E.S. FOX LIMITED
WSP FILE 221-01223

9127 MONTROSE ROAD – PARCEL B
NIAGARA FALLS, ONTARIO

E.S. FOX MIXED-USE DEVELOPMENT PARCEL B

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

AUGUST 16, 2023

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APPENDICES

1 INTRODUCTION

WSP Canada Inc. (WSP) has been retained by E.S. Fox Limited (the Owner) to prepare a Functional Servicing and Stormwater Management report in support of a rezoning application for the proposed development located in the City of Niagara Falls, Ontario. This report provides the preliminary design framework for water distribution, sanitary sewage, storm drainage and stormwater management for the planned development.

In preparation of this report, WSP have consulted with the requirements and available information from the City of Niagara Falls (City), the Region of Niagara (Region), the Niagara Peninsula Conservation Authority (NPCA), and the Ministry of Environment, Conservation and Parks (MECP). Specific documentation in which this report is based on includes, but is not limited to:

- The City of Niagara Falls Engineering Design Guidelines Manual, dated April 2016;
- Region of Niagara 2016 Water and Wastewater Master Servicing Plan (W&WWMSP) Update, dated June 2017, by GM BluePlan;
- South Niagara Falls Wastewater Solutions Environmental Study Report for Public Review, dated July 2022, by GM BluePlan;
- Official Plan for the City of Niagara Falls, amended April 2019, by the City of Niagara Falls;
- Preliminary Municipal Servicing Report Grand Niagara Secondary Plan, dated November 2016, by WSP;
- Stormwater Management Plan Grand Niagara Secondary Plan, dated November 2016, by WSP
- Engineering Drawings for Niagara Region Contract #2021-T-269 Road Reconstruction and Widening, dated March 2022, by Parsons Corporation
- Record drawings:
  - Grassy Brook Road As-Constructed Plan/Profiles
  - Montrose Road As- Constructed Plan/Profiles
  - Grassy Brook Sewage Pumping Station As-Constructed Site Plan/SCADA Drawings
- Niagara Peninsula Conservation Authority standards and regulations;
- Erosion and Sediment Control Guidelines for Urban Construction, dated December 2006, prepared by the Greater Golden Horseshoe Area Conservation Authorities
- MECP Stormwater Management Planning and Design Manual (2003, Updated 2019);
- MECP Design Guidelines for Sewage Works (2008, Updated 2019); and
- MECP Design Guidelines for Drinking-Water Systems (2008, Updated 2019).

In addition, this report is based upon the latest architectural plan provided by Raimondo + Associates Architects Inc., dated January 18, 2023.

1.1 SITE DESCRIPTION

The subject property is located at 9127 Montrose Road in the City of Niagara Falls, Ontario, and occupies an area of approximately 1.46 hectares. The site is bounded by the Canadian Pacific rail corridor to the northwest, Grassy Brook Road to the south, and Montrose Road to the west. The land is currently vacant and is designated for employment uses, as outlined in the City's Official Plan under the Grand Niagara Secondary Plan.

The proposed development involves the construction of three two-storey buildings, with a total Gross Floor Area (GFA) of approximately 7159 m^2, and a surface parking lot containing 173 parking spaces. Access to the proposed development is provided off the adjacent Montrose Road and Grassy Brook Road.

Refer to **Appendix A** for the architectural site plan.

2 WATER SERVICING

The water supply and distribution infrastructure surrounding the subject property is under the jurisdiction of the City of Niagara Falls. Water servicing in the wider area is based on a two-tiered approach. Niagara Region is responsible for the treatment, storage, pumping, and watermains over 300 mm diameter. The City of Niagara Falls is responsible for watermains 300 mm in diameter or less.

2.1 EXISTING WATER SUPPLY

There is only one pressure zone for the City of Niagara Falls, NF1, and the subject property falls within this zone. The water supplied to the NF1 area comes from the Niagara Falls Water Treatment Plant (WTP), which is located east of the site and owned by the Region. The treatment plant draws water from the nearby Niagara River and, in addition to the City of Niagara Falls, serves the City of St. Catharines, Niagara-on-the-Lake, and parts of Thorold. The 2016 Water and Wastewater Master Servicing Plan Update, prepared by GM BluePlan, mentions that the treatment plant has a rated capacity of 1,684 L/s (145.5 MLD) and a reservoir with 37.4 MLD of available storage.

The existing local water supply infrastructure include two municipal watermains, 300 mm in diameter, on Grassy Brook Road and Montrose Road. These watermain lines are part of a well-looped distribution network that connect to the 500mm diameter regional watermain on McLeod Road, north of the site.

2.2 ESTIMATED WATER DEMAND

The estimated domestic water demand for the development has been calculated based on the City of Niagara Falls Storm and Sanitary Sewer Design Criteria in conjunction with the MECP Design for Drinking Water Systems criteria.

Domestic water demand calculations are summarized in the following table.

Table 1: Domestic Water Demand

Site Area	1.46 ha
Population Density	180.4 persons / ha
Equivalent Population	263 persons
Water Demand Flow Rate	450 L/c/d
Average Water Demand	1.37 L/s
Peaking Factor	Maximum Day: 4.9 Peak Hour: 7.4
Total Peak Water Demand from Site	**Maximum Day: 6.71 L/s** **Peak Hour: 10.14 L/s**

The estimated fire flows for the proposed development have been prepared using the recommendations of the Water Supply for Public Fire Protection, 1999 – Fire Underwriters Survey (FUS). The fire flow calculations have been prepared with the assumption that the buildings will be non-combustible and that they will be equipped with a sprinkler system that is supervised. Calculated fire flows for each building are summarized below. For detailed calculations, refer to **Appendix C**.

Table 2: Fire Flow Water Demand

Building No.	**Total GFA**	**Required Fire Flow**
Building A	2400 m^2	4,000 Lpm (66.67 L/s)
Building B	2563 m^2	4,000 Lpm (66.67 L/s)
Building C	2196 m^2	4,000 Lpm (66.67 L/s)

Given the above, the overall fire flow demand for the proposed development was determined to be 4,000 L/min (equivalent to 66.67 L/s or 1,055 US GPM). However, it is important to note that according to the City of Niagara Falls Engineering Design Guidelines Manual (April 2016), the minimum fire flow for new developments is 80 L/s.

In accordance with the City of Niagara Falls design criteria, all watermain shall be sized to meet the greater of the following:

- Peak hourly demand (10.14 L/s); or
- Maximum daily demand plus fire flow (86.71 L/s)

Therefore, the maximum daily demand plus fire flow scenario governs, requiring a peak water demand of 86.71 L/s.

2.3 PROPOSED WATER SERVICING

Water servicing for the proposed development will be supplied from the existing 300 mm diameter watermain on the adjacent Montrose Road via a 150 mm diameter service connection. All proposed watermains will be installed at a minimum depth of 1.50 m as per City guidelines and meet AWWA disinfection regulations. As required, hydrant and valves shall be placed in accordance with the City standards. Exact locations of proposed hydrants and valves will be provided during the site plan application stage.

Refer to **Appendix B** for the preliminary servicing plan.

The City of Niagara Falls Engineering Design Guidelines Manual indicate under normal operating conditions, the maximum operating pressure should not exceed 700 kPa (101.5 psi). Additionally, pressures should not drop below 250 kPa (36.3 psi) under normal operation conditions and should not drop below 149 kPa (21.6 psi) under maximum day plus fire conditions.

2.4 HYDRANT FLOW TESTING

A hydrant flow test was conducted by WSP on September 20, 2022, to confirm the available water supply from the existing 300 mm diameter watermain line on Montrose Road, adjacent to the proposed development.

The flow test results were used to determine the available fire flow at a minimum residual pressure of 20 psi as summarized in the **Table 3**. The complete test results are provided in **Appendix D**.

Table 3: Hydrant Flow Test Results

Location	Estimated Fire Flow at Minimum Residual (USGPM)	Estimated Fire Flow at Minimum Residual (L/S)
Intersection of Montrose Road and Reixinger Road Approx. 850m south of site	3,100	196

From the results outlined above, the existing water distribution system within the site's vicinity can service the proposed development's water servicing demands.

3 SANITARY SERVICING

The sanitary servicing infrastructure in the City of Niagara Falls is based on a two-tiered approach. Niagara Region is responsible for the wastewater treatment, trunk sewers, pumping stations, and forcemains. The City of Niagara Falls is responsible for local gravity sewer systems.

3.1 EXISTING SANITARY SEWAGE SYSTEM

Currently, there are no sanitary services to the site. Adjacent to the site, records drawings indicate an existing 450 mm diameter sanitary sewer on Montrose Road and an existing 375 mm diameter sanitary sewer on Grassy Brook Road. The existing sewers convey flows to the Grassy Brook Sewage Pumping Station (SPS), located on the east end of Grassy Brook Road. The existing pumping station services the general area surrounding the subject lands. Wastewater from the local area ultimately outlet to the Niagara Falls Wastewater Treatment Plant (WWTP) via a series of additional pumping stations, forcemains, and gravity sewers. The Grassy Brook SPS is equipped with 2 pumps (1 duty and 1 stand-by), with capacity for up to a total of four pumps. The pumping station outlets to a 750 mm gravity sewer on Montrose Road via a 150 mm forcemain under the Welland River. As per the 2016 Niagara Region W&WWMSP Update document, the operational capacity of the Grassy Brook SPS is 20.9 L/s.

3.1.1 PLANNED REGIONAL SANITARY SYSTEM IMPROVEMENTS

The Niagara Region Water and Wastewater Master Servicing Plan Update outlines several future planned sanitary system improvements for the wider region area, in anticipation of the future growth up to the year 2041, which includes the proposed development. Below are key planned improvements outlined in the 2016 document that have direct impact on the South Niagara Falls area and the proposed development:

- New South Niagara Falls Wastewater Treatment Plant (Master Plan ID# WW-TP-002); and
- South Side High Lift sewer conveyance to new South Niagara Falls Wastewater Treatment Plant (Master Plan ID# WW-FM-008)

The Region initiated the Schedule C Class Environmental Assessment process for the projects above in April 2019. The South Niagara Falls Wastewater Solutions Environmental Study Report (ESR), prepared by GM BluePlan, was released in July 2022 for public review. The report outlines the preliminary details of the proposed South Niagara Falls WWTP and accompanying sanitary trunk sewer:

- New South Niagara Falls Wastewater Treatment Plant located at 6811 Reixinger Road; and
- New South Niagara Falls trunk sewer along Montrose Road

As per Volume 3.11 of the 2022 ESR, the new South Niagara Falls WWTP has a capacity of 60 MLD (694.4 L/s) at full build-out and will be commissioned in two stages:

- Stage 1: Provide 30 MLD of capacity to offload approximately 15 MLD from the existing Niagara Falls WWTP, which services existing South Niagara Falls developments, and to service approximately 15 MLD from new developments areas.

- Stage 2: Provide 60 MLD of capacity to service the full future build-out of the South Niagara Falls area.

Outlined in Volume 2.4 of the ESR, the proposed tunneled sanitary trunk sewer along Montrose Road will range from 1200 mm to 2500 mm in diameter and be at depths of 10 m to 18 m below ground.

Upon completion of the South Niagara Falls WWTP and Montrose Road sanitary trunk sewer, flows from the Grassy Brook SPS will be redirected from the existing Niagara Falls WWTP to the new nearby treatment plant.

3.2 PROPOSED DEVELOPMENT FLOWS

An estimate of the post-development sanitary sewage flows from the site has been calculated. The approximate peak sanitary flows were calculated based the City of Niagara Falls Engineering Design Guidelines Manual - Section 4: Sanitary Drainage Systems and the City of Niagara Falls Storm and Sanitary Sewer Design Criteria. Key design guidelines and the complete sanitary flow generation calculation is below.

- Population Density – 180.4 persons/ha
- Proposed Wastewater Generation Rate - 380 L/cap/day;
- Infiltration Allowance for New Installations - 0.18 L/s/ha; and
- Peaking Factor - Harmon Formula (minimum 2.0, maximum 4.0)

Table 4: Sanitary Flow Generation

Site Area	1.46 ha
Population Density	180.4 persons / ha
Equivalent Population	263 persons
Wastewater Generation Rate	380 L/c/d
Average Wastewater Flow Rate	1.16 L/s
Peaking Factor	4.0
Peak Wastewater Flow	**4.64 L/s**
Infiltration Allowance Rate	0.18 L/s/ha
Infiltration Allowance for Site	**0.26 L/s**
Total Sanitary Flow from Site	**4.90 L/s**

Based on SCADA data provided to WSP by the Region, a design wet weather flow rate, including extraneous flows, into the existing Grassy Brook SPS was determined to be 11.4 L/s. As discussed in **Section 3.1**, the pumping station has a capacity of 20.9 L/s, resulting in 9.5 L/s of available

capacity. While it is understood that all remaining capacity in the Grassy Brook SPS is reserved for the future South Niagara Hospital, it is theoretically feasible to service the proposed development under the existing local sanitary infrastructure, without a reliance on the construction of the future sanitary trunk sewer on Montrose Road. Upon its completion, the future Montrose Road sanitary trunk sewer can adequately accommodate all projected sanitary flows from the proposed development.

At this time, WSP seeks confirmation from the City regarding the available capacity within the existing wastewater system and the timing of future system upgrades.

3.3 PROPOSED SANITARY SERVICING

As mentioned in **Section 3.1**, record drawings indicate an existing sanitary sewer directly adjacent to the site, along Montrose Road and Grassy Brook Road. A 200 mm diameter sanitary connection is proposed to connect the subject lands to the existing 450 mm diameter sanitary sewer on Montrose Road. Internal to the site, proposed sanitary sewers shall conform with minimum size and depth requirements per the City of Niagara Falls Engineering Design Guidelines Manual - Section 4: Sanitary Drainage Systems. Furthermore, in accordance with the City of Niagara Falls design criteria and the Niagara Region Sewer Use By-law, a manhole shall be located along the site's property line for maintenance and inspection purposes.

Refer to **Appendix B** for the preliminary servicing plan.

4 STORM SERVICING

4.1 EXISTING CONDITIONS

The proposed development is within the Niagara Peninsula Conservation Authority (NPCA) jurisdiction and the Welland River Watershed. Existing surface runoff from the site generally drains southwards and is conveyed to Grassy Brook Creek via existing roadside ditches along Montrose Road and Grassy Brook Road. Grassy Brook Creek merges with the Welland River at a confluence point east of the site and all existing stormwater flows from the subject lands ultimately outlet to the Niagara River.

4.2 PROPOSED STORM SERVICING

The majority of the site's at-grade runoff will be captured by proposed catchbasins and catchbasin manholes and directed to the proposed quality treatment unit at the south corner of the site, draining to the existing roadside ditch along Grassy Brook Road, and ultimately outletting to Grassy Brook Creek. Per City design criteria, proposed storm sewers shall be a minimum of 300 mm in size and installed at a minimum depth of 1.2 m below ground for frost protection.

Proposed storm servicing is shown in the preliminary servicing plan found in **Appendix B**.

4.3 MINOR DRAINAGE SYSTEM

The onsite storm drainage system will be designed to capture and convey the runoff from the 5-year storm event. This will ensure runoff from the controlled areas of the site, for all storm events up to and including the 5-year storm event, will be conveyed to the proposed water quality treatment unit prior to outletting to the existing roadside ditch on Grassy Brook Road, and ultimately to Grassy Brook Creek.

Further details regarding the proposed water quality treatment within the site are provided in subsequent sections of this report.

4.4 MAJOR DRAINAGE SYSTEM

The major storm system is a conveyance system for flows in excess of the minor system flows. As mentioned in the 2016 Stormwater Management Plan Grand Niagara Secondary Plan, quantity control under the major storm event is not recommended for the proposed development. Please refer to the 2016 report for further details.

The major storm will be directed to the existing Grassy Brook Road ditch via internal grading of the site. The major system flow routes consist of private roadways and grassed swales.

5 STORMWATER MANAGEMENT

The proposed development of Parcel B consists of three two-storey buildings and an associated parking lot. The proposed development shall convert part of the site from pervious surface to impervious surface, and result in reduction in infiltration and evapotranspiration, and increase in surface runoff.

This section of the report shall examine the impacts on water balance, water quality, erosion, and water quantity due to the proposed development, and summarize how each shall be addressed in compliance of the approved studies and stormwater management (SWM) design criteria set by the City of Niagara Falls (the City), Niagara Peninsula Conservation Authority (NPCA), the Ministry of Environment, Conservation and Parks (MECP).

5.1 EXISTING CONDITIONS

The site runoff generally drains southeasterly as sheet flow towards existing roadside ditches along Grassy Brook Road and Montrose Road. The runoff is conveyed to an existing culvert underneath Grassy Brook Road and discharges into Grassy Brook Creek immediately south of Grassy Brook Road. Grassy Brook Creek runs easterly and merges with the Welland River east of the Queen Elizabeth Way (QEW) and ultimately outlet to the Niagara River.

The site is situated within the Physiographic Region known as the Haldimand Clay Plain, which is characterized by heavy clay soils with poor drainage, resulting in a high level of runoff and minimal groundwater recharge.

5.2 SWM DESIGN CRITERIA

The management of water resources within the subject development shall be undertaken in accordance with the directions of MECP's SWM Manual (2003), NPCA's SWM Guidelines (2010), City of Niagara Falls Engineering Design Guidelines Manual (2016), and the design criteria established in the SWM Plan for Grand Niagara Secondary Plan (2016). The SWM requirements applicable to the proposed development are summarized as below.

Water Balance

Best efforts should be made to match pre-development infiltration volumes to the practically feasible extent.

Water Quality

An Enhanced Level Protection or a long-term removal of 80% total suspended solids (TSS) is required for all development areas.

Erosion Control

Erosion control in terms of extended detention of the 25 mm rainfall event is not required for the subject development.

Quantity Control

The subject development is located at the downstream of the Brassy Brook sub-watershed. The SWM Plan for Grand Niagara Secondary Plan (2016) has demonstrated that providing quantity control storage on the subject site shall result in the coincidence of the controlled peak flows and upstream peaks, and thus increase downstream peak flow rates. Therefore, quantity control is not recommended for the subject development.

Quantity control is not required for the subject development from the sub-watershed perspective. A further assessment of the capacity of downstream conveyance infrastructure will be provided at the site plan application stage, to ensure the site runoff can be safely conveyed to the receiving watercourse.

5.3 PROPOSED SWM PLAN

Under proposed conditions, the site runoff shall be captured and conveyed by the dual drainage system described in Section 4. The runoff shall be directed southwards and discharge to the existing roadside ditch along Grassy Brook Road without erosion and quantity control.

The key objective the SWM plan is to address water balance and water quality. Various SWM practices are evaluated and the following measures are proposed to achieve water balance and water quality design criteria.

5.3.1 LOW IMPACT DEVELOPMENT (LID) MEASURES

LID is a sustainable stormwater management strategy that emphasizes conservation and the use of existing natural site features integrated with distributed, small-scale stormwater controls to more closely mimic natural hydrologic patterns.

Due to the low infiltration potential of the soil conditions, the site may have the challenge of employing the LID practices that depends on infiltration mechanism. Some potential LID measures for the subject development are listed as follows:

- Implement flat grading (1.0% ~ 2.0%) wherever feasible to promote natural infiltration;
- Downspout disconnection and direct roof leaders to pervious areas;
- Direct roof runoff to underground infiltration trenches;
- Apply extra depth of topsoils;
- Implement permeable pavement at parking lot areas to remove sediment and pollutant, and to enhance groundwater recharge.

Above LID measures shall be further evaluated during the Site Plan Approval (SPA) application stage in terms of physical constraints, maintenance concerns and costs, etc.

5.3.2 OIL/GRIT SEPARATOR (OGS) UNIT

As per NPCA's SWM Guidelines, properly sized oil/grit separator (OGS) units may be considered for commercial or industrial developments for water quality treatment.

A treatment train approach consisting of OGS unit and low impact development (LID) measures is proposed to provide an Enhanced Level of protection or 80% TSS removal on a long-term average annual loading basis. For the preliminary design purpose, a CDS unit – PMSU 2020 is proposed to provide a minimum 60% TSS removal for runoff from a 1.46 ha development area at an imperviousness of 100%. Refer to Appendix E for the OGS sizing report.

In the case that LID measures are not feasible, a Jellyfish Filter unit might be proposed as a stand-alone device to achieve an 80% TSS removal on a long-term average annual loading basis.

5.3.3 ON-SITE WATER QUANTITY

Quantity control is not required for the subject development from the sub-watershed perspective. A further assessment of the conveyance capacity of the existing roadside ditches and the culvert will be provided at the site plan application stage, to ensure the site runoff can be safely conveyed to the receiving watercourse.

In the case that the downstream infrastructure (roadside ditches and the existing culvert) do not have sufficient conveyance capacity to convey the uncontrolled flow rate from the subject development site, two options could be implemented to mitigate the impacts:

Option #1 – Improvement of existing roadside ditches and culvert replacement can be implemented to increase the conveyance capacity of downstream infrastructures.

Option #2 – Provision of on-site quantity control storage facility to control post-development peak flow rates to pre-development levels for all storms from 2-year up to 100-year events.

A Visual OTTHYMO (VO) model shall be used to estimate the pre- and post-development peak flow rates from the site and to determine the required quantity control storage to control post-development peak flow rates to pre-development levels for all storms from 2-year up to 100-year events.

Different design storm distribution and durations (such as the 3-hour Chicago, 12-hour AES, and 24-hour SCS storms) shall be assessed in order to determine the critical storm that yields the lowest pre-development peak flow rates and the highest post-development peak flow rates as well as the maximum required storage volume.

Subsurface and/or surface storage shall be provided at the parking lot area and appropriately sized orifice plates/tubes shall be proposed to limit the release rates from the site to pre-development levels. Details on the storage provision and sizing of control devices shall be included in the Site Plan Approval (SPA) stage.

6 SITE GRADING

The grading design of the proposed development will direct most of the minor storm drainage to the on-site collection points such that the drainage is contained within the subject lands. An overland flow route will direct the major storm drainage towards the existing roadside ditches adjacent to the property and away from proposed structures within the site. The site grading will also take into consideration the following:

- Existing grades along all boundaries are to be matched so that there will be no impact to adjacent properties.
- Minimize disruption to the municipal right-of-way containing existing utilities and services.
- Promote drainage into the minor storm sewer system.
- Building floor level will be set to avoid building / property damage during all design storms.
- Entrance ramps into loading areas will be protected from major storm flows.
- Ponding over 0.30 m is avoided, and excess rainfall will be conveyed to the surrounding municipal rights-of-way.

During construction, erosion and sediment control measures will be provided to prevent sediment runoff to the municipal storm system and adjacent Welland River watercourse. Fencing and hoarding will be erected surrounding the perimeter of the site, and mud mats will be required at the site's access points. In addition, any municipal catchbasins on the adjacent rights-of-way will be protected with geotextile fabric.

The grading and erosion and sediment control design will be refined and updated at the site plan application stage to provide more details.

7 CONCLUSION

WATER SERVICING

The proposed development will connect to the existing 300 mm watermain on Montrose Road via a 150 mm diameter service connection. Proposed watermain shall be installed at a minimum depth of 1.50 m per City standards. Valves and hydrant within the site shall be located as required based on City design criteria; exact locations are to be determine at the site plan application stage. Based on City design criteria for watermain design, the maximum day and fire flow demand for the proposed development was calculated to be 86.71 L/s. A hydrant flow test conducted by WSP, in late 2022, indicated that the existing 300 mm watermain on Montrose Road is able to supply 196 L/s of fire flow, at a minimum pressure of 20 psi. Therefore, the existing water distribution system within the site's vicinity is able to adequately accommodate the proposed development's water demands.

SANITARY SERVICING

The local sewershed area surrounding the site is serviced by the existing Grassy Brook SPS, located east of the subject lands. A new regional trunk sewer is proposed along Montrose Road and has been designed to accommodate flows from the proposed development. Following its completion, the Grassy Brook SPS will be decommissioned and all flows from the local sewershed shall drain to the new Montrose Road trunk sewer. Records drawings indicate existing sanitary sewers along Montrose Road and Grassy Brook Road, directly adjacent to the proposed development. A proposed 200 mm diameter sanitary connection shall connect the site to the existing municipal wastewater infrastructure on Montrose Road. Internal to the development, proposed sanitary sewers shall conform with minimum size and depth requirements per City standards. Furthermore, and in accordance with the Niagara Region Sewer Use By-law, a manhole shall be located along the site's property line for maintenance and inspection purposes. Based on City design criteria for sanitary sewers, the total anticipated sanitary flow from the proposed development was calculated to be 4.90 L/s. SCADA data, provided to WSP by the Region, indicates an available capacity of 9.5 L/s within the existing Grassy Brook SPS. While it is understood that all remaining capacity in the Grassy Brook SPS is reserved for the future South Niagara Hospital, it is theoretically feasible to service the proposed development under the existing local sanitary infrastructure, without a reliance on the construction of the future sanitary trunk sewer on Montrose Road.

At this time, WSP seeks confirmation from the City regarding the available capacity within the existing wastewater system and the timing of future system upgrades.

STORM SERVICING

The proposed storm servicing of the site includes two systems; the minor and major storm systems. The minor storm system shall convey stormwater runoff flows from storms up to, and including, the 5-year storm event to the existing roadside ditch on Grassy Brook Road, via proposed storm sewers, catchbasins, and catchbasin manholes. Proposed storm sewers shall be a minimum size of 300 mm in diameter and installed at a minimum depth of 1.20 m, per City standards. Minor flows shall undergo water quality treatment prior to outletting to the roadside

ditch, and ultimately the Welland River. The major storm system shall convey stormwater flows for event beyond the 5-year storm, via overland flow routes to outlet into existing roadside ditch and ultimately Grassy Brook Creek. Based on the findings of the 2016 Stormwater Management Plan Grand Niagara Secondary Plan, the proposed development does not require any implementation of stormwater quantity control.

STORMWATER MANAGEMENT

The proposed development shall convert part of the site from pervious surface to impervious surface, and result in reduction in infiltration and evapotranspiration, and increase in surface runoff. A SWM plan has been prepared to mitigate the impacts due to the proposed development.

SWM design criteria for the subject development have been established in the SWM Plan for Grand Niagara Secondary Plan (2016). LID measures and an OGS unit are proposed to address site water balance and water quality.

Erosion control and quantity control are not required for the subject development from the sub-watershed perspective. However, capacity of downstream conveyance infrastructure shall be further investigated at the site plan application stage to ensure the site runoff can be safely directed to the receiving watercourse.

SITE GRADING

Proposed site grading shall be designed to direct minor storm drainage to the appropriate collection points and an overland flow route will be provided for major storm drainage to outlet to the existing Grassy Brook Road ditch. Appropriate erosion and sediment control measure shall be implemented during the construction stages to prevent sediment runoff into adjacent municipal drainage systems and natural waterways. The grading and erosion and sediment control design will be revised and updated at the site plan application stage to provide more details.

8 STANDARD LIMITATIONS

This report was prepared by WSP Canada Inc. (WSP) for the client in accordance with the agreement between WSP and the client. This report is based on information provided to WSP which has not been independently verified. The disclosure of any information contained in this report is the sole responsibility of the client. The material in this report, accompanying spreadsheets and all information relating to this activity reflect WSP's judgment in light of the information available to us at the time of preparation of this report. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made or actions based on this report.

WSP warrants that it performed services hereunder with that degree of care, skill, and diligence normally provided in the performance of such services in respect of projects of similar nature at the time and place those services were rendered. WSP disclaims all other warranties, representations, or conditions, either express or implied, including, without limitation, warranties, representations, or conditions of merchantability or profitability, or fitness for a particular purpose.

This Standard Limitations statement is considered part of this report.

PREPARED BY

Alessandro D. Raimondo, P.Eng., PMP
Project Manager

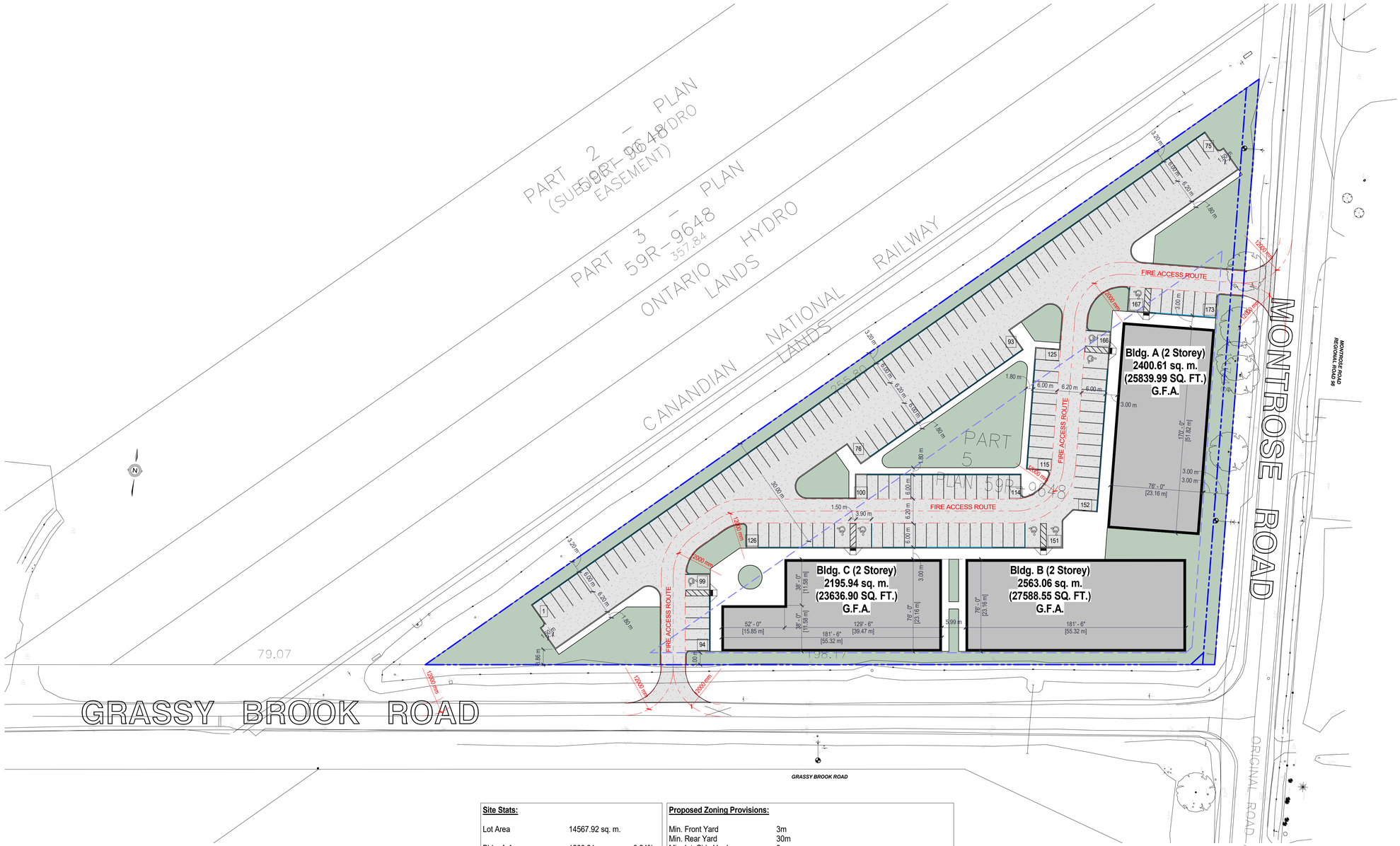
Date

James Zhou, P.Eng.
Senior Project Engineer, Water Resources

08/16/2023
Date

APPENDIX

A SITE PLAN



GRASSY BROOK ROAD

Site Stats:

Lot Area	14567.92 sq. m.	
Bldg. A Area	1200.31 sq. m.	8.24%
Bldg. A G.F.A.	2400.61 sq. m.	
Bldg. B Area	1281.53 sq. m.	8.80%
Bldg. B G.F.A.	2563.06 sq. m.	
Bldg. C Area	1097.97 sq. m.	7.54%
Bldg. C G.F.A.	2195.94 sq. m.	
Asphalt Area	5561.80 sq. m.	38.18%
Landscape Area	5426.31 sq. m.	37.24%

Parking Stats:

Parking Provided	173 Spaces
Accessible Parking	8 of 173 (4% min.)

Proposed Zoning Provisions:

Min. Front Yard	3m
Min. Rear Yard	30m
Min. Int. Side Yard	3m
Min. Ext. Side Yard	3m
Max. Bldg. Height	20m
CN Railway Setback	30m

Parking Rates:

Medical Clinic / Office	3 spaces per practitioner
Office	1 space per 35 sq. m. GFA
Hotel	1 space per 2 bedrooms, plus 1 space per 5.5 sq. m. floor area used as place of assembly
Warehouse	1 space per 90 sq. m. G.F.A.
Retail Store	1 space per 26 sq. m. G.L.F.A., plus 1 space per 90 sq. m. storage

Site Plan - Parcel B
scale: 1 : 500

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Parcel B
ES Fox
9127 Montrose Road, Niagara Falls Ontario

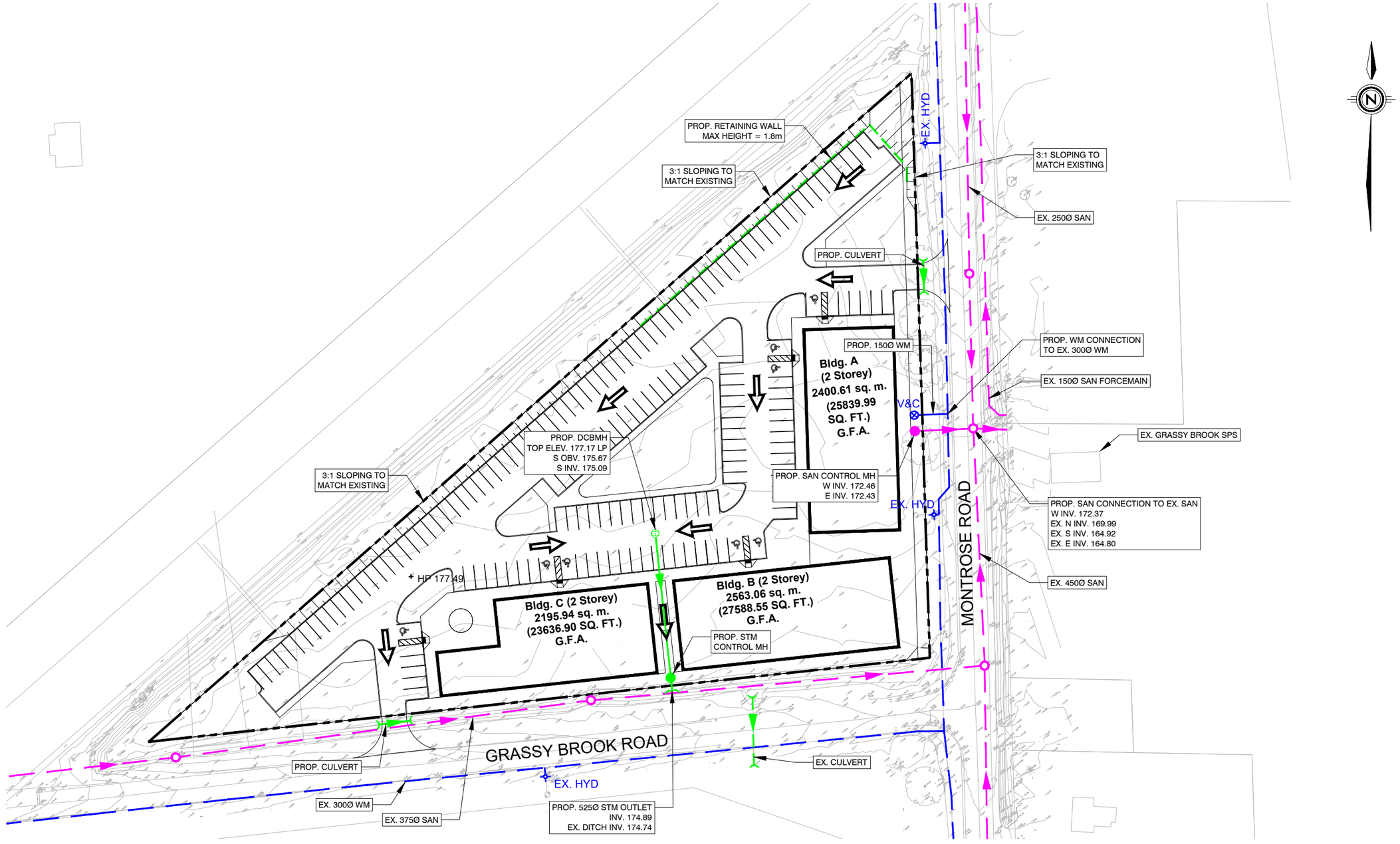
Overall Site Plan + Zoning Info

DRAWN BY: JJV
DATE: 11/6/2023 10:53:04 AM
SCALE: 1 : 500
PROJECT NO.: 21-007
CHECKED: ER

A1-000

APPENDIX

B PRELIMINARY SERVICING PLAN



LEGEND

- RETAINING WALL
- 3:1 SLOPING
- LIMIT OF PROPERTY
- EX. STORM SEWER
- PROP. STORM SEWER
- OVERLAND FLOW DIRECTION
- EX. SANITARY SEWER
- PROP. SANITARY SEWER
- EX. WATERMAIN
- V&C PROP. WATERMAIN

CLIENT: E.S. FOX LIMITED

TITLE: 9217 MONTROSE ROAD

PARCEL B
PRELIMINARY SERVICING PLAN

wsp
100 Commerce Valley Dr. West, Thornhill, ON Canada L3T 0A1
t: 905.882.1100 f: 905.882.0055 www.wsp.com

Checked	Drawn
ADR	NP
Date: MAR 2023	Proj. No.: 221-01223
Scale: 1:1000	Figure No.: SS1

FILENAME: C:\Users\CAVL074581\ACCDocs\WSP Canada projects (AMER)\LDO\Files\221-01223 9127 & 9515 Montrose Road\MUNIFSR\221-01223-gen-B.dwg
PLOTDATE: Feb 23, 2023 - 10:31am, CAVL074581

APPENDIX

C FIRE FLOW CALCULATIONS

APPENDIX C

FIRE FLOW CALCULATIONS

Project: **9127 MONTROSE ROAD - PARCEL B - BLDG. A**
Job No.: **221-01223**

Fire Flow Calculation Procedure per Water Supply for Public Fire Protection, 1999 by Fire Underwriter Survey, p 20.

$$F = 220\ C\sqrt{A}$$

where

F = Fire flow in Litres per minute (Lpm)
C = coefficient related to the type of construction
A = total floor area in square metres

A. **Determine Type of Construction**
=> Fire-resistive construction (fully protected frame, floors, roof)
Therefore C = 0.6

B. **Determine Ground Floor Area**
=> Fire-resistive building with vertical openings and exterior vertical communications properly protected
Therefore A = Largest Floor + 25% of 2 immediately adjoining floors
A = 1200.31 + 0.25*(1200.31 + 0)
A = 1,500 m2 *GFA for floors 1 and 2 used in calculation.

C. **Determine Height in Storeys**
=> 2 Storeys

D. **Determined the Fire Flow**
F = 220 x 0.6 x √1500
F = 5,000 Lpm

E. **Determine Increase or Decrease for Occupancy**
=> Reduction for Limited Combustible Occupancies
Therefore 15% reduction
15% reduction of 5000 Lpm = 750 Lpm
5000 - 750 = 4,250 Lpm

F. **Determine Decrease for Automatic Sprinkler Protection**
=> Has Automatic Sprinkler Protection (Per NFPA 13 Standards)
Therefore 30% reduction
30% reduction of 4250 Lpm = 1,275 Lpm

G. **Determine the Total Increase For Exposures**

Face	Distance (m)	Charge
West Side	50.00	0%
East Side	40.00	5%
North Side	50.00	0%
South Side	7.00	20%

Total 25% of 1,063 = 797 Lpm

H. **Req'd Fire Flow = D - F + G**
F = 3,772 Lpm
F = 4,000 Lpm (4,800 Lpm < F < 45,000 Lpm; OK)
F = 1,055 US GPM

APPENDIX C

FIRE FLOW CALCULATIONS

Project: **9127 MONTROSE ROAD - PARCEL B - BLDG. B**
Job No.: **221-01223**

Fire Flow Calculation Procedure per Water Supply for Public Fire Protection, 1999 by Fire Underwriter Survey, p 20.

$$F = 220\ C\sqrt{A}$$

where

F = Fire flow in Litres per minute (Lpm)
C = coefficient related to the type of construction
A = total floor area in square metres

A. **Determine Type of Construction**
=> Fire-resistive construction (fully protected frame, floors, roof)
Therefore C = 0.6

B. **Determine Ground Floor Area**
=> Fire-resistive building with vertical openings and exterior vertical communications properly protected
Therefore A = Largest Floor + 25% of 2 immediately adjoining floors
A = 1281.53 + 0.25*(1281.53 + 0)
A = 1,602 m2 *GFA for floors 1 and 2 used in calculation.

C. **Determine Height in Storeys**
=> 2 Storeys

D. **Determined the Fire Flow**
F = 220 x 0.6 x √1602
F = 5,000 Lpm

E. **Determine Increase or Decrease for Occupancy**
=> Reduction for Limited Combustible Occupancies
Therefore 15% reduction
15% reduction of 5000 Lpm = 750 Lpm
5000 - 750 = 4,250 Lpm

F. **Determine Decrease for Automatic Sprinkler Protection**
=> Has Automatic Sprinkler Protection (Per NFPA 13 Standards)
Therefore 30% reduction
30% reduction of 4250 Lpm = 1,275 Lpm

G. **Determine the Total Increase For Exposures**

Face	Distance (m)	Charge
West Side	6.00	20%
East Side	40.00	5%
North Side	7.00	20%
South Side	50.00	0%

Total 45% of 1,913 = 1,434 Lpm

H. **Req'd Fire Flow = D - F + G**
F = 4,409 Lpm
F = 4,000 Lpm (4,800 Lpm < F < 45,000 Lpm; OK)
F = 1,055 US GPM

APPENDIX C

FIRE FLOW CALCULATIONS

Project: **9127 MONTROSE ROAD - PARCEL B - BLDG. C**
Job No.: **221-01223**

Fire Flow Calculation Procedure per Water Supply for Public Fire Protection, 1999 by Fire Underwriter Survey, p 20.

$$F = 220\ C\sqrt{A}$$

where

F = Fire flow in Litres per minute (Lpm)
C = coefficient related to the type of construction
A = total floor area in square metres

A. **Determine Type of Construction**
=> Fire-resistive construction (fully protected frame, floors, roof)
Therefore C = 0.6

B. **Determine Ground Floor Area**
=> Fire-resistive building with vertical openings and exterior vertical communications properly protected
Therefore A = Largest Floor + 25% of 2 immediately adjoining floors
A = 1097.97 + 0.25*(1097.97 + 0)
A = 1,372 m2 *GFA for floors 1 and 2 used in calculation.

C. **Determine Height in Storeys**
=> 2 Storeys

D. **Determined the Fire Flow**
F = 220 x 0.6 x √1372
F = 5,000 Lpm

E. **Determine Increase or Decrease for Occupancy**
=> Reduction for Limited Combustible Occupancies
Therefore 15% reduction
15% reduction of 5000 Lpm = 750 Lpm
5000 - 750 = 4,250 Lpm

F. **Determine Decrease for Automatic Sprinkler Protection**
=> Has Automatic Sprinkler Protection (Per NFPA 13 Standards)
Therefore 30% reduction
30% reduction of 4250 Lpm = 1,275 Lpm

G. **Determine the Total Increase For Exposures**

Face	Distance (m)	Charge
West Side	50.00	0%
East Side	6.00	20%
North Side	50.00	0%
South Side	50.00	0%

Total 20% of 850 = 638 Lpm

H. **Req'd Fire Flow = D - F + G**
F = 3,613 Lpm
F = 4,000 Lpm (4,800 Lpm < F < 45,000 Lpm; OK)
F = 1,055 US GPM

APPENDIX

D HYDRANT FLOW TEST RESULTS

9659 MONTROSE RD (2927)

HYDRANT FLOW TEST RESULTS

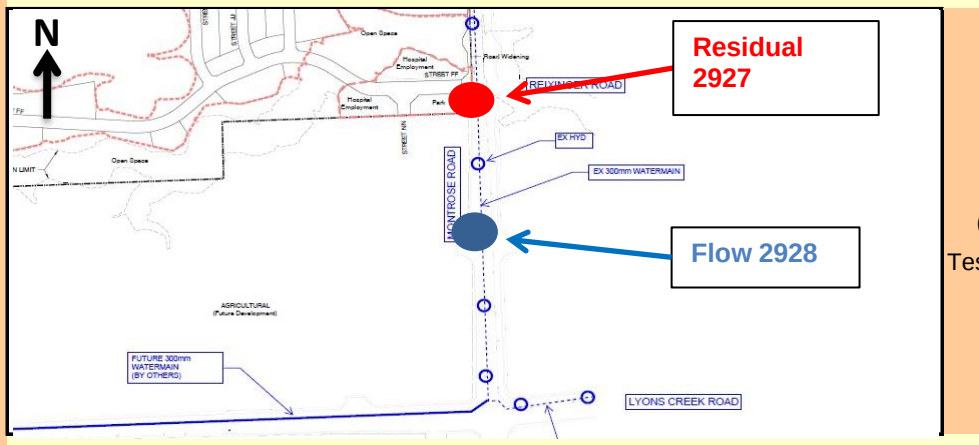
Date: 20-Sep-22 Time: 11:37 (hh/mm)

Tested By: Sen

Municipality: City of Niagara Falls

Operator: Rick

Test No: **2**



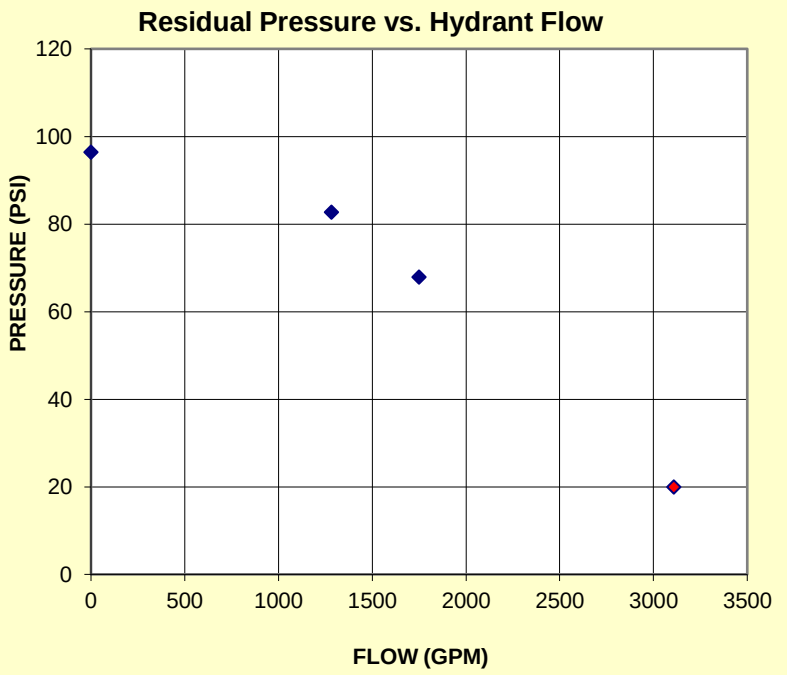
Conditions before Test (STATIC)

Residual Hydrant:	96.5 psi	665 kPa
Hydrant that will Flow:	96.5 psi	665 kPa
Δ pressure:	0.0 psi	0 kPa
Elevation Difference: (Flow El. - Residual El.)	0.0 ft	0.0 m

Test Notes:

TEST		TEST FLOW		RESIDUAL PRESSURE (psi)		Minimum Residual P_r (psi)	Fire Flow at Minimum Residual, Q_r (USGPM)	Fire Flow at Minimum Residual, Q_r (L/s)	10% Pressure Drop Achieved?
Port Size (in)	Nozzle Pressure (psi)	(USGPM)	(L/s)	Monitoring Hydrant	Flow Hydrant (Corrected) *				
STATIC	n/a	0	0	96.5	96.5				
Single Port Tests									
2"	58.7	1282.0	80.9	82.7	82.7	20	3238	204	YES
2"						20			
Two Port Test									
1"						20			
2"									
Two Port Test									
2"	27.0	870.0	54.9	67.9	67.9	20	2979	188	YES
2"	27.6	880.0	55.5						

* Pressure correction is equal to the elevation difference. Column 2 (and Table A) show the nozzle pressure while flowing.



Results			
Static Pressure		Flow at 20 psi (140kPa)*	
(psi)	(kPa)	(gpm)	(L/s)
96.5	665	3100	196

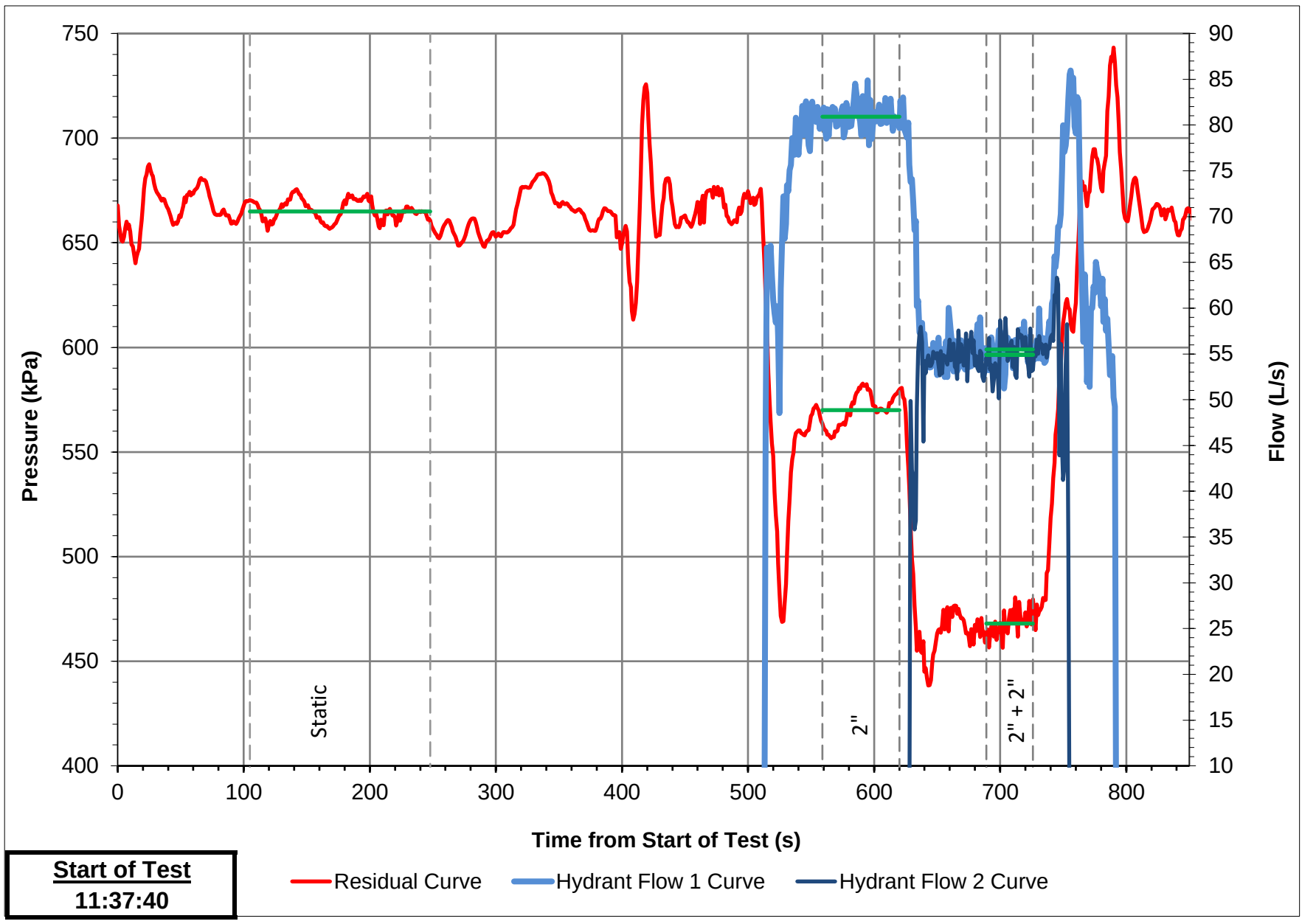
* Results carried to nearest 50 gpm or 100 gpm if over 1000 gpm

Hydrant Classification as per NFPA 291			
Class	AA	Color	BLUE

Water Discharged During Test:	25500 L

Rounded up to closest 100L

9659 MONTROSE RD (2927)



Subject Watermain Details				Subject Hydrant & Valve Details	
Diameter:	300 mm	**Material:**	PVC	**Residual Hydrant:**	2927
Area:	0.071 m2			**Flow Hydrant:**	2928

TABLE A: TESTED PRESSURES AND FLOWS

Point	Time		Residual Hydrant (2927)		Flow Hydrant (2928)				Total Flow		Velocity
			Residual (S1)		Port 1 (S1)		Port 2 (S2)				
	Start	Finish	(kPa)	(psi)	(L/s)	(GPM)	(L/s)	(GPM)	(L/s)	(GPM)	(m/s)
Static	105	248	665	96.5	0.0	0	0.0	0	0.0	0	0.0
2"	559	620	570	82.7	80.9	1282	0.0	0	80.9	1282	1.1
2"			0	0.0	0.0	0	0.0	0	0.0	0	0.0
1" + 2"			0	0.0	0.0	0	0.0	0	0.0	0	0.0
2" + 2"	689	726	468	67.9	55.5	880	54.9	870	110.4	1750	1.6

APPENDIX

E SWM - OGS SIZING REPORT

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON A FINE PARTICLE SIZE DISTRIBUTION

Project Name:	9127 Montrose Rd	**Engineer:**	**WSP**
Location:	Niagara Falls, ON	**Contact:**	James Zhou, M. Eng., P. Eng.
OGS #:	Parcel B	**Report Date:**	1-Mar-23

Area	1.46	ha	**Rainfall Station #**	209	
Weighted C	0.9		**Particle Size Distribution**	FINE	
CDS Model	2020		**CDS Treatment Capacity**	31	l/s

Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
0.5	9.3%	9.3%	1.8	1.8	5.9	97.2	9.0
1.0	10.3%	19.6%	3.7	3.7	11.7	95.5	9.9
1.5	9.6%	29.2%	5.5	5.5	17.6	93.8	9.0
2.0	9.1%	38.3%	7.3	7.3	23.5	92.1	8.4
2.5	7.0%	45.3%	9.1	9.1	29.3	90.5	6.4
3.0	6.6%	51.9%	11.0	11.0	35.2	88.8	5.9
3.5	3.9%	55.8%	12.8	12.8	41.0	87.1	3.4
4.0	5.4%	61.2%	14.6	14.6	46.9	85.4	4.6
4.5	3.7%	64.9%	16.4	16.4	52.8	83.7	3.1
5.0	3.6%	68.5%	18.3	18.3	58.6	82.1	2.9
6.0	5.4%	73.9%	21.9	21.9	70.4	78.7	4.3
7.0	5.0%	78.9%	25.6	25.6	82.1	75.3	3.8
8.0	3.4%	82.4%	29.2	29.2	93.8	72.0	2.5
9.0	3.1%	85.5%	32.9	31.2	100.0	66.5	2.1
10.0	2.0%	87.4%	36.5	31.2	100.0	59.9	1.2
15.0	7.4%	94.8%	54.8	31.2	100.0	39.9	2.9
20.0	2.3%	97.2%	73.1	31.2	100.0	29.9	0.7
25.0	1.1%	98.2%	91.3	31.2	100.0	23.9	0.3
30.0	0.6%	98.8%	109.6	31.2	100.0	20.0	0.1
35.0	0.7%	99.4%	127.9	31.2	100.0	17.1	0.1
40.0	0.3%	99.7%	146.1	31.2	100.0	15.0	0.0
45.0	0.3%	100.0%	164.4	31.2	100.0	13.3	0.0
50.0	0.0%	100.0%	182.6	31.2	100.0	12.0	0.0
							80.5

Removal Efficiency Adjustment[2] = 6.5%

Predicted Net Annual Load Removal Efficiency = 74.0%

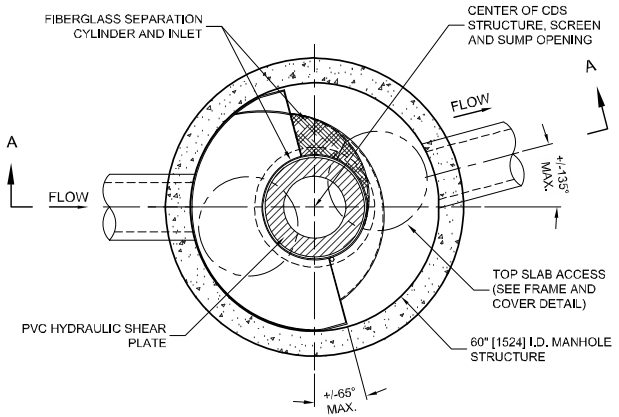
Predicted % Annual Rainfall Treated = 93.0%

1 - Based on 36 years of hourly rainfall data from Canadian Station 6135638, Niagara Falls ON

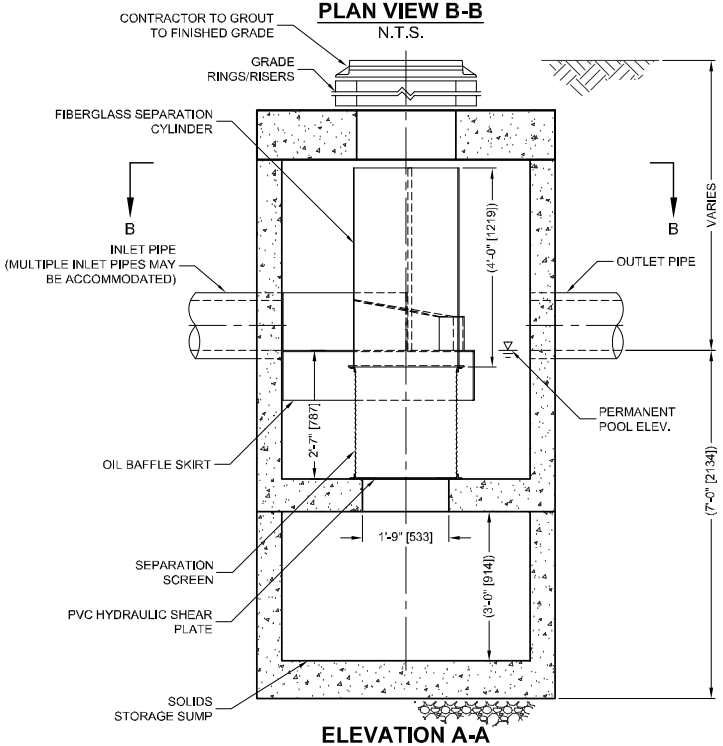
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

* CDS Efficiency based on testing conducted at the University of Central Florida

** CDS design flowrate and scaling based on standard manufacturer model & product specifications



PLAN VIEW B-B
N.T.S.

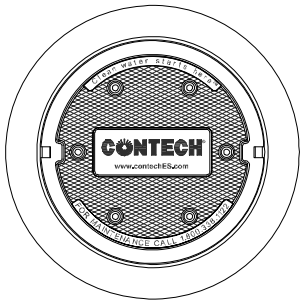


ELEVATION A-A
N.T.S.

CDS PMSU2020-5-C DESIGN NOTES

THE STANDARD CDS PMSU2020-5-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
CUSTOMIZABLE SUMP DEPTH AVAILABLE
ANTI-FLOTATION DESIGN AVAILABLE UPON REQUEST



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400. West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS PMSU2020-5-C INLINE CDS STANDARD DETAIL