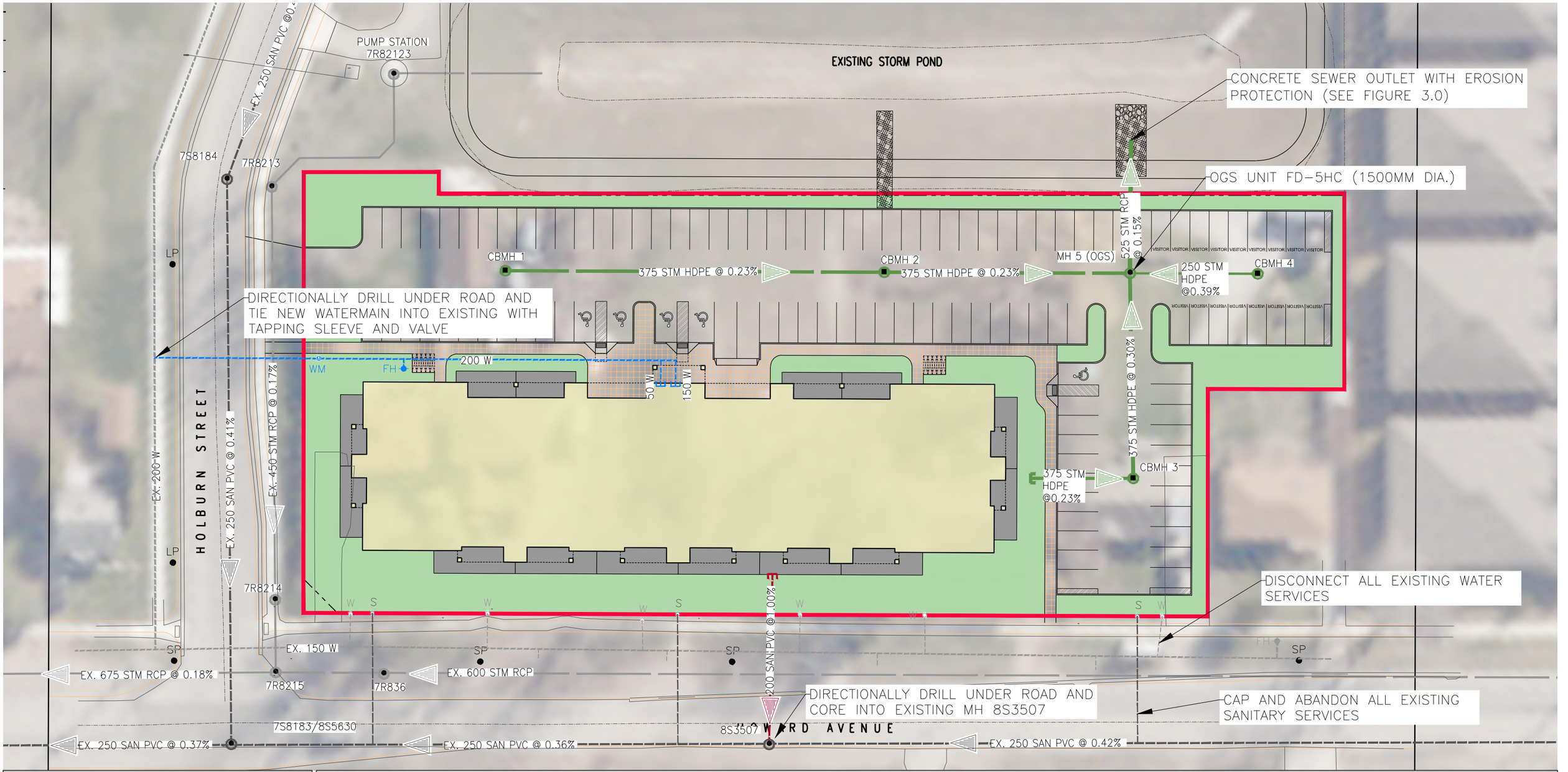
SUBJECT AREA
(±0.74ha / 1.83ac)

SOURCE: COUNTY OF ESSEX AERIAL PHOTOGRAPHY (2023)

MAP/DRAWING INFORMATION
THIS DRAWING IS FOR INFORMATION PURPOSE ONLY. ALL DIMENSIONS AND BOUNDARY INFORMATION SHOULD BE VERIFIED BY AN O.L.S PRIOR TO CONSTRUCTION.
CREATED BY: KYD
CHECKED BY: KNE
DESIGNED BY: KYD

SCALE: 1:500m

PROJECT: 24-8813
STATUS: DRAFT
DATE: 10/10/2025



J. RAUTI DEVELOPMENTS INC. & 2601817 ONTARIO LIMITED
3694-3738 Howard Avenue
WINDSOR ONTARIO

UTILITY PLAN
FIGURE 2.0

SUBJECT AREA (±0.74ha / 1.83ac)

LP EXISTING LIGHT POLE

SP EXISTING SERVICE POLE

EX. 600 STM EXISTING STORM SEWER AND MANHOLE

EX. 250 SAN EXISTING SANITARY SEWER AND MANHOLE

W EX. 150 W EXISTING WATERMAIN AND VALVE

375 STM PROPOSED STORM SEWER

200 SAN PROPOSED SANITARY SEWER

WV 150 W PROPOSED WATERMAIN AND VALVE

PROPOSED STORM MANHOLE

PROPOSED STORM CATCHBASIN MANHOLE

FH PROPOSED FIRE HYDRANT

SOURCE: COUNTY OF ESSEX AERIAL PHOTOGRAPHY (2023)

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CREATED BY: KYD
CHECKED BY: KNE
DESIGNED BY: KYD

SCALE: 1:500m

PROJECT: 24-8813
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DATE: 10/10/2025

INSTALL STANDARD CONCRETE DRIVEWAY APPROACH AND CURB CUT AS PER C.O.W. AS-204

EXISTING STORM POND

INSTALL EROSION CONTROL BLANKET ALONG BANKS OF THE POND AND RIP-RAP AT THE BOTTOM OF THE OUTLET PIPE.

CURB CUT WITH A SHALLOW SWALE TO POND. INSTALL EROSION CONTROL BLANKET FROM CURB CUT AND ALONG BANKS OF THE POND

187.95

187.67

187.93

187.66

187.60

187.95

187.70

187.98

R

RC

FFE = 188.40m
(188.30m MIN.)

187.67

188.05

HOLBURN STREET

HOWARD AVENUE

RC R

RC R

REMOVE EXISTING CONCRETE DRIVEWAY APPROACHES. REPLACE CURB CUT WITH STANDARD CURB AS PER C.O.W. AS-208A

J. RAUTI DEVELOPMENTS INC. & 2601817 ONTARIO LIMITED
3694-3738 Howard Avenue
WINDSOR ONTARIO

GRADING & REMOVALS PLAN
FIGURE 3.0

SUBJECT AREA (±0.74ha / 1.83ac)

188.05 PROPOSED ELEVATION (LOW POINT)

188.05 PROPOSED ELEVATION (HIGH POINT)

OVERLAND FLOW ROUTE

RC REMOVE CURB

R REMOVE SIDEWALK

R REMOVE DRIVEWAY

SOURCE: COUNTY OF ESSEX AERIAL PHOTOGRAPHY (2023)

MAP/DRAWING INFORMATION
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CREATED BY: KYD
CHECKED BY: KNE
DESIGNED BY: KYD

SCALE: 1:500m

PROJECT: 24-8813
STATUS: DRAFT
DATE: 10/10/2025

APPENDIX A

BACKGROUND INFORMATION

THE ORCHARDS SUBDIVISION
STORMWATER MANAGEMENT REPORT

IN THE

CITY OF WINDSOR

COUNTY OF ESSEX

ONTARIO

RC SPENCER ASSOCIATES INC.
Consulting Engineers

File No. 17-726

2 June 2021

Table of Contents

Appendices:

Appendix 'A' Storm Sewer Design

Appendix 'B' Hydrologic and Hydraulic Modelling Reports
Storm Sewer Profile Plots

Appendix 'C' Hydrologic and Hydraulic Modelling Reports
Roadway Storage Profile Plots

Appendix 'D' Storm Water Quality Control
Oil-Grit Separator (OGS) Details

D1 T.S.S. Removal Efficiency Spreadsheet

D2 Hydro First Defense Unit Details

INTRODUCTION

RC Spencer Associates Inc. was retained by Imperial Developments (Windsor) Inc. and J. Rauti Developments Inc. to complete the subdivision design and associated Stormwater Management Report for their lands known as "The Orchards" subdivision.

The proposed residential development is located East of Howard Avenue with connection to Howard Avenue to the west as well as the Holburn Street / Maguire Street intersection to the east. The subject site is approximately 8.46 hectares in size, which will be servicing 86 single family dwellings. The Site Location Plan is shown on Figure 1.

RC Spencer Associates Inc. was directed by the City of Windsor to oversize the storm sewers as required to accommodate the future development of the Bragianis lands (1.82 hectares) to the north of the subject site.

This report addresses the hydrologic and hydraulic modelling of both the storm sewer system and stormwater management facility for the above noted subdivision. The allowable release rates are in accordance with the findings of the *East Howard Development Lands Servicing Summary* dated 31 July 2020 prepared by Dillon Consulting.

1. GENERAL

1.1 Land Use

The subject site as well as all of the surrounding properties are all existing residential properties or designated as future residential for the City of Windsor Official Plan.

1.2 Soil Classification

The general area is characterized as brookston clay and brookston clay sand spot phase, as identified by the Ontario Ministry of Natural Resources and Essex Region Conservation Authorities, as shown on Figure 2. These soil types have almost level topography with poor natural drainage and assigned as hydrologic soil Group 'D' per the *Windsor/Essex Region Stormwater Management Standards Manual* (Dec. 2018).

1.3 Existing Drainage Network

The area lies within the Turkey Creek watershed. Currently, the drainage of Howard Avenue in the study area is provided by roadside catch basins and a storm network which outlets to the Grand Marais Drain via South Cameron Boulevard. The overall map of the regional drainage network is demonstrated on Figure 3.

1.4 Existing Storm Sewer Network

The existing storm sewer along Howard Avenue fronting the proposed site is a 675mm diameter sewer. The sewer network flows northerly toward its outlet into the roadside ditch located west of South Cameron Boulevard. As noted above, the drainage ultimately outlets to the Grand Marais Drain. The existing storm sewer network is demonstrated on Figure 4.

The *East Howard Development Lands Servicing Summary* dated 31 July 2020 prepared by Dillon Consulting describes this existing drainage area and sewer network in further detail. This study modelled the capacity of the existing storm sewer network and provides the following recommendation:

The allowable release rate to cause no adverse impacts on the downstream system for the East Howard Development Lands was therefore calculated to be 35 L/s/ha.
The maximum required release rate is consistent with approximately a Chicago 1:5 year 4 hour pre-development release rate from the undeveloped sites.

1.5 Proposed Conditions

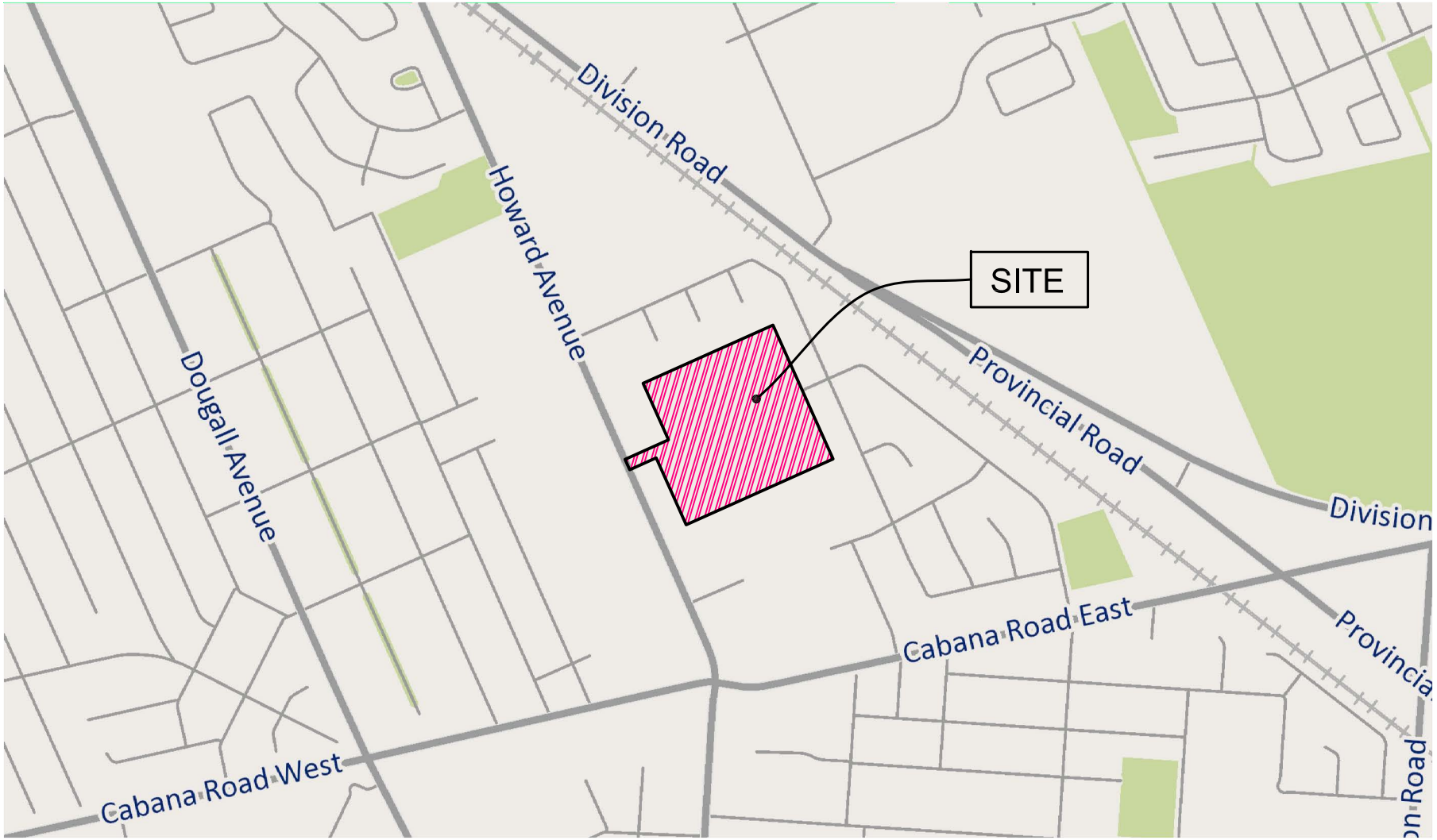
The proposed residential development is approximately 8.46 hectares in size, which will be servicing 86 single-family dwellings. The proposed development will consist of:

- 2.33 ha of Right-of-way
- 5.62 ha of Single-family homes (86 residential lots)
- 0.49 ha for Block 87 (dry pond SWM facility)
- 0.02 ha for Block 88 (active transportation pedestrian pathway)

The Bragianis lands (1.82 hectares) to the north of the subject site will also be directed to the new Holburn SWM Facility. The total drainage area for this dry pond will be 10.28 hectares.

The services for the proposed development including storm sewer, sanitary sewer and watermain. Storm and sanitary sewers to be connected to the existing infrastructure provided on Howard Avenue. Watermain to be looped between existing mains on Howard Avenue and Maguire Street.

The road layout and lot grading plan is demonstrated on Figure 5.



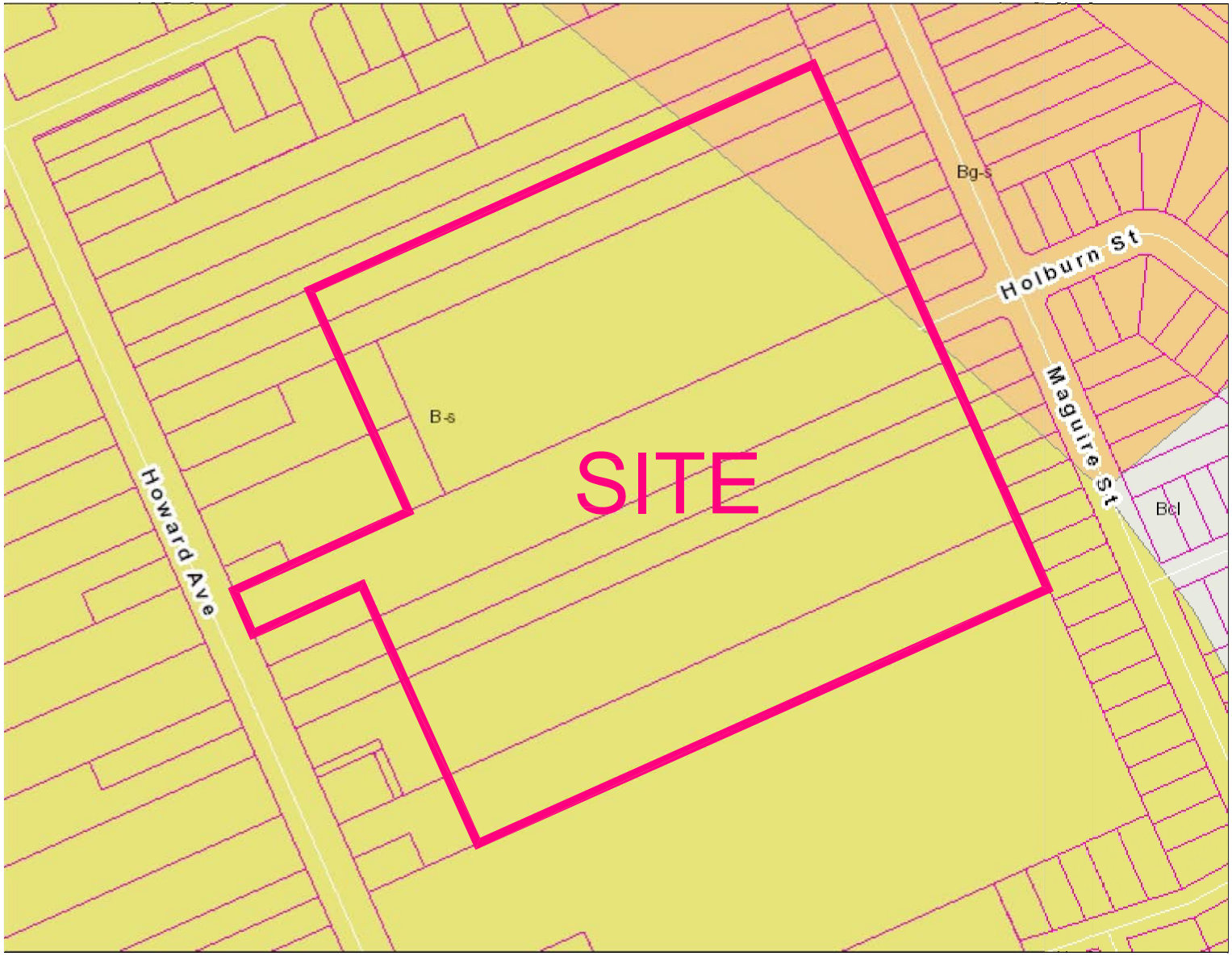
RC SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 800 University Avenue W. – Windsor ON N9A 5R9
Leamington: 18 Talbot Street W. – Leamington ON N8H 1M4
Chatham-Kent: 49 Raleigh Street – Chatham ON N7M 2M6

THE ORCHARDS SUBDIVISION
STORMWATER MANAGEMENT REPORT

PROJECT NO.
17-726

SITE LOCATION PLAN

FIGURE NO.
1



Essex Region Conservation Authority

Public Interactive Mapping

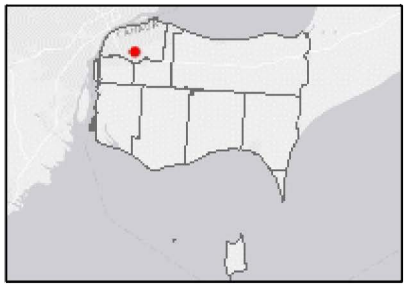
Legend

- Parcel Fabric - City
- Parcel Fabric - County

Essex Soils

- B-s
- B.L.
- Bc
- Bcl
- Bel
- Bes
- Bg
- Bg-s
- C-s
- Cac
- Cacl
- Cc
- Cdl
- Es
- Fl
- Fsl

Location



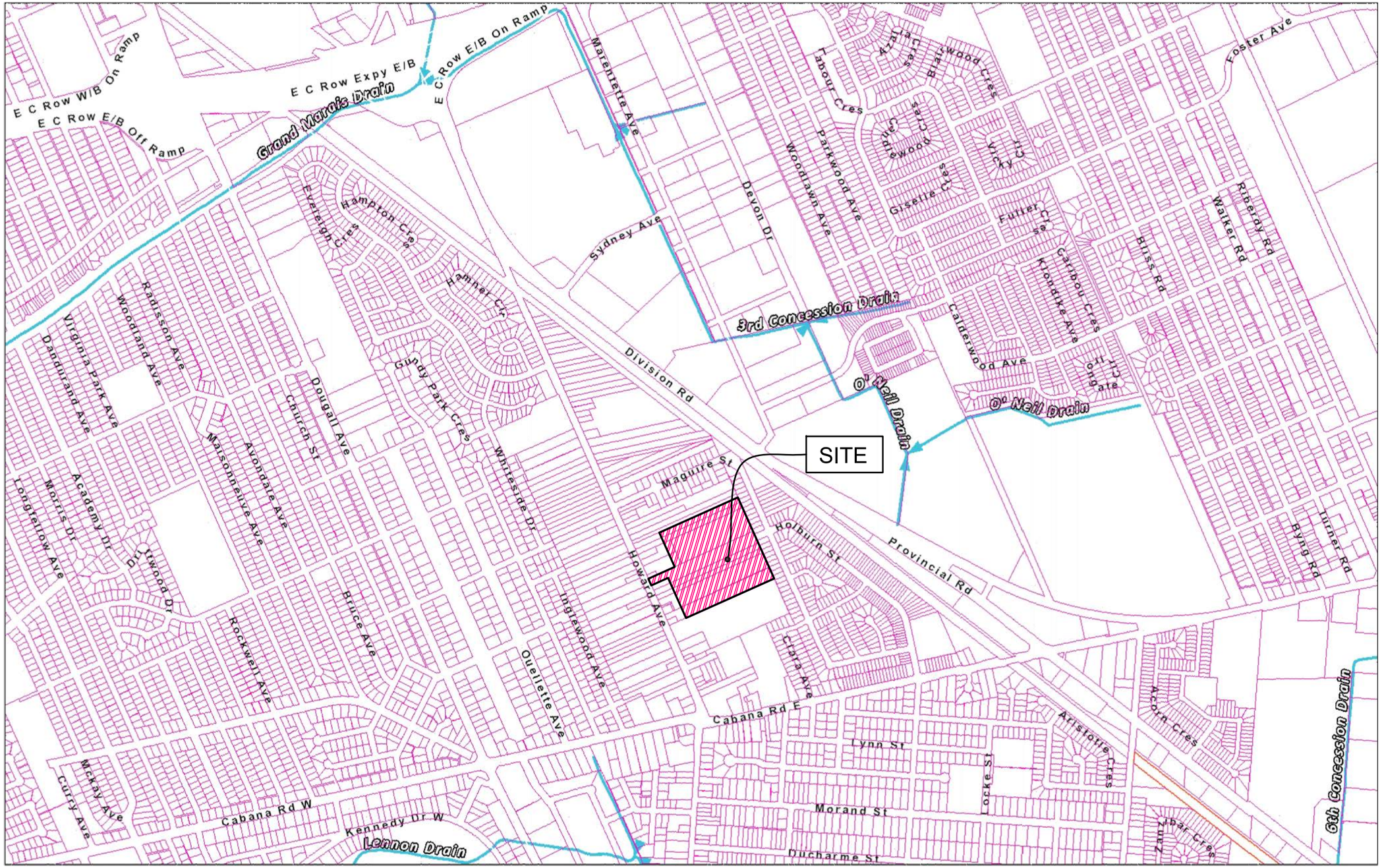
RC SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 800 University Avenue W. – Windsor ON N9A 5R9
Leamington: 18 Talbot Street W. – Leamington ON N8H 1M4
Chatham-Kent: 49 Raleigh Street – Chatham ON N7M 2M6

THE ORCHARDS SUBDIVISION
STORMWATER MANAGEMENT REPORT

PROJECT NO. 17-726

SOILS

FIGURE NO. 2



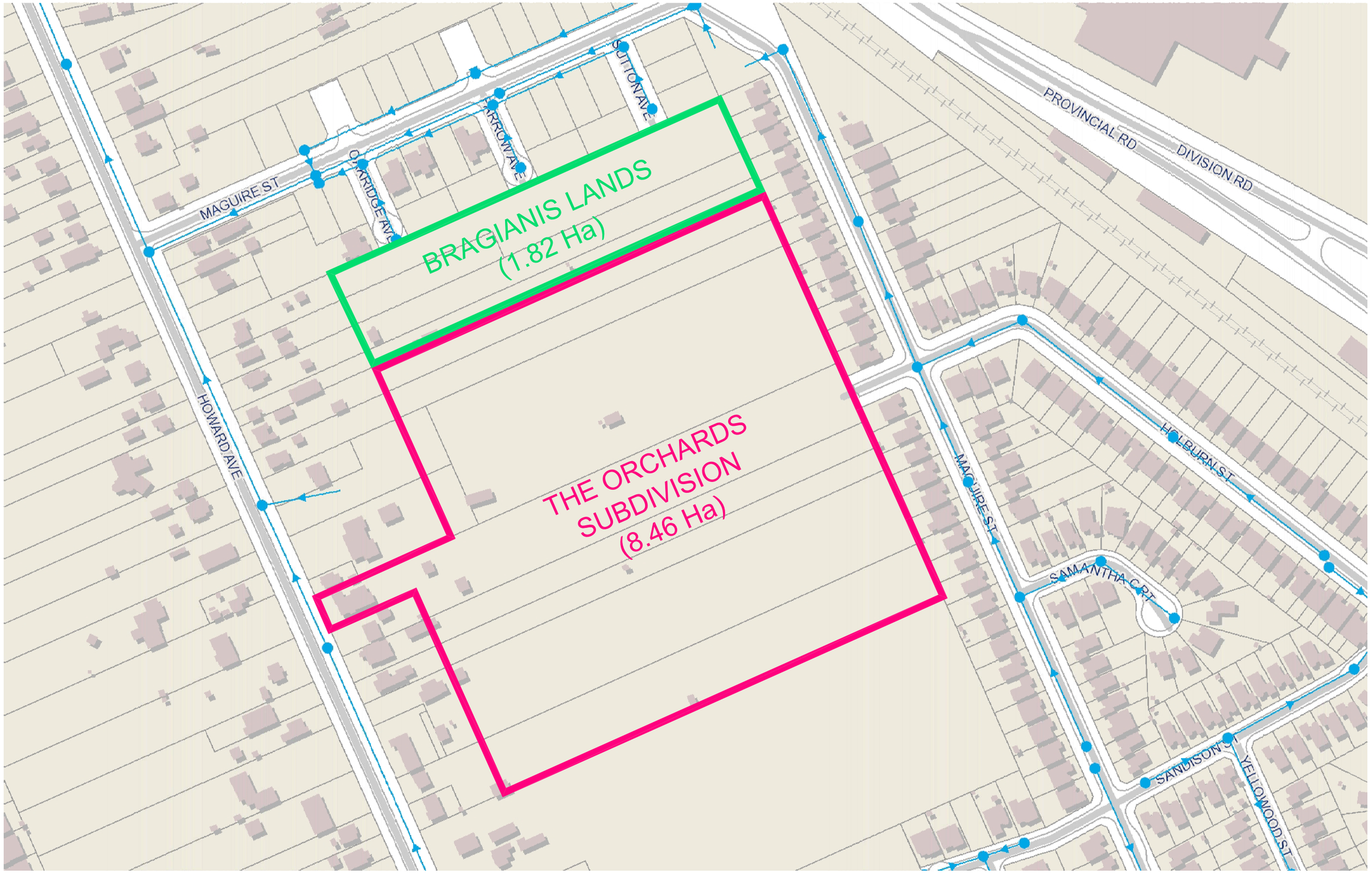
RC SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 300 University Avenue W. – Windsor ON N9A 5R9
Leamington: 18 Talbot Street W. – Leamington ON N8H 1M4
Chatham-Kent: 49 Raleigh Street – Chatham ON N7M 2M6

THE ORCHARDS SUBDIVISION
STORMWATER MANAGEMENT REPORT

REGIONAL DRAINAGE NETWORK

PROJECT NO. 17-726

FIGURE NO. 3



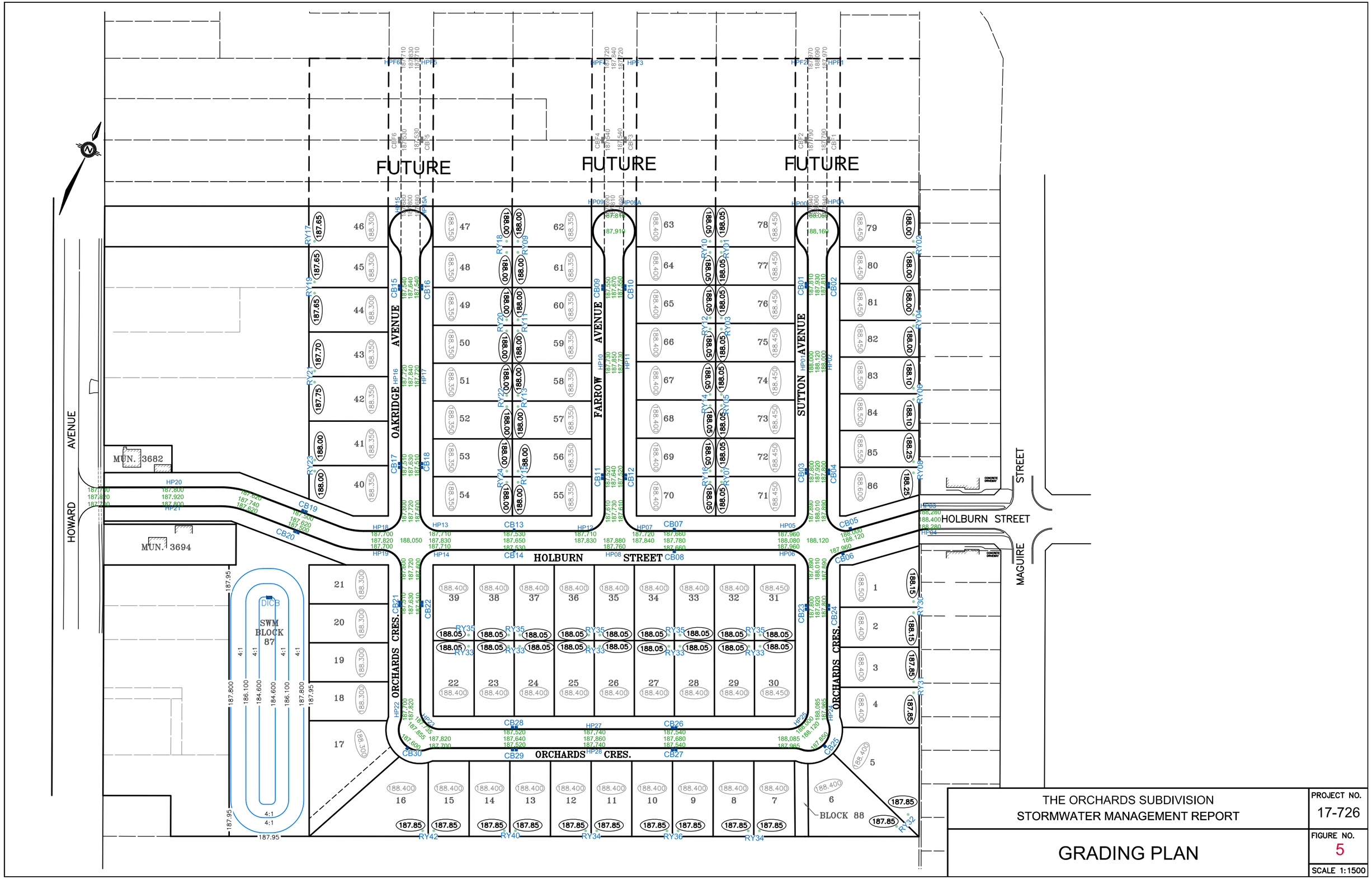
RC SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 800 University Avenue W. – Windsor ON N9A 5R9
Leamington: 18 Talbot Street W. – Leamington ON N8H 1M4
Chatham-Kent: 49 Raleigh Street – Chatham ON N7M 2M6

THE ORCHARDS SUBDIVISION
STORMWATER MANAGEMENT REPORT

EXISTING STORM SEWER NETWORK

PROJECT NO. 17-726

FIGURE NO. 4



THE ORCHARDS SUBDIVISION
STORMWATER MANAGEMENT REPORT

PROJECT NO. 17-726

GRADING PLAN

FIGURE NO. 5

SCALE 1:1500

2. STORM SEWER DESIGN

2.1 Design Methodology and Return Period

The new storm sewer was designed using Rational Method**.** The 1:5 year return period was used for new storm sewer design as standard for urbanized areas in Windsor-Essex Region.

2.2 Rainfall Intensity

The design storm Intensity was calculated using the following Equation:

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

Where:

I is rainfall intensity in mm/hr
T is time of concentration in minutes

Intensity-Duration-Frequency (IDF) curve parameters (a,b,c) are based on 61 years (1946-2007) of historical rainfall data from Windsor Airport as summarized in Table 3.2.1.1 of the ERCA SWM Manual. Thus, the Equation for intensity calculation for 1:5 Year return period is:

$$\boldsymbol{I = 1259/(T+8.8)^{0.838}}$$

2.3 Hydraulics

Storm drainage systems are designed based on the assumption of free surface flow. The pressure created for full flow or by surcharge conditions are not considered in the sewer design. This approach is commonly employed in the design of shallow municipal storm sewer systems.

Sewer flow velocities based on flow rates, sewer size and slope are limited by the need to provide flushing capacity, at the low limit of 0.8 m/s and by the need to prevent excessive mechanical corrosion (scour) by soil particles at 3.0 m/s.

2.4 Sizing

The sewers were designed by applying the Rational Method and an IDF relationship curve (as discussed in Section 2.2) to provide rainfall intensity for individual sewers.

The sewer design chart is demonstrated in Table 1 (Appendix A).

Design considerations, i.e., velocity, size and sewer depth constraints were satisfied. The Storm Sewer Drainage Area Plan is shown on Figure 7 (Appendix A).

3. HYDROLOGIC AND HYDRAULIC MODELLING

3.1 Modelling Approach and Assumptions

While storm sewers are designed to convey flows from minor (more frequent) storm events, the major (less frequent) storm events, in addition to storm sewer networks, are conveyed by street overland flow features such as inlets, curbs and gutters, roadside swales, etc.
A dual drainage network model was created for this development to simulate drainage system performance during major storm events.

3.2 Software Application

The hydrologic and hydraulic analysis for this development was completed using the **PCSWMM Professional 2D software distributed by CHI**. PCSWMM is advanced modelling software for stormwater, wastewater and watershed systems. Surface flows routed overland (major systems such as roads, swales, street sags, storage areas) can easily and accurately be combined with underground flows (minor system, such as sewer infrastructure).

3.3 Design Storm Distributions

The selection of the design storm distribution was based on the recommendations of the current ERCA SWM Manual. The following storm distributions were used for the model:

- 5-Year Design Storm (Chicago 4-Hour, 49.5mm Depth, 5 min. Time Step)
- 100-Year Design Storm (Chicago 4-Hour, 81.6mm Depth, 5 min. Time Step)
- Urban Stress Test (Chicago 100 -Year 24-Hours,150mm Depth, 15min. Time Step)

The custom rainfall time series were created for each storm distribution based on data published in Appendix B of the ERCA SWM Manual.

3.4 Hydrologic Modelling

The Green-Ampt Infiltration method was selected to estimate infiltration losses. This method uses model parameters based on soil type. The model input parameters represent Hydrologic Soil Group D.

Infiltration Parameters:	Suction Head	Su	180mm
	Conductivity	Ks	0.5mm/hr
	Initial deficit (normal)	IMD	0.1

Physical sub-catchment properties:

Drainage area (ha)	varies
Width (m)	varies
Impervious Area	
No Depression	25%
Manning Roughness	0.013
Depression Depth	2.5mm
Pervious Area	
Manning Roughness	0.24
Depression Depth	7.5mm

An overall impervious of **60%** was used for this single-family residential development.

The contributing drainage area is divided into 85 drainage sub-catchments representing storm water management pond, rear yards, and front yards combined with right-of-way drainage, as shown on the attached Storm Area Drainage Plan as Figure 6.

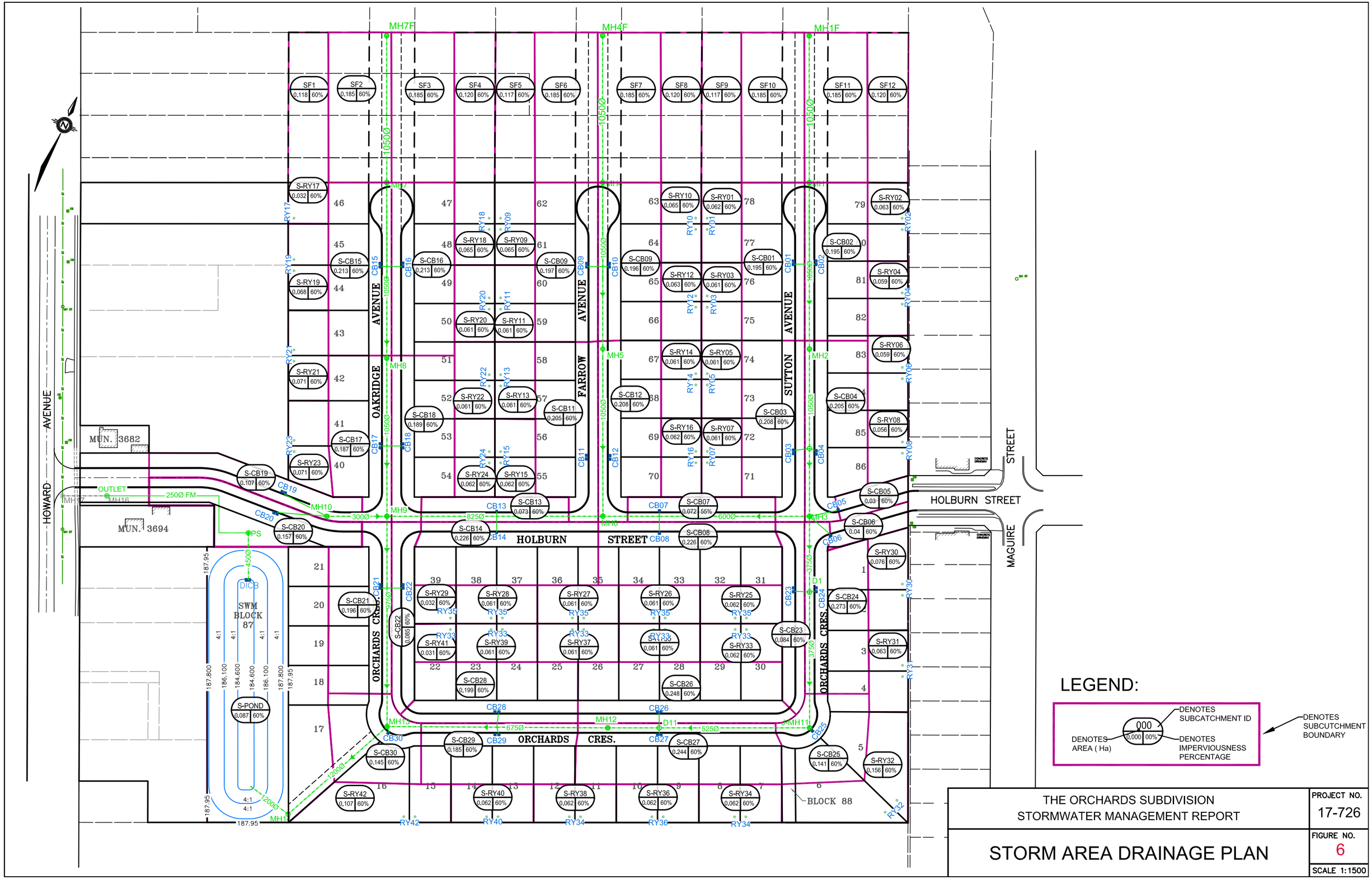
3.5 Hydraulic Modelling

3.5.1 General

The input parameters for the model elements are shown on the attached Grading Plan and Storm Area Drainage Plan (Figure 5 and Figure 6).

The model is represented by:

1) Junctions representing inlets on grade and road high points.
2) Storage nodes representing storm water management pond, manholes, road catchbasins on sag, and rear yard catchbasins.
3) Conduits representing underground piping as well as open channels representing on-surface roadway drainage.
4) Orifices representing curb inlet catchbasin openings.
5) Weirs representing road crown connection to upstream points of the roadway drainage.
6) Outlet is modelled as pump with free outfall conditions.



THE ORCHARDS SUBDIVISION
STORMWATER MANAGEMENT REPORT

PROJECT NO. 17-726

STORM AREA DRAINAGE PLAN

FIGURE NO. 6

SCALE 1:1500

3.5.2 Storage Nodes

A storage curve was created to model the storm water management facility designed as a dry pond with pumped outlet. Additional storage curves were created to model on-surface storage above road catchbasins on-sag and for rear yard catchbasins.

3.5.3 Inlets Control

The proposed catchbasins for the development are curb inlet type. The model assumes the road catchbasins inflow is controlled by rectangular orifices of size equal to curb inlet opening size. The rear yard drainage is controlled by 150mm diameter conduits representing private drain connections.

3.5.4. Routing Method

Hydrodynamic routing method was chosen in the modelling. Hydrodynamic routing has the capability of modelling backwater effects, flow reversal, surcharging, looped connections, tidal outfalls and pressure flow throughout the drainage network.

Model Layout

3.6 Model Results

The models were conducted to analyze four (4) different scenarios for the entire drainage area (10.28 hectares) including the future Bragianis lands to the north:

a) 1:5 year frequency storm event
b) 1:100 year frequency storm event
c) Urban Stress Test
d) 1:100 year storm with zero outflow (pump failure)

The modelling results are demonstrated in Appendix B and Appendix C.

Appendix B includes profile plots for the storm drainage systems showing peak flow results and maximum hydraulic grade lines for each simulated storm event.

Appendix C includes profile plots for the roadway storage which represent the maximum depth of stormwater runoff for each simulated storm event.

Below is the analysis summary of the stormwater management facility, based on the specified boundary conditions.

Storm Event	Water Level	Pond Storage Volume (m^3)	Peak Inflow (m^3/s)	Peak Outflow (m^3/s)	Detention Time (hr.)
5-Year	186.33	2,461	1.742	0.086	15.7
100-Year	187.25	4,921	2.690	0.091	25.6
Urban Stress Test	187.61	6,111	2.399	0.091	48.1
100-Year (Pump Failure)	187.51	5,768	2.604	0	0

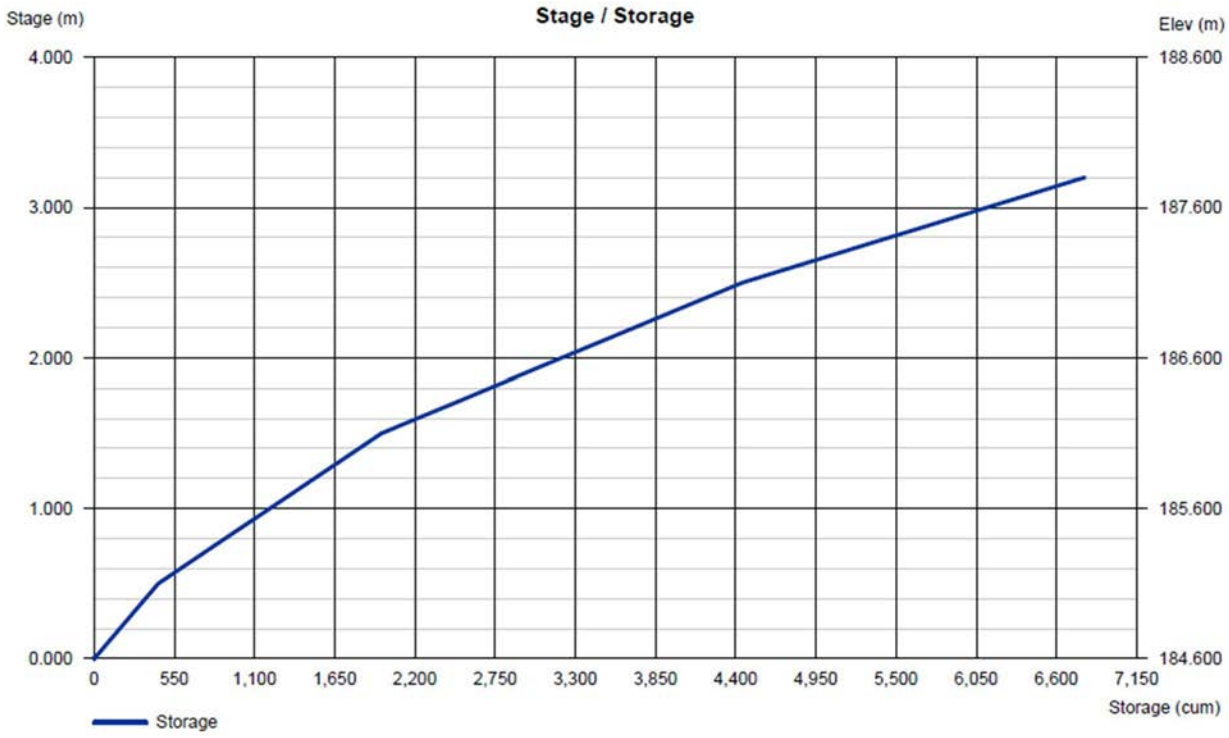
The modelling results of the SWM facility considering the Urban Stress Test event and the major 100-Year storm with pump failure result in a maximum water level of 187.61m. The proposed finished grade (minimum lowest building opening) of 188.30m provides 0.69m freeboard to this maximum water level.

The freeboard provided for this development far exceeds the criteria for Floodproofing Elevations described in Section 3.2.3.4 of the *Windsor/Essex Region Stormwater Management Standards Manual* (Dec. 2018).

Pond Report

Stage / Storage Table

Stage (m)	Elevation (m)	Contour area (sqm)	Incr. Storage (cum)	Total storage (cum)
0.00	184.60	673	0	0
0.50	185.10	1,083	439	439
1.50	186.10	1,978	1,531	1,970
2.50	187.10	2,974	2,476	4,446
3.20	187.80	3,731	2,347	6,792



4. STORM WATER QUALITY CONTROL

The proposed end-of-pipe storm water management facility receives storm water from the conveyance system and discharges the treated water to the existing sewer system and ultimately to the Grand Marais Drain. The dry pond is proposed principally as a storage facility, which provides a Basic treatment level (60% long-term suspended solid removal) per the *Stormwater Management Planning and Design Manual* (March 2003). Therefore, an oil-grit separator (OGS) is proposed for additional quality treatment.

The specified OGS unit was selected to provide a Normal Protection Level (70% long-term suspended solid removal) in series with the dry pond specified above to provide a combined treatment exceeding the Enhanced Protection Level (80% long-term suspended solid removal).

Recommended oil grit separator for this development is model number FD-6HC First Defense by Hydro International. The Hydro First Defense unit is certified by Canada ETV (Environment Technology Verification). The T.S.S. Removal Efficiency Spreadsheet is attached to this report in Appendix D.

Inspection of the unit shall occur periodically (once a month) over the first year of the operation to determine the rate of sediment and floatables accumulation. A probe (or dipstick) may be used to determine the depth in the collection facility. The maintenance collection schedule will be established based on this inspection information. A sump vac may be used to remove captured floatables and solids.

5. SUMMARY

The modelling results show that the proposed storm sewers in combination with the proposed roadway conveyance system have sufficient capacity to convey flows generated during the minor 1:5 year storm event. The hydraulic grade line will remain at least 0.80m below the finished road grade at all locations within the proposed development. Therefore, no flooding will occur during minor storm events. This meets the criteria for the Storm Sewer (Minor) System described in Section 3.2.2.5 of the *Windsor/Essex Region Stormwater Management Standards Manual* (Dec. 2018).

The results of the major 1:100 year storm event simulation demonstrate the hydraulic grade line will remain no more than 0.21m above the proposed catch basins. This meets the criteria for Surface Ponding described in Section 3.2.3.3 of the *Windsor/Essex Region Stormwater Management Standards Manual* (Dec. 2018).

The modelling results of the SWM facility considering the Urban Stress Test event and the major 100-Year storm with pump failure result in a maximum water level of 187.61m. The proposed finished grade (minimum lowest building opening) of 188.30m provides 0.69m freeboard to this maximum water level. This meets the criteria for Floodproofing Elevations described in Section 3.2.3.4 of the *Windsor/Essex Region Stormwater Management Standards Manual* (Dec. 2018).

As directed by the City of Windsor, the storm sewers were oversized to accommodate the future development flows from the Bragianis lands (1.82 hectares) to the north of the subject site. In order to maintain the above noted standards for the minor and major storm events, the storm sewers along Oakridge Avenue, Farrow Avenue and Sutton Avenue were upsized to 1050mm diameter north of Holburn Street. This same sewer size will also need to be maintained for the future extension to the north for the Bragianis lands.

The *East Howard Development Lands Servicing Summary* dated 31 July 2020 prepared by Dillon Consulting calculates the allowable release rate of 35 L/s/ha to cause no adverse impacts on the downstream system for the East Howard Development Lands. For this 8.46-hectare development, that results in an allowable release rate of 296 L/s. The peak outflow from this site by means of the storm pumping station is equal to 91 L/s (30% of allowable). Therefore, the outflow from this development is restricted to far less than the allowable release rate for all storm events.

A dry pond in conjunction with the oil grit separator model FD-6HC First Defense by Hydro International has been selected to provide long-term suspended solids removal in accordance with the *Stormwater Management Planning and Design Manual* (March 2003).

APPENDIX A

Storm Sewer Design

STORM SEWER DESIGN CHART - METRIC UNITS

TABLE 1

PROJECT NAME: "THE ORCHARDS" SUBDIVISION
PROJECT NO. 17-726
CLIENT:
DATE: 2 JUNE 2021

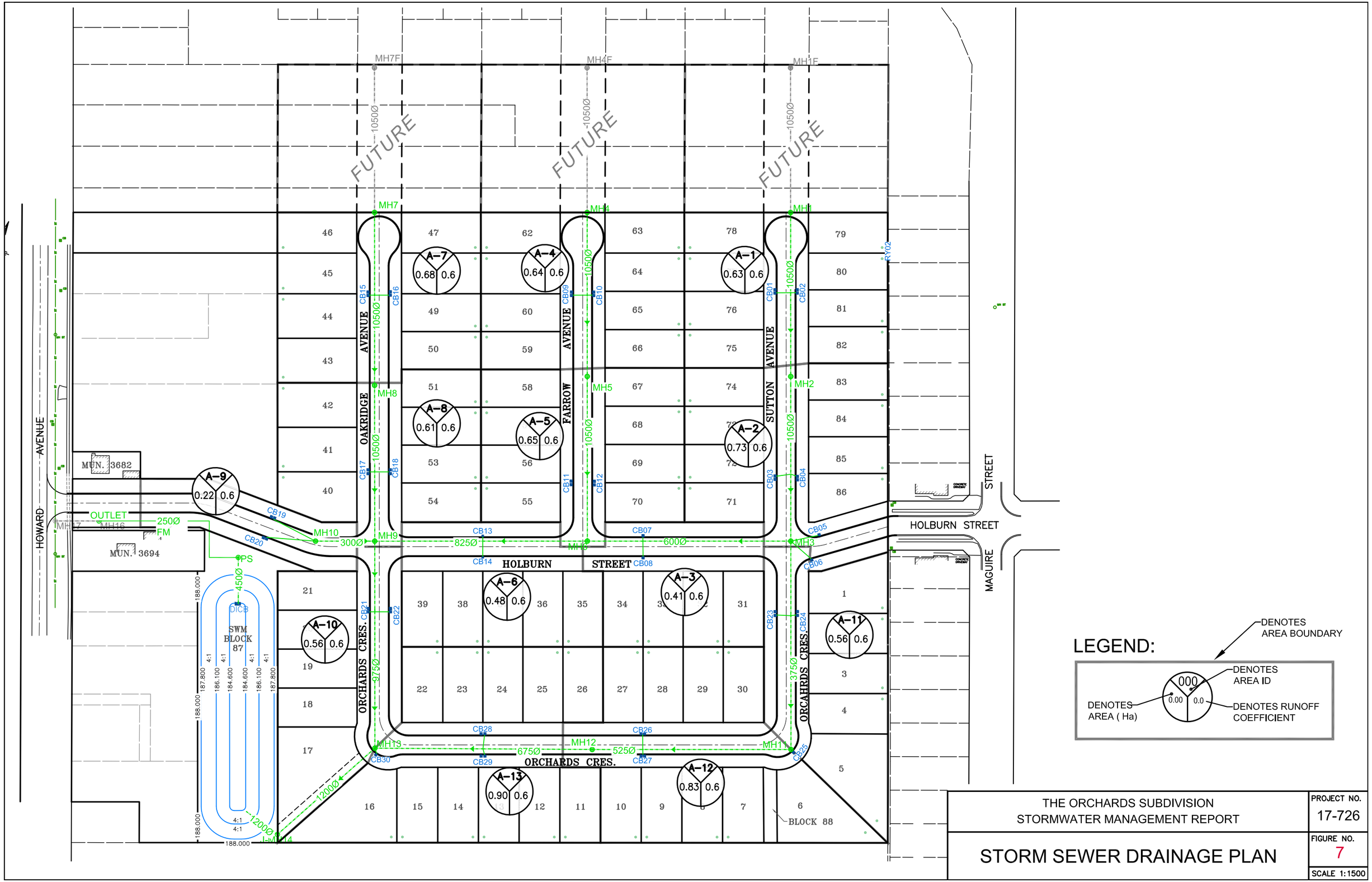
DESIGN CRITERIA

STORM CURVE: 5 YEAR - C.O.W.
ENTRY TIME: 20 MINUTES
MIN. VELOCITY: 0.8m/s
MAX. VELOCITY: 3.0m/s

C FACTORS: LAWNS - 0.20
PAVED - 0.90
ROOF - 0.95
n FACTOR: 0.013

LEGEND:
Oversized to prvide storage for future development of Bragianis Lands

LOCATION				AREA		A X C				RAINFALL INTENSITY			Q	SEWER DESIGN									
AREA No.	STREET	FROM	TO	AREA ha	TOTAL AREA ha	RUNOFF COEFF. "C"	INCR. AXC	TOTAL LAT. AXC	TOTAL SEWER AXC	FLOW SECT.	TIME ACCUM.	INTEN-SITY cm/HR	REQ'D cms	PIPE DIA.	SLOPE %	CAP. cms	VEL. m/s	LENGTH m	FLOW TIME MINS.	STOR-- AGE CM	INV. U.S.	INV. D.S.	FALL IN SEWER
A-1	Sutton Ave.	MH 1	MH 2	0.63	0.63	0.60	0.378		0.378	1.47	20.00	7.94	0.083	1.050	0.07	0.722	0.83	73.6	1.47	64	185.600	185.550	0.050
A-2	Sutton Ave.	MH 2	MH 3	0.73	1.36	0.60	0.438	0.378	0.816	1.48	21.47	7.66	0.174	1.050	0.07	0.722	0.83	74.0	1.48	64	185.540	185.490	0.050
A-3	Holburn St.	MH 3	MH 6	0.41	1.77	0.60	0.246	0.816	1.062	1.88	22.95	7.39	0.218	0.600	0.14	0.230	0.81	91.4	1.88	26	185.470	185.340	0.130
A-4	Farrow Ave.	MH 4	MH 5	0.64	0.64	0.60	0.384		0.384	1.47	20.00	7.94	0.085	1.050	0.07	0.722	0.83	73.6	1.47	64	185.450	185.400	0.050
A-5	Farrow Ave.	MH 5	MH 6	0.65	1.29	0.60	0.390	0.384	0.774	1.48	21.47	7.66	0.165	1.050	0.07	0.722	0.83	74.0	1.48	64	185.390	185.340	0.050
A-6	Holburn St.	MH 6	MH 9	0.50	3.56	0.60	0.300	1.836	2.136	1.84	24.82	7.08	0.420	0.825	0.10	0.463	0.87	95.5	1.84	51	185.320	185.220	0.100
A-7	Oakridge Ave.	MH 7	MH 8	0.68	0.68	0.60	0.408		0.408	1.55	20.00	7.94	0.090	1.050	0.07	0.722	0.83	77.6	1.55	67	185.335	185.280	0.055
A-8	Oakridge Ave.	MH 8	MH 9	0.61	1.29	0.60	0.366	0.408	0.774	1.40	21.55	7.64	0.164	1.050	0.07	0.722	0.83	70.0	1.40	61	185.270	185.220	0.050
A-9	Holburn St.	MH 10	MH 9	0.22	0.22	0.60	0.132		0.132	0.53	20.00	7.94	0.029	0.300	0.38	0.059	0.84	26.6	0.53	2	186.200	186.100	0.100
A-10	Orchards Cres.	MH 9	MH 13	0.56	5.63	0.60	0.336	3.042	3.378	1.63	26.66	6.80	0.638	0.975	0.10	0.709	0.95	93.0	1.63	69	185.200	185.105	0.095
A-11	Orchards Cres.	MH 3	MH 11	0.58	0.58	0.60	0.348		0.348	1.92	20.00	7.94	0.077	0.375	0.26	0.090	0.81	93.6	1.92	10	186.350	186.105	0.245
A-12	Orchards Cres.	MH 11	MH 12	0.83	1.41	0.60	0.498	0.348	0.846	1.67	21.92	7.57	0.178	0.525	0.20	0.193	0.89	89.3	1.67	19	185.955	185.775	0.180
A-13	Orchards Cres.	MH 12	MH 13	0.90	2.31	0.60	0.540	0.846	1.386	2.02	23.59	7.28	0.280	0.675	0.12	0.289	0.81	97.6	2.02	35	185.625	185.510	0.115
EASEMENT		MH 13	MH 14	0.00	7.94	0.60	0.000	4.764	4.764	1.03	28.29	6.57	0.870	1.200	0.08	1.103	0.98	60.0	1.03	68	185.085	185.035	0.050
SWM BLOCK		MH 14	POND	0.00	7.94	0.60	0.000	4.764	4.764	0.38	29.32	6.44	0.852	1.200	0.08	1.103	0.98	22.0	0.38	25	185.020	185.000	0.020


FUTURE
FUTURE
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MH7F
MH4F
MH1F
MH7
MH4
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MH8
MH5
MH2
MH10
MH9
MH3
MH13
MH12
MH11
MH14
1050Ø
1200Ø
600Ø
825Ø
675Ø
525Ø
450Ø
300Ø
250Ø
975Ø
375Ø
OUTLET
FM
PS
DICB
SWM BLOCK 87
MUN. 3682
MUN. 3694
HOWARD AVENUE
OAKRIDGE AVENUE
FARROW AVENUE
SUTTON AVENUE
HOLBURN STREET
ORCHARDS CRES.
ORCHARDS CRES.
MAGUIRE STREET
BLOCK 88
A-1 0.63 0.6
A-2 0.73 0.6
A-3 0.41 0.6
A-4 0.64 0.6
A-5 0.65 0.6
A-6 0.48 0.6
A-7 0.68 0.6
A-8 0.61 0.6
A-9 0.22 0.6
A-10 0.56 0.6
A-11 0.56 0.6
A-12 0.83 0.6
A-13 0.90 0.6
CB01
CB02
CB03
CB04
CB05
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CB26
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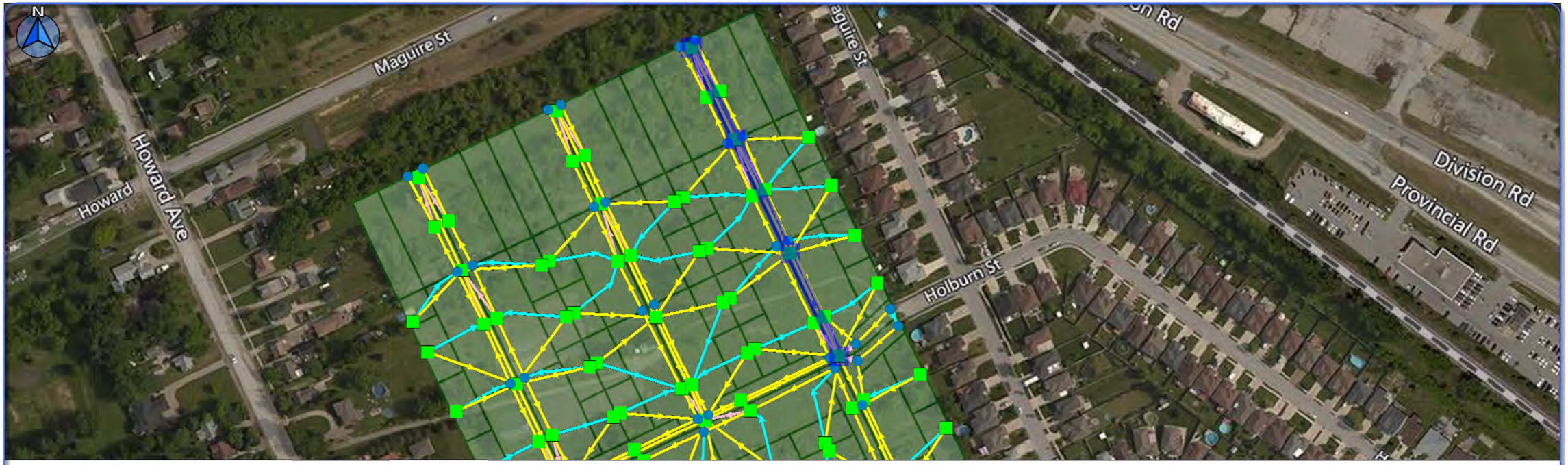
CB28
CB29
CB30
RY02
LEGEND:
DENOTES AREA BOUNDARY
DENOTES AREA ID
DENOTES AREA (Ha)
DENOTES RUNOFF COEFFICIENT
000
0.00
0.0
THE ORCHARDS SUBDIVISION
STORMWATER MANAGEMENT REPORT
STORM SEWER DRAINAGE PLAN
PROJECT NO.
17-726
FIGURE NO.
7
SCALE 1:1500

APPENDIX B

Hydrologic and Hydraulic Modelling Reports
Storm Sewer Profile Plots

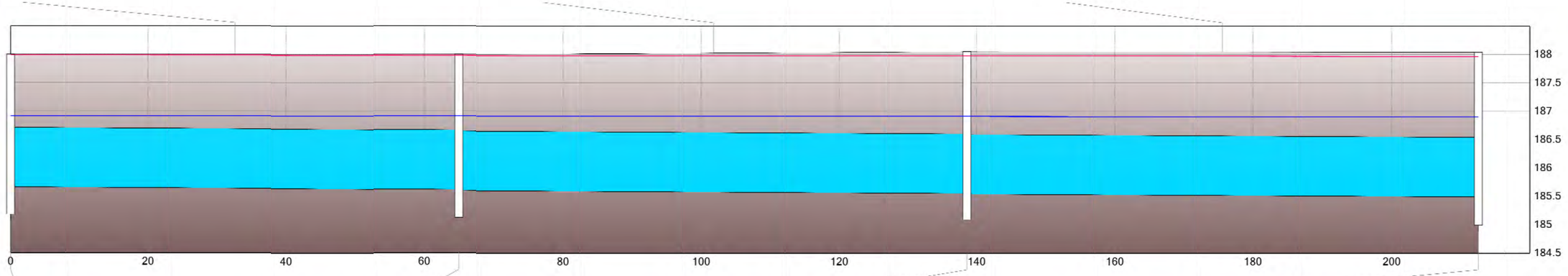


The Orcahrds - 5-YR
The Orcahrds - 100-YR PUMP ON
Peak values

Conduit C1F
Flow = 0.103 m³/s
Length = 65 m
Depth = 1.05 m
Slope = 0.00069 m/m
Invert1 = 185.66 m
Invert2 = 185.615 m

Conduit C-01
Flow = 0.18 m³/s
Length = 73.6 m
Depth = 1.05 m
Slope = 0.00068 m/m
Invert1 = 185.6 m
Invert2 = 185.55 m

Conduit C-02
Flow = 0.241 m³/s
Length = 74 m
Depth = 1.05 m
Slope = 0.00068 m/m
Invert1 = 185.54 m
Invert2 = 185.49 m

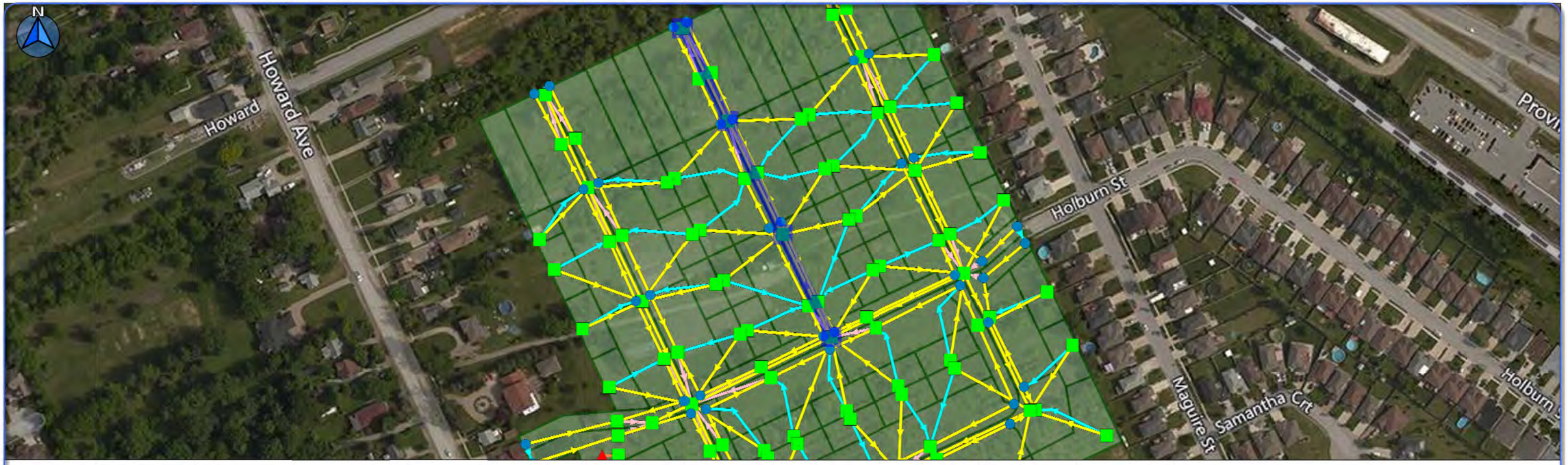


Storage MH1F
Max. CWSEL = 186.9148 m
05/10/2021 01:45AM

Storage MH1
Max. CWSEL = 186.9143 m
05/10/2021 01:45AM

Storage MH2
Max. CWSEL = 186.9082 m
05/10/2021 01:45AM

Storage MH3
Max. CWSEL = 186.8969 m
05/10/2021 01:45AM



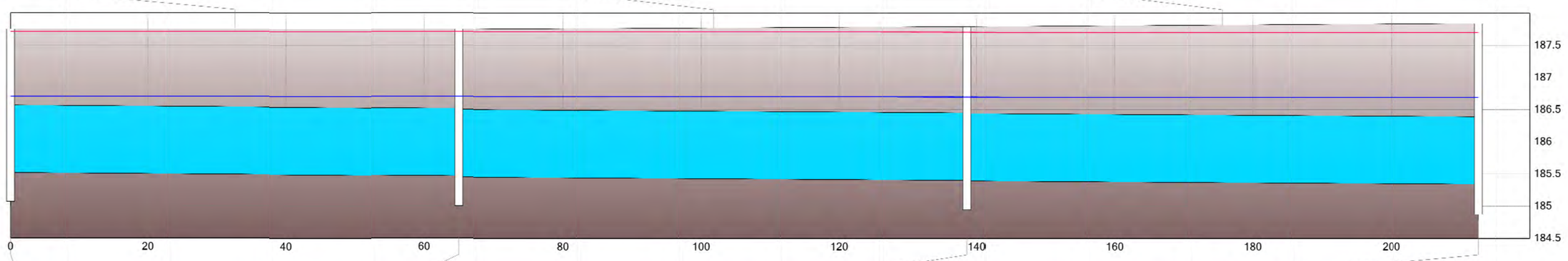
The Orcahrds - 5-YR — The Orcahrds - 100-YR PUMP ON

Peak values

Conduit C4F
Flow = 0.113 m³/s
Length = 65 m
Depth = 1.05 m
Slope = 0.00077 m/m
Invert1 = 185.515 m
Invert2 = 185.465 m

Conduit C-04
Flow = 0.187 m³/s
Length = 73.6 m
Depth = 1.05 m
Slope = 0.00068 m/m
Invert1 = 185.45 m
Invert2 = 185.4 m

Conduit C-05
Flow = 0.243 m³/s
Length = 74 m
Depth = 1.05 m
Slope = 0.00068 m/m
Invert1 = 185.39 m
Invert2 = 185.34 m

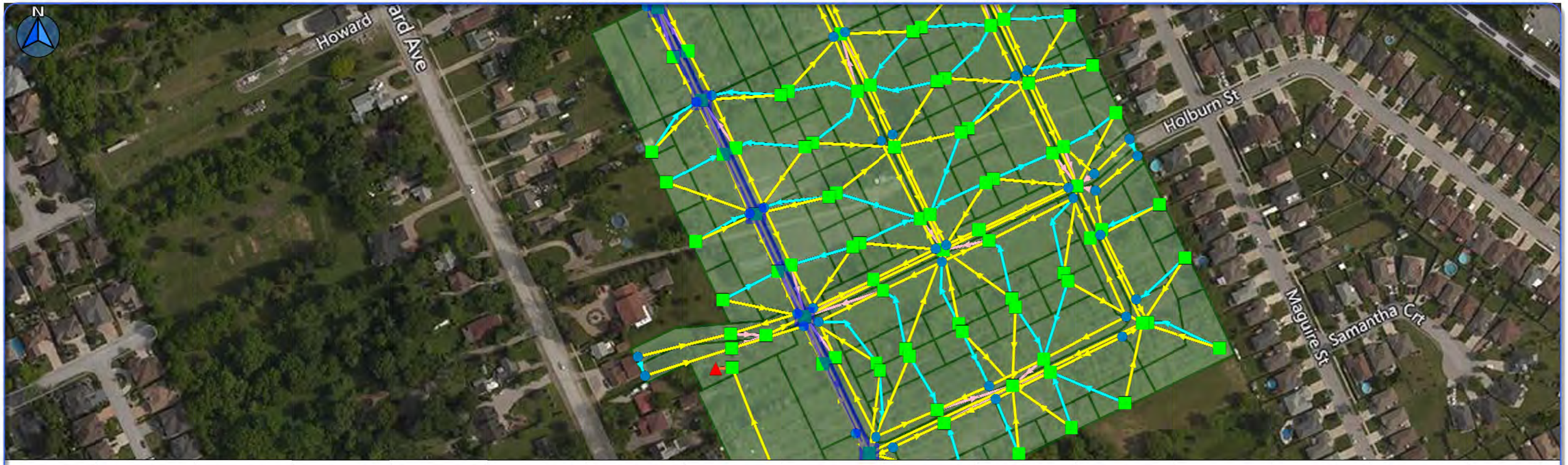


Storage MH4F
Max. CWSEL = 186.701 m
05/10/2021 01:45AM

Storage MH4
Max. CWSEL = 186.7023 m
05/10/2021 01:45AM

Storage MH5
Max. CWSEL = 186.6958 m
05/10/2021 01:45AM

Storage MH6
Max. CWSEL = 186.6871 m
05/10/2021 01:45AM



The Orcahrds - 5-YR The Orcahrds - 100-YR PUMP ON

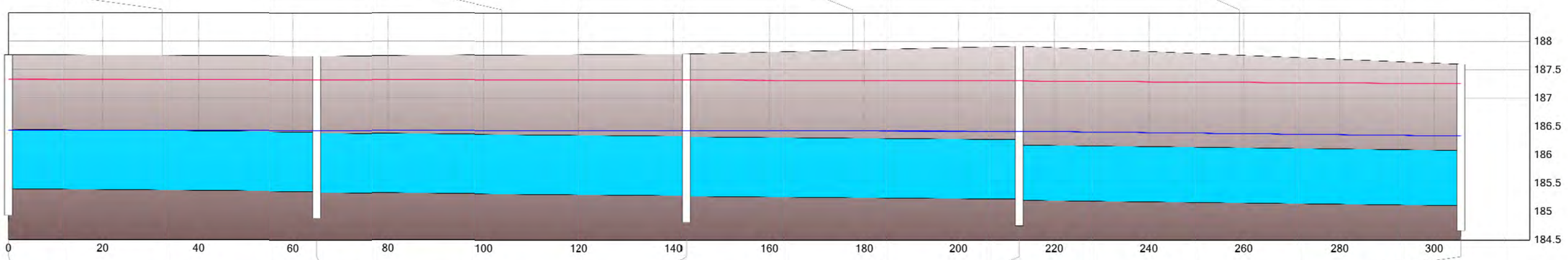
Peak values

Conduit C7F
Flow = 0.113 m³/s
Length = 65 m
Depth = 1.05 m
Slope = 0.00069 m/m
Invert1 = 185.395 m
Invert2 = 185.35 m

Conduit C-07
Flow = 0.189 m³/s
Length = 77.6 m
Depth = 1.05 m
Slope = 0.00071 m/m
Invert1 = 185.335 m
Invert2 = 185.28 m

Conduit C-08
Flow = 0.249 m³/s
Length = 70 m
Depth = 1.05 m
Slope = 0.00071 m/m
Invert1 = 185.27 m
Invert2 = 185.22 m

Conduit C-09
Flow = 1.172 m³/s
Length = 93 m
Depth = 0.975 m
Slope = 0.00102 m/m
Invert1 = 185.2 m
Invert2 = 185.105 m



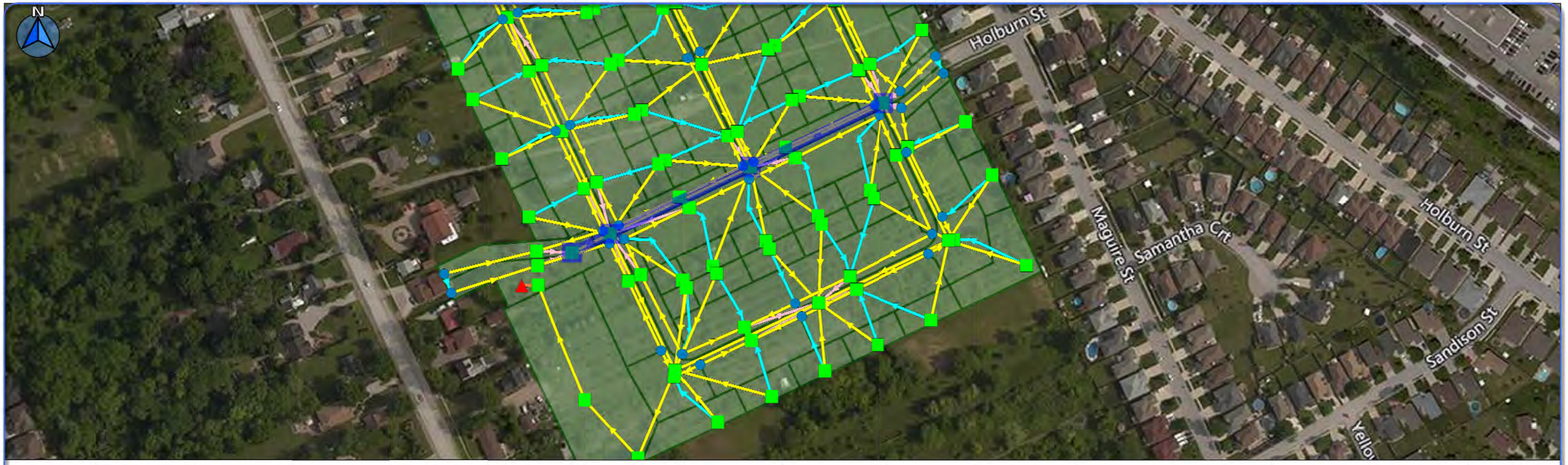
Storage MH7F
Max. CWSEL = 186.4292 m
05/10/2021 01:45AM

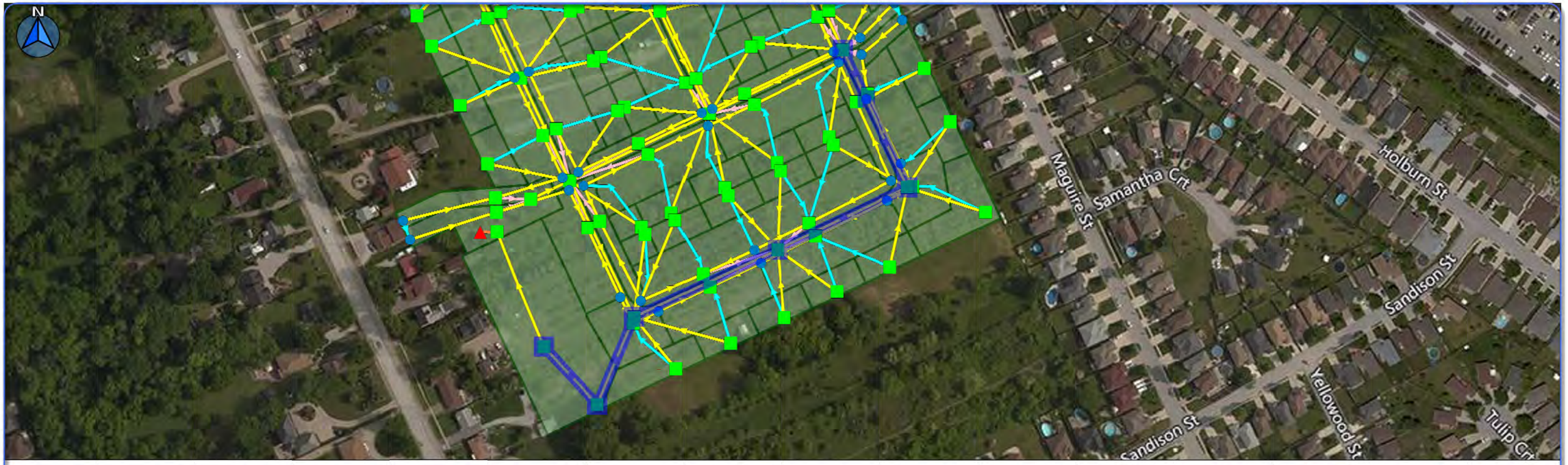
Storage MH7
Max. CWSEL = 186.4294 m
05/10/2021 01:45AM

Storage MH8
Max. CWSEL = 186.4251 m
05/10/2021 01:45AM

Storage MH9
Max. CWSEL = 186.4187 m
05/10/2021 01:45AM

Storage MH13
Max. CWSEL = 186.3336 m
05/10/2021 03:15AM


N
Holburn St
Maguire St
Samantha Crt
Holburn St
Sandison St
The Orcahrds - 5-YR
The Orcahrds - 100-YR PUMP ON
Peak values
Conduit C-10
Flow = 0.065 m³/s
Length = 26.6 m
Depth = 0.3 m
Slope = 0.00376 m/m
Invert1 = 186.2 m
Invert2 = 186.1 m
Conduit C-06
Flow = 0.695 m³/s
Length = 95.5 m
Depth = 0.825 m
Slope = 0.00105 m/m
Invert1 = 185.32 m
Invert2 = 185.22 m
Conduit C-03
Flow = 0.284 m³/s
Length = 91.4 m
Depth = 0.6 m
Slope = 0.00142 m/m
Invert1 = 185.47 m
Invert2 = 185.34 m
188
187.5
187
186.5
186
185.5
185
184.5
0
20
40
60
80
100
120
140
160
180
200
Storage MH10
Max. CWSEL = 186.4863 m
05/10/2021 01:40AM
Storage MH9
Max. CWSEL = 186.4187 m
05/10/2021 01:45AM
Storage MH6
Max. CWSEL = 186.6871 m
05/10/2021 01:45AM
Storage MH3
Max. CWSEL = 186.8969 m
05/10/2021 01:45AM



The Orcahrds - 5-YR
The Orcahrds - 100-YR PUMP ON
Peak values

Conduit C-14
Flow = 1.641 m³/s
Length = 22 m
Depth = 1.2 m
Slope = 0.00091 m/m
Invert1 = 185.02 m
Invert2 = 185 m

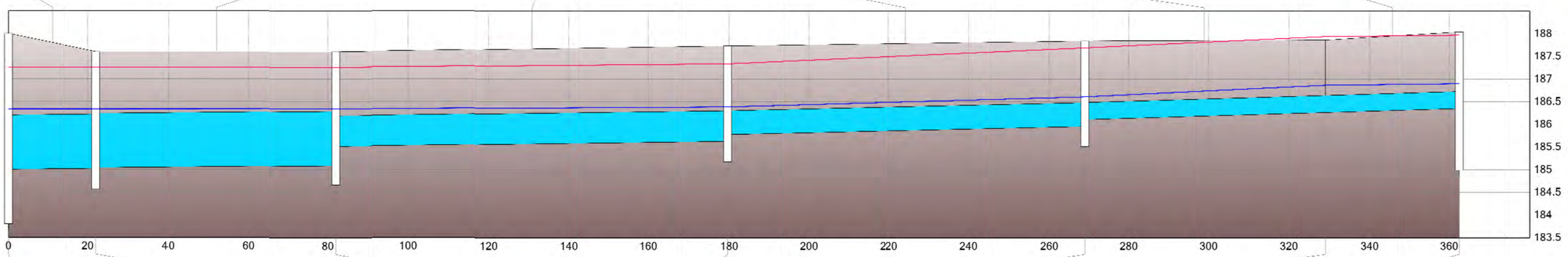
Conduit C-13
Flow = 1.633 m³/s
Length = 60 m
Depth = 1.2 m
Slope = 0.00083 m/m
Invert1 = 185.085 m
Invert2 = 185.035 m

Conduit C-12
Flow = 0.416 m³/s
Length = 97.6 m
Depth = 0.675 m
Slope = 0.00118 m/m
Invert1 = 185.625 m
Invert2 = 185.51 m

Conduit C-11
Flow = 0.202 m³/s
Length = 89.3 m
Depth = 0.525 m
Slope = 0.00202 m/m
Invert1 = 185.955 m
Invert2 = 185.775 m

Conduit C-03b
Flow = 0.111 m³/s
Length = 60 m
Depth = 0.375 m
Slope = 0.00262 m/m
Invert1 = 186.262 m
Invert2 = 186.105 m

Conduit C-03a
Flow = 0.071 m³/s
Length = 33.6 m
Depth = 0.375 m
Slope = 0.00262 m/m
Invert1 = 186.35 m
Invert2 = 186.262 m



Storage POND
Max. CWSEL = 186.3328 m
05/10/2021 03:20AM

Storage MH14
Max. CWSEL = 186.333 m
05/10/2021 03:15AM

Storage MH13
Max. CWSEL = 186.3336 m
05/10/2021 03:15AM

Storage MH12
Max. CWSEL = 186.3845 m
05/10/2021 01:45AM

Storage MH11
Max. CWSEL = 186.6063 m
05/10/2021 01:45AM

Junction D1
Max. CWSEL = 186.8631 m
05/10/2021 01:45AM

Storage MH3
Max. CWSEL = 186.8969 m
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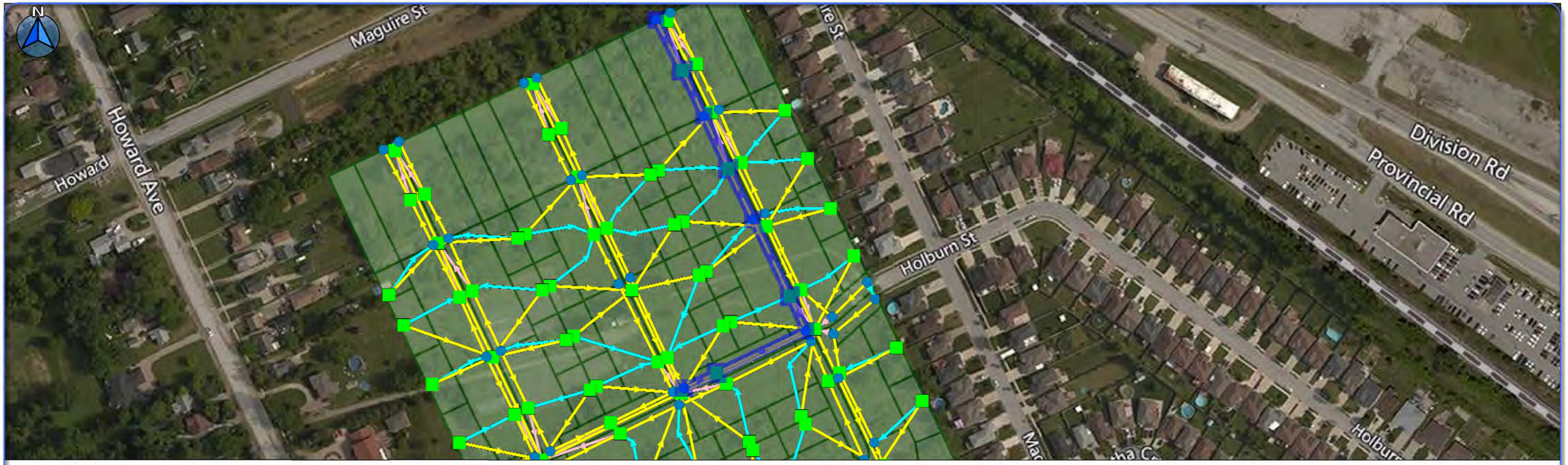
APPENDIX C

Hydrologic and Hydraulic Modelling Reports
Roadway Storage Profile Plots



The Orcahrds - 100-YR PUMP ON — The Orcahrds - UST

Peak values

Conduit C12
Length = 36 m
Invert1 = 187.97 m
Invert2 = 187.79 m

Conduit C13
Length = 30 m
Invert1 = 187.94 m
Invert2 = 187.79 m

Conduit RD1
Length = 40.1 m
Invert1 = 187.94 m
Invert2 = 187.785 m

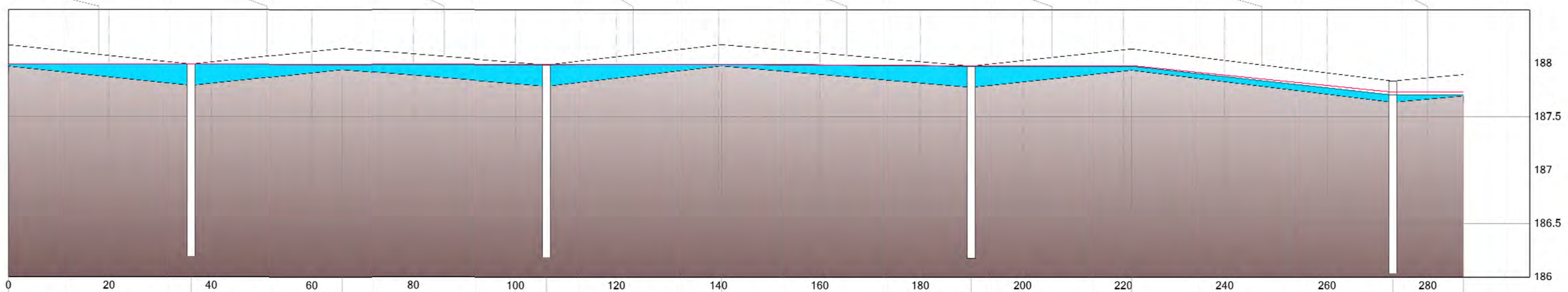
Conduit RD3
Length = 34.5 m
Invert1 = 187.975 m
Invert2 = 187.785 m

Conduit RD5
Length = 49.4 m
Invert1 = 187.975 m
Invert2 = 187.775 m

Conduit RD7
Length = 31.6 m
Invert1 = 187.935 m
Invert2 = 187.775 m

Conduit RD11
Length = 51.4 m
Invert1 = 187.935 m
Invert2 = 187.635 m

Conduit RD13
Length = 14 m
Invert1 = 187.695 m
Invert2 = 187.635 m



Junction HPF2
Max. CWSEL = 187.988 m
05/10/2021 01:50AM

Storage CBF2
Max. CWSEL = 187.9873 m
05/10/2021 01:50AM

Junction HP00
Max. CWSEL = 187.9867 m
05/10/2021 01:50AM

Storage CB01
Max. CWSEL = 187.9866 m
05/10/2021 01:50AM

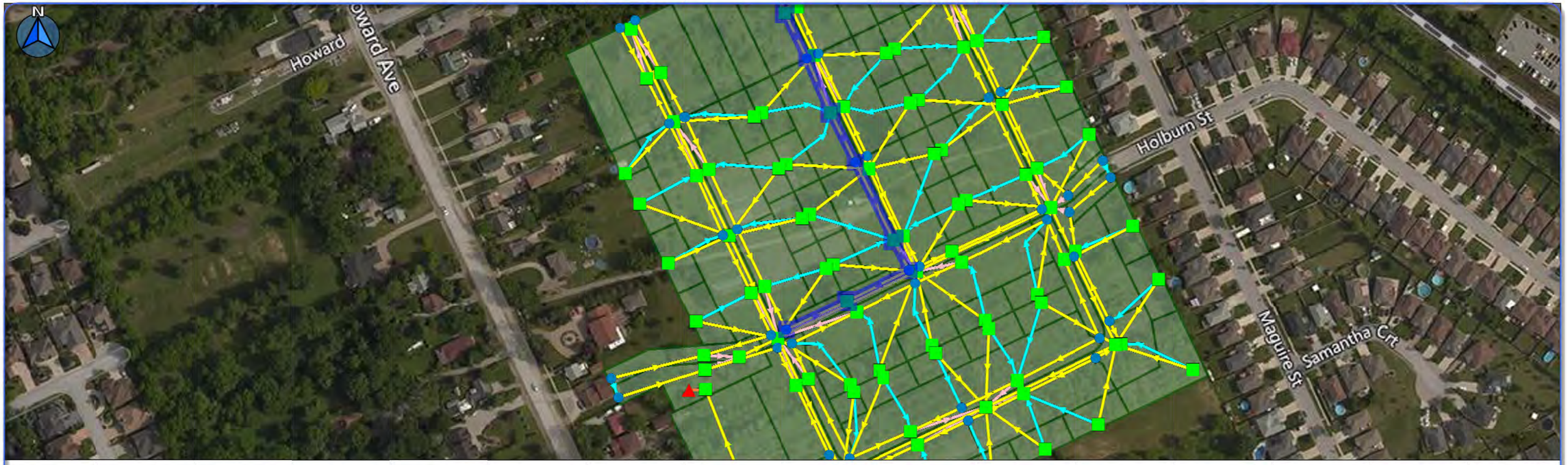
Junction HP01
Max. CWSEL = 187.9897 m
05/10/2021 01:50AM

Storage CB03
Max. CWSEL = 187.9713 m
05/10/2021 01:50AM

Junction HP05
Max. CWSEL = 187.9719 m
05/10/2021 01:50AM

Storage CB07
Max. CWSEL = 187.7023 m
05/10/2021 01:45AM

Junction HP07
Max. CWSEL = 187.702 m
05/10/2021 01:50AM



The Orcahrds - 100-YR PUMP ON — The Orcahrds - UST

Peak values

Conduit C8
Length = 36 m
Invert1 = 187.72 m
Invert2 = 187.54 m

Conduit C9
Length = 30 m
Invert1 = 187.69 m
Invert2 = 187.54 m

Conduit RD15
Length = 36.5 m
Invert1 = 187.69 m
Invert2 = 187.525 m

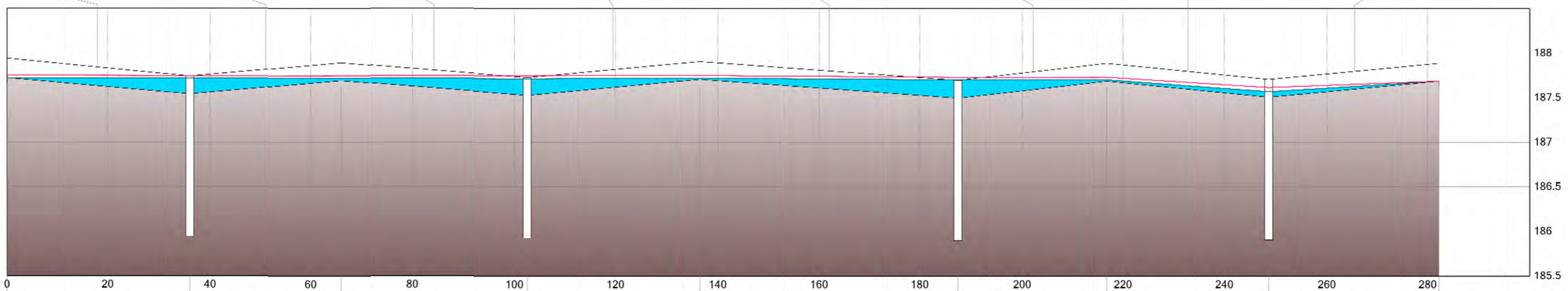
Conduit RD17
Length = 34 m
Invert1 = 187.705 m
Invert2 = 187.525 m

Conduit RD19
Length = 51 m
Invert1 = 187.705 m
Invert2 = 187.495 m

Conduit RD21
Length = 29.3 m
Invert1 = 187.685 m
Invert2 = 187.495 m

Conduit RD23
Length = 31.9 m
Invert1 = 187.685 m
Invert2 = 187.505 m

Conduit RD25
Length = 33.5 m
Invert1 = 187.685 m
Invert2 = 187.505 m



Junction HPF3
Max. CWSEL = 187.72 m
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Storage CBF4
Max. CWSEL = 187.7136 m
05/10/2021 01:45AM

Junction HP09
Max. CWSEL = 187.7169 m
05/10/2021 01:45AM

Storage CB09
Max. CWSEL = 187.7119 m
05/10/2021 01:45AM

Junction HP10
Max. CWSEL = 187.7191 m
05/10/2021 01:50AM

Storage CB11
Max. CWSEL = 187.6988 m
05/10/2021 01:45AM

Junction HP12
Max. CWSEL = 187.7007 m
05/10/2021 01:45AM

Storage CB13
Max. CWSEL = 187.5667 m
05/10/2021 01:35AM

Junction HP13
Max. CWSEL = 187.685 m
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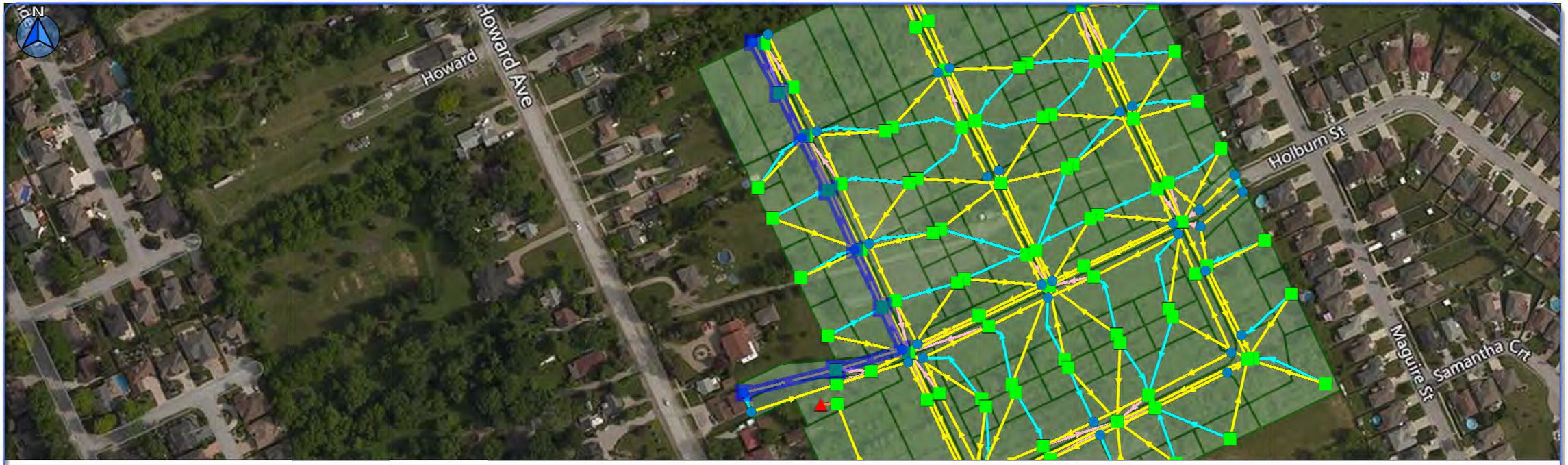
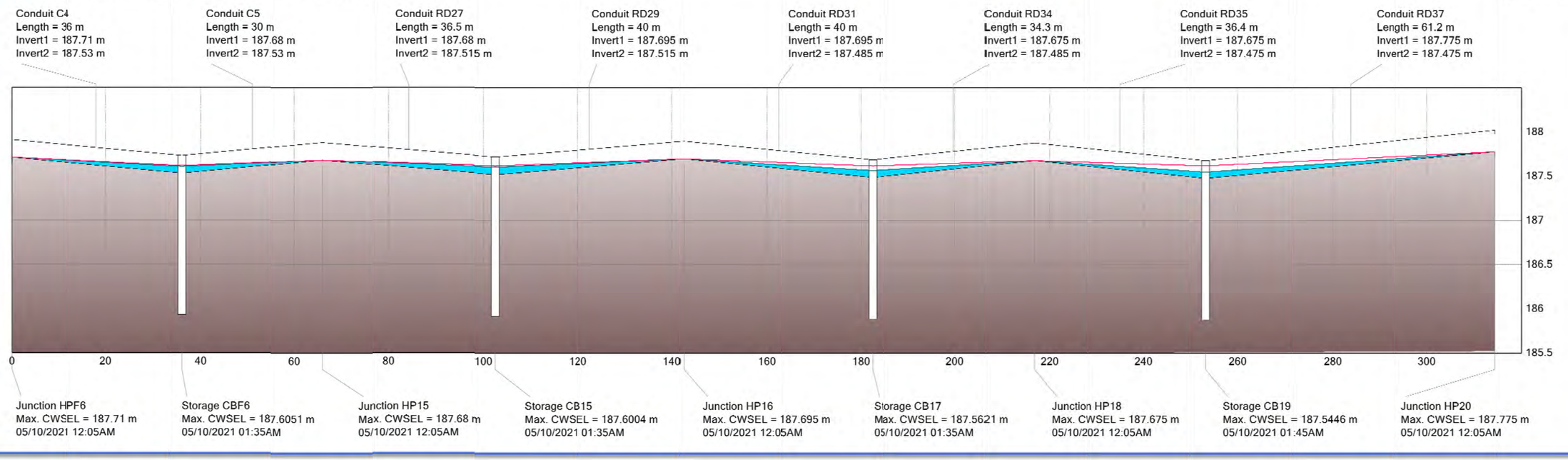


The Orcahrds - 100-YR PUMP ON — The Orcahrds - UST

Peak values

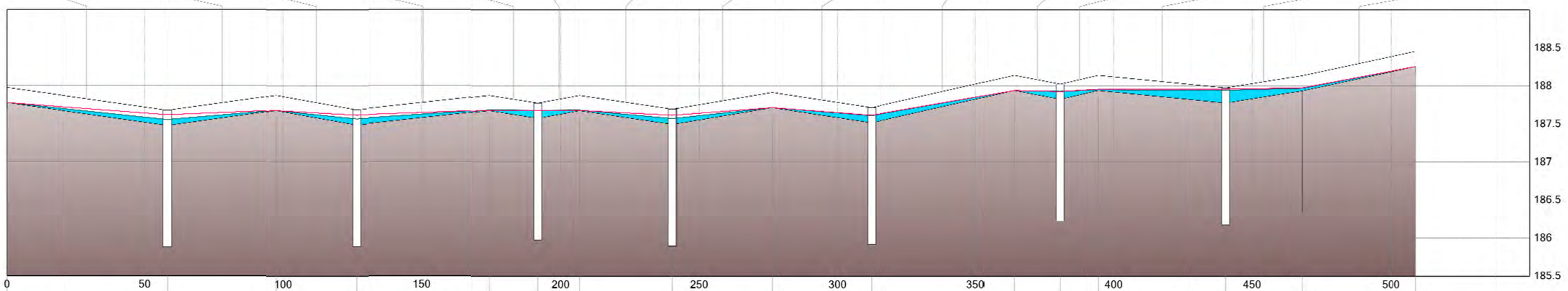


The Orcahrds - 100-YR PUMP ON — The Orcahrds - UST

Peak values

Links:

RD38	RD36	RD41	RD42	RD43	RD58	RD57	RD55	RD53	RD51	RD49	RD48	RD46	RD44	RD10
L=58 m	L=39.5 m	L=29.2 m	L=47.55 m	L=17.5 m	L=15.3 m	L=33.5 m	L=35.8 m	L=36 m	L=51.5 m	L=16.6 m	L=14 m	L=46 m	L=27.3 m	L=41.2 m
I1=187.775 m	I1=187.675 m	I1=187.675 m	I1=187.675 m	I1=187.675 m	I1=187.675 m	I1=187.675 m	I1=187.715 m	I1=187.715 m	I1=187.94 m	I1=187.94 m	I1=187.94 m	I1=187.94 m	I1=187.935 m	I1=188.255 m
I2=187.475 m	I2=187.475 m	I2=187.485 m	I2=187.485 m	I2=187.575 m	I2=187.575 m	I2=187.495 m	I2=187.495 m	I2=187.515 m	I2=187.515 m	I2=187.825 m	I2=187.825 m	I2=187.775 m	I2=187.775 m	I2=187.935 m



Nodes:

HP21	CB20	HP19	CB21	HP22	CB30	HP29	CB29	HP28	CB27	HP26	CB25	HP24	CB24	CB06	HP04
M=187.775 m	M=187.5524 m	M=187.675 m	M=187.5651 m	M=187.6832 m	M=187.6799 m	M=187.6824 m	M=187.5713 m	M=187.715 m	M=187.6085 m	M=187.94 m	M=187.929 m	M=187.9493 m	M=187.9426 m	M=187.968 m	M=188.255 m

APPENDIX D

Storm Water Quality Control
Oil-Grit Separator (OGS) Details

Hydro First Defense® - HC

Rev. 9.9

Project Name:	**THE ORCHARDS**	*Report Date:*	**2021-06-02**
Street:	**Holburn Street**	*City:*	**Windsor**
Province:	**Ontario**	*Country:*	**Canada**
Designer:	**S.M.L.**	*email:*	**slafontaine@rcspencer.ca**

Paste

Treatment Parameters:

Structure ID:	MH 17	
TSS Goal:	70	% Removal
TSS Particle Size:	Fine	
Area:	10.28	ha
Percent Impervious:	60%	
Rational C value:	0.60	Calc. Cn
Rainfall Station:	Windsor, ONT	MAP
Peak Storm Flow:	91	L/s

RESULTS SUMMARY

Model	TSS	Volume
FD-3HC	60.8%	33.2%
FD-4HC	64.1%	59.4%
FD-5HC	67.1%	74.5%
FD-6HC	**69.1%**	**85.4%**
FD-8HC	72.9%	97.3%

Model Specification:

Model:	**FD-6HC**	
Diameter:	1800	mm
Peak Flow Capacity:	906.00	L/s
Sediment Storage:	1.22	m^3
Oil Storage:	1878.00	L

Installation Configuration:

Placement:	Online		
Outlet Pipe Size:	525	mm	*OK*
Inlet Pipe 1 Size:	450	mm	*OK*
Inlet Pipe 2 Size:		mm	*OK*
Inlet Pipe 3 Size:		mm	*OK*

Rim Level:	187.900	m	Calc Invs.
Outlet Pipe Invert:	186.115	m	*Additional cover may be required*
Invert Pipe 1:	186.115	m	*OK*
Invert Pipe 2:		m	
Invert Pipe 3:		m	

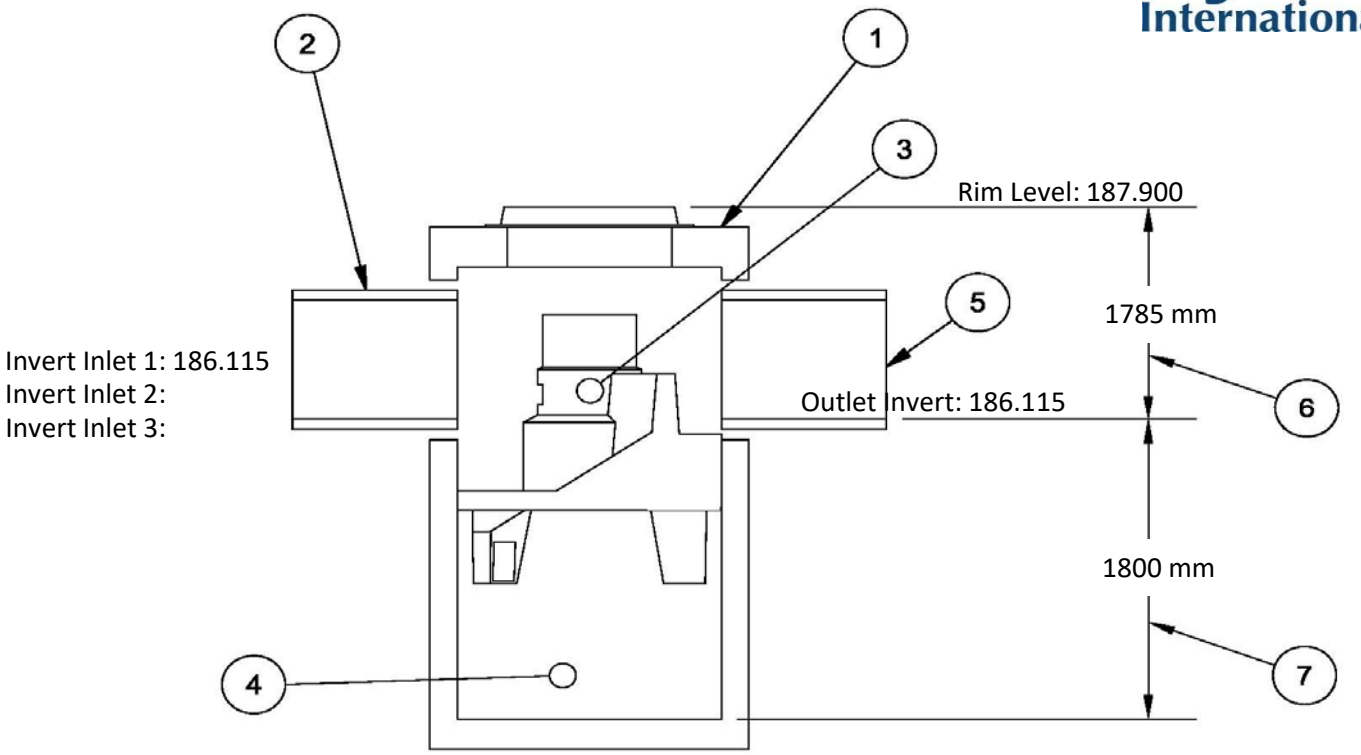
Designer Notes:

Net Annual Removal Model: FD-6HC

Intensity[1]	Fraction of Rainfall[1]	FD-6HC Removal Efficiency[2]	Weighted Net Annual Efficiency
(mm/hr)	(%)	(%)	(%)
3.00	13.2%	77.7%	10.3%
4.00	9.6%	75.7%	7.3%
5.00	7.5%	74.1%	5.6%
6.00	6.0%	72.9%	4.4%
7.00	4.8%	71.9%	3.4%
8.00	4.1%	71.0%	2.9%
9.00	3.6%	70.2%	2.5%
10.00	3.2%	69.5%	2.2%
11.00	2.8%	68.9%	1.9%
12.00	2.5%	68.3%	1.7%
15.00	6.6%	66.9%	4.4%
20.00	8.3%	65.2%	5.4%
25.00	5.8%	63.8%	3.7%
30.00	4.6%	62.8%	2.9%
35.00	3.8%	61.9%	2.4%
40.00	2.9%	61.1%	1.8%
45.00	2.4%	60.4%	1.5%
50.00	1.8%	59.8%	1.1%
65.00	6.6%	58.4%	3.9%
Total Net Annual Removal Efficiency:			**69.1%**
Total Annual Runoff Volume Treated:			**85.4%**

1. Based on Windsor/Essex Region Stormwater Manual 2018, Table 3.4.1.5
2. Based on third party verified data and appoximating the removal of a PSD similar to the STC Fine distribution
3. Rainfall adjusted to 5 min peak intensity based on hourly average.

Hydro First Defense® - HC



All drawing elevations are metres.

FD-6HC Specification

1	Vortex Chamber Diameter	1800	mm
2	Inlet Pipe Diameter	450	mm
3	Oil Storage Capacity	1878.00	L
4	Min. Provided Sediment Storage Capacity	1.22	m^3
5	Outlet Pipe Diameter	525	mm
6	Height(Final Grade to Outlet Invert)	1785	mm
7	Sump Depth(Outlet Invert to Sump)	1130	mm
	Total Depth	**2915**	**mm**

Notes:

17-726

THE ORCHARDS SUBDIVISION AS-CONSTRUCTED

IMPERIAL DEVELOPMENTS (WINDSOR) INC.
2601817 ONTARIO LTD.
J. RAUTI DEVELOPMENTS INC.

CITY OF WINDSOR
DWG. REF. NO.: S-2116

LEGEND		
DESCRIPTION	EXISTING	NEW
STORM SEWER	EX 375mmø ST	300mmø STM
SANITARY SEWER	EX 250mmø SAN	250mmø SAN
WATER MAIN	EX 200mmø W	200mmø WAT
GAS MAIN	G	
GAS MARKER	G.M.	
BELL, HYDRO, & CABLE TV	B H TV	
BELL, & CABLE TV PED.	B.P.,C.P.	B.P.,C.P.
WATER VALVE	W.V.	W.V.
FIRE HYDRANT & WATER VALVE	F.H.	F.H. & W.V.
CURB AND GUTTER		
CATCH BASIN	C.B.	CB
CURB INLET CATCH BASIN	C.I.C.B.	CICB
TWIN INLET CATCH BASIN	T.I.C.B.	TICB
MANHOLE	M.H.	MH
LOT ELEVATION	183.61	183.35
ROAD ELEVATION	183.61	183.35
TRANSFORMER / VAULT	T V	T V
STREETLIGHT		
TRAFFIC SIGN		
ROAD CROSSINGS		
SIDEWALK/ DRIVEWAY		

INDEX	
No.	DESCRIPTION
1.	INDEX, LEGEND, KEY PLAN & BENCH MARK
2.	PAVING AND GRADING
3.	PAVING AND GRADING DETAILS
4.	SITE SERVICES
5.	PLAN & PROFILE 1 – HOLBURN STREET
6.	PLAN & PROFILE 2 – OAKRIDGE AVENUE
7.	PLAN & PROFILE 3 – FARROW AVENUE
8.	PLAN & PROFILE 4 – SUTTON AVENUE
9.	PLAN & PROFILE 5 – ORCHARDS CRES. & POND INLET
10.	S.W.M. POND PLAN & CROSS–SECTION
11.	STORM PUMPING STATION – PLAN & SECTIONS
12.	STORM PUMPING STATION – DETAILS
13.	TYPICAL SERVICE LAYOUT AND CROSS SECTIONS
14.	MISCELLANEOUS DETAILS
15.	MISCELLANEOUS DETAILS 2
16.	STORM DRAINAGE AREAS
17.	SANITARY DRAINAGE AREAS

KEY PLAN

AS–BUILT DRAWING

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ELEVATIONS
ELEVATIONS SHOWN ON THIS PLAN ARE IN METRIC TO CANADIAN GEODETIC DATUM

SITE BENCH MARK (BM#1) — ELEVATION = 188.450m
TOP OPERATING NUT OF FIRE HYDRANT FRONTING MUN. #3676 HOWARD AVENUE.

SITE BENCH MARK (BM#2) — ELEVATION = 189.300m
TOP OPERATING NUT OF FIRE HYDRANT ON MAGUIRE STREET IN THE SIDE YARD OF MUN. #3605 HOLBURN STREET.

THE ORCHARDS SUBDIVISION AS-CONSTRUCTED

C.O.W. DWG. NO. S–2116

APPROVED AS TO FORM IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF RC SPENCER ASSOCIATES INC., AS TO DESIGN AND SPECIFICATIONS.

PREVIOUSLY SIGNED 17 AUGUST 2021

CITY ENGINEER
WINDSOR, ONTARIO

LICENSED PROFESSIONAL ENGINEER — R.C. SPENCER — 43851018 — PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER — S.M. LAMONTAGNE — 100144152 — PROVINCE OF ONTARIO

RC SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 500 University Ave. W. - Windsor, ON N9A 5R9
Leamington: 18 Talbot St. W. - Leamington, ON N8H 1M4
Chatham: 49 Raleigh Street - Chatham, ON N7M 2M6
Professional Engineers Ontario

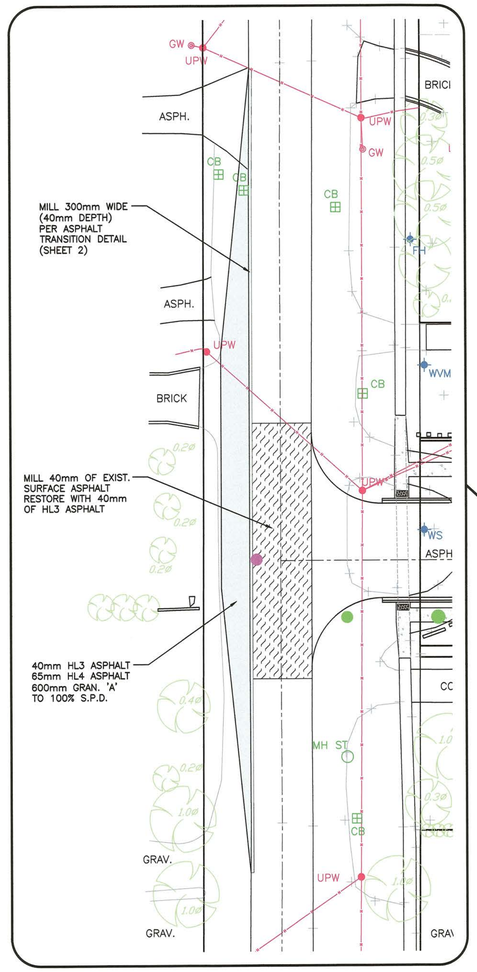
NO.	REVISION	DATE	BY	APP.
8.	AS–CONSTRUCTED	18 FEB. 2022	J.R.	R.C.S.
7.	REVISED PER BUILDING DEPT. COMMENTS	20 JAN. 2022	S.M.L.	R.C.S.
6.	PUMPING STATION FLOAT ELEVATIONS	15 NOV. 2021	S.M.L.	R.C.S.
5.	ISSUED FOR CONSTRUCTION	12 AUG. 2021	S.M.L.	R.C.S.
4.	REVISED PER ENWIN WATER COMMENTS	26 JUL. 2021	S.M.L.	R.C.S.
3.	ISSUED FOR TENDER	02 JUL. 2021	S.M.L.	R.C.S.
2.	REVISED PER CITY COMMENTS	28 JUN. 2021	S.M.L.	R.C.S.
1.	SUBMIT FOR CITY REVIEW	09 FEB. 2021	S.M.L.	R.C.S.

DESIGN M.M.H.
CHECKED R.C.S.
DRAWN M.M.H.
CHECKED R.C.S
SCALE N.T.S.

THE ORCHARDS

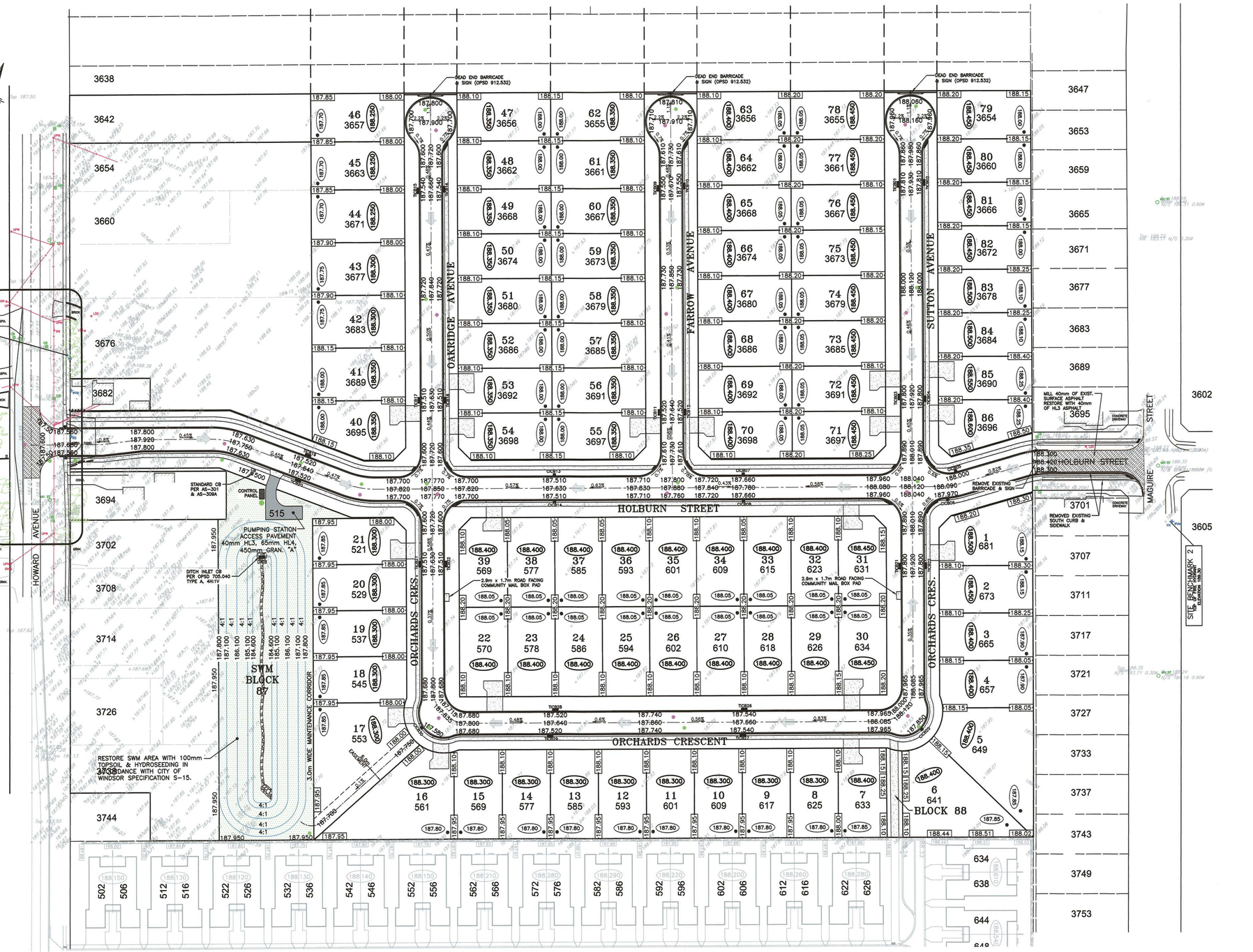
INDEX, LEGEND, KEY PLAN & BENCHMARK

PROJECT NO. 17–726
SHEET NO. 1
OF 17



ASPHALT PAVEMENT TRANSITION DETAIL

N.T.S.



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PREVIOUSLY SIGNED 26 JANUARY 2022

CHIEF BUILDING OFFICIAL

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PREVIOUSLY SIGNED 26 JANUARY 2022

CITY ENGINEER
WINDSOR, ONTARIO

LICENSED PROFESSIONAL ENGINEER R.C. SPENCER 43558018 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER S.M. LIMONTAINE 100129762 PROVINCE OF ONTARIO

RC SPENCER ASSOCIATES INC.
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Leamington: 18 Talbot St. W.- Leamington, ON N8H 1M4
Chatham: 49 Raleigh Street - Chatham, ON N7M 2M6
Professional Engineers Ontario

NO.	REVISION	DATE	BY	APP.
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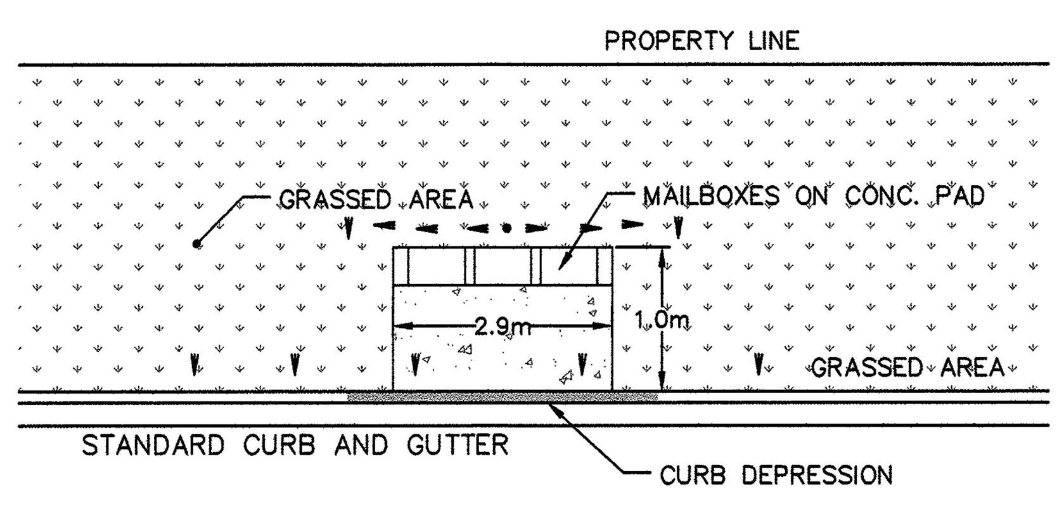
DESIGN M.M.H.
CHECKED R.C.S.
DRAWN M.M.H.
CHECKED R.C.S
SCALE 1:750

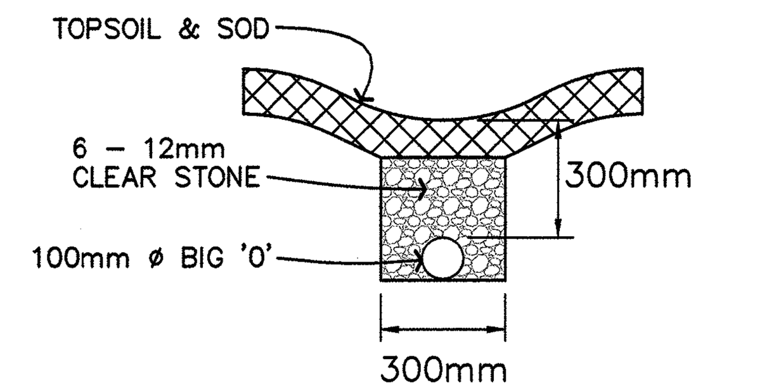
THE ORCHARDS

PAVING AND GRADING

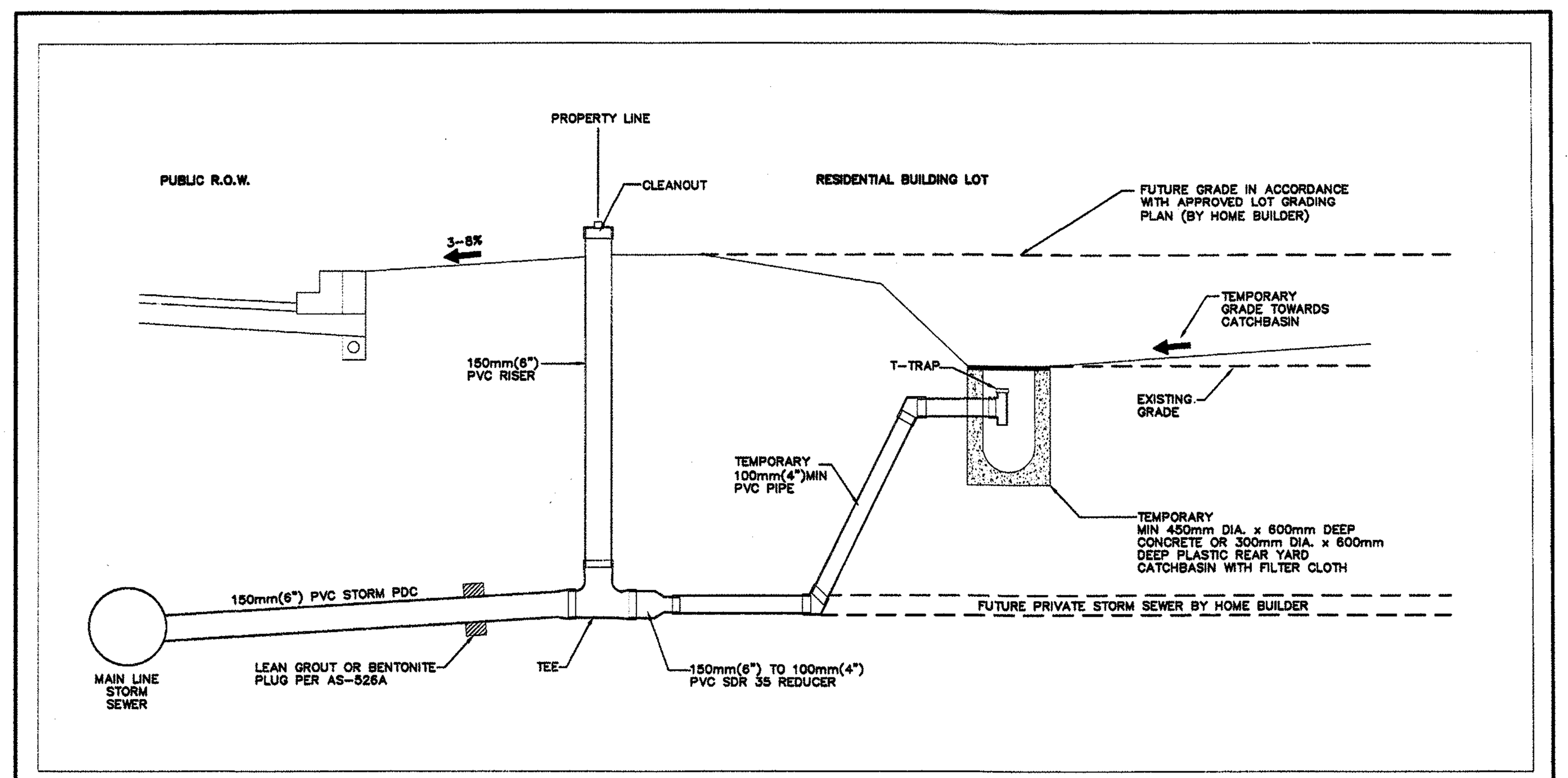
C.O.W. DWG. NO. S-2116
PROJECT NO. 17-726
SHEET NO. 2
OF 17



TYPICAL COMMUNITY MAILBOX/ SIDEWALK LAYOUT



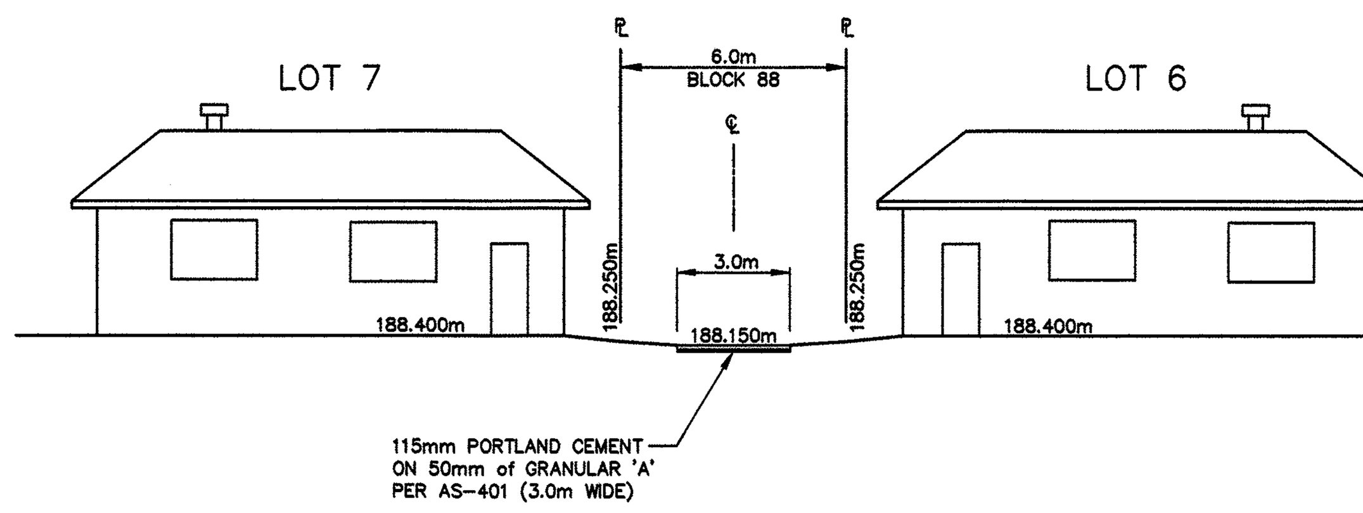
REAR YARD SWALE DETAIL
N.T.S.



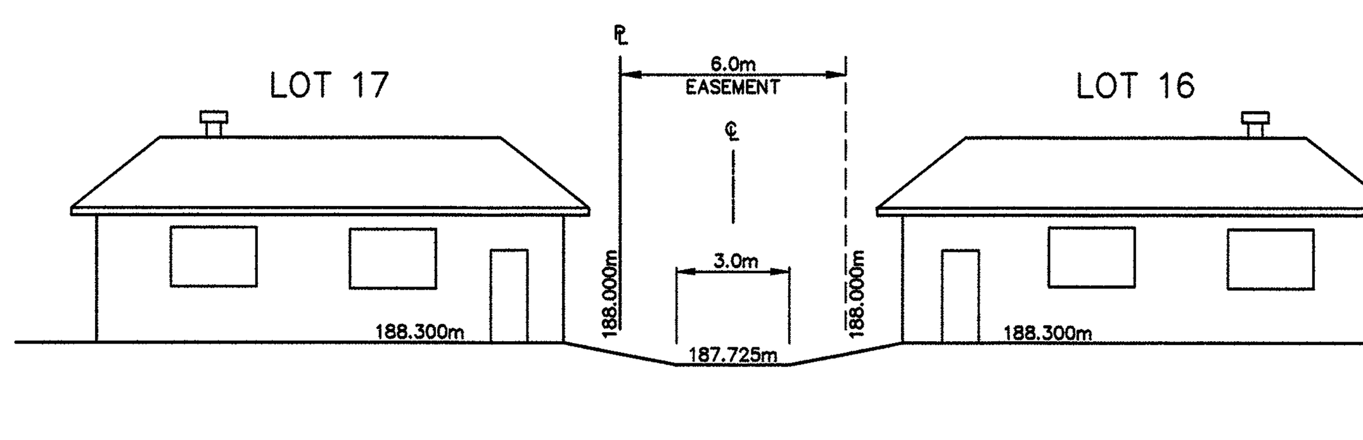
NOTES:
1. DEVELOPER IS TO CONSTRUCT TEMPORARY LOT DRAINAGE FOR EACH BUILDING LOT AS SHOWN ABOVE AT THE TIME OF SEWER CONSTRUCTION
2. HOME BUILDER TO CONNECT PRIVATE STORM SEWER TO EXISTING TEE AT THE PROPERTY LINE AND REMOVE TEMPORARY CATCHBASIN AND PIPES ON PRIVATE PROPERTY.
3. DETERMINATION OF WHETHER TEMPORARY LOT DRAINAGE IS REQUIRED SHALL BE AT THE DISCRETION OF THE CITY ENGINEER AND THE CHIEF BUILDING OFFICIAL.

CITY OF WINDSOR ENGINEERING DEPARTMENT	
TEMPORARY LOT DRAINAGE	
DR'N BY: J.L.	DATE: AUGUST, 2013
REVISION:	CH'KD BY: S.S.
CH'KD BY: PJU	PASSED BY:
Oct 1/2013 CITY ENGINEER	AS-550

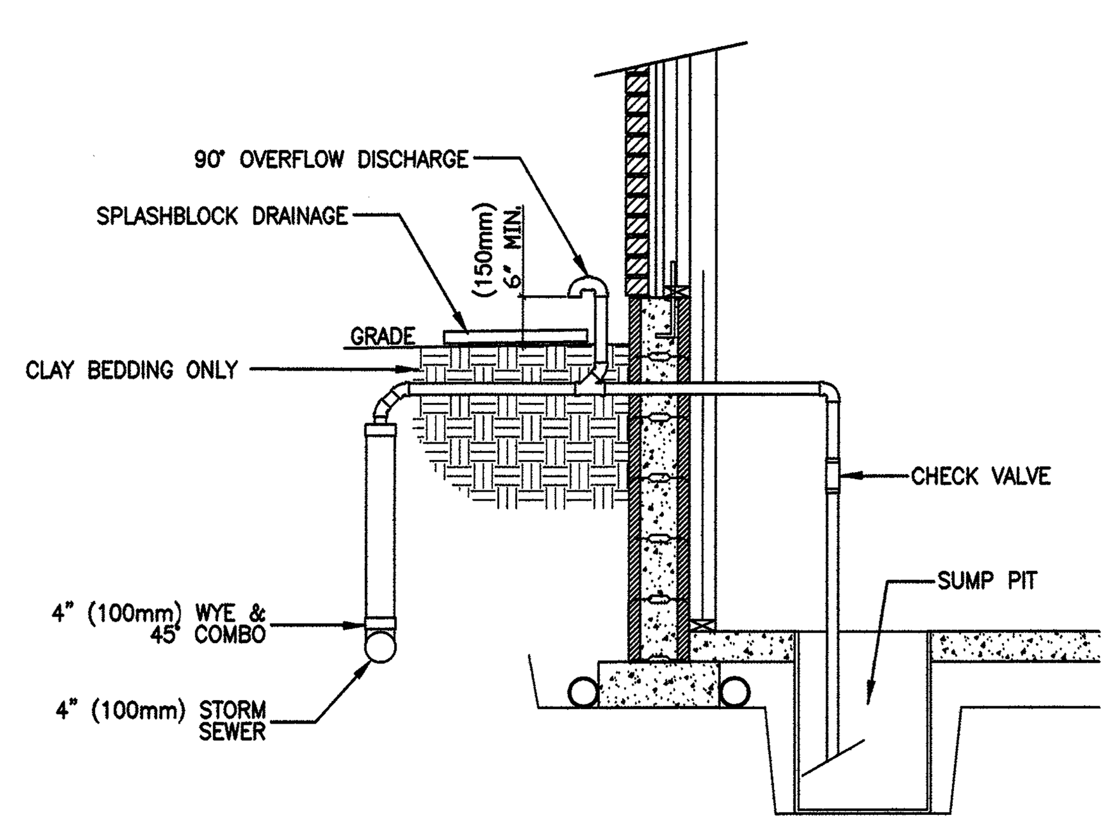
*** CONTRACTOR TO INSTALL BENTONITE PLUG AT 0.5m BEFORE PROPERTY LINE ON ALL PRIVATE DRAIN CONNECTIONS.



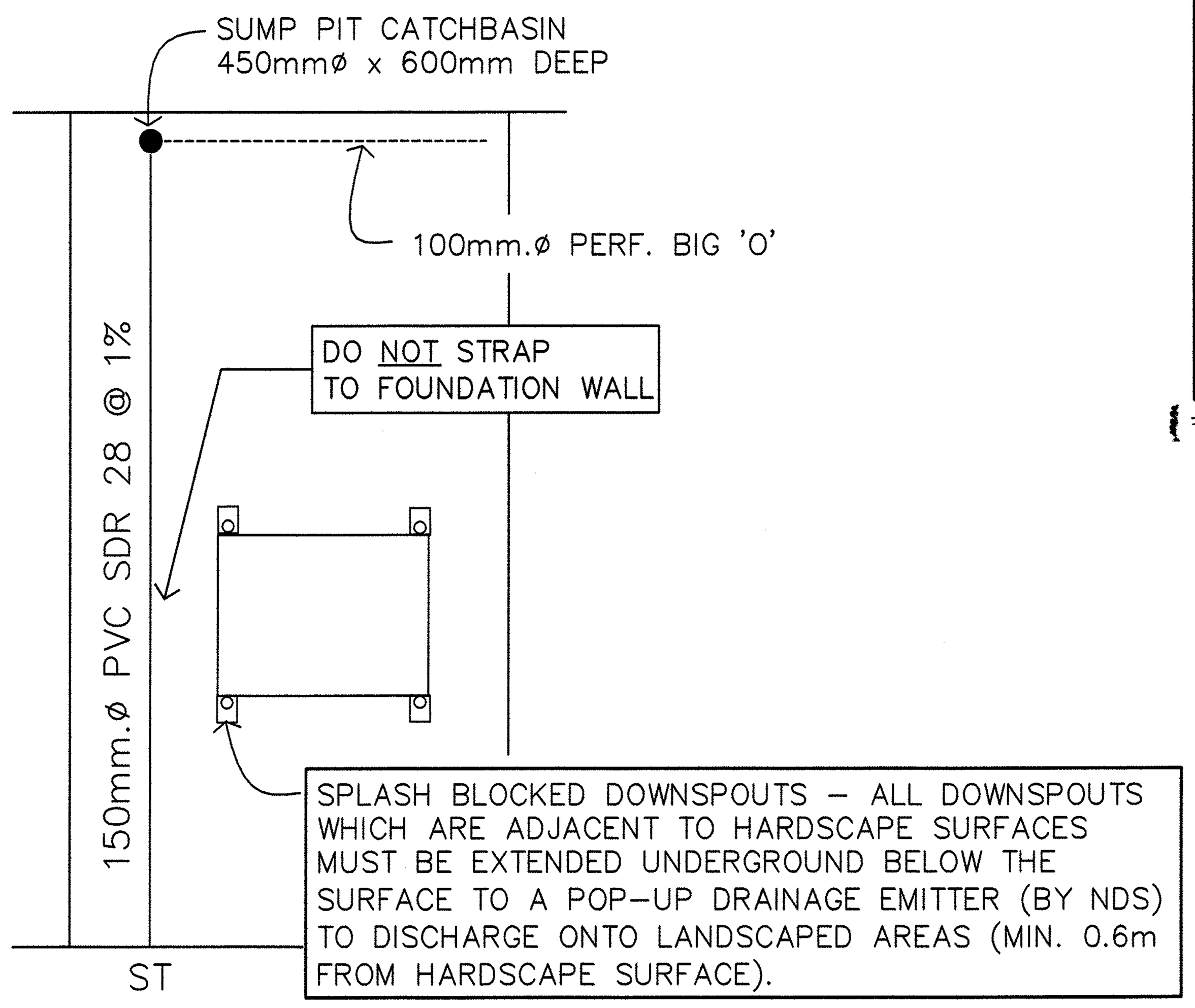
BLOCK 88 CROSS–SECTION
SCALE 1:200



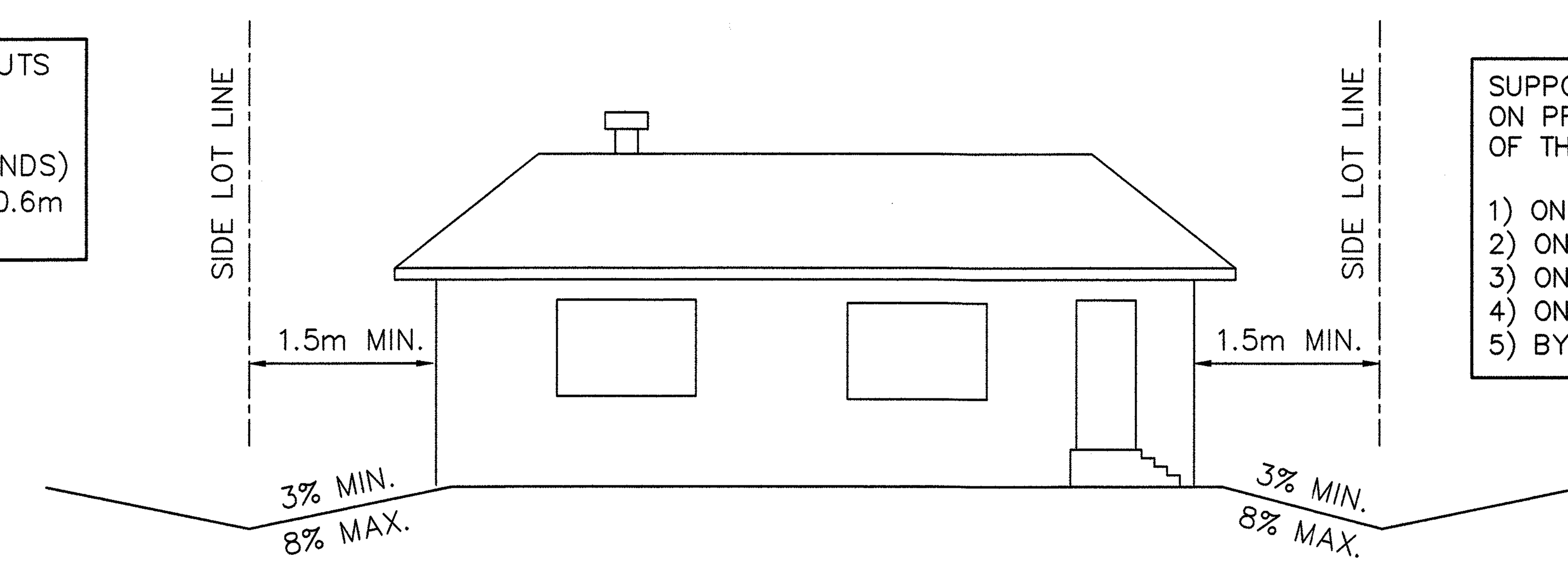
LOT 17 EASEMENT CROSS–SECTION
SCALE 1:200



SUMP PUMP DISCHARGE DETAIL



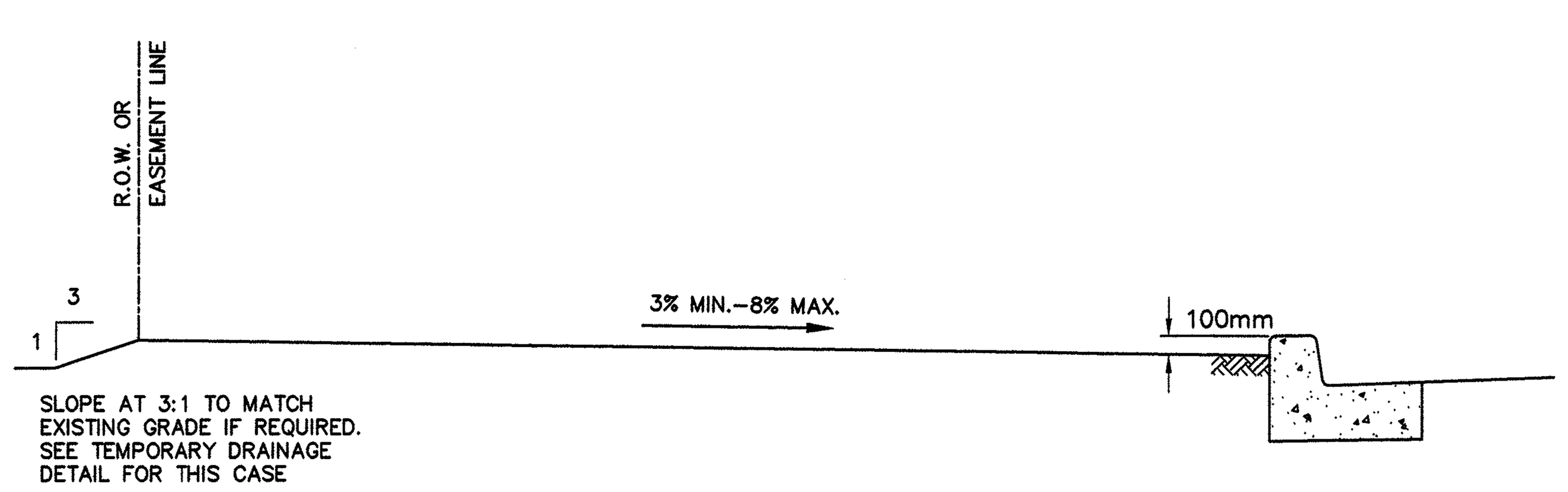
PLAN VIEW
N.T.S.



SECTION THROUGH SIDE YARDS

SUPPORT OF THE HORIZONTAL STORM WATER PIPING ON PRIVATE PROPERTY IS TO BE PROVIDED BY ONE OF THE FOLLOWING OPTIONS:

1) ON UNDISTURBED SOIL
2) ON CLEAR STONE PLACED ON UNDISTURBED SOIL
3) ON ENGINEERED BACKFILL
4) ON AN ENGINEERED SUPPORT STRUCTURE
5) BY ENGINEERED STRAPPING TO FOUNDATION WALL



TEMPORARY CLAY BOULEVARD GRADING DETAIL
N.T.S.

AS-BUILT DRAWING

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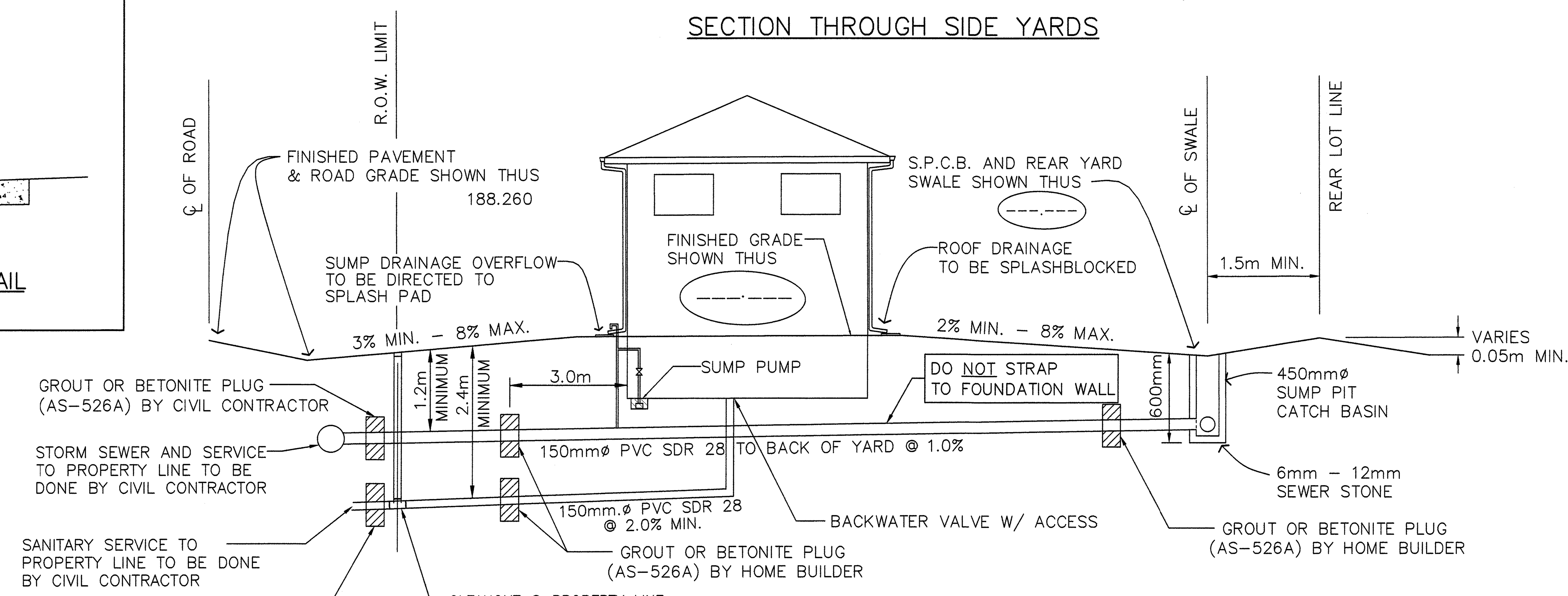

SECTION THROUGH FRONT AND REAR YARDS
N.T.S.

NOTES

1. PAVEMENT GRADES SHOWN ARE AT EDGE OF PAVEMENT AND ℄ ROAD.
2. CHAINAGES SHOWN REFER TO ROAD ℄.
3. RESTORE ALL DISTURBED AREAS WITHIN EXISTING R.O.W. TO CITY OF WINDSOR STANDARDS
4. FINISHED GRADES AT HOUSE AND REAR YARD DRAIN SHOWN THUS –SEE DETAIL THIS SHEET– (188.950)
5. FINISHED GRADE AT BOULEVARD –SEE DETAIL THIS SHEET– [188.950]
6. ● DENOTES SUMP PIT CATCH BASINS
7. ALL RADII REFERS TO EDGE OF PAVEMENT AT CORNERS, 9m RADIUS UNLESS NOTED OTHERWISE
8. CONTRACTOR TO CONSTRUCT TEMPORARY ASPHALT BOX–OUT FOR CATCHBASIN SET AT BASE ASPHALT LEVEL. ONCE SURFACE ASPHALT HAS BEEN PLACED, RAISE CATCHBASIN AND CONSTRUCT PERMANENT CONCRETE BOX–OUT. DO NOT EXCEED 4 RISERS PER CATCHBASIN.
9. CONTRACTOR TO GRADE BOULEVARDS AS PER DETAIL (SHEET 3).
10. TRAFFIC SIGNAGE MUST BE INSTALLED TO THE SATISFACTION OF CITY OF WINDSOR SUPERVISOR OF SIGNS AND MARKINGS PRIOR TO THE RELEASE OF PERMITS.
11. SIGHT LINE TRIANGLE MUST BE FREE OF ANY VISUAL OBSTRUCTION TO TRAFFIC.
12. CONTRACTOR/BUILDER/OWNER TO ADHERE TO PROPOSED DRIVEWAY LOCATIONS SHOWN ON THIS DRAWING.
DENOTED AS:

APPROVED AS TO FORM IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF RC SPENCER ASSOCIATES INC., AS TO DESIGN AND SPECIFICATIONS.

PREVIOUSLY SIGNED 26 JANUARY 2022
CHIEF BUILDING OFFICIAL

APPROVED AS TO FORM IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF RC SPENCER ASSOCIATES INC., AS TO DESIGN AND SPECIFICATIONS.

PREVIOUSLY SIGNED 26 JANUARY 2022
CITY ENGINEER
WINDSOR, ONTARIO

LICENSED PROFESSIONAL ENGINEER R.C. SPENCER 43858018 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER S.M. LAFONTAINE 100202162 18 FEB 2022 PROVINCE OF ONTARIO

RC SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 800 University Ave. W.- Windsor, ON N9A 5R9
Leamington: 18 Talbot St. W.- Leamington, ON N8H 1M4
Chatham: 49 Raleigh Street - Chatham, ON N7M 2M6
Professional Engineers Ontario

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CHECKED R.C.S.
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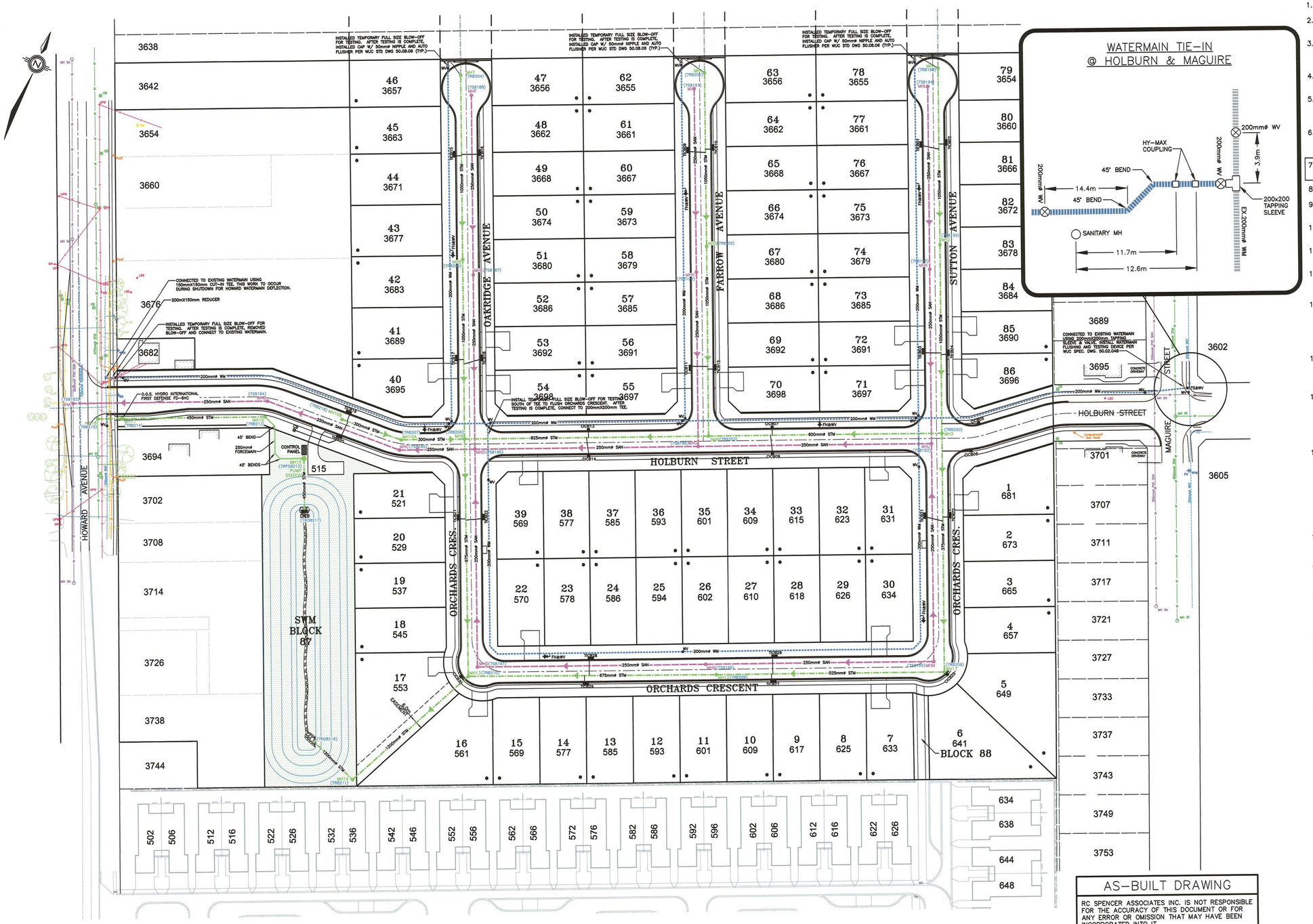
SCALE AS SHOWN

THE ORCHARDS

PAVING AND GRADING DETAILS

C.O.W. DWG. NO. S–2116
PROJECT NO. 17–726
SHEET NO. 3 OF 17



WATERMAIN TIE-IN @ HOLBURN & MAGUIRE

GENERAL NOTES

1. PERFORM ALL WORK TO CITY OF WINDSOR AND W.U.C. STANDARDS.
2. RESTORE ALL DISTURBED AREAS WITHIN EXISTING R.O.W. LIMITS TO CITY OF WINDSOR STANDARDS.
3. ALL EXCAVATIONS UNDER PAVEMENT AND WITHIN 300mm OF CURB TO BE BACKFILLED WITH GRANULAR "A", 0-75mm GRANULAR OR APPROVED RECYCLED AGGREGATE AS PER CITY OF WINDSOR SPECIFICATIONS (100% S.P.D.).
4. SEWER AND WATERMAIN TRENCHES IN BOULEVARD TO BE COMPACTED TO 95% STANDARD PROCTOR DRY DENSITY.
5. FOR CONCRETE PIPE, THE INLET AND OUTLET PIPE FROM MANHOLES SHALL BE SUPPORTED WITH CLASS 'A' BEDDING TO THE FIRST PIPE JOINT PER AS-310A AND AS-314. ALL OTHER SEWER BEDDING SHALL BE CLASS 'B'.
6. UTILITY SUPPORTS OR GRANULAR BACKFILL (C.O.W. 0mm TO 75mm CRUSHER RUN) SHALL BE USED WHERE STORM P.D.C.'S CROSS SANITARY SEWER TRENCH. (COMPACTED TO 100% S.P.D.).
7. CONTRACTOR TO ENSURE ALL MANHOLES AND MANHOLE OPENINGS ARE NOT CONSTRUCTED IN CONFLICT WITH CURB AND GUTTER/ SIDEWALK.
8. ALL MANHOLES TO BE 1200mm DIA. UNLESS OTHERWISE NOTED.
9. NO BENCHING IN STORM MANHOLES. 0.45m SUMP TO BE PROVIDED IN STORM MANHOLES & 0.6m SUMPS PROVIDED IN CATCHBASINS.
10. MANHOLES SHALL BE CONSTRUCTED TO BASE ASPHALT ELEVATION. PRIOR TO SURFACE ASPHALT PLACEMENT MANHOLES TO BE RAISED.
11. PRIVATE DRAIN CONNECTIONS AND WATER SERVICES SHALL BE LOCATED AS SHOWN ON PLANS.
12. SANITARY PRIVATE DRAIN CONNECTION SHALL CONSIST OF 150mmø PVC SDR 28 PIPE. STORM PRIVATE DRAIN CONNECTION SHALL CONSIST OF 150mmø PVC SDR 28 PIPE.
13. PRIVATE SERVICE CONNECTIONS TO BE MARKED WITH A 50mm x 100mm STAKE EXTENDING 600mm ABOVE GRADE FROM TOP OF CONNECTION @ PROPERTY LINE & PAINTED AS FOLLOWS:
    PINK - SANITARY
    GREEN - STORM
    BLUE - WATER
14. THE DEPTH OF THE SANITARY CONNECTIONS SHALL BE A MINIMUM OF 2.4m AND A MAXIMUM OF 3.0m BELOW FINISHED GRADE AT THE LOT LINE. STORM CONNECTIONS SHALL HAVE AN INVERT DEPTH OF A MINIMUM 1.25m BELOW THE FINISHED GRADE AT THE LOT LINE OR AS DIRECTED BY THE ENGINEER.
15. CONNECTIONS TO PVC PIPE: CONTRACTOR SHALL BE REQUIRED TO USE ONLY PLANT MANUFACTURED TEES WHEN INSTALLING PRIVATE DRAIN CONNECTIONS. THE ANGULAR RISE OF THE CONNECTIONS SHALL BE BETWEEN 5° AND 85°. IF ANGULAR RISE EXCEEDS 45° THE CONTRACTOR SHALL PROVIDE A "DOUBLE STOP" AT THE SEWER. THIS SHALL CONSIST OF AN APPROVED PVC FITTING PLACED ADJACENT TO THE SEWER TEE OR TAP FITTING.
16. CONNECTIONS TO CONCRETE PIPE: CONCRETE PIPE 375mm DIAMETER OR LARGER MAY BE FIELD TAPPED IN PLACE. CARE SHALL BE TAKEN TO ENSURE THE CONNECTING TEE DOES NOT PROTRUDE INTO THE MAIN SEWER. A NON-SHRINKING, FAST-SETTING GROUT SHALL BE USED AND A CURING PERIOD OF 12 HOURS MINIMUM IS REQUIRED BEFORE BACKFILLING. FIELD TAPPING OF CONCRETE PIPE SMALLER THAN 375mm DIAMETER SHALL NOT BE ALLOWED. SUCH A CONNECTION REQUIRES THE REMOVAL OF A SECTION OF PIPE AND THE INSTALLATION OF A PLANT MANUFACTURED CONCRETE TEE USING MECHANICAL COUPLINGS THAT CONFORM TO C.S.A. STANDARD B602 TO ENSURE A SOUND AND WATERTIGHT JOINT.
17. ALL WATER MAINS & SERVICES SHALL HAVE 1.50m MINIMUM COVER. FOR COVER LESS THAN 1.50m, CONTRACTOR SHALL INSTALL INSULATION IN ACCORDANCE WITH W.U.C. DWG. NO. 50.01.02
18. ALL WATER SERVICES TO BE 25mm DIA. P.E. SERIES 160 WITH TRACER WIRE TO W.U.C. SPECS. CONTRACTOR TO INSTALL A 1LB ANODE AT THE BASE OF EVERY CURB STOP FOR TRACER WIRE AS PER W.U.C. SPEC DRAWING 50.12.01.
19. ALL WATERMAIN BENDS, DEFLECTIONS, THRUST BLOCKS, RESTRAINING JOINTS, ETC. ARE TO BE CONSTRUCTED TO WINDSOR UTILITIES COMMISSION STANDARDS. 24# ANODES TO BE CAD WELDED TO ALL IRON FITTINGS. SWABS ARE REQUIRED COMPLETE WITH FULL DIA. BLOW-OFFS.
20. A 150mm x 90° BEND IS NEEDED AT ALL HYDRANTS.
21. SWABS, SAMPLING POINTS AND CHLORINE RISERS SHALL BE INSTALLED AS PER W.U.C. SPECIFICATIONS AT LOCATIONS DECIDED BY W.U.C. STAFF AT SITE. USE COPPER TUBING FOR ALL CHLORINE RISERS FOR SAFETY REASONS.
22. CONTRACTOR SHALL INSTALL WATERMAIN, FIRE HYDRANTS AND ALL REQUIRED APPURTENANCES TO WINDSOR UTILITIES COMMISSION STANDARDS.
23. CATCH BASIN LEADS, UNLESS OTHERWISE NOTED:
    SINGLE - 200mmø PVC SDR 35
    DOUBLE - 250mmø PVC SDR 35.
24. CONTRACTOR TO CONSTRUCT TEMPORARY ASPHALT BOX-OUT FOR CATCHBASIN SET AT BASE ASPHALT LEVEL. WHEN SURFACE ASPHALT IS PLACED, RAISE CATCHBASIN AND CONSTRUCT PERMANENT CONCRETE CURB.
25. CONTRACTOR TO ENSURE NO PRIVATE DRAIN CONNECTIONS, MANHOLES, WATER VALVES OR FIRE HYDRANTS ARE CONSTRUCTED IN CONFLICT WITH HYDRO VAULTS, TRANSFORMERS AND STREET LIGHTS. AS SHOWN ON DRAWINGS.
26. CONTRACTOR TO INSTALL UTILITY CROSSINGS AS PER ELECTRICAL DRAWINGS AND CO-ORDINATE INSTALLATION WITH BELL CANADA, COGECO CABLE AND MNSi
27. CONTRACTOR WILL NOT BE ALLOWED TO AIR TEST OR CCTV INSPECTION THE SEWERS UNTIL ALL ROAD-CUT RELATED GRANULAR MATERIAL HAS BEEN PLACED AND COMPACTED IN ROADWAY.
28. NO ACCEPTANCE TESTING WILL BE ALLOWED UNTIL ALL UNDERGROUND WORK HAS BEEN COMPLETED INCLUDING PROPER BACKFILL AND COMPACTION OF ALL TRENCHES.
29. FILTER CLOTH OVER CATCHBASIN INLETS FOLLOWING RELEASE OF BUILDING PERMITS, REQUIRED TO SEPARATE FINE MATERIALS.

AS-BUILT DRAWING

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PREVIOUSLY SIGNED 17 AUGUST 2021

CITY ENGINEER
WINDSOR, ONTARIO

RC SPENCER ASSOCIATES INC.
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Leamington: 18 Talbot St. W. - Leamington, ON N8H 1M4
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Professional Engineers Ontario

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SCALE 1:750

THE ORCHARDS

SITE SERVICES

C.O.W. DWG. NO. S-2116
PROJECT NO. 17-726
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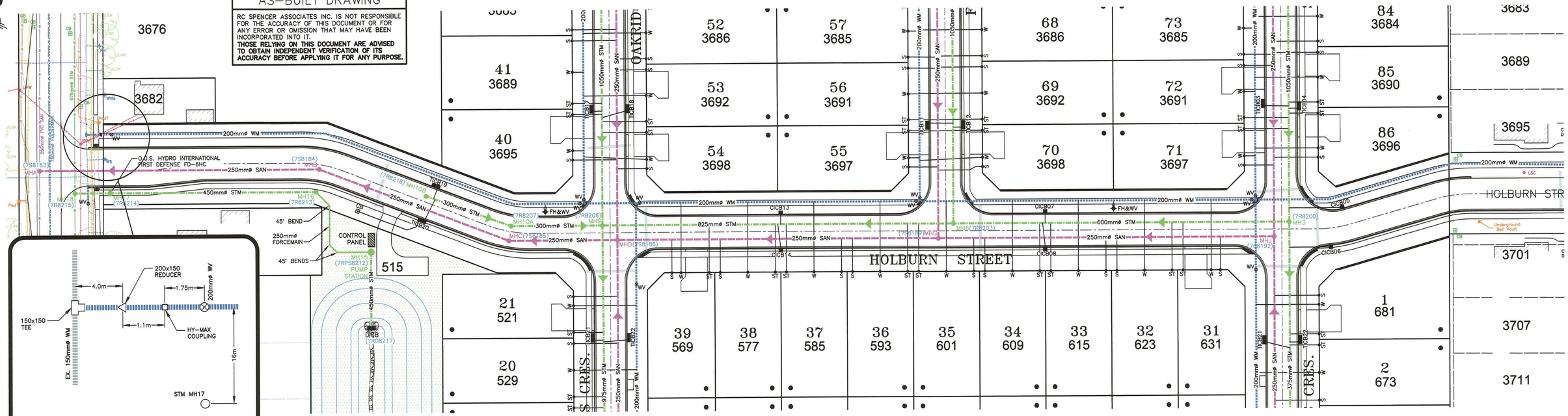
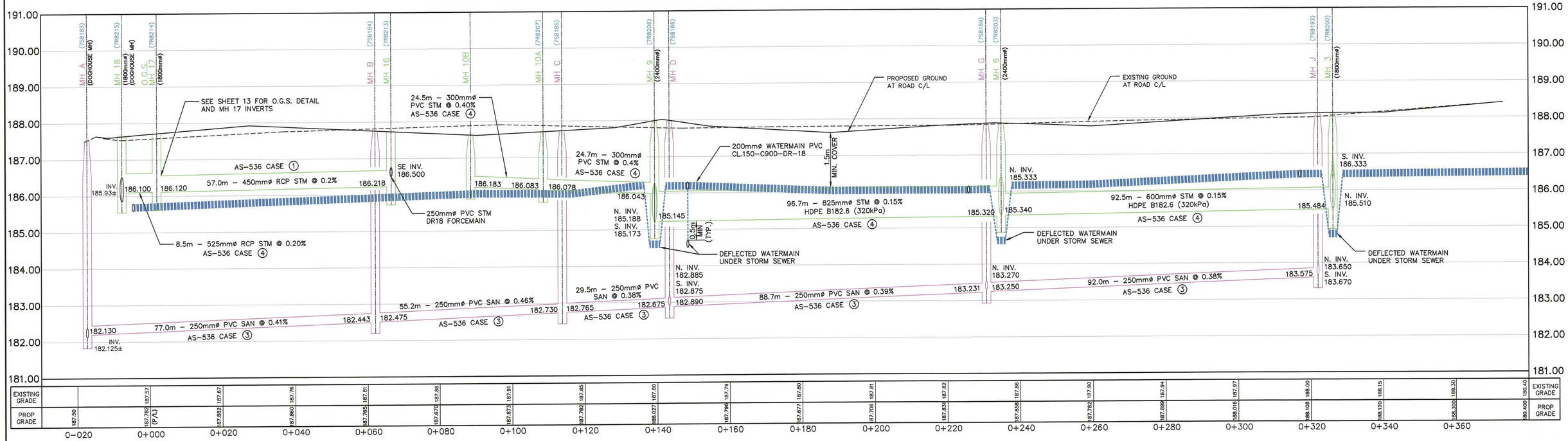


WATERMAIN TIE–IN
@ HOWARD & HOLBURN



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WINDSOR, ONTARIO

LICENSED PROFESSIONAL ENGINEER — R.C. SPENCER — 43858018 — PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER — S.M. LAPOINTE — 100186052 — PROVINCE OF ONTARIO

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PLAN & PROFILE 1 HOLBURN STREET

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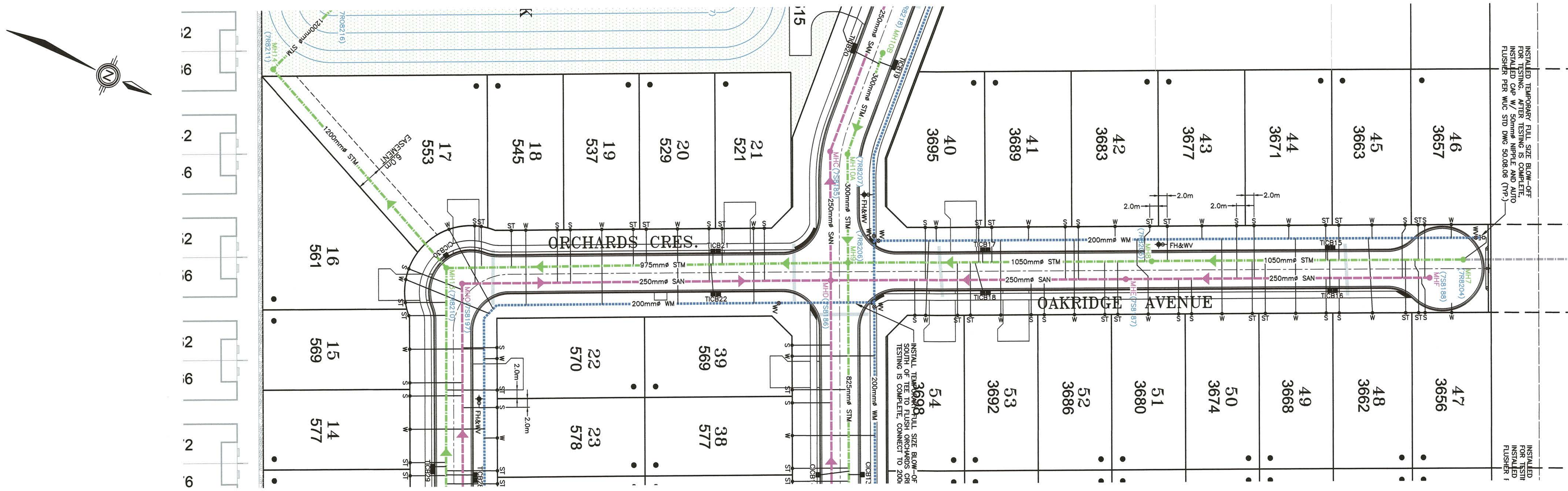

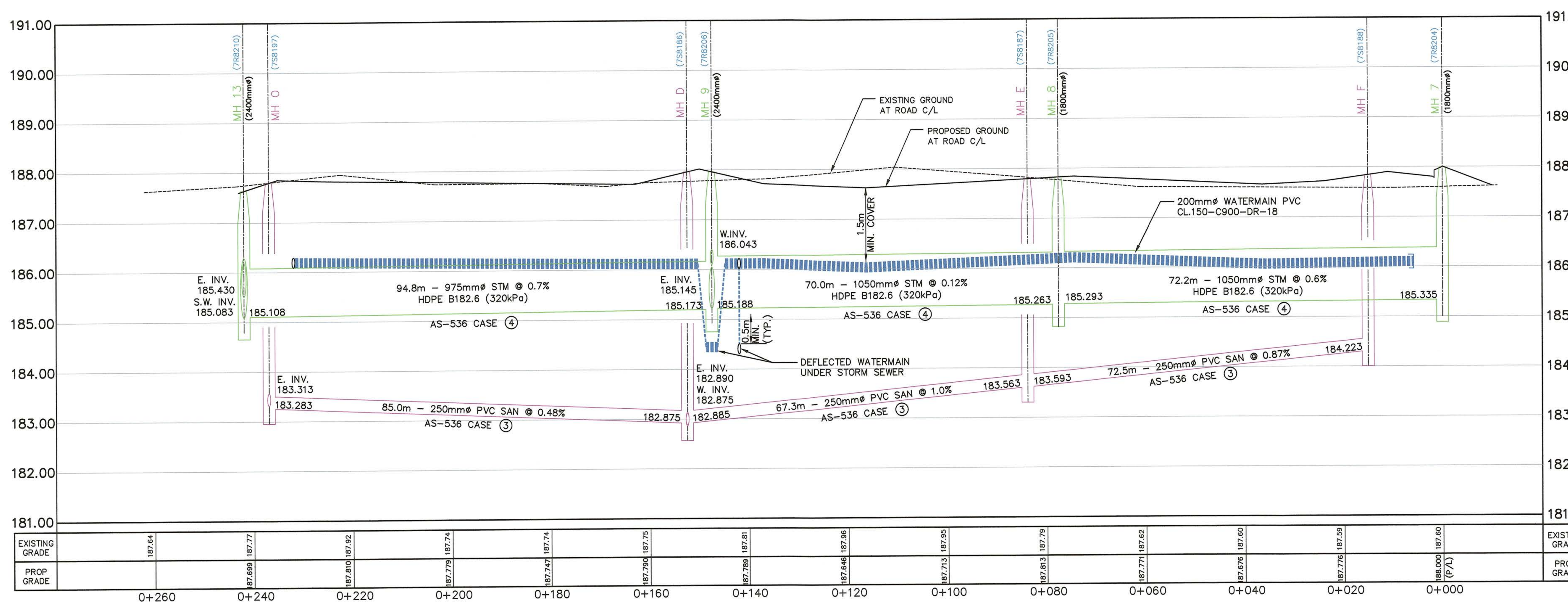

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WINDSOR, ONTARIO

LICENSED PROFESSIONAL ENGINEER — R.C. SPENCER — PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER — S.M. LAFONTAINE — PROVINCE OF ONTARIO — 18 FEB 2022

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THE ORCHARDS

PLAN & PROFILE 2
OAKRIDGE AVENUE

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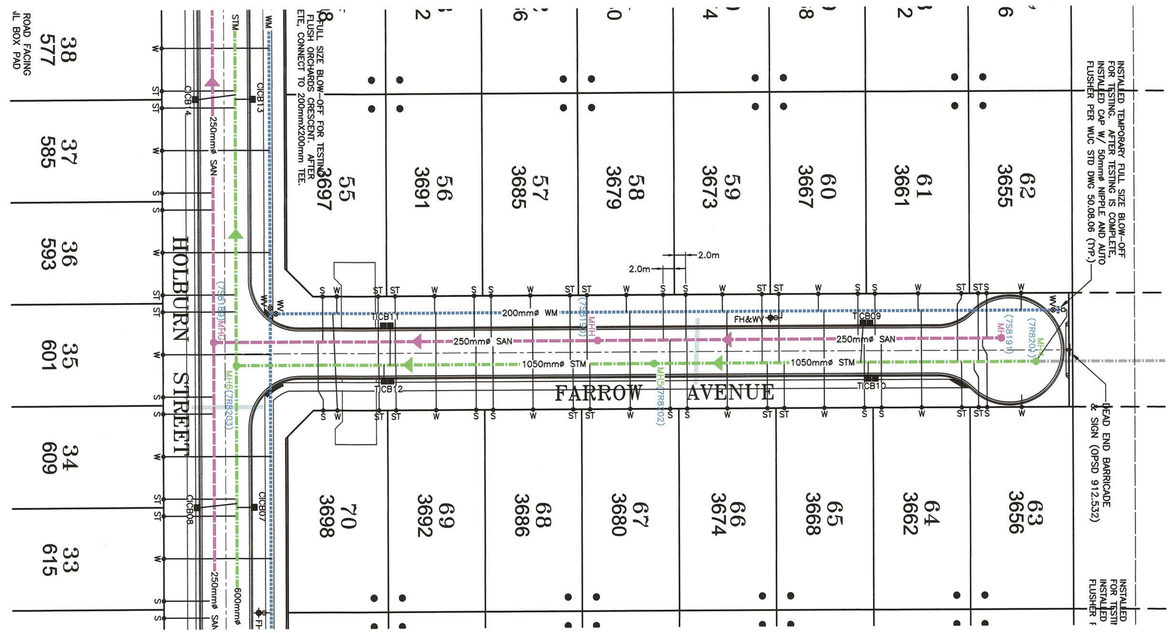

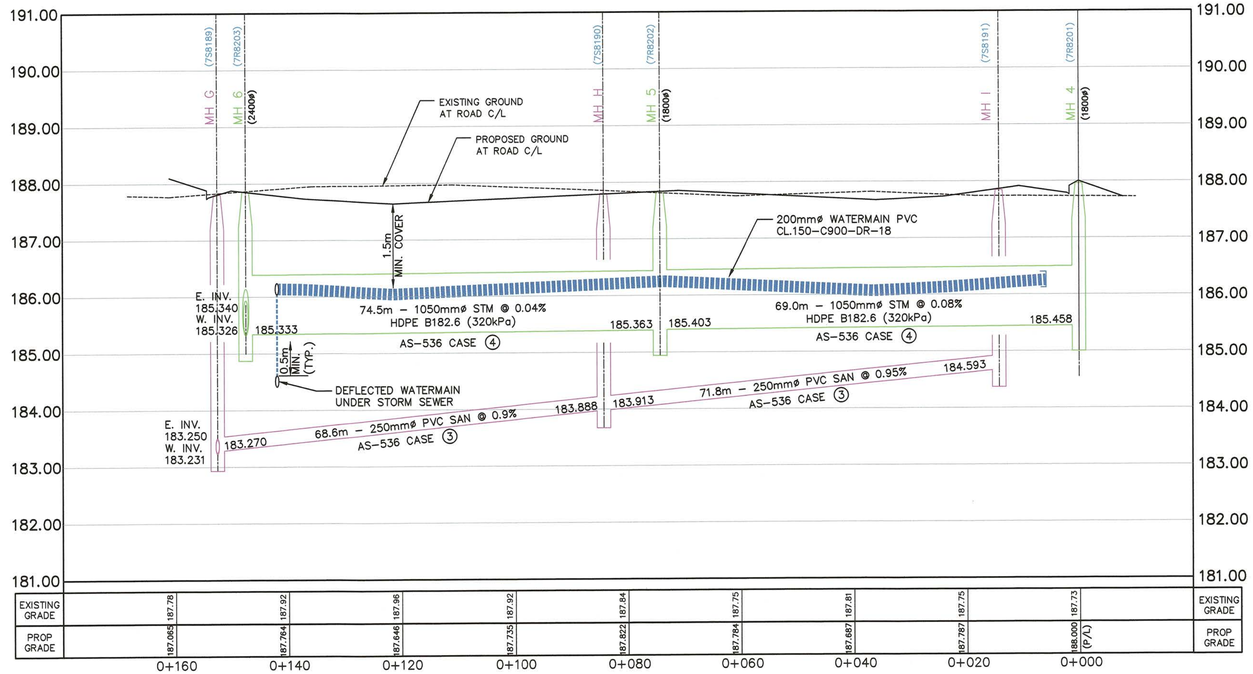

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PREVIOUSLY SIGNED 17 AUGUST 2021

CITY ENGINEER
WINDSOR, ONTARIO

LICENSED PROFESSIONAL ENGINEER R.C. SPENCER A 43658018 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER S.M. LAKOMTAWE 100148702 PROVINCE OF ONTARIO

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Professional Engineers Ontario

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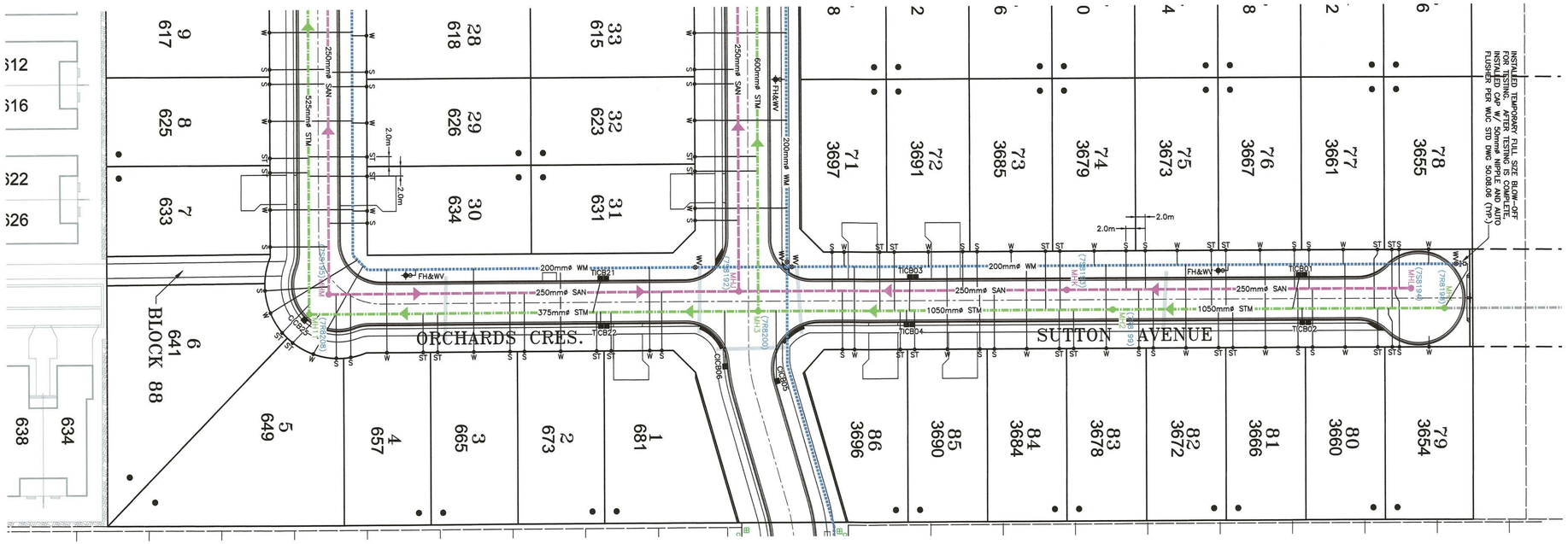
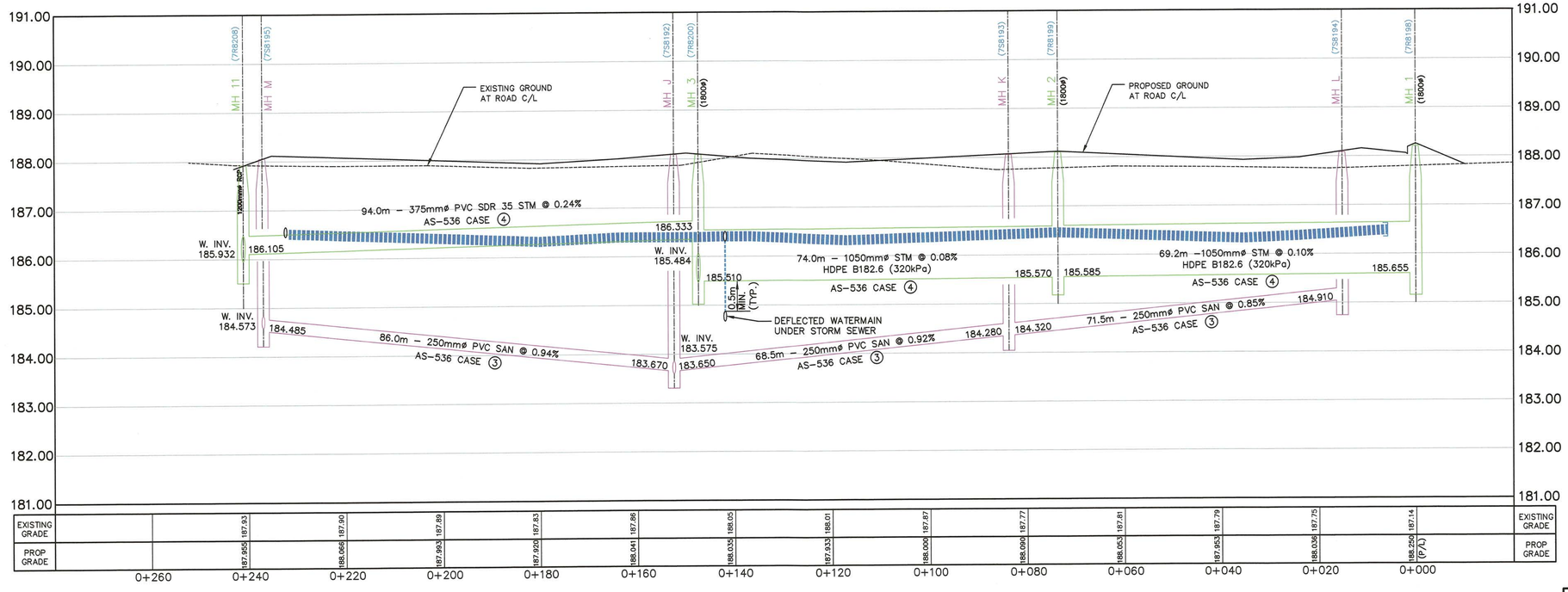
DESIGN M.M.H.
CHECKED R.C.S.
DRAWN M.M.H.
CHECKED R.C.S
SCALE H 1:500 V 1:50

THE ORCHARDS

PLAN & PROFILE 3 FARROW AVENUE

C.O.W. DWG. NO. S-2116
PROJECT NO. 17-726
SHEET NO. 7
OF 17





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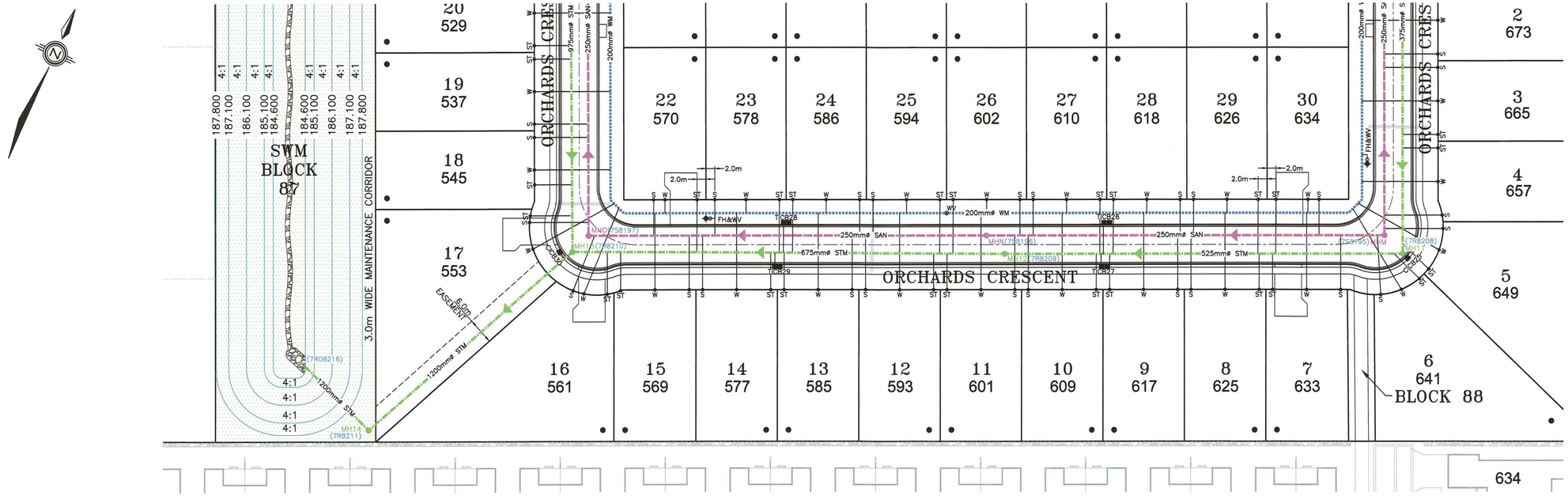
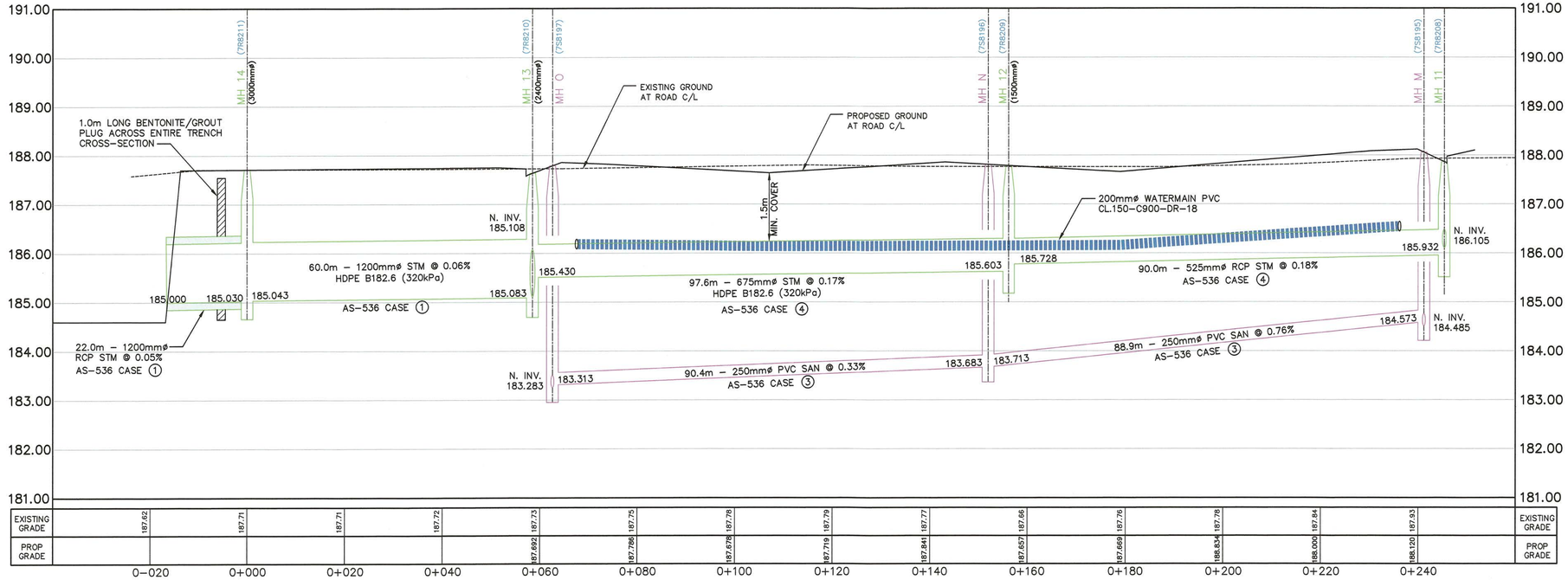
CHECKED	R.C.S.
DRAWN	M.M.H.
CHECKED	R.C.S.
SCALE	H 1:500 V 1:50

THE ORCHARDS

PLAN & PROFILE 4 SUTTON AVENUE

C.O.W. DWG. NO. S–2116
PROJECT NO. 17–726
SHEET NO. 8
OF 17





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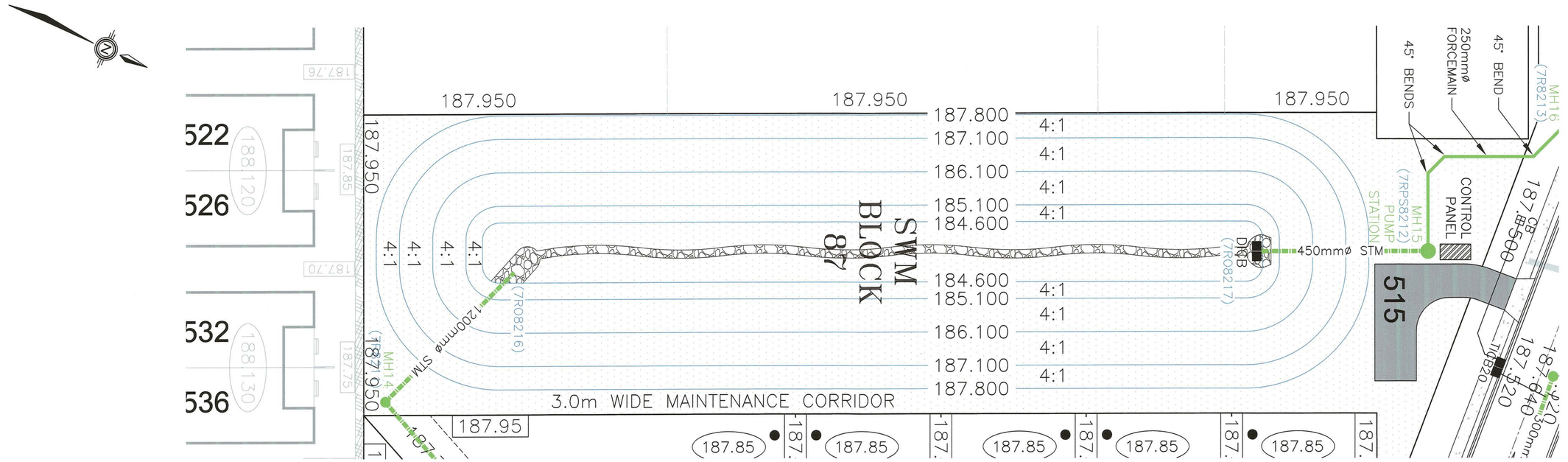
C.O.W. DWG. NO. S-2116

THE ORCHARDS

PROJECT NO. 17-726

PLAN & PROFILE 5 ORCHARDS CRES. & POND INLET

SHEET NO. 9 OF 17



SWM POND PLAN

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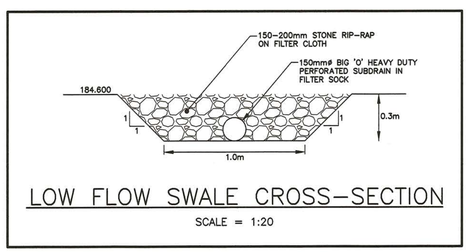

LOW FLOW SWALE CROSS-SECTION

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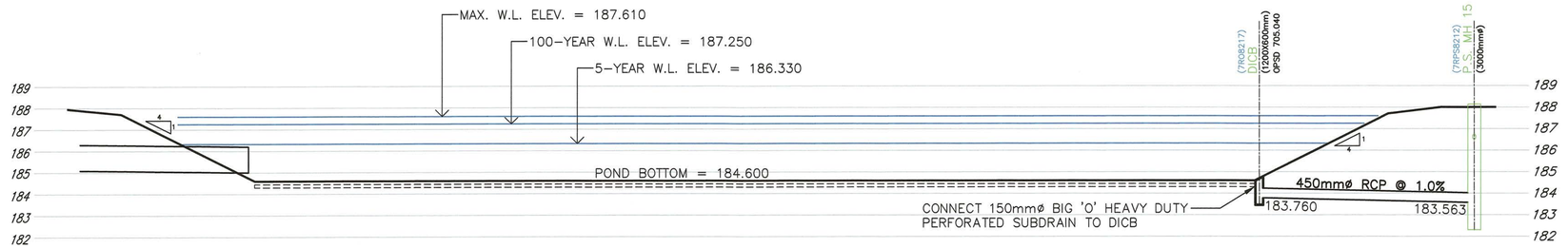

SWM POND CROSS-SECTION

SCALE: V=1:125
H=1:250

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LICENSED PROFESSIONAL ENGINEER S.M. LAPOINTE 100148762 PROVINCE OF ONTARIO

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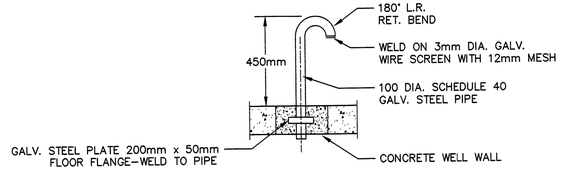
CHECKED R.C.S.
DRAWN M.M.H.
CHECKED R.C.S
SCALE AS SHOWN

C.O.W. DWG. NO. S-2116
PROJECT NO. 17-726

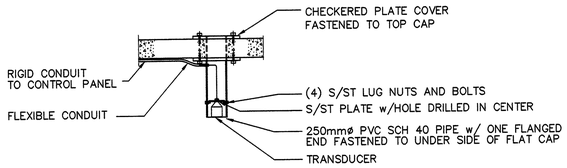
THE ORCHARDS

S.W.M. POND PLAN & CROSS-SECTION

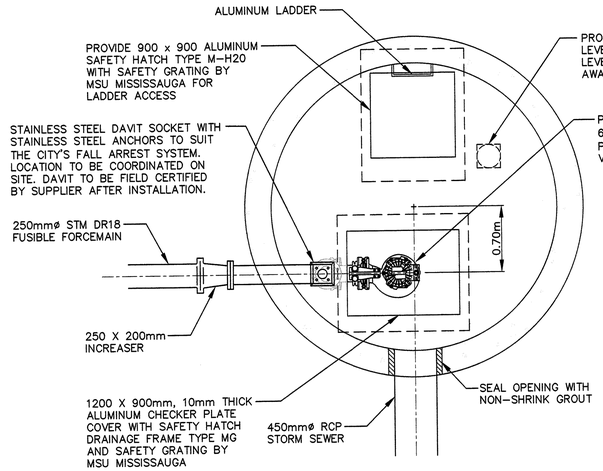
SHEET NO. 10
OF 17



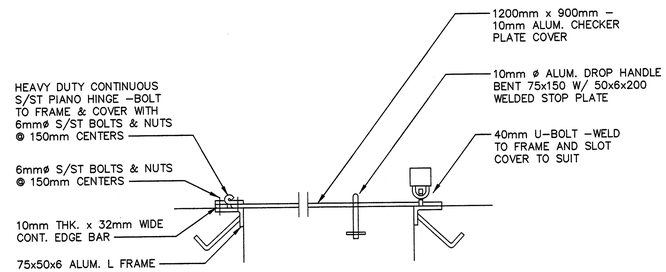
VENT DETAIL



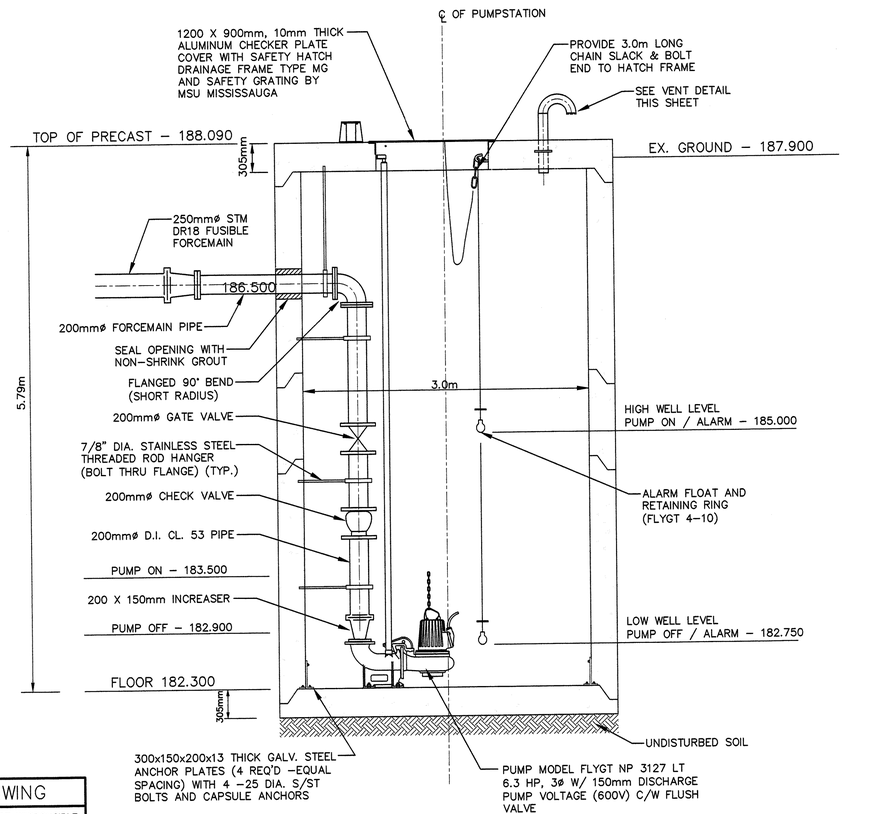
TRANSDUCER MOUNTING DETAIL



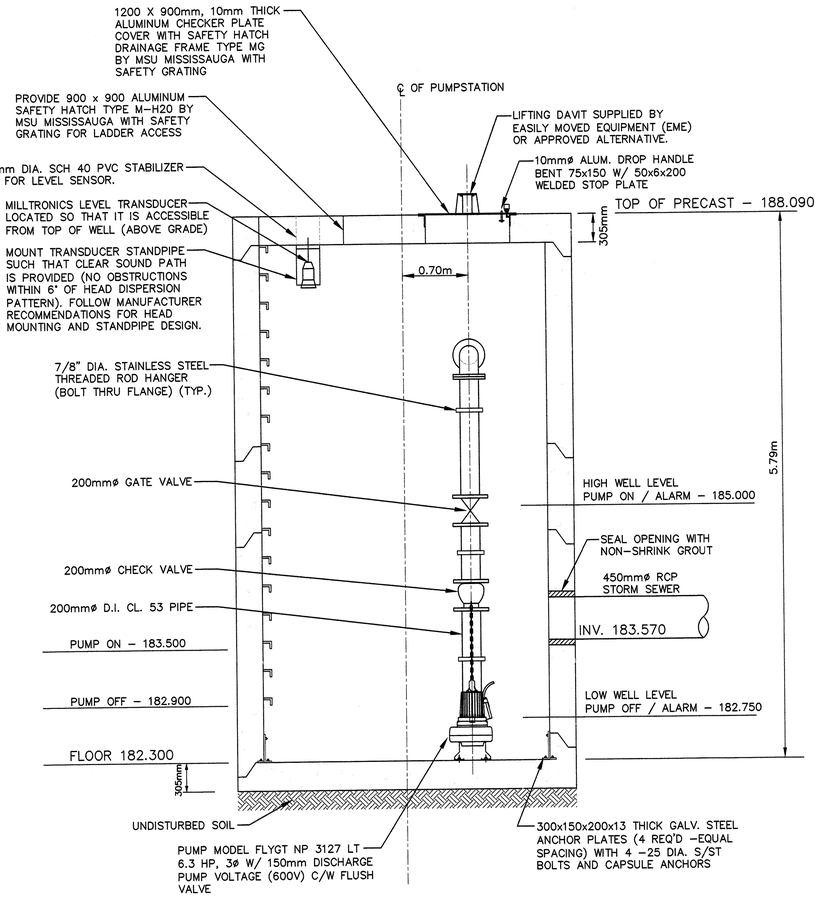
PLAN VIEW
PUMPING STATION MH15



HATCH DETAIL



NOTE:
CONTRACTOR TO SUPPLY CITY OF WINDSOR WITH ONE ADDITIONAL FLYGT NP 3127 LT PUMP AS EMERGENCY BACK–UP.



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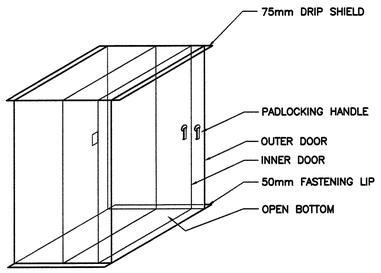
DESIGN M.M.H. | CHECKED R.C.S. | DRAWN M.M.H. | CHECKED R.C.S | SCALE 1:30

THE ORCHARDS

STORM PUMPING STATION PLAN & SECTIONS

C.O.W. DWG. NO. S–2116
PROJECT NO. 17–726
SHEET NO. 11 OF 17

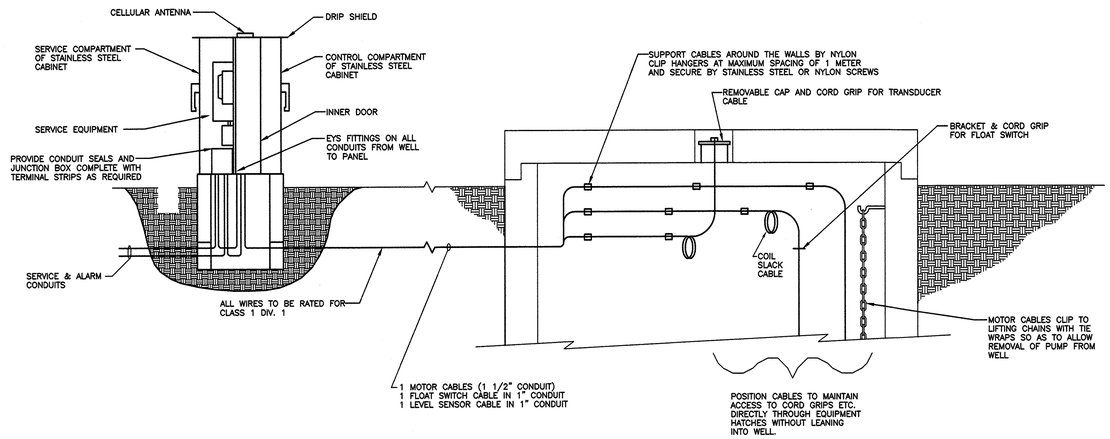


ENCLOSURE C/W METER SOCKET OPENING

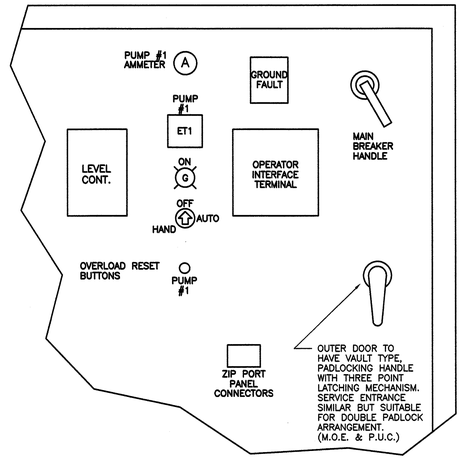
NOTE:

HYDRO FEED TO BE PROVIDED FROM EXISTING POLE TO METER BOX. HYDRO SERVICE INSTALLED U/G BY THIS CONTRACTOR.

EYSs TO BE MOUNTED OUTSIDE OF WET WELL, NO JUNCTIONS OR SPLICES TO BE MADE IN THE WET WELL.



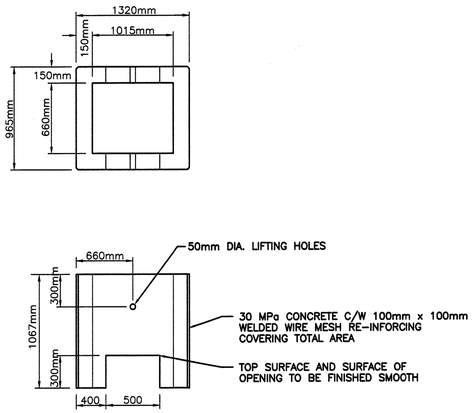
PUMPING STATION CONTROL PANEL & SERVICE EQUIPMENT MOUNTING DETAIL



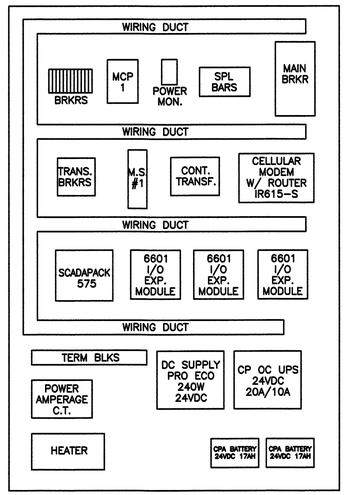
INNER DOOR LAYOUT

NOTES:

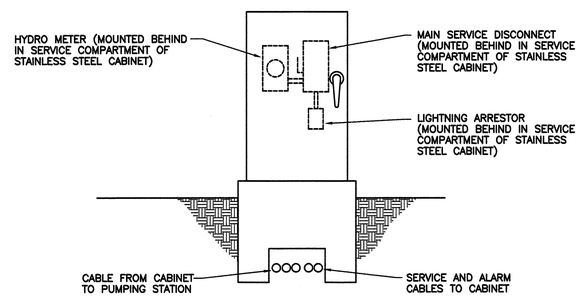
1. ALL WORK TO CONFORM TO CITY OF WINDSOR PUMPING STATION GENERAL SPECIFICATION (REV.NOV.2015).
2. PUMP ACCESS HATCH MUST BE ALUMINUM, HINGED WITH A NON RECESSED LATCH SUITABLE FOR A LARGE SCHLAGE LOCK. ACCESS HATCH MUST BE A SAFE HATCH. ie.: WITH INNER SAFETY GRATE.
3. ALL FASTENERS, ANCHORS, ETC. TO BE 316 STAINLESS STEEL, INCLUDING FORCEMAIN SUPPORTS.
4. CONTROL PANEL, STARTER, AND MAIN DISCONNECT SHOULD ALL BE LOCATED INSIDE A STAINLESS STEEL LOCKABLE CABINET.
5. THE OVERLOAD RESET PUSHBUTTON SHOULD BE LOCATED OUTSIDE THE STARTER BOX (ON THE INNER DOOR).
6. DRAWINGS TO SHOW WIRE NUMBERS FOR ALL CONNECTIONS. ALL WIRES INSTALLED TO BE MARKED TO MATCH THESE NUMBERS.
7. 575/120V CONTROL TRANSFORMER SHALL BE MOUNTED IN CABINET AND FUSED ON PRIMARY AND SECONDARY.
8. ALL CONTROL EQUIPMENT SHALL BE LOCATED WITHIN ONE STAINLESS STEEL WEATHERPROOF ENCLOSURE OF NEMA 4X RATING.
9. THE ENCLOSURE SHALL INCLUDE A DRAWING POCKET ON THE INSIDE OF THE OUTER DOOR, A ZIP PORT RECEPTACLE, AND A HEATER WITH A GUARD AND THERMOSTAT.
10. CONTROL RELAYS, PUSH BUTTONS, STARTERS AND LIGHTS TO BE ALLEN BRADLEY, SQUARE 'D' OR EATON.
11. STARTER AND CONTROL RELAY SHALL BE PROVIDED WITH SPARE CONTACTS (ONE OPEN AND ONE CLOSED).
12. OVERLOADS TO BE AUTOMATIC TYPE.
13. EXACT SIZE OF CONCRETE BASE AND CABINET TO BE SUFFICIENT TO HOUSE ALL EQUIPMENT. CONTRACTOR TO SUBMIT SHOP DRAWINGS FOR SAME PRIOR TO FABRICATION FOR APPROVAL BY CITY.
14. PUMP CONTROL SYSTEM DRAWINGS SHALL ALSO BE SUBMITTED TO CITY FOR APPROVAL PRIOR TO FABRICATION.
15. SCADAPACK SYSTEM SHALL MEET THE REQUIREMENTS OF CLAUSE 16.15 OF THE PUMPING STATION GENERAL SPECIFICATION EXCEPT AS AMENDED IN THE CONTRACT DOCUMENTS.
16. THE INTEGRATOR/PANEL BUILDER FOR CONTROLS SHALL HAVE SIMILAR EXPERIENCE WITH MUNICIPAL PUMPING STATIONS.
17. SCADAPACK I/O SHALL BE 24VDC.



CONCRETE BASE



SUGGESTED BACKPLATE LAYOUT
(SEE NOTE 14)



CONTROL PANEL & SERVICE EQUIPMENT FRONT VIEW

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C.O.W. DWG. NO. S-2116
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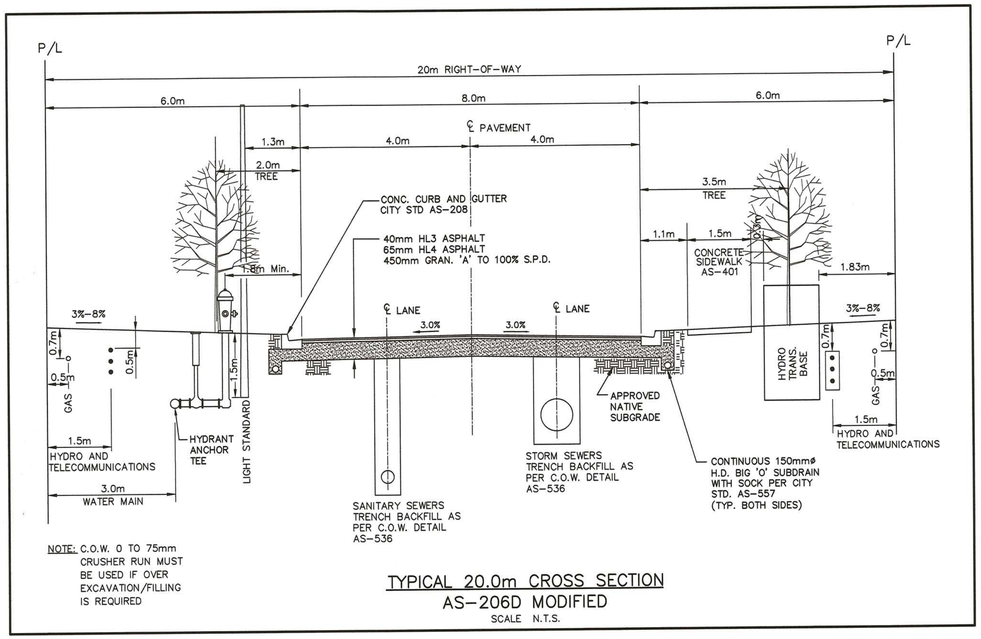
SHEET NO. 12
OF 17

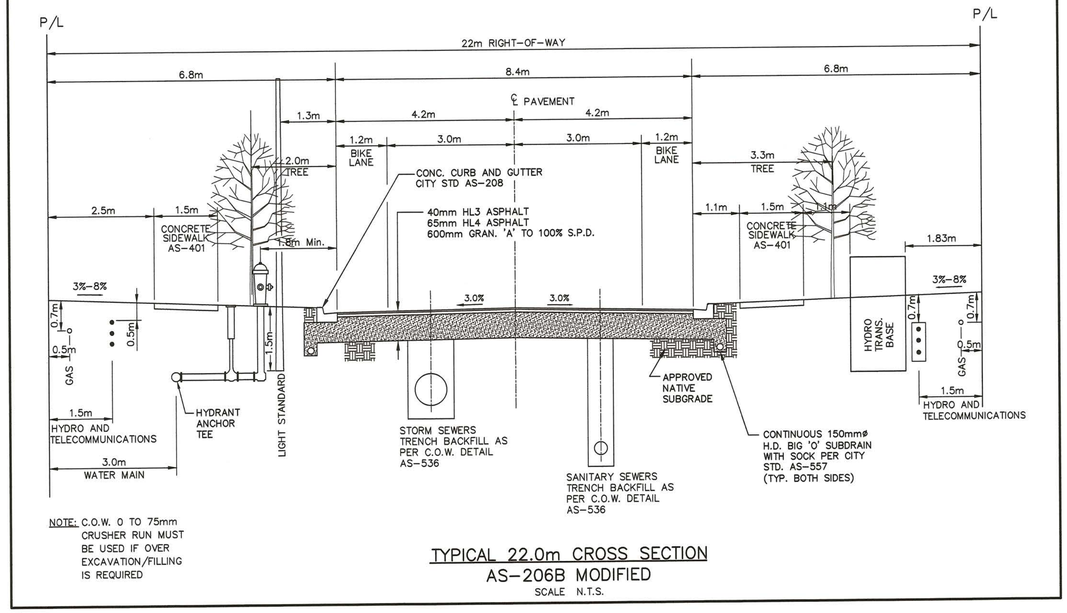
THE ORCHARDS

STORM PUMPING STATION DETAILS



NOTE: C.O.W. 0 TO 75mm CRUSHER RUN MUST BE USED IF OVER EXCAVATION/FILLING IS REQUIRED

TYPICAL 20.0m CROSS SECTION
AS-206D MODIFIED
SCALE N.T.S.



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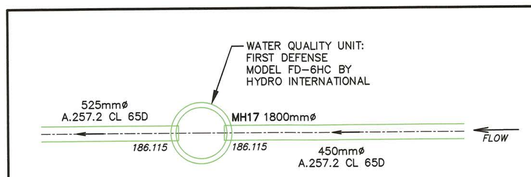
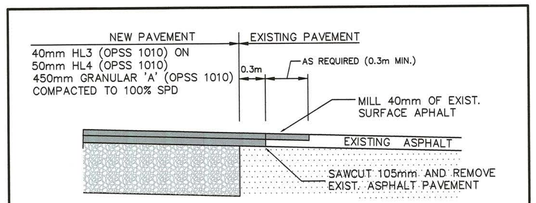
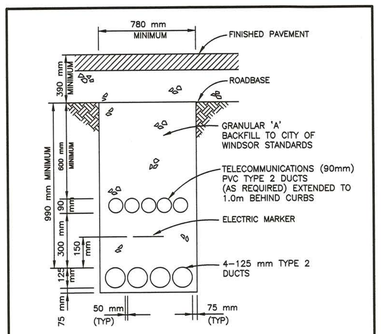
TYPICAL 22.0m CROSS SECTION
AS-206B MODIFIED
SCALE N.T.S.



WATER QUALITY UNIT DETAIL
SCALE 1:100

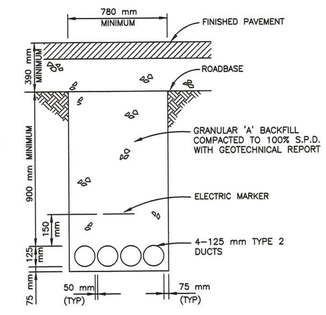


ASPHALT PAVEMENT CONNECTION DETAIL
SCALE N.T.S.

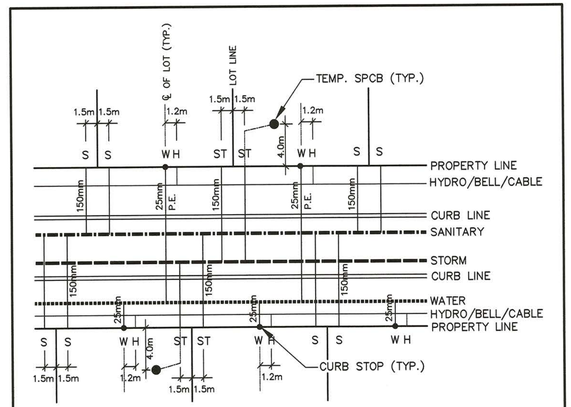


COMBINED UTILITY CROSSING
4-127mm DIA. PRIMARY DUCTS
90mm BELL DUCTS
50mm CABLE T.V. DUCTS

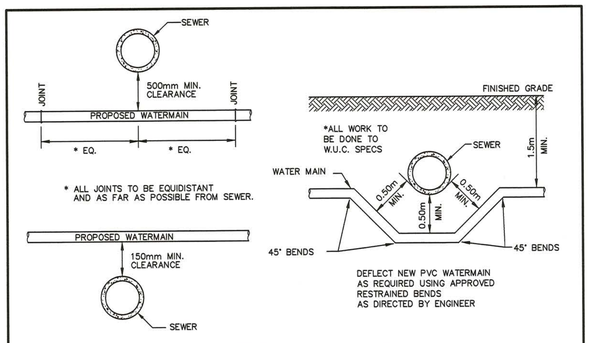
SHALLOW CROSSING
4-127mm DIA. PRIMARY DUCTS
UNSHRINKABLE BACKFILL OR 20MPA CONCRETE



DIRECT BURIED CROSSING
4-127mm DIA. PRIMARY DUCTS



TYPICAL 20.0m R.O.W. SERVICE LAYOUT
SCALE N.T.S.



TYPICAL WATERMAIN DEFLECTION DETAIL
NTS

AS-BUILT DRAWING

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PREVIOUSLY SIGNED 17 AUGUST 2021

CITY ENGINEER
WINDSOR, ONTARIO

LICENSED PROFESSIONAL ENGINEER R.C. SPENCER 43659015 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER S.M. LANGHAM 100126402 PROVINCE OF ONTARIO

RC SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 800 University Ave. W.- Windsor, ON N9A 5R9
Leamington: 18 Talbot St. W.- Leamington, ON N8H 1M4
Chatham: 49 Raleigh Street - Chatham, ON N7M 2M6
Professional Engineers Ontario

NO.	REVISION	DATE	BY	APP.
8.	AS-CONSTRUCTED	18 FEB. 2022	J.R.	R.C.S.
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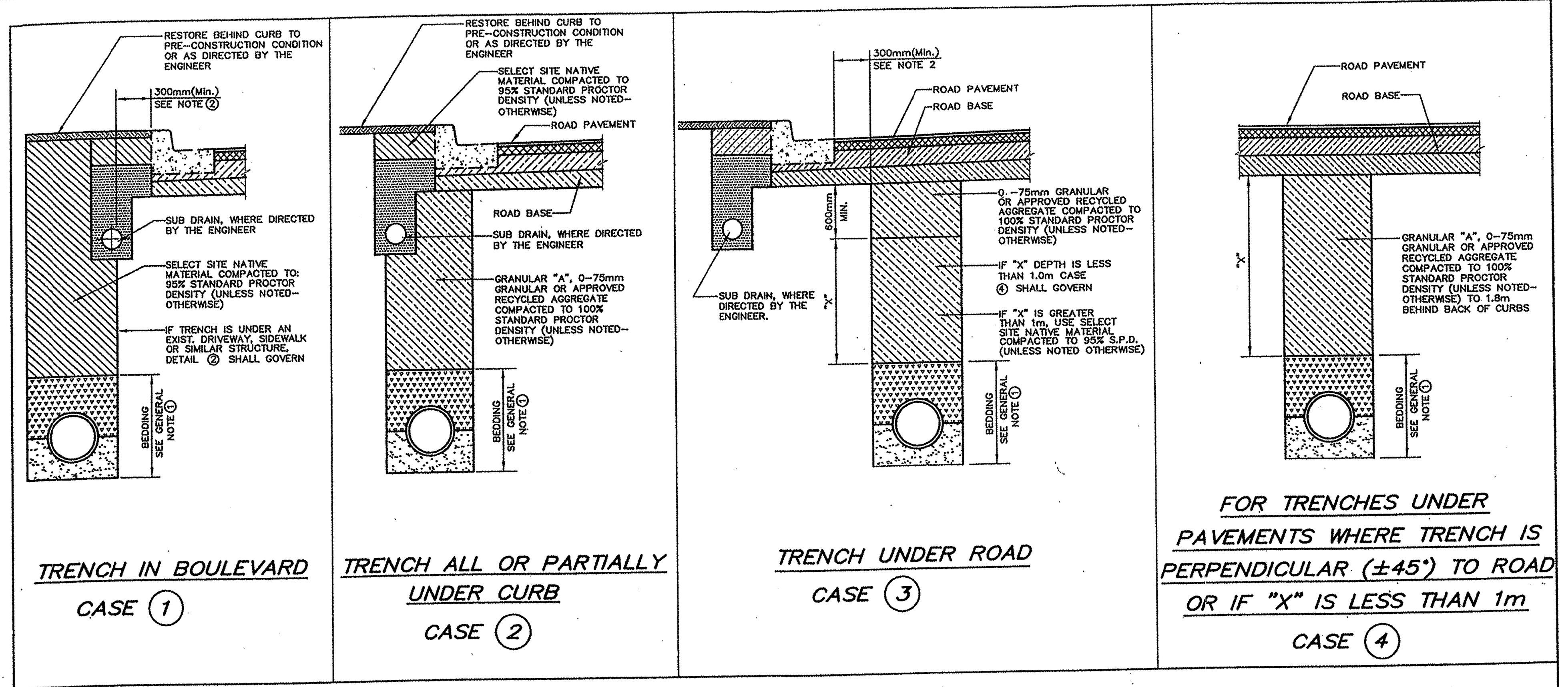
1.	SUBMIT FOR CITY REVIEW	09 FEB. 2021	S.M.L.	R.C.S.

DESIGN M.M.H.
CHECKED R.C.S.
DRAWN M.M.H.
CHECKED R.C.S
SCALE N.T.S.

THE ORCHARDS

TYPICAL SERVICE LAYOUT AND CROSS SECTIONS

C.O.W. DWG. NO. S-2116
PROJECT NO. 17-726
SHEET NO. 13
OF 17



GENERAL NOTES:

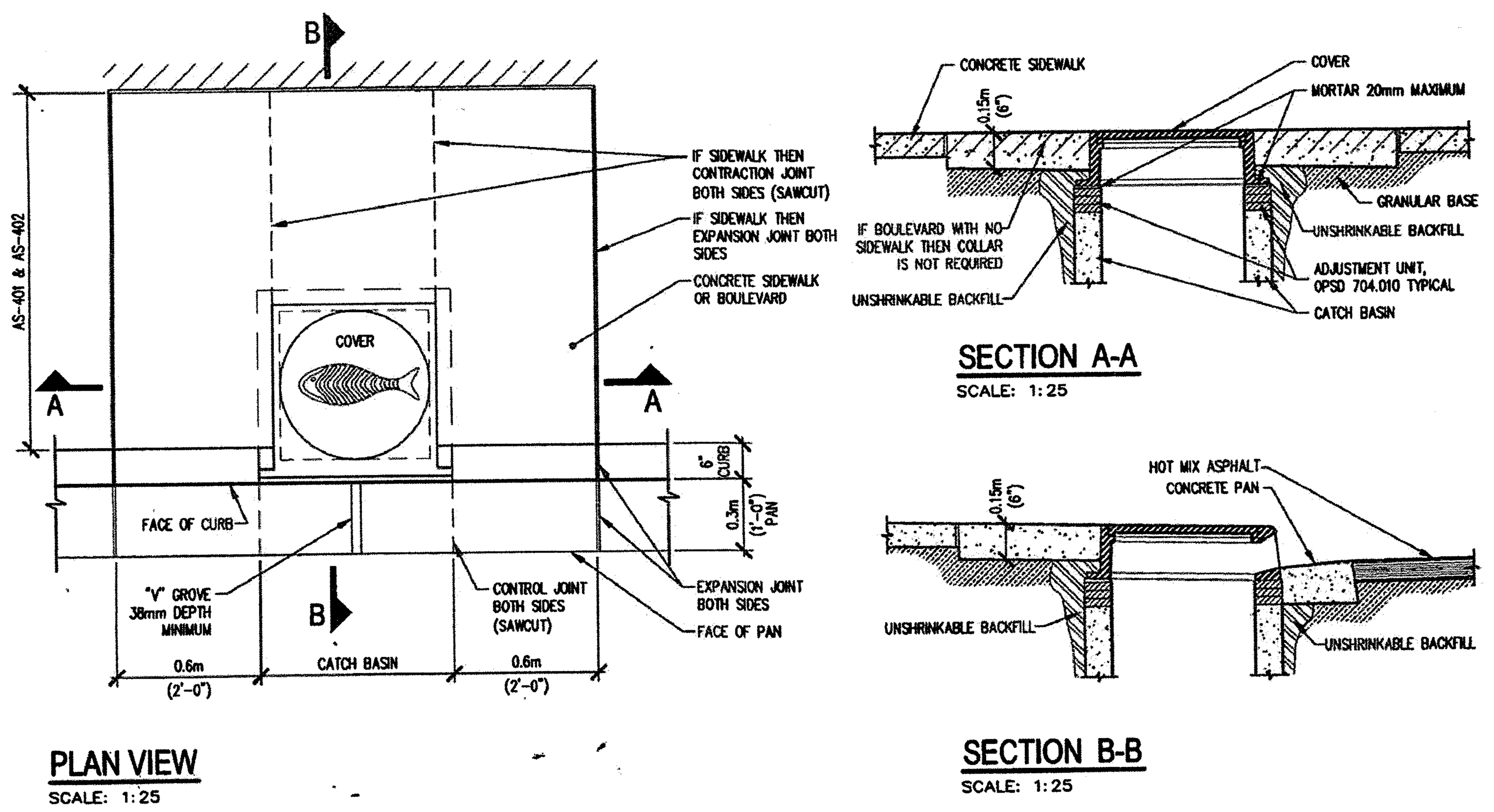
① FOR SEWER AND PRIVATE SEWER CONNECTION CONSTRUCTION, ALL WORK TO BE IN ACCORDANCE WITH THE CITY OF WINDSOR STANDARD SPECIFICATIONS S-1 APPLIED TO ALL CASES ①, ②, ③ & ④ OF THIS STANDARD DRAWING.

② FOR ALL CASES, IF TRENCH WALL IS CLOSER THAN 300mm FROM THE BACK OF CURB (FUTURE OR EXISTING) OR EDGE OF PAVEMENT (FUTURE OR EXISTING), IN ANY DIRECTION, THEN CASE ② SHALL GOVERN.

③ FOR CASE ④, WHERE TRENCH CROSSES PERPENDICULAR TO ROADWAY (±45°) AND CROSSES UNDERNEATH AN EXISTING CURB, DRIVEWAY OR SIMILAR STRUCTURE, EXTEND GRANULAR BACKFILL TO 1.8m (MIN.) EITHER SIDE OF STRUCTURE.

④ THIS DETAIL ADDRESSES TRENCH BACKFILL ONLY. SURFACE RESTORATION SHALL BE AS OTHERWISE APPROVED BY THE COMMISSIONER OF WORKS.

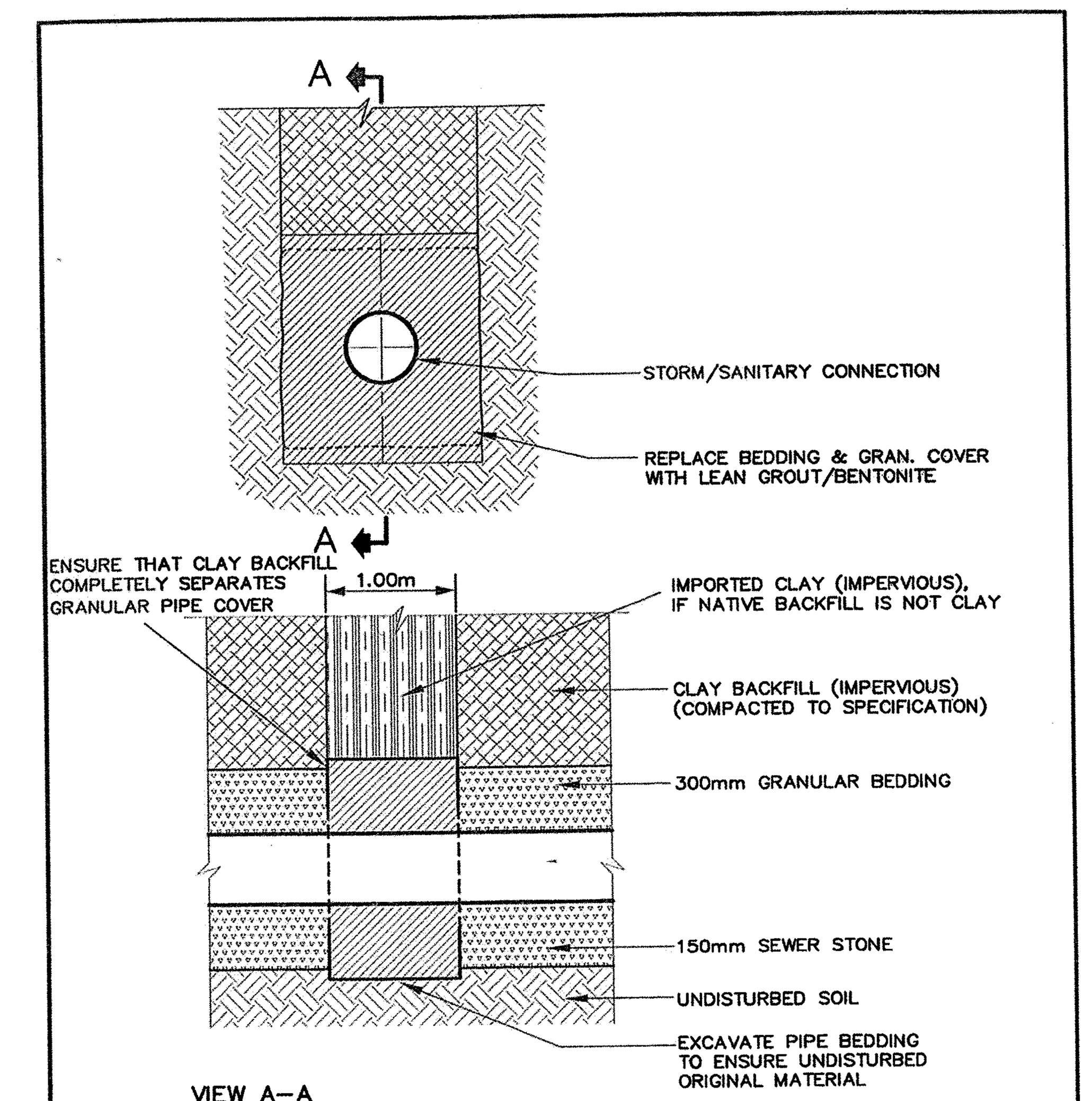
CITY OF WINDSOR DEPARTMENT OF PUBLIC WORKS	
STANDARD TRENCH BACKFILL DETAILS	
DR'N BY: R.C.	DATE: OCTOBER, 2002
REVISION:	CH'KD BY:
CH'KD BY:	PASSED BY:
COMMISSIONER OF WORKS	AS-536



GENERAL NOTES:

1.) CATCH BASIN TO BE CENTERED WITHIN THE SIDEWALK BAY IF PLACED IN SIDEWALK.
2.) CONCRETE SIDEWALK THICKNESS SHALL BE 150mm FOR SIDEWALK BAY WITH CATCH BASIN.
3.) FOR EXPANSION AND CONTRACTION JOINT DETAIL SEE OPSD 310.010.
4.) CAST IRON CURB INLET FRAME ACCORDING TO OPSD 400.082.
5.) IF PLACED IN GRASSED BOULEVARD AREAS, CONCRETE SUPPORT COLLAR NOT REQUIRED.
6.) "V" GROVE IN PAN TO ALLOW DRAINAGE DURING MAINTENANCE PERIOD PRIOR TO SURFACE ASPHALT COURSE BEING PLACED.
7.) UNSHRINKABLE BACKFILL REQUIRED IN CATCH BASIN EXCAVATION.

CITY OF WINDSOR ENGINEERING DEPARTMENT	
INLET CATCH BASIN BOX-OUT FOR ASPHALT PAVEMENT	
DR'N BY: AJC, AP	DATE: OCT, 2011
REVISION:	CH'KD BY: A.L.
CH'KD BY: P.J.U.	PASSED BY:
Feb 28, 2012 MARIO SONEGO, CITY ENGINEER	AS-546

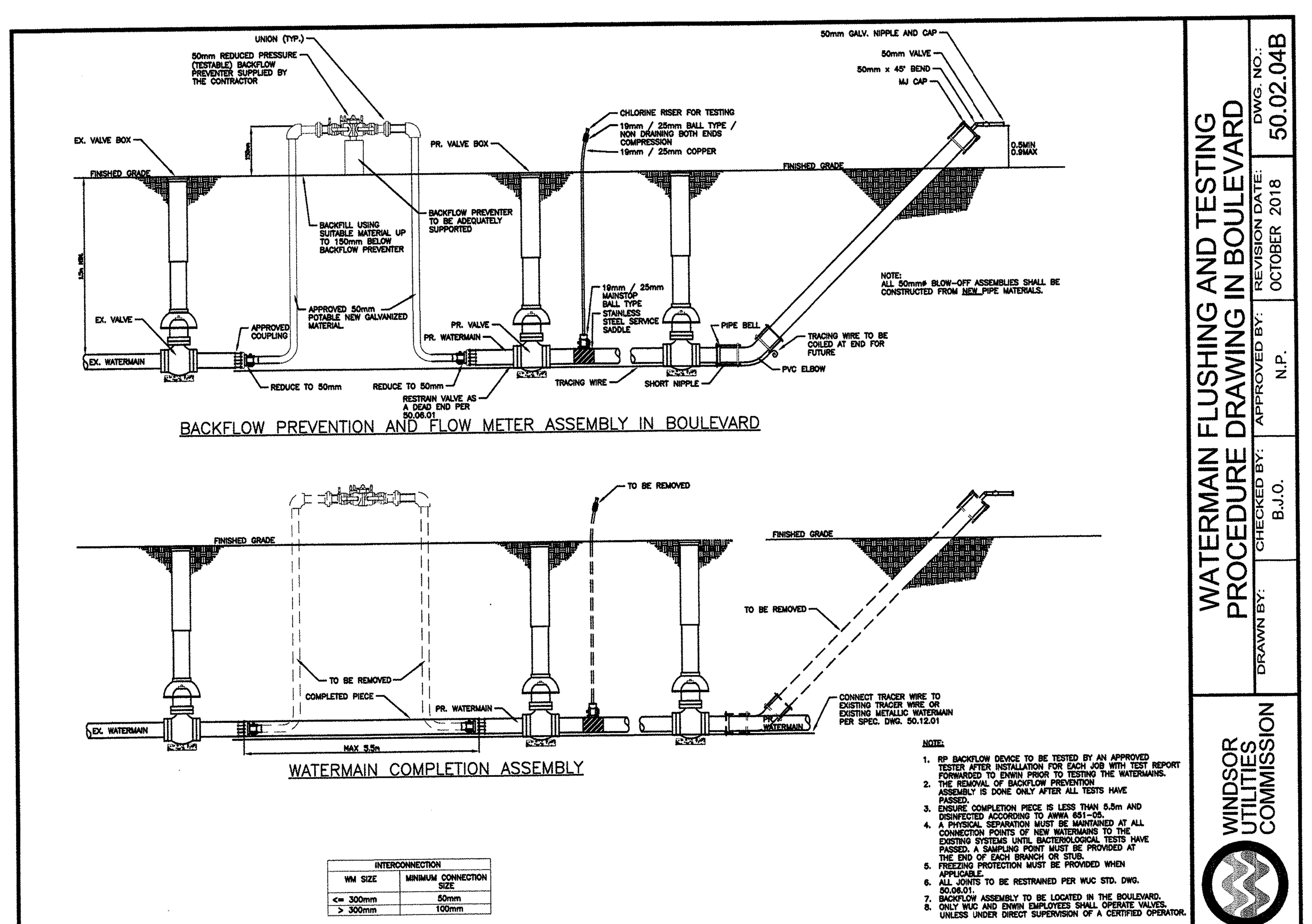


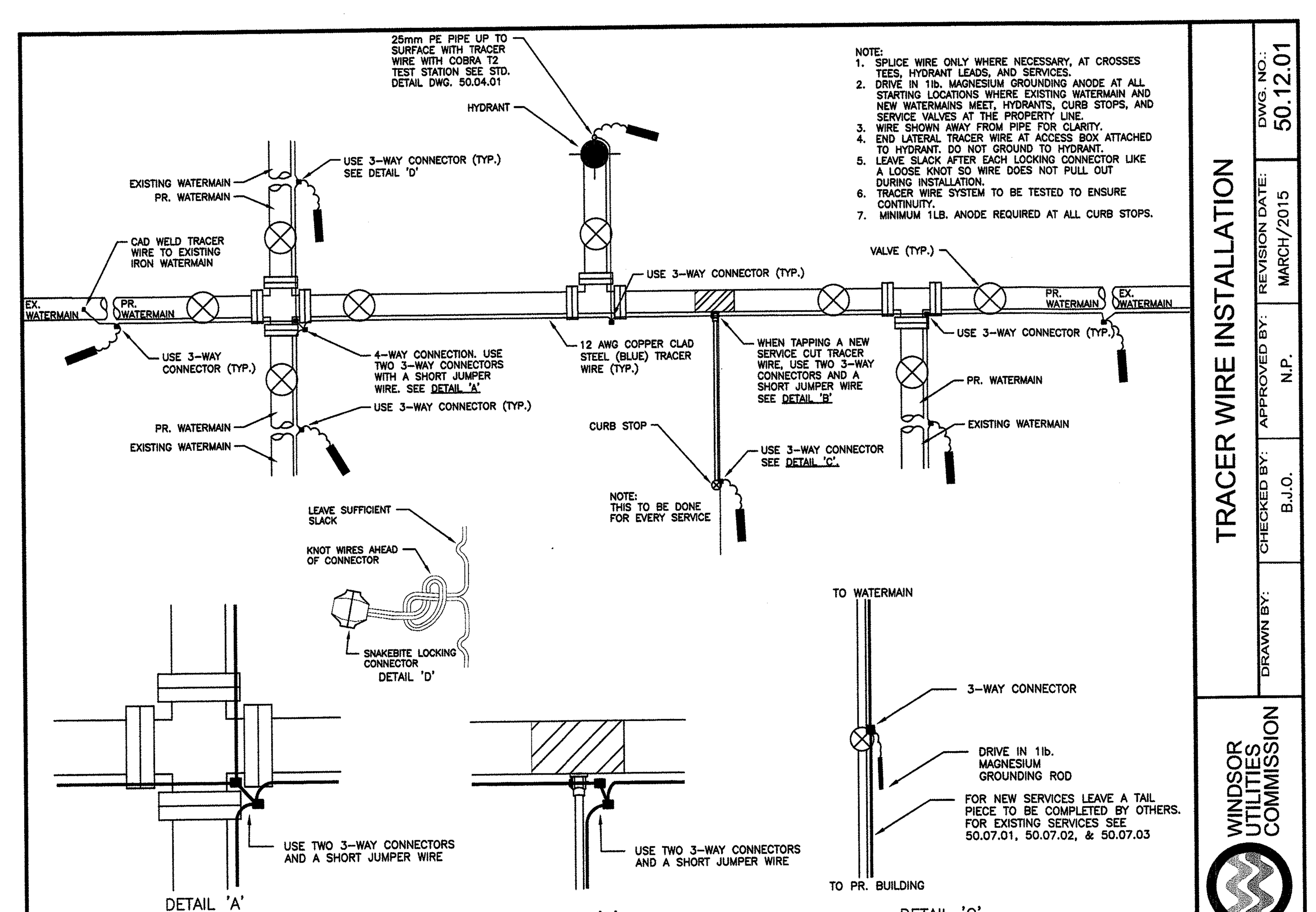
TYPICAL LEAN GROUT/BENTONITE PLUG DETAIL (SERVICE CONNECTION)

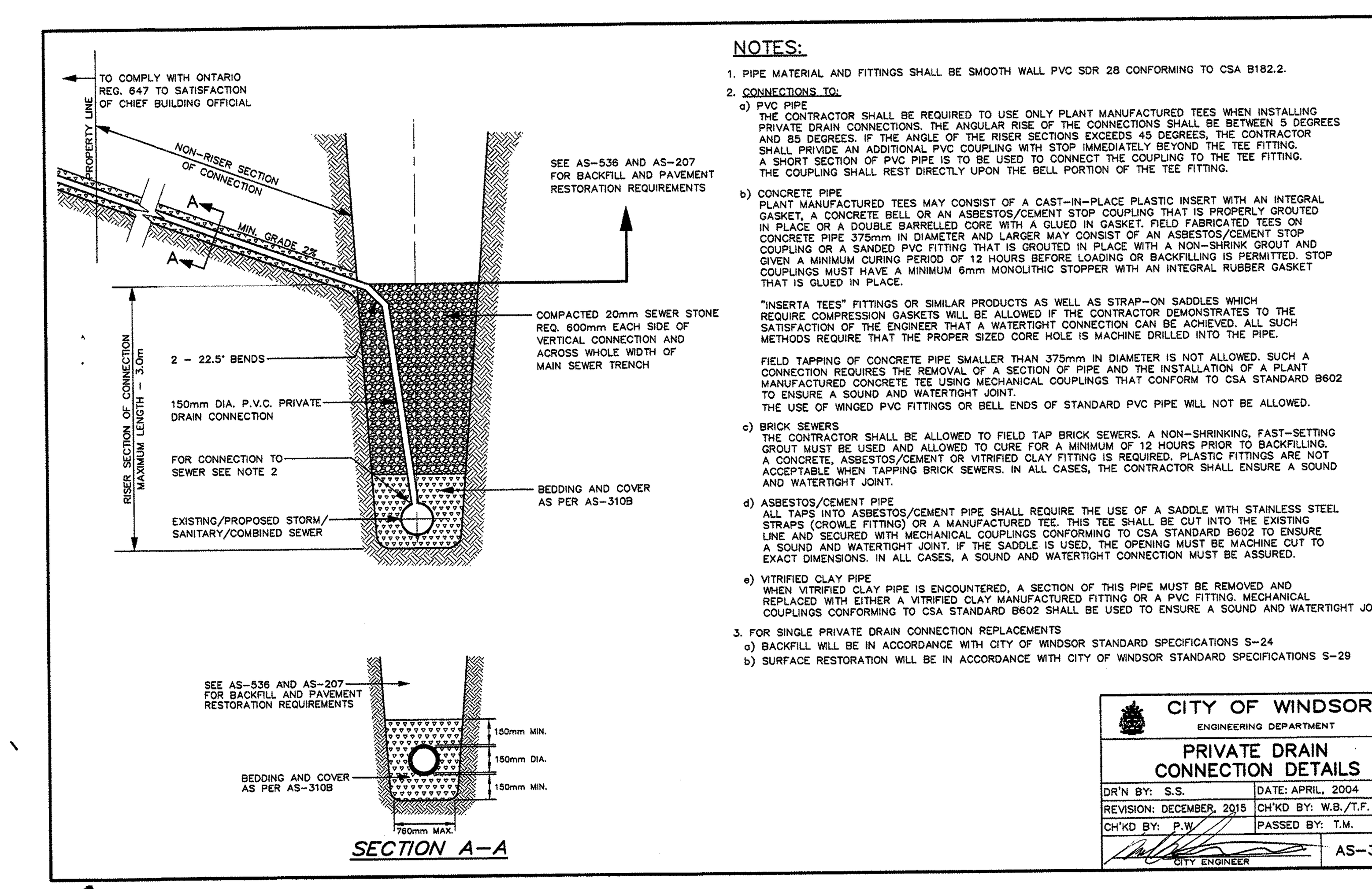
NOTES:

1) ANY MATERIAL MUST BE APPROVED BY THE ENGINEER.
2) IN SANDY OR PERVIOUS SOIL THIS WILL REQUIRE SPECIAL DESIGN.
3) UNLESS SPECIFIED, THE CONTRACTOR WILL HAVE A CHOICE OF EITHER LEAN GROUT OR BENTONITE.

CITY OF WINDSOR INFRASTRUCTURE SERVICES	
STANDARD LEAN GROUT / BENTONITE PLUG DETAIL (SERVICE CONNECTION)	
DRAWN BY: W.A.	DATE: MAY, 2003
REVISION:	CH'KD BY:
CH'KD BY:	PASSED BY:
CITY ENGINEER	AS-526-A







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PREVIOUSLY SIGNED 17 AUGUST 2021

CITY ENGINEER
WINDSOR, ONTARIO

LICENSED PROFESSIONAL ENGINEER — R.C. SPENCER — PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER — S.M. LAKATOS — 18 FEB 2022 — PROVINCE OF ONTARIO

RC SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 800 University Ave. W. - Windsor, ON N9A 5R9
Leamington: 18 Talbot St. W. - Leamington, ON N8H 1M4
Chatham: 49 Raleigh Street - Chatham, ON N7M 2M6
Professional Engineers Ontario

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1.	SUBMIT FOR CITY REVIEW	09 FEB. 2021	S.M.L.	R.C.S.

DESIGN	M.M.H.
CHECKED	R.C.S.
DRAWN	M.M.H.
CHECKED	R.C.S
SCALE	N.T.S.

THE ORCHARDS

MISCELLANEOUS DETAILS

C.O.W. DWG. NO.	S-2116
PROJECT NO.	17-726
SHEET NO.	14
OF	17

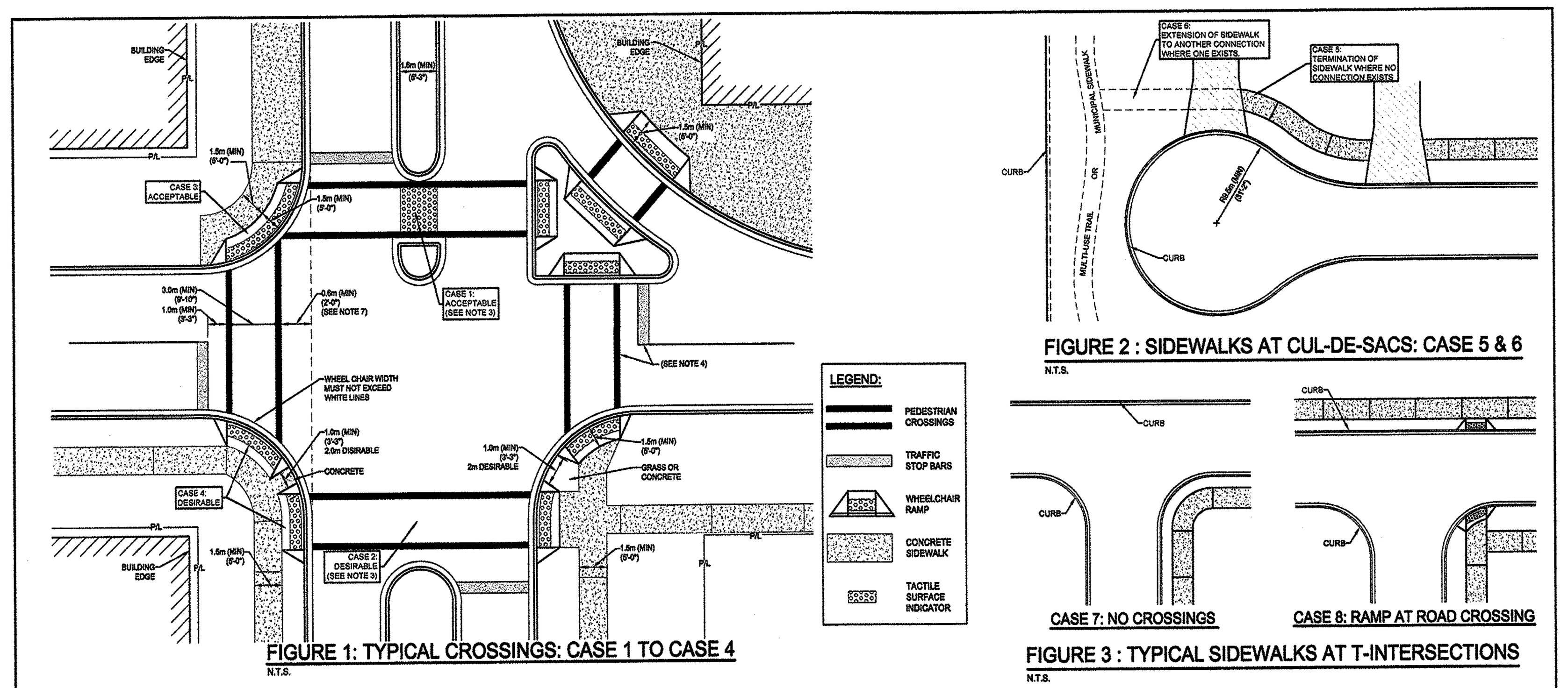


FIGURE 1: TYPICAL CROSSINGS: CASE 1 TO CASE 4
N.T.S.

FIGURE 3 : TYPICAL SIDEWALKS AT T-INTERSECTIONS
N.T.S.

GENERAL NOTES:

1.) All wheelchair ramps in accordance with AS-402. Tactile surface indicators to be truncated dome type in accordance with AS-549 unless otherwise approved by the City Engineer.

2.) Sidewalks in accordance with AS-401 and AS-403.

3.) The median shall terminate before the pedestrian crossing (Case 2 – desirable). where the median island exists or where pedestrian refuge is required, pedestrian crossings may continue through the median island as an at-grade crossing (Case 1 – acceptable)

4.) Signs and lane markings to the satisfaction of the City Engineer and within accordance of the Ontario Traffic Manual. Stop bars and pedestrian crossings required at signalized intersections only.

5.) Pedestrian crossings shall be a straight line across the intersection free and clear of obstacles, and aligned with wheelchair ramps.

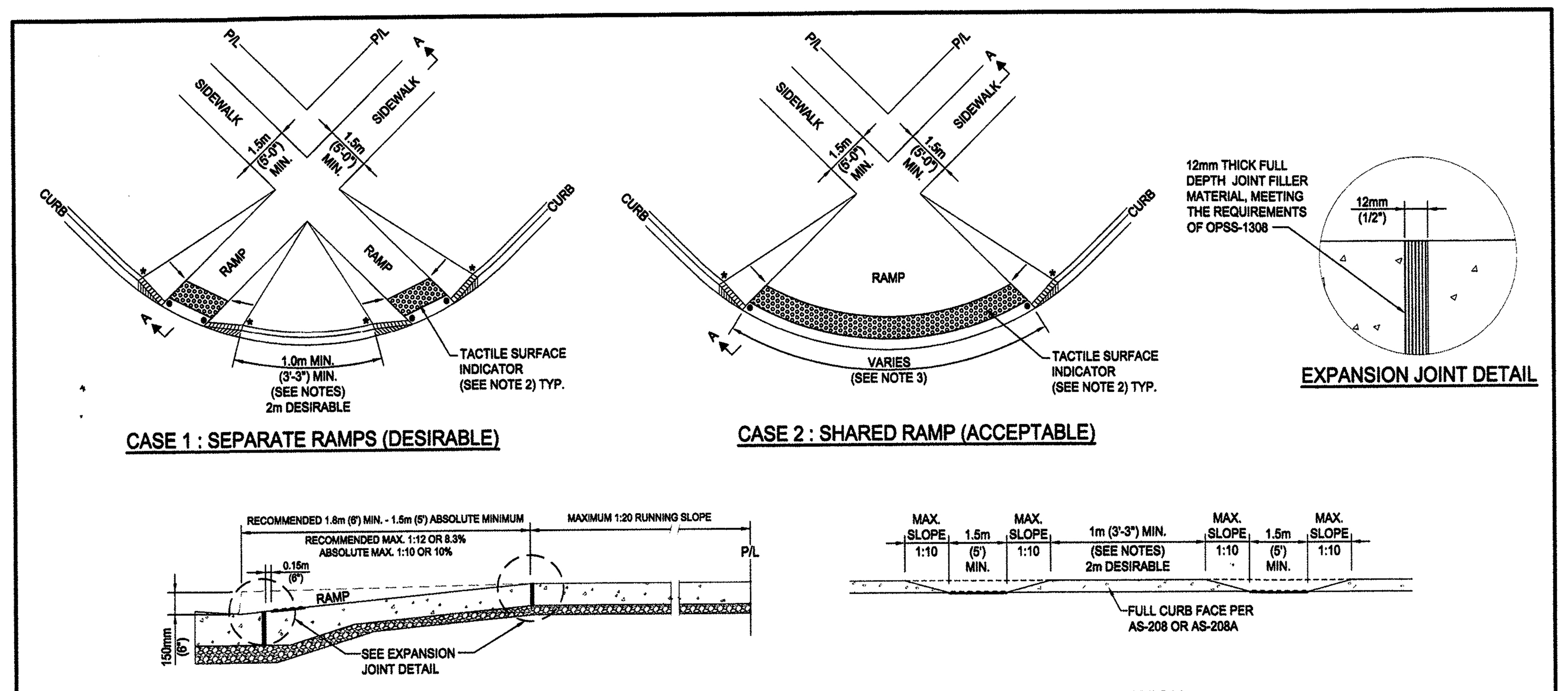
6.) Wheelchair ramps to be oriented in the direction of the pedestrian crossing.

7.) 2.0m desirable, 3.0 absolute maximum for roadways posted under 80 km/h. For roadways with posted speeds greater than or equal to 80 km/h, minimum 1.0m required.

8.) Shared wheelchair ramps (Case 3) may be accepted only where a 1.0m separation between dropped curbs as shown in Case 4 cannot be achieved. 2.0m separation between dropped curbs is desirable.

9.) All work within public right-of-way to be completed to City of Windsor Standards and the satisfaction of the City Engineer.

CITY OF WINDSOR ENGINEERING DEPARTMENT	
WHEELCHAIR RAMPS & PEDESTRIAN CROSSINGS AT INTERSECTIONS AND CUL-DE-SAC SIDEWALK TERMINATION	
DR'N BY: A.P., M.L., M.F.	DATE: DEC, 2012
REVISION: DECEMBER 2015	CH'KD BY: S.S., M.C.
CH'KD BY: P.U.	PASSED BY:
CITY ENGINEER	AS-404



CROSS SECTION A-A

ELEVATION

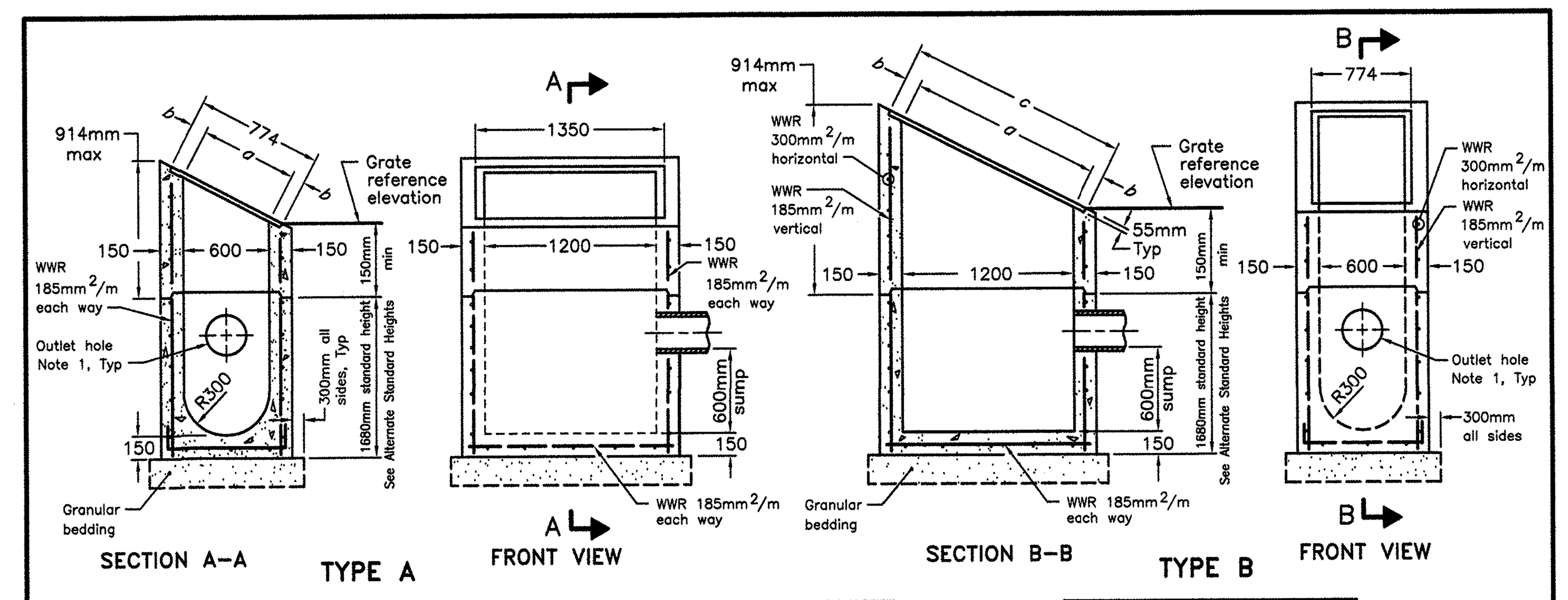
GENERAL NOTES:

1. The surface texture of the ramp shall be coarse broom finished draining towards the gutter so that it is rougher than the texture of the surrounding sidewalk.
2. The tactile surface indicators shall:
   i) Be yellow and have a high tonal contrast with the adjacent ramp surface.
   ii) Extend the full width of the ramp section that is flush with the gutter and not to extend along the flared section.
   iii) Consist of truncated domes in accordance with AS-549 or other raised tactile profile as approved by the City Engineer.
3. Ramps shall be aligned to provide a direct connection from the sidewalk to the ramp and provide straight-line connection to the ramp on the other side of the street. Where the distance between ramps is less than 1m (3'-3") as shown on Case①, a shared ramp shall be used (Case②).
4. The width of a shared ramp shall be determined by aligning each ramp edge with the respective edge on the other side of the crossing in each direction.
5. Where a painted crosswalk exists, the width of the ramp must match the width of the crosswalk.
6. To be read in conjunction with AS-401 and AS-403.
7. All work within public right-of-way to be completed to City of Windsor Standards and to the satisfaction of the City Engineer.

* elevation to match existing

● elevation to be flush with the gutter

CITY OF WINDSOR ENGINEERING DEPARTMENT	
SIDEWALK WHEEL CHAIR RAMP	
DR'N BY: M.L./M.F./N.B.	DATE: AUG, 2013
REVISION: DEC. 2015; FEB. 2016	CH'KD BY: S.S. / M.C.
CH'KD BY: P.U.	PASSED BY:
CITY ENGINEER	AS-402



Opening Dimensions			
Grate		a	b
Type	Slope		
B	2H:1V	670	52
	3H:1V	632	71
	4H:1V	618	78
	HOR	600	87

Alternate Standard Heights	
Alternate	Dimension
A	1980
B	1520
C	1380

Opening Dimensions				
Grate		a	b	c
Type	Slope			
C	2H:1V	1341	66	1473
	3H:1V	1265	104	1473
	4H:1V	1237	118	1473
B	6H:1V	1216	65	1346
	HOR	1200	73	1346

NOTES:

1 Outlet hole size 525mm max diameter.

A Where inlet is placed across ditch and is accessible to vehicular traffic, grating slope shall be 6H:1V or flatter.

B Center reinforcing in wall and base slab ±25mm.

C Lap riser horizontal wires 300mm. Laps shall be placed at corners.

D Granular backfill shall be placed to a minimum thickness of 300mm all around the ditch inlet.

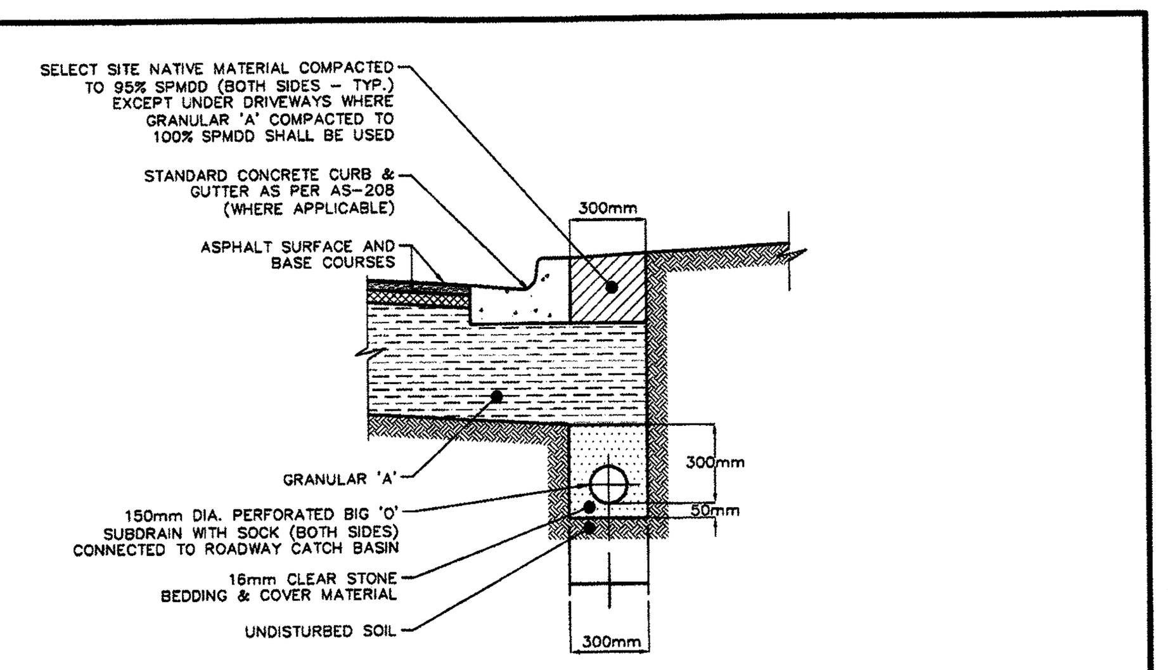
E Grating shall be according to OPSD 403.010.

F Pipe support shall be according to OPSD 708.020.

G All dimensions are nominal.

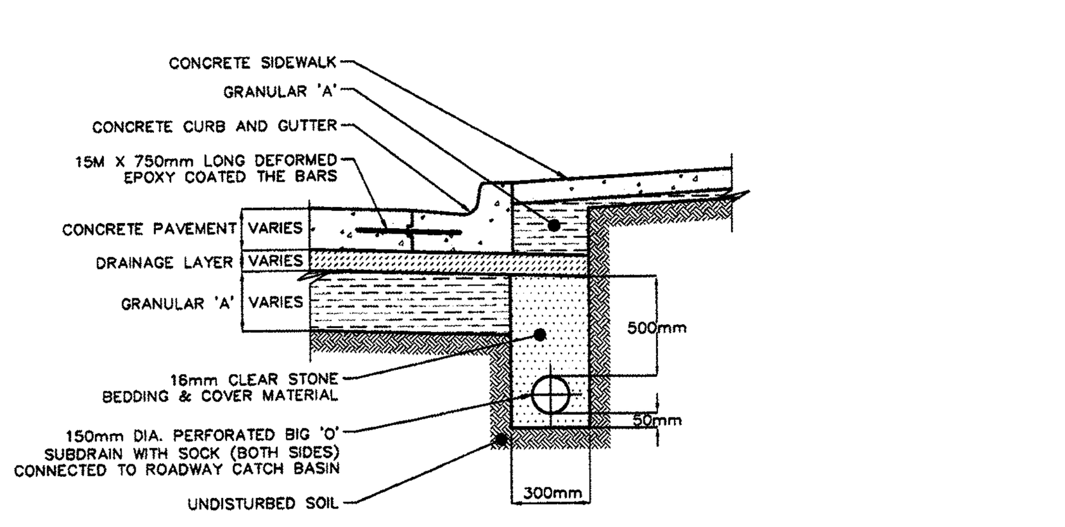
H All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2019	Rev 4
PRECAST CONCRETE DITCH INLETS 600 x 1200mm	OPSD 705.040	



SUBDRAIN DETAIL FOR ASPHALT PAVEMENT

N.T.S.



SUBDRAIN DETAIL FOR CONCRETE PAVEMENT

N.T.S.

GENERAL NOTES:

1. TO BE READ IN CONJUNCTION WITH CITY OF WINDSOR STANDARD SPECIFICATIONS S-16.

CITY OF WINDSOR ENGINEERING DEPARTMENT	
SUBDRAIN DETAIL FOR ASPHALT & CONCRETE PAVEMENT	
DR'N BY: B.C.	DATE: JUNE 2015
REVISION:	CH'KD BY: P.U.
CH'KD BY:	PASSED BY: S.C.
CITY ENGINEER	AS-557

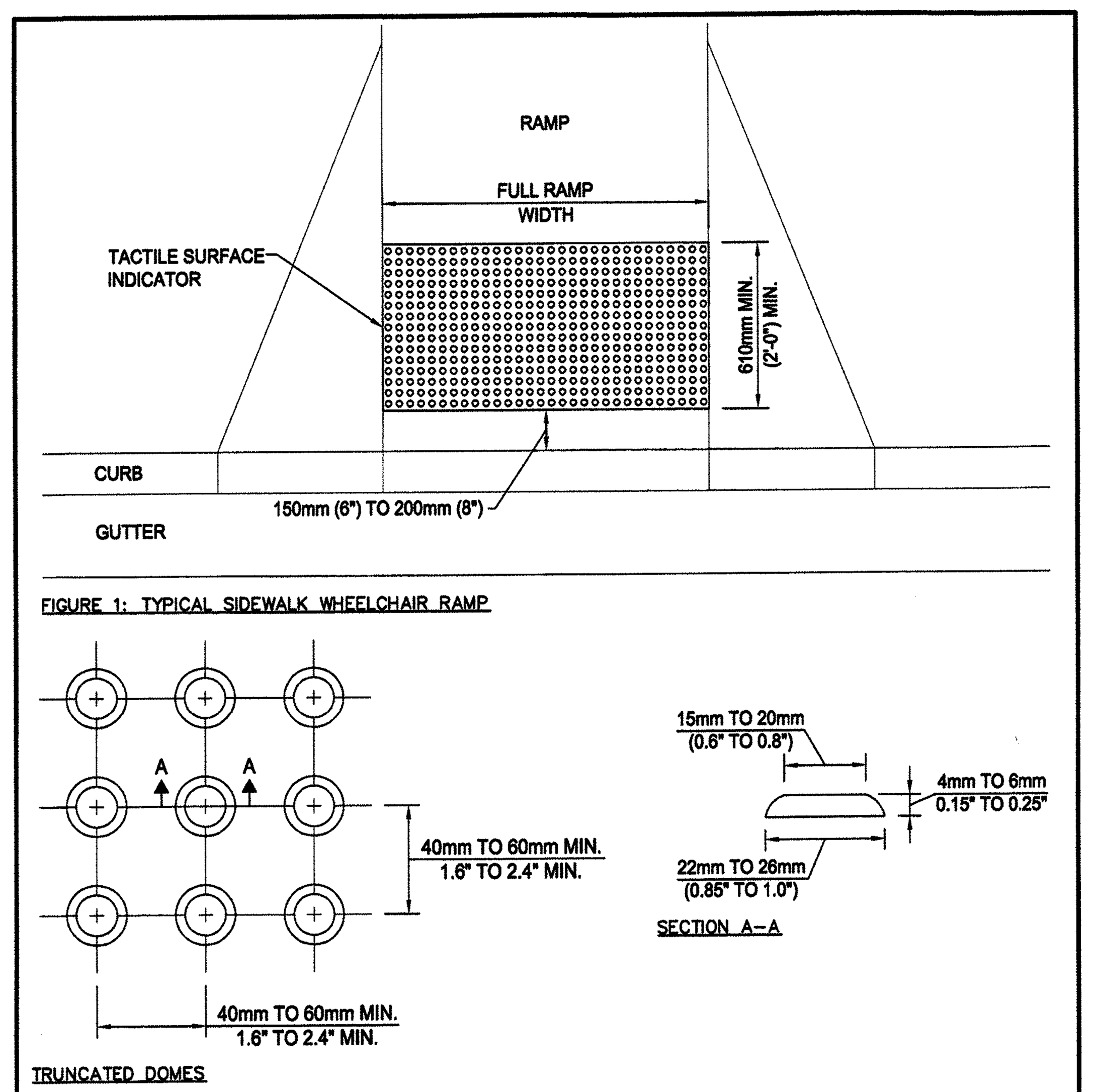


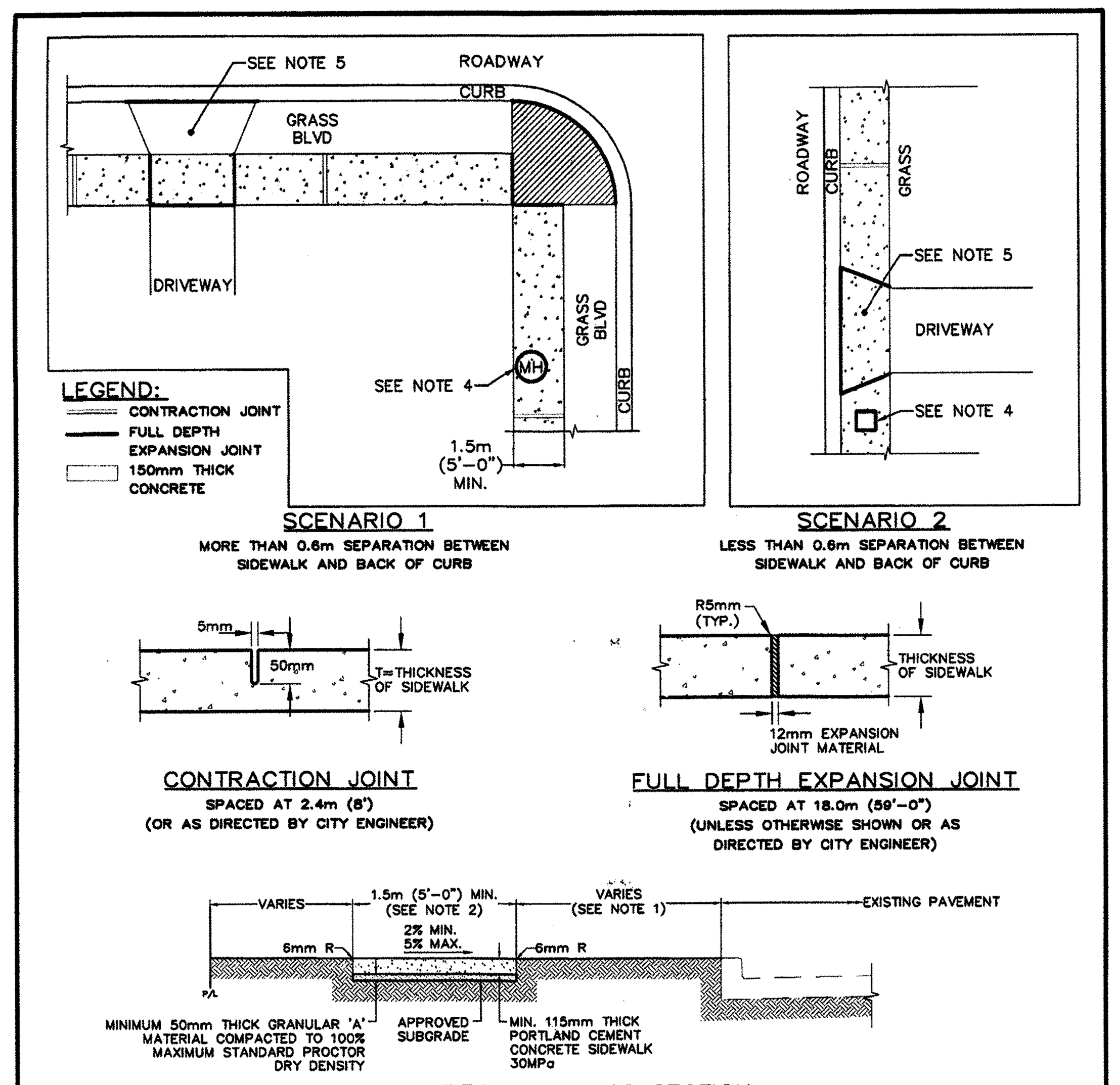
FIGURE 1: TYPICAL SIDEWALK WHEELCHAIR RAMP

TRUNCATED DOMES

NOTES:

1. TACTILE SURFACE INDICATOR COLOUR TO BE APPROVED BY THE CITY ENGINEER WITH HIGH TONAL CONTRAST TO THE ADJACENT RAMP SURFACE.
2. TACTILE SURFACE INDICATOR TO BE SLIP RESISTANT AND EXTEND THE FULL RAMP WIDTH.
3. TACTILE SURFACE INDICATOR TO BE CAST IN PLACE FOR NEW RAMP CONSTRUCTION IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATION.

CITY OF WINDSOR ENGINEERING DEPARTMENT	
TRUNCATED DOME TACTILE SURFACE INDICATORS	
DR'N BY: M. LADOUCEUR	CH'KD BY: S. SHYSHAK
CH'KD BY: P. UBENE	PASSED BY:
DATE: AUGUST, 2013	REVISION:
CITY ENGINEER Oct 4/2013	AS-549

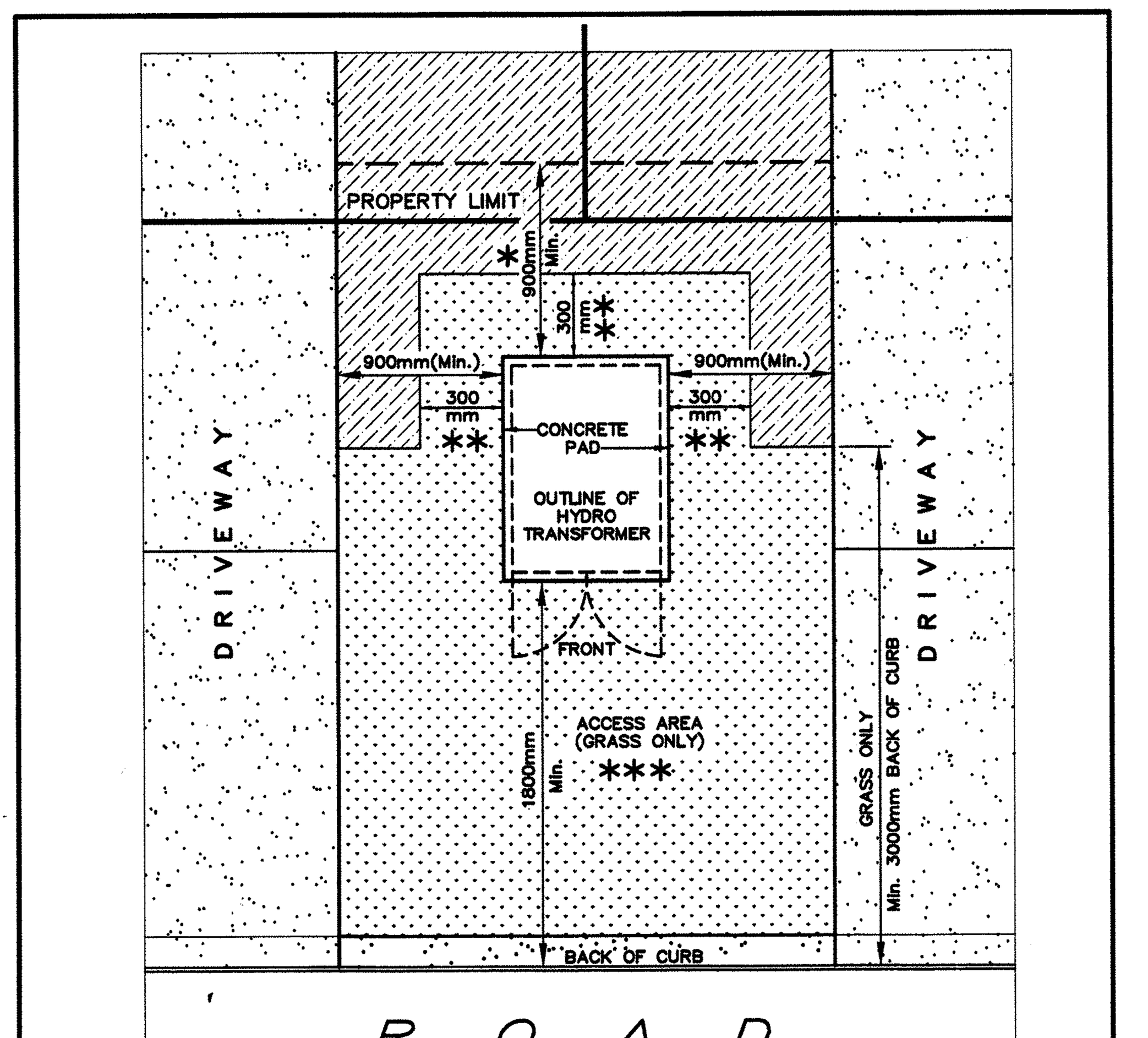


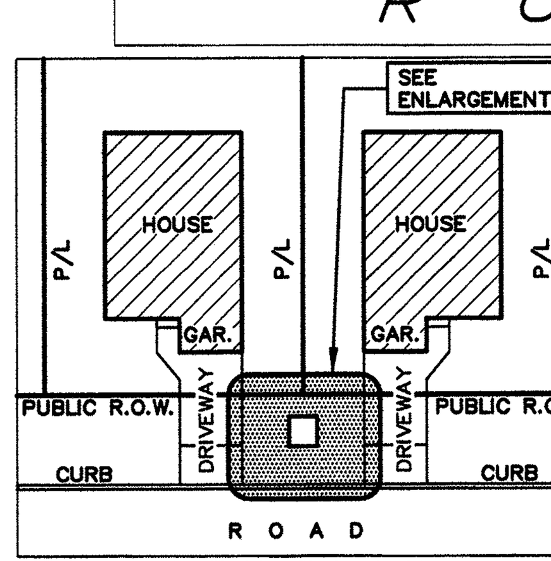
TYPICAL SIDEWALK CROSS SECTION

GENERAL NOTES:

1. Unless sidewalk abuts the curb, the distance between sidewalk and back of curb must be 600mm minimum.
2. Any sidewalk width exceeding 3m must have a centered longitudinal contraction joint. Maximum spacing between longitudinal contraction joints to be 1.5m.
3. Expansion joints are required at all fixed objects (poles, hydrants, manholes, structures, etc) and change in sidewalk direction.
4. All manholes, boxes, valves, etc. to match finished grade of sidewalk.
5. To be read in conjunction with AS-222, AS-402, AS-404 and S-6.
6. All work within public right-of-way to be completed to City of Windsor Standards and to the satisfaction of the City Engineer.

CITY OF WINDSOR ENGINEERING DEPARTMENT	
RESIDENTIAL CONCRETE SIDEWALK	
DR'N BY: B.C., N.B.	DATE: APRIL, 2004
REVISION: APRIL, 2015	CH'KD BY: W.B.
CH'KD BY: P.U., M.C.	PASSED BY: T.M.
CITY ENGINEER	AS-401





KEY PLAN

* DENOTES BACK OF TRANSFORMER TO DRIVEWAY(IF APPLICABLE)

** GUIDELINE SET BACK FROM OTHER ABOVE GROUND UTILITIES (i.e. STREETLIGHT POLES, FIRE HYDRANTS) IS 300mm (Min.)

*** GRASS AREA AS PER BP 3.2.2. LANDSCAPING IN RIGHT OF WAY – RESIDENTIAL

CITY OF WINDSOR ENGINEERING DEPARTMENT	
ACCESS AREA & MINIMUM CLEARANCE FOR ABOVE GROUND UTILITIES	
DR'N BY: R.C. / M.M.	DATE: JULY, 2001
REVISION: OCT./24/03 SEPT./19/12	CH'KD BY: A. LEWIS
CH'KD BY: P. UBENE	PASSED BY:
City Engineer Feb 12/2013	AS-534A

AS-BUILT DRAWING

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WINDSOR, ONTARIO

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LICENSED PROFESSIONAL ENGINEER S.M. LAFONTAINE 100200162 18/FEB/2022 PROVINCE OF ONTARIO

RC SPENCER ASSOCIATES INC.
Consulting Engineers
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Professional Engineers Ontario

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DESIGN	M.M.H.
CHECKED	R.C.S.
DRAWN	M.M.H.
CHECKED	R.C.S
SCALE	N.T.S.

THE ORCHARDS

MISCELLANEOUS DETAILS 2

C.O.W. DWG. NO.	S-2116
PROJECT NO.	17-726
SHEET NO.	15
OF	17

DENOTES AREA BOUNDARY

DENOTES AREA ID

DENOTES AREA (Ha)

DENOTES RUNOFF COEFFICIENT

STORM DRAINAGE PLAN

FUTURE A=0.61Ha

FUTURE A=0.61Ha

FUTURE A=0.61Ha

OAKRIDGE AVENUE

FARROW AVENUE

SUTTON AVENUE

HOLBURN STREET

ORCHARDS CRES.

ORCHARDS CRESCENT

HOWARD AVENUE

SWM BLOCK 87

BLOCK 88

MAGUIRE STREET

0.0.S. HYDRO INTERNATIONAL FIRST DEFENSE FD-3HC

CONTROL PANEL

AS-BUILT DRAWING

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APPROVED AS TO FORM IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF RC SPENCER ASSOCIATES INC., AS TO DESIGN AND SPECIFICATIONS.

PREVIOUSLY SIGNED 17 AUGUST 2021

CITY ENGINEER
WINDSOR, ONTARIO

LICENSED PROFESSIONAL ENGINEER R.C. SPENCER 43859018 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER S.M. LAMONTAGNE 100146402 PROVINCE OF ONTARIO

RC SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 800 University Ave. W.- Windsor, ON N9A 5R9
Leamington: 18 Talbot St. W.- Leamington, ON N8H 1M4
Chatham: 49 Raleigh Street - Chatham, ON N7M 2M6
Professional Engineers Ontario

NO.	REVISION	DATE	BY	APP.
8.	AS-CONSTRUCTED	18 FEB. 2022	J.R.	R.C.S.
7.	REVISED PER BUILDING DEPT. COMMENTS	20 JAN. 2022	S.M.L.	R.C.S.
6.	PUMPING STATION FLOAT ELEVATIONS	15 NOV. 2021	S.M.L.	R.C.S.
5.	ISSUED FOR CONSTRUCTION	12 AUG. 2021	S.M.L.	R.C.S.
4.	REVISED PER ENWIN WATER COMMENTS	26 JUL. 2021	S.M.L.	R.C.S.
3.	ISSUED FOR TENDER	02 JUL. 2021	S.M.L.	R.C.S.
2.	REVISED PER CITY COMMENTS	28 JUN. 2021	S.M.L.	R.C.S.
1.	SUBMIT FOR CITY REVIEW	09 FEB. 2021	S.M.L.	R.C.S.

DESIGN M.M.H.
CHECKED R.C.S.
DRAWN M.M.H.
CHECKED R.C.S
SCALE 1:800

C.O.W. DWG. NO. S-2116
PROJECT NO. 17-726

THE ORCHARDS

STORM DRAINAGE AREAS

SHEET NO. 16
OF 17

DENOTES AREA BOUNDARY

1.27 / 53 — AREA IN HECTARES / NUMBER OF PEOPLE

SANITARY DRAINAGE PLAN

AS–BUILT DRAWING

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PREVIOUSLY SIGNED 17 AUGUST 2021

CITY ENGINEER
WINDSOR, ONTARIO

LICENSED PROFESSIONAL ENGINEER — R.C. SPENCER — 43551016 — PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER — S.M. LAKATOS — 100146052 — PROVINCE OF ONTARIO

RC SPENCER ASSOCIATES INC.
Consulting Engineers
Windsor: 800 University Ave. W.- Windsor, ON N9A 5R9
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DESIGN M.M.H.
CHECKED R.C.S.
DRAWN M.M.H.
CHECKED R.C.S
SCALE 1:750

THE ORCHARDS

SANITARY DRAINAGE AREAS

C.O.W. DWG. NO. S–2116
PROJECT NO. 17–726
SHEET NO. 17
OF 17

APPENDIX B

MODELLING ANALYSIS AND SWM DESIGN

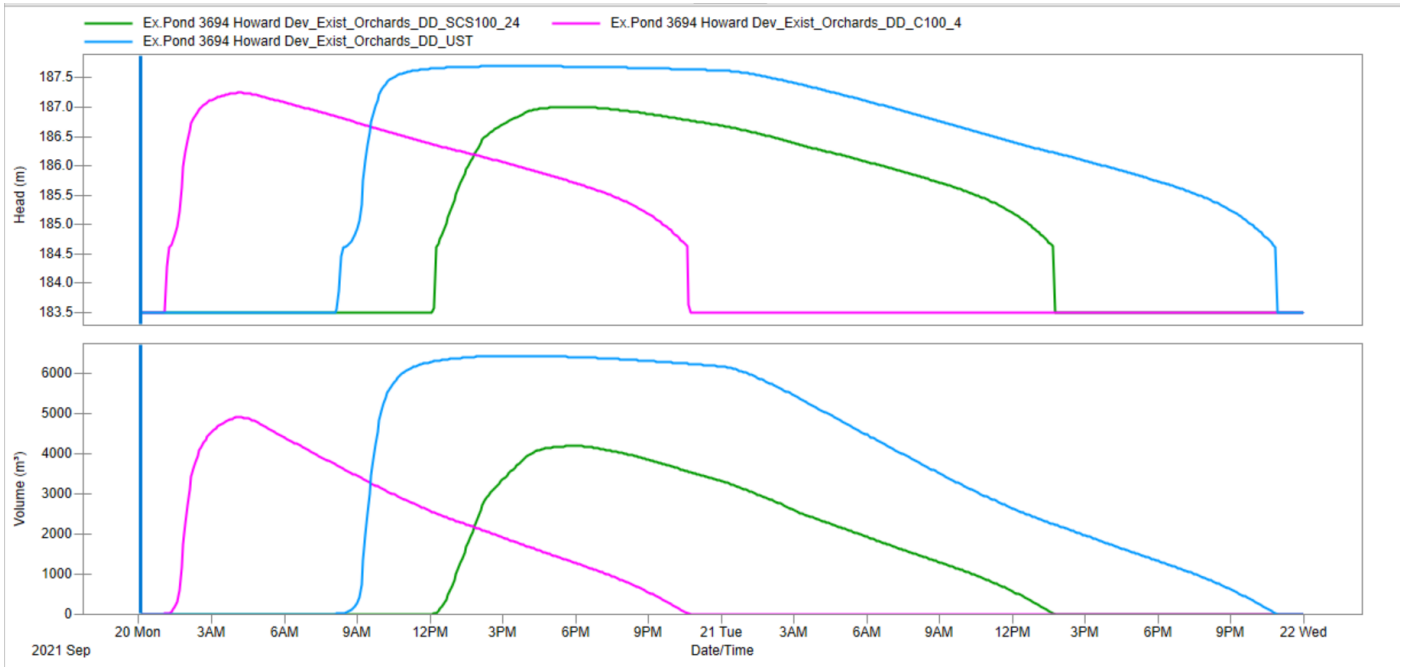
EXISTING CONDITION ANALYSIS
PCSWMM MODEL SCHEMATIC

Note: Proposed.dev catchment area shown is for visual purposes only and not connected to the SWM Pond under existing conditions

PROPOSED CONDITION ANALYSIS
PCSWMM MODEL SCHEMATIC

Pre-Development Condition: Existing Orchards Pond WESL (Head) and Volume

- Under Chicago 100-Year,4-hour, SCS Type II 100-Year, 24 hour and UST



Data | Objectives | Error | Storage | Patterns | Edit | Derive | Audit | Events | Scatter | Duration | IDF

Objective functions for: Head (m)

From Sep 19, 2021 9:41 PM to Sep 22, 2021 2:23 AM (52.71 hours)

	Ex.Pond 3694 Howard Dev_Exist_Orchards_DD_C100_4	Ex.Pond 3694 Howard Dev_Exist_Orchards_DD_SCS100_24	Ex.Pond 3694 Howard Dev_Exist_Orchards_DD_UST
Maximum Head (m)	187.248	187.009	187.7
Minimum Head (m)	183.5	183.5	183.5
Mean Head (m)	184.729	184.962	186.195
Duration of Exceedances (h)	47.917	47.917	47.917
Duration of Deficits (h)	0	0	0
Number of Exceedances	1	1	1
Number of Deficits	0	0	0

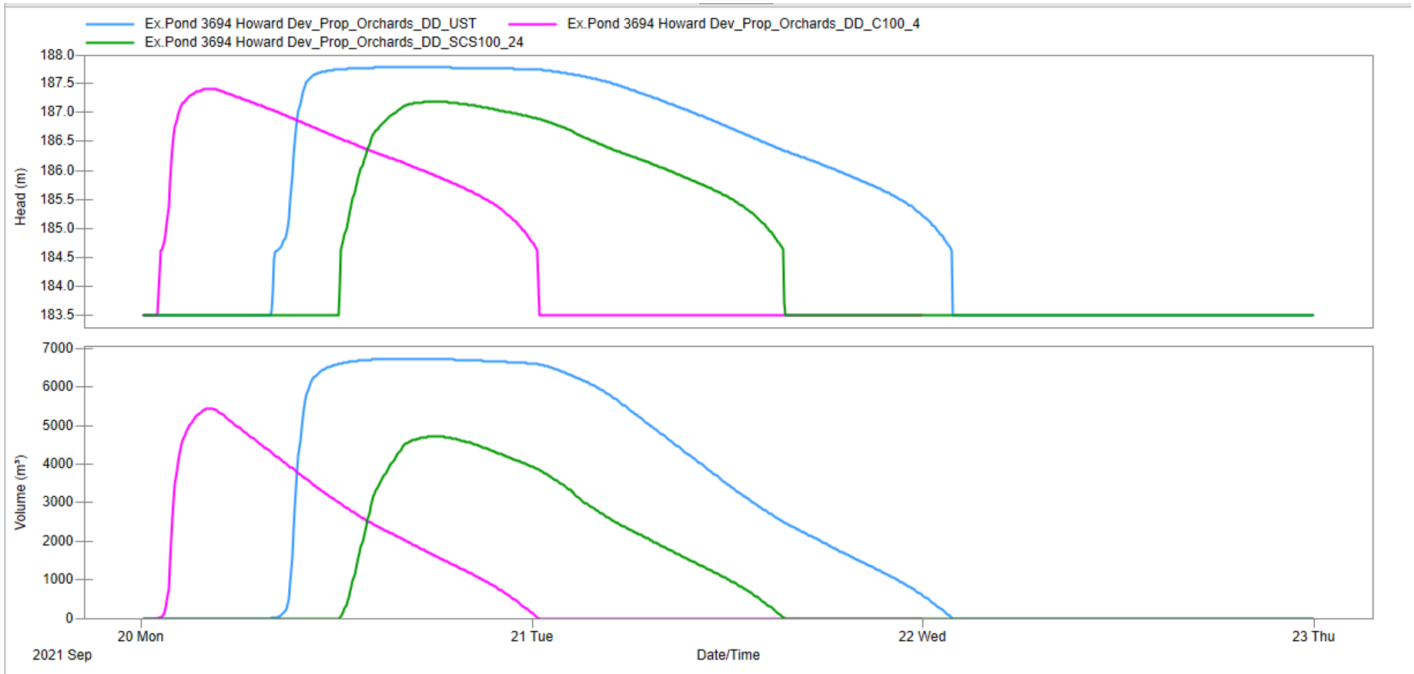
Head (m) Exceedance: 0

Head (m) Deficit: 0

Min interevent time (hrs): 0

Post-Development Condition: Proposed Orchards Pond WESL (Head) and Volume

- Under Chicago 100-Year,4-hour, SCS Type II 100-Year, 24 hour and UST



Data | Objectives | Error | Storage | Patterns | Edit | Derive | Audit | Events | Scatter | Duration | IDF

Objective functions for Head (m)

From Sep 19, 2021 8:29 PM to Sep 23, 2021 3:35 AM (3.3 days)

	Ex.Pond 3694 Howard Dev_Prop_Orchards_DD_C100_4	Ex.Pond 3694 Howard Dev_Prop_Orchards_DD_SCS100_24	Ex.Pond 3694 Howard Dev_Prop_Orchards_DD_UST
Maximum Head (m)	187.416	187.191	187.783
Minimum Head (m)	183.5	183.5	183.5
Mean Head (m)	184.878	184.586	185.49
Duration of Exceedances (h)	47.917	71.917	71.917
Duration of Deficits (h)	0	0	0
Number of Exceedances	1	1	1
Number of Deficits	0	0	0

Head (m) Exceedance: 0

Head (m) Deficit: 0

Min interevent time (hrs): 0

ADS OGS Sizing Summary

Project Name: 3694 Howard Avenue

Consulting Engineer: Counterpoint Land Dev./Dillon Consulting

Location: Windsor, ON

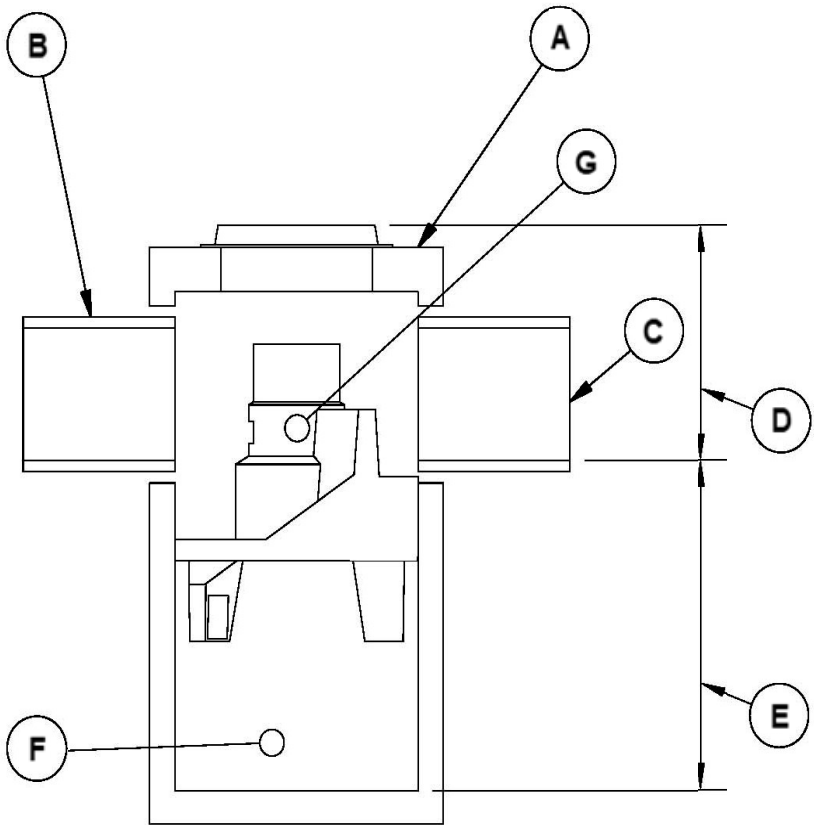
Sizing Completed By: Steve Buckley **Email:** steve.buckley@adspipe.com

Treatment Requirements		
Treatment Goal:	Normal (MOE)	
Selected Parameters:	70% TSS	90% Volume
Selected Unit:	**FD-5HC**	

Site Details	
Site Area:	0.74 ha
% Impervious:	80%
Rational C:	0.78
Rainfall Station:	Windsor, ONT
Particle Size Distribution:	MOE
Peak Flowrate:	104.7 L/s

Summary of Results		
Model	**TSS Removal**	**Volume Treated**
FD-4HC	69.0%	>90%
FD-5HC	73.0%	>90%
FD-6HC	76.0%	>90%
FD-8HC	81.0%	>90%
FD-10HC	85.0%	>90%

FD-5HC Specification	
Unit Diameter (A):	1,500 mm
Inlet Pipe Diameter (B):	mm
Outlet Pipe Diameter (C):	mm
Height, T/G to Outlet Invert (D):	0 mm
Height, Outlet Invert to Sump (E):	1780 mm
Sediment Storage Capacity (F):	2.1 m³ m³
Oil Storage Capacity (G):	1,135 L
Max. Pipe Diameter:	600 mm
Peak Flow Capacity:	566 L/s



Site Elevations:	
Rim Elevation:	0.00
Inlet Pipe Elevation:	,
Outlet Pipe Elevation:	0.00

Notes:

Removal efficiencies are based on NJDEP Test Protocols and independently verified.

All units supplied by ADS have numerous local, provincial, and international certifications (copies of which can be provided upon request). The design engineer is responsible for ensuring compliance with applicable regulations.

Project Name: 3694 Howard Avenue
Consulting Engineer: Counterpoint Land Dev./Dillon Consulting
Location: Windsor, ON

Net Annual Removal Efficiency Summary: FD-5HC

Rainfall Intensity[1]	Fraction of Rainfall[1]	FD-5HC Removal Efficiency[2]	Weighted Net-Annual Removal Efficiency
mm/hr	%	%	%
3.00	13.2%	83.9%	11.1%
4.00	9.6%	81.2%	7.8%
5.00	7.5%	79.2%	5.9%
6.00	6.0%	77.6%	4.7%
7.00	4.8%	76.3%	3.7%
8.00	4.1%	75.2%	3.1%
9.00	3.6%	74.2%	2.7%
10.00	3.2%	73.3%	2.3%
11.00	2.8%	72.5%	2.0%
12.00	2.5%	71.8%	1.8%
15.00	6.6%	70.1%	4.6%
20.00	8.3%	67.8%	5.6%
25.00	5.8%	66.2%	3.8%
30.00	4.6%	64.8%	3.0%
35.00	3.8%	63.7%	2.4%
40.00	2.9%	62.8%	1.8%
45.00	2.4%	61.9%	1.5%
50.00	1.8%	61.2%	1.1%
65.00	6.6%	59.4%	3.9%
		Total Net Annual Removal Efficiency:	72.9%
		Total Runoff Volume Treated:	99.9%

Notes:

(1) Based on Windsor/Essex Region Stormwater Manual 2018, Table 3.4.1.5

(2) Based on independently verified test data.

(3) Rainfall adjusted to 5 min peak intensity based on hourly average.