RESIDENTIAL DEVELOPMENT AT 10TH STREET EAST & 18TH AVENUE EAST IN OWEN SOUND ONTARIO

Functional Servicing and Stormwater Management Report

January 30, 2023

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1 Introduction

1.1 Scope of the Report

Stantec Consulting Limited (Stantec) has been retained by Calloway Real Estate Investment Trust Inc to prepare a Functional Servicing and Stormwater Management Report (FSSWMR) for a proposed Residential Development in Owen Sound, Ontario.

The development of the Site is to occur in two phases; Phase 1 includes the western portion of the Site and Phase 2 includes the eastern portion. This report has been prepared to detail the overall development concept for both phases in support of rezoning, and in support of the Site Plan Application for the Phase 1 lands.

1.2 Site Location and Description

The Site is located at 10th Street East & 18th Avenue East in the City of Owen Sound. The Site has a total area of 6.01 ha which is split between the Phase 1 lands to the west (3.975 ha), and the Phase 2 lands to the east (2.035 ha).

For details, refer to **Figure 1-1**.

1.3 Development Proposal

Both the Phase 1 and Phase 2 lands will be accessed via a private road that is to connect to the City of Owen Sound's right-of-way (ROW) at the intersection of 10th Street East and 18the Avenue East.

The Ultimate Phase 1 Residential Development will consist of two (2) residential apartment buildings with a total of 156 units (78 units per building) along with individual park/amenity spaces and surface parking for both residents and visitors. The collective gross floor area is approximately 26,042 m². Phase 1 will also include ten (10) townhouse blocks with a total of 87 dwelling units. The Phase 1 lands will also include a parkland area at the southwest.

The Ultimate Phase 2 Residential Development is envisioned to consist of three (3) residential apartment buildings with a total of 234 units (78 units per building) along with individual park/amenity spaces and surface parking for both residents and visitors. The collective gross floor area is approximately 15,395 m².

For details, refer to details provided on the Architect's Site Plan included in **Appendix A**.

Figure 1-1: Site Location

1.4 Background Documents

The following guidelines were followed in preparation of this report:

- "By-Law No. 2006-043", City of Owen Sound, April 2014. [City Bylaw]; and
- "Site Development Engineering Standards", City of Owen Sound, March 2021 [City Guidelines].

And the following documents were reviewed in preparation of this report:

- "Stormwater Management Design Brief – Hwy 26 & 18th Ave. East Commercial Development – Owen Sound", December 1998 [Cosburn Patterson Mather];
- Drawing "10th Street Extension – Plan and Profile – Plan No. 2 of 5 and Plan No. 3 of 5", September 12, 2000 [Gramsby and Mannerow Limited for the City of Owen Sound];
- "City of Owen Sound, East Owen Sound Master Servicing Study, Volume I, Water and Wastewater Servicing", December 2007 [Burnside]; and
- Topographic Survey "Plan No: L-5923", August 26, 2022 [Archibald, Gray & McKay Ltd.]

Excerpts from the above noted documents are provided in **Appendix A**.

1.5 Site Topography

A topographic survey of the Site was completed in August 2022 by Archibald, gray & McKay Ltd. The survey notes that stormwater generated by the Site will flow from southeast to northwest with flows generally collected by a ditch that traverses the northern portion of the Site. The ditch conveys stormwater to a ditch inlet catch basin located within the City's ROW at the southeast corner of the 10th Street East & 18th Avenue East intersection.

The drainage pattern delineated based on the 2022 topographic survey is in general conformance with drainage plans noted within the report "Stormwater Management Design Brief – Hwy 26 & 18th Ave. East Commercial Development – Owen Sound" (the Background SWM Report) prepared by Cosburn Patterson Mather Consulting Engineers, dated April 20, 1999; as noted in **Section 1.4** of this report. Figure 2 "Phase 1 Drainage Plan" within the SWM report notes flows from the Site area (the southern portion of Catchment 102) draining via overland flow to the northwest.

Under existing conditions, the Site is comprised of dense vegetation including trees.

1.6 Existing Stormwater Conditions

The stormwater management (SWM) strategy for the overall subdivision is detailed in the Background SWM Report. Within The Background SWM Report, the Site is part of Catchment 102A. The Site is serviced by an existing stormwater management facility, which is situated on the north side of 10th Street East. There is an existing storm sewer stub situated on the northern limit of the Site at the junction of 10th Street East and 18th Avenue East. The existing storm sewer stub is located approximately 1.9 m below existing grade and will serve as the outlet for the proposed development. Refer to **Figure 2** "Post Development Drainage Plan" of the Background SWM Report included in **Appendix A** for catchment identification used throughout this report.

The downstream SWM pond is a dry pond that was designed to provide quantity control to a release rate of 1.9 m^3/s for stormwater generated by the 100 year storm event (based on 1994 IDF data). The pond was designed to provide stormwater quantity control for the existing commercial plaza to the north of the Site, and for the Site – a total area of 26.85 ha. The Background SWM Report notes that an existing downstream SWM pond is to provide stormwater quality treatment for the area; however, the details of the quality treatment are not provided.

According to Background SWM Report, Figure 2, external catchments 101B and 101A drain through the Site (Catchment 102A) and flow uncontrolled to the stormwater facility. The Background SWM Report was completed prior to the construction of 10th Street to the west and the Grey Bruce Health Services Hospital to the south; therefore, it is assumed that these Catchments 101A and 101B no longer drain through the Site.

1.7 Existing Sanitary Services

There is an existing 250 mm diameter PVC sanitary sewer at a depth of approximately 3.0 m, flowing northward in 18th Ave East right-of-way, which will serve as the sanitary outlet for the proposed development.

1.8 Existing Water Supply

A 250 mm diameter PVC watermain exists on both 10th Street East & 18th Ave East to supply water to the development.

2 Site Grading

The proposed grading design for the Site as shown on **Drawing C-102**, has been prepared based on the site plan prepared by Chamberlain.

The grading design for the Site aims to achieve the following:

- Match the existing boundary elevations along the perimeter of the Site;
- Minimize grading encroachment on the surrounding lands and match to existing grades, where practical;
- Provide driveway and parking lot grades with a minimum of 1% slope;
- Direct major stormwater flows to designated overland flow route at the corner of 10th street East and 18the Avenue East and match overland flow route of the existing Site;
- Provide pedestrian areas with slopes of 2% or less, where practical;
- Proposed grading plan will direct drainage away from buildings (Finished Floor Elevation (FFE) for each building as shown on Drawing C-102);
- Proposed grading plan will maintain the general landform character; and
- Proposed grading plan will provide safe vehicular and pedestrian traffic.

The proposed grading design has been completed in accordance with the design standards of the City of Owen Sound.

3 Stormwater Management Strategy

3.1 Stormwater Management Design Criteria

As the site ultimately drains to the existing SWM facility, the Site will be subject to criteria outlined in the Stormwater Management Design Brief by Cosburn Patterson Mathers. In addition to this, the City of Owen Sound has two documents that establish design requirements for stormwater management within their jurisdiction:

- "Site Development Engineering Standards", City of Owen Sound, March 2021 [City Guidelines];
- "By-Law No. 2006-043", City of Owen Sound, April 2014. [City Guidelines]

Key requirements for stormwater management on this site are summarized as follows

- **Quantity Control**
    - The receiving stormwater management infrastructure including the storm sewers, overland flow routes and existing SWM pond shall not be negatively affected by the proposed Site development;
    - 100-yr proposed flow shall not exceed predevelopment 100-yr flow of 1.72 m^3/s as provided in updated existing conditions scenario (refer to details below); and
    - Minor system to capture 5-year event.
- **Quality Treatment**
    - Quality treatment shall achieve 80% TSS removal.

3.2 Updated Existing Conditions Modeling

To calculate the allowable release rate from the Site, the SWMHYMO 95 modeling presented in the Background SWM Report was brought into the current modeling format of Visual OTTHYMO Version 6 (VO6). The transfer from SWMHYMO to VO6 included the storm events from the 1999 modeling.

Recognizing the construction of 10th Street and the Hospital, an updated existing conditions scenario was developed where 102A was severed into 3 separate catchments. The area of 10th Street running through catchment 102A has an area of 0.26 ha and was separated as it drains uncontrolled to the SWM facility. The remainder of 102A was divided into the Phase 1 and Phase 2 Sites.

The table below summarized the differences between the original SWMHYMO modeling, SWMHYMO modeling converted into VO6, and the updated existing conditions model in VO6. With software differences the VO6 model calculated higher outflows and volumes given the identical SWMHYMO conditions. The updated existing VO6 model is close to the original model in VO6 as noted in **Table 3.1, Table 3.2, and Table 3.3** below.

Table 3.1: Summary of Site Catchment Flow Rates

Modelling Release Rates	Original SWMHYMO	Original in VO6	Updated Existing VO6
5-Year Storm Outflow	1.320 m^3/s	1.410 m^3/s	1.419 m^3/s
100-Year Storm Outflow	2.910 m^3/s	2.800 m^3/s	2.820 m^3/s

Table 3.2: Summary of Pond Volumes

Modelling Pond Volumes	Original SWMHYMO	Original in VO6	Updated Existing VO6
5-Year Storm Pond Volume	5,440 m^3	5,745 m^3	5,750 m^3
100-Year Storm Pond Volume	8,203 m^3	8,652 m^3	8,656 m^3

Table 3.3: Summary of Pond Release Rates

Modelling Pond Release Rates	Original SWMHYMO	Original in VO6	Updated Existing VO6
5-Year Storm Pond Volume	0.410 m^3/s	0.285 m^3/s	0.286 m^3/s
100-Year Storm Pond Volume	0.410 m^3/s	0.430 m^3/s	0.430 m^3/s

The Updated Existing Conditions VO6 model used to simulate the Site has been provided in **Appendix C**

3.3 Stormwater Quantity Control

3.3.1 CATCHMENT PARAMETERS

Based on proposed Phase 1 Site conditions a total imperviousness of 69% and a directly connected imperviousness of 61% was calculated; these imperviousness values were also applied to the Phase 2 lands. A detailed breakdown of the Phase 1 lands is included in **Appendix C**.

3.3.2 PROTECTION OF EXISTING DOWNSTREAM STORMWATER MANAGEMENT INFRASTRUCTRE

To ensure protection of downstream stormwater infrastructure, flow rates for the 5-year and 100-year storm were compared at two nodes. The first node being the connection to city services on 18th Ave East, and the second node being the SWM pond. Node one analyzed flow rates to ensure the capacity in the sewer infrastructure is not exceeded. Node two analyzed the impacts the site will have on the downstream pond volume and ensured the volume available will not be exceeded with the site addition.

The table below summarizes the volume requirements for each condition. The proposed pond volume for the 100-year storm should not exceed 8,656 m^3 and 5,750 m^3 for the 5-year event as noted in **Table 3.4** below.

Table 3.4: Existing SWM Pond Volume Modeling Updates

Modelling Release Rates	Original SWMHYMO	Original in VO6	Updated Existing VO6
5-Year Storm Pond Volume	5,440 m^3	5,745 m^3	5,750 m^3
100-Year Storm Pond Volume	8,203 m^3	8,652 m^3	8,656 m^3

3.3.3 ONSITE STORMWATER DETENTION

3.3.3.1 Phase 1 Lands

In support of the Phase 1 Lands, 830 m^3 of stormwater storage is required. The stormwater storage is to be provided via underground storage located within the parking area for the Phase 1 apartment buildings. To control stormwater release from the Phase 1 lands, a 252 mm diameter orifice plate located within Maintenance Hole Control 1 will attenuate storm flows to a peak release rate of 0.215 m^3/s.

When the capacity of the orifice has been exceeded, stormwater will be released from the underground system and discharged to surface via catch basins within the proposed north road at which point stormwater will be conveyed as overland flow to the existing SWM pond at a rate of 0.574 m^3/s (0.789 m^3/s total flow – 0.215 m^3/s) as noted in **Table 3.5** below; the table also includes summary of full Site flows for comparison the updated existing condition noted above.

Table 3.5: Phase 1 Site Outlet Flows Modeling

Modelling Release Rates	Updated Existing VO6	Phase 1 Proposed Flow	Total Site Proposed Flow
5-Year Storm Outflow	1.419 m^3/s	0.182 m^3/s	0.607 m^3/s
100-Year Storm Outflow	2.820 m^3/s	1.004 m^3/s	1.446 m^3/s

Release rates from the proposed flow is less than the existing conditions flow in both 5-year and 100-year events. The 5-year storm is completely captured within the storm system as the proposed flow rate is less than the peak release rate governed by the 252 mm diameter orifice plate. As mentioned prior, proposed flows were over controlled to compensate for downstream SWM storage. Refer to **Appendix C** for a detailed hydrologic modelling summary.

3.3.3.2 Phase 2 Lands

To allow for Phase 1 and Phase 2 to proceed at different times, the Phase 2 lands will have independent stormwater controls. The Phase 2 lands will connect to the municipal stormwater servicing via the Phase

1 lands as noted within the private road on the northside shown on Servicing Plan C-101; this configuration has also been reflected within the stormwater modeling provided in **Appendix C**.

In support of the Phase 2 Lands, 420 m^3 of stormwater storage is required. The stormwater storage is to be provided via underground storage located to the northwest of the Phase 2 lands within the private north road. To control stormwater release from the Phase 2 lands, a 181 mm diameter orifice plate located within Maintenance Hole Control 2 will attenuate storm flows to a peak release rate of 0.110 m^3/s.

When the capacity of the orifice has been exceeded, stormwater will be release from the underground system and discharged to surface via catch basins within the private north road, at which point stormwater will be conveyed as overland flow to the existing SWM pond at a rate of 0.398 m^3/s (0.398 m^3/s total flow – 0.110 m^3/s) as noted in Table 3.6 below; the table also includes summary of full Site flows for comparison the updated existing condition noted above..

Table 3.6: Phase 2 Site Outlet Flows Modeling

Modelling Release Rates	Updated Existing	Phase 2 Proposed Flow	Total Site Proposed Flow
5-Year Storm Outflow	1.419 m^3/s	0.081 m^3/s	0.607 m^3/s
100-Year Storm Outflow	2.820 m^3/s	0.508 m^3/s	1.446 m^3/s

Release rates from the proposed flow is less than the existing conditions flow in both 5-year and 100-year events. The 5-year storm is completely captured within the storm system as the proposed flow rate is less than the peak release rate governed by the 181 mm diameter orifice plate. As mentioned prior, proposed flows were over controlled to compensate for downstream SWM storage. Refer to **Appendix C** for a detailed hydrologic modelling summary.

3.3.3.3 Existing Downstream SWM Pond

As indicated in the Table below, the proposed volume required in the downstream SWM facility is below the existing conditions volume. The onsite storage provided for the Phase 1 and Phase 2 reduce storage required by the SWM pond downstream. The volume required for the 5-year storm event governed the site and thus, release rate were over controlled and 100-year storage was over provided as noted in Table 3.7 below. Furthermore, the proposed 100-year storm pond volume is below the required storage indicated in the background SWM report being 8,293 m^3 as noted in **Table 3.8** below.

Table 3.7: Proposed SWM Pond Release Rates

Modelling Volumes	Updated Existing	Proposed
5-Year Storm Pond Release	0.286 m^3/s	0.278 m^3/s
100-Year Storm Pond Release	0.430 m^3/s	0.412 m^3/s

Table 3.8: Proposed SWM Pond Volumes

Modelling Volumes	Updated Existing	Proposed
5-Year Storm Pond Volume	5,750 m^3	5,599 m^3
100-Year Storm Pond Volume	8,656 m^3	8,288 m^3

As noted in the tables above, due to the onsite storage provided in both phases of the Site development, the existing downstream SWM pond will be unaffected by the proposed Site development. Refer to **Appendix C** for a detailed hydrologic modelling summary.

3.4 Quality Treatment

Although the Background SWM Report notes that downstream quality treatment is provided by an offsite SWM pond; documentation of the pond design and level of treatment provided cannot be confirmed. Based on the timing for design of the offsite quality treatment, it is unlikely that current quality control parameters would be met. Therefore, in accordance with the City of Owen Sound, the Site shall provide an Enhanced level (80% TSS removal) of water quality treatment.

Two (2) OGS will be provided to treat flows from the Phase 1 and Phase 2 lands. Each Phase has an independent OGS sized to provide enhanced treatment. One (1) Stormceptor EFO10 unit will be provided to treat flows at a TSS removal of 82% for Phase 1 with a drainage area of 3.97 ha. Also, one (1) Stormceptor EFO8 unit will be provided to treat flows at a TSS removal of 85% for Phase 2 with a drainage area of 2.04 ha. As some of the area is comprised of roof area which typically generated clean stormwater runoff, we predict that the TSS removal will be greater than 80%. Stormceptor Detailed Sizing Report is provided in **Appendix C.**

In addition to the above noted OGS units, the underground storage units will also contain isolator rows to provide a treatment train approach to achieve TSS removal regulations. Furthermore, the Site consists of rooftop area which also generates clean runoff; thus, quality control is achieved for the overall Site area (Phase 1 and Phase 2 lands).

3.5 Storm Sewers

The proposed Site consists of private access roads with vehicular movement, which will generate oil and grit. The remaining Site is occupied by the new buildings, townhouses with backyards and paved surfaces for pedestrian or non-vehicular movement, generating clean runoff. The proposed surface with traffic, drains to catchbasins (CB) which then enters the underground storage tank. All the storm sewers within the site are designed to meet the engineering standards for the City of Owen Sound. Pipe crossings, frost protection, inverts matching to the proposed surface drainage, pipe sizes and slopes are all being implemented into the detail design. Flows from the surface parking lot, roadway, and walkway areas will be captured by catch basins (CBs) and directed towards the underground storage facility with pre-treatment provided by an OGS unit. Flows from the building rooftop will be directed towards the underground storage facility via roof leader connections.

4 Water Supply

A 250 mm PVC watermain exists on the south side of the 10th street east right-of-way, northwest of the site. Water supply for the property would be provided by connection via tapping sleeve and valve to this municipal watermain. A detail configuration of the water servicing design is provided on Drawing C-102.

One (1) municipal fire hydrant exist at the site frontage in the 10th Street East right-of-way (at the northwest corner of the proposed site access). Additionally, eight (8) private fire hydrants will be installed within the site for phase 1 and two (2) private fire hydrants for phase 2 as required to provide firefighting coverage for the proposed buildings and townhouses.

The estimated water consumption for the ultimate development plan (i.e., Phases 1 and 2) was calculated based on the occupancy rate of 400 L/cap/day based on the City standards and Ministry of Environment, Conservation and Parks (MECP) design guidelines for drinking water systems. The maximum day demand for the Site is approximately 549 L/min and the maximum hour demand for the Site is approximately 823 L/min. The required fire flow was determined in accordance with the calculations from the Water Supply for Public Fire Protection (Fire Underwriters Survey FUS, 1999). A fire flow demand analysis was completed for each type of proposed structure (Apartment buildings and Townhouse Blocks). The townhouse buildings were assumed to be of ordinary wood-frame, brick and metal siding exterior construction. The floor area used in the analysis conservatively assumes that there are no rated fire walls subdividing units, and therefore represents the entire row unit. The contents of the buildings are considered limited combustible, as defined in the FUS guidelines, consisting of normal low-risk residential occupancy. The exposure charges are based on separation distance from adjacent buildings. Based on the above criteria, the fire flow demands were calculated as shown in **Table 4.1** below using the FUS method.

Table 4.1: Summary of Fire Flow Demands

Dwelling Notation	Number of Units	Number of Floors	Fire Flow Demand (Lps)	Fire Flow Demand (Lpm)
TH-1 - 9 Units	9	3	167	10,000
TH-2 - 9 Units	9	3	183	11,000
TH-3 - 9 Units	9	3	183	11,000
TH-4 - 10 Units	10	3	183	11,000
TH-5 - 10 Units	10	3	183	11,000
TH-6 - 10 Units	10	3	167	10,000
TH-7 - 6 Units	6	3	150	9,000
TH-8 - 8 Units	8	3	183	11,000
TH-9 - 8 Units	8	3	183	11,000
TH-10 - 8 Units	8	3	183	11,000
Building (A)	78	4	33	2,000

Building (B)	78	4	50	3,000
Building (C)	78	4	50	3,000
Building (D)	78	4	33	2,000
Building (E)	78	4	33	2,000

Overall, the water demand (maximum day demand plus fire flow) for the Site is approximately 11,549 L/min. Fire flow demand calculations and water demand calculations are provided in **Appendix D**.

A flow test will be provided with future submissions to confirm that fire flows can be sufficiently accommodated.

5 Sanitary Servicing

A 250 mm diameter sanitary sewer is located along 18th Avenue East and the proposed servicing design contemplates one (1) sanitary connection from the proposed road to this existing municipal sanitary sewer in accordance with City of Owen Sound standards. A detail configuration of the sanitary servicing design is provided on ***Drawing C-102***.

The sanitary flow estimate was calculated based on the expected design population for the ultimate development (i.e., Phases 1 and 2) using an average flow of 400 L/capita/day. The expected average daily dry weather flow was calculated to be 5.08 L/s. Applying a peaking factor, and allowance for extraneous flow results in an estimated sanitary design flow of 19.5 L/s, as detailed in **Appendix E**.

A downstream sanitary capacity analysis was completed to review the impact of the proposed development on the existing sewer network. All relevant background information such as pipe sizes, slopes, and plan and profile drawings were gathered from the City of Owen Sound. Each section of existing MHs and sewer capacity were analyzed using contribution area as demonstrated in **Appendix E**.

The impact of the proposed development on the downstream collection system was evaluated based on the downstream capacity, in terms of depth-to-diameter (d/D) ratio and flow-to-pipe capacity ratio (q/Q). The original sanitary pipe capacity for the receiving sanitary sewer in the intersection of 10th Avenue East and 18th Avenue East, is currently 3% and increases to 12% once the ultimate development flows are added. It is noted that some existing downstream pipes appear to be above capacity based on the provided analysis as summarized below:

- From MH 1705 to MH 1707 - These pipes are over capacity in existing conditions. It appears the City's database of sewer sizes/inverts is incorrect, and this sewer capacity may not be an issue.

- From MH 2606 to MH 2603 – These pipes are over capacity in existing conditions. It appears the City's database of sewer sizes/inverts is incorrect, and this sewer capacity may not be an issue.

- From MH 1785 to MH 1789 – This stretch of pipe is more than 2 m below existing surface; therefore, minor HGL increases pose no threat of causing basement flooding conditions.

Because the receiving sewer immediately downstream of the development has surplus capacity, and the pipes noted above are either safely deep or showing capacity issues only due to incorrect data, it is our belief that the receiving municipal sewer network has adequate capacity to accommodate the proposed development.

6 Erosion and Sediment Control

Soils are exposed during construction due to the removal of the natural vegetative cover, thereby increasing the potential for sediment wash-off from the Site during rainstorms. The following erosion and sediment control measures are to be installed prior to construction and maintained until surface works are completed and the Site is stabilized.

- Silt fences must be installed along the perimeter of the proposed development where it will be effective in intercepting surface flow;
- Mud mats must be installed at all construction entrances to the Site;
- Stockpiles must be contained by sedimentation control fence;
- Filter fabric must be placed on the catch basins that will receive runoff from the disturbed Site. Once exposed soils have been stabilized the filter fabric may be removed;
- The erosion and sediment control measures must be inspected regularly and repaired and cleaned out if required; particularly after a rainfall event.
- Install temporary swales with rock check dams as required.
- Install temporary sediment traps to capture and treat runoff before releasing into existing areas.

7 Conclusion

From the findings of this report, the conclusions are as follows:

- Stormwater quantity control consisting of underground storage chambers with orifice plates will be provided to meet the design intent of the overall stormwater management strategy.
- The onsite stormwater detention provided will protect the function of existing downstream stormwater management infrastructure.
- Stormwater quality treatment is to be provided via oil-grit separator units.
- The proposed stormwater management strategy will allow for the Phase 1 and Phase 2 developments to occur at different times.
- A 250 mm diameter watermain exists in the corner of 10th Street East and 18th Avenue East right-of-way adjacent to the site. Water supply for the property can be provided by connection to this municipal watermain.
- Ten (10) private fire hydrants will be installed within the site as required to provide firefighting coverage for the proposed buildings.
- The proposed development can be serviced for sanitary drainage by connecting to the existing 250mm diameter sanitary sewer along 18th Avenue East. A sanitary analysis of the downstream municipal sewer system was completed. The receiving sewer immediately downstream of the development has adequate capacity to accept the increased flows from the development. Although the analysis shows that some isolated existing downstream sewers may be over capacity, it appears that the municipal sewer network can accommodate the proposed development.

We trust the above information is complete, should you have any questions please contact the undersigned.

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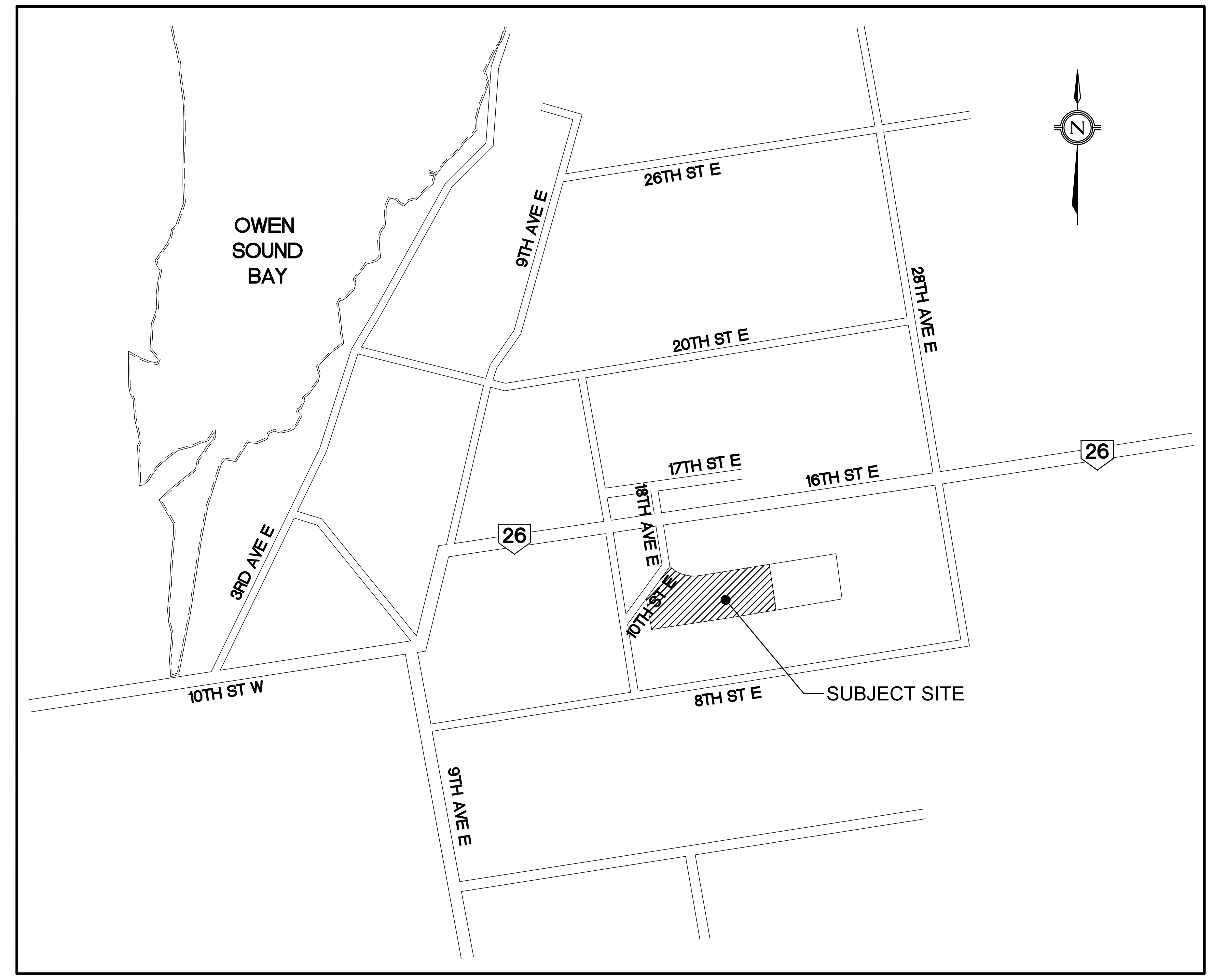
PROPOSED RESIDENTIAL CONDOMINIUM DEVELOPMENT

1555 18th AVENUE EAST

CALLOWAY REAL ESTATE INVESTMENT TRUST INC.

CITY OF OWEN SOUND
COMMUNITY SERVICING DEPARTMENT

CITY FILE No.: D06-21007



SITE PLAN
N.T.S

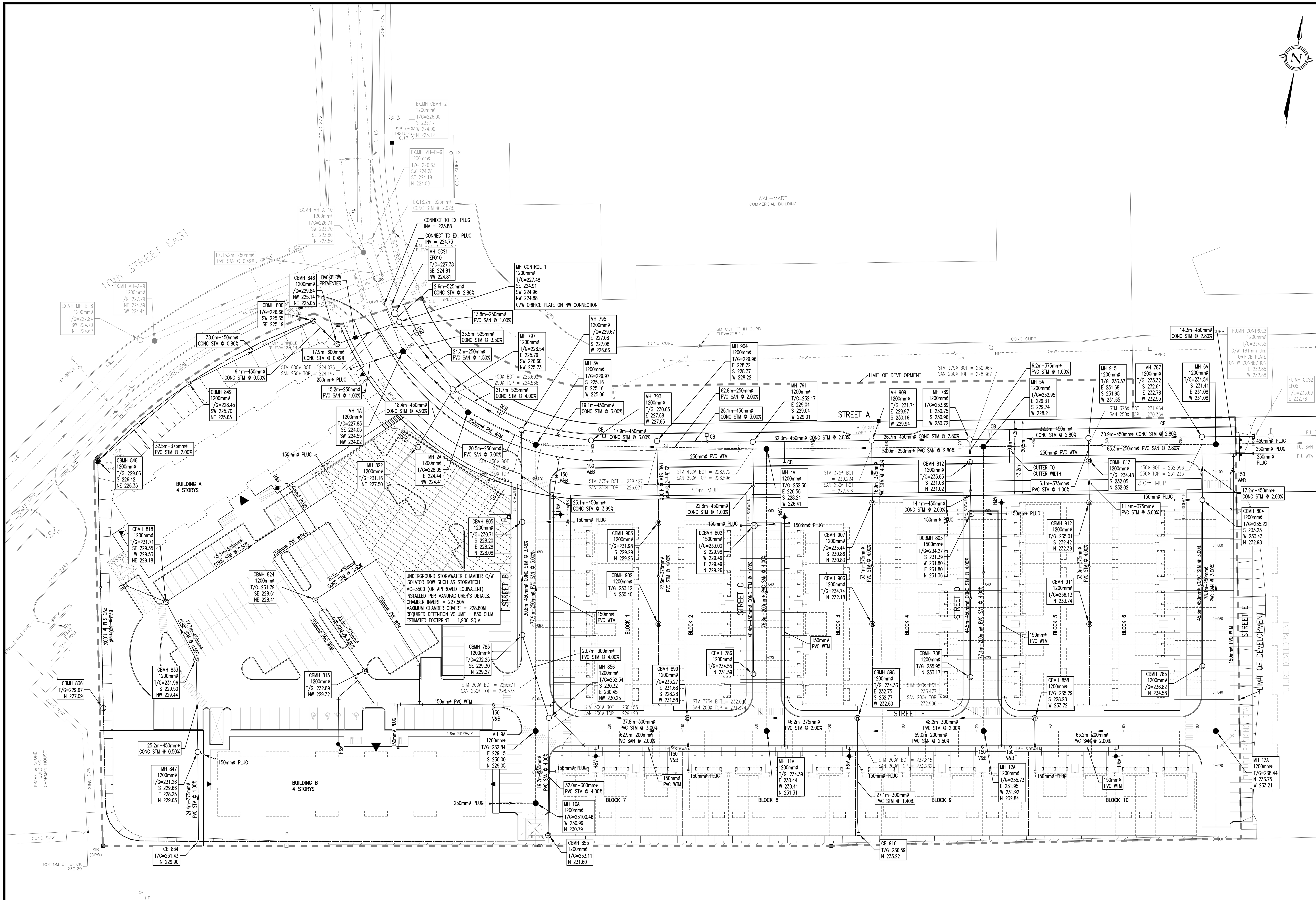
Sheet List Table	
Sheet Number	Sheet Title
000	Cover
101	Servicing Plan
102	Grading Plan
501	Details and Notes
502	Details and Notes
701	Erosion & Sediment Control Plan
702	Erosion & Sediment Control Details

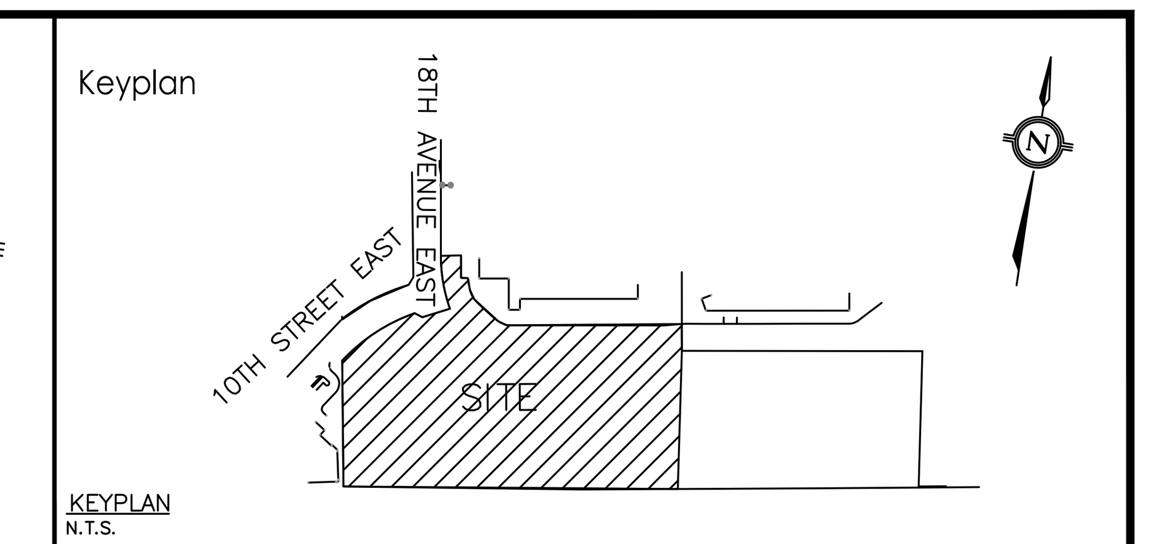
ISSUED FOR SITE PLAN APPROVAL (FIRST SUBMISSION)

JANUARY 2023

Project Number: 160623088

1555 18th AVENUE EAST 160623088 ISSUED FOR SITE PLAN APPROVAL (FIRST SUBMISSION)





LEGEND

- PROPOSED STORM
- PROPOSED SANITARY
- FUTURE STORM
- FUTURE SANITARY
- EXISTING STORM
- EXISTING SANITARY
- PROPOSED WATERMAIN
- EXISTING WATERMAIN
- SINGLE OR REARLOT CATCHBASIN
- CATCHBASIN MANHOLE
- DITCH INLET CATCHBASIN
- DOUBLE CATCHBASIN
- HYDRANT & VALVE
- VALVE & BOX
- SINGLE SANITARY CONNECTION
- SINGLE STORM LATERAL CONNECTION
- EXISTING SANITARY CONNECTION
- EXISTING STORM LATERAL CONNECTION
- WATER SERVICE
- EXISTING WATER SERVICE
- DRIVEWAY LOCATION
- DEAD END BARRICADE
- PROPOSED SWALE
- LIMIT OF CONSTRUCTION
- 1.5m CHAINLINK FENCE
- 1.2m CHAINLINK FENCE
- PRIVACY FENCE (REFER TO LANDSCAPING DRAWINGS)
- UNDERGROUND STORMWATER STORAGE TANK

SITE TOPOGRAPHIC SURVEYOR:

SURVEY PREPARED BY: ARCHIBALD, GARY, & McKAY LTD
AUGUST 26, 2022

ELEVATION/BENCHMARK NOTE

ELEVATION ARE GEOTETIC CGVS28 (HTV2.0), DERIVED FROM G.P.S. OBSERVATION AND THE LEICA GPS SMARTNET NETWORK.

No.	DESCRIPTION	DATE	BY	APPROVED
1.	ISSUED FOR FIRST SUBMISSION	01.31.'23	P.H.	P.F.

REVISIONS

CITY OF OWEN SOUND
PLANNING AND DEVELOPMENT SERVICES

owen sound
where you want to live

1555 18th AVENUE EAST
CITY OF OWEN SOUND
CITY FILE No.: D06-21007

SERVICING PLAN

Stantec Consulting Ltd.
300 - 675 Cochrane Drive West Tower
Markham, Ontario L3R 0B8
Tel. 905.944.7777
www.stantec.com

LICENSED PROFESSIONAL ENGINEER
P. J. H. HSIEH
100222501
JAN 31, 2023
PROVINCE OF ONTARIO

SCALE: 1:500 (0 5 15 25m)

DRAWN BY: P.H
DESIGNED BY: P.H.
CHECKED BY: P.F.
DATE: JANUARY 2023

PROJECT No.: 160623088
DRAWING No.: 101

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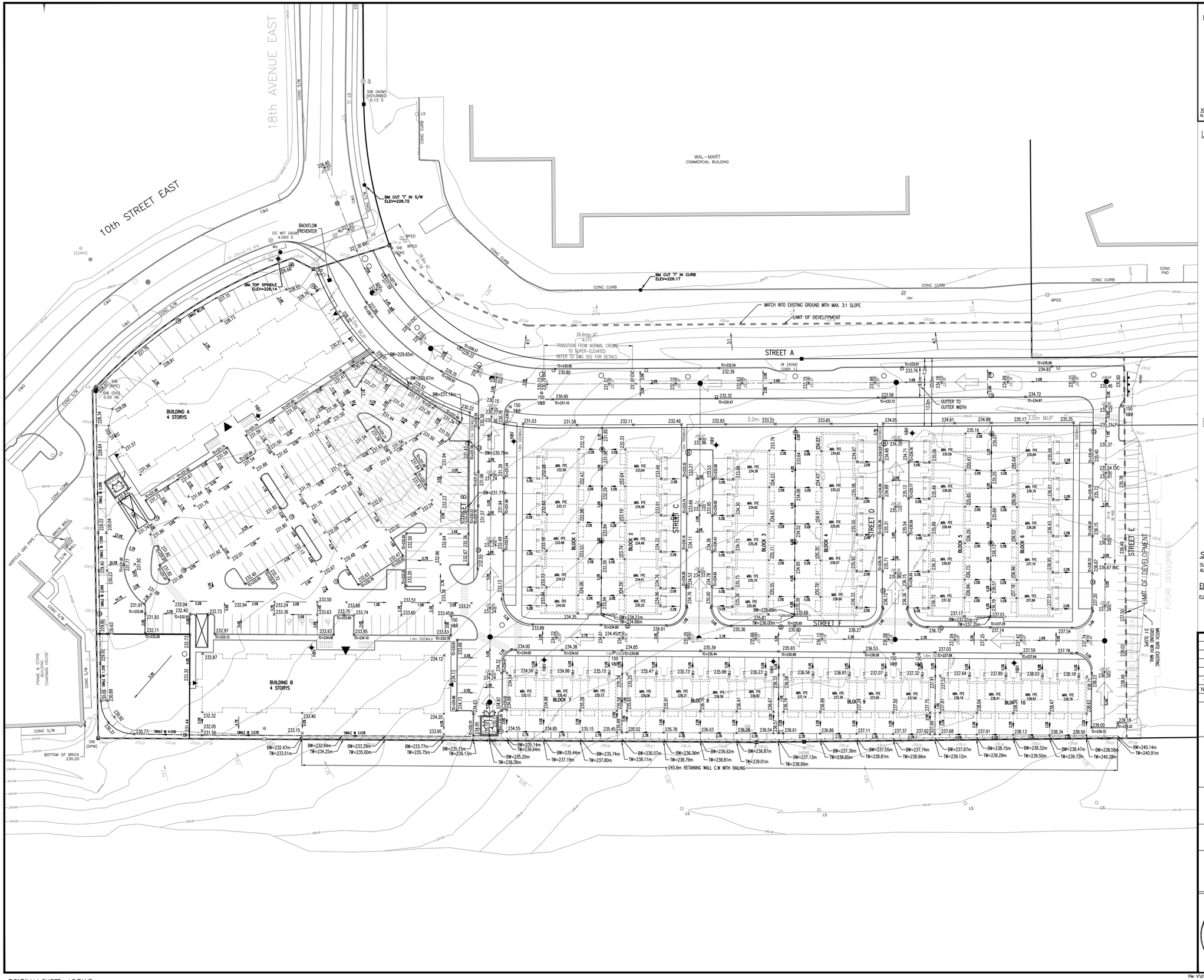
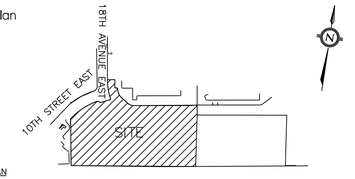
ORIGINAL SHEET - ARCH D



Keyplan



KEYPLAN
N.T.S.

LEGEND

184.15	EXISTING SPOT ELEVATION
184.15	PROPOSED SPOT ELEVATION
184.15 LP	PROPOSED LOW POINT
184.15 HP	PROPOSED HIGH POINT
184.15 BVC	BEGINING OF VERTICAL CURVE
184.15 EVC	END OF VERTICAL CURVE
TC=184.15	TOP OF CURB ELEVATION
195.0	EXISTING CONTOUR & ELEVATION
1.0%	ROAD SLOPE
2.0%	PROPOSED SURFACE GRADE
233.70	MAXIMUM PONDING ELEV
	PROPOSED STORM/SANITARY
	EXISTING STORM/SANITARY
	SINGLE/DOUBLE CATCHBASIN
	HYDRANT & VALVE
	VALVE & BOX/CHAMBER
	WATER SERVICE BOX LOCATION
LS LB	PROP. LIGHT STANDARD/BOLLARD
	PROPOSED TRANSFORMER AND GROUNDING RODS
	STOP SIGN
	STREET NAME SIGN
MB	MAIL PAD (SEE DWG C1206 FOR DETAIL)
	STREET LIGHT PEDESTAL
	ANTICIPATED ENGINEERED FILL LOT (TO BE CONFIRMED BY GEOTECHNICAL ENGINEER)
	MAXIMUM 3:1 SLOPE
	MAJOR SYSTEM FLOW DIRECTION
	PROPOSED RETAINING WALL
	UNDERGROUND STORMWATER STORAGE TANK

SITE TOPOGRAPHIC SURVEYOR:

SURVEY PREPARED BY: ARCHIBALD, GARY, & McKAY LTD
AUGUST 26, 2022

ELEVATION/BENCHMARK NOTE

ELEVATION ARE GEOTECTIC CGVD28 (HTV2.0), DERIVED FROM G.P.S. OBSERVATION AND THE LEICA GPS SMARTNET NETWORK.

No.	DESCRIPTION	DATE	BY	APPROVED
	REVISIONS			
1.	ISSUED FOR FIRST SUBMISSION	01.31.'23	P.H.	P.F.

owen sound
where you want to live

CITY OF OWEN SOUND
PLANNING AND DEVELOPMENT SERVICES

1555 18th AVENUE EAST
CITY OF OWEN SOUND
CITY FILE No.: D06-21007

GRADING PLAN

Stantec

Stantec Consulting Ltd.
300 - 675 Cochrane Drive West Tower
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www.stantec.com

LICENSED PROFESSIONAL ENGINEER
P.J. H. HSIEH
100222501
JAN 31, 2023
PROVINCE OF ONTARIO

SCALE: 1:500 (0, 5, 15, 25m)
DRAWN BY: P.H
DESIGNED BY: P.H.
CHECKED BY: P.F.
DATE: JANUARY 2023
PROJECT No.: 160623088
DRAWING No.: 102

ORIGINAL SHEET - ARCH D

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CITY STANDARD NOTES:

1. ALL CURBS CUTS OR CURB FILLS REQUIRE A SPECIAL SERVICES APPLICATION ISSUED BY THE ENGINEERING SERVICES DIVISION.
2. TAPPING OF WATER MAINS WILL BE PERFORMED BY CITY FORCES AND REQUIRES A SPECIAL SERVICES APPLICATION ISSUED BY THE ENGINEERING SERVICES DIVISION.
3. THE SIZING OF CULVERTS LOCATED ON THE ROAD ALLOWANCE IS TO BVE VERIFIED BY THE ENGINEERING SERVICES DIVISION PRIOR TO INSTALLATION

GENERAL NOTES – GENERAL

1. GENERAL

A. ALL WORK SHALL BE IN ACCORDANCE WITH OPSS / OPSD STANDARD SPECIFICATIONS AND DRAWINGS UNLESS OTHERWISE STATED.

B. LOCATION OF EXISTING SERVICES ARE NOT GUARANTEED. THE CONTRACTOR IS REQUIRED TO OBTAIN ALL LOCATES & NOTIFY THE VARIOUS UTILITY COMPANIES 48 HOURS PRIOR TO THE COMMENCEMENT OF ANY WORK.

C. A ROAD OCCUPANCY PERMIT IS REQUIRED FROM THE PUBLIC WORKS DEPARTMENT PRIOR TO WORKING WITHIN ANY CITY RIGHT–OF–WAY.

D. NATIVE MATERIAL, SUITABLE FOR BACKFILL, SHALL BE COMPACTED TO 95% STANDARD PROCTOR DENSITY. WHERE ENGINEERED FILL IS SPECIFIED COMPACT TO 98% SPD.

E. GRANULAR MATERIAL, USED FOR BACKFILL, SHALL BE APPROVED BY THE GEOTECHNICAL ENGINEER AND COMPACTED TO 100% STANDARD PROCTOR DENSITY.

F. ALL DISTURBED AREAS ARE TO BE REINSTATED TO THEIR ORIGINAL CONDITION.

G. ALL SILT CONTROL AND EROSION PROTECTION DEVICES ARE TO BE IN PLACE PRIOR TO COMMENCEMENT OF CONSTRUCTION AND SHALL REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE SURFACES STABILIZED, SUBJECT TO APPROVALAL OF THE ENGINEER.

H. WHERE FROST WEDGE IS REQUIRED USE MIMIMUM 4:1 SLOPE. OR AS OTHERWISE SPECIFIED BY THE GEOTECHNICAL CONSULTANT.

GENERAL NOTES – SANITARY SEWER

1. SANITARY SERVICE LATERALS

A. PIPE TO BE MINIMUM 125mm DIA. PVC DR28, RUBBER GASKET TYPE JOINTS AND SHALL BE CERTIFIED TO C.S.A. – B–182.2.

B. 125mm x 100mm TEST FITTING TO BE INSTALLED ON LATERAL 5.0m PAST BACK OF CURB.

C. LOCATION OF LATERAL TO BE MARKED 5.0m PAST BACK OF CURB (AT THE TEST FITTING).

D. MINIMUM DEPTH OF COVER OVER LATERAL TO BE 1.5m.

E. MINIMUM SLOPE OF LATERAL TO BE 2.0%.

F. COLOUR OF SERVICE LATERAL PIPE TO BE GREEN OR BLACK.

G. ALL CONNECTIONS TO THE SANITARY MAIN SHALL BE MADE WITH INJECTION MOULDED, APPROVED TEES.

H. TEST FITTING TO BE MANUFACTURED BY CROWLE OR IPEX. PVC AS PER CSA B182.2. CAST IRON AS PER CSA B70.

2. SANITARY SEWER

A. SANITARY SEWER TO BE LOCATED TYPICALLY AT THE CENTRELINE OF THE ROAD UNLESS OTHERWISE SHOWN ON THE DRAWINGS.

B. PIPE SHALL BE PVC DR35.

C. SEWERS SHALL BE CONSTRUCTED WITH BEDDING AS PER OPSD 802.010, CLASS B, UNLESS APPROVED OTHERWISE BY THE CITY ENGINEER.

D. ALL CONNECTIONS TO THE SANITARY MAIN SHALL BE MADE WITH INJECTION MOULDED APPROVED TEES.

E. "KOR–N–SEAL" GASKETS TO BE USED ON ALL PIPES ENTERING MANHOLES.

F. MANHOLE TOPS ARE TO BE SET TO BASE COURSE ASPHALT GRADE AND THEN ADJUSTED TO FINAL GRADE USING A MINIMUM OF 1 TO A MAXIMUM OF 3 ADJUSTMENT RINGS. MAXIMUM VERTICAL ADJUSTMENT OF MH BY ADJUSTMENT RINGS (MODULOC) SHALL NOT EXCEED 300mm. ADJUSTMENT EXCEEDING 300mm SHALL CONSIST OF PRECAST CONCRETE RISER SECTIONS.

G. MANHOLE GRATES AS PER OPSD 401.010 (CLOSED COVER) WITH DATE AND "SANITARY" CAST INTO THE COVER.

H. MANHOLE FRAMES TO BE ADJUSTABLE / AUTOSTABLE.

I. ALL MANHOLES TO BE WATERTIGHT. EXTERIOR WATERPROOF MEMBRANE OR PETROLEUM TAPE SHALL BE APPLIED AROUND ALL JOINTS, INCLUDING ALL MODULOC AND SHALL BE OVERLAPPED HALFWAY UP THE STRUCTURE FRAME (AT FINAL ADJUSTMENT TO TOP COURSE ASPHALT). THE MEMBRANE SHALL BE INSTALLED AS PER MANUFACTURER SPECIFICATIONS AND PROTECTED DURING BACKFILL OPERATIONS.

J. PIPE:
POLYVINYL CHLORIDE (PVC):
–CERTIFIED TO CSA B182.2
–RUBBER GASKET IN INTEGRAL BELL & SPIGOT JOINTS CERTIFIED TO CSA B182.2
–INJECTION–MOLDED GASKETED FITTINGS CERTIFIED TO CSA B182.2
–MANUFACTURED BY IPEX ("RING–TITE"), ROYAL BUILDING PRODUCTS, REHAU ("DURALOC"), DIAMOND PLASTICS
–COLOUR OF MAIN PIPE TO BE GREEN.
–WHERE THE INVERT OF THE SEWER IS BELOW THE GROUNDWATER TABLE, CLAY/BENTONITE SEALS SHALL BE INSTALLED AT 50m INTERVALS PER OPSS 1205, OPSD 802.095, OR AS OTHERWISE RECOMMENDED BY THE GEOTECHNICAL ENGINEER. PLUGS ARE TO BE 1m THICK MEASURED ALONG THE PIPE AND ARE TO REPLACE BEDDING AND COVER AND ARE TO BE KEYED INTO THE TRENCH BOTTOM AND WALLS TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER

K. MANHOLES:
–PRE–CAST CONCRETE CERTIFIED TO CSA A257.4
–RUBBER GASKET TYPE JOINTS CERTIFIED TO CSA A257.3
–MANUFACTURED BY OCPA PLANT PREQUALIFICATION MEMBER
APPROVED EXTERIOR WATERPROOFING MEMBRANE OR PETROLEUM TAPE SHALL BE APPLIED OVER ALL JOINTS OF SANITARY MANHOLES AND CHAMBERS, INCLUDING ALL MODULOC AND SHALL OVERLAP HALFWAY UP THE CAST IRON FRAME TO THE SATISFACTION OF THE CITY.

L. MANHOLE GRATES:
–CERTIFIED TO OPSS 1850

M. MANHOLE FRAMES:
–CERTIFIED TO OPSS 1850.

N. MANHOLE ADJUSTEMENT UNITS:
CONCRETE:
–PRE–CAST CONCRETE GRADE ADJUSTMENT UNITS WITH MODULOC TAPE BETWEEN LAYERS.
–MANUFACTURED BY OCPA PLANT PREQUALIFICATION MEMBER.
DUCTILE IRON:
–RISER RINGS (ONLY TO BE USED WHEN APPROVED BY THE CITY)
–MANUFACTURED BY SIGMA, MH–640102DI (38 OR 51MM)

O. ALL SANITARY DROP STRUCTURES AS PER OPSD 1003.01.

P. WATERTIGHT BULKHEADS AND PLUGS IN ACCORDANCE WITH THE DETAIL ON DRAWING C–1201 EXISTS IN Ex.MH9B AND SHALL REMAIN INSTALLED UNTIL FIRST OCCUPANCY WITHIN THE DEVELOPMENT.

3. TESTING REQUIREMENTS
ALL NEW SANITARY SEWERS SHALL UNDERGO THE FOLLOWING TESTING REQUIREMENTS:
–DEFLECTION TESTING IN ACCORDANCE WITH OPSS 410
–INFILTRATION/EXFILTRATION TESTING IN ACCORDANCE WITH OPSS 410
–CCTV INSPECTION IN ACCORDANCE WITH CITY OF INNISFIL STANDARDS APPENDIXD:CCTV INSPECTION REQUIREMENTS
–VISUAL INSPECTION OF MAINTENANCE HOLES BY THE ENGINEER

GENERAL NOTES – STORM SEWER

2. CATCH BASINS

A. SINGLE CATCHBASIN LEADS TO BE MINIMUM 250mm DIAMETER AT 0.70% SLOPE.

B. TWIN–INLET CATCHBASIN LEADS TO BE MINIMUM 300mm DIAMETER AT 1.5% SLOPE OR GREATER OR LEADS TO BE MINIMUM 375mm at 0.7% SLOPE OR GREATER.

C. LEAD PIPE SHALL BE PVC DR35.

D. CATCHBASIN GRATES ARE TO BE RAMPED USING HOT–MIX ASPHALT.

E. WHERE CATCHBASIN LEADS ARE CONNECTED DIRECTLY TO SEWERS, INJECTION MOULDED TEES SHALL BE USED.

F. SINGLE CATCHBASINS AS PER OPSD 705.010.

G. DOUBLE CATCHBASINS AS PER OPSD 705.020.

H. CATCHBASIN FRAME & GRATE AS PER OPSD 400.020.

I. REAR YARD CATCHBASIN FRAME & GRATE AS PER OPSD 400.120.

J. CATCHBASIN TOPS ARE TO BE SET TO BASE COURSE ASPHALT GRADE AND THEN ADJUSTED TO FINAL GRADE USING A MINIMUM OF 1 TO A MAXIMUM OF 3 ADJUSTMENT RINGS. MAXIMUM VERTICAL ADJUSTMENT OF MH BY ADJUSTMENT RINGS (MODULOC) SHALL NOT EXCEED 300mm. ADJUSTMENT EXCEEDING 300mm SHALL CONSIST OF PRECAST CONCRETE RISER SECTIONS.

3. STORM SEWER

A. STORM SEWER TO BE LOCATED TYPICALLY 2.8m TO THE EAST OR SOUTH OF CENTRELINE OF THE ROAD, OR AS OTHERWISE REQUIRED TO ENSURE CBMH INLETS ALIGN WITH GUTTER.

B. MINIMUM PIPE SIZE TO BE 300mm DIAMETER.

C. PIPE SHALL BE REINFORCED CONCRETE (525mm AND LARGER PIPE SIZE), OR PVC DR35 (300mm TO 450mm PIPE SIZE), ALL WITH RUBBER GASKET TYPE JOINTS.

D. SEWERS SHALL BE CONSTRUCTED WITH BEDDING AS PER OPSD 802.010 (FLEXIBLE PIPE) 802.030 TO 802.032 (RIGID PIPE) INCLUSIVE, CLASS B, UNLESS APPROVED OTHERWISE BY THE CITY ENGINEER.

E. ALL CONNECTIONS TO THE STORM MAIN SHALL BE MADE WITH EITHER INJECTION MOULDED APPROVED TEES OR FACTORY–INSTALLED TEES.

F. MANHOLES AS PER OPSD 701.010 TO 701.012 INCLUSIVE.

H. MANHOLE TOPS ARE TO BE SET TO BASE COURSE ASPHALT GRADE AND THEN ADJUSTED TO FINAL GRADE USING A MINIMUM OF 1 TO A MAXIMUM OF 3 ADJUSTMENT RINGS. MAXIMUM VERTICAL ADJUSTMENT OF MH BY ADJUSTMENT RINGS (MODULOC) SHALL NOT EXCEED 300mm. ADJUSTMENT EXCEEDING 300mm SHALL CONSIST OF PRECAST CONCRETE RISER SECTIONS.

I. MANHOLE GRATE AS PER OPSD 401.010 (TYPE 'A' – CLOSED COVER) WITH THE DATE AND "STORM" CAST INTO THE COVER.

J. WHERE SOFT OR WET TRENCH SUBGRADE CONDITIONS ARE ENCOUNTERED, FURTHER ON–SITE GEOTECHNICAL ASSESSMENT MAY BE REQUIRED TO DETERMINE THE APPROPRIATE BEDDING WHICH WILL STABILIZE THE SUBGRADE FOR SEWER CONSTRUCTION. (ie. INCREASE BEDDING THICKNESS, STONE IMMERSION TECHNIQUES CLASS 'A' BEDDING, ETC.)

4. CULVERTS

A. PIPE SHALL BE HDPE (UP TO 600mm) BIG 'O' BOSS POLY–TITE, 320 kPa, OR GALVANIZED CORRUGATED METAL PIPE (CMP) WITH WALL THICKNESS AS RECOMMENDED BY THE MANUFACTURER FOR H20 LOADING (MIN. 2.0mm THICKNESS FOR ROAD CROSSING AND MIN. 1.6mm FOR DRIVEWAYS), OR REINFORCED CONCRETE.

5. STORM SEWER SYSTEM

A. PIPE
REINFORCED CONCRETE:
–CERTIFIED TO CSA A257.2. CLASS 65–D.
–RUBBER GASKET TYPE JOINTS CERTIFIED TO CSA A257.3
–MANUFACTURED BY OCPA PLANT–PREQUALIFICATION MEMBER

POLYVINYL CHLORIDE (PVC):
–CERTIFIED TO CSA B182.2
–RUBBER GASKET IN INTEGRAL BELL & SPIGOT JOINTS CERTIFIED TO CSA B182.2
–INJECTION–MOLDED GASKETED FITTINGS CERTIFIED TO CSA B182.2
–MANUFACTURED BY IPEX ("RING–TITE"), ROYAL BUILDING PRODUCTS, DIAMOND PLASTICS.
–COLOUR OF MAIN PIPE TO BE GREEN.
–WHERE THE INVERT OF THE SEWER IS BELOW THE GROUNDWATER TABLE, CLAY/BENTONITE SEALS SHALL BE INSTALLED AT 50m INTERVALS PER OPSS 1205, OPSD 802.095, OR AS OTHERWISE RECOMMENDED BY THE GEOTECHNICAL ENGINEER. PLUGS ARE TO BE 1m THICK MEASURED ALONG THE PIPE AND ARE TO REPLACE BEDDING AND COVER AND ARE TO BE KEYED INTO THE TRENCH BOTTOM AND WALLS TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER

B. MANHOLES
–PRE–CAST CONCRETE CERTIFIED TO CSA A257.4
–RUBBER GASKET TYPE JOINTS CERTIFIED TO CSA A257.3
–MANUFACTURED BY OCPA PLANT–PREQUALIFICATION MEMBER

C. MANHOLE GRATES:
–CERTIFIED TO OPSS 1850

D. MANHOLES FRAMES:
–CERTIFIED TO OPSS 1850
–MANUFACTURED BY BIBBY ST. CROIX (C–50M–ONT),
–SIGMA (MH62502–D),
–MUELLER CANADA (AJ775, AJ633,AJ22.5)

E. MANHOLE ADJUSTEMENT UNITS:
CONCRETE:
–CERTIFIED TO CSA A257.4
–MANUFACTURED BY OCPA PLANT PRE–QUALIFICATION MEMBER
DUCTILE IRON:
–USE TO BE APPROVED BY CITY
–MANUFACTURED BY SIGMA MH–640102DI (38 OR 51mm)

F. MANUFACTURED BY OCPA PLANT–PRE–QUALIFIED MEMBER.

6. TESTING REQUIREMENTS
ALL STORM SEWERS SHALL UNDERGO THE FOLLOWING TESTING REQUIREMENTS:
–DEFLECTION TESTING IN ACCORDANCE WITH OPSS 410 (FOR PVC SEWERS ONLY)
–INFILTRATION/EXFILTRATION TESTING IN ACCORDANCE WITH OPSS 410 (PVC SEWERS ONLY)
–CCTV INSPECTION IN ACCORDANCE WITH CITY OF INNISFIL STANDARDS APPENDIX D:CCTV INSPECTION REQUIREMENTS
–VISUAL INSPECTION OF MAINTENANCE HOLES BY THE ENGINEER

GENERAL NOTES – WATERMAIN

1. WATER SERVICE CONNECTIONS

A. PIPE TO BE MINIMUM 25mm DIAMETER POLYETHYLENE TUBING, SERIES 200 OR TYPE 'K' COPPER TUBING. ANY SERVICES REQUIRING INSULATION SHALL BE URECON PRE–INSULATED 25mm TYPE 'K' COPPER WATER SERVICE PIPE

B. CAST BRONZE SERVICE SADDLE–DOUBLE STRAP STAINLESS STEEL SERVICE SADDLES.

C. CURB STOPS TO BE LOCATED AS PER SERVICING PLAN DRAWINGS WITH THE USE OF GPS EQUIPMENT OR OTHER SUITABLE MEANS. MAXIMUM ALLOWABE DEVIATION OF CURB STOP NORTHING/EASTING LOCATION IS 0.3m .

D. LOCATION OF WATER SERVICE TO BE MARKED AT THE CURB STOP LOCATION WITH A 38mm x 89mm x 2.4 METRE WOOD MARKER, PAINTED BLUE.

E. WATER SERVICES ARE NOT TO BE LOCATED IN DRIVEWAYS WHERE POSSIBLE. MINIMUM 1.0 METRE CLEARANCE REQUIRED.

F. MINIMUM DEPTH OF COVER OVER THE WATER SERVICE TO BE 1.7m AT ALL TIMES.

G. SERVICE PIPE:
–POLYETHYLENE TUBING AS PER CSA B137.1 (SERVICE 200)
–TYPE 'K' COPPER TUBING AS PER ASTM B88–88

H. MAIN STOP:
–25mm, AWWA C800
–MUELLER H 25008
–CAMBRIDGE BRASS 301–A3H3
–FORD 25mm F1000–3–Q
–EMCO 17072 COMPRESSION

I. SADDLE:
–CAST BRONZE SERVICE SADDLE BODY, DOUBLE STRAPS
–ROBAR 2706
–CAMBRIDGE BRASS SERIES 812

J. CURB STOP:
–NON SELF–DRAINING
–25mm, AWWA C800
–EMCO 17402 BALL COMPRESSION
–MUELLER H–15209
–CAMBRIDGE BRASS 202–H3H3
–FORD B44–333

K. SERVICE BOX:
–STEEL BOOT ONLY
–CONCORD CLOW CLASS SIZE 8
–MUELLER D1, D3, SIZE 8
–BIBBY/TROJAN
–EMCO A–714, A–715, A–716
–ROSSLAND SUPPLY
–SIGMA CORPORATION
–SERVICE BOX RODS – 36" STAINLESS STEEL

L. COUPLINGS
–25mm, AWWA C800
–MUELLER H–15–403
–CAMBRIDGE BRASS 118–H3–H3
–FORD C44–33
–MCDONALD BRASS 4758T

GENERAL NOTES – WATERMAIN

2. WATERMAIN

A. ALL WORK ON ANY EXISITNG WATERMAINS TO BE COORDINATED WITH THE CITY.

B. PIPE SHALL BE PVC, MINIMUM PRESSURE CLASS 235, DR18. PIPE MAY BE CEMENT–LINED DUCTILE IRON UPON APPROVAL BY THE CITY.

C. ALL FITTINGS SHALL BE DUCTILE IRON CEMENT LINED WITH MECHANICAL JOINTS AND SHALL BE COMPLETE WITH CATHODIC PROTECTION.

D. MINIMUM DEPTH OF COVER OVER WATERMAIN SHALL BE 1.7m OR 1.9m BELOW ROAD CENTRELINE, WHICHEVER IS DEEPER.

E. TRACER WIRE SHALL BE INSTALLED ON ALL WATERMAINS AND HYDRANT LATERALS . TRACER WIRE SHALL BE #12 AWG HIGH STRENGTH COPPER CLAD STEEL CONDUCTOR (HC–CCS). TRACER WIRE SHALL NOT BE WRAPPED AROUND BOLTS OR OTHER COMPONENTS ALONG MAINLINE AND SHALL NOT BE PLACED UNDER ANY PIPE OR APPURTENANCE. TRACER WIRE SHALL BE LAID FLAT AND SECURELY AFFIXED WITH MASTIC TAPE TO THE TOP OF THE WATERMAIN AT 5–METER INTERVALS. BREAKS OR CUTS IN THE TRACER WIRE ARE ONLY PERMITTED AT THE FOLLOWING PRESCRIBED LOCATIONS: HYDRANT LATERALS, WATER SERVICES (FIRE AND DOMESTIC), TEES AND CROSSES. TRACER WIRE SHALL BE LOOPED AT EACH HYDRANT AS SUCH THAT THE TRACER WIRE FROM THE MAINLINE CONTINUES UP THE HYDRANT LEAD AND IS BROUGHT ABOVE GROUND IN A 1" RIGID PVC CONDUIT PLACED AT THE BACK OF THE HYDRANT AND LOOPED BACK DOWN THE HYDRANT LEAD TO THE MAINLINE. THE LOOPED WIRES ARE TO BE TIGHTLY TAPED TOGETHER AND LEFT UNTOUCHED IN A HYDRANT TEST STATION WHICH IS TO BE INSTALLED AT THE BACK OF EACH HYDRANT AND BOLTED AT THE FLANGE. TRACER WIRE SHALL NOT BE BROUGHT UP ANY MAIN LINE VALVES OR HYDRANT VALVES.

F. HYDRANT SHALL BE INSTALLED IN ACCORDANCE WITH OPSD 1105.010, COMPLETE WITH THRUST BLOCKS AND MECHANICAL JOINTS.

G. VALVES SHALL BE MECHANICAL JOINT GATE VALVES WITH SLIDING TYPE VALVE BOX.

H. BEDDING AS PER OPSD 802.010.

I. MAINPIPE

POLYVINYL CHLORIDE (PVC):
–CERTIFIED TO CSA B137.3
–RUBBER GASKET IN INTEGRAL BELL & SPIGOT JOINTS CERTIFIED TO CSA B137.3
–PIPE SIZE 300mm AND SMALLER, CI OD AS PER AWWA C900 DR 18 CLASS 150
–PIPE SIZE 350mm AND LARGER, CI OD AS PER AWWA C905
–MANUFACTURED BY IPEX, ROYAL BUILDING PRODUCTS, REHAU, DIAMOND PIPE, NATIONAL PIPe COLOUR CODED BLUE

J. TRACER WIRE

–#12 AWG (0.0808" DIAMETER) HIGH STRENGTH COPPER CLAD STEEL CONDUCTOR (HS–CCS), INSULATED WITH A 30mm HIGH DENSITY POLYETHYLENE (HDPE) INSULATION RATED FOR DIRECT BURIAL USE AT 30 VOLTS.
–MANUFACTURED BY COPPERHEAD

TRACER WIRE CONNECTORS:
–WATERPROOF CONNECTOR, SNAKEBITE LOCKING CONNECTOR, 12 AWG
–MANUFACTURED BY COPPERHEAD

HYDRANT THREE TERMINAL TEST STATION:
–COBRA T3 HYDRANT FLANGE PACKAGE, BLUE IN COLOUR
–MANUFACTURED BY COPPERHEAD

K. MAIN FITTINGS

DUCTILE IRON:
–MINIMUM PRESSURE CLASS 350
–CEMENT MORTAR LINED
–MECHANICAL JOINT
–MANUFACTURED BY BIBBY ST. CROIX, TYLER PIPE, STAR, SIGMA, MAGOTTEAX
–AS PER AWWA C104/A21.4, C110/A21.10, C153/A21.53, C111/A21.11

L. VALVES
–RESILIENT SEAT GATE VALVE WITH NON–RISING STEM AND 50mm SQUARE OPERATING NUT, OPENING COUNTER CLOCKWISE.
–EPOXY COATED INSIDE AND OUTSIDE PER AWWA C550
–MECHANICAL JOINTS WITH RESTRAINERS
–BOND BREAKER BETWEEN CONCRETE SUPPORT AND VALVE BODY
–MANUFACTURED BY AVK ("SERIES 2500"), Clow ("F–6100"), MUELLER ("A2360"), CONCORD DAIGLE ("COMPRESSION C2000M"), BIBBY, AFC.
–AWWA C509, AWWA 515, AWWA C11/A21.11

M. VALVE BOX
–150mm COVER – MANUFACTURED BY BIBBY VB800, EMCO CONCORD 4 SL–48
–GUIDE PLATE – BIBBY VB875, EMCO CONCORD GP
–EXTENSION 300mm – BIBBY VB700, EMCO CONCORD 4SL–18E
–EXTENSION 450mm – BIBBY VB705, EMCO CONCORD 4SL–18E
–EXTENSION 600mm – BIBBY VB710, EMCO CONCROD 4SL–24E
–WHERE VALVE BOXES ARE TO BE INSTALLED WITHIN A CONCRETE SURFACE, EAST JORDAN SELF–LEVEL VALVE BOX TOPS ARE TO BE INSTALLED

N. VALVE STEM EXTENSIONS
–REQUIRED FOR ADDITIONAL DEPTH OVER 1.7m
–52mm TOP OPERATION C/W SET SCREW

O. JOINT RESTRAINT DEVICES

RETAINING GLAND FOR PVC PIPE:
–ASTM STANDARD F1674–96
–ANSI/AWWA C111/A21.11 WHERE APPLICABLE
–NI BELL STANDARD UNI–B–13–94
–UNI–FLANGE SERIES 1300
–STARGRIP SERIES 4000
–EBAA IRON SERIES 2000

RETAINING GLAND FOR DI PIPE:
–UNI–FLANGE SERIES 1400
–STARGRIP 3000
–EBAA IRON 1100

SPLIT RING RESTRAINER & TIE BOLTS:
–UNI–FLANGE SERIES 1390
–STARGRIP 1100C
–EBAA IRON SERIES 1500

JOINT RESTRAIN SYSTEM IN–LINE FOR PVC WATER MAIN
–INTEGRAL JOINT RESTRAINT SYSTEM FOR USE WITH 100mm TO 300mm DIAMETER PVC WATERMAIN
–MANUFACTURED BY ROYAL BUILDING PRODUCTS ("BULLDOG"), IPEX ("TERRABRUTE")
–AWWA STANDARD C900
–CSA B137.3
–ASTM F1674
–NSF 61

P. FIRE HYDRANTS
- AWWA C502, AWWA C509–01
- POST TYPE DRY BARREL COMPRESSION SHUTOFF WITH BALL VALVE CLOSING WITH FLOW, OPENING COUNTER CLOCKWISE
- M.J ELBOW
- 125MM VALVE BALL
- 2 SIDE OUTLETS WITH 2.5" CSA STANDARD HOSE NOZZLE THREADS
- 1 – 4" STORZ PUMPER NOZZLE OUTLET
- BREAKAWAY FLANGE
- SELF DRAINING
- PVC DR18 HYDRANT LATERALS
- BOND BREAKER BETWEEN CONCRETE SUPPORT AND FITTINGS
- HYDRANT SHALL BE PAINTED M20 RAPID DRY GLOSS ENAMEL (SAFETY COLOURS), OR APPROVED EQUIVALENT.
- 4–5 MM THICK PAINT WHEN WET
- HYDRANT BARREL SHALL BE SAFETY RED M20–21
- BONNET, SIDE OUTLET AND PUMPER NOZZLE CAPS SHALL BE LIGHT BLUE M20–35, GREEN M20– 41, ORANGE M20–65 OR RED M20–21,BASED ON HYDRANT FLOWS.
- MCGARD HYDRANT LOCK ANTITAMPER DEVICE
- MANUFACTURE BY CLOW PREMIER D–67–M, MUELLER CENTUREY, AVK SERIES 2780, CONCORD DAIGLE 67M, MCAVITY BRIGADIER M–67
- HYDRANTS ARE TO BE FIRE FLOW TESTED IN ACCORDANCE WITH NFPA 291
- RISERS TO BE INSTALLED IN ONE SINGLE SECTION. EXTENSIONS WILL NOT BE PERMITTED

Q. CATHODIC PROTECTION
- CATHODIC NUTS AND SACRIFICIAL CAPS ON EVERY FITTING BOLT
- 99.9% HIGH GRADE ZINC, STEEL CORE
- COATED WITH LOW RESISTANT DEPOLARIZING MATERIALS: 175 GRAMS ASTM B–418–73–TYPE II AT THEIR DISCRETION, THE CITY MAY ALSO REQUIRE ZINC ANODES OR OTHER CORROSION PROTECTION MEASURES.

R. WATERMAINS TO BE INSTALLED TO GRADES AS SHOWN ON APPROVED PLANS, COPY OF GRADE SHEET MUST BE SUPPLIED TO INSPECTOR PRIOR TO COMMENCEMENT OF WORK, WHERE REQUESTED BY INSPECTOR.

S. ALL VALVE AND BOXES AS PER OPSD 1101.020.

T. ALL WATERMAINS AND WATER SERVICE MATERIALS AND CONSTRUCTION METHODS MUST CORRESPOND TO THE CURRENT CITY OF OWEN SOUND ENGINEERING STANDARDS AND SPECIFICATIONS.

U. TESTING REQUIREMENTS
–ALL WATERMAINS SHALL UNDERGO THE FOLLOWING TESTING REQUIREMENTS. WATERMAIN COMMISSIONING AND TESTING PROCEDURES ARE TO BE IN ACCORDANCE WITH INNSERVICES WATERMAIN CONNECTION AND COMMISSIONING STANDARD MANUAL.
–SWABBING
–HYDROSTATIC TESTING AS PER AWWA C605
–DISINFECTION AS PER AWWA C651
–BACTERIOLOGICAL TESTING AS PER AWWA C651
–CONTINUITY TESTING

GENERAL NOTES – WATERMAIN

3. WATERMAIN FILL AREAS

A. FILL TO BE PLACED TO A MINIMUM OF 600 mm ABOVE THE WATERMAIN GRADES AND TO 3.0m MINIMUM ON EACH SIDE PRIOR TO WATERMAIN LAYING COMPACTED TO A MINIMUM OF 100% STANDARD PROCTOR DENSITY IN 300mm LIFTS.

B. TESTS SHALL BE TAKEN ALONG THE CENTRE LINE OF THE WATERMAIN AND ON LINES 1.50m ON EITHER SIDE OF SAME AT A MAXIMUM INTERVAL OF 30.0m. TESTS TO BE TAKEN AT EACH 600mm LIFT.

C. ALL JOINTS, HYDRANTS, TEES, BRANCH VALVES AND HORIZONTAL BENDS ARE TO BE MECHANICALLY RESTRAINED WITH RODS IN ADDITION TO CONCRETE BLOCKING WHERE OTHERWISE REQUIRED.

D. PIPE JOINT DEFLECTIONS ARE NOT ALLOWED IN FILL AREAS.

E. ALL WATERMAIN JOINTS SHALL BE MECHANICALLY RESTRAINED IN AREAS OF EARTH FILL

GENERAL NOTES – ROADWORK

1. CULVERTS

A. FROST TAPERS REQUIRED ON ALL CULVERTS AS PER OPSD 803.03 WITH 10:1 SLOPE.

B. MINIMUM SIZE OF ROAD CROSSING CULVERTS TO BE 500mm DIAMETER, 2.0mm THICK, WITH A MINIMUM LENGTH AS REQUIRED FROM CENTRE OF DITCH TO CENTRE OF DITCH. MINIMUM COVER OVER PIPE TO BE 300mm.

C. MINIMUM SIZE OF DRIVEWAY CULVERTS TO BE 400mm DIAMETER, 1.6mm THICK, WITH MINIMUM LENGTH AS REQUIRED FROM CENTRE OF DITCH TO CENTRE OF DITCH.

2. ROADS

A. NATIVE SUBGRADE SHALL HAVE A CROSSFALL OF 3% AND THE MATERIAL SHALL BE APPROVED SUITABLE BY A SOILS CONSULTANT, AND ARE SUBJECT TO APPROVAL BY THE CITY ENGINEER.

B. NATIVE SUBGRADE TO BE COMPACTED TO MINIMUM 98% STANDARD PROCTOR DENSITY AND SHALL BE PROOF ROLLED AND APPROVED PRIOR TO PLACEMENT OF GRANULAR ROAD BASE.

C. GRANULAR MATERIALS USED IN THE ROAD BASE SHALL BE COMPACTED TO 100% SPDD.

D. THE ROAD BASE SHALL INCORPORATE 100mm DIAMETER CONTINOUS SUB–DRAINS PER OPSS 1840, COMPLETE WITH GRANULAR A BACKFILL. PIPE TO BE HDPE 210 KPa PIPE STIFFNESS, PERFORATED WITH GEO–TEXTILE SOCK FILTER. SUB–DRAIN PIPE TO BE ARMTECH BIG 'O'. CONTRACTOR TO ENSURE ALL SUB–DRAINS HAVE POSITIVE DRAINAGE AND ARE TO BE CONNECTED TO CATCH BASINS.

E. MINIMUM PAVEMENT STRUCTURE TO BE AS SHOWN ON ROAD SECTION DETAILS (DWG. C–502)

GENERAL NOTES – CURB AND SIDEWALK

A. ALL CURB SHALL BE STANDARD TWO–STAGE BARRIER CURB AS PER OPSD 600.070 (TWO STAGE). CONCRETE CURB SHALL BE IN ACCORDANCE WITH OPSS 353, WITH THE EXCEPTION THAT ALL CONCRETE SHALL BE SUPPLIED IN ACCORDANCE WITH THE "PERFORMANCE SPECIFICATION ALTERNATIVE" OF OPSS.MUNI 1350 AND SHALL MEET THE REQUIREMENTS OF CSA A23.1, EXPOSURE CLASS C–2, WITH A MINIMUM COMPRESSIVE STRENGTH OF 32 MPA AT 28 DAYS.

B. SIDEWALKS TO COMPLY WITH OPSD 310.010 AND ARE TO BE 1.5 METRES WIDE ON A 150mm COMPACTED GRANULAR 'A' BASE. THICKNESS TO BE 150mm IN GENERAL AND COMPACTED TO 95% STANDARD PROCTOR DENSITY. CONCRETE SIDEWALK SHALL BE IN ACCORDANCE WITH OPSS 351, WITH THE EXCEPTION THAT ALL CONCRETE SHALL BE SUPPLIED IN ACCORDANCE WITH THE "PERFORMANCE SPECIFICATION ALTERNATIVE" OF OPSS.MUNI 1350 AND SHALL MEET THE REQUIREMENTS OF CSA A23.1, EXPOSURE CLASS C–2, WITH A MINIMUM COMPRESSIVE STRENGTH OF 32 MPA AT 28 DAYS. DIRECTIONAL LINES SHALL BE INSERTED IN THE SIDEWALK AT ALL STREET INTERSECTIONS.

GENERAL NOTES – GENERAL BACKFILL

A. WHEN TRENCH BACKFILLING ON PROPOSED ROADS, THE SIDES OF THE TRENCH SHOULD BE FLATTENED TO 1 VERTICAL; 2 HORIZONTAL. WHERE THE EXCAVATED INORGANIC NATIVE SUBSOIL IS USED FOR TRENCH BACKFILLING, THE BACKFILL SHOULD BE PLACED IN MAXIMUM 200mm THICK LAYERS, AND COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY WITHIN 2% OF THE OPTIMUM MOISTURE CONTENT. THE TOP 1000mm OF THE SUBGRADE IS TO BE COMPACTED TO A MINIMUM OF 98% OF STANDARD PROCTOR DENSITY WITHIN 2% OF OPTIMUM MOISTURE CONTENT. SAND BACKFILL IS RECOMMENDED ADJACENT TO MANHOLES, CATCHBASINS AND SERVICE CROSSINGS.

B. ALL FILL WITHIN PROPOSED ROAD ALLOWANCE AND EASEMENTS TO BE COMPACTED TO MINIMUM 95% STANDARD PROCTOR DENSITY IN LIFTS NOT EXCEEDING 200mm. THE SUITABILITY AND COMPACTION OF ALL FILL MATERIAL IS TO BE CONFIRMED BY A RECOGNIZED SOIL CONSULTANT TO THE CITY ENGINEER PRIOR TO THE INSTALLATION OF ANY ROAD BASE MATERIAL.

C. ALL UNDERGROUND SERVICE CONNECTIONS WITHIN PAVED PORTION OF AND EXISTING ROAD TO BE BACKFILLED WITH GRANULAR MATERIAL AND COMPACTED TO 98% STANDARD PROCTOR DENSITY.

D. TRENCHES FOR SERVICE CROSSINGS SHALL BE CUT TO 1 VERTICAL : 1 HORIZONTAL.

E. NON–SHRINK BACKFILL IS REQUIRED FOR TRENCHES WITHIN EXISTING ROAD ALLOWANCES.

F. PRIOR TO THE INSTALLATION OF ANY GRANULAR MATERIALS, THE SOILS CONSULTANT MUST HAVE ISSUED A COMPACTION CERTIFICATE AND APPROVAL BE ISSUED BY THE ENGINEER.

G. NO COBBLES AND BOULDERS GREATER THAN 150mm IN DIAMETER ARE TO BE USED AS TRENCH BACKFILL, USE ONLY MATERIAL APPROVED BY SOIL CONSULTANT.

GENERAL NOTES – SIGNS AND PAVEMENT MARKINGS

STREET NAME SIGNS

A. STREET NAME SIGNS ARE TO INCLUDE "911" EMERGENCY ADDRESS RANGES, AS PROVIDED BY THE CITY.

TRAFFIC SIGNS
B. SIGNS OF THE STANDARD TYPE APPROVED BY THE MINISTRY OF TRANSPORTATION SHALL BE MOUNTED ON 3.6 M (1.2 M LOWER CHANNEL AND 2.4 M UPPER CHANNEL), DOUBLE–SLIDE, "UCHANNEL" GALVANIZED STEEL POSTS, EMBEDDED 0.9 M IN THE GROUND.

PAVEMENT MARKINGS
C. PAVEMENT MARKINGS SHALL BE PAINTED CONFORMING WITH THE STANDARDS OF THE MINISTRY OF TRANSPORTATION OF ONTARIO, BOOK 11.

D. STOP BARS ARE TO BE DURABLE PAVEMENT MARKINGS OR FIELD REACTED POLYMERIC PAVEMENT MARKINGS IN ACCORDANCE WITH OPSS 710, OPSS 1713 AND OPSS 1714.

E. ALL PAVEMENT MARKING REMOVAL REQUIRED TO PREPARE THE AREA FOR FINAL PAVEMENT MARKING SHALL BE DONE BY ABRASION.

SITE TOPOGRAPHIC SURVEYOR:

SURVEY PREPARED BY: ARCHIBALD, GARY, & McKAY LTD
AUGUST 26, 2022

ELEVATION/BENCHMARK NOTE

ELEVATION ARE GEOTETIC CGVS28 (HTV2.0), DERIVED FROM G.P.S. OBSERVATION AND THE LEICA GPS SMARTNET NETWORK.

No.	DESCRIPTION	DATE	BY	APPROVED
1.	ISSUED FOR FIRST SUBMISSION	01.31.'23	P.H.	P.F.

REVISIONS

owen sound where you want to live

CITY OF OWEN SOUND
PLANNING AND DEVELOPMENT SERVICES

1555 18th AVENUE EAST
CITY OF OWEN SOUND
CITY FILE No.: D06-21007

DETAILS AND NOTES

Stantec

Stantec Consulting Ltd.
300 - 675 Cochrane Drive West Tower
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www.stantec.com

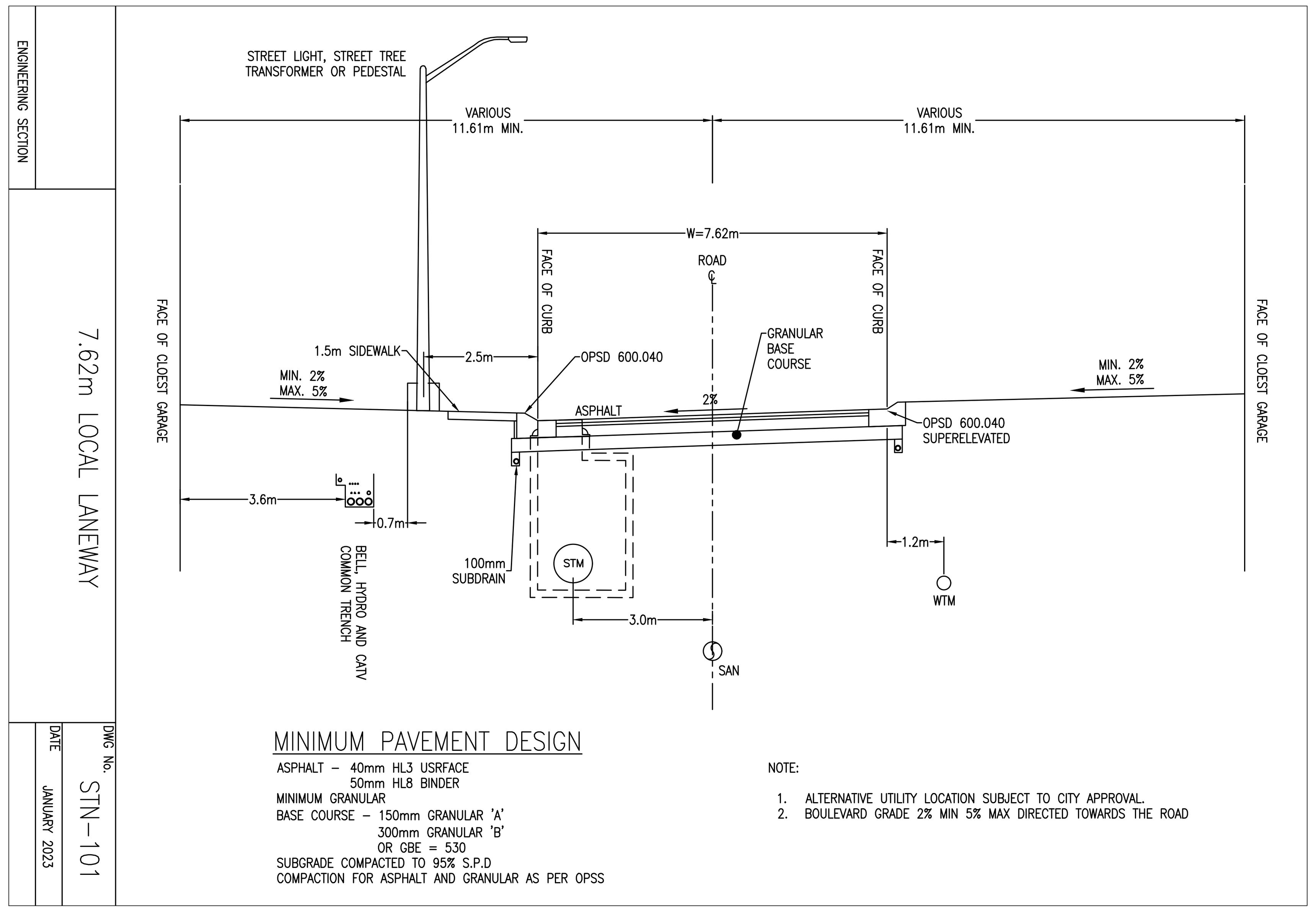
LICENSED PROFESSIONAL ENGINEER
P. J. H. HSIEH
100222501
JAN 31, 2023
PROVINCE OF ONTARIO

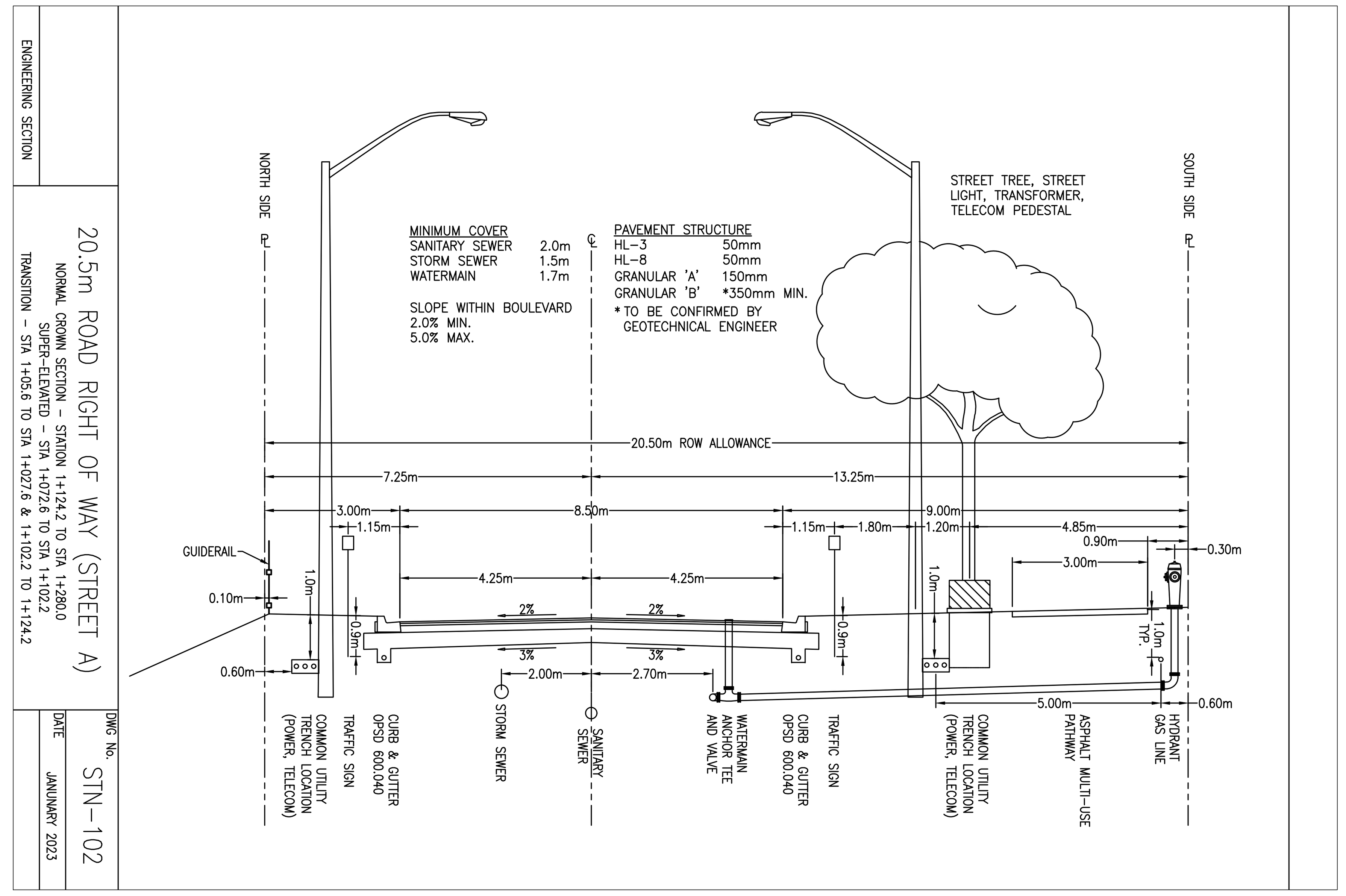
SCALE:

DRAWN BY: P.H
DESIGNED BY: P.H.
CHECKED BY: P.F.
DATE: JANUARY 2023

PROJECT No.: 160623088

DRAWING No.: 501





SITE TOPOGRAPHIC SURVEYOR:

SURVEY PREPARED BY: ARCHIBALD, GARY, & McKAY LTD
AUGUST 26, 2022

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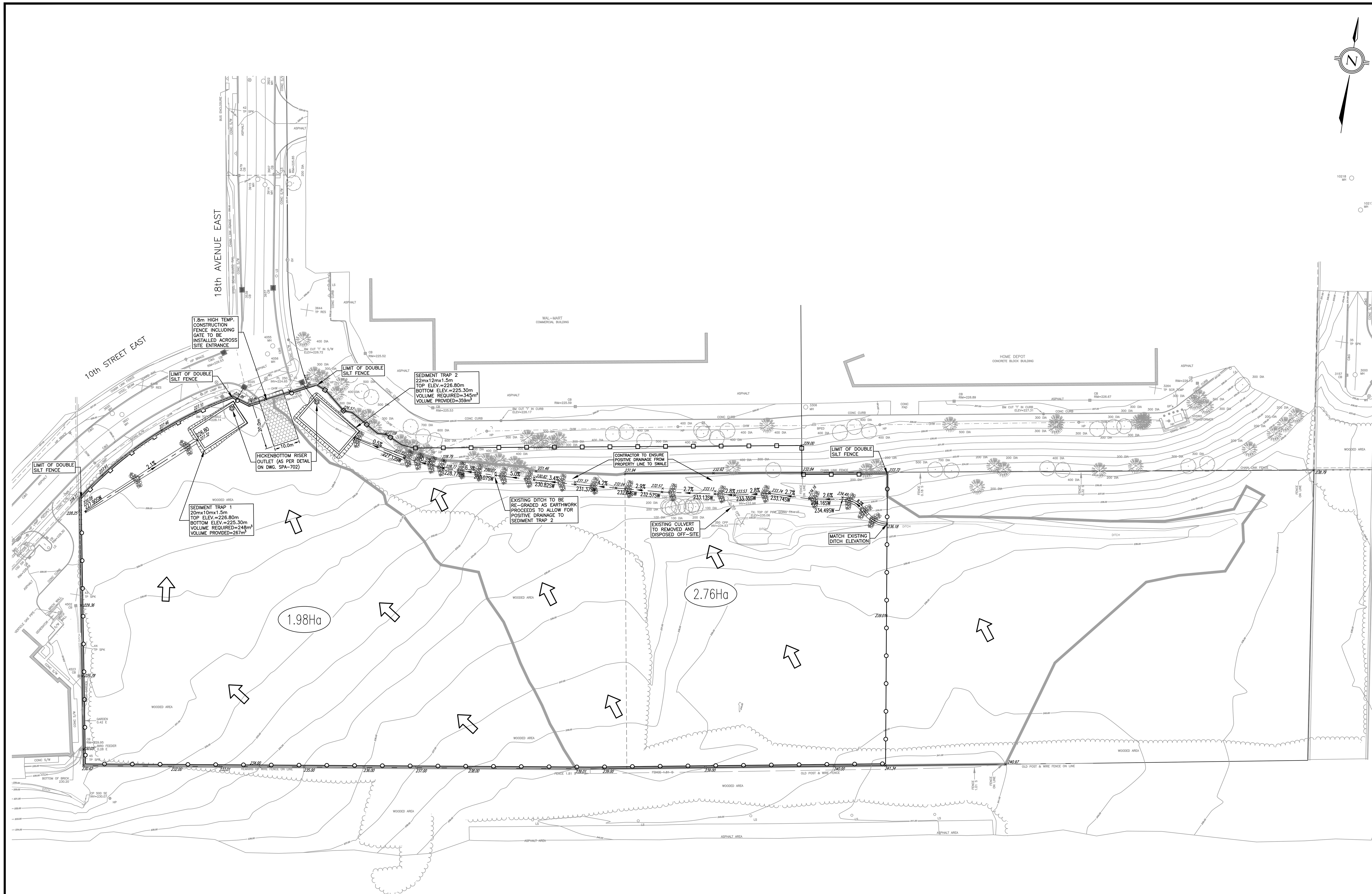

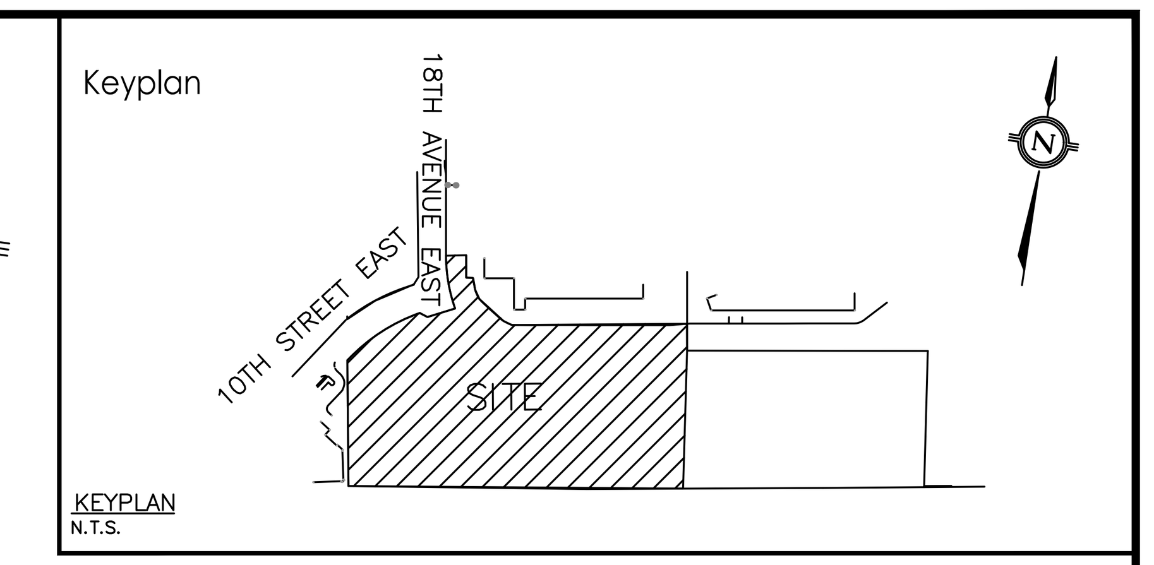

LEGEND

- DOUBLE SILT FENCE AND STRAW BALES
- SILTATION CONTROL FENCE INSTALLED ON GRADING LIMITS (AS PER OPSD STD. 219.131)
- TEMPORARY INTERCEPTOR SWALE (SEE DETAIL ON DWG. SPA-702)
- ROCK FLOW CHECK DAM (SEE DETAIL ON DWG. SPA-702)
- TEMPORARY MUD MAT / CONSTRUCTION ACCESS (AS PER DETAIL ON DWG. SPA-702)
- PROPERTY BOUNDARY
- OVERLAND FLOW DIRECTION
- CATCHBASIN SILT SACK (SEE DETAIL ON DWG. SPA-702)
- + 123.00 — MATCH TO EXISTING GRADES
- + 123.00 SW — PROPOSED SWALE GRADES
- CONTRIBUTING DRAINAGE BOUNDARY

EROSION AND SEDIMENTATION CONTROL NOTES

1. ALL SILT FENCING IS TO BE INSTALLED PRIOR TO THE COMMENCEMENT OF ANY GRADING, EXCAVATING OR DEMOLITION.
2. EROSION CONTROL FENCING TO BE INSTALLED AROUND THE BASE OF ALL STOCKPILES.
3. EROSION PROTECTION TO BE PROVIDED AROUND ALL STORM AND SANITARY MH'S AND CB'S.
4. ADDITIONAL EROSION CONTROL MEASURES MAY BE REQUIRED AS SITE DEVELOPMENT PROGRESSES.
   THE CONTRACTOR IS TO PROVIDE ALL ADDITIONAL EROSION CONTROL STRUCTURES.
5. THE DESIGN CONSULTANT IS TO MONITOR EROSION CONTROL STRUCTURES TO ENSURE FENCING IS INSTALLED AND MAINTENANCE IS PERFORMED TO CITY REQUIREMENTS.
6. EROSION CONTROL STRUCTURES ARE TO BE MONITORED REGULARLY AND ANY DAMAGE TO STRUCTURES REPAIRED IMMEDIATELY. SEDIMENTS ARE TO BE REMOVED ON A REGULAR BASIS AND PRIOR TO ACCUMULATIONS REACHING A MAXIMUM OF ½ THE HEIGHT OF THE FENCE.
7. ALL EROSION CONTROL STRUCTURES ARE TO REMAIN IN PLACE UNTIL ALL DISTURBED GROUND SURFACES HAVE BEEN REHABILITATED EITHER BY PAVING OR RESTORATION OF VEGETATIVE GROUND COVER.
8. NO ALTERNATE METHODS OF EROSION PROTECTION SHALL BE PERMITTED UNLESS APPROVED BY THE DESIGN CONSULTANT AND THE CITY OF OWEN SOUND WORKS DEPARTMENT.
9. THE CONTRACTOR IS RESPONSIBLE TO ENSURE THAT MUNICIPAL ROADWAYS AND SIDEWALKS ARE CLEANED OF ALL SEDIMENTS FROM VEHICULAR TRACKING ETC. TO AND FROM THE SITE AT THE END OF EACH WORK DAY.

SUGGESTED EROSION & SEDIMENT CONTROL PHASING

1. INSTALL SEDIMENT CONTROL FENCE.
2. INSTALL CONSTRUCTION ACCESS.
3. INSTALL EROSION & SEDIMENT CONTROL MEASURES.
   - INSTALL SWALES
   - INSTALL ROCK CHECK DAMS
   - INSTALL SEDIMENT TRAP
   - CONSTRUCT SEDIMENT TRAP OUTFLOW
   - ETC
4. TREE REMOVAL, CLEARING AND GRUBBING AS PER ARBORIST PLAN.
5. INSTALL SITE SERVICING.
6. COMPLETE SURFACE WORKS.
7. REMOVE ESC MEASURES.

SITE TOPOGRAPHIC SURVEYOR:

SURVEY PREPARED BY: ARCHIBALD, GARY, & McKAY LTD
AUGUST 26, 2022

ELEVATION/BENCHMARK NOTE

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CITY OF OWEN SOUND
PLANNING AND DEVELOPMENT SERVICES

1555 18th AVENUE EAST
CITY OF OWEN SOUND
CITY FILE No.: D06-21007

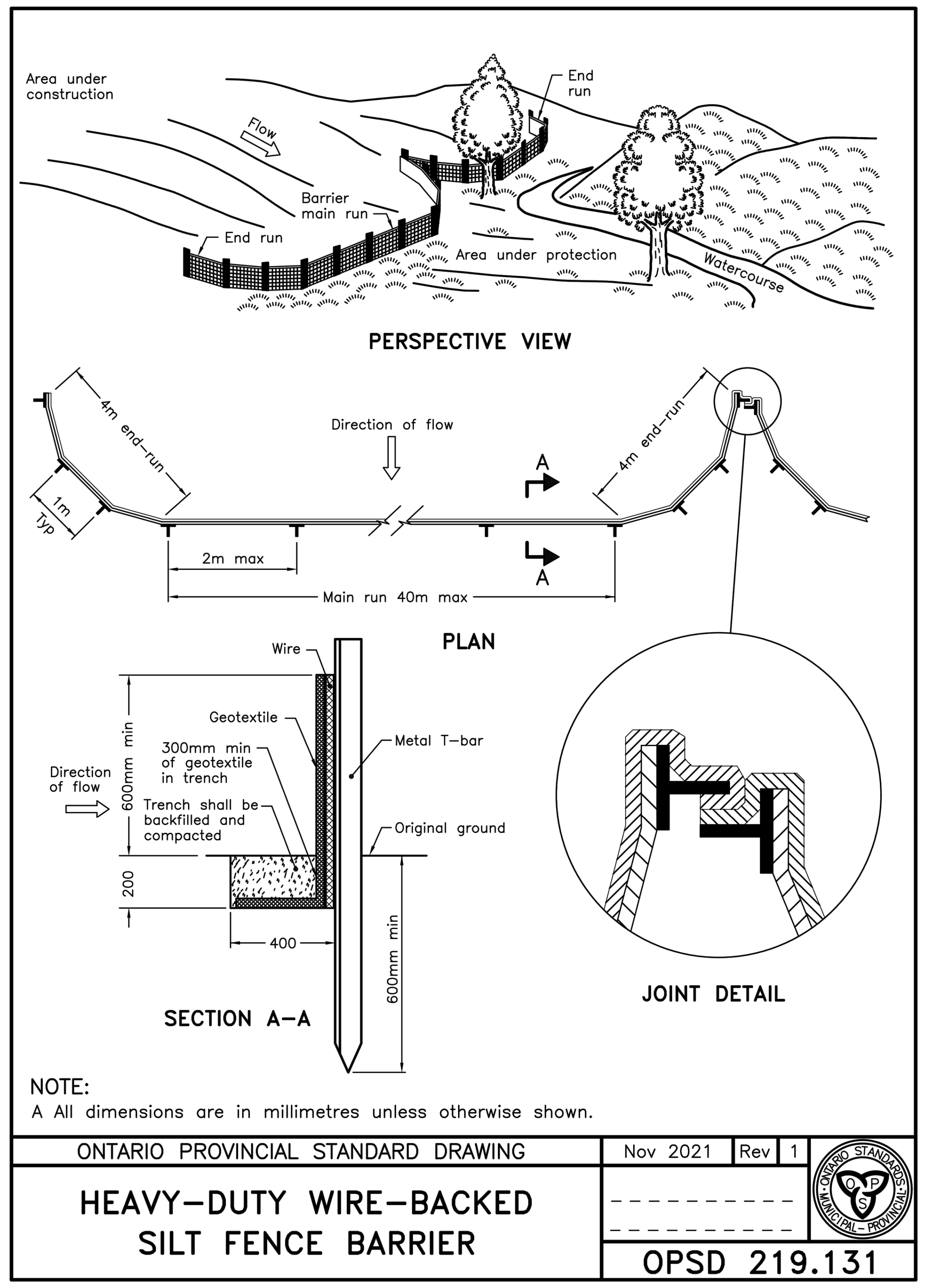
EROSION & SEDIMENT CONTROL PLAN

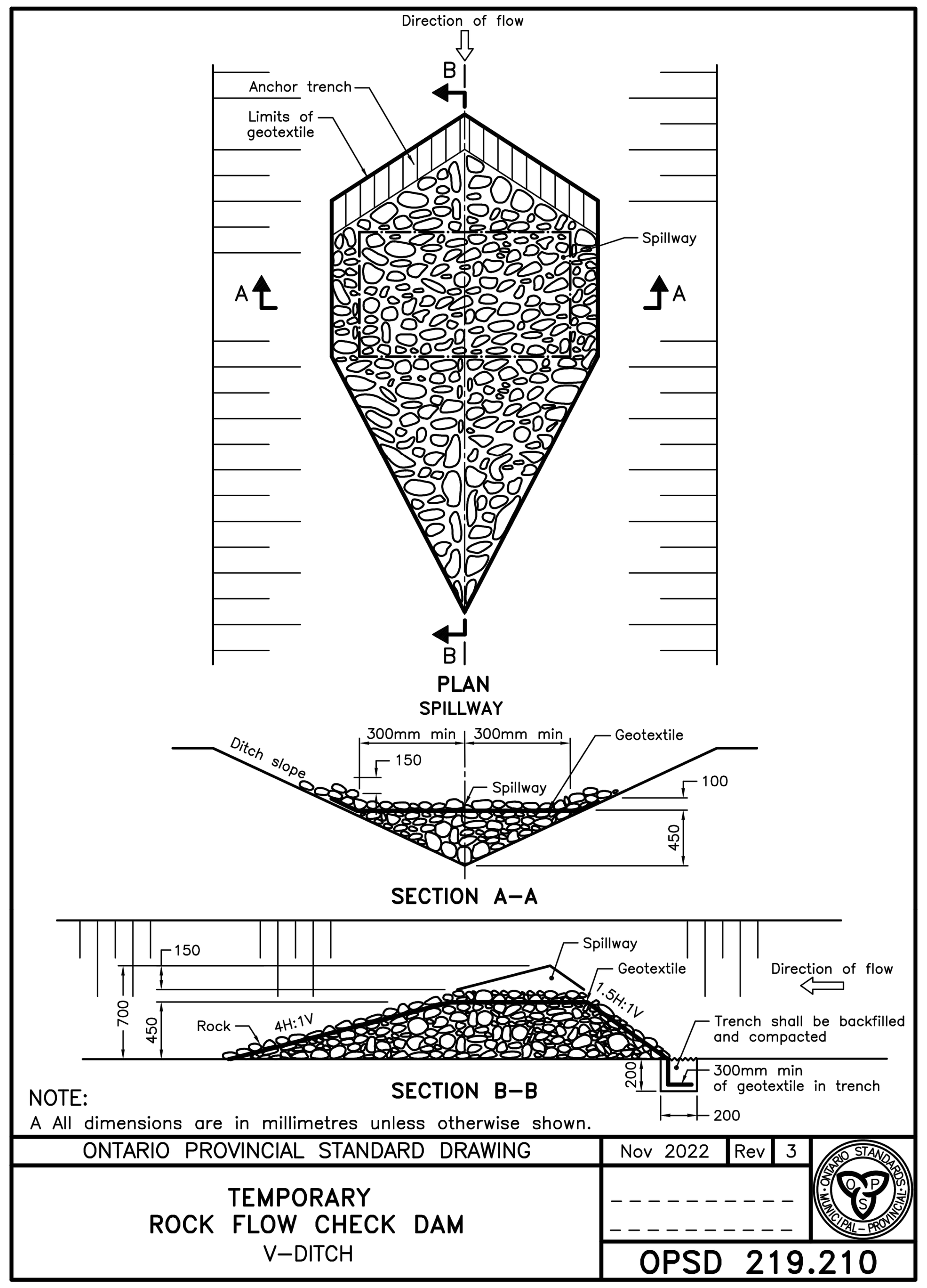
Stantec Consulting Ltd.
300 - 675 Cochrane Drive West Tower
Markham, Ontario L3R 0B8
Tel. 905.944.7777
www.stantec.com

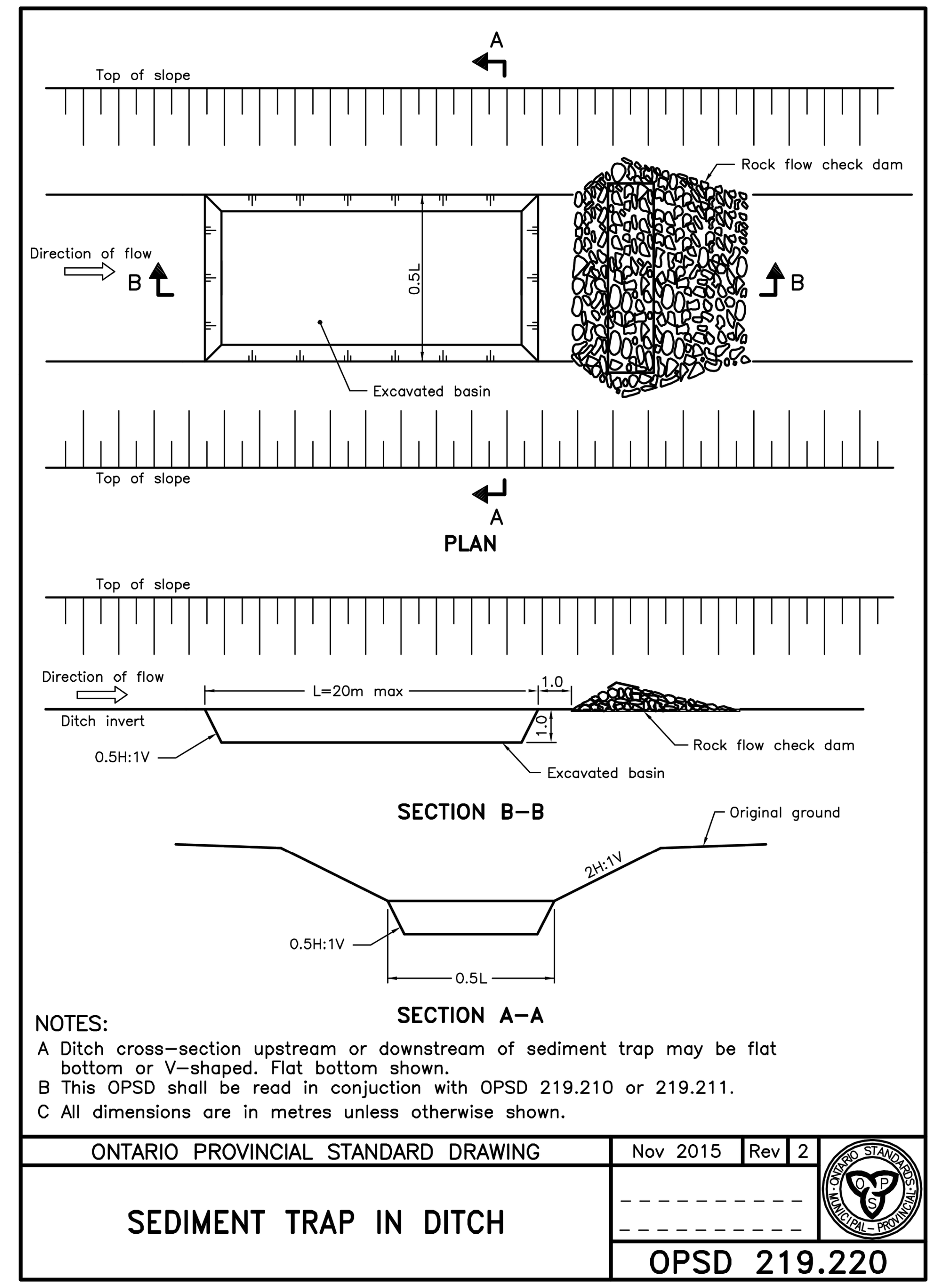
LICENSED PROFESSIONAL ENGINEER — P. J. H. HSIEH — 100222501 — JAN 31, 2023 — PROVINCE OF ONTARIO

SCALE: 1:500 (0 5 15 25m)

DRAWN BY: P.H	PROJECT No.: 160623088
DESIGNED BY: P.H.	
CHECKED BY: P.F.	DRAWING No.: 701
DATE: JANUARY 2023	







CITY STANDARD NOTES:

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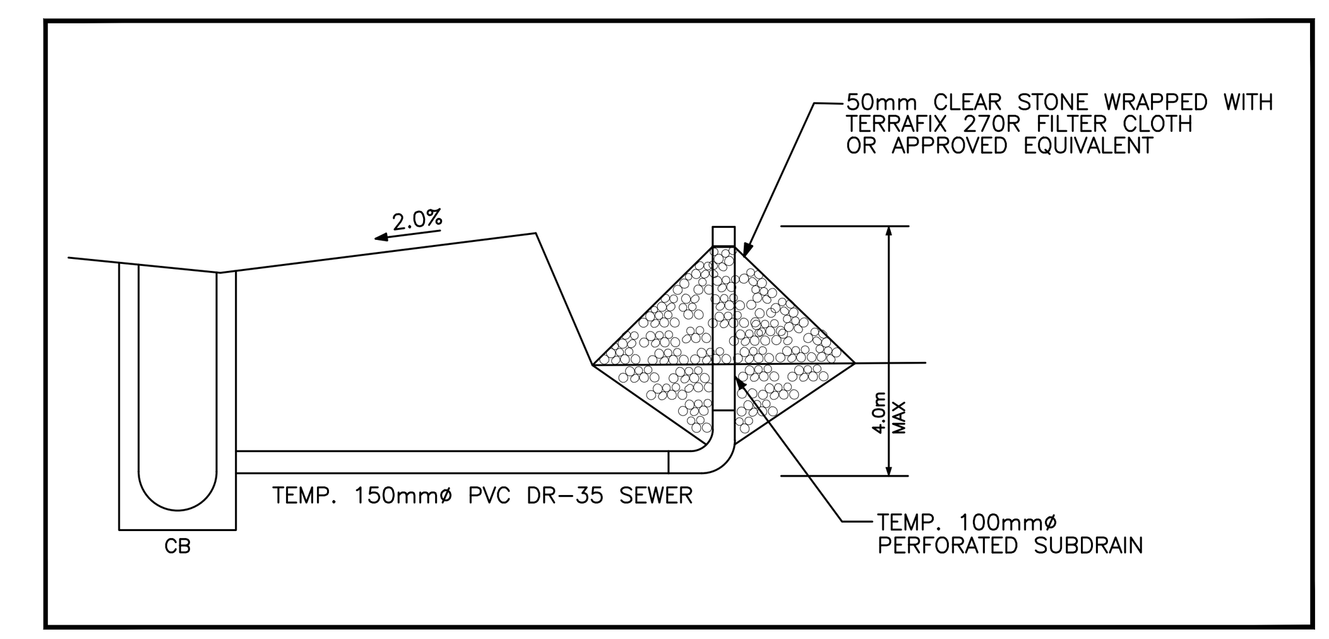
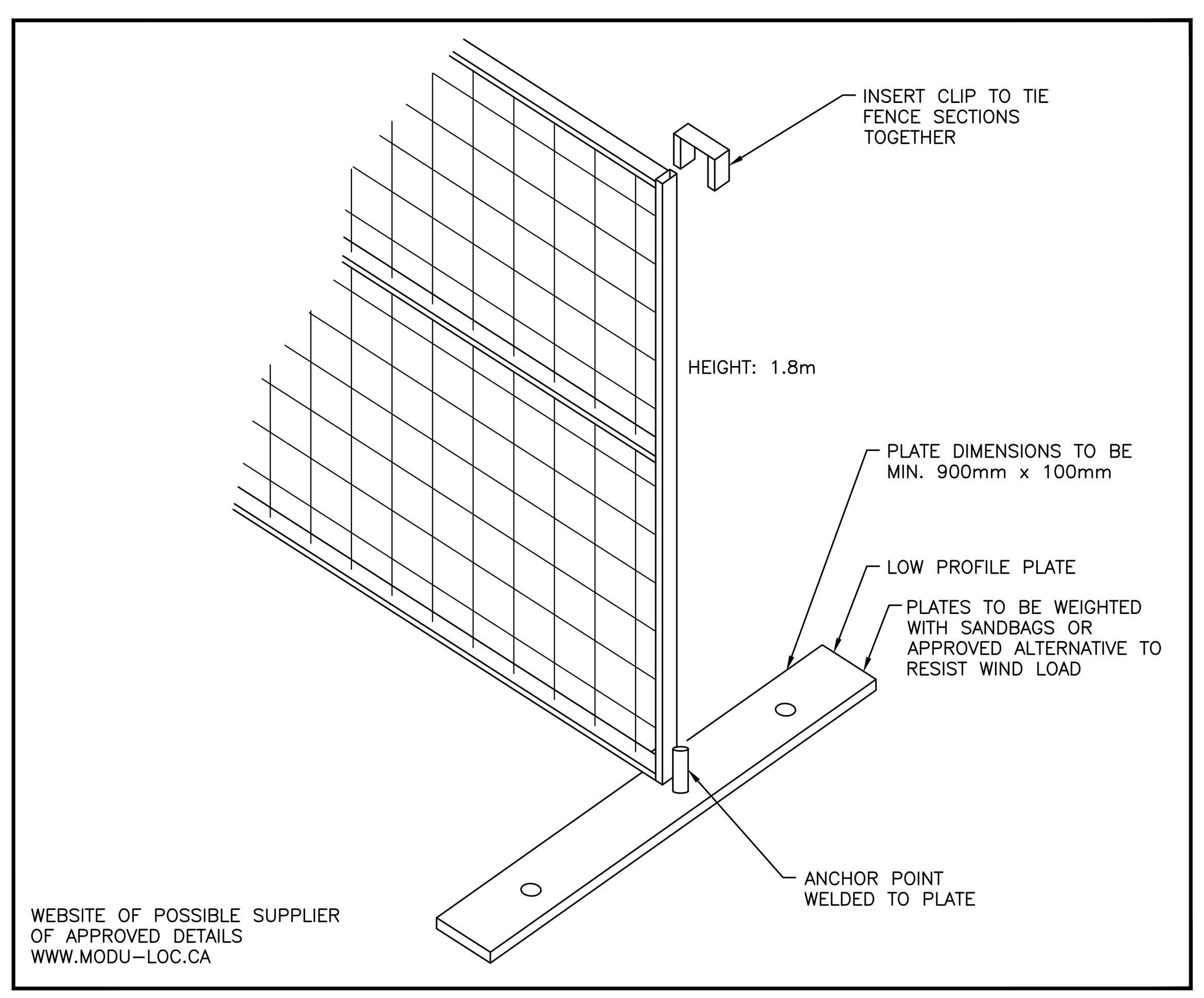


TEMPORARY HICKENBOTTOM RISER DRAIN WITH FILTER SOCK SEDIMENTATION DETAIL
SCALE: N.T.S.



TEMPORARY CONSTRUCTION FENCE DETAIL
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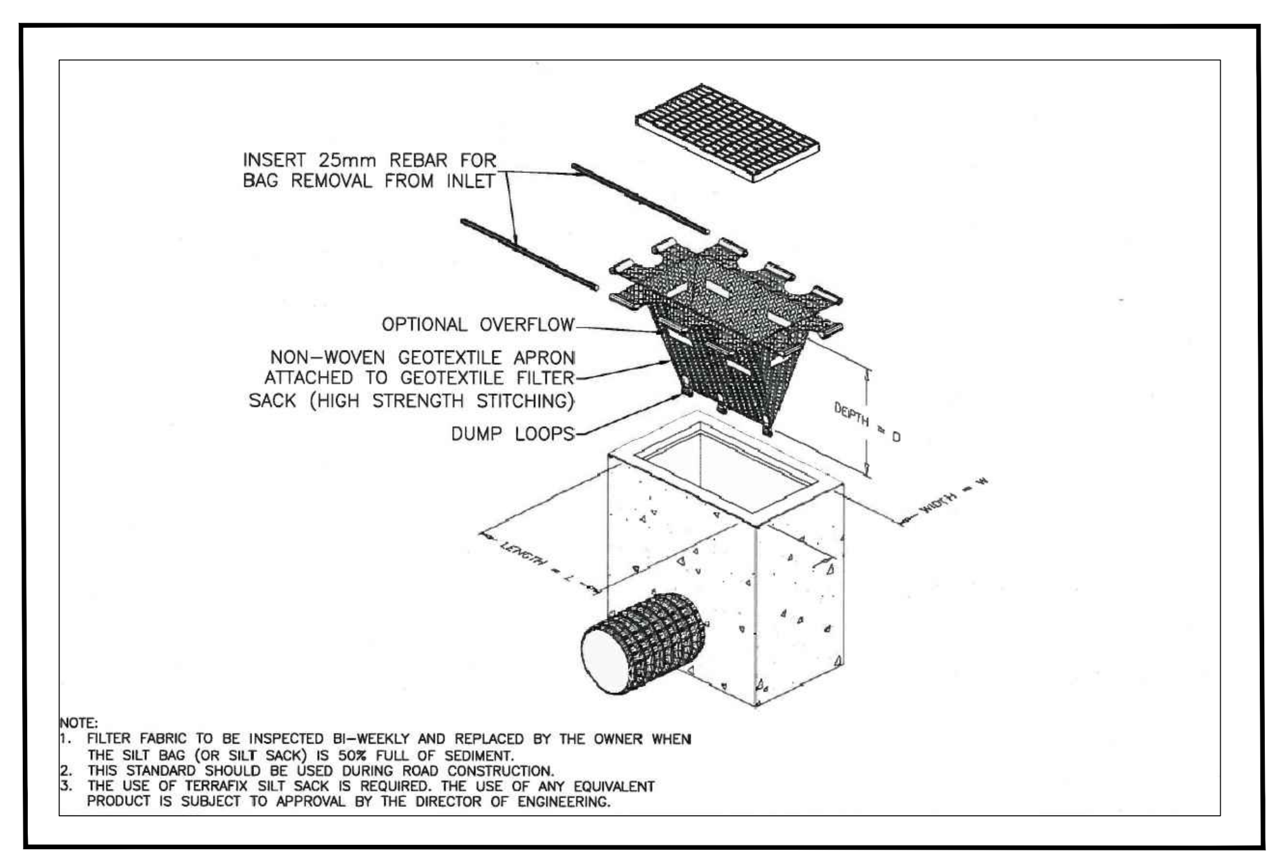

CATCHBASIN SILT SACK DETAIL
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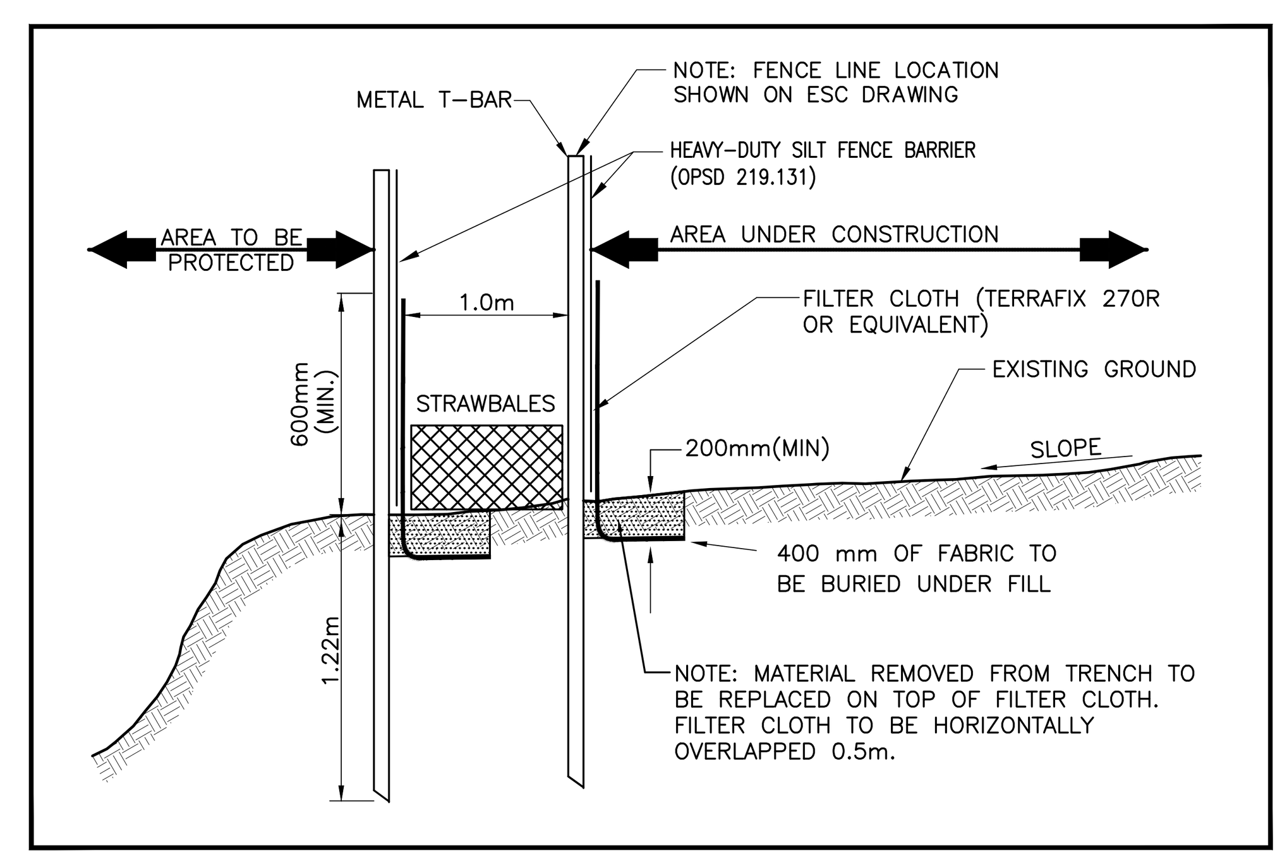

DOUBLE SILT FENCE AND STRAW BALES
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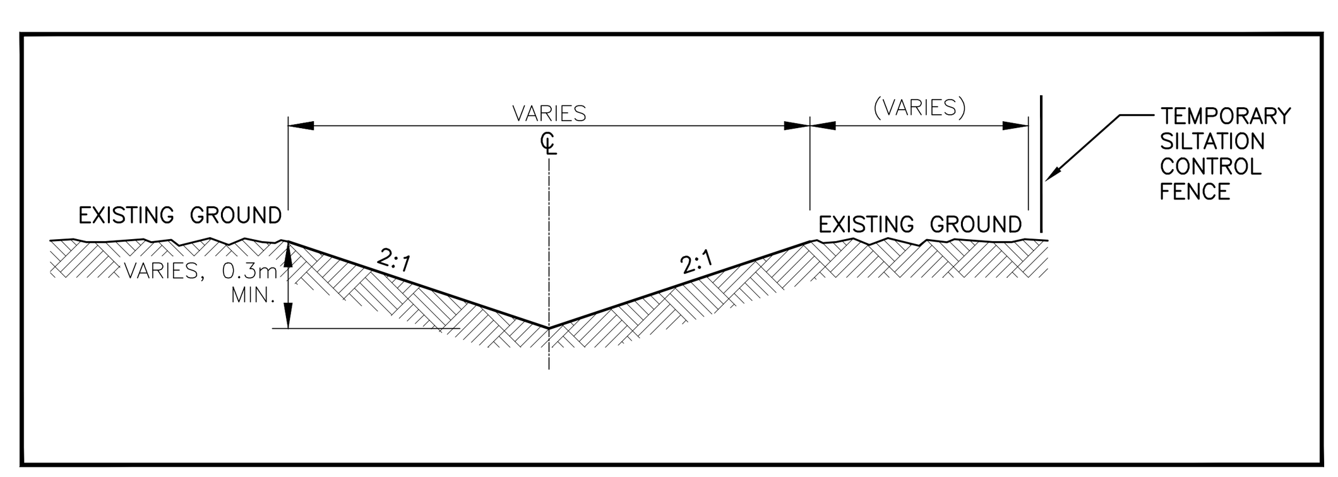

TYPICAL TEMPORARY INTERCEPTOR SWALE
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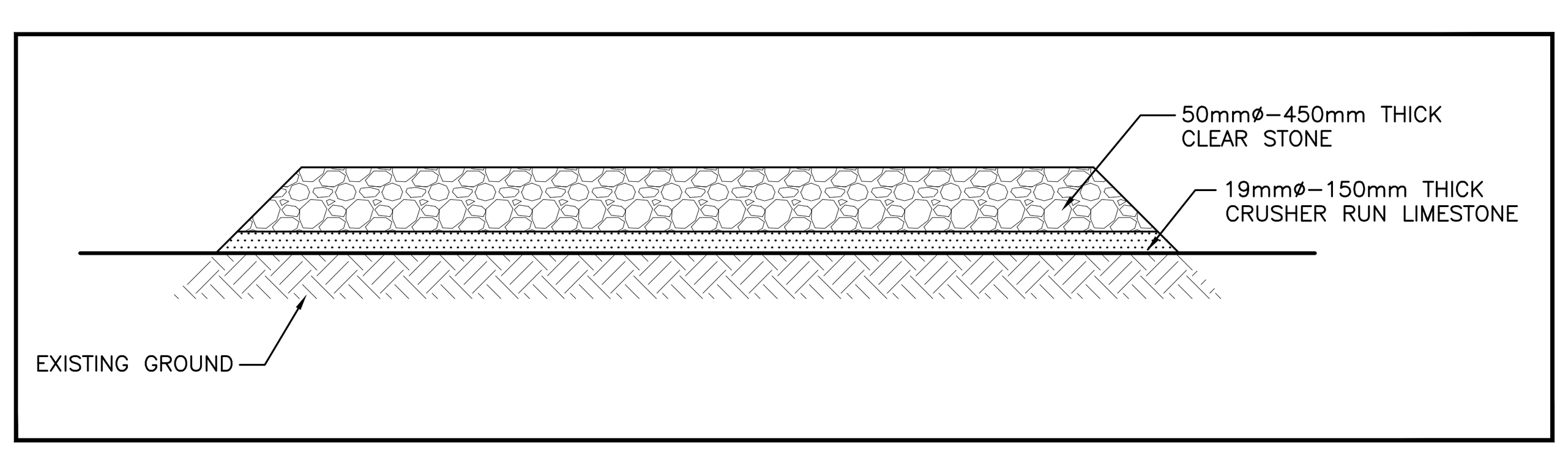

CONSTRUCTION ACCESS ROAD
SCALE: N.T.S.

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1.	ISSUED FOR FIRST SUBMISSION	01.31.'23	P.H.	P.F.

REVISIONS

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CITY FILE No.: D06-21007

EROSION & SEDIMENT CONTROL DETAILS

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LICENSED PROFESSIONAL ENGINEER
P. J. H. HSIEH
100222501
JAN 31, 2023
PROVINCE OF ONTARIO

SCALE:

DRAWN BY: P.H	PROJECT No.: 160623088
DESIGNED BY: P.H.	
CHECKED BY: P.F.	DRAWING No.: 702
DATE: JANUARY 2023	

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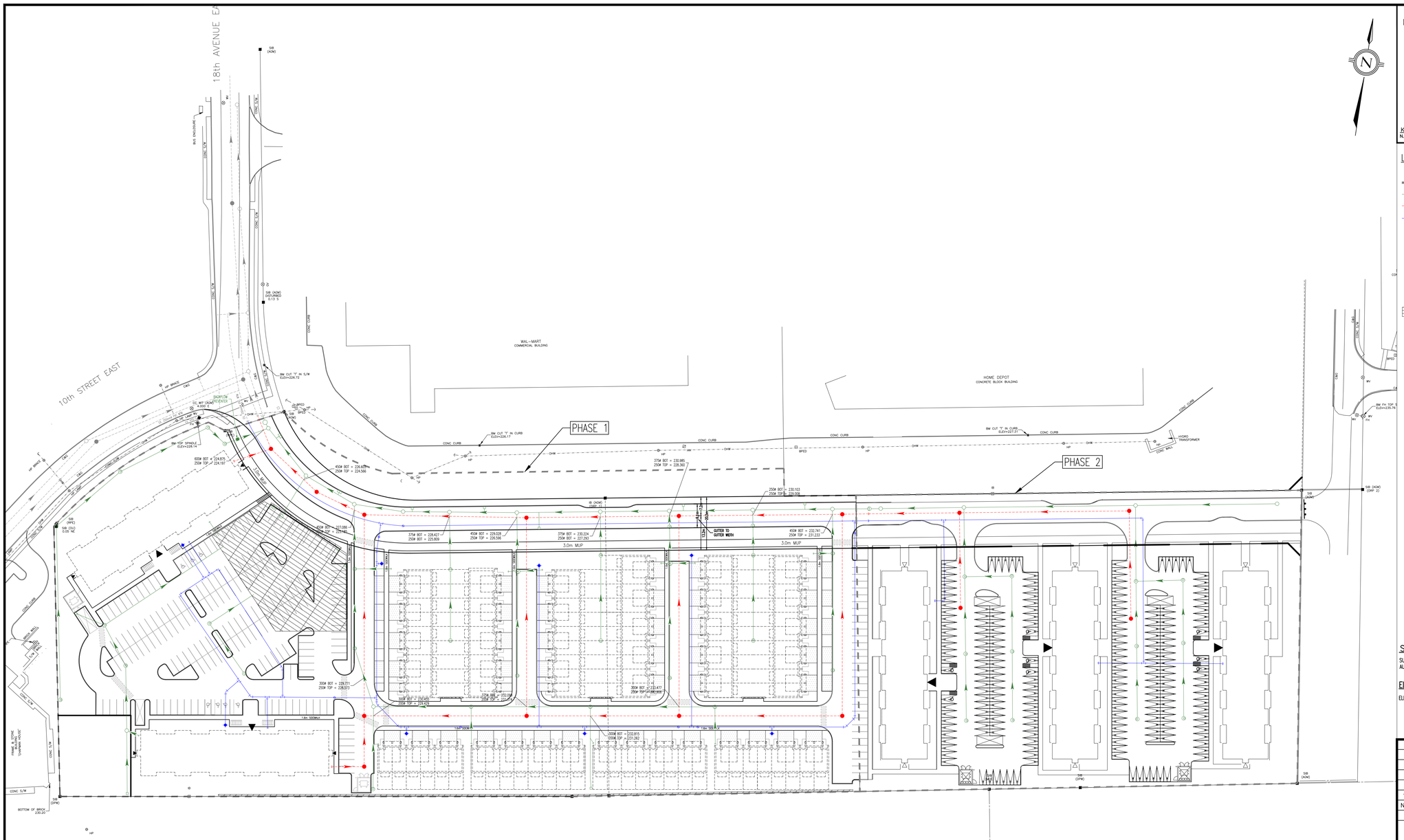
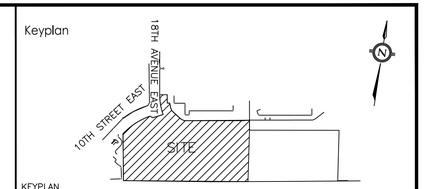




KEYPLAN
N.T.S.

LEGEND

- DEVELOPMENT LIMIT
- PROPOSED STORM
- PROPOSED SANITARY
- PROPOSED WATERMAIN
- SINGLE OR REARLOT CATCHBASIN
- CATCHBASIN MANHOLE
- DITCH INLET CATCHBASIN
- DOUBLE CATCHBASIN
- HYDRANT & VALVE
- VALVE & BOX
- UNDERGROUND STORMWATER STORAGE TANK

SITE TOPOGRAPHIC SURVEYOR:

SURVEY PREPARED BY: ARCHIBALD, GARY, & McKAY LTD
AUGUST 26, 2022

ELEVATION/BENCHMARK NOTE

ELEVATION ARE GEODETIC COVS28 (HTV2.0), DERIVED FROM G.P.S. OBSERVATION AND THE LEICA GPS SMARTNET NETWORK.

No.	DESCRIPTION	DATE	BY	APPROVED
1.	ISSUED FOR FIRST SUBMISSION	01.25.'23	P.H.	P.F.

REVISIONS

owen sound
where you want to live

CITY OF OWEN SOUND
PLANNING AND DEVELOPMENT SERVICES

1555 18th AVENUE EAST
CITY OF OWEN SOUND
CITY FILE No.: D06-21007

OVERALL SERVICING CONCEPT PLAN

Stantec Consulting Ltd.
300 - 675 Cochrane Drive West Tower
Markham, Ontario L3R 0B8
Tel. 905.944.7777
www.stantec.com

SCALE: 1:750 (0, 7.5, 22.5, 37.5m)

DRAWN BY: P.H
DESIGNED BY: P.H.
CHECKED BY: P.F.
DATE: JANUARY 2023

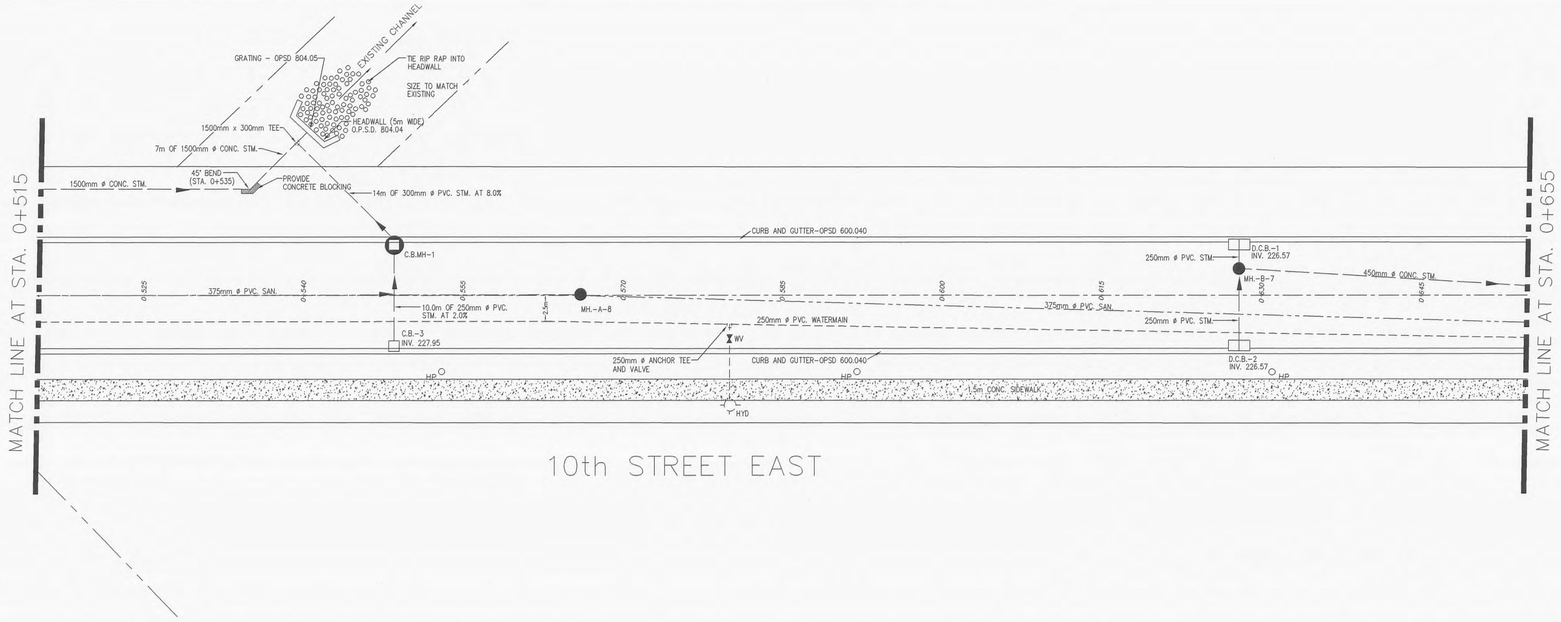
PROJECT No.: 160623088
DRAWING No.: OV

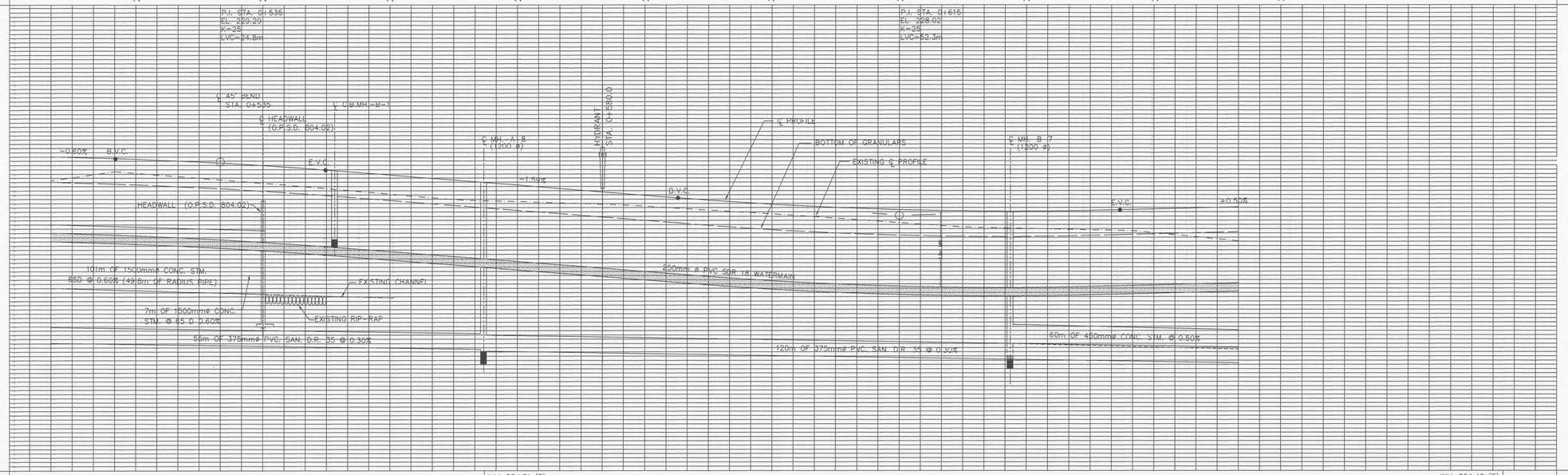
ORIGINAL SHEET - ARCH D

File: V:\01606\Active\160623088\Drawing\sheet_files\160623088_FSR Servicing.dwg – Revised by <Hsieh, Preston> : Tue, Jan 31, 2023 , 12:47 PM

Appendix A Background Documents

A.1 Record Drawings





PROPOSED CENTRELINE ELEVATION	229.35	229.20	228.97	228.74	228.50	228.28	228.16	228.12	228.17	228.25
SANITARY SEWER INVERTS				INV. 224.81 (E) INV. 224.85 (W)						INV. 224.40 (E) INV. 224.45 (W)
STORM SEWER INVERTS		INV. 226.17	INV. 227.75 (S) INV. 227.70 (NW)				INV. 225.00 (E) INV. 226.49 (N) INV. 226.38 (S)			INV. 224.70 (W)
STATION	0+525	0+540	0+555	0+570	0+585	0+600	0+615	0+630	0+645	0+660	0+675	0+690

NORTH

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NOTES:

1) ALL SEWER AND WATERMAIN BEDDING TO BE IN ACCORDANCE WITH OPSD 802.010

BENCHMARK:

ELEV. 243.282m TOP OF NAIL IN HYDRO POLE ON SOUTH SIDE OF INTERSECTION OF 8TH STREET EAST & 16TH AVENUE EAST

GAMSBY AND MANNEROW LIMITED
CONSULTING PROFESSIONAL ENGINEERS
GUELPH - OWEN SOUND

No.	DESCRIPTION	BY	DATE
1	SIDEWALK REVISIONS	KC	SEPT 12/00

REVISIONS

PLAN & PROFILE

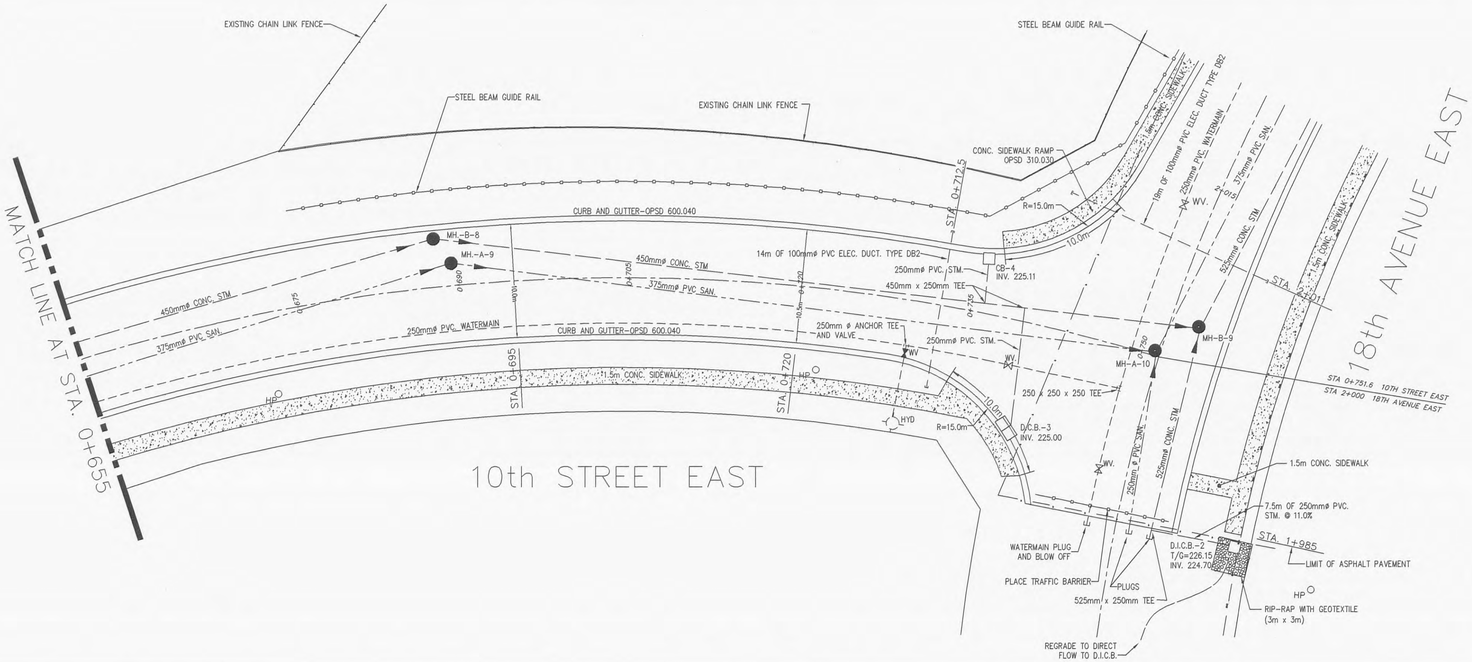
10th STREET EAST EXTENSION

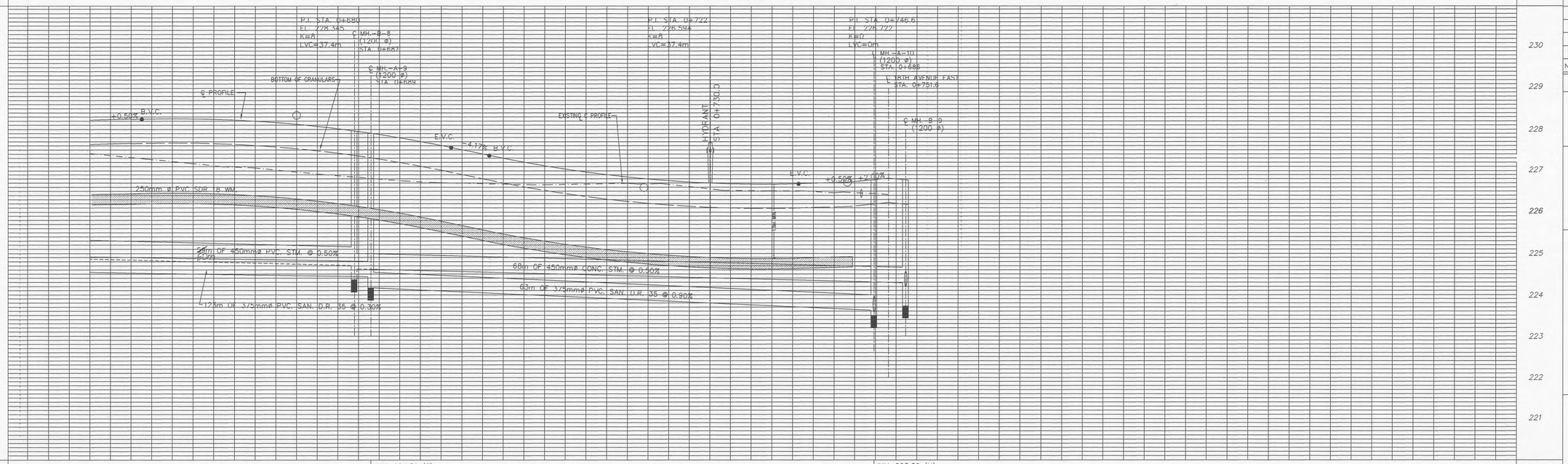
City of Owen Sound

REGISTERED PROFESSIONAL ENGINEER
K. A. CAMERON
PROVINCE OF ONTARIO
P. Eng.

DRAWN BY: L.V.M.	CHECKED BY: J.V.D.
SCALE: HOR. 1:250 VERT. 1:50	DATE: JULY 12, 2000
PROJECT No: M-1453	PLAN No. 2 of 5
CONTRACT No: 2000-22	

G&M DWG No.: M1453PHLDWG





PROPOSED CENTRELINE ELEVATION	228.25	228.20	227.88	227.31	226.85	226.68	226.79
SANITARY SEWER INVERTS		INV. 224.39 (E) INV. 224.44 (W)			INV. 223.59 (N) INV. 223.80 (S) INV. 223.70 (W)		
STORM SEWER INVERTS		INV. 224.70 (W) INV. 224.62 (E)			INV. 224.09 (N) INV. 224.19 (S) INV. 224.10 (W)		
STATION	0+660	0+675	0+690	0+705	0+720	0+735	0+750

NORTH

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NOTES:

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BENCHMARK:

ELEV. 243.282m TOP OF NAIL IN HYDRO POLE ON SOUTH SIDE OF INTERSECTION OF 8TH STREET EAST & 16TH AVENUE EAST

GAMSBY AND MANNEROW LIMITED
CONSULTING PROFESSIONAL ENGINEERS
GUELPH – OWEN SOUND

No.	DESCRIPTION	BY	DATE
1	SIDEWALK & DRAINAGE REVISIONS	KC	SEPT 12/00

REVISIONS

PLAN & PROFILE

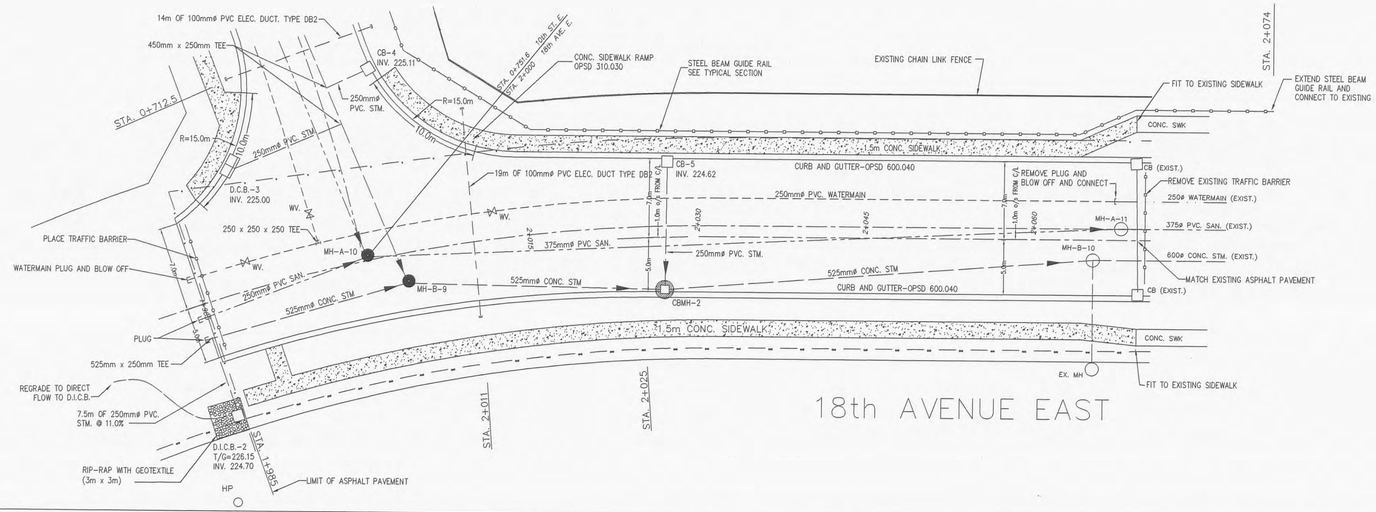
10th STREET EAST EXTENSION

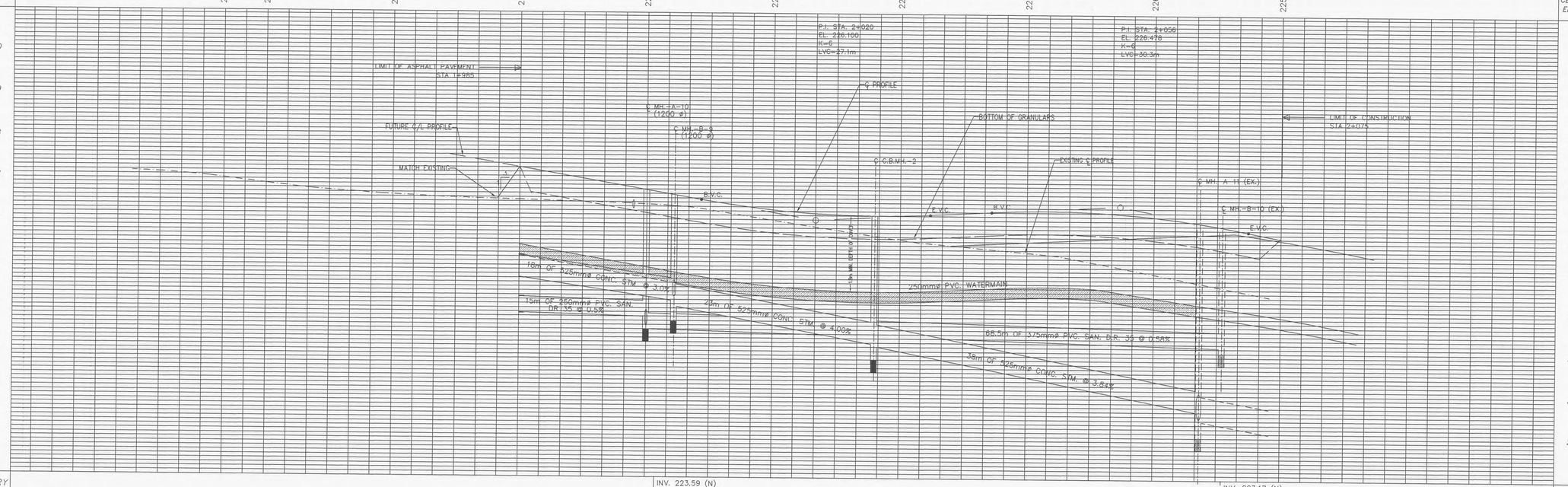
City of Owen Sound

REGISTERED PROFESSIONAL ENGINEER
K. A. CAMERON
PROVINCE OF ONTARIO
P. Eng.

DRAWN BY: P.R.H.	CHECKED BY: J.V.D.
SCALE: HOR. 1:250 VERT. 1:50	DATE: JULY 12, 2000
PROJECT No: M-1453	PLAN No. 3 of 5
CONTRACT No: 2000-22	

G&M DWG No.: M1453P4LDWG





NORTH

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NOTES:

1) ALL SEWER AND WATERMAIN BEDDING TO BE IN ACCORDANCE WITH OPSD 802.010

BENCHMARK:

ELEV. 243.282m TOP OF NAIL IN HYDRO POLE ON SOUTH SIDE OF INTERSECTION OF 8TH STREET EAST & 16TH AVENUE EAST

GAMSBY AND MANNEROW LIMITED
CONSULTING PROFESSIONAL ENGINEERS
GUELPH – OWEN SOUND

No.	DESCRIPTION	BY	DATE
1	GENERAL REVISIONS	KC	SEPT 12/00

REVISIONS

PLAN & PROFILE

10th STREET EAST EXTENSION

City of Owen Sound

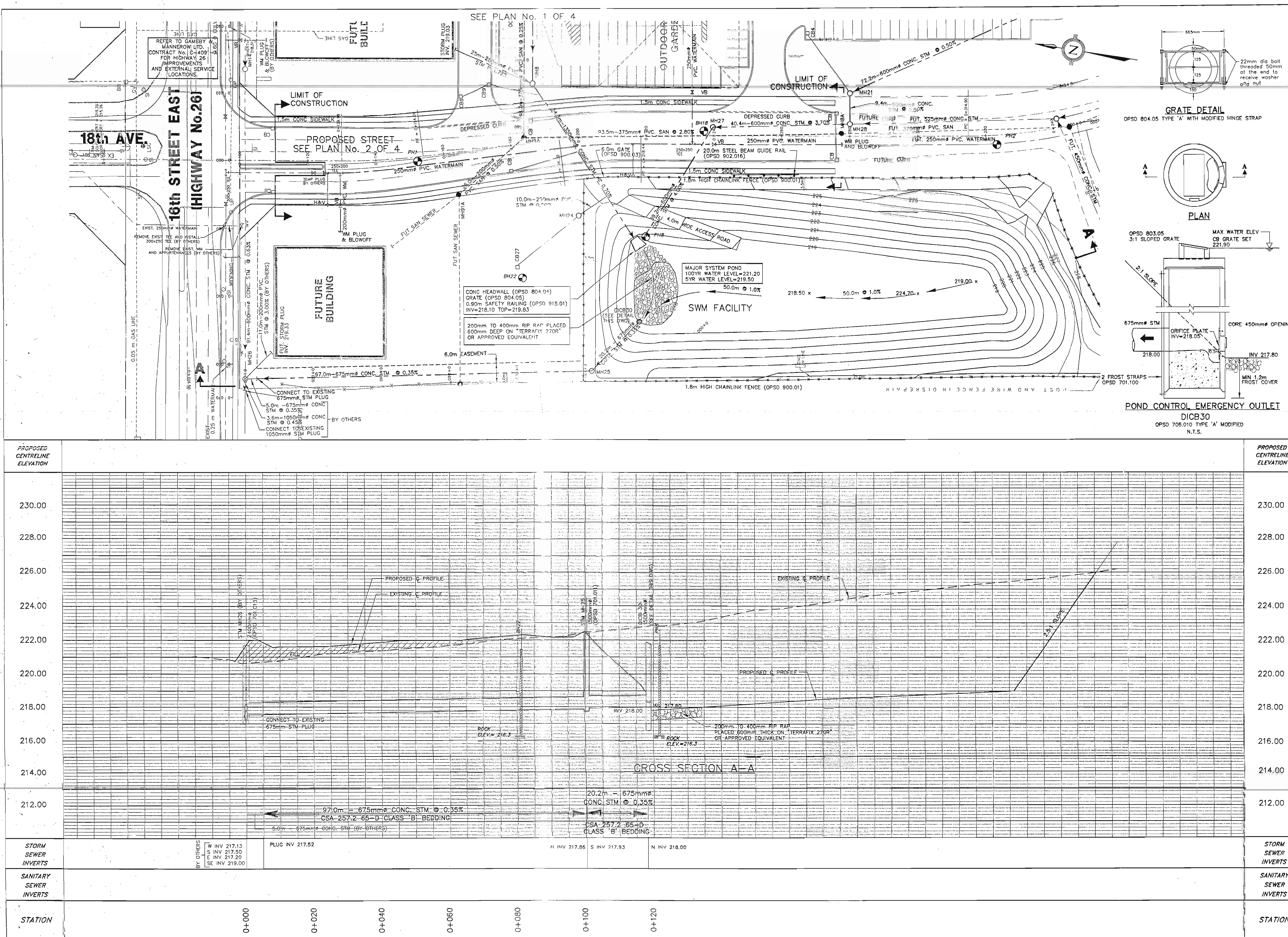
REGISTERED PROFESSIONAL ENGINEER
K. A. CAMERON
PROVINCE OF ONTARIO
P. Eng.

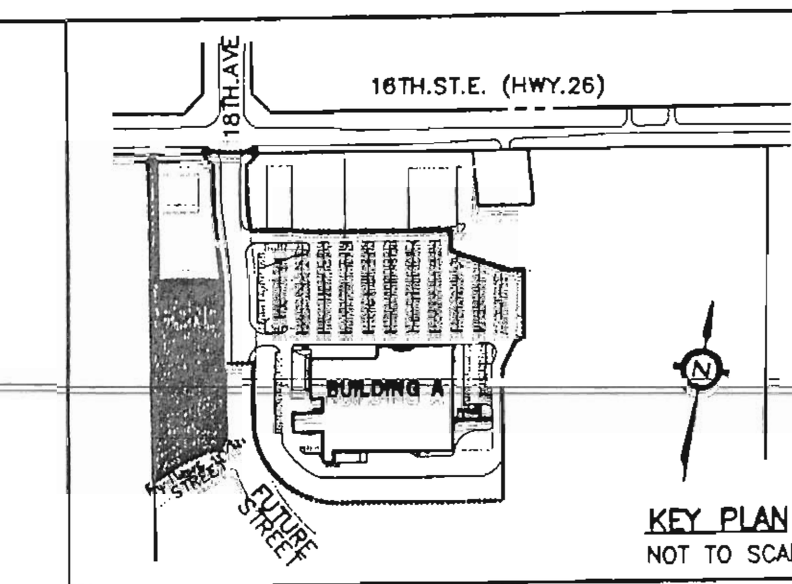
DRAWN BY: P.R.H. | CHECKED BY: J.V.D.

SCALE: HOR. 1:250 VERT. 1:50 | DATE: JULY 12, 2000

PROJECT No: M-1453 | PLAN No. 4 of 5

CONTRACT No: 2000-22





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NOTES:

3mm THICK ORIFICE PLATE (ALUMINUM) — 450mmø CORED OPENING — LAG SCREWS AND LEAD PLUG(TYP) — 335mmø ORIFICE PLATE INV.= 218.05 — 900mmø — 75TYP — GRATE SEE DETAIL THIS DWG. — MANHOLE — PLAN — ORIFICE PLATE

ORIFICE PLATE FOR DICB30

BENCHMARK:

ELEVATIONS ARE GEODETIC AND ARE REFERRED TO THE CITY OF OWEN SOUND LOCAL BENCHMARK HAVING AN ELEVATION OF 217.912 METRES, TOP NUT OF FIRE HYDRANT ON THE NORTH WEST CORNER OF 16th STREET EAST AND 9th AVENUE EAST.

No.	DESCRIPTION	BY	DATE
8	ISSUED FOR CONSTRUCTION	TL	JUN.16/99
7/7a	REVISED WATERMAIN	TL	JUNE 4/99
6	REVISED 18th AVE. & 16th ST. INTERSECTION	TL	MAY 5/99
5	REVISED AS PER CITY COMMENTS THIRD SUBMISSION (BUILDING PERMIT)	SAH	APR.29/99
4	REVISED AS PER CITY COMMENTS	TL	APR. 8/99

REVISIONS

COSBURN PATTERSON MATHER LIMITED
Consulting engineers to municipalities and the development industry
7270 Woodbine Avenue, Suite 300 Markham, Ontario L3R 4B9
Telephone: (905) 474-0456 Fax: (905) 474-9889 E-mail: psoc@cosburn.com

COMMERCIAL DEVELOPMENT
HWY No. 26 and 18th AVENUE EAST
REAL SOUND INVESTMENTS LIMITED

PLAN AND PROFILE STORM SEWER OUTFALLS AND POND

City of Owen Sound

CONSULTANT
LICENSED PROFESSIONAL ENGINEER S. A. HADER 16/06/99 PROVINCE OF ONTARIO

DESIGNED BY: T.L.	CHECKED BY: S.H.
SCALE: HOR.– 1:500 VERT.– 1:100	DATE: DECEMBER 1998
PROJECT No. 98642	PLAN No. 3 of 4

A.2 Topographic Survey

UTM GRID NOTES

BEARINGS ARE U.T.M. GRID NAD83 (CSRS) EPOCH(2010), DERIVED FROM G.N.S.S. OBSERVATIONS AND THE LEICA SMARTNET BASE STATION NETWORK AND ARE REFERRED TO THE CENTRAL MERIDIAN 81°00' WEST LONGITUDE, ZONE 17.

DISTANCES SHOWN ON THIS PLAN ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999569951

OBSERVED REFERENCE POINTS (ORPs) DERIVED FROM G.N.S.S. OBSERVATIONS USING REAL TIME NETWORK (RTN). U.T.M. ZONE 17, NAD83 (CSRS) EPOCH(2010). COORDINATES TO URBAN ACCURACY PER SEC. 14(2) OF O.REG. 216/10		
POINT ID	NORTHING	EASTING
ORP 1	4935480.414	507096.880
ORP 2	4935527.042	507386.330
COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.		

FOR BEARING COMPARISONS, A ROTATION OF 00°08'15" COUNTER CLOCKWISE WAS APPLIED TO BEARINGS ON PLANS P1 AND P2, A ROTATION OF 00°11'15" COUNTER CLOCKWISE WAS APPLIED TO BEARINGS ON PLAN P3, A ROTATION OF 01°44'20" CLOCKWISE WAS APPLIED TO BEARINGS ON PLAN P6.

NOTES & LEGEND

■	DENOTES MONUMENT FOUND
□	DENOTES MONUMENT PLANTED
SIB	DENOTES STANDARD IRON BAR
IB	DENOTES IRON BAR
CC	DENOTES CUT CROSS
WIT	DENOTES WITNESS
AGM	DENOTES ARCHIBALD, GRAY & McKAY LTD., O.L.S.'s
DPW	DENOTES DEPARTMENT OF PUBLIC WORKS, CANADA
MGS	DENOTES MINISTRY OF GOVERNMENT SERVICES, ONTARIO
RPE	DENOTES RADY–PENTEK & EDWARD SURVEYING LTD., O.L.S.'s
ZUMO	DENOTES ZUBEK, EMO & PATTEN LTD., O.L.S.'s
OU	DENOTES ORIGIN UNKNOWN
P1	DENOTES PLAN 16R–7779
P2	DENOTES PLAN 16R–7308
P3	DENOTES PLAN 16R–6702
P4	DENOTES AGM PLAN# 8–L–2474, FILE# SYD–R5E–07–15, DATED JUNE 6, 2008.
P5	DENOTES PLAN 16R–11190
P6	DENOTES PLAN 16R–1172

TOPOGRAPHIC LEGEND

BM	DENOTES BENCHMARK
BPED	DENOTES BELL PEDESTAL
CB	DENOTES CATCH BASIN
CP	DENOTES CONCRETE PIPE
CPP	DENOTES CORRUGATED PLASTIC PIPE
PL	DENOTES PLASTIC PIPE
CONC	DENOTES CONCRETE
C&G	DENOTES CURB AND GUTTER
DIA	DENOTES DIAMETER IN mm
DICB	DENOTES DITCH INLET CATCH BASIN
FF	DENOTES FINISHED FLOOR
FH	DENOTES FIRE HYDRANT
GV	DENOTES GAS VALVE
GP	DENOTES GUARD POST
HP	DENOTES HYDRO POLE
INV	DENOTES INVERT
LS	DENOTES LIGHT STANDARD
MH	DENOTES MANHOLE
S/W	DENOTES SIDEWALK
T/S	DENOTES TOP SPINDLE OF FIRE HYDRANT
WV	DENOTES WATER VALVE
N	DENOTES NORTH
E	DENOTES EAST
W	DENOTES WEST
S	DENOTES SOUTH
NE	DENOTES NORTHEAST
←	DENOTES POLE ANCHOR
▷	DENOTES SIGN
	DENOTES CONIFEROUS TREE
	DENOTES DECIDUOUS TREE

MANHOLE / CATCH BASIN TABLE

Point	Description	Rim	Invert	Direction	Size
3000	MH STM	234.62	232.63	West	250
			232.52	North	400
			232.89	East	250
			232.61	South	400
3026	CB	234.51	233.33	West	250
			233.16	SUMP	
3157	CB	234.55	232.88	East	250
			231.85	SUMP (Top of Dirt)	
3479	CB	225.87	224.53	East	250
			224.09	SUMP	
3539	CB	225.97	224.49	East	250
			223.93	SUMP	
3620	MH STM	227.83	224.56	Northeast	500
			224.62	Southwest	500
3621	MH SAN ?	227.79	224.27	West	500
			224.24	East	500
3822	MH STM	224.51	219.59	Northwest	600+–
			219.89	South	600+–
3907	CB	225.91	224.38	West	250
			223.87	SUMP	
3914	MH STM	226.04	221.44	North	500
			221.65	South	500
			221.47	East	600+–
3915	MH SAN ?	226.02	223.07	North	500
			223.12	South	500
3937	CB	225.97	223.15	South	500
			223.14	North	500
			224.36	West	250
			222.92	SUMP	
4025	CB	226.55	225.20	North	250
			224.57	SUMP	
4055	MH STM	226.63	224.18	Southwest	500
			224.08	North	500+–
			224.58	West	500
4056	MH SAN ?	226.74	223.75	West	350
			223.54	North	350
			223.74	Southwest	250
4350	CB	227.96	225.85	SUMP	
				Northwest (Unable to measure)	
4398	CB	227.96	226.44	Southeast	300
			226.01	SUMP	
4400	MH STM	228.07	224.94	NorthEast	500
			226.30	Southeast	250
			226.40	Northwest	250
4502	CB	229.15	227.23	Northwest	250
			227.26	Southwest	250
			227.29	South	250
			226.67	SUMP	
4523	CB	229.71	228.26	North	250
4633	CB	229.95	228.95	North	150
			228.49	SUMP	
			228.26	South	150
			227.70	SUMP	
10217	MH STM	233.68	231.76	North	400
			232.12	East	250
			231.92	South	400
			231.86	West	250
10218	MH SAN	233.46	228.66	South	200
			228.51	North	200
			228.54	East	200

SURVEYOR'S CERTIFICATE:

I CERTIFY THAT:

1) THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.

2) THE SURVEY WAS COMPLETED ON THE 11th DAY OF AUGUST, 2022.

DATE

JASON WILBAND
ONTARIO LAND SURVEYOR

THIS PLAN OF SURVEY IS RELATED TO AOLS PLAN SUBMISSION FORM NUMBER 0000000.

PLAN OF SURVEY WITH TOPOGRAPHICAL DETAIL

OF PART OF

PARK LOTS 7 AND 8 RANGE 5 EAST OF THE GARAFRAXA ROAD

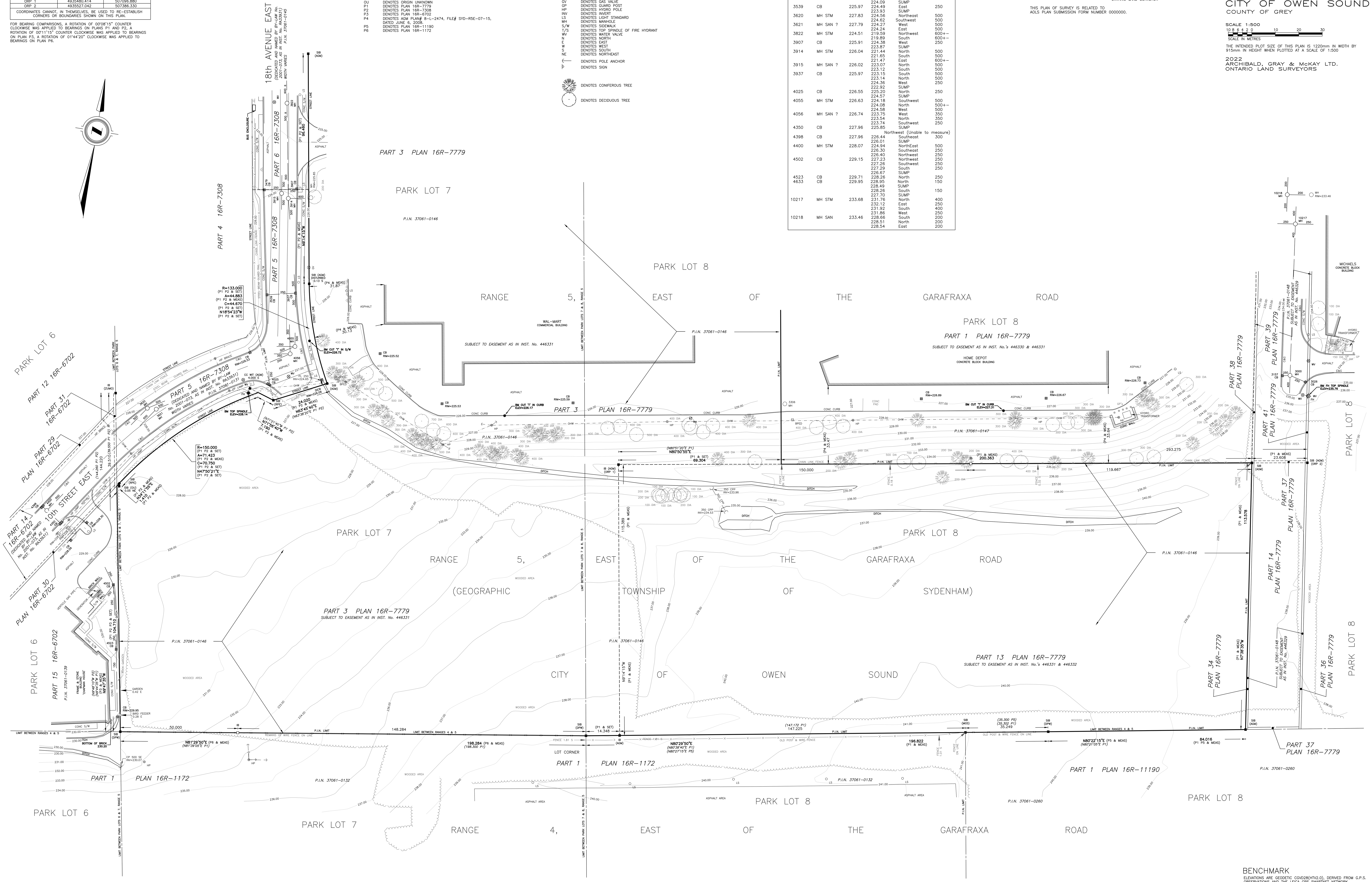
(GEOGRAPHIC TOWNSHIP OF SYDENHAM)
IN THE

CITY OF OWEN SOUND

COUNTY OF GREY

SCALE 1:500
10 8 6 4 2 0 10 20 30
SCALE IN METRES

THE INTENDED PLOT SIZE OF THIS PLAN IS 1220mm IN WIDTH BY 915mm IN HEIGHT WHEN PLOTTED AT A SCALE OF 1:500



BENCHMARK

ELEVATIONS ARE GEODETIC CGVD28(HTV2.0), DERIVED FROM G.P.S. OBSERVATIONS AND THE LEICA GPS SMARTNET NETWORK.

SITE BENCHMARKS

AS INDICATED ON THE FACE OF THIS PLAN.

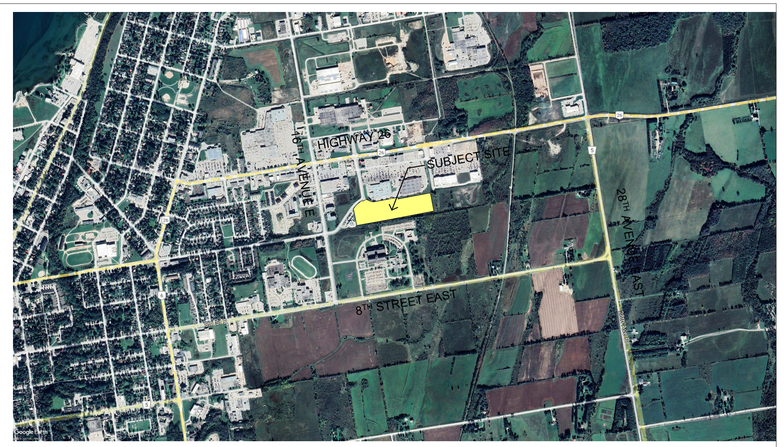
METRIC: DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

AGM PLAN • SURVEY • ENGINEER
ARCHIBALD, GRAY & McKAY LTD.
3514 WHITE OAK ROAD, LONDON, ON, N6E 2Z9
PHONE 519-685-5300 FAX 519-685-5303
EMAIL info@agm.on.ca WEB www.agm.on.ca

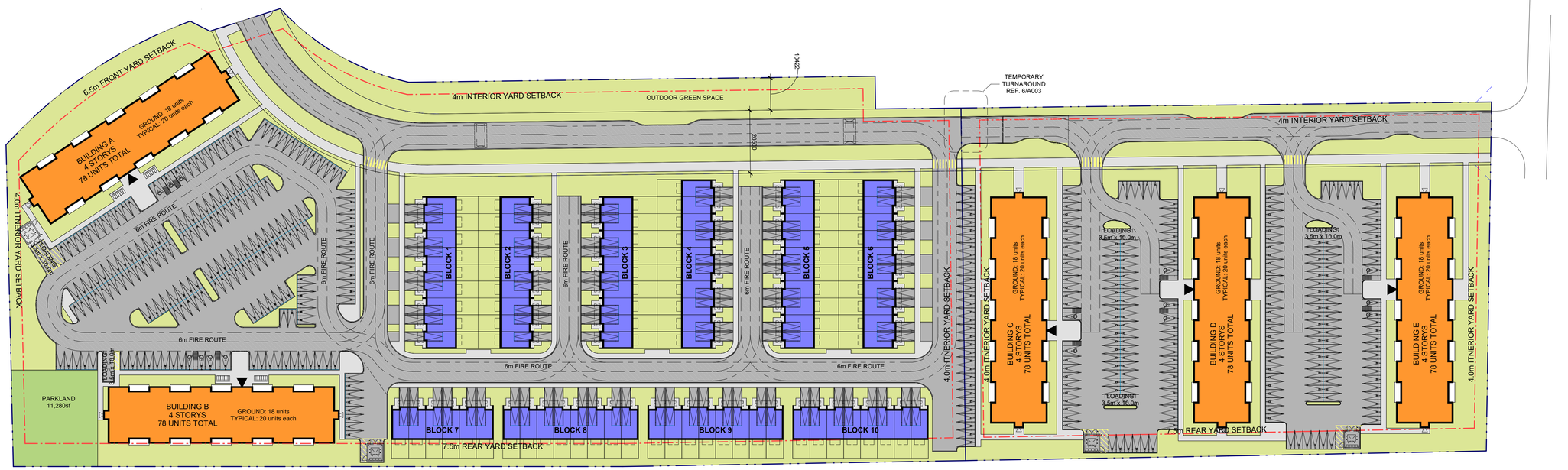
DRAWN BY: BLB	DIGITAL FILE: OT2106TP1C19.dwg	PLAN No: L-5923
CHECKED BY: JPW		
Plot date: Aug 26, 2022	FILE No: SYD–R5E–07–16	

F:\Projects\S\Sydenham\SYD\SYD–R5E\SYD–R5E–07\SYD–R5E–07–16\CAD\OT2106TP1C19.dwg

Appendix B Site Plan



KEY PLAN
1 : 125



6 / A001 Site Plan - MASTER
1 : 700

Chamberlain Architects Constructors Managers

Chamberlain Architect Services Limited

4671 Palladium Way (Unit 1)
Burlington, Ontario. L7M 0W9
CANADA

Phone: 905.631.7777

www.chamberlainIPD.com

NO.	ISSUED	DATE
1	ISSUED TO CLIENT	2022-09-19
2	FOR CO-ORDINATION	2022-12-07
3	DRAFT PACKAGE	2023-01-19
4	CLIENT REVIEW	2023-01-31

SEAL

CONSTRUCTION NORTH TRUE NORTH

OWEN SOUND SMART CENTRES

10th STREET EAST &
18th AVENUE EAST
OWEN SOUND, ON

SHEET NAME

MASTER PLAN

START DATE	2022.09.12
DRAWN BY	MMW/ SS
CHECKED BY	CC
SCALE	As indicated
PROJECT NO.	122038
DRAWING	A001

C:\Users\ccostal\Documents\122038 - Owen Sound - SITE - R2022_2022.10.26) OP4 CURRENT ccostal@chamberlainipd.com.rvt
2023-01-29 1:47:19 PM

1 A002 Site Plan - PHASE 1
1 : 400

PARKING REQUIREMENTS

APARTMENTS - 1.25/UNIT

BUILDING A:	78 units
BUILDING B:	78 units
	156 units x 1.25 = 195 spaces
Total Apartment Unit Parking:	**195 spaces**

Portion to be Accessible:
"1, plus 3% of the total required"
3% of 195 = 5.85 (6) + 1 = 7
1 + 6 = 7 spaces accessible (3 Type A, 4 Type B)

TYPE A = 6m x 3.4m + 1.5m transfer space
TYPE B = 6m x 2.4m + 1.5m transfer space

DWELLING UNITS (TOWNHOUSE) - 1.0/DWELLING

BLOCKS 1, 2, 3	9 dwelling units each (27 units)
BLOCKS 4,5,6,	10 dwelling units each (30 units)
BLOCK 7	6 dwelling units (6 units)
BLOCK 8,9,10,	8 dwelling units (24 units)
TOTAL UNITS:	87 Dwelling Units
Total Dwelling Unit Parking:	**87 spaces**

TOTAL PARKING REQUIRED: 195 + 87 = **282 spaces**

PHASE 1 - PARKING SCHEDULE

DESCRIPTION	COUNT
BUILDING A	
ACCESSIBLE TYPE A - 6.00m x 3.40m	1
ACCESSIBLE TYPE B - 6.00m x 2.40m	2
TYPICAL PARKING - 6.00m x 2.65m	94
	97
BUILDING B	
ACCESSIBLE TYPE A - 6.00m x 3.40m	2
ACCESSIBLE TYPE B - 6.00m x 2.40m	2
TYPICAL PARKING - 6.00m x 2.65m	94
	98
TOWNHOUSE	
TYPICAL PARKING - 6.00m x 2.65m	87
	87
	282

PHASE 1 - SITE STATISTICS

DESCRIPTION	AREA (SM)	AREA (SF)	PERCENTAGE
BUILDING FOOTPRINT			
APARTMENT	2,592.87 m²	27,909 ft²	7.1%
TOWNHOUSE	3,495.82 m²	37,629 ft²	9.6%
	6,088.69 m²	65,538 ft²	16.7%
HARD LANDSCAPE			
ASPHALT	12,176.46 m²	131,066 ft²	33.5%
CURB	411.30 m²	4,427 ft²	1.1%
DRIVEWAY	1,352.18 m²	14,555 ft²	3.7%
PAVER	239.78 m²	2,581 ft²	0.7%
SIDEWALK	2,875.64 m²	30,953 ft²	7.9%
	17,055.37 m²	183,582 ft²	46.9%
SOFT LANDSCAPE			
LANDSCAPE	10,151.90 m²	109,274 ft²	27.9%
TOWNHOUSE BACKYARD	2,208.47 m²	23,772 ft²	6.1%
PARKLAND	872.99 m²	9,397 ft²	2.4%
	13,233.36 m²	142,443 ft²	36.4%
	36,377.42 m²	391,563 ft²	100.0%
OVERALL SITE	39,774.72 m²	428,132 ft²	100.0%

Chamberlain Architects Constructors Managers

Chamberlain Architect Services Limited

4671 Palladium Way (Unit 1)
Burlington, Ontario. L7M 0W9
CANADA

Phone: 905.631.7777

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NO.	ISSUED	DATE
1	ISSUED TO CLIENT	2022-09-12
2	ISSUED TO CLIENT	2022-10-26
3	ISSUED TO CLIENT	2022-10-27
4	CLIENT REVIEW	2022-11-17
5	FOR CO-ORDINATION	2022-12-07

SEAL

CONSTRUCTION NORTH TRUE NORTH

OWEN SOUND SMART CENTRES

10th STREET EAST &
18th AVENUE EAST
OWEN SOUND, ON

SHEET NAME

SITE PLAN
PHASE 1

START DATE	2022.09.12
DRAWN BY	MMW/ SS
CHECKED BY	CC
SCALE	1 : 400
PROJECT NO.	122038
DRAWING	A002

C:\Users\ccosta\Documents\122038 - Owen Sound - SITE - R2022_2022.10.26_OPA CURRENT_ccosta@chamberlainpd.com.rvt
2023-01-13 3:13:51 PM

PHASE 1 GFA

Level	AREA (SF)	AREA SM
APARTMENT BUILDING A		
LEVEL 1	13,854.75 ft²	1,287.15 m²
LEVEL 2	13,861.53 ft²	1,287.78 m²
LEVEL 3	13,761.35 ft²	1,278.47 m²
LEVEL 4	13,760.52 ft²	1,278.39 m²
	55,238.16 ft²	5,131.79 m²
APARTMENT BUILDING B		
LEVEL 1	13,854.75 ft²	1,287.15 m²
LEVEL 2	13,861.53 ft²	1,287.78 m²
LEVEL 3	13,761.35 ft²	1,278.47 m²
LEVEL 4	13,760.52 ft²	1,278.39 m²
	55,238.16 ft²	5,131.79 m²
TOWNHOUSE BLOCK 1		
LEVEL 1	5,614.07 ft²	521.56 m²
LEVEL 2	5,981.56 ft²	555.71 m²
LEVEL 3	5,970.60 ft²	554.69 m²
	17,566.24 ft²	1,631.96 m²
TOWNHOUSE BLOCK 2		
LEVEL 1	5,614.07 ft²	521.56 m²
LEVEL 2	5,981.56 ft²	555.71 m²
LEVEL 3	5,970.60 ft²	554.69 m²
	17,566.24 ft²	1,631.96 m²
TOWNHOUSE BLOCK 3		
LEVEL 1	5,614.07 ft²	521.56 m²
LEVEL 2	5,981.56 ft²	555.71 m²
LEVEL 3	5,970.60 ft²	554.69 m²
	17,566.24 ft²	1,631.96 m²
TOWNHOUSE BLOCK 4		
LEVEL 1	6,234.82 ft²	579.23 m²
LEVEL 2	6,642.80 ft²	617.14 m²
LEVEL 3	6,630.34 ft²	615.98 m²
	19,507.96 ft²	1,812.35 m²
TOWNHOUSE BLOCK 5		
LEVEL 1	6,234.82 ft²	579.23 m²
LEVEL 2	6,642.80 ft²	617.14 m²
LEVEL 3	6,630.34 ft²	615.98 m²
	19,507.96 ft²	1,812.35 m²
TOWNHOUSE BLOCK 6		
LEVEL 1	6,234.82 ft²	579.23 m²
LEVEL 2	6,642.80 ft²	617.14 m²
LEVEL 3	6,630.34 ft²	615.98 m²
	19,507.96 ft²	1,812.35 m²
TOWNHOUSE BLOCK 7		
LEVEL 1	3,751.81 ft²	348.55 m²
LEVEL 2	3,997.85 ft²	371.41 m²
LEVEL 3	3,991.39 ft²	370.81 m²
	11,741.06 ft²	1,090.78 m²
TOWNHOUSE BLOCK 8		
LEVEL 1	4,993.32 ft²	463.89 m²
LEVEL 2	5,320.33 ft²	494.27 m²
LEVEL 3	5,310.87 ft²	493.40 m²
	15,624.51 ft²	1,451.56 m²
TOWNHOUSE BLOCK 9		
LEVEL 1	4,993.32 ft²	463.89 m²
LEVEL 2	5,320.33 ft²	494.27 m²
LEVEL 3	5,310.87 ft²	493.40 m²
	15,624.51 ft²	1,451.56 m²
TOWNHOUSE BLOCK 10		
LEVEL 1	4,993.32 ft²	463.89 m²
LEVEL 2	5,320.33 ft²	494.27 m²
LEVEL 3	5,310.87 ft²	493.40 m²
	15,624.51 ft²	1,451.56 m²
	280,313.51 ft²	26,041.98 m²

UNIT MATRIX - BUILDING A

UNITS	Area	AREA SM	Count	%
LEVEL 1				
1 BEDROOM	5,513.60 ft²	512 m²	10	12.8%
1 BEDROOM - ACCESSIBLE	2,203.63 ft²	205 m²	4	5.1%
2 BEDROOM	2,486.66 ft²	231 m²	3	3.8%
2 BEDROOM - ACCESSIBLE	843.22 ft²	78 m²	1	1.3%
	11,047.12 ft²	1026 m²	18	23.1%
LEVEL 2				
1 BEDROOM	7,166.15 ft²	666 m²	13	16.7%
1 BEDROOM (SMALL)	965.09 ft²	90 m²	2	2.6%
1 BEDROOM - ACCESSIBLE	551.08 ft²	51 m²	1	1.3%
2 BEDROOM	2,486.66 ft²	231 m²	3	3.8%
2 BEDROOM - ACCESSIBLE	843.22 ft²	78 m²	1	1.3%
	12,012.20 ft²	1116 m²	20	25.6%
LEVEL 3				
1 BEDROOM	7,166.15 ft²	666 m²	13	16.7%
1 BEDROOM (SMALL)	965.09 ft²	90 m²	2	2.6%
1 BEDROOM - ACCESSIBLE	551.08 ft²	51 m²	1	1.3%
2 BEDROOM	2,486.66 ft²	231 m²	3	3.8%
2 BEDROOM - ACCESSIBLE	843.22 ft²	78 m²	1	1.3%
	12,012.20 ft²	1116 m²	20	25.6%
LEVEL 4				
1 BEDROOM	7,166.00 ft²	666 m²	13	16.7%
1 BEDROOM (SMALL)	962.29 ft²	89 m²	2	2.6%
1 BEDROOM - ACCESSIBLE	551.08 ft²	51 m²	1	1.3%
2 BEDROOM	2,488.78 ft²	231 m²	3	3.8%
2 BEDROOM - ACCESSIBLE	843.22 ft²	78 m²	1	1.3%
	12,011.37 ft²	1116 m²	20	25.6%
Grand total: 78	47,082.89 ft²	4374 m²	78	100.0%

UNIT MATRIX - BUILDING B

UNITS	AREA (SF)	AREA (SM)	Count	%
LEVEL 1				
1 BEDROOM	5,513.60 ft²	512.23 m²	10	12.8%
1 BEDROOM - ACCESSIBLE	2,203.63 ft²	204.72 m²	4	5.1%
2 BEDROOM	2,486.66 ft²	231.02 m²	3	3.8%
2 BEDROOM - ACCESSIBLE	843.22 ft²	78.34 m²	1	1.3%
	11,047.12 ft²	1,026.31 m²	18	23.1%
LEVEL 2				
1 BEDROOM	7,166.15 ft²	665.76 m²	13	16.7%
1 BEDROOM (SMALL)	965.09 ft²	89.66 m²	2	2.6%
1 BEDROOM - ACCESSIBLE	551.08 ft²	51.20 m²	1	1.3%
2 BEDROOM	2,486.66 ft²	231.02 m²	3	3.8%
2 BEDROOM - ACCESSIBLE	843.22 ft²	78.34 m²	1	1.3%
	12,012.20 ft²	1,115.97 m²	20	25.6%
LEVEL 3				
1 BEDROOM	7,166.15 ft²	665.76 m²	13	16.7%
1 BEDROOM (SMALL)	965.09 ft²	89.66 m²	2	2.6%
1 BEDROOM - ACCESSIBLE	551.08 ft²	51.20 m²	1	1.3%
2 BEDROOM	2,486.66 ft²	231.02 m²	3	3.8%
2 BEDROOM - ACCESSIBLE	843.22 ft²	78.34 m²	1	1.3%
	12,012.20 ft²	1,115.97 m²	20	25.6%
LEVEL 4				
1 BEDROOM	7,166.00 ft²	665.74 m²	13	16.7%
1 BEDROOM (SMALL)	962.29 ft²	89.40 m²	2	2.6%
1 BEDROOM - ACCESSIBLE	551.08 ft²	51.20 m²	1	1.3%
2 BEDROOM	2,488.78 ft²	231.22 m²	3	3.8%
2 BEDROOM - ACCESSIBLE	843.22 ft²	78.34 m²	1	1.3%
	12,011.37 ft²	1,115.89 m²	20	25.6%
Grand total: 78	47,082.89 ft²	4,374.14 m²	78	100.0%

UNIT MATRIX - APARTMENT BUILDINGS

UNITS	AREA (SF)	AREA (SM)	Count	%
APARTMENT BUILDING A				
1 BEDROOM	27,011.91 ft²	2509.49 m²	49	31.4%
1 BEDROOM (SMALL)	2,892.46 ft²	268.72 m²	6	3.8%
1 BEDROOM - ACCESSIBLE	3,856.89 ft²	358.32 m²	7	4.5%
2 BEDROOM	9,948.76 ft²	924.27 m²	12	7.7%
2 BEDROOM - ACCESSIBLE	3,372.87 ft²	313.35 m²	4	2.6%
	47,082.89 ft²	4374.14 m²	78	50.0%
APARTMENT BUILDING B				
1 BEDROOM	27,011.91 ft²	2509.49 m²	49	31.4%
1 BEDROOM (SMALL)	2,892.46 ft²	268.72 m²	6	3.8%
1 BEDROOM - ACCESSIBLE	3,856.89 ft²	358.32 m²	7	4.5%
2 BEDROOM	9,948.76 ft²	924.27 m²	12	7.7%
2 BEDROOM - ACCESSIBLE	3,372.87 ft²	313.35 m²	4	2.6%
	47,082.89 ft²	4374.14 m²	78	50.0%
	94,165.78 ft²	8748.29 m²	156	100.0%

TOWNHOUSE- END UNITS (FLOOR AREA)

UNITS	AREA (SF)	AREA (SM)	AREA %
LEVEL 1			
GARAGE	19 m²	18.70 m²	10%
GROUND FLOOR	40 m²	40.24 m²	22%
LEVEL 2			
SECOND FLOOR	63 m²	62.84 m²	34%
LEVEL 3			
THIRD FLOOR	63 m²	62.82 m²	34%
	185 m²	184.61 m²	100%

TOWNHOUSE- MID UNITS (FLOOR AREA)

UNITS	AREA (SF)	AREA (SM)	AREA %
LEVEL 1			
CAR GARAGE	19 m²	18.70 m²	10%
GROUND FLOOR	39 m²	38.97 m²	22%
LEVEL 2			
SECOND FLOOR	61 m²	61.43 m²	34%
LEVEL 3			
THIRD FLOOR	61 m²	61.29 m²	34%
	180 m²	180.39 m²	100%

PHASE 1 - SITE STATISTICS

DESCRIPTION	AREA (SM)	AREA (SF)	PERCENTAGE
BUILDING FOOTPRINT			
APARTMENT	2,592.87 m²	27,909 ft²	6.5%
TOWNHOUSE	5,062.35 m²	54,491 ft²	12.7%
	7,655.22 m²	82,400 ft²	19.2%
HARD LANDSCAPE			
ASPHALT	12,175.27 m²	131,054 ft²	30.6%
CURB	411.22 m²	4,426 ft²	1.0%
DRIVEWAY	1,858.75 m²	20,007 ft²	4.7%
PAVER	239.78 m²	2,581 ft²	0.6%
SIDEWALK	3,046.27 m²	32,790 ft²	7.7%
	17,731.30 m²	190,858 ft²	44.6%
SOFT LANDSCAPE			
LANDSCAPE	10,144.72 m²	109,197 ft²	25.5%
TOWNHOUSE BACKYARD	3,370.51 m²	36,280 ft²	8.5%
PARKLAND	872.99 m²	9,397 ft²	2.2%
	14,388.22 m²	154,874 ft²	36.2%
	39,774.74 m²	428,132 ft²	100.0%
OVERALL SITE	39,774.72 m²	428,132 ft²	100.0%

PARKING

APARTMENTS - 1.25/UNIT
BUILDING A: 78 units
BUILDING B: 78 units
156 units x 1.25 = 195 spaces
Total Apartment Unit Parking: **195 spaces**

Portion to be Accessible:
"1, plus 3% of the total required"
3% of 195 = 5.85 (6) + 1 = 7
1 + 6 = 7 spaces accessible (3 Type A, 4 Type B)

TYPE A = 6m x 3.4m + 1.5m transfer space
TYPE B = 6m x 2.4m + 1.5m transfer space

DWELLING UNITS (TOWNHOUSE) - 1.0/DWELLING
BLOCKS 1, 2, 3 — 9 dwelling units each (27 units)
BLOCKS 4,5,6, — 10 dwelling units each (30 units)
BLOCK 7 — 6 dwelling units (6 units)
BLOCK 8,9,10, — 8 dwelling units (24 units)
TOTAL UNITS: 87 Dwelling Units
Total Dwelling Unit Parking: **87 spaces**

TOTAL PARKING REQUIRED: 195 + 87 = **282 spaces**

PHASE 1 - PARKING SCHEDULE

DESCRIPTION	COUNT
BUILDING A	
ACCESSIBLE TYPE A - 6.00m x 3.40m	1
ACCESSIBLE TYPE B - 6.00m x 2.40m	2
TYPICAL PARKING - 6.00m x 2.65m	94
	97
BUILDING B	
ACCESSIBLE TYPE A - 6.00m x 3.40m	2
ACCESSIBLE TYPE B - 6.00m x 2.40m	2
TYPICAL PARKING - 6.00m x 2.65m	94
	98
TOWNHOUSE	
TYPICAL PARKING - 6.00m x 2.65m	87
	87
	282

PHASE 1 - BICYCLE PARKING

DESCRIPTION	COUNT
BUILDING A	
BICYCLE PARKING	7
	7
BUILDING B	
BICYCLE PARKING	7
	7
	14

PHASE 1 - SNOW STORAGE

Name	AREA (SF)	AREA (SM)	PERCENTAGE
ASPHALT AREA	67,596.28 ft²	6,279.90 m²	95.7%
SNOW STORAGE	3,144.65 ft²	292.15 m²	4.5%

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Chamberlain
Architects
Constructors
Managers

Chamberlain Architect Services Limited

4671 Palladium Way (Unit 1)
Burlington, Ontario, L7M 0W9
CANADA

Phone: 905.631.7777

www.chamberlainIPD.com

NO.	ISSUED	DATE
1	FOR CO-ORDINATION	2023-01-17
2	DRAFT PACKAGE	2023-01-19

SEAL

OWEN SOUND
SMART CENTRES

10th STREET EAST &
18th AVENUE EAST
OWEN SOUND, ON

SHEET NAME

PROJECT STATISTICS - PHASE 1

START DATE 2022.09.12

DRAWN BY HK

CHECKED BY CMC

SCALE

PROJECT NO. 122038

DRAWING

A005

Appendix C Stormwater Management

Stantec

Project: Owen Sound SmartCentres
Project Number: 160623088
Project Location: Owen Sound
Date: 1/31/2023

Existing and Proposed Catchment Parameters

Pre-Devleopment Areas

Catchment Description	Catchment ID	Area (ha)	Runoff Coefficient	Total Imperviousness
Ph 1 Naturalized	102A	3.97	0.48	0.48
Ph 2A Naturalized	102A	1.32	0.48	0.48
Ph 2B Naturalized Split	102B	0.72	0.50	0.50
Total		**6.01**	**0.48**	**0.48**

Percent impervious (I) converted from C values based on Simple Method, C = 0.05 + 0.009(I); (Schueler, 1987)

Phase 1 Controlled Post-Development Areas

Catchment Description	Catchment ID	Area (ha)	Runoff Coefficient	Total Imperviousness	Direct Imperviousness
Apartment Roof		0.259	0.95	1.00	1.00
Townhouse Roof		0.501	0.95	1.00	1.00
Asphalt + Curb		1.265	0.90	0.94	0.94
Driveway		0.186	0.90	0.94	0.94
Paver		0.024	0.90	0.94	0.94
Sidewalk		0.302	0.90	0.94	0.94
Landscape		1.014	0.25	0.22	0.00
Backyard		0.337	0.25	0.22	0.00
Parkland		0.087	0.25	0.22	0.00
Total	**202**	**3.975**	**0.67**	**0.69**	**0.61**

Phase 2 Controlled Post-Development Areas

Catchment Description	Catchment ID	Area (ha)	Runoff Coefficient	Total Imperviousness	Direct Imperviousness
Total	**2022**	**2.035**	**0.67**	**0.69**	**0.61**

Total Post-Development Area

Catchment Description	Catchment ID	Area (ha)	Runoff Coefficient	Total Imperviousness	Direct Imperviousness
Phase 1	202	3.975	0.67	0.69	0.61
Phase 2	2022	2.035	0.67	0.69	0.61
Total		**6.010**	**0.67**	**0.69**	**0.61**

Project:	**Owen Sound SmartCentres**
Project Number:	**160623088**
Project Location:	**Owen Sound**
Date:	**1/31/2023**

Existing Conditions Hydrologic Modeling Summary

CPM Modeling (Original)

Catchment	Area (ha)	Storm Event	Outflow (m^3/s)	Volume (ha.m)
AddHyd 500	8.34	5 Year	1.320	-
AddHyd 500	8.15	100 Year	2.910	-
Pond	23.28	5 Year	0.410	0.5440
Pond	23.12	100 Year	0.410	0.8203

Note: 5 and 100 Year areas differ do to split hyd for Catchment 102B

CPM Modeling (Conversion to VO6)

Catchment	Area (ha)	Storm Event	Outflow (m^3/s)	Volume (ha.m)
AddHyd 500	8.231	5 Year	1.410	-
AddHyd 500	8.065	100 Year	2.800	-
Pond	23.189	5 Year	0.285	0.5745
Pond	23.023	100 Year	0.430	0.8652

Note: 5 and 100 Year areas differ do to split hyd for Catchment 102B

Updated Existing Modeling to Account for 10th Street East Construction in Catchment 102A

Catchment	Area (ha)	Storm Event	Outflow (m^3/s)	Volume (ha.m)
AddHyd 500	8.231	5 Year	1.419	-
AddHyd 500	8.065	100 Year	2.820	-
Pond	23.189	5 Year	0.286	0.5750
Pond	23.023	100 Year	0.430	0.8656

Note: 5 and 100 Year areas differ do to split hyd for Catchment 102B

Project:	**Owen Sound SmartCentres**
Project Number:	**160623088**
Project Location:	**Owen Sound**
Date:	**1/31/2023**

Proposed Conditions Hydrologic Modeling Summary

Proposed Site Conditions Modeling for Phase 1 and Phase 2 Developments

Phase Chamber 1 Details

Modeled Parameters

Discharge (m^3/s)	Storage (ha.m)
0.000	0.000
0.215	0.083

Model Output

Storm	Discharge (m^3/s)	Storage (ha.m)
5 Year	0.182	0.072
100 Year Pipe	0.215	0.083
100 Year Overflow	0.789	-

Phase Chamber 2 Details

Modeled Parameters

Discharge (m^3/s)	Storage (ha.m)
0.000	0.000
0.110	0.042

Model Output

Storm	Discharge (m^3/s)	Storage (ha.m)
5 Year	0.081	0.031
100 Year Pipe	0.110	0.042
100 Year Overflow	0.398	-

Summary

Catchment	Area (ha)	Storm Event	Outflow (m^3/s)	Volume (ha.m)
AddHyd 500	8.333	5 Year	0.607	-
AddHyd 500	8.333	100 Year	1.446	-
Pond	23.291	5 Year	0.278	0.5599
Pond	23.291	100 Year	0.412	0.8288

Note 1: In proposed condition underground chambers have been designed to control post-development flows to pre-development levels at AddHyd500 (connection to municipal services) and to match release rates from the existing downstream SWM Pond. The total required volume of the existing downstream SWM pond was also matched to existing conditions.

Note 2: The underground chambers have been modeled with a spill conditoin. When the volume is exceeded, stormwater will be discharged to surface and conveyed via overland flow to the existing downstream SWM pond.

Project: Owen Sound SmartCentres
Project Num 160623088
Project Loca Owen Sound
Date: 1/31/2023

Orifice Plate Sizing

Orifice Equation: $Q = C_d A(2gh)^{1/2}$

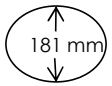
Phase 1 Orifice Control - MH Control 1

Invert =	224.88	m
Size =	252	mm
C =	0.62	
Obvert =	225.132	m
Top of MH =	227.48	m
Area =	0.050	m^2
Head =	2.47	m
Required Flow =	0.215	m^3/s
Design Flow =	**0.215**	**m^3/s**

Type of Orifice Control: VERTICAL
Location: MH4

Phase 2 Orifice Control - MH Control 2

Invert =	233.31	m
Size =	181	mm
C =	0.62	
Obvert =	233.491	m
Top of MH =	235.81	m
Area =	0.026	m^2
Head =	2.41	m
Required Flow =	0.110	m^3/s
Design Flow =	**0.110**	**m^3/s**



Type of Orifice Control: VERTICAL
Location: MH3

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

01/31/2023

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

Site Name:	

Drainage Area (ha):	2.04
% Imperviousness:	80.00

Runoff Coefficient 'c': 0.78

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

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	60.10
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:	Owen Sound
Project Number:	60458
Designer Name:	Jay Pawar
Designer Company:	Stantec
Designer Email:	jay.Pawar@stantec.com
Designer Phone:	647-292-9104
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	62
EFO6	76
EFO8	85
EFO10	90
EFO12	93

Recommended Stormceptor EFO Model: EFO8

Estimated Net Annual Sediment (TSS) Load Reduction (%): 85

Water Quality Runoff Volume Capture (%): > 90

imbrium

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 waterwavs.

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

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Stormceptor® EF Sizing Report

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	2.21	133.0	28.0	100	10.3	10.3
1	20.8	31.1	4.42	265.0	56.0	100	20.8	31.1
2	15.1	46.2	8.85	531.0	113.0	95	14.3	45.4
3	10.1	56.3	13.27	796.0	169.0	87	8.8	54.2
4	7.7	64.0	17.69	1062.0	226.0	82	6.4	60.5
5	6.4	70.4	22.12	1327.0	282.0	79	5.1	65.6
6	4.6	75.1	26.54	1592.0	339.0	77	3.6	69.2
7	3.4	78.4	30.96	1858.0	395.0	74	2.5	71.7
8	2.7	81.1	35.39	2123.0	452.0	72	1.9	73.6
9	2.6	83.7	39.81	2389.0	508.0	69	1.8	75.4
10	1.9	85.6	44.24	2654.0	565.0	66	1.2	76.6
11	1.7	87.3	48.66	2920.0	621.0	64	1.1	77.7
12	1.2	88.5	53.08	3185.0	678.0	64	0.7	78.5
13	1.1	89.6	57.51	3450.0	734.0	64	0.7	79.2
14	0.7	90.3	61.93	3716.0	791.0	63	0.5	79.7
15	0.6	90.9	66.35	3981.0	847.0	63	0.4	80.1
16	0.7	91.6	70.78	4247.0	904.0	62	0.4	80.5
17	0.6	92.3	75.20	4512.0	960.0	62	0.4	80.9
18	0.8	93.0	79.62	4777.0	1016.0	61	0.5	81.4
19	0.3	93.3	84.05	5043.0	1073.0	60	0.2	81.5
20	0.9	94.2	88.47	5308.0	1129.0	59	0.5	82.0
21	0.7	94.9	92.89	5574.0	1186.0	57	0.4	82.4
22	0.5	95.3	97.32	5839.0	1242.0	56	0.3	82.7
23	1.0	96.3	101.74	6104.0	1299.0	55	0.5	83.2
24	0.9	97.2	106.16	6370.0	1355.0	53	0.5	83.7
25	0.1	97.3	110.59	6635.0	1412.0	52	0.1	83.8
30	1.6	98.9	132.71	7962.0	1694.0	43	0.7	84.4
35	0.2	99.1	154.82	9289.0	1976.0	37	0.1	84.5
40	0.4	99.5	176.94	10616.0	2259.0	33	0.1	84.6
45	0.4	99.9	199.06	11944.0	2541.0	29	0.1	84.8
Estimated Net Annual Sediment (TSS) Load Reduction =								**85 %**

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

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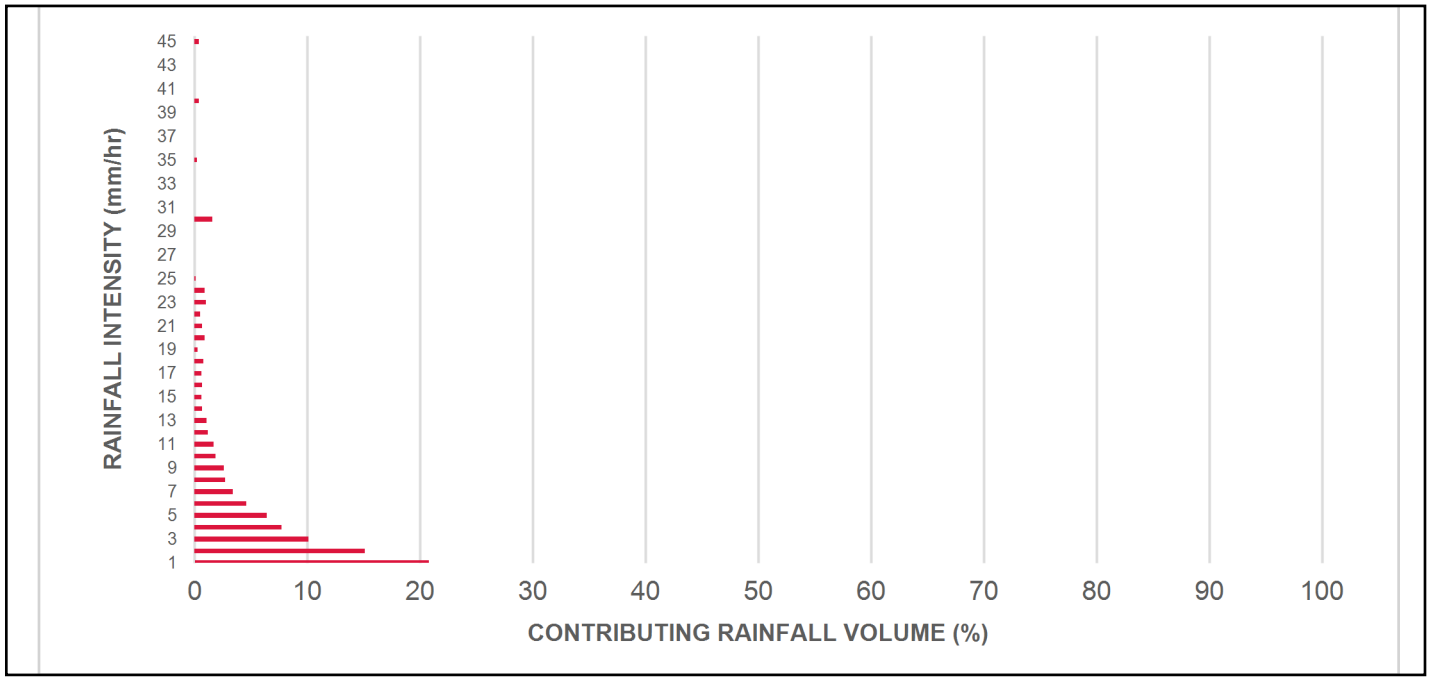
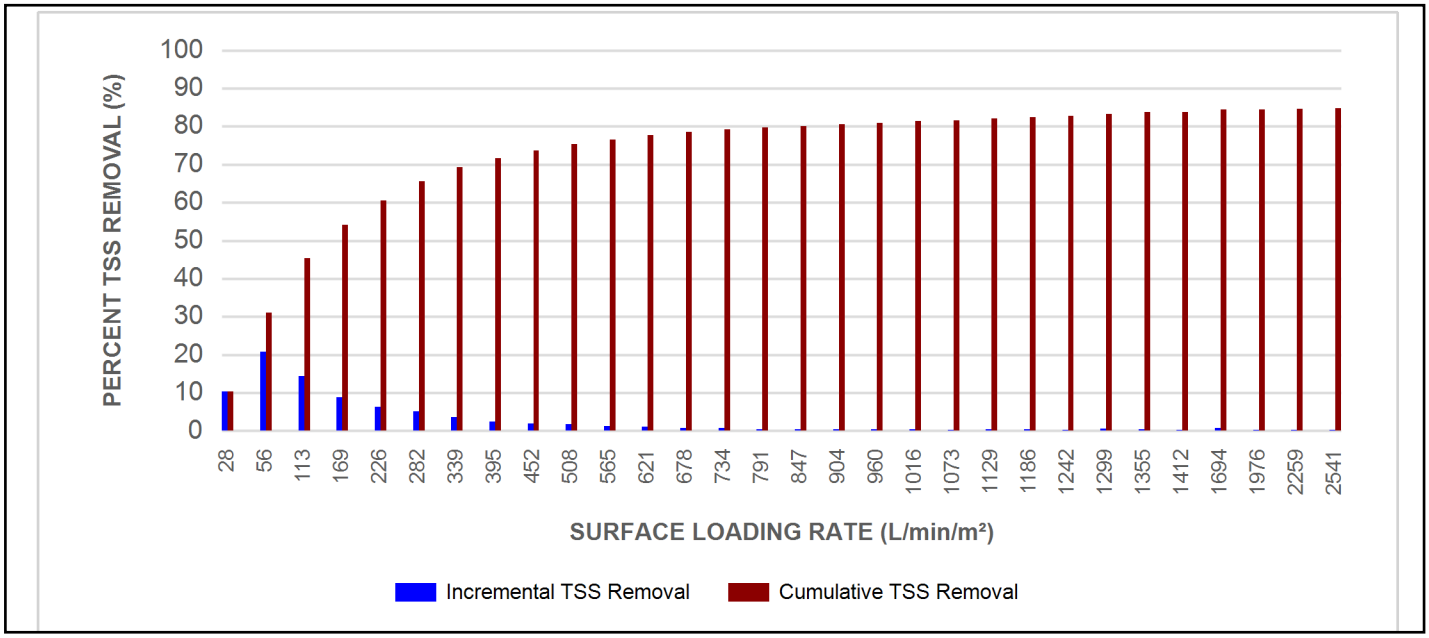
RAINFALL DATA FROM OWEN SOUND MOE RAINFALL STATION



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

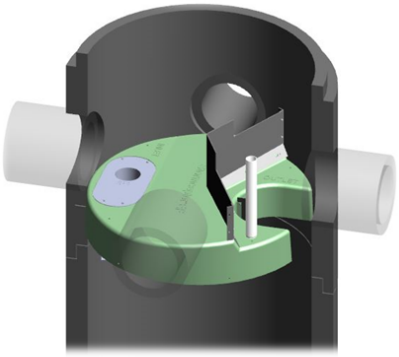
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test 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.

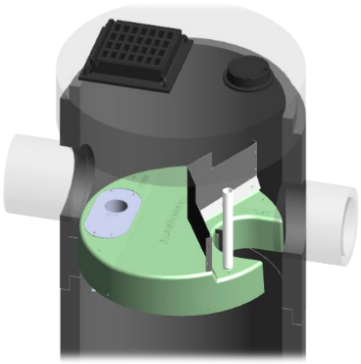
DESIGN FLEXIBILITY

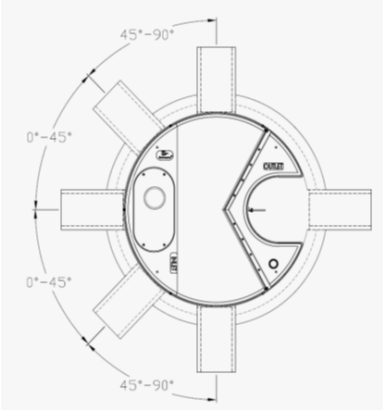
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

Stormceptor®

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Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

01/31/2023

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

Site Name:	

Drainage Area (ha):	3.973
% Imperviousness:	80.00

Runoff Coefficient 'c': 0.78

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

Project Name:	Owen Sound
Project Number:	60458
Designer Name:	Jay Pawar
Designer Company:	Stantec
Designer Email:	jay.Pawar@stantec.com
Designer Phone:	647-292-9104
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	117.04
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	49
EFO6	65
EFO8	75
EFO10	82
EFO12	87

Recommended Stormceptor EFO Model: EFO10

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

Water Quality Runoff Volume Capture (%): > 90

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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 waterwavs.

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

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Stormceptor® EF Sizing Report

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	4.31	258.0	35.0	100	10.3	10.3
1	20.8	31.1	8.62	517.0	71.0	100	20.8	31.1
2	15.1	46.2	17.23	1034.0	142.0	91	13.7	44.8
3	10.1	56.3	25.85	1551.0	212.0	83	8.3	53.2
4	7.7	64.0	34.46	2068.0	283.0	79	6.1	59.3
5	6.4	70.4	43.08	2585.0	354.0	76	4.9	64.2
6	4.6	75.1	51.69	3101.0	425.0	73	3.4	67.5
7	3.4	78.4	60.31	3618.0	496.0	70	2.4	69.9
8	2.7	81.1	68.92	4135.0	566.0	66	1.8	71.7
9	2.6	83.7	77.54	4652.0	637.0	64	1.7	73.4
10	1.9	85.6	86.15	5169.0	708.0	64	1.2	74.5
11	1.7	87.3	94.77	5686.0	779.0	63	1.1	75.6
12	1.2	88.5	103.38	6203.0	850.0	63	0.7	76.4
13	1.1	89.6	112.00	6720.0	921.0	62	0.7	77.0
14	0.7	90.3	120.61	7237.0	991.0	62	0.5	77.5
15	0.6	90.9	129.23	7754.0	1062.0	60	0.4	77.9
16	0.7	91.6	137.84	8270.0	1133.0	59	0.4	78.3
17	0.6	92.3	146.46	8787.0	1204.0	57	0.4	78.6
18	0.8	93.0	155.07	9304.0	1275.0	55	0.4	79.1
19	0.3	93.3	163.69	9821.0	1345.0	54	0.2	79.2
20	0.9	94.2	172.30	10338.0	1416.0	52	0.4	79.7
21	0.7	94.9	180.92	10855.0	1487.0	49	0.3	80.0
22	0.5	95.3	189.53	11372.0	1558.0	47	0.2	80.2
23	1.0	96.3	198.15	11889.0	1629.0	45	0.4	80.7
24	0.9	97.2	206.76	12406.0	1699.0	43	0.4	81.1
25	0.1	97.3	215.38	12923.0	1770.0	41	0.1	81.1
30	1.6	98.9	258.45	15507.0	2124.0	35	0.5	81.7
35	0.2	99.1	301.53	18092.0	2478.0	30	0.1	81.7
40	0.4	99.5	344.60	20676.0	2832.0	26	0.1	81.8
45	0.4	99.9	387.68	23261.0	3186.0	24	0.1	81.9
Estimated Net Annual Sediment (TSS) Load Reduction =								**82 %**

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

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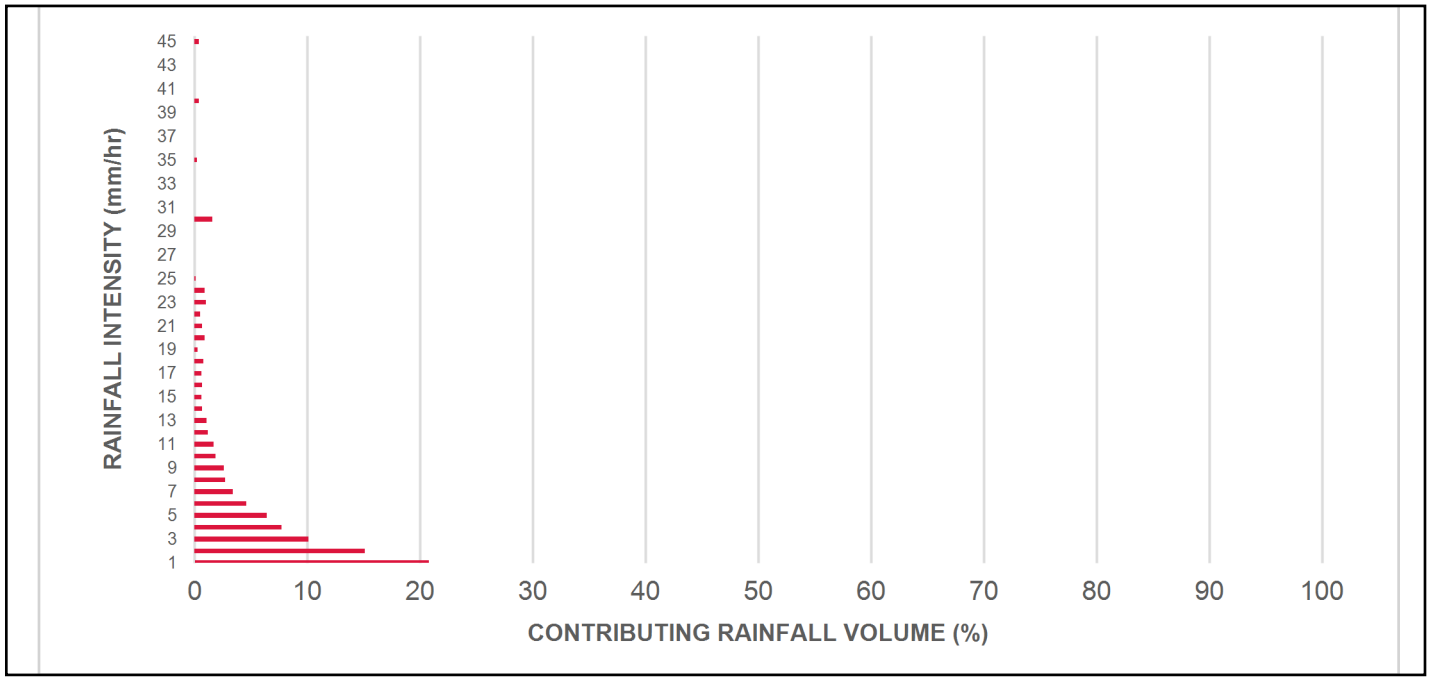

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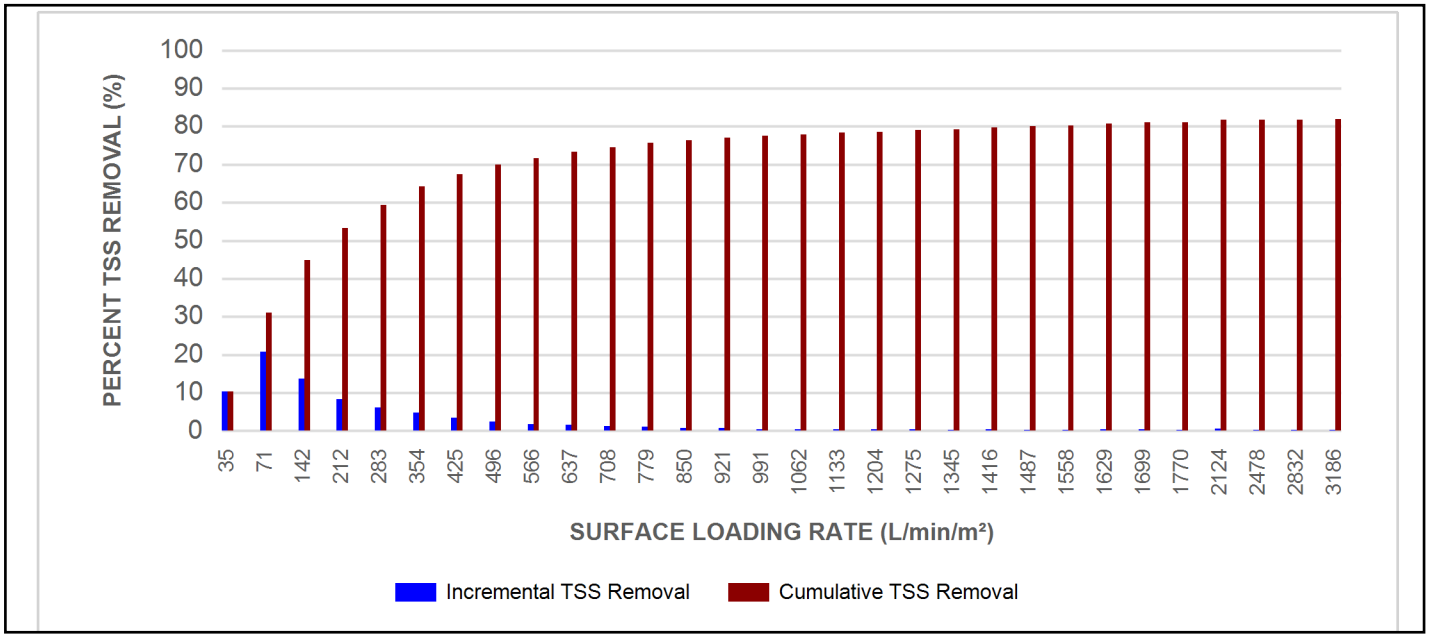

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EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

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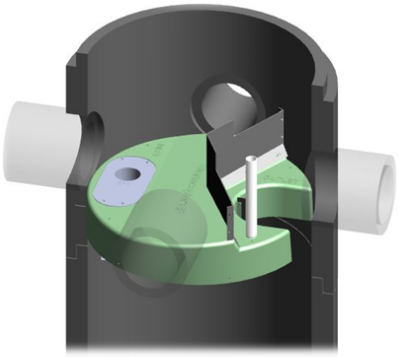
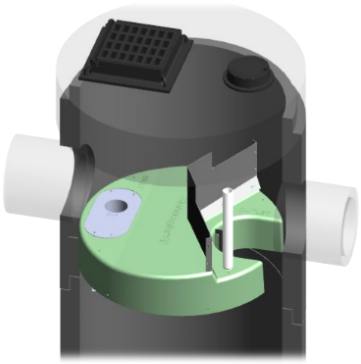
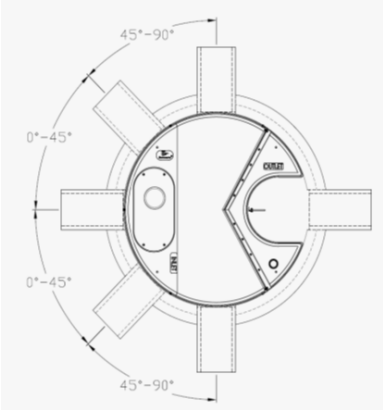
►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **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.

Recreation

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==========================================================================================================

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2006)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


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  Summary filename: C:\Users\jpawar\AppData\Local\Civica\VH5\2b3c193d-6de5-462d-b715-9837f51ac3f4\9f8f3237-2d0


DATE: 01/31/2023                          TIME: 01:31:33

USER:



COMMENTS: _____________________________________________________________


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  ************************************************
  ** SIMULATION : Storm Input_5yr                **
  ************************************************


--------------------
|    READ STORM    |    Filename: C:\Users\jpawar\AppD
|                  |              ata\Local\Temp\
|                  |              15ee888d-fd3a-4cd4-a679-0c8bc64d5e0a\14412636
| Ptotal= 45.45 mm |    Comments: Storm Input_5yr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.08    0.00 |  1.50    0.00 |  2.92    5.38 |  4.33    9.14
                0.17    0.00 |  1.58    0.00 |  3.00    5.97 |  4.42    8.23
                0.25    0.00 |  1.67    0.00 |  3.08    6.73 |  4.50    7.52
                0.33    0.00 |  1.75    0.00 |  3.17    7.75 |  4.58    6.91
                0.42    0.00 |  1.83    0.00 |  3.25    9.17 |  4.67    6.40
                0.50    0.00 |  1.92    0.00 |  3.33   11.33 |  4.75    5.97
                0.58    0.00 |  2.00    0.00 |  3.42   15.04 |  4.83    5.61
                0.67    0.00 |  2.08    0.00 |  3.50   22.81 |  4.92    5.28
                0.75    0.00 |  2.17    0.00 |  3.58   49.53 |  5.00    5.00
                0.83    0.00 |  2.25    0.00 |  3.67  140.94 |  5.08    4.75
                0.92    0.00 |  2.33    0.00 |  3.75   59.18 |  5.17    4.52
                1.00    0.00 |  2.42    0.00 |  3.83   32.59 |  5.25    4.32
                1.08    0.00 |  2.50    0.00 |  3.92   22.48 |  5.33    4.14
                1.17    0.00 |  2.58    3.91 |  4.00   17.22 |  5.42    3.96
                1.25    0.00 |  2.67    4.19 |  4.08   14.02 |  5.50    3.81
                1.33    0.00 |  2.75    4.52 |  4.17   11.86 |
                1.42    0.00 |  2.83    4.90 |  4.25   10.31 |

------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD (  0213)|   Area    (ha)=   0.72
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  40.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.36          0.36
     Dep. Storage     (mm)=       0.51          5.08
     Average Slope     (%)=       2.50          2.50
     Length            (m)=      69.28         40.00
     Mannings n             =     0.013         0.250

     Max.Eff.Inten.(mm/hr)=     140.94          2.83
               over (min)          5.00         30.00
     Storage Coeff.  (min)=        1.02 (ii)     5.88 (ii)
     Unit Hyd. Tpeak (min)=        5.00          5.00
```

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     Unit Hyd. peak  (cms)=       0.34         0.19
                                                              *TOTALS*
     PEAK FLOW       (cms)=       0.11         0.01           0.122 (iii)
     TIME TO PEAK    (hrs)=       3.67         3.67            3.67
     RUNOFF VOLUME    (mm)=      44.94         1.18           18.68
     TOTAL RAINFALL   (mm)=      45.45        45.45           45.45
     RUNOFF COEFFICIENT   =       0.99         0.03            0.41

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0011)|
| Inlet Cap.= 0.060|
| #of Inlets=     1|
| Total(cms)=   0.1|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   0.72      0.12      3.67   18.68
     ==========================================================
     MAJOR SYS.(ID= 2):   0.10      0.06      3.67   18.68
     MINOR SYS.(ID= 3):   0.62      0.06      3.67   18.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0012)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.5300      0.0100
                          0.5000     0.0050   |   1.5400      3.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)      0.099      0.062      3.67      18.68
   OUTFLOW: ID= 1 (  0012)      0.099      0.037      3.67      20.18

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 60.00
                  TIME SHIFT OF PEAK FLOW          (min)=  0.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0007

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   2.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  61.00   Dir. Conn.(%)=  43.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.26         0.80
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       2.50         2.50
     Length            (m)=     117.19        39.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     140.94        36.31
               over (min)          5.00        15.00
     Storage Coeff.  (min)=       1.44 (ii)    5.40 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.33         0.21
                                                              *TOTALS*
     PEAK FLOW       (cms)=       0.34         0.08           0.420 (iii)
     TIME TO PEAK    (hrs)=       3.67         3.67            3.67
     RUNOFF VOLUME    (mm)=      44.94         4.14           21.69
     TOTAL RAINFALL   (mm)=      45.45        45.45           45.45
     RUNOFF COEFFICIENT   =       0.99         0.09            0.48

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   5.55
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  40.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.78          2.78
     Dep. Storage     (mm)=       0.51          0.51
     Average Slope     (%)=       2.50          2.50
     Length            (m)=     192.35         40.00
     Mannings n            =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     140.94         35.92
               over (min)         5.00         15.00
     Storage Coeff.  (min)=       1.92 (ii)     8.16 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.31          0.13
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.83          0.21          0.930 (iii)
     TIME TO PEAK    (hrs)=       3.67          3.75           3.67
     RUNOFF VOLUME    (mm)=      44.94          4.99          20.97
     TOTAL RAINFALL   (mm)=      45.45         45.45          45.45
     RUNOFF COEFFICIENT   =       0.99          0.11           0.46

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0001)|   Area    (ha)=   0.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  35.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.00          0.00
     Dep. Storage     (mm)=       0.99          1.50
     Average Slope     (%)=       1.00          2.00
     Length            (m)=       0.00         40.00
     Mannings n            =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     140.94         76.30
               over (min)         5.00         10.00
     Storage Coeff.  (min)=       0.00 (ii)     7.86 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.34          0.17
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.00          0.00          0.000 (iii)
     TIME TO PEAK    (hrs)=       0.00          0.00           0.00
     RUNOFF VOLUME    (mm)=        NaN           NaN            NaN
     TOTAL RAINFALL   (mm)=      45.45         45.45          45.45
     RUNOFF COEFFICIENT   =        NaN           NaN            NaN

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  85.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0213)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0001 <ID= 1> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0213 = HYDROGRAPH 0011
        ID1= 1 (  0001):     0.00   0.000     0.00      NaN
      + ID2= 2 (  0011):     0.62   0.060     3.67    18.68
        ==================================================
        ID = 3 (  0213):     0.62   0.060     3.67    18.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0500)|
```

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0213):     0.62   0.060     3.67    18.68
      + ID2= 2 (  0201):     2.06   0.420     3.67    21.69
        ================================================
        ID = 3 (  0500):     2.68   0.480     3.67    20.99

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0500)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0500):     2.68   0.480     3.67    20.99
      + ID2= 2 (  0202):     5.55   0.930     3.67    20.97
        ================================================
        ID = 1 (  0500):     8.23   1.410     3.67    20.98

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=  11.37
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.23          1.14
     Dep. Storage     (mm)=       0.51          5.08
     Average Slope     (%)=       3.00          3.00
     Length            (m)=     275.29         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     140.94      ********
               over (min)         5.00          5.00
     Storage Coeff.  (min)=       2.13 (ii)     9.12 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.31          0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       3.75          0.00          3.750 (iii)
     TIME TO PEAK    (hrs)=       3.67          0.00           3.67
     RUNOFF VOLUME    (mm)=      44.94          0.00          40.45
     TOTAL RAINFALL   (mm)=      45.45         45.45          45.45
     RUNOFF COEFFICIENT   =       0.99          0.00           0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0203)|   Area    (ha)=   1.79
|ID= 1 DT= 5.0 min |   Total Imp(%)=  95.00   Dir. Conn.(%)=  95.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.70          0.09
     Dep. Storage     (mm)=       1.27          5.08
     Average Slope     (%)=       0.30          0.30
     Length            (m)=     109.21         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     140.94      ********
               over (min)         5.00         10.00
     Storage Coeff.  (min)=       2.65 (ii)    20.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00         20.00
     Unit Hyd. peak  (cms)=       0.29          0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.60          0.00          0.597 (iii)
     TIME TO PEAK    (hrs)=       3.67          0.00           3.67
     RUNOFF VOLUME    (mm)=      44.18          0.00          41.97
     TOTAL RAINFALL   (mm)=      45.45         45.45          45.45
     RUNOFF COEFFICIENT   =       0.97          0.00           0.92

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
```

```
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0203)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.5300      0.0100
                          0.5000     0.0050   |   1.5400      3.0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0203)      1.789      0.597      3.67      41.97
   OUTFLOW: ID= 1 (  0203)      1.789      0.464      3.75      41.97

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 77.75
                  TIME SHIFT OF PEAK FLOW         (min)=  5.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0067

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0211)|   Area    (ha)=   1.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.90         0.90
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       3.00         3.00
     Length            (m)=     109.57        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     140.94         0.00
               over (min)         5.00       175.00
     Storage Coeff.  (min)=       1.32 (ii)    6.48 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.33         0.18
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.35         0.00          0.347 (iii)
     TIME TO PEAK    (hrs)=       3.67         0.00           3.67
     RUNOFF VOLUME    (mm)=      44.94         0.00          22.47
     TOTAL RAINFALL   (mm)=      45.45        45.45          45.45
     RUNOFF COEFFICIENT   =       0.99         0.00           0.49

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0500)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0203):     1.79   0.464     3.75    41.97
      + ID2= 2 (  0204):    11.37   3.750     3.67    40.45
        ==================================================
        ID = 3 (  0500):    13.16   4.202     3.67    40.66

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0500)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0500):    13.16   4.202     3.67    40.66
      + ID2= 2 (  0211):     1.80   0.347     3.67    22.47
        ==================================================
        ID = 1 (  0500):    14.96   4.550     3.67    38.47

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
```

```
--------------------
| ADD HYD  (  0500)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0500):    14.96   4.550     3.67    38.47
     + ID2= 2 (  0500):     8.23   1.410     3.67    20.98
       ================================================
       ID = 3 (  0500):    23.19   5.960     3.67    32.26

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0021)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.4080      0.8210

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0500)     23.189      5.960      3.67      32.26
   OUTFLOW: ID= 1 (  0021)     23.189      0.285      4.67      32.24

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  4.79
                  TIME SHIFT OF PEAK FLOW          (min)= 60.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.5745

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0106)|   Area    (ha)=   3.56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  66.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.35         1.21
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       3.00         3.00
     Length            (m)=     154.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     140.94     ********
               over (min)          5.00        10.00
     Storage Coeff.  (min)=       2.04 (ii)   16.50 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.31         0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.87         0.00          0.867 (iii)
     TIME TO PEAK    (hrs)=       3.67         0.00           3.67
     RUNOFF VOLUME    (mm)=      44.94         0.00          29.66
     TOTAL RAINFALL   (mm)=      45.45        45.45          45.45
     RUNOFF COEFFICIENT   =       0.99         0.00           0.65

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0023)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0106):     3.56   0.867     3.67    29.66
     + ID2= 2 (  0021):    23.19   0.285     4.67    32.24
       ================================================
       ID = 3 (  0023):    26.75   0.999     3.67    31.89

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

 FINISH
================================================================================================================
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```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2006)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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```

***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\jpawar\AppData\Local\Civica\VH5\2b3c193d-6de5-462d-b715-9837f51ac3f4\04779d20-9ac
Summary filename: C:\Users\jpawar\AppData\Local\Civica\VH5\2b3c193d-6de5-462d-b715-9837f51ac3f4\04779d20-9ac

DATE: 01/20/2023 TIME: 12:27:31

USER:

COMMENTS: _____

****
** SIMULATION : Storm Input_100yr **
****

READ STORM	Filename: C:\Users\jpawar\AppData\Local\Temp\011b497e-197f-41c5-b32b-228a782123b3\d3518e5d
Ptotal= 63.48 mm	Comments: Storm Input_100yr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	0.00	1.42	0.00	2.75	8.38	4.08	10.16
0.17	0.00	1.50	0.00	2.83	9.65	4.17	9.40
0.25	0.00	1.58	0.00	2.92	11.43	4.25	8.64
0.33	0.00	1.67	0.00	3.00	13.97	4.33	8.13
0.42	0.00	1.75	0.00	3.08	18.29	4.42	7.62
0.50	0.00	1.83	0.00	3.17	27.69	4.50	7.11
0.58	0.00	1.92	0.00	3.25	62.74	4.58	6.60
0.67	0.00	2.00	0.00	3.33	256.54	4.67	6.35
0.75	0.00	2.08	0.00	3.42	76.20	4.75	6.10
0.83	0.00	2.17	0.00	3.50	39.62	4.83	5.84
0.92	0.00	2.25	4.83	3.58	27.18	4.92	5.59
1.00	0.00	2.33	5.33	3.67	20.83	5.00	5.08
1.08	0.00	2.42	5.59	3.75	17.27	5.08	5.08
1.17	0.00	2.50	6.35	3.83	14.73	5.17	4.83
1.25	0.00	2.58	6.86	3.92	12.70		
1.33	0.00	2.67	7.62	4.00	11.43		

CALIB	
STANDHYD (0213)	Area (ha)= 0.72
ID= 1 DT= 5.0 min	Total Imp(%)= 50.00 Dir. Conn.(%)= 40.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.36	0.36
Dep. Storage	(mm)=	0.51	5.08
Average Slope	(%)=	2.50	2.50
Length	(m)=	69.28	40.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=	over (min)	256.54	********
		5.00	10.00
Storage Coeff.	(min)=	1.02 (ii)	5.88 (ii)
Unit Hyd. Tpeak	(min)=	5.00	5.00
Unit Hyd. peak	(cms)=	0.34	0.19

```
                                                                  *TOTALS*
     PEAK FLOW       (cms)=       0.20         0.09           0.297 (iii)
     TIME TO PEAK    (hrs)=       3.33         3.33            3.33
     RUNOFF VOLUME    (mm)=      62.97        12.56           32.72
     TOTAL RAINFALL   (mm)=      63.48        63.48           63.48
     RUNOFF COEFFICIENT   =       0.99         0.20            0.52

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0011)|
| Inlet Cap.= 0.060|
| #of Inlets=     1|
| Total(cms)=   0.1|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   0.72      0.30      3.33   32.72
     ====================================================
     MAJOR SYS.(ID= 2):   0.27      0.24      3.33   32.72
     MINOR SYS.(ID= 3):   0.45      0.06      3.33   32.72

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0012)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.5300      0.0100
                          0.5000     0.0050   |   1.5400      3.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)      0.265      0.237      3.33      32.72
   OUTFLOW: ID= 1 (  0012)      0.265      0.145      3.42      32.77

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 61.27
                  TIME SHIFT OF PEAK FLOW         (min)=  5.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0028

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   2.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  61.00   Dir. Conn.(%)=  43.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.26         0.80
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       2.50         2.50
     Length            (m)=     117.19        39.60
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     256.54       140.75
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.44 (ii)    5.40 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.33         0.21
                                                                  *TOTALS*
     PEAK FLOW       (cms)=       0.62         0.32           0.936 (iii)
     TIME TO PEAK    (hrs)=       3.33         3.33            3.33
     RUNOFF VOLUME    (mm)=      62.97        16.07           36.24
     TOTAL RAINFALL   (mm)=      63.48        63.48           63.48
     RUNOFF COEFFICIENT   =       0.99         0.25            0.57

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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```
| CALIB             |
| STANDHYD (  0202)|   Area    (ha)=   5.55
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  40.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.78          2.78
     Dep. Storage     (mm)=       0.51          0.51
     Average Slope     (%)=       2.50          2.50
     Length            (m)=     192.35         40.00
     Mannings n            =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     256.54        117.86
               over (min)          5.00         10.00
     Storage Coeff.  (min)=       1.92 (ii)     8.16 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.31          0.13
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.49          0.65          1.804 (iii)
     TIME TO PEAK    (hrs)=       3.33          3.42           3.33
     RUNOFF VOLUME    (mm)=      62.97         16.37          35.01
     TOTAL RAINFALL   (mm)=      63.48         63.48          63.48
     RUNOFF COEFFICIENT   =       0.99          0.26           0.55

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD (  0001)|   Area    (ha)=   0.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  35.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.00          0.00
     Dep. Storage     (mm)=       0.99          1.50
     Average Slope     (%)=       1.00          2.00
     Length            (m)=       0.00         40.00
     Mannings n            =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     256.54        148.01
               over (min)          5.00         10.00
     Storage Coeff.  (min)=       0.00 (ii)     6.03 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.34          0.18
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.00          0.00          0.000 (iii)
     TIME TO PEAK    (hrs)=       0.00          0.00           0.00
     RUNOFF VOLUME    (mm)=        NaN           NaN            NaN
     TOTAL RAINFALL   (mm)=      63.48         63.48          63.48
     RUNOFF COEFFICIENT   =        NaN           NaN            NaN

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  85.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0213)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0001 <ID= 1> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0213 = HYDROGRAPH 0011
       ID1= 1 (  0001):     0.00   0.000     0.00      NaN
     + ID2= 2 (  0011):     0.45   0.060     3.33    32.72
       ==========================================
       ID = 3 (  0213):     0.45   0.060     3.33    32.72

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0500)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
```

```
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0213):     0.45   0.060     3.33    32.72
      + ID2= 2 (  0201):     2.06   0.936     3.33    36.24
        ================================================
        ID = 3 (  0500):     2.51   0.996     3.33    35.60

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------


--------------------
| ADD HYD  (  0500)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0500):     2.51   0.996     3.33    35.60
      + ID2= 2 (  0202):     5.55   1.804     3.33    35.01
        ================================================
        ID = 1 (  0500):     8.06   2.800     3.33    35.19

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=  11.37
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.23          1.14
     Dep. Storage     (mm)=       0.51          5.08
     Average Slope     (%)=       3.00          3.00
     Length            (m)=     275.29         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     256.54         52.71
               over (min)          5.00          5.00
     Storage Coeff.  (min)=       2.13 (ii)     9.12 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.31          0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       6.75          0.12          6.813 (iii)
     TIME TO PEAK    (hrs)=       3.33          3.42           3.33
     RUNOFF VOLUME    (mm)=      62.97          8.79          57.55
     TOTAL RAINFALL   (mm)=      63.48         63.48          63.48
     RUNOFF COEFFICIENT   =       0.99          0.14           0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0203)|   Area    (ha)=   1.79
|ID= 1 DT= 5.0 min |   Total Imp(%)=  95.00   Dir. Conn.(%)=  95.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.70          0.09
     Dep. Storage     (mm)=       1.27          5.08
     Average Slope     (%)=       0.30          0.30
     Length            (m)=     109.21         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     256.54         52.71
               over (min)          5.00         10.00
     Storage Coeff.  (min)=       2.65 (ii)    20.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00         20.00
     Unit Hyd. peak  (cms)=       0.29          0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.07          0.00          1.070 (iii)
     TIME TO PEAK    (hrs)=       3.33          3.58           3.33
     RUNOFF VOLUME    (mm)=      62.21          8.79          59.53
     TOTAL RAINFALL   (mm)=      63.48         63.48          63.48
     RUNOFF COEFFICIENT   =       0.98          0.14           0.94

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
```

```
          THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0203)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.5300      0.0100
                          0.5000     0.0050   |   1.5400      3.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0203)      1.789      1.070      3.33      59.53
   OUTFLOW: ID= 1 (  0203)      1.789      0.829      3.33      59.54

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 77.46
                  TIME SHIFT OF PEAK FLOW          (min)=  0.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0102

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0211)|   Area    (ha)=   1.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.90         0.90
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       3.00         3.00
     Length            (m)=     109.57        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     256.54        52.71
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.32 (ii)    6.48 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.33         0.18
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.63         0.14          0.772 (iii)
     TIME TO PEAK    (hrs)=       3.33         3.33           3.33
     RUNOFF VOLUME    (mm)=      62.97         8.78          35.88
     TOTAL RAINFALL   (mm)=      63.48        63.48          63.48
     RUNOFF COEFFICIENT   =       0.99         0.14           0.57

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0500)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0203):     1.79   0.829     3.33    59.54
     + ID2= 2 (  0204):    11.37   6.813     3.33    57.55
       ================================================
       ID = 3 (  0500):    13.16   7.642     3.33    57.82

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0500)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0500):    13.16   7.642     3.33    57.82
     + ID2= 2 (  0211):     1.80   0.772     3.33    35.88
       ================================================
       ID = 1 (  0500):    14.96   8.414     3.33    55.18

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0500)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
```

```
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0500):    14.96   8.414     3.33    55.18
      + ID2= 2 (  0500):     8.06   2.800     3.33    35.19
        ================================================
        ID = 3 (  0500):    23.02  11.214     3.33    48.18

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0021)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.4080      0.8210

                                    AREA     QPEAK     TPEAK       R.V.
                                    (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0500)     23.023     11.214      3.33      48.18
   OUTFLOW: ID= 1 (  0021)     23.023      0.430      4.17      48.16

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  3.83
                  TIME SHIFT OF PEAK FLOW         (min)= 50.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.8652

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0106)|   Area    (ha)=   3.56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  66.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.35         1.21
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       3.00         3.00
     Length            (m)=     154.08        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     256.54        52.71
               over (min)          5.00        10.00
     Storage Coeff.  (min)=       2.04 (ii)   16.50 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.31         0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.56         0.07          1.589 (iii)
     TIME TO PEAK    (hrs)=       3.33         3.50           3.33
     RUNOFF VOLUME    (mm)=      62.97         8.79          44.55
     TOTAL RAINFALL   (mm)=      63.48        63.48          63.48
     RUNOFF COEFFICIENT   =       0.99         0.14           0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0023)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0106):     3.56   1.589     3.33    44.55
      + ID2= 2 (  0021):    23.02   0.430     4.17    48.16
        ================================================
        ID = 3 (  0023):    26.58   1.782     3.33    47.67

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
```

Updated Existing

```
==========================================================================================================

       V    V   I    SSSSS  U   U    A    L             (v 6.2.2006)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\jpawar\AppData\Local\Civica\VH5\2b3c193d-6de5-462d-b715-9837f51ac3f4\0c702644-8a3
  Summary filename: C:\Users\jpawar\AppData\Local\Civica\VH5\2b3c193d-6de5-462d-b715-9837f51ac3f4\0c702644-8a3


DATE: 01/31/2023                          TIME: 01:36:26

USER:



COMMENTS: _____________________________________________________________

----------------------------------------------------------------------------------------------------------
  ***********************************************
  ** SIMULATION : Run 04                       **
  ***********************************************


--------------------
|    READ STORM    |    Filename: C:\Users\jpawar\AppD
|                  |              ata\Local\Temp\
|                  |              179505be-72a9-4dbd-b4c0-49d4ac8fe091\36b9e3a1
| Ptotal= 45.45 mm |    Comments: Storm Input_5yr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.08    0.00 |  1.50    0.00 |  2.92    5.38 |  4.33    9.14
                0.17    0.00 |  1.58    0.00 |  3.00    5.97 |  4.42    8.23
                0.25    0.00 |  1.67    0.00 |  3.08    6.73 |  4.50    7.52
                0.33    0.00 |  1.75    0.00 |  3.17    7.75 |  4.58    6.91
                0.42    0.00 |  1.83    0.00 |  3.25    9.17 |  4.67    6.40
                0.50    0.00 |  1.92    0.00 |  3.33   11.33 |  4.75    5.97
                0.58    0.00 |  2.00    0.00 |  3.42   15.04 |  4.83    5.61
                0.67    0.00 |  2.08    0.00 |  3.50   22.81 |  4.92    5.28
                0.75    0.00 |  2.17    0.00 |  3.58   49.53 |  5.00    5.00
                0.83    0.00 |  2.25    0.00 |  3.67  140.94 |  5.08    4.75
                0.92    0.00 |  2.33    0.00 |  3.75   59.18 |  5.17    4.52
                1.00    0.00 |  2.42    0.00 |  3.83   32.59 |  5.25    4.32
                1.08    0.00 |  2.50    0.00 |  3.92   22.48 |  5.33    4.14
                1.17    0.00 |  2.58    3.91 |  4.00   17.22 |  5.42    3.96
                1.25    0.00 |  2.67    4.19 |  4.08   14.02 |  5.50    3.81
                1.33    0.00 |  2.75    4.52 |  4.17   11.86 |
                1.42    0.00 |  2.83    4.90 |  4.25   10.31 |

--------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD (  0213)|   Area    (ha)=   0.72
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  40.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.36         0.36
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       2.50         2.50
     Length            (m)=      69.28        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     140.94         2.83
               over (min)          5.00        30.00
     Storage Coeff.  (min)=        1.02 (ii)    5.88 (ii)
     Unit Hyd. Tpeak (min)=        5.00         5.00
```

```
     Unit Hyd. peak  (cms)=       0.34         0.19
                                                              *TOTALS*
     PEAK FLOW       (cms)=       0.11         0.01           0.122 (iii)
     TIME TO PEAK    (hrs)=       3.67         3.67            3.67
     RUNOFF VOLUME    (mm)=      44.94         1.18           18.68
     TOTAL RAINFALL   (mm)=      45.45        45.45           45.45
     RUNOFF COEFFICIENT   =       0.99         0.03            0.41

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0011)|
| Inlet Cap.= 0.060|
| #of Inlets=     1|
| Total(cms)=   0.1|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   0.72      0.12      3.67   18.68
     ==========================================================
     MAJOR SYS.(ID= 2):   0.10      0.06      3.67   18.68
     MINOR SYS.(ID= 3):   0.62      0.06      3.67   18.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0012)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.5300      0.0100
                          0.5000     0.0050   |   1.5400      3.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)      0.099      0.062      3.67      18.68
   OUTFLOW: ID= 1 (  0012)      0.099      0.037      3.67      20.18

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 60.00
                  TIME SHIFT OF PEAK FLOW          (min)=  0.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0007

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   2.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  61.00   Dir. Conn.(%)=  43.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.26         0.80
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       2.50         2.50
     Length            (m)=     117.19        39.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     140.94        36.31
               over (min)          5.00        15.00
     Storage Coeff.  (min)=       1.44 (ii)    5.40 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.33         0.21
                                                              *TOTALS*
     PEAK FLOW       (cms)=       0.34         0.08           0.420 (iii)
     TIME TO PEAK    (hrs)=       3.67         3.67            3.67
     RUNOFF VOLUME    (mm)=      44.94         4.14           21.69
     TOTAL RAINFALL   (mm)=      45.45        45.45           45.45
     RUNOFF COEFFICIENT   =       0.99         0.09            0.48

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
```

```
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  48.00   Dir. Conn.(%)=  38.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.91          2.06
     Dep. Storage     (mm)=       0.51          0.51
     Average Slope     (%)=       2.50          2.50
     Length            (m)=     162.69         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     140.94         23.53
               over (min)          5.00         15.00
     Storage Coeff.  (min)=       1.92 (ii)     8.16 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.31          0.13
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.56          0.15          0.637 (iii)
     TIME TO PEAK    (hrs)=       3.67          3.75           3.67
     RUNOFF VOLUME    (mm)=      44.94          4.93          20.14
     TOTAL RAINFALL   (mm)=      45.45         45.45          45.45
     RUNOFF COEFFICIENT   =       0.99          0.11           0.44

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0001)|   Area    (ha)=   0.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  35.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.00          0.00
     Dep. Storage     (mm)=       0.99          1.50
     Average Slope     (%)=       1.00          2.00
     Length            (m)=       0.00         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     140.94         76.30
               over (min)          5.00         10.00
     Storage Coeff.  (min)=       0.00 (ii)     7.86 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.34          0.17
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.00          0.00          0.000 (iii)
     TIME TO PEAK    (hrs)=       0.00          0.00           0.00
     RUNOFF VOLUME    (mm)=        NaN           NaN            NaN
     TOTAL RAINFALL   (mm)=      45.45         45.45          45.45
     RUNOFF COEFFICIENT   =        NaN           NaN            NaN

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  85.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0213)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0001 <ID= 1> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0213 = HYDROGRAPH 0011
        ID1= 1 (  0001):     0.00   0.000     0.00      NaN
      + ID2= 2 (  0011):     0.62   0.060     3.67    18.68
        ================================================
        ID = 3 (  0213):     0.62   0.060     3.67    18.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  2022)|   Area    (ha)=   1.32
```

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  48.00   Dir. Conn.(%)=  38.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.63         0.69
     Dep. Storage     (mm)=       0.51         0.51
     Average Slope     (%)=       2.50         2.50
     Length            (m)=      93.81        40.00
     Mannings n             =    0.013        0.250

     Max.Eff.Inten.(mm/hr)=     140.94        23.53
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       1.92 (ii)    8.16 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.19         0.05          0.212 (iii)
     TIME TO PEAK    (hrs)=       3.67         3.75           3.67
     RUNOFF VOLUME    (mm)=      44.94         4.93          20.14
     TOTAL RAINFALL   (mm)=      45.45        45.45          45.45
     RUNOFF COEFFICIENT   =       0.99         0.11           0.44

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  2000)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0213):     0.62   0.060     3.67    18.68
      + ID2= 2 (  0202):     3.97   0.637     3.67    20.14
        ================================================
        ID = 3 (  2000):     4.59   0.697     3.67    19.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  2000)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  2000):     4.59   0.697     3.67    19.94
      + ID2= 2 (  2022):     1.32   0.212     3.67    20.14
        ================================================
        ID = 1 (  2000):     5.91   0.909     3.67    19.98

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  2021)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.23         0.03
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       2.50         2.50
     Length            (m)=      41.63        40.00
     Mannings n             =    0.013        0.250

     Max.Eff.Inten.(mm/hr)=     140.94     ********
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.44 (ii)    5.40 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.33         0.21
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.09         0.00          0.090 (iii)
     TIME TO PEAK    (hrs)=       3.67         0.00           3.67
     RUNOFF VOLUME    (mm)=      44.94         0.00          40.44
     TOTAL RAINFALL   (mm)=      45.45        45.45          45.45
     RUNOFF COEFFICIENT   =       0.99         0.00           0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
```

```
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0500)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  2000):     5.91   0.909     3.67    19.98
      + ID2= 2 (  0201):     2.06   0.420     3.67    21.69
        ================================================
        ID = 3 (  0500):     7.97   1.329     3.67    20.42

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0500)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0500):     7.97   1.329     3.67    20.42
      + ID2= 2 (  2021):     0.26   0.090     3.67    40.44
        ================================================
        ID = 1 (  0500):     8.23   1.419     3.67    21.06

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=  11.37
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.23          1.14
     Dep. Storage     (mm)=       0.51          5.08
     Average Slope     (%)=       3.00          3.00
     Length            (m)=     275.29         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     140.94      ********
               over (min)         5.00          5.00
     Storage Coeff.  (min)=       2.13 (ii)     9.12 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.31          0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       3.75          0.00          3.750 (iii)
     TIME TO PEAK    (hrs)=       3.67          0.00           3.67
     RUNOFF VOLUME    (mm)=      44.94          0.00          40.45
     TOTAL RAINFALL   (mm)=      45.45         45.45          45.45
     RUNOFF COEFFICIENT   =       0.99          0.00           0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0211)|   Area    (ha)=   1.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.90          0.90
     Dep. Storage     (mm)=       0.51          5.08
     Average Slope     (%)=       3.00          3.00
     Length            (m)=     109.57         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     140.94          0.00
               over (min)         5.00        175.00
     Storage Coeff.  (min)=       1.32 (ii)     6.48 (ii)
     Unit Hyd. Tpeak (min)=       5.00          5.00
     Unit Hyd. peak  (cms)=       0.33          0.18
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.35          0.00          0.347 (iii)
```

```
     TIME TO PEAK    (hrs)=       3.67         0.00          3.67
     RUNOFF VOLUME    (mm)=      44.94         0.00         22.47
     TOTAL RAINFALL   (mm)=      45.45        45.45         45.45
     RUNOFF COEFFICIENT   =       0.99         0.00          0.49

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD (  0203)|   Area    (ha)=   1.79
|ID= 1 DT= 5.0 min |   Total Imp(%)=  95.00   Dir. Conn.(%)=  95.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.70         0.09
     Dep. Storage     (mm)=       1.27         5.08
     Average Slope     (%)=       0.30         0.30
     Length            (m)=     109.21        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     140.94     ********
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.65 (ii)   20.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.29         0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.60         0.00          0.597 (iii)
     TIME TO PEAK    (hrs)=       3.67         0.00           3.67
     RUNOFF VOLUME    (mm)=      44.18         0.00          41.97
     TOTAL RAINFALL   (mm)=      45.45        45.45          45.45
     RUNOFF COEFFICIENT   =       0.97         0.00           0.92

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0203)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.5300      0.0100
                          0.5000     0.0050   |   1.5400      3.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0203)      1.789     0.597      3.67       41.97
   OUTFLOW: ID= 1 (  0203)      1.789     0.464      3.75       41.97

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 77.75
                  TIME SHIFT OF PEAK FLOW         (min)=  5.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0067

------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0500)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0203):     1.79   0.464     3.75    41.97
     + ID2= 2 (  0204):    11.37   3.750     3.67    40.45
       ==================================================
       ID = 3 (  0500):    13.16   4.202     3.67    40.66

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0500)|
```

```
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
------------------           (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0500):    13.16   4.202     3.67    40.66
      + ID2= 2 (  0211):     1.80   0.347     3.67    22.47
        ================================================
        ID = 1 (  0500):    14.96   4.550     3.67    38.47

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------


-------------------
| ADD HYD  (  0500)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------           (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0500):    14.96   4.550     3.67    38.47
      + ID2= 2 (  0500):     8.23   1.419     3.67    21.06
        ================================================
        ID = 3 (  0500):    23.19   5.968     3.67    32.29

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
-------------------
| RESERVOIR(  0021)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.4080      0.8210

                                    AREA     QPEAK     TPEAK       R.V.
                                    (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0500)     23.189      5.968      3.67      32.29
   OUTFLOW: ID= 1 (  0021)     23.189      0.286      4.67      32.26

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  4.79
                  TIME SHIFT OF PEAK FLOW         (min)= 60.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.5750

--------------------------------------------------------------------------------
-------------------
| CALIB            |
| STANDHYD (  0106)|   Area    (ha)=   3.56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  66.00
-------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.35         1.21
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       3.00         3.00
     Length            (m)=     154.08        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     140.94     ********
               over (min)          5.00        10.00
     Storage Coeff.  (min)=       2.04 (ii)   16.50 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.31         0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.87         0.00          0.867 (iii)
     TIME TO PEAK    (hrs)=       3.67         0.00           3.67
     RUNOFF VOLUME    (mm)=      44.94         0.00          29.66
     TOTAL RAINFALL   (mm)=      45.45        45.45          45.45
     RUNOFF COEFFICIENT   =       0.99         0.00           0.65

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| ADD HYD  (  0023)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------           (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0106):     3.56   0.867     3.67    29.66
      + ID2= 2 (  0021):    23.19   0.286     4.67    32.26
        ================================================
        ID = 3 (  0023):    26.75   0.999     3.67    31.92

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

FINISH

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```
       V    V   I    SSSSS  U   U    A    L              (v 6.2.2006)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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```

***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\jpawar\AppData\Local\Civica\VH5\2b3c193d-6de5-462d-b715-9837f51ac3f4\48981463-eb7
Summary filename: C:\Users\jpawar\AppData\Local\Civica\VH5\2b3c193d-6de5-462d-b715-9837f51ac3f4\48981463-eb7

DATE: 01/20/2023 TIME: 01:00:16

USER:

COMMENTS: _____

****
** SIMULATION : Storm Input_100yr **
****

READ STORM	Filename: C:\Users\jpawar\AppData\Local\Temp\2c65bffc-3003-4575-aa29-c47b12efffdb\d3518e5d
Ptotal= 63.48 mm	Comments: Storm Input_100yr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	0.00	1.42	0.00	2.75	8.38	4.08	10.16
0.17	0.00	1.50	0.00	2.83	9.65	4.17	9.40
0.25	0.00	1.58	0.00	2.92	11.43	4.25	8.64
0.33	0.00	1.67	0.00	3.00	13.97	4.33	8.13
0.42	0.00	1.75	0.00	3.08	18.29	4.42	7.62
0.50	0.00	1.83	0.00	3.17	27.69	4.50	7.11
0.58	0.00	1.92	0.00	3.25	62.74	4.58	6.60
0.67	0.00	2.00	0.00	3.33	256.54	4.67	6.35
0.75	0.00	2.08	0.00	3.42	76.20	4.75	6.10
0.83	0.00	2.17	0.00	3.50	39.62	4.83	5.84
0.92	0.00	2.25	4.83	3.58	27.18	4.92	5.59
1.00	0.00	2.33	5.33	3.67	20.83	5.00	5.08
1.08	0.00	2.42	5.59	3.75	17.27	5.08	5.08
1.17	0.00	2.50	6.35	3.83	14.73	5.17	4.83
1.25	0.00	2.58	6.86	3.92	12.70		
1.33	0.00	2.67	7.62	4.00	11.43		

CALIB	
STANDHYD (0213)	Area (ha)= 0.72
ID= 1 DT= 5.0 min	Total Imp(%)= 50.00 Dir. Conn.(%)= 40.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.36	0.36
Dep. Storage	(mm)=	0.51	5.08
Average Slope	(%)=	2.50	2.50
Length	(m)=	69.28	40.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=	over (min)	256.54	90.43
		5.00	10.00
Storage Coeff.	(min)=	1.02 (ii)	5.88 (ii)
Unit Hyd. Tpeak	(min)=	5.00	5.00
Unit Hyd. peak	(cms)=	0.34	0.19

```
                                                                  *TOTALS*
     PEAK FLOW       (cms)=       0.20         0.09           0.297 (iii)
     TIME TO PEAK    (hrs)=       3.33         3.33            3.33
     RUNOFF VOLUME    (mm)=      62.97        12.56           32.72
     TOTAL RAINFALL   (mm)=      63.48        63.48           63.48
     RUNOFF COEFFICIENT   =       0.99         0.20            0.52

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| DUHYD    (  0011)|
| Inlet Cap.= 0.060|
| #of Inlets=     1|
| Total(cms)=   0.1|      AREA     QPEAK     TPEAK    R.V.
--------------------      (ha)     (cms)     (hrs)    (mm)
     TOTAL HYD.(ID= 1):   0.72      0.30      3.33   32.72
     ====================================================
     MAJOR SYS.(ID= 2):   0.27      0.24      3.33   32.72
     MINOR SYS.(ID= 3):   0.45      0.06      3.33   32.72

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0012)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.5300      0.0100
                          0.5000     0.0050   |   1.5400      3.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)      0.265      0.237      3.33      32.72
   OUTFLOW: ID= 1 (  0012)      0.265      0.145      3.42      32.77

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 61.27
                  TIME SHIFT OF PEAK FLOW         (min)=  5.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0028

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0201)|   Area    (ha)=   2.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  61.00   Dir. Conn.(%)=  43.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.26         0.80
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       2.50         2.50
     Length            (m)=     117.19        39.60
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     256.54       140.75
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.44 (ii)    5.40 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.33         0.21
                                                                  *TOTALS*
     PEAK FLOW       (cms)=       0.62         0.32           0.936 (iii)
     TIME TO PEAK    (hrs)=       3.33         3.33            3.33
     RUNOFF VOLUME    (mm)=      62.97        16.07           36.24
     TOTAL RAINFALL   (mm)=      63.48        63.48           63.48
     RUNOFF COEFFICIENT   =       0.99         0.25            0.57

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB             |
| STANDHYD (  0202)|   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  48.00   Dir. Conn.(%)=  38.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.91          2.06
     Dep. Storage     (mm)=       0.51          0.51
     Average Slope     (%)=       2.50          2.50
     Length            (m)=     162.69         40.00
     Mannings n            =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     256.54        116.39
               over (min)        5.00         10.00
     Storage Coeff.  (min)=       1.92 (ii)     8.16 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.31          0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.01          0.48          1.244 (iii)
     TIME TO PEAK    (hrs)=       3.33          3.42           3.33
     RUNOFF VOLUME    (mm)=      62.97         16.27          34.02
     TOTAL RAINFALL   (mm)=      63.48         63.48          63.48
     RUNOFF COEFFICIENT   =       0.99          0.26           0.54

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD (  0001)|   Area    (ha)=   0.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  35.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.00          0.00
     Dep. Storage     (mm)=       0.99          1.50
     Average Slope     (%)=       1.00          2.00
     Length            (m)=       0.00         40.00
     Mannings n            =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     256.54        148.01
               over (min)        5.00         10.00
     Storage Coeff.  (min)=       0.00 (ii)     6.03 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.34          0.18
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.00          0.00          0.000 (iii)
     TIME TO PEAK    (hrs)=       0.00          0.00           0.00
     RUNOFF VOLUME    (mm)=        NaN           NaN            NaN
     TOTAL RAINFALL   (mm)=      63.48         63.48          63.48
     RUNOFF COEFFICIENT   =        NaN           NaN            NaN

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  85.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0213)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0001 <ID= 1> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0213 = HYDROGRAPH 0011
       ID1= 1 (  0001):     0.00   0.000     0.00      NaN
     + ID2= 2 (  0011):     0.45   0.060     3.33    32.72
       ==========================================
       ID = 3 (  0213):     0.45   0.060     3.33    32.72

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD (  2022)|   Area    (ha)=   1.32
|ID= 1 DT= 5.0 min |   Total Imp(%)=  48.00   Dir. Conn.(%)=  38.00
```

```
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.63         0.69
     Dep. Storage     (mm)=       0.51         0.51
     Average Slope     (%)=       2.50         2.50
     Length            (m)=      93.81        40.00
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     256.54       116.39
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.92 (ii)    8.16 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.34         0.16         0.414 (iii)
     TIME TO PEAK    (hrs)=       3.33         3.42          3.33
     RUNOFF VOLUME    (mm)=      62.97        16.27         34.01
     TOTAL RAINFALL   (mm)=      63.48        63.48         63.48
     RUNOFF COEFFICIENT   =       0.99         0.26          0.54

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  2000)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0213):     0.45   0.060     3.33    32.72
     + ID2= 2 (  0202):     3.97   1.244     3.33    34.02
       ================================================
       ID = 3 (  2000):     4.42   1.304     3.33    33.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  2000)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  2000):     4.42   1.304     3.33    33.88
     + ID2= 2 (  2022):     1.32   0.414     3.33    34.01
       ================================================
       ID = 1 (  2000):     5.74   1.717     3.33    33.91

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  2021)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.23         0.03
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       2.50         2.50
     Length            (m)=      41.63        40.00
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     256.54        52.71
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.44 (ii)    5.40 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.33         0.21
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.16         0.00         0.167 (iii)
     TIME TO PEAK    (hrs)=       3.33         3.33          3.33
     RUNOFF VOLUME    (mm)=      62.97         8.79         57.54
     TOTAL RAINFALL   (mm)=      63.48        63.48         63.48
     RUNOFF COEFFICIENT   =       0.99         0.14          0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
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          THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  2001)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  2000):     5.74   1.717     3.33    33.91
      + ID2= 2 (  0201):     2.06   0.936     3.33    36.24
        ================================================
        ID = 3 (  2001):     7.80   2.653     3.33    34.53

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  2001)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  2001):     7.80   2.653     3.33    34.53
      + ID2= 2 (  2021):     0.26   0.167     3.33    57.54
        ================================================
        ID = 1 (  2001):     8.06   2.820     3.33    35.27

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0204)|   Area    (ha)=  11.37
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.23          1.14
     Dep. Storage     (mm)=       0.51          5.08
     Average Slope     (%)=       3.00          3.00
     Length            (m)=     275.29         40.00
     Mannings n             =     0.013         0.250

     Max.Eff.Inten.(mm/hr)=     256.54         52.71
               over (min)          5.00          5.00
     Storage Coeff.  (min)=       2.13 (ii)     9.12 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.31          0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       6.75          0.12          6.813 (iii)
     TIME TO PEAK    (hrs)=       3.33          3.42           3.33
     RUNOFF VOLUME    (mm)=      62.97          8.79          57.55
     TOTAL RAINFALL   (mm)=      63.48         63.48          63.48
     RUNOFF COEFFICIENT   =       0.99          0.14           0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0211)|   Area    (ha)=   1.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.90          0.90
     Dep. Storage     (mm)=       0.51          5.08
     Average Slope     (%)=       3.00          3.00
     Length            (m)=     109.57         40.00
     Mannings n             =     0.013         0.250

     Max.Eff.Inten.(mm/hr)=     256.54         52.71
               over (min)          5.00         10.00
     Storage Coeff.  (min)=       1.32 (ii)     6.48 (ii)
     Unit Hyd. Tpeak (min)=       5.00          5.00
     Unit Hyd. peak  (cms)=       0.33          0.18
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.63          0.14          0.772 (iii)
     TIME TO PEAK    (hrs)=       3.33          3.33           3.33
     RUNOFF VOLUME    (mm)=      62.97          8.78          35.88
     TOTAL RAINFALL   (mm)=      63.48         63.48          63.48
```

```
     RUNOFF COEFFICIENT   =       0.99         0.14           0.57

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0203)|   Area    (ha)=   1.79
|ID= 1 DT= 5.0 min |   Total Imp(%)=  95.00   Dir. Conn.(%)=  95.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.70         0.09
     Dep. Storage     (mm)=       1.27         5.08
     Average Slope     (%)=       0.30         0.30
     Length            (m)=     109.21        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     256.54        52.71
               over (min)          5.00        10.00
     Storage Coeff.  (min)=       2.65 (ii)   20.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.29         0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.07         0.00          1.070 (iii)
     TIME TO PEAK    (hrs)=       3.33         3.58           3.33
     RUNOFF VOLUME    (mm)=      62.21         8.79          59.53
     TOTAL RAINFALL   (mm)=      63.48        63.48          63.48
     RUNOFF COEFFICIENT   =       0.98         0.14           0.94

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0203)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.5300      0.0100
                          0.5000     0.0050   |   1.5400      3.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0203)      1.789      1.070      3.33      59.53
   OUTFLOW: ID= 1 (  0203)      1.789      0.829      3.33      59.54

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 77.46
                  TIME SHIFT OF PEAK FLOW         (min)=  0.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0102

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0500)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0203):     1.79   0.829     3.33    59.54
     + ID2= 2 (  2001):     8.06   2.820     3.33    35.27
       ================================================
       ID = 3 (  0500):     9.85   3.649     3.33    39.67

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0500)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0500):     9.85   3.649     3.33    39.67
     + ID2= 2 (  0204):    11.37   6.813     3.33    57.55
       ================================================
```

```
        ID = 1 (  0500):    21.22  10.462     3.33    49.25

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0500)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0500):    21.22  10.462     3.33    49.25
      + ID2= 2 (  0211):     1.80   0.772     3.33    35.88
        ================================================
        ID = 3 (  0500):    23.02  11.235     3.33    48.20

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0021)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.4080      0.8210

                                    AREA     QPEAK     TPEAK       R.V.
                                    (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0500)     23.023     11.235      3.33       48.20
   OUTFLOW: ID= 1 (  0021)     23.023      0.430      4.17       48.18

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  3.83
                  TIME SHIFT OF PEAK FLOW          (min)= 50.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.8656

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0106)|   Area    (ha)=   3.56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  66.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.35         1.21
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       3.00         3.00
     Length            (m)=     154.08        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     256.54        52.71
               over (min)          5.00        10.00
     Storage Coeff.  (min)=       2.04 (ii)   16.50 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.31         0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.56         0.07          1.589 (iii)
     TIME TO PEAK    (hrs)=       3.33         3.50           3.33
     RUNOFF VOLUME    (mm)=      62.97         8.79          44.55
     TOTAL RAINFALL   (mm)=      63.48        63.48          63.48
     RUNOFF COEFFICIENT   =       0.99         0.14           0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0023)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0106):     3.56   1.589     3.33    44.55
      + ID2= 2 (  0021):    23.02   0.430     4.17    48.18
        ================================================
        ID = 3 (  0023):    26.58   1.782     3.33    47.70

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
```

Proposed

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*******************************
** SIMULATION:Run 04          **
*******************************
--------------------
| CALIB            |
| STANDHYD (  0040)|   Area    (ha)=   2.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  69.00   Dir. Conn.(%)=  61.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.41          0.63
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       2.50          2.50
     Length            (m)=     116.62         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     140.94      ********
                 over (min)        5.00         10.00
     Storage Coeff.  (min)=       1.92 (ii)     8.16 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.31          0.13
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.46          0.02          0.472 (iii)
     TIME TO PEAK    (hrs)=       3.67          3.75           3.67
     RUNOFF VOLUME    (mm)=      44.45          1.81          27.82
     TOTAL RAINFALL   (mm)=      45.45         45.45          45.45
     RUNOFF COEFFICIENT   =       0.98          0.04           0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0044)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.1100      0.0420

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0040)      2.040     0.472      3.67       27.82
   OUTFLOW: ID= 1 (  0044)      2.040     0.081      3.92       27.78
   OVERFLOW:ID= 3 (  0003)      0.000     0.000      0.00        0.00

                  TOTAL NUMBER OF SIMULATION OVERFLOW  =     0
                  CUMULATIVE TIME OF OVERFLOW  (HOURS) =  0.00
                  PERCENTAGE OF TIME OVERFLOWING   (%) =  0.00

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.16
                  TIME SHIFT OF PEAK FLOW         (min)= 15.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0310

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0050)|   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  69.00   Dir. Conn.(%)=  61.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.74          1.23
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       2.50          2.50
     Length            (m)=     162.75         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     140.94      ********
                 over (min)        5.00         10.00
     Storage Coeff.  (min)=       1.92 (ii)     8.16 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.31          0.13
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.90          0.03          0.920 (iii)
     TIME TO PEAK    (hrs)=       3.67          3.75           3.67
     RUNOFF VOLUME    (mm)=      44.45          1.81          27.82
     TOTAL RAINFALL   (mm)=      45.45         45.45          45.45
     RUNOFF COEFFICIENT   =       0.98          0.04           0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
```

```
       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0056)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0044):     2.04   0.081     3.92    27.78
      + ID2= 2 (  0050):     3.97   0.920     3.67    27.82
        ================================================
        ID = 3 (  0056):     6.01   0.966     3.67    27.81

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0048)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.2150      0.0830

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0056)      6.013      0.966      3.67      27.81
   OUTFLOW: ID= 1 (  0048)      6.013      0.182      4.08      27.79
   OVERFLOW:ID= 3 (  0003)      0.000      0.000      0.00       0.00

                  TOTAL NUMBER OF SIMULATION OVERFLOW  =     0
                  CUMULATIVE TIME OF OVERFLOW  (HOURS) =  0.00
                  PERCENTAGE OF TIME OVERFLOWING   (%) =  0.00

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.79
                  TIME SHIFT OF PEAK FLOW         (min)= 25.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0702

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--------------------
| CALIB            |
| STANDHYD (  0046)|   Area    (ha)=   2.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  61.00   Dir. Conn.(%)=  43.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.26         0.80
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       2.50         2.50
     Length            (m)=     117.19        39.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     140.94        36.31
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       1.44 (ii)    5.40 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.33         0.21
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.34         0.08          0.420 (iii)
     TIME TO PEAK    (hrs)=       3.67         3.67           3.67
     RUNOFF VOLUME    (mm)=      44.94         4.14          21.69
     TOTAL RAINFALL   (mm)=      45.45        45.45          45.45
     RUNOFF COEFFICIENT   =       0.99         0.09           0.48

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0049)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.23         0.03
```

```
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       2.50         2.50
     Length            (m)=      41.63        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     140.94     ********
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       1.44 (ii)    5.40 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.33         0.21
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.09         0.00          0.090 (iii)
     TIME TO PEAK    (hrs)=       3.67         0.00           3.67
     RUNOFF VOLUME    (mm)=      44.94         0.00          40.44
     TOTAL RAINFALL   (mm)=      45.45        45.45          45.45
     RUNOFF COEFFICIENT   =       0.99         0.00           0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0042)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0046):     2.06   0.420     3.67    21.69
     + ID2= 2 (  0048):     6.01   0.182     4.08    27.79
       ================================================
       ID = 3 (  0042):     8.07   0.517     3.67    26.23

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0042)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0042):     8.07   0.517     3.67    26.23
     + ID2= 2 (  0049):     0.26   0.090     3.67    40.44
       ================================================
       ID = 1 (  0042):     8.33   0.607     3.67    26.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0057)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   0048 <ID= 2> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0003 = HYDROGRAPH 0001
       ID1= 1 (  0042):     8.33   0.607     3.67    26.68
     + ID2= 2 (  0048):     0.00   0.000     0.00     0.00
       ================================================
       ID = 3 (  0057):     8.33   0.607     3.67    26.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0043)|   Area    (ha)=   1.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.90         0.90
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       3.00         3.00
     Length            (m)=     109.57        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     140.94         0.00
               over (min)         5.00       175.00
     Storage Coeff.  (min)=       1.32 (ii)    6.48 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.33         0.18
                                                        *TOTALS*
```

```
     PEAK FLOW       (cms)=       0.35         0.00          0.347 (iii)
     TIME TO PEAK    (hrs)=       3.67         0.00           3.67
     RUNOFF VOLUME    (mm)=      44.94         0.00          22.47
     TOTAL RAINFALL   (mm)=      45.45        45.45          45.45
     RUNOFF COEFFICIENT   =       0.99         0.00           0.49

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0047)|   Area    (ha)=   1.79
|ID= 1 DT= 5.0 min |   Total Imp(%)=  95.00   Dir. Conn.(%)=  95.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.70         0.09
     Dep. Storage     (mm)=       1.27         5.08
     Average Slope     (%)=       0.30         0.30
     Length            (m)=     109.21        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     140.94     ********
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.65 (ii)   20.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.29         0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.60         0.00          0.597 (iii)
     TIME TO PEAK    (hrs)=       3.67         0.00           3.67
     RUNOFF VOLUME    (mm)=      44.18         0.00          41.97
     TOTAL RAINFALL   (mm)=      45.45        45.45          45.45
     RUNOFF COEFFICIENT   =       0.97         0.00           0.92

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0052)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.5300      0.0100
                          0.5000     0.0050   |   1.5400      3.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0047)      1.789      0.597      3.67       41.97
   OUTFLOW: ID= 1 (  0052)      1.789      0.464      3.75       41.97

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 77.75
                  TIME SHIFT OF PEAK FLOW         (min)=  5.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0067

--------------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0054)|   Area    (ha)=  11.37
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.23         1.14
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       3.00         3.00
     Length            (m)=     275.29        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     140.94     ********
               over (min)        5.00         5.00
```

```
     Storage Coeff.  (min)=       2.13 (ii)    9.12 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       3.75         0.00          3.750 (iii)
     TIME TO PEAK    (hrs)=       3.67         0.00           3.67
     RUNOFF VOLUME    (mm)=      44.94         0.00          40.45
     TOTAL RAINFALL   (mm)=      45.45        45.45          45.45
     RUNOFF COEFFICIENT   =       0.99         0.00           0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0041)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0043):     1.80   0.347     3.67    22.47
     + ID2= 2 (  0052):     1.79   0.464     3.75    41.97
       ================================================
       ID = 3 (  0041):     3.59   0.800     3.67    32.19

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0041)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0041):     3.59   0.800     3.67    32.19
     + ID2= 2 (  0054):    11.37   3.750     3.67    40.45
       ================================================
       ID = 1 (  0041):    14.96   4.550     3.67    38.47

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0041)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0041):    14.96   4.550     3.67    38.47
     + ID2= 2 (  0057):     8.33   0.607     3.67    26.68
       ================================================
       ID = 3 (  0041):    23.29   5.156     3.67    34.25

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0055)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.4080      0.8210

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0041)     23.291      5.156      3.67       34.25
   OUTFLOW: ID= 1 (  0055)     23.291      0.278      5.42       34.23

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  5.40
                  TIME SHIFT OF PEAK FLOW          (min)=105.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.5599

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0045)|   Area    (ha)=   3.56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  66.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.35         1.21
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       3.00         3.00
     Length            (m)=     154.08        40.00
```

```
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     140.94      ********
               over (min)         5.00         10.00
     Storage Coeff.  (min)=       2.04 (ii)    16.50 (ii)
     Unit Hyd. Tpeak (min)=       5.00         15.00
     Unit Hyd. peak  (cms)=       0.31          0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.87          0.00          0.867 (iii)
     TIME TO PEAK    (hrs)=       3.67          0.00           3.67
     RUNOFF VOLUME    (mm)=      44.94          0.00          29.66
     TOTAL RAINFALL   (mm)=      45.45         45.45          45.45
     RUNOFF COEFFICIENT   =       0.99          0.00           0.65

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: THE PERVIOUS AREA HAS NO FLOW .

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0053)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0045):     3.56   0.867     3.67    29.66
      + ID2= 2 (  0055):    23.29   0.278     5.42    34.23
        ================================================
        ID = 3 (  0053):    26.85   0.983     3.67    33.62

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
**********************************
** SIMULATION:Storm Input_100yr **
**********************************
--------------------
| CALIB            |
| STANDHYD (  0040)|   Area    (ha)=   2.04
|ID= 1 DT= 5.0 min |   Total Imp(%)=  69.00   Dir. Conn.(%)=  61.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.41          0.63
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       2.50          2.50
     Length            (m)=     116.62         40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     256.54      ********
               over (min)         5.00         10.00
     Storage Coeff.  (min)=       1.92 (ii)     8.16 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.31          0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.84          0.13          0.895 (iii)
     TIME TO PEAK    (hrs)=       3.33          3.42           3.33
     RUNOFF VOLUME    (mm)=      62.48         13.51          43.38
     TOTAL RAINFALL   (mm)=      63.48         63.48          63.48
     RUNOFF COEFFICIENT   =       0.98          0.21           0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0044)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.1100      0.0420

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0040)      2.040      0.895      3.33      43.38
```

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   OUTFLOW: ID= 1 (  0044)      1.681      0.110      3.42      45.83
   OVERFLOW:ID= 3 (  0003)      0.359      0.398      3.42      45.83

                  TOTAL NUMBER OF SIMULATION OVERFLOW  =     0
                  CUMULATIVE TIME OF OVERFLOW  (HOURS) =  0.00
                  PERCENTAGE OF TIME OVERFLOWING   (%) =  0.00

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.29
                  TIME SHIFT OF PEAK FLOW         (min)=  5.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0420

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0050)|   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  69.00   Dir. Conn.(%)=  61.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.74         1.23
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       2.50         2.50
     Length            (m)=     162.75        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     256.54     ********
               over (min)          5.00        10.00
     Storage Coeff.  (min)=       1.92 (ii)    8.16 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.63         0.24          1.744 (iii)
     TIME TO PEAK    (hrs)=       3.33         3.42           3.33
     RUNOFF VOLUME    (mm)=      62.48        13.51          43.38
     TOTAL RAINFALL   (mm)=      63.48        63.48          63.48
     RUNOFF COEFFICIENT   =       0.98         0.21           0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0056)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0044):     1.68   0.110     3.42    45.83
      + ID2= 2 (  0050):     3.97   1.744     3.33    43.38
        ==========================================================
        ID = 3 (  0056):     5.65   1.814     3.33    44.11

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0048)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.2150      0.0830

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0056)      5.654      1.814      3.33      44.11
   OUTFLOW: ID= 1 (  0048)      4.700      0.215      3.42      44.74
   OVERFLOW:ID= 3 (  0003)      0.954      0.789      3.42      44.74

                  TOTAL NUMBER OF SIMULATION OVERFLOW  =     0
                  CUMULATIVE TIME OF OVERFLOW  (HOURS) =  0.00
                  PERCENTAGE OF TIME OVERFLOWING   (%) =  0.00

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 11.85
                  TIME SHIFT OF PEAK FLOW         (min)=  5.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0830

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--------------------
| CALIB            |
| STANDHYD (  0046)|   Area    (ha)=   2.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  61.00   Dir. Conn.(%)=  43.00
```

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--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.26         0.80
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       2.50         2.50
     Length            (m)=     117.19        39.60
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     256.54     ********
               over (min)          5.00        10.00
     Storage Coeff.  (min)=       1.44 (ii)    5.40 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.33         0.21
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.62         0.32          0.936 (iii)
     TIME TO PEAK    (hrs)=       3.33         3.33           3.33
     RUNOFF VOLUME    (mm)=      62.97        16.07          36.24
     TOTAL RAINFALL   (mm)=      63.48        63.48          63.48
     RUNOFF COEFFICIENT   =       0.99         0.25           0.57

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0049)|   Area    (ha)=   0.26
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.23         0.03
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       2.50         2.50
     Length            (m)=      41.63        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     256.54     ********
               over (min)          5.00         5.00
     Storage Coeff.  (min)=       1.44 (ii)    5.40 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.33         0.21
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.16         0.00          0.167 (iii)
     TIME TO PEAK    (hrs)=       3.33         3.33           3.33
     RUNOFF VOLUME    (mm)=      62.97         8.79          57.54
     TOTAL RAINFALL   (mm)=      63.48        63.48          63.48
     RUNOFF COEFFICIENT   =       0.99         0.14           0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0042)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0046):     2.06   0.936     3.33    36.24
     + ID2= 2 (  0048):     4.70   0.215     3.42    44.74
       ================================================
       ID = 3 (  0042):     6.76   1.080     3.33    42.15

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0042)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0042):     6.76   1.080     3.33    42.15
     + ID2= 2 (  0049):     0.26   0.167     3.33    57.54
       ================================================
```

```
        ID = 1 (  0042):     7.02   1.248     3.33    42.72

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0057)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0042):     7.02   1.248     3.33    42.72
      + ID2= 2 (  0048):     0.95   0.789     3.42    44.74
        ================================================
        ID = 3 (  0057):     7.97   1.446     3.42    42.96

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0043)|   Area    (ha)=   1.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  50.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.90         0.90
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       3.00         3.00
     Length            (m)=     109.57        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     256.54     ********
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.32 (ii)    6.48 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.33         0.18
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.63         0.14          0.772 (iii)
     TIME TO PEAK    (hrs)=       3.33         3.33           3.33
     RUNOFF VOLUME    (mm)=      62.97         8.78          35.88
     TOTAL RAINFALL   (mm)=      63.48        63.48          63.48
     RUNOFF COEFFICIENT   =       0.99         0.14           0.57

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0047)|   Area    (ha)=   1.79
|ID= 1 DT= 5.0 min |   Total Imp(%)=  95.00   Dir. Conn.(%)=  95.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.70         0.09
     Dep. Storage     (mm)=       1.27         5.08
     Average Slope     (%)=       0.30         0.30
     Length            (m)=     109.21        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     256.54     ********
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.65 (ii)   20.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.29         0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.07         0.00          1.070 (iii)
     TIME TO PEAK    (hrs)=       3.33         3.58           3.33
     RUNOFF VOLUME    (mm)=      62.21         8.79          59.53
     TOTAL RAINFALL   (mm)=      63.48        63.48          63.48
     RUNOFF COEFFICIENT   =       0.98         0.14           0.94

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00           K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
```

```
--------------------
| RESERVOIR(  0052)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   1.5300      0.0100
                          0.5000     0.0050   |   1.5400      3.0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0047)      1.789      1.070      3.33       59.53
   OUTFLOW: ID= 1 (  0052)      1.789      0.829      3.33       59.54

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 77.46
                  TIME SHIFT OF PEAK FLOW         (min)=  0.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0102

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0054)|   Area    (ha)=  11.37
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      10.23         1.14
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       3.00         3.00
     Length            (m)=     275.29        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     256.54     ********
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       2.13 (ii)    9.12 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       6.75         0.12          6.813 (iii)
     TIME TO PEAK    (hrs)=       3.33         3.42           3.33
     RUNOFF VOLUME    (mm)=      62.97         8.79          57.55
     TOTAL RAINFALL   (mm)=      63.48        63.48          63.48
     RUNOFF COEFFICIENT   =       0.99         0.14           0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0041)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0043):      1.80   0.772     3.33    35.88
     + ID2= 2 (  0052):      1.79   0.829     3.33    59.54
       ================================================
       ID = 3 (  0041):      3.59   1.601     3.33    47.67

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0041)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0041):      3.59   1.601     3.33    47.67
     + ID2= 2 (  0054):     11.37   6.813     3.33    57.55
       ================================================
       ID = 1 (  0041):     14.96   8.414     3.33    55.18

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0041)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0041):     14.96   8.414     3.33    55.18
     + ID2= 2 (  0057):      7.97   1.446     3.42    42.96
       ================================================
```

```
        ID = 3 (  0041):    22.93   9.662     3.33    50.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0055)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.4080      0.8210

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0041)     22.932      9.662      3.33      50.93
   OUTFLOW: ID= 1 (  0055)     22.932      0.412      4.75      50.91

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  4.26
                  TIME SHIFT OF PEAK FLOW         (min)= 85.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.8288

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0045)|   Area    (ha)=   3.56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  66.00   Dir. Conn.(%)=  66.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.35         1.21
     Dep. Storage     (mm)=       0.51         5.08
     Average Slope     (%)=       3.00         3.00
     Length            (m)=     154.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     256.54     ********
               over (min)          5.00        10.00
     Storage Coeff.  (min)=       2.04 (ii)   16.50 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.31         0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.56         0.07          1.589 (iii)
     TIME TO PEAK    (hrs)=       3.33         3.50           3.33
     RUNOFF VOLUME    (mm)=      62.97         8.79          44.55
     TOTAL RAINFALL   (mm)=      63.48        63.48          63.48
     RUNOFF COEFFICIENT   =       0.99         0.14           0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) HORTONS EQUATION SELECTED FOR PERVIOUS LOSSES:
            Fo   (mm/hr)=127.00          K  (1/hr)=  2.00
            Fc   (mm/hr)=  6.35     Cum.Inf.   (mm)=  0.00
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0053)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0045):     3.56   1.589     3.33    44.55
     + ID2= 2 (  0055):    22.93   0.412     4.75    50.91
       ==========================================================
       ID = 3 (  0053):    26.49   1.758     3.33    50.05

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
```

Appendix D Water Supply

PRELIMINARY ESTIMATE of Expected Water Demand ***January 2023***

10th Street East *Project #16063088*

Owen Sound, Ontario

Program Details

	Unit Type	# of Units	Persons per Unit	Equivalent Population
Residential:	Apartments	390	2.3	897
	Townhouses	87	2.3	200.1
		Total Residential Population		**1097**
			Unit Count	**477**

Commercial/Retail: N/A

TOTAL DESIGN POPULATION = **1097**

Flow Calculation

Flow Rate =	**400**	litres/capita/day	
For a total population of	**1097**	people,	
The total flow is:	**438,840**	litres/day	
Applying a peaking factor of	**1.80**	(maximum day)	
Maximum Day Demand =	**789,912**	litres/day	
or,	**549**	litres/minute	**(A)**
Fire Flow Demand **	**11,000**	litres/minute	**(B)**

** Refer to FUS calculation. "Fire flow is to be in accordance with the Fure Underwriters Survey" (FUS).

***Total Flow = (A) + (B) =** **11,549** **litres/minute** **(maximum day demand plus fire flow)**

Check peak hour demand:

The total flow is:	**438,840**	litres/day	
or,	**305**	litres/minute	
Applying a peaking factor of *	**2.70**	(peak hour)	* residential
Peak Hour Demand =	**823**	litres/minute	

Total water demand (on basis of maximum day demand plus fire flow) = **11,549** **litres/minute**

*Per *East Owen Sound Master Servicing Study*

Project: SmartCentres, Proposed Residential Complex
Project Number: 160623088
Project Location: Owen Sound, Ontario
Designer: AK
Date: 1/31/2023

Summary of Fire Flow Demands

Dwelling Notation	Number of Units	Number of Floors	Fire Flow Demand (Lps)	Fire Flow Demand (Lpm)
TH-1 - 9 Units	9	3	167	10,000
TH-2 - 9 Units	9	3	183	11,000
TH-3 - 9 Units	9	3	183	11,000
TH-4 - 10 Units	10	3	183	11,000
TH-5 - 10 Units	10	3	183	11,000
TH-6 - 10 Units	10	3	167	10,000
TH-7 - 6 Units	6	3	150	9,000
TH-8 - 8 Units	8	3	183	11,000
TH-9 - 8 Units	8	3	183	11,000
TH-10 - 8 Units	8	3	183	11,000
Building (A)	78	4	33	2,000
Building (B)	78	4	50	3,000
Building (C)	78	4	50	3,000
Building (D)	78	4	33	2,000
Building (E)	78	4	33	2,000

Stantec

Project: SmartCentres, Proposed Retirement Residence
Project Number: 160623088
Project Location: Owen Sound, Ontario
Designer: AK
Date: 1/31/2023

PRELIMINARY ESTIMATE of Required Fire Flow
Fire Underwriters Survey "Water Supply for Public Fire Protection", 1999
Townhouse-Block 1: (9 units, 3 floors)

F = 220 · C · √A

where,

F = the required fire flow in litres per minute

C = 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).

= **1.00**

A = The total floor area in square metres (including all storeys, but excluding basements at least 50% below grade) in the building being considered. Note: for fire-resistive buildings, consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors. *

A = **1,632** **sq.m.**

F = 220 · (C) · √(A)

= **8,887** **Lpm**

= **9,000** **Lpm** (Rounded to the nearest 1,000 L/min)

The value obtained above may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Apply a reduction of **15%** (Apartments/Dwellings = LOW HAZARD occupancy), or **-1,350** **Lpm**

F = **7,650** **Lpm**

The value obtained above may be reduced by up to 50% for complete automatic sprinkler protection depending upon the adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both they system and fire department hose lines required.

Apply a reduction of **0%** or **0** **Lpm**

(per the OBC, a fully supervised NFPA 13 sprinkler system is required for this building)

Reduction = **0** **Lpm**

To the value obtained, a percentage should be added for structures exposed within 45 metres:

North side	-	>45	m	-	**0%**
East side	-	11.0	m	-	**15%**
South side	-	17.0	m	-	**15%**
West side	-	32.0	m	-	**5%**
					35% (not to exceed 75%)

Increase = **2,678** **Lpm**

F =

7,650	Lpm
0	
2,678	
10,328	**Lpm**

= **10,000** **Lpm** (Rounded to the nearest 1,000 L/min)

= **167** **Lps**

= 2642 USGPM

Stantec

Project: SmartCentres, Proposed Retirement Residence
Project Number: 160623088
Project Location: Owen Sound, Ontario
Designer: AK
Date: 1/31/2023

PRELIMINARY ESTIMATE of Required Fire Flow
Fire Underwriters Survey "Water Supply for Public Fire Protection", 1999
Townhouse-2: (9 units, 3 floors)

F = 220 · C · √A

where,

F = the required fire flow in litres per minute

C = 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).

= **1.00**

A = The total floor area in square metres (including all storeys, but excluding basements at least 50% below grade) in the building being considered. Note: for fire-resistive buildings, consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors. *

A = **1,632** **sq.m.**

F = 220 · (C) · √(A)

= **8,887** **Lpm**

= **9,000** **Lpm** (Rounded to the nearest 1,000 L/min)

The value obtained above may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Apply a reduction of **15%** (Apartments/Dwellings = LOW HAZARD occupancy), or **-1,350** **Lpm**

F = **7,650** **Lpm**

The value obtained above may be reduced by up to 50% for complete automatic sprinkler protection depending upon the adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both they system and fire department hose lines required.

Apply a reduction of **0%** or **0** **Lpm**

(per the OBC, a fully supervised NFPA 13 sprinkler system is required for this building)

Reduction = **0** **Lpm**

To the value obtained, a percentage should be added for structures exposed within 45 metres:

North side	-	>45	m	-	**0%**
East side	-	18.0	m	-	**15%**
South side	-	17.0	m	-	**15%**
West side	-	11.0	m	-	**15%**
					45% (not to exceed 75%)

Increase = **3,443** **Lpm**

F =

7,650	Lpm
0	
3,443	
11,093	**Lpm**

= **11,000** **Lpm** (Rounded to the nearest 1,000 L/min)

= **183** **Lps**

= 2906 USGPM

Stantec

Project: SmartCentres, Proposed Retirement Residence
Project Number: 160623088
Project Location: Owen Sound, Ontario
Designer: AK
Date: 1/31/2023

PRELIMINARY ESTIMATE of Required Fire Flow
Fire Underwriters Survey "Water Supply for Public Fire Protection", 1999
Townhouse-3: (9 units, 3 floors)

F = 220 · C · √A

where,

F = the required fire flow in litres per minute

C = 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).

= **1.00**

A = The total floor area in square metres (including all storeys, but excluding basements at least 50% below grade) in the building being considered. Note: for fire-resistive buildings, consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors. *

A = **1,632** **sq.m.**

F = 220 · (C) · √(A)

= **8,887** **Lpm**

= **9,000** **Lpm** (Rounded to the nearest 1,000 L/min)

The value obtained above may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Apply a reduction of **15%** (Apartments/Dwellings = LOW HAZARD occupancy), or **-1,350** **Lpm**

F = **7,650** **Lpm**

The value obtained above may be reduced by up to 50% for complete automatic sprinkler protection depending upon the adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both they system and fire department hose lines required.

Apply a reduction of **0%** or **0** **Lpm**

(per the OBC, a fully supervised NFPA 13 sprinkler system is required for this building)

Reduction = **0** **Lpm**

To the value obtained, a percentage should be added for structures exposed within 45 metres:

North side	-	>45	m	-	**0%**
East side	-	13.0	m	-	**15%**
South side	-	17.0	m	-	**15%**
West side	-	18.0	m	-	**15%**
					45% (not to exceed 75%)

Increase = **3,443** **Lpm**

F =

7,650	Lpm
0	
3,443	
11,093	**Lpm**

= **11,000** **Lpm** (Rounded to the nearest 1,000 L/min)

= **183** **Lps**

= 2906 USGPM

Stantec

Project: SmartCentres, Proposed Retirement Residence
Project Number: 160623088
Project Location: Owen Sound, Ontario
Designer: AK
Date: 1/31/2023

PRELIMINARY ESTIMATE of Required Fire Flow
Fire Underwriters Survey "Water Supply for Public Fire Protection", 1999
Townhouse-4: (10 units, 3 floors)

F = 220 · C · √A

where,

F = the required fire flow in litres per minute

C = 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).

= **1.00**

A = The total floor area in square metres (including all storeys, but excluding basements at least 50% below grade) in the building being considered. Note: for fire-resistive buildings, consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors. *

A = **1,812** **sq.m.**

F = 220 · (C) · √(A)

= **9,366** **Lpm**

= **9,000** **Lpm** (Rounded to the nearest 1,000 L/min)

The value obtained above may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Apply a reduction of **15%** (Apartments/Dwellings = LOW HAZARD occupancy), or **-1,350** **Lpm**

F = **7,650** **Lpm**

The value obtained above may be reduced by up to 50% for complete automatic sprinkler protection depending upon the adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both they system and fire department hose lines required.

Apply a reduction of **0%** or **0** **Lpm**

(per the OBC, a fully supervised NFPA 13 sprinkler system is required for this building)

Reduction = **0** **Lpm**

To the value obtained, a percentage should be added for structures exposed within 45 metres:

North side	-	>45	m	-	**0%**
East side	-	18.0	m	-	**15%**
South side	-	17.0	m	-	**15%**
West side	-	13.0	m	-	**15%**
					45% (not to exceed 75%)

Increase = **3,443** **Lpm**

F =

7,650	Lpm
0	
3,443	
11,093	**Lpm**

= **11,000** **Lpm** (Rounded to the nearest 1,000 L/min)

= **183** **Lps**

= 2906 USGPM

Stantec

Project: SmartCentres, Proposed Retirement Residence
Project Number: 160623088
Project Location: Owen Sound, Ontario
Designer: AK
Date: 1/31/2023

PRELIMINARY ESTIMATE of Required Fire Flow
Fire Underwriters Survey "Water Supply for Public Fire Protection", 1999
Townhouse-5: (10 units, 3 floors)

F = 220 · C · √A

where,

F = the required fire flow in litres per minute

C = 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).

= **1.00**

A = The total floor area in square metres (including all storeys, but excluding basements at least 50% below grade) in the building being considered. Note: for fire-resistive buildings, consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors. *

A = **1,812** **sq.m.**

F = 220 · (C) · √(A)

= **9,366** **Lpm**

= **9,000** **Lpm** (Rounded to the nearest 1,000 L/min)

The value obtained above may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Apply a reduction of **15%** (Apartments/Dwellings = LOW HAZARD occupancy), or **-1,350** **Lpm**

F = **7,650** **Lpm**

The value obtained above may be reduced by up to 50% for complete automatic sprinkler protection depending upon the adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both they system and fire department hose lines required.

Apply a reduction of **0%** or **0** **Lpm**

(per the OBC, a fully supervised NFPA 13 sprinkler system is required for this building)

Reduction = **0** **Lpm**

To the value obtained, a percentage should be added for structures exposed within 45 metres:

North side	-	>45	m	-	**0%**
East side	-	13.0	m	-	**15%**
South side	-	17.0	m	-	**15%**
West side	-	18.0	m	-	**15%**
					45% (not to exceed 75%)

Increase = **3,443** **Lpm**

F =

7,650	Lpm
0	
3,443	
11,093	**Lpm**

= **11,000** **Lpm** (Rounded to the nearest 1,000 L/min)

= **183** **Lps**

= 2906 USGPM

Stantec

Project: SmartCentres, Proposed Retirement Residence
Project Number: 160623088
Project Location: Owen Sound, Ontario
Designer: AK
Date: 1/31/2023

PRELIMINARY ESTIMATE of Required Fire Flow
Fire Underwriters Survey "Water Supply for Public Fire Protection", 1999
Townhouse-6: (10 units, 3 floors)

F = 220 · C · √A

where,

F = the required fire flow in litres per minute

C = 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).

= **1.00**

A = The total floor area in square metres (including all storeys, but excluding basements at least 50% below grade) in the building being considered. Note: for fire-resistive buildings, consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors. *

A = **1,812** **sq.m.**

F = 220 · (C) · √(A)

= **9,366** **Lpm**

= **9,000** **Lpm** (Rounded to the nearest 1,000 L/min)

The value obtained above may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Apply a reduction of **15%** (Apartments/Dwellings = LOW HAZARD occupancy), or **-1,350** **Lpm**

F = **7,650** **Lpm**

The value obtained above may be reduced by up to 50% for complete automatic sprinkler protection depending upon the adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both they system and fire department hose lines required.

Apply a reduction of **0%** or **0** **Lpm**

(per the OBC, a fully supervised NFPA 13 sprinkler system is required for this building)

Reduction = **0** **Lpm**

To the value obtained, a percentage should be added for structures exposed within 45 metres:

North side	-	>45	m	-	**0%**
East side	-	30.0	m	-	**5%**
South side	-	17.0	m	-	**15%**
West side	-	13.0	m	-	**15%**
					35% (not to exceed 75%)

Increase = **2,678** **Lpm**

F =

7,650	Lpm
0	
2,678	
10,328	**Lpm**

= **10,000** **Lpm** (Rounded to the nearest 1,000 L/min)

= **167** **Lps**

= 2642 USGPM

Stantec

Project: SmartCentres, Proposed Retirement Residence
Project Number: 160623088
Project Location: Owen Sound, Ontario
Designer: AK
Date: 1/31/2023

PRELIMINARY ESTIMATE of Required Fire Flow
Fire Underwriters Survey "Water Supply for Public Fire Protection", 1999
Townhouse-7: (6 units, 3 floors)

F = 220 · C · √A

where,

F = the required fire flow in litres per minute

C = 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).

= **1.00**

A = The total floor area in square metres (including all storeys, but excluding basements at least 50% below grade) in the building being considered. Note: for fire-resistive buildings, consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors. *

A = **1,091** **sq.m.**

F = 220 · (C) · √(A)

= **7,266** **Lpm**

= **7,000** **Lpm** (Rounded to the nearest 1,000 L/min)

The value obtained above may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Apply a reduction of **15%** (Apartments/Dwellings = LOW HAZARD occupancy), or **-1,050** **Lpm**

F = **5,950** **Lpm**

The value obtained above may be reduced by up to 50% for complete automatic sprinkler protection depending upon the adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both they system and fire department hose lines required.

Apply a reduction of **0%** or **0** **Lpm**

(per the OBC, a fully supervised NFPA 13 sprinkler system is required for this building)

Reduction = **0** **Lpm**

To the value obtained, a percentage should be added for structures exposed within 45 metres:

North side	-	17.0	m	-	**15%**
East side	-	3.0	m	-	**25%**
South side	-	>45	m	-	**0%**
West side	-	17.4	m	-	**15%**
					55% (not to exceed 75%)

Increase = **3,273** **Lpm**

F =

5,950	Lpm
0	
3,273	
9,223	**Lpm**

= **9,000** **Lpm** (Rounded to the nearest 1,000 L/min)

= **150** **Lps**

= 2378 USGPM

Stantec

Project: SmartCentres, Proposed Retirement Residence
Project Number: 160623088
Project Location: Owen Sound, Ontario
Designer: AK
Date: 1/31/2023

PRELIMINARY ESTIMATE of Required Fire Flow
Fire Underwriters Survey "Water Supply for Public Fire Protection", 1999
Townhouse-8: (8 units, 3 floors)

F = 220 · C · √A

where,

F = the required fire flow in litres per minute

C = 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).

= **1.00**

A = The total floor area in square metres (including all storeys, but excluding basements at least 50% below grade) in the building being considered. Note: for fire-resistive buildings, consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors. *

A = **1,452** **sq.m.**

F = 220 · (C) · √(A)

= **8,382** **Lpm**

= **8,000** **Lpm** (Rounded to the nearest 1,000 L/min)

The value obtained above may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Apply a reduction of **15%** (Apartments/Dwellings = LOW HAZARD occupancy), or **-1,200** **Lpm**

F = **6,800** **Lpm**

The value obtained above may be reduced by up to 50% for complete automatic sprinkler protection depending upon the adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both they system and fire department hose lines required.

Apply a reduction of **0%** or **0** **Lpm**

(per the OBC, a fully supervised NFPA 13 sprinkler system is required for this building)

Reduction = **0** **Lpm**

To the value obtained, a percentage should be added for structures exposed within 45 metres:

North side	-	17.0	m	-	**15%**
East side	-	3.0	m	-	**25%**
South side	-	>45	m	-	**0%**
West side	-	3.0	m	-	**25%**
					65% (not to exceed 75%)

Increase = **4,420** **Lpm**

F =

6,800	Lpm
0	
4,420	
11,220	**Lpm**

= **11,000** **Lpm** (Rounded to the nearest 1,000 L/min)

= **183** **Lps**

= 2906 USGPM

Stantec

Project: SmartCentres, Proposed Retirement Residence
Project Number: 160623088
Project Location: Owen Sound, Ontario
Designer: AK
Date: 1/31/2023

PRELIMINARY ESTIMATE of Required Fire Flow
Fire Underwriters Survey "Water Supply for Public Fire Protection", 1999
Townhouse-9: (8 units, 3 floors)

F = 220 · C · √A

where,

F = the required fire flow in litres per minute

C = 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).

= **1.00**

A = The total floor area in square metres (including all storeys, but excluding basements at least 50% below grade) in the building being considered. Note: for fire-resistive buildings, consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors. *

A = **1,452** **sq.m.**

F = 220 · (C) · √(A)

= **8,382** **Lpm**

= **8,000** **Lpm** (Rounded to the nearest 1,000 L/min)

The value obtained above may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Apply a reduction of **15%** (Apartments/Dwellings = LOW HAZARD occupancy), or **-1,200** **Lpm**

F = **6,800** **Lpm**

The value obtained above may be reduced by up to 50% for complete automatic sprinkler protection depending upon the adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both they system and fire department hose lines required.

Apply a reduction of **0%** or **0** **Lpm**

(per the OBC, a fully supervised NFPA 13 sprinkler system is required for this building)

Reduction = **0** **Lpm**

To the value obtained, a percentage should be added for structures exposed within 45 metres:

North side	-	17.0	m	-	**15%**
East side	-	3.0	m	-	**25%**
South side	-	>45	m	-	**0%**
West side	-	3.0	m	-	**25%**
					65% (not to exceed 75%)

Increase = **4,420** **Lpm**

F =

6,800	Lpm
0	
4,420	
11,220	**Lpm**

= **11,000** **Lpm** (Rounded to the nearest 1,000 L/min)

= **183** **Lps**

= 2906 USGPM

Stantec

Project: SmartCentres, Proposed Retirement Residence
Project Number: 160623088
Project Location: Owen Sound, Ontario
Designer: AK
Date: 1/31/2023

PRELIMINARY ESTIMATE of Required Fire Flow
Fire Underwriters Survey "Water Supply for Public Fire Protection", 1999
Townhouse-10: (8 units, 3 floors)

F = 220 · C · √A

where,

F = the required fire flow in litres per minute

C = 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).

= **1.00**

A = The total floor area in square metres (including all storeys, but excluding basements at least 50% below grade) in the building being considered. Note: for fire-resistive buildings, consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors. *

A = **1,452** **sq.m.**

F = 220 · (C) · √(A)

= **8,382** **Lpm**

= **8,000** **Lpm** (Rounded to the nearest 1,000 L/min)

The value obtained above may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Apply a reduction of **15%** (Apartments/Dwellings = LOW HAZARD occupancy), or **-1,200** **Lpm**

F = **6,800** **Lpm**

The value obtained above may be reduced by up to 50% for complete automatic sprinkler protection depending upon the adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both they system and fire department hose lines required.

Apply a reduction of **0%** or **0** **Lpm**

(per the OBC, a fully supervised NFPA 13 sprinkler system is required for this building)

Reduction = **0** **Lpm**

To the value obtained, a percentage should be added for structures exposed within 45 metres:

North side	-	17.0	m	-	**15%**
East side	-	20.0	m	-	**15%**
South side	-	>45	m	-	**0%**
West side	-	3.0	m	-	**25%**
					55% (not to exceed 75%)

Increase = **3,740** **Lpm**

F =

6,800	Lpm
0	
3,740	
10,540	**Lpm**

= **11,000** **Lpm** (Rounded to the nearest 1,000 L/min)

= **183** **Lps**

= 2906 USGPM

Stantec

Project: 7350 Markham Road
Project Number: 160622803
Project Location: Markham, Ontario
Designer: AK
Date: 1/31/2023

PRELIMINARY ESTIMATE of Required Fire Flow
Fire Underwriters Survey "Water Supply for Public Fire Protection", 1999
Building A

F = 220 · C · √A

where,

F = the required fire flow in litres per minute

C = 0.6 for fire resistive construction (fully protected frame, floors, roof)

= **0.60**

A = The total floor area in square metres (including all storeys, but excluding basements at least 50% below grade) in the building being considered. Note: for fire-resistive buildings, consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors. *

*** vertical openings and exterior vertical communications properly protected (minimum one hour rating):**

Level 2	1,288	sq.m.	(Largest floor)		
Level 3	1,278	sq.m.	(1st adjoining floor)	@	25%
Level 1	1,287	sq.m.	(2nd adjoining floor)	@	25%

A = **1,929** **sq.m.**

F = **220 · (C) · √(A)**

= **5,798** **Lpm**

= **6,000** **Lpm** (Rounded to the nearest 1,000 L/min)

The value obtained above may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Apply a reduction of **25%** (Apartments/Dwellings = LOW HAZARD occupancy), or **-1,500** **Lpm**

F = **4,500** **Lpm**

The value obtained above may be reduced by up to 50% for complete automatic sprinkler protection depending upon the adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both they system and fire department hose lines required.

Apply a reduction of **50%** or **-2,250** **Lpm**

(per the OBC, a fully supervised NFPA 13 sprinkler system is required for this building)

Reduction = **-2,250** **Lpm**

To the value obtained, a percentage should be added for structures exposed within 45 metres:

North side	-	>45	m	-	**0%**	
East side	-	>45	m	-	**0%**	
South side	-	>45	m	-	**0%**	
West side	-	44	m	-	**5%**	
					5%	(not to exceed 75%)

Increase = **225** **Lpm**

F =

4,500	Lpm
-2,250	
225	
2,475	**Lpm**

= **2,000** **Lpm** (Rounded to the nearest 1,000 L/min)

= **33** **Lps**

= 528 USGPM

Project: 7350 Markham Road
Project Number: 160622803
Project Location: Markham, Ontario
Designer: AK
Date: 1/31/2023

PRELIMINARY ESTIMATE of Required Fire Flow
Fire Underwriters Survey "Water Supply for Public Fire Protection", 1999
Building B

F = 220 · C · √A

where,

F = the required fire flow in litres per minute

C = 0.6 for fire resistive construction (fully protected frame, floors, roof)

= **0.60**

A = The total floor area in square metres (including all storeys, but excluding basements at least 50% below grade) in the building being considered. Note: for fire-resistive buildings, consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors. *

*** vertical openings and exterior vertical communications properly protected (minimum one hour rating):**

Level 2	1,288	sq.m.	(Largest floor)		
Level 3	1,278	sq.m.	(1st adjoining floor)	@	25%
Level 1	1,287	sq.m.	(2nd adjoining floor)	@	25%

A = **1,929** **sq.m.**

F = **220 · (C) · √(A)**

= **5,798** **Lpm**

= **6,000** **Lpm** (Rounded to the nearest 1,000 L/min)

The value obtained above may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Apply a reduction of **25%** (Apartments/Dwellings = LOW HAZARD occupancy), or **-1,500** **Lpm**

F = **4,500** **Lpm**

The value obtained above may be reduced by up to 50% for complete automatic sprinkler protection depending upon the adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both they system and fire department hose lines required.

Apply a reduction of **50%** or **-2,250** **Lpm**

(per the OBC, a fully supervised NFPA 13 sprinkler system is required for this building)

Reduction = **-2,250** **Lpm**

To the value obtained, a percentage should be added for structures exposed within 45 metres:

North side	-	>45	m	-	**0%**	
East side	-	17	m	-	**15%**	
South side	-	>45	m	-	**0%**	
West side	-	35	m	-	**5%**	
					20%	(not to exceed 75%)

Increase = **900** **Lpm**

F =

4,500	Lpm
-2,250	
900	
3,150	**Lpm**

= **3,000** **Lpm** (Rounded to the nearest 1,000 L/min)

= **50** **Lps**

= 793 USGPM

Stantec

Project: 7350 Markham Road
Project Number: 160622803
Project Location: Markham, Ontario
Designer: AK
Date: 1/31/2023

PRELIMINARY ESTIMATE of Required Fire Flow
Fire Underwriters Survey "Water Supply for Public Fire Protection", 1999
Building C

F = 220 · C · √A

where,

F = the required fire flow in litres per minute

C = 0.6 for fire resistive construction (fully protected frame, floors, roof)

= **0.60**

A = The total floor area in square metres (including all storeys, but excluding basements at least 50% below grade) in the building being considered. Note: for fire-resistive buildings, consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors. *

*** vertical openings and exterior vertical communications properly protected (minimum one hour rating):**

Level 2	1,288	sq.m.	(Largest floor)		
Level 3	1,278	sq.m.	(1st adjoining floor)	@	25%
Level 1	1,287	sq.m.	(2nd adjoining floor)	@	25%

A = **1,929** **sq.m.**

F = **220 · (C) · √(A)**

= **5,798** **Lpm**

= **6,000** **Lpm** (Rounded to the nearest 1,000 L/min)

The value obtained above may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Apply a reduction of **25%** (Apartments/Dwellings = LOW HAZARD occupancy), or **-1,500** **Lpm**

F = **4,500** **Lpm**

The value obtained above may be reduced by up to 50% for complete automatic sprinkler protection depending upon the adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both they system and fire department hose lines required.

Apply a reduction of **50%** or **-2,250** **Lpm**

(per the OBC, a fully supervised NFPA 13 sprinkler system is required for this building)

Reduction = **-2,250** **Lpm**

To the value obtained, a percentage should be added for structures exposed within 45 metres:

North side	-	>45	m	-	**0%**	
East side	-	>45	m	-	**0%**	
South side	-	>45	m	-	**0%**	
West side	-	20	m	-	**15%**	
					15%	(not to exceed 75%)

Increase = **675** **Lpm**

F =

4,500	Lpm
-2,250	
675	
2,925	**Lpm**

= **3,000** **Lpm** (Rounded to the nearest 1,000 L/min)

= **50** **Lps**

= 793 USGPM

Project: 7350 Markham Road
Project Number: 160622803
Project Location: Markham, Ontario
Designer: AK
Date: 1/31/2023

PRELIMINARY ESTIMATE of Required Fire Flow
Fire Underwriters Survey "Water Supply for Public Fire Protection", 1999
Building D

F = 220 · C · √A

where,

F = the required fire flow in litres per minute

C = 0.6 for fire resistive construction (fully protected frame, floors, roof)

= **0.60**

A = The total floor area in square metres (including all storeys, but excluding basements at least 50% below grade) in the building being considered. Note: for fire-resistive buildings, consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors. *

*** vertical openings and exterior vertical communications properly protected (minimum one hour rating):**

Level 2	1,288	sq.m.	(Largest floor)		
Level 3	1,278	sq.m.	(1st adjoining floor)	@	25%
Level 1	1,287	sq.m.	(2nd adjoining floor)	@	25%

A = **1,929** **sq.m.**

F = **220 · (C) · √(A)**

= **5,798** **Lpm**

= **6,000** **Lpm** (Rounded to the nearest 1,000 L/min)

The value obtained above may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Apply a reduction of **25%** (Apartments/Dwellings = LOW HAZARD occupancy), or **-1,500** **Lpm**

F = **4,500** **Lpm**

The value obtained above may be reduced by up to 50% for complete automatic sprinkler protection depending upon the adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both they system and fire department hose lines required.

Apply a reduction of **50%** or **-2,250** **Lpm**

(per the OBC, a fully supervised NFPA 13 sprinkler system is required for this building)

Reduction = **-2,250** **Lpm**

To the value obtained, a percentage should be added for structures exposed within 45 metres:

North side	-	>45	m	-	**0%**
East side	-	>45	m	-	**0%**
South side	-	>45	m	-	**0%**
West side	-	>45	m	-	**0%**
					0% (not to exceed 75%)

Increase = **0** **Lpm**

F =

4,500	Lpm
-2,250	
0	
2,250	**Lpm**

= **2,000** **Lpm** (Rounded to the nearest 1,000 L/min)

= **33** **Lps**

= 528 USGPM

Project: 7350 Markham Road
Project Number: 160622803
Project Location: Markham, Ontario
Designer: AK
Date: 1/31/2023

PRELIMINARY ESTIMATE of Required Fire Flow
Fire Underwriters Survey "Water Supply for Public Fire Protection", 1999
Building E

F = 220 · C · √A

where,

F = the required fire flow in litres per minute

C = 0.6 for fire resistive construction (fully protected frame, floors, roof)

= **0.60**

A = The total floor area in square metres (including all storeys, but excluding basements at least 50% below grade) in the building being considered. Note: for fire-resistive buildings, consider the two largest adjoining floors plus 50% of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors. *

*** vertical openings and exterior vertical communications properly protected (minimum one hour rating):**

Level 2	1,288	sq.m.	(Largest floor)		
Level 3	1,278	sq.m.	(1st adjoining floor)	@	25%
Level 1	1,287	sq.m.	(2nd adjoining floor)	@	25%

A = **1,929** **sq.m.**

F = **220 · (C) · √(A)**

= **5,798** **Lpm**

= **6,000** **Lpm** (Rounded to the nearest 1,000 L/min)

The value obtained above may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard.

Apply a reduction of **25%** (Apartments/Dwellings = LOW HAZARD occupancy), or **-1,500** **Lpm**

F = **4,500** **Lpm**

The value obtained above may be reduced by up to 50% for complete automatic sprinkler protection depending upon the adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both they system and fire department hose lines required.

Apply a reduction of **50%** or **-2,250** **Lpm**

(per the OBC, a fully supervised NFPA 13 sprinkler system is required for this building)

Reduction = **-2,250** **Lpm**

To the value obtained, a percentage should be added for structures exposed within 45 metres:

North side	-	>45	m	-	**0%**
East side	-	>45	m	-	**0%**
South side	-	>45	m	-	**0%**
West side	-	>45	m	-	**0%**
					0% (not to exceed 75%)

Increase = **0** **Lpm**

F =

4,500	Lpm
-2,250	
0	
2,250	**Lpm**

= **2,000** **Lpm** (Rounded to the nearest 1,000 L/min)

= **33** **Lps**

= 528 USGPM

Appendix E Sanitary Servicing

ESTIMATE of Expected Sanitary Flow *Project #160623088*

Phase 1 - Residential

Owen Sound, Ontario

Program Details

	Unit Type	# of Units	Persons * per Unit	Equivalent Population
Residential:	Townhouses	87	2.3	200
	Apartment	390	2.3	897
		Total Residential Population		**1097**
			Unit Count	**477**

TOTAL DESIGN POPULATION **=** **1097**

Site Development Area: **59,299** **m^2**

5.930 **Ha.**

Average Daily Dry Weather Flow

Average Daily Dry Weather Flow = **400** **litres/capita/day ***

for a Total Population of **1097** people,

the Average Daily Dry Weather Flow is: **438,840** **litres/day**

or, **5.08** **litres/second** **(A)**

Sanitary Flow Peaking Factor

Residential Peaking Factor (PF) = $1 + (14/(4+(P/1000)^{1/2}))$ (where P is the population is thousands) *

for a Total Population of **1097** people,

the Residential Peaking Factor is: **3.60** **(B)**

Infiltration Allowance (Site Area Basis)

Inflow/Infiltration allowance calculated on the basis of **0.2** L/s/ha of Site Area *

for a total site development area of **5.930** Ha.,

the Infiltration Allowance is: **1.19** **litres/second** **(C)**

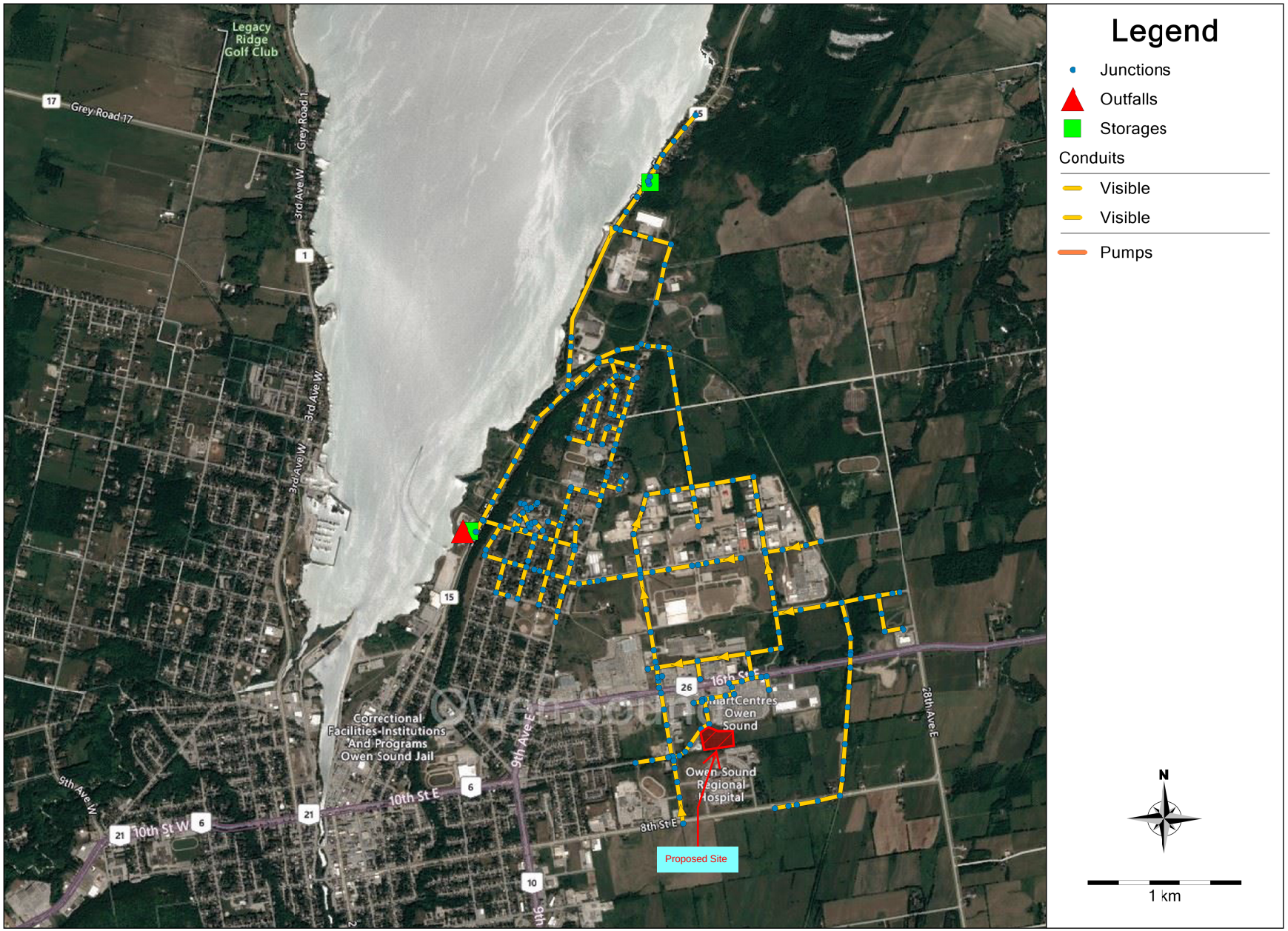
Sanitary Design Flow

Sanitary Design Flow **=** **(Average Daily Dry Weather Flow) x (Peaking Factor) + (Infiltration Allowance)**

= **(A) x (B) + (C)**

= **19.5** **litres/second**

*Per City *Criteria for Sanitary Sewers*


Legacy Ridge Golf Club
17
Grey Road 17
Grey Road 1
3rd Ave W
1
15
Correctional Facilities-Institutions And Programs Owen Sound Jail
9th Ave E
9th Ave W
10th St W
10th St E
6
21
10
26
16th St E
SmartCentres Owen Sound
Owen Sound Regional Hospital
8th St E
28th Ave E
Proposed Site
Legend
Junctions
Outfalls
Storages
Conduits
Visible
Visible
Pumps
N
1 km

Smartcentre - Phase 1A

Sanitary Sewer Design Sheet

Project Number:	1606 23088	**Mannings 'n' :**	0.013	**Max. Capacity (%):**	85%	**Harmon Peaking Factor:**	**Q =** Design Flow (L/s)
Date:	January 2023	**Min. Velocity (m/s):**	0.75	**Infiltration Flow (L/s):**	0.20	$M = 1+(14/(4+P^{0.5}))$	**q =** Avg. Domestic Flow (L/c/d)
Stantec Ltd.	Stantec Ltd.	**Max. Velocty m/s):**	3.65	**Max. Peaking Factor:**	3.6		**P =** Population/1000
City File Number:	N/A	**Min. Pipe Slope (%):**	50.00%	**Min. Peaking Factor:**	1.5	**Design Flow:**	**I =** Infiltration Flow
Prepared By:	Amir K & Jay P	**Avg. Domestic Flow, q (L/c/d):**	400			$Q = (MqP/86.4) + IA$	**A =** Gross Drainage Area (ha)

Manhole			Contributing Area					Comm./Ind./Inst.		Population		Design Calculations					Capactity Calculations					Hydraulic Grade Line Analysis				
Location	U/S MH	D/S MH	Drainage Area	Accum. Area	Units	Density (Area)	Density (Unit)	Static Area	Peak Flow	Pop.	Accum. Area	Peaking Factor	Infil. Flow	Static Flow	Design Flow	Total Flow	Size	Slope	Full Capacity	Full Velocity	QA/QC	U/S HGL	D/S HGL	HGL Above U/S Obv.	U/S Basement Elev	Bsmt to U/S HGL
			(ha)	(ha)	"R"	(p/ha)	(p/unit)	(ha)	(L/ha/s)	(p)	(ha)		(L/s)	(L/s)	(L/s)	(L/s)	(mm)	(%)	(L/s)	(m/s)	(%)	(m)	(m)	(m)	(m)	(m)
	SSMH1859	SSMH1858		0.00				1.00	0.0	0	0	3.6	0.00	0.00	0.00	0.00	250	2.79	99.28	2.02	0%	238.39	233.63	0.00	239.91	1.52
	SSMH1858	SSMH1857		0.00				1.00	6.6	0	0	3.6	0.00	6.62	0.00	6.62	250	3.06	104.02	2.12	6%	233.46	230.39	0.00	235.79	2.33
	SSMH1857	SSMH1776		0.00				1.00	0.0	0	0	3.6	0.00	6.62	0.00	6.62	250	2.73	98.20	2.00	7%	230.29	227.79	0.00	232.68	2.39
	SSMH1776	SSMH1775		0.00				1.00	0.0	0	0	3.6	0.00	6.62	0.00	6.62	250	1.00	59.36	1.21	11%	227.34	226.86	0.00	229.52	2.18
	SSMH1775	SSMH1773		0.00				1.00	0.0	0	0	3.6	0.00	6.62	0.00	6.62	250	1.38	69.79	1.42	9%	226.86	226.49	0.00	228.12	1.26
	SSMH1770	SSMH1771		0.00				1.00	0.0	0	0	3.6	0.00	0.00	0.00	0.00	250	3.19	106.27	2.16	0%	233.23	229.67	0.00	234.80	1.57
	SSMH1771	SSMH1774		0.00				1.00	0.0	0	0	3.6	0.00	0.00	0.00	0.00	250	2.96	102.37	2.09	0%	229.56	226.43	0.00	231.08	1.52
	SSMH1774	SSMH1773		0.00				1.00	0.0	0	0	3.6	0.00	0.00	0.00	0.00	250	1.05	60.86	1.24	0%	226.43	226.10	0.00	227.68	1.25
	SSMH1773	SSMH1777		0.00				1.00	0.0	0	0	3.6	0.00	6.62	0.00	6.62	250	1.05	60.91	1.24	11%	226.10	225.67	0.00	227.65	1.55
	SSMH1777	SSMH1779		0.00				1.00	0.0	0	0	3.6	0.00	6.62	0.00	6.62	250	1.24	66.32	1.35	10%	225.64	225.17	0.00	227.33	1.69
	SSMH1779	SSMH1790		0.00				1.00	0.0	0	0	3.6	0.00	6.62	0.00	6.62	350	0.73	124.66	1.30	5%	225.17	224.78	0.00	227.02	1.85
	SSMH1790	SSMH1782		0.00				1.00	0.0	0	0	3.6	0.00	6.62	0.00	6.62	375	0.42	114.21	1.03	6%	224.78	224.26	0.00	226.35	1.57
	SSMH1782	SSMH1781		0.00				1.00	0.0	0	0	3.6	0.00	6.62	0.00	6.62	375	0.93	168.98	1.53	4%	224.22	223.64	0.00	225.42	1.20
Proposed Building	SSMH1781	SSMH2447		0.00				1.00	19.6	0	0	3.6	0.00	26.25	0.00	26.25	375	1.44	210.13	1.90	12%	223.51	222.20	0.00	224.34	0.83
	SSMH2447	SSMH1783		0.00				1.00	0.0	0	0	3.6	0.00	26.25	0.00	26.25	375	2.41	272.09	2.46	10%	222.20	220.67	0.00	222.78	0.57
	SSMH2538	SSMH2537		0.00				1.00	0.1	0	0	3.6	0.00	0.13	0.00	0.13	200	0.01	2.83	0.09	5%	220.94	220.93	0.00	219.94	-1.00
	SSMH2537	SSMH1784		0.00				1.00	0.0	0	0	3.6	0.00	0.13	0.00	0.13	200	0.10	10.40	0.33	1%	220.83	220.82	0.00	220.13	-0.70
	SSMH1784	SSMH1783		0.00				1.00	0.1	0	0	3.6	0.00	0.26	0.00	0.26	200	0.40	20.87	0.66	1%	220.68	220.67	0.12	220.12	-0.56
	SSMH1783	SSMH1785		0.00				1.00	0.0	0	0	3.6	0.00	26.51	0.00	26.51	250	0.37	36.28	0.74	73%	220.67	220.46	0.33	220.18	-0.50
	SSMH1785	SSMH1786		0.00				1.00	0.1	0	0	3.6	0.00	26.64	0.00	26.64	250	0.21	27.16	0.55	98%	220.46	220.21	0.32	220.91	0.45
	SSMH1786	SSMH1787		0.00				1.00	0.1	0	0	3.6	0.00	26.77	0.00	26.77	250	0.21	27.17	0.55	99%	220.21	220.05	0.27	221.65	1.44
	SSMH1787	SSMH1788		0.00				1.00	0.1	0	0	3.6	0.00	26.90	0.00	26.90	250	0.28	31.54	0.64	85%	220.05	219.88	0.25	222.30	2.24
	SSMH1788	SSMH1789		0.00				1.00	0.1	0	0	3.6	0.00	27.03	0.00	27.03	250	0.13	21.27	0.43	127%	219.88	219.83	0.21	222.55	2.67
	SSMH1789	SSMH1791		0.00				1.00	0.1	0	0	3.6	0.00	27.16	0.00	27.16	450	0.13	101.47	0.64	27%	219.83	219.72	0.00	221.55	1.72
	SSMH1791	SSMH1807		0.00				1.00	0.1	0	0	3.6	0.00	27.29	0.00	27.29	450	0.13	101.88	0.64	27%	219.72	219.64	0.00	222.84	3.12
	SSMH1810	SSMH1809		0.00				1.00	0.3	0	0	3.6	0.00	0.26	0.00	0.26	450	0.83	259.04	1.63	0%	226.27	225.61	0.00	227.87	1.60
	SSMH1809	SSMH1808		0.00				1.00	0.0	0	0	3.6	0.00	0.26	0.00	0.26	450	6.13	705.67	4.44	0%	225.61	223.43	0.00	227.80	2.19
	SSMH1808	SSMH1807		0.00				1.00	0.0	0	0	3.6	0.00	0.26	0.00	0.26	450	6.13	705.73	4.44	0%	223.43	219.64	0.00	226.56	3.13
	SSMH1807	SSMH2560		0.00				1.00	0.0	0	0	3.6	0.00	27.55	0.00	27.55	450	1.05	292.15	1.84	9%	219.62	219.34	0.00	225.26	5.64
	SSMH2560	SSMH1811		0.00				1.00	0.1	0	0	3.6	0.00	27.68	0.00	27.68	450	1.05	292.09	1.84	9%	219.34	217.94	0.00	223.68	4.34
	SSMH1814	SSMH1811		0.00				1.00	0.0	0	0	3.6	0.00	0.00	0.00	0.00	450	3.63	542.95	3.41	0%	223.29	217.84	0.00	222.59	-0.70
	SSMH1811	SSMH1793		0.00				1.00	0.4	0	0	3.6	0.00	28.07	0.00	28.07	300	0.64	77.32	1.09	36%	216.93	215.15	0.45	217.14	0.21
	SSMH1792	SSMH1793		0.00				1.00	0.3	0	0	3.6	0.00	0.26	0.00	0.26	200	0.32	18.54	0.59	1%	215.19	215.15	0.37	217.29	2.10
	SSMH1793	SSMH1803		0.00				1.00	2.5	0	0	3.6	0.00	30.82	0.00	30.82	300	0.22	45.48	0.64	68%	215.15	214.46	0.80	215.01	-0.14
	SSMH1773	SSMH1772		0.00				1.00	0.0	0	0	3.6	0.00	6.62	0.00	6.62	250	1.99	83.86	1.71	8%	226.10	225.94	0.00	227.65	1.55

Smartcentre - Phase 1A

Sanitary Sewer Design Sheet

Project Number:	1606 23088	**Mannings 'n' :**	0.013	**Max. Capacity (%):**	85%	**Harmon Peaking Factor:**	**Q =** Design Flow (L/s)
Date:	January 2023	**Min. Velocity (m/s):**	0.75	**Infiltration Flow (L/s):**	0.20	$M = 1+(14/(4+P^{0.5}))$	**q =** Avg. Domestic Flow (L/c/d)
Stantec Ltd.	Stantec Ltd.	**Max. Velocty m/s):**	3.65	**Max. Peaking Factor:**	3.6		**P =** Population/1000
City File Number:	N/A	**Min. Pipe Slope (%):**	50.00%	**Min. Peaking Factor:**	1.5	**Design Flow:**	**I =** Infiltration Flow
Prepared By:	Amir K & Jay P	**Avg. Domestic Flow, q (L/c/d):**	400			$Q = (MqP/86.4) + IA$	**A =** Gross Drainage Area (ha)

Manhole			Contributing Area					Comm./Ind./Inst.		Population		Design Calculations					Capactity Calculations					Hydraulic Grade Line Analysis				
Location	U/S MH	D/S MH	Drainage Area	Accum. Area	Units	Density (Area)	Density (Unit)	Static Area	Peak Flow	Pop.	Accum. Area	Peaking Factor	Infil. Flow	Static Flow	Design Flow	Total Flow	Size	Slope	Full Capacity	Full Velocity	QA/QC	U/S HGL	D/S HGL	HGL Above U/S Obv.	U/S Basement Elev	Bsmt to U/S HGL
			(ha)	(ha)	"R"	(p/ha)	(p/unit)	(ha)	(L/ha/s)	(p)	(ha)		(L/s)	(L/s)	(L/s)	(L/s)	(mm)	(%)	(L/s)	(m/s)	(%)	(m)	(m)	(m)	(m)	(m)
	SSMH1772	SSMH1780		0.00				1.00	0.0	0	0	3.6	0.00	6.62	0.00	6.62	250	2.00	84.00	1.71	8%	225.94	223.89	0.00	227.44	1.51
	SSMH1780	SSMH1794		0.00				1.00	0.1	0	0	3.6	0.00	6.75	0.00	6.75	250	1.94	82.81	1.69	8%	223.70	221.75	0.00	223.37	-0.33
	SSMH1794	SSMH1796		0.00				1.00	0.0	0	0	3.6	0.00	6.75	0.00	6.75	250	1.01	59.79	1.22	11%	221.50	220.45	0.00	221.39	-0.11
	SSMH1796	SSMH1798		0.00				1.00	0.3	0	0	3.6	0.00	7.01	0.00	7.01	250	0.69	49.27	1.00	14%	220.39	219.68	0.00	219.60	-0.79
	SSMH1798	SSMH1797		0.00				1.00	0.4	0	0	3.6	0.00	7.40	0.00	7.40	250	2.52	94.37	1.92	8%	219.68	218.69	0.00	219.09	-0.59
	SSMH1797	SSMH1800		0.00				1.00	0.0	0	0	3.6	0.00	7.40	0.00	7.40	250	2.75	98.70	2.01	7%	218.53	217.30	0.00	217.81	-0.72
	SSMH1800	SSMH1801		0.00				1.00	0.0	0	0	3.6	0.00	7.40	0.00	7.40	250	3.28	107.75	2.20	7%	217.15	216.32	0.00	216.61	-0.54
	SSMH1801	SSMH1803		0.00				1.00	0.0	0	0	3.6	0.00	7.92	0.00	7.92	250	4.17	121.40	2.47	7%	216.26	214.46	0.00	215.68	-0.58
	SSMH1804	SSMH1803		0.00				1.00	0.2	0	0	3.6	0.00	0.15	0.00	0.15	250	0.50	42.06	0.86	0%	214.48	214.46	0.21	214.54	0.07
	SSMH1802	SSMH1801		0.00				1.00	0.5	0	0	3.6	0.00	0.52	0.00	0.52	200	1.71	42.85	1.36	1%	216.77	216.29	0.00	216.08	-0.69
	SSMH1803	SSMH1805		0.00				1.00	0.0	0	0	3.6	0.00	38.89	0.00	38.89	350	0.23	69.33	0.72	56%	214.46	214.37	0.66	214.78	0.32
	SSMH1805	SSMH1806		0.00				1.00	0.2	0	0	3.6	0.00	39.11	0.00	39.11	350	0.23	69.47	0.72	56%	214.37	214.19	0.65	214.50	0.13
	SSMH1806	SSMH1703		0.00				1.00	0.0	0	0	3.6	0.00	39.11	0.00	39.11	350	0.47	100.12	1.04	39%	214.19	213.69	0.64	213.99	-0.19
	SSMH1703	SSMH1702		0.00				1.00	0.0	0	0	3.6	0.00	39.11	0.00	39.11	350	0.22	68.17	0.71	57%	213.69	213.34	0.76	213.58	-0.11
	SSMH1702	SSMH1698		0.00				1.00	1.0	0	0	3.6	0.00	40.10	0.00	40.10	350	0.38	89.49	0.93	45%	213.34	212.61	0.74	213.02	-0.32
	SSMH1698	SSMH1697		0.00				1.00	0.0	0	0	3.6	0.00	40.10	0.00	40.10	350	0.38	89.32	0.93	45%	212.61	212.51	0.79	212.64	0.03
	SSMH1725	SSMH1724		0.00				1.00	0.9	0	0	3.6	0.00	0.87	0.00	0.87	350	1.00	145.73	1.51	1%	214.32	212.76	0.00	215.71	1.39
	SSMH1724	SSMH1723		0.00				1.00	0.4	0	0	3.6	0.00	1.25	0.00	1.25	350	0.07	38.63	0.40	3%	212.76	212.75	0.02	214.12	1.37
	SSMH1723	SSMH1721		0.00				1.00	0.2	0	0	3.6	0.00	1.44	0.00	1.44	350	0.59	111.75	1.16	1%	212.75	212.71	0.06	214.28	1.54
	SSMH1721	SSMH1720		0.00				1.00	0.2	0	0	3.6	0.00	1.63	0.00	1.63	350	1.90	201.13	2.09	1%	212.71	212.65	0.34	213.91	1.19
	SSMH1720	SSMH2591		0.00				1.00	1.2	0	0	3.6	0.00	2.80	0.00	2.80	350	0.10	45.71	0.48	6%	212.65	212.58	1.02	213.22	0.57
	SSMH2591	SSMH1719		0.00				1.00	0.2	0	0	3.6	0.00	2.99	0.00	2.99	300	0.10	30.32	0.43	10%	212.58	212.53	1.25	212.84	0.27
	SSMH1719	SSMH1697		0.00				1.00	0.0	0	0	3.6	0.00	2.99	0.00	2.99	350	0.10	45.76	0.48	7%	212.53	212.51	1.26	212.40	-0.14
	SSMH1697	SSMH1699		0.00				1.00	0.0	0	0	3.6	0.00	43.09	0.00	43.09	250	0.38	36.47	0.74	118%	212.51	212.38	0.90	212.48	-0.02
	SSMH1699	SSMH1700		0.00				1.00	1.2	0	0	3.6	0.00	44.26	0.00	44.26	250	0.38	36.50	0.74	121%	212.38	211.79	0.87	212.43	0.04
	SSMH1700	SSMH2494		0.00				1.00	0.4	0	0	3.6	0.00	44.63	0.00	44.63	250	0.38	36.47	0.74	122%	211.79	211.23	0.73	212.41	0.62
	SSMH2494	SSMH1701		0.00				1.00	1.2	0	0	3.6	0.00	45.80	0.00	45.80	250	0.38	36.46	0.74	126%	211.23	210.37	0.60	211.89	0.66
	SSMH1701	SSMH1704		0.00				1.00	0.0	0	0	3.6	0.00	45.80	0.00	45.80	250	0.38	36.47	0.74	126%	210.37	209.91	0.40	210.09	-0.28
	SSMH1704	SSMH1705		0.00				1.00	0.7	0	0	3.6	0.00	46.51	0.00	46.51	250	0.38	36.50	0.74	127%	209.91	209.37	0.30	209.05	-0.86
	SSMH1705	SSMH1707		0.00				1.00	0.0	0	0	3.6	0.00	46.51	0.00	46.51	250	0.02	8.84	0.18	526%	209.37	209.37	0.17	208.53	-0.84
	SSMH1707	SSMH1706		0.00				1.00	0.0	0	0	3.6	0.00	46.51	0.00	46.51	250	0.58	45.45	0.93	102%	209.37	208.81	0.42	208.50	-0.87
	SSMH1706	SSMH1708		0.00				1.00	0.2	0	0	3.6	0.00	46.70	0.00	46.70	300	0.50	68.34	0.97	68%	208.81	208.29	0.24	208.87	0.06
	SSMH1711	SSMH1710		0.00				1.00	0.1	0	0	3.6	0.00	0.10	0.00	0.10	300	1.80	129.74	1.84	0%	211.47	209.72	0.00	211.86	0.39
	SSMH1710	SSMH1709		0.00				1.00	0.2	0	0	3.6	0.00	0.29	0.00	0.29	300	1.32	111.03	1.57	0%	209.69	208.61	0.00	210.60	0.91
	SSMH1709	SSMH1708		0.00				1.00	0.2	0	0	3.6	0.00	0.48	0.00	0.48	300	0.76	84.31	1.19	1%	208.57	208.29	0.00	209.93	1.36
	SSMH2547	SSMH2546		0.00				1.00	3.2	0	0	3.6	0.00	3.23	0.00	3.23	600	2.03	874.27	3.09	0%	230.70	228.91	0.00	232.03	1.33
	SSMH2546	SSMH2545		0.00				1.00	0.0	0	0	3.6	0.00	3.23	0.00	3.23	600	1.23	681.37	2.41	0%	228.89	228.22	0.00	230.22	1.33
	SSMH2545	SSMH2544		0.00				1.00	0.0	0	0	3.6	0.00	3.23	0.00	3.23	600	0.12	215.84	0.76	1%	228.20	228.03	0.00	229.66	1.46

Smartcentre - Phase 1A

Sanitary Sewer Design Sheet

Project Number:	1606 23088	**Mannings 'n' :**	0.013	**Max. Capacity (%):**	85%	**Harmon Peaking Factor:**	**Q =** Design Flow (L/s)
Date:	January 2023	**Min. Velocity (m/s):**	0.75	**Infiltration Flow (L/s):**	0.20	$M = 1+(14/(4+P^{0.5}))$	**q =** Avg. Domestic Flow (L/c/d)
Stantec Ltd.	Stantec Ltd.	**Max. Velocty m/s):**	3.65	**Max. Peaking Factor:**	3.6		**P =** Population/1000
City File Number:	N/A	**Min. Pipe Slope (%):**	50.00%	**Min. Peaking Factor:**	1.5	**Design Flow:**	**I =** Infiltration Flow
Prepared By:	Amir K & Jay P	**Avg. Domestic Flow, q (L/c/d):**	400			$Q = (MqP/86.4) + IA$	**A =** Gross Drainage Area (ha)

Manhole			Contributing Area					Comm./Ind./Inst.		Population		Design Calculations					Capacity Calculations					Hydraulic Grade Line Analysis				
Location	U/S MH	D/S MH	Drainage Area	Accum. Area	Units	Density (Area)	Density (Unit)	Static Area	Peak Flow	Pop.	Accum. Area	Peaking Factor	Infil. Flow	Static Flow	Design Flow	Total Flow	Size	Slope	Full Capacity	Full Velocity	QA/QC	U/S HGL	D/S HGL	HGL Above U/S Obv.	U/S Basement Elev	Bsmt to U/S HGL
			(ha)	(ha)	"R"	(p/ha)	(p/unit)	(ha)	(L/ha/s)	(p)	(ha)		(L/s)	(L/s)	(L/s)	(L/s)	(mm)	(%)	(L/s)	(m/s)	(%)	(m)	(m)	(m)	(m)	(m)
	SSMH2544	SSMH2548		0.00				1.00	0.0	0	0	3.6	0.00	3.23	0.00	3.23	600	0.21	280.60	0.99	1%	228.01	227.70	0.00	230.48	2.47
	SSMH2548	SSMH2549		0.00				1.00	0.0	0	0	3.6	0.00	3.23	0.00	3.23	600	0.41	392.67	1.39	1%	227.67	227.23	0.00	232.13	4.46
	SSMH2549	SSMH2550		0.00				1.00	0.0	0	0	3.6	0.00	3.23	0.00	3.23	600	0.27	316.60	1.12	1%	227.21	226.90	0.00	231.27	4.06
	SSMH2550	SSMH2551		0.00				1.00	0.0	0	0	3.6	0.00	3.23	0.00	3.23	600	0.24	298.51	1.06	1%	226.85	226.58	0.00	230.82	3.97
	SSMH2551	SSMH2552		0.00				1.00	0.0	0	0	3.6	0.00	3.23	0.00	3.23	600	0.87	572.47	2.02	1%	226.55	225.51	0.00	230.23	3.68
	SSMH2552	SSMH2553		0.00				1.00	0.0	0	0	3.6	0.00	3.23	0.00	3.23	600	0.00	17.68	0.06	18%	225.46	225.46	0.00	229.08	3.62
	SSMH2553	SSMH2554		0.00				1.00	0.1	0	0	3.6	0.00	3.36	0.00	3.36	600	0.48	424.55	1.50	1%	225.44	224.88	0.00	228.16	2.72
	SSMH2554	SSMH2555		0.00				1.00	0.0	0	0	3.6	0.00	3.36	0.00	3.36	750	0.19	491.45	1.11	1%	224.88	224.64	0.00	226.97	2.09
	SSMH2555	SSMH2556		0.00				1.00	0.0	0	0	3.6	0.00	3.36	0.00	3.36	600	0.38	377.53	1.34	1%	224.45	224.19	0.00	225.80	1.35
	SSMH2556	SSMH2501		0.00				1.00	0.0	0	0	3.6	0.00	3.36	0.00	3.36	600	0.12	216.58	0.77	2%	224.19	224.19	0.08	225.56	1.37
	SSMH2501	SSMH2540		0.00				1.00	0.0	0	0	3.6	0.00	3.36	0.00	3.36	700	0.12	323.16	0.84	1%	224.19	224.07	0.00	225.73	1.54
	SSMH2540	SSMH2500		0.00				1.00	0.0	0	0	3.6	0.00	3.36	0.00	3.36	700	0.76	805.99	2.09	0%	223.84	222.92	0.00	225.37	1.53
	SSMH2500	SSMH2499		0.00				1.00	0.0	0	0	3.6	0.00	3.36	0.00	3.36	550	0.76	423.62	1.78	1%	222.77	221.90	0.00	224.46	1.69
	SSMH1823	SSMH1822		0.00				1.00	1.0	0	0	3.6	0.00	0.99	0.00	0.99	150	2.16	22.40	1.27	4%	230.61	230.33	0.00	231.24	0.63
	SSMH1822	SSMH1821		0.00				1.00	0.0	0	0	3.6	0.00	0.99	0.00	0.99	250	2.05	85.08	1.73	1%	229.88	227.43	0.00	230.86	0.98
	SSMH1821	SSMH1820		0.00				1.00	0.0	0	0	3.6	0.00	0.99	0.00	0.99	300	2.32	147.40	2.09	1%	227.42	224.68	0.00	227.91	0.49
	SSMH1820	SSMH1817		0.00				1.00	0.0	0	0	3.6	0.00	0.99	0.00	0.99	250	0.98	58.79	1.20	2%	224.12	222.97	0.00	224.60	0.48
	SSMH1818	SSMH1819		0.00				1.00	0.0	0	0	3.6	0.00	0.00	0.00	0.00	250	2.01	84.37	1.72	0%	224.37	223.38	0.00	224.29	-0.08
	SSMH1819	SSMH1817		0.00				1.00	0.0	0	0	3.6	0.00	0.00	0.00	0.00	250	0.41	37.90	0.77	0%	223.38	223.01	0.00	223.25	-0.13
	SSMH1817	SSMH1816		0.00				1.00	0.0	0	0	3.6	0.00	0.99	0.00	0.99	250	0.35	35.18	0.72	3%	222.95	222.55	0.00	222.16	-0.79
	SSMH1816	SSMH2499		0.00				1.00	0.0	0	0	3.6	0.00	0.99	0.00	0.99	250	1.06	61.17	1.25	2%	222.51	221.47	0.00	221.61	-0.90
	SSMH2499	SSMH2498		0.00				1.00	0.0	0	0	3.6	0.00	4.35	0.00	4.35	600	0.27	319.79	1.13	1%	221.47	221.15	0.00	223.39	1.92
	SSMH2498	SSMH2497		0.00				1.00	0.0	0	0	3.6	0.00	4.35	0.00	4.35	600	0.16	249.06	0.88	2%	221.06	220.81	0.00	224.75	3.69
	SSMH2497	SSMH2496		0.00				1.00	0.0	0	0	3.6	0.00	4.35	0.00	4.35	550	2.52	773.25	3.25	1%	220.72	216.68	0.00	223.90	3.18
	SSMH1814	SSMH1812		0.00				1.00	0.0	0	0	3.6	0.00	0.00	0.00	0.00	425	8.76	724.34	5.11	0%	223.27	217.33	0.00	222.59	-0.68
	SSMH1812	SSMH1815		0.00				1.00	0.0	0	0	3.6	0.00	0.00	0.00	0.00	450	0.51	203.83	1.28	0%	217.33	216.80	0.00	223.60	6.27
	SSMH1815	SSMH2496		0.00				1.00	0.0	0	0	3.6	0.00	0.00	0.00	0.00	450	0.23	136.07	0.86	0%	216.80	216.68	0.00	221.36	4.56
	SSMH2496	SSMH2495		0.00				1.00	0.0	0	0	3.6	0.00	4.35	0.00	4.35	600	0.23	292.77	1.04	1%	216.68	216.51	0.00	218.19	1.52
	SSMH2495	SSMH1729		0.00				1.00	0.0	0	0	3.6	0.00	4.35	0.00	4.35	600	0.23	292.89	1.04	1%	216.51	216.36	0.00	218.19	1.68
	SSMH1729	SSMH1728		0.00				1.00	0.0	0	0	3.6	0.00	4.35	0.00	4.35	600	0.23	293.38	1.04	1%	216.36	216.21	0.00	218.43	2.07
	SSMH1728	SSMH1727		0.00				1.00	0.0	0	0	3.6	0.00	4.35	0.00	4.35	600	0.74	529.81	1.87	1%	216.21	214.75	0.00	217.95	1.74
	SSMH1731	SSMH1730		0.00				1.00	1.0	0	0	3.6	0.00	0.99	0.00	0.99	300	0.21	43.89	0.62	2%	218.98	218.73	0.00	221.63	2.65
	SSMH1730	SSMH1732		0.00				1.00	3.0	0	0	3.6	0.00	3.95	0.00	3.95	300	1.49	117.99	1.67	3%	218.73	216.69	0.00	220.81	2.08
	SSMH1732	SSMH1727		0.00				1.00	0.0	0	0	3.6	0.00	3.95	0.00	3.95	300	1.76	128.44	1.82	3%	216.69	214.75	0.00	217.07	0.38
	SSMH1727	SSMH1718		0.00				1.00	0.0	0	0	3.6	0.00	8.30	0.00	8.30	600	0.55	455.03	1.61	2%	214.75	214.65	0.00	216.20	1.45
	SSMH1718	SSMH1716		0.00				1.00	1.0	0	0	3.6	0.00	9.29	0.00	9.29	600	0.55	454.17	1.61	2%	214.65	214.04	0.00	216.21	1.56
	SSMH1716	SSMH1717		0.00				1.00	2.1	0	0	3.6	0.00	11.36	0.00	11.36	600	0.41	392.48	1.39	3%	214.04	213.54	0.00	216.41	2.37
	SSMH1717	SSMH1715		0.00				1.00	2.2	0	0	3.6	0.00	13.52	0.00	13.52	600	0.49	427.84	1.51	3%	213.54	212.94	0.00	216.44	2.90
	SSMH1715	SSMH1714		0.00				1.00	1.3	0	0	3.6	0.00	14.80	0.00	14.80	600	0.84	564.33	2.00	3%	212.94	211.88	0.00	214.47	1.53
	SSMH1714	SSMH1713		0.00				1.00	0.1	0	0	3.6	0.00	14.90	0.00	14.90	600	0.81	553.45	1.96	3%	211.50	210.39	0.00	212.34	0.84

Smartcentre - Phase 1A

Sanitary Sewer Design Sheet

Project Number:	1606 23088	**Mannings 'n' :**	0.013	**Max. Capacity (%):**	85%	**Harmon Peaking Factor:**	**Q =** Design Flow (L/s)
Date:	January 2023	**Min. Velocity (m/s):**	0.75	**Infiltration Flow (L/s):**	0.20	$M = 1+(14/(4+P^{0.5}))$	**q =** Avg. Domestic Flow (L/c/d)
Stantec Ltd.	Stantec Ltd.	**Max. Velocty m/s):**	3.65	**Max. Peaking Factor:**	3.6		**P =** Population/1000
City File Number:	N/A	**Min. Pipe Slope (%):**	50.00%	**Min. Peaking Factor:**	1.5	**Design Flow:**	**I =** Infiltration Flow
Prepared By:	Amir K & Jay P	**Avg. Domestic Flow, q (L/c/d):**	400			$Q = (MqP/86.4) + IA$	**A =** Gross Drainage Area (ha)

Manhole			Contributing Area					Comm./Ind./Inst.		Population		Design Calculations					Capacity Calculations					Hydraulic Grade Line Analysis				
Location	U/S MH	D/S MH	Drainage Area	Accum. Area	Units	Density (Area)	Density (Unit)	Static Area	Peak Flow	Pop.	Accum. Area	Peaking Factor	Infil. Flow	Static Flow	Design Flow	Total Flow	Size	Slope	Full Capacity	Full Velocity	QA/QC	U/S HGL	D/S HGL	HGL Above U/S Obv.	U/S Basement Elev	Bsmt to U/S HGL
			(ha)	(ha)	"R"	(p/ha)	(p/unit)	(ha)	(L/ha/s)	(p)	(ha)		(L/s)	(L/s)	(L/s)	(L/s)	(mm)	(%)	(L/s)	(m/s)	(%)	(m)	(m)	(m)	(m)	(m)
	SSMH1713	SSMH1712		0.00				1.00	0.0	0	0	3.6	0.00	14.90	0.00	14.90	600	0.81	553.27	1.96	3%	210.39	209.28	0.00	211.29	0.90
	SSMH1712	SSMH1708		0.00				1.00	0.1	0	0	3.6	0.00	15.00	0.00	15.00	600	0.66	499.96	1.77	3%	209.28	208.39	0.00	210.28	1.00
	SSMH1708	SSMH1860		0.00				1.00	0.1	0	0	3.6	0.00	62.28	0.00	62.28	600	0.76	535.49	1.89	12%	208.29	207.33	0.00	209.39	1.10
	SSMH1860	SSMH1861		0.00				1.00	0.0	0	0	3.6	0.00	62.28	0.00	62.28	600	1.16	662.68	2.34	9%	207.33	205.81	0.00	208.15	0.82
	SSMH1861	SSMH1862		0.00				1.00	0.0	0	0	3.6	0.00	62.28	0.00	62.28	600	3.03	1069.55	3.78	6%	205.26	201.32	0.00	206.03	0.77
	SSMH1862	SSMH1863		0.00				1.00	0.0	0	0	3.6	0.00	62.28	0.00	62.28	600	2.04	877.59	3.10	7%	201.32	198.60	0.00	202.98	1.66
	SSMH1863	SSMH1864		0.00				1.00	0.0	0	0	3.6	0.00	62.28	0.00	62.28	600	2.04	877.41	3.10	7%	198.60	196.10	0.00	199.03	0.43
	SSMH1864	SSMH1865		0.00				1.00	0.0	0	0	3.6	0.00	62.28	0.00	62.28	600	2.04	877.52	3.10	7%	196.10	193.75	0.00	194.74	-1.36
	SSMH1865	SSMH1020		0.00				1.00	0.0	0	0	3.6	0.00	62.28	0.00	62.28	600	2.04	877.49	3.10	7%	193.75	191.34	0.00	193.22	-0.53
	SSMH1020	SSMH1019		0.00				1.00	0.0	0	0	3.6	0.00	62.28	0.00	62.28	600	2.04	877.87	3.10	7%	191.34	190.52	0.00	191.89	0.55
	SSMH1019	SSMH1021		0.00				1.00	0.0	0	0	3.6	0.00	62.28	0.00	62.28	600	2.04	877.45	3.10	7%	190.52	189.11	0.00	190.54	0.02
	SSMH1021	SSMH1022		0.00				1.00	0.0	0	0	3.6	0.00	62.28	0.00	62.28	600	3.26	1109.08	3.92	6%	189.11	186.86	0.00	190.17	1.06
	SSMH1022	SSMH1023		0.00				1.00	0.0	0	0	3.6	0.00	62.28	0.00	62.28	600	1.09	640.03	2.26	10%	186.86	186.66	0.00	189.65	2.79
	SSMH1023	SSMH1018		0.00				1.00	0.0	0	0	3.6	0.00	62.28	0.00	62.28	900	1.08	1884.94	2.96	3%	186.66	186.26	0.00	187.00	0.34
	SSMH1018	SSMH1024		0.00				1.00	0.0	0	0	3.6	0.00	62.28	0.00	62.28	900	0.33	1037.22	1.63	6%	186.26	185.84	0.00	187.16	0.90
	SSMH1024	SSMH1025		0.00				1.00	0.0	0	0	3.6	0.00	62.28	0.00	62.28	900	0.24	880.98	1.38	7%	185.84	185.52	0.00	187.28	1.44
	SSMH1025	SSMH1026		0.00				1.00	0.0	0	0	3.6	0.00	62.28	0.00	62.28	900	0.24	881.91	1.39	7%	185.52	185.45	0.00	187.80	2.28
	SSMH1026	SSMH1027		0.00				1.00	0.0	0	0	3.6	0.00	62.32	0.00	62.32	900	0.20	802.63	1.26	8%	185.45	185.23	0.00	188.05	2.60
	SSMH1027	SSMH1028		0.00				1.00	0.0	0	0	3.6	0.00	62.36	0.00	62.36	900	0.69	1507.55	2.37	4%	185.23	184.56	0.00	187.53	2.30
	SSMH1028	SSMH1031		0.00				1.00	0.1	0	0	3.6	0.00	62.42	0.00	62.42	900	0.69	1508.56	2.37	4%	184.56	184.27	0.00	186.63	2.06
	SSMH1697	SSMH1696		0.00				1.00	0.0	0	0	3.6	0.00	43.09	0.00	43.09	400	0.10	65.34	0.52	66%	211.28	211.14	0.05	212.48	1.21
	SSMH1696	SSMH1695		0.00				1.00	0.0	0	0	3.6	0.00	43.09	0.00	43.09	400	0.10	65.15	0.52	66%	211.14	211.02	0.03	213.01	1.87
	SSMH1695	SSMH1165		0.00				1.00	1.8	0	0	3.6	0.00	44.84	0.00	44.84	400	0.10	65.68	0.52	68%	211.02	210.98	0.02	212.94	1.92
	SSMH1165	SSMH1164		0.00				1.00	1.8	0	0	3.6	0.00	46.59	0.00	46.59	400	0.10	65.10	0.52	72%	210.98	210.92	0.01	213.07	2.09
	SSMH1164	SSMH1163		0.00				1.00	0.0	0	0	3.6	0.00	46.61	0.00	46.61	400	0.54	153.15	1.22	30%	210.92	210.55	0.00	212.82	1.90
	SSMH1163	SSMH1162		0.00				1.00	0.2	0	0	3.6	0.00	46.77	0.00	46.77	400	0.41	132.86	1.06	35%	210.55	210.24	0.00	212.70	2.15
	SSMH1175	SSMH1154		0.00				1.00	0.1	0	0	3.6	0.00	0.05	0.00	0.05	200	2.51	51.95	1.65	0%	216.29	214.43	0.00	215.32	-0.97
	SSMH1154	SSMH1160		0.00				1.00	1.9	0	0	3.6	0.00	1.90	0.00	1.90	200	0.99	32.72	1.04	6%	214.43	213.45	0.00	215.08	0.65
	SSMH1160	SSMH1162		0.00				1.00	0.2	0	0	3.6	0.00	2.06	0.00	2.06	200	1.05	33.58	1.07	6%	213.41	212.37	0.00	214.01	0.60
	SSMH1162	SSMH1161		0.00				1.00	0.2	0	0	3.6	0.00	49.01	0.00	49.01	400	0.59	160.38	1.28	31%	210.11	210.01	0.02	212.65	2.54
	SSMH1161	SSMH1105		0.00				1.00	0.2	0	0	3.6	0.00	49.37	0.00	49.37	450	0.31	159.88	1.01	31%	210.01	209.68	0.00	212.52	2.51
	SSMH1105	SSMH1104		0.00				1.00	0.3	0	0	3.6	0.00	49.65	0.00	49.65	450	0.50	201.66	1.27	25%	209.68	209.25	0.00	211.93	2.25
	SSMH1104	SSMH1102		0.00				1.00	0.1	0	0	3.6	0.00	49.70	0.00	49.70	450	0.06	72.40	0.46	69%	209.25	209.23	0.00	211.43	2.18
	SSMH1147	SSMH1161		0.00				1.00	0.2	0	0	3.6	0.00	0.20	0.00	0.20	150	0.88	14.27	0.81	1%	212.71	211.86	0.00	212.82	0.11
	SSMH1099	SSMH1100		0.00				1.00	0.0	0	0	3.6	0.00	0.01	0.00	0.01	200	0.28	17.47	0.56	0%	211.88	211.74	0.00	211.53	-0.35
	SSMH1100	SSMH1103		0.00				1.00	0.0	0	0	3.6	0.00	0.04	0.00	0.04	200	0.16	13.23	0.42	0%	211.74	211.55	0.00	211.39	-0.35
	SSMH1103	SSMH1102		0.00				1.00	0.0	0	0	3.6	0.00	0.04	0.00	0.04	200	14.22	123.70	3.94	0%	211.55	209.99	0.00	211.24	-0.31
	SSMH1102	SSMH1087		0.00				1.00	0.0	0	0	3.6	0.00	49.75	0.00	49.75	450	0.21	129.62	0.82	38%	209.23	208.98	0.00	211.27	2.04
	SSMH2491	SSMH2490		0.00				1.00	0.1	0	0	3.6	0.00	0.06	0.00	0.06	250	0.22	27.67	0.56	0%	213.81	213.70	0.00	213.52	-0.29

Smartcentre - Phase 1A

Sanitary Sewer Design Sheet

Project Number:	1606 23088	**Mannings 'n' :**	0.013	**Max. Capacity (%):**	85%	**Harmon Peaking Factor:**	**Q =** Design Flow (L/s)
Date:	January 2023	**Min. Velocity (m/s):**	0.75	**Infiltration Flow (L/s):**	0.20	$M = 1+(14/(4+P^{0.5}))$	**q =** Avg. Domestic Flow (L/c/d)
Stantec Ltd.	Stantec Ltd.	**Max. Velocty m/s):**	3.65	**Max. Peaking Factor:**	3.6		**P =** Population/1000
City File Number:	N/A	**Min. Pipe Slope (%):**	50.00%	**Min. Peaking Factor:**	1.5	**Design Flow:**	**I =** Infiltration Flow
Prepared By:	Amir K & Jay P	**Avg. Domestic Flow, q (L/c/d):**	400			$Q = (MqP/86.4) + IA$	**A =** Gross Drainage Area (ha)

Manhole			Contributing Area					Comm./Ind./Inst.		Population		Design Calculations					Capacity Calculations					Hydraulic Grade Line Analysis				
Location	U/S MH	D/S MH	Drainage Area	Accum. Area	Units	Density (Area)	Density (Unit)	Static Area	Peak Flow	Pop.	Accum. Area	Peaking Factor	Infil. Flow	Static Flow	Design Flow	Total Flow	Size	Slope	Full Capacity	Full Velocity	QA/QC	U/S HGL	D/S HGL	HGL Above U/S Obv.	U/S Basement Elev	Bsmt to U/S HGL
			(ha)	(ha)	"R"	(p/ha)	(p/unit)	(ha)	(L/ha/s)	(p)	(ha)		(L/s)	(L/s)	(L/s)	(L/s)	(mm)	(%)	(L/s)	(m/s)	(%)	(m)	(m)	(m)	(m)	(m)
	SSMH2490	SSMH1098		0.00				1.00	0.1	0	0	3.6	0.00	0.11	0.00	0.11	250	0.22	27.70	0.56	0%	213.70	213.59	0.00	214.24	0.54
	SSMH1098	SSMH1097		0.00				1.00	0.1	0	0	3.6	0.00	0.18	0.00	0.18	250	0.39	36.90	0.75	0%	213.59	213.22	0.00	213.95	0.36
	SSMH1107	SSMH1106		0.00				1.00	0.0	0	0	3.6	0.00	0.02	0.00	0.02	250	0.51	42.53	0.87	0%	213.56	213.41	0.00	214.03	0.47
	SSMH1106	SSMH1097		0.00				1.00	0.0	0	0	3.6	0.00	0.03	0.00	0.03	250	0.35	35.16	0.72	0%	213.32	213.11	0.00	213.95	0.63
	SSMH1097	SSMH1096		0.00				1.00	0.0	0	0	3.6	0.00	0.25	0.00	0.25	250	0.40	37.68	0.77	1%	213.11	212.82	0.00	213.95	0.84
	SSMH1096	SSMH1095		0.00				1.00	0.0	0	0	3.6	0.00	1.17	0.00	1.17	250	0.58	45.13	0.92	3%	212.82	212.23	0.00	213.47	0.65
	SSMH1095	SSMH2489		0.00				1.00	0.1	0	0	3.6	0.00	1.24	0.00	1.24	250	0.98	58.88	1.20	2%	212.23	212.06	0.00	212.62	0.39
	SSMH2489	SSMH1094		0.00				1.00	0.0	0	0	3.6	0.00	1.28	0.00	1.28	250	0.31	32.86	0.67	4%	212.06	211.81	0.00	212.51	0.45
	SSMH1094	SSMH1093		0.00				1.00	0.0	0	0	3.6	0.00	1.32	0.00	1.32	250	0.82	53.82	1.10	2%	211.73	211.54	0.00	212.15	0.42
	SSMH1093	SSMH1092		0.00				1.00	0.0	0	0	3.6	0.00	1.34	0.00	1.34	250	0.18	25.44	0.52	5%	211.49	211.36	0.00	211.98	0.49
	SSMH1092	SSMH1091		0.00				1.00	0.0	0	0	3.6	0.00	1.38	0.00	1.38	250	0.33	34.01	0.69	4%	211.32	211.08	0.00	211.71	0.39
	SSMH1091	SSMH1090		0.00				1.00	0.0	0	0	3.6	0.00	1.39	0.00	1.39	250	0.01	6.95	0.14	20%	211.06	211.06	0.00	211.42	0.36
	SSMH1090	SSMH1088		0.00				1.00	0.0	0	0	3.6	0.00	1.41	0.00	1.41	250	3.08	104.37	2.13	1%	210.86	209.37	0.00	211.23	0.37
	SSMH1088	SSMH1087		0.00				1.00	0.0	0	0	3.6	0.00	1.50	0.00	1.50	250	0.24	28.99	0.59	5%	209.33	209.08	0.00	211.05	1.72
	SSMH2533	SSMH1096		0.00				1.00	0.9	0	0	3.6	0.00	0.88	0.00	0.88	250	0.50	42.02	0.86	2%	213.19	212.87	0.00	212.46	-0.72
	SSMH1082	SSMH1088		0.00				1.00	0.1	0	0	3.6	0.00	0.06	0.00	0.06	250	0.52	42.99	0.88	0%	209.78	209.34	0.00	210.53	0.75
	SSMH1144	SSMH1145		0.00				1.00	0.0	0	0	3.6	0.00	0.03	0.00	0.03	200	1.17	35.48	1.13	0%	213.94	213.52	0.00	213.43	-0.51
	SSMH1145	SSMH1146		0.00				1.00	0.1	0	0	3.6	0.00	0.08	0.00	0.08	200	0.83	29.90	0.95	0%	213.50	213.06	0.00	213.36	-0.14
	SSMH1148	SSMH1159		0.00				1.00	0.0	0	0	3.6	0.00	0.02	0.00	0.02	200	0.79	29.10	0.93	0%	214.32	213.53	0.00	214.42	0.10
	SSMH1159	SSMH1146		0.00				1.00	0.1	0	0	3.6	0.00	0.11	0.00	0.11	200	0.35	19.35	0.62	1%	213.47	213.08	0.00	213.41	-0.06
	SSMH1146	SSMH1089		0.00				1.00	0.0	0	0	3.6	0.00	0.19	0.00	0.19	200	0.48	22.62	0.72	1%	213.03	212.52	0.00	213.20	0.17
	SSMH1089	SSMH1087		0.00				1.00	0.1	0	0	3.6	0.00	0.27	0.00	0.27	200	0.93	31.69	1.01	1%	212.52	211.52	0.00	212.24	-0.28
	SSMH1087	SSMH1086		0.00				1.00	0.0	0	0	3.6	0.00	51.56	0.00	51.56	450	0.21	129.46	0.81	40%	208.98	208.83	0.00	211.24	2.26
	SSMH1086	SSMH1083		0.00				1.00	0.0	0	0	3.6	0.00	51.58	0.00	51.58	450	0.21	129.34	0.81	40%	208.83	208.69	0.00	211.62	2.79
	SSMH1083	SSMH1063		0.00				1.00	0.0	0	0	3.6	0.00	51.82	0.00	51.82	450	0.34	166.50	1.05	31%	208.69	208.25	0.00	212.51	3.82
	SSMH1063	SSMH1062		0.00				1.00	0.0	0	0	3.6	0.00	52.03	0.00	52.03	525	0.55	317.79	1.47	16%	208.25	207.77	0.00	210.62	2.38
	SSMH1062	SSMH1058		0.00				1.00	0.0	0	0	3.6	0.00	53.14	0.00	53.14	525	27.70	2263.33	10.46	2%	207.77	176.50	0.00	209.11	1.34
	SSMH1058	ADD_MH_2		0.00				1.00	0.0	0	0	3.6	0.00	53.14	0.00	53.14	250	2.75	98.68	2.01	54%	176.50	176.39	0.56	177.16	0.65
	ADD_MH_2	SSMH2543		0.00				1.00	0.0	0	0	3.6	0.00	53.14	0.00	53.14	300	5.39	224.44	3.18	24%	176.39	176.12	0.50	177.05	0.67
	SSMH1138	SSMH1085		0.00				1.00	0.1	0	0	3.6	0.00	0.08	0.00	0.08	250	0.59	45.48	0.93	0%	213.17	212.61	0.00	213.31	0.14
	SSMH1085	SSMH1084		0.00				1.00	0.1	0	0	3.6	0.00	0.20	0.00	0.20	250	0.35	35.04	0.71	1%	212.61	212.41	0.00	212.72	0.11
	SSMH1084	SSMH1083		0.00				1.00	0.0	0	0	3.6	0.00	0.24	0.00	0.24	250	20.76	270.93	5.52	0%	212.41	209.04	0.00	212.45	0.04
	SSMH1149	SSMH1158		0.00				1.00	0.1	0	0	3.6	0.00	0.05	0.00	0.05	200	0.41	20.94	0.67	0%	214.09	213.64	0.00	213.87	-0.22
	SSMH1158	SSMH1142		0.00				1.00	0.1	0	0	3.6	0.00	0.17	0.00	0.17	200	0.37	20.06	0.64	1%	213.64	213.25	0.00	213.51	-0.13
	SSMH1142	SSMH1143		0.00				1.00	0.0	0	0	3.6	0.00	0.20	0.00	0.20	200	0.40	20.87	0.66	1%	213.24	212.93	0.00	213.79	0.55
	SSMH1143	SSMH1141		0.00				1.00	0.1	0	0	3.6	0.00	0.28	0.00	0.28	200	2.09	47.39	1.51	1%	212.93	211.51	0.00	213.11	0.18
	SSMH1141	SSMH1140		0.00				1.00	0.2	0	0	3.6	0.00	0.82	0.00	0.82	200	0.43	21.55	0.69	4%	211.46	210.88	0.00	211.83	0.37

Smartcentre - Phase 1A

Sanitary Sewer Design Sheet

Project Number:	1606 23088	**Mannings 'n' :**	0.013	**Max. Capacity (%):**	85%	**Harmon Peaking Factor:**	**Q =** Design Flow (L/s)
Date:	January 2023	**Min. Velocity (m/s):**	0.75	**Infiltration Flow (L/s):**	0.20	$M = 1+(14/(4+P^{0.5}))$	**q =** Avg. Domestic Flow (L/c/d)
Stantec Ltd.	Stantec Ltd.	**Max. Velocty m/s):**	3.65	**Max. Peaking Factor:**	3.6		**P =** Population/1000
City File Number:	N/A	**Min. Pipe Slope (%):**	50.00%	**Min. Peaking Factor:**	1.5	**Design Flow:**	**I =** Infiltration Flow
Prepared By:	Amir K & Jay P	**Avg. Domestic Flow, q (L/c/d):**	400			$Q = (MqP/86.4) + IA$	**A =** Gross Drainage Area (ha)

Manhole			Contributing Area					Comm./Ind./Inst.		Population		Design Calculations					Capactity Calculations					Hydraulic Grade Line Analysis				
Location	U/S MH	D/S MH	Drainage Area	Accum. Area	Units	Density (Area)	Density (Unit)	Static Area	Peak Flow	Pop.	Accum. Area	Peaking Factor	Infil. Flow	Static Flow	Design Flow	Total Flow	Size	Slope	Full Capacity	Full Velocity	QA/QC	U/S HGL	D/S HGL	HGL Above U/S Obv.	U/S Basement Elev	Bsmt to U/S HGL
			(ha)	(ha)	"R"	(p/ha)	(p/unit)	(ha)	(L/ha/s)	(p)	(ha)		(L/s)	(L/s)	(L/s)	(L/s)	(mm)	(%)	(L/s)	(m/s)	(%)	(m)	(m)	(m)	(m)	(m)
	SSMH1140	SSMH1139		0.00				1.00	0.1	0	0	3.6	0.00	0.90	0.00	0.90	200	0.26	16.88	0.54	5%	210.88	210.79	0.00	210.87	-0.01
	SSMH1139	SSMH1066		0.00				1.00	0.1	0	0	3.6	0.00	0.96	0.00	0.96	200	0.47	22.51	0.72	4%	210.75	210.29	0.00	210.79	0.04
	SSMH1066	SSMH1062		0.00				1.00	0.1	0	0	3.6	0.00	1.07	0.00	1.07	200	1.03	33.33	1.06	3%	210.29	209.41	0.00	210.08	-0.21
	SSMH1153	SSMH1150		0.00				1.00	0.1	0	0	3.6	0.00	0.05	0.00	0.05	200	2.30	49.70	1.58	0%	213.99	212.19	0.00	213.69	-0.30
	SSMH1150	SSMH1157		0.00				1.00	0.1	0	0	3.6	0.00	0.12	0.00	0.12	200	0.28	17.37	0.55	1%	212.16	211.88	0.00	211.84	-0.32
	SSMH1157	SSMH1141		0.00				1.00	0.2	0	0	3.6	0.00	0.35	0.00	0.35	200	0.36	19.68	0.63	2%	211.88	211.48	0.00	211.52	-0.36
	SSMH1074	SSMH1073		0.00				1.00	0.0	0	0	3.6	0.00	0.03	0.00	0.03	150	1.88	20.89	1.18	0%	211.55	210.20	0.00	212.35	0.80
	SSMH1073	SSMH1072		0.00				1.00	0.0	0	0	3.6	0.00	0.05	0.00	0.05	200	0.19	14.24	0.45	0%	210.20	210.16	0.00	210.97	0.77
	SSMH1072	SSMH1070		0.00				1.00	0.0	0	0	3.6	0.00	0.06	0.00	0.06	200	0.77	28.78	0.92	0%	210.14	209.97	0.00	210.44	0.30
	SSMH1071	SSMH1070		0.00				1.00	0.0	0	0	3.6	0.00	0.00	0.00	0.00	200	2.93	56.13	1.79	0%	211.15	210.54	0.00	212.14	0.99
	SSMH1070	SSMH1069		0.00				1.00	0.0	0	0	3.6	0.00	0.08	0.00	0.08	200	2.02	46.63	1.48	0%	209.97	208.35	0.00	210.96	0.99
	SSMH1076	SSMH1077		0.00				1.00	0.0	0	0	3.6	0.00	0.01	0.00	0.01	200	1.34	37.97	1.21	0%	209.20	208.86	0.00	209.55	0.35
	SSMH1077	SSMH1078		0.00				1.00	0.0	0	0	3.6	0.00	0.01	0.00	0.01	200	1.16	35.35	1.13	0%	208.81	208.48	0.00	209.76	0.95
	SSMH1078	SSMH1075		0.00				1.00	0.0	0	0	3.6	0.00	0.01	0.00	0.01	200	0.62	25.90	0.82	0%	208.48	208.44	0.00	210.07	1.59
	SSMH1081	SSMH1080		0.00				1.00	0.0	0	0	3.6	0.00	0.01	0.00	0.01	350	1.43	174.39	1.81	0%	208.90	208.71	0.00	209.93	1.03
	SSMH1080	SSMH1079		0.00				1.00	0.0	0	0	3.6	0.00	0.03	0.00	0.03	350	0.50	103.20	1.07	0%	208.71	208.51	0.00	209.86	1.16
	SSMH1079	SSMH1075		0.00				1.00	0.0	0	0	3.6	0.00	0.04	0.00	0.04	350	0.29	78.32	0.81	0%	208.51	208.44	0.00	209.98	1.47
	SSMH1075	SSMH1069		0.00				1.00	0.0	0	0	3.6	0.00	0.05	0.00	0.05	350	0.24	71.28	0.74	0%	208.44	208.35	0.00	210.09	1.65
	SSMH1069	SSMH1068		0.00				1.00	0.0	0	0	3.6	0.00	0.14	0.00	0.14	350	0.16	58.06	0.60	0%	208.35	208.27	0.00	210.23	1.88
	SSMH1065	SSMH1064		0.00				1.00	0.0	0	0	3.6	0.00	0.01	0.00	0.01	200	0.61	25.65	0.82	0%	211.49	211.14	0.00	211.43	-0.06
	SSMH1064	SSMH1067		0.00				1.00	0.0	0	0	3.6	0.00	0.02	0.00	0.02	200	0.72	27.88	0.89	0%	210.87	210.47	0.00	210.87	0.00
	SSMH1067	SSMH1068		0.00				1.00	0.0	0	0	3.6	0.00	0.03	0.00	0.03	200	11.61	111.76	3.56	0%	210.39	208.25	0.00	210.86	0.47
	SSMH2488	SSMH2487		0.00				1.00	0.0	0	0	3.6	0.00	0.01	0.00	0.01	200	0.49	22.87	0.73	0%	210.62	210.58	0.00	210.25	-0.37
	SSMH2487	SSMH1068		0.00				1.00	0.0	0	0	3.6	0.00	0.01	0.00	0.01	200	0.48	22.73	0.72	0%	210.58	210.29	0.00	210.44	-0.13
	SSMH1068	SSMH1063		0.00				1.00	0.0	0	0	3.6	0.00	0.18	0.00	0.18	350	0.02	18.88	0.20	1%	208.25	208.25	0.00	210.48	2.23
	SSMH1108	SSMH1110		0.00				1.00	0.1	0	0	3.6	0.00	0.09	0.00	0.09	200	3.27	59.28	1.89	0%	212.96	210.02	0.00	213.76	0.80
	SSMH1110	SSMH1109		0.00				1.00	0.1	0	0	3.6	0.00	0.14	0.00	0.14	200	3.96	65.23	2.08	0%	209.99	208.31	0.00	210.82	0.83
	SSMH1109	SSMH1111		0.00				1.00	0.3	0	0	3.6	0.00	0.41	0.00	0.41	200	2.64	53.33	1.70	1%	208.14	205.67	0.00	208.96	0.82
	SSMH1114	SSMH1113		0.00				1.00	0.1	0	0	3.6	0.00	0.13	0.00	0.13	200	3.43	60.78	1.93	0%	210.17	206.50	0.00	211.39	1.22
	SSMH1113	SSMH1112		0.00				1.00	0.2	0	0	3.6	0.00	0.37	0.00	0.37	200	2.23	49.01	1.56	1%	206.48	206.17	0.00	206.87	0.39
	SSMH1112	SSMH1111		0.00				1.00	0.2	0	0	3.6	0.00	0.53	0.00	0.53	200	0.62	25.85	0.82	2%	206.15	205.70	0.00	206.67	0.52
	SSMH1111	SSMH1115		0.00				1.00	0.1	0	0	3.6	0.00	0.99	0.00	0.99	200	2.96	56.43	1.80	2%	205.64	203.05	0.00	206.31	0.67

Smartcentre - Phase 1A

Sanitary Sewer Design Sheet

Project Number:	1606 23088	**Mannings 'n' :**	0.013	**Max. Capacity (%):**	85%	**Harmon Peaking Factor:**	**Q =** Design Flow (L/s)
Date:	January 2023	**Min. Velocity (m/s):**	0.75	**Infiltration Flow (L/s):**	0.20	$M = 1+(14/(4+P^{0.5}))$	**q =** Avg. Domestic Flow (L/c/d)
Stantec Ltd.	Stantec Ltd.	**Max. Velocty m/s):**	3.65	**Max. Peaking Factor:**	3.6		**P =** Population/1000
City File Number:	N/A	**Min. Pipe Slope (%):**	50.00%	**Min. Peaking Factor:**	1.5	**Design Flow:**	**I =** Infiltration Flow
Prepared By:	Amir K & Jay P	**Avg. Domestic Flow, q (L/c/d):**	400			$Q = (MqP/86.4) + IA$	**A =** Gross Drainage Area (ha)

Manhole			Contributing Area					Comm./Ind./Inst.		Population		Design Calculations					Capactity Calculations					Hydraulic Grade Line Analysis				
Location	U/S MH	D/S MH	Drainage Area	Accum. Area	Units	Density (Area)	Density (Unit)	Static Area	Peak Flow	Pop.	Accum. Area	Peaking Factor	Infil. Flow	Static Flow	Design Flow	Total Flow	Size	Slope	Full Capacity	Full Velocity	QA/QC	U/S HGL	D/S HGL	HGL Above U/S Obv.	U/S Basement Elev	Bsmt to U/S HGL
			(ha)	(ha)	"R"	(p/ha)	(p/unit)	(ha)	(L/ha/s)	(p)	(ha)		(L/s)	(L/s)	(L/s)	(L/s)	(mm)	(%)	(L/s)	(m/s)	(%)	(m)	(m)	(m)	(m)	(m)
	SSMH1116	SSMH1115		0.00				1.00	0.0	0	0	3.6	0.00	0.03	0.00	0.03	200	1.69	42.63	1.36	0%	204.01	203.00	0.00	204.48	0.47
	SSMH1115	SSMH1121		0.00				1.00	0.1	0	0	3.6	0.00	1.12	0.00	1.12	200	1.10	34.36	1.09	3%	202.97	202.01	0.00	203.58	0.61
	SSMH1121	SSMH1122		0.00				1.00	0.1	0	0	3.6	0.00	1.22	0.00	1.22	250	0.54	43.55	0.89	3%	202.00	201.56	0.00	202.85	0.85
	SSMH1122	SSMH1123		0.00				1.00	0.1	0	0	3.6	0.00	1.27	0.00	1.27	250	0.57	44.97	0.92	3%	201.42	200.95	0.00	202.40	0.98
	SSMH2503	SSMH1123		0.00				1.00	0.0	0	0	3.6	0.00	0.02	0.00	0.02	250	0.22	28.13	0.57	0%	201.16	201.10	0.00	201.66	0.50
	SSMH1123	SSMH1125		0.00				1.00	0.0	0	0	3.6	0.00	1.33	0.00	1.33	250	0.45	39.80	0.81	3%	200.83	200.49	0.00	201.99	1.16
	SSMH1125	SSMH1126		0.00				1.00	0.0	0	0	3.6	0.00	1.37	0.00	1.37	250	5.71	142.15	2.90	1%	200.30	198.05	0.00	201.08	0.78
	SSMH1133	SSMH1132		0.00				1.00	0.0	0	0	3.6	0.00	0.02	0.00	0.02	200	0.34	19.15	0.61	0%	212.26	211.82	0.00	212.58	0.32
	SSMH1132	SSMH1131		0.00				1.00	0.0	0	0	3.6	0.00	0.04	0.00	0.04	200	2.63	53.14	1.69	0%	211.78	209.51	0.00	212.91	1.13
	SSMH1131	SSMH1130		0.00				1.00	0.1	0	0	3.6	0.00	0.09	0.00	0.09	200	2.80	54.89	1.75	0%	209.01	206.21	0.00	210.61	1.60
	SSMH1130	SSMH1129		0.00				1.00	0.1	0	0	3.6	0.00	0.15	0.00	0.15	200	2.16	48.18	1.53	0%	206.16	203.64	0.00	206.91	0.75
	SSMH1129	SSMH1128		0.00				1.00	0.1	0	0	3.6	0.00	0.20	0.00	0.20	200	0.02	4.98	0.16	4%	203.36	203.34	0.00	204.44	1.08
	SSMH1134	SSMH1135		0.00				1.00	0.0	0	0	3.6	0.00	0.02	0.00	0.02	200	1.34	37.95	1.21	0%	212.22	211.82	0.00	212.35	0.13
	SSMH1135	SSMH1136		0.00				1.00	0.0	0	0	3.6	0.00	0.05	0.00	0.05	200	0.54	24.03	0.76	0%	211.79	211.32	0.00	212.69	0.90
	SSMH1136	SSMH1137		0.00				1.00	0.0	0	0	3.6	0.00	0.07	0.00	0.07	200	1.28	37.15	1.18	0%	211.21	210.04	0.00	211.51	0.30
	SSMH1137	SSMH1128		0.00				1.00	0.1	0	0	3.6	0.00	0.12	0.00	0.12	200	8.34	94.71	3.01	0%	209.75	202.91	0.00	210.13	0.38
	SSMH1128	SSMH1127		0.00				1.00	0.0	0	0	3.6	0.00	0.36	0.00	0.36	200	6.21	81.71	2.60	0%	202.88	199.86	0.00	204.47	1.59
	SSMH1127	SSMH1120		0.00				1.00	0.0	0	0	3.6	0.00	0.39	0.00	0.39	200	3.41	60.58	1.93	1%	199.80	197.58	0.00	200.93	1.13
	SSMH1120	SSMH1126		0.00				1.00	0.0	0	0	3.6	0.00	0.57	0.00	0.57	200	0.74	28.14	0.90	2%	197.47	197.07	0.00	198.20	0.73
	SSMH1126	SSMH1016		0.00				1.00	0.0	0	0	3.6	0.00	1.97	0.00	1.97	250	7.32	160.94	3.28	1%	196.87	189.09	0.00	198.76	1.89
	SSMH1117	SSMH1118		0.00				1.00	0.0	0	0	3.6	0.00	0.03	0.00	0.03	200	1.43	39.24	1.25	0%	203.80	202.68	0.00	204.49	0.69
	SSMH1118	SSMH1119		0.00				1.00	0.1	0	0	3.6	0.00	0.09	0.00	0.09	200	2.57	52.61	1.67	0%	202.59	200.53	0.00	203.21	0.62
	SSMH1119	SSMH1120		0.00				1.00	0.1	0	0	3.6	0.00	0.14	0.00	0.14	200	3.82	64.10	2.04	0%	200.40	197.59	0.00	201.13	0.73
	SSMH1017	SSMH1124		0.00				1.00	0.0	0	0	3.6	0.00	0.02	0.00	0.02	200	4.08	66.25	2.11	0%	201.71	198.84	0.00	201.35	-0.36
	SSMH1124	SSMH1016		0.00				1.00	0.0	0	0	3.6	0.00	0.06	0.00	0.06	200	7.98	92.62	2.95	0%	198.65	190.27	0.00	198.97	0.32
	SSMH1016	SSMH1015		0.00				1.00	0.0	0	0	3.6	0.00	2.06	0.00	2.06	250	1.26	66.78	1.36	3%	188.87	187.82	0.00	190.71	1.84
	SSMH1015	SSMH1014		0.00				1.00	0.1	0	0	3.6	0.00	2.14	0.00	2.14	250	0.91	56.57	1.15	4%	187.75	186.75	0.00	188.12	0.37
	SSMH1014	SSMH1029		0.00				1.00	0.1	0	0	3.6	0.00	2.27	0.00	2.27	250	0.97	58.55	1.19	4%	186.75	185.63	0.00	187.59	0.84
	SSMH1029	SSMH1031		0.00				1.00	0.0	0	0	3.6	0.00	2.29	0.00	2.29	450	15.17	1110.50	6.98	0%	185.63	184.82	0.00	186.41	0.78
	SSMH1034	SSMH1033		0.00				1.00	0.0	0	0	3.6	0.00	0.02	0.00	0.02	350	0.31	81.74	0.85	0%	185.39	185.20	0.00	184.87	-0.52
	SSMH1033	SSMH1032		0.00				1.00	0.1	0	0	3.6	0.00	0.08	0.00	0.08	350	0.23	70.26	0.73	0%	185.20	184.99	0.00	185.19	-0.01
	SSMH1032	SSMH1013		0.00				1.00	0.1	0	0	3.6	0.00	0.14	0.00	0.14	350	0.20	65.84	0.68	0%	184.99	184.80	0.00	185.50	0.51
	SSMH1013	SSMH2611		0.00				1.00	0.0	0	0	3.6	0.00	0.16	0.00	0.16	350	0.88	136.45	1.42	0%	184.80	184.27	0.00	185.77	0.97
	SSMH2611	SSMH1031		0.00				1.00	0.0	0	0	3.6	0.00	0.18	0.00	0.18	450	0.88	267.94	1.68	0%	184.27	184.27	0.14	186.00	1.73
	SSMH1031	SSMH1036		0.00				1.00	0.0	0	0	3.6	0.00	64.91	0.00	64.91	900	0.70	1512.82	2.38	4%	184.27	184.17	0.00	186.44	2.17
	SSMH1036	SSMH2610		0.00				1.00	23.7	0	0	3.6	0.00	88.61	0.00	88.61	900	0.69	1507.63	2.37	6%	184.17	183.33	0.00	186.54	2.37
	SSMH2610	SSMH2609		0.00				1.00	0.0	0	0	3.6	0.00	88.64	0.00	88.64	900	1.91	2501.94	3.93	4%	183.28	181.44	0.00	185.99	2.71

Smartcentre - Phase 1A

Sanitary Sewer Design Sheet

Project Number:	1606 23088	**Mannings 'n' :**	0.013	**Max. Capacity (%):**	85%	**Harmon Peaking Factor:**	**Q =** Design Flow (L/s)
Date:	January 2023	**Min. Velocity (m/s):**	0.75	**Infiltration Flow (L/s):**	0.20	$M = 1+(14/(4+P^{0.5}))$	**q =** Avg. Domestic Flow (L/c/d)
Stantec Ltd.	Stantec Ltd.	**Max. Velocty m/s):**	3.65	**Max. Peaking Factor:**	3.6		**P =** Population/1000
City File Number:	N/A	**Min. Pipe Slope (%):**	50.00%	**Min. Peaking Factor:**	1.5	**Design Flow:**	**I =** Infiltration Flow
Prepared By:	Amir K & Jay P	**Avg. Domestic Flow, q (L/c/d):**	400			$Q = (MqP/86.4) + IA$	**A =** Gross Drainage Area (ha)

Manhole			Contributing Area					Comm./Ind./Inst.		Population		Design Calculations					Capacity Calculations					Hydraulic Grade Line Analysis				
Location	U/S MH	D/S MH	Drainage Area	Accum. Area	Units	Density (Area)	Density (Unit)	Static Area	Peak Flow	Pop.	Accum. Area	Peaking Factor	Infil. Flow	Static Flow	Design Flow	Total Flow	Size	Slope	Full Capacity	Full Velocity	QA/QC	U/S HGL	D/S HGL	HGL Above U/S Obv.	U/S Basement Elev	Bsmt to U/S HGL
			(ha)	(ha)	"R"	(p/ha)	(p/unit)	(ha)	(L/ha/s)	(p)	(ha)		(L/s)	(L/s)	(L/s)	(L/s)	(mm)	(%)	(L/s)	(m/s)	(%)	(m)	(m)	(m)	(m)	(m)
	SSMH2609	SSMH2608		0.00				1.00	0.1	0	0	3.6	0.00	88.72	0.00	88.72	900	1.42	2157.79	3.39	4%	181.39	180.05	0.00	182.87	1.48
	SSMH2608	SSMH2607		0.00				1.00	0.1	0	0	3.6	0.00	88.79	0.00	88.79	900	2.09	2615.91	4.11	3%	180.00	177.68	0.00	181.33	1.33
	SSMH2607	SSMH2606		0.00				1.00	0.1	0	0	3.6	0.00	88.91	0.00	88.91	900	0.21	827.75	1.30	11%	177.60	177.37	0.00	179.24	1.64
	SSMH2606	SSMH2605		0.00				1.00	0.1	0	0	3.6	0.00	88.96	0.00	88.96	350	0.29	78.96	0.82	113%	177.24	176.88	0.47	178.13	0.89
	SSMH2605	SSMH2604		0.00				1.00	0.2	0	0	3.6	0.00	89.11	0.00	89.11	350	0.20	64.70	0.67	138%	176.88	176.60	0.42	177.66	0.77
	SSMH2604	SSMH2603		0.00				1.00	0.1	0	0	3.6	0.00	89.16	0.00	89.16	350	0.15	56.23	0.58	159%	176.60	176.37	0.40	177.67	1.07
	SSMH2603	SSMH2543		0.00				1.00	0.0	0	0	3.6	0.00	89.19	0.00	89.19	450	0.16	112.84	0.71	79%	176.37	176.12	0.50	177.23	0.85
	SSMH2543	SSMH2542		0.00				1.00	0.0	0	0	3.6	0.00	142.33	0.00	142.33	900	0.26	922.58	1.45	15%	176.12	175.90	0.00	176.78	0.66
	SSMH2542	SSMH1057		0.00				1.00	0.0	0	0	3.6	0.00	142.33	0.00	142.33	900	2.31	2752.67	4.33	5%	175.90	175.42	0.00	176.94	1.04
	SSMH1057	WWTP		0.00				1.00	0.0	0	0	3.6	0.00	142.35	0.00	142.35	1050	0.71	2292.92	2.65	6%	174.01	173.81	0.00	176.96	2.95
	START	END		0.00						0	0	3.6	0.00	0.00	0.00	0.00	-	-	-	-	-	-	0.00	-	-	-