FUNCTIONAL SERVICING & STORMWATER MANAGEMENT REPORT

In support of Zoning H Removal and Site Plan Application

3195 EAST BAYSHORE ROAD, OWEN SOUND, ONTARIO

Prepared For:

5 Douglas Street, Suite 301

Guelph, Ontario

N1H 2S8

KWA Project No. 22693

October 31st, 2022

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1.0 INTRODUCTION

KWA Site Development Consulting Inc. ("KWA") was retained by Skyline Retail Real Estate Holdings Inc. ("SkyDev") to prepare a Stormwater Management ("SWM") Brief in support of a Zoning H Removal and Site Plan Application for a proposed development on East Bayshore Road off the shore of Georgian Bay in the City of Owen Sound, County of Grey. The lands are legally described as Part of Lots 7, 53 and 54, in the City of Owen Sound, County of Grey.

This report will depict how the development will be serviced with regards to sanitary, water, and storm drainage infrastructure including stormwater management.

In preparing this report, the following documents were reviewed:

- Pre-Consultation Comments by the City of Owen Sound, dated May 16th, 2022
- County of Grey ZBA Comments, dated July 19th, 2022
- Site Plan SA-001r3, prepared by KWA, dated October 21st, 2022
- Topographic Survey, File No. 12-163, prepared by Hewett and Milne Ltd., dated September 10th, 2012
- Drawing Package for East Bayshore Road provided by the City of Owen Sound
- Geotechnical Investigation Report by WSP, dated July 7th, 2017
- Skydev Bayshore Watermain Analysis, prepared by Municipal Engineering Solutions, dated October 21st, 2022
- Functional Servicing & Stormwater Management Report by R.J. Burnside & Associates Limited, dated January 2016
- Environmental Assessment for the Goodyear Sanitary Pump Station, prepared by WSP, dated February 2017
- Northridge Residential Development Functional Servicing and Stormwater Management Report, prepared by R.J. Burnside & Associated Ltd., dated January 2016
- Country of Grey Development Application Guidelines
- City of Owen Sound Site Development Engineering Standards, dated February 3rd, 2021
- Ministry of Environment's Stormwater Management Planning and Design Manual, dated 2003

2.0 SITE DESCRIPTION

The area that is subject to this application (herein the "site") is approximately 15.4 hectares (38.05 acres) and is presently occupied by the demolished RCA radio building with associated parking and landscaping. The building is located in the centre portion of the lands along with an asphalt driveway and gravel parking areas used for outdoor storage. The eastern portion of the lands are partially vacant and partially utilized for storage purposes. The site is square shaped, with an approximate frontage of 400 m on East Lake Shore Road and approximately 350 m on 32nd Street East. An existing driveway to the site runs from 32nd Street East southward to the table land area and existing building.

Surrounding land uses include:

- A commercial development (former Northridge Property / Veyance building containing light industrial uses) to the north,
- Industrial (McArthur Retread Facility and vacant lands) and recreational (Kiwanis Soccer Complex) lands to the east,

- Kenny Drain stormwater outlet channel and Industrial (Hobart manufacturing facility) lands to the south and,
- East Bayshore Road, publicly owned shoreline with boat launch area, small piece of land owned by SkyDev and Georgian Bay consisting of primarily hazard lands to the west.

The site is within the South Georgian Bay Shoreline Subwatershed. Generally, the site is sloped east to west with elevations ranging from 188 m (along the eastern perimeter) to 179 m (along the western perimeter). Note, there is a forested (Hazard) area (approximately 1.53 ha) at the southwest corner of the site. See **Figure 1 (Site Location Plan)** below.

Recent planning applications have been approved for a variety of residential uses. SkyDev's vision is to re-zone the property to allow higher densities such that up to 712 apartment units can be developed. A **Site Plan (SA-001r3)** has been developed by KWA and provides the basis for this Report.

The site plan proposes three 6-storey apartment buildings with 89 units each. Access to the site will be provided from East Bay Shore Road (Main Entrance) and from 32nd Street East. A gated emergency access is provided to 9th street East in the southeast corner of the development. Two proposed amenity buildings with patio area are included in the plan. There will be multiple outdoor amenity areas, including fenced dog runs and pickleball courts. Refer to the **Site Plan (SA-001r3).**

3.0 DESIGN POPULATION FOR WATER AND SANITARY

There are 712 units and 2 amenity buildings contemplated for the proposed development. As per WSP's Environmental Assessment for the Goodyear Sanitary Pump Station and through correspondence with WSP, the projected design population for the development is approximately **1688 persons**:

- 712 units with equivalent population density of 2.3 persons/unit = 1638 persons
- Allocation of 50 persons for two amenity buildings (as confirmed with the City by WSP) = 50 persons

4.0 WATER SERVICING

4.1 EXISTING WATER SERVICING

The City of Owen Sound functions under six pressure zones. The proposed development is within the Municipal Zone and borders the Industrial Zone.

An existing 250 mm diameter ductile iron watermain within the Municipal Zone extends north along the East Bay Shore Road and east along 32nd Street and terminates at the entrance of the former RCA site. A 300 mm diameter asbestos cement watermain within the Industrial Zone extended north on 9th Avenue East, west on 32nd Street East, and terminates past the entrance to the former RCA site.

4.2 PROPOSED WATER SERVICING

4.2.1 DOMESTIC DEMAND

Municipal Engineering Solutions ("MES") was consulted to conduct a hydraulic water analysis for the proposed development. As part of the hydraulic assessment, MES calculated water demands for the proposed development using provincial and industry standards and developed a water

REVISION BLOCK		
#	DATE	DESCRIPTION
1.	10/17/22	ZONING H REMOVAL AND SPA

KWA SITE DEVELOPMENT CONSULTING INC.
2453 Auckland Drive
Burlington, ON L7L 7A9

FIGURE 1 - SITE LOCATION FIGURE

SKYDEV
OWEN SOUND (BAYSHORE)
OWEN SOUND, ONTARIO

PROJECT No: 22693 | DRAWN BY:BC | CHECKED BY:BJ

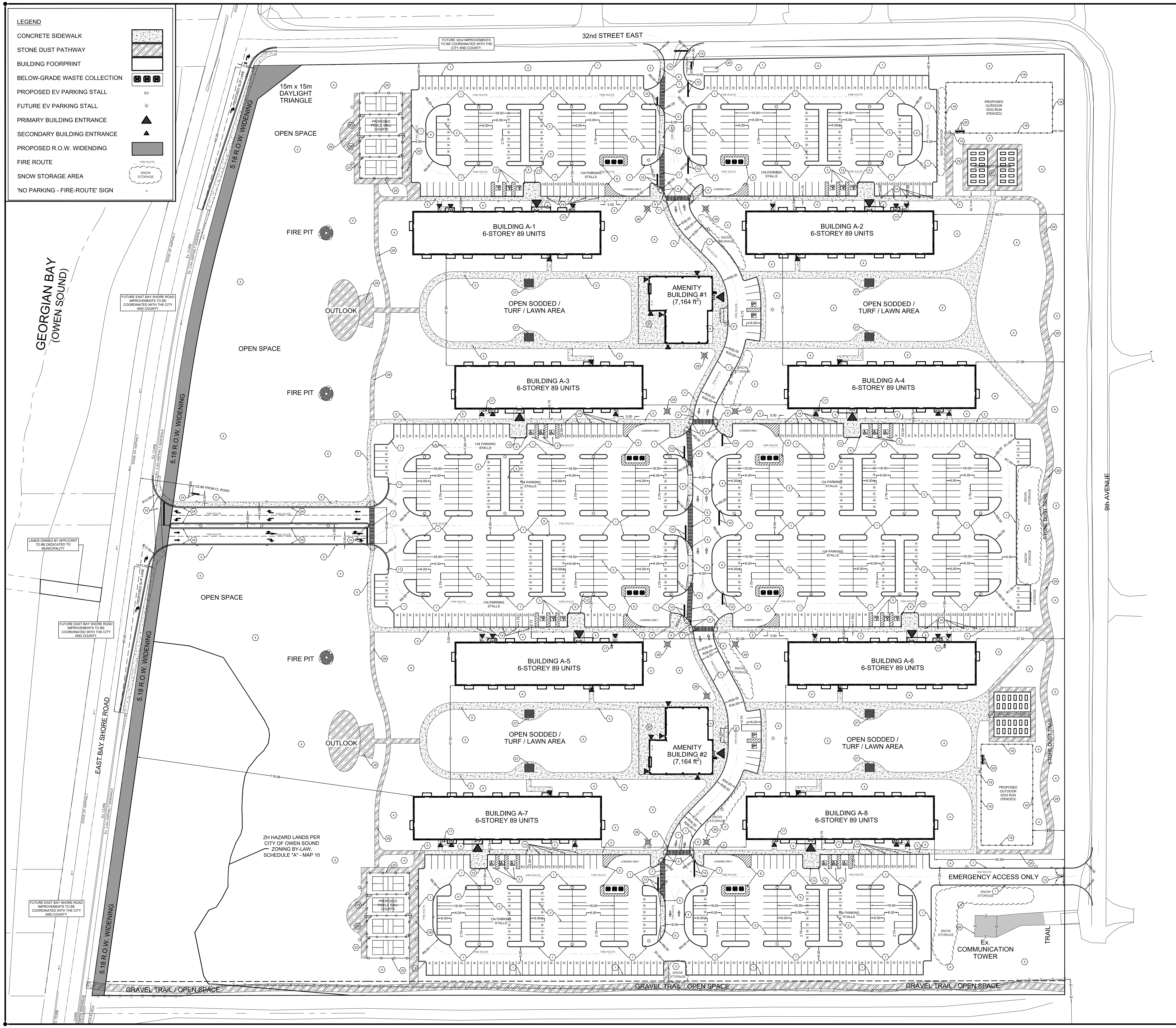
NORTH ARROW

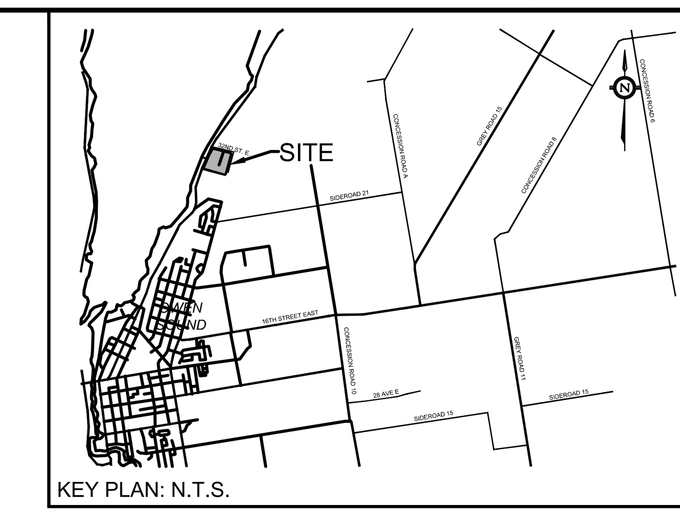
METRIC SCALE
N.T.S

FIG 1

LEGEND

- CONCRETE SIDEWALK
- STONE DUST PATHWAY
- BUILDING FOORPRINT
- BELOW-GRADE WASTE COLLECTION
- PROPOSED EV PARKING STALL
- FUTURE EV PARKING STALL
- PRIMARY BUILDING ENTRANCE
- SECONDARY BUILDING ENTRANCE
- PROPOSED R.O.W. WIDENING
- FIRE ROUTE
- SNOW STORAGE AREA
- 'NO PARKING - FIRE-ROUTE' SIGN





REVISION BLOCK

#	DATE	DESCRIPTION
1.	10/31/2022	ISSUED FOR SPA

REGISTERED PROFESSIONAL ENGINEER
B.JACKSON
100210382
OCT. 31, 2022
PROVINCE OF ONTARIO

KWA SITE DEVELOPMENT CONSULTING INC.
2453 Auckland Drive
Burlington, ON L7L 7A9

NORTH ARROW

SKYLINE SKYDEV

CONSTRUCTION NOTES

1. BARRIER CURB (AS PER OPSD 600.110)
2. 90° PARKING STRIPE (YELLOW - 0.15m STRIPES)
3. BARRIER FREE PAVEMENT MARKING AND Rb-93 SIGN (SEE DETAILS ON SP-D)
4. LANDSCAPED AREA (REFER TO LANDSCAPE DRAWINGS)
5. CONCRETE SIDEWALK (PER OPSD 310.010)
6. SIDEWALK RAMP (TO INCLUDE TACTILE ATTENTION MATS PER: OPSD - 310.039 - REFER TO SP-D FOR DETAIL)
7. PEDESTRIAN CROSSING (YELLOW ZEBRA STRIPING - 0.30m AT 0.60m O.C.)
8. PAINTED ISLAND (0.15m STRIPES 0.45m O.C. @ 45°) - YELLOW
9. PEDESTRIAN CROSSING SIGN (SEE DETAIL ON SP-D)
10. STOP BAR (WHITE) AND STOP SIGN (SEE DETAILS ON SP-D)
11. TRANSITION FROM BARRIER CURB TO CURB/GUTTER
12. FLUSH SIDEWALK / ASPHALT CONDITION WITH TACTILE ATTENTION INDICATOR (OPSD - 310.039) REFER TO GRADING PLAN FOR DETAILED GRADING AND SP-D FOR DETAILS
13. PROPOSED VEHICULAR GATE (EMERGENCY ACCESS ONLY)
14. ELECTRICAL VEHICLE CHARGING STATION (DUAL VEHICLES) (REFER TO DETAILS ON ELECTRICAL PLANS)
15. PROPOSED MONUMENT SIGN (REFER SKYDEV STANDARDS)
16. 'NO PARKING - FIRE ROUTE' SIGN (SEE DETAIL ON SP-D)
17. SIAMESE CONNECTION
18. PROPOSED 1.8m (6.0') BLACK CHAIN-LINK FENCE AROUND DOG RUN (REFER TO L4 LANDSCAPE DETAILS)
19. FENCE MOUNTED 'PICK UP AFTER YOUR PET' SIGN (SEE DETAIL ON SP-D)
20. PROPOSED BENCH ON CONCRETE PAD (REFER TO LANDSCAPE DRAWINGS)
21. COMMUNITY GARDENS (REFER TO LANDSCAPE PLANS)
22. REFER TO LANDSCAPE DRAWINGS FOR PATIO FURNITURE
23. PROPOSED 1.2m HIGH BLACK VINYL CHAIN-LINK FENCE (REFER TO LANDSCAPE DETAILS)
24. CURB AND GUTTER (AS PER OPSD 600.04)
25. PROPOSED 3.0m (10') FENCE AROUND PICKLEBALL COURT (REFER TO LANDSCAPE PLANS)
26. EXISTING FENCE ENCLOSURE AROUND COMMUNICATION TOWER
27. PROPOSED PERGOLA (REFER TO LANDSCAPE PLANS)
28. PROPOSED TRANSFORMER ON CONCRETE BASE (REFER TO SITE ELECTRICAL DRAWINGS)
29. STONE DUST PATH
30. MAIN SW AND FUSE, PRIMARY METER AND SWITCH (REFER TO SITE ELECTRICAL DRAWINGS FOR DETAILS)

SITE STATISTICS	
	PROPOSED
APARTMENT BLOCK SIZE	37.99 ACRES (15.37 Ha)
APARTMENT COUNT	
BUILDING A-1	89 UNITS
BUILDING A-2	89 UNITS
BUILDING A-3	89 UNITS
BUILDING A-4	89 UNITS
BUILDING A-5	89 UNITS
BUILDING A-6	89 UNITS
BUILDING A-7	89 UNITS
BUILDING A-8	89 UNITS
TOTAL	712 UNITS
DENSITY	46.32 UNITS / Ha.
PARKING REQUIRED (1.50 / UNIT)	
BUILDING A-1 (134 CARS)	134 CARS (1.50 / UNIT)
BUILDING A-2 (134 CARS)	134 CARS (1.50 / UNIT)
BUILDING A-3 (134 CARS)	134 CARS (1.50 / UNIT)
BUILDING A-4 (134 CARS)	134 CARS (1.50 / UNIT)
BUILDING A-5 (134 CARS)	134 CARS (1.50 / UNIT)
BUILDING A-6 (134 CARS)	134 CARS (1.50 / UNIT)
BUILDING A-7 (134 CARS)	134 CARS (1.50 / UNIT)
BUILDING A-8 (134 CARS)	134 CARS (1.50 / UNIT)
AMENITY BLDG. #1	8 CARS
AMENITY BLDG. #2	8 CARS
TOTAL (1,072 CARS)	1,088 CARS (1.53 / UNIT)

METRIC SCALE
0m 10m 20m 30m
1:750

SITE PLAN
SKYDEV BAYSHORE OWEN SOUND LP
OWEN SOUND, ONTARIO
PROJECT No: 22693
DRAWN BY: BH
CHECKED BY: RA

SA-001 r3

model to size the subject mains to achieve service criteria during Minimum Hour, Peak Hour, and fire flow during Maximum Day demand. The calculated demands by MES are as follows:

- Average Day Demand = 7.75 L/s
- Minimum Hour Demand = 3.49 L/s
- Maximum Day Demand = 13.96 L/s
- Peak Hour Demand = 20.94 L/s

Refer to the Watermain Analysis report by MES in **Appendix A**.

4.2.2 FIRE DEMAND

The fire demands were calculated using the Fire Underwriters Survey ("FUS") formula outlined in the `Water Supply for Public Fire Protection Guideline', dated 2020. The fire flow requirements are:

- 6-storey building = 117 L/s
- Amenity building = 33 L/s

The fire flow requirements are based on the following assumptions, which are to be confirmed with the architect/ owner during future design stages.

- Type of construction = Non-combustible
- Occupant type = Limited Combustible
- Fire Protection = Sprinklers

Two hydrant flow tests were conducted on July 26, 2022. Based on the results for the hydrant along East Bayshore Road (1A-182), it is anticipated that the static pressure would be 95 psi and the available flow would be 4106 USGPM or **259 L/s** at 20 psi (~140 kPa). The hydrant along 9th Avenue East (1C-232) indicated a static pressure would be 119 psi and the available flow of 6196 USGPM or **391 L/s** at 20 psi (~140 kPa).

The hydrant flow test results were compared with the MES hydraulic model to confirm the system pressures with the model results. The MES analysis confirmed that the available fire flow within the site meets or exceeds the fire flow demands at the minimum pressure of 20 psi (140 kPa) based on the proposed watermain configuration.

4.2.3 WATER SERVICING

The site has frontage on two pressure zones – Municipal pressure zone and the Industrial pressure zone. Based on discussions with the City of Owen Sounds Public works department, the 2 distinct pressure zones are to be connected. This allows for 3 separate watermain connections (for consideration of construction sequencing) to all be supplied by the municipal pressure zone while providing added security of a looped connection for both pressure zones in the event of a significant pressure drop in either zone. The 32nd Street East municipal and industrial watermains are to be connected and a pressure reducing valve (PRV) constructed on 9th Avenue near the entrance to the Kiwanis Soccer complex as shown on the Site Servicing Plan.

There will be three 200 mm diameter PVC connections into the 300 mm diameter watermain on 9th Avenue to service the site as follows:

- **North Connection** consisting of Buildings A-1, A-2, A-3 and Amenity Building #1 will be serviced by the northern most 200 mm connection into the site. A 150 mm domestic connection and a 200 mm fire connection is provided for each residential building, whereas a 150 mm domestic connection is provided for the amenity building.

- **Central Connection** consisting of Buildings A-5, A-7, A-8 and Amenity Building #2 will be serviced by the southern most 200 mm connection into the site. A 150 mm domestic connection and a 200 mm fire connection is provided for each residential building, whereas a 150 mm domestic connection is provided for the amenity building.
- **South Connection** consisting of Buildings A-4 and A-6 will be serviced by the middle 200 mm connection into the site. A 150 mm domestic connection and a 200 mm fire connection is provided for both residential buildings.

The hydraulic analysis by MES confirmed that pipes sized at 150 – 200 mm would meet the pressure requirements. Individual meters will be installed within each building as shown on the Servicing Plan. All buildings shall have distinct addresses in order to accommodate separate water metering as per City standards. The pressures to the building supply points will be over the OBC limit of 550 kPa (80 psi). The pressures must be taken into consideration in the building mechanical design. Individual PRVs may be needed to meet the OBC limit. Individual meters and PRVs will be further explored during future design stages.

Refer to **Appendix A** for the MES report and completed hydrant flow tests at East Bayshore Road and 9th Avenue East.

5.0 Sanitary Servicing

5.1 Existing Sanitary Servicing

Servicing to the former RCA site was provided via gravity sewer connected to a 350 mm diameter gravity sewer along 32nd Street East to the north. The gravity sewer flowed west along 32nd Street East and into the Goodyear Sewage Pumping Station (SPS), located at the northeast corner of East Bayshore Road and 32nd Street East. Sewage was collected in the Goodyear Sanitary Pumping Station (SPS) and pumped via a 150 mm diameter forcemain approximately 780 m south along East Bayshore Road to the intersection of 28th Street East. From there, flow continued by gravity via a 350 mm diameter gravity sewer.

As discussed in WSP's Environmental Assessment for the Goodyear Sanitary Pump Station, the existing Goodyear SPS and East Bayshore Road SPS have been decommissioned, and a new combined sanitary pumping station, approximately 30 m south, on the east side of East Bayshore Road, has been constructed. The new pump station provides larger capacity pumps and new wet well with increased storage.

5.2 Proposed Sanitary Servicing

5.2.1 Sanitary Servicing

The proposed development will be serviced by gravity sewers along 32nd Street East flowing west and along East Bayshore Road flowing north to the new East Bayshore Road SPS.

The sanitary sewers within the site are directed west towards the main sanitary trunk designed along the western property limit, conveying north to the municipal manhole on 32nd Street East. See **Site Servicing Plan** in **Appendix G**.

5.2.2 Sanitary Flow Calculations

In accordance with the Owen Sound Municipal Engineering Design Criteria, the anticipated peak sanitary discharge for the site can be calculated based on the following formula:

$$Q = \frac{population\ x\ average\ daily\ per\ capita\ flow\ x\ peaking\ factor}{86.4} + infiltration * area$$

Where:

- Q = Peak Sanitary Flow (L/s)
- Population = 1688 people (as calculated in Section 3.0)
- Per Capita Flow = 400 L/capita/day
- Peaking Factor $M = 1 + (\frac{14}{4+P^{\frac{1}{2}}})$ [3.64]
  - Where M = ratio of peak flow to average flow

    P = tributary population in thousands [1.688]
- Infiltration = 0.20 L/s/ha [3.08 L/s]

This results in a sanitary demand of **31.5 L/s**, including extraneous flows.

Refer to **Appendix B** for sanitary demand calculations.

5.2.3 Downstream Sanitary Analysis

The City confirmed that the subject site sanitary flows have been analyzed by WSP during the design of the sanitary sewer upgrades along East Bayshore Road and for inclusion in the Environmental Site Assessment for the Goodyear Sanitary Pump Station (dated February 2017). WSP has since updated that analysis with a more accurate assumption of the drainage areas' land usage type (i.e, industrial, commercial, and residential). Through email correspondence on October 14th, 2022, WSP confirmed that there is sufficient capacity in the gravity sewer system and the new SPS for the addition of 712 units and 2 amenity buildings in our proposed development.

KWA has also completed a sanitary design sheet with subject site sanitary flows and external flows to confirm WSP's calculations. Although the peaking factors in the KWA analysis are more conservative based on the site-focused approach, the future 55.3 L/s of sanitary flows calculated are still less than the SPS capacity of 55.78 L/s. Therefore, the future gravity sewers and pump station have capacity to service the proposed development. Refer to **Appendix B** for the sanitary sewer design sheet for the new SPS.

6.0 Stormwater Management

6.1 Stormwater Management Objectives

This report has been prepared in accordance with the City of Owen Sound Design Criteria, Grey County, Grey Sauble Conservation Authority, pre-submission consultation comments, and the Ministry of the Environment Conservation and Parks ('MECP'). The criteria as it applies to this development is as follows:

- **Quantity Control:** Due to the proximity of Georgian Bay, there are no quantity controls for this site. However, Grey County has requested that the 32nd Street Culvert flows be maintained (no increase), therefore, peak flow rates from the site must be controlled to pre-development levels.
- **Quality Control:** All stormwater management measures shall provide an "Enhanced" level of protection (80% TSS Removal) in accordance with the MOE Stormwater Management Planning and Design Manual (March 2003).

- **Water Balance**: Minimize impact on the natural water balance through use of Low Impact Development (LID)
- **Thermal Mitigation**: Georgian Bay (Owen Sound) is a cold-water fishery; Thermal mitigation strategies shall be applied when evaluating stormwater runoff.

6.2 Existing Conditions

The site is currently vacant and undeveloped; the previously existing building has been demolished, leaving only the parking area and footing / slab. While most of the site drains to the northwest (32nd Street Culvert – 3.5 m x 1.5 m Concrete Box Culvert), there are some areas that drain towards the south, and west. The existing drainage areas can be considered as follows:

- **Area 1:** Approximately 11.28 ha of the site drains northwest towards the 32nd Street Culvert. This catchment has a runoff coefficient of 0.46 (37% impervious).
- **Area 2:** Approximately 2.93 ha of the site drains south to the Kenny Drain drainage channel. This catchment has a runoff coefficient of 0.58 (54% impervious).
- **UNC:** Approximately 1.37 ha of the site drains uncontrolled to the Kenny Drain via drainage swale along East Bayshore Road. This catchment has a runoff coefficient of 0.20 (0% impervious).

The total drainage area for the site is approximately 15.58 ha. Refer to the **Existing Drainage Plan** located in **Appendix G**.

6.3 Allowable Release Rates

The pre-development peak flows for the site were calculated using PCSWMM modeling software.

The catchment characteristics for the pre-development drainage areas are summarized in **Table 1** below:

Table 1: Pre-Development Catchment Characteristics

Attributes	Area 1	Area 2	UNC
Area (ha)	11.28	2.93	1.37
Width (m)	385	235	90
Slope (%)	2.0	1.0	5.0
Imperviousness (%)	37	54	0

Note, the impervious values were calculated using the following equation:

Imp. (%) = (R.C. – 0.2) / 0.7

The pre-development flows in **Table 2** were determined using the PCSWMM modeling software.

Table 2: Pre-Development Peak Flows

Storm Event	Peak Flows (m^3/s)	
	32nd Street	Kenny Drain
5-yr	1.635	0.583
25-yr	2.380	0.874
100-yr	3.061	1.137

Refer to **Appendix D** for PCSWMM output results.

6.4 PROPOSED CONDITIONS

The overall drainage divide on the property, between the 32nd Street Culvert and the Kenny Drain, has been changed; increased drainage to the north outlet (32nd Street Culvert) versus the Kenny Drain. The purpose of this is to avoid the intrusive construction of a storm outlet through the wood lot and into the Kenny Drain. Storage is provided on site to account for the increased drainage and mitigate peak flows to less than pre-development levels at the 32nd Street Culvert.

The proposed development contemplates eight apartment buildings, two amenity buildings, multiple outdoor amenity areas, and associated surface parking lots: 3 parking lots total. To accommodate the proposed development and to reduce uncontrolled flow, the drainage areas in the post-development condition are considered as follows:

- **Area 201:** Approximately 3.37 ha of the site is captured in the north parking lot (Parking A) and drains west towards the main trunk designed along East Bayshore Road, ultimately discharging to the 32nd Street East Culvert. This catchment has a runoff coefficient of 0.59 (56% impervious).
  - The 5-year storm event will be captured in the storm sewer network within the parking area (minor system).
  - All storm events exceeding the 5-year storm event will be captured and released at a reduced flow to meet the pre-development release rate at the 32nd Street East Culvert.
  - Flows from this catchment will be controlled via orifice plate with pipe and surface storage.

- **Area 202:** Approximately 4.80 ha of the site is captured in the middle parking lot (Parking B) and drains west towards the main entrance and trunk designed along East Bayshore Road, ultimately discharging to the 32nd Street East Culvert. This catchment has a runoff coefficient of 0.67 (67% impervious).
  - The 5-year storm event will be captured in the storm sewer network within the parking area (minor system)
  - All storm events exceeding the 5-year storm event will be captured and released at a reduced flow to meet the pre-development release rate at the 32nd Street East Culvert.
  - Flows from this catchment will be controlled via orifice plate with pipe and surface storage.

- **Area 203:** Approximately 2.26 ha of the site is captured in the south parking lot (Parking C) and drains towards the main trunk designed along East Bayshore Road, ultimately discharging to the 32nd Street East Culvert. This catchment has a runoff coefficient of 0.69 (69% impervious).
  - The 5-year storm event will be captured in the storm sewer network within the parking area (minor system)
  - All storm events exceeding the 5-year storm event will be captured and released at a reduced flow to meet the pre-development release rate at the 32nd Street East Culvert.
  - Flows from this catchment will be controlled via orifice plate with pipe and surface storage.

- **Area L204:** Approximately 1.95 ha of the site drains west, uncontrolled, towards East Bayshore Road. This catchment has a runoff coefficient of 0.40 (29% impervious).

- The 5-year storm event will be captured in the storm sewer network within the parking area (minor system)
- All storm exceeding the 5-year storm event will be conveyed west to a swale with a 100-year storm event capture point (major system) via ditch inlet catchbasin.
- Flows from this catchment are uncontrolled.

- **Area L205:** Approximately 1.24 ha of the site drains west, uncontrolled, towards East Bayshore Road. This catchment has a runoff coefficient of 0.40 (29% impervious).
  - The 5-year storm event will be captured in the storm sewer network within the parking area (minor system)
  - All storm exceeding the 5-year storm event will be conveyed west to a low point in the parking lot that drains to a swale with a 100-year storm event capture point (major system) via ditch inlet catchbasin.
  - Flows from this catchment are uncontrolled.

- **Area MH100:** Approximately 0.14 ha of the site drains west, uncontrolled, towards East Bayshore Road. This catchment has a runoff coefficient of 0.60 (57% impervious).
  - The 5-to-100 year storm event will be captured in the storm sewer network within the landscaped area (CB35)
  - Flows from this catchment are uncontrolled.

- **Area ENT:** Approximately 0.22 ha of the site drains west towards East Bayshore Road.
  - All storm events will be captured within the entrance right-of-way via interceptor catch basins and conveyed to the 32nd Street East Culvert via the main trunk designed along East Bayshore Road.
  - Flows from this catchment are uncontrolled.

- **UNC:** This area corresponds to the pre-development Area UNC which will remain unchanged with an area of 1.37 ha.

All buildings (apartments and amenity) will have direct connections (including roof drainage) to the storm sewer system. The storm sewer design sheet calculations can be found in **Appendix C**.

The catchment characteristics for the post-development drainage areas are summarized in **Table 3** below:

Table 3: Post-Development Catchment Characteristics

Attributes	201	202	203	L204	L205	MH100	ENT
Area (ha)	3.37	4.80	2.26	1.95	3.06	1.36	1.36
Width (m)	130	185	85	75	120	90	90
Slope (%)	0.5	0.5	0.5	2.0	2.0	5.0	5.0
Imperviousness (%)	56	67	69	29	29	57	100

The post-development uncontrolled flows in **Table 4** were determined using the PCSWMM modeling software.

Table 4: Post-Development Uncontrolled Peak Flows

Storm Event	Peak Flows (m^3/s)	
	32nd Street	Kenny Drain
5-yr	2.316	0.111
25-yr	3.385	0.187
100-yr	4.495	0.256

Refer to **Appendix D** for PCSWMM output results.

Site grading is constrained by existing ground elevations at the site boundaries. The site drops drastically at East Bayshore Road. This has allowed opportunity to design storage nodes for the three separate parking lots (catchments 201, 202 and 203).

Refer to the **Site Grading Plan (SGP)**, **Site Servicing Plan (SSP), Proposed Drainage Plan (PDP)** and **Stormwater Management Plan (SWM)** located in **Appendix G**.

6.5 Quantity Control

As per the proposed drainage areas outlined in Section 6.4, there are multiple stormwater outlets for the subject site that require independent stormwater management. In order to control the post-development flows to the pre-development conditions, 3 storage nodes have been proposed: one at the west end of each parking area (catchments 201, 202 and 203); the remaining catchments will be released uncontrolled. The release rate from the storage node in combination with the uncontrolled release rates will be less-than or equal-to the pre-development release rates.

The storage node volumes and orifice diameters are summarized below:

- **Area 201:** This area requires 305 m^3 of storage and uses a 375 mm diameter orifice to achieve the required release rates.
- **Area 202:** This area requires 548 m^3 of storage and uses a 375 mm diameter orifice to achieve the required release rates.
- **Area 203:** This area requires 541 m^3 of storage and uses a 375 mm diameter orifice to achieve the required release rates.

Each area will use both underground and surface storage. Underground storage may consist of pipe storage and chamber storage. The required and provide storage for each area is summarized in **Table 5** below:

Table 5: Required & Provided Storage

Catchment	Required [m^3]	Provided			
		Surface - 0.30m Max Ponding [m^3]	Underground - Pipe + MH [m^3]	Underground - Chamber [m^3]	Total [m^3]
201	**305**	150	123	32	**273**
202	**548**	370	187	0	**557**
203	**541**	460	113	0	**573**

Refer to **Appendix D** for PCSWMM output results.

The release rates for each storage node are summarized in **Table 6** below:

Table 6: Post-Development Storage Release Rates

Storage Event	Peak Flows (m^3/s)		
	Area 201	Area 202	Area 203
5-yr	0.362	0.623	0.163
25-yr	0.37	0.638	0.165
100-yr	0.62	0.791	0.166

Refer to **Appendix D** for PCSWMM output results.

The post-development controlled flows in **Table 7** were determined using the PCSWMM modeling software.

Table 7: Post-Development Controlled Peak Flows

Storm Event	Peak Flows (m^3/s)	
	32nd Street	Kenny Drain
5-yr	1.632	0.111
25-yr	1.88	0.187
100-yr	2.086	0.256

Refer to **Appendix D** for PCSWMM output results.

See **Table 8** below for the flow comparison between the pre-development and post-development controlled.

Table 8: Flow Comparison (Pre- vs. Post-Controlled)

Storm Event	Peak Flows (m^3/s)		
	Pre-Development	Post-Development (Controlled)	Difference
5-yr	1.635	1.578	-0.057
25-yr	2.380	2.201	-0.179
100-yr	3.061	2.73	-0.331

Therefore, to control the post-development peak flows to equal or less than the pre-development release rates, flow restrictions and associated storage are required.

6.6 Quality Control

As per the Owen Sound Design Criteria, an Enhanced Level of Protection (80% TSS removal) is required on an average annual loading basis from all runoff leaving the proposed development. For Catchments 201, 202, and 203, an oil grit separator (OGS) is proposed to treat runoff from the addition of paved areas in the post-development condition. The runoff from the remaining catchments is considered clean and will not require quality treatment. The OGS Sizing for catchments 201, 202, and 203 are as follows:

- **Area 201:** This area requires a EFO10 which provides 82% TSS removal, achieving an "Enhanced" level of protection (80% TSS Removal).
- **Area 202:** This area requires a EFO12 which provides 82% TSS removal, achieving an "Enhanced" level of protection (80% TSS Removal).

- **Area 203:** This area requires a EFO8 which provides 82% TSS removal, achieving an "Enhanced" level of protection (80% TSS Removal).

Note, the online modelling software / tool PCSWMM for Stormceptor was used to size the OGS units. Sizing reports for the OGS units can be found in **Appendix D**.

6.7 Water Balance

Based on the pre-consultation and discussion with the City of Owen Sound and Grey Sauble Conservation Authority (GSCA), best management efforts / practice will be made to minimize impact on the natural water balance through use of Low Impact Development (LID).

A geotechnical report was completed by WSP, dated July 7th, 2017 (see **Appendix E**) states that the soil composition for the site is not conducive to infiltration; soil composition is as follows:

- Clay: 36%
- Silt: 58%
- Gravel: 0%
- Sand: 6%

It also noted that groundwater was only present in one of twelve boreholes / monitoring wells. Also note, bedrock is present at <2m below the ground surface. Based on these findings, there is little to no need for water balance mitigation on this site.

6.8 Thermal Mitigation

Georgian Bay (Owen Sound) is a cold-water fishery, hence thermal mitigation strategies shall be applied when evaluating stormwater runoff. The following mitigation techniques were reviewed regarding thermal mitigation:

- Stormwater Management Pond
- Cooling Trenches
- Infiltration
- Cooling Chamber
- Increased Plantings (provide shade)

Due to site constraints, a stormwater management pond, cooling trench and infiltration is not feasible. Hence, a cooling chamber was designed to mitigate the thermal impact.

A 10-15mm rain event (runoff volume) makes up approximately 80-90% of all rainfall events during the summer months of the year. Typically, when soils are conducive to infiltration, thermal mitigation measures are designed to this volume. Since this site has soils non-conducive to infiltration, as well as high bed rock, the thermal mitigation chamber will be sized for the 5mm rain event. This is a best-efforts approach to mitigate the thermal impacts from the site.

Bed rock is an excellent source for cooling as it will hold a steady cool temperature during the hot summer months. Therefore, thermal mitigation chambers designed close to the bedrock will be more efficient in mitigating thermal impacts.

Thermal mitigation chambers have been placed in each of the catchment areas (Area 201, 202 & 203). The thermal mitigation chamber sizing can be found in **Table 9** (below) and detail found on the **Stormwater Management Plan (SWM)** and **Side Notes & Detail Plan (SND)** located in **Appendix G**.

Table 9: Thermal Mitigation Chamber Design

Attributes	Area 201	Area 202	Area 203
Chamber Depth (m)	2.10	2.60	1.60
Chamber Volume (m^3)	169	240	113
WSE in Chamber (masl)	181.30	182.70	183.65

Detailed calculations for the thermal mitigation chambers can be found in **Appendix F**.

7.0 CONCLUSIONS

Based on the information presented in this report, it is proposed that the site can be serviced as follows:

Water Servicing

- The Maximum Day demand and Peak Hour demand are 13.54 L/s and 20.32 L/s, respectively. The fire flow requirements are 117 L/s for the 6-storey building and 33 L/s for the amenity building.
- The proposed site will be supplied from the Municipal zone. The 32nd Street East watermains are to be connected together and a pressure reducing valve (PRV) constructed on 9th Avenue near the site south property line.
- The hydraulic analysis by MES confirmed that pipes sized at 150 – 200 mm would meet the pressure requirements.

Sanitary Servicing

- The existing Goodyear SPS and East Bayshore Road SPS are decommissioned, and a new combined sanitary pumping station, approximately 30 m south, on the east side of East Bayshore Road, is constructed.
- The proposed development will be serviced by gravity sewers along 32nd Street East flowing west and East Bayshore Road flowing north to the new East Bayshore Road SPS.
- WSP, who originally completed a sanitary analysis for the area, confirmed that there is sufficient capacity in the gravity sewer system and the new SPS for the addition of 712 units and 2 amenity buildings in our proposed development.

Storm Servicing & Stormwater Management

- The proposed development will attenuate post-development flows to pre-development levels for all outlets using orifices and surface / underground storage. Stormwater flows will be conveyed to the 32nd Street Culvert.
- An Enhanced Level of Protection (80% TSS removal) is provided by the OGS units.
- Water Balance is not achievable due to the site conditions.
- Thermal Mitigation will be achieved through the use of thermal mitigation chambers.

We trust that this information is adequate to support the approval of this project, including lifting the Holding Provision with respect to servicing and stormwater management and site plan approval. If you have any questions, please don't hesitate to contact us.

Regards,

KWA Site Development Consulting Inc.

Per: Ben Jackson, P.Eng.
(416)-984-0970

David Hoover, P.Eng.
(416)-684-4151

APPENDIX A

WATER SERVICING CALCULATIONS

October 21, 2022 Project No. 17015-03

Sent via email
Mr. Rod Alderson
KWA Site Development Consulting
2453 Auckland Drive,
Burlington, ON L7L 7A9

**Subject: Skydev Bayshore Watermain Analysis
City of Owen Sound**

Dear Mr. Alderson,

We are pleased to submit our report entitled "Skydev Bayshore Watermain Analysis" outlining the results of our water distribution analysis for a residential development in the City of Owen Sound.

The findings of our analysis are summarized in the following report.

We trust you find this report satisfactory. Should you have any questions or require further clarification, please call.

Yours truly,

Municipal Engineering Solutions

Per: John C. Bourrie, P.Eng.

/LMC

File Location: D:\Projects\2022\22-019 Owen Sound KWA 17015-03\3.0 Report\Final Report\17015-03 Owen Sound Watermain Analysis_20221020.docx

55 Gilbank Drive, Aurora, Ontario L4G 6H9
Tel: 905.726.1016 Cell: 416.434.0186 Fax: 905.726.1225

SKYDEV BAYSHORE

WATERMAIN ANALYSIS

PREPARED BY:

MUNICIPAL ENGINEERING SOLUTIONS

FOR:

KWA SITE DEVELOPMENT CONSULTING

September 2022

Project Number: 17015-03

TABLE OF CONTENTS

APPENDICES

Section 1 – INTRODUCTION

Municipal Engineering Solutions ("MES") was retained by KWA Site Development Consulting to conduct a hydraulic water analysis for the proposed Skydev Bayshore Development located in the City of Owen Sound. As part of this hydraulic assessment MES was requested to undertake the following:

1. Calculate/verify water demands for the proposed development using City of Owen Sound, provincial and industry design standards;
2. Add the subject watermains/development/boundary information to development water model;
3. Run the model to size the subject mains to achieve service criteria during Minimum Hour, Peak Hour and fire flow during Maximum Day demand; and
4. Prepare a Report summarizing the modeling results for agency review and design purposes.

1.1 Development Background

The Skydev Bayshore site is located between East Bayshore Drive and 9th Avenue, south of 32nd Street East in the City of Owen Sound. The residential development consists of eight (8) low rise buildings with 712 apartments in total along with two amenity buildings. The demands for the site are shown in **Appendix A**. The proposed development is shown below on **Figure 1**.

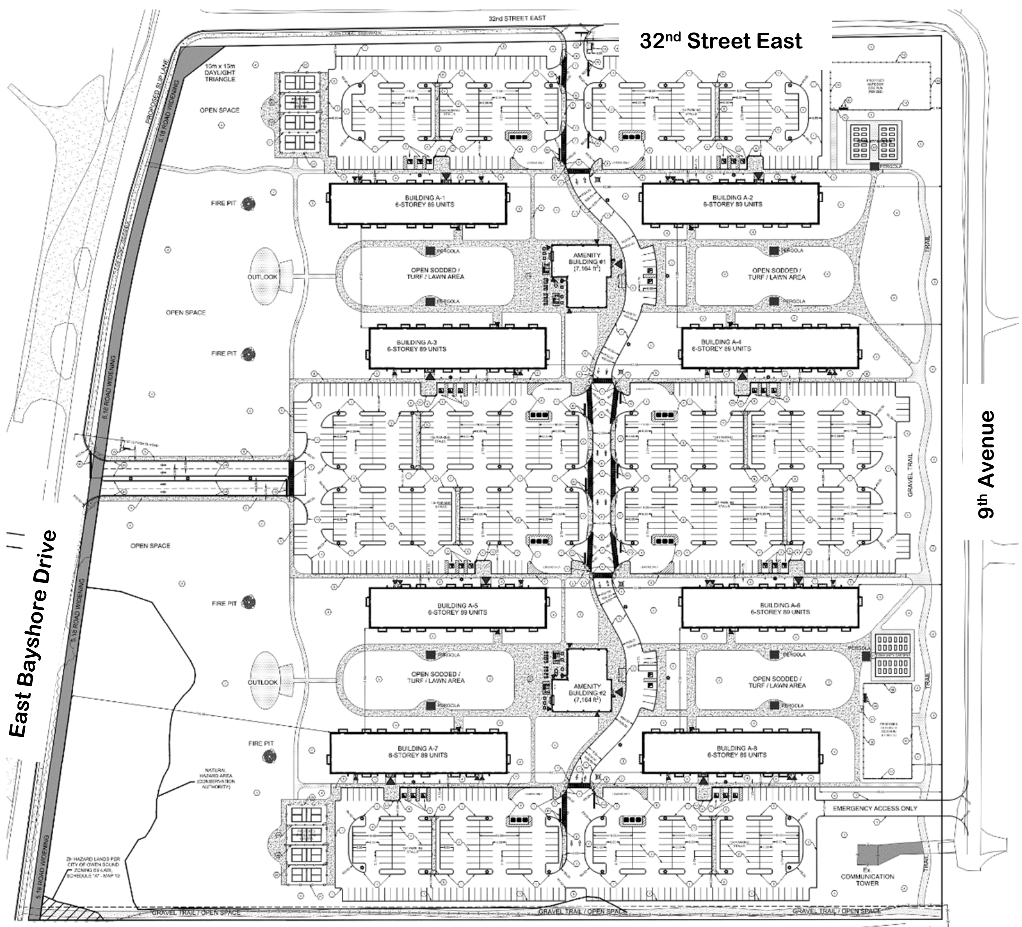


Figure 1 - Proposed Skydev Bayshore Development

Section 2 – WATERMAIN DESIGN CRITERIA

The design criteria utilized to estimate the water demands for the hydraulic water model follows general industry standards and is calculated using the design criteria and guidelines outlined in the East Owen Sound Master Servicing Study 2007, the Ministry of the Environment Conservation and Parks (MECP) Watermain Design Criteria, and the Fire Underwriters Survey.

The following sections summarize the specific design criteria used to carry out the hydraulic watermain assessment for this development.

2.1 Equivalent Population Densities & Water Design Factors

To calculate the equivalent population and water design factors for this development MES used the population densities as noted in the *"Environmental Assessment for the Goodyear Sanitary Pump Station, February 2017"* as utilized for the KWA sanitary calculations. **Table 1** summarizes the population densities. **Table 2** summarizes the average daily demand and peaking factors used for this analysis. For the amenity buildings, an allowance of 25 people per building was considered in line with the sanitary design by KWA.

Table 1 – Equivalent Population Density

Type of Development	Equivalent Population (Persons/Unit)
Apartment	2.3

Source: EA for the Goodyear Sanitary PS 2017

Table 2 - Water Design Factors

Type of Development	Average Daily Demand (L per capita)	Minimum Hour Demand Peaking Factor	Maximum Daily Demand Peaking Factor	Peak Hour Demand Peaking Factor
Residential	397	0.45	1.8	2.7

Source: East Owen Sound MSS 2007 and MECP

Section 3 –FLOW DEMANDS

Utilizing the equivalent population data from **Table 1** and the corresponding Minimum Hour, Peak Hour and Maximum Day data from **Table 2** the water demands for this development were calculated.

3.1 Equivalent Population Flow Demands

The calculated demands for the development are summarized in **Table 3**. For additional details on the development water demands and assigned demand nodes used in the water model see **Appendix A**.

Table 3 – Water Demand for Skydev Bayshore Development

	Average Day Demand (L/S)	Minimum Hour Demand (L/S)	Maximum Day Demand (L/S)	Peak Hour Demand (L/S)
Total	7.75	3.49	13.96	20.94

3.2 Fire Flow Demands

The fire demands were calculated using the Fire Underwriters Survey ("FUS") formula outlined in the `Water Supply For Public Fire Protection Guideline', dated 2020. The fire flows are shown in Table 4. Details on the calculations are in Appendix A.

Table 4 –Fire Flow Requirements

Type of Development	Fire Flow (L/S)
6 Storey Building	117
Amenity Building	33

Source: FUS 2020

For the calculated fire flows in **Table 4,** the FUS formula and GFA's for each building type were used. **Table 5** below summarizes the criteria utilized. Once the detailed designs/configurations (specifics) for these building(s) are finalized the assumptions noted in **Table 5** and in each of the FUS calculations must be reviewed and confirmed by the appropriate designer (architect or sprinkler system designer) and any design/criteria changes required are to be reported to MES so that the actual required fire flows can be confirmed. Building construction and sprinkler systems may need to be designed to suit the available flow and pressure.

Table 5 – FUS Criteria/Assumptions

	6 Storey Buildings	Amenity Buildings
Type of Construction	Non-Combustible	Non-Combustible
Occupancy Type	Limited Combustible	Limited Combustible
Fire Protection (Sprinkler/Firewalls)	Sprinklers	Sprinklers
Area Considered	Footprint Area 1,450 m2 Total Area Considered 8,700 m2	Total Area Considered 665.6 m2

Note: For Additional Information on FUS Criteria Refer to Water Supply for Public Protection Guide, Fire Underwriters Survey, 2020

3.3 External Demands

The model provided by the City contained external demands.

Section 4 – OTHER SYSTEM REQUIREMENTS

4.1 System Pressure Requirements

In addition to meeting the various flow requirements, the system must also satisfy minimum and maximum pressure requirements as outlined by the Ministry of the Environment Conservation and Parks (MECP) Watermain Design Criteria and the Ontario Building Code (OBC). The pressure requirements are outlined below:

1. The minimum system pressure shall not be less than 140 kPa (20 psi) at any point in the water system under fire flow conditions.
2. The minimum operating pressure shall be 275 kPa (40 psi).
3. The maximum operating pressure shall be 700 kPa (100 psi).
4. Normal operating pressure range shall be between 350 to 480 kPa (50 to 70 psi)
5. Where the maximum pressures exceed 550 kPa (80 psi). Pressure reducing valves are required after the water meter.

4.2 Watermain Sizing

The MECP also stipulates that all watermains are adequately sized to maintain demand flows at the required pressures without causing excessive energy loss or result in water quality decay. The watermain system must therefore be designed to accommodate the Maximum day plus fire demand.

For distribution systems providing fire protection the minimum pipe size shall be 150 mm diameter in accordance with Ministry of the Environment Conservation and Parks (MECP) and NFPA requirements.

To provide appropriate fire protection, reliable supply and pressures the water distribution system should be looped wherever possible to improve supply security and water quality and also have two connections to the existing system where possible.

4.3 Watermain C-Factor

In designing and modeling of the pipes the Coefficient of Roughness (C-Factor) factors from the MECP design manual were utilized. The Coefficient of Roughness assigned to each pipe size in summarized in **Table 5** below.

Table 6- Hazen-Williams Coefficient of Roughness (C-Factors)

Size of Pipe (Diameter in mm)	Coefficient of Roughness (C)
150 mm	100
200 mm to 250 mm	110
300 mm to 600 mm	120
Greater Than 600 mm	130

Source: MECP

Section 5 – ANALYSIS & MODELING RESULTS

To conduct the hydraulic water analysis for the proposed development the water demands were estimated by MES using the design criteria previously discussed and incorporated the demands into an InfoWater model based on the EPAnet models provided by the City. The following sections discusses the model setup and results.

5.1 Model Setup

The City of Owen Sound provided EPAnet models for the existing community for both Average Day and Maximum Day demand scenarios. The maximum day model was imported into Infowater for the analysis. The maximum day model is setup as an extended period model with diurnal curves assigned to the demand nodes. The development was input to the Infowater model along with the maximum day demands.

The site is located on the boundary of two pressure districts – Municipal pressure zone and the Industrial pressure zone. After discussions with the City of Owen Sound, changes to the local system were proposed to supply the Skydev Bayshore site from the Municipal zone. The 32nd Street East watermains are to be connected together and a pressure reducing valve constructed on 9th Avenue near the site south property line so that the area has two supply points.

Hydrant tests were completed on July 26, 2022 on East Bayshore Road and 9th Avenue East. The results were compared with the model to confirm the system pressures with the model results. The pressures were in keeping with the model and confirmed that the watermains to be connected were in different pressure zones. See the Appendix for the test results.

The residential diurnal curve utilized in the Municipal zone was copied and edited to suit the peaking factors, **Table 2** above. Results are provided for the minimum hour, peak hour, and maximum day demand periods along with the fire flows from the maximum day hour. For maximum day, timestep Hour 18 was output, for peak hour, timestep Hour 12 and for minimum hour, timestep Hour 3. Friction factor for the pipes were assigned according to **Table 6**.

5.2 Watermain Sizing and System Pressures

The analysis was conducted under Minimum Hour, Maximum Day, and Maximum day plus Fire demands to size the watermains and meet the pressure requirements. The pipes were sized at 150 mm to 200 mm as shown on the schematic in **Appendix B**.

As noted in Section 5.1, the area is currently supplied by two different pressure zones. The existing Industrial zone watermain on 9th Avenue will be moved to the Municipal zone by connecting the existing dead-end sections on 32nd Street East and constructing a pressure reducing valve (PRV) on 9th Avenue near the site south boundary. The PRV setting within the model was set to suit the municipal zone hydraulic grade line but also to allow some flow over the course of the day to ensure that water will flow to the area from both supply points. This setting is an estimate only and the valve must be set to suit field conditions and will need to be adjusted to suit any zone changes to make sure the water is sufficiently turned over to address any potential water quality concerns.

The pressures to the building supply points will be over the OBC limit of 550 kPa (80 psi). The pressures must be taken into consideration in the building mechanical design. Individual pressure reducing valves may be needed to meet the OBC limit.

Modeled service pressures are summarized in Table 6. Fire flow demand can be met based on the assumptions outlined in this report.

Detailed pipe and node tables for the various scenarios modelled are attached to this report in **Appendix B**.

Table 7 - Modeled Service Pressures

Scenario	Minimum Hour	Maximum Day	Peak Hour	Max. Day + Fire
Existing Conditions	605 to 651 kPa (87.7 to 94.5 psi)	587 to 634 kPa (85.1 to 91.9 psi)	585 to 629 kPa (84.9 to 91.2 psi)	131 to 432 L/s @ 140 kPa (20 psi)

Section 6 – CONCLUSIONS/RECOMMENDATIONS

The results are summarized below.

- The service pressures are expected to range from 585 to 651 kPa (84.9 to 94.5 psi) under existing conditions.
- The available fire flow within the site meets or exceeds the fire flow demands as noted in Table 4 at the minimum pressure of 20 psi (140 kPa) based on the proposed watermain configuration.
- A hydrant test must be completed prior to finalizing the building designs and the start of any building construction to confirm system pressures after the zone switch is completed.
- The PRV model setting is an estimate based on the model results. The setting must be confirmed in the field by the City and the setting must allow for the PRV to supply some flow to the area over the course of the day to address possible water quality issues.
- The pressures to the building supply points will be over the OBC limit of 550 kPa (80 psi). The pressures must be taken into consideration in the building mechanical design. Individual pressure reducing valves may be needed to meet the OBC limit.
- Once the building designs/configurations are known for the proposed development the FUS fire flows summarized in Table 4 must be reviewed and confirmed by the designer(s), architect, and mechanical consultant as appropriate to ensure the fire flows used within this report are still valid prior to implementation and construction. It may also be necessary for the building construction or fire protection system to be designed to suit the available flows.
- Required fire flows for all proposed buildings must be confirmed with the appropriate designer (architect or mechanical designer) as well as the City to determine the appropriate level of fire protection required.
- Confirmation and/or changes to the criteria should also be provided to and reviewed with MES prior to the finalization of the detailed design drawings and construction of the watermain system. Final design parameters are to be provided to MES prior to construction for further review to confirm that the actual (final) site conditions and building design(s) reflect those modeled by MES within this report.
- This report, including all modeling assumptions used, is to be submitted to and reviewed by the water operating authority (municipality) to confirm that the modeling parameters used are acceptable to the operating authority and/or confirm if modified domestic or fire flow requirements are required or should be implemented for this particular development.

Appendix A

Demands

Owen Sound Design Criteria
(East Owen Sound MSS 2007 unless otherwise stated)

Equivalent Population by Unit

(22017 EA for the Goodyear Sanitary PS, WSP)

Type of Development	Equivalent Population Density
	(Person/Unit)
Single Family or Semi-Detached	2.30
Townhouse	2.30
Apartment	2.30

Equivalent Population by Area

Type of Development	Equivalent Population Density
	(Person/Hectare)
Future Residential	48.30
Commercial Areas	24.40
Industrial Areas	48.90

Water Design Factors

Average Daily Demand (m3/capita)	0.397	
Minimum Hourly Demand P.F.	0.45	MECP (1001-2000)
Maximum Daily Demand P.F.	1.8	
Maximum Hourly Demand P.F.		
Residential	*2.7*	
I/C/I	*2.7*	

Cofficient of Roughness (MECP)

Size of Pipe (mm Dia.)	Coefficient of Roughness (C)
150	100
200-250	110
300-600	120
Over 600	130

Minimum Pipe Size

Type of Development	Size of Pipe (mm Dia.)
Designed for Fire Protection	150
Domestic supply only	75

Working Pressures

Parameter	Pressure
Normal Condition	
Minimum Pressure	375kPa (40 psi)
Maximum (Building Code)	550 kPa (80 psi)
Maximum	700 kPa (100 psi)
Fire Flow Conditions	
Minimum Pressure	140 kPa (20 psi)

Water Demand
Skydev Owen Sound, ON
October 19, 2022

Municipal Engineering Solutions

Node	Connection	Elevation	Type of Development			Equivalent Population		Demands				Fire Flow Demands
			Apartments	Commercial	Industrial	Total Population	Total Population	ADD	MHD	MDD	PHD	
		(m)	*(units)*	*(ha)*	*(ha)*	*(Residential)*	*(ICI)*	*(L/s)*	*(L/s)*	*(L/s)*	*(L/s)*	*(L/s)*
HYD-300	Hydrant	185.68				0	0	0.00	0.00	0.00	0.00	117
HYD-301	Hydrant	184.95				0	0	0.00	0.00	0.00	0.00	117
HYD-302	Hydrant	186.45				0	0	0.00	0.00	0.00	0.00	117
HYD-303	Hydrant	186.00				0	0	0.00	0.00	0.00	0.00	117
HYD-304	Hydrant	186.30				0	0	0.00	0.00	0.00	0.00	117
HYD-305	Hydrant	185.95				0	0	0.00	0.00	0.00	0.00	117
HYD-306	Hydrant	187.50				0	0	0.00	0.00	0.00	0.00	117
HYD-307	Hydrant	187.50				0	0	0.00	0.00	0.00	0.00	117
HYD-308	Hydrant	186.10				0	0	0.00	0.00	0.00	0.00	117
J-SD-100		186.32				0	0	0.00	0.00	0.00	0.00	
J-SD-101		185.53				0	0	0.00	0.00	0.00	0.00	
J-SD-102		185.70				0	0	0.00	0.00	0.00	0.00	
J-SD-103	A-2 Fire	186.00				0	0	0.00	0.00	0.00	0.00	117
J-SD-104	A-2 Domestic	186.00	89			205	0	0.94	0.42	1.69	2.54	
J-SD-105		185.53				0	0	0.00	0.00	0.00	0.00	
J-SD-106		185.00				0	0	0.00	0.00	0.00	0.00	
J-SD-107	Amenity #1	186.30				25	0	0.11	0.05	0.21	0.31	33
J-SD-108		184.80				0	0	0.00	0.00	0.00	0.00	
J-SD-109		185.00				0	0	0.00	0.00	0.00	0.00	
J-SD-110	A-1 Fire	185.50				0	0	0.00	0.00	0.00	0.00	117
J-SD-111	A-1 Domestic	185.50	89			205	0	0.94	0.42	1.69	2.54	
J-SD-112		188.00				0	0	0.00	0.00	0.00	0.00	
J-SD-113		186.30				0	0	0.00	0.00	0.00	0.00	
J-SD-114		186.30				0	0	0.00	0.00	0.00	0.00	
J-SD-115		186.80				0	0	0.00	0.00	0.00	0.00	
J-SD-116	A-4 Fire	187.00				0	0	0.00	0.00	0.00	0.00	117
J-SD-117	A-4 Domestic	187.00	89			205	0	0.94	0.42	1.69	2.54	
J-SD-118		186.05				0	0	0.00	0.00	0.00	0.00	
J-SD-119		186.30				0	0	0.00	0.00	0.00	0.00	
J-SD-120	A-3 Fire	186.50				0	0	0.00	0.00	0.00	0.00	117
J-SD-121	A-3 Domestic	186.50	89			205	0	0.94	0.42	1.69	2.54	
J-SD-122		186.35				0	0	0.00	0.00	0.00	0.00	
J-SD-123		187.55				0	0	0.00	0.00	0.00	0.00	
J-SD-124		186.70				0	0	0.00	0.00	0.00	0.00	
J-SD-125	A-6 Fire	187.00				0	0	0.00	0.00	0.00	0.00	117
J-SD-126	A-6 Domestic	187.00	89			205	0	0.94	0.42	1.69	2.54	
J-SD-127		186.15				0	0	0.00	0.00	0.00	0.00	
J-SD-128		186.10				0	0	0.00	0.00	0.00	0.00	
J-SD-129	Amenity #2	187.25				25	0	0.11	0.05	0.21	0.31	33
J-SD-130		185.80				0	0	0.00	0.00	0.00	0.00	
J-SD-131		186.40				0	0	0.00	0.00	0.00	0.00	
J-SD-132	A-5 Fire	186.50				0	0	0.00	0.00	0.00	0.00	117
J-SD-133	A-5 Domestic	186.50	89			205	0	0.94	0.42	1.69	2.54	
J-SD-134		188.64				0	0	0.00	0.00	0.00	0.00	
J-SD-135		187.40				0	0	0.00	0.00	0.00	0.00	
J-SD-136		187.40				0	0	0.00	0.00	0.00	0.00	
J-SD-137		187.70				0	0	0.00	0.00	0.00	0.00	
J-SD-138	A-8 Fire	188.00				0	0	0.00	0.00	0.00	0.00	117
J-SD-139	A-8 Domestic	188.00	89			205	0	0.94	0.42	1.69	2.54	
J-SD-140		187.40				0	0	0.00	0.00	0.00	0.00	
J-SD-141		187.80				0	0	0.00	0.00	0.00	0.00	
J-SD-142	A-7 Fire	188.00				0	0	0.00	0.00	0.00	0.00	117
J-SD-143	A-7 Domestic	188.00	89			205	0	0.94	0.42	1.69	2.54	
J-SD-144		186.20				0	0	0.00	0.00	0.00	0.00	
Total			**712**	**0**	**0**	**1688**	**0**	**7.75**	**3.49**	**13.96**	**20.94**	

Calculations are based on "Water Supply for Public Fire Protection Guide" by Fire Underwriters Survey Dated 2020

Municipal Engineering Solutions

FUS CALCULATION

Project:	Skydev Owen Sound	**Building Type/Block #**	Typical Res Bldg A1 - 6 Storey
Project Number:	17015-03	**Firewalls/Sprinkler:**	
Project Location:	Owen Sound	**Number of Units/Unit #'s**	89
Date:	01-Sep-22		

1.0 FUS Formula

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

where: RFF = required fire flow in litres per minute;
C = the Coefficient related to the type of construction; and
A = the Total Effective Floor Area in square metres (excluding basements at least 50% below grade) [a]

NBC Occupancy	Group C
Type of Construction [b]	Noncombustible Construction (Type II)
Footprint area	1450.0 sq. metres
Storeys	6
C =	0.8
A =	8700.0 Total Effective Area [a]
F =	**16000 L/min** (rounded)

2.0 Occupancy Adjustment

Type of Occupancy [c]	Limited Combustible
Hazard Allowance	-0.15
	-2400 L/min
Adjusted Fire Flow	**13600 L/min**

3.0 Sprinkler Adjustment

		Credit	Total
NFPA 13 sprinkler standard	YES	30%	50%
Standard Water Supply	YES	10%	
Fully Supervised system	YES	10%	

Sprinkler Credit 6800 L/min

4.0 Exposure Adjustment

Construction Type of the Exposed Building Face: Type II (unprotected openings)

North Side		Percent	Total*
Distance to Building (m)	over 30	0%	0%
Length (m) by height in storeys	over 100		
South Side			
Distance to Building (m)	over 30	0%	
Length (m) by height in storeys	over 100		
East Side			
Distance to Building (m)	over 30	0%	
Length (m) by height in storeys	0 to 20		
West Side			
Distance to Building (m)	over 30	0%	
Length (m) by height in storeys	0 to 20		

*max 75%

Exposures Surcharge 0 L/min

Total Required Fire Flow (rounded)	**7000 L/min**
	117 L/sec

a) For buildings buildings with a construction coefiicinet from 1.0 to 1.5, consider 100% of all floor areas. For buildings with a construction coefficient below 1.0 (vertical openings are inadequately protected), consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to a maximum of eight. If the vertical openings and exterior vertical communications are properly protected, consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors.
b) Wood Frame=1.5, Mass Timber= 0.8 to 1.5, Ordinary=1.0, Noncombustible=0.8, Fire-Resistive=0.6
c) Noncombustible=-25%, Limited Combustible=-15%, Combustible=0%, Free Burning=+15%, Rapid Burning=+25%

55 Gilbank Drive, Aurora, Ontario L4G 6H9
Tel: 905.726.1016 Cell: 416.434.0186 Fax: 905.726.1225

Calculations are based on "Water Supply for Public Fire Protection Guide" by Fire Underwriters Survey Dated 2020

Municipal Engineering Solutions

FUS CALCULATION

Project:	Skydev Owen Sound	**Building Type/Block #**	Amenity Bldg - 1 Storey
Project Number:	17015-03	**Firewalls/Sprinkler:**	
Project Location:	Owen Sound	**Number of Units/Unit #'s**	
Date:	01-Sep-22		

1.0 FUS Formula

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

where: RFF = required fire flow in litres per minute;
C = the Coefficient related to the type of construction; and
A = the Total Effective Floor Area in square metres (excluding basements at least 50% below grade) [a]

NBC Occupancy	Group A	
Type of Construction [b]	Noncombustible Construction (Type II)	
Footprint area	665.6	sq. metres
Storeys	1	
C =	0.8	
A =	665.6	Total Effective Area [a]
F =	**5000**	**L/min** (rounded)

2.0 Occupancy Adjustment

Type of Occupancy [c]	Limited Combustible	
Hazard Allowance	-0.15	
	-750	L/min
Adjusted Fire Flow	**4250**	**L/min**

3.0 Sprinkler Adjustment

		Credit	Total
NFPA 13 sprinkler standard	YES	30%	50%
Standard Water Supply	YES	10%	
Fully Supervised system	YES	10%	

Sprinkler Credit **2125 L/min**

4.0 Exposure Adjustment

Construction Type of the Exposed Building Face: Type II (unprotected openings)

		Percent	Total*
North Side			0%
Distance to Building (m)	over 30	0%	
Length (m) by height in storeys	21 to 40		
South Side			
Distance to Building (m)	over 30	0%	
Length (m) by height in storeys	21 to 40		
East Side			
Distance to Building (m)	over 30	0%	
Length (m) by height in storeys	21 to 40		
West Side			
Distance to Building (m)	over 30	0%	
Length (m) by height in storeys	21 to 40		

*max 75%

Exposures Surcharge **0 L/min**

Total Required Fire Flow (rounded)	**2000 L/min**
	33 L/sec

a) For buildings buildings with a construction coefiicinet from 1.0 to 1.5, consider 100% of all floor areas. For buildings with a construction coefficient below 1.0 (vertical openings are inadequately protected), consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to a maximum of eight. If the vertical openings and exterior vertical communications are properly protected, consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors.
b) Wood Frame=1.5, Mass Timber= 0.8 to 1.5, Ordinary=1.0, Noncombustible=0.8, Fire-Resistive=0.6
c) Noncombustible=-25%, Limited Combustible=-15%, Combustible=0%, Free Burning=+15%, Rapid Burning=+25%

55 Gilbank Drive, Aurora, Ontario L4G 6H9
Tel: 905.726.1016 Cell: 416.434.0186 Fax: 905.726.1225

Appendix B

Boundary Information

Hydrant Flow Test Report

Residual Hydrant Number ____________

watermark
water loss management

Operator: Colin Powell

Date: 26-Jul-22 Time: 9:15 AM

Witness: City of Owen Sound

Residual Test Hydrant:	East Bayshore Road (S of 32nd St.)
Hydrant Number:	1A-182
Owner:	Owen Sound

NFPA Colour Code: **CLASS AA - BLUE**

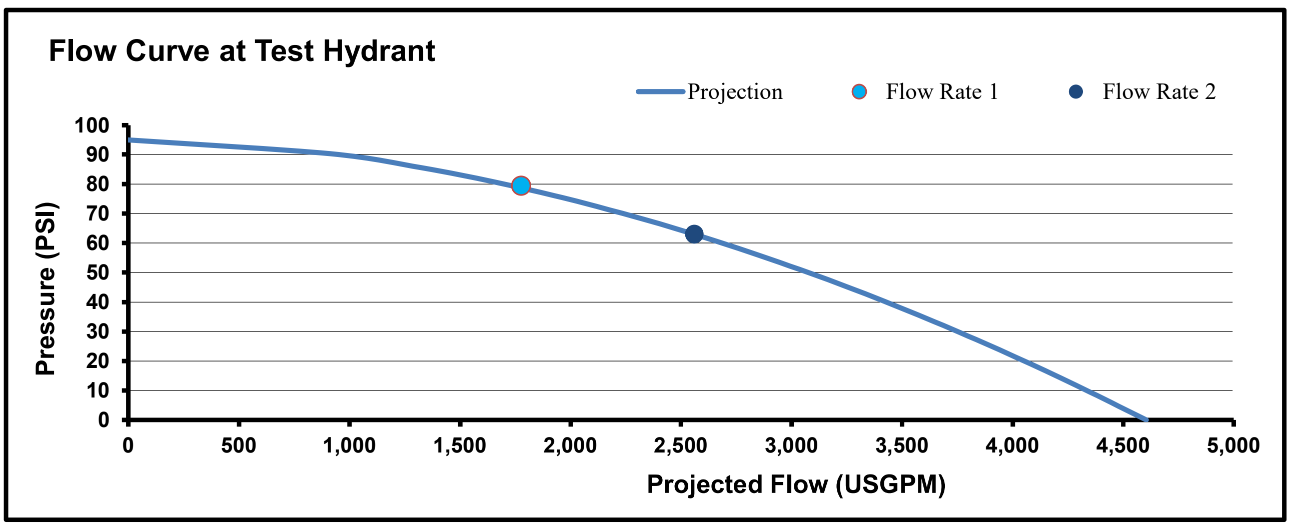
	psi	kPa	Pressure Drop
STATIC PRESSURE:	95 psi	655 kPa	
RESIDUAL PRESSURE 1:	79.5 psi	548 kPa	16.3%
RESIDUAL PRESSURE 2:	63 psi	434 kPa	33.7%

Flow Hydrants:

		Hydrant Number
A	359000 East Bayshore Road	1A183
B	359038 East Bayshore Road	1A-39
C		

Hydrant No.	Flow Device	Outlet Dia. (in.)	Flow Rate 1 Reading (psi)	Flow Rate 1 (USGPM)	Flow Rate 2 Reading (psi)	Flow Rate 2 (USGPM)
B	Pitot	2.5		0	15	604
B	Pitot	2.5		0	15	604
A	HoseMonster	4"		1775	1475	1350
Total Flow (USGPM)			1775		2558	
Total Flow (L/second)			112		161	
Available Flow At Test Hydrant at 20 ps			4,159	USGPM	4,052	USGPM
			262	L/second	256	L/second

Average Projection at 20 PSI: 4,106 USGPM



Comments/Discrepencies/Diagram:

Watermark Solutions Limited
(705) 250-0368 www.watermark.ca

Hydrant Flow Test Report

Residual Hydrant Number ____________

Operator: Colin Powell

Date: 26-Jul-22 Time: 9:52 AM

Witness: City of Owen Sound

Residual Test Hydrant:	9th Ave East
Hydrant Number:	1C-232
Owner:	City of Owen Sound

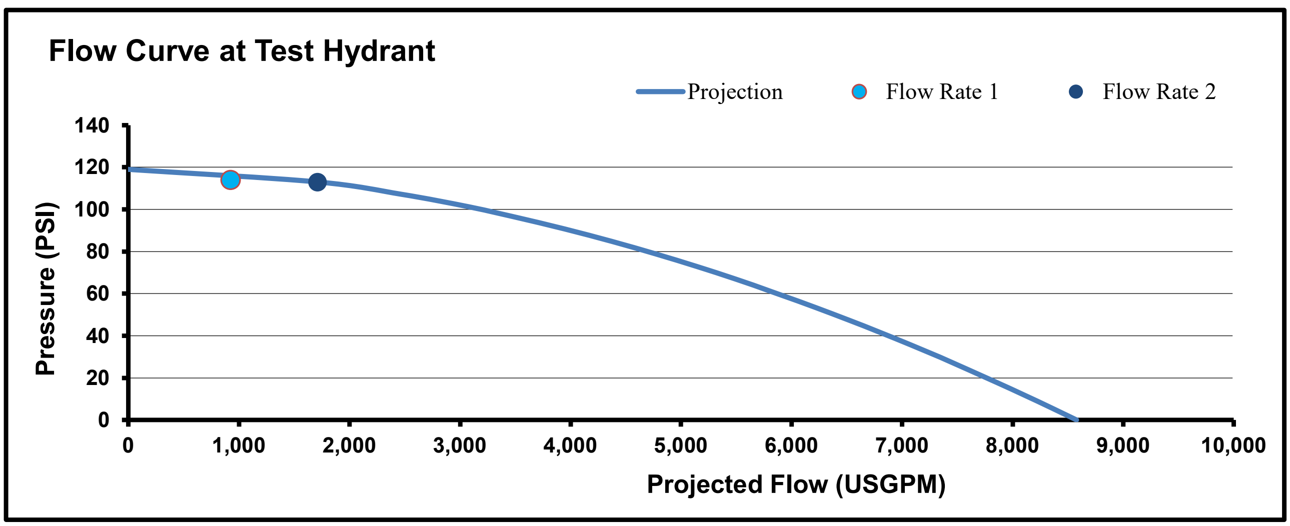
NFPA Colour Code: **CLASS AA - BLUE**

STATIC PRESSURE:	119 psi	820 kPa	Pressure Drop
RESIDUAL PRESSURE 1:	114 psi	786 kPa	4.2%
RESIDUAL PRESSURE 2:	113 psi	779 kPa	5.0%

Flow Hydrants:			**Hydrant Number**
	A	9th Ave East	1C-40
	B		
	C		

Hydrant No.	Flow Device	Outlet Dia. (in.)	Flow Rate 1 Reading (psi)	Flow Rate 1 (USGPM)	Flow Rate 2 Reading (psi)	Flow Rate 2 (USGPM)
A	Pitot	2.5	35	923	30	854
A	Pitot	2.5		0	30	854
A	HoseMonster	4"		0		
Total Flow (USGPM)			923		1709	
Total Flow (L/second)			58		108	
Available Flow At Test Hydrant at 20 ps			4,628	USGPM	7,765	USGPM
			292	L/second	490	L/second

Average Projection at 20 PSI: 6,196 USGPM



Comments/Discrepencies/Diagram:

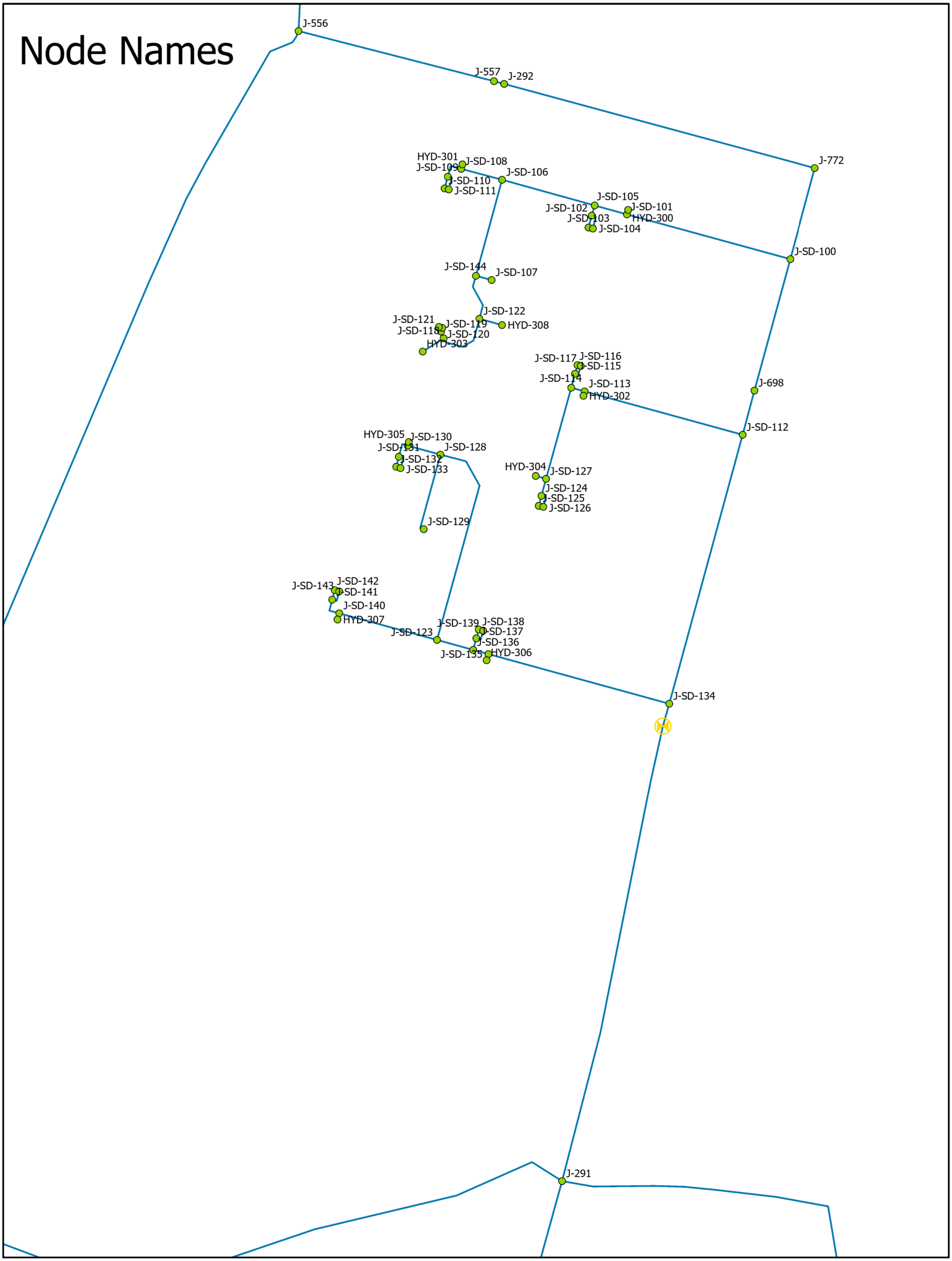
Assuming booster pumps were called on during Flow Rate 2

Watermark Solutions Limited
(705) 250-0368 www.watermark.ca

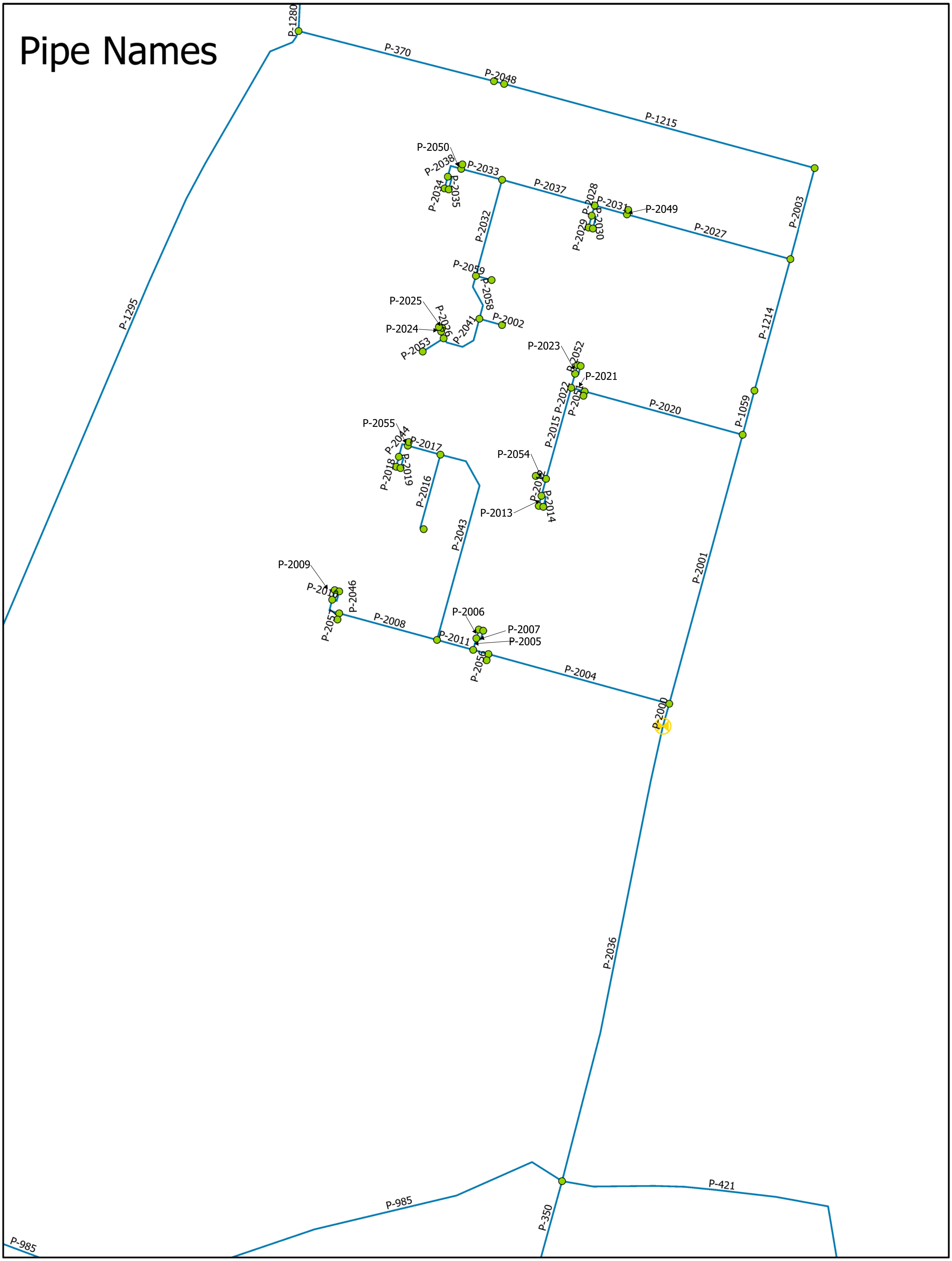
Appendix C

Model Results

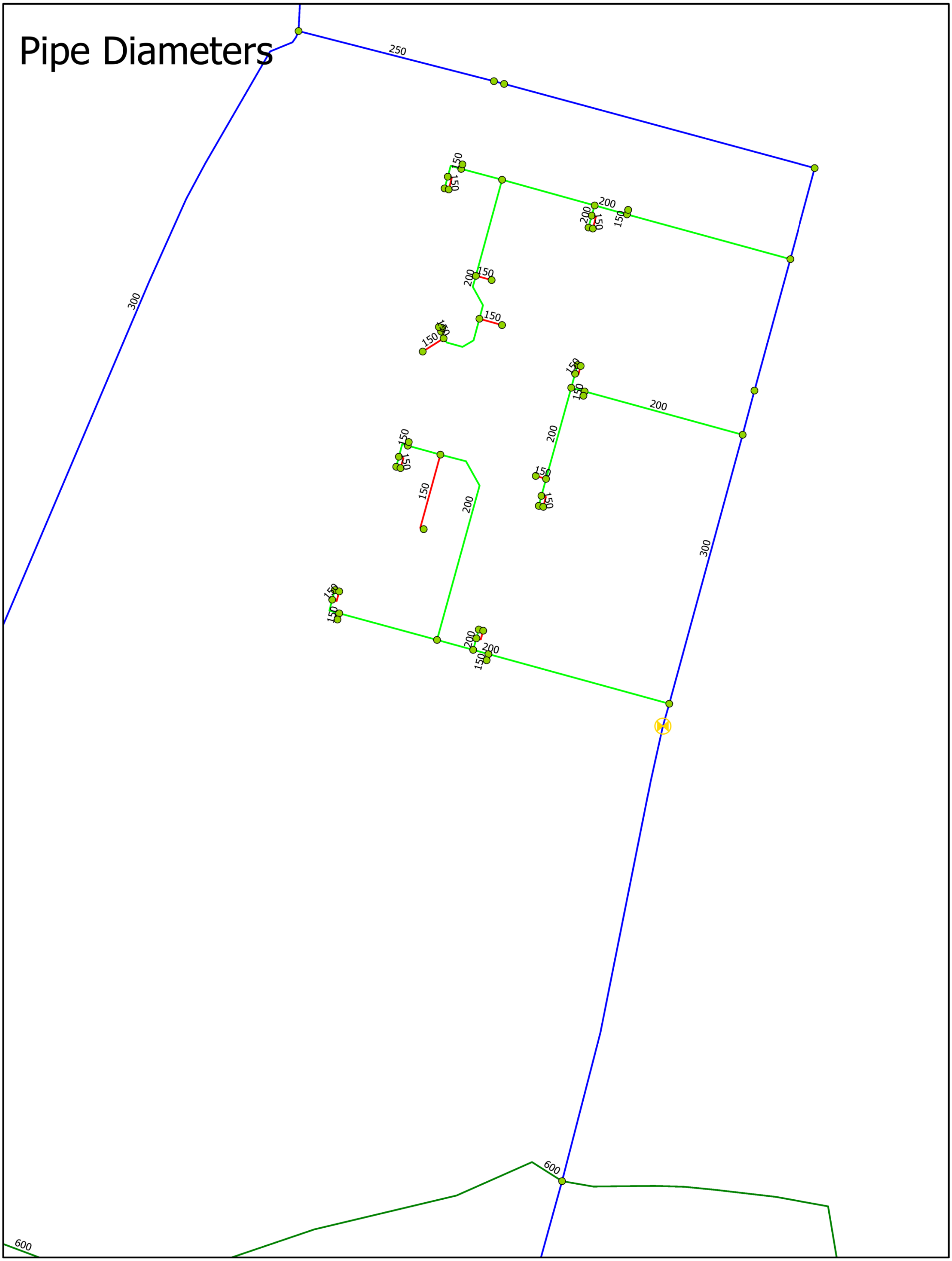
Node Names


J-556
J-557
J-292
J-772
HYD-301
J-SD-108
J-SD-109
J-SD-106
J-SD-110
J-SD-111
J-SD-105
J-SD-102
J-SD-101
J-SD-103
HYD-300
J-SD-104
J-SD-100
J-SD-144
J-SD-107
J-SD-122
J-SD-121
J-SD-119
HYD-308
J-SD-118
J-SD-120
HYD-303
J-SD-117
J-SD-116
J-SD-115
J-SD-114
J-SD-113
HYD-302
J-698
J-SD-112
HYD-305
J-SD-130
J-SD-131
J-SD-128
J-SD-132
J-SD-133
HYD-304
J-SD-127
J-SD-124
J-SD-125
J-SD-126
J-SD-129
J-SD-143
J-SD-142
J-SD-141
J-SD-140
HYD-307
J-SD-123
J-SD-139
J-SD-138
J-SD-137
J-SD-136
J-SD-135
HYD-306
J-SD-134
J-291

Pipe Names


P-1280
P-370
P-2048
P-1215
P-1295
P-2050
P-2038
P-2033
P-2034
P-2035
P-2037
P-2028
P-2031
P-2049
P-2029
P-2030
P-2027
P-2003
P-2032
P-2059
P-2058
P-2025
P-2026
P-2024
P-2041
P-2002
P-2053
P-1214
P-2023
P-2052
P-2021
P-2022
P-2051
P-2020
P-1059
P-2015
P-2055
P-2044
P-2017
P-2018
P-2019
P-2016
P-2054
P-2012
P-2014
P-2013
P-2043
P-2001
P-2009
P-2010
P-2046
P-2057
P-2008
P-2006
P-2007
P-2005
P-2011
P-2056
P-2004
P-2000
P-2036
P-421
P-985
P-350
P-985

Pipe Diameters



2020 Conditions
SkyDev, Owen Sound ON
October 20, 2022

Municipal Engineering Solutions

Minimum Hour

Node Table

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
HYD-300	0.00	185.68	250.48	633.72
HYD-301	0.00	184.95	250.48	640.85
HYD-302	0.00	186.45	250.48	626.21
HYD-303	0.00	186.00	250.48	630.58
HYD-304	0.00	186.30	250.48	627.67
HYD-305	0.00	185.95	250.48	631.08
HYD-306	0.00	187.50	250.48	615.93
HYD-307	0.00	187.50	250.48	615.93
HYD-308	0.00	186.10	250.48	629.60
J-291	0.00	189.30	275.14	839.52
J-292	0.21	183.88	250.49	651.38
J-557	0.00	183.91	250.49	651.09
J-698	0.00	187.85	250.48	612.52
J-772	0.00	186.65	250.48	624.27
J-SD-100	0.00	186.32	250.48	627.49
J-SD-101	0.00	185.53	250.48	635.19
J-SD-102	0.00	185.70	250.48	633.52
J-SD-103	0.00	186.00	250.48	630.59
J-SD-104	0.42	186.00	250.48	630.59
J-SD-105	0.00	185.53	250.48	635.19
J-SD-106	0.00	185.00	250.48	640.36
J-SD-107	0.05	186.30	250.48	627.65
J-SD-108	0.00	184.80	250.48	642.32
J-SD-109	0.00	185.00	250.48	640.36
J-SD-110	0.00	185.50	250.48	635.47
J-SD-111	0.42	185.50	250.48	635.47
J-SD-112	0.00	188.00	250.48	611.05
J-SD-113	0.00	186.30	250.48	627.68
J-SD-114	0.00	186.30	250.48	627.68
J-SD-115	0.00	186.80	250.48	622.79
J-SD-116	0.00	187.00	250.48	620.83
J-SD-117	0.42	187.00	250.48	620.83
J-SD-118	0.00	186.05	250.48	630.09
J-SD-119	0.00	186.30	250.48	627.65
J-SD-120	0.00	186.50	250.48	625.69
J-SD-121	0.42	186.50	250.48	625.69
J-SD-122	0.00	186.35	250.48	627.16
J-SD-123	0.00	187.55	250.48	615.44
J-SD-124	0.00	186.70	250.48	623.76
J-SD-125	0.00	187.00	250.48	620.83
J-SD-126	0.42	187.00	250.48	620.83
J-SD-127	0.00	186.15	250.48	629.14
J-SD-128	0.00	186.10	250.48	629.62
J-SD-129	0.05	187.25	250.48	618.37
J-SD-130	0.00	185.80	250.48	632.55
J-SD-131	0.00	186.40	250.48	626.68
J-SD-132	0.00	186.50	250.48	625.70
J-SD-133	0.42	186.50	250.48	625.70
J-SD-134	0.00	188.64	250.48	604.79
J-SD-135	0.00	187.40	250.48	616.91
J-SD-136	0.00	187.40	250.48	616.91
J-SD-137	0.00	187.70	250.48	613.97
J-SD-138	0.00	188.00	250.48	611.04
J-SD-139	0.42	188.00	250.48	611.04
J-SD-140	0.00	187.40	250.48	616.90
J-SD-141	0.00	187.80	250.48	612.99
J-SD-142	0.00	188.00	250.48	611.04
J-SD-143	0.42	188.00	250.48	611.04
J-SD-144	0.00	186.20	250.48	628.63

MIN		**183.88**		**604.79**
MAX		**189.30**		**839.52**

Pipe Table

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness (C)	Flow (L/s)	Velocity (m/s)
P-1059	J-698	J-SD-112	30.13	300	130	2.17	0.03
P-1214	J-SD-100	J-698	89.75	300	130	2.17	0.03
P-1215	J-772	J-292	199.81	300	130	-3.49	0.05
P-2000	V8000	J-SD-134	15.35	300	130	0.00	0.00
P-2001	J-SD-112	J-SD-134	282.62	300	130	1.32	0.02
P-2002	J-SD-122	HYD-308	15.48	150	100	0.00	0.00
P-2003	J-772	J-SD-100	62.12	300	130	3.49	0.05
P-2004	J-SD-134	J-SD-135	14.19	200	110	1.32	0.04
P-2005	J-SD-136	J-SD-137	7.88	200	110	0.42	0.01
P-2006	J-SD-137	J-SD-138	6.01	200	110	0.00	0.00
P-2007	J-SD-137	J-SD-139	8.99	150	100	0.42	0.02
P-2008	J-SD-123	J-SD-140	66.78	200	110	0.42	0.01
P-2009	J-SD-141	J-SD-142	6.51	200	110	0.00	0.00
P-2010	J-SD-143	J-SD-141	9.56	150	100	-0.42	0.02
P-2011	J-SD-136	J-SD-123	24.71	200	110	0.90	0.03
P-2012	J-SD-127	J-SD-124	47.26	200	110	0.42	0.01
P-2013	J-SD-124	J-SD-125	6.83	200	110	0.00	0.00
P-2014	J-SD-124	J-SD-126	9.73	150	100	0.42	0.02
P-2015	J-SD-127	J-SD-114	80.09	200	110	-0.42	0.01
P-2016	J-SD-128	J-SD-129	52.48	150	100	0.05	0.00
P-2017	J-SD-128	J-SD-130	22.30	200	110	0.42	0.01
P-2018	J-SD-131	J-SD-132	6.85	200	110	0.00	0.00
P-2019	J-SD-133	J-SD-131	9.99	150	100	-0.42	0.02
P-2020	J-SD-112	J-SD-113	13.56	200	110	0.85	0.03
P-2021	J-SD-113	J-SD-114	9.14	200	110	0.85	0.03
P-2022	J-SD-114	J-SD-115	9.58	200	110	0.42	0.01
P-2023	J-SD-115	J-SD-116	5.89	200	110	0.00	0.00
P-2024	J-SD-121	J-SD-119	4.75	150	100	-0.42	0.02
P-2025	J-SD-119	J-SD-120	2.53	200	110	0.00	0.00
P-2026	J-SD-119	J-SD-118	5.25	200	110	-0.42	0.01
P-2027	J-SD-100	J-SD-101	111.63	200	110	1.32	0.04
P-2028	J-SD-105	J-SD-102	23.22	200	110	0.42	0.01
P-2029	J-SD-102	J-SD-103	8.14	200	110	0.00	0.00
P-2030	J-SD-102	J-SD-104	10.76	150	100	0.42	0.02
P-2031	J-SD-101	J-SD-105	22.05	200	110	1.32	0.04
P-2032	J-SD-106	J-SD-144	65.58	200	110	0.48	0.02
P-2033	J-SD-106	J-SD-108	27.87	200	110	0.42	0.01
P-2034	J-SD-109	J-SD-110	8.02	200	110	0.00	0.00
P-2035	J-SD-109	J-SD-111	10.60	150	100	0.42	0.02
P-2036	J-291	V8000	307.21	300	130	0.00	0.00
P-2037	J-SD-105	J-SD-106	63.31	200	110	0.90	0.03
P-2038	J-SD-108	J-SD-109	14.56	200	110	0.42	0.01
P-2041	J-SD-118	J-SD-122	37.40	200	110	-0.42	0.01
P-2043	J-SD-128	J-SD-123	141.18	200	110	-0.47	0.02
P-2044	J-SD-130	J-SD-131	12.38	200	110	0.42	0.01
P-2045	J-SD-135	J-SD-136	10.42	200	110	1.32	0.04
P-2046	J-SD-140	J-SD-141	14.17	200	110	0.42	0.01
P-2048	J-557	J-292	6.94	300	120	3.69	0.05
P-2049	J-SD-101	HYD-300	22.25	150	100	0.00	0.00
P-2050	J-SD-108	HYD-301	3.06	150	100	0.00	0.00
P-2051	J-SD-113	HYD-302	2.97	150	100	0.00	0.00
P-2052	J-SD-117	J-SD-115	8.06	150	100	-0.42	0.02
P-2053	J-SD-118	HYD-303	16.29	150	100	0.00	0.00
P-2054	J-SD-127	HYD-304	7.06	150	100	0.00	0.00
P-2055	J-SD-130	HYD-305	2.47	150	100	0.00	0.00
P-2056	J-SD-135	HYD-306	4.24	150	100	0.00	0.00
P-2057	J-SD-140	HYD-307	4.24	150	100	0.00	0.00
P-2058	J-SD-144	J-SD-122	30.60	200	110	0.42	0.01
P-2059	J-SD-144	J-SD-107	10.71	150	100	0.05	0.00

Valve Table

ID	Diameter (mm)	Elevation (m)	Upstream Pressure (psi)	Downstream Pressure (psi)	Flow (L/s)	Velocity (m/s)	Headloss (m)
V8000	250	189.12	841.29	600.10	0.00	0.00	0.00

Maximum Day

Node Table

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
HYD-300	0.00	185.68	248.64	615.68
HYD-301	0.00	184.95	248.62	622.67
HYD-302	0.00	186.45	248.66	608.35
HYD-303	0.00	186.00	248.62	612.36
HYD-304	0.00	186.30	248.65	609.78
HYD-305	0.00	185.95	248.63	613.02
HYD-306	0.00	187.50	248.65	597.98
HYD-307	0.00	187.50	248.64	597.90
HYD-308	0.00	186.10	248.62	611.39
J-291	0.00	189.30	275.09	838.98
J-292	0.35	183.88	248.71	634.01
J-557	0.00	183.91	248.71	633.73
J-698	0.00	187.85	248.66	594.69
J-772	0.00	186.65	248.68	606.59
J-SD-100	0.00	186.32	248.67	609.72
J-SD-101	0.00	185.53	248.64	617.14
J-SD-102	0.00	185.70	248.63	615.42
J-SD-103	0.00	186.00	248.63	612.48
J-SD-104	1.69	186.00	248.63	612.47
J-SD-105	0.00	185.53	248.63	617.09
J-SD-106	0.00	185.00	248.62	622.19
J-SD-107	0.21	186.30	248.62	609.45
J-SD-108	0.00	184.80	248.62	624.13
J-SD-109	0.00	185.00	248.62	622.17
J-SD-110	0.00	185.50	248.62	617.28
J-SD-111	1.69	185.50	248.62	617.27
J-SD-112	0.00	188.00	248.66	593.20
J-SD-113	0.00	186.30	248.66	609.81
J-SD-114	0.00	186.30	248.65	609.80
J-SD-115	0.00	186.80	248.65	604.91
J-SD-116	0.00	187.00	248.65	602.95
J-SD-117	1.69	187.00	248.65	602.94
J-SD-118	0.00	186.05	248.62	611.87
J-SD-119	0.00	186.30	248.62	609.42
J-SD-120	0.00	186.50	248.62	607.47
J-SD-121	1.69	186.50	248.61	607.46
J-SD-122	0.00	186.35	248.62	608.95
J-SD-123	0.00	187.55	248.64	597.43
J-SD-124	0.00	186.70	248.65	605.85
J-SD-125	0.00	187.00	248.65	602.92
J-SD-126	1.69	187.00	248.65	602.90
J-SD-127	0.00	186.15	248.65	611.24
J-SD-128	0.00	186.10	248.63	611.56
J-SD-129	0.21	187.25	248.63	600.31
J-SD-130	0.00	185.80	248.63	614.48
J-SD-131	0.00	186.40	248.63	608.61
J-SD-132	0.00	186.50	248.63	607.63
J-SD-133	1.69	186.50	248.63	607.62
J-SD-134	0.00	188.64	248.65	586.87
J-SD-135	0.00	187.40	248.65	598.96
J-SD-136	0.00	187.40	248.64	598.93
J-SD-137	0.00	187.70	248.64	595.99
J-SD-138	0.00	188.00	248.64	593.06
J-SD-139	1.69	188.00	248.64	593.05
J-SD-140	0.00	187.40	248.64	598.88
J-SD-141	0.00	187.80	248.64	594.96
J-SD-142	0.00	188.00	248.64	593.00
J-SD-143	1.69	188.00	248.64	592.99
J-SD-144	0.00	186.20	248.62	610.43

MIN		**183.88**		**586.87**
MAX		**189.30**		**838.98**

Pipe Table

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness (C)	Flow (L/s)	Velocity (m/s)
P-1059	J-698	J-SD-112	30.13	300	130	8.66	0.12
P-1214	J-SD-100	J-698	89.75	300	130	8.66	0.12
P-1215	J-772	J-292	199.81	300	130	-13.94	0.20
P-2000	V8000	J-SD-134	15.35	300	130	0.00	0.00
P-2001	J-SD-112	J-SD-134	282.62	300	130	5.28	0.07
P-2002	J-SD-122	HYD-308	15.48	150	100	0.00	0.00
P-2003	J-772	J-SD-100	62.12	300	130	13.94	0.20
P-2004	J-SD-134	J-SD-135	14.19	200	110	5.28	0.17
P-2005	J-SD-136	J-SD-137	7.88	200	110	1.69	0.05
P-2006	J-SD-137	J-SD-138	6.01	200	110	0.00	0.00
P-2007	J-SD-137	J-SD-139	8.99	150	100	1.69	0.10
P-2008	J-SD-123	J-SD-140	66.78	200	110	1.69	0.05
P-2009	J-SD-141	J-SD-142	6.51	200	110	0.00	0.00
P-2010	J-SD-143	J-SD-141	9.56	150	100	-1.69	0.10
P-2011	J-SD-136	J-SD-123	24.71	200	110	3.59	0.11
P-2012	J-SD-127	J-SD-124	47.26	200	110	1.69	0.05
P-2013	J-SD-124	J-SD-125	6.83	200	110	0.00	0.00
P-2014	J-SD-124	J-SD-126	9.73	150	100	1.69	0.10
P-2015	J-SD-127	J-SD-114	80.09	200	110	-1.69	0.05
P-2016	J-SD-128	J-SD-129	52.48	150	100	0.21	0.01
P-2017	J-SD-128	J-SD-130	22.30	200	110	1.69	0.05
P-2018	J-SD-131	J-SD-132	6.85	200	110	0.00	0.00
P-2019	J-SD-133	J-SD-131	9.99	150	100	-1.69	0.10
P-2020	J-SD-112	J-SD-113	13.56	200	110	3.38	0.11
P-2021	J-SD-113	J-SD-114	9.14	200	110	3.38	0.11
P-2022	J-SD-114	J-SD-115	9.58	200	110	1.69	0.05
P-2023	J-SD-115	J-SD-116	5.89	200	110	0.00	0.00
P-2024	J-SD-121	J-SD-119	4.75	150	100	-1.69	0.10
P-2025	J-SD-119	J-SD-120	2.53	200	110	0.00	0.00
P-2026	J-SD-119	J-SD-118	5.25	200	110	-1.69	0.05
P-2027	J-SD-100	J-SD-101	111.63	200	110	5.28	0.17
P-2028	J-SD-105	J-SD-102	23.22	200	110	1.69	0.05
P-2029	J-SD-102	J-SD-103	8.14	200	110	0.00	0.00
P-2030	J-SD-102	J-SD-104	10.76	150	100	1.69	0.10
P-2031	J-SD-101	J-SD-105	22.05	200	110	5.28	0.17
P-2032	J-SD-106	J-SD-144	65.58	200	110	1.90	0.06
P-2033	J-SD-106	J-SD-108	27.87	200	110	1.69	0.05
P-2034	J-SD-109	J-SD-110	8.02	200	110	0.00	0.00
P-2035	J-SD-109	J-SD-111	10.60	150	100	1.69	0.10
P-2036	J-291	V8000	307.21	300	130	0.00	0.00
P-2037	J-SD-105	J-SD-106	63.31	200	110	3.59	0.11
P-2038	J-SD-108	J-SD-109	14.56	200	110	1.69	0.05
P-2041	J-SD-118	J-SD-122	37.40	200	110	-1.69	0.05
P-2043	J-SD-128	J-SD-123	141.18	200	110	-1.90	0.06
P-2044	J-SD-130	J-SD-131	12.38	200	110	1.69	0.05
P-2045	J-SD-135	J-SD-136	10.42	200	110	5.28	0.17
P-2046	J-SD-140	J-SD-141	14.17	200	110	1.69	0.05
P-2048	J-557	J-292	6.94	300	120	14.29	0.20
P-2049	J-SD-101	HYD-300	22.25	150	100	0.00	0.00
P-2050	J-SD-108	HYD-301	3.06	150	100	0.00	0.00
P-2051	J-SD-113	HYD-302	2.97	150	100	0.00	0.00
P-2052	J-SD-117	J-SD-115	8.06	150	100	-1.69	0.10
P-2053	J-SD-118	HYD-303	16.29	150	100	0.00	0.00
P-2054	J-SD-127	HYD-304	7.06	150	100	0.00	0.00
P-2055	J-SD-130	HYD-305	2.47	150	100	0.00	0.00
P-2056	J-SD-135	HYD-306	4.24	150	100	0.00	0.00
P-2057	J-SD-140	HYD-307	4.24	150	100	0.00	0.00
P-2058	J-SD-144	J-SD-122	30.60	200	110	1.69	0.05
P-2059	J-SD-144	J-SD-107	10.71	150	100	0.21	0.01

Valve Table

ID	Diameter (mm)	Elevation (m)	Upstream Pressure (psi)	Downstream Pressure (psi)	Flow (L/s)	Velocity (m/s)	Headloss (m)
V8000	250	189.12	840.75	582.18	0.00	0.00	0.00

Municipal Engineering Solutions

Peak Hour

Node Table

ID	Demand	Elevation	Head	Pressure
	(L/s)	*(m)*	*(m)*	*(psi)*
HYD-300	0.00	185.68	248.18	611.21
HYD-301	0.00	184.95	248.15	618.03
HYD-302	0.00	186.45	248.29	604.79
HYD-303	0.00	186.00	248.14	607.68
HYD-304	0.00	186.30	248.28	606.18
HYD-305	0.00	185.95	248.44	611.11
HYD-306	0.00	187.50	248.46	596.21
HYD-307	0.00	187.50	248.45	596.04
HYD-308	0.00	186.10	248.14	606.72
J-291	0.00	189.30	267.21	761.90
J-292	0.49	183.88	248.19	628.91
J-557	0.00	183.91	248.19	628.60
J-698	0.00	187.85	248.28	591.00
J-772	0.00	186.65	248.23	602.22
J-SD-100	0.00	186.32	248.24	605.58
J-SD-101	0.00	185.53	248.18	612.67
J-SD-102	0.00	185.70	248.16	610.87
J-SD-103	0.00	186.00	248.16	607.94
J-SD-104	2.53	186.00	248.16	607.90
J-SD-105	0.00	185.53	248.17	612.55
J-SD-106	0.00	185.00	248.15	617.56
J-SD-107	0.31	186.30	248.14	604.79
J-SD-108	0.00	184.80	248.15	619.49
J-SD-109	0.00	185.00	248.14	617.53
J-SD-110	0.00	185.50	248.14	612.64
J-SD-111	2.53	185.50	248.14	612.60
J-SD-112	0.00	188.00	248.29	589.66
J-SD-113	0.00	186.30	248.29	606.25
J-SD-114	0.00	186.30	248.29	606.23
J-SD-115	0.00	186.80	248.29	601.33
J-SD-116	0.00	187.00	248.29	599.38
J-SD-117	2.53	187.00	248.29	599.35
J-SD-118	0.00	186.05	248.14	607.19
J-SD-119	0.00	186.30	248.14	604.74
J-SD-120	0.00	186.50	248.14	602.78
J-SD-121	2.53	186.50	248.13	602.77
J-SD-122	0.00	186.35	248.14	604.28
J-SD-123	0.00	187.55	248.45	595.60
J-SD-124	0.00	186.70	248.28	602.23
J-SD-125	0.00	187.00	248.28	599.30
J-SD-126	2.53	187.00	248.28	599.26
J-SD-127	0.00	186.15	248.28	607.64
J-SD-128	0.00	186.10	248.44	609.66
J-SD-129	0.31	187.25	248.44	598.41
J-SD-130	0.00	185.80	248.44	612.58
J-SD-131	0.00	186.40	248.44	606.70
J-SD-132	0.00	186.50	248.44	605.72
J-SD-133	2.53	186.50	248.43	605.69
J-SD-134	0.00	188.64	248.47	585.14
J-SD-135	0.00	187.40	248.46	597.19
J-SD-136	0.00	187.40	248.46	597.13
J-SD-137	0.00	187.70	248.46	594.19
J-SD-138	0.00	188.00	248.46	591.26
J-SD-139	2.53	188.00	248.46	591.23
J-SD-140	0.00	187.40	248.45	597.02
J-SD-141	0.00	187.80	248.45	593.10
J-SD-142	0.00	188.00	248.45	591.14
J-SD-143	2.53	188.00	248.44	591.11
J-SD-144	0.00	186.20	248.14	605.77

MIN		**183.88**		**585.14**
MAX		**189.30**		**619.49**

Pipe Table

ID	From Node	To Node	Length	Diameter	Roughness	Flow	Velocity
			(m)	*(mm)*	*(C)*	*(L/s)*	*(m/s)*
P-1059	J-698	J-SD-112	30.13	300	130	-23.48	0.33
P-1214	J-SD-100	J-698	89.75	300	130	-23.48	0.33
P-1215	J-772	J-292	199.81	300	130	15.56	0.22
P-2000	V8000	J-SD-134	15.35	300	130	36.47	0.52
P-2001	J-SD-112	J-SD-134	282.62	300	130	-28.55	0.40
P-2002	J-SD-122	HYD-308	15.48	150	100	0.00	0.00
P-2003	J-772	J-SD-100	62.12	300	130	-15.56	0.22
P-2004	J-SD-134	J-SD-135	14.19	200	110	7.92	0.25
P-2005	J-SD-136	J-SD-137	7.88	200	110	2.53	0.08
P-2006	J-SD-137	J-SD-138	6.01	200	110	0.00	0.00
P-2007	J-SD-137	J-SD-139	8.99	150	100	2.53	0.14
P-2008	J-SD-123	J-SD-140	66.78	200	110	2.54	0.08
P-2009	J-SD-141	J-SD-142	6.51	200	110	0.00	0.00
P-2010	J-SD-143	J-SD-141	9.56	150	100	-2.53	0.14
P-2011	J-SD-136	J-SD-123	24.71	200	110	5.39	0.17
P-2012	J-SD-127	J-SD-124	47.26	200	110	2.53	0.08
P-2013	J-SD-124	J-SD-125	6.83	200	110	0.00	0.00
P-2014	J-SD-124	J-SD-126	9.73	150	100	2.53	0.14
P-2015	J-SD-127	J-SD-114	80.09	200	110	-2.54	0.08
P-2016	J-SD-128	J-SD-129	52.48	150	100	0.31	0.02
P-2017	J-SD-128	J-SD-130	22.30	200	110	2.54	0.08
P-2018	J-SD-131	J-SD-132	6.85	200	110	0.00	0.00
P-2019	J-SD-133	J-SD-131	9.99	150	100	-2.53	0.14
P-2020	J-SD-112	J-SD-113	13.56	200	110	5.07	0.16
P-2021	J-SD-113	J-SD-114	9.14	200	110	5.07	0.16
P-2022	J-SD-114	J-SD-115	9.58	200	110	2.53	0.08
P-2023	J-SD-115	J-SD-116	5.89	200	110	0.00	0.00
P-2024	J-SD-121	J-SD-119	4.75	150	100	-2.53	0.14
P-2025	J-SD-119	J-SD-120	2.53	200	110	0.00	0.00
P-2026	J-SD-119	J-SD-118	5.25	200	110	-2.54	0.08
P-2027	J-SD-100	J-SD-101	111.63	200	110	7.92	0.25
P-2028	J-SD-105	J-SD-102	23.22	200	110	2.53	0.08
P-2029	J-SD-102	J-SD-103	8.14	200	110	0.00	0.00
P-2030	J-SD-102	J-SD-104	10.76	150	100	2.53	0.14
P-2031	J-SD-101	J-SD-105	22.05	200	110	7.92	0.25
P-2032	J-SD-106	J-SD-144	65.58	200	110	2.85	0.09
P-2033	J-SD-106	J-SD-108	27.87	200	110	2.54	0.08
P-2034	J-SD-109	J-SD-110	8.02	200	110	0.00	0.00
P-2035	J-SD-109	J-SD-111	10.60	150	100	2.53	0.14
P-2036	J-291	V8000	307.21	300	130	36.47	0.52
P-2037	J-SD-105	J-SD-106	63.31	200	110	5.39	0.17
P-2038	J-SD-108	J-SD-109	14.56	200	110	2.54	0.08
P-2041	J-SD-118	J-SD-122	37.40	200	110	-2.54	0.08
P-2043	J-SD-128	J-SD-123	141.18	200	110	-2.85	0.09
P-2044	J-SD-130	J-SD-131	12.38	200	110	2.54	0.08
P-2045	J-SD-135	J-SD-136	10.42	200	110	7.92	0.25
P-2046	J-SD-140	J-SD-141	14.17	200	110	2.54	0.08
P-2048	J-557	J-292	6.94	300	120	-15.07	0.21
P-2049	J-SD-101	HYD-300	22.25	150	100	0.00	0.00
P-2050	J-SD-108	HYD-301	3.06	150	100	0.00	0.00
P-2051	J-SD-113	HYD-302	2.97	150	100	0.00	0.00
P-2052	J-SD-117	J-SD-115	8.06	150	100	-2.53	0.14
P-2053	J-SD-118	HYD-303	16.29	150	100	0.00	0.00
P-2054	J-SD-127	HYD-304	7.06	150	100	0.00	0.00
P-2055	J-SD-130	HYD-305	2.47	150	100	0.00	0.00
P-2056	J-SD-135	HYD-306	4.24	150	100	0.00	0.00
P-2057	J-SD-140	HYD-307	4.24	150	100	0.00	0.00
P-2058	J-SD-144	J-SD-122	30.60	200	110	2.54	0.08
P-2059	J-SD-144	J-SD-107	10.71	150	100	0.31	0.02

Valve Table

ID	Diameter (mm)	Elevation (m)	Upstream Pressure (psi)	Downstream Pressure (psi)	Flow (L/s)	Velocity (m/s)	Headloss (m)
V8000	250	189.12	760.69	580.60	36.47	0.74	18.41

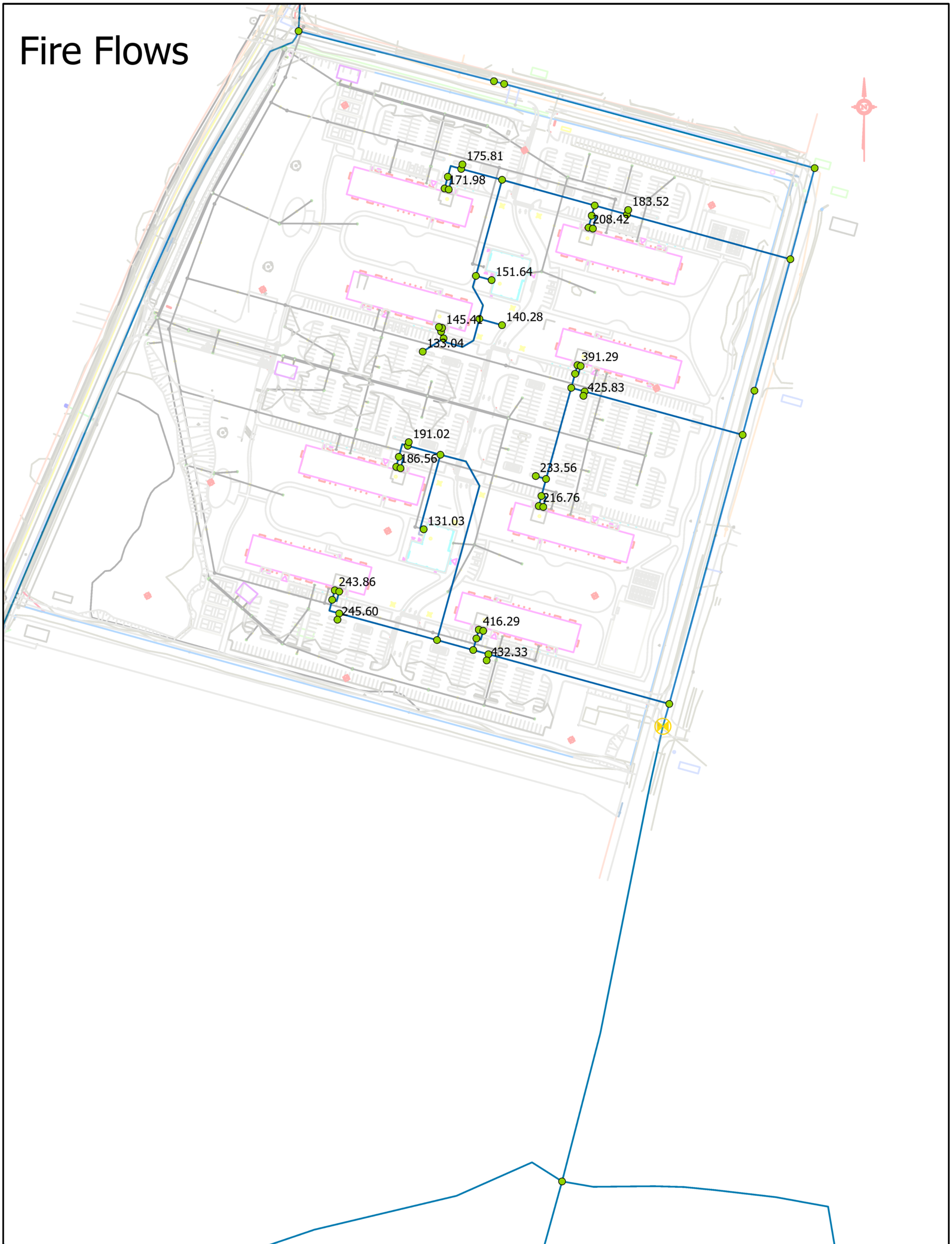
2020 Conditions
SkyDev, Owen Sound ON
October 20, 2022

Municipal Engineering Solutions

Fire Flow Table			
ID	Total Demand *(L/s)*	Available Flow *(L/s)*	**Fire Flow Met?**
HYD-300	117.00	183.52	**TRUE**
HYD-301	117.00	175.81	**TRUE**
HYD-302	117.00	425.83	**TRUE**
HYD-303	117.00	133.04	**TRUE**
HYD-304	117.00	233.56	**TRUE**
HYD-305	117.00	191.02	**TRUE**
HYD-306	117.00	432.33	**TRUE**
HYD-307	117.00	245.60	**TRUE**
HYD-308	117.00	140.28	**TRUE**
J-SD-103	117.00	208.42	**TRUE**
J-SD-107	33.21	151.64	**TRUE**
J-SD-110	117.00	171.98	**TRUE**
J-SD-116	117.00	391.29	**TRUE**
J-SD-120	117.00	145.41	**TRUE**
J-SD-125	117.00	216.76	**TRUE**
J-SD-129	33.21	131.03	**TRUE**
J-SD-132	117.00	186.56	**TRUE**
J-SD-138	117.00	416.29	**TRUE**
J-SD-142	117.00	243.86	**TRUE**

MIN	**131.03**
MAX	**432.33**

Fire Flows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171.98
183.52
208.42
151.64
145.41
140.28
133.04
391.29
425.83
191.02
186.56
233.56
216.76
131.03
243.86
245.60
416.29
432.33

APPENDIX B

SANITARY SEWER CALCULATIONS

Sanitary Demands - All Buildings

Project Name:	SkyDev Owen Sound
Project Number:	22693
Location:	Owen Sound, ON
Date:	14-Oct-22
Prepared by:	PB

Total Site Area	15.4	ha
Total # of Units	712	Units
# of Amenity Buildings	2	
Population	1688	People

Average Residential Flow (Lpcd)	400
Flow (L/s)	7.81

Harmon's Peaking Factor (M)

$$M = \left[1 + \frac{14}{4 + P^{\frac{1}{2}}}\right]$$

3.64

Infiltration (I)

0.20 L/s/ha

3.08 L/s

Sanitary Demand

$$Q = \frac{P \times q \times M}{86.4} + IA$$

31.5 L/s

Sanitary Sewer Design Sheet - New SPS

Project Name:	SkyDev Owen Sound
Project Number:	22693
Location:	Owen Sound, ON
Date:	14-Oct-22
Prepared by:	PB

LOCATION											PIPE PARAMETERS					
Street	Node No.		INDIVIDUAL		CUMULATIVE		Peak Factor	Pop Flow (L/s)	Inflow & Infiltration	Design Flow	Length	Diameter	Slope	Pipe Capacity	Full Flow Velocity	Ratio (Flow to Capacity)
	From	To	Pop	Area (ha)	Pop	Area (ha)	Fp			Q des	Length	D	S	Q cap	V Full	
	MH	MH							(L/s)	(L/s)	(m)	(mm)	(%)	(L/s)	(m/s)	
9th Ave. East (Area 4)	EX MH 13	EX MH 12	**287**	**5.78**	287	5.78		**1.33**	**1.16**	**2.49**	89	200	1.09	34.24	1.09	0.073
9th Ave. East (Area 5 - assume residential)	EX MH 12	EX MH 11	**220**	**4.45**	507	10.23		**1.02**	**0.89**	**1.91**	154	250	1.91	82.19	1.67	0.023
9th Ave. East (Area 6 - assume residential)	EX MH 11	EX MH 10	**292**	**5.88**	799	16.11		**1.35**	**1.18**	**2.53**	141	350	0.58	111.09	1.15	0.023
9th Ave. East (Area 3 - assume residential)	EX MH 10	EX MH 9	**1688.0**	**15.6**	2487	31.71	3.64	**28.46**	**3.12**	**31.58**	109	350	0.36	87.52	0.91	0.361
9th Ave. East (Area 2 - assume residential)	EX MH 9	EX MH 8	**557**	**11.2**	3044	42.91		**2.58**	**2.24**	**4.82**	97	350	1.18	158.45	1.65	0.030
32nd St. East										**43.32**						
EX EBSPS (Pumps test shows 10 l/s, assume 12 l/s for Area 1)										12.00						
										55.32						

APPENDIX C

STORM SEWER CALCULATIONS

Storm Sewer Design Sheet (Rational Method)

Project Name: Skydev Bayshore
Project Number: 22693
Location: Owen Sound, ON
Date: 14-Oct
Prepared by: BJ

Rainfall Data	(Main Storm Event)	(Additional design storm events, if needed)				
	5yr	100yr				
a	29.10	47.70				
b	-0.72	-0.74				

Manning's Roughness Coefficient 0.013

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Description	Upstream Node	Downstream Node	Pipe Shape	Pipe Diameter OR Span/Rise (mm)	Length (m)	Slope (%)	Area (ha)	C	A x C (ha)	Accumulative A x C (ha)	Design Event	Intensity (mm/hr)	Time of Concentration (min)	Area Flow (l/s)	Other Flows	Total Flow (l/s)	Actual Diamete (m)	Pipe Area (m2)	Hydraulic Radiu (m)	Material	Pipe Capacity (l/s)	Velocity (m/s)	Time of Flow (min)	Ratio (Flow to Capacity)	OK?
201																									
A-8	PLUG	MH32	Circular	300	16.3	1.00%	0.15	0.9	0.135	0.135	5yr	106.48	10	39.93	0	39.93	0.2980	0.0697	0.0745	PVC	94.99	1.36	0.20	0.42	YES
	MH32	CBMH37	Circular	300	30.6	2.00%	0	0	0	0.135	5yr	104.97	10.20	39.36	0	39.36	0.2980	0.0697	0.0745	PVC	134.34	1.93	0.26	0.29	YES
	MH37	CBMH36	Circular	525	38	0.70%	0.81	0.9	0.729	0.864	5yr	103.04	10.46	247.30	0	247.30	0.5334	0.2235	0.1334	PVC	375.37	1.68	0.38	0.66	YES
	CBMH36	CBMH35	Circular	525	52	0.70%	0.24	0.9	0.216	1.08	5yr	100.43	10.84	301.30	0	301.30	0.5334	0.2235	0.1334	PVC	375.37	1.68	0.52	0.80	YES
	CBMH35	MH30	Circular	675	49	0.50%	0.61	0.9	0.549	1.629	5yr	97.11	11.36	439.42	0	439.42	0.6858	0.3694	0.1715	CONC	620.09	1.68	0.49	0.71	YES
A-7	PLUG	MH31	Circular	300	16.3	1.00%	0.15	0.9	0.135	0.135	5yr	106.48	10	39.93	0	39.93	0.2980	0.0697	0.0745	PVC	94.99	1.36	0.20	0.42	YES
	MH31	MH30	Circular	300	28.5	1.00%	0	0	0	0.135	5yr	104.97	10.20	39.36	0	39.36	0.2980	0.0697	0.0745	PVC	94.99	1.36	0.35	0.41	YES
30-OGS3	MH30	MH28	Circular	750	64.3	0.50%	0.29	0.9	0.261	2.025	5yr	94.20	11.84	529.90	0	529.90	0.7620	0.4560	0.1905	CONC	821.24	1.80	0.60	0.65	YES
(375 mm ORIFICE)	MH28	MH27	Circular	375	76.3	1.59%	0	0	0	2.025	5yr	90.92	12.44	0.00	163	163.00	0.3810	0.1140	0.0953	PVC	230.64	2.02	0.63	0.71	YES
	MH29	MH27	Circular	300	18.7	6.19%	0.82	0.3	0.246	0.246	5yr	106.48	10	72.76	0	72.76	0.2980	0.0697	0.0745	PVC	236.34	3.39	0.09	0.31	YES
	MH27	MH13	Circular	375	99.1	3.28%	0.43	0.3	0.129	0.375	5yr	87.73	13.07	91.39	163	254.39	0.3810	0.1140	0.0953	PVC	331.27	2.91	0.57	0.77	YES
	CBMH34	MH33	Circular	300	30.1	1.50%	0.81	0.4	0.324	0.324	5yr	106.48	10	95.83	0	95.83	0.2980	0.0697	0.0745	PVC	116.34	1.67	0.30	0.82	YES
AM2	AM2	MH33	Circular	300	14.1	0.85%	0.07	0.9	0.063	0.063	5yr	106.48	10	18.63	0	18.63	0.2980	0.0697	0.0745	PVC	87.58	1.26	0.19	0.21	YES
	MH33	MH19	Circular	525	86.4	0.52%	0.47	0.9	0.423	0.81	5yr	104.22	10.30	234.50	0	234.50	0.5334	0.2235	0.1334	PVC	323.53	1.45	0.99	0.72	YES
	MH22	MH20	Circular	450	38.7	0.70%	0.72	0.9	0.648	0.648	5yr	106.48	10	191.67	0	191.67	0.4480	0.1576	0.1120	PVC	235.72	1.50	0.43	0.81	YES
A-6	PLUG	MH24	Circular	300	11.7	1.05%	0.15	0.9	0.135	0.135	5yr	106.48	10	39.93	0	39.93	0.2980	0.0697	0.0745	PVC	97.34	1.40	0.14	0.41	YES
	MH24	MH20	Circular	375	38.8	0.70%	0.11	0.9	0.099	0.234	5yr	105.42	10.14	68.52	0	68.52	0.3810	0.1140	0.0953	PVC	153.03	1.34	0.48	0.45	YES
A-4	PLUG	MH21	Circular	300	11.7	1.00%	0.08	0.9	0.072	0.072	5yr	106.48	10	21.30	0	21.30	0.2980	0.0697	0.0745	PVC	94.99	1.36	0.14	0.22	YES
	MH21	MH20	Circular	375	33.9	0.70%	0.14	0.9	0.126	0.198	5yr	105.39	10.14	57.97	0	57.97	0.3810	0.1140	0.0953	PVC	153.03	1.34	0.42	0.38	YES
	MH20	MH19	Circular	600	54.7	0.50%	0	0	0	1.08	5yr	97.49	11.30	292.48	0	292.48	0.6096	0.2919	0.1524	CONC	452.94	1.55	0.59	0.65	YES
	MH19	MH18	Circular	750	55.3	0.50%	0.27	0.9	0.243	2.133	5yr	93.98	11.88	556.83	0	556.83	0.7620	0.4560	0.1905	CONC	821.24	1.80	0.51	0.68	YES
	MH18	MH16	Circular	825	39.4	0.50%	0.82	0.9	0.738	2.871	5yr	91.15	12.39	726.95	0	726.95	0.8382	0.5518	0.2096	CONC	1058.89	1.92	0.34	0.69	YES
A-3	PLUG	MH17	Circular	300	17.3	1.00%	0.15	0.9	0.135	0.135	5yr	106.48	10	39.93	0	39.93	0.2980	0.0697	0.0745	PVC	94.99	1.36	0.21	0.42	YES
	MH17	MH16	Circular	375	29.1	0.70%	0.13	0.9	0.117	0.252	5yr	106.48	10	74.54	0	74.54	0.3810	0.1140	0.0953	PVC	153.03	1.34	0.36	0.49	YES
A-5	PLUG	MH23	Circular	300	16.3	1.00%	0.15	0.9	0.135	0.135	5yr	106.48	10	39.93	0	39.93	0.2980	0.0697	0.0745	PVC	94.99	1.36	0.20	0.42	YES
	MH23	MH16	Circular	375	33.6	0.70%	0.11	0.9	0.099	0.234	5yr	106.48	10	69.21	0	69.21	0.3810	0.1140	0.0953	PVC	153.03	1.34	0.42	0.45	YES
	MH16	OGS2	Circular	825	27.5	0.50%	0	0	0	3.357	5yr	89.37	12.74	833.41	0	833.41	0.8382	0.5518	0.2096	CONC	1058.89	1.92	0.24	0.79	YES
	MH25	OGS2	Circular	300	9.8	1.50%	0.24	0.9	0.216	0.216	5yr	106.48	10	63.89	0	63.89	0.2980	0.0697	0.0745	PVC	116.34	1.67	0.10	0.55	YES
	MH26	OGS2	Circular	300	14.4	1.39%	0.3	0.9	0.27	0.27	5yr	106.48	10	79.86	0	79.86	0.2980	0.0697	0.0745	PVC	111.99	1.61	0.15	0.71	YES
	OGS2	MH35	Circular	900	23.9	0.50%	0	0	0	3.843	5yr	88.18	12.98	941.32	0	941.32	0.9144	0.6567	0.2286	CONC	1335.43	2.03	0.20	0.70	YES
(375 mm ORIFICE)	MH35	MH14	Circular	525	64.8	3.13%	0	0	0	3.843	5yr	87.23	13.17	0.00	623	623.00	0.5334	0.2235	0.1334	PVC	793.76	3.55	0.30	0.78	YES
100 YR CAPTURE	MH14	MH13	Circular	600	22.2	2.00%	0.22	0.9	0	3.843	5yr	87.23	13.17	0.00	721.44	721.44	0.6096	0.2919	0.1524	CONC	905.89	3.10	0.12	0.80	YES
	MH13	MH11	Circular	900	89.9	0.28%	0	0	0	0.375	5yr	86.66	13.29	90.27	721.44	811.71	0.9144	0.6567	0.2286	CONC	999.35	1.52	0.98	0.81	YES
	CBMH9	MH5	Circular	375	34.8	1.40%	0.73	0.45	0.3285	0.3285	5yr	106.48	10	97.16	0	97.16	0.3810	0.1140	0.0953	PVC	216.42	1.90	0.31	0.45	YES
AM1	PLUG	MH5	Circular	300	7.8	0.92%	0.07	0.9	0.063	0.063	5yr	106.48	10	18.63	0	18.63	0.2980	0.0697	0.0745	PVC	91.11	1.31	0.10	0.20	YES
	MH5	MH3	Circular	450	64.1	0.52%	0	0	0	0.3915	5yr	104.19	10.31	113.30	0	113.30	0.4480	0.1576	0.1120	PVC	203.17	1.29	0.83	0.56	YES
A-2	PLUG	MH4	Circular	300	28.4	1.00%	0.15	0.9	0.135	0.135	5yr	106.48	10	39.93	0	39.93	0.2980	0.0697	0.0745	PVC	94.99	1.36	0.35	0.42	YES
	MH4	MH3	Circular	525	55	0.70%	1.07	0.9	0.963	0.963	5yr	106.48	10	284.84	0	284.84	0.5334	0.2235	0.1334	PVC	375.37	1.68	0.55	0.76	YES
	MH3	CBMH8	Circular	675	62.9	0.50%	0	0	0	1.3545	5yr	102.46	10.55	385.52	0	385.52	0.6858	0.3694	0.1715	CONC	620.09	1.68	0.62	0.62	YES
	CBMH8	CBMH7	Circular	750	29	0.50%	0.8	0.9	0.72	2.0745	5yr	98.28	11.17	566.36	0	566.36	0.7620	0.4560	0.1905	CONC	821.24	1.80	0.27	0.69	YES
A-1	PLUG	MH2	Circular	300	11.7	1.00%	0.15	0.9	0.135	0.135	5yr	106.48	10	39.93	0	39.93	0.2980	0.0697	0.0745	PVC	94.99	1.36	0.14	0.42	YES
	MH2	CBMH7	Circular	300	35.4	1.00%	0	0	0	0.135	5yr	105.39	10.14	39.52	0	39.52	0.2980	0.0697	0.0745	PVC	94.99	1.36	0.43	0.42	YES
	CBMH7	CBMH6	Circular	750	29	0.50%	0.18	0.9	0.162	2.3715	5yr	96.61	11.44	636.41	0	636.41	0.7620	0.4560	0.1905	CONC	821.24	1.80	0.27	0.77	YES
	CBMH6	OGS1	Circular	750	18.9	0.50%	0.21	0.9	0.189	2.5605	5yr	95.00	11.71	675.68	0	675.68	0.7620	0.4560	0.1905	CONC	821.24	1.80	0.17	0.82	YES
	OGS1	MH1	Circular	750	24.8	0.50%	0	0	0	2.5605	5yr	93.98	11.88	668.47	0	668.47	0.7620	0.4560	0.1905	CONC	821.24	1.80	0.23	0.81	YES
(375 mm ORIFICE)	MH1	MH100	Circular	375	42.5	6.51%	0.12	0.9	0.108	2.6685	5yr	92.69	12.11	0.00	362	362.00	0.3810	0.1140	0.0953	PVC	466.69	4.09	0.17	0.78	YES

APPENDIX D

PCSWMM MODELING OUTPUT

201 Storage

Underground Chamber

Required	305
Event =	100
Quantity Control Volume =	32 m^3

Surface Ponding

Event =	100
Total Volume =	150 m^3

Pipe Storage

Diameter (mm)	Area (m2)	Length (m)	Volume (m3)
200	0.031		0.0
250	0.049		0.0
300	0.071	75.7	5.4
375	0.110	34.8	3.8
450	0.159	67	10.7
525	0.216	55	11.9
600	0.283		0.0
675	0.358	63	22.5
750	0.442	101.7	44.9
825	0.535		0.0
900	0.636		0.0
		Total Volume	**99.2**

MH Storage

MH	Area (m2)	Depth (m) (m)	Volume (m3)
MH1	1.767	2.7	4.8
MH34	1.767	2.3	4.1
CBMH6	1.767	2.2	3.9
CBMH7	1.767	1.9	3.4
CBMH8	1.767	1.7	3.0
MH3	1.767	1.5	2.7
MH4	1.131	1	1.1
MH5	1.131	0.8	0.9
		Total Volume	**23.8**

Total Storage =	**273.0**

202 Storage

Underground Chamber

Required	548
Event =	100
Quantity Control Volume =	0 m^3

Surface Ponding

Event =	100
Total Volume =	370 m^3

Pipe Storage

Diameter (mm)	Area (m2)	Length (m)	Volume (m3)
200	0.031		0.0
250	0.049		0.0
300	0.071	125.7	8.9
375	0.110	135.3	14.9
450	0.159	38.7	6.2
525	0.216	89.1	19.3
600	0.283	54.7	15.5
675	0.358		0.0
750	0.442	55.3	24.4
825	0.535	66.9	35.8
900	0.636	31.4	20.0
		Total Volume	**144.9**

MH Storage

MH	Area (m2)	Depth (m) (m)	Volume (m3)
MH35	2.545	3	7.6
MH15	2.545	2.8	7.1
OGS2	2.545	2.6	6.6
MH16	2.545	2.3	5.9
MH18	2.545	2.1	5.3
MH19	2.545	2	5.1
MH20	1.767	1.6	2.8
MH22	1.131	1.2	1.4
		Total Volume	**41.8**

Total Storage =	**556.8**

203 Storage

Underground Chamber

Required	541
Event =	100
Quantity Control Volume =	0 m^3

Surface Ponding

Event =	100
Total Volume =	460 m^3

Pipe Storage

Diameter (mm)	Area (m2)	Length (m)	Volume (m3)
200	0.031		0.0
250	0.049		0.0
300	0.071	91.7	6.5
375	0.110		0.0
450	0.159		0.0
525	0.216	90	19.5
600	0.283		0.0
675	0.358	49	17.5
750	0.442	64.3	28.4
825	0.535		0.0
900	0.636		0.0
		Total Volume	**71.9**

MH Storage

MH	Area (m2)	Depth (m) (m)	Volume (m3)
MH28	1.767	3.8	6.7
MH37	1.767	3.65	6.5
MH36	1.767	3.3	5.8
OGS3	1.767	3.2	5.7
MH30	1.767	2.95	5.2
CBMH35	1.767	2.5	4.4
CBMH36	1.767	2	3.5
CBMH37	1.767	1.7	3.0
		Total Volume	**40.8**

Total Storage =	**572.7**

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

09/19/2022

Province:	Ontario
City:	Owen Sound
Nearest Rainfall Station:	OWEN SOUND MOE
Climate Station Id:	6116132
Years of Rainfall Data:	40
Site Name:	201
Drainage Area (ha):	3.37
% Imperviousness:	100.00
Runoff Coefficient 'c':	0.90
Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0
Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	114.55
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	SkyDev - Owen Sound
Project Number:	22693
Designer Name:	David Hoover
Designer Company:	KWA Site Development
Designer Email:	david.hoover@KWAsitedev.com
Designer Phone:	416-684-4151
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	50
EFO6	65
EFO8	76
EFO10	82
EFO12	87

Recommended Stormceptor EFO Model: EFO10

Estimated Net Annual Sediment (TSS) Load Reduction (%): 82

Water Quality Runoff Volume Capture (%): > 90

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

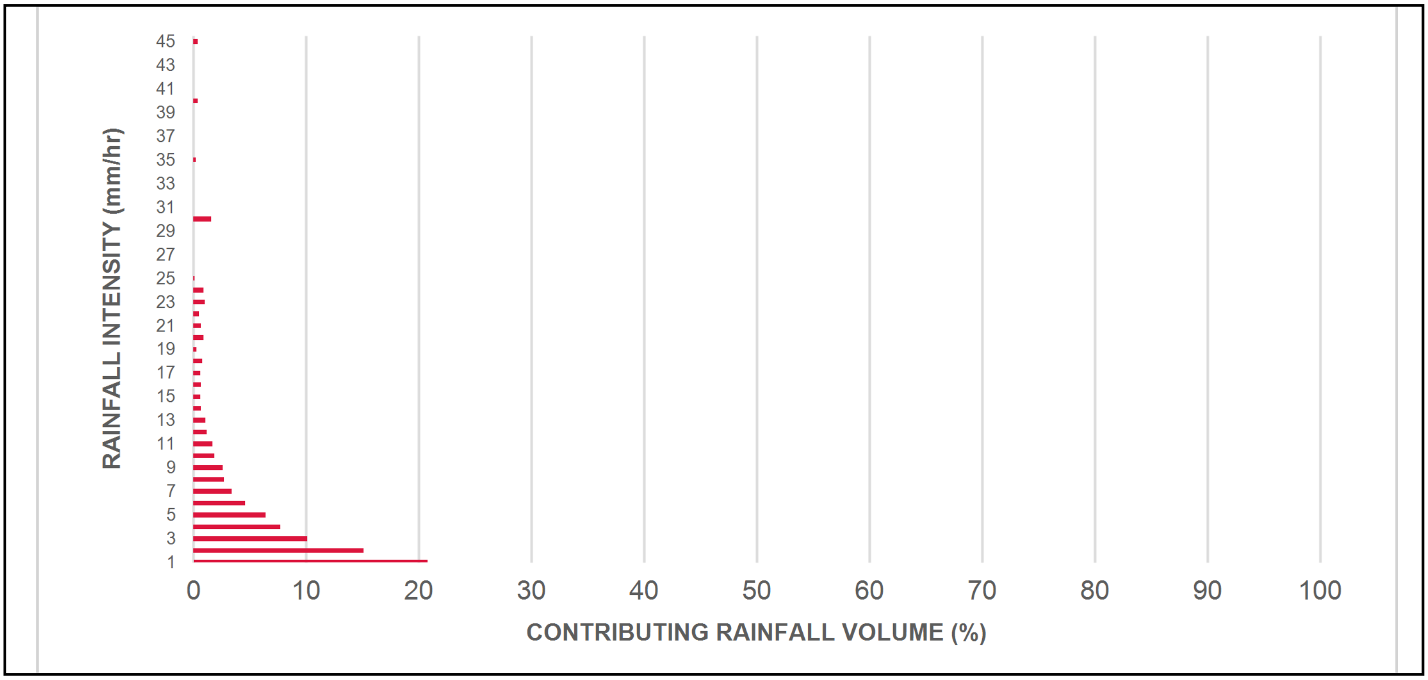
►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (μm)	Percent Less Than	Particle Size Fraction (μm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

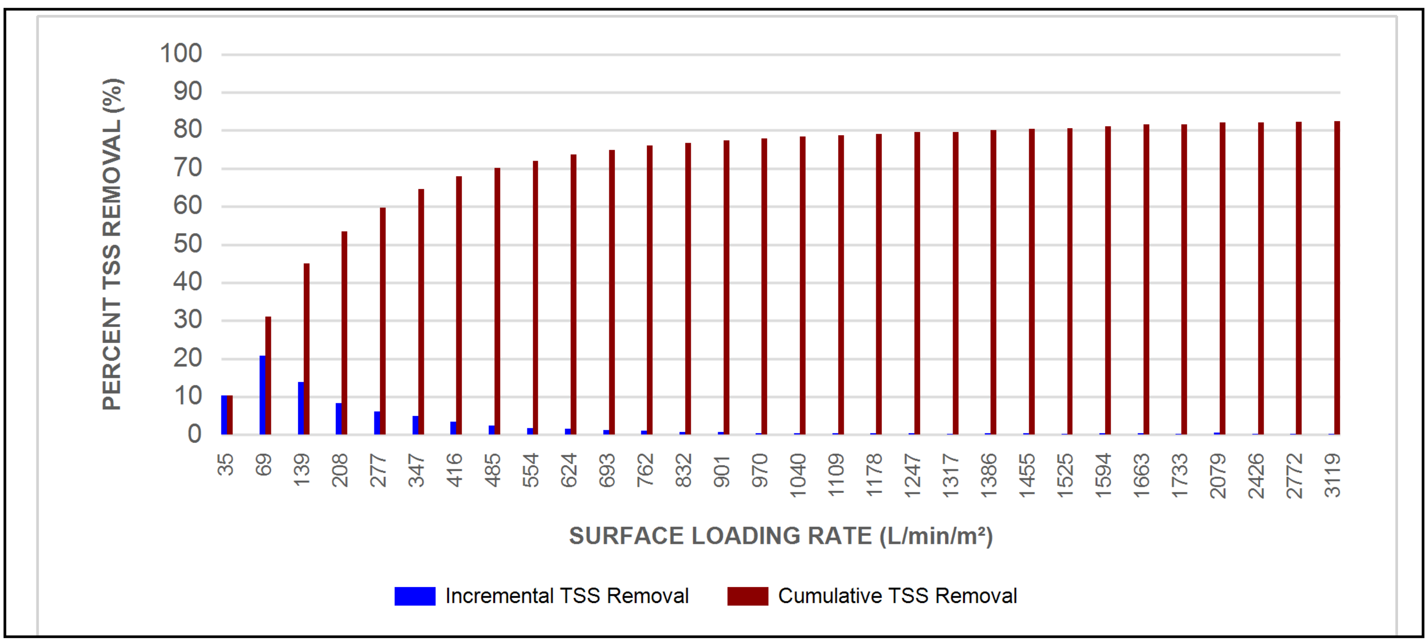
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	10.3	10.3	4.22	253.0	35.0	100	10.3	10.3
1	20.8	31.1	8.43	506.0	69.0	100	20.8	31.1
2	15.1	46.2	16.86	1012.0	139.0	92	13.9	45.0
3	10.1	56.3	25.30	1518.0	208.0	83	8.4	53.4
4	7.7	64.0	33.73	2024.0	277.0	80	6.2	59.6
5	6.4	70.4	42.16	2530.0	347.0	77	4.9	64.5
6	4.6	75.1	50.59	3035.0	416.0	73	3.4	67.9
7	3.4	78.4	59.02	3541.0	485.0	70	2.4	70.2
8	2.7	81.1	67.45	4047.0	554.0	67	1.8	72.0
9	2.6	83.7	75.89	4553.0	624.0	64	1.7	73.7
10	1.9	85.6	84.32	5059.0	693.0	64	1.2	74.9
11	1.7	87.3	92.75	5565.0	762.0	63	1.1	76.0
12	1.2	88.5	101.18	6071.0	832.0	63	0.7	76.7
13	1.1	89.6	109.61	6577.0	901.0	62	0.7	77.4
14	0.7	90.3	118.04	7083.0	970.0	62	0.5	77.9
15	0.6	90.9	126.48	7589.0	1040.0	61	0.4	78.3
16	0.7	91.6	134.91	8094.0	1109.0	59	0.4	78.7
17	0.6	92.3	143.34	8600.0	1178.0	58	0.4	79.0
18	0.8	93.0	151.77	9106.0	1247.0	56	0.4	79.5
19	0.3	93.3	160.20	9612.0	1317.0	54	0.2	79.6
20	0.9	94.2	168.63	10118.0	1386.0	53	0.4	80.1
21	0.7	94.9	177.07	10624.0	1455.0	51	0.3	80.4
22	0.5	95.3	185.50	11130.0	1525.0	48	0.2	80.6
23	1.0	96.3	193.93	11636.0	1594.0	46	0.5	81.1
24	0.9	97.2	202.36	12142.0	1663.0	44	0.4	81.5
25	0.1	97.3	210.79	12648.0	1733.0	42	0.1	81.5
30	1.6	98.9	252.95	15177.0	2079.0	35	0.6	82.1
35	0.2	99.1	295.11	17707.0	2426.0	30	0.1	82.1
40	0.4	99.5	337.27	20236.0	2772.0	27	0.1	82.3
45	0.4	99.9	379.43	22766.0	3119.0	24	0.1	82.4
							Estimated Net Annual Sediment (TSS) Load Reduction =	**82 %**

Climate Station ID: 6116132 *Years of Rainfall Data*: 40

RAINFALL DATA FROM OWEN SOUND MOE RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL
FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

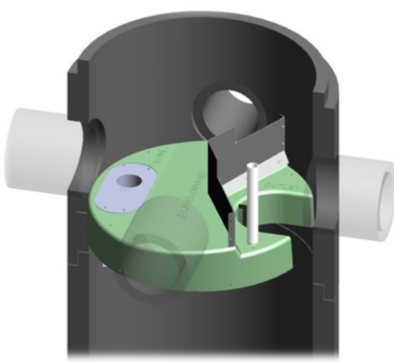
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

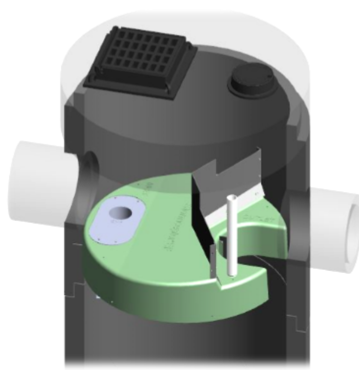
DESIGN FLEXIBILITY

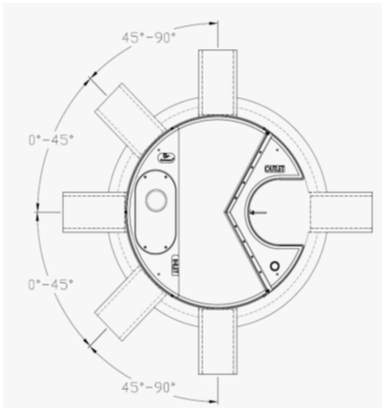
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
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EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

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1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

09/19/2022

Province:	Ontario
City:	Owen Sound
Nearest Rainfall Station:	OWEN SOUND MOE
Climate Station Id:	6116132
Years of Rainfall Data:	40

Project Name:	SkyDev - Owen Sound
Project Number:	22693
Designer Name:	David Hoover
Designer Company:	KWA Site Development
Designer Email:	david.hoover@KWAsitedev.com
Designer Phone:	416-684-4151
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Site Name:	202

Drainage Area (ha):	4.8
% Imperviousness:	100.00

Runoff Coefficient 'c': 0.90

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	163.16
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	42
EFO6	58
EFO8	70
EFO10	77
EFO12	82

Recommended Stormceptor EFO Model: **EFO12**

Estimated Net Annual Sediment (TSS) Load Reduction (%): **82**

Water Quality Runoff Volume Capture (%): **> 90**

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

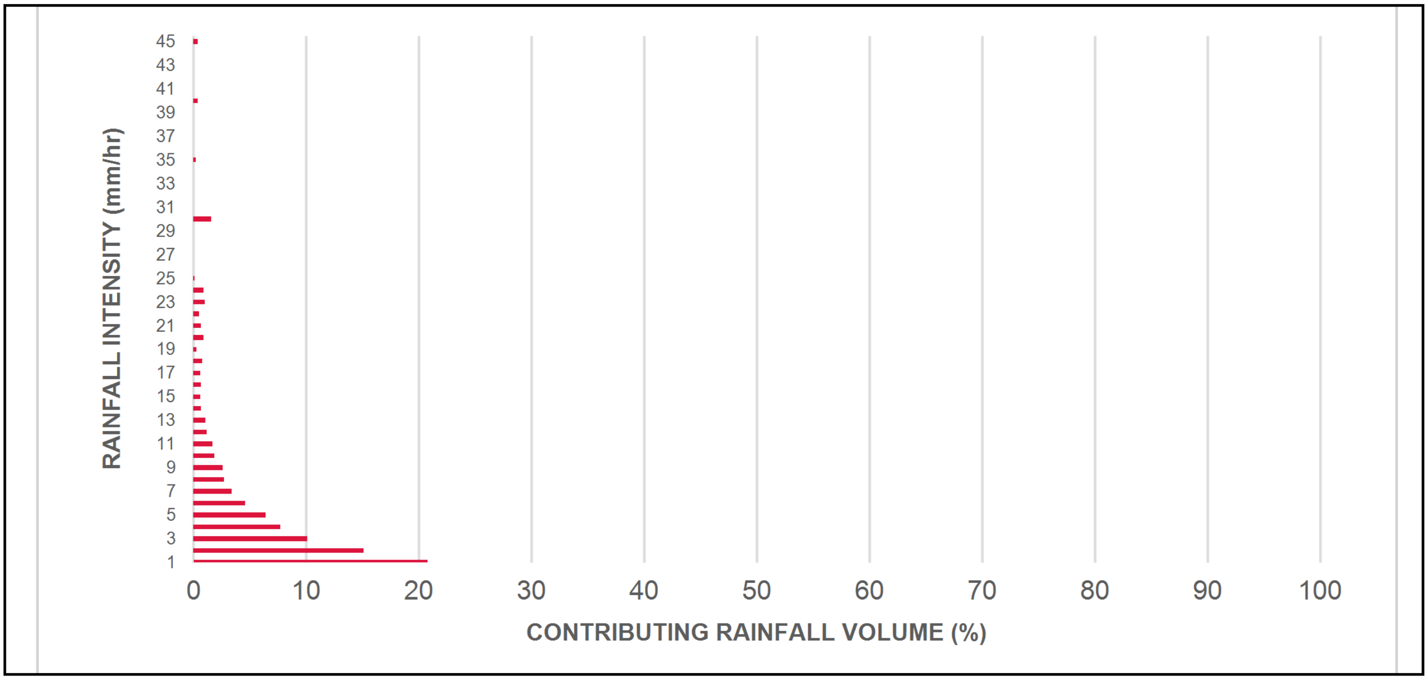
►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (μm)	Percent Less Than	Particle Size Fraction (μm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

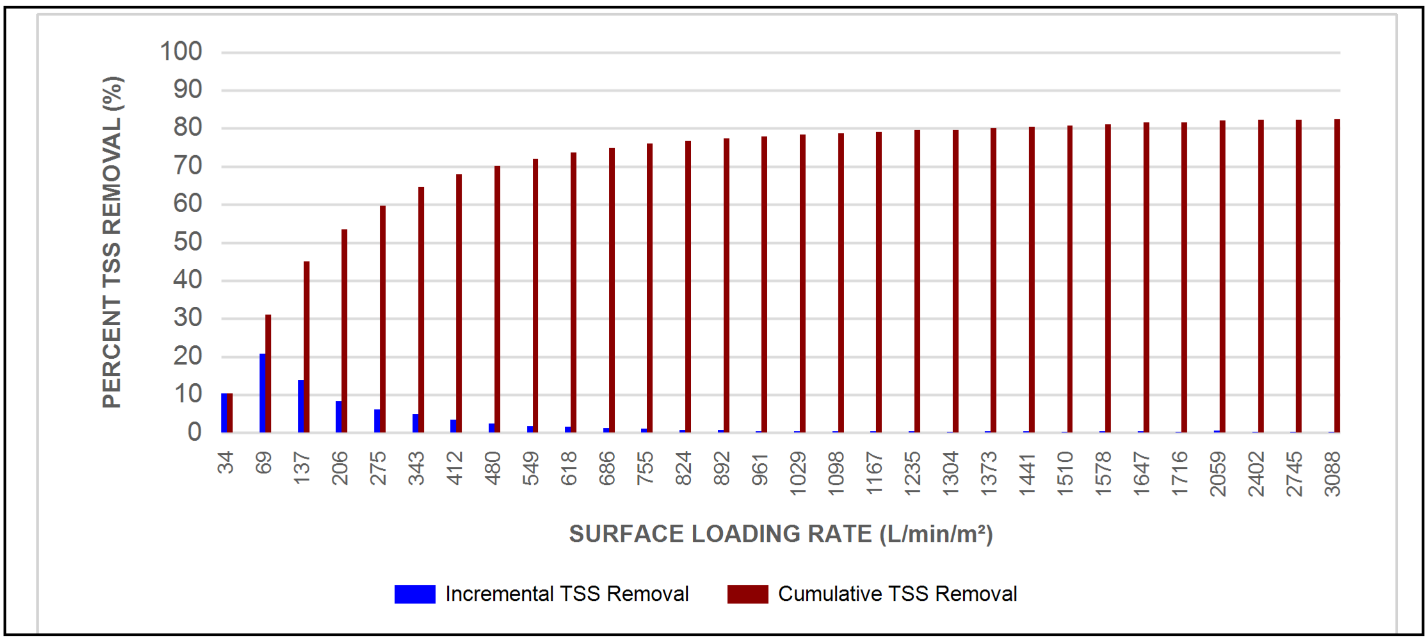
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	10.3	10.3	6.00	360.0	34.0	100	10.3	10.3
1	20.8	31.1	12.01	721.0	69.0	100	20.8	31.1
2	15.1	46.2	24.02	1441.0	137.0	92	13.9	45.0
3	10.1	56.3	36.03	2162.0	206.0	83	8.4	53.4
4	7.7	64.0	48.04	2882.0	275.0	80	6.2	59.6
5	6.4	70.4	60.05	3603.0	343.0	77	4.9	64.5
6	4.6	75.1	72.06	4323.0	412.0	73	3.4	67.9
7	3.4	78.4	84.07	5044.0	480.0	70	2.4	70.2
8	2.7	81.1	96.08	5765.0	549.0	67	1.8	72.0
9	2.6	83.7	108.09	6485.0	618.0	65	1.7	73.7
10	1.9	85.6	120.10	7206.0	686.0	64	1.2	74.9
11	1.7	87.3	132.11	7926.0	755.0	63	1.1	76.0
12	1.2	88.5	144.12	8647.0	824.0	63	0.7	76.7
13	1.1	89.6	156.12	9367.0	892.0	62	0.7	77.4
14	0.7	90.3	168.13	10088.0	961.0	62	0.5	77.9
15	0.6	90.9	180.14	10809.0	1029.0	61	0.4	78.3
16	0.7	91.6	192.15	11529.0	1098.0	59	0.4	78.7
17	0.6	92.3	204.16	12250.0	1167.0	58	0.4	79.0
18	0.8	93.0	216.17	12970.0	1235.0	56	0.4	79.5
19	0.3	93.3	228.18	13691.0	1304.0	55	0.2	79.6
20	0.9	94.2	240.19	14412.0	1373.0	53	0.5	80.1
21	0.7	94.9	252.20	15132.0	1441.0	51	0.3	80.4
22	0.5	95.3	264.21	15853.0	1510.0	48	0.2	80.7
23	1.0	96.3	276.22	16573.0	1578.0	47	0.5	81.1
24	0.9	97.2	288.23	17294.0	1647.0	45	0.4	81.5
25	0.1	97.3	300.24	18014.0	1716.0	43	0.1	81.6
30	1.6	98.9	360.29	21617.0	2059.0	36	0.6	82.1
35	0.2	99.1	420.34	25220.0	2402.0	31	0.1	82.2
40	0.4	99.5	480.38	28823.0	2745.0	27	0.1	82.3
45	0.4	99.9	540.43	32426.0	3088.0	24	0.1	82.4
Estimated Net Annual Sediment (TSS) Load Reduction =								**82 %**

Climate Station ID: 6116132 *Years of Rainfall Data*: 40

RAINFALL DATA FROM OWEN SOUND MOE RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL
FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
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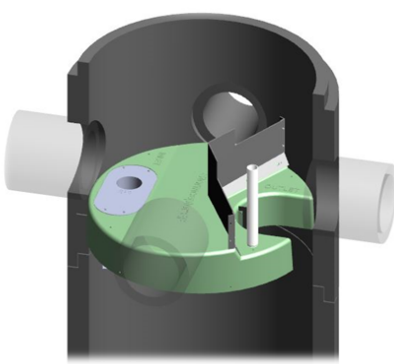

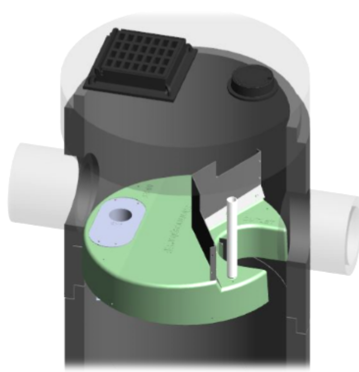

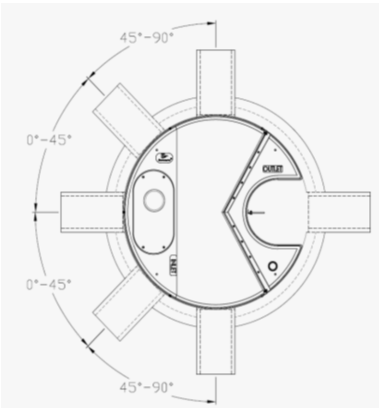

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** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

Feature	Benefit	Feature Appeals To
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Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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PART 3 – PERFORMANCE & DESIGN

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remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

09/19/2022

Province:	Ontario
City:	Owen Sound
Nearest Rainfall Station:	OWEN SOUND MOE
Climate Station Id:	6116132
Years of Rainfall Data:	40
Site Name:	203
Drainage Area (ha):	2.26
% Imperviousness:	100.00
Runoff Coefficient 'c':	0.90
Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0
Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	76.82
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	SkyDev - Owen Sound
Project Number:	22693
Designer Name:	David Hoover
Designer Company:	KWA Site Development
Designer Email:	david.hoover@KWAsitedev.com
Designer Phone:	416-684-4151
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	58
EFO6	73
EFO8	82
EFO10	87
EFO12	91

Recommended Stormceptor EFO Model:	**EFO8**
Estimated Net Annual Sediment (TSS) Load Reduction (%):	**82**
Water Quality Runoff Volume Capture (%):	**> 90**

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

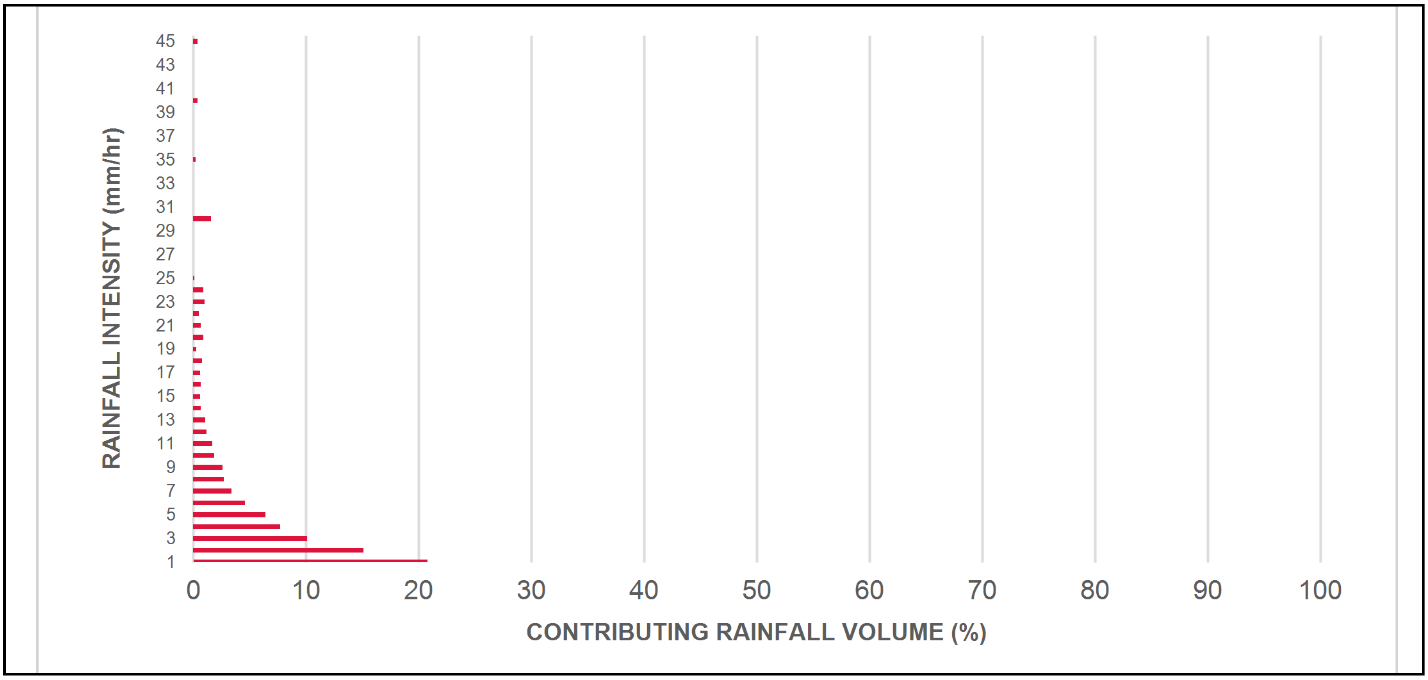
►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (μm)	Percent Less Than	Particle Size Fraction (μm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

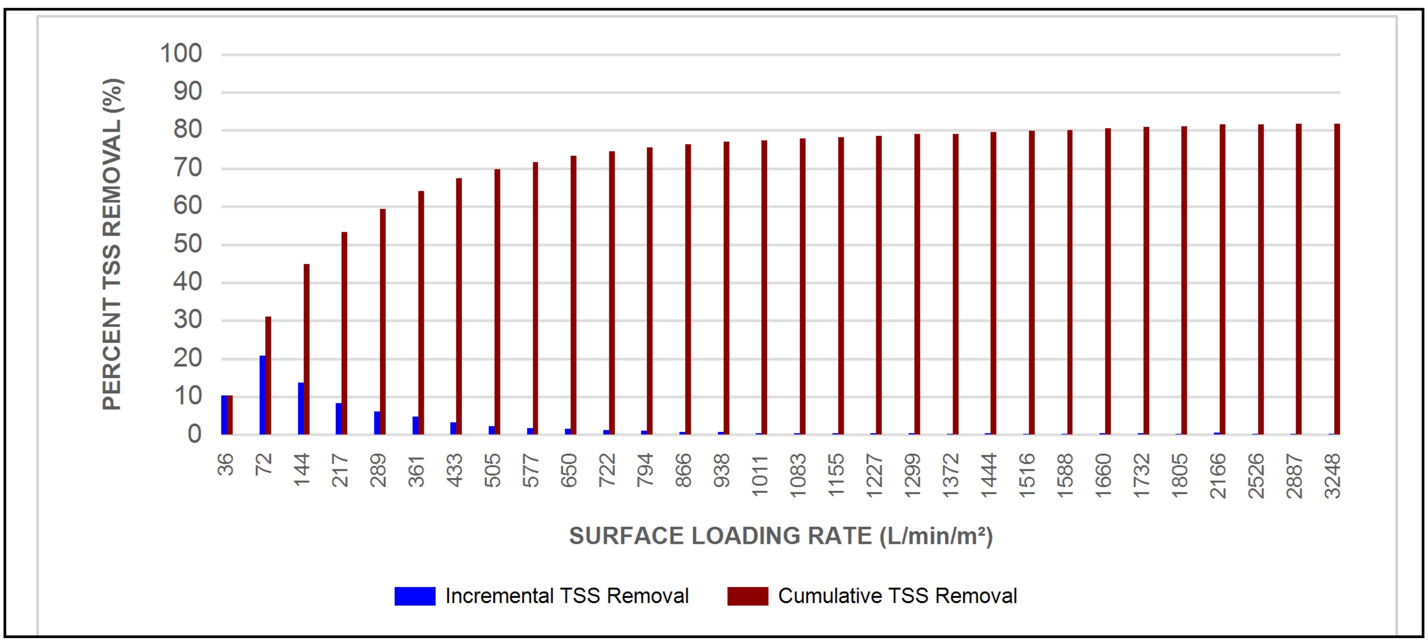
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	10.3	10.3	2.83	170.0	36.0	100	10.3	10.3
1	20.8	31.1	5.65	339.0	72.0	100	20.8	31.1
2	15.1	46.2	11.31	679.0	144.0	91	13.7	44.8
3	10.1	56.3	16.96	1018.0	217.0	83	8.3	53.2
4	7.7	64.0	22.62	1357.0	289.0	79	6.1	59.3
5	6.4	70.4	28.27	1696.0	361.0	76	4.8	64.1
6	4.6	75.1	33.93	2036.0	433.0	72	3.3	67.5
7	3.4	78.4	39.58	2375.0	505.0	69	2.3	69.8
8	2.7	81.1	45.24	2714.0	577.0	66	1.8	71.6
9	2.6	83.7	50.89	3053.0	650.0	64	1.7	73.3
10	1.9	85.6	56.55	3393.0	722.0	64	1.2	74.5
11	1.7	87.3	62.20	3732.0	794.0	63	1.1	75.5
12	1.2	88.5	67.85	4071.0	866.0	63	0.7	76.3
13	1.1	89.6	73.51	4411.0	938.0	62	0.7	77.0
14	0.7	90.3	79.16	4750.0	1011.0	61	0.5	77.4
15	0.6	90.9	84.82	5089.0	1083.0	60	0.4	77.8
16	0.7	91.6	90.47	5428.0	1155.0	58	0.4	78.2
17	0.6	92.3	96.13	5768.0	1227.0	56	0.4	78.5
18	0.8	93.0	101.78	6107.0	1299.0	55	0.4	79.0
19	0.3	93.3	107.44	6446.0	1372.0	53	0.2	79.1
20	0.9	94.2	113.09	6785.0	1444.0	51	0.4	79.6
21	0.7	94.9	118.74	7125.0	1516.0	48	0.3	79.9
22	0.5	95.3	124.40	7464.0	1588.0	46	0.2	80.1
23	1.0	96.3	130.05	7803.0	1660.0	44	0.4	80.5
24	0.9	97.2	135.71	8143.0	1732.0	42	0.4	80.9
25	0.1	97.3	141.36	8482.0	1805.0	41	0.1	81.0
30	1.6	98.9	169.64	10178.0	2166.0	34	0.5	81.5
35	0.2	99.1	197.91	11874.0	2526.0	29	0.1	81.5
40	0.4	99.5	226.18	13571.0	2887.0	26	0.1	81.7
45	0.4	99.9	254.45	15267.0	3248.0	23	0.1	81.8
Estimated Net Annual Sediment (TSS) Load Reduction =								**82 %**

Climate Station ID: 6116132 *Years of Rainfall Data*: 40

RAINFALL DATA FROM OWEN SOUND MOE RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

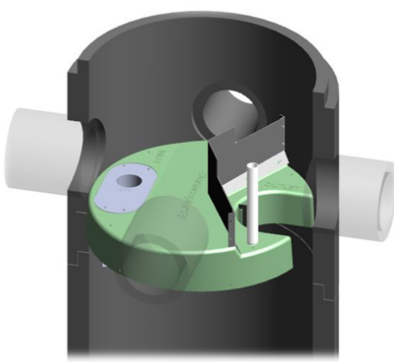
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

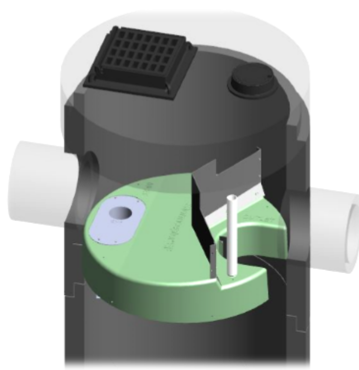
DESIGN FLEXIBILITY

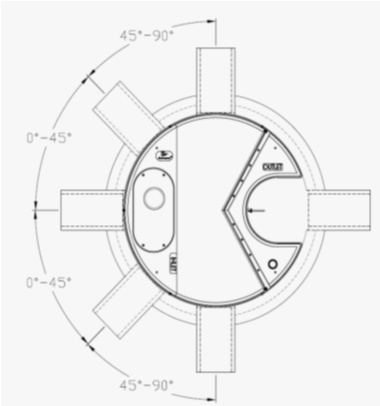
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

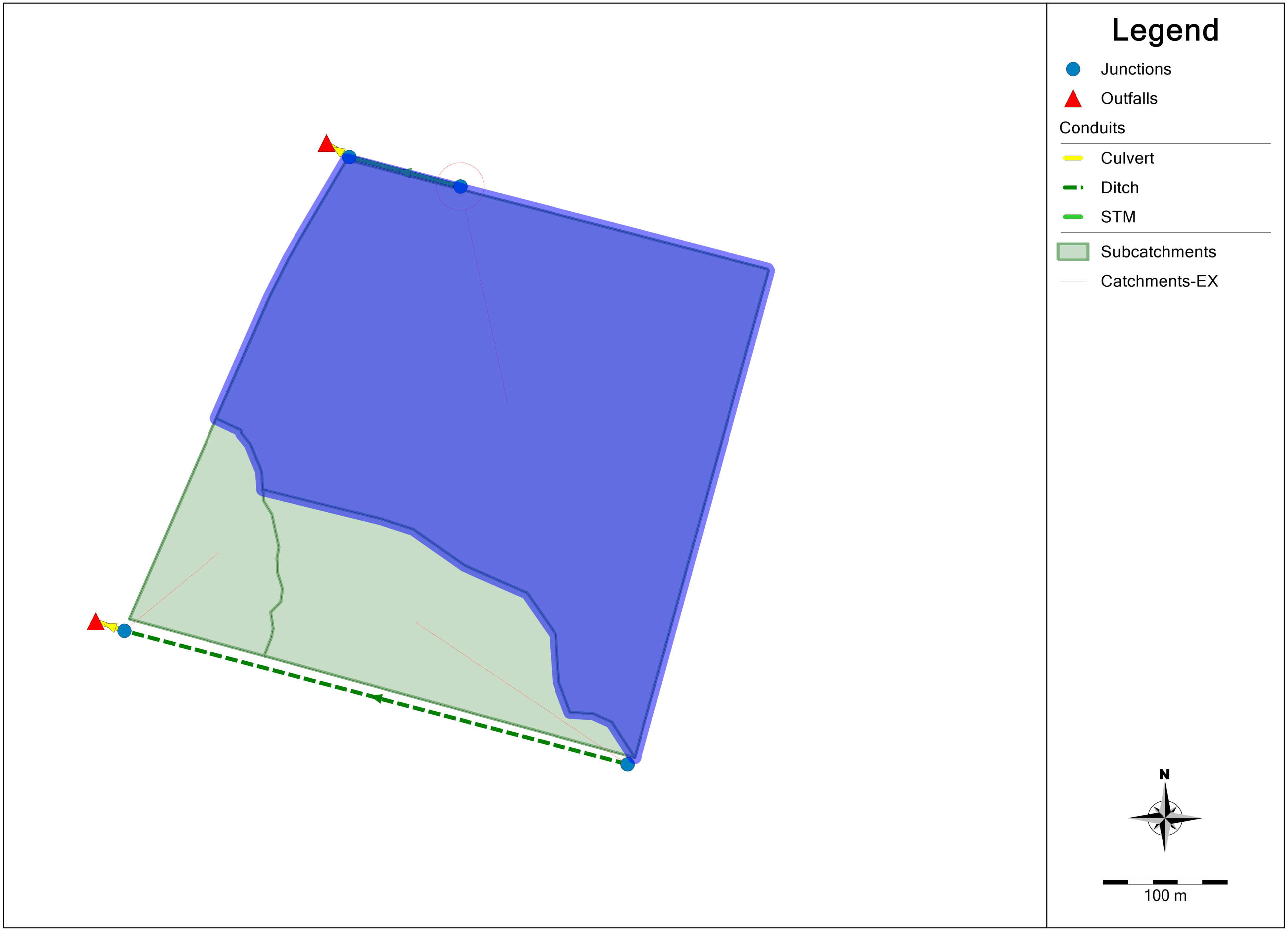
assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

APPENDIX D

PCSWMM MODELING OUTPUT

Pre-development


Legend
Junctions
Outfalls
Conduits
Culvert
Ditch
STM
Subcatchments
Catchments-EX
N
100 m

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

****
Element Count
****

Number of rain gages 4
Number of subcatchments ... 3
Number of nodes 6
Number of links 4
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
100yr_Chicago_3hr_Owen-Sound	100yr_Chicago_3hr_Owen-Sound	INTENSITY	5 min.
25yr_Chicago_3hr_Owen-Sound	25yr_Chicago_3hr_Owen-Sound	INTENSITY	5 min.
2yr_Chicago_3hr_Owen-Sound	2yr_Chicago_3hr_Owen-Sound	INTENSITY	5 min.
5yr_Chicago_3hr_Owen-Sound	5yr_Chicago_3hr_Owen-Sound	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	1.37	90.00	0.00	5.0000	100yr_Chicago_3hr_Owen-Sound	J3
S2_1	11.29	385.00	37.00	2.0000	100yr_Chicago_3hr_Owen-Sound	J1
S3_1	2.93	235.00	54.00	1.0000	100yr_Chicago_3hr_Owen-Sound	J4

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	178.31	4.71	0.0	
J2	JUNCTION	177.85	2.04	0.0	
J3	JUNCTION	177.17	3.83	0.0	
J4	JUNCTION	186.00	3.00	0.0	
32nd_Drain	OUTFALL	177.58	1.50	0.0	
Kenny_Drain	OUTFALL	177.11	1.80	0.0	

****

Link Summary
****

Name	From Node	To Node	Type	Length	% Slope	Roughness
C2	J1	J2	CONDUIT	91.9	0.5005	0.0100
C3	J2	32nd_Drain	CONDUIT	21.2	1.2720	0.0100
C4	J3	Kenny_Drain	CONDUIT	24.2	0.2480	0.0130
C5	J4	J3	CONDUIT	415.3	2.1266	0.0350

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C2	HORIZ_ELLIPSE	1.20	1.83	0.37	1.80	1	6.63
C3	RECT_CLOSED	1.50	5.25	0.52	3.50	1	38.54
C4	RECT_CLOSED	1.80	4.32	0.51	2.40	2	10.62
C5	TRAPEZOIDAL	3.00	45.00	1.80	24.00	1	277.68

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****

```
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... SLOT
Starting Date ............ 08/22/2022 00:00:00
```

```
Ending Date .............. 08/23/2022 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:00:05
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.000500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         1.111        71.271
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.100         6.410
Surface Runoff ...........         1.009        64.755
Final Storage ............         0.007         0.463
Continuity Error (%) .....        -0.500


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         1.009        10.090
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         1.009        10.088
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.014


***************************
Time-Step Critical Elements
***************************
Link C3 (4.09%)


********************************
Highest Flow Instability Indexes
********************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :      2.98 sec
Average Time Step           :      4.96 sec
```

```
Maximum Time Step           :     5.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
Time Step Frequencies       :
    5.000 -  0.910 sec      :   100.00 %
    0.910 -  0.166 sec      :     0.00 %
    0.166 -  0.030 sec      :     0.00 %
    0.030 -  0.005 sec      :     0.00 %
    0.005 -  0.001 sec      :     0.00 %
```

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S1	71.27	0.00	0.00	7.22	0.00	64.29	64.29	0.88	0.27	0.902
S2_1	71.27	0.00	0.00	7.14	26.15	37.85	64.01	7.23	2.99	0.898
S3_1	71.27	0.00	0.00	3.21	38.16	29.70	67.86	1.99	1.17	0.952

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	Time of Max Occurrence hr:min	Reported Max Depth Meters
J1	JUNCTION	0.05	0.58	178.89	0	01:20	0.58
J2	JUNCTION	0.01	0.23	178.08	0	01:20	0.23
J3	JUNCTION	0.01	0.19	177.36	0	01:26	0.19
J4	JUNCTION	0.01	0.14	186.14	0	01:22	0.14
32nd_Drain	OUTFALL	0.01	0.23	177.81	0	01:20	0.23
Kenny_Drain	OUTFALL	0.01	0.18	177.29	0	01:27	0.18

****
Node Inflow Summary
****

```
                               Maximum  Maximum                  Lateral
```

Node	Type	Lateral Inflow CMS	Total Inflow CMS	Time of Max Occurrence days hr:min	Inflow Volume 10^6 ltr	Inflow Volume 10^6 ltr	Balance Error Percent
J1	JUNCTION	2.989	2.989	0 01:20	7.23	7.23	-0.000
J2	JUNCTION	0.000	3.033	0 01:20	0	7.23	0.019
J3	JUNCTION	0.269	1.243	0 01:23	0.879	2.87	0.086
J4	JUNCTION	1.175	1.175	0 01:20	1.99	1.99	-0.104
32nd_Drain	OUTFALL	0.000	3.061	0 01:20	0	7.22	0.000
Kenny_Drain	OUTFALL	0.000	1.137	0 01:27	0	2.86	0.000

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
32nd_Drain	44.52	0.222	3.061	7.224
Kenny_Drain	67.06	0.059	1.137	2.864
System	55.79	0.281	3.578	10.088

****
Link Flow Summary
****

Maximum |Flow|	Time of Max Occurrence	Maximum |Veloc|	Max/ Full	Max/ Full

Link	Type	CMS	days hr:min	m/sec	Flow	Depth
C2	CONDUIT	3.033	0 01:20	6.26	0.46	0.34
C3	CONDUIT	3.061	0 01:20	3.86	0.08	0.15
C4	CONDUIT	1.137	0 01:27	1.28	0.05	0.10
C5	CONDUIT	0.999	0 01:22	1.06	0.00	0.05

****
Flow Classification Summary
****

	Adjusted	---------- Fraction of Time in Flow Class ----------								
	/Actual		Up	Down	Sub	Sup	Up	Down	Norm	Inlet
Conduit	Length	Dry	Dry	Dry	Crit	Crit	Crit	Crit	Ltd	Ctrl
C2	1.00	0.01	0.00	0.00	0.62	0.37	0.00	0.00	0.24	0.00
C3	1.00	0.01	0.00	0.00	0.56	0.43	0.00	0.00	0.29	0.00
C4	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
C5	1.00	0.01	0.00	0.00	0.98	0.01	0.00	0.00	0.95	0.00

****
Conduit Surcharge Summary
****

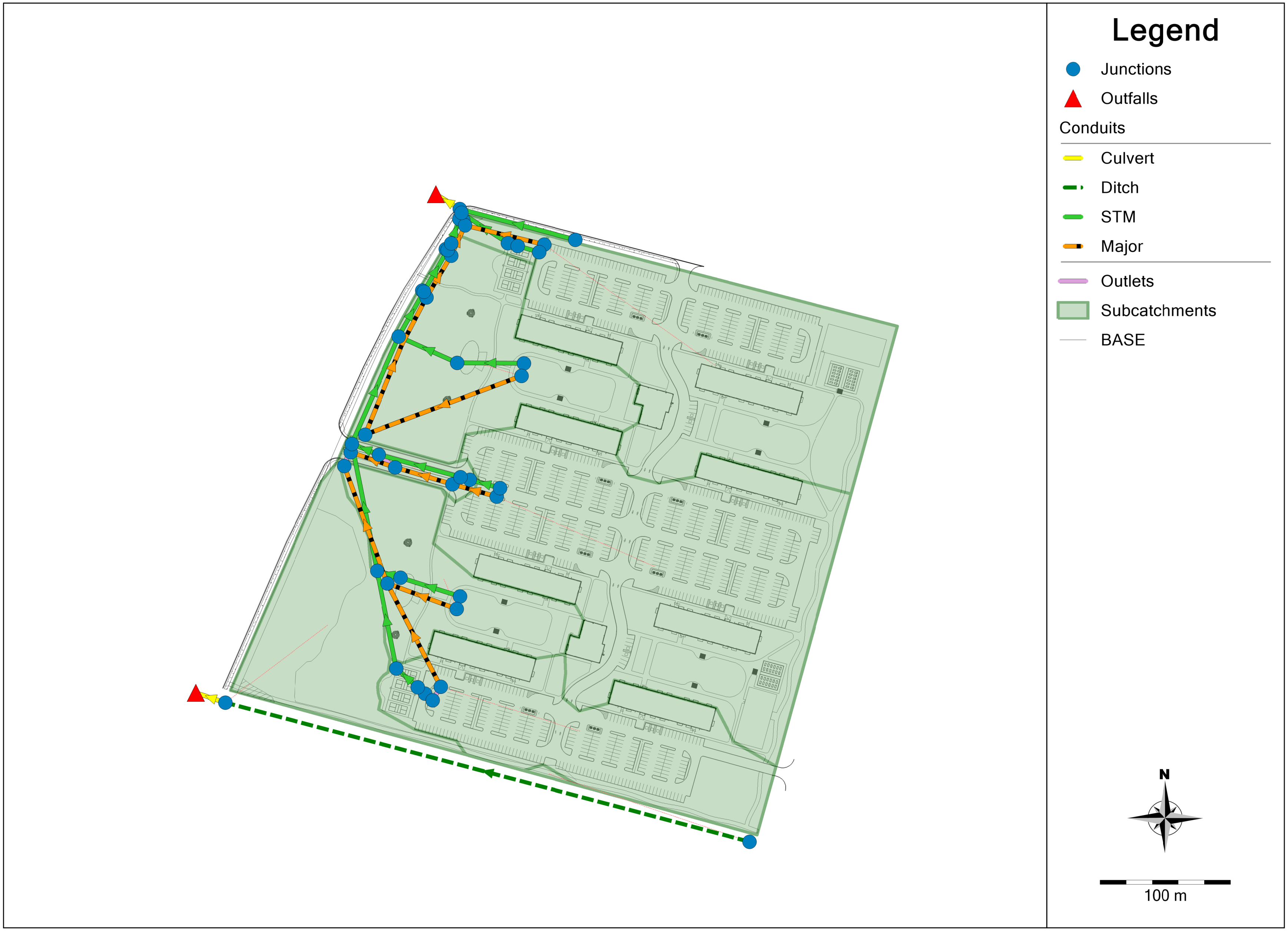
No conduits were surcharged.

Analysis begun on: Fri Oct 14 14:59:41 2022
Analysis ended on: Fri Oct 14 14:59:42 2022
Total elapsed time: 00:00:01

APPENDIX D

PCSWMM MODELING OUTPUT

Post-development (Uncontrolled)


Legend
Junctions
Outfalls
Conduits
Culvert
Ditch
STM
Major
Outlets
Subcatchments
BASE
N
100 m

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------

WARNING 03: negative offset ignored for Link C16
WARNING 03: negative offset ignored for Link C16
WARNING 04: minimum elevation drop used for Conduit C18
WARNING 03: negative offset ignored for Link C21
WARNING 03: negative offset ignored for Link OL1
WARNING 03: negative offset ignored for Link OL5

*************
Element Count
*************
Number of rain gages ...... 4
Number of subcatchments ... 9
Number of nodes ........... 46
Number of links ........... 52
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                    Data       Recording
Name                 Data Source                    Type       Interval
-----------------------------------------------------------------------
100yr_Chicago_3hr_Owen-Sound 100yr_Chicago_3hr_Owen-Sound   INTENSITY    5 min.
25yr_Chicago_3hr_Owen-Sound 25yr_Chicago_3hr_Owen-Sound    INTENSITY    5 min.
2yr_Chicago_3hr_Owen-Sound 2yr_Chicago_3hr_Owen-Sound     INTENSITY    5 min.
5yr_Chicago_3hr_Owen-Sound 5yr_Chicago_3hr_Owen-Sound     INTENSITY    5 min.


********************
Subcatchment Summary
********************
  Name                       Area     Width   %Imperv    %Slope Rain Gage
Outlet
  ---------------------------------------------------------------------------------
--------------------------
  S1                         1.46     90.00      5.00    5.0000
100yr_Chicago_3hr_Owen-Sound J3
  S2                         0.22     20.00     25.00    0.5000
100yr_Chicago_3hr_Owen-Sound J9
  S3                         0.14     20.00     57.00    0.5000
100yr_Chicago_3hr_Owen-Sound J18
  S4                         2.26     85.00    100.00    0.5000
100yr_Chicago_3hr_Owen-Sound J11
  S5                         1.24    135.00     29.00    0.5000
100yr_Chicago_3hr_Owen-Sound J13
  S6                         4.80    185.00    100.00    0.5000
100yr_Chicago_3hr_Owen-Sound J10
  S7                         3.37    130.00    100.00    0.5000
100yr_Chicago_3hr_Owen-Sound J18
  S8                         1.95     75.00     29.00    0.5000
100yr_Chicago_3hr_Owen-Sound J19
  S9                         0.02     25.00     15.00    0.5000
100yr_Chicago_3hr_Owen-Sound J4
```

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CB21_(22693-STM)	JUNCTION	184.15	1.65	0.0	
CB22_(22693-STM)	JUNCTION	178.86	1.29	0.0	
CB23_(22693-STM)	JUNCTION	178.94	1.52	0.0	
CB24_(22693-STM)	JUNCTION	181.35	0.30	0.0	
CB35_(22693-STM)	JUNCTION	178.82	1.33	0.0	
CB6_(22693-STM)	JUNCTION	182.85	1.95	0.0	
EndNullStruct18	JUNCTION	178.11	2.04	0.0	
J1	JUNCTION	178.31	4.71	0.0	
J10	JUNCTION	185.67	0.30	0.0	
J11	JUNCTION	187.21	0.30	0.0	
J12	JUNCTION	185.14	0.30	0.0	
J13	JUNCTION	185.80	0.30	0.0	
J14	JUNCTION	181.38	0.30	0.0	
J15	JUNCTION	180.45	0.30	0.0	
J16	JUNCTION	180.15	0.30	0.0	
J17	JUNCTION	180.15	0.30	0.0	
J18	JUNCTION	183.93	0.30	0.0	
J19	JUNCTION	184.80	0.30	0.0	
J2	JUNCTION	177.85	2.04	0.0	
J3	JUNCTION	177.17	3.83	0.0	
J4	JUNCTION	186.00	3.00	0.0	
J5	JUNCTION	178.17	1.98	0.0	
J6	JUNCTION	178.25	2.21	0.0	
J7	JUNCTION	181.38	0.30	0.0	
J8	JUNCTION	183.45	0.30	0.0	
J9	JUNCTION	185.55	0.30	0.0	
MH1_(22693-STM)	JUNCTION	181.30	2.43	0.0	
MH10_(22693-STM)	JUNCTION	178.16	2.22	0.0	
MH100_(22693-STM)	JUNCTION	178.10	1.40	0.0	
MH11_(22693-STM)	JUNCTION	178.45	2.34	0.0	
MH12_(22693-STM)	JUNCTION	182.20	3.34	0.0	
MH13_(22693-STM)	JUNCTION	179.05	2.33	0.0	
MH14_(22693-STM)	JUNCTION	179.65	2.84	0.0	
MH15_(22693-STM)	JUNCTION	182.84	2.80	0.0	
MH27_(22693-STM)	JUNCTION	182.10	3.04	0.0	
MH28_(22693-STM)	JUNCTION	183.36	4.39	0.0	
MH29_(22693-STM)	JUNCTION	182.60	3.65	0.0	
MH34_(22693-STM)	JUNCTION	181.68	2.19	0.0	
MH35_(22693-STM)	JUNCTION	182.53	3.01	0.0	
MH36_(22693-STM)	JUNCTION	183.84	3.44	0.0	
MH37_(22693-STM)	JUNCTION	183.50	3.98	0.0	
OGS1_(22693-STM)	JUNCTION	181.78	2.15	0.0	
OGS2_(22693-STM)	JUNCTION	183.05	2.62	0.0	
OGS3_(22693-STM)	JUNCTION	183.96	3.24	0.0	
32nd_Drain	OUTFALL	177.58	1.50	0.0	
Kenny_Drain	OUTFALL	177.11	1.80	0.0	

****

Link Summary

****

Name	From Node	To Node	Type	Length	% Slope	Roughness
22693-STM_Pipe_-_(1)_(22693-STM)	CB6_(22693-STM)	MH12_(22693-STM)	CONDUIT	51.2	1.2741	0.0130
22693-STM_Pipe_-_(111)_(22693-STM)	MH10_(22693-STM)	EndNullStruct18	CONDUIT	19.7	0.2594	0.0130
22693-STM_Pipe_-_(120)_(22693-STM)	MH29_(22693-STM)	MH27_(22693-STM)	CONDUIT	18.7	2.6700	0.0130
22693-STM_Pipe_-_(121)_(22693-STM)	MH12_(22693-STM)	MH11_(22693-STM)	CONDUIT	49.1	7.0346	0.0130
22693-STM_Pipe_-_(25)_(22693-STM)	CB21_(22693-STM)	MH29_(22693-STM)	CONDUIT	47.6	3.2573	0.0130
22693-STM_Pipe_-_(41)_(1)_(1)_(22693-STM)	MH35_(22693-STM)	MH14_(22693-STM)	CONDUIT	64.8	4.4537	0.0130
22693-STM_Pipe_-_(41)_(1)_(22693-STM)	MH15_(22693-STM)	MH35_(22693-STM)	CONDUIT	7.5	4.1198	0.0130
22693-STM_Pipe_-_(41)_(2)_(22693-STM)	OGS2_(22693-STM)	MH15_(22693-STM)	CONDUIT	23.9	0.8783	0.0130
22693-STM_Pipe_-_(42)_(22693-STM)	MH14_(22693-STM)	MH13_(22693-STM)	CONDUIT	22.3	1.6539	0.0130
22693-STM_Pipe_-_(43)_(22693-STM)	MH13_(22693-STM)	MH11_(22693-STM)	CONDUIT	89.9	0.6674	0.0130
22693-STM_Pipe_-_(44)_(22693-STM)	MH11_(22693-STM)	J6	CONDUIT	39.4	0.5251	0.0130
22693-STM_Pipe_-_(53)_(1)_(1)_(1)_(22693-STM)	MH34_(22693-STM)	MH1_(22693-STM)	CONDUIT	7.9	4.8120	0.0130
22693-STM_Pipe_-_(53)_(1)_(1)_(22693-STM)	OGS1_(22693-STM)	MH34_(22693-STM)	CONDUIT	16.9	0.4971	0.0130
22693-STM_Pipe_-_(54)_(22693-STM)	MH1_(22693-STM)	MH100_(22693-STM)	CONDUIT	42.5	6.5235	0.0130
22693-STM_Pipe_-_(58)_(22693-STM)	CB35_(22693-STM)	EndNullStruct18	CONDUIT	3.4	0.9901	0.0130
22693-STM_Pipe_-_(72)_(2)_(1)_(1)_(1)_(22693-STM)	MH37_(22693-STM)	MH28_(22693-STM)	CONDUIT	21.7	0.5014	0.0130
22693-STM_Pipe_-_(72)_(2)_(1)_(1)_(22693-STM)	MH36_(22693-STM)	MH37_(22693-STM)	CONDUIT	7.6	0.5031	0.0130
22693-STM_Pipe_-_(72)_(2)_(1)_(22693-STM)	OGS3_(22693-STM)	MH36_(22693-STM)	CONDUIT	7.7	0.4912	0.0130
22693-STM_Pipe_-_(73)_(22693-STM)	MH28_(22693-STM)	MH27_(22693-STM)	CONDUIT	76.3	1.5860	0.0130
22693-STM_Pipe_-_(74)_(22693-STM)	MH27_(22693-STM)	MH13_(22693-STM)	CONDUIT	99.1	2.7732	0.0130
C1	MH100_(22693-STM)	J2	CONDUIT	5.0	5.0063	0.0130
C10	CB23_(22693-STM)	J6	CONDUIT	1.5	16.3093	0.0130
C11	J10	J9	CONDUIT	35.2	0.3354	0.0130
C12	J9	J8	CONDUIT	45.7	4.6071	0.0130
C13	J8	J7	CONDUIT	36.0	5.7689	0.0130
C14	J11	J12	CONDUIT	89.2	2.3158	0.0350
C15	J13	J12	CONDUIT	56.5	1.1639	0.0350

C16	J12	CB24_(22693-STM)	CONDUIT	95.9	3.9592	0.0350
C17	J18	J17	CONDUIT	62.2	6.0942	0.0350
C18	J16	J17	CONDUIT	25.6	0.0012	0.0350
C19	J15	J16	CONDUIT	37.2	0.8140	0.0350
C2	J1	J2	CONDUIT	91.9	0.5005	0.0130
C20	J14	J15	CONDUIT	115.3	0.8031	0.0350
C21	J19	J14	CONDUIT	128.1	2.6724	0.0350
C3	J2	32nd_Drain	CONDUIT	21.2	1.2720	0.0130
C4	J3	Kenny_Drain	CONDUIT	24.2	0.2480	0.0130
C5	J4	J3	CONDUIT	415.3	2.1266	0.0350
C6	EndNullStruct18	MH100_(22693-STM)	CONDUIT	4.9	0.2037	0.0100
C7	J6	J5	CONDUIT	36.7	0.1991	0.0130
C8	J5	MH10_(22693-STM)	CONDUIT	5.9	0.2046	0.0130
C9	CB22_(22693-STM)	J5	CONDUIT	1.5	15.7562	0.0130
OL1	CB24_(22693-STM)	MH13_(22693-STM)	OUTLET			
OL10	J11	OGS3_(22693-STM)	OUTLET			
OL11	J17	CB35_(22693-STM)	OUTLET			
OL2	J7	MH13_(22693-STM)	OUTLET			
OL3	J8	MH14_(22693-STM)	OUTLET			
OL4	J10	OGS2_(22693-STM)	OUTLET			
OL5	J19	CB6_(22693-STM)	OUTLET			
OL6	J13	CB21_(22693-STM)	OUTLET			
OL7	J16	CB22_(22693-STM)	OUTLET			
OL8	J15	CB23_(22693-STM)	OUTLET			
OL9	J18	OGS1_(22693-STM)	OUTLET			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
22693-STM_Pipe_-_(1)_(22693-STM)	CIRCULAR	0.68	0.36	0.17	0.68	1	0.95
22693-STM_Pipe_-_(111)_(22693-STM)	CIRCULAR	0.97	0.75	0.24	0.97	1	1.14
22693-STM_Pipe_-_(120)_(22693-STM)	CIRCULAR	0.68	0.36	0.17	0.68	1	1.37
22693-STM_Pipe_-_(121)_(22693-STM)	CIRCULAR	0.68	0.36	0.17	0.68	1	2.23
22693-STM_Pipe_-_(25)_(22693-STM)	CIRCULAR	0.68	0.36	0.17	0.68	1	1.52

22693-STM_Pipe_-_(41)_(1)_(1)_(22693-STM)	CIRCULAR	0.75	0.44	0.19	0.75	1	2.35
22693-STM_Pipe_-_(41)_(1)_(22693-STM)	CIRCULAR	0.75	0.44	0.19	0.75	1	2.26
22693-STM_Pipe_-_(41)_(2)_(22693-STM)	CIRCULAR	0.75	0.44	0.19	0.75	1	1.04
22693-STM_Pipe_-_(42)_(22693-STM)	CIRCULAR	0.75	0.44	0.19	0.75	1	1.43
22693-STM_Pipe_-_(43)_(22693-STM)	CIRCULAR	0.97	0.75	0.24	0.97	1	1.83
22693-STM_Pipe_-_(44)_(22693-STM)	CIRCULAR	0.97	0.75	0.24	0.97	1	1.62
22693-STM_Pipe_-_(53)_(1)_(1)_(1)_(22693-STM)	CIRCULAR	0.53	0.22	0.13	0.53	1	0.94
22693-STM_Pipe_-_(53)_(1)_(1)_(22693-STM)	CIRCULAR	0.53	0.22	0.13	0.53	1	0.30
22693-STM_Pipe_-_(54)_(22693-STM)	CIRCULAR	0.53	0.22	0.13	0.53	1	1.10
22693-STM_Pipe_-_(58)_(22693-STM)	CIRCULAR	0.30	0.07	0.07	0.30	1	0.10
22693-STM_Pipe_-_(72)_(2)_(1)_(1)_(1)_(22693-STM)	CIRCULAR	0.60	0.28	0.15	0.60	1	0.43
22693-STM_Pipe_-_(72)_(2)_(1)_(1)_(22693-STM)	CIRCULAR	0.60	0.28	0.15	0.60	1	0.44
22693-STM_Pipe_-_(72)_(2)_(1)_(22693-STM)	CIRCULAR	0.60	0.28	0.15	0.60	1	0.43
22693-STM_Pipe_-_(73)_(22693-STM)	CIRCULAR	0.60	0.28	0.15	0.60	1	0.77
22693-STM_Pipe_-_(74)_(22693-STM)	CIRCULAR	0.68	0.36	0.17	0.68	1	1.40
C1	CIRCULAR	0.97	0.75	0.24	0.97	1	5.02
C10	CIRCULAR	0.53	0.22	0.13	0.53	1	1.74
C11	Entrance	0.30	4.60	0.17	28.00	1	6.19
C12	Entrance	0.30	4.60	0.17	28.00	1	22.96
C13	Entrance	0.30	4.60	0.17	28.00	1	25.69
C14	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	0.84
C15	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	0.59
C16	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	1.10
C17	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	1.36
C18	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	0.02
C19	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	0.50
C2	HORIZ_ELLIPSE	1.20	1.83	0.37	1.80	1	5.10
C20	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	0.49
C21	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	0.90
C3	RECT_CLOSED	1.50	5.25	0.52	3.50	1	29.65

C4	RECT_CLOSED	1.80	4.32	0.51	2.40	2
10.62						
C5	TRAPEZOIDAL	3.00	45.00	1.80	24.00	1
277.68						
C6	CIRCULAR	0.97	0.75	0.24	0.97	1
1.32						
C7	CIRCULAR	0.97	0.75	0.24	0.97	1
1.00						
C8	CIRCULAR	0.97	0.75	0.24	0.97	1
1.01						
C9	CIRCULAR	0.53	0.22	0.13	0.53	1
1.71						

****
Transect Summary
****

Transect Entrance

Area:

0.0004	0.0016	0.0035	0.0063	0.0098
0.0141	0.0192	0.0250	0.0317	0.0391
0.0473	0.0563	0.0661	0.0767	0.0880
0.1002	0.1131	0.1268	0.1413	0.1565
0.1726	0.1894	0.2070	0.2254	0.2446
0.2647	0.2861	0.3087	0.3324	0.3574
0.3836	0.4109	0.4395	0.4691	0.4991
0.5296	0.5605	0.5918	0.6235	0.6557
0.6882	0.7212	0.7546	0.7884	0.8226
0.8573	0.8923	0.9278	0.9637	1.0000

Hrad:

0.0176	0.0353	0.0529	0.0705	0.0881
0.1058	0.1234	0.1410	0.1587	0.1763
0.1939	0.2115	0.2292	0.2468	0.2644
0.2821	0.2997	0.3173	0.3349	0.3526
0.3702	0.3878	0.4055	0.4231	0.4407
0.4582	0.4747	0.4905	0.5057	0.5203
0.5345	0.5484	0.5619	0.5862	0.6156
0.6444	0.6727	0.7005	0.7278	0.7546
0.7810	0.8070	0.8325	0.8576	0.8823
0.9066	0.9305	0.9540	0.9772	1.0000

Width:

0.0214	0.0429	0.0643	0.0857	0.1071
0.1286	0.1500	0.1714	0.1929	0.2143
0.2357	0.2571	0.2786	0.3000	0.3214
0.3429	0.3643	0.3857	0.4071	0.4286
0.4500	0.4714	0.4929	0.5143	0.5357
0.5686	0.6014	0.6343	0.6671	0.7000
0.7329	0.7657	0.7986	0.8171	0.8286
0.8400	0.8514	0.8629	0.8743	0.8857
0.8971	0.9086	0.9200	0.9314	0.9429
0.9543	0.9657	0.9771	0.9886	1.0000

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,

```
not just on results from each reporting time step.
**********************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... SLOT
Starting Date ............ 08/22/2022 00:00:00
Ending Date .............. 08/23/2022 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:00:05
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 8
Head Tolerance ........... 0.000500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         1.102        71.271
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.044         2.869
Surface Runoff ...........         1.050        67.862
Final Storage ............         0.015         0.954
Continuity Error (%) .....        -0.581


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         1.050        10.496
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         1.035        10.346
Flooding Loss ............         0.017         0.166
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....        -0.160
```

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***************************
Time-Step Critical Elements
***************************
Link C10 (85.85%)
Link C1 (11.86%)


********************************
Highest Flow Instability Indexes
********************************
Link C6 (64)
Link OL7 (9)
Link C1 (6)
Link OL8 (6)
Link OL4 (5)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.04 sec
Average Time Step           :     0.91 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.14
Percent Not Converging      :     0.93
Time Step Frequencies       :
    5.000 -  0.910 sec      :    32.07 %
    0.910 -  0.166 sec      :    67.82 %
    0.166 -  0.030 sec      :     0.11 %
    0.030 -  0.005 sec      :     0.00 %
    0.005 -  0.001 sec      :     0.00 %


***************************
Subcatchment Runoff Summary
***************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S1	71.27	0.00	0.00	9.59	3.50	58.36	61.87	0.90	0.28	0.868
S2	71.27	0.00	0.00	8.34	17.62	45.24	62.86	0.14	0.05	0.882
S3	71.27	0.00	0.00	4.05	40.24	26.76	67.00	0.09	0.06	0.940
S4	71.27	0.00	0.00	0.00	70.47	0.00	70.47	1.60	0.79	0.989

S5	71.27	0.00	0.00	7.53	20.44	43.22	63.65	0.79	0.32	0.893
S6	71.27	0.00	0.00	0.00	70.48	0.00	70.48	3.38	1.70	0.989
S7	71.27	0.00	0.00	0.00	70.48	0.00	70.48	2.38	1.20	0.989
S8	71.27	0.00	0.00	9.47	20.51	41.19	61.69	1.20	0.37	0.866
S9	71.27	0.00	0.00	7.11	10.51	54.13	64.64	0.01	0.01	0.907

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	Time of Max Occurrence hr:min	Reported Max Depth Meters
CB21_(22693-STM)	JUNCTION	0.03	0.16	184.31	0	01:20	0.16
CB22_(22693-STM)	JUNCTION	0.03	0.87	179.73	0	01:22	0.82
CB23_(22693-STM)	JUNCTION	0.06	1.34	180.27	0	01:19	1.31
CB24_(22693-STM)	JUNCTION	0.03	0.24	181.60	0	01:24	0.24
CB35_(22693-STM)	JUNCTION	0.05	0.65	179.47	0	01:23	0.65
CB6_(22693-STM)	JUNCTION	0.05	0.21	183.07	0	01:20	0.21
EndNullStruct18	JUNCTION	0.18	1.44	179.55	0	01:23	1.29
J1	JUNCTION	0.00	0.00	178.31	0	00:00	0.00
J10	JUNCTION	0.02	0.12	185.79	0	01:20	0.12
J11	JUNCTION	0.02	0.13	187.34	0	01:20	0.13
J12	JUNCTION	0.02	0.15	185.29	0	01:22	0.15
J13	JUNCTION	0.02	0.13	185.93	0	01:20	0.13
J14	JUNCTION	0.05	0.18	181.56	0	01:24	0.18
J15	JUNCTION	0.01	0.04	180.49	0	01:24	0.04
J16	JUNCTION	0.00	0.04	180.19	0	01:23	0.04
J17	JUNCTION	0.03	0.27	180.42	0	01:23	0.27
J18	JUNCTION	0.02	0.15	184.08	0	01:20	0.15
J19	JUNCTION	0.03	0.13	184.93	0	01:20	0.13
J2	JUNCTION	0.04	0.33	178.18	0	01:20	0.33
J3	JUNCTION	0.02	0.08	177.25	0	01:32	0.08
J4	JUNCTION	0.00	0.00	186.00	0	01:34	0.00
J5	JUNCTION	0.20	1.50	179.67	0	01:23	1.49
J6	JUNCTION	0.22	2.00	180.25	0	01:19	1.95
J7	JUNCTION	0.02	0.24	181.61	0	01:26	0.24
J8	JUNCTION	0.01	0.07	183.52	0	01:21	0.07
J9	JUNCTION	0.01	0.07	185.63	0	01:20	0.07
MH1_(22693-STM)	JUNCTION	0.05	0.37	181.67	0	01:20	0.37
MH10_(22693-STM)	JUNCTION	0.20	1.45	179.61	0	01:22	1.45
MH100_(22693-STM)	JUNCTION	0.11	0.75	178.85	0	01:24	0.74
MH11_(22693-STM)	JUNCTION	0.19	2.21	180.66	0	01:19	2.20
MH12_(22693-STM)	JUNCTION	0.03	0.13	182.33	0	01:20	0.13
MH13_(22693-STM)	JUNCTION	0.18	2.33	181.38	0	01:19	2.33
MH14_(22693-STM)	JUNCTION	0.12	2.39	182.03	0	01:19	2.37
MH15_(22693-STM)	JUNCTION	0.06	0.42	183.26	0	01:20	0.42
MH27_(22693-STM)	JUNCTION	0.06	0.37	182.47	0	01:21	0.37
MH28_(22693-STM)	JUNCTION	0.06	0.41	183.77	0	01:20	0.41

MH29_(22693-STM)	JUNCTION	0.03	0.17	182.77	0	01:20	0.17
MH34_(22693-STM)	JUNCTION	0.05	0.42	182.10	0	01:20	0.42
MH35_(22693-STM)	JUNCTION	0.06	0.40	182.93	0	01:20	0.40
MH36_(22693-STM)	JUNCTION	0.13	0.60	184.44	0	01:20	0.60
MH37_(22693-STM)	JUNCTION	0.08	0.64	184.14	0	01:20	0.64
OGS1_(22693-STM)	JUNCTION	0.11	1.20	182.98	0	01:20	1.19
OGS2_(22693-STM)	JUNCTION	0.09	0.72	183.77	0	01:20	0.72
OGS3_(22693-STM)	JUNCTION	0.08	0.56	184.52	0	01:20	0.56
32nd_Drain	OUTFALL	0.04	0.31	177.89	0	01:20	0.31
Kenny_Drain	OUTFALL	0.01	0.07	177.18	0	01:32	0.07

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days	Time of Max Occurrence hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
CB21_(22693-STM)	JUNCTION	0.000	0.196	0	01:20	0	0.483	0.001
CB22_(22693-STM)	JUNCTION	0.000	0.199	0	01:39	0	0.183	0.068
CB23_(22693-STM)	JUNCTION	0.000	0.212	0	01:41	0	0.584	0.020
CB24_(22693-STM)	JUNCTION	0.000	0.280	0	01:22	0	0.674	0.024
CB35_(22693-STM)	JUNCTION	0.000	0.196	0	01:23	0	0.501	0.002
CB6_(22693-STM)	JUNCTION	0.000	0.189	0	01:20	0	0.607	0.000
EndNullStruct18	JUNCTION	0.000	3.108	0	01:23	0	7.61	-0.169
J1	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
J10	JUNCTION	1.704	1.704	0	01:20	3.38	3.38	-0.007
J11	JUNCTION	0.793	0.793	0	01:20	1.6	1.6	-0.011
J12	JUNCTION	0.000	0.294	0	01:20	0	0.674	0.007
J13	JUNCTION	0.318	0.318	0	01:20	0.791	0.791	-0.007
J14	JUNCTION	0.000	0.169	0	01:20	0	0.597	0.056
J15	JUNCTION	0.000	0.147	0	01:24	0	0.597	-0.008
J16	JUNCTION	0.000	0.137	0	01:23	0	0.177	-0.016
J17	JUNCTION	0.000	0.334	0	01:20	0	0.662	0.019

J18	JUNCTION	1.256	1.256	0	01:20	2.47	2.47	-0.015
J19	JUNCTION	0.367	0.367	0	01:20	1.2	1.2	-0.028
J2	JUNCTION	0.000	4.303	0	01:21	0	9.43	-0.000
J3	JUNCTION	0.277	0.279	0	01:25	0.902	0.914	0.023
J4	JUNCTION	0.009	0.009	0	01:20	0.012	0.012	0.320
J5	JUNCTION	0.000	2.815	0	01:23	0	7.12	-0.007
J6	JUNCTION	0.000	2.643	0	01:23	0	6.94	-0.003
J7	JUNCTION	0.000	0.405	0	01:21	0	0.609	0.124
J8	JUNCTION	0.000	0.457	0	01:20	0	0.744	-0.088
J9	JUNCTION	0.049	0.459	0	01:20	0.141	0.744	0.013
MH1_(22693-STM)	JUNCTION	0.000	0.921	0	01:20	0	1.81	0.000
MH10_(22693-STM)	JUNCTION	0.000	2.841	0	01:22	0	7.11	-0.003
MH100_(22693-STM)	JUNCTION	0.000	4.463	0	01:22	0	9.43	-0.012
MH11_(22693-STM)	JUNCTION	0.000	2.522	0	01:20	0	6.35	-0.016
MH12_(22693-STM)	JUNCTION	0.000	0.189	0	01:20	0	0.607	-0.005
MH13_(22693-STM)	JUNCTION	0.000	2.763	0	01:22	0	5.91	-0.025
MH14_(22693-STM)	JUNCTION	0.000	1.358	0	01:20	0	2.92	0.001
MH15_(22693-STM)	JUNCTION	0.000	1.382	0	01:20	0	2.78	0.002
MH27_(22693-STM)	JUNCTION	0.000	0.812	0	01:20	0	1.71	0.007
MH28_(22693-STM)	JUNCTION	0.000	0.618	0	01:20	0	1.23	-0.000
MH29_(22693-STM)	JUNCTION	0.000	0.196	0	01:20	0	0.483	0.001
MH34_(22693-STM)	JUNCTION	0.000	0.921	0	01:20	0	1.81	0.000
MH35_(22693-STM)	JUNCTION	0.000	1.322	0	01:21	0	2.78	0.025
MH36_(22693-STM)	JUNCTION	0.000	0.615	0	01:20	0	1.23	0.007
MH37_(22693-STM)	JUNCTION	0.000	0.615	0	01:20	0	1.23	0.001
OGS1_(22693-STM)	JUNCTION	0.000	0.919	0	01:20	0	1.81	0.003
OGS2_(22693-STM)	JUNCTION	0.000	1.294	0	01:20	0	2.78	0.001
OGS3_(22693-STM)	JUNCTION	0.000	0.615	0	01:20	0	1.23	0.001
32nd_Drain	OUTFALL	0.000	3.959	0	01:20	0	9.43	0.000
Kenny_Drain	OUTFALL	0.000	0.256	0	01:32	0	0.913	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
CB22_(22693-STM)	JUNCTION	0.20	0.341	0.421
CB23_(22693-STM)	JUNCTION	0.29	0.812	0.180
CB35_(22693-STM)	JUNCTION	0.32	0.348	0.683
EndNullStruct18	JUNCTION	0.10	0.466	0.599
J5	JUNCTION	0.34	0.521	0.481
J6	JUNCTION	0.38	1.027	0.205
MH10_(22693-STM)	JUNCTION	0.32	0.471	0.775
MH11_(22693-STM)	JUNCTION	0.36	1.235	0.126
MH13_(22693-STM)	JUNCTION	0.30	1.351	0.000
MH14_(22693-STM)	JUNCTION	0.26	1.637	0.450
OGS1_(22693-STM)	JUNCTION	0.36	0.670	0.959

****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CMS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Ponded Depth Meters
MH13_(22693-STM)	0.16	0.560	0 01:19	0.166	0.000

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
32nd_Drain	99.71	0.306	3.959	9.433
Kenny_Drain	86.15	0.035	0.256	0.913
System	92.93	0.341	4.081	10.346

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	Time of Max Occurrence hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
22693-STM_Pipe_-_(1)_(22693-STM)	CONDUIT	0.189	0	01:20	2.60	0.20	0.26
22693-STM_Pipe_-_(111)_(22693-STM)	CONDUIT	2.853	0	01:22	3.82	2.50	1.00
22693-STM_Pipe_-_(120)_(22693-STM)	CONDUIT	0.196	0	01:20	1.49	0.14	0.40
22693-STM_Pipe_-_(121)_(22693-STM)	CONDUIT	0.189	0	01:20	2.56	0.08	1.00
22693-STM_Pipe_-_(25)_(22693-STM)	CONDUIT	0.196	0	01:20	2.83	0.13	0.25
22693-STM_Pipe_-_(41)_(1)_(1)_(22693-STM)	CONDUIT	1.309	0	01:20	3.95	0.56	1.00
22693-STM_Pipe_-_(41)_(1)_(22693-STM)	CONDUIT	1.322	0	01:21	5.42	0.59	0.54
22693-STM_Pipe_-_(41)_(2)_(22693-STM)	CONDUIT	1.382	0	01:20	3.92	1.32	0.75
22693-STM_Pipe_-_(42)_(22693-STM)	CONDUIT	1.437	0	01:19	3.25	1.00	1.00
22693-STM_Pipe_-_(43)_(22693-STM)	CONDUIT	2.346	0	01:28	3.14	1.28	1.00
22693-STM_Pipe_-_(44)_(22693-STM)	CONDUIT	2.517	0	01:20	3.37	1.55	1.00
22693-STM_Pipe_-_(53)_(1)_(1)_(1)_(22693-STM)	CONDUIT	0.921	0	01:20	5.29	0.98	0.75
22693-STM_Pipe_-_(53)_(1)_(1)_(22693-STM)	CONDUIT	0.921	0	01:20	4.25	3.04	1.00
22693-STM_Pipe_-_(54)_(22693-STM)	CONDUIT	0.922	0	01:20	5.68	0.84	0.70
22693-STM_Pipe_-_(58)_(22693-STM)	CONDUIT	0.266	0	01:22	3.76	2.77	1.00
22693-STM_Pipe_-_(72)_(2)_(1)_(1)_(1)_(22693-STM)	CONDUIT	0.618	0	01:20	2.22	1.42	0.96
22693-STM_Pipe_-_(72)_(2)_(1)_(1)_(22693-STM)	CONDUIT	0.615	0	01:20	2.34	1.41	0.88
22693-STM_Pipe_-_(72)_(2)_(1)_(22693-STM)	CONDUIT	0.615	0	01:20	2.31	1.43	0.89
22693-STM_Pipe_-_(73)_(22693-STM)	CONDUIT	0.618	0	01:21	3.04	0.80	0.68
22693-STM_Pipe_-_(74)_(22693-STM)	CONDUIT	0.812	0	01:21	3.02	0.58	1.00
C1	CONDUIT	4.303	0	01:21	11.07	0.86	0.55
C10	CONDUIT	0.269	0	01:41	3.70	0.15	1.00
C11	CHANNEL	0.410	0	01:20	0.93	0.07	0.31
C12	CHANNEL	0.457	0	01:20	1.90	0.02	0.23
C13	CHANNEL	0.405	0	01:21	0.75	0.02	0.50
C14	CONDUIT	0.176	0	01:20	0.93	0.21	0.47
C15	CONDUIT	0.118	0	01:20	0.64	0.20	0.45
C16	CONDUIT	0.280	0	01:22	1.07	0.26	0.65
C17	CONDUIT	0.334	0	01:20	1.11	0.25	0.69
C18	CONDUIT	0.127	0	01:23	0.56	6.67	0.52
C19	CONDUIT	0.011	0	01:24	0.27	0.02	0.12
C2	CONDUIT	0.000	0	00:00	0.00	0.00	0.14
C20	CONDUIT	0.147	0	01:24	0.99	0.30	0.37

C21	CONDUIT	0.169	0	01:20	0.84	0.19	0.50
C3	CONDUIT	3.959	0	01:20	3.59	0.13	0.21
C4	CONDUIT	0.256	0	01:32	0.74	0.01	0.04
C5	CONDUIT	0.003	0	01:34	0.01	0.00	0.01
C6	CONDUIT	3.563	0	01:22	5.15	2.71	1.00
C7	CONDUIT	2.671	0	01:23	3.58	2.67	1.00
C8	CONDUIT	2.841	0	01:22	3.81	2.80	1.00
C9	CONDUIT	0.271	0	01:22	2.35	0.16	1.00
OL1	DUMMY	0.277	0	01:29			
OL10	DUMMY	0.615	0	01:20			
OL11	DUMMY	0.196	0	01:23			
OL2	DUMMY	0.358	0	01:26			
OL3	DUMMY	0.051	0	01:21			
OL4	DUMMY	1.294	0	01:20			
OL5	DUMMY	0.189	0	01:20			
OL6	DUMMY	0.196	0	01:20			
OL7	DUMMY	0.137	0	01:23			
OL8	DUMMY	0.135	0	01:24			
OL9	DUMMY	0.919	0	01:20			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class ----------								
22693-STM_Pipe_-_(1)_(22693-STM)	1.00	0.00	0.00	0.00	0.15	0.85	0.00	0.00	0.37	0.00
22693-STM_Pipe_-_(111)_(22693-STM)	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.41	0.00
22693-STM_Pipe_-_(120)_(22693-STM)	1.00	0.00	0.10	0.00	0.31	0.60	0.00	0.00	0.98	0.00
22693-STM_Pipe_-_(121)_(22693-STM)	1.00	0.00	0.00	0.00	0.07	0.04	0.00	0.89	0.04	0.00
22693-STM_Pipe_-_(25)_(22693-STM)	1.00	0.00	0.00	0.00	0.25	0.75	0.00	0.00	0.39	0.00
22693-STM_Pipe_-_(41)_(1)_(1)_(22693-STM)	1.00	0.00	0.00	0.00	0.08	0.92	0.00	0.00	0.98	0.00
22693-STM_Pipe_-_(41)_(1)_(22693-STM)	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.03	0.00
22693-STM_Pipe_-_(41)_(2)_(22693-STM)	1.00	0.00	0.00	0.00	0.12	0.87	0.00	0.00	0.04	0.00
22693-STM_Pipe_-_(42)_(22693-STM)	1.00	0.00	0.00	0.00	0.04	0.02	0.00	0.94	0.00	0.00
22693-STM_Pipe_-_(43)_(22693-STM)	1.00	0.00	0.00	0.00	0.68	0.32	0.00	0.00	0.94	0.00
22693-STM_Pipe_-_(44)_(22693-STM)	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.90	0.00
22693-STM_Pipe_-_(53)_(1)_(1)_(1)_(22693-STM)	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.48	0.00

22693-STM_Pipe_-_(53)_(1)_(1)_(22693-STM)   1.00   0.00 0.00 0.00 0.00 0.00
0.00 1.00 0.00 0.00
22693-STM_Pipe_-_(54)_(22693-STM)   1.00   0.00 0.00 0.00 0.00 0.00 0.00
1.00 0.00 0.00
22693-STM_Pipe_-_(58)_(22693-STM)   1.00   0.00 0.00 0.00 0.01 0.00 0.00
0.98 0.00 0.00
22693-STM_Pipe_-_(72)_(2)_(1)_(1)_(1)_(22693-STM)   1.00   0.00 0.00 0.00
0.00 0.00 0.00 1.00 0.00 0.00
22693-STM_Pipe_-_(72)_(2)_(1)_(1)_(22693-STM)   1.00   0.00 0.00 0.00 0.00
0.00 0.00 1.00 0.00 0.00
22693-STM_Pipe_-_(72)_(2)_(1)_(22693-STM)   1.00   0.00 0.00 0.00 0.01 0.00
0.00 0.98 0.00 0.00
22693-STM_Pipe_-_(73)_(22693-STM)   1.00   0.00 0.00 0.00 0.00 0.00 0.00
1.00 0.00 0.00
22693-STM_Pipe_-_(74)_(22693-STM)   1.00   0.00 0.00 0.00 0.04 0.02 0.00
0.94 0.02 0.00
C1   1.00   0.00 0.00 0.00 0.00 1.00 0.00 0.00 0.02
0.00
C10   1.00   0.01 0.00 0.00 0.06 0.03 0.00 0.90 0.01
0.00
C11   1.00   0.00 0.06 0.00 0.81 0.13 0.00 0.00 0.87
0.00
C12   1.00   0.00 0.00 0.00 0.22 0.78 0.00 0.00 0.05
0.00
C13   1.00   0.25 0.00 0.00 0.34 0.42 0.00 0.00 0.09
0.00
C14   1.00   0.00 0.03 0.00 0.97 0.00 0.00 0.00 0.95
0.00
C15   1.00   0.00 0.26 0.00 0.74 0.00 0.00 0.00 0.81
0.00
C16   1.00   0.00 0.00 0.00 0.98 0.02 0.00 0.00 0.16
0.00
C17   1.00   0.01 0.02 0.00 0.73 0.24 0.00 0.00 0.29
0.00
C18   1.00   0.20 0.00 0.00 0.80 0.00 0.00 0.00 0.00
0.00
C19   1.00   0.15 0.00 0.00 0.85 0.00 0.00 0.00 0.01
0.00
C2   1.00   0.00 1.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00
C20   1.00   0.00 0.00 0.00 0.91 0.09 0.00 0.00 0.00
0.00
C21   1.00   0.00 0.10 0.00 0.89 0.00 0.00 0.00 0.97
0.00
C3   1.00   0.00 0.00 0.00 0.21 0.79 0.00 0.00 0.37
0.00
C4   1.00   0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00
0.00
C5   1.00   0.00 0.01 0.00 0.99 0.00 0.00 0.00 0.98
0.00
C6   1.00   0.00 0.00 0.00 0.19 0.80 0.00 0.00 0.10
0.00
C7   1.00   0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.47
0.00
C8   1.00   0.00 0.00 0.00 1.00 0.00 0.00 0.00 0.06
0.00
C9   1.00   0.01 0.00 0.00 0.07 0.03 0.00 0.90 0.02
0.00

****
Conduit Surcharge Summary
****

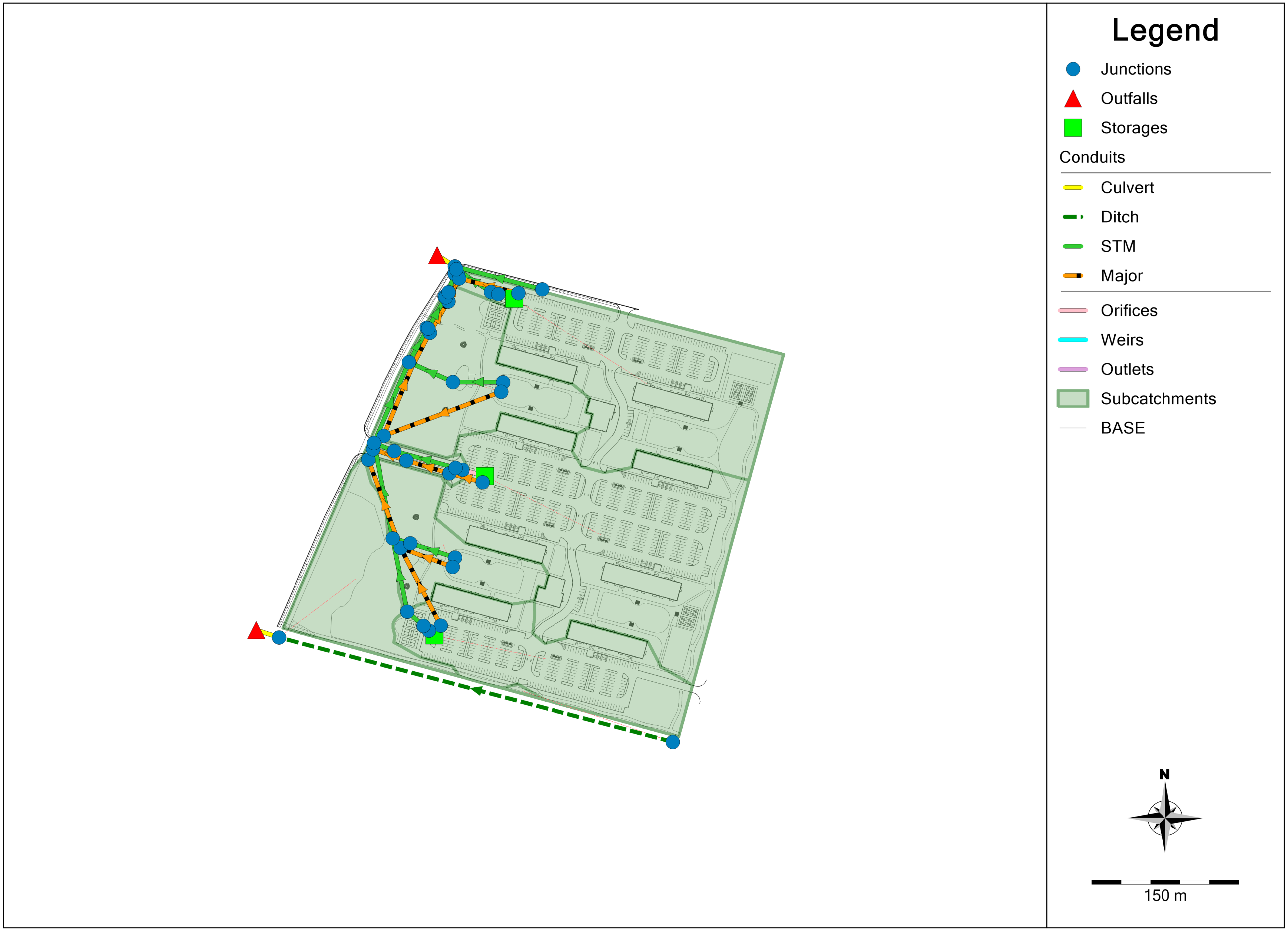
Conduit	Hours Full Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
22693-STM_Pipe_-_(111)_(22693-STM)	0.10	0.32	0.10	0.48	0.27
22693-STM_Pipe_-_(121)_(22693-STM)	0.01	0.01	0.36	0.01	0.01
22693-STM_Pipe_-_(41)_(1)_(1)_(22693-STM)	0.01	0.01	0.26	0.01	0.01
22693-STM_Pipe_-_(41)_(2)_(22693-STM)	0.01	0.01	0.01	0.17	0.01
22693-STM_Pipe_-_(42)_(22693-STM)	0.26	0.26	0.30	0.01	0.01
22693-STM_Pipe_-_(43)_(22693-STM)	0.30	0.30	0.36	0.24	0.23
22693-STM_Pipe_-_(44)_(22693-STM)	0.36	0.36	0.38	0.32	0.31
22693-STM_Pipe_-_(53)_(1)_(1)_(22693-STM)	0.20	0.36	0.20	0.46	0.33
22693-STM_Pipe_-_(58)_(22693-STM)	0.22	0.32	0.22	0.45	0.28
22693-STM_Pipe_-_(72)_(2)_(1)_(1)_(1)_(22693-STM)	0.01	0.10	0.01	0.22	0.01
22693-STM_Pipe_-_(72)_(2)_(1)_(1)_(22693-STM)	0.01	0.01	0.01	0.22	0.01
22693-STM_Pipe_-_(72)_(2)_(1)_(22693-STM)	0.01	0.01	0.01	0.22	0.01
22693-STM_Pipe_-_(74)_(22693-STM)	0.01	0.01	0.30	0.01	0.01
C10	0.29	0.29	0.38	0.01	0.01
C18	0.01	0.01	0.01	0.49	0.01
C6	0.01	0.10	0.01	0.45	0.01
C7	0.34	0.38	0.34	0.53	0.36
C8	0.32	0.34	0.32	0.53	0.32
C9	0.20	0.20	0.34	0.01	0.01

Analysis begun on: Fri Oct 14 15:05:32 2022
Analysis ended on: Fri Oct 14 15:05:44 2022
Total elapsed time: 00:00:12

APPENDIX D

PCSWMM MODELING OUTPUT

Post-development (Controlled)


Legend
Junctions
Outfalls
Storages
Conduits
Culvert
Ditch
STM
Major
Orifices
Weirs
Outlets
Subcatchments
BASE
N
150 m

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

WARNING 03: negative offset ignored for Link C16
WARNING 03: negative offset ignored for Link C16
WARNING 04: minimum elevation drop used for Conduit C18
WARNING 03: negative offset ignored for Link C21
WARNING 03: negative offset ignored for Link 22693-STM_Pipe_-_(72)_(2)_(1)_(22693-STM)
WARNING 03: negative offset ignored for Link OL1
WARNING 03: negative offset ignored for Link OL5
WARNING 02: maximum depth increased for Node OGS1_(22693-STM)
WARNING 02: maximum depth increased for Node OGS2_(22693-STM)
WARNING 02: maximum depth increased for Node OGS3_(22693-STM)

****
Element Count
****

Number of rain gages 4
Number of subcatchments ... 9
Number of nodes 46
Number of links 52
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
100yr_Chicago_3hr_Owen-Sound	100yr_Chicago_3hr_Owen-Sound	INTENSITY	5 min.
25yr_Chicago_3hr_Owen-Sound	25yr_Chicago_3hr_Owen-Sound	INTENSITY	5 min.
2yr_Chicago_3hr_Owen-Sound	2yr_Chicago_3hr_Owen-Sound	INTENSITY	5 min.
5yr_Chicago_3hr_Owen-Sound	5yr_Chicago_3hr_Owen-Sound	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	1.46	90.00	5.00	5.0000	100yr_Chicago_3hr_Owen-Sound	J3
S2	0.22	20.00	100.00	5.0000	100yr_Chicago_3hr_Owen-Sound	J9
S3	0.14	20.00	57.00	0.5000	100yr_Chicago_3hr_Owen-Sound	J18
S4	2.26	85.00	69.00	0.5000	100yr_Chicago_3hr_Owen-Sound	OGS3_(22693-STM)
S5	1.24	135.00	29.00	2.0000	100yr_Chicago_3hr_Owen-Sound	J13
S6	4.80	185.00	67.00	0.5000	100yr_Chicago_3hr_Owen-Sound	OGS2_(22693-STM)

```
  S7                          3.37    130.00     56.00    0.5000
100yr_Chicago_3hr_Owen-Sound OGS1_(22693-STM)
  S8                          1.95     75.00     29.00    2.0000
100yr_Chicago_3hr_Owen-Sound J19
  S9                          0.02     25.00     15.00    0.5000
100yr_Chicago_3hr_Owen-Sound J4
```

```
  ************
  Node Summary
  ************
```

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CB21_(22693-STM)	JUNCTION	184.15	1.65	0.0	
CB22_(22693-STM)	JUNCTION	178.86	1.29	0.0	
CB23_(22693-STM)	JUNCTION	178.94	1.52	0.0	
CB24_(22693-STM)	JUNCTION	181.35	0.30	0.0	
CB35_(22693-STM)	JUNCTION	178.82	1.33	0.0	
CB6_(22693-STM)	JUNCTION	182.85	1.95	0.0	
EndNullStruct18	JUNCTION	178.11	2.04	0.0	
J1	JUNCTION	178.31	4.71	0.0	
J10	JUNCTION	185.67	0.30	0.0	
J11	JUNCTION	187.21	0.30	0.0	
J12	JUNCTION	185.14	0.30	0.0	
J13	JUNCTION	185.80	0.30	0.0	
J14	JUNCTION	181.38	0.30	0.0	
J15	JUNCTION	180.45	0.30	0.0	
J16	JUNCTION	180.15	0.30	0.0	
J17	JUNCTION	180.15	0.30	0.0	
J18	JUNCTION	183.93	0.30	0.0	
J19	JUNCTION	184.80	0.30	0.0	
J2	JUNCTION	177.85	2.04	0.0	
J3	JUNCTION	177.17	3.83	0.0	
J4	JUNCTION	186.00	3.00	0.0	
J5	JUNCTION	178.17	1.98	0.0	
J6	JUNCTION	178.25	2.21	0.0	
J7	JUNCTION	181.38	0.30	0.0	
J8	JUNCTION	183.45	0.30	0.0	
J9	JUNCTION	185.55	0.30	0.0	
MH1_(22693-STM)	JUNCTION	180.30	3.43	0.0	
MH10_(22693-STM)	JUNCTION	178.16	2.22	0.0	
MH100_(22693-STM)	JUNCTION	178.10	1.40	0.0	
MH11_(22693-STM)	JUNCTION	178.45	2.34	0.0	
MH12_(22693-STM)	JUNCTION	182.20	3.34	0.0	
MH13_(22693-STM)	JUNCTION	179.05	3.33	0.0	
MH14_(22693-STM)	JUNCTION	179.65	2.84	0.0	
MH15_(22693-STM)	JUNCTION	182.84	2.80	0.0	
MH27_(22693-STM)	JUNCTION	182.10	3.04	0.0	
MH28_(22693-STM)	JUNCTION	183.36	4.39	0.0	
MH29_(22693-STM)	JUNCTION	182.60	3.65	0.0	
MH34_(22693-STM)	JUNCTION	180.68	3.19	0.0	
MH35_(22693-STM)	JUNCTION	182.53	3.01	0.0	
MH36_(22693-STM)	JUNCTION	183.84	3.44	0.0	
MH37_(22693-STM)	JUNCTION	183.80	3.68	0.0	
32nd_Drain	OUTFALL	177.58	1.50	0.0	
Kenny_Drain	OUTFALL	177.11	1.80	0.0	

```
  OGS1_(22693-STM)     STORAGE             180.78      3.75       0.0
  OGS2_(22693-STM)     STORAGE             183.05      3.22       0.0
  OGS3_(22693-STM)     STORAGE             183.96      3.84       0.0


  ************
  Link Summary
  ************
  Name               From Node        To Node          Type            Length    %
Slope Roughness
  -----------------------------------------------------------------------------------
------------
  22693-STM_Pipe_-_(1)_(22693-STM) CB6_(22693-STM)  MH12_(22693-STM) CONDUIT
51.2    1.2741    0.0130
  22693-STM_Pipe_-_(111)_(22693-STM) MH10_(22693-STM) EndNullStruct18  CONDUIT
19.7    0.2594    0.0130
  22693-STM_Pipe_-_(120)_(22693-STM) MH29_(22693-STM) MH27_(22693-STM) CONDUIT
18.7    2.6700    0.0130
  22693-STM_Pipe_-_(121)_(22693-STM) MH12_(22693-STM) MH11_(22693-STM) CONDUIT
49.1    6.8808    0.0130
  22693-STM_Pipe_-_(25)_(22693-STM) CB21_(22693-STM) MH29_(22693-STM) CONDUIT
47.6    3.2573    0.0130
  22693-STM_Pipe_-_(41)_(1)_(1)_(22693-STM) MH35_(22693-STM) MH14_(22693-STM)
CONDUIT           64.8    4.4537    0.0130
  22693-STM_Pipe_-_(41)_(1)_(22693-STM) MH15_(22693-STM) MH35_(22693-STM) CONDUIT
7.5    4.1198    0.0130
  22693-STM_Pipe_-_(42)_(22693-STM) MH14_(22693-STM) MH13_(22693-STM) CONDUIT
22.3    1.3168    0.0130
  22693-STM_Pipe_-_(43)_(22693-STM) MH13_(22693-STM) MH11_(22693-STM) CONDUIT
89.9    0.6674    0.0130
  22693-STM_Pipe_-_(44)_(22693-STM) MH11_(22693-STM) J6               CONDUIT
39.4    0.5251    0.0130
  22693-STM_Pipe_-_(53)_(1)_(1)_(1)_(22693-STM) MH34_(22693-STM) MH1_(22693-STM)
CONDUIT            7.9    4.8120    0.0130
  22693-STM_Pipe_-_(54)_(22693-STM) MH1_(22693-STM)  MH100_(22693-STM) CONDUIT
42.5    3.9820    0.0130
  22693-STM_Pipe_-_(58)_(22693-STM) CB35_(22693-STM) EndNullStruct18  CONDUIT
3.4    0.9901    0.0130
  22693-STM_Pipe_-_(72)_(2)_(1)_(1)_(1)_(22693-STM) MH37_(22693-STM) MH28_(22693-
STM) CONDUIT           21.7    1.8817    0.0130
  22693-STM_Pipe_-_(72)_(2)_(1)_(1)_(22693-STM) MH36_(22693-STM) MH37_(22693-STM)
CONDUIT            7.6    0.5296    0.0130
  22693-STM_Pipe_-_(73)_(22693-STM) MH28_(22693-STM) MH27_(22693-STM) CONDUIT
76.3    1.5860    0.0130
  22693-STM_Pipe_-_(74)_(22693-STM) MH27_(22693-STM) MH13_(22693-STM) CONDUIT
99.1    2.6974    0.0130
  C1                 MH100_(22693-STM) J2               CONDUIT            5.0
5.0063    0.0130
  C10                CB23_(22693-STM) J6               CONDUIT            1.5
16.3093    0.0130
  C11                J10              J9               CONDUIT           35.2
0.3354    0.0130
  C12                J9               J8               CONDUIT           45.7
4.6071    0.0130
  C13                J8               J7               CONDUIT           36.0
5.7689    0.0130
  C14                J11              J12              CONDUIT           89.2
2.3158    0.0350
  C15                J13              J12              CONDUIT           56.5
1.1639    0.0350
```

```
  C16               J12               CB24_(22693-STM)  CONDUIT           95.9
3.9592    0.0350
  C17               J18               J17               CONDUIT           62.2
6.0942    0.0350
  C18               J16               J17               CONDUIT           25.6
0.0012    0.0350
  C19               J15               J16               CONDUIT           37.2
0.8140    0.0350
  C2                J1                J2                CONDUIT           91.9
0.5005    0.0130
  C20               J14               J15               CONDUIT          115.3
0.8031    0.0350
  C21               J19               J14               CONDUIT          128.1
2.6724    0.0350
  C3                J2                32nd_Drain        CONDUIT           21.2
1.2720    0.0130
  C4                J3                Kenny_Drain       CONDUIT           24.2
0.2480    0.0130
  C5                J4                J3                CONDUIT          415.3
2.1266    0.0350
  C6                EndNullStruct18  MH100_(22693-STM) CONDUIT            4.9
0.2037    0.0100
  C7                J6                J5                CONDUIT           36.7
0.1991    0.0130
  C8                J5                MH10_(22693-STM)  CONDUIT            5.9
0.2046    0.0130
  C9                CB22_(22693-STM)  J5                CONDUIT            1.5
15.7562    0.0130
  22693-STM_Pipe_-_(41)_(2)_(22693-STM) OGS2_(22693-STM) MH15_(22693-STM) ORIFICE
  22693-STM_Pipe_-_(53)_(1)_(1)_(22693-STM) OGS1_(22693-STM) MH34_(22693-STM)
ORIFICE
  22693-STM_Pipe_-_(72)_(2)_(1)_(22693-STM) OGS3_(22693-STM) MH36_(22693-STM)
ORIFICE
  OL10              OGS3_(22693-STM)  J11               WEIR
  OL4               OGS2_(22693-STM)  J10               WEIR
  OL9               OGS1_(22693-STM)  J18               WEIR
  OL1               CB24_(22693-STM)  MH13_(22693-STM)  OUTLET
  OL11              J17               CB35_(22693-STM)  OUTLET
  OL2               J7                MH13_(22693-STM)  OUTLET
  OL3               J8                MH14_(22693-STM)  OUTLET
  OL5               J19               CB6_(22693-STM)   OUTLET
  OL6               J13               CB21_(22693-STM)  OUTLET
  OL7               J16               CB22_(22693-STM)  OUTLET
  OL8               J15               CB23_(22693-STM)  OUTLET


  *********************
  Cross Section Summary
  *********************
                                        Full     Full     Hyd.     Max.   No. of
Full
  Conduit           Shape               Depth     Area     Rad.    Width  Barrels
Flow
  ---------------------------------------------------------------------------------
------
  22693-STM_Pipe_-_(1)_(22693-STM) CIRCULAR            0.68     0.36     0.17
0.68        1     0.95
  22693-STM_Pipe_-_(111)_(22693-STM) CIRCULAR            1.05     0.87     0.26
1.05        1     1.39
```

22693-STM_Pipe_-_(120)_(22693-STM)	CIRCULAR	0.68	0.36	0.17	0.68	1	1.37
22693-STM_Pipe_-_(121)_(22693-STM)	CIRCULAR	0.68	0.36	0.17	0.68	1	2.21
22693-STM_Pipe_-_(25)_(22693-STM)	CIRCULAR	0.68	0.36	0.17	0.68	1	1.52
22693-STM_Pipe_-_(41)_(1)_(1)_(22693-STM)	CIRCULAR	0.75	0.44	0.19	0.75	1	2.35
22693-STM_Pipe_-_(41)_(1)_(22693-STM)	CIRCULAR	0.75	0.44	0.19	0.75	1	2.26
22693-STM_Pipe_-_(42)_(22693-STM)	CIRCULAR	0.75	0.44	0.19	0.75	1	1.28
22693-STM_Pipe_-_(43)_(22693-STM)	CIRCULAR	1.05	0.87	0.26	1.05	1	2.23
22693-STM_Pipe_-_(44)_(22693-STM)	CIRCULAR	1.05	0.87	0.26	1.05	1	1.98
22693-STM_Pipe_-_(53)_(1)_(1)_(1)_(22693-STM)	CIRCULAR	0.53	0.22	0.13	0.53	1	0.94
22693-STM_Pipe_-_(54)_(22693-STM)	CIRCULAR	0.53	0.22	0.13	0.53	1	0.86
22693-STM_Pipe_-_(58)_(22693-STM)	CIRCULAR	0.30	0.07	0.07	0.30	1	0.10
22693-STM_Pipe_-_(72)_(2)_(1)_(1)_(1)_(22693-STM)	CIRCULAR	0.60	0.28	0.15	0.60	1	0.84
22693-STM_Pipe_-_(72)_(2)_(1)_(1)_(22693-STM)	CIRCULAR	0.60	0.28	0.15	0.60	1	0.45
22693-STM_Pipe_-_(73)_(22693-STM)	CIRCULAR	0.60	0.28	0.15	0.60	1	0.77
22693-STM_Pipe_-_(74)_(22693-STM)	CIRCULAR	0.68	0.36	0.17	0.68	1	1.38
C1	CIRCULAR	1.05	0.87	0.26	1.05	1	6.11
C10	CIRCULAR	0.53	0.22	0.13	0.53	1	1.74
C11	Entrance	0.30	4.60	0.17	28.00	1	6.19
C12	Entrance	0.30	4.60	0.17	28.00	1	22.96
C13	Entrance	0.30	4.60	0.17	28.00	1	25.69
C14	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	0.84
C15	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	0.59
C16	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	1.10
C17	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	1.36
C18	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	0.02
C19	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	0.50
C2	HORIZ_ELLIPSE	1.20	1.83	0.37	1.80	1	5.10
C20	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	0.49
C21	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	0.90
C3	RECT_CLOSED	1.50	5.25	0.52	3.50	1	29.65

C4	RECT_CLOSED	1.80	4.32	0.51	2.40	2
10.62						
C5	TRAPEZOIDAL	3.00	45.00	1.80	24.00	1
277.68						
C6	CIRCULAR	1.05	0.87	0.26	1.05	1
1.60						
C7	CIRCULAR	1.05	0.87	0.26	1.05	1
1.22						
C8	CIRCULAR	1.05	0.87	0.26	1.05	1
1.24						
C9	CIRCULAR	0.53	0.22	0.13	0.53	1
1.71						

****
Transect Summary
****

Transect Entrance

Area:

0.0004	0.0016	0.0035	0.0063	0.0098
0.0141	0.0192	0.0250	0.0317	0.0391
0.0473	0.0563	0.0661	0.0767	0.0880
0.1002	0.1131	0.1268	0.1413	0.1565
0.1726	0.1894	0.2070	0.2254	0.2446
0.2647	0.2861	0.3087	0.3324	0.3574
0.3836	0.4109	0.4395	0.4691	0.4991
0.5296	0.5605	0.5918	0.6235	0.6557
0.6882	0.7212	0.7546	0.7884	0.8226
0.8573	0.8923	0.9278	0.9637	1.0000

Hrad:

0.0176	0.0353	0.0529	0.0705	0.0881
0.1058	0.1234	0.1410	0.1587	0.1763
0.1939	0.2115	0.2292	0.2468	0.2644
0.2821	0.2997	0.3173	0.3349	0.3526
0.3702	0.3878	0.4055	0.4231	0.4407
0.4582	0.4747	0.4905	0.5057	0.5203
0.5345	0.5484	0.5619	0.5862	0.6156
0.6444	0.6727	0.7005	0.7278	0.7546
0.7810	0.8070	0.8325	0.8576	0.8823
0.9066	0.9305	0.9540	0.9772	1.0000

Width:

0.0214	0.0429	0.0643	0.0857	0.1071
0.1286	0.1500	0.1714	0.1929	0.2143
0.2357	0.2571	0.2786	0.3000	0.3214
0.3429	0.3643	0.3857	0.4071	0.4286
0.4500	0.4714	0.4929	0.5143	0.5357
0.5686	0.6014	0.6343	0.6671	0.7000
0.7329	0.7657	0.7986	0.8171	0.8286
0.8400	0.8514	0.8629	0.8743	0.8857
0.8971	0.9086	0.9200	0.9314	0.9429
0.9543	0.9657	0.9771	0.9886	1.0000

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,

```
not just on results from each reporting time step.
**********************************************************

****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... SLOT
Starting Date ............ 08/22/2022 00:00:00
Ending Date .............. 08/23/2022 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:00:05
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 5.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 8
Head Tolerance ........... 0.000500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         1.102        71.271
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.082         5.293
Surface Runoff ...........         1.016        65.715
Final Storage ............         0.010         0.651
Continuity Error (%) .....        -0.543


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         1.016        10.164
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         1.016        10.164
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....        -0.002
```

****
Time-Step Critical Elements
****
Link C10 (77.68%)
Link C1 (13.74%)
Link C9 (2.34%)

****
Highest Flow Instability Indexes
****
Link C6 (40)
Link C1 (9)
Link OL7 (8)
Link OL8 (7)
Link 22693-STM_Pipe_-_(111)_(22693-STM) (4)

****
Routing Time Step Summary
****
Minimum Time Step : 0.02 sec
Average Time Step : 1.08 sec
Maximum Time Step : 5.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.04
Percent Not Converging : 0.03
Time Step Frequencies :
5.000 - 0.910 sec : 36.71 %
0.910 - 0.166 sec : 63.28 %
0.166 - 0.030 sec : 0.01 %
0.030 - 0.005 sec : 0.00 %
0.005 - 0.001 sec : 0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S1	71.27	0.00	0.00	9.59	3.50	58.36	61.87	0.90	0.28	0.868
S2	71.27	0.00	0.00	0.00	70.58	0.00	70.58	0.16	0.14	0.990
S3	71.27	0.00	0.00	4.05	40.24	26.76	67.00	0.09	0.06	0.940
S4	71.27	0.00	0.00	3.44	48.70					

S5	71.27	0.00	0.00	6.78	20.37	44.07	64.44	0.80	0.39	0.904
S6	71.27	0.00	0.00	3.68	47.30	19.89	67.18	3.23	1.50	0.943
S7	71.27	0.00	0.00	5.22	39.55	26.19	65.75	2.22	0.95	0.922
S8	71.27	0.00	0.00	8.05	20.47	42.66	63.13	1.23	0.45	0.886
S9	71.27	0.00	0.00	7.11	10.51	54.13	64.64	0.01	0.01	0.907

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	Time of Max Occurrence hr:min	Reported Max Depth Meters
CB21_(22693-STM)	JUNCTION	0.03	0.19	184.34	0	01:20	0.19
CB22_(22693-STM)	JUNCTION	0.01	0.25	179.11	0	01:23	0.24
CB23_(22693-STM)	JUNCTION	0.03	0.17	179.11	0	01:23	0.17
CB24_(22693-STM)	JUNCTION	0.02	0.12	181.47	0	01:23	0.12
CB35_(22693-STM)	JUNCTION	0.03	0.38	179.20	0	01:34	0.38
CB6_(22693-STM)	JUNCTION	0.05	0.23	183.09	0	01:20	0.23
EndNullStruct18	JUNCTION	0.20	0.82	178.93	0	01:30	0.82
J1	JUNCTION	0.00	0.00	178.31	0	00:00	0.00
J10	JUNCTION	0.00	0.08	185.75	0	01:35	0.08
J11	JUNCTION	0.00	0.00	187.21	0	00:00	0.00
J12	JUNCTION	0.01	0.10	185.24	0	01:22	0.10
J13	JUNCTION	0.02	0.16	185.96	0	01:20	0.16
J14	JUNCTION	0.05	0.21	181.59	0	01:23	0.21
J15	JUNCTION	0.01	0.05	180.50	0	01:24	0.05
J16	JUNCTION	0.00	0.03	180.18	0	01:32	0.03
J17	JUNCTION	0.01	0.23	180.38	0	01:31	0.23
J18	JUNCTION	0.01	0.13	184.06	0	01:30	0.13
J19	JUNCTION	0.03	0.14	184.94	0	01:20	0.14
J2	JUNCTION	0.05	0.21	178.06	0	01:30	0.21
J3	JUNCTION	0.02	0.08	177.25	0	01:32	0.08
J4	JUNCTION	0.00	0.00	186.00	0	01:34	0.00
J5	JUNCTION	0.21	0.87	179.05	0	01:23	0.87
J6	JUNCTION	0.22	0.94	179.19	0	01:23	0.94
J7	JUNCTION	0.01	0.11	181.49	0	01:36	0.11
J8	JUNCTION	0.01	0.05	183.50	0	01:35	0.05
J9	JUNCTION	0.01	0.05	185.60	0	01:35	0.05
MH1_(22693-STM)	JUNCTION	0.07	0.24	180.54	0	01:30	0.24
MH10_(22693-STM)	JUNCTION	0.21	0.85	179.01	0	01:23	0.85
MH100_(22693-STM)	JUNCTION	0.12	0.43	178.53	0	01:30	0.43
MH11_(22693-STM)	JUNCTION	0.18	0.81	179.26	0	01:23	0.81
MH12_(22693-STM)	JUNCTION	0.03	0.15	182.35	0	01:20	0.15
MH13_(22693-STM)	JUNCTION	0.15	0.58	179.63	0	01:21	0.58
MH14_(22693-STM)	JUNCTION	0.10	0.39	180.03	0	01:35	0.39
MH15_(22693-STM)	JUNCTION	0.07	0.27	183.11	0	01:34	0.27
MH27_(22693-STM)	JUNCTION	0.07	0.25	182.35	0	01:21	0.25
MH28_(22693-STM)	JUNCTION	0.08	0.19	183.55	0	01:54	0.19

MH29_(22693-STM)	JUNCTION	0.03	0.20	182.80	0	01:20	0.20
MH34_(22693-STM)	JUNCTION	0.07	0.23	180.91	0	01:30	0.23
MH35_(22693-STM)	JUNCTION	0.07	0.27	182.80	0	01:34	0.27
MH36_(22693-STM)	JUNCTION	0.10	0.25	184.09	0	01:54	0.25
MH37_(22693-STM)	JUNCTION	0.07	0.18	183.98	0	01:54	0.18
32nd_Drain	OUTFALL	0.05	0.21	177.79	0	01:30	0.21
Kenny_Drain	OUTFALL	0.01	0.07	177.18	0	01:32	0.07
OGS1_(22693-STM)	STORAGE	0.54	3.50	184.28	0	01:30	3.50
OGS2_(22693-STM)	STORAGE	0.43	2.96	186.01	0	01:34	2.96
OGS3_(22693-STM)	STORAGE	1.13	3.51	187.47	0	01:54	3.51

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
CB21_(22693-STM)	JUNCTION	0.000	0.251	0	01:20	0	0.535	0.001
CB22_(22693-STM)	JUNCTION	0.000	0.097	0	01:32	0	0.0796	0.358
CB23_(22693-STM)	JUNCTION	0.000	0.178	0	01:24	0	0.593	0.007
CB24_(22693-STM)	JUNCTION	0.000	0.125	0	01:22	0	0.266	0.021
CB35_(22693-STM)	JUNCTION	0.000	0.178	0	01:31	0	0.193	0.002
CB6_(22693-STM)	JUNCTION	0.000	0.225	0	01:20	0	0.624	-0.000
EndNullStruct18	JUNCTION	0.000	1.719	0	01:30	0	7.19	0.002
J1	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
J10	JUNCTION	0.000	0.145	0	01:34	0	0.092	0.247
J11	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
J12	JUNCTION	0.000	0.138	0	01:20	0	0.266	0.011
J13	JUNCTION	0.394	0.394	0	01:20	0.801	0.801	-0.013
J14	JUNCTION	0.000	0.215	0	01:20	0	0.609	0.068
J15	JUNCTION	0.000	0.185	0	01:23	0	0.608	-0.011
J16	JUNCTION	0.000	0.097	0	01:31	0	0.0708	-0.051
J17	JUNCTION	0.000	0.276	0	01:30	0	0.249	0.040

J18	JUNCTION	0.059	0.276	0	01:30	0.0908	0.249	-0.074
J19	JUNCTION	0.453	0.453	0	01:20	1.23	1.23	-0.035
J2	JUNCTION	0.000	2.108	0	01:30	0	9.25	-0.010
J3	JUNCTION	0.277	0.279	0	01:25	0.902	0.914	0.023
J4	JUNCTION	0.009	0.009	0	01:20	0.012	0.012	0.320
J5	JUNCTION	0.000	1.772	0	01:23	0	7.01	-0.004
J6	JUNCTION	0.000	1.659	0	01:23	0	6.93	0.001
J7	JUNCTION	0.000	0.151	0	01:35	0	0.185	0.149
J8	JUNCTION	0.000	0.173	0	01:35	0	0.25	-0.080
J9	JUNCTION	0.138	0.174	0	01:34	0.158	0.25	-0.115
MH1_(22693-STM)	JUNCTION	0.000	0.373	0	01:30	0	2.06	-0.000
MH10_(22693-STM)	JUNCTION	0.000	1.685	0	01:23	0	7	0.001
MH100_(22693-STM)	JUNCTION	0.000	2.282	0	01:30	0	9.25	0.009
MH11_(22693-STM)	JUNCTION	0.000	1.501	0	01:22	0	6.33	-0.005
MH12_(22693-STM)	JUNCTION	0.000	0.226	0	01:20	0	0.624	0.001
MH13_(22693-STM)	JUNCTION	0.000	1.281	0	01:22	0	5.71	-0.002
MH14_(22693-STM)	JUNCTION	0.000	0.668	0	01:35	0	3.2	0.001
MH15_(22693-STM)	JUNCTION	0.000	0.646	0	01:34	0	3.13	0.001
MH27_(22693-STM)	JUNCTION	0.000	0.413	0	01:20	0	2.06	0.002
MH28_(22693-STM)	JUNCTION	0.000	0.166	0	01:54	0	1.53	-0.003
MH29_(22693-STM)	JUNCTION	0.000	0.251	0	01:20	0	0.535	-0.004
MH34_(22693-STM)	JUNCTION	0.000	0.373	0	01:30	0	2.06	0.000
MH35_(22693-STM)	JUNCTION	0.000	0.646	0	01:34	0	3.13	-0.001
MH36_(22693-STM)	JUNCTION	0.000	0.166	0	01:54	0	1.53	0.000
MH37_(22693-STM)	JUNCTION	0.000	0.166	0	01:54	0	1.53	-0.000
32nd_Drain	OUTFALL	0.000	2.086	0	01:30	0	9.25	0.000
Kenny_Drain	OUTFALL	0.000	0.256	0	01:32	0	0.913	0.000
OGS1_(22693-STM)	STORAGE	0.953	0.953	0	01:20	2.22	2.22	0.004
OGS2_(22693-STM)	STORAGE	1.497	1.497	0	01:20	3.23	3.23	0.005
OGS3_(22693-STM)	STORAGE	0.709	0.709	0	01:20	1.53	1.53	0.004

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
CB35_(22693-STM)	JUNCTION	0.15	0.079	0.952

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
OGS1_(22693-STM)	0.023	3	0	0	0.305	34	0 01:30	0.620
OGS2_(22693-STM)	0.038	2	0	0	0.548	28	0 01:34	0.791
OGS3_(22693-STM)	0.105	4	0	0	0.541	20	0 01:54	0.166

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
32nd_Drain	98.06	0.334	2.086	9.250
Kenny_Drain	88.45	0.037	0.256	0.913
System	93.25	0.371	2.339	10.164

```
********************
Link Flow Summary
********************

-----------------------------------------------------------------------------
                               Maximum  Time of Max   Maximum    Max/    Max/
                                |Flow|   Occurrence   |Veloc|    Full    Full
Link                     Type      CMS  days hr:min     m/sec    Flow   Depth
-----------------------------------------------------------------------------
22693-STM_Pipe_-_(1)_(22693-STM) CONDUIT     0.226     0  01:20      2.74    0.24
0.28
22693-STM_Pipe_-_(111)_(22693-STM) CONDUIT     1.675     0  01:23      2.27
1.20    0.80
22693-STM_Pipe_-_(120)_(22693-STM) CONDUIT     0.251     0  01:20      2.43
0.18    0.33
22693-STM_Pipe_-_(121)_(22693-STM) CONDUIT     0.225     0  01:20      2.65
0.10    0.42
22693-STM_Pipe_-_(25)_(22693-STM) CONDUIT     0.251     0  01:20      3.03
0.17    0.28
22693-STM_Pipe_-_(41)_(1)_(1)_(22693-STM) CONDUIT     0.646     0  01:34
3.52    0.28    0.44
22693-STM_Pipe_-_(41)_(1)_(22693-STM) CONDUIT     0.646     0  01:34      4.47
0.29    0.36
22693-STM_Pipe_-_(42)_(22693-STM) CONDUIT     0.668     0  01:35      2.95
0.52    0.51
22693-STM_Pipe_-_(43)_(22693-STM) CONDUIT     1.283     0  01:22      2.16
0.58    0.66
22693-STM_Pipe_-_(44)_(22693-STM) CONDUIT     1.485     0  01:22      1.96
0.75    0.83
22693-STM_Pipe_-_(53)_(1)_(1)_(1)_(22693-STM) CONDUIT     0.373     0  01:30
3.96    0.39    0.45
22693-STM_Pipe_-_(54)_(22693-STM) CONDUIT     0.373     0  01:30      3.82
0.43    0.46
22693-STM_Pipe_-_(58)_(22693-STM) CONDUIT     0.178     0  01:31      2.51
1.85    1.00
22693-STM_Pipe_-_(72)_(2)_(1)_(1)_(1)_(22693-STM) CONDUIT     0.166     0  01:54
2.32    0.20    0.30
22693-STM_Pipe_-_(72)_(2)_(1)_(1)_(22693-STM) CONDUIT     0.166     0  01:54
1.80    0.37    0.36
22693-STM_Pipe_-_(73)_(22693-STM) CONDUIT     0.166     0  01:55      2.18
0.22    0.32
22693-STM_Pipe_-_(74)_(22693-STM) CONDUIT     0.412     0  01:21      3.37
0.30    0.37
C1                       CONDUIT     2.108     0  01:30      9.53    0.34    0.30
C10                      CONDUIT     0.178     0  01:24      3.70    0.10    0.63
C11                      CHANNEL     0.144     0  01:35      0.68    0.02    0.22
C12                      CHANNEL     0.173     0  01:35      1.50    0.01    0.16
C13                      CHANNEL     0.151     0  01:35      0.73    0.01    0.26
C14                      CONDUIT     0.000     0  00:00      0.00    0.00    0.16
C15                      CONDUIT     0.138     0  01:20      0.84    0.23    0.41
C16                      CONDUIT     0.125     0  01:22      0.91    0.11    0.36
C17                      CONDUIT     0.276     0  01:30      1.14    0.20    0.60
C18                      CONDUIT     0.087     0  01:31      0.48    4.60    0.44
C19                      CONDUIT     0.009     0  01:31      0.25    0.02    0.11
C2                       CONDUIT     0.000     0  00:00      0.00    0.00    0.09
C20                      CONDUIT     0.185     0  01:23      1.06    0.37    0.42
C21                      CONDUIT     0.215     0  01:20      0.91    0.24    0.57
C3                       CONDUIT     2.086     0  01:30      2.84    0.07    0.14
```

C4	CONDUIT	0.256	0	01:32	0.74	0.01	0.04
C5	CONDUIT	0.003	0	01:34	0.01	0.00	0.01
C6	CONDUIT	1.910	0	01:30	3.64	1.19	0.59
C7	CONDUIT	1.663	0	01:23	2.10	1.36	0.86
C8	CONDUIT	1.685	0	01:23	2.22	1.36	0.82
C9	CONDUIT	0.145	0	01:29	1.33	0.08	0.62
22693-STM_Pipe_-_(41)_(2)_(22693-STM)	ORIFICE	0.646	0	01:34			1.00
22693-STM_Pipe_-_(53)_(1)_(1)_(22693-STM)	ORIFICE	0.373	0	01:30			1.00
22693-STM_Pipe_-_(72)_(2)_(1)_(22693-STM)	ORIFICE	0.166	0	01:54			1.00
OL10	WEIR	0.000	0	00:00			0.00
OL4	WEIR	0.145	0	01:34			0.12
OL9	WEIR	0.248	0	01:30			0.15
OL1	DUMMY	0.123	0	01:23			
OL11	DUMMY	0.178	0	01:31			
OL2	DUMMY	0.147	0	01:36			
OL3	DUMMY	0.021	0	01:35			
OL5	DUMMY	0.225	0	01:20			
OL6	DUMMY	0.251	0	01:20			
OL7	DUMMY	0.097	0	01:32			
OL8	DUMMY	0.178	0	01:24			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class ----------								
22693-STM_Pipe_-_(1)_(22693-STM)	1.00	0.00	0.00	0.00	0.23	0.77	0.00	0.00	0.53	0.00
22693-STM_Pipe_-_(111)_(22693-STM)	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.56	0.00
22693-STM_Pipe_-_(120)_(22693-STM)	1.00	0.00	0.17	0.00	0.69	0.13	0.00	0.00	0.98	0.00
22693-STM_Pipe_-_(121)_(22693-STM)	1.00	0.00	0.00	0.00	0.03	0.09	0.00	0.88	0.04	0.00
22693-STM_Pipe_-_(25)_(22693-STM)	1.00	0.00	0.00	0.00	0.31	0.69	0.00	0.00	0.29	0.00
22693-STM_Pipe_-_(41)_(1)_(1)_(22693-STM)	1.00	0.00	0.00	0.00	0.18	0.81	0.00	0.00	0.98	0.00
22693-STM_Pipe_-_(41)_(1)_(22693-STM)	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.04	0.00
22693-STM_Pipe_-_(42)_(22693-STM)	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
22693-STM_Pipe_-_(43)_(22693-STM)	1.00	0.00	0.00	0.00	0.56	0.44	0.00	0.00	0.93	0.00
22693-STM_Pipe_-_(44)_(22693-STM)	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.87	0.00

```
  22693-STM_Pipe_-_(53)_(1)_(1)_(1)_(22693-STM)     1.00   0.00  0.00  0.00  0.00
1.00  0.00  0.00  0.97  0.00
  22693-STM_Pipe_-_(54)_(22693-STM)    1.00   0.00  0.00  0.00  0.00  0.00  0.00
1.00  0.00  0.00
  22693-STM_Pipe_-_(58)_(22693-STM)    1.00   0.00  0.00  0.00  0.00  0.01  0.00
0.99  0.00  0.00
  22693-STM_Pipe_-_(72)_(2)_(1)_(1)_(1)_(22693-STM)     1.00   0.00  0.00  0.00
0.00  0.00  0.00  1.00  0.00  0.00
  22693-STM_Pipe_-_(72)_(2)_(1)_(1)_(22693-STM)     1.00   0.00  0.00  0.00  0.31
0.69  0.00  0.00  0.16  0.00
  22693-STM_Pipe_-_(73)_(22693-STM)    1.00   0.00  0.00  0.00  0.00  0.02  0.00
0.98  0.01  0.00
  22693-STM_Pipe_-_(74)_(22693-STM)    1.00   0.00  0.00  0.00  0.00  0.00  0.00
1.00  0.00  0.00
  C1                        1.00   0.00  0.00  0.00  0.00  1.00  0.00  0.00  0.03
0.00
  C10                       1.00   0.01  0.00  0.00  0.06  0.06  0.00  0.88  0.01
0.00
  C11                       1.00   0.00  0.08  0.00  0.89  0.03  0.00  0.00  0.93
0.00
  C12                       1.00   0.00  0.00  0.00  0.22  0.77  0.00  0.00  0.05
0.00
  C13                       1.00   0.31  0.00  0.00  0.34  0.36  0.00  0.00  0.04
0.00
  C14                       1.00   0.00  1.00  0.00  0.00  0.00  0.00  0.00  0.00
0.00
  C15                       1.00   0.00  0.32  0.00  0.68  0.00  0.00  0.00  0.69
0.00
  C16                       1.00   0.00  0.00  0.00  0.97  0.02  0.00  0.00  0.12
0.00
  C17                       1.00   0.10  0.02  0.00  0.67  0.20  0.00  0.00  0.13
0.00
  C18                       1.00   0.27  0.00  0.00  0.73  0.00  0.00  0.00  0.00
0.00
  C19                       1.00   0.20  0.00  0.00  0.79  0.00  0.00  0.00  0.00
0.00
  C2                        1.00   0.00  1.00  0.00  0.00  0.00  0.00  0.00  0.00
0.00
  C20                       1.00   0.00  0.00  0.00  0.88  0.11  0.00  0.00  0.00
0.00
  C21                       1.00   0.00  0.18  0.00  0.82  0.00  0.00  0.00  0.97
0.00
  C3                        1.00   0.00  0.00  0.00  0.24  0.75  0.00  0.00  0.32
0.00
  C4                        1.00   0.00  0.00  0.00  1.00  0.00  0.00  0.00  0.00
0.00
  C5                        1.00   0.00  0.01  0.00  0.98  0.00  0.00  0.00  0.98
0.00
  C6                        1.00   0.00  0.00  0.00  0.29  0.70  0.00  0.00  0.13
0.00
  C7                        1.00   0.00  0.00  0.00  1.00  0.00  0.00  0.00  0.63
0.00
  C8                        1.00   0.00  0.00  0.00  1.00  0.00  0.00  0.00  0.00
0.00
  C9                        1.00   0.01  0.00  0.00  0.12  0.00  0.00  0.87  0.03
0.00


  *************************
  Conduit Surcharge Summary
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Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
22693-STM_Pipe_-_(111)_(22693-STM)	0.01	0.01	0.01	0.35	0.01
22693-STM_Pipe_-_(58)_(22693-STM)	0.07	0.15	0.07	0.20	0.14
C18	0.01	0.01	0.01	0.22	0.01
C6	0.01	0.01	0.01	0.21	0.01
C7	0.01	0.01	0.01	0.46	0.01
C8	0.01	0.01	0.01	0.45	0.01

Analysis begun on: Fri Oct 14 15:01:59 2022
Analysis ended on: Fri Oct 14 15:02:08 2022
Total elapsed time: 00:00:09

APPENDIX E

THERMAL MITIGATION

201

Thermal Mitigation Reservoir Volume Calculation

Area =	3.37	ha
Runoff Volume =	5	mm
	50	m^3/ha
Thermal Mitigation Volume =	169	m^3

Chamber Calculation

Depth =	1.50	m	*Below Invert
Area =	112.33	m^2	
Length =	14.00	m	
Width =	8.02	m	
Top Elevation =	184.28	m	
Outlet Invert =	181.30	m	*WSE in tank
Outlet Pipe Diameter =	300.00	mm	
Chamber Invert =	179.80	m	
Total Chamber Depth =	2.10	m	
Total Depth (from G.S.) =	4.48	m	
Bedrock Elevation =	179.80	m	

202

Thermal Mitigation Reservoir Volume Calculation

Area =	4.80	ha
Runoff Volume =	5	mm
	50	m^3/ha
Thermal Mitigation Volume =	240	m^3

Chamber Calculation

Depth =	2.00	m	*Below Invert
Area =	120.00	m^2	
Length =	14.00	m	
Width =	8.57	m	
Top Elevation =	185.54	m	
Outlet Invert =	182.70	m	*WSE in tank
Outlet Pipe Diameter =	300.00	mm	
Chamber Invert =	180.70	m	
Total Chamber Depth =	2.60	m	
Total Depth (from G.S.) =	4.84	m	
Bedrock Elevation =	180.00	m	

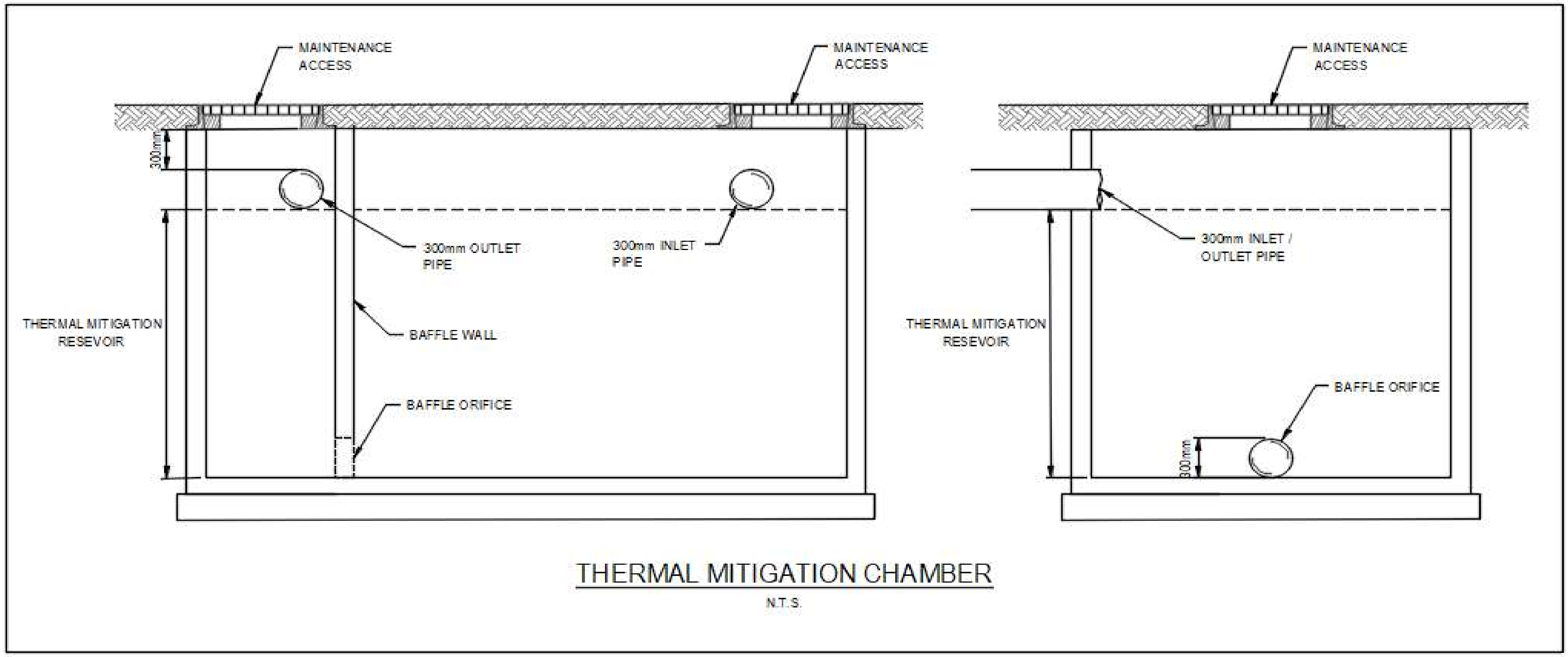
203

Thermal Mitigation Reservoir Volume Calculation

Area =	2.26	ha
Runoff Volume =	5	mm
	50	m^3/ha
Thermal Mitigation Volume =	113	m^3

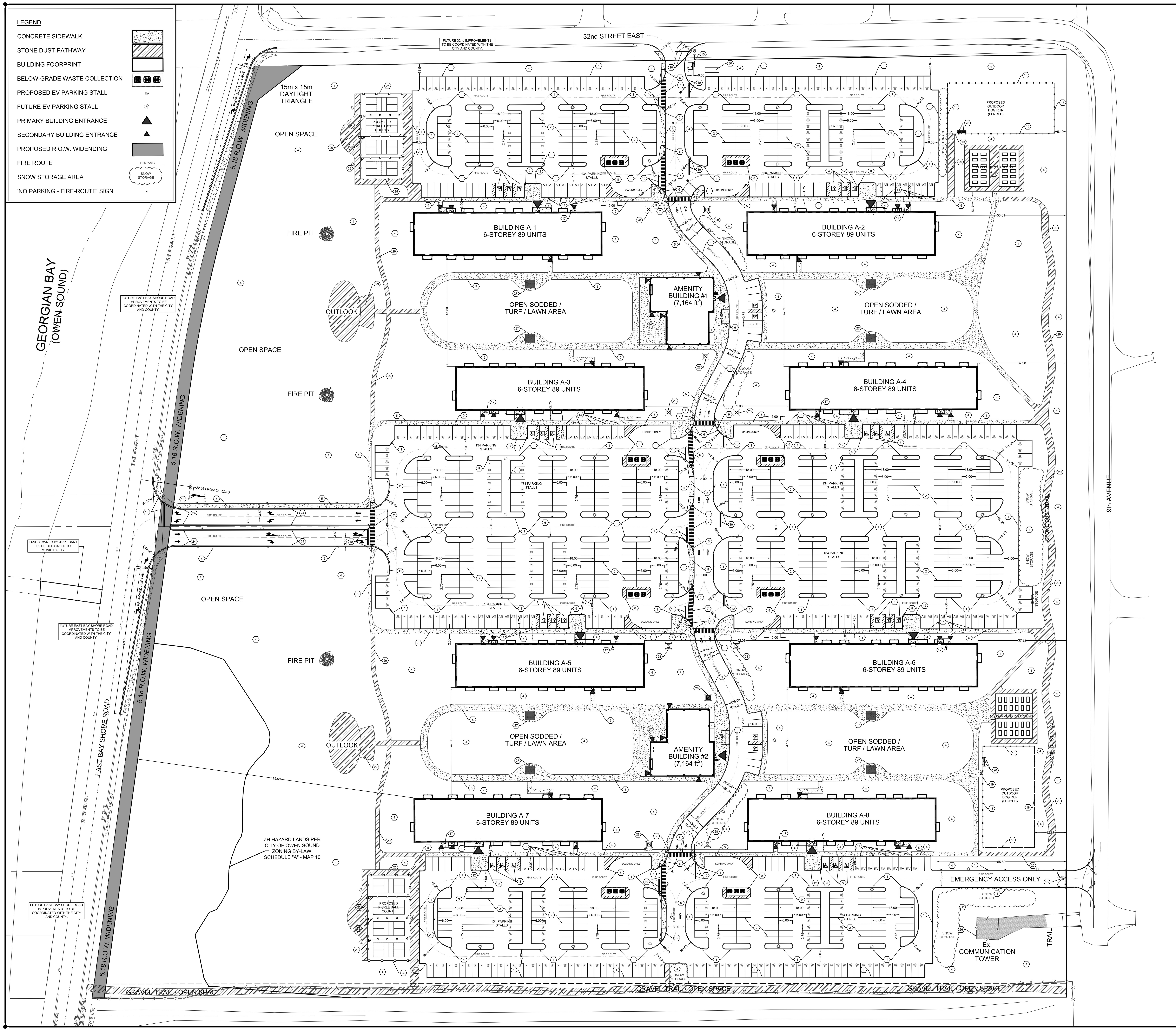
Chamber Calculation

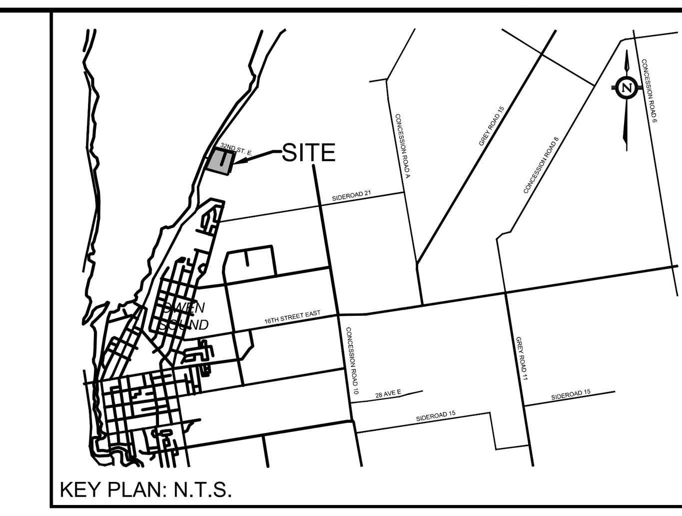
Depth =	1.00	m	*Below Invert
Area =	113.00	m^2	
Length =	14.00	m	
Width =	8.07	m	
Top Elevation =	187.48	m	
Outlet Invert =	183.65	m	*WSE in tank
Outlet Pipe Diameter =	300.00	mm	
Chamber Invert =	182.65	m	
Total Chamber Depth =	1.60	m	
Total Depth (from G.S.) =	4.83	m	
Bedrock Elevation =	181.90	m	



APPENDIX F

DRAWINGS





REVISION BLOCK

#	DATE	DESCRIPTION
1.	10/31/2022	ISSUED FOR SPA

REGISTERED PROFESSIONAL ENGINEER
B.JACKSON
100210382
OCT. 31, 2022
PROVINCE OF ONTARIO

KWA SITE DEVELOPMENT CONSULTING INC.
2453 Auckland Drive
Burlington, ON L7L 7A9

NORTH ARROW

SKYLINE SKYDEV

METRIC SCALE
0m 10m 20m 30m
1:750

CONSTRUCTION NOTES

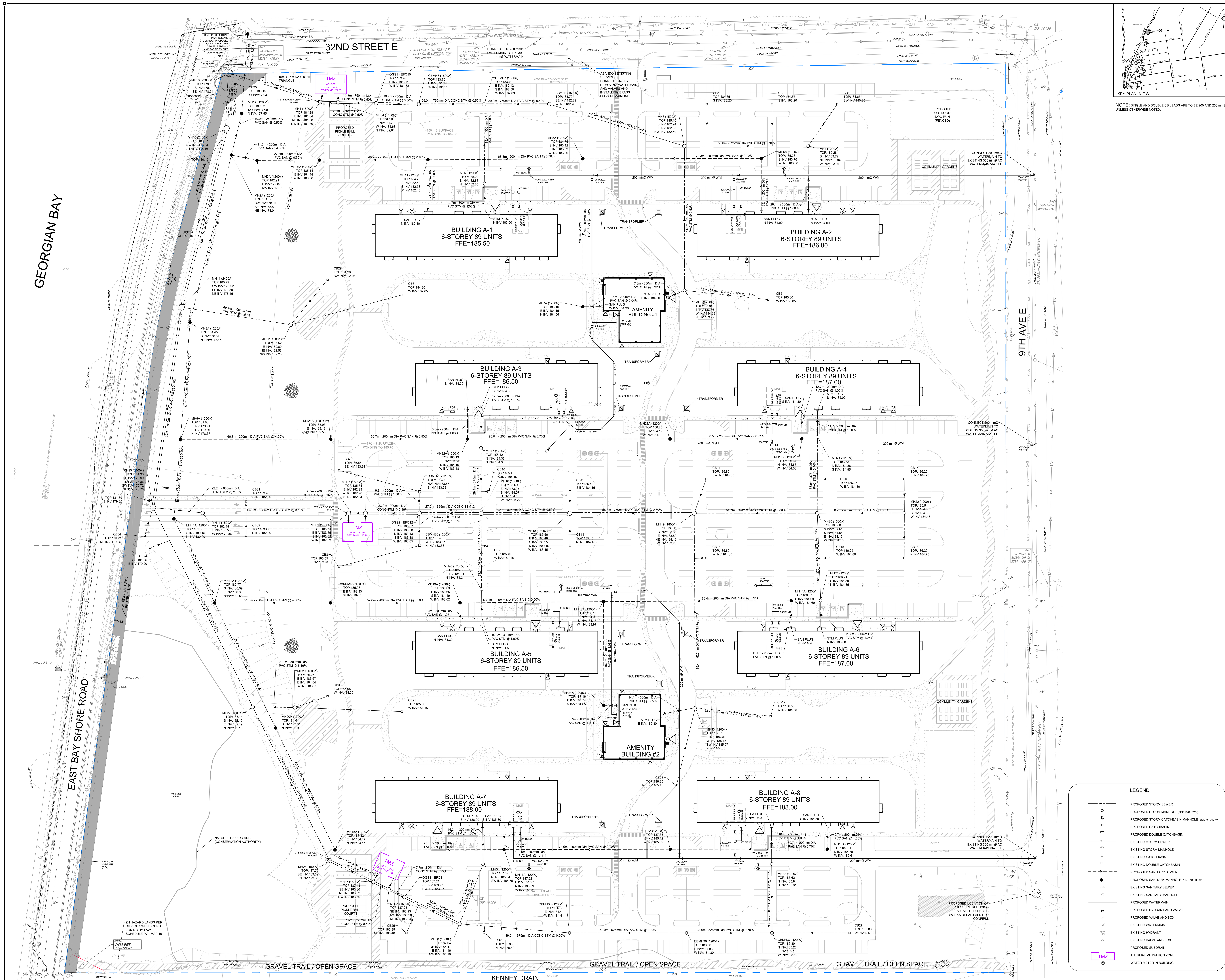
1. BARRIER CURB (AS PER OPSD 600.110)
2. 90° PARKING STRIPE (YELLOW - 0.15m STRIPES)
3. BARRIER FREE PAVEMENT MARKING AND Rb-93 SIGN (SEE DETAILS ON SP-D)
4. LANDSCAPED AREA (REFER TO LANDSCAPE DRAWINGS)
5. CONCRETE SIDEWALK (PER OPSD 310.010)
6. SIDEWALK RAMP (TO INCLUDE TACTILE ATTENTION MATS PER: OPSD - 310.039 - REFER TO SP-D FOR DETAIL)
7. PEDESTRIAN CROSSING (YELLOW ZEBRA STRIPING - 0.30m AT 0.60m O.C.)
8. PAINTED ISLAND (0.15m STRIPES 0.45m O.C. @ 45°) - YELLOW
9. PEDESTRIAN CROSSING SIGN (SEE DETAIL ON SP-D)
10. STOP BAR (WHITE) AND STOP SIGN (SEE DETAILS ON SP-D)
11. TRANSITION FROM BARRIER CURB TO CURB/GUTTER
12. FLUSH SIDEWALK / ASPHALT CONDITION WITH TACTILE ATTENTION INDICATOR (OPSD - 310.039) REFER TO GRADING PLAN FOR DETAILED GRADING AND SP-D FOR DETAILS
13. PROPOSED VEHICULAR GATE (EMERGENCY ACCESS ONLY)
14. ELECTRICAL VEHICLE CHARGING STATION (DUAL VEHICLES) (REFER TO DETAILS ON ELECTRICAL PLANS)
15. PROPOSED MONUMENT SIGN (REFER SKYDEV STANDARDS)
16. 'NO PARKING - FIRE ROUTE' SIGN (SEE DETAIL ON SP-D)
17. SIAMESE CONNECTION
18. PROPOSED 1.8m (6.0') BLACK CHAIN-LINK FENCE AROUND DOG RUN (REFER TO L4 LANDSCAPE DETAILS)
19. FENCE MOUNTED 'PICK UP AFTER YOUR PET' SIGN (SEE DETAIL ON SP-D)
20. PROPOSED BENCH ON CONCRETE PAD (REFER TO LANDSCAPE DRAWINGS)
21. COMMUNITY GARDENS (REFER TO LANDSCAPE PLANS)
22. REFER TO LANDSCAPE DRAWINGS FOR PATIO FURNITURE
23. PROPOSED 1.2m HIGH BLACK VINYL CHAIN-LINK FENCE (REFER TO LANDSCAPE DETAILS)
24. CURB AND GUTTER (AS PER OPSD 600.04)
25. PROPOSED 3.0m (10') FENCE AROUND PICKLEBALL COURT (REFER TO LANDSCAPE PLANS)
26. EXISTING FENCE ENCLOSURE AROUND COMMUNICATION TOWER
27. PROPOSED PERGOLA (REFER TO LANDSCAPE PLANS)
28. PROPOSED TRANSFORMER ON CONCRETE BASE (REFER TO SITE ELECTRICAL DRAWINGS)
29. STONE DUST PATH
30. MAIN SW AND FUSE, PRIMARY METER AND SWITCH (REFER TO SITE ELECTRICAL DRAWINGS FOR DETAILS)

SITE STATISTICS	
	PROPOSED
APARTMENT BLOCK SIZE	37.99 ACRES (15.37 Ha)
APARTMENT COUNT	
BUILDING A-1	89 UNITS
BUILDING A-2	89 UNITS
BUILDING A-3	89 UNITS
BUILDING A-4	89 UNITS
BUILDING A-5	89 UNITS
BUILDING A-6	89 UNITS
BUILDING A-7	89 UNITS
BUILDING A-8	89 UNITS
TOTAL	712 UNITS
DENSITY	46.32 UNITS / Ha.
PARKING REQUIRED (1.50 / UNIT)	
BUILDING A-1 (134 CARS)	134 CARS (1.50 / UNIT)
BUILDING A-2 (134 CARS)	134 CARS (1.50 / UNIT)
BUILDING A-3 (134 CARS)	134 CARS (1.50 / UNIT)
BUILDING A-4 (134 CARS)	134 CARS (1.50 / UNIT)
BUILDING A-5 (134 CARS)	134 CARS (1.50 / UNIT)
BUILDING A-6 (134 CARS)	134 CARS (1.50 / UNIT)
BUILDING A-7 (134 CARS)	134 CARS (1.50 / UNIT)
BUILDING A-8 (134 CARS)	134 CARS (1.50 / UNIT)
AMENITY BLDG. #1	8 CARS
AMENITY BLDG. #2	8 CARS
TOTAL (1,072 CARS)	1,088 CARS (1.53 / UNIT)

SITE PLAN

SKYDEV BAYSHORE OWEN SOUND LP
OWEN SOUND, ONTARIO
PROJECT No: 22693
DRAWN BY: BH
CHECKED BY: RA

SA-001 r3



LEGEND

- PROPOSED STORM SEWER
- PROPOSED STORM MANHOLE (SIZE AS SHOWN)
- PROPOSED STORM CATCHBASIN MANHOLE (SIZE AS SHOWN)
- PROPOSED CATCHBASIN
- PROPOSED DOUBLE CATCHBASIN
- EXISTING STORM SEWER
- EXISTING STORM MANHOLE
- EXISTING CATCHBASIN
- EXISTING DOUBLE CATCHBASIN
- PROPOSED SANITARY SEWER
- PROPOSED SANITARY MANHOLE (SIZE AS SHOWN)
- EXISTING SANITARY SEWER
- EXISTING SANITARY MANHOLE
- PROPOSED WATERMAIN
- PROPOSED HYDRANT AND VALVE
- PROPOSED VALVE AND BOX
- EXISTING WATERMAIN
- EXISTING HYDRANT
- EXISTING VALVE AND BOX
- PROPOSED SUBDRAIN
- THERMAL MITIGATION ZONE
- WATER METER IN BUILDING

REVISION BLOCK

#	DATE	DESCRIPTION
1.	10/21/2022	ISSUED FOR ZONING H REMOVAL & SITE PLAN APPROVAL

REGISTERED PROFESSIONAL ENGINEER
B.JACKSON
100210382
OCT. 21, 2022
PROVINCE OF ONTARIO

KWA SITE DEVELOPMENT CONSULTING INC.
2453 Auckland Drive
Burlington, ON L7L 7A9

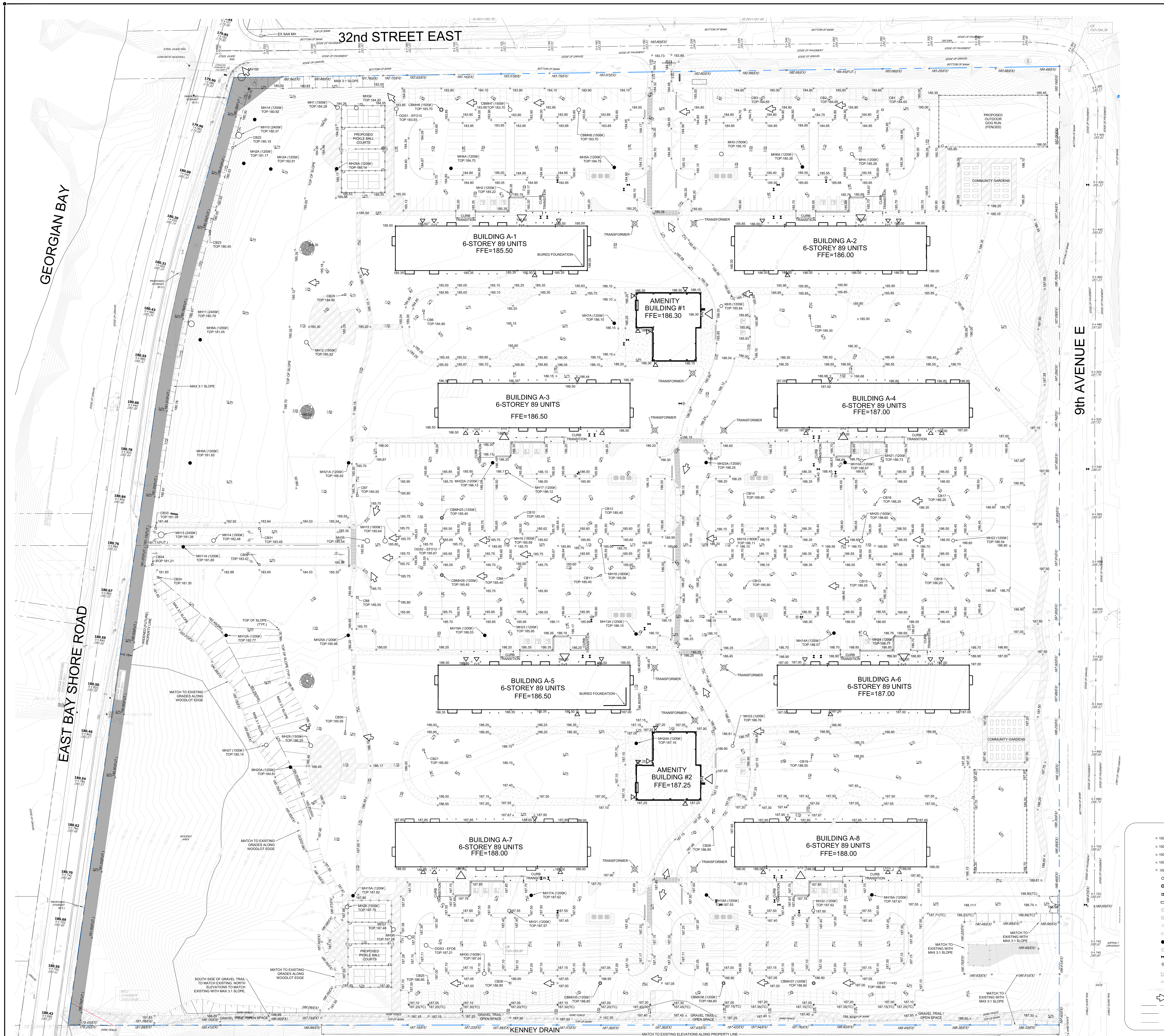
METRIC SCALE
1:500

SITE SERVICING PLAN

SKYDEV BAYSHORE
OWEN SOUND LP
OWEN SOUND (BAYSHORE)
OWEN SOUND, ONTARIO

PROJECT No: 22693
DRAWN BY: BC
CHECKED BY: BJ

SSP



REVISION BLOCK

#	DATE	DESCRIPTION
1.	10/21/2022	ISSUED FOR ZONING H REMOVAL & SITE PLAN APPROVAL

REGISTERED PROFESSIONAL ENGINEER
B.JACKSON
100210382
OCT. 21, 2022
PROVINCE OF ONTARIO

KWA SITE DEVELOPMENT CONSULTING INC.
2453 Auckland Drive
Burlington, ON L7L 7A9

NORTH ARROW

LEGEND

× 100.00	PROPOSED PAVEMENT ELEVATION
× 100.00(TC)	PROPOSED TOP OF CURB ELEVATION
× 100.00(FUT.)	PROPOSED FUTURE ELEVATION BY OTHERS
× 100.00(SW)	PROPOSED SWALE CENTRELINE ELEVATION
× 100.00(EX)	PROPOSED ELEVATION TO MATCH EXISTING ELEVATION
	PROPOSED STORM MANHOLE (SIZE AS SHOWN)
	PROPOSED STORM CATCHBASIN MANHOLE (SIZE AS SHOWN)
	PROPOSED CATCHBASIN
	PROPOSED DOUBLE CATCHBASIN
	EXISTING STORM MANHOLE
	EXISTING STORM CATCHBASIN MANHOLE
	EXISTING CATCHBASIN
	EXISTING DOUBLE CATCHBASIN
	PROPOSED SANITARY MANHOLE (SIZE AS SHOWN)
	EXISTING SANITARY MANHOLE
	PROPOSED HYDRANT AND VALVE
	PROPOSED VALVE AND BOX
	EXISTING HYDRANT
	EXISTING VALVE AND BOX
100.00	EXISTING CONTOUR
	DIRECTION OF EMERGENCY OVERLAND FLOW
	PROPOSED BOTTOM OF SWALE
	PROPOSED TOP OF SLOPE
	EXISTING TOP OF SLOPE

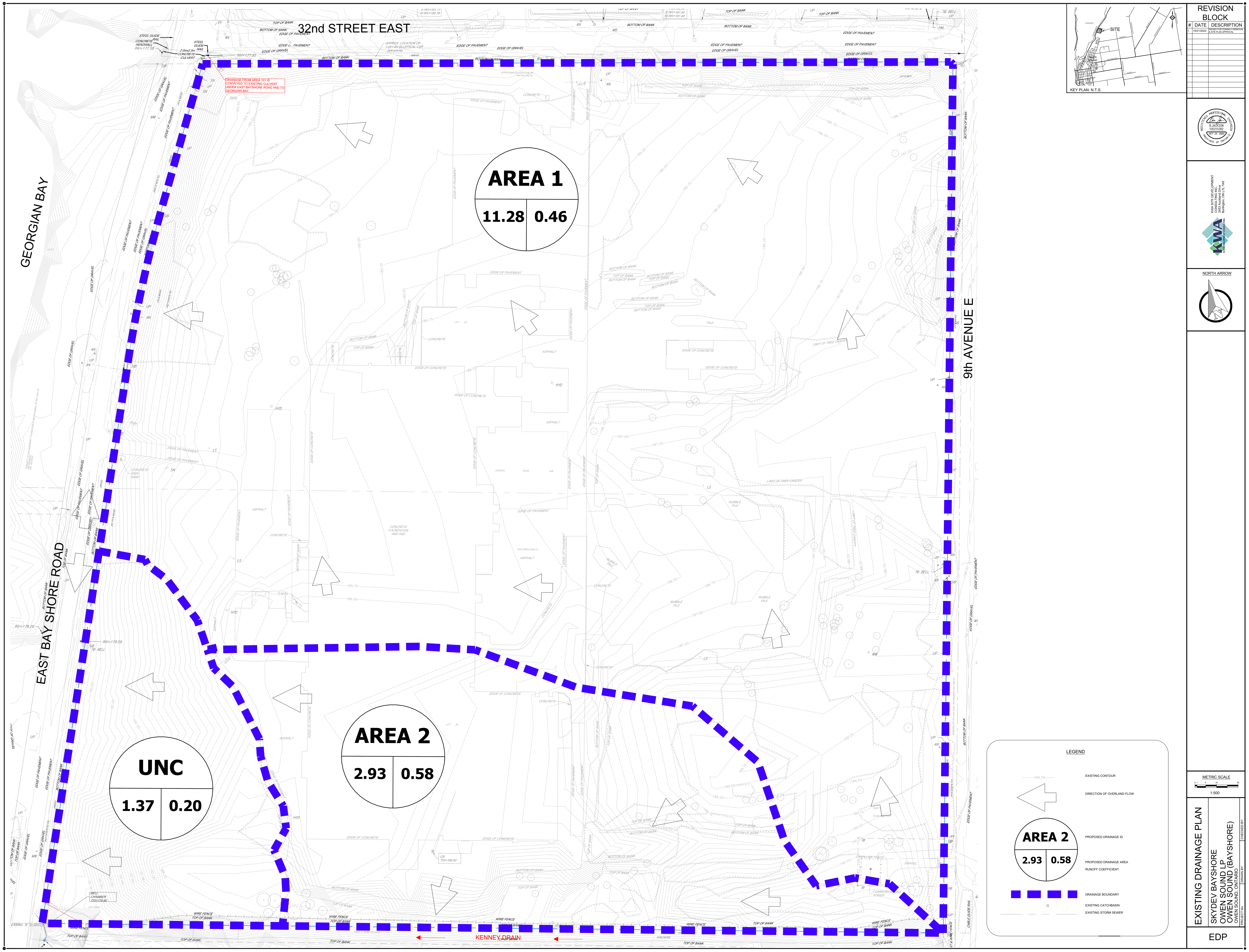
METRIC SCALE
0 1 5 10 20
1:500

SITE GRADING PLAN

SKYDEV BAYSHORE
OWEN SOUND LP
OWEN SOUND (BAYSHORE)
OWEN SOUND, ONTARIO

PROJECT No: 22693 | DRAWN BY: BC | CHECKED BY: BJ

SGP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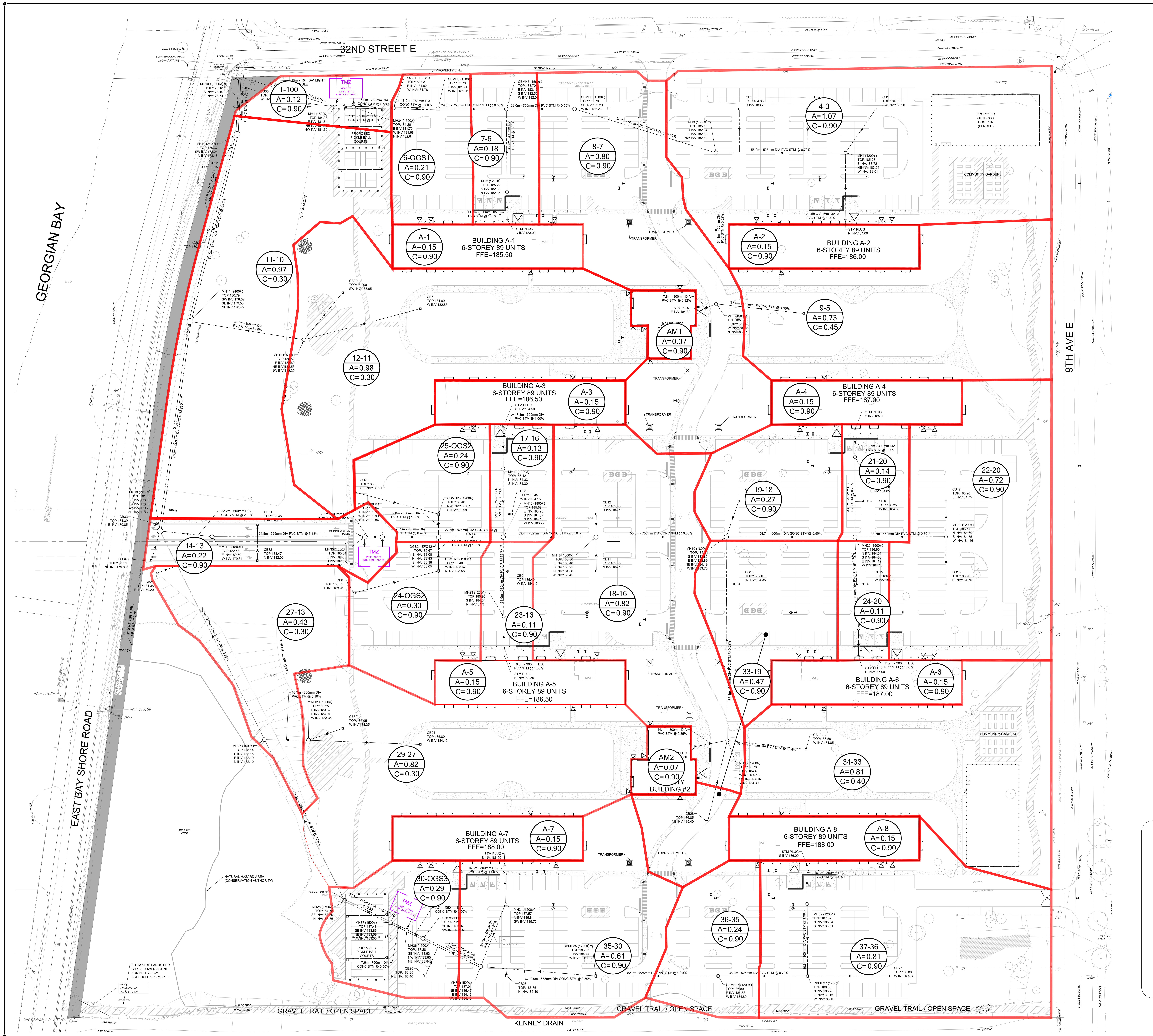
9th AVENUE E
EAST BAY SHORE ROAD
GEORGIAN BAY
KENNEY DRAIN
AREA 1
11.28
0.46
AREA 2
2.93
0.58
UNC
1.37
0.20
LEGEND
EXISTING CONTOUR
DIRECTION OF OVERLAND FLOW
PROPOSED DRAINAGE ID
PROPOSED DRAINAGE AREA
RUNOFF COEFFICIENT
DRAINAGE BOUNDARY
EXISTING CATCHBASIN
EXISTING STORM SEWER
REVISION BLOCK
#
DATE
DESCRIPTION
KEY PLAN: N.T.S.
SITE
NORTH ARROW
METRIC SCALE
1:500
EXISTING DRAINAGE PLAN
SKYDEV BAYSHORE OWEN SOUND LP
OWEN SOUND (BAYSHORE)
EDP



LEGEND

- EXISTING CONTOUR
- PROPOSED STORM SEWER
- PROPOSED STORM MANHOLE (SIZE AS SHOWN)
- PROPOSED CATCHBASIN
- EXISTING STORM SEWER
- EXISTING STORM MANHOLE
- PROPOSED DRAINAGE BOUNDARY
- THERMAL MITIGATION ZONES
- DIRECTION OF OVERLAND FLOW
- 202 — PROPOSED DRAINAGE ID
- A=4.66 — PROPOSED DRAINAGE AREA
- C=0.58 — RUNOFF COEFFICIENT
- PROPOSED PONDING LIMIT

REVISION BLOCK

#	DATE	DESCRIPTION
1.	10/21/2022	ISSUED FOR ZONING H REMOVAL & SITE PLAN APPROVAL

REGISTERED PROFESSIONAL ENGINEER
B.JACKSON
100210382
OCT. 21, 2022
PROVINCE OF ONTARIO

KWA SITE DEVELOPMENT CONSULTING INC.
2453 Auckland Drive
Burlington, ON L7L 7A9

NORTH ARROW

METRIC SCALE

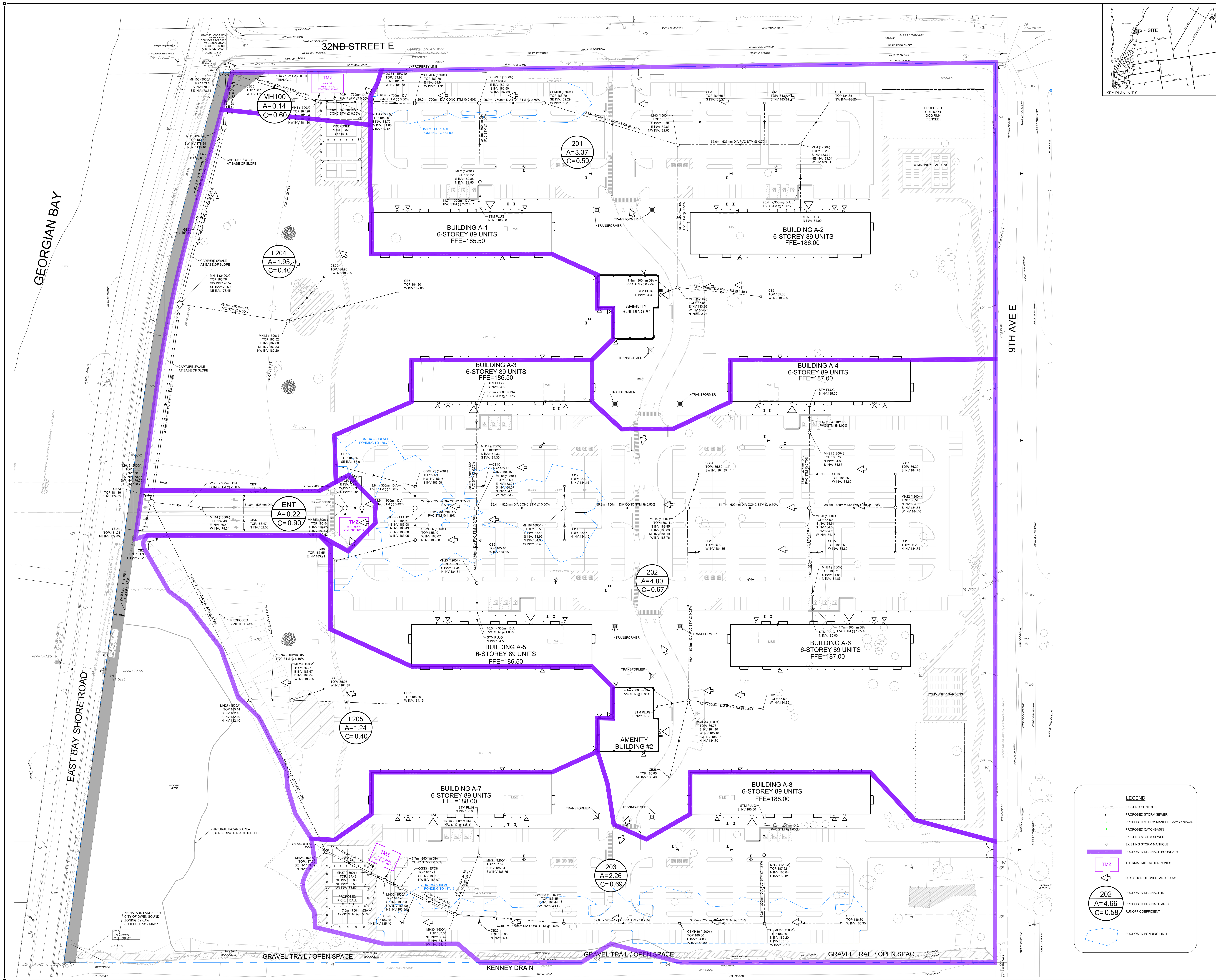
1:500

PROPOSED DRAINAGE PLAN

SKYDEV BAYSHORE
OWEN SOUND LP
OWEN SOUND (BAYSHORE)
OWEN SOUND, ONTARIO

PROJECT No: 22693 | DRAWN BY: BC | CHECKED BY: BJ

PDP



REVISION BLOCK

#	DATE	DESCRIPTION
1.	10/21/2022	ISSUED FOR ZONING-BY-LAW & SITE PLAN APPROVAL

NORTH ARROW

METRIC SCALE
1:500

STORMWATER MANAGEMENT PLAN

SKYDEV BAYSHORE OWEN SOUND LP
OWEN SOUND (BAYSHORE)
OWEN SOUND, ONTARIO

PROJECT No: 22693 | DRAWN BY: BC | CHECKED BY: BJ

SWM

GENERAL NOTES

1. ALL WORK WITHIN THE CITY RIGHT-OF-WAY SHALL BE CONSTRUCTED ACCORDING TO THE LATEST CITY OF OWEN SOUND SPECIFICATIONS. ONTARIO PROVINCIAL STANDARD DRAWINGS AND SPECIFICATIONS MAY, SUBJECT TO THE APPROVAL OF THE CITY OF OWEN SOUND, BE USED WHERE NO CITY STANDARD OR SPECIFICATION IS AVAILABLE.
2. ALL WORK SHALL BE COMPLETED ACCORDING TO THE CURRENT OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS. THE GENERAL CONTRACTOR SHALL BE DEEMED TO BE THE CONSTRUCTOR AS DEFINED IN THE ACT.
3. ALL MATERIALS FOR SEWER, FORCEMAIN, WATERMAIN, HYDRANTS AND APPURTENANCES, SHALL BE ACCORDING TO OWEN SOUND MUNICIPAL STANDARDS.
4. ALL SURVEY STAKE LAYOUT POINTS SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION. ANY DISCREPANCIES BETWEEN THE DRAWINGS AND THE LAYOUT SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER.
5. ALL DIMENSIONS ARE EXPRESSED IN METERS(m) AND PIPE SIZES ARE EXPRESSED IN MILLIMETERS (mm) UNLESS OTHERWISE NOTED.
6. ALL TEMPORARY CONSTRUCTION FENCING, TRAFFIC CONTROL AND SIGNAGE DURING CONSTRUCTION (INCLUDING ALL NECESSARY SIGNALS, SIGNS, DELINEATORS, MARKERS AND BARRIERS) SHALL BE IN ACCORDANCE WITH CURRENT ONTARIO TRAFFIC MANUAL BOOK 7: TEMPORARY CONDITIONS FIELD EDITION.
7. INFORMATION REGARDING ALL EXISTING UNDERGROUND UTILITIES AND SERVICES SHOWN ON THE DRAWINGS IS BASED ON INFORMATION PROVIDED BY OTHERS AND/OR AVAILABLE HISTORICAL DRAWINGS. THE ACCURACY OF THIS INFORMATION HAS NOT BEEN CONFIRMED BY KWA SITE DEVELOPMENT CONSULTING AND ALL UNDERGROUND INFORMATION NEEDS TO BE VERIFIED IN THE FIELD PRIOR TO BIDDING AND CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE TO ACQUIRE ALL UTILITY LOCATES PRIOR TO CONSTRUCTION AND TO NOTIFY THE ENGINEER OF ANY DISCREPANCIES. ANY LOST TIME DUE TO FAILURE TO IDENTIFY DISCREPANCIES OR NOTIFY THE ENGINEER SHALL BE AT THE CONTRACTOR'S EXPENSE. THE CONTRACTOR WILL BE RESPONSIBLE FOR ANY DAMAGE TO EXISTING INFRASTRUCTURE.
8. CONTRACTOR IS RESPONSIBLE TO SUPPLY AND INSTALL ALL NECESSARY CONSTRUCTION FENCING.
9. THIS DRAWING SET SHOULD BE READ IN CONJUNCTION WITH ALL OTHER CONSULTANT'S PLANS AND ANY DISCREPANCIES REPORTED TO THE ENGINEER PRIOR TO CONSTRUCTION.
10. ALL DIMENSIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO ANY CONSTRUCTION AND ANY DISCREPANCIES REPORTED TO THE ENGINEER.
11. NO SUBSTITUTIONS SHALL BE ALLOWED WITHOUT ENGINEERS APPROVAL AND ACCEPTANCE BY THE CITY OF OWEN SOUND.
12. ALL DISTURBED AREAS ON PRIVATE LANDS SHALL BE REPAIRED TO ORIGINAL CONDITION OR BETTER AND TO THE SATISFACTION OF THE ENGINEER. WITHIN CITY RIGHT-OF-WAY AND EASEMENTS, REPAIRS TO ORIGINAL CONDITION OR BETTER MUST BE TO THE SATISFACTION OF THE CITY OF OWEN SOUND.
13. THE CONTRACTOR IS ADVISED THAT WORKS AND OPERATIONS BY OTHERS MAY BE ONGOING AT THE SAME TIME AS THIS CONTRACT. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES AND PREVENT CONSTRUCTION CONFLICTS.
14. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING AND PAYING FOR ALL PERMITS INCLUDING ROAD OCCUPANCY PERMITS AND THIRD PARTY UTILITY COSTS.
15. THE CONTRACTOR IS TO PROVIDE A WEEKLY REDLINE AS-BUILT SURVEY TO THE ENGINEER FOR REVIEW. AS-BUILT TO SHOW PIPE ALIGNMENT AND INVERT, PIPE SIZE, PIPE MATERIAL, MAINTENANCE HOLES, HYDRANTS, VALVES AND BENDS.
16. THE CONTRACTOR IS TO PROVIDE AN AS-BUILT SURVEY OF COMPLETED SERVICING AND GRADING WORKS, INCLUDING INVERTS, ALL ABOVE GROUND WORKS, AND SPOT ELEVATIONS AT A MAXIMUM 10m GRID INTERVAL. ALL ABOVEGROUND ITEMS, INCLUDING CURBS, SIDEWALKS, WALLS, BUILDING APRONS, STAIRS, ETC. TO INCLUDE ADEQUATE SPOT ELEVATIONS TO CONFIRM DESIGN INTENT (IE. DRAINAGE AROUND CURBED ISLANDS, TOP & BOTTOM OF CURB, SHOTS ON EACH RISER, ETC.). SURVEY TO BE PREPARED BY LICENSED ONTARIO LAND SURVEYOR.
17. ALL WORK TO BE COMPLETED IN ACCORDANCE WITH THE SITE-SPECIFIC GEOTECHNICAL REPORT BY WSP, DATED JULY 7, 2017.
18. THE CONTRACTOR IS RESPONSIBLE TO INSTALL AND MAINTAIN EROSION AND SEDIMENT CONTROLS AS REQUIRED BY THIS CONTRACT AND CITY AND PROVINCIAL STANDARDS.

GRADING

1. ALL SUBGRADE TO BE PROOF-ROLLED BY A FULLY LOADED TRI-AXLE TRUCK AND INSPECTED PRIOR TO PLACEMENT OF GRANULAR MATERIALS. THE CONTRACTOR IS TO ENSURE THAT THE GEOTECHNICAL CONSULTANT WITNESSES THE PROOF-ROLL AND GIVES APPROVAL TO PROCEED FORWARD. ANY SOFT SPOTS IDENTIFIED WILL BE CORRECTED BY THE CONTRACTOR BASED UPON GEOTECHNICAL RECOMMENDATIONS IN THE FIELD. ADDITIONAL COSTS FOR REMEDIAL WORK MUST BE APPROVED BY THE ENGINEER PRIOR TO PROCEEDING. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF ALL INSPECTIONS.
2. LINE PAINTING SHALL BE APPLIED WITH A MINIMUM OF TWO (2) COATS OF ORGANIC SOLVENT BASED PAINT.
3. PROVIDE STEP JOINT AT THE INTERFACE OF ALL PROPOSED AND EXISTING ASPHALT AREAS, REFER TO DETAIL ON SD1. WHERE THE THICKNESS OF THE ADJACENT PAVEMENT IS LESS THAN 90mm, A BUTT JOINT SHALL SUFFICE. PROVIDE TACK COAT ON ALL SURFACES.
4. ANY POTENTIAL RE-USE TO BE IN ACCORDANCE WITH GEOTECHNICAL RECOMMENDATIONS AND APPROVAL.
5. GRADES TO MEET EXISTING OR PROPOSED ELEVATIONS SHALL BE AT 3:1 SLOPE OF FLATTER UNLESS OTHERWISE NOTED.
6. ALL TREE AND SHRUB RELOCATION SHALL BE IN ACCORDANCE WITH THE LANDSCAPE PLANS.
7. ALL ITEMS FOR REMOVAL SHALL BE TAKEN AWAY FROM SITE AND DISPOSED OF AT AN APPROVED DISPOSAL FACILITY.
8. ALL DISTURBED AREAS TO BE REINSTATED TO ORIGINAL CONDITION OR BETTER.
9. DIMENSIONS AND LOCATION OF ALL RAMPS, PAINTED LINES, WALKWAYS, SIDEWALKS, CURBS, CONCRETE PADS, AND ISLANDS SHALL BE TAKEN FROM THE SITE PLAN.
10. SAW CUT EXISTING PAVEMENT, SIDEWALK, CURB, GUTTER, DRIVEWAYS, WALKWAYS, ETC. AT CONSTRUCTION LIMITS TO PROVIDE A CLEAN JOINT FOR THE PROPOSED WORK.
11. CONCRETE BARRIER CURB AS PER OPSD 600.110, CONCRETE CURB AND GUTTER AS PER OPSD 600.04.
13. PAVEMENT STRUCTURES TO BE AS PER GEOTECHINCAL RECOMMENDATIONS FOLLOWING THE REPORT PREPARED BY WSP, DATED JULY 7, 2017:

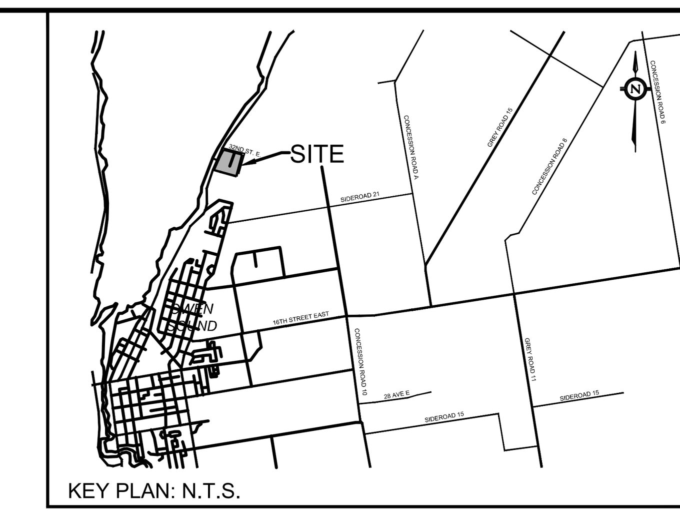
* MINIMUM PAVEMENT (15 YEAR DESIGN LIFE)
** 40mm HL3 SURFACE COURSE ASPHALT CONCRETE (OPSS.MUNI 1150)
** 50mm HL8 BINDER COURSE ASPHALT CONCRETE (OPSS.MUNI 1150)
** 150mm GRANULAR 'A' BASE (OPSS.MUNI 1010)
** 350mm GRANULAR 'B' SUBBASE (OPSS.MUNI 1010)

SANITARY AND STORM SEWERS

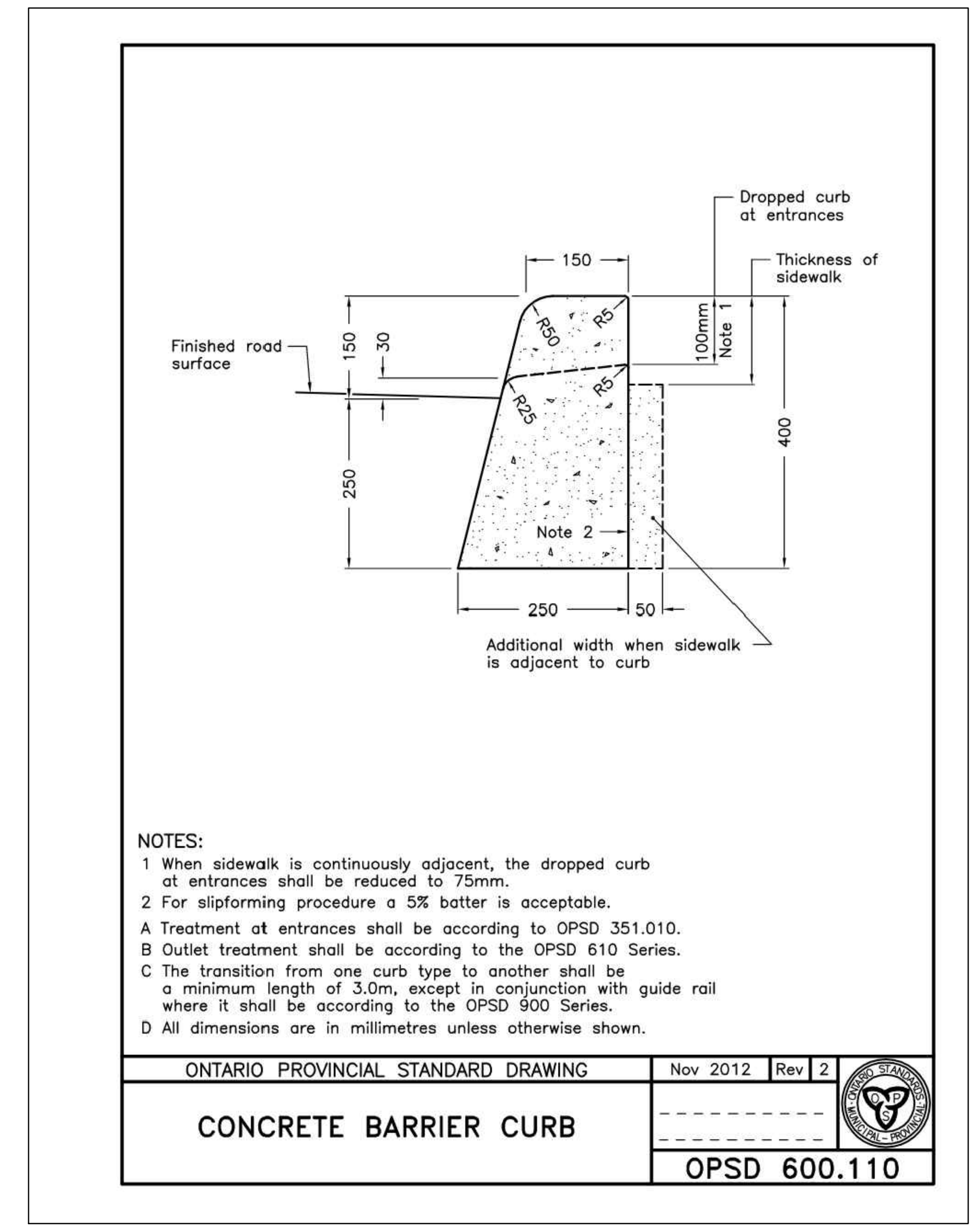
1. ALL SANITARY AND STORM SEWER CONSTRUCTION IS TO BE DONE IN ACCORDANCE WITH OPSS AND OWEN SOUND MUNICIPAL ENGINEERING DESIGN STANDARDS.
2. ALL SANITARY SEWERS TO BE PVC SDR35 CONFORMING TO CSA B182.2.
3. ALL CIRCULAR CONCRETE STORM SEWERS 600mm DIAMETER AND GREATER TO BE REINFORCED CONCRETE PIPE CONFORMING TO CSA STANDARD A257.2 UNLESS OTHERWISE NOTED.
4. ALL CIRCULAR PVC STORM SEWERS TO BE PVC DR35 CONFORMING TO CSA STANDARD B182.2 AND OPSD 806.040.
5. UNLESS OTHERWISE NOTED, MINIMUM SIZE OF SINGLE CATCHBASIN LEADS TO BE 250mm DIAMETER (PVC SDR35). UNLESS OTHERWISE NOTED, ALL DOUBLE CATCHBASIN LEADS TO BE 300mm DIAMETER (PVC SDR35).
6. CATCHBASIN LEADS CONNECTED TO MAINLINE SEWERS SHALL BE CONNECTED AS PER OPSD 708.010 AND 708.030.
7. MINIMUM COVER FOR STORM SEWERS SHALL BE 1.3M FROM FINISHED GRADE AND 1.5m FROM CENTRELINE OF ROAD.
8. MINIMUM COVER FOR SANITARY SEWERS SHALL BE 2.0M FROM FINISHED GRADE.
7. SANITARY AND STORM SEWER BEDDING, COVER, BACKFILL, MATERIAL, AND COMPACTION TESTING TO BE AS PER GEOTECHNICAL RECOMMENDATIONS.
8. MAINTENANCE HOLES SHALL BE ACCORDING TO OPSD 701.010 (1200 DIAMETER) TO 701.015 (3600 DIAMETER) UNLESS OTHERWISE SPECIFIED. FRAME AND COVER SHALL BE ACCORDING TO OPSD 401.010 TYPE A CLOSED (SANITARY AND STORM) UNLESS STATED OTHERWISE. INCLUDE SAFETY PLATFORM WHERE DEPTHS EXCEED 5.0m.
9. MAINTENANCE HOLE CHAMBER OPENINGS SHALL BE LOCATED ON THE SIDE OF THE MANHOLE PARALLEL TO THE FLOW FOR STRAIGHT RUN MANHOLES, OR ON THE UPSTREAM SIDE OF THE MANHOLE AT ALL JUNCTIONS..
10. MAINTENANCE HOLE STEPS TO BE AS PER SOLID ALUMINUM AS PER OPSD 405.020.
11. MAINTENANCE HOLE ADJUSTMENT UNITS TO BE PRECAST AS PER OPSD 704.010. CLAY BRICK IS NOT ACCEPTABLE.
12. BENCHING DETAILS SHALL BE ACCORDING TO OPSD 701.021. ALL SANITARY/STORM SEWER MANHOLES SHALL BE BENCHED TO THE OBVERT OF THE OUTLET PIPE ON A VERTICAL PROJECTION FROM THE SPRING LINE OF THE SEWER. THE MINIMUM WIDTH OF BENCHING IN ALL MANHOLES SHALL BE 230mm.
13. ALL CATCHBASIN MANHOLES SHALL HAVE 600mm DEEP SUMP.
14. WHERE THE DIFFERENCE IN ELEVATION BETWEEN THE STORM UPSTREAM INVERT AND DOWNSTREAM INVERT EXCEEDS 1.0m, A DROP STRUCTURE SHALL BE PLACED ON THE INLET PIPE, WITH THE INVERT OF THE DROP PIPE LOCATED AT THE SPRING LINE OF THE OUTLET PIPE. DESIGN SHALL BE IN CONFORMITY WITH OPSD 1003.031.
15. WHERE THE DIFFERENCE IN ELEVATION BETWEEN THE SANITARY UPSTREAM INVERT AND DOWNSTREAM INVERT EXCEEDS 1.0m, A DROP STRUCTURE SHALL BE PLACED ON THE INLET PIPE, WITH THE INVERT OF THE DROP PIPE LOCATED AT THE SPRING LINE OF THE OUTLET PIPE. DESIGN SHALL BE IN CONFORMITY WITH ENGINEERING SERVICES STANDARD DESIGN DRAWING OSS-203.
16. SANITARY MAINTENANCE HOLES IN PONDING AREAS SHALL HAVE WATERTIGHT FRAMES AND COVERS AS PER OPSD 401.050.
17. SINGLE CATCHBASINS SHALL BE ACCORDING TO OPSD 705.010. DOUBLE CATCHBASINS AS PER OPSD 705.020. FRAME AND GRATE SHALL BE OPSD 400.100.
18. ALL NEW STORM AND SANITARY SEWERS SHALL BE VIDEO INSPECTED USING CLOSED CIRCUIT TELEVISION (CCTV) EQUIPMENT. CCTV INSPECTION SHALL BE CONDUCTED IN ACCORDANCE TO OPSS 409. DIGITAL COPIES OF THE CCTV INSPECTION REPORTS AND VIDEOS SHALL BE PROVIDED TO THE ENGINEER OF RECORD..
19. PERFORATED SUBDRAINS ARE TO BE CONNECTED TO INTERNAL CATCH BASINS AND CATCHBASIN MANHOLES IN A QUADRANT FORMATION AT THE SUBGRADE INTERFACE EXCEPT IN THE BOULEVARD AREAS. CONTRACTOR IS TO ENSURE A MINIMUM 3% SLOPE OF THE SUBDRAINS TOWARDS THE CATCH BASIN AND CATCHBASIN MANHOLES. SUBDRAIN PIPE TO BE 100mmØ PERFORATED, CORRUGATED, POLYETHYLENE ENCASED IN FILTER FABRIC `SOCK'. BACKFILL WITH 20mmØ WELL GRADED FREE DRAINING GRANULAR MATERIAL APPROVED BY THE ENGINEER. SUBDRAINS SHALL BE CAPPED AT UPSTREAM ENDS. SEE DETAIL ON THIS PLAN.

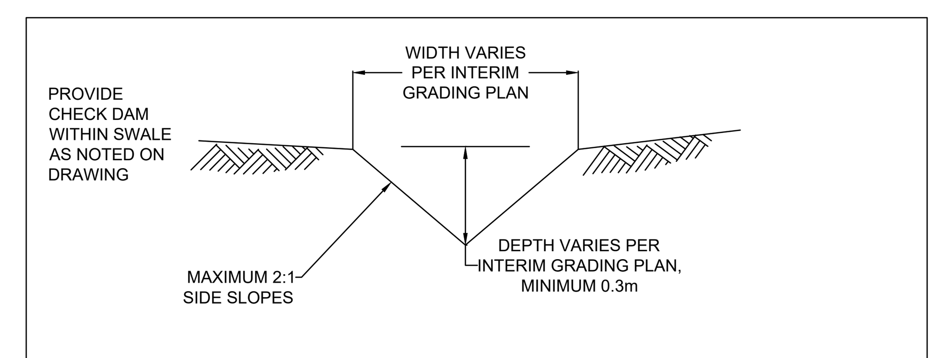
WATERMAINS

1. ALL WATERMAIN CONSTRUCTION IS TO BE DONE IN ACCORDANCE WITH THE CITY OF OWEN SOUND STANDARD CONTRACT DOCUMENTS FOR MUNICIPAL CONSTRUCTION.
2. WATERMAINS 100mm TO 300mm DIAMETER SHALL BE PVC CONFORMING TO AWWA C900 AND CSA B137.3, CLASS 150 DR-18 WITH CAST IRON O.D. DIMENSIONS. REFER TO SPECIFICATIONS FOR WATERMAIN CONSTRUCTION, CITY OF OWEN SOUND, ENGINEERING DIVISION, OPERATIONS DEPARTMENT, REV. 2.
3. BEDDING TO BE CLASS 'B' (SUCH AS GRANULAR 'A' CONFORMING TO OPSS 1010) AND AS PER OPSD 802.010. BEDDING TO BE PLACED IN MAX 150mm LIFTS AND COMPACTED TO 98% SPMDD. COMPACTION TESTING TO BE COORDINATED WITH THE GEOTECHNICAL ENGINEER.
4. MINIMUM COVER ON WATERMAINS SHALL BE 1.7m UNLESS SHOWN OTHERWISE ON APPROVED DRAWINGS.
5. ALL HYDRANTS AND VALVES SHALL BE CONSTRUCTED ACCORDING TO MUNICIPAL STANDARDS. HYDRANTS TO HAVE MECHANICAL THRUST RESTRAINTS AS PER OSS-400.
6. MECHANICAL THRUST RESTRAINTS SHALL BE INSTALLED AT ALL FITTINGS, BENDS, TEES, CROSSES, REDUCERS AND VALVES FOR ALL WATERMAIN SIZES.
7. WATERMAIN MUST FOLLOW THE MINISTRY OF THE ENVIRONMENT PROCEDURE F-6-1 THAT GOVERN THE SEPARATION OF SEWERS AND WATERMAINS. A MINIMUM VERTICAL CLEARANCE OF 0.30m IS REQUIRED WHEN CROSSING OVER SEWERS AND ALL OTHER UTILTIES. WHEN CROSSING UNDER A SEWER OR UTILITY, 0.5m CLEARANCE IS REQUIRED. A MINIMUM HORIZONTAL CLEAR SEPARATION OF 2.5m IS REQUIRED AT ALL TIMES.
8. CATHODIC PROTECTION TO BE INSTALLED FOR ALL METALLIC APPURTENANCES AND FITTINGS ON PVC PIPE ACCORDING TO OPSD 1109.011
9. TRACER WIRE TO BE INSTALLED ON ALL NON-METALLIC WATERMAIN. WIRE TO BE DIRECT BURIAL #12 AWG TRACER WIRE WITH HIGH-DENSITY POLYETHYLENE JACKET (BLUE).
10. HYDROSTATIC PRESSURE TEST SHALL BE CONDUCTED AS PER MUNICIPAL STANDARDS.
11. SWABBING, FLUSHING, DISINFECTION, AND BACTERIOLOGICAL TESTING OF NEW WATERMAIN SHALL BE AS PER CITY OF OWEN SOUND SPECIFICATIONS. NEW WATERMAIN SHALL BE ISOLATED FROM EXISTING MAINS THROUGH PHYSICAL SEPARATION UNTIL BACTERIOLOGICAL TESTS ARE SATISFACTORILY COMPLETED, REVIEWED, AND APPROVED BY THE CITY.
12. CITY IN-SERVICE WATER VALVES, CURB STOPS, FIRE HYDRANTS CAN ONLY BE OPERATED BY OWEN SOUND WATER STAFF.

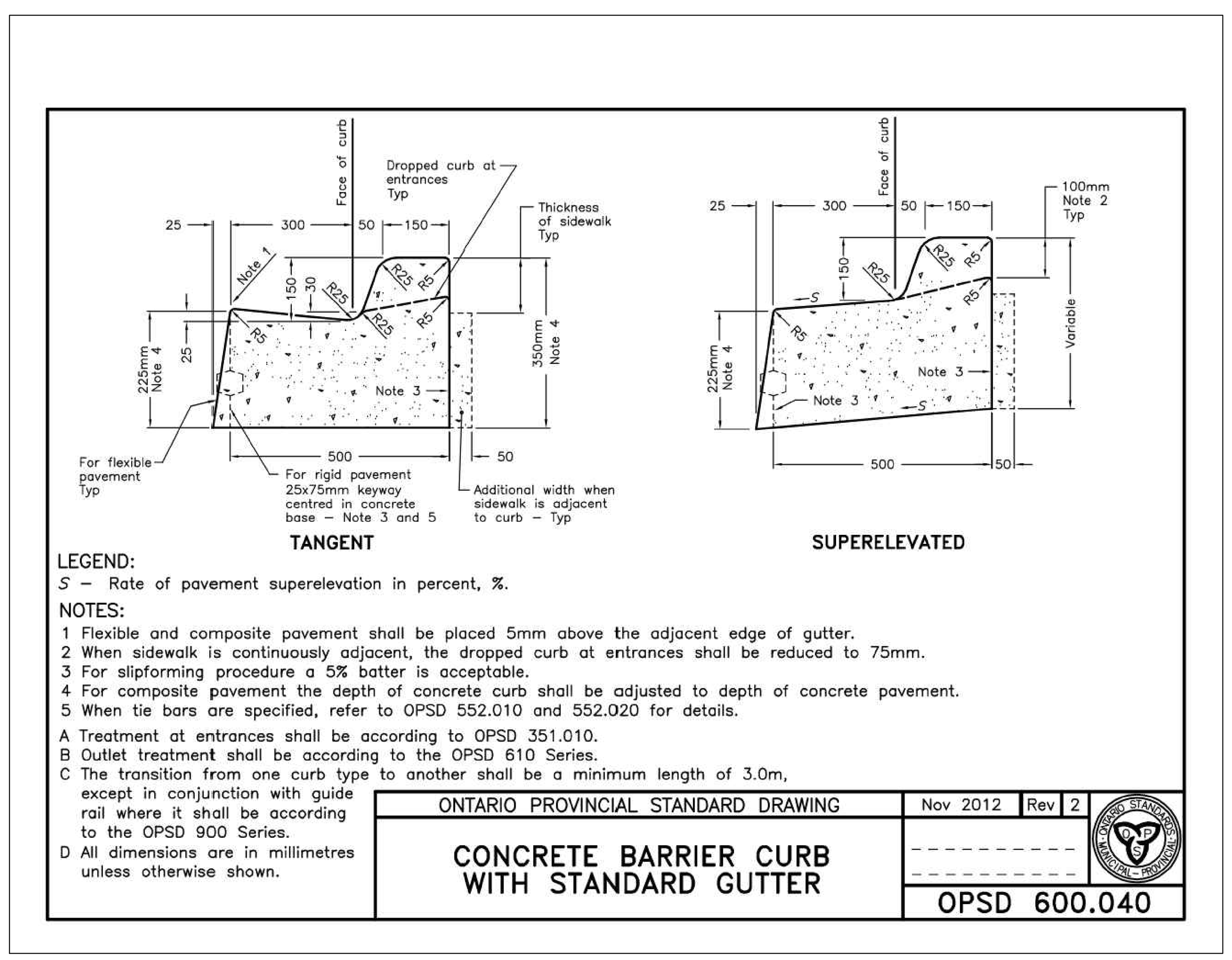


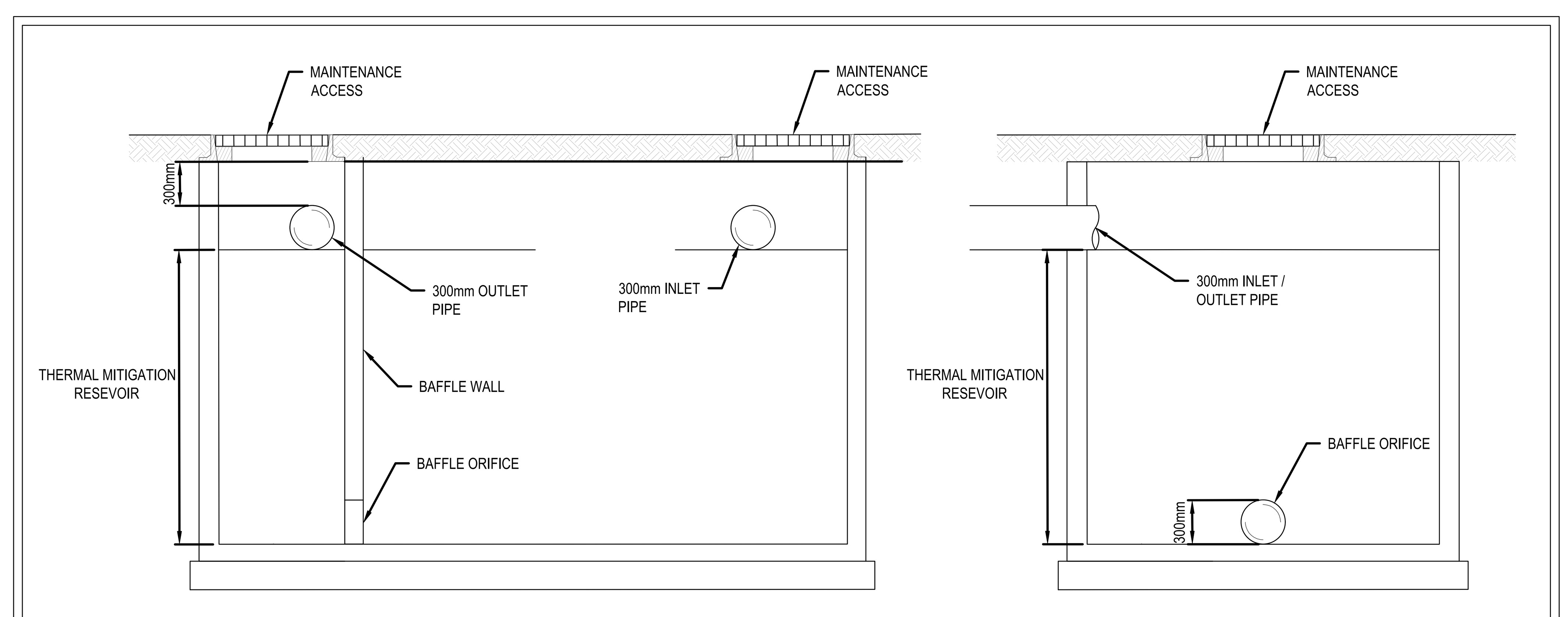
KEY PLAN: N.T.S.





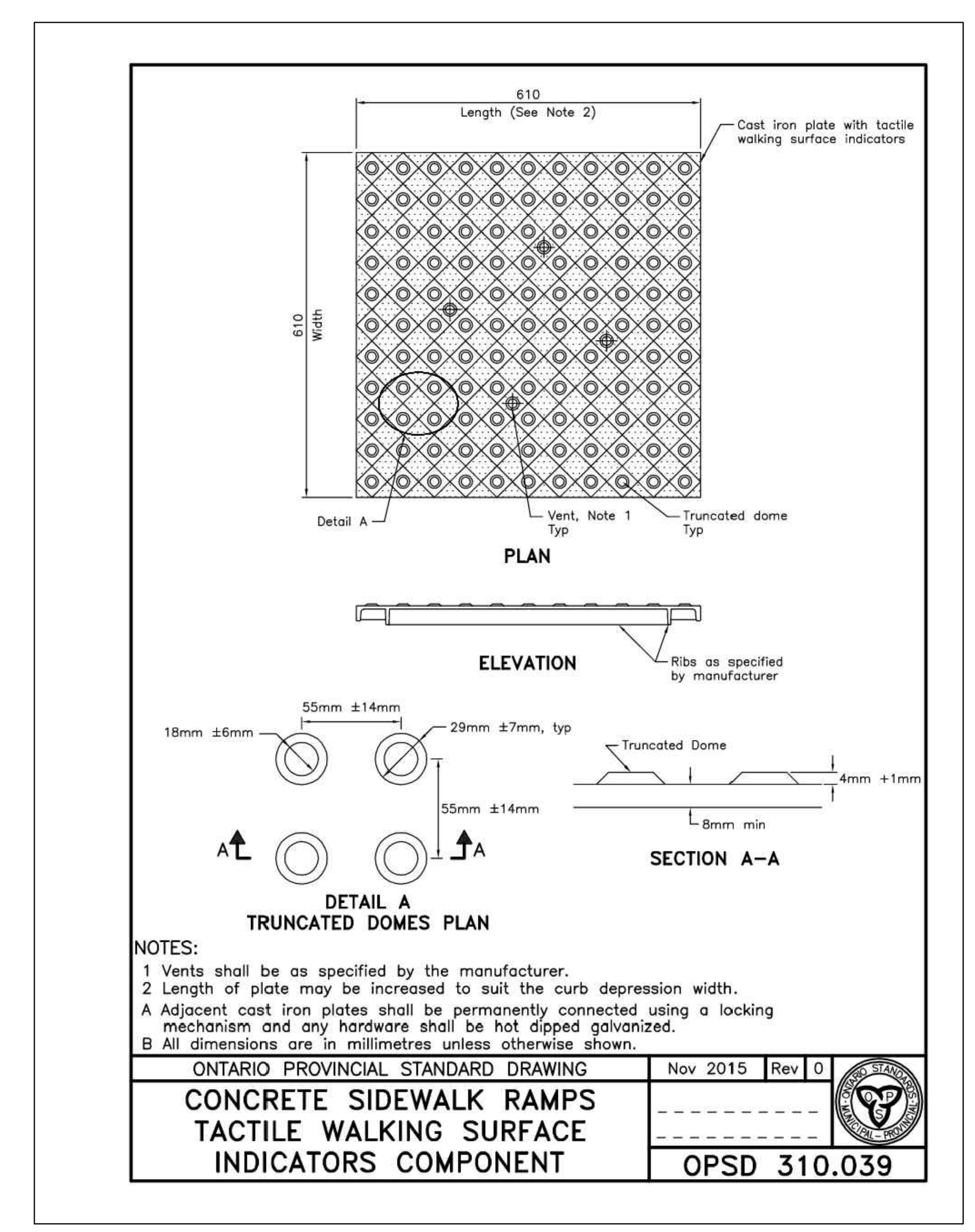
TYPICAL V-NOTCH/INTERIM INTERCEPTOR SWALE





THERMAL MITIGATION CHAMBER

N.T.S.



REVISION BLOCK

#	DATE	DESCRIPTION
1.	10/21/2022	ISSUED FOR ZONING BY-LAW & SITE PLAN APPROVAL

REGISTERED PROFESSIONAL ENGINEER B.JACKSON 100210382 OCT. 21, 2022 PROVINCE OF ONTARIO

KWA SITE DEVELOPMENT CONSULTING INC.
2453 Auckland Drive
Burlington, ON L7L 7A9

NORTH ARROW

SKYLINE SKYDEV

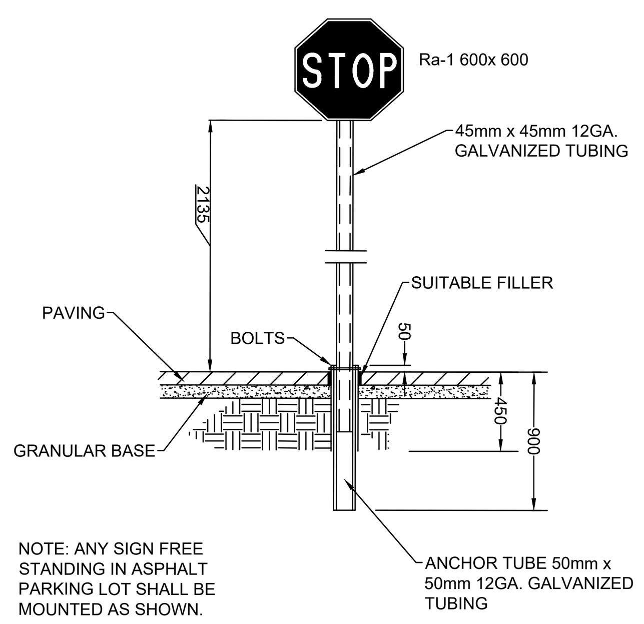
METRIC SCALE

SITE NOTES AND DETAILS

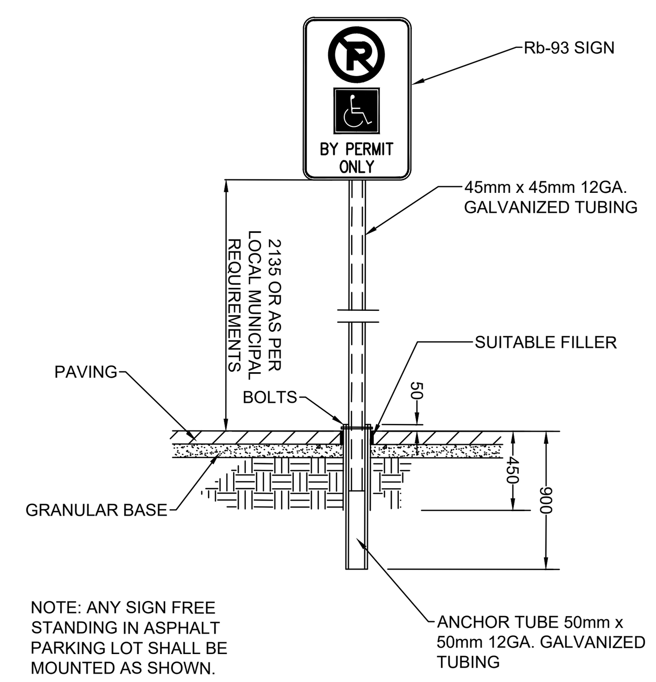
SKYDEV BAYSHORE
OWEN SOUND LP
OWEN SOUND (BAYSHORE)
OWEN SOUND, ONTARIO

PROJECT No. 22093 | DRAWN BY: BJ | CHECKED BY: RA

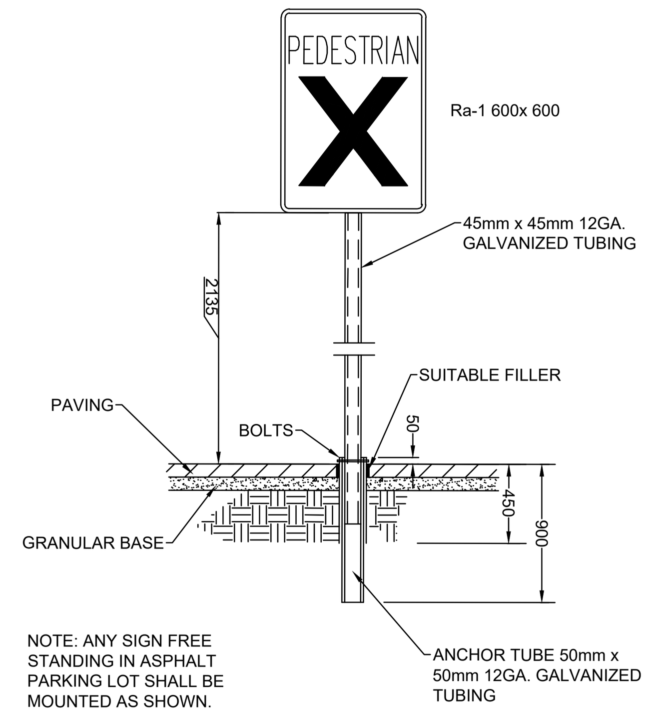
SND



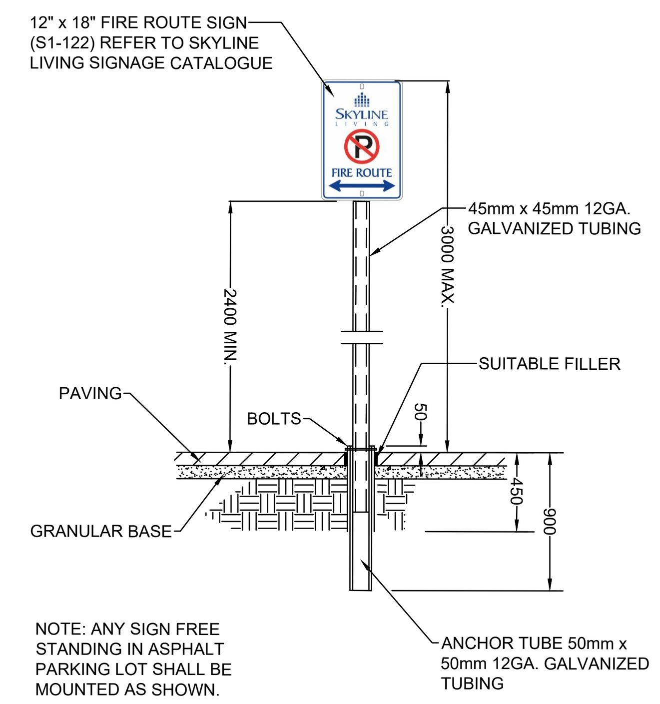
STOP SIGN



ACCESSIBLE PARKING SIGN



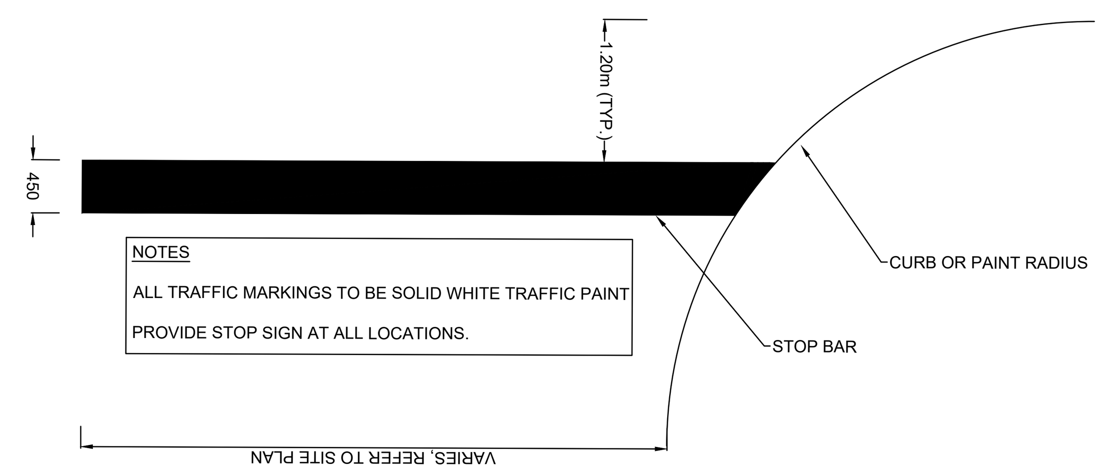
PEDESTRIAN CROSSING SIGN



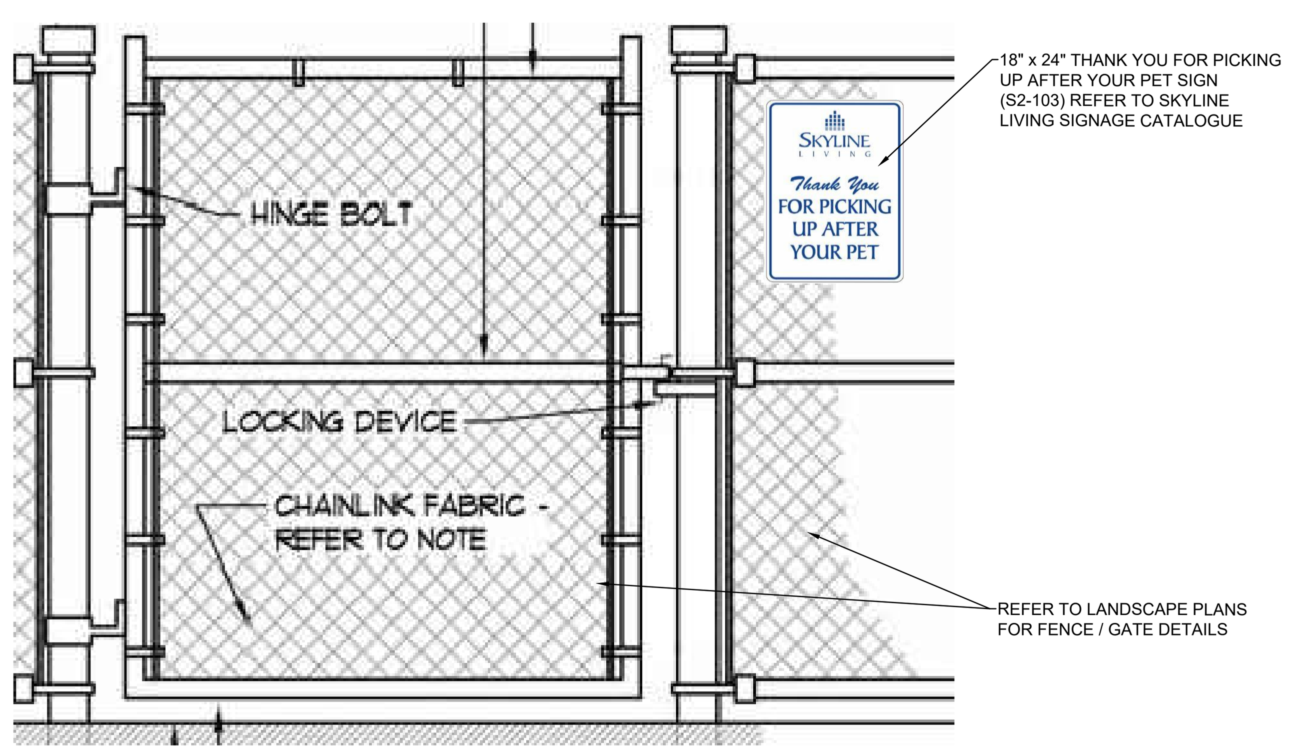
FIRE ROUTE SIGN

SITE LINE PAINTING NOTES:

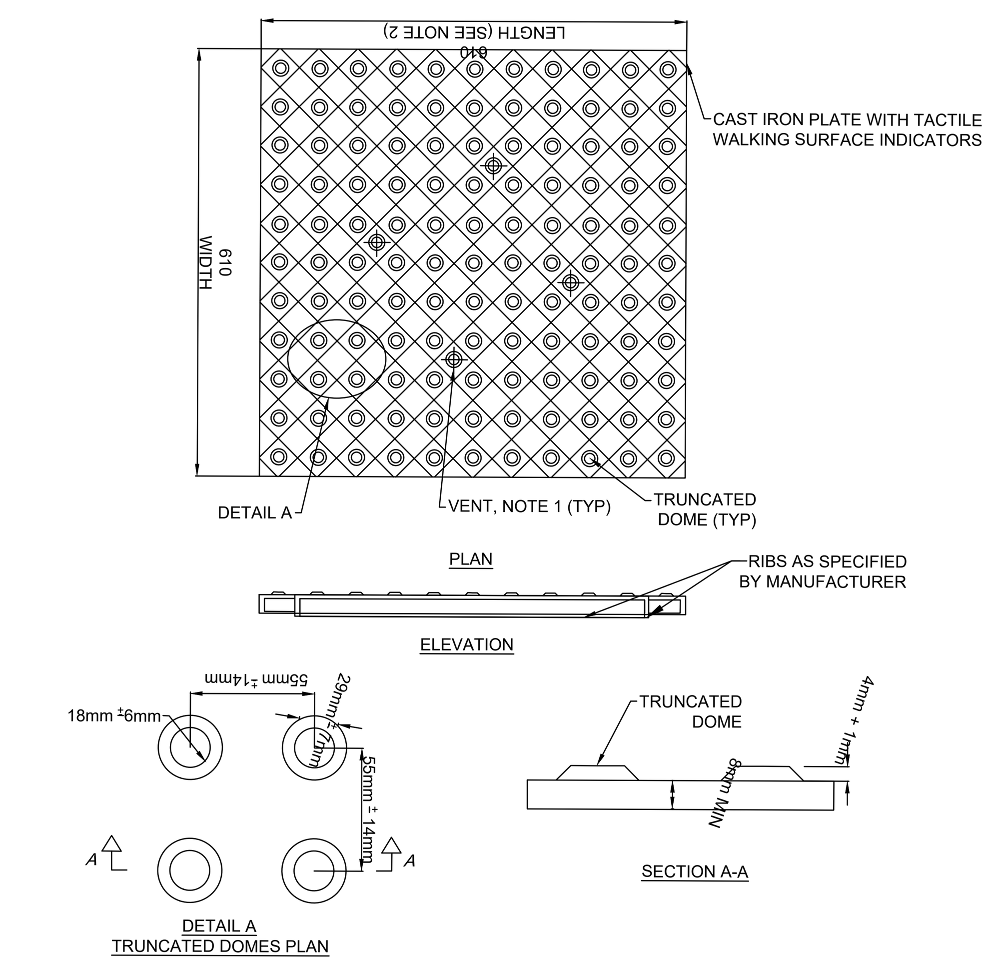
1. SWEEP AND CLEAN SURFACE TO ELIMINATE LOOSE MATERIAL, DEBRIS, AND/OR DUST PRIOR TO APPLYING PAINT.
2. WHERE EXISTING PAVEMENT MARKINGS ARE TO BE REMOVED OR INTERFERES WITH PROPOSED LINE PAINT, HIGH PRESSURE WATER OR SAND BLASTING WILL BE USED TO REMOVE THE EXISTING PAINT IN ENTIRETY PRIOR TO APPLYING NEW PAINT.
3. ALL LINE PAINTING SHALL BE APPLIED IN TWO (2) COATS OF PAINT AT THE MANUFACTURER RECOMMENDED RATE WITHOUT THE ADDITION OF THINNER. THE FIRST COAT SHALL BE APPLIED UPON COMPLETION OF THE SURFACE ASPHALT, AND THE SECOND COST SHALL BE APPLIED NO SOONER THAN 48 HOURS AFTER THE INITIAL APPLICATION.
4. ALL PAINT IS TO BE APPLIED WITH MECHANICAL CONSTRUCTION EQUIPMENT TO PRODUCE UNIFORM STRAIGHT EDGES.
5. APPLY ALL LINE PAINT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDED PROCEDURES FOR THE SPECIFIED MATERIAL.
6. ALL LINE PAINTING COLOUR SHALL BE IN ACCORDANCE WITH THE SITE PLAN.



STOP BAR



FENCE MOUNTED 'PICK UP AFTER YOUR PET' SIGN



NOTES:

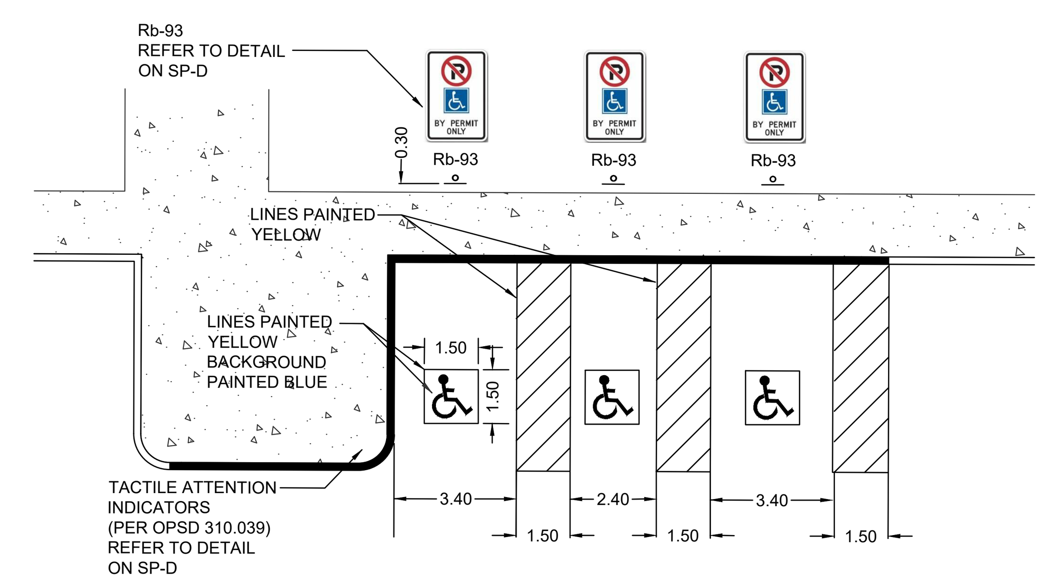
1. VENTS SHALL BE AS SPECIFIED BY MANUFACTURER
2. LENGTH OF PLATE MAY BE INCREASED TO SUIT THE CURB DEPRESSION WIDTH.

A. ADJACENT CAST IRON PLATES SHALL BE PERMANENTLY CONNECTED USING A LOCKING MECHANISM AND ANY HARDWARE SHALL BE HOT DIPPED GALVANIZED.

B. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN.

C. MODELED OFF OF ONTARIO PROVINCIAL STANDARD (OPSD) 310.039. IN ONTARIO, REFERENCE SHALL BE MADE TO THE LATEST VERSION OF THIS DETAIL.

TACTILE WARNING INDICATOR



TYPICAL BARRIER FREE PARKING STALLS

REVISION BLOCK

#	DATE	DESCRIPTION
1.	10/31/2022	ISSUED FOR SPA

KWA SITE DEVELOPMENT CONSULTING INC.
2453 Auckland Drive
Burlington, ON L7L 7A9

SCALE

N.T.S.

SITE PLAN DETAILS

SKYDEV BAYSHORE OWEN SOUND LP

OWEN SOUND, ONTARIO

PROJECT No. 22093

DRAWN BY: BH

CHECKED BY: RA

SP-D