



# 350 Wellington Road 7

## Functional Servicing and Stormwater Management Report

**Project Location:**

350 Wellington Road 7, Elora, ON

**Prepared for:**

Elora 7 OP Inc.

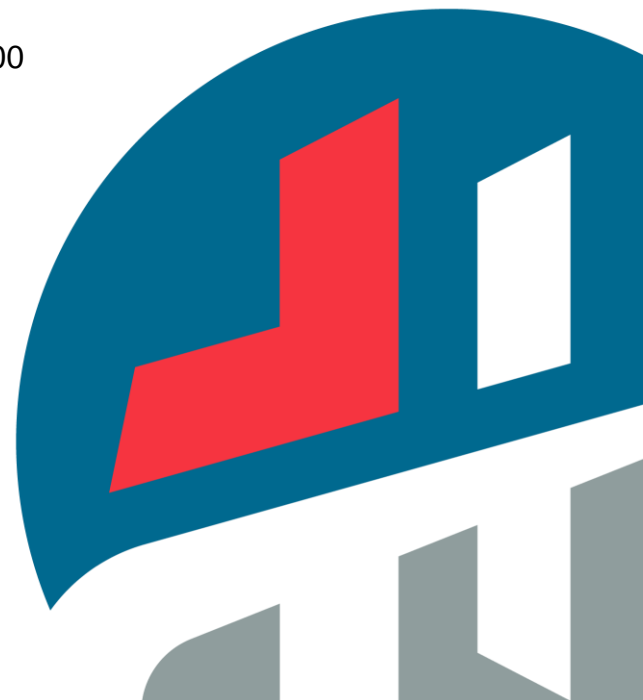
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MTE Drawing No. C1.1 .....	Appended Separately
Functional Grading Plan #1	
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MTE Drawing No. C2.2 .....	Appended Separately
Functional Grading Plan #3	
MTE Drawing No. C2.3 .....	Appended Separately
Functional Servicing Plan #1	
MTE Drawing No. C2.4 .....	Appended Separately
Functional Servicing Plan #2	
MTE Drawing No. C2.5 .....	Appended Separately
Functional Servicing Plan #3	
MTE Drawing No. C2.6 .....	Appended Separately

## 1.0 Introduction

MTE Consultants Inc. was retained by the property owner to complete a Functional Servicing and Stormwater Management (FS-SWM) Report for a new residential development to be constructed at 350 Wellington Road 7 (herein referred to as ‘the Site’) in the Town of Elora, located in the Township of Centre Wellington.

The purpose of this study is to support the Official Plan Amendment (OPA) and Zoning By-Law Amendment (ZBA) Applications. This will be accomplished by reviewing the opportunities and constraints for the subject property with respect to servicing, grading, and stormwater management; reviewing the requirements of the reviewing agencies; describing the development concept; and demonstrating the functional serviceability of the property.

### 1.1 Site Description and Official Plan/Zoning Designations

The Site comprises of approximately 4.46ha of agricultural land and is located on Wellington Road 7 between Wellington Road 18/Woolwich Street West and Middlebrook Road / David Street West, approximately 490m north of the Grand River. The Site is bounded to the east by Wellington Road 7 and bounded to the north, south and west by existing agricultural land. Existing residential properties and the Elora municipal cemetery are located on the other side of Wellington Road 7, fronting the Site. In addition, there are four Grand River Conservation Authority (GRCA) regulated wetlands adjacent to the Site; three to the northwest and one to the southwest. The southwest wetland regulation limit extends into the southwest portion of the Site. For the exact location of the Site refer to Figure 1.0.

The current Official Plan designation of the Site is Highway Commercial. The current zoning of the Site is Highway Commercial Zone, C2. The Official Plan and Zoning By-Law Amendment Applications are proposed to re-designate and re-zone the Site to allow for the development as outlined in the accompanying planning justification report.

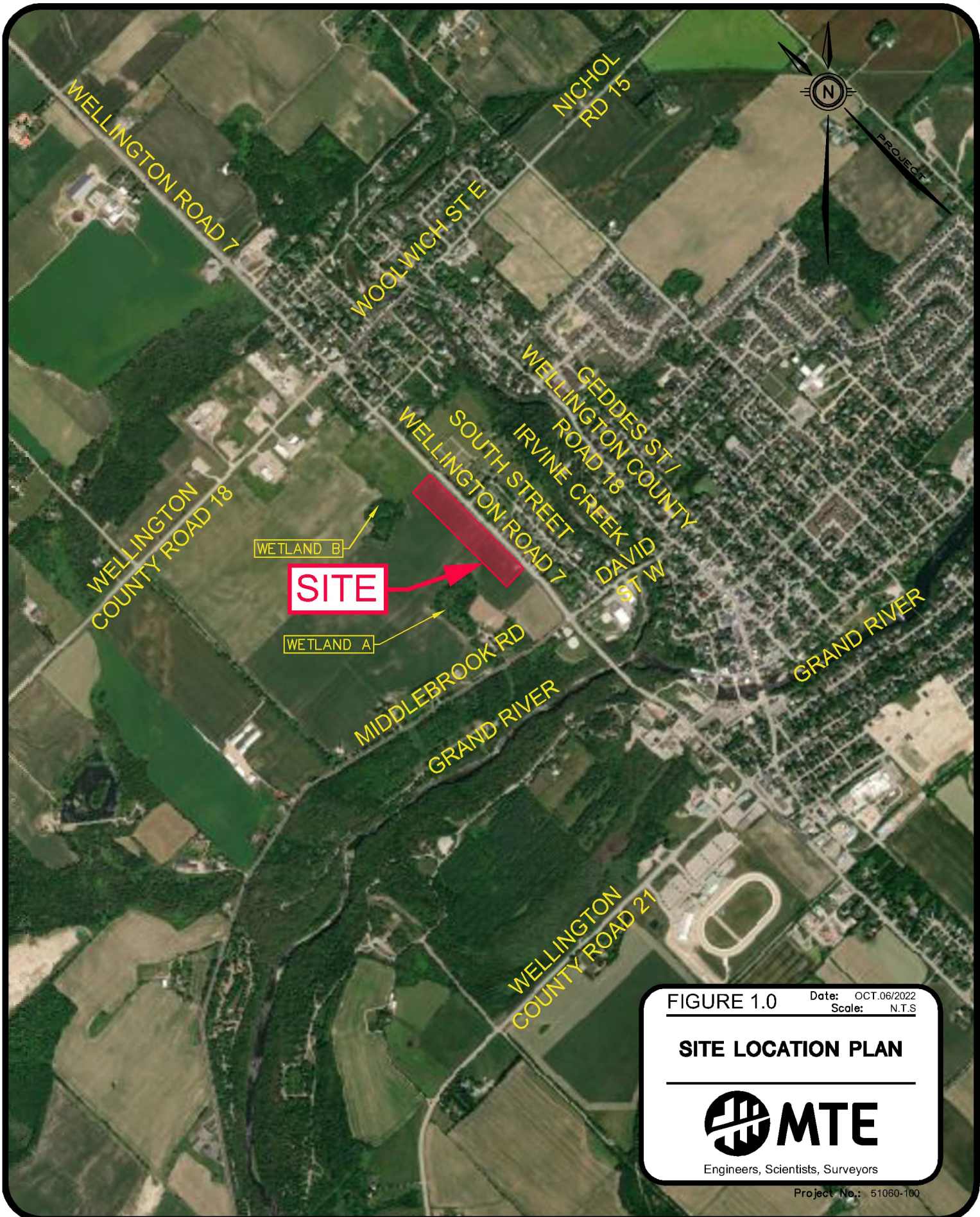
### 1.2 Proposed Development

The proposed development for the Site is the construction of 34 townhome blocks complete with common drive aisles, surface parking, landscape and amenity areas. The proposed development is intended to create a 273 unit townhome community consisting of conventional, back to backs and double front live/work style townhomes. To create an inviting urban street-scape, which reflects the character of the Town and enhances the function of the community, it is proposed to urbanize the southbound lane of Wellington Road 7 from the northern portion of the Site to the intersection of Wellington Road 7 and Middlebrook Road / David Street West. Given the size of the proposed development, it is expected to be constructed in two phases from south to north. In order to service the development, the existing municipal sanitary sewer and watermain will be extended from the Wellington Road 7 and David Street West intersection to the Site. A municipal storm sewer will also be installed to allow for the urbanization of the southbound lane of Wellington Road 7.

### 1.3 Reviewing Agencies

Functional grading, servicing and stormwater management designs as well as this FS-SWM Report will be required for submission to the Township of Centre Wellington in support of the Official Plan Amendment and the Zoning By-Law Amendment Applications. The Township will also be responsible for the review and approval of site plans, lighting and landscape designs and ultimately issuing building permits.







As the southwest portion of the Site falls within the GRCA Regulation limit, and the proposed storm sewer will ultimately outlet to the Grand River, the site engineering design will also be submitted to the GRCA for their review and approval. A 'Fill Permit' will be required.

Wellington Road 7 is a County Road. As such, the Wellington County will be circulated on the Official Plan Amendment and the Zoning By-Law Amendment Applications and will need to approve the functional site grading, servicing and stormwater management design as well as this FS-SWM Report.

## 2.0 Grading

### 2.1 Existing Topography

The Site is currently agricultural land with two driveway entrances off Wellington Road 7. In the existing condition, the Site drains via broad sheet flow to four main drainage paths based on the existing contours; to the southwest towards Wetland A, to the southeast towards the neighbouring agricultural lands, to the northeast towards Wellington Road 7 and to the northwest towards Wetland B. Fronting the Site, Wellington Road 7 has a rural cross-section with roadside ditches and no pedestrian walkways. There is an elevation difference of approximately 7.7m between the highpoint in Wellington Road 7 along the frontage of the Site and the low point at the southwest corner of the Site. The elevation difference occurs over the length of the Site at a gradual slope. The Site is fully pervious in the existing condition.

### 2.2 Existing Soils Information

A geotechnical investigation and hydrogeological assessment were undertaken by Grounded Engineering Inc. Their findings are documented in the Geotechnical Engineering Report, dated October 17, 2022 and in the Hydrogeological Assessment dated October 17, 2022, which are included with this submission.

The subsurface stratigraphy is generally comprised of topsoil underlain by disturbed soil consisting of sands and silts with trace to some clay and trace gravel. Beneath the disturbed soils, a sandy silt till with trace to some clay and trace gravel was encountered, followed by sands, underlain by a silt to clayey silt till with trace gravel. The sand deposit is of moderate permeability and will provide moderate recharge capability and groundwater movement, while the tills and disturbed soil deposits are of moderate to low permeability based on the in-situ testing and grain size analyses.

Based on the measured groundwater levels in the monitoring wells on May 17, 2022, the design groundwater table for engineering purposes is at Elev. 403.2 m at the north end of the Site decreasing to Elev. 397.7m at the south end of the Site. The groundwater depth below existing grade varies from 3.7mBGS at the north end of the Site to 0.8mBGS at the middle of the Site to 2.6mBGS at the south end of the Site. There is also perched water in the disturbed soils, which is flowing down towards the groundwater table. It is noted that the observed groundwater table will fluctuate with time depending on the amount of precipitation and surface runoff and may be influenced by known or unknown dewatering activities at nearby sites.

Refer to the Geotechnical Engineering Report and the Hydrogeological Assessment by Grounded for more information.

### 2.3 Proposed Grading

The preliminary grading strategy for the proposed development was developed based on the topographic survey and Conceptual Site Plan prepared by We Merchandise Space Inc. Refer to

the separately appended MTE Drawings, C2.1, C2.2 and C2.3, for the functional grading design for the Site.

The proposed development has 34 townhome blocks complete common drive aisles, surface parking, landscape and amenity areas. The common drive aisles will be connected to Wellington Road 7 through three proposed driveway entrances; one at the north, middle and south end of the Site. The proposed townhome blocks finished floor elevations (FFE) vary from 408.55 at the north end of the Site to 403.30 at the south end of the Site. The finished floor elevations were set to follow the profile of Wellington Road 7, while ensuring at least 1.0m of separation was maintained between the underside of the footings to the groundwater elevations noted in Section 2.2. The proposed development is intended to create a 273 unit townhome community consisting of conventional, back to backs and double front live/work style townhomes. To create an inviting urban street-scape, which reflects the character of the Town and enhances the function of the community, it is proposed to urbanize the southbound lane of Wellington Road 7 from the northern portion of the Site to the intersection of Wellington Road 7 and Middlebrook Road / David Street West. This will include filling in the existing roadside ditch, installing storm sewers, curb and gutter and a multi-use pathway. It is understood that external infrastructure and road works will be designed and administered by the Township/County. On-site, the proposed grading strategy will respect the existing grades along the north, south and west property lines. Regrading will involve raising the east property line to accommodate the proposed urban road cross-section along with raising the majority of the Site to ensure groundwater separation is maintained and to direct the major overland flow route for the Site to the Wellington Road 7 right-of-way.

## 3.0 Servicing

The preliminary servicing strategy for the proposed development was developed based on the topographic survey, plan and profile information, Municipal Servicing Assessment by Triton Engineering Services Limited and Conceptual Site Plan prepared by We Merchandise Space Inc. Refer to the separately appended MTE Drawings, C2.4, C2.5 and C2.6, for the functional servicing design for the Site and the preliminary watermain and sanitary sewer plan in Appendix A by Triton for the functional municipal service extension design from the Wellington Road 7 and David Street West intersection to the Site. It is understood that external infrastructure and road works will be designed and administered by the Township/County. The proposed servicing strategy has been developed to accommodate the potential for a phase build out of the Site from south to north.

### 3.1 Water

There is an existing 100mm diameter municipal watermain along Wellington Road 7, from 321 Wellington Road 7 (the south end of the Site) connecting to an existing 300mm diameter municipal watermain along David Street West, located east of Wellington Road 7. There is also an existing 300mm diameter watermain along Wellington Road 7 south of David Street West, which connects to the 300mm watermain on David Street West at the intersection of Wellington Road 7, David Street West, and Middlebrook Road. The closest municipal fire hydrant is located on the east side of Wellington Road 7 in front of 311 Wellington Road 7. The hydrant connects to the 100mm diameter watermain along Wellington Road 7. The Site is not currently serviced by municipal water.

A municipal servicing assessment was undertaken by Triton Engineering Services Limited. Their findings are documented in the 350 Wellington Road 7 Municipal Servicing Assessment,

dated July 11, 2022, included in Appendix A. Their assessment indicates that the existing 100mm diameter municipal watermain along Wellington Road 7 does not meet Municipal Standards and is not adequate to convey fire flows to the Site. Additionally, Wellington Road 7 is intended as part of the future trunk watermain loop to service Salem area. As such, Triton recommends that the existing 100mm diameter municipal watermain be replaced with a 200mm watermain extended north to, at a minimum, South Street so the existing 150mm watermain on South Street could be extended to connect to this proposed 200mm watermain. This will increase fire flows, ensure redundancy of supply and provide looping of the system. Assuming these recommendations are implemented as part of the external infrastructure and road works which will be designed and administered by the Township, an expected fire flow of 143.5L/s (8,610L/min) will be available at the site with an expected static pressure of approximately 54PSI at an elevation of 407m. Based on their assessment, the Centre Wellington Water system is expected to have sufficient capacity and pressure to supply the development for domestic and fire flows once the services discussed above are extended to the Site.

A new connection to the extended municipal watermain along Wellington Road 7 will be required in order to service the proposed development. The required private water service size(s) will be determined during detailed design but will be at least 150mm diameter. Each townhome will be serviced with a minimum 25mm diameter domestic connection off the private water service. Given the length of the Site, it is anticipated that seven new private hydrants will be required to service the proposed townhome blocks.

Preliminary water demands were calculated for the proposed development and are included in Appendix B. The maximum day domestic demand for the Site was determined to be 9.4L/s. In addition to the domestic demands, the pressures and flows in the extended system must be sufficient for firefighting conditions as established by the Ontario Building Code (2012). The minimum residual pressure under firefighting conditions is 140kPa (20.3psi) per OBC 2012 A-3.2.5.7 3(b). Preliminary fire flow demand calculations indicate that the required minimum water supply rate based on OBC and FUS is 150L/s (9,000L/min) and 400L/s (24,000L/min), respectively, for the worst-case block (Block 30). Since these fire flow demands are greater than the expected available fire flow of 143.5L/s (8,610L/min) at the Site, building components such as firewalls will need to be added during detailed design to reduce the required fire flow demand to the available fire flow level. It should be noted that even with building components the FUS fire flow demand may still not be met given the limitations of the existing water distribution system, but OBC fire flow demands will be met. Fire flow demands for all blocks, and associated firefighting capacity at each private hydrant, will need to be confirmed at detailed design.

### 3.2 Sanitary

There is no existing municipal sanitary sewer along Wellington Road 7; therefore, the Site is not currently serviced. There is an existing 200mm diameter municipal sanitary sewer on David Street West draining east. There is an existing 200mm diameter municipal sanitary sewer stub at the intersection of David Street West and Wellington Road 7.

Based on available topographical information from the GRCA mapping tool, there appears to be a 14.5m elevation difference between the south end of the Site and the location of the existing sanitary stub at the intersection of David Street West and Wellington Road 7. Therefore, there is adequate elevation change to extend the sanitary sewer along Wellington Road 7 in order to service the proposed development, and future developments along Wellington Road 7, with a gravity sewer. The existing 200mm diameter municipal sanitary sewer will be extended from the intersection to at least the south end of the Site, where a private sanitary service connection will be made and extended into the Site. It is proposed that the Site will be serviced by a new 200mm diameter sanitary sewer complete with a new manhole at the extended municipal sewer

on Wellington Road 7. The private sanitary sewer will be installed at a slope that provides depth for the servicing of each townhome while maintaining adequate capacity. The service sizes and inverts will be confirmed at detailed design.

Based on Triton's municipal servicing assessment, the existing David Street Sanitary Pumping Station (SPS) has sufficient capacity to service the proposed development. In addition, the Elora Waste Water Treatment Facility (WWTF) is also expected to have sufficient capacity to treat the estimated flows produced by the proposed development. Municipal sanitary sewers will need to be extended to the Site as discussed above, but the existing downstream municipal sanitary sewers are also expected to have adequate capacity based on the current SPS configuration / pump rates.

A sanitary flow analysis has been prepared to determine the flows anticipated to be generated by the proposed development. Based on the Township's Development Manual, the anticipated average sanitary flow generation rate is 350L/d/capita and the average density is 3.09 persons/unit based on the 2021 Reserve Capacity Calculations for Centre Wellington. With the proposed townhome blocks having a total of 273 units and a Site area of 4.46ha, the resulting peak flow including infiltration is expected to be 13.81L/s from the Site. Refer to Appendix C for sanitary flow rate calculations.

### 3.3 Storm

Wellington Road 7 has a rural road cross-section along the front of the Site; therefore, there are no existing municipal storm sewers. However, there are roadside ditches along both sides of Wellington Road 7. The roadside ditches north of the highpoint in Wellington Road 7 drain toward Woolwich Street West, while the roadside ditches south of the highpoint in Wellington Road 7 drain toward David Street West/Middlebrook Road. The roadside ditch along the northbound lane drains across the road to the west side of Wellington Road 7 via an existing 600mm CSP culvert at the intersection of Wellington Road 7 and David Street West / Middlebrook Road. From there, runoff collected from both roadside ditches drain west through the roadside ditch along the north side of Middlebrook Road where it eventually crosses Middlebrook Road via an existing culvert, discharging through lands owned by the GRCA, and ultimately to the Grand River. Surface runoff from a majority of the Site is currently conveyed overland to the southwest of the Site where it eventually enters Wetland A, which eventually discharges to a Grand River tributary and ultimately to the Grand River.

To create an inviting urban street-scape, which reflects the character of the Town and enhances the function of the community, it is proposed to urbanize the southbound lane of Wellington Road 7 from the northern portion of the Site to the intersection of Wellington Road 7 and Middlebrook Road / David Street West. The external infrastructure and road works will be designed and administered by the Township/County, but it is assumed a new municipal storm sewer will be installed along the frontage of the Site with catchbasin manholes spaced less than every 90 metres. The diameter of the municipal storm sewer will increase where the private storm sewer system connects to accommodate the flows from the Site. The proposed municipal storm sewer system will extend to the intersection of Wellington Road 7 and Middlebrook Road / David Street West. Beyond this point, two outlet options have been provided to the GRCA for review and comment. Option one proposes extending the proposed storm sewer across Middlebrook Road and further down Wellington Road 7 boulevard, toward the existing bridge, where it would daylight just upstream of the Grand River. This option would require minor regrading of the west boulevard along Wellington Road 7 to maintain cover over the storm sewer and erosion and control measures to be implemented at the storm sewer outlet and/or between the outlet and the Grand River. Option two proposes terminating the proposed storm sewer along Wellington Road 7 at Middlebrook Road where runoff would continue to be

conveyed along the north side of Middlebrook Road where it eventually crosses Middlebrook Road via a culvert, discharging through lands owned by the GRCA, and ultimately to the Grand River as it does in the existing condition. This option would require possible upgrades to north roadside ditch along Middlebrook Road and the upsizing of the existing culvert crossing to accommodate the proposed flows. Refer to Appendix D for correspondence with the GRCA and illustration of both options. At the time this report was published, the GRCA had yet to respond to their preferred outlet option. The sewer sizes and inverts will be confirmed at detailed design, along with the requirements to implement the preferred outlet option. This work would be completed during the right-of-way works required to extend the municipal watermain and sanitary sewer.

A private storm sewer system will be installed on-site to collect runoff generated from the interior rooftops, landscape, drive aisles and parking areas. The runoff collected in the storm sewers will be directed to an OGS unit located in the south entrance to the Site prior to discharging to the proposed municipal storm sewer system in the Wellington Road 7 right-of-way. Runoff from the frontage of the property will sheet flow towards the Wellington Road 7 right-of-way. Runoff from the outer perimeter townhome blocks and landscape areas will be directed to the east property line, toward Wetland A and B, to maintain a surface water balance to each Wetland. All townhomes with basements will require sump pumps.

## 4.0 Preliminary Stormwater Management Design

### 4.1 SWM Criteria

The stormwater management design criteria for the subject Site, as proposed to Triton in the SWM Criteria Brief by MTE dated September 12, 2022, to initiate discussion with Wellington County and the Township of Centre Wellington staff, are as follows:

- i) Establish a legal outlet(s) for the Site;
- ii) Maintain an annual surface runoff water balance to Wetland A and Wetland B;
- iii) Attenuation of the post-development peak flows for the 2-year through 100-year storm events to the allowable flow rate using a C value of 0.75;
- iv) Implementation of water quality controls; and,
- v) Provide erosion and sediment controls.

Refer to the SWM Criteria Brief in Appendix E for rationale as to why the Township's general stormwater management design criteria is not feasible for the subject Site and how the proposed criteria were established.

Since the receipt of the first OPA/ZBA application submission comments, which referenced back to the Township's typical water quantity control requirements, MTE has had correspondence with Triton who has confirmed the alternate SWM strategy outlined in August 2022 is being considered. Triton is not concerned about the capacity of the Wellington Road 7 system, as the system will be designed to accommodate the proposed flows from the Site, but has requested additional review of the outlet options and constraints from the proposed storm sewer to the Grand River.

### 4.2 Legal Outlet

In the existing condition, the majority of the runoff from the Site is directed across the neighbouring property via broad sheet flow to Wetland A and B. Generally, there is no right of



drainage for surface water. Therefore, the only legal outlet for the Site in the existing condition is to the municipal right-of-way (Wellington Road 7).

In the post-development condition, it is proposed that the Site's private storm sewer system will outlet to the proposed municipal storm sewer along Wellington Road 7 which will ultimately outlet the Grand River, via one of the outlet options discussed in Section 3.3 of this report. Once the preferred option is established in consultation with the GRCA, outlet constraints will be reviewed. Depending on timing, this review could be completed during detailed design. Through the Site grading design, the major overland flow route will also be directed to the Wellington Road 7 right-of-way. However, given the need to maintain a surface runoff water balance to Wetland A and B, an easement is currently being pursued with the neighbouring property owner to the west to legally allow surface drainage across the adjacent property to these wetlands.

It should be noted that even if an easement is obtained, the primary legal outlet for the Site should still be to Wellington Road 7.

### 4.3 Water Balance

An annual surface runoff water balance to Wetland A and Wetland B will be achieved in the post-development condition by directing runoff from rooftop and landscape areas adjacent the west property line to the neighbouring property. From there, runoff will continue to sheet flow across the neighbouring property and into each wetland as it does in the existing condition. A preliminary annual surface runoff water balance analysis was completed for Wetland A and Wetland B resulting in a 4m<sup>3</sup>/yr and 12m<sup>3</sup>/yr net gain of runoff, respectively. Refer to Appendix F for the preliminary annual surface runoff water balance analysis calculations. The required catchment area to be directed to Wetland A and B is illustrated on the post-development catchment areas Figure 3.0 (Catchment 204 & 205, respectively).

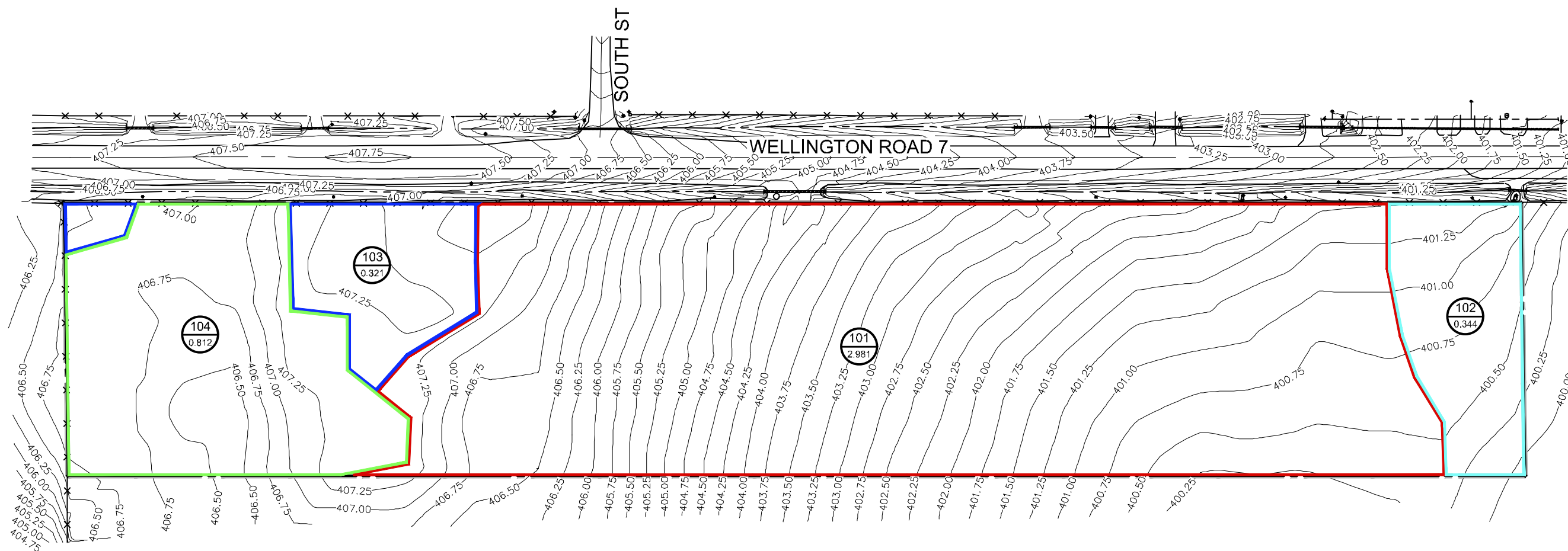
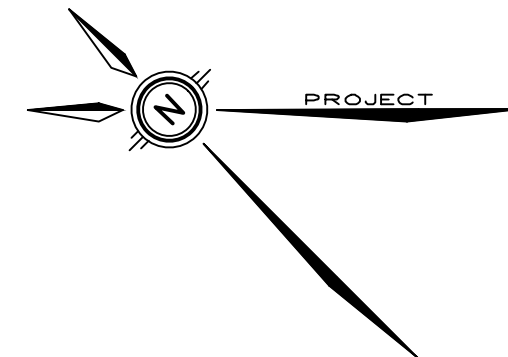
It should be noted that being able to achieve a surface runoff water balance to Wetland A and B is conditional on obtaining an easement to allow surface drainage across the neighbouring property to the west.

### 4.4 Water Quantity Control

In order to successfully complete the preliminary stormwater management design for the Site, the following specific tasks were undertaken:

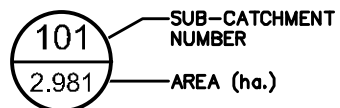
- i) Calculate the pre-development runoff rates using MIDUSS NET and the allowable runoff rates using the Rational Method;
- ii) Determine the percent impervious of the Site and catchment parameters for inclusion in MIDUSS modeling; and,
- iii) Calculate post-development runoff hydrographs using MIDUSS NET.

The following table summarizes the catchments used in modeling of the Site. The pre-development condition was separated into four catchment areas based on the existing drainage paths for the Site. The post-development condition was separated into five catchment areas; the controlled area and the uncontrolled areas. Figure 2.0 illustrates the limits of the pre-development catchment area. Figure 3.0 illustrates the limits of the post-development catchment areas.



**LEGEND**

- CATCHMENT 101
- CATCHMENT 102
- CATCHMENT 103
- CATCHMENT 104



406.50 EXISTING CONTOURS

**FIGURE 2.0** Date: SEPT. 06/22  
Scale: 1:1500

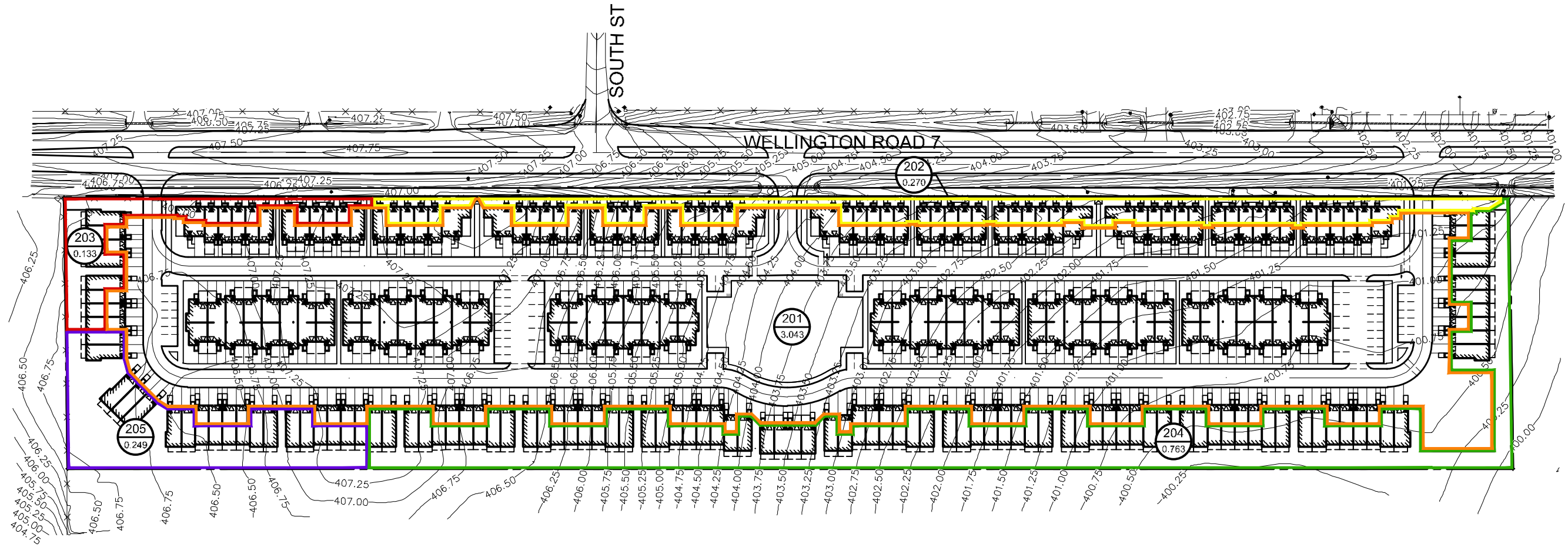
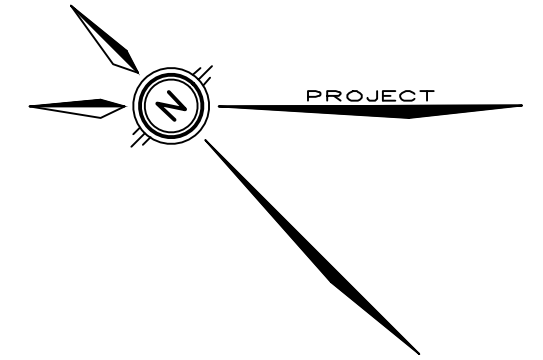
**PRE-DEVELOPMENT  
CATCHMENT AREAS**



Engineers, Scientists, Surveyors

Project No.: 51060-100





**LEGEND**

- CATCHMENT 201
  - CATCHMENT 202
  - CATCHMENT 203
  - CATCHMENT 204
  - CATCHMENT 205
- 
- 201

SUB-CATCHMENT NUMBER

3.043

AREA (ha.)
  - EXISTING CONTOURS
  - PROPOSED BUILDING

**FIGURE 3.0** Date: SEPT. 06/22  
Scale: 1:1500

**POST-DEVELOPMENT  
CATCHMENT AREAS**

**MTE**  
Engineers, Scientists, Surveyors

Project No.: 51060-100

**Table 4.1 – Catchment Parameters**

#	Catchment	Area (ha)	% Impervious	Pervious CN	Impervious CN	Slope (%)	Flow Length (m)
<b>Pre-Development Catchment Areas</b>							
101	To Wetland A (Southwest)	2.981	0.0	75	98	3.5	200.0
102	To adjacent property (South)	0.344	0.0	75	98	2.0	100.0
103	To Wellington Road 7 (Northeast)	0.321	0.0	75	98	1.5	50.0
104	To Wetland B (Northwest)	0.812	0.0	75	98	2.5	80.0
<b>Post-Development Catchment Areas</b>							
201	Controlled Area to Wellington Road 7 (Southeast)	3.043	81.2	75	98	2.0	30.0
202	Uncontrolled Area to Wellington Road 7 (Southeast)	0.270	69.0	75	98	2.0	5.0
203	Uncontrolled Area to Wellington Road 7 (Northeast)	0.133	55.3	75	98	2.0	5.0
204	Uncontrolled Area to Wetland A (Southwest)	0.763	48.1	75	98	3.0	20.0
205	Uncontrolled Area to Wetland B (Northwest)	0.249	37.5	75	98	3.0	20.0

Based on the findings from the geotechnical investigation by Grounded, as detailed in Section 2.2, a pervious CN of 75 for grass areas is appropriate.

In order to achieve the stormwater management requirements for the Site, runoff generated from the interior rooftops, landscape, drive aisles and parking areas will be controlled with a properly sized outlet pipe to Wellington Road 7. Storage volume for the control outlet pipe will be provided in two underground storm tanks located at the south end of the Site. Refer to Appendix G for preliminary storm tank sizing sheets. The following table illustrates the stage-storage-discharge relationship of the storm system.

**Table 4.2 – Stage-Storage-Discharge Information**

Elevation (m)	Head (m)	Outlet Pipe Flow (m <sup>3</sup> /s)	Volume (m <sup>3</sup> )	Remarks
399.000	0.00	0.00000	0.000	Estimated Invert of Outlet Pipe
399.300	0.30	0.05381	0.000	Estimated Invert of Storm Tanks
401.000	2.00	0.59910	998.150	Estimated Obvert of Storm Tanks
402.190	3.19	0.80540	998.150	Top of Grate of CBMH41 & CBMH42

With the addition of the 525mm diameter outlet control pipe with a 1.0% slope, the post-development runoff from the controlled portion of the site for the 5- and 100-year storm events is controlled to 0.272m<sup>3</sup>/s and 0.542m<sup>3</sup>/s, respectively. The following table summarizes the expected flows that will be generated by the whole Site. Refer to Appendix G for the MIDUSS NET output, but please note that these flows are subject to change at the detailed design stage.

**Table 4.3 – Summary of Flows**

Modelling Condition	2-Year Storm Event (m <sup>3</sup> /s)	5-Year Storm Event (m <sup>3</sup> /s)	10-Year Storm Event (m <sup>3</sup> /s)	25-Year Storm Event (m <sup>3</sup> /s)	50-Year Storm Event (m <sup>3</sup> /s)	100-Year Storm Event (m <sup>3</sup> /s)
Pre-Development – Total Site	0.036	0.102	0.171	0.277	0.377	0.491
Allowable (C=0.75) – Total Site	0.511	0.724	0.887	1.055	1.202	1.349
Post-Development – Total Site	0.279	0.404	0.508	0.630	0.739	0.860
Pre-Development – to Wetland A	0.022	0.064	0.107	0.174	0.237	0.308
Post-Development – to Wetland A	0.085	0.119	0.151	0.180	0.210	0.234
Pre-Development – to Wetland B	0.009	0.024	0.040	0.064	0.089	0.112
Post-Development – to Wetland B	0.022	0.031	0.039	0.048	0.056	0.070
Pre-Development – to Wellington Road 7	0.004	0.010	0.017	0.028	0.037	0.048
Post-Development – to Wellington Road 7	0.212	0.306	0.378	0.460	0.530	0.599

Note: Time of Concentration (Tc) of 20 mins was used in the rational method calculations to determine the allowable flow rates.

With the addition of the outlet control pipe, the post-development runoff from the Site is controlled well below the allowable peak flow rates based on a runoff coefficient of 0.75 requested in the SWM Criteria Brief. This results in reduced storm pipe sizes on- and off-site, reduces the additional peak flow rate to Wellington Road 7 while still avoiding over controlling the Site given the proximity to the Grand River. This helps allow the peak flow from the Site to occur in advance of the peak flow from the upstream drainage area.

Peak flows leaving the Site towards Wetland A and Wetland B are increased in the smaller storm events but are reduced in the larger storm events. This is a result of the increase in impervious area directed to the wetlands but the reduction in catchment area. These peak flows will be attenuated further as they sheet flow across the agricultural lands and by the natural features of the Wetlands. It should be noted that the proposed wetland catchments areas are dictated based on the water balance requirements discussed in Section 4.3.

Downstream of Wetland A, a GRCA regulated watercourse conveys runoff from the wetland to the Grand River. During an open house for this proposed development, a property owner adjacent to this watercourse brought up concerns with an existing culvert restricting flow and keeping the upstream water levels quite high close to their barns finished floor elevation. It is

unknown if this culvert in question is a municipal or private culvert, but it should be investigated during detailed design to design to ensure downstream impacts are avoided and by the Township/Owner as it appears to be an issue in the existing condition. Cleaning out this culvert or upsizing it may be required.

#### 4.5 Water Quality Control

A Stormceptor EFO10 will be installed on the private storm sewer system to provide water quality control for the Site (Catchment 201). The chosen unit is expected to provide Enhanced Level water quality control. Refer to Appendix G for the sizing output from the Stormceptor Expert program. The Stormceptor will require regular annual maintenance to ensure it is operating properly. The owner may be required to enter into a maintenance agreement with a suitable contractor to complete this work. In addition, all the storm structures will have a 600mm sump.

Runoff from the frontage of the property and towards the wetlands will be from rooftop and landscape areas which are considered “clean”; therefore no quality controls are required for those catchment areas (Catchment 202, 203, 204 and 205).

#### 4.6 Erosion & Sediment Control

Precautions will need to be taken during construction to limit erosion and sedimentation. Typically, the following measures are recommended during construction for erosion and sedimentation control:

- i) Erosion and sedimentation facilities are to be installed prior to any area grading operations;
- ii) All erosion control measures are to be inspected and monitored by the contractor and repairs are to be completed as required;
- iii) All materials and equipment used for the purpose of site preparation and project completion should be operated and stored in a manner that prevents any deleterious substance from leaving the site;
- iv) Construction of temporary swales to direct runoff to a sedimentation basin, with rock check dams as required to control velocities;
- v) Stripping and strategic placement of topsoil stockpiles. Placement of sediment control fencing around all stockpile areas;
- vi) Re-vegetation of completed areas as soon as possible after construction, including those areas not slated for construction, within 60 days of rough grading; and,
- vii) To minimize the amount of mud being tracked onto the roadway, a mud mat should be installed at the primary construction entrance.

#### 4.7 Low Impact Development (LID)

Based on the findings of the geotechnical investigation and hydrogeological assessment by Grounded, as detailed in Section 2.2, there is only 3.7 m at the north end of the Site to 0.8m at the middle of the Site to 2.6m at the south end of the Site between the existing grade and the groundwater table across the Site. This shallow groundwater table is not ideal for the installation of a traditional on-site infiltration gallery given the required 1m vertical separation between the bottom of the gallery and the seasonal high groundwater table. In addition, the soils above the observed groundwater table were noted to be moist to wet, further indicating the Site may not be suitable for an infiltration gallery. However, this will be reviewed further during detailed design given the majority of the Site is being raised. Other LID methods such as amended topsoil will also be explored during detailed design to help promote at-surface infiltration.

## 5.0 Conclusions

Based on the foregoing analysis, it is concluded that:

- The proposed grading design will match into existing grades along the north, south and west property boundaries, and will raise the grade along the east property boundary and the majority of the Site to achieve an overland flow route to the municipal right-of-way;
- The proposed development will include urbanizing the southbound land of Wellington Road 7 from the northern portion of the Site to the intersection of Wellington Road 7 and Middlebrook Road / David Street West to create an inviting urban street-scape, which reflects the character of the Town and enhances the function of the community;
- Existing municipal infrastructure for water and sanitary servicing is available at the intersection of Wellington Road 7 and David Street West and will be extended along Wellington Road 7 to service the Site;
- Installation of a municipal storm sewer will be required, and outlet directly to the Grand River or existing roadside ditches along Middlebrook Road, to urbanize the southbound land of Wellington Road 7 and provide storm servicing to the Site;
- The existing municipal infrastructure, Elora WWTF and Centre Wellington Water system are expected to have sufficient capacity to support the proposed development. The expected max day domestic water demand for the Site is 9.4L/s. The expected available fire flow demand is 143.5L/s (8,610L/min) at the Site, building components such as firewalls will need to be added during detailed design to reduce the required fire flow demand to the available fire flow level. The expected peak sanitary flow rate is 13.81L/s. These flow rates are provided to the Township for inclusion in their model; and,
- The SWM criteria, established in the SWM Criteria Brief, can be satisfied and with the implementation of on-site controls for water quantity and water quality. A surface water runoff balance can be maintained to Wetland A and Wetland B through grading and will result in a small net gain in annual runoff over pre-development site conditions, given an easement with the neighboring property owner to the west can be obtained. LID methods will be explored during detailed design.

Additional grading, servicing and stormwater management details will be provided during detailed design.

All of which is respectfully submitted,

**MTE Consultants Inc.**

**Tyler Arndt, E.I.T.**

Designer

519-743-6500 ext. 1386

[tarndt@mte85.com](mailto:tarndt@mte85.com)

**Lynn Ingram, P.Eng.**

Design Engineer

519-743-6500 ext. 1381

[lingram@mte85.com](mailto:lingram@mte85.com)

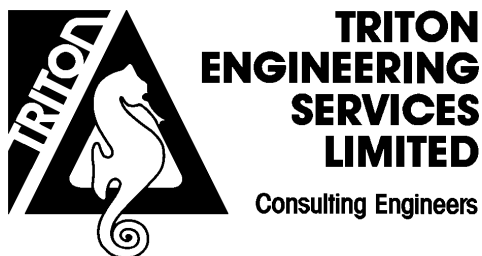
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# Appendix A

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## **350 Wellington Road 7 Municipal Servicing Assessment & Preliminary Watermain and Sanitary Sewer Plan**



## Memorandum

DATE: July 11, 2022  
 TO: Chantalle Pellizzari  
 FROM: Dustin Lyttle & Ray Kirtz  
 RE: 350 Wellington Road 7  
 Municipal Servicing  
 Assessment  
 FILE: A6764A

### Introduction:

The following memo is intended to provide insight on the expected downstream sanitary sewer capacity, water system operating conditions and available municipal water for fire fighting purposes within the proposed 350 Wellington Road 7 (W.R.7) condominium development. A concept plan was provided by the developer that outlined the proposed 280 townhouse units on the 4.45 ha development area.

### Sanitary Servicing:

#### **David Street Sewage Pumping Station:**

##### Existing Run-Times:

The Township provided historical data indicating the hours that the pumps operated each day over the past 3-years. On average, Pump One runs for 18 minutes each day, and Pump Two runs for 13 minutes each day. The maximum time that Pump One has operated was on April 29<sup>th</sup>, 2021 for 3.9 hours. For Pump Two, this occurred on April 30<sup>th</sup>, 2021, operating for 1.4 hours. Based on historical data, the high flows do not correlate with a rain event, and therefore are expected to be the result of operation occurring at the neighbouring small community centre and curling club.

##### Existing Pump Rates:

There is no flow metering at the David Street SPS, therefore, Triton/Twsp staff performed a series of drawdown tests in order to estimate the pumping rate. The pumps do not have variable frequency drives, and therefore operate at full speed when running. The tests revealed that Pump One pumps at a rate of 2.55 L/s, and Pump Two at a rate of 15.7 L/s. When the pumps are run at the same time, they pump at a combined rate of 15.3 L/s. These calculations are outlined in Table 1 below.

Table 1 – Pump Drawdown Test Results

Parameter	Pump One		Pump Two	Pumps One & Two
	1 <sup>st</sup> Run	2 <sup>nd</sup> Run	1 <sup>st</sup> Run	1 <sup>st</sup> Run
Run Time (s)	90	120	120	120
Initial Depth (m)	2.45	1.64	2.40	2.00
Final Depth (m)	2.39	1.59	2.00	1.61
Change in Depth (m)	0.06	0.05	0.400	0.39
Volume of Sewage (L)	282.7	235.6	1,884.8	1,837.7
Pump Rate (L/s)	3.14	1.96	15.7	15.3

*Note: the diameter on the wet well was measured as 2.45m on site.*

During the pump test, it was observed that Pump One was not operating properly and causing significant turbulence, indicating that the impeller volute may be cracked or broken, which may provide explanation of the low pump rate. It was also observed that the flow was coming through the overflow check valve from the adjoining



tank into the wet well during the pump test at low liquid levels. For this reason, it is expected that both pumps may be able to operate at higher rates than noted, and that the 15.7 L/s is a conservative value. This assumes that Pump One is repaired.

Existing Flow Rates:

Using the existing run times and pump rates, the existing flow rates received by the pumping station can be calculated. The pumping station currently services 48 units, or **149 people**, as well as a small community centre and curling club. The average existing daily flow rate is **0.18 L/s** (15.2 m<sup>3</sup>/day). The maximum existing day flow rate was calculated based off of the day where the greatest volume of sewage was pumped. This occurred on April 29<sup>th</sup>, 2021, resulting in a maximum day flow of **0.94 L/s** (81.0 m<sup>3</sup>/day).

From this, an average existing per person flow rate of **102.0 L/capita/day** (315.1 L/unit/day) was determined. The maximum day existing per person flow rate is **543.4 L/capita/day** (1679.0 L/unit/day) Further to this, it is worth noting that the existing per person flow rates include any additional flows contributed by ICI users.

Proposed Development Loading:

The 2021 Reserve Capacity Calculations (RCC) for Centre Wellington reported that the current system has an average density of 3.09 persons/unit, a maximum day water demand of 0.92 m<sup>3</sup>/day/unit (297 L/d/capita), and an average daily sewage flow of 0.664 m<sup>3</sup>/day/unit (215 L/d/capita).

Based on the expected populations of the proposed development, and considering both sanitary the flow rates from the RCC (226 L/d/capita), as well as values outlined by the MOE (450 L/d/capita), the total expected peak sanitary sewage flows produced may range from **8.58 L/s** (740.9 m<sup>3</sup>/day) to **17.07 L/s** (1475.1 m<sup>3</sup>/day) (using a calculated Harmon peaking factor of 3.84).

Expected Flow Rates from the Combined Existing and Proposed Development:

The flows generated from this development will be directed to the David Street Sewage Pumping Station (SPS), which pumps across the David Street bridge to a manhole at the north end of Smith Street. From this manhole it flows down Victoria Street through the downtown area, ultimately discharging to the Clyde St. SPS where it is then again pumped to the Elora WWTP.

As seen in the following table, the average day flows to be directed to this SPS, including the existing users and subject development, are estimated between **2.51 L/s** and **4.62 L/s**. This will result in the pumps running between 44 and 80 times per day for approximately 5 minutes, based on the volume available between the design set points within the wet well, for a total run-time of 4 to 7 hours a day.

Table 2 – Effect of Average Flows on Pump Run Time

ADF (L/capita/day)	Expected Flow Rate (L/s)	Cycle Duration (minutes)	Frequency (times/day)	Total Hours Operating per day
226	2.23	5.35	41	3.7
450	4.62	5.35	80	7.0

The flows directed to the SPS are estimated between **8.76 L/s** and **17.255 L/s** when peaked using the Harmon formula and combined with the historic maximum day flows calculated at the SPS. Although the highest peak flow exceeds the measured capacity of the pumps, these flows are not expected to occur for a long duration, or frequently and therefore can be attenuated by the existing stations storage capacity. Further to this, due to the emergency storage contribution during the pump test, the expectation is that the pumps have greater capacity that has not been quantified.

### Emergency Storage:

The SPS overflow chamber provides emergency storage (14.36 m<sup>3</sup>) in the event that both pumps fail. Based on the RCC ADF, the time the Township has before the overflow begins discharging to the environment is over 95 hours under average day flows, and over 24 hours under peak day flows. When considering the MOE ADF, the emergency storage provides over 51 and 13 hours under average day flows and peak day flows.

### Existing Sewer & Forcemain Capacity Assessment:

An existing 200mm diameter sanitary sewer is located on David Street which discharges into the David SPS. To service the subject development, a 200mm sanitary sewer needs to be extended north along W.R.7 from David Street. The existing sewer on David St. has sufficient capacity to convey flows from the subject development to the SPS.

The hydraulic capacity of the sanitary sewers downstream of the discharge point were explored using the existing and future condition SewerCAD model. The system was modelled under both the existing and developed condition scenarios with the developed condition scenario including complete build out of all current known developments and within the current urban boundary.

Conveying the specified pump rate of **15.7 L/s** during the peak day flow condition identified a number of sections of sewer that are surpassing, or close to, their theoretical capacity based on modelling. These sections are indicated in the following table.

Table 3 – Sewer Capacity

Sewer Section	Percent Full	
	Existing Condition	Future Developed Condition
MH-133 to MH-134 on Victoria Cr.	70.0%	102%
MH-140 to MH-141 on Price St.	82.4%	118%
MH-141 to MH-144 on Church St. W	68.4%	97%

The velocity of the sewage discharged from the SPS through the 100mm forcemain is 2.00 m/s, which is within MOE guidelines.

### **Reserve Capacity:**

As indicated within the 2021 RCC for the Elora Wastewater Treatment Facility (WWTF), there are 2,774 uncommitted units remaining in treatment capacity which includes the proposed development of 280 units.

### **Water Servicing:**

The existing water distribution system does not provide servicing to the subject site. Currently, a 100mm diameter Asbestos Cement watermain is located along the east side of W.R.7 to approximately 250m north of David Street which serves the residences fronting this section of W.R.7. This main does not meet Municipal Standards and is not adequate to convey fire flows to the subject site. Additionally, W.R.7 is intended as part of the future trunk watermain loop to service the Salem area.

As such, it is recommended that the existing 100mm watermain on W.R.7 be replaced with a 200mm watermain extended north to, at a minimum, South Street. Further, the existing 150mm watermain on South Street should be extended northerly/westerly to connect to the future W.R.7 watermain. This will increase fire flows, ensure redundancy of supply, and provide looping of the system.

Following these recommendations, an expected fire flow of 143.5 L/s will be available at the site with an expected static pressure of approximately 54PSI at an elevation of 407m

The 2021 RCC for the Centre Wellington Water System indicate that there are 1,113 uncommitted units available in water supply capacity which includes the proposed development of 280 units.

## **Stormwater:**

The subject site slopes westerly (i.e., away from W.R.7) where runoff sheet flows onto another agricultural property. It may be necessary to investigate and secure an adequate outlet to the west. It is possible that part of the site could be graded to drain to W.R.7 where the existing ditch drains southerly to Middlebrook Road, then westerly along Middlebrook Road to an eventual outlet to the Grand River. Wellington County will need to be consulted and approve any stormwater design intended to discharge to their ROW.

Regardless of the outlet, it is recommended at this preliminary stage that Enhance Quality Treatment and Post-to-Pre-Peak Flow attenuation be provided. The southwest portion of the site is within a GRCA regulation limit, therefore GRCA approval of stormwater design must be obtained.

## **Conclusion:**

### ***David St. SPS & Reserve Capacity***

As noted above the existing per person flow rates are lower than those reported in the RCC. However, as a factor of safety, we believe it is reasonable to assess the SPS using the RCC per person flow rates. This results in the existing SPS having sufficient capacity to service the development, although repairs and improvements are warranted given the current condition.

To further assess the impact of this development, we completed the assessment utilizing the MOE recommended value of 450L/capita/day which are 99% larger than the current RCC flow rates. Although considering these flows result in the current station being under sized, we do not believe these flows are realistic. Further to this, given the large overflow/emergency storage available and the opportunity to adjust float elevations, it is our opinion that the current station is adequately sized to attenuate the flows in the rare event larger flows are realized.

Additionally, the Elora WWTF is expected to have sufficient capacity to treat the estimated flows produced by the development.

### ***Existing Sewers:***

Based on the current SPS configuration/pump rates, it is expected that the downstream sewers will have adequate capacity. As a point of clarification, following development build-out the pumps will run more frequently, albeit at the same rate, resulting in no increase in flow rate directed to the existing downstream sewer system. However, it is worth noting that as Elora continues to develop there may be some areas of concern, as noted previously. These should be closely monitored moving forward to reduce the risk of surcharge events.

Sanitary sewers will need to be extended to the proposed development frontage, however the existing sewers on David Street are expected to have sufficient depth and capacity to service this development.

### ***Water Servicing:***

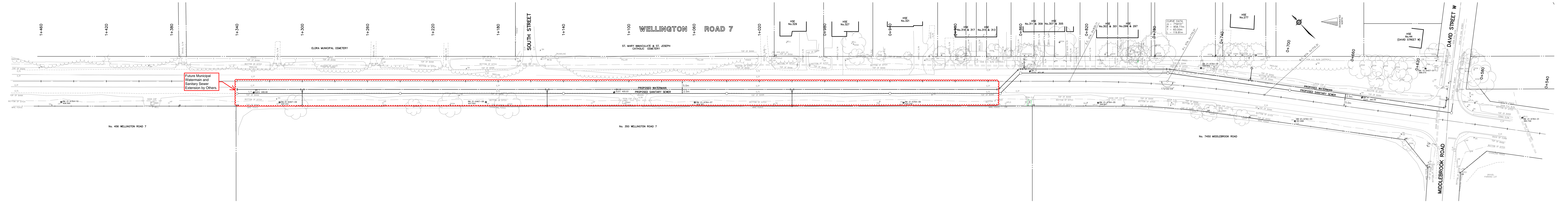
Based on the above analysis/recommendations, the expected system pressures and fire flow available in the site is expected to be acceptable for typical housing needs. However, the adequacy of the fire flows will need to be confirmed by the developer and their agents based on building specifics.

Further to this, the Centre Wellington Water system is expected to have sufficient capacity to supply the Development once services are extended to the site.

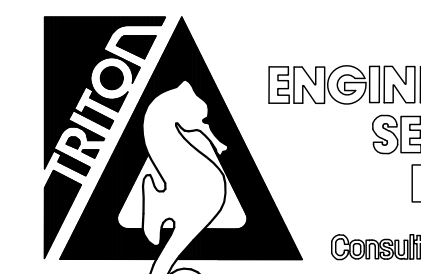
### ***Stormwater Management:***

As discussed above, an enhanced level of treatment and GRCA permitting is expected. Additionally, Wellington County approval of drainage to their ROW is required. Further, GRCA is to be consulted regarding SWM requirements to development of the site.

If you have any questions or concerns, please do not hesitate to contact us.



**PRELIMINARY**

	TRITON ENGINEERING SERVICES LIMITED <small>Consulting Engineers</small>	TOWNSHIP OF CENTRE WELLINGTON WELLINGTON ROAD 7 STUDY PLAN
	PROJECT No. A6764	
DRAWN BY: A.S.B.	SCALE: 1:500	
DATE: DECEMBER 2021	DWG. No. SK-01	

# Appendix B

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## Water Demand Analysis





**350 Wellington Road 7  
WATER FLOW DEMANDS**

Elora, Ontario

Project #: 51060-100

Date: April 27, 2023

Design By: TMA

Checked By : LEI

Development Information <sup>1,5</sup>									Fire Flow <sup>2,5</sup>											Domestic Flow <sup>3,4</sup>																					
									Ontario Building Code				Fire Underwriters Survey																												
Node ID / Area ID / Building #	F.F.E. (m.a.s.l.)	Description	# of Units	Site Area ha	Population # of people	Bldg Area (1 <sup>st</sup> Floor) m <sup>2</sup>	Total Bldg Area m <sup>2</sup>	Building Volume m <sup>3</sup>	K	V	S <sub>tot</sub>	Q	F	F	C	A	F	(2) Occupancy Reduction	(3) Sprinkler Protection	(4) Building Exposure	F	F	Fire Flow (Max OBC /FUS) L/s	2021 RCC Guidelines L/s	Average Day L/s	Max Day L/s	Peak Hour L/s	Minimum Hour L/s	Max Day + Fire Flow L/s												
																														m <sup>3</sup>	L	L/min	L/s	m <sup>2</sup>	L/min	L/min	L/s				
	Varies	Townhouse Block	273	4.46	844	948	2,875	7,763	23	7,763	2.00	357,120	9,000	150	1.50	2,460	16,000	-15%	0%	75%	24,000	400	400	3.417	3.417	9.397	14.216	1.367	409												
<b>TOTALS FOR SITE</b>									<b>Governing OBC Fire Flow =</b>				<b>Max Fire Flow =</b>																												
									150				400																												
																						<b>Sum of Maximum Day Flows + OBC Fire Flow (L/s) =</b>				159								<b>Sum of Maximum Day Flows + FUS Fire Flow (L/s) =</b>				409			

**Assumptions:**

- The building area, volume and units are based on the Conceptual Site Plan by Requezza Design Inc. and are based on the worst case block (Block 30). Assumed 3.09 ppu based on 2021 Reserve Capacity Calculations (RCC) for Centre Wellington.
- The building is classified as occupancy group C (Residential Occupancy) with limited combustible contents. All units The building construction type was assumes to be combustible.
- Average Day Demand based on the Township of Centre Wellington Development Manual:  
Residential = 350 L/cap/day
- Peaking Factors based on "Design Guidelines for Drinking-Water Systems" (MOE, 2008):  
Average Day = 1  
Maximum Day = 2.75  
Peak Hour = 4.16  
Minimum Hour = 0.4
- The raised deck/patio was included in the calculations. The basement was not included in the FUS calculations given at least 50% of it is below grade.

# Appendix C

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## Sanitary Flow Analysis

**350 Wellington Road 7**  
**Sanitary Flow Rate Analysis**

Elora, Ontario

Project #: 51060-100  
 Date: April 25, 2023  
 By: TMA  
 Checked By: LEI



Sanitary Flow Calculations											
Land Use	Site Area <i>(ha)</i>	# of units <sup>1</sup>	Equivalent Population Density <sup>2</sup> <i>(ppu/ppha)</i>	Population <i>(capita)</i>	Average Per Capita DWF <sup>3</sup> <i>(L/cap/d)</i>	Average Flow <i>(L/s)</i>	Peaking Factor <sup>4</sup>	Peak Flow <i>(L/s)</i>	Infiltration <sup>5</sup> <i>(L/s)</i>	Total Average Flow + Infiltration <i>(L/s)</i>	Total Peak Flow + Infiltration <i>(L/s)</i>
Residential	4.46	273	3.09	843.57	350.00	3.42	3.85	13.14	0.67	4.09	13.81

**Assumptions:**

- 1 Unit count of 273 was obtained from the Site Plan prepared by We Merchandise Space Inc.
- 2 Based on 2021 Reserve Capacity Calculations (RCC) for Centre Wellington, a rate of 3.09 ppu was used.
- 3 Average residential sanitary design flow of 350 L/cap/d was used per the Township of Centre Wellington Development Manual.
- 4 Residential Harmon Peaking Factor Formula per the Township of Centre Wellington Development Manual;  
 $F=1+(14/(4+P^{0.5}))$  Where P = population (in thousands) F = min 2.0, max 4.0
- 5 Infiltration Rate of 0.15 L/s/ha was used per the Township of Centre Wellington Development Manual.



# Appendix D

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## Storm Outlet Options

## Tyler Arndt

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**From:** Ray Kirtz <rkirtz@tritoneng.on.ca>  
**Sent:** Tuesday, March 28, 2023 4:14 PM  
**To:** Tyler Arndt  
**Cc:** Lynn Ingram; Dustin Lyttle  
**Subject:** RE: 350 Wellington Rd 7, Elora - Storm Water Management

**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

Hi Tyler;

Approach to confirm SWM strategy/criteria is acceptable.

Regarding comments that can be deferred to detailed design, highlighted items are OK **except**;

- Items related to SWM Storage sizing needs to be addressed as part of OPA and ZBA Applications to confirm site layout/configuration. This would include comments 1.19, 1.20, 1.23, 1.24 and 1.26.

/Ray

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**From:** Tyler Arndt <TArndt@mte85.com>  
**Sent:** March 27, 2023 12:29 PM  
**To:** Ray Kirtz <rkirtz@tritoneng.on.ca>  
**Cc:** Lynn Ingram <LIngram@mte85.com>; Dustin Lyttle <dlyttle@tritoneng.on.ca>  
**Subject:** RE: 350 Wellington Rd 7, Elora - Storm Water Management

Hi Ray,

Thank you for providing your notes from our August 2022 meeting regarding an alternate SWM Strategy, they generally align with ours and what we expected to see in Triton's Engineering Review Comments... we will continue our functional design on this bases.

As suggested, we will be reaching out to the GRCA to discuss the proposed outlet beyond the WR7 and Middlebrook intersection to review the adequacy of the outlet and if they have any specific requirements which need to be met... I will follow up after to inform you of the outcome of these discussions, at which point a meeting may be required to discuss what Triton will require for review of this outlet at this functional design stage to support the OPA and ZBA Applications given design flexibility and review during detailed design.

On the topic of functional design vs detailed design, we have reviewed Triton's Engineering Review Comments and believe the majority of them are requesting information above and beyond that typically required at a functional design stage and request they be differed to detail design. I have attached our comment response matrix and have highlighted Triton's Engineering Review Comments related to MTE's design that we believe should be differed. Please review and confirm if you're in agreement, we would be happy to attend a meeting to discuss the comments in question further if required.

Thanks,  
Tyler

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**Tyler Arndt, E.I.T. | Designer**  
**MTE Consultants Inc.**

T: 519-743-6500 x1386 | [TArndt@mte85.com](mailto:TArndt@mte85.com)

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**From:** Ray Kirtz <[rkirtz@tritoneng.on.ca](mailto:rkirtz@tritoneng.on.ca)>

**Sent:** Monday, March 13, 2023 11:50 AM

**To:** Tyler Arndt <[TArndt@mte85.com](mailto:TArndt@mte85.com)>

**Cc:** Lynn Ingram <[LIngram@mte85.com](mailto:LIngram@mte85.com)>; Dustin Lyttle <[dlyttle@tritoneng.on.ca](mailto:dlyttle@tritoneng.on.ca)>

**Subject:** RE: 350 Wellington Rd 7, Elora - Storm Water Management

Hi Tyler,

I have reviewed my notes from our August 2022 meeting and you are correct that an alternate SWM strategy was considered as follows;

- Currently no runoff is directed to WR7 from this site, however, an appropriate outlet is needed and this is only one available. Obviously, they can't achieve post-pre on the runoff to WR7. Not sure the value of trying to achieve post-pre for the site as it will require significant storage since the proposed site is very high imperviousness. Suggested that the hydraulic considerations (ditch, culverts, watercourse) of the outlet along WR7, Middlebrook and watercourse to the river be reviewed to determine if there are any limitations/concerns with this outlet.
- A quantity control strategy which provides attenuation to a level that is feasible to implement within the proposed site configuration should be looked at.

Based on this, the outlet constraints would need to be reviewed, which I don't believe was done on the previous submission. We're not too worried about WR7 system since we're going to be designing this system to accommodate whatever flows come from the site. That said, controlling the flows on-site will reduce the size/cost of this future system on WR7.

However, the storm system downstream on Middlebrook and across GRCA property to the Grand River will need to be considered if flows to this system are going to be increased. Also, we'd suggest that you touch base with GRCA regarding the adequacy of the outlet across their property and any specific requirements they have.

If you want to discuss this please contact me.

/Ray

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**From:** Tyler Arndt <[TArndt@mte85.com](mailto:TArndt@mte85.com)>

**Sent:** March 10, 2023 2:12 PM

**To:** Ray Kirtz <[rkirtz@tritoneng.on.ca](mailto:rkirtz@tritoneng.on.ca)>

**Cc:** Lynn Ingram <[LIngram@mte85.com](mailto:LIngram@mte85.com)>; Dustin Lyttle <[dlyttle@tritoneng.on.ca](mailto:dlyttle@tritoneng.on.ca)>

**Subject:** RE: 350 Wellington Rd 7, Elora - Storm Water Management

Hi Ray,

I hope all is well with you.

Based on our meeting back in August 2022, it was understood that the typical quantity control SWM Criteria (Post to Pre) should not apply to this Site given the existing conditions and that a new storm sewer is proposed to be installed along Wellington Road 7... We recently received Triton's Engineering Review Comments which note that the proposed SWM criteria is not acceptable given the size of the proposed development and that post-development flows are to be

within the pre-development rates, requesting the typical quantity control SWM Criteria which we discussed was not feasible given the Site's circumstances. Given this, we would like to request another meeting with Triton to review the quantity control SWM Criteria for the Site and come up with a resolution that works for all parties.

Please provide your availability over the next week or two so we can find a suitable time to meet... In addition, we believe it would be best to have any required parties from the Township or County in attendance so please pass this email on accordingly.

Thanks,  
Tyler

---

**Tyler Arndt, E.I.T. | Designer**  
**MTE Consultants Inc.**

T: 519-743-6500 x1386 | [TArndt@mte85.com](mailto:TArndt@mte85.com)

---

**From:** Zenthus Anyalemechi <[ZAnyalemechi@mte85.com](mailto:ZAnyalemechi@mte85.com)>  
**Sent:** Monday, September 12, 2022 2:37 PM  
**To:** 'Ray Kirtz' <[rkirtz@tritoneng.on.ca](mailto:rkirtz@tritoneng.on.ca)>; Dustin Lyttle <[dlyttle@tritoneng.on.ca](mailto:dlyttle@tritoneng.on.ca)>  
**Cc:** Lynn Ingram <[LIngram@mte85.com](mailto:LIngram@mte85.com)>; Tyler Arndt <[TArndt@mte85.com](mailto:TArndt@mte85.com)>  
**Subject:** RE: 350 Wellington Rd 7, Elora - Storm Water Management

Good day Ray, we have completed a preliminary SWM brief based on our discussions during our meeting on the August 24th.

Let us know if you have any comments/concerns.

Please click on the following link to download the attachments: <https://files.mte85.ca/message/jgbsX8bVkhI9rRikeEg1A0>  
The attachments are available until: **Monday, 26 September.**

FILES INCLUDED IN THIS LINK:  
SWM Criteria Brief.pdf 2.68 MB

Thanks

---

**Client First | Right Solution | Work Together** Zenthus Anyalemechi, M.Eng., P.Eng.  
*Project Manager*  
Kitchener x1321

---

**From:** Ray Kirtz <[rkirtz@tritoneng.on.ca](mailto:rkirtz@tritoneng.on.ca)>  
**Sent:** Tuesday, August 23, 2022 4:36 PM  
**To:** Zenthus Anyalemechi <[ZAnyalemechi@mte85.com](mailto:ZAnyalemechi@mte85.com)>  
**Cc:** Dustin Lyttle <[dlyttle@tritoneng.on.ca](mailto:dlyttle@tritoneng.on.ca)>  
**Subject:** RE: 350 Wellington Rd 7, Elora - Storm Water Management

Hi Zenthus,

Typically the Twsp/Cty would require Post to Pre quantity control for a development unless there are extenuating circumstances that make this not feasible.

I am available most of tomorrow (except 3- 3:30) to discuss if you would like.

/Ray

---

**From:** Zenthus Anyalemechi <[ZAnyalemechi@mte85.com](mailto:ZAnyalemechi@mte85.com)>  
**Sent:** August 17, 2022 11:58 AM  
**To:** Ray Kirtz <[rkirtz@tritoneng.on.ca](mailto:rkirtz@tritoneng.on.ca)>  
**Subject:** FW: 350 Wellington Rd 7, Elora - Storm Water Management

Good day Ray, we are having some conversations around the SWM for this site and would like to add you to this conversation.

While we are looking at maintaining flows to the wetland per existing conditions and to meet GRCA requirements our primary legal outlet remains WR7.

We would like to discussed with the township and County to come up with an appropriate release rate for our Site, since our client will be urbanizing a portion of the WR7 to eliminate the ditch.

Currently working with post to pre will require huge storage within our site given that the site is 100% pervious under pre development condition.

Please let me know your thoughts and if we can set up a meeting to discuss.

---

**Zenthus Anyalemechi, M.Eng., P.Eng. | Project Manager**  
**MTE Consultants Inc.**

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## Tyler Arndt

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**From:** Jessica Conroy <jconroy@grandriver.ca>  
**Sent:** Wednesday, April 12, 2023 11:46 AM  
**To:** Tyler Arndt  
**Subject:** RE: 51060-100\_350 Wellington Road 7, Township of Elora - Storm Outlet Review

Hi Tyler,

Received, thank you. We will review and get back to you as soon as possible.

Thank you,  
Jessica

**Jessica Conroy, MES Pl.**

Resource Planner

Grand River Conservation Authority

400 Clyde Road, PO Box 729

Cambridge, ON N1R 5W6

Office: 519-621-2763 ext. 2230

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Email: [jconroy@grandriver.ca](mailto:jconroy@grandriver.ca)

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---

**From:** Tyler Arndt <TArndt@mte85.com>  
**Sent:** Tuesday, April 11, 2023 8:27 AM  
**To:** Jessica Conroy <jconroy@grandriver.ca>; Maria Vogiatzis <mvogiatzis@grandriver.ca>; Laura Warner <lwarner@grandriver.ca>  
**Cc:** Lynn Ingram <LIngram@mte85.com>  
**Subject:** RE: 51060-100\_350 Wellington Road 7, Township of Elora - Storm Outlet Review

Hello All,

I hope you enjoyed the long weekend and thanks again for meeting last week to discuss the proposed storm sewer outlet from 350 Wellington Road 7 (WR7) to the Grand River. Below I have provided an overview of the proposed development, stormwater management design, and the proposed storm outlet options to the Grand River which I've attached schematic markups for. Note, I have worked in the points that were discussed during our meeting regarding the storm outlets into this overview.

### Proposed Development

The proposed development for the Site is the construction of 34 townhome blocks complete with common drive aisles, surface parking, landscape and amenity areas. To create an inviting urban street-scape, which reflects the character of the Town and enhances the function of the community, it is proposed to urbanize the southbound lane of Wellington Road 7 along the frontage of the Site down to Middlebrook Road/ David Street West Intersection. This work would include filling in the existing roadside ditch and installing a municipal storm sewer in its place, providing catchbasins and concrete curb and gutters to create a proper boulevard which will facilitate a multi-use path and street trees. The installation of the new municipal storm sewer will provide a legal storm outlet for the Site and will be sized to accommodate the proposed flows. It is our understanding that the design of the external Site works will be completed by the Township/County's Engineer, Triton.

## Stormwater Management Design

Typically the Stormwater Management (SWM) Design Criteria in the Township of Centre Wellington is post- to pre-development quantity control for the 2-year through 100-year storm events, implementation of enhanced level water quality controls, and to provide erosion and sediment controls based on the Township's draft Development Manual. However, early on in the project MTE met with Triton to review the challenges and opportunities for the Site in regards to the typical quantity control SWM Design Criteria. Based on that meeting, Triton agreed that given the need to maintain a water balance to the existing GRCA Regulated Wetlands, the lack of runoff toward WR7 in the existing condition and the Site's proximity to the Grand River that post- to pre-development quantity control isn't reasonable to WR7. Therefore, an alternate quantity control SWM Design Criteria is warranted and acceptable since the WR7 storm sewer system is going to be designed to accommodate the flows from the Site.

During our meeting Maria mentioned that the GRCA would have typically expected post- to pre-development quantity control for the Site, however, the paragraph above gives some background on why an alternate quantity control SWM Design Criteria is proposed. Based on past MTE projects, the GRCA typically requests no quantity controls on properties in close proximity to the Grand River as implementing flow controls increases the drawdown time of the stormwater from sites and lags the hydrographs for the various storm events causing more conflict with the river's peak flow. We understand that this Site is not adjacent to the Grand River, however, it is only 490m north of it. With the proposed storm sewer, the concentration time in the pipe from the Site to the Grand River is only a few minutes, meaning the Site should be considered as adjacent to the Grand River and no quantity controls should be required as agreed by Triton.

Based on the comments from the first OPA and ZBA Application, and additional correspondence with Triton, they have requested further review of the proposed storm sewer outlet from Middlebrook Road to the Grand River. Based on our functional review, two storm outlet options appear to be available; 1. Extending the proposed storm sewer further down WR7 where it will daylight just upstream of the Grand River, 2. Directs flows from the proposed storm sewer to the Middlebrook Road roadside ditch which will convey the flow to an existing culvert crossing that outlets to the GRCA owned lands and ultimately to the Grand River, mimicking the existing flow route for runoff from WR7. These options were briefly discussed during our meeting but are discussed in more detail below for the GRCA's review.

### Outlet Option #1

As mentioned above, Outlet Option #1 is extending the proposed storm sewer further down WR7 where it will daylight just upstream of the Grand River. The proposed storm sewer would need to cross Middlebrook Road to continue down WR7. The sewer would be located in the southwest boulevard of WR7 from Middlebrook to the WR7 bridge, minor regrading would be required to ensure cover over the storm sewer. The sewer would daylight just before the WR7 bridge where runoff would be conveyed overland for a short distance prior to reaching the Grand River. Erosion control measures would be required as Maria mentioned during our meeting either at the sewer outlet and/or between the outlet and the Grand River. See attached markup for illustration.

### Outlet Option #2

As mentioned above, Outlet Option #2 directs flows from the proposed storm sewer to the Middlebrook Road roadside ditch which will convey the flow to an existing culvert crossing that outlets to the GRCA owned lands and ultimately to the Grand River, mimicking the existing flow route for runoff from WR7. The proposed storm sewer would end at the WR7 and Middlebrook Road intersection. The storm sewer would outlet to the existing roadside ditch along the north side of Middlebrook Road, and upgrades to the ditch may be required to ensure the proposed flow can be conveyed. Approximately 150m southwest of the intersection, flow would be conveyed through an existing culvert crossing Middlebrook Road towards the GRCA owned lands. This existing culvert may also need to be upsized to ensure it can convey the proposed flow. Flow would then travel overland across the GRCA owned lands where it would ultimately reach the Grand River. See attached markup for illustration. As discussed on our call, this outlet option will need to be reviewed by GRCA's property management department. It should be noted that this is the existing flow route for runoff for a portion of WR7, Middlebrook Road and other private lands. Given the low point in Middlebrook Road at this location, it is anticipated this flow route will always need to remain to accommodate the existing upstream catchment area.

Please review the information above and provide comment on both storm outlet options noting the design requirements for each and which option would be preferred by the GRCA. I want to reiterate that we are only at a functional/high level design stage at this time and will be resubmitting our OPA and ZBA Application at the end of this month. Therefore, we ask that the GRCA provides a timely response on this matter so we can incorporate the preferred option in our updated Functional Servicing and Stormwater Management (FS-SWM) Report for the Site. We would be happy to meet again if required to discuss the GRCA's review.

Thanks,  
Tyler

---

**Tyler Arndt, E.I.T. | Designer**  
**MTE Consultants Inc.**

T: 519-743-6500 x1386 | [TArndt@mte85.com](mailto:TArndt@mte85.com)

---

**From:** Jessica Conroy <[jconroy@grandriver.ca](mailto:jconroy@grandriver.ca)>  
**Sent:** Friday, March 31, 2023 3:56 PM  
**To:** Tyler Arndt <[TArndt@mte85.com](mailto:TArndt@mte85.com)>  
**Subject:** RE: 350 Wellington Road 7, Township of Elora - Storm Outlet Review

Hi Tyler,

Okay sounds good.

GRCA staff involved would be myself and Maria Vogiatzis, Water Resources Engineer ([mvogiatzis@grandriver.ca](mailto:mvogiatzis@grandriver.ca)), and Laura Warner ([lwarner@grandriver.ca](mailto:lwarner@grandriver.ca)) may also attend.

Thank you and have a great weekend too.

Thank you,  
Jessica

**Jessica Conroy, MES Pl.**

Resource Planner

Grand River Conservation Authority

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[www.grandriver.ca](http://www.grandriver.ca) | [Connect with us on social media](#)

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**From:** Tyler Arndt <[TArndt@mte85.com](mailto:TArndt@mte85.com)>  
**Sent:** Friday, March 31, 2023 3:49 PM  
**To:** Jessica Conroy <[jconroy@grandriver.ca](mailto:jconroy@grandriver.ca)>  
**Cc:** Lynn Ingram <[LIngram@mte85.com](mailto:LIngram@mte85.com)>  
**Subject:** RE: 350 Wellington Road 7, Township of Elora - Storm Outlet Review

Hi Jessica,

Thank you for providing GRCA staff availability, April 5<sup>th</sup> 2-3pm works best for us.



This meeting will be virtual, please send us a meeting invite or inform us of what GRCA staff are required and we will send one out.

Have a great weekend,  
Tyler

---

**Tyler Arndt, E.I.T. | Designer**  
**MTE Consultants Inc.**

T: 519-743-6500 x1386 | [TArndt@mte85.com](mailto:TArndt@mte85.com)

---

**From:** Jessica Conroy <[jconroy@grandriver.ca](mailto:jconroy@grandriver.ca)>  
**Sent:** Friday, March 31, 2023 2:54 PM  
**To:** Tyler Arndt <[TArndt@mte85.com](mailto:TArndt@mte85.com)>  
**Subject:** RE: 350 Wellington Road 7, Township of Elora - Storm Outlet Review

Good afternoon Tyler,

Thank you for your email.

GRCA staff currently have availability at the following dates and times:

- April 5 between 1-3pm;
- April 6 between 9am and 12pm or between 1pm and 4pm;
- April 11 between 2:30 and 4pm;
- April 13 between 1pm and 4pm.

Please let me know what works best. Would this be a virtual meeting?

Thank you,  
Jessica

**Jessica Conroy, MES Pl.**

Resource Planner

Grand River Conservation Authority

400 Clyde Road, PO Box 729

Cambridge, ON N1R 5W6

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**From:** Tyler Arndt <[TArndt@mte85.com](mailto:TArndt@mte85.com)>  
**Sent:** Wednesday, March 29, 2023 11:29 AM  
**To:** Laura Warner <[lwarn@grandriver.ca](mailto:lwarn@grandriver.ca)>; Jessica Conroy <[jconroy@grandriver.ca](mailto:jconroy@grandriver.ca)>  
**Cc:** Lynn Ingram <[LIngram@mte85.com](mailto:LIngram@mte85.com)>  
**Subject:** RE: 350 Wellington Road 7, Township of Elora - Storm Outlet Review  
**Importance:** High

Hi Laura,

Thank you for informing us and passing this request on, it is much appreciated.

Welcome to this project Jessica! Please provide the availability of required staff and yourself as soon as possible so we can get a meeting schedule for early to mid-next week.

Thanks,  
Tyler

---

**Tyler Arndt, E.I.T. | Designer**  
**MTE Consultants Inc.**

T: 519-743-6500 x1386 | [TArndt@mte85.com](mailto:TArndt@mte85.com)

---

**From:** Laura Warner <[lwarner@grandriver.ca](mailto:lwarner@grandriver.ca)>  
**Sent:** Tuesday, March 28, 2023 10:20 AM  
**To:** Tyler Arndt <[TArndt@mte85.com](mailto:TArndt@mte85.com)>; Jessica Conroy <[jconroy@grandriver.ca](mailto:jconroy@grandriver.ca)>  
**Cc:** Lynn Ingram <[LIngram@mte85.com](mailto:LIngram@mte85.com)>  
**Subject:** RE: 350 Wellington Road 7, Township of Elora - Storm Outlet Review

Hi Tyler,

Jessica Conroy is now our Resource Planner covering the Township of Centre Wellington, so I'm passing your request over to her by way of this email. Jessica will need a bit of time to review the file and engage appropriate staff here, so a virtual meeting next week is more likely.

Jessica, the file is [here](#) for context.

Kind regards,  
Laura

**Laura Warner**

Assistant Supervisor of Resource Planning  
Grand River Conservation Authority

400 Clyde Road, PO Box 729  
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---

**From:** Tyler Arndt <[TArndt@mte85.com](mailto:TArndt@mte85.com)>  
**Sent:** Monday, March 27, 2023 1:42 PM  
**To:** Laura Warner <[lwarner@grandriver.ca](mailto:lwarner@grandriver.ca)>  
**Cc:** Lynn Ingram <[LIngram@mte85.com](mailto:LIngram@mte85.com)>  
**Subject:** 350 Wellington Road 7, Township of Elora - Storm Outlet Review

Hi Laura,

As you may know, MTE is the Civil Consultant for the proposed townhouse development proposed at 350 Wellington Road 7 in the Township of Elora which you provided GRCA comments for dated January 31, 2023. We have no concerns with the comments provided, however, we are hoping we could meet later this week to discuss the Site's storm outlet to the Grand River with the appropriate GRCA staff. Currently the majority of the Site drains to a GRCA regulated wetland southwest of the Site which we will be providing a surface runoff water balance to in the post development condition. In addition to maintaining the flows to the wetland, a new legal storm outlet for the Site will be established to

Wellington Road 7 as part of the urbanization of Wellington Road 7 from the Site down to the intersection of Wellington Road 7 and Middlebrook Road. The new storm outlet beyond this intersection to the Grand River is what we wish to discuss with the GRCA, see attached markup for reference.

Please let us know staffs availability for this week/early next week and we will send out a meeting invite accordingly.

Thanks,  
Tyler

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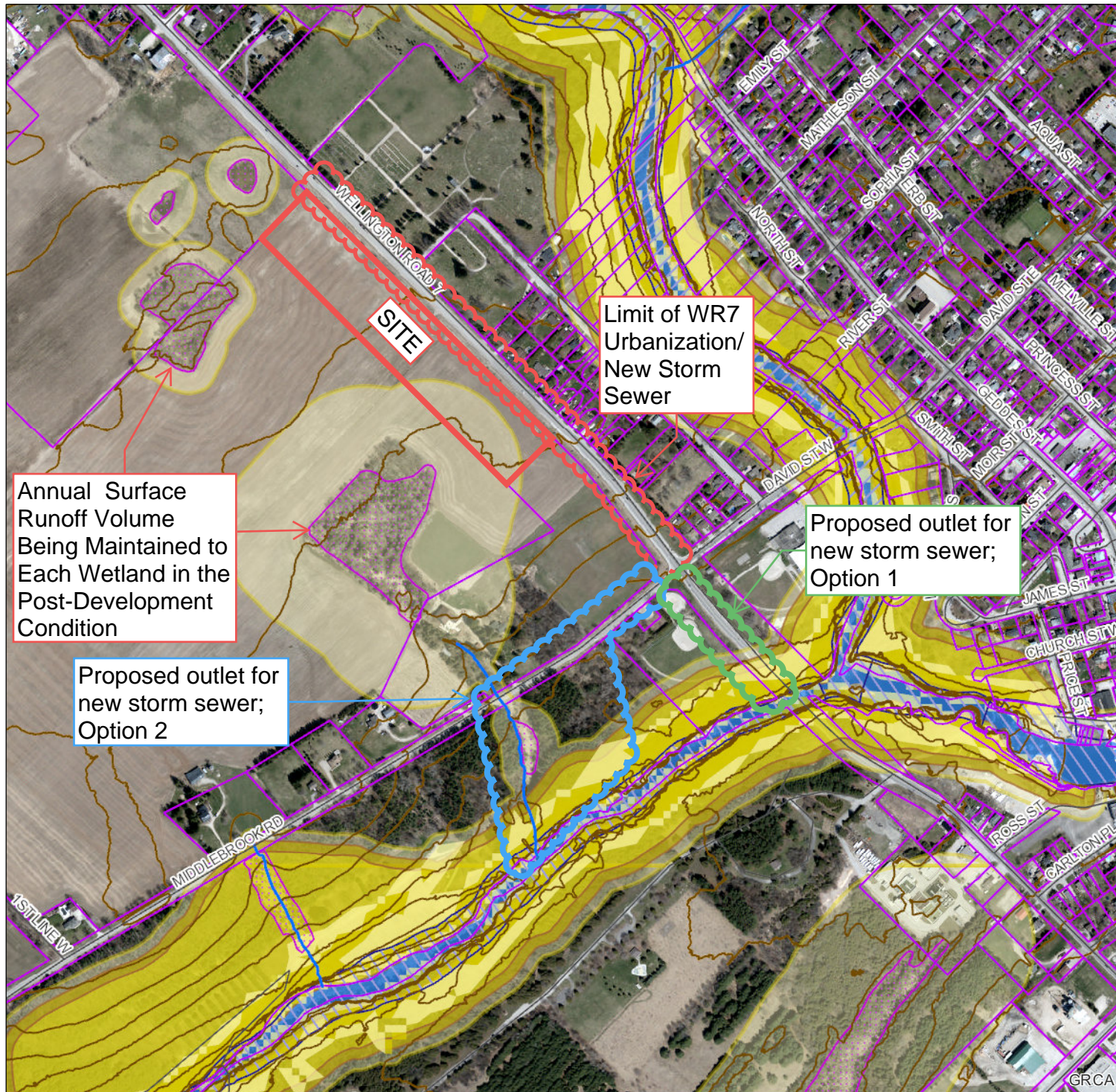
**Tyler Arndt, E.I.T. | Designer**  
**MTE Consultants Inc.**

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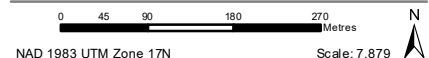


Legend

- Regulation Limit (GRCA)
- Regulated Watercourse (GRCA)
- Regulated Waterbody (GRCA)
- Wetland (GRCA)
- Floodplain (GRCA)
  - Engineered
  - Estimated
  - Approximate
  - Special Policy Area
- Slope Valley (GRCA)
  - Steep
  - Oversteep
  - Steep
- Slope Erosion (GRCA)
  - Oversteep
  - Toe
- Lake Erie Flood (GRCA)
- Lake Erie Shoreline Reach (GRCA)
- Lake Erie Dynamic Beach (GRCA)
- Lake Erie Erosion (GRCA)
- Parcel - Assessment (MPAC/MNRF)

This legend is static and may not fully reflect the layers shown on the map. The text of Ontario Regulation 150/06 supercedes the mapping as represented by these layers.

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New Storm Sewer from the North end of the Site to WR7 & Middlebrook Road Intersection.

Proposed Storm Sewer is extended from Middlebrook Road to the WR7 Bridge as shown. Minor boulevard regarding will be required to get cover over the sewer.

Erosion control measures to be implemented at the storm sewer outlet and/or between the outlet and the Grand River.

Approximate flow route from the storm sewer down to the Grand River based on review of the GRCA Web Map.

STORM OUTLET OPTION #1 MARKUP  
2023-04-06



Elora tubing launch

Elora Gorge Hole in the Rock

Elora River valley lookout ( walk on...

Image © 2023 Maxar Technologies

Google Earth

1985

Imagery Date: 3/28/2022

17 T 545262.46 m E 4836806.09 m N elev 1275 ft eye alt 2921 ft



Ex. Culvert Crossing Middlebrook Road (Approx Location), may need to be up-sized to convey the flow.

Flow from new storm sewer will be conveyed to the existing roadside ditch along Middlebrook Road as shown. Upgrades may be required to ensure the ditch can convey the flow.

New Storm Sewer from the North end of the Site to WR7 & Middlebrook Road Intersection.

Approximate flow routes from the culvert to the Grand River over GRCA Lands based on review of the GRCA Web Map.

STORM OUTLET OPTION #2 MARKUP  
2023-04-06



Elora tubing launch

Elora Gorge Hole in the Rock

Image © 2023 Maxar Technologies

Elora River valley lookout ( walk on...

Google Earth

1985

Imagery Date: 3/28/2022

17 T 545262.46 m E 4836806.09 m N elev 1275 ft eye alt 2921 ft



# Appendix E

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## **SWM Criteria Brief**



**Project Name:** 350 Wellington Road 7

**MTE File No.:** 51060-100

**To:** Ray Kirtz & Dustin Lyttle  
Triton Engineering Services Limited

**Date:** September 12, 2022

**cc:** Bob & Colleen Forrest, We Merchandise  
Space Inc.  
Eldon Theodore, MHBC Planning Limited

**From:** Tyler Arndt, E.I.T.  
Lynn Ingram, P.Eng.

---

**RE: SWM Criteria Brief  
350 Wellington Road 7, Elora ON**

MTE Consultants Inc. has been retained to complete the preliminary grading, servicing, and stormwater management design for the proposed townhouse development, to be constructed at 350 Wellington Road 7 (herein referred to as 'the Site') in the Town of Elora, located in the Township of Centre Wellington.

The overall Site comprises of approximately 4.46ha of agricultural land and is located on Wellington Road 7 between Wellington Road 18/Woolwich Street West and Middlebrook Road/David Street West, approximately 490m north of the Grand River. The Site is bounded to the east by Wellington Road 7 and bounded to the north, south and west by existing agricultural land. Existing residential properties and the Elora municipal cemetery are located on the other side of Wellington Road 7, fronting the Site. In addition, there are four Grand River Conservation Authority (GRCA) regulated wetlands adjacent to the Site; three to the northwest and one to the southwest. The southwest wetland regulation limit extends into the southwest portion of the Site. Refer to the appended GRCA Web-Map figure for illustration of the exact Site location, surrounding wetlands and regulation limits.

The proposed concept for the Site is the construction of approximately 35 townhouse blocks complete with common drive aisles, surface parking, landscape and amenity areas. The development will create approximately 272 townhouse units varying from conventional, back to backs and double front live/work style units. In order to service the development, the existing municipal sanitary sewer and watermain will be extended from the Wellington Road 7 and David Street West intersection to the Site. The proposed storm servicing strategy is discussed in a following section in this memo.

The purpose of this technical memorandum is to review the Township's general requirements for stormwater management criteria, the Site specific constraints and to propose practical stormwater management design criteria for the subject Site for approval by the appropriate reviewing agencies.

## Stormwater Management

### General Stormwater Management Requirements

Based on the Township of Centre Wellington's draft Development Manual, and previous email correspondence with Triton Engineering Services Limited, general stormwater management design criteria is typically as follows:

- i) Attenuation of the post-development peak flows for the 2-year through 100-year storm events to the pre-development (existing) peak flows;
- ii) Implementation of water quality controls; and,
- iii) Provide erosion and sediment controls.



We agree that the water quality control and erosion control criteria remain valid for this Site. However, it is our understanding that the Township's typical water quantity control requirement to attenuate post-development peak flows to pre-development (existing) peak flows is typically required in more urban/developed areas to mitigate capacity concerns with existing downstream municipal infrastructure. Given the rural cross-section of Wellington Road 7 (i.e., road side ditches), the Site's proximity to the Grand River and Site specific stormwater management constraints discussed below, we believe a deviation from the typical water quantity control requirement is warranted.

### Existing Site Conditions/Constraints

To understand the Site constraints associated with the aforementioned wetlands, MTE has been working with Michalski Nielsen Associates Limited who has been retained to complete the Environmental Impact Assessment (EIS) for the Site. Through discussions regarding the natural functions of Wetland A and B within the area, it was determined that is necessary to maintain an annual surface runoff water balance to Wetland A and B to mimic the existing sheet flow from the Site in the post-development condition.

In the existing condition, the Site drains via broad sheet flow to four main drainage paths based on the existing contours; to the southwest towards Wetland A (Catchment 101), to the southeast towards the neighbouring agricultural lands (Catchment 102), to the north towards Wellington Road 7 (Catchment 103) and to the northwest towards Wetland B (Catchment 104). Refer to appended Figure 1.0 for illustration of the limits of the pre-development catchment areas directed to each drainage path. Based on these catchment areas, only around 7% of the Site currently drains to the Wellington Road 7 right-of-way to the north, 8% of the Site currently drains to the neighbouring agricultural lands to the southeast, while 18% and 67% (totaling to 85%) of the Site currently drains to Wetland B and A, respectively. Therefore, if the Township's typical water quantity control criterion was required for this Site, no flow would be allowed to drain to Wellington Road 7 towards the southeast (i.e., to the Grand River) and the majority of flow would need to be directed across the neighbouring property to the adjacent wetlands. Understanding the importance of establishing a legal outlet for green field developments such as this, the typical water quantity control criterion cannot be achieved.

### Proposed Stormwater Management Strategy

Based on the existing Site conditions and constraints mentioned above, we propose the stormwater management design criteria for the Site be as follows:

- i) Establish a legal outlet(s) for the Site;
- ii) Maintain an annual surface runoff water balance to Wetland A and Wetland B;
- iii) Attenuation of the post-development peak flows for the 2-year through 100-year storm events to the allowable flow rate using a C value of 0.75;
- iv) Implementation of water quality controls; and,
- v) Provide erosion and sediment controls.

A brief description has been provided below on how each criteria is anticipated to be met, and in some cases, justification for the proposed criteria has been provided.

### Legal Outlet

In the existing condition, the majority of the runoff from the Site is directed across the neighbouring property via broad sheet flow to Wetland A and B. Generally, there is no right of drainage for surface water. Therefore, the only legal outlet for the Site in the existing condition is to the municipal right-of-way (Wellington Road 7).

In the post-development condition, it is proposed that the Site's private storm sewer system will outlet to the existing roadside ditch within the Wellington Road 7 right-of-way at the southeast corner of the Site. Through the Site grading design, the major overland flow route will also be directed to the Wellington Road 7 right-of-way. However, given the need to maintain a surface runoff water balance to Wetland A and B, an easement is currently being pursued with the neighbouring property owner to legally allow surface drainage across the adjacent property to these wetlands.

It should be noted that even if an easement is obtained, the primary legal outlet for the Site should still be to Wellington Road 7.

### **Water Balance**

An annual surface runoff water balance to Wetland A and Wetland B will be achieved in the post-development condition by directing runoff from rooftop and landscape areas adjacent the west property line to the neighbouring property. From there, runoff will continue to sheet flow across the neighbouring property and into each wetland as it does in the existing condition. A preliminary annual surface runoff water balance analysis was completed for each wetland and the required catchment area to be directed to Wetland A and B is illustrated on the appended post-development catchment areas Figure 2.0 (Catchment 204 & 205, respectively).

It should be noted that being able to achieve a surface runoff water balance to Wetland A and B is conditional on obtaining an easement to allow surface drainage across the neighbouring property.

### **Water Quantity Control**

In the pre-development condition, no surface runoff from the Site is directed toward the southeast to Wellington Road 7. However, it is imperative that an allowable flow rate be established to Wellington Road 7, south of the existing high point in the road, to support the appropriate legal outlet location for the Site.

Currently Wellington Road 7 has a rural cross-section with approximately four existing driveway/road crossing culverts between the Site and the Grand River. Given the limited infrastructure constraints, we believe an appropriate runoff coefficient should be utilized based on the proposed Site use, rather than the pre-development (existing) peak flows. Based on past experience, and the Region of Waterloo Design Guidelines and Supplemental Specifications for Municipal Services 2022 as a reference, typical runoff coefficients for residential row dwellings/townhouse blocks vary from 0.50 to 0.80. Considering the proximity to the Grand River, we believe a runoff coefficient of 0.75 is appropriate and would help allow the peak flow from the Site to occur in advance of the peak flow from the upstream drainage area. We understand that due to the increased flow to Wellington Road, road side ditch improvements and upsizing of any existing culverts may be required. If necessary, this could be completed during the necessary sanitary sewer and watermain extensions along Wellington Road 7 from the David Street West intersection to the Site. In the future when Wellington Road 7 is urbanized, the required storm sewers can be sized accordingly.

On-site quantity control requirements will be met through the use of an on-line orifice plate on the controlled catchment area (Catchment 201). Storage volume for the orifice plate will be provided via surface ponding in the drive aisles and parking areas, along with the implementation of underground storage tanks as required.

### **Water Quality Control**

The quality control requirement will be met for the controlled catchment area (Catchment 201) through the installation of an oil-grit separator (OGS) unit on the private storm sewer system before outletting to the municipal ditch. Runoff from the frontage of the property and towards the wetlands will be from rooftop and landscape areas which are considered "clean", therefore no quality controls are required for those catchment areas (Catchment 202, 203, 204 and 205).



### Erosion and Sediment Control

Precautions will need to be taken during construction to limit erosion and sedimentation. Typically, the following measures are recommended during construction for erosion and sedimentation control:

- i) Erosion and sedimentation facilities are to be installed prior to any area grading operations;
- ii) All erosion control measures are to be inspected and monitored by the contractor and repairs are to be completed as required;
- iii) All materials and equipment used for the purpose of site preparation and project completion should be operated and stored in a manner that prevents any deleterious substance from leaving the site;
- iv) Stripping and strategic placement of topsoil stockpiles. Placement of sediment control fencing around all stockpile areas;
- v) Re-vegetation of completed areas as soon as possible after construction, including those areas not slated for construction, within 60 days of rough grading; and,
- vi) To minimize the amount of mud being tracked onto the roadway, a mud mat should be installed at the primary construction entrance.

The exact erosion and sediment control measures will be determined during detailed design.

We trust the above provides rationale as to why the Township's general stormwater management design water quantity control criteria is not feasible for the subject Site. We respectfully request that the proposed alternate stormwater management criteria be reviewed and approved by the appropriate reviewing agencies. A functional servicing and SWM report and functional design drawings will be prepared and submitted once the stormwater management criteria is agreed upon.

Yours truly,

**MTE Consultants Inc.**

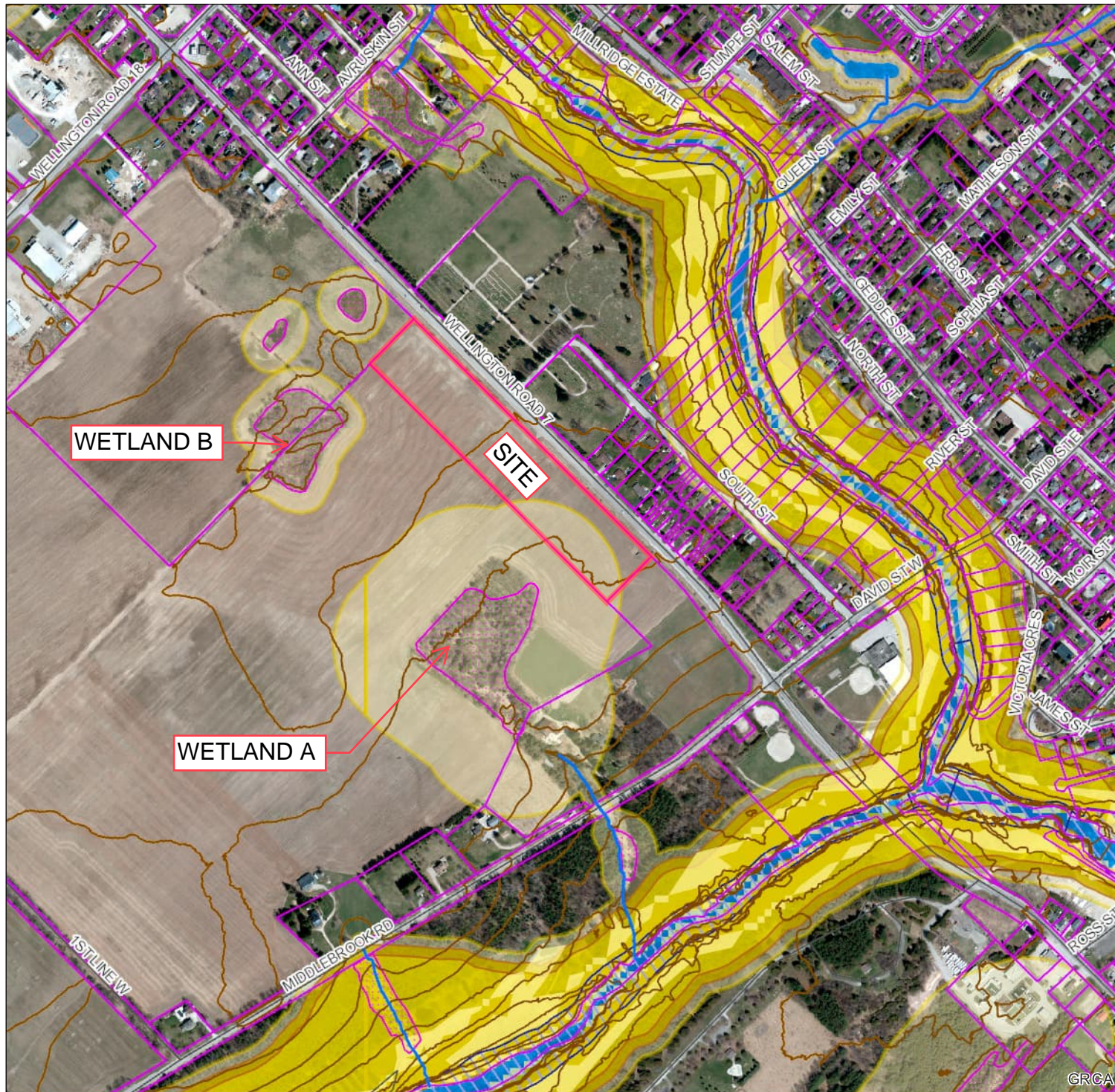
**Tyler Arndt, E.I.T.**  
Designer  
519-743-6500 ext.1386  
[tarndt@mte85.com](mailto:tarndt@mte85.com)

**Lynn Ingram, P.Eng.**  
Design Engineer  
519-743-6500 ext.1381  
[lingram@mte85.com](mailto:lingram@mte85.com)

TMA:dlb  
Encl.

M:\51060\100\Reports\SWM Criteria Brief\SWM Criteria Brief.docx



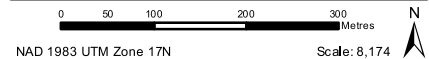


Legend

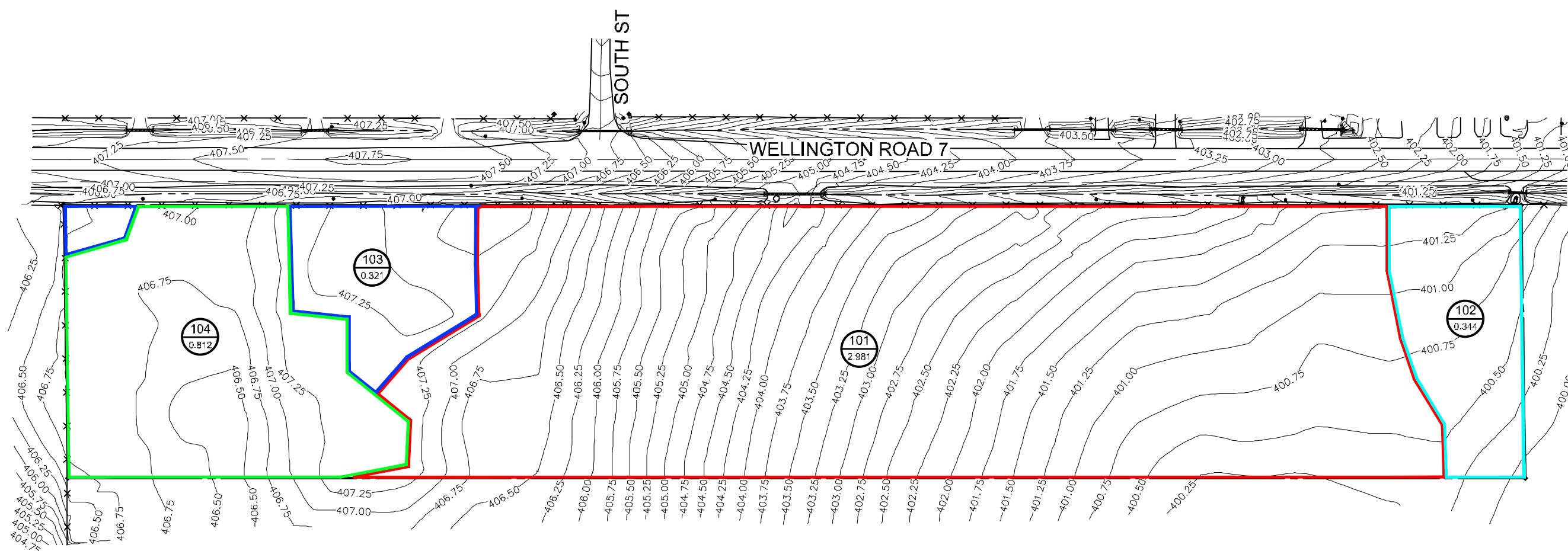
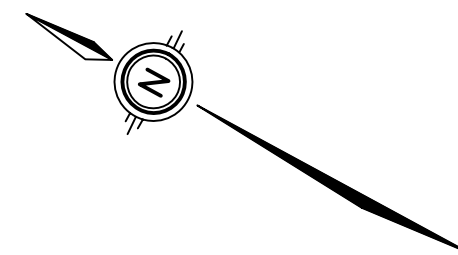
- Regulation Limit (GRCA)
- Regulated Watercourse (GRCA)
- Regulated Waterbody (GRCA)
- Wetland (GRCA)
- Floodplain (GRCA)
  - Engineered
  - Estimated
  - Approximate
  - Special Policy Area
- Slope Valley (GRCA)
  - Steep
  - Oversteep
  - Steep
- Slope Erosion (GRCA)
  - Oversteep
  - Toe
- Lake Erie Flood (GRCA)
- Lake Erie Shoreline Reach (GRCA)
- Lake Erie Dynamic Beach (GRCA)
- Lake Erie Erosion (GRCA)
- Parcel - Assessment (MPAC/MNRF)

This legend is static and may not fully reflect the layers shown on the map. The text of Ontario Regulation 150/06 supercedes the mapping as represented by these layers.

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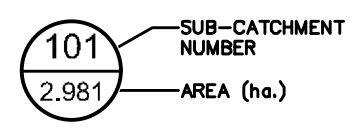






**LEGEND**

- CATCHMENT 101
- CATCHMENT 102
- CATCHMENT 103
- CATCHMENT 104



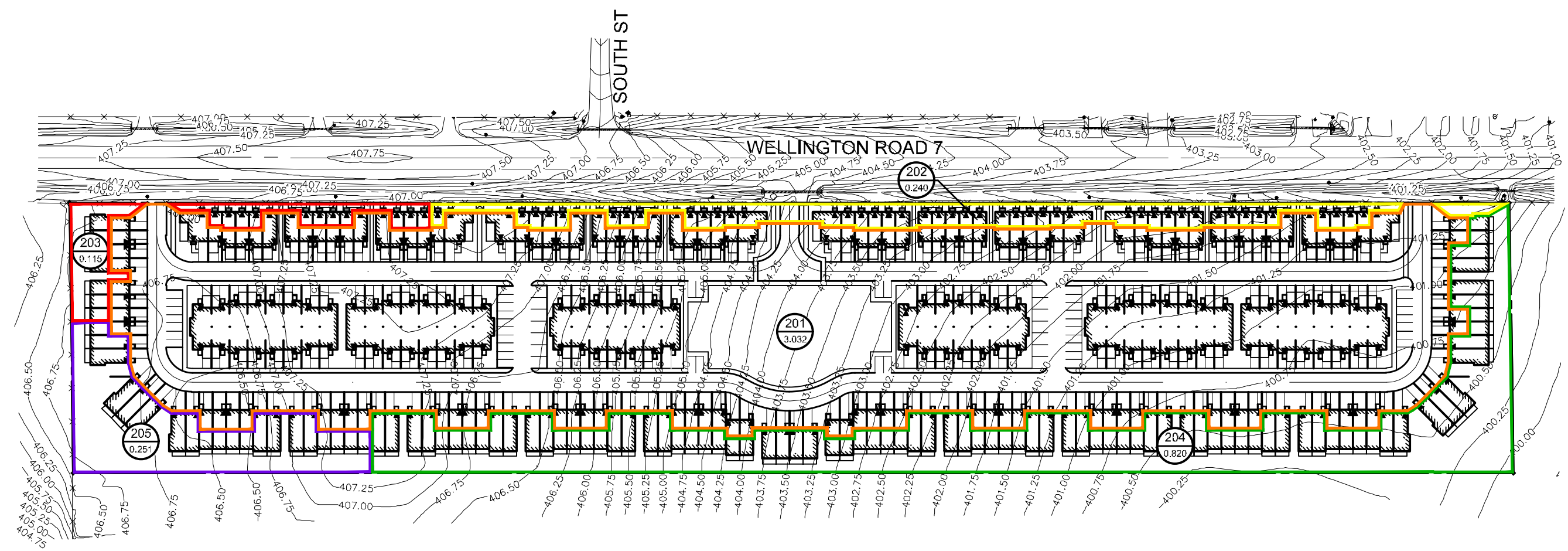
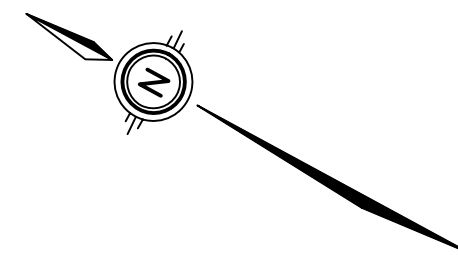
— 406.50 — EXISTING CONTOURS

FIGURE 1.0 Date: SEPT. 06/22  
Scale: 1:1500

**PRE-DEVELOPMENT  
CATCHMENT AREAS**



Project No.: 51060-100



**LEGEND**







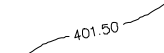

-  CATCHMENT 201
-  CATCHMENT 202
-  CATCHMENT 203
-  CATCHMENT 204
-  CATCHMENT 205
  
-  SUB-CATCHMENT NUMBER  
AREA (ha.)
  
-  EXISTING CONTOURS
  
-  PROPOSED BUILDING

FIGURE 2.0 Date: SEPT. 06/22  
Scale: 1:1500

**POST-DEVELOPMENT  
CATCHMENT AREAS**



Project No.: 51060-100

# Appendix F

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## Water Balance Analysis



**350 Wellington Road 7**  
**WATER BALANCE (SURFACE RUNOFF) ANALYSIS**  
 Elora, Ontario

Project Number: 51060-100  
 Date: April 25, 2023  
 Design By: TMA  
 Checked By: LEI  
 File: Q:\51060\100\Preliminary Design\Water Balance\51060-100\_Micro Drainage Analysis\_Rev2.xlsx

**Hydrologic Cycle Component Values**

Annual Precipitation = 924mm

	Pre-Development (Flat Lands - Moderately Rooted Crops)	Post-Development (Flat Lands - Urban Lawns)	Roof Areas
<i>Fine Sandy Loam</i>	579 mm Evapo-Transpiration <b>104 mm Runoff</b> 242 mm Infiltration	564 mm Evapo-Transpiration <b>126 mm Runoff</b> 234 mm Infiltration	214 mm Evapo-Transpiration <b>710 mm Net Runoff from roof (Based on 30mm)</b> 0 mm Infiltration

**SOUTHWEST WETLAND A - SURFACE RUNOFF**

Location	Pre-development			Post-development						Comments
	Area Draining to Location	Runoff Rate	Runoff Volume	Pervious			Impervious			
				Area Draining to Location	Runoff Rate	Runoff Volume	Area Draining to Location	Runoff Rate	Runoff Volume	
	ha	mm/yr/m <sup>2</sup>	m <sup>3</sup> /yr	ha	mm/yr/m <sup>2</sup>	m <sup>3</sup> /yr	ha	mm/yr/m <sup>2</sup>	m <sup>3</sup> /yr	
Pre-Development (101)										
Landscape Area	2.981	104	3100							
Post-Development (204)										
Roof Area							0.367	710	2606	
Landscape Area				0.396	126	499				
<b>Total</b>	2.981	104	<b>3100</b>	0.396	126	<b>499</b>	0.367	710	<b>2606</b>	
									<b>Total Post-development Runoff</b>	<b>3105</b>
									<b>Net Gain of Runoff</b>	<b>4</b>





**350 Wellington Road 7**  
**WATER BALANCE (SURFACE RUNOFF) ANALYSIS**  
 Elora, Ontario

Project Number: 51060-100  
 Date: April 25, 2023  
 Design By: TMA  
 Checked By: LEI  
 File: Q:\51060\100\Preliminary Design\Water Balance\51060-100\_Micro Drainage Analysis\_Rev2.xlsx

**Hydrologic Cycle Component Values**

Annual Precipitation = 924mm

	Pre-Development (Flat Lands - Moderately Rooted Crops)	Post-Development (Flat Lands - Urban Lawns)	Roof Areas
<i>Fine Sandy Loam</i>	579 mm Evapo-Transpiration <b>104 mm Runoff</b> 242 mm Infiltration	564 mm Evapo-Transpiration <b>126 mm Runoff</b> 234 mm Infiltration	214 mm Evapo-Transpiration <b>710 mm Net Runoff from roof (Based on 30mm)</b> 0 mm Infiltration

**NORTHWEST WETLAND B - SURFACE RUNOFF**

Location	Pre-development			Post-development						Comments
	Area Draining to Location	Runoff Rate	Runoff Volume	Pervious			Impervious			
				Area Draining to Location	Runoff Rate	Runoff Volume	Area Draining to Location	Runoff Rate	Runoff Volume	
	ha	mm/yr/m <sup>2</sup>	m <sup>3</sup> /yr	ha	mm/yr/m <sup>2</sup>	m <sup>3</sup> /yr	ha	mm/yr/m <sup>2</sup>	m <sup>3</sup> /yr	
Pre-Development (104)										
Landscape Area	0.812	104	844							
Post-Development (205)										
Roof Area							0.093	710	660	
Landscape Area				0.156	126	197				
<b>Total</b>	0.812	104	<b>844</b>	0.156	126	<b>197</b>	0.093	710	<b>660</b>	
									<b>Total Post-development Runoff</b>	<b>857</b>
									<b>Net Gain of Runoff</b>	<b>12</b>

# Appendix G

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## **Storm Tank Sizing Sheets & MIDUSS Outputs**

## User Inputs

<b>Chamber Model:</b>	MC-3500
<b>Outlet Control Structure:</b>	No
<b>Project Name:</b>	350 Wellington Road 7
<b>Engineer:</b>	Tyler Arndt
<b>Project Location:</b>	Ontario
<b>Measurement Type:</b>	Metric
<b>Required Storage Volume:</b>	600.00 cubic meters.
<b>Stone Porosity:</b>	40%
<b>Stone Foundation Depth:</b>	261 mm.
<b>Stone Above Chambers:</b>	305 mm.
<b>Average Cover Over Chambers:</b>	458 mm.
<b>Design Constraint Dimensions:</b>	(24.00 m. x 22.01 m.)

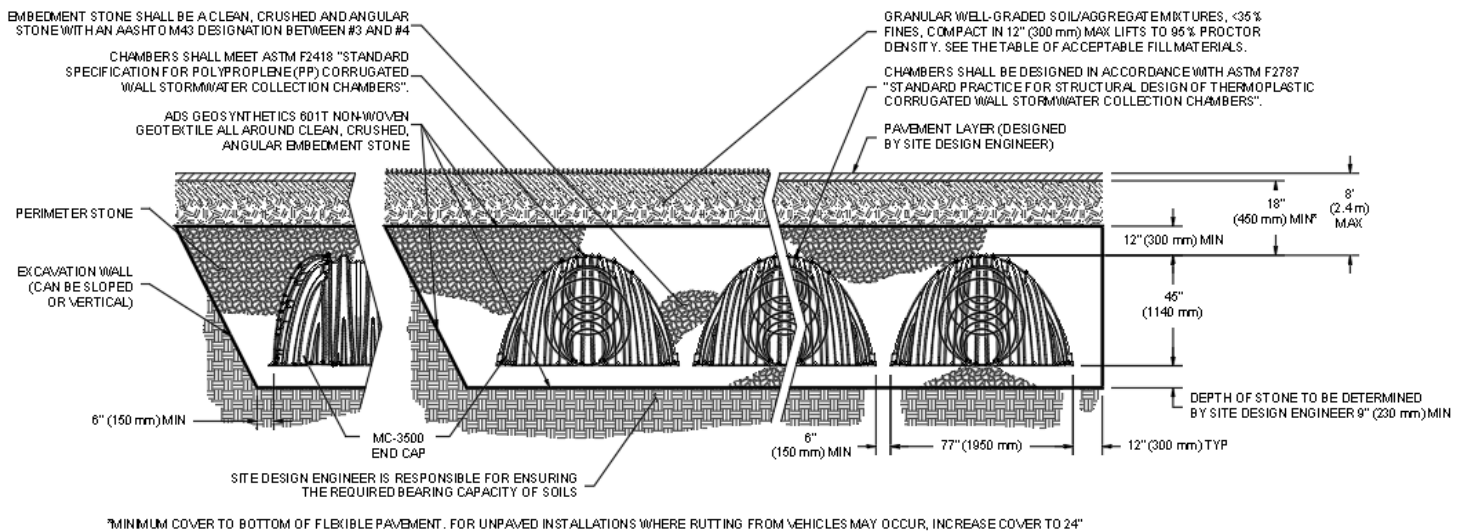
## Results

### System Volume and Bed Size

<b>Installed Storage Volume:</b>	550.57 cubic meters.
<b>Storage Volume Per Chamber:</b>	3.12 cubic meters.
<b>Number Of Chambers Required:</b>	99
<b>Number Of End Caps Required:</b>	22
<b>Chamber Rows:</b>	11
<b>Maximum Length:</b>	22.68 m.
<b>Maximum Width:</b>	23.65 m.
<b>Approx. Bed Size Required:</b>	527.17 square me- ters.

### System Components

<b>Amount Of Stone Required:</b>	583 cubic meters
<b>Volume Of Excavation (Not Including Fill):</b>	901 cubic meters
<b>Total Non-woven Geotextile Required:</b>	1456 square meters
<b>Woven Geotextile Required (excluding Isolator Row):</b>	98 square meters
<b>Woven Geotextile Required (Isolator Row):</b>	67 square meters
<b>Total Woven Geotextile Required:</b>	165 square meters
<b>Impervious Liner Required:</b>	YES



## User Inputs

<b>Chamber Model:</b>	MC-3500
<b>Outlet Control Structure:</b>	No
<b>Project Name:</b>	350 Wellington Road 7
<b>Engineer:</b>	Tyler Arndt
<b>Project Location:</b>	Ontario
<b>Measurement Type:</b>	Metric
<b>Required Storage Volume:</b>	600.00 cubic meters.
<b>Stone Porosity:</b>	40%
<b>Stone Foundation Depth:</b>	261 mm.
<b>Stone Above Chambers:</b>	305 mm.
<b>Average Cover Over Chambers:</b>	458 mm.
<b>Design Constraint Dimensions:</b>	(18.01 m. x 25.00 m.)

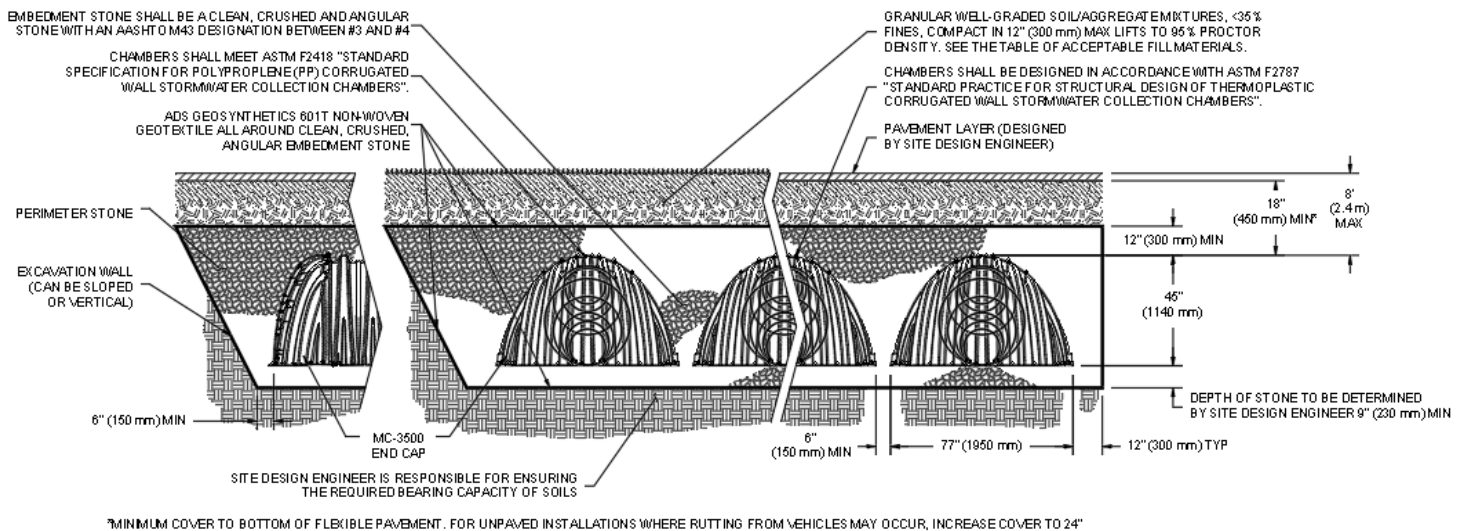
## Results

### System Volume and Bed Size

<b>Installed Storage Volume:</b>	447.58 cubic meters.
<b>Storage Volume Per Chamber:</b>	3.12 cubic meters.
<b>Number Of Chambers Required:</b>	80
<b>Number Of End Caps Required:</b>	16
<b>Chamber Rows:</b>	8
<b>Maximum Length:</b>	24.86 m.
<b>Maximum Width:</b>	17.33 m.
<b>Approx. Bed Size Required:</b>	430.58 square me- ters.

### System Components

<b>Amount Of Stone Required:</b>	480 cubic meters
<b>Volume Of Excavation (Not Including Fill):</b>	736 cubic meters
<b>Total Non-woven Geotextile Required:</b>	1207 square meters
<b>Woven Geotextile Required (excluding Isolator Row):</b>	98 square meters
<b>Woven Geotextile Required (Isolator Row):</b>	74 square meters
<b>Total Woven Geotextile Required:</b>	172 square meters
<b>Impervious Liner Required:</b>	YES



## Pre-Development



```

"          MIDUSS Output ----->"
"          MIDUSS version              Version 2.25 rev. 473"
"          MIDUSS created              Sunday, February 7, 2010"
"          10 Units used:              ie METRIC"
"          Job folder:                 Q:\51060\100\Preliminary Design\SWM\
"                                     SWM Memo"
"          Output filename:           2YR - PRE B.out"
"          Licensee name:              A"
"          Company                     "
"          Date & Time last used:     9/12/2022 at 9:16:29 AM"

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31 TIME PARAMETERS"

```

"          5.000 Time Step"
"          180.000 Max. Storm length"
"          1500.000 Max. Hydrograph"

```

32 STORM Chicago storm"

```

"          1 Chicago storm"
"          743.000 Coefficient A"
"          6.000 Constant B"
"          0.799 Exponent C"
"          0.400 Fraction R"
"          180.000 Duration"
"          1.000 Time step multiplier"
"          Maximum intensity          109.374 mm/hr"
"          Total depth                 34.259 mm"
"          6 002hyd Hydrograph extension used in this file"

```

33 CATCHMENT 101"

```

"          1 Triangular SCS"
"          1 Equal length"
"          1 SCS method"
"          101 To Southwest Wetland A"
"          0.000 % Impervious"
"          2.981 Total Area"
"          200.000 Flow length"
"          3.500 Overland Slope"
"          2.981 Pervious Area"
"          200.000 Pervious length"
"          3.500 Pervious slope"
"          0.000 Impervious Area"
"          200.000 Impervious length"
"          3.500 Impervious slope"
"          0.250 Pervious Manning 'n'"
"          75.000 Pervious SCS Curve No."
"          0.176 Pervious Runoff coefficient"
"          0.100 Pervious Ia/S coefficient"
"          8.467 Pervious Initial abstraction"
"          0.015 Impervious Manning 'n'"
"          98.000 Impervious SCS Curve No."
"          0.000 Impervious Runoff coefficient"
"          0.100 Impervious Ia/S coefficient"
"          0.518 Impervious Initial abstraction"

```

```

"          0.022 0.000 0.000 0.000 c.m/sec"

```

Catchment 101	Pervious	Impervious	Total Area	"
Surface Area	2.981	0.000	2.981	hectare"
Time of concentration	69.388	5.831	69.387	minutes"
Time to Centroid	187.782	96.786	187.782	minutes"
Rainfall depth	34.259	34.259	34.259	mm"
Rainfall volume	1021.25	0.00	1021.25	c.m"
Rainfall losses	28.237	5.140	28.237	mm"
Runoff depth	6.021	29.119	6.021	mm"



"	Runoff volume	179.49	0.00	179.49	c.m"
"	Runoff coefficient	0.176	0.000	0.176	"
"	Maximum flow	0.022	0.000	0.022	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.022 0.022 0.000 0.000"				
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.022 0.022 0.022 0.000"				
" 40	HYDROGRAPH Combine 1"				
"	6 Combine "				
"	1 Node #"				
"	Total Site"				
"	Maximum flow	0.022		c.m/sec"	
"	Hydrograph volume	179.489		c.m"	
"	0.022 0.022 0.022 0.022"				
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.022 0.000 0.022 0.022"				
" 33	CATCHMENT 102"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	1 SCS method"				
"	102 To the South"				
"	0.000 % Impervious"				
"	0.344 Total Area"				
"	100.000 Flow length"				
"	2.000 Overland Slope"				
"	0.344 Pervious Area"				
"	100.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.000 Impervious Area"				
"	100.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	75.000 Pervious SCS Curve No."				
"	0.176 Pervious Runoff coefficient"				
"	0.100 Pervious Ia/S coefficient"				
"	8.467 Pervious Initial abstraction"				
"	0.015 Impervious Manning 'n'"				
"	98.000 Impervious SCS Curve No."				
"	0.000 Impervious Runoff coefficient"				
"	0.100 Impervious Ia/S coefficient"				
"	0.518 Impervious Initial abstraction"				
"	0.003 0.000 0.022 0.022 c.m/sec"				
"	Catchment 102 Pervious Impervious Total Area "				
"	Surface Area 0.344 0.000 0.344 hectare"				
"	Time of concentration 54.147 4.550 54.147 minutes"				
"	Time to Centroid 169.233 94.883 169.232 minutes"				
"	Rainfall depth 34.259 34.259 34.259 mm"				
"	Rainfall volume 117.85 0.00 117.85 c.m"				
"	Rainfall losses 28.238 5.281 28.238 mm"				
"	Runoff depth 6.021 28.978 6.021 mm"				
"	Runoff volume 20.71 0.00 20.71 c.m"				
"	Runoff coefficient 0.176 0.000 0.176 "				
"	Maximum flow 0.003 0.000 0.003 c.m/sec"				
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"	4 Add Runoff "				
"	0.003 0.003 0.022 0.022"				

```

" 40      HYDROGRAPH Copy to Outflow"
"          8 Copy to Outflow"
"              0.003    0.003    0.003    0.022"
" 40      HYDROGRAPH Combine 1"
"          6 Combine "
"          1 Node #"
"              Total Site"
"              Maximum flow                0.025    c.m/sec"
"              Hydrograph volume          200.201    c.m"
"              0.003    0.003    0.003    0.025"
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"              0.003    0.000    0.003    0.025"
" 33      CATCHMENT 103"
"          1 Triangular SCS"
"          1 Equal length"
"          1 SCS method"
"          103 To the north ROW"
"          0.000 % Impervious"
"          0.321 Total Area"
"          50.000 Flow length"
"          1.500 Overland Slope"
"          0.321 Pervious Area"
"          50.000 Pervious length"
"          1.500 Pervious slope"
"          0.000 Impervious Area"
"          50.000 Impervious length"
"          1.500 Impervious slope"
"          0.250 Pervious Manning 'n'"
"          75.000 Pervious SCS Curve No."
"          0.176 Pervious Runoff coefficient"
"          0.100 Pervious Ia/S coefficient"
"          8.467 Pervious Initial abstraction"
"          0.015 Impervious Manning 'n'"
"          98.000 Impervious SCS Curve No."
"          0.000 Impervious Runoff coefficient"
"          0.100 Impervious Ia/S coefficient"
"          0.518 Impervious Initial abstraction"
"              0.004    0.000    0.003    0.025 c.m/sec"
"          Catchment 103      Pervious      Impervious      Total Area "
"          Surface Area      0.321      0.000      0.321      hectare"
"          Time of concentration 38.944      3.273      38.944      minutes"
"          Time to Centroid    150.729     92.946     150.729     minutes"
"          Rainfall depth      34.259     34.259     34.259     mm"
"          Rainfall volume     109.97     0.00      109.97     c.m"
"          Rainfall losses     28.237     5.510     28.237     mm"
"          Runoff depth        6.021     28.748     6.021     mm"
"          Runoff volume       19.33     0.00      19.33     c.m"
"          Runoff coefficient   0.176     0.000     0.176     "
"          Maximum flow       0.004     0.000     0.004     c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4 Add Runoff "
"              0.004    0.004    0.003    0.025"
" 40      HYDROGRAPH Copy to Outflow"
"          8 Copy to Outflow"
"              0.004    0.004    0.004    0.025"
" 40      HYDROGRAPH Combine 1"
"          6 Combine "
"          1 Node #"

```

```

"           Total Site"
"           Maximum flow           0.028   c.m/sec"
"           Hydrograph volume      219.529  c.m"
"           0.004   0.004   0.004   0.028"
" 40 HYDROGRAPH Start - New Tributary"
"           2 Start - New Tributary"
"           0.004   0.000   0.004   0.028"
" 33 CATCHMENT 104"
"           1 Triangular SCS"
"           1 Equal length"
"           1 SCS method"
"           104 To the NW Wetland B"
"           0.000 % Impervious"
"           0.812 Total Area"
"           80.000 Flow length"
"           2.500 Overland Slope"
"           0.812 Pervious Area"
"           80.000 Pervious length"
"           2.500 Pervious slope"
"           0.000 Impervious Area"
"           80.000 Impervious length"
"           2.500 Impervious slope"
"           0.250 Pervious Manning 'n'"
"           75.000 Pervious SCS Curve No."
"           0.176 Pervious Runoff coefficient"
"           0.100 Pervious Ia/S coefficient"
"           8.467 Pervious Initial abstraction"
"           0.015 Impervious Manning 'n'"
"           98.000 Impervious SCS Curve No."
"           0.000 Impervious Runoff coefficient"
"           0.100 Impervious Ia/S coefficient"
"           0.518 Impervious Initial abstraction"
"           0.009   0.000   0.004   0.028 c.m/sec"
"           Catchment 104           Pervious   Impervious Total Area "
"           Surface Area           0.812     0.000     0.812     hectare"
"           Time of concentration  44.295   3.722     44.295   minutes"
"           Time to Centroid       157.240  93.696   157.240  minutes"
"           Rainfall depth         34.259   34.259   34.259   mm"
"           Rainfall volume        278.18   0.00     278.18   c.m"
"           Rainfall losses        28.239   5.618    28.239   mm"
"           Runoff depth           6.020    28.641   6.020    mm"
"           Runoff volume          48.88    0.00     48.88    c.m"
"           Runoff coefficient      0.176    0.000    0.176    "
"           Maximum flow           0.009    0.000    0.009    c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"           4 Add Runoff "
"           0.009   0.009   0.004   0.028"
" 40 HYDROGRAPH Copy to Outflow"
"           8 Copy to Outflow"
"           0.009   0.009   0.009   0.028"
" 40 HYDROGRAPH Combine 1"
"           6 Combine "
"           1 Node #"
"           Total Site"
"           Maximum flow           0.036   c.m/sec"
"           Hydrograph volume      268.408  c.m"
"           0.009   0.009   0.009   0.036"
" 38 START/RE-START TOTALS 104"
"           3 Runoff Totals on EXIT"

```

"	Total Catchment area	4.458	hectare"
"	Total Impervious area	0.000	hectare"
"	Total % impervious	0.000"	
" 19	EXIT"		

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                         Q:\51060\100\Preliminary Design\SWM\
"                                               SWM Memo"
"          Output filename:                    5YR - PRE B.out"
"          Licensee name:                      A"
"          Company                             "
"          Date & Time last used:              9/12/2022 at 9:18:02 AM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          180.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          1593.000 Coefficient A"
"          11.000  Constant B"
"          0.879  Exponent C"
"          0.400  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity                    139.288  mm/hr"
"          Total depth                          47.265  mm"
"          6  005hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 101"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          101  To Southwest Wetland A"
"          0.000  % Impervious"
"          2.981  Total Area"
"          200.000 Flow length"
"          3.500  Overland Slope"
"          2.981  Pervious Area"
"          200.000 Pervious length"
"          3.500  Pervious slope"
"          0.000  Impervious Area"
"          200.000 Impervious length"
"          3.500  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          75.000 Pervious SCS Curve No."
"          0.258  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"
"          8.467  Pervious Initial abstraction"
"          0.015  Impervious Manning 'n'"
"          98.000 Impervious SCS Curve No."
"          0.000  Impervious Runoff coefficient"
"          0.100  Impervious Ia/S coefficient"
"          0.518  Impervious Initial abstraction"

```

	0.064	0.000	0.000	0.000	c.m/sec"
"	Catchment 101		Pervious	Impervious	Total Area "
"	Surface Area	2.981	0.000	2.981	hectare"
"	Time of concentration	50.487	5.226	50.487	minutes"
"	Time to Centroid	160.521	93.566	160.521	minutes"
"	Rainfall depth	47.265	47.265	47.265	mm"
"	Rainfall volume	1408.96	0.00	1408.96	c.m"
"	Rainfall losses	35.078	5.507	35.078	mm"
"	Runoff depth	12.187	41.758	12.187	mm"
"	Runoff volume	363.29	0.00	363.29	c.m"
"	Runoff coefficient	0.258	0.000	0.258	"
"	Maximum flow	0.064	0.000	0.064	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4	Add Runoff "			
"	0.064	0.064	0.000	0.000"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8	Copy to Outflow"			
"	0.064	0.064	0.064	0.000"	
" 40	HYDROGRAPH Combine 1"				
"	6	Combine "			
"	1	Node #"			
"	Total Site"				
"	Maximum flow		0.064		c.m/sec"
"	Hydrograph volume		363.289		c.m"
"	0.064	0.064	0.064	0.064"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"			
"	0.064	0.000	0.064	0.064"	
" 33	CATCHMENT 102"				
"	1	Triangular SCS"			
"	1	Equal length"			
"	1	SCS method"			
"	102	To the South"			
"	0.000	% Impervious"			
"	0.344	Total Area"			
"	100.000	Flow length"			
"	2.000	Overland Slope"			
"	0.344	Pervious Area"			
"	100.000	Pervious length"			
"	2.000	Pervious slope"			
"	0.000	Impervious Area"			
"	100.000	Impervious length"			
"	2.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	75.000	Pervious SCS Curve No."			
"	0.258	Pervious Runoff coefficient"			
"	0.100	Pervious Ia/S coefficient"			
"	8.467	Pervious Initial abstraction"			
"	0.015	Impervious Manning 'n'"			
"	98.000	Impervious SCS Curve No."			

```

"      0.000 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"          0.009      0.000      0.064      0.064 c.m/sec"
"      Catchment 102 Pervious Impervious Total Area "
"      Surface Area      0.344      0.000      0.344      hectare"
"      Time of concentration 39.398      4.078      39.398      minutes"
"      Time to Centroid      146.826      91.941      146.825      minutes"
"      Rainfall depth      47.265      47.265      47.265      mm"
"      Rainfall volume      162.59      0.00      162.59      c.m"
"      Rainfall losses      35.075      5.720      35.075      mm"
"      Runoff depth      12.190      41.545      12.190      mm"
"      Runoff volume      41.93      0.00      41.93      c.m"
"      Runoff coefficient      0.258      0.000      0.258      "
"      Maximum flow      0.009      0.000      0.009      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"          0.009      0.009      0.064      0.064"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"          0.009      0.009      0.009      0.064"
" 40      HYDROGRAPH Combine 1"
"      6      Combine "
"      1      Node #"
"          Total Site"
"          Maximum flow      0.072      c.m/sec"
"          Hydrograph volume      405.221      c.m"
"          0.009      0.009      0.009      0.072"
" 40      HYDROGRAPH Start - New Tributary"
"      2      Start - New Tributary"
"          0.009      0.000      0.009      0.072"
" 33      CATCHMENT 103"
"      1      Triangular SCS"
"      1      Equal length"
"      1      SCS method"
"      103      To the north ROW"
"      0.000      % Impervious"
"      0.321      Total Area"
"      50.000      Flow length"
"      1.500      Overland Slope"
"      0.321      Pervious Area"
"      50.000      Pervious length"
"      1.500      Pervious slope"
"      0.000      Impervious Area"
"      50.000      Impervious length"
"      1.500      Impervious slope"
"      0.250      Pervious Manning 'n'"
"      75.000      Pervious SCS Curve No."
"      0.258      Pervious Runoff coefficient"
"      0.100      Pervious Ia/S coefficient"

```



```

"      8.467 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
" 98.000 Impervious SCS Curve No."
"      0.000 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"          0.010      0.000      0.009      0.072 c.m/sec"
"      Catchment 103      Pervious      Impervious Total Area "
"      Surface Area      0.321      0.000      0.321      hectare"
"      Time of concentration 28.336      2.933      28.336      minutes"
"      Time to Centroid      133.168      90.243      133.168      minutes"
"      Rainfall depth      47.265      47.265      47.265      mm"
"      Rainfall volume      151.72      0.00      151.72      c.m"
"      Rainfall losses      35.083      5.984      35.083      mm"
"      Runoff depth      12.181      41.281      12.181      mm"
"      Runoff volume      39.10      0.00      39.10      c.m"
"      Runoff coefficient      0.258      0.000      0.258      "
"      Maximum flow      0.010      0.000      0.010      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"          0.010      0.010      0.009      0.072"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"          0.010      0.010      0.010      0.072"
" 40      HYDROGRAPH Combine 1"
"      6      Combine "
"      1      Node #"
"          Total Site"
"          Maximum flow      0.080      c.m/sec"
"          Hydrograph volume      444.323      c.m"
"          0.010      0.010      0.010      0.080"
" 40      HYDROGRAPH Start - New Tributary"
"      2      Start - New Tributary"
"          0.010      0.000      0.010      0.080"
" 33      CATCHMENT 104"
"      1      Triangular SCS"
"      1      Equal length"
"      1      SCS method"
"      104      To the NW Wetland B"
"      0.000      % Impervious"
"      0.812      Total Area"
" 80.000      Flow length"
"      2.500      Overland Slope"
"      0.812      Pervious Area"
" 80.000      Pervious length"
"      2.500      Pervious slope"
"      0.000      Impervious Area"
" 80.000      Impervious length"
"      2.500      Impervious slope"
"      0.250      Pervious Manning 'n'"

```

```

"      75.000  Pervious SCS Curve No."
"      0.258  Pervious Runoff coefficient"
"      0.100  Pervious Ia/S coefficient"
"      8.467  Pervious Initial abstraction"
"      0.015  Impervious Manning 'n'"
"     98.000  Impervious SCS Curve No."
"      0.000  Impervious Runoff coefficient"
"      0.100  Impervious Ia/S coefficient"
"      0.518  Impervious Initial abstraction"
"              0.024      0.000      0.010      0.080 c.m/sec"
"      Catchment 104      Pervious      Impervious Total Area "
"      Surface Area      0.812      0.000      0.812      hectare"
"      Time of concentration 32.230      3.336      32.229      minutes"
"      Time to Centroid      137.983      90.888      137.983      minutes"
"      Rainfall depth      47.265      47.265      47.265      mm"
"      Rainfall volume      383.79      0.00      383.79      c.m"
"      Rainfall losses      35.080      5.976      35.080      mm"
"      Runoff depth      12.184      41.288      12.184      mm"
"      Runoff volume      98.94      0.00      98.94      c.m"
"      Runoff coefficient      0.258      0.000      0.258      "
"      Maximum flow      0.024      0.000      0.024      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"              0.024      0.024      0.010      0.080"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"              0.024      0.024      0.024      0.080"
" 40      HYDROGRAPH Combine 1"
"      6      Combine "
"      1      Node #"
"      Total Site"
"      Maximum flow      0.102      c.m/sec"
"      Hydrograph volume      543.261      c.m"
"              0.024      0.024      0.024      0.102"
" 38      START/RE-START TOTALS 104"
"      3      Runoff Totals on EXIT"
"      Total Catchment area      4.458      hectare"
"      Total Impervious area      0.000      hectare"
"      Total % impervious      0.000"
" 19      EXIT"

```

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        Q:\51060\100\Preliminary Design\SWM\
"                                           SWM Memo"
"          Output filename:                    10YR - PRE B.out"
"          Licensee name:                      A"
"          Company                            "
"          Date & Time last used:              9/12/2022 at 9:18:53 AM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          180.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          2221.000 Coefficient A"
"          12.000  Constant B"
"          0.908  Exponent C"
"          0.400  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          169.551  mm/hr"
"          Total depth                56.290  mm"
"          6  010hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 101"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          101  To Southwest Wetland A"
"          0.000  % Impervious"
"          2.981  Total Area"
"          200.000 Flow length"
"          3.500  Overland Slope"
"          2.981  Pervious Area"
"          200.000 Pervious length"
"          3.500  Pervious slope"
"          0.000  Impervious Area"
"          200.000 Impervious length"
"          3.500  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          75.000 Pervious SCS Curve No."
"          0.307  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"
"          8.467  Pervious Initial abstraction"
"          0.015  Impervious Manning 'n'"
"          98.000 Impervious SCS Curve No."
"          0.000  Impervious Runoff coefficient"
"          0.100  Impervious Ia/S coefficient"
"          0.518  Impervious Initial abstraction"

```

	0.107	0.000	0.000	0.000	c.m/sec"
"	Catchment 101	Pervious	Impervious	Total Area	"
"	Surface Area	2.981	0.000	2.981	hectare"
"	Time of concentration	42.571	4.808	42.571	minutes"
"	Time to Centroid	149.285	91.994	149.285	minutes"
"	Rainfall depth	56.290	56.290	56.290	mm"
"	Rainfall volume	1678.01	0.00	1678.01	c.m"
"	Rainfall losses	39.034	5.712	39.034	mm"
"	Runoff depth	17.256	50.579	17.256	mm"
"	Runoff volume	514.40	0.00	514.41	c.m"
"	Runoff coefficient	0.307	0.000	0.307	"
"	Maximum flow	0.107	0.000	0.107	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4	Add Runoff "			
"	0.107	0.107	0.000	0.000"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8	Copy to Outflow"			
"	0.107	0.107	0.107	0.000"	
" 40	HYDROGRAPH Combine 1"				
"	6	Combine "			
"	1	Node #"			
"	Total Site"				
"	Maximum flow		0.107		c.m/sec"
"	Hydrograph volume		514.405		c.m"
"	0.107	0.107	0.107	0.107"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"			
"	0.107	0.000	0.107	0.107"	
" 33	CATCHMENT 102"				
"	1	Triangular SCS"			
"	1	Equal length"			
"	1	SCS method"			
"	102	To the South"			
"	0.000	% Impervious"			
"	0.344	Total Area"			
"	100.000	Flow length"			
"	2.000	Overland Slope"			
"	0.344	Pervious Area"			
"	100.000	Pervious length"			
"	2.000	Pervious slope"			
"	0.000	Impervious Area"			
"	100.000	Impervious length"			
"	2.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	75.000	Pervious SCS Curve No."			
"	0.307	Pervious Runoff coefficient"			
"	0.100	Pervious Ia/S coefficient"			
"	8.467	Pervious Initial abstraction"			
"	0.015	Impervious Manning 'n'"			
"	98.000	Impervious SCS Curve No."			

```

"      0.000  Impervious Runoff coefficient"
"      0.100  Impervious Ia/S coefficient"
"      0.518  Impervious Initial abstraction"
"          0.015      0.000      0.107      0.107 c.m/sec"
"      Catchment 102      Pervious  Impervious  Total Area  "
"      Surface Area      0.344      0.000      0.344      hectare"
"      Time of concentration  33.220      3.752      33.220      minutes"
"      Time to Centroid      137.540      90.510      137.540      minutes"
"      Rainfall depth      56.290      56.290      56.290      mm"
"      Rainfall volume      193.64      0.00      193.64      c.m"
"      Rainfall losses      39.032      6.201      39.032      mm"
"      Runoff depth      17.258      50.089      17.258      mm"
"      Runoff volume      59.37      0.00      59.37      c.m"
"      Runoff coefficient      0.307      0.000      0.307      "
"      Maximum flow      0.015      0.000      0.015      c.m/sec"
" 40      HYDROGRAPH Add Runoff  "
"      4  Add Runoff  "
"          0.015      0.015      0.107      0.107"
" 40      HYDROGRAPH Copy to Outflow"
"      8  Copy to Outflow"
"          0.015      0.015      0.015      0.107"
" 40      HYDROGRAPH Combine  1"
"      6  Combine  "
"      1  Node #"
"      Total Site"
"      Maximum flow      0.121      c.m/sec"
"      Hydrograph volume      573.773      c.m"
"          0.015      0.015      0.015      0.121"
" 40      HYDROGRAPH Start - New Tributary"
"      2  Start - New Tributary"
"          0.015      0.000      0.015      0.121"
" 33      CATCHMENT 103"
"      1  Triangular SCS"
"      1  Equal length"
"      1  SCS method"
"      103  To the north ROW"
"      0.000  % Impervious"
"      0.321  Total Area"
"      50.000  Flow length"
"      1.500  Overland Slope"
"      0.321  Pervious Area"
"      50.000  Pervious length"
"      1.500  Pervious slope"
"      0.000  Impervious Area"
"      50.000  Impervious length"
"      1.500  Impervious slope"
"      0.250  Pervious Manning 'n'"
"      75.000  Pervious SCS Curve No."
"      0.307  Pervious Runoff coefficient"
"      0.100  Pervious Ia/S coefficient"

```

```

"      8.467 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
" 98.000 Impervious SCS Curve No."
"      0.000 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"          0.017      0.000      0.015      0.121 c.m/sec"
"      Catchment 103      Pervious      Impervious Total Area "
"      Surface Area      0.321      0.000      0.321      hectare"
"      Time of concentration 23.893      2.698      23.893      minutes"
"      Time to Centroid      125.809      88.912      125.809      minutes"
"      Rainfall depth      56.290      56.290      56.290      mm"
"      Rainfall volume      180.69      0.00      180.69      c.m"
"      Rainfall losses      39.036      6.338      39.036      mm"
"      Runoff depth      17.254      49.953      17.254      mm"
"      Runoff volume      55.39      0.00      55.39      c.m"
"      Runoff coefficient      0.307      0.000      0.307      "
"      Maximum flow      0.017      0.000      0.017      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"          0.017      0.017      0.015      0.121"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"          0.017      0.017      0.017      0.121"
" 40      HYDROGRAPH Combine 1"
"      6      Combine "
"      1      Node #"
"          Total Site"
"          Maximum flow      0.134      c.m/sec"
"          Hydrograph volume      629.160      c.m"
"          0.017      0.017      0.017      0.134"
" 40      HYDROGRAPH Start - New Tributary"
"      2      Start - New Tributary"
"          0.017      0.000      0.017      0.134"
" 33      CATCHMENT 104"
"      1      Triangular SCS"
"      1      Equal length"
"      1      SCS method"
"      104      To the NW Wetland B"
"      0.000      % Impervious"
"      0.812      Total Area"
" 80.000      Flow length"
"      2.500      Overland Slope"
"      0.812      Pervious Area"
" 80.000      Pervious length"
"      2.500      Pervious slope"
"      0.000      Impervious Area"
" 80.000      Impervious length"
"      2.500      Impervious slope"
"      0.250      Pervious Manning 'n'"

```

```

"      75.000  Pervious SCS Curve No."
"      0.307  Pervious Runoff coefficient"
"      0.100  Pervious Ia/S coefficient"
"      8.467  Pervious Initial abstraction"
"      0.015  Impervious Manning 'n'"
"     98.000  Impervious SCS Curve No."
"      0.000  Impervious Runoff coefficient"
"      0.100  Impervious Ia/S coefficient"
"      0.518  Impervious Initial abstraction"
"           0.040    0.000    0.017    0.134 c.m/sec"
"      Catchment 104      Pervious  Impervious Total Area "
"      Surface Area      0.812    0.000    0.812    hectare"
"      Time of concentration 27.176    3.069    27.176    minutes"
"      Time to Centroid    129.929    89.471    129.929    minutes"
"      Rainfall depth      56.290    56.290    56.290    mm"
"      Rainfall volume     457.08    0.00    457.08    c.m"
"      Rainfall losses     39.031    6.208    39.031    mm"
"      Runoff depth        17.259    50.082    17.259    mm"
"      Runoff volume       140.15    0.00    140.15    c.m"
"      Runoff coefficient   0.307    0.000    0.307    "
"      Maximum flow        0.040    0.000    0.040    c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4  Add Runoff "
"           0.040    0.040    0.017    0.134"
" 40      HYDROGRAPH Copy to Outflow"
"      8  Copy to Outflow"
"           0.040    0.040    0.040    0.134"
" 40      HYDROGRAPH  Combine  1"
"      6  Combine "
"      1  Node #"
"      Total Site"
"      Maximum flow                0.171    c.m/sec"
"      Hydrograph volume            769.306    c.m"
"           0.040    0.040    0.040    0.171"
" 38      START/RE-START TOTALS 104"
"      3  Runoff Totals on EXIT"
"      Total Catchment area                4.458    hectare"
"      Total Impervious area                0.000    hectare"
"      Total % impervious                0.000"
" 19      EXIT"

```



```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                         Q:\51060\100\Preliminary Design\SWM\
"                                               SWM Memo"
"          Output filename:                    25YR - PRE B.out"
"          Licensee name:                      A"
"          Company                             "
"          Date & Time last used:              9/12/2022 at 9:19:46 AM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          180.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          3158.000 Coefficient A"
"          15.000  Constant B"
"          0.936  Exponent C"
"          0.400  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          191.557  mm/hr"
"          Total depth                68.266  mm"
"          6  025hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 101"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          101  To Southwest Wetland A"
"          0.000  % Impervious"
"          2.981  Total Area"
"          200.000 Flow length"
"          3.500  Overland Slope"
"          2.981  Pervious Area"
"          200.000 Pervious length"
"          3.500  Pervious slope"
"          0.000  Impervious Area"
"          200.000 Impervious length"
"          3.500  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          75.000 Pervious SCS Curve No."
"          0.362  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"
"          8.467  Pervious Initial abstraction"
"          0.015  Impervious Manning 'n'"
"          98.000 Impervious SCS Curve No."
"          0.000  Impervious Runoff coefficient"
"          0.100  Impervious Ia/S coefficient"
"          0.518  Impervious Initial abstraction"

```

"		0.174	0.000	0.000	0.000 c.m/sec"
"	Catchment 101		Pervious	Impervious	Total Area "
"	Surface Area	2.981	0.000	2.981	hectare"
"	Time of concentration	37.271	4.560	37.271	minutes"
"	Time to Centroid	141.084	91.030	141.084	minutes"
"	Rainfall depth	68.266	68.266	68.266	mm"
"	Rainfall volume	2035.01	0.00	2035.02	c.m"
"	Rainfall losses	43.524	5.797	43.524	mm"
"	Runoff depth	24.742	62.470	24.742	mm"
"	Runoff volume	737.55	0.00	737.56	c.m"
"	Runoff coefficient	0.362	0.000	0.362	"
"	Maximum flow	0.174	0.000	0.174	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4	Add Runoff "			
"		0.174	0.174	0.000	0.000"
" 40	HYDROGRAPH Copy to Outflow"				
"	8	Copy to Outflow"			
"		0.174	0.174	0.174	0.000"
" 40	HYDROGRAPH Combine 1"				
"	6	Combine "			
"	1	Node #"			
"		Total Site"			
"			0.174		c.m/sec"
"			737.555		c.m"
"		0.174	0.174	0.174	0.174"
" 40	HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"			
"		0.174	0.000	0.174	0.174"
" 33	CATCHMENT 102"				
"	1	Triangular SCS"			
"	1	Equal length"			
"	1	SCS method"			
"	102	To the South"			
"	0.000	% Impervious"			
"	0.344	Total Area"			
"	100.000	Flow length"			
"	2.000	Overland Slope"			
"	0.344	Pervious Area"			
"	100.000	Pervious length"			
"	2.000	Pervious slope"			
"	0.000	Impervious Area"			
"	100.000	Impervious length"			
"	2.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	75.000	Pervious SCS Curve No."			
"	0.362	Pervious Runoff coefficient"			
"	0.100	Pervious Ia/S coefficient"			
"	8.467	Pervious Initial abstraction"			
"	0.015	Impervious Manning 'n'"			
"	98.000	Impervious SCS Curve No."			

```

"      0.000  Impervious Runoff coefficient"
"      0.100  Impervious Ia/S coefficient"
"      0.518  Impervious Initial abstraction"
"          0.024      0.000      0.174      0.174 c.m/sec"
"      Catchment 102      Pervious  Impervious  Total Area  "
"      Surface Area      0.344      0.000      0.344      hectare"
"      Time of concentration  29.085      3.559      29.085      minutes"
"      Time to Centroid      130.864      89.678      130.863      minutes"
"      Rainfall depth      68.266      68.266      68.266      mm"
"      Rainfall volume      234.84      0.00      234.84      c.m"
"      Rainfall losses      43.536      6.654      43.536      mm"
"      Runoff depth      24.730      61.613      24.730      mm"
"      Runoff volume      85.07      0.00      85.07      c.m"
"      Runoff coefficient      0.362      0.000      0.362      "
"      Maximum flow      0.024      0.000      0.024      c.m/sec"
" 40      HYDROGRAPH Add Runoff  "
"      4  Add Runoff  "
"          0.024      0.024      0.174      0.174"
" 40      HYDROGRAPH Copy to Outflow"
"      8  Copy to Outflow"
"          0.024      0.024      0.024      0.174"
" 40      HYDROGRAPH Combine  1"
"      6  Combine  "
"      1  Node #"
"      Total Site"
"      Maximum flow      0.197      c.m/sec"
"      Hydrograph volume      822.626      c.m"
"          0.024      0.024      0.024      0.197"
" 40      HYDROGRAPH Start - New Tributary"
"      2  Start - New Tributary"
"          0.024      0.000      0.024      0.197"
" 33      CATCHMENT 103"
"      1  Triangular SCS"
"      1  Equal length"
"      1  SCS method"
"      103  To the north ROW"
"      0.000  % Impervious"
"      0.321  Total Area"
"      50.000  Flow length"
"      1.500  Overland Slope"
"      0.321  Pervious Area"
"      50.000  Pervious length"
"      1.500  Pervious slope"
"      0.000  Impervious Area"
"      50.000  Impervious length"
"      1.500  Impervious slope"
"      0.250  Pervious Manning 'n'"
"      75.000  Pervious SCS Curve No."
"      0.362  Pervious Runoff coefficient"
"      0.100  Pervious Ia/S coefficient"

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"      8.467 Pervious Initial abstraction"
"      0.015 Impervious Manning 'n'"
" 98.000 Impervious SCS Curve No."
"      0.000 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"          0.028      0.000      0.024      0.197 c.m/sec"
"      Catchment 103      Pervious      Impervious Total Area "
"      Surface Area      0.321      0.000      0.321      hectare"
"      Time of concentration 20.918      2.559      20.918      minutes"
"      Time to Centroid      120.675      88.180      120.675      minutes"
"      Rainfall depth      68.266      68.266      68.266      mm"
"      Rainfall volume      219.13      0.00      219.13      c.m"
"      Rainfall losses      43.527      6.542      43.527      mm"
"      Runoff depth      24.740      61.724      24.740      mm"
"      Runoff volume      79.41      0.00      79.41      c.m"
"      Runoff coefficient      0.362      0.000      0.362      "
"      Maximum flow      0.028      0.000      0.028      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"          0.028      0.028      0.024      0.197"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"          0.028      0.028      0.028      0.197"
" 40      HYDROGRAPH Combine 1"
"      6      Combine "
"      1      Node #"
"          Total Site"
"          Maximum flow      0.219      c.m/sec"
"          Hydrograph volume      902.040      c.m"
"          0.028      0.028      0.028      0.219"
" 40      HYDROGRAPH Start - New Tributary"
"      2      Start - New Tributary"
"          0.028      0.000      0.028      0.219"
" 33      CATCHMENT 104"
"      1      Triangular SCS"
"      1      Equal length"
"      1      SCS method"
"      104      To the NW Wetland B"
"      0.000      % Impervious"
"      0.812      Total Area"
" 80.000      Flow length"
"      2.500      Overland Slope"
"      0.812      Pervious Area"
" 80.000      Pervious length"
"      2.500      Pervious slope"
"      0.000      Impervious Area"
" 80.000      Impervious length"
"      2.500      Impervious slope"
"      0.250      Pervious Manning 'n'"

```

```

"      75.000  Pervious SCS Curve No."
"      0.362  Pervious Runoff coefficient"
"      0.100  Pervious Ia/S coefficient"
"      8.467  Pervious Initial abstraction"
"      0.015  Impervious Manning 'n'"
"     98.000  Impervious SCS Curve No."
"      0.000  Impervious Runoff coefficient"
"      0.100  Impervious Ia/S coefficient"
"      0.518  Impervious Initial abstraction"
"              0.064      0.000      0.028      0.219 c.m/sec"
"      Catchment 104      Pervious      Impervious Total Area "
"      Surface Area      0.812      0.000      0.812      hectare"
"      Time of concentration 23.793      2.911      23.793      minutes"
"      Time to Centroid      124.266      88.716      124.266      minutes"
"      Rainfall depth      68.266      68.266      68.266      mm"
"      Rainfall volume      554.32      0.00      554.32      c.m"
"      Rainfall losses      43.527      6.771      43.527      mm"
"      Runoff depth      24.739      61.496      24.739      mm"
"      Runoff volume      200.88      0.00      200.88      c.m"
"      Runoff coefficient      0.362      0.000      0.362      "
"      Maximum flow      0.064      0.000      0.064      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"              0.064      0.064      0.028      0.219"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"              0.064      0.064      0.064      0.219"
" 40      HYDROGRAPH Combine 1"
"      6      Combine "
"      1      Node #"
"      Total Site"
"      Maximum flow      0.277      c.m/sec"
"      Hydrograph volume      1102.920      c.m"
"              0.064      0.064      0.064      0.277"
" 38      START/RE-START TOTALS 104"
"      3      Runoff Totals on EXIT"
"      Total Catchment area      4.458      hectare"
"      Total Impervious area      0.000      hectare"
"      Total % impervious      0.000"
" 19      EXIT"

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"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                         Q:\51060\100\Preliminary Design\SWM\
"                                               SWM Memo"
"          Output filename:                    50YR - PRE B.out"
"          Licensee name:                      A"
"          Company                             "
"          Date & Time last used:              9/12/2022 at 9:20:34 AM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          180.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          3886.000 Coefficient A"
"          16.000  Constant B"
"          0.950  Exponent C"
"          0.400  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          215.802  mm/hr"
"          Total depth                77.647  mm"
"          6  050hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 101"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          101  To Southwest Wetland A"
"          0.000  % Impervious"
"          2.981  Total Area"
"          200.000 Flow length"
"          3.500  Overland Slope"
"          2.981  Pervious Area"
"          200.000 Pervious length"
"          3.500  Pervious slope"
"          0.000  Impervious Area"
"          200.000 Impervious length"
"          3.500  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          75.000 Pervious SCS Curve No."
"          0.400  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"
"          8.467  Pervious Initial abstraction"
"          0.015  Impervious Manning 'n'"
"          98.000 Impervious SCS Curve No."
"          0.000  Impervious Runoff coefficient"
"          0.100  Impervious Ia/S coefficient"
"          0.518  Impervious Initial abstraction"

```

"		0.237	0.000	0.000	0.000 c.m/sec"
"	Catchment 101		Pervious	Impervious	Total Area "
"	Surface Area	2.981	0.000	2.981	hectare"
"	Time of concentration	33.817	4.339	33.816	minutes"
"	Time to Centroid	135.954	90.329	135.954	minutes"
"	Rainfall depth	77.647	77.647	77.647	mm"
"	Rainfall volume	2314.67	0.00	2314.67	c.m"
"	Rainfall losses	46.553	6.059	46.553	mm"
"	Runoff depth	31.094	71.588	31.094	mm"
"	Runoff volume	926.91	0.00	926.91	c.m"
"	Runoff coefficient	0.400	0.000	0.400	"
"	Maximum flow	0.237	0.000	0.237	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.237	0.237	0.000	0.000"
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"		0.237	0.237	0.237	0.000"
" 40	HYDROGRAPH Combine 1"				
"	6 Combine "				
"	1 Node #"				
"	Total Site"				
"	Maximum flow		0.237		c.m/sec"
"	Hydrograph volume		926.913		c.m"
"		0.237	0.237	0.237	0.237"
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"		0.237	0.000	0.237	0.237"
" 33	CATCHMENT 102"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	1 SCS method"				
"	102 To the South"				
"	0.000 % Impervious"				
"	0.344 Total Area"				
"	100.000 Flow length"				
"	2.000 Overland Slope"				
"	0.344 Pervious Area"				
"	100.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.000 Impervious Area"				
"	100.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	75.000 Pervious SCS Curve No."				
"	0.400 Pervious Runoff coefficient"				
"	0.100 Pervious Ia/S coefficient"				
"	8.467 Pervious Initial abstraction"				
"	0.015 Impervious Manning 'n'"				
"	98.000 Impervious SCS Curve No."				



```

"      0.000  Impervious Runoff coefficient"
"      0.100  Impervious Ia/S coefficient"
"      0.518  Impervious Initial abstraction"
"          0.032      0.000      0.237      0.237 c.m/sec"
"      Catchment 102      Pervious  Impervious  Total Area  "
"      Surface Area      0.344      0.000      0.344      hectare"
"      Time of concentration  26.389      3.386      26.389      minutes"
"      Time to Centroid      126.646      89.011      126.646      minutes"
"      Rainfall depth      77.647      77.647      77.647      mm"
"      Rainfall volume      267.11      0.00      267.11      c.m"
"      Rainfall losses      46.561      6.769      46.561      mm"
"      Runoff depth      31.086      70.878      31.086      mm"
"      Runoff volume      106.94      0.00      106.94      c.m"
"      Runoff coefficient      0.400      0.000      0.400      "
"      Maximum flow      0.032      0.000      0.032      c.m/sec"
" 40      HYDROGRAPH Add Runoff  "
"      4  Add Runoff  "
"          0.032      0.032      0.237      0.237"
" 40      HYDROGRAPH Copy to Outflow"
"      8  Copy to Outflow"
"          0.032      0.032      0.032      0.237"
" 40      HYDROGRAPH  Combine  1"
"      6  Combine  "
"      1  Node #"
"          Total Site"
"          Maximum flow      0.267      c.m/sec"
"          Hydrograph volume      1033.849      c.m"
"          0.032      0.032      0.032      0.267"
" 40      HYDROGRAPH Start - New Tributary"
"      2  Start - New Tributary"
"          0.032      0.000      0.032      0.267"
" 33      CATCHMENT 103"
"      1  Triangular SCS"
"      1  Equal length"
"      1  SCS method"
"      103  To the north ROW"
"      0.000  % Impervious"
"      0.321  Total Area"
"      50.000  Flow length"
"      1.500  Overland Slope"
"      0.321  Pervious Area"
"      50.000  Pervious length"
"      1.500  Pervious slope"
"      0.000  Impervious Area"
"      50.000  Impervious length"
"      1.500  Impervious slope"
"      0.250  Pervious Manning 'n'"
"      75.000  Pervious SCS Curve No."
"      0.400  Pervious Runoff coefficient"
"      0.100  Pervious Ia/S coefficient"

```

"	8.467	Pervious Initial abstraction"				
"	0.015	Impervious Manning 'n'"				
"	98.000	Impervious SCS Curve No."				
"	0.000	Impervious Runoff coefficient"				
"	0.100	Impervious Ia/S coefficient"				
"	0.518	Impervious Initial abstraction"				
"		0.037	0.000	0.032	0.267 c.m/sec"	
"		Catchment 103	Pervious	Impervious	Total Area	"
"		Surface Area	0.321	0.000	0.321	hectare"
"		Time of concentration	18.980	2.435	18.980	minutes"
"		Time to Centroid	117.376	87.587	117.376	minutes"
"		Rainfall depth	77.647	77.647	77.647	mm"
"		Rainfall volume	249.25	0.00	249.25	c.m"
"		Rainfall losses	46.596	6.665	46.596	mm"
"		Runoff depth	31.052	70.982	31.052	mm"
"		Runoff volume	99.68	0.00	99.68	c.m"
"		Runoff coefficient	0.400	0.000	0.400	"
"		Maximum flow	0.037	0.000	0.037	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.037	0.037	0.032	0.267"	
" 40		HYDROGRAPH Copy to Outflow"				
"	8	Copy to Outflow"				
"		0.037	0.037	0.037	0.267"	
" 40		HYDROGRAPH Combine 1"				
"	6	Combine "				
"	1	Node #"				
"		Total Site"				
"		Maximum flow		0.295	c.m/sec"	
"		Hydrograph volume		1133.525	c.m"	
"		0.037	0.037	0.037	0.295"	
" 40		HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"				
"		0.037	0.000	0.037	0.295"	
" 33		CATCHMENT 104"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	1	SCS method"				
"	104	To the NW Wetland B"				
"	0.000	% Impervious"				
"	0.812	Total Area"				
"	80.000	Flow length"				
"	2.500	Overland Slope"				
"	0.812	Pervious Area"				
"	80.000	Pervious length"				
"	2.500	Pervious slope"				
"	0.000	Impervious Area"				
"	80.000	Impervious length"				
"	2.500	Impervious slope"				
"	0.250	Pervious Manning 'n'"				

```

"      75.000  Pervious SCS Curve No."
"      0.400  Pervious Runoff coefficient"
"      0.100  Pervious Ia/S coefficient"
"      8.467  Pervious Initial abstraction"
"      0.015  Impervious Manning 'n'"
"     98.000  Impervious SCS Curve No."
"      0.000  Impervious Runoff coefficient"
"      0.100  Impervious Ia/S coefficient"
"      0.518  Impervious Initial abstraction"
"              0.089      0.000      0.037      0.295 c.m/sec"
"      Catchment 104      Pervious      Impervious Total Area "
"      Surface Area      0.812      0.000      0.812      hectare"
"      Time of concentration  21.588      2.770      21.588      minutes"
"      Time to Centroid      120.642      88.113      120.642      minutes"
"      Rainfall depth      77.647      77.647      77.647      mm"
"      Rainfall volume      630.50      0.00      630.50      c.m"
"      Rainfall losses      46.564      6.995      46.564      mm"
"      Runoff depth      31.083      70.652      31.083      mm"
"      Runoff volume      252.39      0.00      252.40      c.m"
"      Runoff coefficient      0.400      0.000      0.400      "
"      Maximum flow      0.089      0.000      0.089      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"              0.089      0.089      0.037      0.295"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"              0.089      0.089      0.089      0.295"
" 40      HYDROGRAPH Combine 1"
"      6      Combine "
"      1      Node #"
"      Total Site"
"      Maximum flow      0.377      c.m/sec"
"      Hydrograph volume      1385.919      c.m"
"              0.089      0.089      0.089      0.377"
" 38      START/RE-START TOTALS 104"
"      3      Runoff Totals on EXIT"
"      Total Catchment area      4.458      hectare"
"      Total Impervious area      0.000      hectare"
"      Total % impervious      0.000"
" 19      EXIT"

```

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                         Q:\51060\100\Preliminary Design\SWM\
"                                               SWM Memo"
"          Output filename:                    100YR - PRE B.out"
"          Licensee name:                      A"
"          Company                             "
"          Date & Time last used:              9/12/2022 at 9:21:23 AM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          180.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          4688.000 Coefficient A"
"          17.000  Constant B"
"          0.962  Exponent C"
"          0.400  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          239.354  mm/hr"
"          Total depth                 87.079  mm"
"          6  100hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 101"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          101  To Southwest Wetland A"
"          0.000  % Impervious"
"          2.981  Total Area"
"          200.000 Flow length"
"          3.500  Overland Slope"
"          2.981  Pervious Area"
"          200.000 Pervious length"
"          3.500  Pervious slope"
"          0.000  Impervious Area"
"          200.000 Impervious length"
"          3.500  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          75.000 Pervious SCS Curve No."
"          0.434  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"
"          8.467  Pervious Initial abstraction"
"          0.015  Impervious Manning 'n'"
"          98.000 Impervious SCS Curve No."
"          0.000  Impervious Runoff coefficient"
"          0.100  Impervious Ia/S coefficient"
"          0.518  Impervious Initial abstraction"

```

"		0.308	0.000	0.000	0.000 c.m/sec"
"	Catchment 101		Pervious	Impervious	Total Area "
"	Surface Area	2.981	0.000	2.981	hectare"
"	Time of concentration	31.173	4.157	31.173	minutes"
"	Time to Centroid	131.911	89.743	131.911	minutes"
"	Rainfall depth	87.079	87.079	87.079	mm"
"	Rainfall volume	2595.83	0.00	2595.83	c.m"
"	Rainfall losses	49.263	6.252	49.263	mm"
"	Runoff depth	37.816	80.827	37.816	mm"
"	Runoff volume	1127.29	0.00	1127.29	c.m"
"	Runoff coefficient	0.434	0.000	0.434	"
"	Maximum flow	0.308	0.000	0.308	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4	Add Runoff "			
"		0.308	0.308	0.000	0.000"
" 40	HYDROGRAPH Copy to Outflow"				
"	8	Copy to Outflow"			
"		0.308	0.308	0.308	0.000"
" 40	HYDROGRAPH Combine 1"				
"	6	Combine "			
"	1	Node #"			
"		Total Site"			
"			0.308		c.m/sec"
"			1127.289		c.m"
"		0.308	0.308	0.308	0.308"
" 40	HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"			
"		0.308	0.000	0.308	0.308"
" 33	CATCHMENT 102"				
"	1	Triangular SCS"			
"	1	Equal length"			
"	1	SCS method"			
"	102	To the South"			
"	0.000	% Impervious"			
"	0.344	Total Area"			
"	100.000	Flow length"			
"	2.000	Overland Slope"			
"	0.344	Pervious Area"			
"	100.000	Pervious length"			
"	2.000	Pervious slope"			
"	0.000	Impervious Area"			
"	100.000	Impervious length"			
"	2.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	75.000	Pervious SCS Curve No."			
"	0.434	Pervious Runoff coefficient"			
"	0.100	Pervious Ia/S coefficient"			
"	8.467	Pervious Initial abstraction"			
"	0.015	Impervious Manning 'n'"			
"	98.000	Impervious SCS Curve No."			



```

"      0.000  Impervious Runoff coefficient"
"      0.100  Impervious Ia/S coefficient"
"      0.518  Impervious Initial abstraction"
"          0.042      0.000      0.308      0.308 c.m/sec"
"      Catchment 102      Pervious  Impervious  Total Area  "
"      Surface Area      0.344      0.000      0.344      hectare"
"      Time of concentration  24.326      3.244      24.326      minutes"
"      Time to Centroid      123.333      88.462      123.333      minutes"
"      Rainfall depth      87.079      87.079      87.079      mm"
"      Rainfall volume      299.55      0.00      299.55      c.m"
"      Rainfall losses      49.244      7.030      49.244      mm"
"      Runoff depth      37.835      80.049      37.835      mm"
"      Runoff volume      130.15      0.00      130.15      c.m"
"      Runoff coefficient      0.434      0.000      0.434      "
"      Maximum flow      0.042      0.000      0.042      c.m/sec"
" 40      HYDROGRAPH Add Runoff  "
"      4  Add Runoff  "
"          0.042      0.042      0.308      0.308"
" 40      HYDROGRAPH Copy to Outflow"
"      8  Copy to Outflow"
"          0.042      0.042      0.042      0.308"
" 40      HYDROGRAPH Combine  1"
"      6  Combine  "
"      1  Node #"
"      Total Site"
"      Maximum flow      0.349      c.m/sec"
"      Hydrograph volume      1257.443      c.m"
"          0.042      0.042      0.042      0.349"
" 40      HYDROGRAPH Start - New Tributary"
"      2  Start - New Tributary"
"          0.042      0.000      0.042      0.349"
" 33      CATCHMENT 103"
"      1  Triangular SCS"
"      1  Equal length"
"      1  SCS method"
"      103  To the north ROW"
"      0.000  % Impervious"
"      0.321  Total Area"
"      50.000  Flow length"
"      1.500  Overland Slope"
"      0.321  Pervious Area"
"      50.000  Pervious length"
"      1.500  Pervious slope"
"      0.000  Impervious Area"
"      50.000  Impervious length"
"      1.500  Impervious slope"
"      0.250  Pervious Manning 'n'"
"      75.000  Pervious SCS Curve No."
"      0.434  Pervious Runoff coefficient"
"      0.100  Pervious Ia/S coefficient"

```

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"      8.467  Pervious Initial abstraction"
"      0.015  Impervious Manning 'n'"
"  98.000  Impervious SCS Curve No."
"      0.000  Impervious Runoff coefficient"
"      0.100  Impervious Ia/S coefficient"
"      0.518  Impervious Initial abstraction"
"          0.048      0.000      0.042      0.349 c.m/sec"
"      Catchment 103      Pervious      Impervious Total Area "
"      Surface Area      0.321      0.000      0.321      hectare"
"      Time of concentration 17.496      2.333      17.496      minutes"
"      Time to Centroid      114.753      87.102      114.753      minutes"
"      Rainfall depth      87.079      87.079      87.079      mm"
"      Rainfall volume      279.52      0.00      279.52      c.m"
"      Rainfall losses      49.274      6.793      49.274      mm"
"      Runoff depth      37.805      80.287      37.805      mm"
"      Runoff volume      121.35      0.00      121.35      c.m"
"      Runoff coefficient      0.434      0.000      0.434      "
"      Maximum flow      0.048      0.000      0.048      c.m/sec"
"  40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"          0.048      0.048      0.042      0.349"
"  40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"          0.048      0.048      0.048      0.349"
"  40      HYDROGRAPH Combine 1"
"      6      Combine "
"      1      Node #"
"          Total Site"
"          Maximum flow      0.389      c.m/sec"
"          Hydrograph volume      1378.798      c.m"
"          0.048      0.048      0.048      0.389"
"  40      HYDROGRAPH Start - New Tributary"
"      2      Start - New Tributary"
"          0.048      0.000      0.048      0.389"
"  33      CATCHMENT 104"
"      1      Triangular SCS"
"      1      Equal length"
"      1      SCS method"
"      104      To the NW Wetland B"
"      0.000      % Impervious"
"      0.812      Total Area"
"  80.000      Flow length"
"      2.500      Overland Slope"
"      0.812      Pervious Area"
"  80.000      Pervious length"
"      2.500      Pervious slope"
"      0.000      Impervious Area"
"  80.000      Impervious length"
"      2.500      Impervious slope"
"      0.250      Pervious Manning 'n'"

```

```

"      75.000  Pervious SCS Curve No."
"      0.434  Pervious Runoff coefficient"
"      0.100  Pervious Ia/S coefficient"
"      8.467  Pervious Initial abstraction"
"      0.015  Impervious Manning 'n'"
"     98.000  Impervious SCS Curve No."
"      0.000  Impervious Runoff coefficient"
"      0.100  Impervious Ia/S coefficient"
"      0.518  Impervious Initial abstraction"
"           0.112      0.000      0.048      0.389 c.m/sec"
"      Catchment 104      Pervious      Impervious Total Area "
"      Surface Area      0.812      0.000      0.812      hectare"
"      Time of concentration 19.900      2.654      19.900      minutes"
"      Time to Centroid      117.773      87.596      117.773      minutes"
"      Rainfall depth      87.079      87.079      87.079      mm"
"      Rainfall volume      707.08      0.00      707.08      c.m"
"      Rainfall losses      49.297      7.107      49.297      mm"
"      Runoff depth      37.782      79.972      37.782      mm"
"      Runoff volume      306.79      0.00      306.79      c.m"
"      Runoff coefficient      0.434      0.000      0.434      "
"      Maximum flow      0.112      0.000      0.112      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"           0.112      0.112      0.048      0.389"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"           0.112      0.112      0.112      0.389"
" 40      HYDROGRAPH Combine 1"
"      6      Combine "
"      1      Node #"
"      Total Site"
"      Maximum flow      0.491      c.m/sec"
"      Hydrograph volume      1685.582      c.m"
"           0.112      0.112      0.112      0.491"
" 38      START/RE-START TOTALS 104"
"      3      Runoff Totals on EXIT"
"      Total Catchment area      4.458      hectare"
"      Total Impervious area      0.000      hectare"
"      Total % impervious      0.000"
" 19      EXIT"

```

## Post-Development

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                          Q:\51060\100\Preliminary Design\SWM\
"                                               FS-SWM Report\Post"
"          Output filename:                     2YR - POST B.out"
"          Licensee name:                       A"
"          Company                               "
"          Date & Time last used:               4/27/2023 at 3:51:24 PM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          180.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          743.000 Coefficient A"
"          6.000  Constant B"
"          0.799  Exponent C"
"          0.400  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity                    109.401  mm/hr"
"          Total depth                          34.276  mm"
"          6  002hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 201"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          201  Controlled Area to W.R.7 (Southeast)"
"          81.200 % Impervious"
"          3.043  Total Area"
"          30.000 Flow length"
"          2.000  Overland Slope"
"          0.572  Pervious Area"
"          30.000 Pervious length"
"          2.000  Pervious slope"
"          2.471  Impervious Area"
"          30.000 Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          75.000 Pervious SCS Curve No."
"          0.176  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"
"          8.467  Pervious Initial abstraction"
"          0.015  Impervious Manning 'n'"
"          98.000 Impervious SCS Curve No."
"          0.841  Impervious Runoff coefficient"
"          0.100  Impervious Ia/S coefficient"
"          0.518  Impervious Initial abstraction"

```



```

"          0.536      0.000      0.000      0.000 c.m/sec"
"      Catchment 201          Pervious  Impervious Total Area  "
"      Surface Area          0.572      2.471      3.043      hectare"
"      Time of concentration 26.279      2.209      3.320      minutes"
"      Time to Centroid     135.317     91.265     93.298     minutes"
"      Rainfall depth       34.276     34.276     34.276     mm"
"      Rainfall volume      196.09     846.94     1043.03    c.m"
"      Rainfall losses      28.252     5.448     9.735     mm"
"      Runoff depth         6.024     28.829     24.542     mm"
"      Runoff volume        34.46     712.34     746.80    c.m"
"      Runoff coefficient    0.176     0.841     0.716     "
"      Maximum flow         0.008     0.535     0.536     c.m/sec"
" 40      HYDROGRAPH Add Runoff  "
"      4  Add Runoff  "
"          0.536      0.536      0.000      0.000"
" 54      POND DESIGN"
"      0.536  Current peak flow  c.m/sec"
"      0.708  Target outflow  c.m/sec"
"      746.8  Hydrograph volume  c.m"
"      4.    Number of stages"
"      399.000  Minimum water level  metre"
"      402.190  Maximum water level  metre"
"      399.000  Starting water level  metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"          Level Discharge  Volume"
"      399.000  0.000  0.000"
"      399.300  0.05381  1.01E-05"
"      401.000  0.5991  998.150"
"      402.190  0.8054  998.150"
"      1.    OUTFLOW PIPE"
"          Upstream Downstr'm      Pipe      Pipe      Manning      Entry"
"          invert  invert      Length  Diameter      'n'      loss Ke"
"      399.000  398.800  20.000  0.525  0.013  0.500"
"      Peak outflow          0.190  c.m/sec"
"      Maximum level        399.725  metre"
"      Maximum storage      249.309  c.m"
"      Centroidal lag       1.789  hours"
"          0.536      0.536      0.190      0.000 c.m/sec"
" 40      HYDROGRAPH  Combine  1"
"      6  Combine  "
"      1  Node #"
"          To W.R.7"
"      Maximum flow          0.190  c.m/sec"
"      Hydrograph volume      742.081  c.m"
"          0.536      0.536      0.190      0.190"
" 40      HYDROGRAPH Start - New Tributary"
"      2  Start - New Tributary"
"          0.536      0.000      0.190      0.190"
" 33      CATCHMENT 202"
"      1  Triangular SCS"

```

```

"          1 Equal length"
"          1 SCS method"
"         202 Uncontrolled Area to W.R.7 (Southeast)"
"        69.000 % Impervious"
"          0.270 Total Area"
"          5.000 Flow length"
"          2.000 Overland Slope"
"          0.084 Pervious Area"
"          5.000 Pervious length"
"          2.000 Pervious slope"
"          0.186 Impervious Area"
"          5.000 Impervious length"
"          2.000 Impervious slope"
"          0.250 Pervious Manning 'n'"
"       75.000 Pervious SCS Curve No."
"          0.175 Pervious Runoff coefficient"
"          0.100 Pervious Ia/S coefficient"
"          8.467 Pervious Initial abstraction"
"          0.015 Impervious Manning 'n'"
"       98.000 Impervious SCS Curve No."
"          0.809 Impervious Runoff coefficient"
"          0.100 Impervious Ia/S coefficient"
"          0.518 Impervious Initial abstraction"
"                0.046      0.000      0.190      0.190 c.m/sec"
"          Catchment 202      Pervious      Impervious      Total Area      "
"          Surface Area      0.084      0.186      0.270      hectare"
"          Time of concentration      8.969      0.754      1.482      minutes"
"          Time to Centroid      114.270      89.306      91.518      minutes"
"          Rainfall depth      34.276      34.276      34.276      mm"
"          Rainfall volume      28.69      63.86      92.55      c.m"
"          Rainfall losses      28.278      6.551      13.287      mm"
"          Runoff depth      5.998      27.725      20.990      mm"
"          Runoff volume      5.02      51.65      56.67      c.m"
"          Runoff coefficient      0.175      0.809      0.612      "
"          Maximum flow      0.002      0.045      0.046      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4      Add Runoff "
"                0.046      0.046      0.190      0.190"
" 40      HYDROGRAPH Copy to Outflow"
"          8      Copy to Outflow"
"                0.046      0.046      0.046      0.190"
" 40      HYDROGRAPH Combine      1"
"          6      Combine "
"          1      Node #"
"                To W.R.7"
"          Maximum flow      0.205      c.m/sec"
"          Hydrograph volume      798.754      c.m"
"                0.046      0.046      0.046      0.205"
" 40      HYDROGRAPH Start - New Tributary"
"          2      Start - New Tributary"

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```

"          0.046      0.000      0.046      0.205"
" 33      CATCHMENT 203"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          203  Uncontrolled to W.R.7 (Northeast)"
" 55.300  % Impervious"
"          0.133  Total Area"
"          5.000  Flow length"
"          2.000  Overland Slope"
"          0.059  Pervious Area"
"          5.000  Pervious length"
"          2.000  Pervious slope"
"          0.074  Impervious Area"
"          5.000  Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
" 75.000  Pervious SCS Curve No."
"          0.175  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"
"          8.467  Pervious Initial abstraction"
"          0.015  Impervious Manning 'n'"
" 98.000  Impervious SCS Curve No."
"          0.809  Impervious Runoff coefficient"
"          0.100  Impervious Ia/S coefficient"
"          0.518  Impervious Initial abstraction"
"          0.018      0.000      0.046      0.205 c.m/sec"
"          Catchment 203      Pervious      Impervious      Total Area  "
"          Surface Area      0.059      0.074      0.133      hectare"
"          Time of concentration  8.969      0.754      1.977      minutes"
"          Time to Centroid      114.270      89.306      93.022      minutes"
"          Rainfall depth      34.276      34.276      34.276      mm"
"          Rainfall volume      20.38      25.21      45.59      c.m"
"          Rainfall losses      28.278      6.551      16.263      mm"
"          Runoff depth      5.998      27.725      18.013      mm"
"          Runoff volume      3.57      20.39      23.96      c.m"
"          Runoff coefficient      0.175      0.809      0.526      "
"          Maximum flow      0.002      0.018      0.018      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4  Add Runoff "
"          0.018      0.018      0.046      0.205"
" 40      HYDROGRAPH Copy to Outflow"
"          8  Copy to Outflow"
"          0.018      0.018      0.018      0.205"
" 40      HYDROGRAPH  Combine  1"
"          6  Combine "
"          1  Node #"
"          To W.R.7"
"          Maximum flow      0.212      c.m/sec"
"          Hydrograph volume      822.711      c.m"

```

```

"          0.018      0.018      0.018      0.212"
" 40      HYDROGRAPH Start - New Tributary"
"          2      Start - New Tributary"
"          0.018      0.000      0.018      0.212"
" 33      CATCHMENT 204"
"          1      Triangular SCS"
"          1      Equal length"
"          1      SCS method"
"          204    Uncontrolled to Wetland A (Southwest)"
" 48.100    % Impervious"
"          0.763    Total Area"
" 20.000    Flow length"
"          3.000    Overland Slope"
"          0.396    Pervious Area"
" 20.000    Pervious length"
"          3.000    Pervious slope"
"          0.367    Impervious Area"
" 20.000    Impervious length"
"          3.000    Impervious slope"
"          0.250    Pervious Manning 'n'"
" 75.000    Pervious SCS Curve No."
"          0.176    Pervious Runoff coefficient"
"          0.100    Pervious Ia/S coefficient"
"          8.467    Pervious Initial abstraction"
"          0.015    Impervious Manning 'n'"
" 98.000    Impervious SCS Curve No."
"          0.841    Impervious Runoff coefficient"
"          0.100    Impervious Ia/S coefficient"
"          0.518    Impervious Initial abstraction"
"          0.085      0.000      0.018      0.212 c.m/sec"
"          Catchment 204          Pervious  Impervious Total Area "
"          Surface Area          0.396      0.367      0.763      hectare"
"          Time of concentration  18.245      1.534      4.610      minutes"
"          Time to Centroid      125.535     90.158     96.670     minutes"
"          Rainfall depth        34.276      34.276      34.276     mm"
"          Rainfall volume       135.73      125.80      261.53     c.m"
"          Rainfall losses       28.251      5.462      17.289     mm"
"          Runoff depth          6.025      28.815     16.987     mm"
"          Runoff volume         23.86      105.75     129.61     c.m"
"          Runoff coefficient     0.176      0.841      0.496      "
"          Maximum flow          0.007      0.084      0.085     c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4      Add Runoff "
"          0.085      0.085      0.018      0.212"
" 40      HYDROGRAPH Copy to Outflow"
"          8      Copy to Outflow"
"          0.085      0.085      0.085      0.212"
" 40      HYDROGRAPH Combine 2"
"          6      Combine "
"          2      Node #"

```

"		Total Site Area"				
"		Maximum flow	0.085		c.m/sec"	
"		Hydrograph volume	129.611		c.m"	
"		0.085	0.085	0.085	0.085"	
" 40		HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"				
"		0.085	0.000	0.085	0.085"	
" 33		CATCHMENT 205"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	1	SCS method"				
"	205	Uncontrolled Area to Wetland B (Northwest)"				
"	37.500	% Impervious"				
"	0.249	Total Area"				
"	20.000	Flow length"				
"	3.000	Overland Slope"				
"	0.156	Pervious Area"				
"	20.000	Pervious length"				
"	3.000	Pervious slope"				
"	0.093	Impervious Area"				
"	20.000	Impervious length"				
"	3.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	75.000	Pervious SCS Curve No."				
"	0.176	Pervious Runoff coefficient"				
"	0.100	Pervious Ia/S coefficient"				
"	8.467	Pervious Initial abstraction"				
"	0.015	Impervious Manning 'n'"				
"	98.000	Impervious SCS Curve No."				
"	0.841	Impervious Runoff coefficient"				
"	0.100	Impervious Ia/S coefficient"				
"	0.518	Impervious Initial abstraction"				
"		0.022	0.000	0.085	0.085 c.m/sec"	
"		Catchment 205	Pervious	Impervious	Total Area "	
"		Surface Area	0.156	0.093	0.249 hectare"	
"		Time of concentration	18.245	1.534	5.853 minutes"	
"		Time to Centroid	125.534	90.158	99.300 minutes"	
"		Rainfall depth	34.276	34.276	34.276 mm"	
"		Rainfall volume	53.34	32.01	85.35 c.m"	
"		Rainfall losses	28.251	5.462	19.705 mm"	
"		Runoff depth	6.025	28.815	14.571 mm"	
"		Runoff volume	9.38	26.91	36.28 c.m"	
"		Runoff coefficient	0.176	0.841	0.425 "	
"		Maximum flow	0.003	0.021	0.022 c.m/sec"	
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.022	0.022	0.085	0.085"	
" 40		HYDROGRAPH Copy to Outflow"				
"	8	Copy to Outflow"				
"		0.022	0.022	0.022	0.085"	

" 40	HYDROGRAPH	Combine	2"		
"	6	Combine "			
"	2	Node #"			
"		Total Site Area"			
"		Maximum flow	0.107	c.m/sec"	
"		Hydrograph volume	165.893	c.m"	
"		0.022 0.022	0.022	0.107"	
" 40	HYDROGRAPH	Confluence	1"		
"	7	Confluence "			
"	1	Node #"			
"		To W.R.7"			
"		Maximum flow	0.212	c.m/sec"	
"		Hydrograph volume	822.711	c.m"	
"		0.022 0.212	0.022	0.000"	
" 40	HYDROGRAPH	Copy to Outflow"			
"	8	Copy to Outflow"			
"		0.022 0.212	0.212	0.000"	
" 40	HYDROGRAPH	Combine	2"		
"	6	Combine "			
"	2	Node #"			
"		Total Site Area"			
"		Maximum flow	0.279	c.m/sec"	
"		Hydrograph volume	988.605	c.m"	
"		0.022 0.212	0.212	0.279"	
" 38	START/RE-START	TOTALS	1"		
"	3	Runoff Totals on EXIT"			
"		Total Catchment area	4.458	hectare"	
"		Total Impervious area	3.191	hectare"	
"		Total % impervious	71.582"		
" 19	EXIT"				



```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                          Q:\51060\100\Preliminary Design\SWM\
"                                               FS-SWM Report\Post"
"          Output filename:                     5YR - POST B.out"
"          Licensee name:                       A"
"          Company                              "
"          Date & Time last used:              4/27/2023 at 3:48:49 PM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          180.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          1593.000 Coefficient A"
"          11.000  Constant B"
"          0.879  Exponent C"
"          0.400  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          139.288  mm/hr"
"          Total depth                 47.265  mm"
"          6  005hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 201"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          201  Controlled Area to W.R.7 (Southeast)"
"          81.200  % Impervious"
"          3.043  Total Area"
"          30.000  Flow length"
"          2.000  Overland Slope"
"          0.572  Pervious Area"
"          30.000  Pervious length"
"          2.000  Pervious slope"
"          2.471  Impervious Area"
"          30.000  Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          75.000  Pervious SCS Curve No."
"          0.257  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"
"          8.467  Pervious Initial abstraction"
"          0.015  Impervious Manning 'n'"
"          98.000  Impervious SCS Curve No."
"          0.879  Impervious Runoff coefficient"
"          0.100  Impervious Ia/S coefficient"
"          0.518  Impervious Initial abstraction"

```

```

"          0.748      0.000      0.000      0.000 c.m/sec"
"      Catchment 201      Pervious      Impervious      Total Area      "
"      Surface Area      0.572      2.471      3.043      hectare"
"      Time of concentration      19.131      1.980      3.070      minutes"
"      Time to Centroid      121.799      88.785      90.882      minutes"
"      Rainfall depth      47.265      47.265      47.265      mm"
"      Rainfall volume      270.39      1167.87      1438.26      c.m"
"      Rainfall losses      35.099      5.742      11.261      mm"
"      Runoff depth      12.166      41.523      36.004      mm"
"      Runoff volume      69.60      1026.00      1095.60      c.m"
"      Runoff coefficient      0.257      0.879      0.762      "
"      Maximum flow      0.024      0.745      0.748      c.m/sec"
" 40      HYDROGRAPH Add Runoff      "
"      4      Add Runoff      "
"          0.748      0.748      0.000      0.000"
" 54      POND DESIGN"
"      0.748      Current peak flow      c.m/sec"
"      0.708      Target outflow      c.m/sec"
"      1095.6      Hydrograph volume      c.m"
"      4.      Number of stages"
"      399.000      Minimum water level      metre"
"      402.190      Maximum water level      metre"
"      399.000      Starting water level      metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"          Level Discharge      Volume"
"      399.000      0.000      0.000"
"      399.300      0.05381      1.01E-05"
"      401.000      0.5991      998.150"
"      402.190      0.8054      998.150"
"      1.      OUTFLOW PIPE"
"          Upstream Downstr'm      Pipe      Pipe      Manning      Entry"
"          invert      invert      Length      Diameter      'n'      loss Ke"
"      399.000      398.800      20.000      0.525      0.013      0.500"
"      Peak outflow      0.272      c.m/sec"
"      Maximum level      399.985      metre"
"      Maximum storage      402.374      c.m"
"      Centroidal lag      1.819      hours"
"          0.748      0.748      0.272      0.000 c.m/sec"
" 40      HYDROGRAPH Combine      1"
"      6      Combine      "
"      1      Node #"
"          To W.R.7"
"      Maximum flow      0.272      c.m/sec"
"      Hydrograph volume      1096.965      c.m"
"          0.748      0.748      0.272      0.272"
" 40      HYDROGRAPH Start - New Tributary"
"      2      Start - New Tributary"
"          0.748      0.000      0.272      0.272"
" 33      CATCHMENT 202"
"      1      Triangular SCS"

```

```

"          1 Equal length"
"          1 SCS method"
"         202 Uncontrolled Area to W.R.7 (Southeast)"
" 69.000 % Impervious"
"    0.270 Total Area"
"    5.000 Flow length"
"    2.000 Overland Slope"
"    0.084 Pervious Area"
"    5.000 Pervious length"
"    2.000 Pervious slope"
"    0.186 Impervious Area"
"    5.000 Impervious length"
"    2.000 Impervious slope"
"    0.250 Pervious Manning 'n'"
" 75.000 Pervious SCS Curve No."
"    0.255 Pervious Runoff coefficient"
"    0.100 Pervious Ia/S coefficient"
"    8.467 Pervious Initial abstraction"
"    0.015 Impervious Manning 'n'"
" 98.000 Impervious SCS Curve No."
"    0.831 Impervious Runoff coefficient"
"    0.100 Impervious Ia/S coefficient"
"    0.518 Impervious Initial abstraction"
"          0.061    0.000    0.272    0.272 c.m/sec"
"      Catchment 202      Pervious  Impervious Total Area "
"      Surface Area      0.084      0.186      0.270      hectare"
"      Time of concentration 6.529      0.676      1.386      minutes"
"      Time to Centroid 106.382      87.252      89.572      minutes"
"      Rainfall depth      47.265      47.265      47.265      mm"
"      Rainfall volume      39.56      88.05      127.61      c.m"
"      Rainfall losses      35.205      7.998      16.433      mm"
"      Runoff depth      12.059      39.266      30.832      mm"
"      Runoff volume      10.09      73.15      83.25      c.m"
"      Runoff coefficient    0.255      0.831      0.652      "
"      Maximum flow      0.006      0.060      0.061      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4 Add Runoff "
"            0.061    0.061    0.272    0.272"
" 40      HYDROGRAPH Copy to Outflow"
"          8 Copy to Outflow"
"            0.061    0.061    0.061    0.272"
" 40      HYDROGRAPH Combine 1"
"          6 Combine "
"          1 Node #"
"            To W.R.7"
"      Maximum flow              0.295      c.m/sec"
"      Hydrograph volume          1180.212      c.m"
"            0.061    0.061    0.061    0.295"
" 40      HYDROGRAPH Start - New Tributary"
"          2 Start - New Tributary"

```

```

"          0.061      0.000      0.061      0.295"
" 33      CATCHMENT 203"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          203  Uncontrolled to W.R.7 (Northeast)"
" 55.300  % Impervious"
"          0.133  Total Area"
"          5.000  Flow length"
"          2.000  Overland Slope"
"          0.059  Pervious Area"
"          5.000  Pervious length"
"          2.000  Pervious slope"
"          0.074  Impervious Area"
"          5.000  Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
" 75.000  Pervious SCS Curve No."
"          0.255  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"
"          8.467  Pervious Initial abstraction"
"          0.015  Impervious Manning 'n'"
" 98.000  Impervious SCS Curve No."
"          0.831  Impervious Runoff coefficient"
"          0.100  Impervious Ia/S coefficient"
"          0.518  Impervious Initial abstraction"
"          0.025      0.000      0.061      0.295 c.m/sec"
"          Catchment 203      Pervious      Impervious      Total Area "
"          Surface Area      0.059      0.074      0.133      hectare"
"          Time of concentration  6.529      0.676      1.840      minutes"
"          Time to Centroid      106.382    87.252    91.057    minutes"
"          Rainfall depth      47.265    47.265    47.265    mm"
"          Rainfall volume      28.10     34.76     62.86     c.m"
"          Rainfall losses      35.205    7.998     20.160    mm"
"          Runoff depth      12.059    39.266    27.105    mm"
"          Runoff volume      7.17      28.88     36.05     c.m"
"          Runoff coefficient    0.255     0.831     0.573     "
"          Maximum flow      0.004     0.024     0.025     c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4  Add Runoff "
"          0.025      0.025      0.061      0.295"
" 40      HYDROGRAPH Copy to Outflow"
"          8  Copy to Outflow"
"          0.025      0.025      0.025      0.295"
" 40      HYDROGRAPH Combine 1"
"          6  Combine "
"          1  Node #"
"          To W.R.7"
"          Maximum flow      0.306     c.m/sec"
"          Hydrograph volume    1216.261   c.m"

```

```

"          0.025      0.025      0.025      0.306"
" 40      HYDROGRAPH Start - New Tributary"
"          2      Start - New Tributary"
"          0.025      0.000      0.025      0.306"
" 33      CATCHMENT 204"
"          1      Triangular SCS"
"          1      Equal length"
"          1      SCS method"
"          204    Uncontrolled to Wetland A (Southwest)"
" 48.100    % Impervious"
"          0.763    Total Area"
" 20.000    Flow length"
"          3.000    Overland Slope"
"          0.396    Pervious Area"
" 20.000    Pervious length"
"          3.000    Pervious slope"
"          0.367    Impervious Area"
" 20.000    Impervious length"
"          3.000    Impervious slope"
"          0.250    Pervious Manning 'n'"
" 75.000    Pervious SCS Curve No."
"          0.257    Pervious Runoff coefficient"
"          0.100    Pervious Ia/S coefficient"
"          8.467    Pervious Initial abstraction"
"          0.015    Impervious Manning 'n'"
" 98.000    Impervious SCS Curve No."
"          0.875    Impervious Runoff coefficient"
"          0.100    Impervious Ia/S coefficient"
"          0.518    Impervious Initial abstraction"
"          0.119      0.000      0.025      0.306 c.m/sec"
"          Catchment 204          Pervious    Impervious Total Area "
"          Surface Area          0.396      0.367      0.763      hectare"
"          Time of concentration 13.282      1.375      4.241      minutes"
"          Time to Centroid      114.600     87.893     94.323     minutes"
"          Rainfall depth        47.265     47.265     47.265     mm"
"          Rainfall volume       187.17     173.46     360.63     c.m"
"          Rainfall losses       35.106     5.889      21.052     mm"
"          Runoff depth          12.159     41.376     26.212     mm"
"          Runoff volume         48.15      151.85     200.00     c.m"
"          Runoff coefficient     0.257      0.875      0.555      "
"          Maximum flow          0.020      0.116      0.119      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4      Add Runoff "
"          0.119      0.119      0.025      0.306"
" 40      HYDROGRAPH Copy to Outflow"
"          8      Copy to Outflow"
"          0.119      0.119      0.119      0.306"
" 40      HYDROGRAPH Combine 2"
"          6      Combine "
"          2      Node #"

```

"		Total Site Area"			
"		Maximum flow	0.119		c.m/sec"
"		Hydrograph volume	199.999		c.m"
"		0.119	0.119	0.119	0.119"
" 40		HYDROGRAPH Start - New Tributary"			
"		2 Start - New Tributary"			
"		0.119	0.000	0.119	0.119"
" 33		CATCHMENT 205"			
"		1 Triangular SCS"			
"		1 Equal length"			
"		1 SCS method"			
"		205 Uncontrolled Area to Wetland B (Northwest)"			
"	37.500	% Impervious"			
"	0.249	Total Area"			
"	20.000	Flow length"			
"	3.000	Overland Slope"			
"	0.156	Pervious Area"			
"	20.000	Pervious length"			
"	3.000	Pervious slope"			
"	0.093	Impervious Area"			
"	20.000	Impervious length"			
"	3.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	75.000	Pervious SCS Curve No."			
"	0.257	Pervious Runoff coefficient"			
"	0.100	Pervious Ia/S coefficient"			
"	8.467	Pervious Initial abstraction"			
"	0.015	Impervious Manning 'n'"			
"	98.000	Impervious SCS Curve No."			
"	0.875	Impervious Runoff coefficient"			
"	0.100	Impervious Ia/S coefficient"			
"	0.518	Impervious Initial abstraction"			
"		0.031	0.000	0.119	0.119 c.m/sec"
"		Catchment 205	Pervious	Impervious	Total Area "
"		Surface Area	0.156	0.093	0.249 hectare"
"		Time of concentration	13.282	1.375	5.289 minutes"
"		Time to Centroid	114.600	87.893	96.673 minutes"
"		Rainfall depth	47.265	47.265	47.265 mm"
"		Rainfall volume	73.56	44.13	117.69 c.m"
"		Rainfall losses	35.106	5.889	24.149 mm"
"		Runoff depth	12.159	41.376	23.115 mm"
"		Runoff volume	18.92	38.63	57.56 c.m"
"		Runoff coefficient	0.257	0.875	0.489 "
"		Maximum flow	0.008	0.029	0.031 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"		4 Add Runoff "			
"		0.031	0.031	0.119	0.119"
" 40		HYDROGRAPH Copy to Outflow"			
"		8 Copy to Outflow"			
"		0.031	0.031	0.031	0.119"



" 40	HYDROGRAPH	Combine	2"		
"	6	Combine "			
"	2	Node #"			
"		Total Site Area"			
"		Maximum flow	0.150	c.m/sec"	
"		Hydrograph volume	257.556	c.m"	
"		0.031 0.031	0.031	0.150"	
" 40	HYDROGRAPH	Confluence	1"		
"	7	Confluence "			
"	1	Node #"			
"		To W.R.7"			
"		Maximum flow	0.306	c.m/sec"	
"		Hydrograph volume	1216.261	c.m"	
"		0.031 0.306	0.031	0.000"	
" 40	HYDROGRAPH	Copy to Outflow"			
"	8	Copy to Outflow"			
"		0.031 0.306	0.306	0.000"	
" 40	HYDROGRAPH	Combine	2"		
"	6	Combine "			
"	2	Node #"			
"		Total Site Area"			
"		Maximum flow	0.404	c.m/sec"	
"		Hydrograph volume	1473.817	c.m"	
"		0.031 0.306	0.306	0.404"	
" 38	START/RE-START	TOTALS	1"		
"	3	Runoff Totals on EXIT"			
"		Total Catchment area	4.458	hectare"	
"		Total Impervious area	3.191	hectare"	
"		Total % impervious	71.582"		
" 19	EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                         Q:\51060\100\Preliminary Design\SWM\
"                                               FS-SWM Report\Post"
"          Output filename:                    10YR - POST B.out"
"          Licensee name:                      A"
"          Company                             "
"          Date & Time last used:              4/27/2023 at 3:47:04 PM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          180.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          2221.000 Coefficient A"
"          12.000  Constant B"
"          0.908  Exponent C"
"          0.400  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          169.551  mm/hr"
"          Total depth                56.290  mm"
"          6  010hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 201"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          201  Controlled Area to W.R.7 (Southeast)"
"          81.200  % Impervious"
"          3.043  Total Area"
"          30.000  Flow length"
"          2.000  Overland Slope"
"          0.572  Pervious Area"
"          30.000  Pervious length"
"          2.000  Pervious slope"
"          2.471  Impervious Area"
"          30.000  Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          75.000  Pervious SCS Curve No."
"          0.306  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"
"          8.467  Pervious Initial abstraction"
"          0.015  Impervious Manning 'n'"
"          98.000  Impervious SCS Curve No."
"          0.894  Impervious Runoff coefficient"
"          0.100  Impervious Ia/S coefficient"
"          0.518  Impervious Initial abstraction"

```

```

"          0.934      0.000      0.000      0.000 c.m/sec"
"      Catchment 201          Pervious  Impervious Total Area  "
"      Surface Area          0.572      2.471      3.043      hectare"
"      Time of concentration  16.132      1.822      2.871      minutes"
"      Time to Centroid      116.081     87.573     89.664     minutes"
"      Rainfall depth        56.290     56.290     56.290     mm"
"      Rainfall volume       322.03     1390.88    1712.91    c.m"
"      Rainfall losses       39.079     5.945     12.174     mm"
"      Runoff depth          17.211     50.345     44.116     mm"
"      Runoff volume         98.46     1243.99    1342.45    c.m"
"      Runoff coefficient     0.306     0.894     0.784     "
"      Maximum flow          0.039     0.928     0.934     c.m/sec"
" 40      HYDROGRAPH Add Runoff  "
"      4  Add Runoff  "
"          0.934      0.934      0.000      0.000"
" 54      POND DESIGN"
"      0.934  Current peak flow  c.m/sec"
"      0.708  Target outflow  c.m/sec"
"      1342.4  Hydrograph volume  c.m"
"      4.  Number of stages"
"      399.000  Minimum water level  metre"
"      402.190  Maximum water level  metre"
"      399.000  Starting water level  metre"
"      0  Keep Design Data: 1 = True; 0 = False"
"          Level Discharge  Volume"
"      399.000      0.000      0.000"
"      399.300      0.05381  1.01E-05"
"      401.000      0.5991  998.150"
"      402.190      0.8054  998.150"
"      1.  OUTFLOW PIPE"
"          Upstream Downstr'm      Pipe      Pipe      Manning      Entry"
"          invert  invert  Length  Diameter      'n'  loss Ke"
"      399.000  398.800  20.000  0.525  0.013  0.500"
"      Peak outflow          0.337  c.m/sec"
"      Maximum level          400.185  metre"
"      Maximum storage          519.835  c.m"
"      Centroidal lag          1.823  hours"
"          0.934      0.934      0.337      0.000 c.m/sec"
" 40      HYDROGRAPH Combine  1"
"      6  Combine  "
"      1  Node #"
"          To W.R.7"
"      Maximum flow          0.337  c.m/sec"
"      Hydrograph volume          1339.022  c.m"
"          0.934      0.934      0.337      0.337"
" 40      HYDROGRAPH Start - New Tributary"
"      2  Start - New Tributary"
"          0.934      0.000      0.337      0.337"
" 33      CATCHMENT 202"
"      1  Triangular SCS"

```

```

"          1 Equal length"
"          1 SCS method"
"         202 Uncontrolled Area to W.R.7 (Southeast)"
" 69.000 % Impervious"
"    0.270 Total Area"
"    5.000 Flow length"
"    2.000 Overland Slope"
"    0.084 Pervious Area"
"    5.000 Pervious length"
"    2.000 Pervious slope"
"    0.186 Impervious Area"
"    5.000 Impervious length"
"    2.000 Impervious slope"
"    0.250 Pervious Manning 'n'"
" 75.000 Pervious SCS Curve No."
"    0.305 Pervious Runoff coefficient"
"    0.100 Pervious Ia/S coefficient"
"    8.467 Pervious Initial abstraction"
"    0.015 Impervious Manning 'n'"
" 98.000 Impervious SCS Curve No."
"    0.836 Impervious Runoff coefficient"
"    0.100 Impervious Ia/S coefficient"
"    0.518 Impervious Initial abstraction"
"          0.077    0.000    0.337    0.337 c.m/sec"
"      Catchment 202      Pervious  Impervious Total Area "
"      Surface Area      0.084      0.186      0.270      hectare"
"      Time of concentration 5.505      0.622      1.309      minutes"
"      Time to Centroid 102.737      86.219      88.545      minutes"
"      Rainfall depth      56.290      56.290      56.290      mm"
"      Rainfall volume      47.11      104.87      151.98      c.m"
"      Rainfall losses      39.128      9.242      18.507      mm"
"      Runoff depth      17.162      47.048      37.783      mm"
"      Runoff volume      14.36      87.65      102.02      c.m"
"      Runoff coefficient    0.305      0.836      0.671      "
"      Maximum flow      0.008      0.073      0.077      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4 Add Runoff "
"            0.077    0.077    0.337    0.337"
" 40      HYDROGRAPH Copy to Outflow"
"          8 Copy to Outflow"
"            0.077    0.077    0.077    0.337"
" 40      HYDROGRAPH Combine 1"
"          6 Combine "
"          1 Node #"
"            To W.R.7"
"      Maximum flow      0.363      c.m/sec"
"      Hydrograph volume    1441.037      c.m"
"            0.077    0.077    0.077    0.363"
" 40      HYDROGRAPH Start - New Tributary"
"          2 Start - New Tributary"

```

```

"          0.077      0.000      0.077      0.363"
" 33      CATCHMENT 203"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          203  Uncontrolled to W.R.7 (Northeast)"
" 55.300  % Impervious"
"          0.133  Total Area"
"          5.000  Flow length"
"          2.000  Overland Slope"
"          0.059  Pervious Area"
"          5.000  Pervious length"
"          2.000  Pervious slope"
"          0.074  Impervious Area"
"          5.000  Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
" 75.000  Pervious SCS Curve No."
"          0.305  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"
"          8.467  Pervious Initial abstraction"
"          0.015  Impervious Manning 'n'"
" 98.000  Impervious SCS Curve No."
"          0.836  Impervious Runoff coefficient"
"          0.100  Impervious Ia/S coefficient"
"          0.518  Impervious Initial abstraction"
"          0.032      0.000      0.077      0.363 c.m/sec"
"          Catchment 203      Pervious      Impervious      Total Area  "
"          Surface Area      0.059      0.074      0.133      hectare"
"          Time of concentration  5.505      0.622      1.734      minutes"
"          Time to Centroid      102.737      86.219      89.980      minutes"
"          Rainfall depth      56.290      56.290      56.290      mm"
"          Rainfall volume      33.47      41.40      74.87      c.m"
"          Rainfall losses      39.128      9.242      22.601      mm"
"          Runoff depth      17.162      47.048      33.689      mm"
"          Runoff volume      10.20      34.60      44.81      c.m"
"          Runoff coefficient      0.305      0.836      0.598      "
"          Maximum flow      0.006      0.029      0.032      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4  Add Runoff "
"          0.032      0.032      0.077      0.363"
" 40      HYDROGRAPH Copy to Outflow"
"          8  Copy to Outflow"
"          0.032      0.032      0.032      0.363"
" 40      HYDROGRAPH  Combine  1"
"          6  Combine "
"          1  Node #"
"          To W.R.7"
"          Maximum flow      0.378      c.m/sec"
"          Hydrograph volume      1485.844      c.m"

```

```

"          0.032    0.032    0.032    0.378"
" 40    HYDROGRAPH Start - New Tributary"
"      2    Start - New Tributary"
"          0.032    0.000    0.032    0.378"
" 33    CATCHMENT 204"
"      1    Triangular SCS"
"      1    Equal length"
"      1    SCS method"
"      204    Uncontrolled to Wetland A (Southwest)"
" 48.100    % Impervious"
"      0.763    Total Area"
" 20.000    Flow length"
"      3.000    Overland Slope"
"      0.396    Pervious Area"
" 20.000    Pervious length"
"      3.000    Pervious slope"
"      0.367    Impervious Area"
" 20.000    Impervious length"
"      3.000    Impervious slope"
"      0.250    Pervious Manning 'n'"
" 75.000    Pervious SCS Curve No."
"      0.306    Pervious Runoff coefficient"
"      0.100    Pervious Ia/S coefficient"
"      8.467    Pervious Initial abstraction"
"      0.015    Impervious Manning 'n'"
" 98.000    Impervious SCS Curve No."
"      0.889    Impervious Runoff coefficient"
"      0.100    Impervious Ia/S coefficient"
"      0.518    Impervious Initial abstraction"
"          0.151    0.000    0.032    0.378 c.m/sec"
"      Catchment 204          Pervious    Impervious Total Area "
"      Surface Area          0.396    0.367    0.763    hectare"
"      Time of concentration  11.199    1.265    3.956    minutes"
"      Time to Centroid      109.843    86.789    93.033    minutes"
"      Rainfall depth        56.290    56.290    56.290    mm"
"      Rainfall volume       222.91    206.59    429.49    c.m"
"      Rainfall losses       39.065    6.254    23.283    mm"
"      Runoff depth          17.226    50.036    33.008    mm"
"      Runoff volume         68.21    183.64    251.85    c.m"
"      Runoff coefficient     0.306    0.889    0.586    "
"      Maximum flow          0.032    0.144    0.151    c.m/sec"
" 40    HYDROGRAPH Add Runoff "
"      4    Add Runoff "
"          0.151    0.151    0.032    0.378"
" 40    HYDROGRAPH Copy to Outflow"
"      8    Copy to Outflow"
"          0.151    0.151    0.151    0.378"
" 40    HYDROGRAPH Combine 2"
"      6    Combine "
"      2    Node #"

```

```

"           Total Site Area"
"           Maximum flow           0.151   c.m/sec"
"           Hydrograph volume      251.848   c.m"
"           0.151   0.151   0.151   0.151"
" 40 HYDROGRAPH Start - New Tributary"
"     2 Start - New Tributary"
"           0.151   0.000   0.151   0.151"
" 33 CATCHMENT 205"
"     1 Triangular SCS"
"     1 Equal length"
"     1 SCS method"
"     205 Uncontrolled Area to Wetland B (Northwest)"
" 37.500 % Impervious"
"     0.249 Total Area"
" 20.000 Flow length"
"     3.000 Overland Slope"
"     0.156 Pervious Area"
" 20.000 Pervious length"
"     3.000 Pervious slope"
"     0.093 Impervious Area"
" 20.000 Impervious length"
"     3.000 Impervious slope"
"     0.250 Pervious Manning 'n'"
" 75.000 Pervious SCS Curve No."
"     0.306 Pervious Runoff coefficient"
"     0.100 Pervious Ia/S coefficient"
"     8.467 Pervious Initial abstraction"
"     0.015 Impervious Manning 'n'"
" 98.000 Impervious SCS Curve No."
"     0.889 Impervious Runoff coefficient"
"     0.100 Impervious Ia/S coefficient"
"     0.518 Impervious Initial abstraction"
"           0.039   0.000   0.151   0.151 c.m/sec"
"           Catchment 205 Pervious Impervious Total Area "
"           Surface Area      0.156   0.093   0.249   hectare"
"           Time of concentration 11.199   1.265   4.887   minutes"
"           Time to Centroid    109.843   86.789   95.194   minutes"
"           Rainfall depth      56.290   56.290   56.290   mm"
"           Rainfall volume     87.60    52.56    140.16   c.m"
"           Rainfall losses     39.065   6.254    26.761   mm"
"           Runoff depth        17.226   50.036   29.530   mm"
"           Runoff volume       26.81    46.72    73.53    c.m"
"           Runoff coefficient   0.306    0.889    0.525    "
"           Maximum flow       0.013    0.037    0.039    c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"     4 Add Runoff "
"           0.039   0.039   0.151   0.151"
" 40 HYDROGRAPH Copy to Outflow"
"     8 Copy to Outflow"
"           0.039   0.039   0.039   0.151"

```



" 40	HYDROGRAPH	Combine	2"		
"	6	Combine "			
"	2	Node #"			
"		Total Site Area"			
"		Maximum flow	0.190	c.m/sec"	
"		Hydrograph volume	325.376	c.m"	
"		0.039 0.039	0.039	0.190"	
" 40	HYDROGRAPH	Confluence	1"		
"	7	Confluence "			
"	1	Node #"			
"		To W.R.7"			
"		Maximum flow	0.378	c.m/sec"	
"		Hydrograph volume	1485.844	c.m"	
"		0.039 0.378	0.039	0.000"	
" 40	HYDROGRAPH	Copy to Outflow"			
"	8	Copy to Outflow"			
"		0.039 0.378	0.378	0.000"	
" 40	HYDROGRAPH	Combine	2"		
"	6	Combine "			
"	2	Node #"			
"		Total Site Area"			
"		Maximum flow	0.508	c.m/sec"	
"		Hydrograph volume	1811.220	c.m"	
"		0.039 0.378	0.378	0.508"	
" 38	START/RE-START	TOTALS	1"		
"	3	Runoff Totals on EXIT"			
"		Total Catchment area	4.458	hectare"	
"		Total Impervious area	3.191	hectare"	
"		Total % impervious	71.582"		
" 19	EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                         Q:\51060\100\Preliminary Design\SWM\
"                                               FS-SWM Report\Post"
"          Output filename:                    25YR - POST B.out"
"          Licensee name:                      A"
"          Company                             "
"          Date & Time last used:              4/27/2023 at 3:45:04 PM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          180.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          3158.000 Coefficient A"
"          15.000  Constant B"
"          0.936  Exponent C"
"          0.400  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          191.557  mm/hr"
"          Total depth                68.266  mm"
"          6  025hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 201"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          201  Controlled Area to W.R.7 (Southeast)"
"          81.200  % Impervious"
"          3.043  Total Area"
"          30.000  Flow length"
"          2.000  Overland Slope"
"          0.572  Pervious Area"
"          30.000  Pervious length"
"          2.000  Pervious slope"
"          2.471  Impervious Area"
"          30.000  Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          75.000  Pervious SCS Curve No."
"          0.362  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"
"          8.467  Pervious Initial abstraction"
"          0.015  Impervious Manning 'n'"
"          98.000  Impervious SCS Curve No."
"          0.910  Impervious Runoff coefficient"
"          0.100  Impervious Ia/S coefficient"
"          0.518  Impervious Initial abstraction"

```

```

"          1.099      0.000      0.000      0.000 c.m/sec"
"      Catchment 201          Pervious  Impervious Total Area  "
"      Surface Area          0.572      2.471      3.043      hectare"
"      Time of concentration  14.123      1.728      2.773      minutes"
"      Time to Centroid      112.217      86.929      89.061      minutes"
"      Rainfall depth        68.266      68.266      68.266      mm"
"      Rainfall volume       390.54      1686.80      2077.34      c.m"
"      Rainfall losses       43.560      6.143      13.177      mm"
"      Runoff depth          24.707      62.124      55.089      mm"
"      Runoff volume         141.34      1535.02      1676.37      c.m"
"      Runoff coefficient     0.362      0.910      0.807      "
"      Maximum flow          0.062      1.088      1.099      c.m/sec"
" 40      HYDROGRAPH Add Runoff  "
"      4  Add Runoff  "
"          1.099      1.099      0.000      0.000"
" 54      POND DESIGN"
"      1.099  Current peak flow  c.m/sec"
"      0.708  Target outflow  c.m/sec"
"      1676.4  Hydrograph volume  c.m"
"      4.      Number of stages"
"      399.000  Minimum water level  metre"
"      402.190  Maximum water level  metre"
"      399.000  Starting water level  metre"
"      0  Keep Design Data: 1 = True; 0 = False"
"          Level Discharge  Volume"
"      399.000      0.000      0.000"
"      399.300      0.05381  1.01E-05"
"      401.000      0.5991  998.150"
"      402.190      0.8054  998.150"
"      1.  OUTFLOW PIPE"
"          Upstream Downstr'm      Pipe      Pipe      Manning      Entry"
"          invert  invert      Length  Diameter      'n'      loss Ke"
"      399.000  398.800      20.000      0.525      0.013      0.500"
"      Peak outflow          0.413      c.m/sec"
"      Maximum level          400.419      metre"
"      Maximum storage          656.890      c.m"
"      Centroidal lag          1.842      hours"
"          1.099      1.099      0.413      0.000 c.m/sec"
" 40      HYDROGRAPH  Combine  1"
"      6  Combine  "
"      1  Node #"
"          To W.R.7"
"      Maximum flow          0.413      c.m/sec"
"      Hydrograph volume          1677.043      c.m"
"          1.099      1.099      0.413      0.413"
" 40      HYDROGRAPH Start - New Tributary"
"      2  Start - New Tributary"
"          1.099      0.000      0.413      0.413"
" 33      CATCHMENT 202"
"      1  Triangular SCS"

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```

"          1 Equal length"
"          1 SCS method"
"         202 Uncontrolled Area to W.R.7 (Southeast)"
" 69.000 % Impervious"
"    0.270 Total Area"
"    5.000 Flow length"
"    2.000 Overland Slope"
"    0.084 Pervious Area"
"    5.000 Pervious length"
"    2.000 Pervious slope"
"    0.186 Impervious Area"
"    5.000 Impervious length"
"    2.000 Impervious slope"
"    0.250 Pervious Manning 'n'"
" 75.000 Pervious SCS Curve No."
"    0.361 Pervious Runoff coefficient"
"    0.100 Pervious Ia/S coefficient"
"    8.467 Pervious Initial abstraction"
"    0.015 Impervious Manning 'n'"
" 98.000 Impervious SCS Curve No."
"    0.843 Impervious Runoff coefficient"
"    0.100 Impervious Ia/S coefficient"
"    0.518 Impervious Initial abstraction"
"          0.090    0.000    0.413    0.413 c.m/sec"
"      Catchment 202      Pervious  Impervious Total Area "
"      Surface Area      0.084      0.186      0.270      hectare"
"      Time of concentration 4.820      0.590      1.272      minutes"
"      Time to Centroid 100.624      85.735      88.135      minutes"
"      Rainfall depth      68.266      68.266      68.266      mm"
"      Rainfall volume      57.14      127.18      184.32      c.m"
"      Rainfall losses      43.648      10.724      20.931      mm"
"      Runoff depth      24.618      57.542      47.336      mm"
"      Runoff volume      20.61      107.20      127.81      c.m"
"      Runoff coefficient    0.361      0.843      0.693      "
"      Maximum flow      0.013      0.084      0.090      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4 Add Runoff "
"          0.090    0.090    0.413    0.413"
" 40      HYDROGRAPH Copy to Outflow"
"          8 Copy to Outflow"
"          0.090    0.090    0.090    0.413"
" 40      HYDROGRAPH Combine 1"
"          6 Combine "
"          1 Node #"
"            To W.R.7"
"      Maximum flow          0.441    c.m/sec"
"      Hydrograph volume      1804.850    c.m"
"          0.090    0.090    0.090    0.441"
" 40      HYDROGRAPH Start - New Tributary"
"          2 Start - New Tributary"

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```

"          0.090      0.000      0.090      0.441"
" 33      CATCHMENT 203"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          203  Uncontrolled to W.R.7 (Northeast)"
" 55.300  % Impervious"
"          0.133  Total Area"
"          5.000  Flow length"
"          2.000  Overland Slope"
"          0.059  Pervious Area"
"          5.000  Pervious length"
"          2.000  Pervious slope"
"          0.074  Impervious Area"
"          5.000  Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
" 75.000  Pervious SCS Curve No."
"          0.361  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"
"          8.467  Pervious Initial abstraction"
"          0.015  Impervious Manning 'n'"
" 98.000  Impervious SCS Curve No."
"          0.843  Impervious Runoff coefficient"
"          0.100  Impervious Ia/S coefficient"
"          0.518  Impervious Initial abstraction"
"          0.038      0.000      0.090      0.441 c.m/sec"
"          Catchment 203      Pervious      Impervious      Total Area  "
"          Surface Area      0.059      0.074      0.133      hectare"
"          Time of concentration  4.820      0.590      1.677      minutes"
"          Time to Centroid      100.624      85.735      89.561      minutes"
"          Rainfall depth      68.266      68.266      68.266      mm"
"          Rainfall volume      40.58      50.21      90.79      c.m"
"          Rainfall losses      43.648      10.724      25.441      mm"
"          Runoff depth      24.618      57.542      42.825      mm"
"          Runoff volume      14.64      42.32      56.96      c.m"
"          Runoff coefficient      0.361      0.843      0.627      "
"          Maximum flow      0.009      0.033      0.038      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4  Add Runoff "
"          0.038      0.038      0.090      0.441"
" 40      HYDROGRAPH Copy to Outflow"
"          8  Copy to Outflow"
"          0.038      0.038      0.038      0.441"
" 40      HYDROGRAPH  Combine  1"
"          6  Combine "
"          1  Node #"
"          To W.R.7"
"          Maximum flow      0.460      c.m/sec"
"          Hydrograph volume      1861.807      c.m"

```

```

"          0.038      0.038      0.038      0.460"
" 40      HYDROGRAPH Start - New Tributary"
"          2      Start - New Tributary"
"          0.038      0.000      0.038      0.460"
" 33      CATCHMENT 204"
"          1      Triangular SCS"
"          1      Equal length"
"          1      SCS method"
"          204      Uncontrolled to Wetland A (Southwest)"
" 48.100      % Impervious"
"          0.763      Total Area"
" 20.000      Flow length"
"          3.000      Overland Slope"
"          0.396      Pervious Area"
" 20.000      Pervious length"
"          3.000      Pervious slope"
"          0.367      Impervious Area"
" 20.000      Impervious length"
"          3.000      Impervious slope"
"          0.250      Pervious Manning 'n'"
" 75.000      Pervious SCS Curve No."
"          0.360      Pervious Runoff coefficient"
"          0.100      Pervious Ia/S coefficient"
"          8.467      Pervious Initial abstraction"
"          0.015      Impervious Manning 'n'"
" 98.000      Impervious SCS Curve No."
"          0.902      Impervious Runoff coefficient"
"          0.100      Impervious Ia/S coefficient"
"          0.518      Impervious Initial abstraction"
"          0.180      0.000      0.038      0.460 c.m/sec"
"          Catchment 204      Pervious      Impervious      Total Area      "
"          Surface Area      0.396      0.367      0.763      hectare"
"          Time of concentration      9.805      1.200      3.791      minutes"
"          Time to Centroid      106.838      86.241      92.443      minutes"
"          Rainfall depth      68.266      68.266      68.266      mm"
"          Rainfall volume      270.33      250.54      520.87      c.m"
"          Rainfall losses      43.673      6.675      25.877      mm"
"          Runoff depth      24.593      61.591      42.389      mm"
"          Runoff volume      97.39      226.04      323.43      c.m"
"          Runoff coefficient      0.360      0.902      0.621      "
"          Maximum flow      0.050      0.167      0.180      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4      Add Runoff "
"          0.180      0.180      0.038      0.460"
" 40      HYDROGRAPH Copy to Outflow"
"          8      Copy to Outflow"
"          0.180      0.180      0.180      0.460"
" 40      HYDROGRAPH Combine      2"
"          6      Combine "
"          2      Node #"

```

"		Total Site Area"			
"		Maximum flow	0.180	c.m/sec"	
"		Hydrograph volume	323.428	c.m"	
"		0.180	0.180	0.180	0.180"
" 40		HYDROGRAPH Start - New Tributary"			
"		2	Start - New Tributary"		
"		0.180	0.000	0.180	0.180"
" 33		CATCHMENT 205"			
"		1	Triangular SCS"		
"		1	Equal length"		
"		1	SCS method"		
"		205	Uncontrolled Area to Wetland B (Northwest)"		
"	37.500	% Impervious"			
"	0.249	Total Area"			
"	20.000	Flow length"			
"	3.000	Overland Slope"			
"	0.156	Pervious Area"			
"	20.000	Pervious length"			
"	3.000	Pervious slope"			
"	0.093	Impervious Area"			
"	20.000	Impervious length"			
"	3.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	75.000	Pervious SCS Curve No."			
"	0.360	Pervious Runoff coefficient"			
"	0.100	Pervious Ia/S coefficient"			
"	8.467	Pervious Initial abstraction"			
"	0.015	Impervious Manning 'n'"			
"	98.000	Impervious SCS Curve No."			
"	0.902	Impervious Runoff coefficient"			
"	0.100	Impervious Ia/S coefficient"			
"	0.518	Impervious Initial abstraction"			
"		0.048	0.000	0.180	0.180 c.m/sec"
"		Catchment 205	Pervious	Impervious	Total Area "
"		Surface Area	0.156	0.093	0.249 hectare"
"		Time of concentration	9.805	1.200	4.638 minutes"
"		Time to Centroid	106.838	86.241	94.471 minutes"
"		Rainfall depth	68.266	68.266	68.266 mm"
"		Rainfall volume	106.24	63.74	169.98 c.m"
"		Rainfall losses	43.673	6.675	29.799 mm"
"		Runoff depth	24.593	61.591	38.467 mm"
"		Runoff volume	38.27	57.51	95.78 c.m"
"		Runoff coefficient	0.360	0.902	0.563 "
"		Maximum flow	0.020	0.042	0.048 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"		4	Add Runoff "		
"		0.048	0.048	0.180	0.180"
" 40		HYDROGRAPH Copy to Outflow"			
"		8	Copy to Outflow"		
"		0.048	0.048	0.048	0.180"



" 40	HYDROGRAPH	Combine	2"		
"	6	Combine "			
"	2	Node #"			
"		Total Site Area"			
"		Maximum flow	0.227	c.m/sec"	
"		Hydrograph volume	419.211	c.m"	
"		0.048 0.048	0.048	0.227"	
" 40	HYDROGRAPH	Confluence	1"		
"	7	Confluence "			
"	1	Node #"			
"		To W.R.7"			
"		Maximum flow	0.460	c.m/sec"	
"		Hydrograph volume	1861.807	c.m"	
"		0.048 0.460	0.048	0.000"	
" 40	HYDROGRAPH	Copy to Outflow"			
"	8	Copy to Outflow"			
"		0.048 0.460	0.460	0.000"	
" 40	HYDROGRAPH	Combine	2"		
"	6	Combine "			
"	2	Node #"			
"		Total Site Area"			
"		Maximum flow	0.630	c.m/sec"	
"		Hydrograph volume	2281.017	c.m"	
"		0.048 0.460	0.460	0.630"	
" 38	START/RE-START	TOTALS 1"			
"	3	Runoff Totals on EXIT"			
"		Total Catchment area	4.458	hectare"	
"		Total Impervious area	3.191	hectare"	
"		Total % impervious	71.582"		
" 19	EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                          Q:\51060\100\Preliminary Design\SWM\
"                                               FS-SWM Report\Post"
"          Output filename:                     50YR - POST B.out"
"          Licensee name:                       A"
"          Company                              "
"          Date & Time last used:               4/27/2023 at 3:25:20 PM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          180.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          3886.000 Coefficient A"
"          16.000  Constant B"
"          0.950  Exponent C"
"          0.400  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity      215.802  mm/hr"
"          Total depth            77.647  mm"
"          5  50hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 201"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          201 Controlled Area to W.R.7 (Southeast)"
"          81.200 % Impervious"
"          3.043  Total Area"
"          30.000 Flow length"
"          2.000  Overland Slope"
"          0.572  Pervious Area"
"          30.000 Pervious length"
"          2.000  Pervious slope"
"          2.471  Impervious Area"
"          30.000 Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          75.000 Pervious SCS Curve No."
"          0.399  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"
"          8.467  Pervious Initial abstraction"
"          0.015  Impervious Manning 'n'"
"          98.000 Impervious SCS Curve No."
"          0.919  Impervious Runoff coefficient"
"          0.100  Impervious Ia/S coefficient"
"          0.518  Impervious Initial abstraction"

```

```

"          1.263      0.000      0.000      0.000 c.m/sec"
"      Catchment 201          Pervious  Impervious Total Area  "
"      Surface Area          0.572      2.471      3.043      hectare"
"      Time of concentration 12.814      1.644      2.665      minutes"
"      Time to Centroid     109.664      86.432      88.556      minutes"
"      Rainfall depth       77.647      77.647      77.647      mm"
"      Rainfall volume      444.21      1918.60      2362.81      c.m"
"      Rainfall losses      46.643      6.306      13.889      mm"
"      Runoff depth         31.004      71.341      63.758      mm"
"      Runoff volume        177.37      1762.79      1940.15      c.m"
"      Runoff coefficient   0.399      0.919      0.821      "
"      Maximum flow        0.081      1.246      1.263      c.m/sec"
" 40      HYDROGRAPH Add Runoff  "
"      4      Add Runoff  "
"          1.263      1.263      0.000      0.000"
" 54      POND DESIGN"
"      1.263      Current peak flow      c.m/sec"
"      0.708      Target outflow      c.m/sec"
"      1940.2      Hydrograph volume      c.m"
"      4.      Number of stages"
"      399.000      Minimum water level      metre"
"      402.190      Maximum water level      metre"
"      399.000      Starting water level      metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"          Level Discharge      Volume"
"      399.000      0.000      0.000"
"      399.300      0.05381      1.01E-05"
"      401.000      0.5991      998.150"
"      402.190      0.8054      998.150"
"      1.      OUTFLOW PIPE"
"          Upstream Downstr'm      Pipe      Pipe      Manning      Entry"
"          invert      invert      Length      Diameter      'n'      loss Ke"
"      399.000      398.800      20.000      0.525      0.013      0.500"
"      Peak outflow          0.477      c.m/sec"
"      Maximum level          400.619      metre"
"      Maximum storage          774.437      c.m"
"      Centroidal lag          1.851      hours"
"          1.263      1.263      0.477      0.000 c.m/sec"
" 40      HYDROGRAPH Combine  1"
"      6      Combine  "
"      1      Node #"
"          To W.R.7"
"      Maximum flow          0.477      c.m/sec"
"      Hydrograph volume          1942.805      c.m"
"          1.263      1.263      0.477      0.477"
" 40      HYDROGRAPH Start - New Tributary"
"      2      Start - New Tributary"
"          1.263      0.000      0.477      0.477"
" 33      CATCHMENT 202"
"      1      Triangular SCS"

```

```

"          1 Equal length"
"          1 SCS method"
"         202 Uncontrolled Area to W.R.7 (Southeast)"
" 69.000 % Impervious"
"   0.270 Total Area"
"   5.000 Flow length"
"   2.000 Overland Slope"
"   0.084 Pervious Area"
"   5.000 Pervious length"
"   2.000 Pervious slope"
"   0.186 Impervious Area"
"   5.000 Impervious length"
"   2.000 Impervious slope"
"   0.250 Pervious Manning 'n'"
" 75.000 Pervious SCS Curve No."
"   0.397 Pervious Runoff coefficient"
"   0.100 Pervious Ia/S coefficient"
"   8.467 Pervious Initial abstraction"
"   0.015 Impervious Manning 'n'"
" 98.000 Impervious SCS Curve No."
"   0.844 Impervious Runoff coefficient"
"   0.100 Impervious Ia/S coefficient"
"   0.518 Impervious Initial abstraction"
"           0.104   0.000   0.477   0.477 c.m/sec"
"      Catchment 202      Pervious  Impervious Total Area  "
"      Surface Area      0.084      0.186      0.270      hectare"
"      Time of concentration 4.373      0.561      1.226      minutes"
"      Time to Centroid 99.145      85.312      87.724      minutes"
"      Rainfall depth 77.647      77.647      77.647      mm"
"      Rainfall volume 64.99      144.66      209.65      c.m"
"      Rainfall losses 46.830      12.078      22.851      mm"
"      Runoff depth 30.817      65.569      54.796      mm"
"      Runoff volume 25.79      122.16      147.95      c.m"
"      Runoff coefficient 0.397      0.844      0.706      "
"      Maximum flow 0.017      0.094      0.104      c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"           0.104   0.104   0.477   0.477"
" 40 HYDROGRAPH Copy to Outflow"
"      8 Copy to Outflow"
"           0.104   0.104   0.104   0.477"
" 40 HYDROGRAPH Combine 1"
"      6 Combine "
"      1 Node #"
"      To W.R.7"
"      Maximum flow           0.508   c.m/sec"
"      Hydrograph volume           2090.755   c.m"
"           0.104   0.104   0.104   0.508"
" 40 HYDROGRAPH Start - New Tributary"
"      2 Start - New Tributary"

```

```

"          0.104      0.000      0.104      0.508"
" 33      CATCHMENT 203"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          203  Uncontrolled to W.R.7 (Northeast)"
" 55.300  % Impervious"
"          0.133  Total Area"
"          5.000  Flow length"
"          2.000  Overland Slope"
"          0.059  Pervious Area"
"          5.000  Pervious length"
"          2.000  Pervious slope"
"          0.074  Impervious Area"
"          5.000  Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
" 75.000  Pervious SCS Curve No."
"          0.397  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"
"          8.467  Pervious Initial abstraction"
"          0.015  Impervious Manning 'n'"
" 98.000  Impervious SCS Curve No."
"          0.844  Impervious Runoff coefficient"
"          0.100  Impervious Ia/S coefficient"
"          0.518  Impervious Initial abstraction"
"          0.044      0.000      0.104      0.508 c.m/sec"
"          Catchment 203      Pervious      Impervious      Total Area  "
"          Surface Area      0.059      0.074      0.133      hectare"
"          Time of concentration  4.373      0.561      1.611      minutes"
"          Time to Centroid      99.145      85.312      89.121      minutes"
"          Rainfall depth      77.647      77.647      77.647      mm"
"          Rainfall volume      46.16      57.11      103.27      c.m"
"          Rainfall losses      46.830      12.078      27.612      mm"
"          Runoff depth      30.817      65.569      50.035      mm"
"          Runoff volume      18.32      48.23      66.55      c.m"
"          Runoff coefficient      0.397      0.844      0.644      "
"          Maximum flow      0.012      0.037      0.044      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4  Add Runoff "
"          0.044      0.044      0.104      0.508"
" 40      HYDROGRAPH Copy to Outflow"
"          8  Copy to Outflow"
"          0.044      0.044      0.044      0.508"
" 40      HYDROGRAPH  Combine  1"
"          6  Combine "
"          1  Node #"
"          To W.R.7"
"          Maximum flow      0.530      c.m/sec"
"          Hydrograph volume      2157.302      c.m"

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```

"          0.044      0.044      0.044      0.530"
" 40      HYDROGRAPH Start - New Tributary"
"          2      Start - New Tributary"
"          0.044      0.000      0.044      0.530"
" 33      CATCHMENT 204"
"          1      Triangular SCS"
"          1      Equal length"
"          1      SCS method"
"          204    Uncontrolled to Wetland A (Southwest)"
" 48.100    % Impervious"
"          0.763    Total Area"
" 20.000    Flow length"
"          3.000    Overland Slope"
"          0.396    Pervious Area"
" 20.000    Pervious length"
"          3.000    Pervious slope"
"          0.367    Impervious Area"
" 20.000    Impervious length"
"          3.000    Impervious slope"
"          0.250    Pervious Manning 'n'"
" 75.000    Pervious SCS Curve No."
"          0.399    Pervious Runoff coefficient"
"          0.100    Pervious Ia/S coefficient"
"          8.467    Pervious Initial abstraction"
"          0.015    Impervious Manning 'n'"
" 98.000    Impervious SCS Curve No."
"          0.908    Impervious Runoff coefficient"
"          0.100    Impervious Ia/S coefficient"
"          0.518    Impervious Initial abstraction"
"          0.210      0.000      0.044      0.530 c.m/sec"
"          Catchment 204          Pervious    Impervious Total Area "
"          Surface Area          0.396      0.367      0.763      hectare"
"          Time of concentration  8.896      1.142      3.634      minutes"
"          Time to Centroid      104.745    85.791    91.882    minutes"
"          Rainfall depth        77.647    77.647    77.647    mm"
"          Rainfall volume       307.48    284.97    592.45    c.m"
"          Rainfall losses       46.691    7.111     27.653    mm"
"          Runoff depth          30.956    70.537    49.995    mm"
"          Runoff volume         122.59    258.87    381.46    c.m"
"          Runoff coefficient     0.399     0.908     0.644     "
"          Maximum flow          0.066     0.190     0.210     c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4      Add Runoff "
"          0.210      0.210      0.044      0.530"
" 40      HYDROGRAPH Copy to Outflow"
"          8      Copy to Outflow"
"          0.210      0.210      0.210      0.530"
" 40      HYDROGRAPH Combine 2"
"          6      Combine "
"          2      Node #"

```

"		Total Site Area"			
"		Maximum flow	0.210		c.m/sec"
"		Hydrograph volume	381.459		c.m"
"		0.210	0.210	0.210	0.210"
" 40		HYDROGRAPH Start - New Tributary"			
"		2 Start - New Tributary"			
"		0.210	0.000	0.210	0.210"
" 33		CATCHMENT 205"			
"		1 Triangular SCS"			
"		1 Equal length"			
"		1 SCS method"			
"		205 Uncontrolled Area to Wetland B (Northwest)"			
"	37.500	% Impervious"			
"	0.249	Total Area"			
"	20.000	Flow length"			
"	3.000	Overland Slope"			
"	0.156	Pervious Area"			
"	20.000	Pervious length"			
"	3.000	Pervious slope"			
"	0.093	Impervious Area"			
"	20.000	Impervious length"			
"	3.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	75.000	Pervious SCS Curve No."			
"	0.399	Pervious Runoff coefficient"			
"	0.100	Pervious Ia/S coefficient"			
"	8.467	Pervious Initial abstraction"			
"	0.015	Impervious Manning 'n'"			
"	98.000	Impervious SCS Curve No."			
"	0.908	Impervious Runoff coefficient"			
"	0.100	Impervious Ia/S coefficient"			
"	0.518	Impervious Initial abstraction"			
"		0.056	0.000	0.210	0.210 c.m/sec"
"		Catchment 205	Pervious	Impervious	Total Area "
"		Surface Area	0.156	0.093	0.249 hectare"
"		Time of concentration	8.896	1.142	4.418 minutes"
"		Time to Centroid	104.745	85.791	93.798 minutes"
"		Rainfall depth	77.647	77.647	77.647 mm"
"		Rainfall volume	120.84	72.50	193.34 c.m"
"		Rainfall losses	46.691	7.111	31.848 mm"
"		Runoff depth	30.956	70.537	45.799 mm"
"		Runoff volume	48.18	65.86	114.04 c.m"
"		Runoff coefficient	0.399	0.908	0.590 "
"		Maximum flow	0.026	0.048	0.056 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"		4 Add Runoff "			
"		0.056	0.056	0.210	0.210"
" 40		HYDROGRAPH Copy to Outflow"			
"		8 Copy to Outflow"			
"		0.056	0.056	0.056	0.210"

" 40	HYDROGRAPH	Combine	2"		
"	6	Combine "			
"	2	Node #"			
"		Total Site Area"			
"		Maximum flow	0.266	c.m/sec"	
"		Hydrograph volume	495.499	c.m"	
"		0.056 0.056	0.056	0.266"	
" 40	HYDROGRAPH	Confluence	1"		
"	7	Confluence "			
"	1	Node #"			
"		To W.R.7"			
"		Maximum flow	0.530	c.m/sec"	
"		Hydrograph volume	2157.302	c.m"	
"		0.056 0.530	0.056	0.000"	
" 40	HYDROGRAPH	Copy to Outflow"			
"	8	Copy to Outflow"			
"		0.056 0.530	0.530	0.000"	
" 40	HYDROGRAPH	Combine	2"		
"	6	Combine "			
"	2	Node #"			
"		Total Site Area"			
"		Maximum flow	0.739	c.m/sec"	
"		Hydrograph volume	2652.801	c.m"	
"		0.056 0.530	0.530	0.739"	
" 38	START/RE-START	TOTALS 1"			
"	3	Runoff Totals on EXIT"			
"		Total Catchment area	4.458	hectare"	
"		Total Impervious area	3.191	hectare"	
"		Total % impervious	71.582"		
" 19	EXIT"				



```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                         Q:\51060\100\Preliminary Design\SWM\
"                                               FS-SWM Report\Post"
"          Output filename:                    100YR - POST B.out"
"          Licensee name:                      A"
"          Company                             "
"          Date & Time last used:              4/27/2023 at 3:05:48 PM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          180.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          4688.000 Coefficient A"
"          17.000  Constant B"
"          0.962  Exponent C"
"          0.400  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          239.354  mm/hr"
"          Total depth                87.079  mm"
"          6  100hyd  Hydrograph extension used in this file"
" 33      CATCHMENT 201"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          201  Controlled Area to W.R.7 (Southeast)"
"          81.200  % Impervious"
"          3.043  Total Area"
"          30.000  Flow length"
"          2.000  Overland Slope"
"          0.572  Pervious Area"
"          30.000  Pervious length"
"          2.000  Pervious slope"
"          2.471  Impervious Area"
"          30.000  Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          75.000  Pervious SCS Curve No."
"          0.433  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"
"          8.467  Pervious Initial abstraction"
"          0.015  Impervious Manning 'n'"
"          98.000  Impervious SCS Curve No."
"          0.925  Impervious Runoff coefficient"
"          0.100  Impervious Ia/S coefficient"
"          0.518  Impervious Initial abstraction"

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```

"          1.424      0.000      0.000      0.000 c.m/sec"
"      Catchment 201          Pervious  Impervious Total Area  "
"      Surface Area          0.572      2.471      3.043      hectare"
"      Time of concentration  11.813      1.575      2.576      minutes"
"      Time to Centroid      107.624      86.014      88.128      minutes"
"      Rainfall depth        87.079      87.079      87.079      mm"
"      Rainfall volume       498.17      2151.65      2649.82      c.m"
"      Rainfall losses       49.356      6.504      14.560      mm"
"      Runoff depth          37.723      80.575      72.519      mm"
"      Runoff volume         215.81      1990.94      2206.75      c.m"
"      Runoff coefficient     0.433      0.925      0.833      "
"      Maximum flow          0.103      1.399      1.424      c.m/sec"
" 40      HYDROGRAPH Add Runoff  "
"      4  Add Runoff  "
"          1.424      1.424      0.000      0.000"
" 54      POND DESIGN"
"      1.424  Current peak flow  c.m/sec"
"      0.708  Target outflow  c.m/sec"
"      2206.7  Hydrograph volume  c.m"
"      4.  Number of stages"
"      399.000  Minimum water level  metre"
"      402.190  Maximum water level  metre"
"      399.000  Starting water level  metre"
"      0  Keep Design Data: 1 = True; 0 = False"
"      Level Discharge  Volume"
"      399.000  0.000  0.000"
"      399.300  0.05381  1.01E-05"
"      401.000  0.5991  998.150"
"      402.190  0.8054  998.150"
"      1.  OUTFLOW PIPE"
"      Upstream Downstr'm  Pipe  Pipe  Manning  Entry"
"      invert  invert  Length  Diameter  'n'  loss Ke"
"      399.000  398.800  20.000  0.525  0.013  0.500"
"      Peak outflow          0.542  c.m/sec"
"      Maximum level          400.822  metre"
"      Maximum storage          893.437  c.m"
"      Centroidal lag          1.850  hours"
"      1.424  1.424  0.542  0.000 c.m/sec"
" 40      HYDROGRAPH Combine  1"
"      6  Combine  "
"      1  Node #"
"      To W.R.7"
"      Maximum flow          0.542  c.m/sec"
"      Hydrograph volume          2199.769  c.m"
"      1.424  1.424  0.542  0.542"
" 40      HYDROGRAPH Start - New Tributary"
"      2  Start - New Tributary"
"      1.424  0.000  0.542  0.542"
" 33      CATCHMENT 202"
"      1  Triangular SCS"

```

```

"          1 Equal length"
"          1 SCS method"
"         202 Uncontrolled Area to W.R.7 (Southeast)"
" 69.000 % Impervious"
"   0.270 Total Area"
"   5.000 Flow length"
"   2.000 Overland Slope"
"   0.084 Pervious Area"
"   5.000 Pervious length"
"   2.000 Pervious slope"
"   0.186 Impervious Area"
"   5.000 Impervious length"
"   2.000 Impervious slope"
"   0.250 Pervious Manning 'n'"
" 75.000 Pervious SCS Curve No."
"   0.428 Pervious Runoff coefficient"
"   0.100 Pervious Ia/S coefficient"
"   8.467 Pervious Initial abstraction"
"   0.015 Impervious Manning 'n'"
" 98.000 Impervious SCS Curve No."
"   0.845 Impervious Runoff coefficient"
"   0.100 Impervious Ia/S coefficient"
"   0.518 Impervious Initial abstraction"
"           0.118   0.000   0.542   0.542 c.m/sec"
" Catchment 202      Pervious  Impervious Total Area "
" Surface Area      0.084      0.186      0.270      hectare"
" Time of concentration 4.031      0.538      1.186      minutes"
" Time to Centroid   97.986      84.961      87.377      minutes"
" Rainfall depth     87.079      87.079      87.079      mm"
" Rainfall volume    72.89       162.23      235.11      c.m"
" Rainfall losses    49.787      13.501      24.750      mm"
" Runoff depth       37.292      73.578      62.329      mm"
" Runoff volume      31.21       137.08      168.29      c.m"
" Runoff coefficient  0.428      0.845      0.716      "
" Maximum flow       0.021      0.105      0.118      c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"   4 Add Runoff "
"           0.118   0.118   0.542   0.542"
" 40 HYDROGRAPH Copy to Outflow"
"   8 Copy to Outflow"
"           0.118   0.118   0.118   0.542"
" 40 HYDROGRAPH Combine 1"
"   6 Combine "
"   1 Node #"
"     To W.R.7"
" Maximum flow           0.578   c.m/sec"
" Hydrograph volume      2368.058   c.m"
"           0.118   0.118   0.118   0.578"
" 40 HYDROGRAPH Start - New Tributary"
"   2 Start - New Tributary"

```

```

"          0.118      0.000      0.118      0.578"
" 33      CATCHMENT 203"
"          1  Triangular SCS"
"          1  Equal length"
"          1  SCS method"
"          203  Uncontrolled to W.R.7 (Northeast)"
" 55.300  % Impervious"
"          0.133  Total Area"
"          5.000  Flow length"
"          2.000  Overland Slope"
"          0.059  Pervious Area"
"          5.000  Pervious length"
"          2.000  Pervious slope"
"          0.074  Impervious Area"
"          5.000  Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
" 75.000  Pervious SCS Curve No."
"          0.428  Pervious Runoff coefficient"
"          0.100  Pervious Ia/S coefficient"
"          8.467  Pervious Initial abstraction"
"          0.015  Impervious Manning 'n'"
" 98.000  Impervious SCS Curve No."
"          0.845  Impervious Runoff coefficient"
"          0.100  Impervious Ia/S coefficient"
"          0.518  Impervious Initial abstraction"
"          0.051      0.000      0.118      0.578 c.m/sec"
"          Catchment 203          Pervious  Impervious  Total Area  "
"          Surface Area          0.059      0.074      0.133      hectare"
"          Time of concentration  4.031      0.538      1.553      minutes"
"          Time to Centroid      97.986     84.961     88.746     minutes"
"          Rainfall depth        87.079     87.079     87.079     mm"
"          Rainfall volume       51.77      64.05      115.82     c.m"
"          Rainfall losses       49.787     13.501     29.721     mm"
"          Runoff depth          37.292     73.578     57.358     mm"
"          Runoff volume         22.17      54.12      76.29      c.m"
"          Runoff coefficient     0.428     0.845     0.659      "
"          Maximum flow         0.015     0.041     0.051     c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4  Add Runoff "
"          0.051      0.051      0.118      0.578"
" 40      HYDROGRAPH Copy to Outflow"
"          8  Copy to Outflow"
"          0.051      0.051      0.051      0.578"
" 40      HYDROGRAPH  Combine  1"
"          6  Combine "
"          1  Node #"
"          To W.R.7"
"          Maximum flow          0.599     c.m/sec"
"          Hydrograph volume     2444.339  c.m"

```

```

"          0.051    0.051    0.051    0.599"
" 40    HYDROGRAPH Start - New Tributary"
"      2    Start - New Tributary"
"          0.051    0.000    0.051    0.599"
" 33    CATCHMENT 204"
"      1    Triangular SCS"
"      1    Equal length"
"      1    SCS method"
"      204    Uncontrolled to Wetland A (Southwest)"
" 48.100    % Impervious"
"      0.763    Total Area"
" 20.000    Flow length"
"      3.000    Overland Slope"
"      0.396    Pervious Area"
" 20.000    Pervious length"
"      3.000    Pervious slope"
"      0.367    Impervious Area"
" 20.000    Impervious length"
"      3.000    Impervious slope"
"      0.250    Pervious Manning 'n'"
" 75.000    Pervious SCS Curve No."
"      0.433    Pervious Runoff coefficient"
"      0.100    Pervious Ia/S coefficient"
"      8.467    Pervious Initial abstraction"
"      0.015    Impervious Manning 'n'"
" 98.000    Impervious SCS Curve No."
"      0.913    Impervious Runoff coefficient"
"      0.100    Impervious Ia/S coefficient"
"      0.518    Impervious Initial abstraction"
"          0.234    0.000    0.051    0.599 c.m/sec"
"      Catchment 204          Pervious    Impervious Total Area "
"      Surface Area          0.396    0.367    0.763    hectare"
"      Time of concentration  8.201    1.094    3.500    minutes"
"      Time to Centroid      103.149  85.421    91.423    minutes"
"      Rainfall depth        87.079    87.079    87.079    mm"
"      Rainfall volume        344.83    319.58    664.41    c.m"
"      Rainfall losses        49.353    7.562    29.252    mm"
"      Runoff depth           37.726    79.518    57.828    mm"
"      Runoff volume          149.39    291.83    441.23    c.m"
"      Runoff coefficient      0.433    0.913    0.664    "
"      Maximum flow           0.083    0.212    0.234    c.m/sec"
" 40    HYDROGRAPH Add Runoff "
"      4    Add Runoff "
"          0.234    0.234    0.051    0.599"
" 40    HYDROGRAPH Copy to Outflow"
"      8    Copy to Outflow"
"          0.234    0.234    0.234    0.599"
" 40    HYDROGRAPH Combine  2"
"      6    Combine "
"      2    Node #"

```

"		Total Site Area"			
"		Maximum flow	0.234		c.m/sec"
"		Hydrograph volume	441.225		c.m"
"		0.234	0.234	0.234	0.234"
" 40		HYDROGRAPH Start - New Tributary"			
"		2	Start - New Tributary"		
"		0.234	0.000	0.234	0.234"
" 33		CATCHMENT 205"			
"		1	Triangular SCS"		
"		1	Equal length"		
"		1	SCS method"		
"		205	Uncontrolled Area to Wetland B (Northwest)"		
"	37.500	% Impervious"			
"	0.249	Total Area"			
"	20.000	Flow length"			
"	3.000	Overland Slope"			
"	0.156	Pervious Area"			
"	20.000	Pervious length"			
"	3.000	Pervious slope"			
"	0.093	Impervious Area"			
"	20.000	Impervious length"			
"	3.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	75.000	Pervious SCS Curve No."			
"	0.433	Pervious Runoff coefficient"			
"	0.100	Pervious Ia/S coefficient"			
"	8.467	Pervious Initial abstraction"			
"	0.015	Impervious Manning 'n'"			
"	98.000	Impervious SCS Curve No."			
"	0.913	Impervious Runoff coefficient"			
"	0.100	Impervious Ia/S coefficient"			
"	0.518	Impervious Initial abstraction"			
"		0.070	0.000	0.234	0.234 c.m/sec"
"		Catchment 205	Pervious	Impervious	Total Area "
"		Surface Area	0.156	0.093	0.249 hectare"
"		Time of concentration	8.201	1.094	4.232 minutes"
"		Time to Centroid	103.149	85.421	93.249 minutes"
"		Rainfall depth	87.079	87.079	87.079 mm"
"		Rainfall volume	135.52	81.31	216.83 c.m"
"		Rainfall losses	49.353	7.562	33.681 mm"
"		Runoff depth	37.726	79.518	53.398 mm"
"		Runoff volume	58.71	74.25	132.96 c.m"
"		Runoff coefficient	0.433	0.913	0.613 "
"		Maximum flow	0.033	0.054	0.070 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"		4	Add Runoff "		
"		0.070	0.070	0.234	0.234"
" 40		HYDROGRAPH Copy to Outflow"			
"		8	Copy to Outflow"		
"		0.070	0.070	0.070	0.234"

" 40	HYDROGRAPH	Combine	2"		
"	6	Combine "			
"	2	Node #"			
"		Total Site Area"			
"		Maximum flow	0.299	c.m/sec"	
"		Hydrograph volume	574.186	c.m"	
"		0.070 0.070	0.070	0.299"	
" 40	HYDROGRAPH	Confluence	1"		
"	7	Confluence "			
"	1	Node #"			
"		To W.R.7"			
"		Maximum flow	0.599	c.m/sec"	
"		Hydrograph volume	2444.339	c.m"	
"		0.070 0.599	0.070	0.000"	
" 40	HYDROGRAPH	Copy to Outflow"			
"	8	Copy to Outflow"			
"		0.070 0.599	0.599	0.000"	
" 40	HYDROGRAPH	Combine	2"		
"	6	Combine "			
"	2	Node #"			
"		Total Site Area"			
"		Maximum flow	0.860	c.m/sec"	
"		Hydrograph volume	3018.530	c.m"	
"		0.070 0.599	0.599	0.860"	
" 38	START/RE-START	TOTALS	1"		
"	3	Runoff Totals on EXIT"			
"		Total Catchment area	4.458	hectare"	
"		Total Impervious area	3.191	hectare"	
"		Total % impervious	71.582"		
" 19	EXIT"				

# Appendix H

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## Stormceptor Sizing Output





Stormceptor® EF Sizing Report

**STORMCEPTOR®**

**ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION**

04/27/2023

Province:	Ontario
City:	Elora
Nearest Rainfall Station:	WATERLOO WELLINGTON AP
Climate Station Id:	6149387
Years of Rainfall Data:	34

Project Name:	350 Wellington Road 7
Project Number:	51060-100
Designer Name:	Tyler Arndt
Designer Company:	MTE Consultants
Designer Email:	tarndt@mte85.com
Designer Phone:	519-743-6500
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Site Name:	Catchment 201
------------	---------------

Drainage Area (ha):	3.043
% Imperviousness:	81.20

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):	90.76
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	52
EFO6	68
EFO8	78
<b>EFO10</b>	<b>84</b>
EFO12	88

**Recommended Stormceptor EFO Model: EFO10**  
**Estimated Net Annual Sediment (TSS) Load Reduction (%): 84**  
**Water Quality Runoff Volume Capture (%): > 90**

## Stormceptor® EF Sizing Report

### THIRD-PARTY TESTING AND VERIFICATION

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

### PERFORMANCE

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

### PARTICLE SIZE DISTRIBUTION (PSD)

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

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

Stormceptor®EF Sizing Report

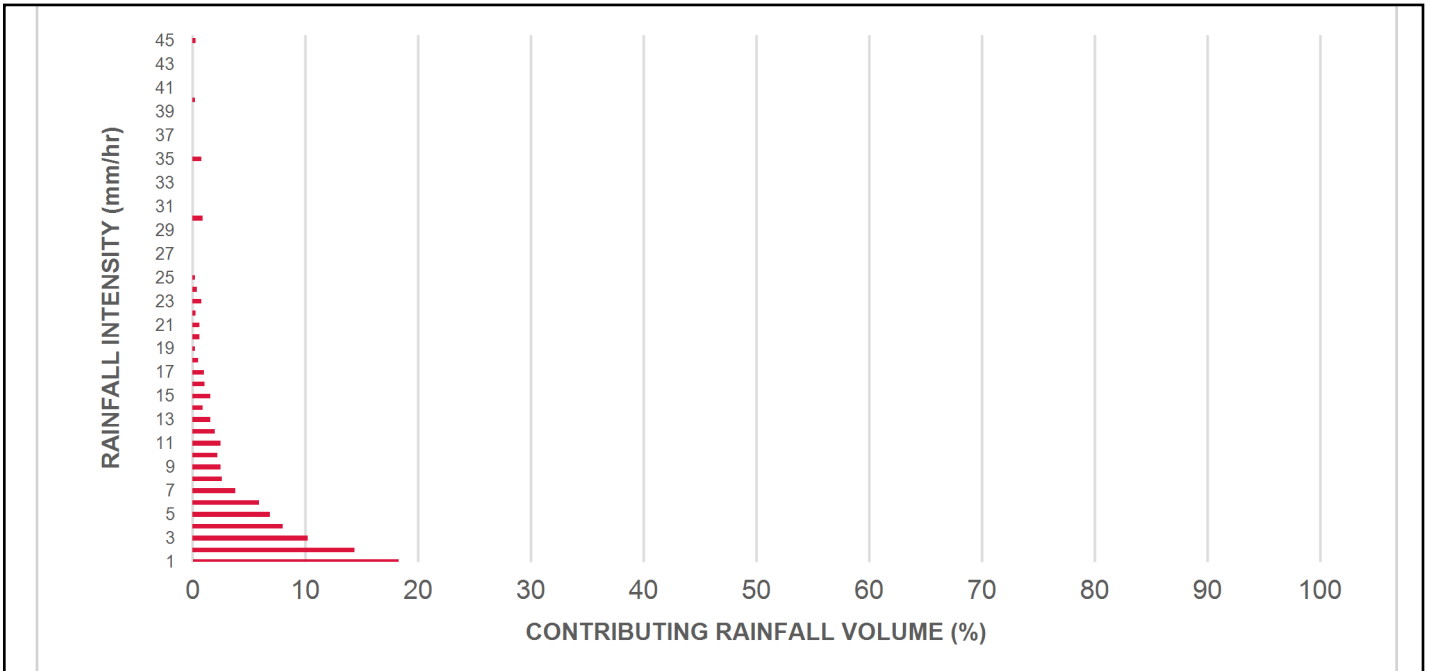
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m <sup>2</sup> )	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.5	8.5	3.33	200.0	27.0	100	8.5	8.5
1	18.3	26.8	6.66	400.0	55.0	100	18.3	26.8
2	14.4	41.3	13.32	799.0	109.0	95	13.7	40.5
3	10.2	51.5	19.98	1199.0	164.0	88	9.0	49.5
4	8.0	59.5	26.64	1598.0	219.0	83	6.6	56.1
5	6.9	66.4	33.30	1998.0	274.0	80	5.5	61.6
6	5.9	72.3	39.96	2397.0	328.0	78	4.6	66.2
7	3.8	76.1	46.62	2797.0	383.0	75	2.8	69.0
8	2.6	78.7	53.27	3196.0	438.0	72	1.9	70.9
9	2.5	81.1	59.93	3596.0	493.0	70	1.7	72.6
10	2.2	83.3	66.59	3996.0	547.0	67	1.5	74.1
11	2.5	85.8	73.25	4395.0	602.0	65	1.6	75.7
12	2.0	87.8	79.91	4795.0	657.0	64	1.3	77.0
13	1.6	89.4	86.57	5194.0	712.0	64	1.0	78.0
14	0.9	90.4	93.23	5594.0	766.0	63	0.6	78.6
15	1.6	91.9	99.89	5993.0	821.0	63	1.0	79.6
16	1.1	93.0	106.55	6393.0	876.0	63	0.7	80.3
17	1.0	94.0	113.21	6793.0	930.0	62	0.6	80.9
18	0.5	94.6	119.87	7192.0	985.0	62	0.3	81.3
19	0.2	94.8	126.53	7592.0	1040.0	61	0.1	81.4
20	0.6	95.4	133.19	7991.0	1095.0	59	0.4	81.8
21	0.6	96.1	139.85	8391.0	1149.0	58	0.4	82.1
22	0.3	96.4	146.51	8790.0	1204.0	57	0.2	82.3
23	0.8	97.2	153.17	9190.0	1259.0	56	0.5	82.8
24	0.4	97.6	159.82	9589.0	1314.0	54	0.2	83.0
25	0.2	97.8	166.48	9989.0	1368.0	53	0.1	83.1
30	0.9	98.7	199.78	11987.0	1642.0	45	0.4	83.5
35	0.8	99.5	233.08	13985.0	1916.0	38	0.3	83.8
40	0.2	99.7	266.37	15982.0	2189.0	33	0.1	83.9
45	0.3	100.0	299.67	17980.0	2463.0	30	0.1	84.0
<b>Estimated Net Annual Sediment (TSS) Load Reduction =</b>								<b>84 %</b>

Climate Station ID: 6149387 Years of Rainfall Data: 34

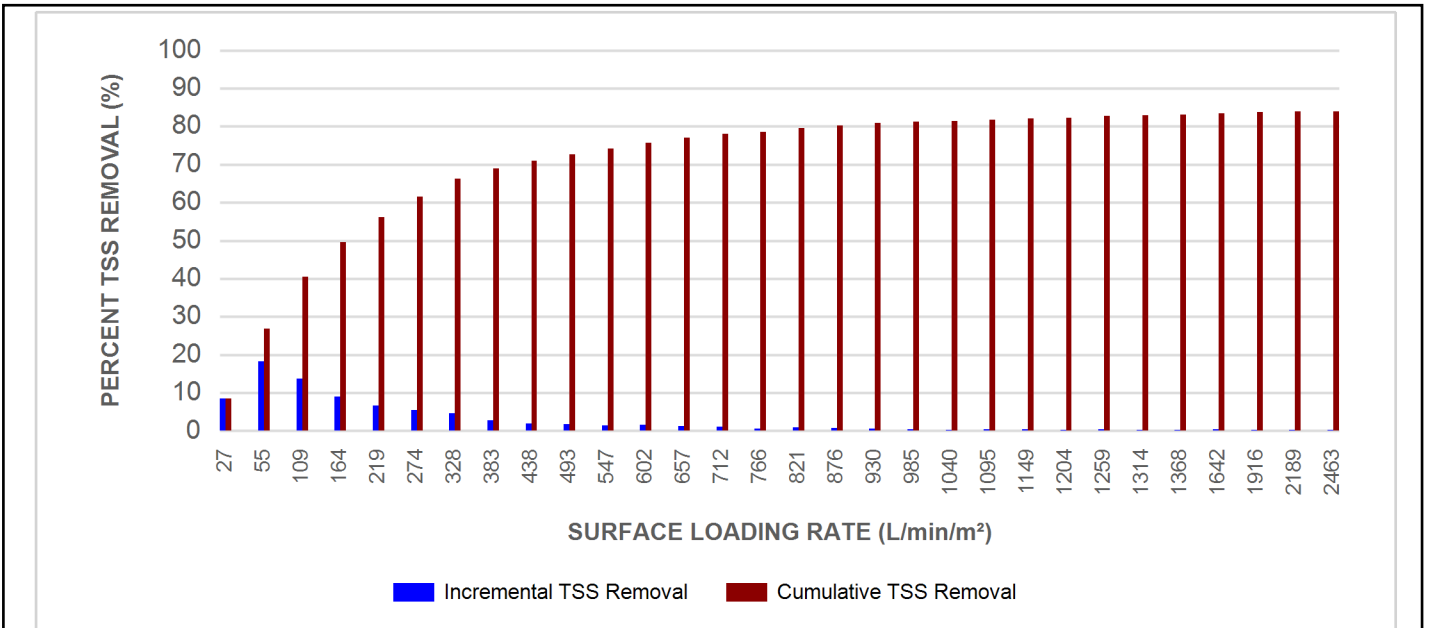


Stormceptor® EF Sizing Report

RAINFALL DATA FROM WATERLOO WELLINGTON AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Stormceptor® **EF** Sizing Report

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**

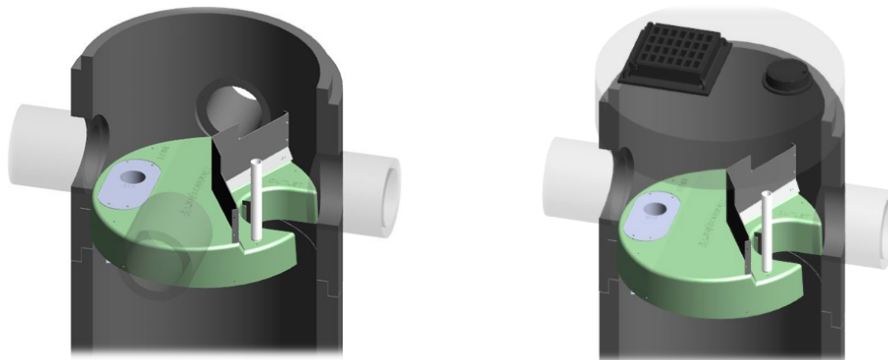
► Stormceptor® EF and EFO feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance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

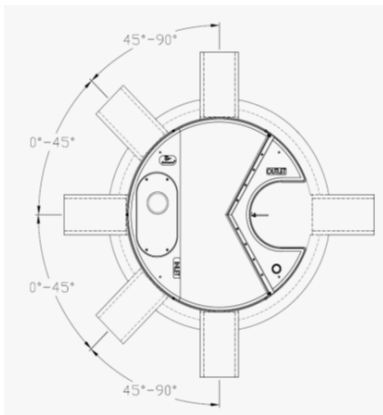
► Stormceptor® EF and EFO offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle,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



## Stormceptor® EF Sizing Report



### INLET-TO-OUTLET DROP

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

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

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

### HEAD LOSS

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

For submerged conditions the applicable K value is 3.0.

### Pollutant Capacity

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

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

### STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

### STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

Stormceptor® **EF** Sizing Report

**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 <sup>3</sup> sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m <sup>3</sup> sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m <sup>3</sup> sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m <sup>3</sup> sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m <sup>3</sup> 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





## Stormceptor® EF Sizing Report

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<sup>2</sup> to 1400 L/min/m<sup>2</sup>, 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<sup>2</sup> and 1400 L/min/m<sup>2</sup> 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<sup>2</sup> shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m<sup>2</sup>. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m<sup>2</sup>.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m<sup>2</sup> shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m<sup>2</sup>, and shall be calculated using a simple proportioning formula, with 1400 L/min/m<sup>2</sup> 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<sup>2</sup>.

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<sup>2</sup>.

### 3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

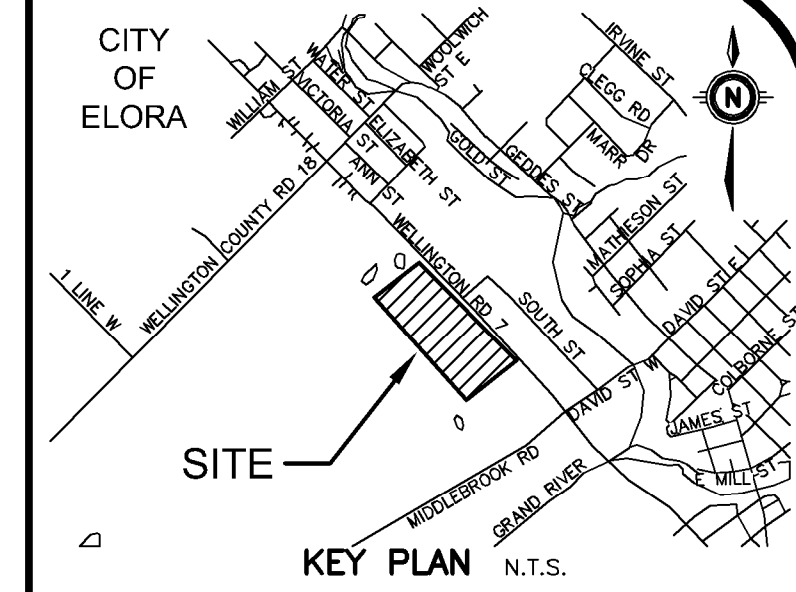
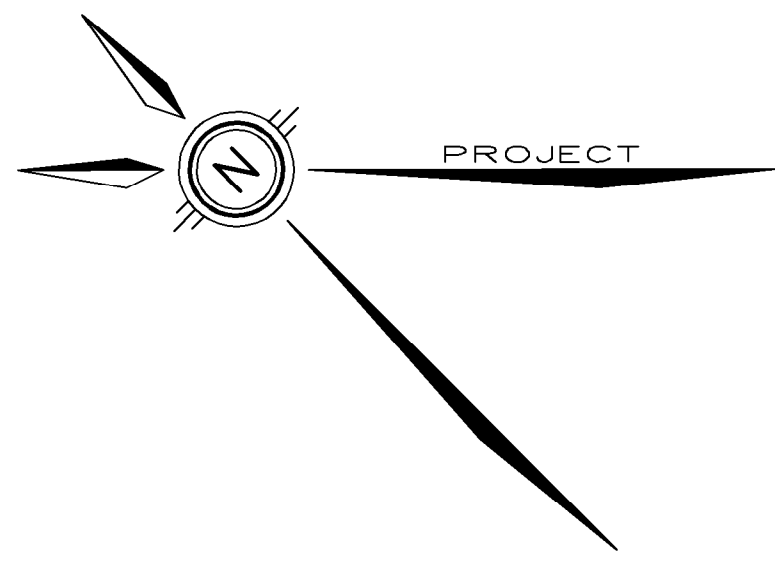
The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators**, with results reported within the Canadian ETV or ISO 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



## Stormceptor® EF Sizing Report

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<sup>2</sup> to 2600 L/min/m<sup>2</sup>) 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.



GEODETIC BM ELEV. = 387.982m  
 ELORA POST OFFICE, BOLT IN FRONT WALL, IN LINTEL OF CENTRE BASEMENT WINDOW. (HISTORICAL NUMBER 16U117E).

SITE BENCHMARK ELEV. = m

**NOTE TO CONTRACTOR :**  
 DO NOT SCALE DRAWINGS.  
 CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.  
 ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED OR REUSED WITHOUT THE ENGINEER'S WRITTEN PERMISSION.  
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2.	Revised per Township/County Comments	PWD 2023-04-27
1.	ISSUED WITH FS-SWM REPORT	PWD 2022-10-20
No.	REVISION	BY YYYY-MM-DD



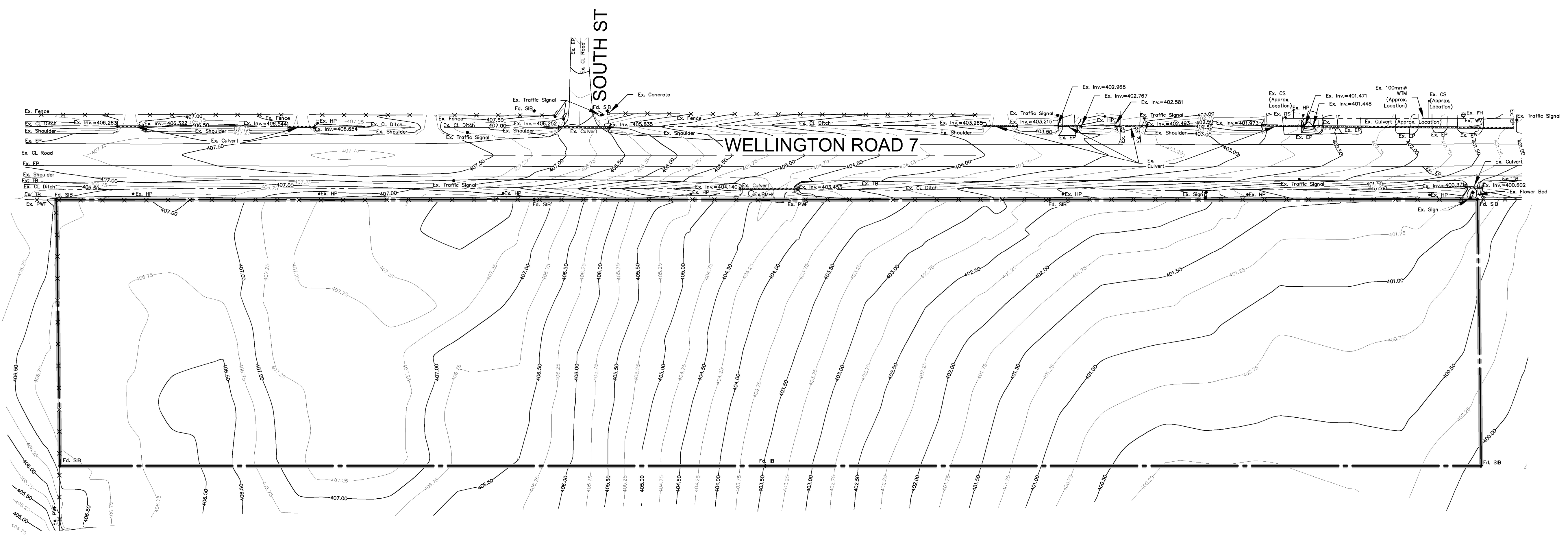
Engineers, Scientists, Surveyors

519-743-6500









OWNER  
**WE MERCHANDISE SPACE INC**  
 590 ALDEN ROAD MARKHAM  
 PROJECT  
**11 ACRE SITE OPA AND REZONING**  
 350 WELLINGTON ROAD 7 ELORA  
 DRAWING

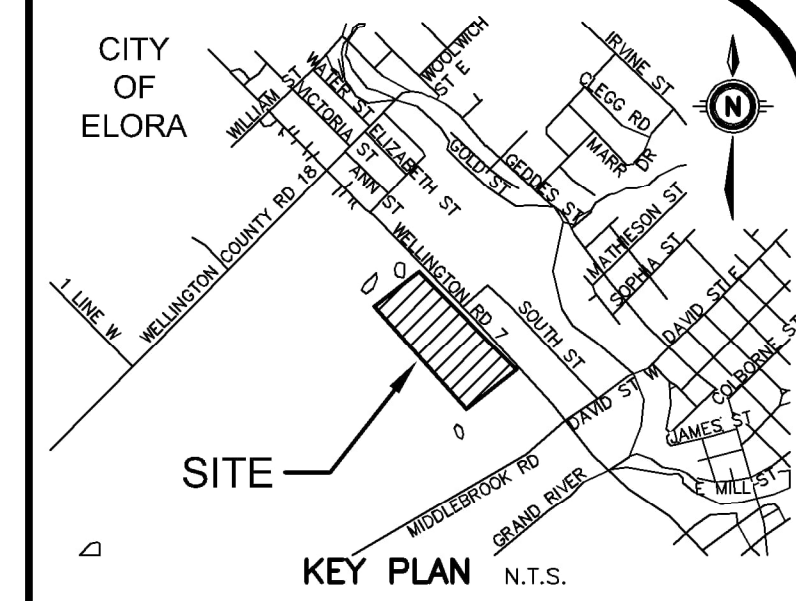
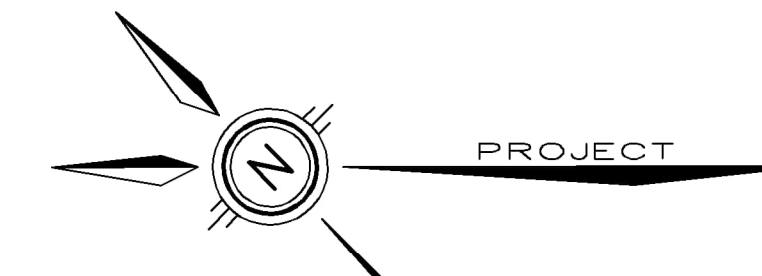
**EXISTING CONDITIONS PLAN**

Project Manager P. DOUGLAS	Project No. <b>51060-100</b>
Design By	Checked By
Drawn By BDW	Checked By
Surveyed By MTE	Drawing No.
Date Jul. 12/22	<b>C1.1</b>
Scale 1:750	Sheet 1 of 7



**LEGEND OF EXISTING FEATURES**

-  SITE BOUNDARY
-  EXISTING CONTOURS
-  EXISTING FENCE
-  EXISTING RIP RAP
-  EXISTING CULVERT
-  EX. 100mm WTM
-  EX. HYD. SET
-  EXISTING WATERMAIN



**GEODETIC BM** ELEV. = 387.982m  
ELORA POST OFFICE, BOLT IN FRONT WALL, IN LINE OF CENTRE BASEMENT WINDOW. (HISTORICAL NUMBER 16U117E).

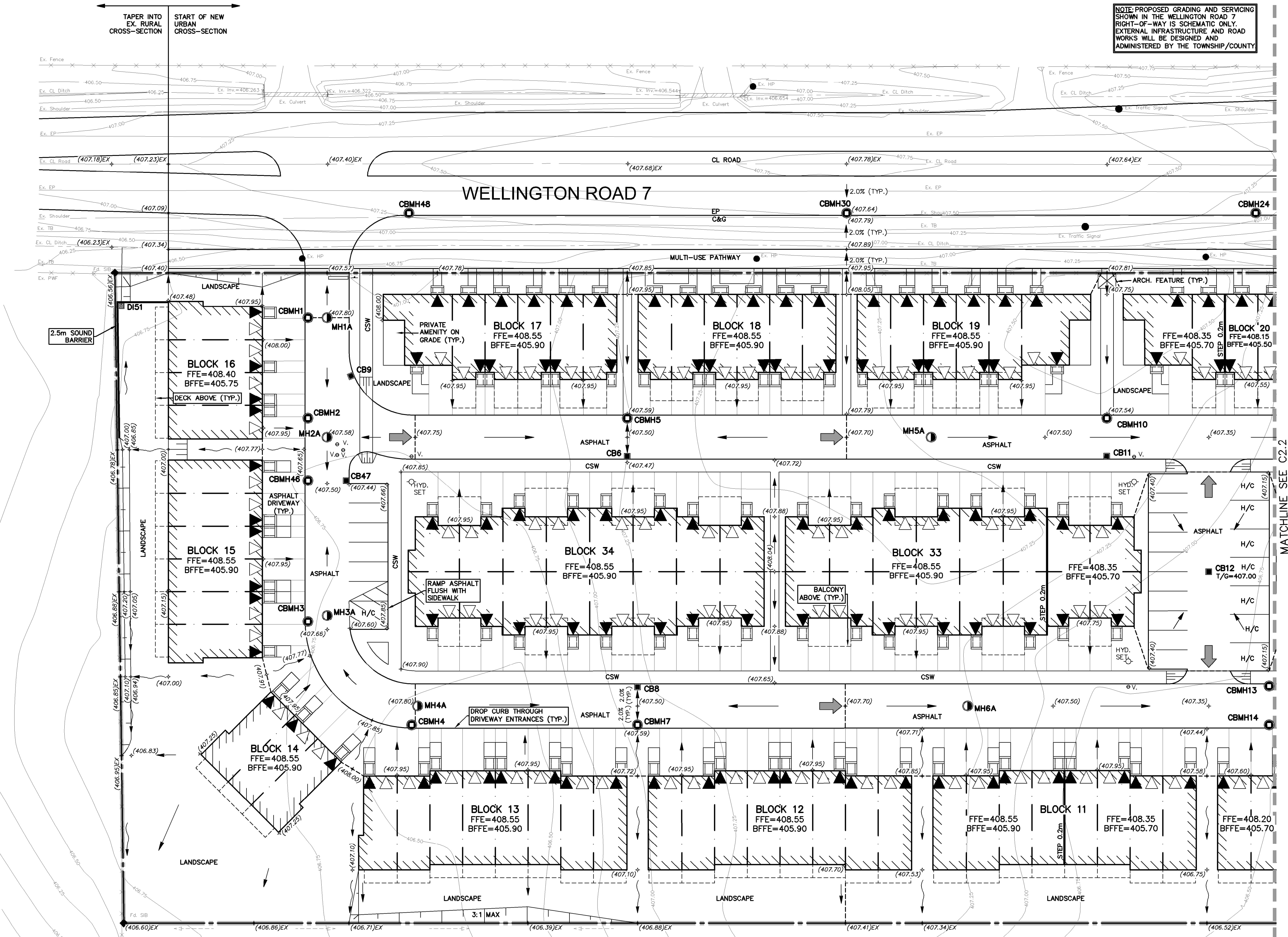
**SITE BENCHMARK** ELEV. = m

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**NOTE: PROPOSED GRADING AND SERVICING SHOWN IN THE WELLINGTON ROAD 7 RIGHT-OF-WAY IS SCHEMATIC ONLY. EXTERNAL INFRASTRUCTURE AND ROAD WORKS WILL BE DESIGNED AND ADMINISTERED BY THE TOWNSHIP/COUNTY**



**LEGEND OF EXISTING FEATURES**

- SITE BOUNDARY
- EXISTING CONTOURS
- - - EXISTING DIRECTION OF DRAINAGE
- EXISTING FENCE
- EXISTING RIP RAP
- EXISTING CULVERT

**LEGEND OF PROPOSED FEATURES**

- +(407.00) PROPOSED SPOT ELEVATIONS
- EX = MAINTAIN EXISTING
- T/G=407.00 = TOP OF CASTING/GRATE
- INV = INVERT ELEVATION
- FFE = FINISHED FLOOR ELEVATION
- DIRECTION OF DRAINAGE/SWALE
- DRAINAGE SPLIT (RIDGE)
- EMBANKMENT (SLOPE AS NOTED)
- PROPOSED BUILDING
- ▲ MAN DOOR
- △ OVERHEAD DOOR
- (DROP CURB) CONCRETE CURB
- RETAINING WALL
- OVERLAND FLOW ROUTE (MAJOR STORM)

**NOTE: SIDE AND REAR DOWNSPOUTS ON BLOCKS 13 AND 14, AND A PORTION OF BLOCKS 12 AND 15, ARE TO SPILL TO GRADE ULTIMATELY TO WETLAND B.**

**NOTE: SIDE AND REAR DOWNSPOUTS ON BLOCKS 1 TO 11, AND A PORTION OF BLOCK 12, ARE TO SPILL TO GRADE ULTIMATELY TO WETLAND A**

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2.	Revised per Township/County Comments	PWD 2023-04-27
1.	ISSUED WITH FS-SWM REPORT	PWD 2022-10-20
No.	REVISION	BY YYYY-MM-DD



519-743-6500

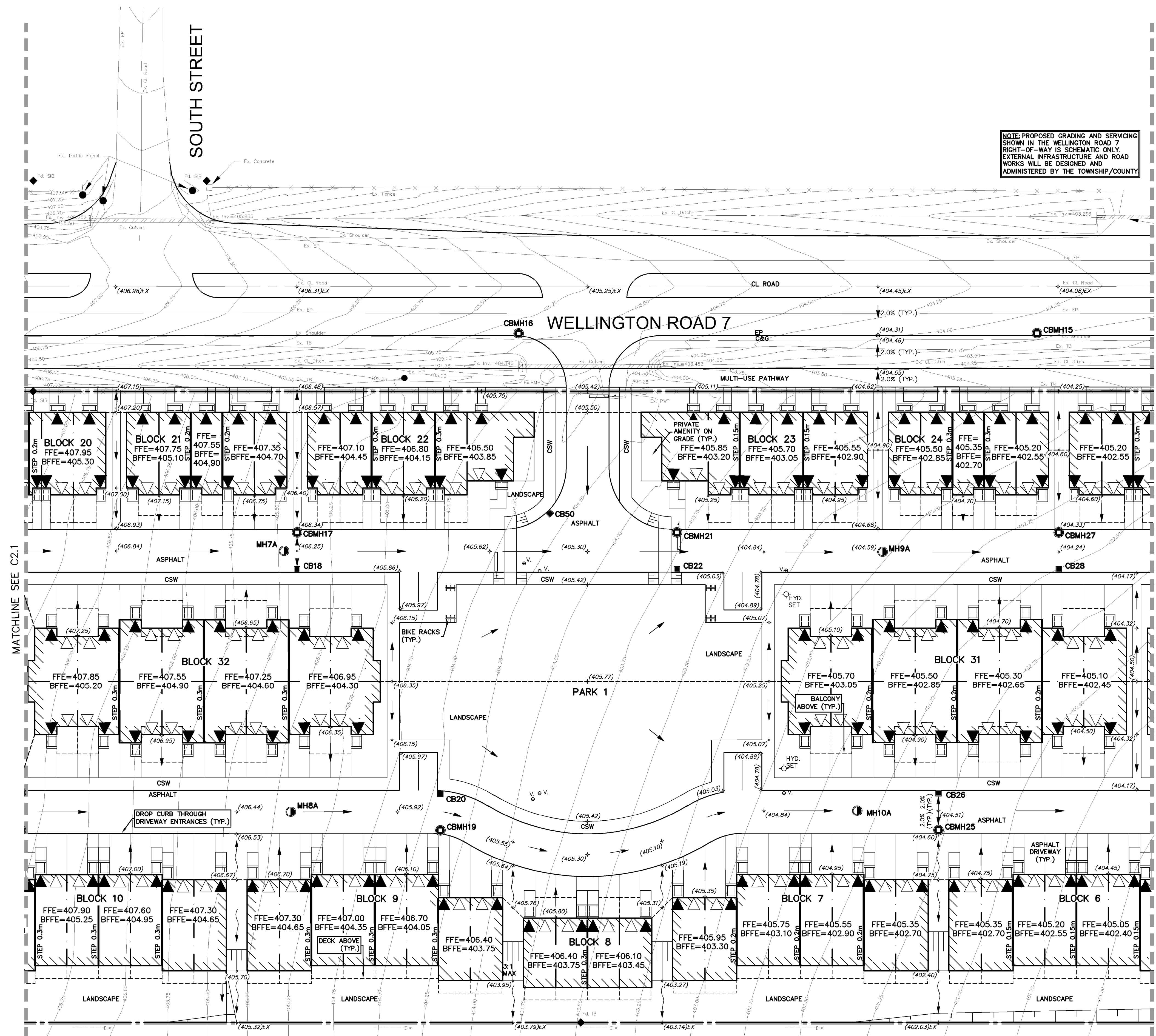
OWNER  
**WE MERCHANDISE SPACE INC**  
590 ALDEN ROAD MARKHAM

PROJECT  
**11 ACRE SITE OPA AND REZONING**  
350 WELLINGTON ROAD 7 ELORA

DRAWING  
**FUNCTIONAL GRADING PLAN #1**

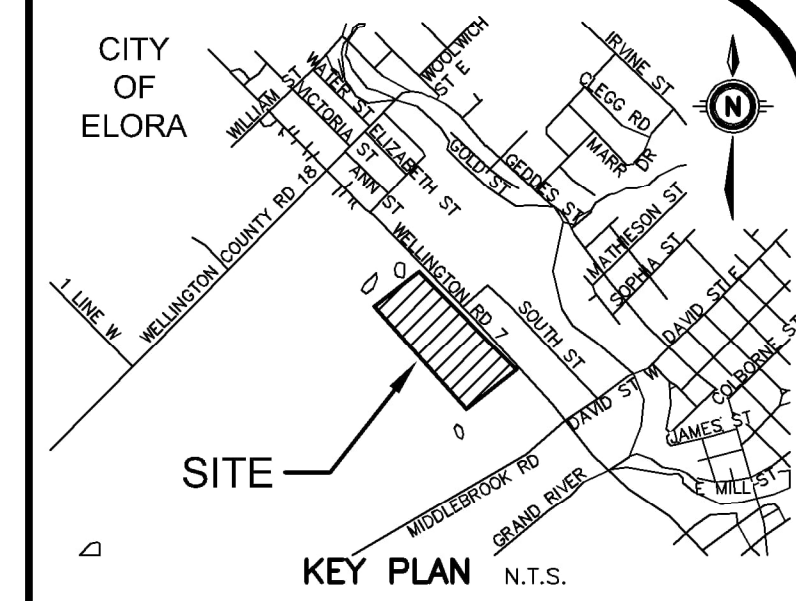
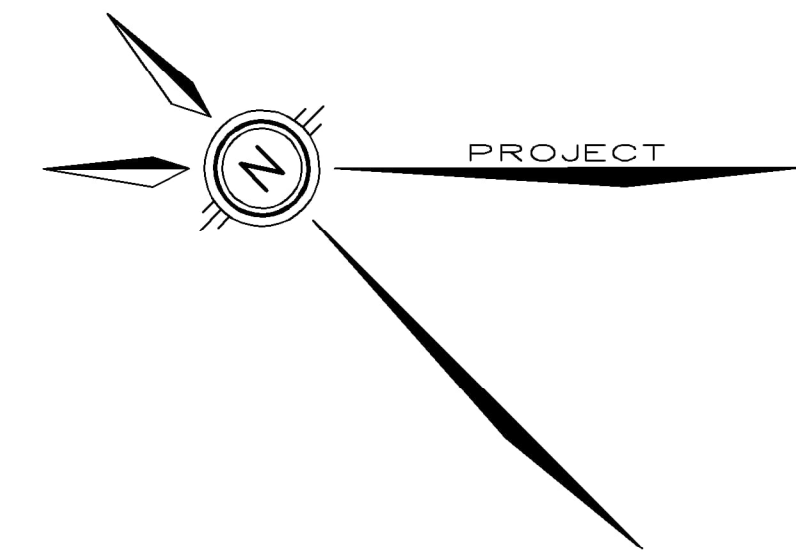
Project Manager	P. DOUGLAS	Project No.	51060-100
Design By	TMA	Checked By	LEI
Drawn By	BDW/APK	Checked By	TMA
Surveyed By	MTE	Drawing No.	C2.1
Date	Jul. 14/22	Scale	1:300
Scale	1:300	Sheet 2 of 7	





NOTE: PROPOSED GRADING AND SERVING SHOWN IN THE WELLINGTON ROAD 7 RIGHT-OF-WAY IS SCHEMATIC ONLY. EXTERNAL INFRASTRUCTURE AND ROAD WORKS WILL BE DESIGNED AND ADMINISTERED BY THE TOWNSHIP/COUNTY

NOTE: SIDE AND REAR DOWNSPOUTS ON BLOCKS 1 TO 11, AND A PORTION OF BLOCK 12, ARE TO SPILL TO GRADE ULTIMATELY TO WETLAND A



**GEODETIC BM** ELEV. = 387.982m  
 ELORA POST OFFICE, BOLT IN FRONT WALL, IN LINE OF CENTRE BASEMENT WINDOW. (HISTORICAL NUMBER 16U117E).

**SITE BENCHMARK** ELEV. = m

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**LEGEND OF EXISTING FEATURES**

- SITE BOUNDARY
- EXISTING CONTOURS
- EXISTING DIRECTION OF DRAINAGE
- EXISTING FENCE
- EXISTING RIP RAP
- EXISTING CULVERT

**LEGEND OF PROPOSED FEATURES**

- PROPOSED SPOT ELEVATIONS
- T/G = TOP OF CASTING/GRATE
- INV = INVERT ELEVATION
- FFE = FINISHED FLOOR ELEVATION
- DIRECTION OF DRAINAGE/SWALE
- DRAINAGE SPLIT (RIDGE)
- EMBANKMENT (SLOPE AS NOTED)
- PROPOSED BUILDING
- MAN DOOR
- OVERHEAD DOOR
- CONCRETE CURB
- RETAINING WALL
- OVERLAND FLOW ROUTE (MAJOR STORM)

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No.	REVISION	BY YYYY-MM-DD



519-743-6500

OWNER  
**WE MERCHANDISE SPACE INC**  
 590 ALDEN ROAD MARKHAM

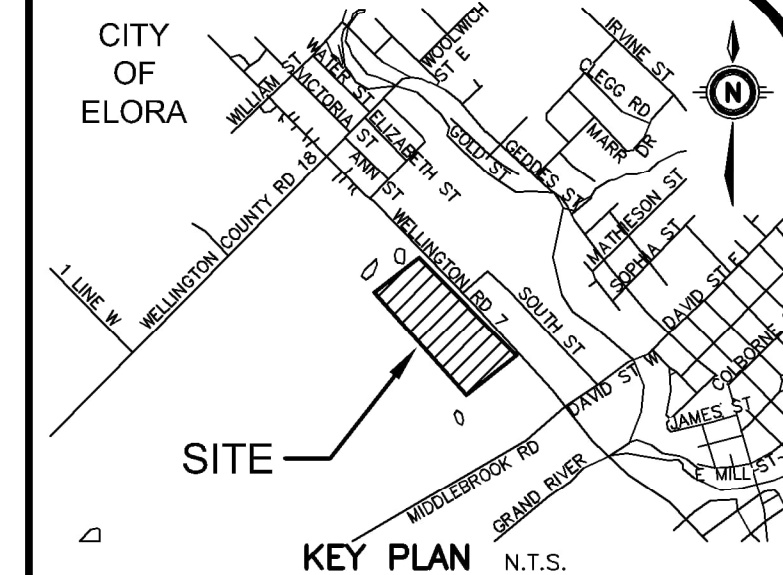
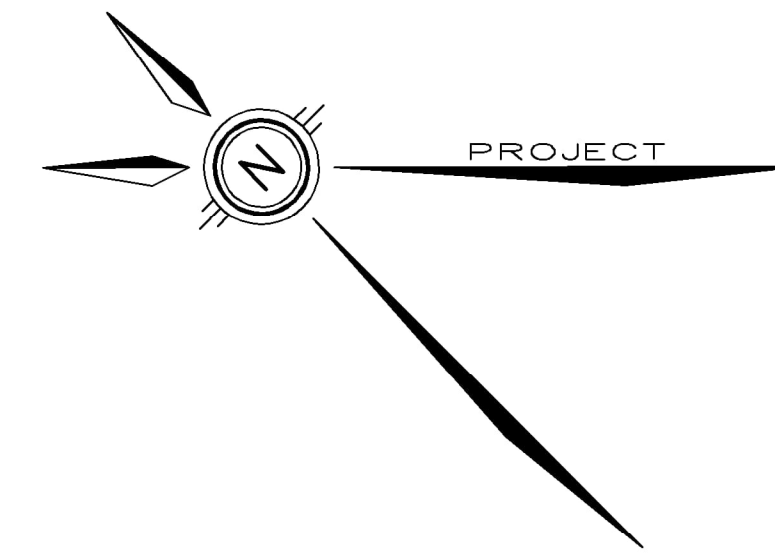
PROJECT  
**11 ACRE SITE OPA AND REZONING**  
 350 WELLINGTON ROAD 7 ELORA

**FUNCTIONAL GRADING PLAN #2**

Project Manager	P. DOUGLAS	Project No.	51060-100
Design By	TMA	Checked By	LEI
Drawn By	BDW/APK	Checked By	TMA
Surveyed By	MTE	Drawing No.	<b>C2.2</b>
Date	Jul. 14/22	Scale	1:300
Sheet	3 of 7		



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GEODETIC BM ELEV. = 387.982m  
ELORA POST OFFICE, BOLT IN FRONT WALL, IN LINTEL OF CENTRE BASEMENT WINDOW. (HISTORICAL NUMBER 16U117E).

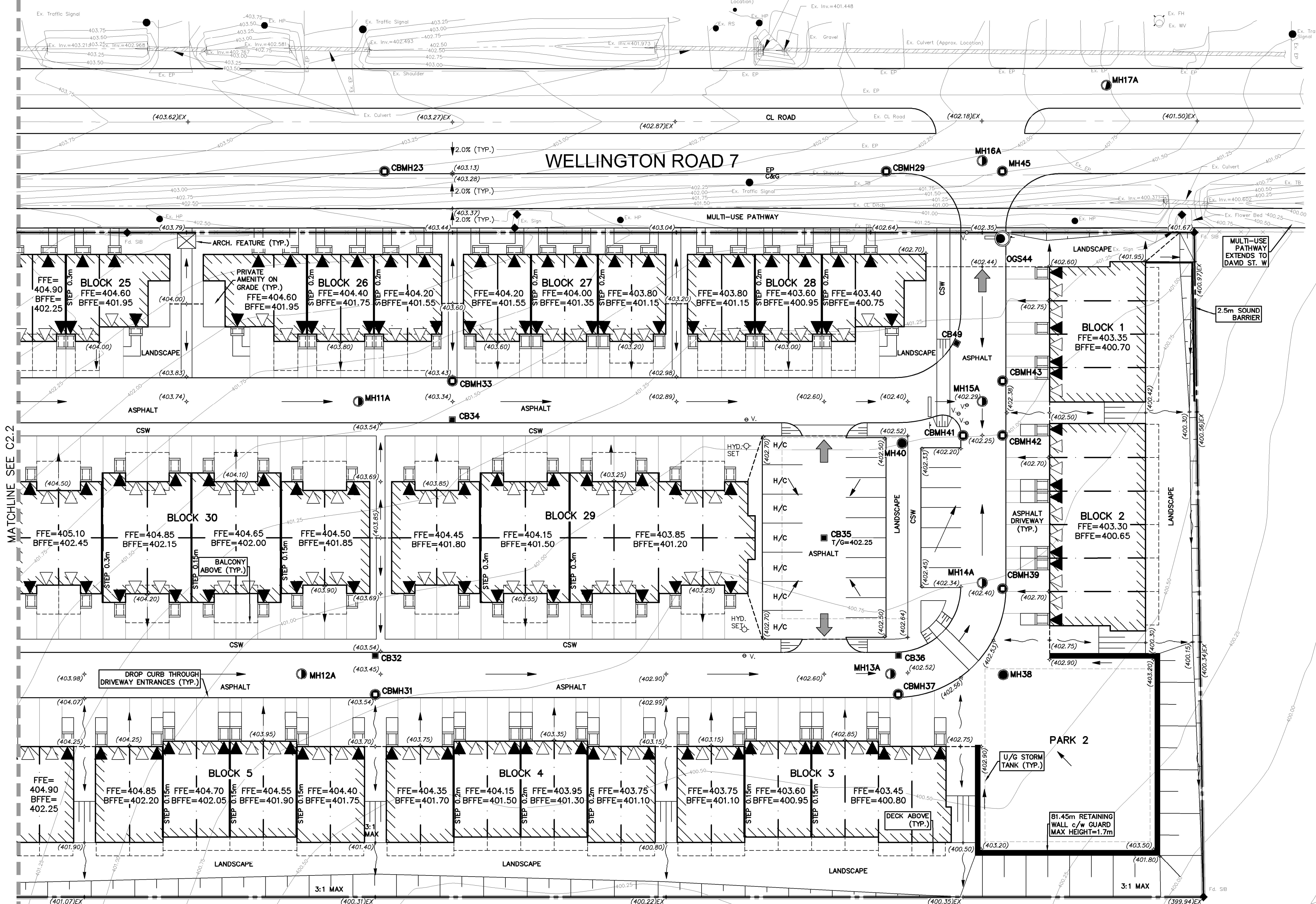
SITE BENCHMARK ELEV. = m

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LEGEND OF EXISTING FEATURES

- SITE BOUNDARY
- EXISTING CONTOURS
- EXISTING DIRECTION OF DRAINAGE
- EXISTING FENCE
- EXISTING RIP RAP
- EXISTING CULVERT

LEGEND OF PROPOSED FEATURES

- PROPOSED SPOT ELEVATIONS
- EX = MAINTAIN EXISTING
- T/G = TOP OF CASTING/GRATE
- INV = INVERT ELEVATION
- FFE = FINISHED FLOOR ELEVATION
- DIRECTION OF DRAINAGE/SWALE
- DRAINAGE SPLIT (RIDGE)
- EMBANKMENT (SLOPE AS NOTED)
- PROPOSED BUILDING
- MAN DOOR
- OVERHEAD DOOR
- CONCRETE CURB
- RETAINING WALL
- OVERLAND FLOW ROUTE (MAJOR STORM)

NOTE: SIDE AND REAR DOWNSPOUTS ON BLOCKS 1 TO 11, AND A PORTION OF BLOCK 12, ARE TO SPILL TO GRADE ULTIMATELY TO WETLAND A

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No.	REVISION	BY YYYY-MM-DD



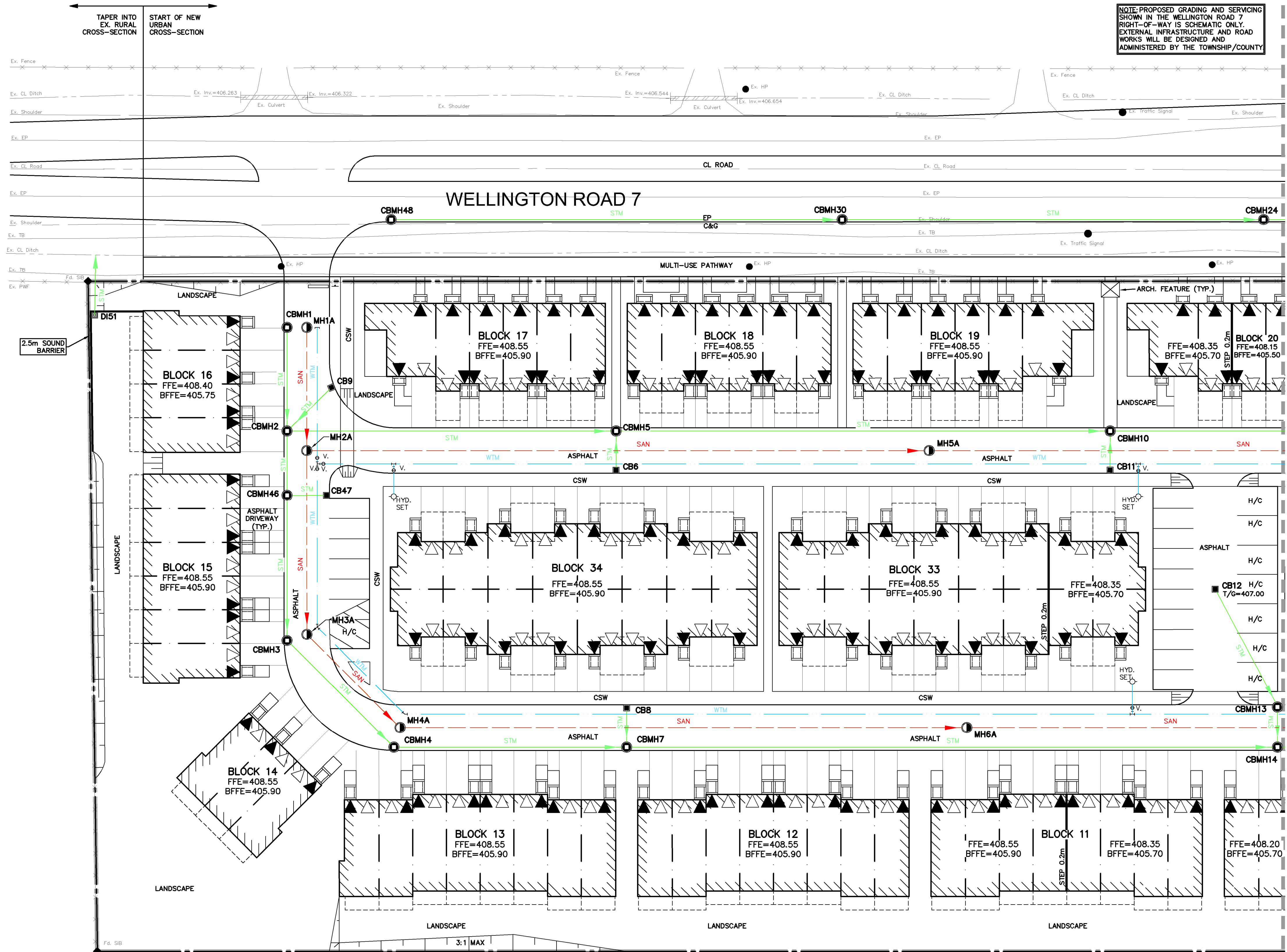
519-743-6500

OWNER  
**WE MERCHANDISE SPACE INC**  
590 ALDEN ROAD MARKHAM  
PROJECT  
**11 ACRE SITE OPA AND REZONING**  
350 WELLINGTON ROAD 7 ELORA  
DRAWING

**FUNCTIONAL GRADING PLAN #3**

Project Manager	P. DOUGLAS	Project No.	51060-100
Design By	TMA	Checked By	LEI
Drawn By	BDW/APK	Checked By	TMA
Surveyed By	MTE	Drawing No.	C2.3
Date	Jul. 14/22	Scale	1:300
Scale	1:300	Sheet	4 of 7

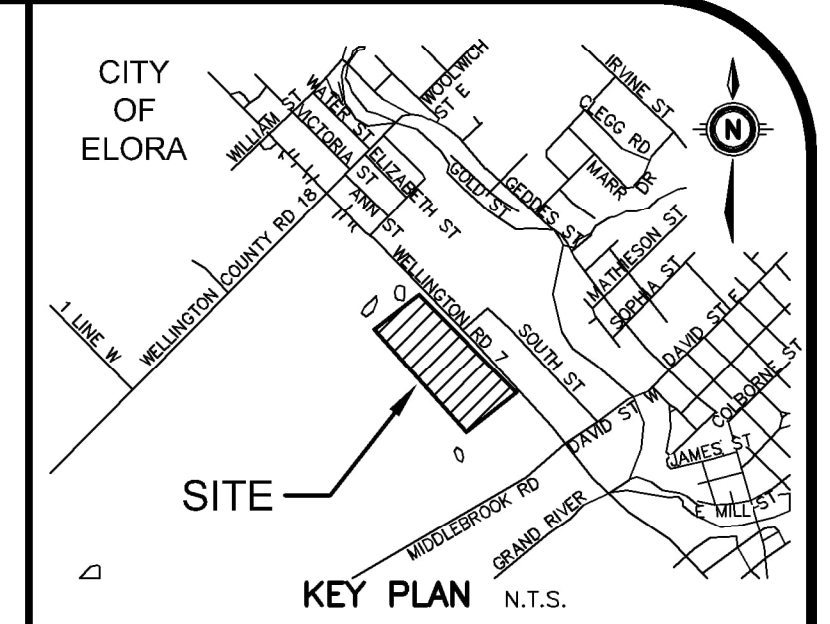
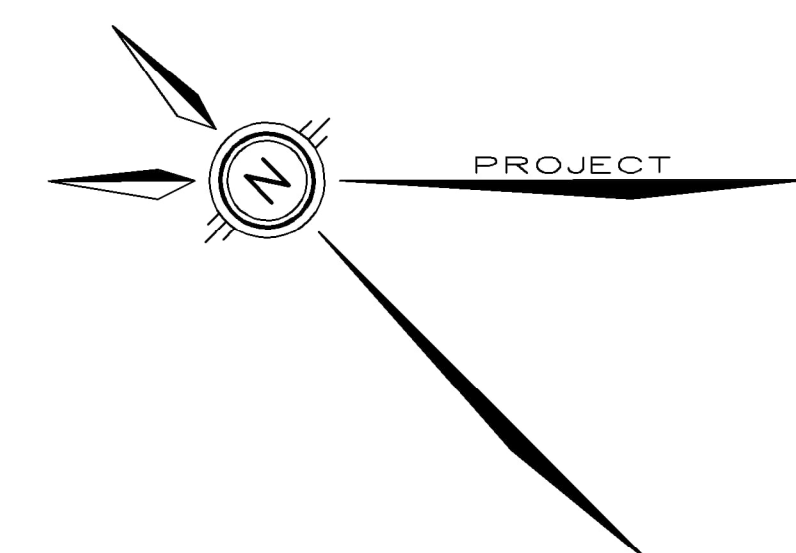




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NOTE: SIDE AND REAR DOWNSPOUTS ON BLOCKS 1 TO 11, AND A PORTION OF BLOCK 12, ARE TO SPILL TO GRADE ULTIMATELY TO WETLAND A



**GEODETIC BM** ELEV. = 387.982m  
 ELORA POST OFFICE, BOLT IN FRONT WALL, IN LINE OF CENTRE BASEMENT WINDOW. (HISTORICAL NUMBER 16U117E).

**SITE BENCHMARK** ELEV. = m

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**LEGEND OF EXISTING FEATURES**

- SITE BOUNDARY
- EXISTING FENCE
- EXISTING RIP RAP
- EXISTING CULVERT
- EX. 100mm<sup>2</sup> WTM
- EX. HYD. SET
- EXISTING WATERMAIN

**LEGEND OF PROPOSED FEATURES**

- MH SAN SANITARY SEWER
- MH STM STORM SEWER
- WTM HYD. SET WATERMAIN
- (TOP) 3:1 EMBANKMENT (SLOPE AS NOTED)
- (BOTTOM) 3:1
- ▲ PROPOSED BUILDING
- ▲ MAN DOOR
- ▲ OVERHEAD DOOR
- ▲ CONCRETE CURB (DROP CURB)
- ▲ RETAINING WALL

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2.	Revised per Township/County Comments	PMD 2023-04-27
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519-743-6500

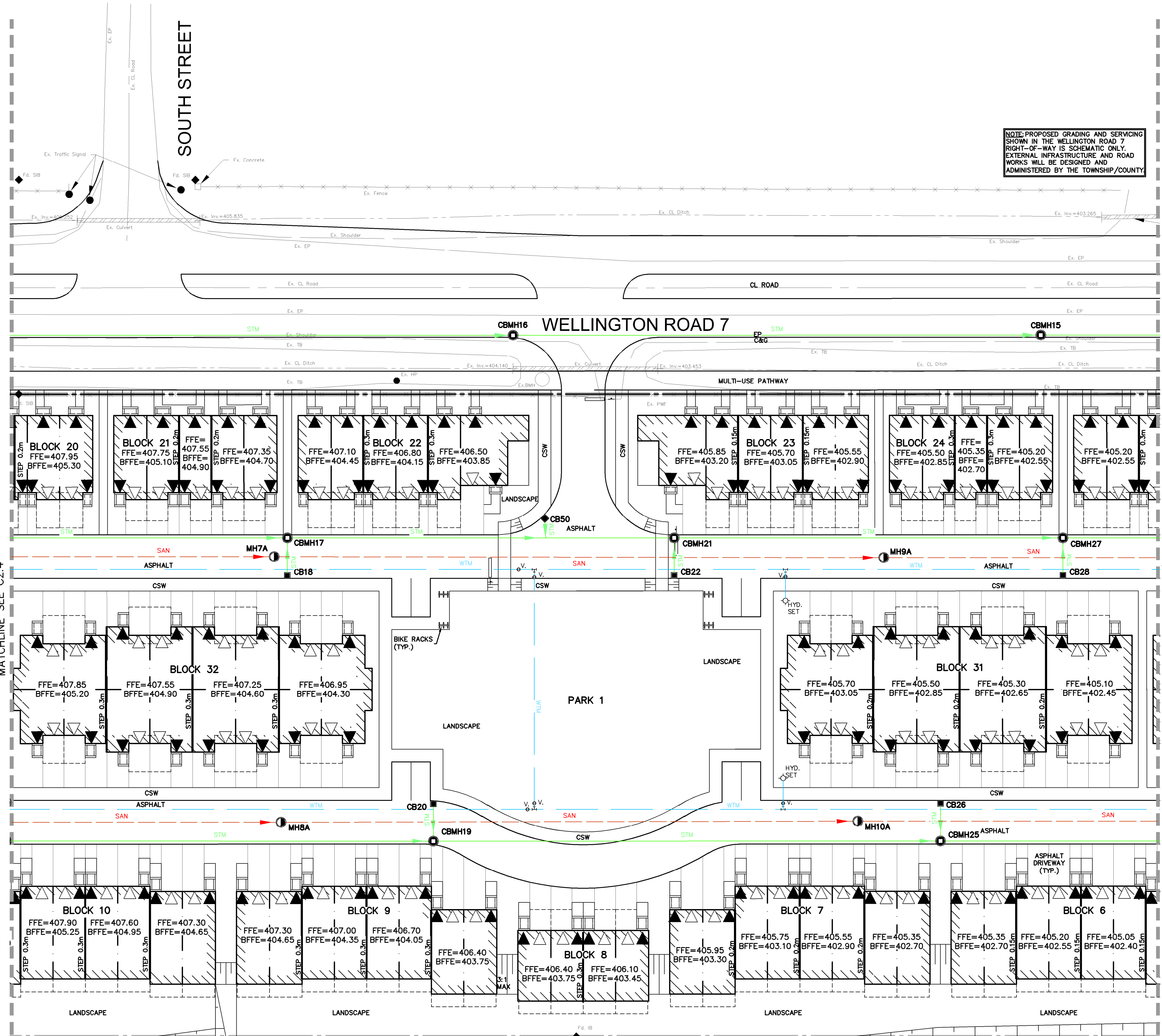
OWNER  
**WE MERCHANDISE SPACE INC**  
 590 ALDEN ROAD MARKHAM

PROJECT  
**11 ACRE SITE OPA AND REZONING**  
 350 WELLINGTON ROAD 7 ELORA

**FUNCTIONAL SERVICING PLAN #1**

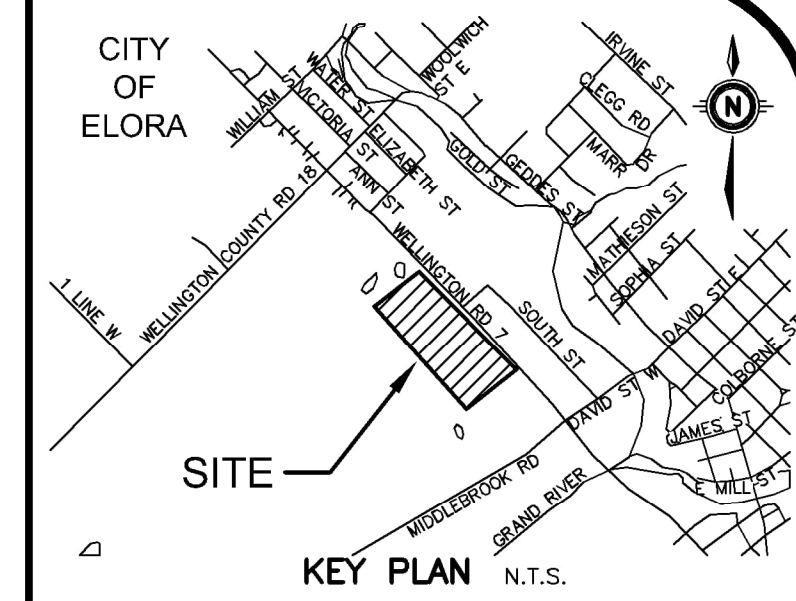
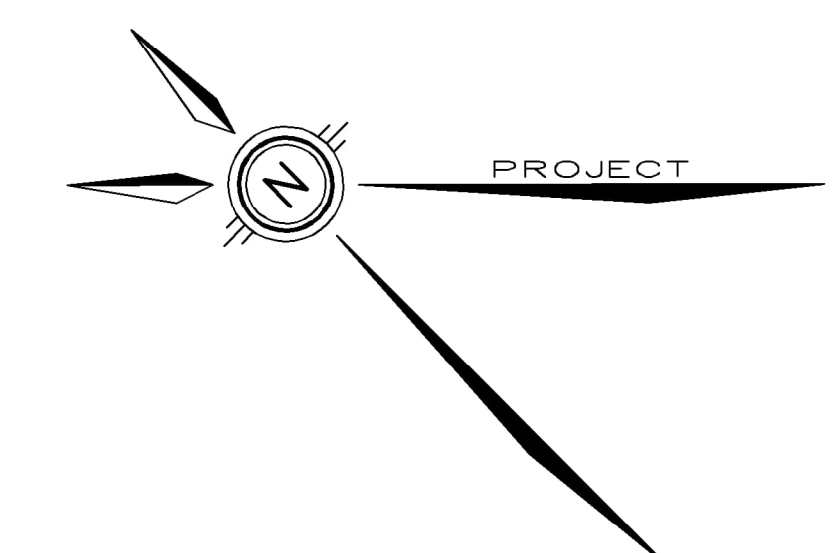
Project Manager	P. DOUGLAS	Project No.	51060-100
Design By	TMA	Checked By	LEI
Drawn By	BDW/APK	Checked By	TMA
Surveyed By	MTE	Drawing No.	C2.4
Date	Jul. 14/22	Scale	1:300
Scale	1:300	Sheet	5 of 7





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NOTE: SIDE AND REAR DOWNSPOUTS ON BLOCKS 1 TO 11, AND A PORTION OF BLOCK 12, ARE TO SPILL TO GRADE ULTIMATELY TO WETLAND A



GEODETIC BM ELEV. = 387.982m  
 ELORA POST OFFICE, BOLT IN FRONT WALL, IN LINE OF CENTRE BASEMENT WINDOW. (HISTORICAL NUMBER 16U117E).  
 SITE BENCHMARK ELEV. = m

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LEGEND OF EXISTING FEATURES

- SITE BOUNDARY
- x-x-x- EXISTING FENCE
- [Pattern] EXISTING RIP RAP
- [Pattern] EXISTING CULVERT
- Ex. 100mm WTM Ex. HYD. SET
- EXISTING WATERMAIN

LEGEND OF PROPOSED FEATURES

- MH SAN SANITARY SEWER
- MH STM STORM SEWER
- WTM HYD. SET WATERMAIN
- [Pattern] EMBANKMENT (SLOPE AS NOTED)
- [Pattern] PROPOSED BUILDING
- ▲ MAN DOOR
- △ OVERHEAD DOOR
- [Pattern] CONCRETE CURB
- [Pattern] RETAINING WALL

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519-743-6500

OWNER  
**WE MERCHANDISE SPACE INC**  
 590 ALDEN ROAD MARKHAM  
 PROJECT  
**11 ACRE SITE OPA AND REZONING**  
 350 WELLINGTON ROAD 7 ELORA  
 DRAWING

**FUNCTIONAL SERVICING PLAN #2**

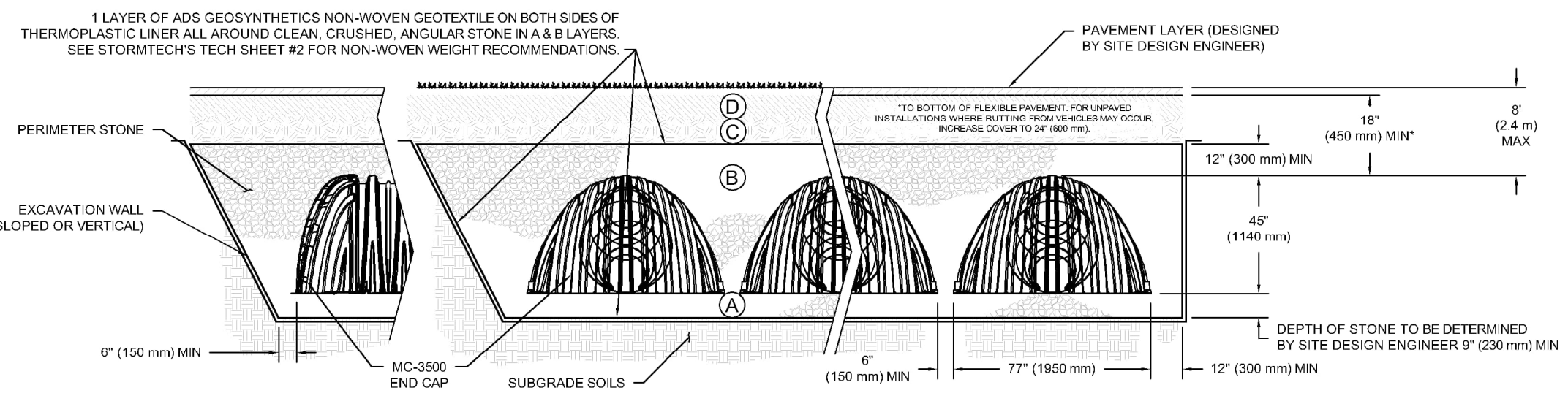
Project Manager P. DOUGLAS	Project No. <b>51060-100</b>
Design By TMA	Checked By LEI
Drawn By BDW/APK	Checked By TMA
Surveyed By MTE	Drawing No.
Date Jul. 14/22	<b>C2.5</b>
Scale 1:300	Sheet 6 of 7



P:\51060\100\51060-100-C2

MTE FILE PATH:

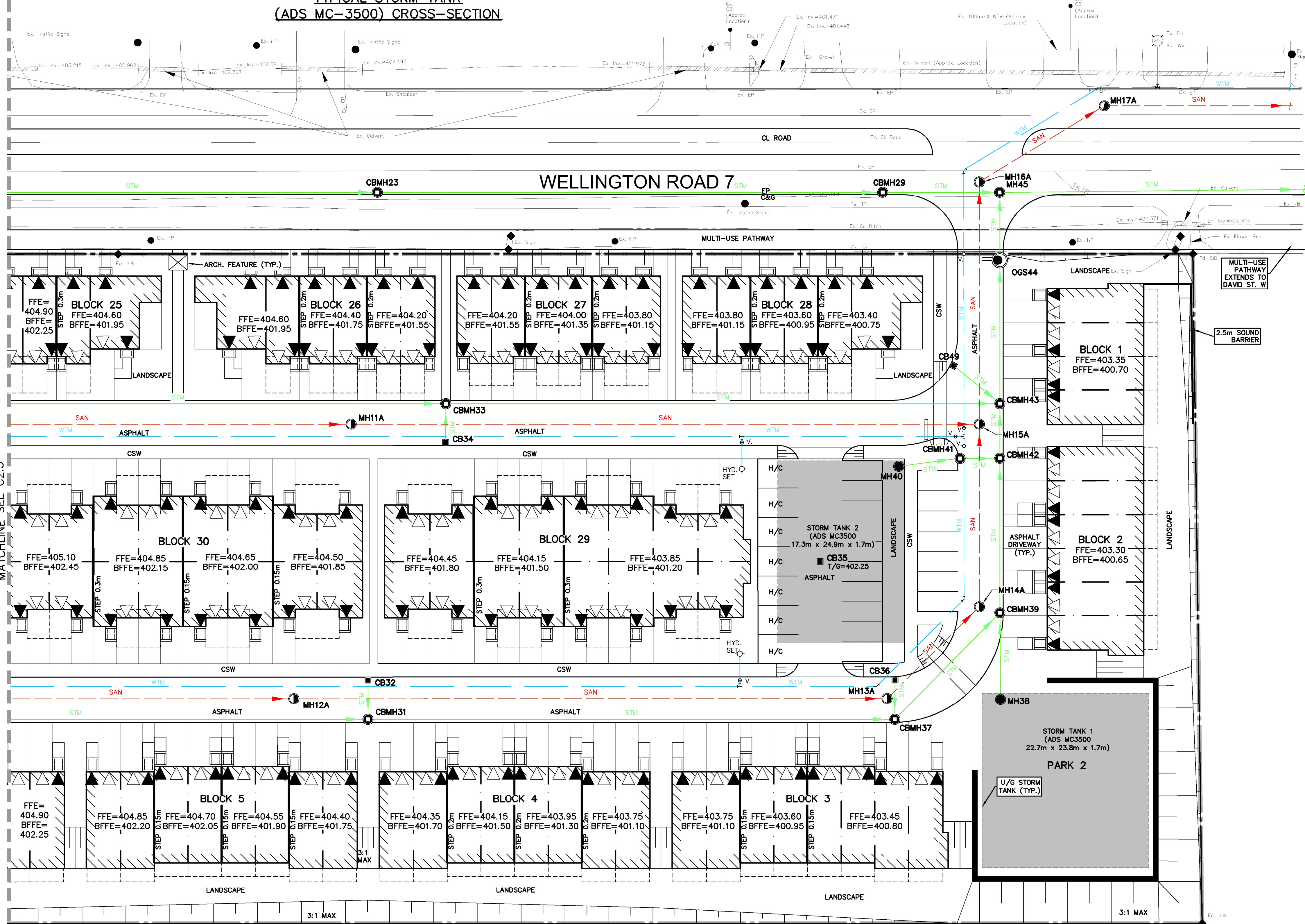
April 27, 2023 - 4:41:53 PM - Plotted By: Belle Wilson



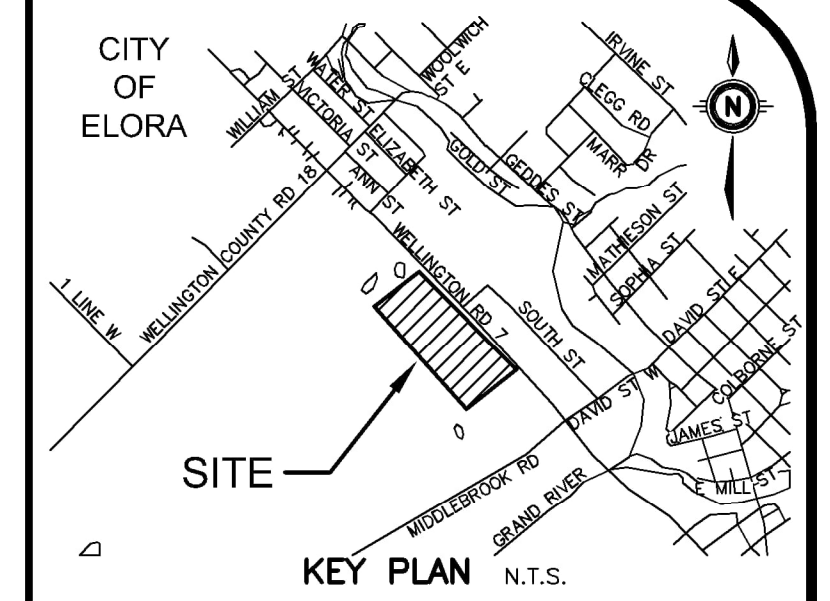
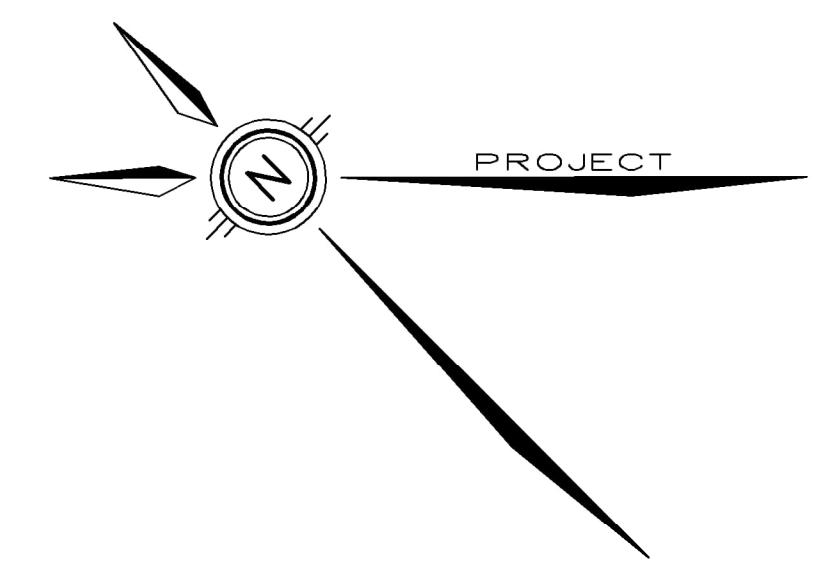
TYPICAL STORM TANK (ADS MC-3500) CROSS-SECTION

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NOTE: REFER TO PRELIMINARY WATERMAIN AND SANITARY SEWER PLANS BY TRITON ENGINEERING SERVICES LIMITED DATED DEC 2021 FOR ILLUSTRATION OF THE PROPOSED WATERMAIN AND SEWER EXTENSION FROM DAVID STREET W. TO THE SITE.



NOTE: SIDE AND REAR DOWNSPOUTS ON BLOCKS 1 TO 11, AND A PORTION OF BLOCK 12, ARE TO SPILL TO GRADE ULTIMATELY TO WETLAND A



GEODETIC BM ELEV. = 387.982m

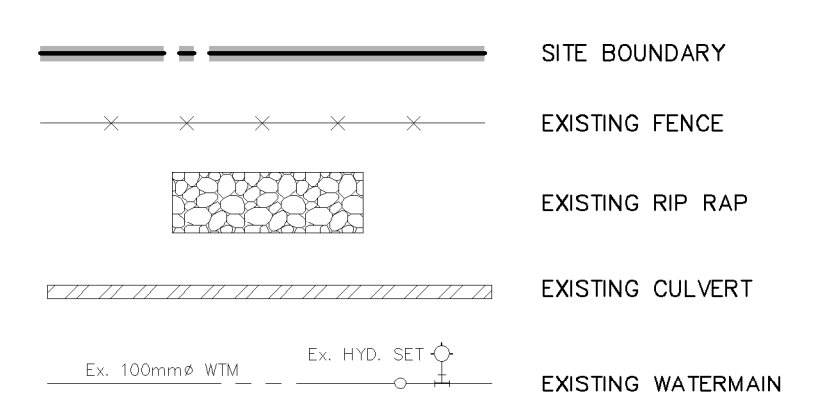
ELORA POST OFFICE, BOLT IN FRONT WALL, IN LINTEL OF CENTRE BASEMENT WINDOW. (HISTORICAL NUMBER 16U117E).

SITE BENCHMARK ELEV. = m

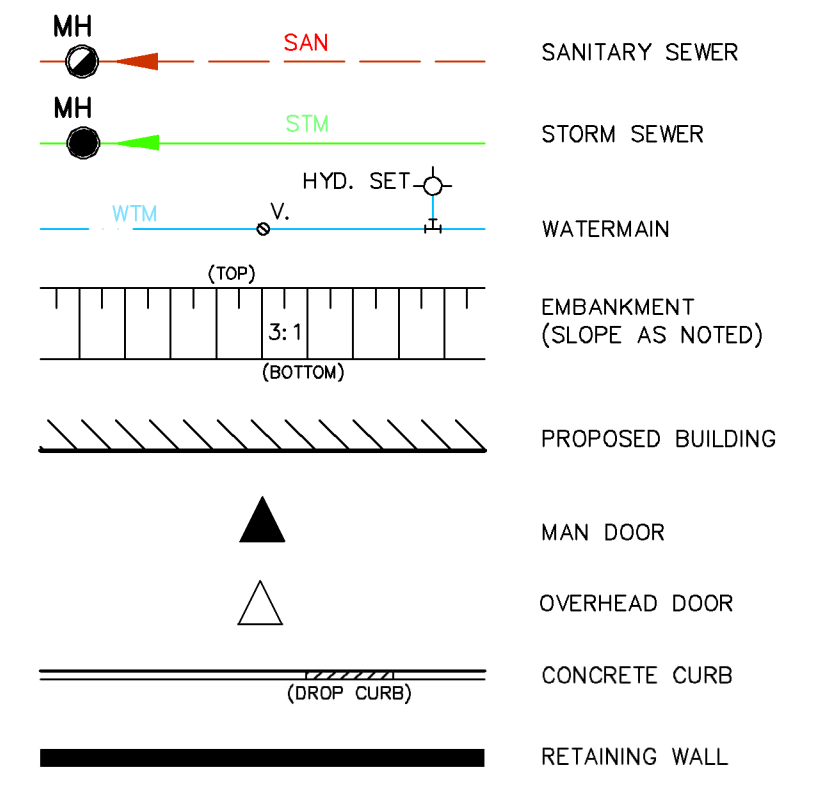
NOTE TO CONTRACTOR :  
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2. EXISTING TOPOGRAPHICAL INFORMATION PROVIDED BY MTE ON APRIL 28, 2022.  
3. THIS PLAN IS PART OF A SET OF PLANS WHICH COMPRISE OF THE FOLLOWING: C1.1, C2.1, C2.2, C2.3, C2.4, C2.5 AND C2.6.

LEGEND OF EXISTING FEATURES



LEGEND OF PROPOSED FEATURES



8.		
7.		
6.		
5.		
4.		
3.		
2.	Revised per Township/County Comments	PWD 2023-04-27
1.	ISSUED WITH FS-SWM REPORT	PWD 2022-10-20
No.	REVISION	BY YYYY-MM-DD



519-743-6500

OWNER: WE MERCHANDISE SPACE INC

590 ALDEN ROAD MARKHAM

PROJECT: 11 ACRE SITE OPA AND REZONING

350 WELLINGTON ROAD 7 ELORA

DRAWING: FUNCTIONAL SERVICING PLAN #3

Project Manager	P. DOUGLAS	Project No.	51060-100
Design By	TMA	Checked By	LEI
Drawn By	BDW/APK	Checked By	TMA
Surveyed By	MTE	Drawing No.	C2.6
Date	Jul. 14/22	Scale	1:300
Sheet	7 of 7		