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Hannan Hills Subdivision

Serviceability and Conceptual Stormwater Management Report

Prepared for: 1384341 Ontario Ltd. (Cavanagh Developments)

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Serviceability and Conceptual Stormwater Management Report

Hannan Hills Subdivision

Almonte, ON

Prepared By:

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June 12, 2024
Revised: May 27, 2025

Novatech File: 118201
Ref: R-2024-048

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Engineers, Planners & Landscape Architects

May 27, 2025

Lanark County
99 Christie Lake Road
Perth, ON K7H 3C6

Attention: Koren Lam, Senior Planner

Reference: Hannan Hills Subdivision
Serviceability and Conceptual Stormwater Management Report
Our File No.: 118201

Please find enclosed the report entitled "Serviceability and Conceptual Stormwater Management Report" dated May 27, 2025, prepared in support of an application for Draft Plan approval for the Hannan Hills Subdivision. This report has been revised in response to comments received by the Municipality of Mississippi Mills dated received up to September 9, 2024 and the MVCA dated August 16, 2024.

The report outlines the preliminary servicing design for the proposed development with respect to water distribution, sanitary servicing, and storm drainage, as well as a preliminary approach to stormwater management. This report is submitted in support of an application for Draft Plan Approval.

This report is to be read in conjunction with the Environmental Impact Study (CIMA+, May 2025) and the Hydrologic Impact Study (Novatech, May 27, 2025).

Yours truly,

NOVATECH

Alex McAuley, P. Eng.
Senior Project Manager | Land Development Engineering

cc: Julie Stewart, Cavanagh Developments

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1.0 INTRODUCTION

Novatech has been retained by Cavanagh Developments to prepare a serviceability and conceptual stormwater management report in support of an application for Draft Plan Approval for the proposed Hannan Hills Subdivision. This report has been revised in response to comments received by the Municipality of Mississippi Mills dated received up to September 9, 2024 and the MVCA dated August 16, 2024.

1.1 Purpose

This report outlines the conceptual servicing design for the proposed development with respect to water, sanitary, and storm servicing as well as the approach to stormwater management.

This report is to be read in conjunction with the Environmental Impact Study (EIS) (CIMA+) and Hydrologic Impact Study (Novatech). The EIS provides discussion on the environmental impacts on the wetland and the Hydrologic Impact Study outlines impacts of the development on the existing wetlands located on the subject property.

1.2 Site Location and Existing Conditions

The property, approximately 4.15 hectares (10.3 acres) in size, is bound by undeveloped lands to the north with existing residential lands to the south, east and west. In addition, the Spring Creek Municipal Drain runs adjacent to the east property boundary. Refer to **Figure 1 (Key Plan)** for the site location.

The site is currently occupied by a single-family home. Refer to **Figure 2 (Existing Conditions Plan)** for an aerial photograph of the property.

The existing site drainage flows overland from west to east and discharges into the Spring Creek Municipal Drain. The portion of the site along the north property line (0.33 ha) drains towards a wetland prior to discharging to the Spring Creek Municipal Drain. The front lots of the houses on the southwest side of Florence Street and a portion of the forested area to the southeast of Adelaide between Florence Street to approximately 35m north of McDermott Street flow through the site to the Spring Creek Municipal Drain. This results in an additional 1.33 ha of upstream drainage, for a total drainage area of 5.48 ha.

The surficial soils consist of silty sand and glacial till (Hydrologic Soil Group 'B') based on the Preliminary Geotechnical Investigation (Paterson Group, 2019).

1.3 Proposed Development

It is proposed to develop a residential subdivision of 106 townhomes and four single family homes. The development would include three connections to the proposed extension of Adelaide Street and a connection to existing Florence Street, both of which would be upgraded as part of this development. A pedestrian connection would be made to the existing Mill Run Subdivision to the north via a pedestrian pathway from Adelaide Street to Honeyborne Street. Refer to the **Concept Plan** for a layout of the proposed subdivision.

The proposed development and its impact on the existing surrounding infrastructure has been examined in a previous report by J.L. Richards (J.L. Richards Master Plan Update Report – February 2018) in which assumptions of future buildout within the town of Almonte have been made, along with recommendations on upgrades to existing infrastructure. This report references the J.L. Richards report throughout, and relevant excerpts are provided in **Appendix F**.

1.4 Adjacent Developments

The adjacent development to the south (proposed Menzie Enclaves) would connect roads and servicing (sanitary sewer and watermain) to the Adelaide Street extension that is planned as part of the Hannan Hills development. The Menzie Enclaves development would have a separate stormwater management facility and outlet. Coordination between the two proposed developments is underway and would continue through the detailed design process. The Menzie Enclaves Draft Plan of Subdivision has been included in **Appendix G** for reference.

It is proposed to provide watermain and sanitary sewer stubs on Florence Street for potential connection of future development lands to the north. These lands are accounted for in the JL Richards Master Plan Report and the proposed sanitary sewer on Florence Street would be sized to account for future flows.

2.0 ENVIRONMENTAL CONSIDERATIONS

The site is bounded by the Spring Creek Municipal Drain to the east and a drainage channel within an existing easement to the north (North Feature). The North Feature channel is a constructed outlet for an existing residential development west of Florence Street.

As indicated in the EIS prepared by CIMA+ (May 2025), the Spring Creek Municipal Drain and approximately 10m of the east portion of the North Feature are considered direct fish habitat. The remainder of the North Feature is considered as contributing to fish habitat.

The existing site also contains a portion of an unevaluated wetland which would be removed. The Spring Creek Municipal Drain and North Feature are identified as turtle habitat, and the EIS notes that turtle exclusion barrier would be required. Turtle exclusion barrier has been shown on the **Preliminary Grading and Servicing Plan (118201-PGS**).

Based on the recommendations provided in the EIS, a 15-meter no-development buffer from the existing top of bank of the Spring Creek Municipal Drain would be provided along the east site boundary. An approximately 9-meter no-development buffer from the existing top of bank of the North Feature would be provided along the north site boundary. These buffers are shown on the **Constraints Plan (118201-ECP)** and the **Preliminary Grading and Servicing Plan (118201-PGS**).

Refer to the EIS prepared by CIMA+ for further environmental consideration details. Refer to the HIS by Novatech for information on the hydrological impacts, including infiltration measures and water balance calculations.

3.0 ROAD DESIGN

The internal subdivision roads would be constructed in accordance with the typical road cross-sections shown on the **Preliminary Grading and Servicing Plan** (**118201-PGS**). The proposed 18-metre right-of-way would have an 8.5-metre asphalt width and curbs with sidewalks on one side. Florence Street and Adelaide Street would be designed with a full urban cross section (8.5m asphalt width and curbs).

The pavement structure would be confirmed based on a geotechnical recommendation during the detailed design stage.

4.0 SITE SERVICING

4.1 Watermain

The proposed 250mm and 200mm watermain would connect to the existing 250mm watermain on Honeyborne Street and to the existing 150mm watermain on Adelaide Street at Finner Court. Refer to **Figure 3 (Watermain Servicing**) for preliminary watermain layout.

<u>Domestic Demand</u>

Domestic water demands for the proposed site were estimated as follows. The Municipal Water and Wastewater System Capacity Check form and water capacity check correspondence can be found in **Appendix A.** Supporting water demand calculations can be found in **Appendix B.**

- Average Day Demand = 1.2 L/s
- Maximum Day Demand = 3.0 L/s
- Peak Hour Demand = 6.7 L/s

The JL Richards Master Plan Report outlines peak flow pressures throughout the town's watermain network at various build-out stages which are summarized in **Table 4.1** below.

Table 4.1: Peak Hour Pressures at Subject Site (JL Richards Master Report, 2018)

Build-out Time Period	Peak Hour Pressure (kPa)	JL Richards Figure #
2023 to 2028	301 to 400	12
2029 to 2037	301 to 400	14
System Capacity Check (2025)	373 to 412	-

As shown in the table, the range of pressures up to the 2037 buildout condition, which includes the development of the subject lands, is above the minimum required 275 kPa (40psi) peak hour pressure. The System Capacity Check confirms that the proposed development can be adequately serviced for domestic water use. Refer to **Appendix F** for figures from the 2018 Master Report.

<u>Fire Demand</u>

Fire hydrants would be installed along the proposed streets to provide fire protection. The Municipality of Mississippi Mills indicated that Fire Underwriter's Survey (FUS) simplified method was to be used to calculate required fire flows. Refer to **Appendix B** for email correspondence.

The FUS Table 7 & 8 Simple Method was used to indicate required fire flows between 67 L/s and 133 L/s, as outlined in **Table 4.2** below.

Table 4.2: Summary of FUS Table 7 & 8 Simple Method Fire Flows

Proposed Unit	Exposure Distance	FUS Table 7/8 Required Fire Flow (L/s)	Required Max Day + Fire Flow (L/s)
Single Family Homes	3m to 10m	67 L/s	70 L/s
Townhomes	3m to 10m	133 L/s	136 L/s

The JL Richards Master Plan Report outlines available maximum day plus fire flow throughout the town's watermain network at various build-out stages which are summarized in **Table 4.3** below.

Table 4.3: Max Day plus Fire Flow at Subject Site (JL Richards Master Report, 2018)

Build-out Time Period	Max Day + Fire Flow (L/s)	JL Richards Figure #
2023 to 2028	100 to 300	11
2029 to 2037	100 to 300	13
System Capacity Check (2025)	133L/s at 173kPa to 223kPa	-

As shown in the table, the required maximum day plus fire flow is within the range indicated for the "2023 to 2028" and "2029 to 2037" buildout conditions. It is our understanding that pressure reducing valves may be required to limit average day pressures. Refer to **Appendix F** for figures from the 2018 Master Report.

Confirmation of existing flow conditions and a hydraulic network analysis of the proposed watermain layout would be completed at the detailed design stage.

4.2 Sanitary Sewer

Refer to **Figure 4 (Sanitary Servicing)** for preliminary sanitary sewer layout.

New 200mm diameter sanitary sewers would service the proposed development. The sewage flows from the site would be directed by gravity and connect to the proposed 375mm diameter sewer located on Florence Street which would tie into the existing sanitary trunk sewer at Victoria Street. The trunk sewer ultimately conveys the flows to the Gemmill Bay Pump Station, which pumps to the Town of Mississippi Mills Wastewater Treatment Plant (WWTP).

The design criteria used to determine the size of the sanitary sewers required to service the development are as follows:

Residential Areas

Average flow - residential	=	350L/cap/day
Population for single family unit	=	3.4
Population for townhouse unit	=	2.7
Residential Peaking	=	based on Harmon Formula

The theoretical peak design flow for the proposed development was calculated to be in the order of 5.6 L/s which is less than the 5.97 L/s allocated to the site from the JL Richard Master Report Update. The Municipal Water and Wastewater System Capacity Check form and sanitary capacity check correspondence can be found in **Appendix A**. The Capacity Check confirms that there is capacity within the existing municipal infrastructure to service the proposed development.

The proposed sanitary sewer on Florence Street would be sized to capture future additional flows from the undeveloped land to the north ("Development Area 2" of J.L. Richards Figure 25), the proposed Menzie Enclaves development to south, and future infill property south of the site. Allocated flows provided in the Master Report would be considered in the design of the affected downstream sanitary sewers. Refer to Master Report Figure 25 in **Appendix F** for location and allocated flows of the future buildout.

The proposed sanitary sewer on Florence Street have sufficient capacity to convey the theoretical sanitary flows from the development as well as the developments adjacent to the site. Refer to the **Conceptual Sanitary Drainage Area Plan** (**118201-CSAN)** and the Sanitary Sewer Design Sheets provided in **Appendix C** for details.

4.3 Storm Drainage

Storm drainage, both the minor and major systems, would outlet to a proposed stormwater management facility along the east side of the development. The stormwater management facility would provide quantity and quality control prior to discharging to the Spring Creek Municipal Drain. Quantity control would be provided by a dry pond. Quality control would be provided by a hydrodynamic separator unit.

Refer to **Figure 5 (Storm Servicing)** for preliminary storm sewer layout.

4.3.1 Storm Sewers (Minor System)

The proposed storm sewers would be designed and sized using the Rational Method in conjunction with City of Ottawa Intensity Duration Frequency (IDF) rainfall data, to convey peak flows associated with a 5-year return period.

Refer to **Appendix D** for the **Pre-Development Storm Drainage Area Plan (118201-PRE-STM), Preliminary Storm Drainage Area Plan (118201-POST-STM)** and the Storm Sewer Design Sheet.

<u>Storm Sewer Design Criteria (Rational Method)</u>

The following is the storm sewer design criteria were used:

- Rational Method (Q) = 2.78CIA, where
    - Q = peak flow (L/s)
    - C = runoff coefficient
        - C = (0.70 * %Imp.) + 0.20
    - I = rainfall intensity for a 2-year return period (mm/hr)
        - $I_{5yr} = 998.071 / [(Tc(min) + 6.053)]^{0.814}$
    - A = site area (ha)
- Minimum Pipe Size = 250 mm; Minimum / Maximum Full Flow Velocity = 0.8 m/s / 3.0 m/s

Foundation Drainage

Foundation drains surrounding the dwellings would be connected to the storm sewers. Based on a preliminary review of the hydraulic grade line, sump pumps would be required to drain the foundations. The sump pumps would connect to the storm sewer and would include backwater valves. The back-to-back townhomes would be slab on grade with no basements.

Inlet Control Devices

Inlet control devices (ICDs) would be used to restrict inflows to the minor system. Rear yard catch basins would be connected in series with an ICD installed at the outlet of the most downstream structure. ICDs would be sized to control minor system peak flows without causing surface ponding during a 5-year storm event. Note, this sizing was done using a hydrologic and hydraulic model (PCSWMM) – refer to **Section 5.1**.

4.3.2 Major System Drainage

During detailed design, the site would be graded to provide an overland flow route to a proposed dry pond following the proposed roadway. The proposed storm sewer system would direct all minor storm runoff to the proposed Stormwater Management (SWM) Facility. Runoff from the major system would be directed overland to the same facility.

5.0 STORMWATER MANAGEMENT

The site is within the jurisdiction of the Municipality of Mississippi Mills and Mississippi Valley Conservation Authority (MVCA). The stormwater management criteria for the Hannan Hills Subdivision are as follows:

Stormwater Quality Criteria:

- Provide an Enhanced level of water quality treatment corresponding to 80% long-term TSS removal.

Stormwater Quantity Criteria:

- Control post-development peak flows to pre-development release rates for all storms up-to and including the 100-year event.

5.1 Hydrologic & Hydraulic Modeling (PCSWMM)

The PCSWMM model created for the conceptual SWM design is a semi-lumped model that represents system flows from the development. The model was used to simulate runoff from the site to meet sizing requirements, with relation to quantity control, for both the dry pond and the ICD. The combination of the dry pond and ICDs ensure the total peak flow leaving the site does not exceed pre-development conditions. ICDs were sized using the PCSWMM model to ensure maximum ponding requirements were not exceeded. PCSWMM model schematics and model output are available in **Appendix E.**

Design Storms

Initial model runs were completed for the 1:100-year event using the 3-hour, 4-hour, and 6-hour Chicago distributions, and the 6-hour, 12-hour, and 24-hour SCS distributions to determine the critical storm event for the site.

The 6-hour Chicago distribution (10-minute time step) was determined to generate the highest peak flows within the post-development site and was selected as the critical storm distribution to be used in the design of the conveyance system. The 4-hour Chicago storm distribution was used for the 25mm event (water quality event). The highest storage volumes in the dry pond occurred during the 12-hour SCS storm event, so this event was used as the critical storm distribution for determining the required quantity control storage in the SWM facility.

Modeling Parameters

Hydrologic modeling parameters for each subcatchment were developed based on soil type, existing and proposed land use, and topography. Modeling parameters were determined as follows:

- Soil types were identified based on test pit data from the Preliminary Geotechnical Investigation (Paterson Group, 2019);
- Land use and ground cover were determined from satellite images and the proposed site layout;
- SCS Curve Numbers were assigned for the pre-development area based on the soil types and land use of the pervious areas;
  - For the pre-development model, an area weighted CN value was used based on land cover. A CN value of 75 was used to represent good condition half acre rural residential lots with the hydrologic soil group (HSG) 'B' and a CN value of 60 was used to represent fair condition forest with the hydrologic soil group (HSG) 'B';
- For post-development conditions, the percentage of impervious area was determined for each subcatchment based on a runoff coefficient that was determined from the proposed impervious area (roads, driveways, proposed building footprints, etc.). The percent impervious was determined using the following equation from the *Ottawa Sewer Design Guidelines* (2012);
  - $C = [\%\, imp \times C_{impervious}] + [(1 - \%\, imp) \times C_{pervious}]$
    - Where: $C_{impervious} = 0.90$; and $C_{pervious} = 0.20$
  - The equation was rearranged to get the following equation:
    - $\%\, imp = \frac{C - 0.2}{0.7}$
- The "zero imperviousness" parameter represents the percent of the impervious area that has no depression storage (i.e., roof area);
- Equivalent width refers to the width of the subcatchment flow path.
- The hydrologic simulation uses depression storage to represent the amount of rainfall required to generate runoff from a catchment area;
  - Depression Storage (pervious areas): 4.67 mm;
  - Depression Storage (roads, driveways): 1.57 mm;
  - Depression Storage (rooftops): 0 mm.
- The simulation uses Manning's roughness coefficients (n) to represent the surface roughness for impervious and pervious land uses. The model uses the following:
  - Impervious areas (roadways, rooftops, paved areas): 0.015;

  - Pervious areas (grassed areas): 0.25;
- The simulation also uses Manning's roughness coefficients (n) to represent the roughness of the conduits that convey major and minor system flows. The model uses the following:
  - Concrete or PVC pipes: 0.013;
  - Roadways for overland flow: 0.015;
  - Open channels: 0.035.

Refer to **Appendix D** for the **Pre-Development Storm Drainage Area Plan (118201-PRE-STM), Preliminary Storm Drainage Area Plan (118201-POST-STM)**. A detailed summary of model subcatchment parameters is included in **Appendix E**.

Dry Pond Sizing

Runoff from the site would be directed to a proposed dry pond, which has been sized to control post-development peak flows to pre-development levels for storms up to and including the 100-year design event. The dry pond would also provide water quality treatment through a 24-hour to 48-hour drawdown time for the water quality event (4-hour 25 mm Chicago Storm event) and a low flow channel. Additional quality control would be provided by a water quality treatment unit located upstream of the pond inlet.

A summary of the pond design and storage volumes is provided in **Table 5.1**. Refer to **Figure 6** for the conceptual layout of the dry pond. For the conceptual pond stage-storage curve that was used in the PCSWMM model that was based on the design presented in Figure 6, refer to **Appendix E.**

Table 5.1: Dry Pond Design Summary

Feature	Dry Pond
Side Slopes (H:V)	3:1
Bottom of Low Flow Channel (masl)	137.60
Bottom of Slope Elevation (masl)	137.70
Top of Pond Elevation (masl)	140.00
Bottom of Slope Area (m^2)	342
Top Area (m^2)	1,497
Storage Volume to Top of Pond (m^3)	2,048

Outflows from the dry pond would be routed through an outlet structure designed to restrict flows to pre-development levels before outletting to the Spring Creek Municipal Drain. Values shown in **Table 5.3** indicate that sufficient measures are in place to ensure that the post-development flows will not exceed pre-development flows from the subject site, into the Spring Creek Municipal Drain. An emergency overflow spillway would be located along the northeast side of the pond, adjacent to the Spring Creek Municipal Drain and would allow for conveyance of events above the 100-year event.

The conceptual design for the dry pond outlet consists of:

- A 75 mm diameter orifice with an invert elevation of 137.60 m for the water quality event;
- A 140mm diameter orifice with an invert elevation of 138.55 m;
- A 0.35 m wide transverse weir with crest elevation of 139.40 m;
- An emergency overflow spillway with a crest elevation of 139.73 m.

The stage-storage-discharge table is provided in **Table 5.2.**

Table 5.2: Dry Pond Stage-Storage-Discharge (12-hour SCS Storm Event)

Stage	Elevation (m)	Volume (m^3)	Release Rate (L/s)
Outlet of Low Flow Channel	137.60	0	0
Inlet of Low Flow Channel	137.70	4	-
Bottom of Slope	137.80	25	-
25mm Event	138.53	412	11
2yr Event	138.72	561	26
5yr Event	139.02	835	42
100yr Event	139.73	1,661	192
Top of Pond	140.00	2,048	-

The volume provided to the top of the pond is provided in Table 5.1 and Table 5.2 (2,048m^3) indicating that the pond has adequate volume for storms up to and including the 100-year event (1,661m^3). The PCSWMM results show a 100-year HGL of 139.73m using the conceptual pond storage information which is less than the top of pond elevation (104.00m).

Model Results – Hydraulic Grade Line

As discussed in Section 4.3.1, sump pumps would be required to drain the foundations to the storm sewers. Hydraulic grade lines would be reviewed further at the time of detailed design.

Model Results – Peak Flows

The PCSWMM model was used to evaluate pre- and post-development peak flows from the pond. The results of this analysis demonstrate that the proposed stormwater management strategy for the Hannan Hills Subdivision would control post-development peak flows to pre-development levels for all storm events up to and including the 100-year design event. While the PCSWMM model shows the 25mm storm exceeding the pre-development peak flow, the PCSWMM model does not account for any post-development infiltration measures. Those infiltration measures are required as part of the water balance, which would reduce the post-development flows further.

The modelled peak flows are summarized in **Table 5.3**.

Table 5.3: Pre vs. Post-Development Peak Flows (L/s)

Scenario		4-hour Chicago	6-hour Chicago			12-hour SCS		
		25mm	2-yr	5-yr	100-yr	2-yr	5-yr	100-yr
Pre-Development		9	36	87	317	50	110	345
Post-Development	*Controlled*	11	25	39	179	26	40	189
	Uncontrolled	7	13	56	205	5	41	110
	Total (System) [1]	15	25	67	232	26	71	200
Difference		5	-10	-20	-85	-24	-39	-145

[1] *System flow, which accounts for the timing of the peaks, was used for the total flow*

5.2 Quality Control

A hydrodynamic separator (HDS) unit providing quality control would be located within the SWM Facility block and would be accessible from the Street One for inspection and maintenance. In addition, the SWM Facility would provide a 24 hour draw down time and a low flow channel to supplement the total suspended solids removal of the HDS. Preliminary sizing determined that a Stormceptor EFO 10 will provide 80% long term TSS removal (using a ‘fine’ particle size distribution). Unit sizing will be confirmed at detailed design. The HDS unit and size would be confirmed at detailed design. HDS sizing is provided in Appendix E.

5.3 Best Management Practices

The proposed development would use the following stormwater best management practices (BMPs) to mitigate the reduction in groundwater infiltration/recharge resulting from development:

- Existing site drainage direction and outlets would generally be maintained.
- Buffers from existing drainage channels would be maintained.
- Roof leaders would be directed to grassed areas.
- Lot grading slopes would be minimized, where possible, to promote infiltration.
- Rear yard swales would be designed with minimal longitudinal slope to promote infiltration.
- To maximize infiltration in the rear yards, Rear yard storm sewers will be designed with perforated pipes surrounded by clearstone (as infiltration trenches) with perched outlets to the storm sewer.

By implementing stormwater management BMPs as part of the storm drainage design, the impacts of development on the hydrologic cycle can be reduced. Infiltration of clean runoff provides additional benefits. The performance of the proposed hydrodynamic separator unit would be improved, and the storage required in the SWM Facility would be reduced. The use of BMPs have not been included in the SWM calculations to provide a conservative estimate of the runoff volumes and storage requirements.

Options for the rear yard infiltration system along the wetland buffer to be disconnected from the sewer and solely drain through infiltration with overflows to the wetland will be explored at detailed design. As part of the conceptual design, the rear yards are assumed to outlet to the SWM facility for conservative quantity control sizing.

Refer to the *Hydraulic Impact Study* (Novatech, 2025) for Water Balance information and calculations for the proposed development.

6.0 EROSION AND SEDIMENT CONTROL

6.1 Temporary Measures

The following erosion and sediment control measures would be implemented during construction in accordance with the "Guidelines on Erosion and Sediment Control for Urban Construction Sites" (Government of Ontario, May 1987).

To mitigate erosion and to prevent sediment from entering the storm sewer system, temporary erosion and sediment control measures would be implemented on-site during construction in accordance with the Best Management Practices for Erosion and Sediment Control. This includes the following temporary measures:

- Filter bags placed under the grates of on-site and nearby catchbasins and manholes and kept in place until vegetation has been established and construction is completed;
- Silt fencing placed around the construction limits;
- Straw bale barriers and/or rock flow check dams placed until vegetation has been established and construction is completed;
- Street sweeping and cleaning performed as required to suppress dust and to provide safe and clean roadways adjacent to the construction site;
- The extent of exposed soil during construction minimized and vegetation re-established as soon as possible; and
- All sewers inspected and cleaned after construction completion.

The proposed temporary erosion and sediment control measures would be implemented prior to construction and remain in place throughout each phase of construction and should be inspected regularly. No control measure is to be permanently removed without prior authorization from the Engineer.

6.2 Permanent Measures

The following would provide permanent erosion and sediment control measures:

- Grass swales along the rear and side yard property lines;
- Slopes on finish lot grades minimized where possible to slow the runoff of water;
- The hydrodynamic separator unit designed to provide quality control for stormwater runoff prior to entering the SWM Facility;
- Vegetated buffers adjacent to the Municipal Drain and the North Feature would be rehabilitated wetland as described in the EIS and HIS, which would provide permanent no-touch areas.

7.0 CONCLUSIONS AND RECOMMENDATIONS

This report has been prepared in support of an application for Draft Plan Approval for the proposed Hannan Hills Residential Subdivision.

- The subdivision has been accounted for in the J.L. Richards Master Plan Update Report – February 2018.
- The development would be serviced by connecting to existing watermains in the adjacent subdivisions (Finner Court and Mill Run) and system capacity has been confirmed.
- The development would be serviced by connecting sanitary sewers to the existing trunk sewer on Victoria Street and system capacity has been confirmed.
- Stormwater runoff from the site would be captured by an onsite storm sewer system via a series of rear-yard swales and roadside catchbasins. The storm sewer system would direct runoff to a Stormwater Management Facility prior to releasing flows to the Spring Creek Municipal Drain.
- Quantity control of stormwater runoff would be provided by the Stormwater Management Facility (Dry Pond).
- Quality control of stormwater runoff would be provided by the Stormwater Management Facility which would include a hydrodynamic separator, a 24-hour draw down time, and a low flow channel.
- Temporary and permanent erosion and sediment control measures would be provided.

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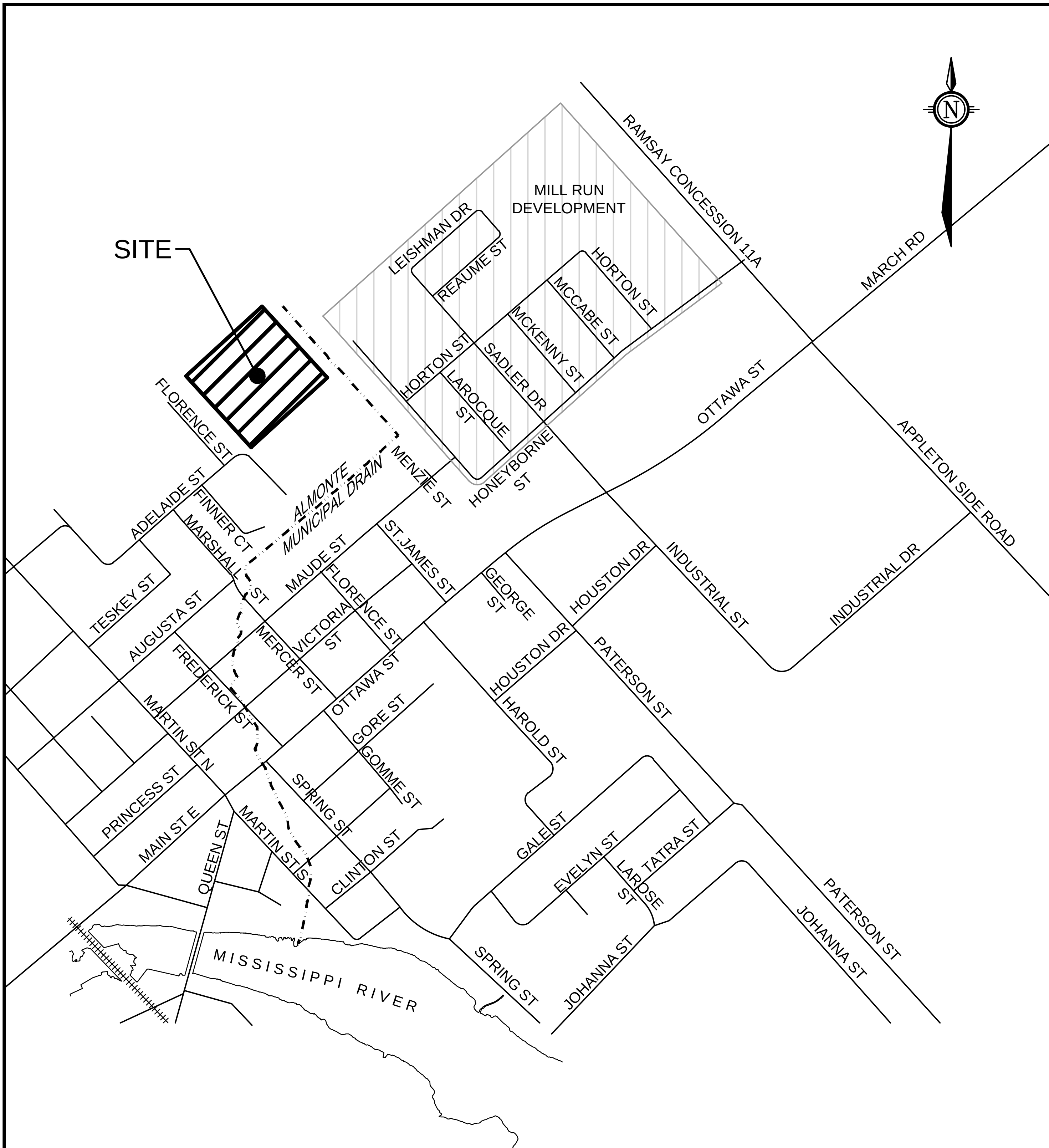

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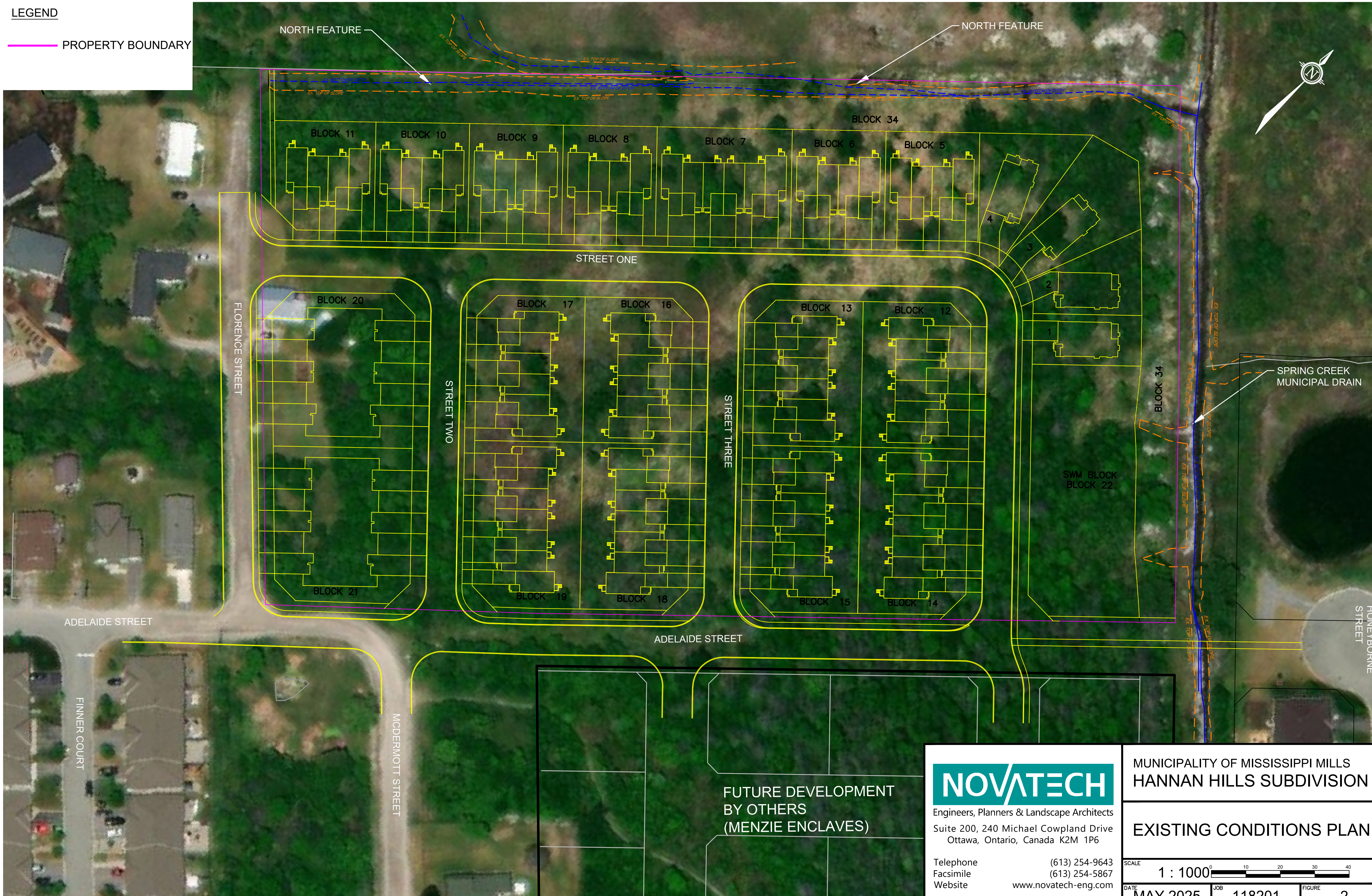
MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS SUBDIVISION

KEY PLAN

SCALE		
N.T.S.		
DATE: MAY 2025	JOB: 118201	FIGURE: 1

SHT8X11.DWG - 216mmx279mm



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Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6

Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS SUBDIVISION

EXISTING CONDITIONS PLAN

SCALE 1 : 1000

DATE MAY 2025 | JOB 118201 | FIGURE 2

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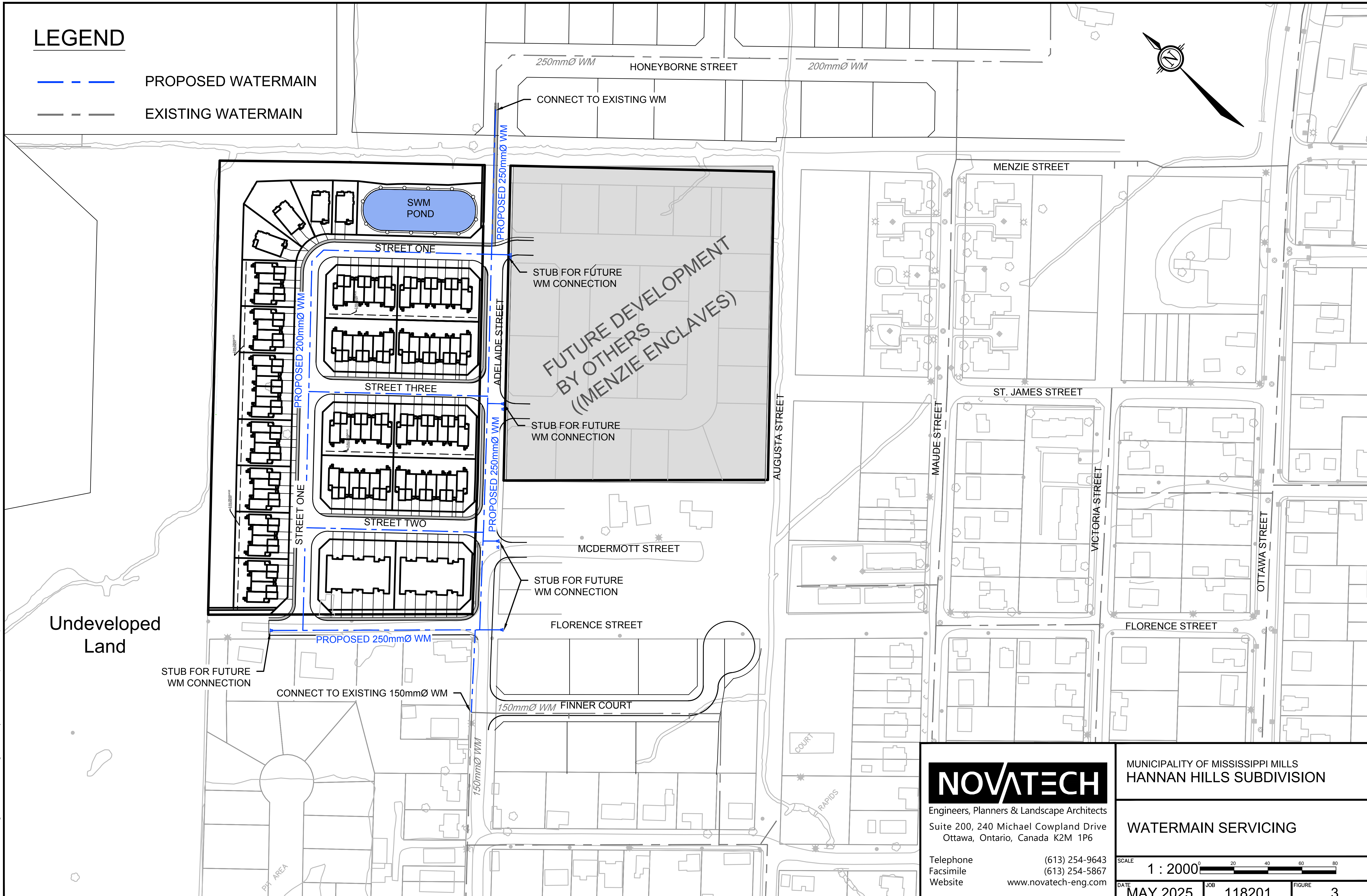

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MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS SUBDIVISION

WATERMAIN SERVICING

SCALE	DATE	JOB	FIGURE
1 : 2000	MAY 2025	118201	3

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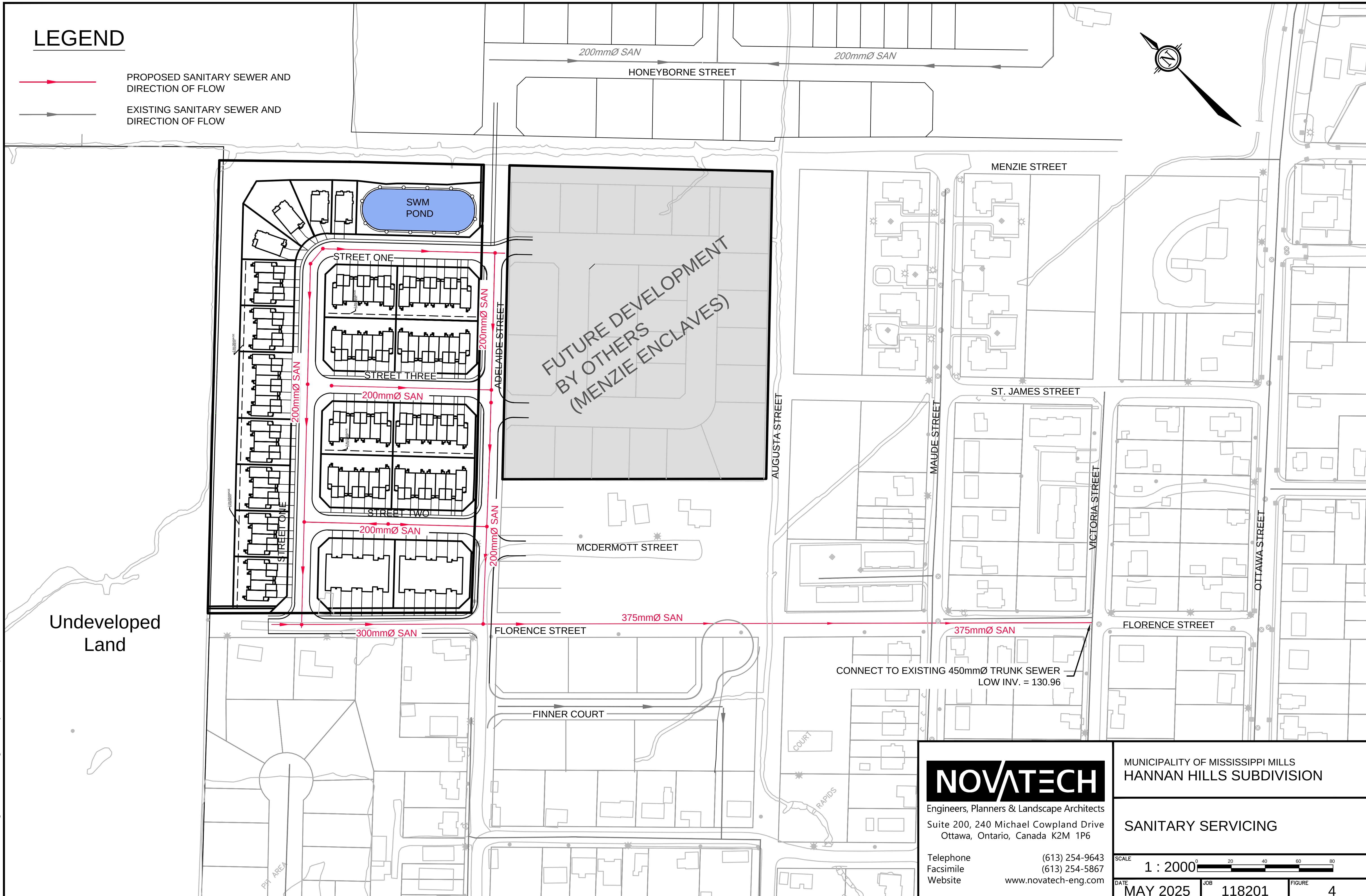

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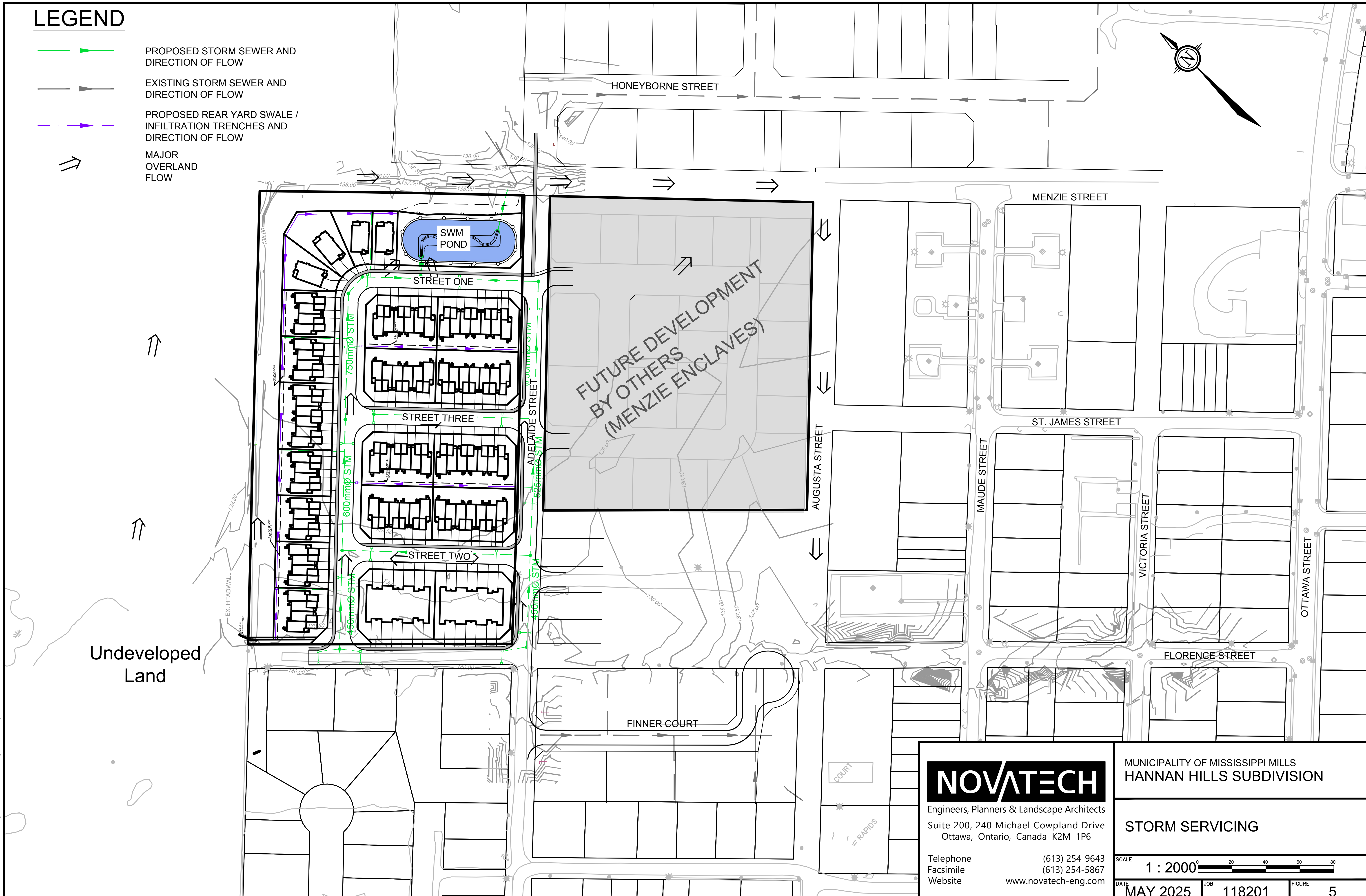
LEGEND
PROPOSED STORM SEWER AND DIRECTION OF FLOW
EXISTING STORM SEWER AND DIRECTION OF FLOW
PROPOSED REAR YARD SWALE / INFILTRATION TRENCHES AND DIRECTION OF FLOW
MAJOR OVERLAND FLOW
HONEYBORNE STREET
MENZIE STREET
ST. JAMES STREET
FLORENCE STREET
FINNER COURT
AUGUSTA STREET
MAUDE STREET
VICTORIA STREET
OTTAWA STREET
ADELAIDE STREET
STREET ONE
STREET TWO
STREET THREE
SWM POND
750mmØ STM
600mmØ STM
450mmØ STM
525mmØ STM
FUTURE DEVELOPMENT BY OTHERS (MENZIE ENCLAVES)
Undeveloped Land
EX. HEADWALL
NOVATECH
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MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS SUBDIVISION
STORM SERVICING
SCALE 1 : 2000
DATE MAY 2025
JOB 118201
FIGURE 5
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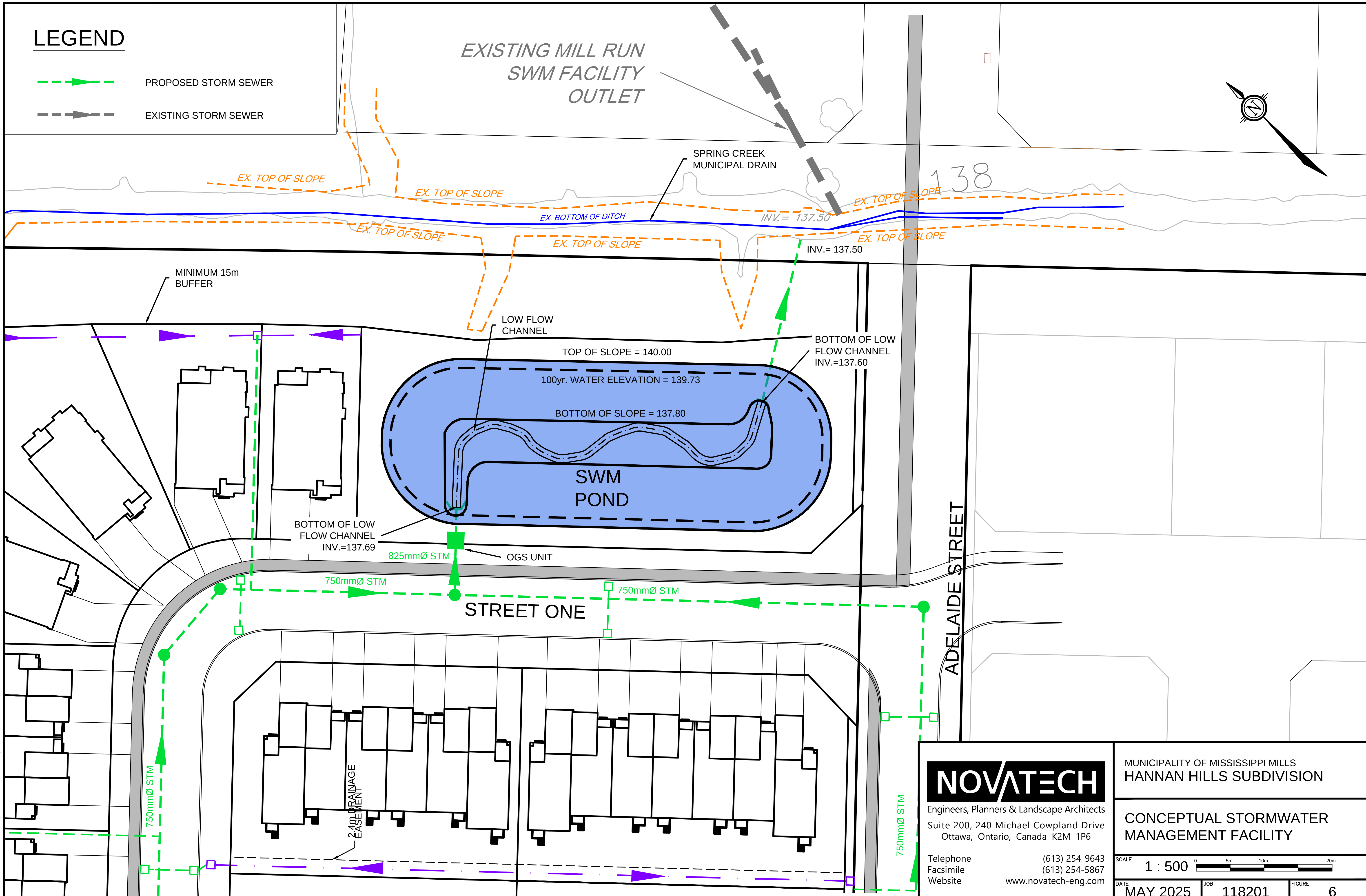

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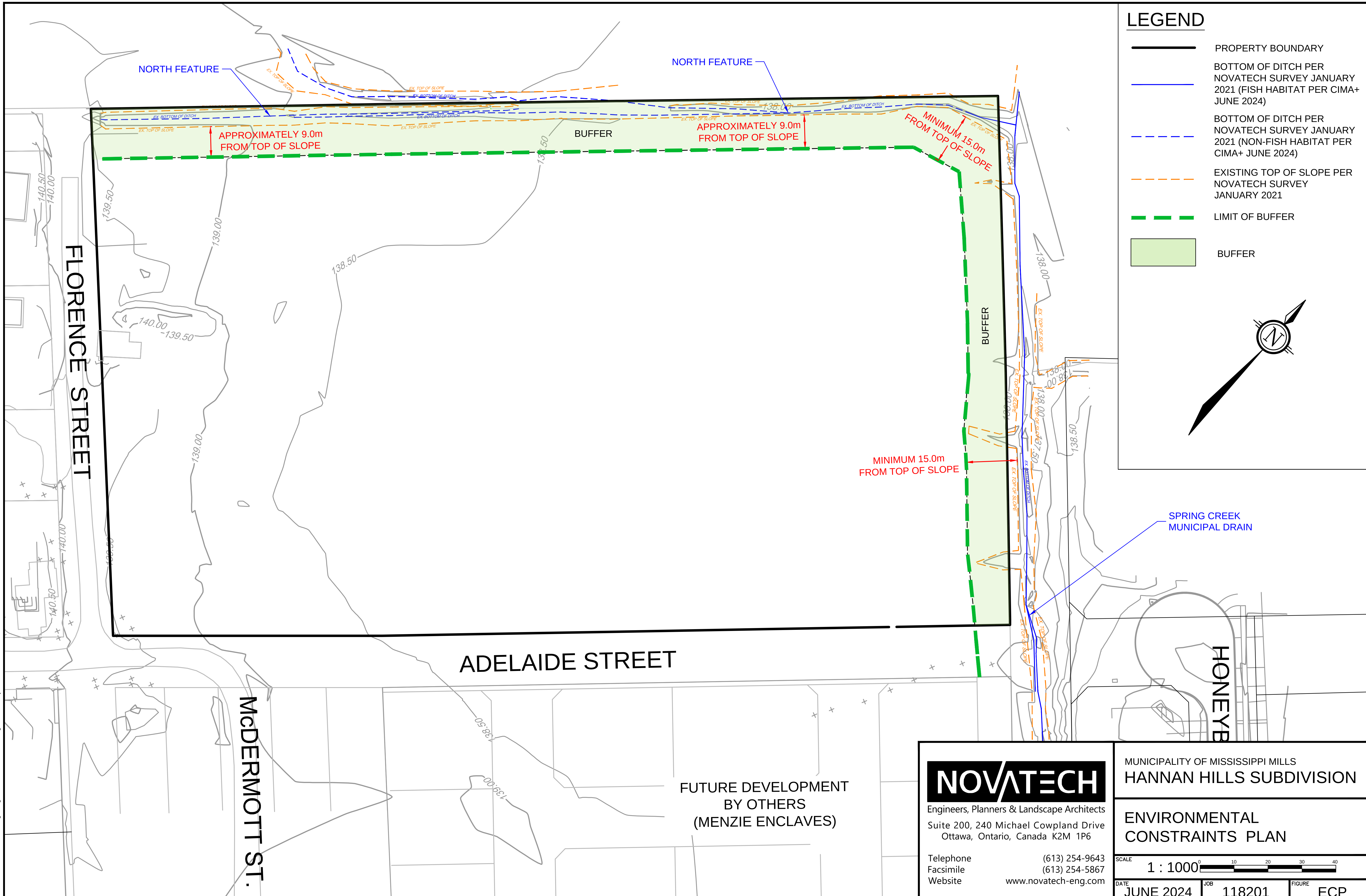

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MUNICIPALITY OF MISSISSIPPI MILLS

HANNAN HILLS SUBDIVISION

ENVIRONMENTAL CONSTRAINTS PLAN

SCALE 1 : 1000 (0 10 20 30 40)

DATE JUNE 2024 | JOB 118201 | FIGURE ECP

SHT11X17.DWG - 279mmX432mm

APPENDIX A

Correspondence

- Pre-consultation Meeting Notes - January 27, 2021
- Municipal Water and Wastewater System Capacity Check Form - October 25, 2024
- Hannan Hills Subdivisions – Capacity Check Email – November 21, 2024
- Response to MVCA Comments – Novatech May 27, 2025
- Response to Municipality Comments – Novatech May 27, 2025

LANARK COUNTY

Pre-Consultation Meeting Notes
Virtual zoom meeting – January 27, 2021
Prepared By: Julie Stewart

In Attendance
Steve Pentz – Senior Project Manager, Novatech
John Riddell – Regional Group
Susan Gordon – Novatech
Matt Nesrallah – Cavanagh Construction
Robert Dick - Neilcorp
Maggie Yet – Junior Planner, Mississippi Mills
Marc Rivet – Planner, JL Richards – Mississippi Mills
Ken Kelly – CAO, Mississippi Mills
Cory Smith – Public Works, Mississippi Mills
Matt Craig - Planner, MVCA
Kelly Stiles – Biologist, MVCA
Diane Reid – Environmental Planner, MVCA
Julie Stewart – County Planner, County of Lanark

Steve Pentz provided a brief background.
Official Plan Designation – Residential
Zoning – Development Reserve

- Proposing an 18 m right of way
- Mix of townhouses and semi-detached – total of 96 units
- Units designed to accommodate the market need of the municipality - family friendly, and price points
- Propose a 15m setback from the wetland

9 metre easement on subject property which is an existing Drainage Easement in favour of the Town

Planning Report – density to be addressed within.

Environmental Impact Study
– MVCA spoke to background and requirements.
Matt provided background on the conservation authorities wetlands policies from 2019 and the consultation at that time.
Following the meeting notes were provided by MVCA and are included below:

Planning

- We will need to review the SW Plan and EIS.
- Components of this plan should include any mitigation from the results of the HIS & EIS and impacts to the function of the wetland on site.
- Lot orientation and layout – seem predetermined prior to submission of an EIS, should include LID

MVCA and the Township have recommended that the SW pond be located on the NE corner of the site, if not possible then these lands may need to remain undeveloped to provide adequate buffer to wetlands to the north.

MVCA Requirements

- Hydrologic Impact Assessment and EIS (concurrent with planning requirements) as it relates to the SW requirements - what are the results of development on the adjacent watercourse, water table and wetlands? The report should include mitigation and offsetting recommendations to address the loss of wetland on site.

- Organic material must be removed from the site.

- Permits required for the development as in regulated area and out letting to any watercourse.

Servicing Options Statement
- As the site is will be on public services, a Conceptual Servicing Report shall be submitted with the application.

Stormwater Drainage Plan
- MVCA advised that Stormwater Management, Quality and Quantity control would be required, with Quality to an enhanced level of treatment – 80%.
- Reference was made to water balance

Traffic Study
- The Municipality advised that a traffic study will be required to address connection to municipal streets and the increase in traffic.

OTHER

Geotechnical Report – required

Environmental Site Assessment

- The developer indicated that an ESA has been prepared.

Please refer to the attached Pre-Consultation Checklist as well as the itemized items above.

Attachments	
1	
2	
3	
4	
Conditions and Acknowledgements	
1.	I/WE HEREBY AGREE THAT ALL INFORMAITON PROVIDED FOR THE PURPOSES OF REQUESTING THIS MUNICIPAL SYSTEM CAPACITY CHECK IS ACCURATE AND CONSISTENT WITH ALL MUNICIPAL GUIDELINES.
2.	I/WE HEREBY ACKNOWLEDGE THAT ANY ERRORS OR OMMISIONS IN THE PROVIDED INFORMATION SHALL RENDER ANY RESULT OF A MUNICIPAL SYSTEM CAPACITY CHECK TO BE INCORRECT AND INVALID FOR THE PURPOSES OF USING SAID RESULT FOR A DEVELOPMENT APPLICATION.
3.	I/WE AGREE TO PAY ALL COSTS RELATED TO THE REQUEST OF THIS MUNCIPAL WATER AND WASTEWATER SYSTEM CAPACITY CHECK WHICH WILL BE FORWARDED ON BY THE MUNICIPALITY FROM THE CONSULTANT RESPONSIBLE FOR COMPLETING THE ANALYSIS.

Applicant has read and understood the conditions of this application

Oct 25, 2024

Date

Signature of Applicant

Matthew Blanton

From: Michel Asselin <masselin@mississippimills.ca>
Sent: Thursday, November 21, 2024 10:08 AM
To: Alex McAuley; Julie Stewart
Cc: Luke Harrington; Melanie Knight; Drew Brennan; Matt Nesrallah; Steve Pentz
Subject: FW: 09-T-21002 – Hannan Hills Subdivision - Capacity Check (118201)
Attachments: Hannan Hills Subdivision_Water.pdf

Good morning Alex,

Here is the capacity check fyi.

I will have Luke check on as-built drawings as per your last e-mail request.

Michel,
While the capacity check is underway, are you able to provide us with the Town record drawings for the servicing connection points at Adelaide/Finner for the water and along Florence to the Victoria Street Sanitary Trunk sewer?

Regards,

Michel Asselin, P.Eng.
Senior Development and Capital Projects Engineer
613-256-2064 x 512
613-302-0789 C

Mississippi Mills

From: Annie Williams
Sent: November 20, 2024 10:01 AM
To: Michel Asselin
Cc: Luke Harrington ; Melanie Knight ; Mark Buchanan ; Ahrani Gnananayakan ; Bobby Pettigrew ; Mathieu Lacelle
Subject: RE: 09-T-21002 – Hannan Hills Subdivision - Capacity Check (118201)

Good morning Michel,

Please find below the capacity check for the Hannan Hills Subdivision.

WASTEWATER

The Mississippi Mills Master Plan Update wastewater modelling has already accounted for the Hannan Hills Subdivision in the 1 to 5 year timeline. In the master plan modelling, the development was assumed to have an area of 3.93 ha with a total unit count of 144 and an equivalent population of 346. The Master Plan modelling applied the following design parameters:

- Unit Density: 2.4 ppu
- Residential Flow: 350 L/cap/day
- Infiltration Allowance: 0.33 L/s/ha
- Peaking Factors applied as per system wide calibrated response

These Master Plan design parameters are identical to those used to calculate the peak design flows in the System Capacity Check Form, except for the calibrated peaking factors. The Master Plan had the loading from the development applied at node SA2MH-215, which is located at the intersection of Florence Street and Victoria Street. Since the population accounted for in the Master Plan (346 persons) is more conservative than the population stated in the most recent System Capacity Check Form (300 persons), the results from the Master Plan remain unchanged in that no additional upgrades are required as a result of this development.

It should be noted though that the model only captures system response in the trunk sewer and does not include analysis of the local sanitary sewers between the trunk sewers and the development.

WATER

Please find below the requested hydraulic boundary conditions for the following connections:

- One (1) connection to the existing 150 mm watermain at the intersection of Finner Court and Adelaide Street; and
- One (1) connection to the existing 200 mm watermain at Honeyborne Street, north of Horton Street.

The proposed Development ("Hannan Hills Subdivision") is located north of Adelaide Street, bordered by Florence Street to the west and Honeyborne Street to the southeast, in the Municipality of Mississippi Mills (Municipality). It was simulated using the Municipality's existing hydraulic water model (2024), to determine hydraulic boundary conditions based on theoretical water demands and fire flows provided by the Developer's Engineer in the Capacity Check Form and the Stormwater Management Report (refer to emails below).

Table 1 summarizes the theoretical water demands as calculated by the Developer's Engineer that were included in the model.

Table 1: Theoretical Water Demands

Scenario	Demand (L/s)
Average Day	0.97
Maximum Day	3.04
Peak Hour	6.68

Table 2 summarizes the various required fire flows as calculated by the Developer's Engineer.

Table 2: Fire Flows

Fire Flows (L/s)		
OBC	45	105
FUS	67	133

The development was modelled with a representative 250 mm diameter on-site watermain loop and junction node J-804. The hydraulic boundary conditions were generated at the connection locations labelled as junction nodes J-212 and J-542 in the model and are summarized in Table 3, with the WaterCAD model outputs provided in the attached. The elevation of 140.15 m for J-804 was taken from the drawings provided by the Developer's Engineer. All scenarios assume an elevated tank level of 179.90 m with all well pumps on. **The simulated maximum available fire flow at the representative node is 143 L/s based on maintaining a minimum pressure in the system of 20 psi.**

Table 3: Hannan Hills Subdivision Boundary Conditions

Demand Scenario	Connection 1 – Finner Court Junction Node J-212 (Elev 140.89 m)		Connection 2 – Honeyborne Junction Node J-542 (Elev 137.00 m)	
	Pressure (kPa)	HGL (m)	Pressure (kPa)	HGL (m)
Average Day (0.97 L/s)	383	180.06	421	180.06
Max Day (3.04 L/s)	379	179.64	417	179.64
Max Day (3.04 L/s) + Fire Flow (45 L/s)	346	176.19	385	176.38
Max Day (3.04 L/s) + Fire Flow (67 L/s)	315	173.07	357	173.44
Max Day (3.04 L/s) + Fire Flow (105 L/s)	242	165.64	288	166.43
Max Day (3.04 L/s) + Fire Flow (133 L/s)	173	158.58	223	159.79
Peak Hour (6.68 L/s)	373	179.04	412	179.05

The foregoing model results are for current conditions and are based on computer model simulation. We have not reviewed the adequacy of the domestic demand nor the fire flow requirements for the proposed development, which remains the responsibility of the Developer's Engineer.

Disclaimer: The model results are based on current simulated operation of the Municipality's water distribution system. The computer model simulation is based on the best information available at this time. The operation of the water distribution system can change on a regular basis, resulting in a variation in the boundary conditions. It is further noted that the operational characteristics of the water supply system and physical properties of the watermains can change and/or deteriorate over time. These changes may affect the supply characteristics of the system and the assumptions made in developing the model, which in turn could lead to variations in the simulation results. This should be considered by any third party undertaking simulation of system upgrades.

Please do not hesitate to contact me should you have any questions regarding the foregoing.

Thank you,
Annie

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

BEST MANAGED COMPANIES Platinum member

Annie Williams, P.Eng. (she/her)
Senior Civil Engineer

1000-343 Preston Street
Ottawa, ON, K1S 1N4

Work: 343-803-4523
awilliams@jlrichards.ca

CORPORATION OF THE MUNICIPALITY OF MISSISSIPPI MILLS

3131 OLD PERTH ROAD · PO BOX 400 · RR 2 · ALMONTE ON · K0A 1A0
PHONE: 613-256-2064
FAX: 613-256-4887
FAX: 613-256-4887

Request No.

Municipal Water and Wastewater System Capacity Check

Applicant

Last Name: McAuley	First Name: Alex	Corporation or Partnership: Cavanagh Developments C/O Novatech

Street Address: 240 Michael Cowpland Dr.		Unit Number: 200	Lot/Con.
Municipality: Ottawa	Postal Code K2M 1P6	Province Ontario	Email (optional) a.mcauley@novatech-eng.com
Telephone Number 613-254-9643 x.292	Fax Number		Mobile Number

Water Works Design Information

Average Daily Per Capita Demand = 350L/cap/day

Design Area (ha) 4.15	Fire Flow as per OBC 45 to 105 L/s
Number of Dwelling Units 110	Fire Flow as per FUS 67 to 133 L/s
Projected Population 300	Average Daily Demand (ADD) 0.97 L/s
Max Day Factor Source: 2.5 per Mississippi Mills WWMP	Max Day Demand (MDD) 3.04 L/s
Peak Hour Factor Source: 2.2 per Mississippi Mills WWMP	Peak Hour Demand (PHD) 6.68 L/s

Sewage Works Design Information

Inflow and Infiltration Allowance = 0.33L/s/ha

Average Daily Per Capita Flow (L/cap/day) 350	Peak Population Flow (L/s) 4.2 L/s
Peaking Factor (Manning's Equation) 3.46	Peak Extraneous Flow (L/s) 1.37
Wastewater Drainage Area for Development (ha) 4.15	Peak Design Flow (L/s) 5.57 L/s

Project Description

Street Address 277 Florence Street		Unit number	Lot/Con.
Postal Code K0A 1A0	Plan number/ other description	City/Town Mississippi Mills	

Description: (Please provide at a minimum the intended location of the development area as well as a preferred connection location(s) for both water and sewer systems.

4.15 Ha subdivision development located at 277 Florence Street. Water connections will be made at the Finner Court and Aderlaide Street intersection and along Honeybourne Street. Sanitary sewer connections will be made at the Florence Street and Victoria Street intersection.

Attachments	
1	
2	
3	
4	

Conditions and Acknowledgements	
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Applicant has read and understood the conditions of this application

Oct 25, 2024
Date

Signature of Applicant

May 27, 2025

Municipality of Mississippi Mills
Development Services and Engineering Department
14 Bridge Street, PO Box 40000
Almonte, Ontario K0A 1A0

Attention: **Melanie Knight, Director of Development Services & Engineering**

Reference: **Hannan Hills Subdivision**
Response to Second Submission Comment Letter
County File 09-T-21002
Our File: 118201

Novatech has filed concurrent Draft Plan of Subdivision and Zoning Amendment applications in relation to the above note subdivision in 2021. A revised application package was submitted in June 2024. This letter, along with the revised documents provided and listed below, respond to Municipality comments regarding our second submission, the last of which were received on September 9, 2024. The comments and responses are provided below in **bold** text and numbered according to the numbering sequence in which they were received.

Please find the following documents enclosed:

- Planning Rationale, dated May 2025, prepared by Novatech
- Serviceability and Conceptual Stormwater Management Report, dated May 2025, prepared by Novatech
- Hydrologic Impact Assessment, dated May 2025, prepared by Novatech
- Environmental Impact Study, dated May 2025, prepared by CIMA+
- Geotechnical Memo, dated November 25, 2024, prepared by Paterson Group

MUNICIPALITY OF MISSISSIPPI MILLS

Planning Department

1. As no parkland is proposed, cash-in-lieu of parkland will be required based on the Municipality's Parkland By-law 15-73.

   Novatech Response: **Noted.**

2. It is noted that the proposed four single detached lots exceed the minimum lot area of the R1 zone consideration could be given to providing additional single detached lots in this area.

   Novatech Response: **The four single detached lot remain on the revised draft plan. No additional single detached units have been included.**

3. Based on the Concept Plan, there are no lots with 13 metre frontages. Please clarify the lot frontages of the single detached lots and note that consideration should be given to proposing more single detached or semi-detached dwellings.

   Novatech Response: **The lot frontage has been revised as a result of minor revisions to the concept plan. The lot frontages have been measured as per the Zoning By-law definition.**

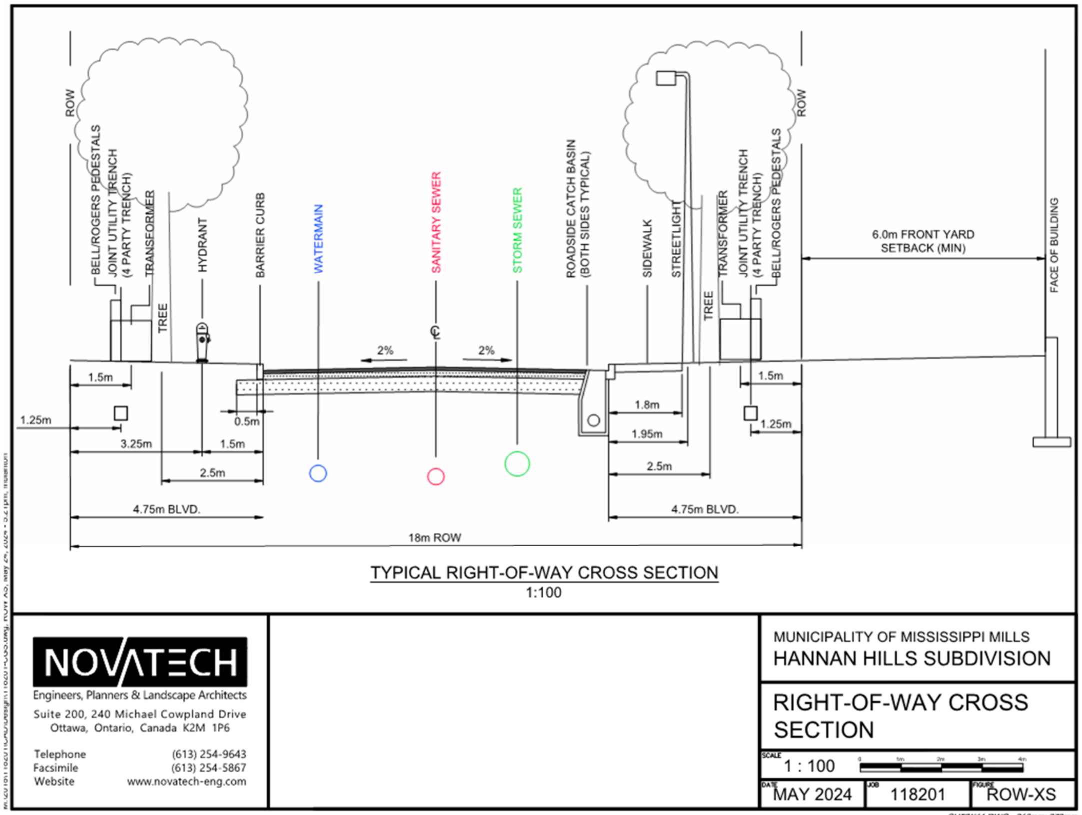
4. As noted in the Transportation Section below, right-of-way widths are proposed at 18 metres. Please amend Street One to a 20-metre right-of-way width. Based on the corner lot setbacks of Blocks and the large front yard setbacks of the for the back-to-back townhouses, there is area available to increase Street One to a 20-metre right-of-way width.

   Novatech Response: **The 18m right-of-way remains on the revised draft plan. It is understood that an 18m right-of-way is acceptable, based on the following rationale provided in Novatech's earlier memorandum dated March 21, 2025:**

   - Street 1 is approximately 300m in length and only provides localized access to 47 proposed residential dwellings. Street 1 is intended to move traffic from the development to the existing local street network and the 18m right-of-way is considered appropriate for this development context and density. In our experience, an 18m right-of-way is widely accepted as being suitable for low volume local roads. It is important to note that the internal streets have been indicated as 18m right-of-way on the concept presented at the initial pre-consultation meeting for this development and have been carried forward on the draft plan since the submission of the first draft plan application in 2021. Further, all plans and reports have been prepared on the basis of an 18m right-of-way.

   - While Table 21 in the 2024 MMTMP suggests a desired 20m ROW for local roads, the recommended Complete Street Standard Cross-Sections provided in Appendix K includes an 18m variant. The main difference between the 18m and 20m cross-sections is an increased road platform with of 9m for the 20m cross-section, compared to 8.5m for the 18m cross-section. While Ontario Traffic Manual (OTM) Book 18 recommends 4.5m lane widths for mixed vehicle/bike traffic lanes, it identifies that 4.3m lanes will provide sufficient space for vehicle passing cyclists under the Highway Traffic Act. The proposed cross-section is consistent with the 18m variant in the 2024 MMTMP and includes an 8.5m wide paved roadway (4.25m lane widths) with a 1.8m wide sidewalk on one side. As Street 1 provides localized access to 47 residential units with four routes to connect to Adelaide Street, traffic travelling on Street 1 is anticipated to be low and the proposed 18m right-of-way cross section is anticipated to operate acceptably from a transportation perspective.

   - The 18m cross-section included with the submission is shown below and demonstrates that the 18m width can meet both functional and operational requirements for servicing. The 18m cross-section accommodates the required sewers, watermain, hydrants, and utilities while still allowing for street parking, sidewalks and trees. Going from an 18m to a 20m cross section increases the pavement width to 9m and lengthens each driveway by 1m. The increase in paved areas negate the nominal increase in grassed boulevards area within the ROW for snow storage, in particular due to the ratio of driveways to lot frontage typical of a townhouse development.



- The stormwater management block has been sized on the basis of calculated storage requirements. The increase in right-of-way width to 20m would widen the paved road platform and require longer driveways that extend across the boulevard to the paved street. The resulting increase in imperviousness results in greater runoff volume leading to the pond which increase the storage requirements and reduces the softscaping which would otherwise help to provide infiltration for the required water balance. Narrowing of the SMW pond block by increasing the ROW width would require additional lands for the stormwater management block. From the perspective of stormwater management considerations, an 18m right-of-way width is desirable and appropriate.

- It is noted that the Adelaide and Florence Streets right-of-ways appear to have widths of 15m. While the proposed widening blocks shown on the draft plan will serve to widen these sections abutting the Hannan Hills development, the overall desired width would not be 20m without widening taken on the opposite sides of Adelaide and Florence.

- Section 4.6.4.2 of the Official Plan (as amended in 2019) states that generally, the right-of-way width for a local road should be 16m to 20m. The above-noted points justify the use of an 18m ROW under this development context.

- Notwithstanding the TMP recommendation for 20m, there are several examples of existing and recently-approved subdivision developments within the Town that include 18m right-of-ways, including the various phases within the Mill Run development, as well as the recently-approved Weaver's Way and Hilan Village developments. We are not aware of any functional and operational challenges arising from an 18m right-of-way associated with an 18m cross-section.

- The draft plan has been amended to include a 14.8m municipal block to encompass the east-west section of drain north of Blocks 5 to Block 11, inclusive. The use of an 18m right-of-way would allow for a rear yard setback of at least 7.7m, in compliance with the requirement of the Zoning By-law. A 20m right-of-way would reduce the rear yard depth to 5.8m which would require rear yard zoning relief. A reduced rear yard setback would result in a smaller, less functional rear yard depth.

5. Please be advised that the Municipality prefers that the entire area of the buffers located in the rear yard of the lots are conveyed to the Municipality as opposed to being incorporated in the rear yards of the proposed lots. The Municipality has no objections to reduced rear yard setbacks/areas for the lots which abut the buffer areas and Municipal drains as a result of the conveyance of the buffer area to the Municipality.

   Novatech Response: **The draft plan has been revised to include the entire buffer area within a single block (Block 34) that is to be conveyed to the Municipality.**

6. Please be advised that due to the presence of Blanding's Turtles in the area, the stormwater management pond will be required to be fenced with turtle fencing to help prevent turtles from nesting in the stormwater pond over time.

   Novatech Response: **Noted. Turtle exclusion barrier has been shown on the Preliminary Grading and Servicing Plan.**

7. For all corner lots (townhouses and back-to-back townhouses) urban design features such as wrap around porches/balconies and additional fenestration (windows) and/or doors should be incorporated to ensure these corner lots are animated as much as possible.

   Novatech Response: **Noted.**

8. It is noted that the EIS notes that a 2024 field survey needs to be completed re: Butternut and Black Ash (page 28) and re-headed Woodpecker Chimney Swift, Loggerhead Strike, Bobolink, (page 44-45). A full review of the EIS will be completed once the results of the field survey are incorporated into the EIS.

   Novatech Response: **Noted. An updated EIS prepared by CIMA+ (dated May 27, 2025), is included with this submission.**

9. Page 34 of the EIS appears to have a reference missing.

   Novatech Response: **This has been corrected in the updated EIS.**

10. Please be advised that, as a standard, tree planting is required at a rate of one tree per lot and for corner lots two trees per lot. Based on the Geotechnical Study, please provide information regarding the planting of trees and if there are any impacts due to the existence of sensitive soils.

    Novatech Response: **See attached memo dated November 25, 2024 from Paterson Group.**

Engineering

Geotechnical

11. It is noted that the bedrock is shallow and is inferred as main bearing surface for development on land. Please confirm if this is accurate.

    Novatech Response: **See attached memo dated November 25, 2024 from Paterson Group.**

12. The Geotechnical Study identifies areas of the site with 65kpa bearing capacity. Please clarify what method of foundation is proposed for these areas. Will construction occur on top of the sensitive clay soils or will these sensitive soils be removed to access the bedrock bearing surface.

    Novatech Response: **See attached memo dated November 25, 2024 from Paterson Group.**

13. A condition in the draft conditions/subdivision agreement regarding sensitive soils may be required to advise future landowners that the area contains sensitive soils based on the response to #11 and 12 above.

    Novatech Response: **See attached memo dated November 25, 2024 from Paterson Group.**

14. Seasonally high ground water table was not identified. **Please note** that CLI ECA has substantial requirements for design of sewers and watermains which cannot be shown to be above the seasonally high ground water table.

    Novatech Response: **See attached memo dated November 25, 2024 from Paterson Group.**

Water

15. Information from the 2018 Water and Wastewater Master Plan Update has been used to show that the area of development can be serviced. All development applications requiring water and sewer connections are required to fill out a system capacity check form. Please submit ASAP the Municipality's system capacity check form **attached to this letter**. Please be advised that an invoice will be provided for the cost of this analysis.

    Novatech Response: **The system capacity check has been completed and is included in the updated Serviceability Report.**

16. Water demand calculations use 280L/Cap/Day, please be advised that 350L/Cap/Day is required to be used. Please amend accordingly.

    Novatech Response: **The demands have been revised in the updated Serviceability Report.**

17. Based on modeling in the new 2023-2024 Water and Wastewater Masterplan it is likely that a trunk watermain is required to run from Victoria Street up Florence Street to serve the proposed subdivision and future surrounding build areas. The Municipality would like to discuss a front ending arrangement with the developer on this matter.

Novatech Response: **Based on the capacity check provided by the Municipality, additional offsite trunk watermain is not required for the proposed subdivision. Additional offsite works under a front ending agreement would be discussed separately with the developer.**

Fire Flow

18. Please confirm through the system capacity design check (form attached) to determine if the required F.U.S fire flows are available.

    Novatech Response: **Based on the capacity check provided by the Municipality, the required FUS fire flows are available. Refer to Section 4.1 of the Serviceability Report.**

19. If the required F.U.S fire flows are not available, please be advised that necessary fire walls or fire suppression systems to lower the fire flow requirements will be required. Alternatively, system upgrades to the water supply may also be considered to improving fire flow availability.

    Novatech Response: **Based on the capacity check provided by the Municipality, the required FUS fire flows are available. Refer to Section 4.1 of the Serviceability Report.**

Wastewater

20. Note: The Municipal CLI ECA requires that sewers conform to the CLI design guidelines including measures for installing sewers in areas with a seasonally high ground water table. If no seasonally high ground water table is identified measures are to be installed in lieu of missing information.

    Novatech Response: **This would be incorporated in the detailed design.**

21. 280L/Cap/Day has been used for wastewater flow calculations. Please update these calculations using 350L/Cap/Day.

    Novatech Response: **The flows have been revised in Section 4.2 of the updated Serviceability Report.**

Stormwater

22. Please provide model information for the manufactured stormwater treatment device.

    Novatech Response: **A preliminary sizing for the manufactured stormwater treatment device has been provided in Section 5.2 and Appendix E of the Serviceability and Conceptual SWM Report. Sizing will be confirmed at detailed design.**

23. Please provide the source for the IDF rainfall data used to perform the calculations.

    Novatech Response: **The IDF data was taken from the City of Ottawa Sewer Design Guidelines and is specified in Section 4.3.1 for the Serviceability and Conceptual SWM Report.**

24. Please clarify which method was used for calculations. Both PCSWMM and Rational Method are referenced. This is likely for pre to post, but that is not clearly stated in the report.

Novatech Response: **Sewer sizing was performed using the Rational Method. All other sizing information (HGLs, ICDs, pre- to post- flows, etc.) was performed using PCSWMM. Any items discussed in Section 5.1: Hydrologic & Hydraulic Modeling (PCSWMM) were done using PCSWMM. Additional text was provided to clarify this (example – ICD sizing mentioned in 4.3.1 referenced PCSWMM.**

25. Pease be advised that basement sump pumps are required to have backup generators or batteries to run sump pumps during a power failure. Sump pump back up systems must be able to run the sump pump system for a minimum of 36 hours without power. These requirements will be included in the subdivision agreement.

    Novatech Response: **This would be incorporated into the detailed design.**

26. Easements in favour of the Municipality (2.4 metres wide) will be required on all rear yard swales for access, maintenance and to ensure that modifications are not permitted by future property owners.

    Novatech Response: **This would be incorporated into the detailed design.**

27. As per the Municipality's CLI ECA new developments are required to implement LID measures in storm water management design. Please provide an overview of what measures have been proposed which would increase the infiltration of water into the ground instead of flowing to the storm water management pond. It is recommended that perforated storm pipes in backyards are considered as one measure.

    Novatech Response: **Potential LID measures such as rear yard infiltration trench systems with perforated rear yard pipes and roof leaders directed to grassed areas have been noted in the Serviceability and Conceptual SWM report. This would be discussed further during the detailed design.**

<u>Roads/Transportation</u>

28. The draft plan proposes 18 metre right of ways. This is in contravention with both the 2016 Transportation Master Plan and the 2023-2024 draft Transportation Master Plan. The minimum required right-of-way width for local streets in both Master Plans is 20 metres. Please amend Street One on the draft plan to a 20-metre right-of-way. The Department is willing to accept Streets Two and Three remaining at an 18-metre right-of-way due to their short length.

    Novatech Response: **See response to Comment #4.**

29. There is no sidewalk proposed on Florence Street. A sidewalk along Florence Street is required, please amend accordingly. Florence Street shall be constructed to full urban local standard.

    Novatech Response: **Noted. A sidewalk will be included on the detailed design drawings.**

30. There are no sidewalks shown on Adelaide Street. A sidewalk along Adelaide Street is required, please amend accordingly. Please be advised that Adelaide Street right-of-way is required to be constructed to a full urban local cross section as per the TMP.

Novatech Response: **Noted. A sidewalk will be included on the detailed design drawings.**

31. The development of Adelaide Street, including sidewalks and infrastructure, will be subject to a latecomer policy proposed in Official Plan Amendment 32, whereby the applicant who constructs any infrastructure that benefits other property owners is reimbursed by a developer prior to benefiting from the new infrastructure. Please provide an update on the financial agreement between this development and the proposed Menzie's subdivision.

    Novatech Response: **A Memorandum of Agreement, dated June 5, 2024, has been prepared and executed by both Cavanagh Developments and Ash Sharma (on behalf of 13165647 Canada Inc. (copy enclosed).**

32. The Florence Street right-of-way between Adelaide and Maude Streets will be required to be re-instated with a foot path for pedestrian connectivity approximately 6 metres wide. Pathway lighting is to be included. Please provide a conceptual design of the pathway for review and comment.

    Novatech Response: **The section of unopened right-of-way between Adelaide and Maude Street, including the existing pathway from Finner Court to Maude Street, will be re-instated to existing conditions. A conceptual design of the pathway and lighting should not be necessary in advance of draft approval and a pedestrian pathway will be included as part of the detailed design.**

33. The proposed connection to Honeybourne is required to be constructed to a full urban local cross section with a crossing of the municipal drain with a suitable structure. A gate shall be placed between Adelaide and Honeybourne to limit vehicle access and signage will be required stating that this area is a future road connection.

    Novatech Response: **We understand that a 3m wide MUP crossing to Mill Run would be acceptable rather than a street connection. Gating and signage would be provided. Crossing details are to be confirmed at detailed design.**

Building Department

34. Please be advised that based on additional information in the next resubmission, there may be requirements/restrictions at the building permit stage, such as low bearing capacity of soil or addressing frost susceptibility, identified in the Geotechnical Study.

    Novatech Response: **Noted**

35. Please be advised that based on additional information in the next submission, there may be requirements/restrictions at the building permit stage, such as the requirement for fire walls. If so, a map identifying the lots requiring additional fire protection at the building permit stage, will be required.

    Novatech Response: **Noted**

Please contact the undersigned if you have any questions.

Sincerely,

NOVATECH

Steve Pentz, MCIP, RPP
Senior Project Manager

cc: Koren Lam, County of Lanark
Julie Stewart, Cavanagh Developments

NOVATECH
Engineers, Planners & Landscape Architects

May 27, 2025

Mississippi Valley Conservation Authority
10979 Highway 7
Carleton Place, Ontario
K0A 3P1

Attention: Mercedes Liedtke, Environmental Planner

Reference: Hannan Hills Subdivision
Response to MVCA Comment Letter
County File 09-T-21002
Our File: 118201

Novatech has filed concurrent Draft Plan of Subdivision and Zoning Amendment applications in relation to the above note subdivision in 2021. A revised application package was submitted in June 2024. This letter, along with the revised documents provided and listed below, respond MVCA comments provided in the letter dated August 16, 2024 and accompanying technical memo of the same date. The comments and responses are provided below in **bold** text and numbered according to the numbering sequence in which they were received.

Please find the following documents enclosed:

- Planning Rationale, dated May 2025, prepared by Novatech
- Serviceability and Conceptual Stormwater Management Report, dated May 2025, prepared by Novatech
- Hydrologic Impact Assessment, dated May 2025, prepared by Novatech
- Environmental Impact Study, dated May 2025, prepared by CIMA+
- Geotechnical Memo (in response to Town comments), dated November 25, 2024, prepared by Paterson Group

Stormwater Management

1. The Preliminary Storm Drainage Area Plan shows two uncontrolled drainage areas (U13 & U14). However, the uncontrolled post-development flow of 146 L/s provided in Table 5.3 appears to include only U13 as per Subcatchment Runoff Summary in the PCSWMM model output. Please clarify how the uncontrolled flow from U14 has been accounted for the total uncontrolled flow.

   Novatech Response: **Table 5.3 has been updated to reflect the uncontrolled and controlled runoff.**

2. The maximum outflow from the dry pond in the PCSWMM model output does not appear to match the controlled post-development flow provided in Table 5.3. Please confirm the allowable release rate from the proposed dry pond.

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

Novatech Response: **See response to Comment 1. Table 5.3 has been updated to show outflow from the pond as controlled flow.**

3. Please demonstrate that the flow in the Spring Creek Municipal Drain downstream of the outlet of the dry pond does not exceed the pre-development flows/levels in the receiving watercourse.

   Novatech Response: **Table 5.3 demonstrates that the post-development flows to the Municipal Drain do not exceed the pre-development flows for all storm events up to and including the 100-year storm event. The only exception is the 25mm 4-hour Chicago event where flows are exceeded by 5 L/s, which does not account for the volume of runoff being infiltrated as part of the water balance measures.**

4. Table 5.2 shows that the required 100-year storage volume is 1,661 m3. Please provide available storage volume within the proposed dry pond for the 100-year storm to confirm that the storage requirement is met and describe how the available storage volume is determined.

   Novatech Response: **The volume provided to the top has been added to Table 5.1 and Table 5.2 (2,048m^3) showing that the pond has adequate volume for storms up to and including the 100-year event. A stage-area-storage curve for the pond was used in PCSWMM to determine the available storage volume and what was required in all the storm events. The stage-area-storage curve was determined based on the design presented in Figure 6 (Conceptual Stormwater Management Facility) and is provided in Appendix E. Additional text was added to Section 5.1 to clarify.**

5. In Table 5.2 states that a 6-hour Chicago Storm Event was used for the table whereas the same discharge values are shown in Table 5.2 for the 12-hour SCS Storm Event. Table 5.2 should have a note that indicates what type of design storm was used for the storage-discharge values, as indicated in Section 5.1 of the report.

   Novatech Response: **Table 5.2 was updated to reference the 12-hour SCS storm event.**

6. The bottom of pond elevation and the 100-year water level provided in the report (i.e., Table 5.1 and Table 5.2, respectively) are not consistent with Figure 6 Conceptual Stormwater Management Facility Plan. Please review and revise.

   Novatech Response: **Figure 6 was revised to reflect the water levels listed in Tables 5.1 and 5.2. The Tables were also reworded for consistency and clarity.**

7. Section 2.2 of the HIS describes the wetland in relation to subject property but does not quantify the annual volumes associated with the hydrologic function of the wetland. Further, the HIS describes that the subject property is approximately 5.8% of the wetland area. As the wetland area is proposed to be removed, an understanding of the potential impact of the wetland is recommended and targets established to maintain runoff volumes, if necessary. Using a simplified methodology, such as the Thornthwaite-Mather method, please provide an assessment of the annual average volumes associated with the existing conditions for both the wetland and the subject property to establish runoff volume targets for the subject property.

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Novatech Response: **Quantitative review of the water balance is discussed in Section 2.3. A water balance using Thornthwaite-Mather method has been provided to quantify the infiltration targets and runoff volumes.**

8. Section 2.3 of the HIS states that the drainage areas and surface runoff volumes to the municipal drain and the wetland area to the north would not be negatively impacted under proposed conditions. However, these statements were not quantified, and there is a concern that the increase in runoff volumes to the receiving municipal drain may increase downstream erosion. Please provide average annual volumetric calculations and supporting tables confirming the proposed change in hydrologic function for the proposed unmitigated for both the area draining to the wetland and the subject property.

   Novatech Response: **Water balance calculations have been provided in the HIS to establish runoff volume targets for detailed design. Refer to the HIS for changes to the annual runoff volumes.**

9. Section 2.5 of the HIS proposes disconnected roof drains to promote infiltration. However, there is no supporting calculations to confirm if this is viable for meeting the existing conditions infiltration or runoff volumes. Please provide annual average runoff volume calculations and supporting tables confirming that the proposed mitigation strategy is sufficient to maintain infiltration volumes and hydrologic function of the area, including reducing the potential for downstream erosion from increased runoff volumes. If necessary, provide additional measures to increase infiltration and reduce runoff volumes, including exploring the potential use of the dry-pond.

   Novatech Response: **Water balance calculations have been provided in the HIS to establish runoff volume targets for detailed design. Mitigation measures are discussed further in the HIS. Due to high groundwater and shallow bedrock, it was not feasible to use the dry pond as an infiltration basin.**

10. Based on the removal for the test for pollution in the updated Ontario Regulation 41/24, review of quality treatment is deferred to the municipality.

    Novatech Response: **Noted.**

<u>EIS and HIS Comments</u>

1. Please add the area of MVCA's 30 m regulation limit to the wetland that is proposed for development to the HIS Table 1.

   Novatech Response: **The areas within the 30m regulation limit has been added to Table 1.**

2. The EIS indicates that the buffer areas will be cleared and graded with the rest of the site, while Table 1 of the HIS indicates that the wetland habitat in that area will be retained. Please clarify if the watercourse setback buffer areas will be cleared and graded as part of the proposed development and to what extent.

a. If the proposal is for removal; please provide an assessment on how this will impact the wetland soils and hydrologic function of the areas within the watercourse corridor and setback buffer.
b. If these areas are to be cleared and graded then there is no "retained wetland" onsite, instead Table 1 of the HIS should be updated to state that 0.36 ha of wetland will be restored on site.
c. Please provide details on what is proposed to be included in the "rehabilitation of the buffers". Will the mitigation measures recommend the re-use of on-site wetland soils?

Novatech Response: **Areas of the retained wetland within the buffers that may be disturbed during construction would be rehabilitated. The rehabilitation is discussed in the EIS, which includes planting of native vegetation. The HIS indicates that the native soil is to be re-used and the grades to be reinstated to match existing. Further details of the rehabilitation measures would be provided at the time of detailed design.**

3. What is the amount and extent of fill to be brought into the site to achieve sufficient soil depth to install servicing?

   a. How will the slope grading be profiled in relation to the watercourse setback and wetland restoration areas?

   Novatech Response: **Up to 2m of fill would be added to the proposed development to allow for servicing and house construction. Grading changes would occur along the depth of the perimeter lots so as to match existing conditions at the retained wetland buffer. Per the HIS, disturbed grades within the wetland during construction would be rehabilitated.**

4. The Preliminary Grading and Servicing Plan within the Stormwater Report (Novatech, 2024) shows that the rear yard overland flows for the northern parcels will be collected in a rear yard swale that then outlets to the stormwater system. How will base flow and hydrology of the watercourse and proposed areas of restored wetland be maintained pre to post under these circumstances?

   a. Please confirm the use of LID infiltration techniques within the intended swale area.

   Novatech Response: **A water balance has been provided in the HIS to show the difference between pre-development and post-development unmitigated infiltration. The rear yard drainage systems abutting the existing drains would be designed to promote infiltration adjacent to the rehabilitated wetland areas adjacent to the drains. Details on potential LID measures are discussed further in the HIS.**

5. The HIS indicates that the onsite wetland habitat will be removed and thus infiltration measures to keep it hydrated are not required. MVCA notes that wetland habitat will be reinstated onsite and infiltration measures may still have a role in maintaining the hydrology of these features. Please provide a discussion coordinated between the EIS, HIS and the Stormwater Plan.

   Novatech Response: **Discussion has been coordinated between the EIS, HIS and Stormwater. Infiltration measures are being proposed along the perimeter wetland being retained/rehabilitated, and within the site.**

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6. Wetland soils are known to absorb runoff and help mitigate flooding and erosion. Please provide further impact assessment discussion on the impacts of removing 2.69 ha of wetland from the downstream end of the overall wetland and how the hydrology of the wetland and the Spring Creek Municipal Drain watershed will be maintained pre to post.

   Novatech Response: **A water balance has been provided in the HIS. The site is located within the downstream portion of the wetland and is not impacting the remaining wetland. The development has shallow bedrock with high groundwater and the existing ditch along the northwest boundary of the development intercepts the groundwater flows and directs them to the Municipal Drain.**

7. Impacts to the on-site natural heritage features have been discussed, however the cumulative impacts of successive development within this catchment area have not been thoroughly discussed in regard to environmental or hydrologic impacts. There are other active development applications adjacent and within the catchment area with anticipated pressures on the wetlands.

   Novatech Response: **There are existing constructed drains located between the site and the upstream offsite wetlands. Review of the previous development and the impact of the existing municipal drainage features on the wetlands is beyond the scope of this project.**

8. MVCA notes that the proponent will require a detailed wetland compensation and restoration plan for conceptual agreement prior to proceeding to detailed design.

   a. The EIS indicates that a wetland compensation and restoration plan will be submitted to MVCA at detailed design. However, overall compensation amounts and locations are to be submitted during the draft plan approval, and further details may be refined during detailed design.
   b. Define the amounts and proposed locations for the various proposed types of on-site habitat enhancements. MVCA requests a figure and summary table be created to show how and where the loss of 2.69 ha of wetland habitat will be compensated.
   c. It should also include a recommended timeline for post construction effectiveness monitoring, and plantings survival/replacement assessments.

   Novatech Response: **Refer to the updated EIS by CIMA+.**

9. MVCA recommends that an overall development plan package harmonize and summarize all recommended impact mitigation measures that are to be carried forward into Detailed Design.

   Novatech Response: **A summary of mitigations measures has been included in the Serviceability and Conceptual SWM Report.**

10. A more through integration of the technical studies (EIS, HIS, SWM) is requested as different terminology is being used and some recommendations have not been included in the preliminary stormwater designs.

    Novatech Response: **The reports have been updated for consistency between reports.**

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Sincerely,

NOVATECH

Alex McAuley, P.Eng.
Senior Project Manager
Land Development Engineering

cc: Koren Lam, County of Lanark
Melanie Knight, Municipality of Mississippi Mills
Julie Stewart, Cavanagh Developments

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APPENDIX B

Watermain Design

- Mississippi Mills FUS Simple Method Email – March 28, 2024
- Water Demand Calculations – May 2025
- Excerpt from FUS – Water Supply for Public Fire Protection - 2020

Aden Rongve

From:	Julie Stewart <JStewart@thomascavanagh.ca>
Sent:	Thursday, March 28, 2024 8:58 AM
To:	Susan Gordon
Cc:	Erin O'Connor; Steve Pentz; Alex McAuley; Aden Rongve; Mitch Parker; Pierre Dufresne; Ben Houle; Marko Cekic
Subject:	RE: Back to Back Towns
Attachments:	System Capacity Check Form Fillable.pdf

Hi Susan – I reached out to Mississippi Mills in regards to the requirement for FUS. The Municipality does require that FUS is met for new developments. Please see the response below from Luke Harrington. Luke has also provided a System Capacity Check Form – I assume that you have seen this form for this project or similar developments ?

Please confirm what separation distance is required based on the available fire flow as noted by Luke. Once you provide this confirmation, I will have egis look at the layout on the conceptual plan and work on meeting the required separation distance. Please advise if you can have this provided to me by Tuesday of next week.

"Hello Julie,

In Almonte there is no direct separation distance requirements for homes. We let the developers engineer determine what separation distance is required based on the available fire flow to the project site. That being said, we do require that developments design their neighbourhoods using the FUS simplified method. I see your email regarding the 3m separation. Like I said, I will leave it up to your engineers to show that it is compliant with the available fire flow.

With regards to the servicing capacity check form. See attached. This form needs to be filled out and returned to the Municipality so that we can determine what water supply and sewer capacity is available for your development. I assume that your intention is to run a capacity check for the Hannan Hills development? If this is the case, please have your engineers provide the theoretical servicing layout for the site such as the future Florence street water main and connections to Adelaide and Honeyborne. If you or your colleagues have any questions, please reach out to me."

Best Regards,

Luke Harrington B.Eng.
Engineering Coordinator
613-256-2064 ext. 408

Thank you,
Julie

Julie Stewart, MCIP, RPP
Project Manager, Planning
Cavanagh Developments
613-257-2918 Ext. 1382 | 613-812-8214
JStewart@thomascavanagh.ca

From: Susan Gordon <s.gordon@novatech-eng.com>
Sent: Friday, March 22, 2024 10:09 AM
To: Julie Stewart <JStewart@thomascavanagh.ca>
Cc: Erin O'Connor <EOConnor@thomascavanagh.ca>; Steve Pentz <s.pentz@novatech-eng.com>; Alex McAuley <a.mcauley@novatech-eng.com>; Aden Rongve <a.rongve@novatech-eng.com>; Mitch Parker <m.parker@novatech-eng.com>
Subject: RE: Back to Back Towns

Hi Julie,

Thank you for the house plans for the back to back townhouses.

In addition, we need to confirm the following for the Draft Plan application engineering, i.e. for our conceptual stormwater management analysis and to establish a preliminary pond size/land area required. This is time critical, so let us know if you would like to discuss so we can finalize our engineering.

- Building separation: We recommend 3.0m separation between buildings otherwise fire walls are required between every few units. With a 3.0m separation our analysis is showing that fire walls are not required (subject to Town's review).
- We are assuming double driveways for the single family homes, single driveways for townhouses and back to back townhouses.
- We are using the setbacks noted on the McIntosh Perry Concept Plan (v10, attached) to estimate the impervious area to calculate the runoff to the storm water management pond.

Susan Gordon, P.Eng., MBA, Director | Land Development
NOVATECH
Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 269 | Cell: 613.265.5415

From: Julie Stewart <JStewart@thomascavanagh.ca>
Sent: Thursday, March 21, 2024 3:03 PM
To: Susan Gordon <s.gordon@novatech-eng.com>; Steve Pentz <s.pentz@novatech-eng.com>
Subject: FW: Back to Back Towns

Hi Susan - I was speaking with Steve this am, and he mentioned the engineers needed more details on driveway and garage locations. Please see the attached set of plans for back-to-back in Shea Village as an example of the Patten product.

You had a few other questions, can you send me an e-mail and I can either respond via e-mail or call you tomorrow. I am in an on-line training session tomorrow, but I may have an opportunity to make a call.

Thanks
Julie

Julie Stewart, MCIP, RPP
Project Manager, Planning
Cavanagh Developments
613-257-2918 Ext. 1382 | 613-812-8214
JStewart@thomascavanagh.ca

From: Alyssa Stack <AStack@pattenhomes.com>
Sent: Thursday, March 21, 2024 2:57 PM
To: Julie Stewart <JStewart@thomascavanagh.ca>
Subject: Back to Back Towns

Hey Julie,

This is a set of plans from BLK 162 in Shea. It has the site plan included and should give them all info they need.

Alyssa Stack
General Manager
613-831-5674 Ext. 106
AStack@pattenhomes.com

Water Demand Design Sheet

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #:	118201
Project Name:	Hannan Hills Subdivision
Date:	May 2025
Input By:	A. Rongve
Reviewed By:	A. McAuley
Drawing Reference:	Figure 3

Legend: Input by User | No Input Required | Calculated Cells →

Reference: Ottawa Design Guidelines - Water Distribution (2010 and TBs)
MOE Design Guidelines for Drinking-Water Systems (2008)
Fire Underwriter's Survey Guideline (2020)
Ontario Building Code, Part 3 (2012)
JL Richards Master Plan Update Report (February 2018)

Small System = NO

	# of Dwellings	Area (ha.)	Pop. Equiv.	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
Residential Input						
Singles	4		13.60	0.06	0.14	0.30
Townhomes	106		286.20	1.16	2.90	6.38
Totals	**110**	**0.00**	**299.80**	**1.21**	**3.04**	**6.68**

Summary

i. Type of Development and Units:	106 Townhomes and 4 Single Family Homes		
ii. Proposed Water Service Connection Location(s):	Refer to Watermain Servicing Figure 3 in the Serviceability and Conceptual Stormwater Management Report.		
iii. Average Day Flow Demand:		1.2	L/s
iv. Peak Hour Flow Demand:		6.7	L/s
v. Maximum Day Flow Demand:		3.0	L/s
vi. Required Fire Flow #1 (Single Family Homes):		67	L/min
vii. Required Fire Flow #2 (Townhouse Buildings):		133	L/min

Design Parameters

Residential					
Unit Type Population Equiv.	**Singles**	**Semis/ Towns**	**Apts (2-BR)**	**Apts (1-BR)**	**Apts (Avg)**
	3.4	2.7	2.1	1.4	1.8
Daily Demand	L/per person/day				
Average Demand	350				

Residential Peaking Factors	**Pop.**	**Max Day (x Avg Day)**	**Peak Hour (x Avg Day)**
Small System (If Applicable)	0	9.50	14.30
	30	9.50	14.30
	150	4.90	7.40
Modified	300	3.60	*5.50*
	450	3.00	*5.50*
	500	2.90	*5.50*
Large System (Default)	> 500	2.50	5.50

EXCERPT FROM FIRE UNDERWRITER'S SURVEY - WATER SUPPLY FOR PUBLIC FIRE PROTECTION (2020)

Additional Items of Note

i. The required fire flow calculation guide is not expected to provide an adequate required fire flow for complex and unusual risks such as lumber yards, petroleum storage, refineries, grain elevators, and large chemical plants, but may indicate a minimum value for these hazards. Applicable industry standards and guidelines should be consulted when reviewing fire flows and emergency response needs for complex and high consequence risks.

ii. Judgment must be used for business, industrial, and other occupancies not specifically mentioned.

iii. Consideration should be given to the configuration of the building(s) being considered and accessibility by the fire department with respect to applying hose streams.

iv. Consideration should be given to carefully reviewing closely spaced, wood frame construction and the potential for fire spread beyond the building of origin. There are many risk factors that may contribute to the risk of these types of fires, one of which is spacing of structures. If the designer or the Authority Having Jurisdiction determines there to be a high potential for fire spread between closely spaced combustible buildings, the designer should consider the maximum probable fire size involvement when determining the Total Effective Area of the design fire.

v. Where wood shingle or shake roofs contribute to risk of fire spread in the subject building, an additional charge of 2,000 L/min to 4,000 L/min should be added to the required fire flow in accordance with the extent and condition of the risk.

vi. For one and two-family dwellings not exceeding two storeys in height and having Total Effective Area of not more than 450 m^2, the following short method may be used in determining a required fire flow:

Table 7 Simple Method for One and Two Family Dwellings Up To 450 sq.m

Exposure distances	Suggested Required Fire Flow (LPM) [4,5,6]	
	Wood Frame	Masonry or Brick
Less than 3m	8,000	6,000
3 to 10m	4,000	4,000
10.1 to 30m	3,000	3,000
Over 30m	2,000	2,000

[4] For sprinkler protected risks, 50% of the value from this table may be used, to a minimum required fire flow of 2,000 LPM

[5] If all exposures within 30m of subject building are sprinkler protected, a minimum required fire flow of 2,000 LPM may be used

[6] If all exposing building faces within 10m have protected openings (or blank walls) and a minimum 1 hr FRR, the required fire flow may be reduced by 2,000 LPM to a minimum of 2,000 LPM.

vii. For one and two-family dwellings not exceeding two storeys but having a Total Effective Area of more than 450 m^2, and for row housing, the following short method may be used in determining a required fire flow:

Table 8 Simple Method for One and Two Family Dwellings Exceeding 450 sq.m, and Row Housing Exposure distances

Exposure distances	Suggested Required Fire Flow [4,5,6]	
	Wood Frame	Masonry or Brick
Less than 3m	12,000	9,000
3 to 10m	8,000	8,000
10.1 to 30m	6,000	6,000
Over 30m	4,000	4,000

Note that for larger and more complex developments, a full calculation of required fire flows is recommended.

viii. Special hazards

a. In areas where there is a significant hazard of wildfires and a significant level of exposure to fuels, further investigation into adequate water supplies for public fire protection should be made and may consider alternative fire suppression strategies including, but not limited to, exterior exposure protection fire sprinkler systems, structure protection units and other methods of protection of the built environment from wildland fires in the interface areas. For further information see the National Research Council publication National Guide for Wildland-Urban Interface Fires.

b. In areas where there is a significant hazard of seismic events, consideration should be given to the need for redundancy in water supplies both for manual fire fighting and for building sprinkler systems, particularly in areas where there is a significant life safety hazard.

APPENDIX C

Sanitary Sewer Design

- Hannan Hills Subdivision Sanitary Flows – May 2025
- Conceptual Sanitary Drainage Area Plan (118201-CSAN) – May 2025
- Sanitary Sewer Design Sheet – May 2025

SANITARY FLOWS FROM PROPOSED DEVELOPMENT

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 118201
Project Name: Hannan Hills Subdivision
Date: May 2025
Input By: A.Rongve
Reviewed By: A.McAuley
Drawing Reference: 118201-CSAN

Legend: Design Input by User
As-Built Input by User
Cumulative Cell
Calculated Design Cell Output

Reference: City of Ottawa - Sewer Design Guidelines (2012 and TBs)
MOE - Design Guidelines for Sewage Works (2008)
JL Richards Master Plan Update Report (February 2018)

Location			Demand											
			Residential Flow									Extraneous Flow Area Method		Total Design Flow
Area ID	From MH	To MH	Singles	Semis / Towns	Population (in 1000's)	Cumulative Population (in 1000's)	Average Pop. Flow Q(q) (L/s)	Design Peaking Factor M	Peak Design Pop. Flow Q(p) (L/s)	Res. Drainage Area (ha.)	Cumulative Res. Drainage Area (ha.)	Cumulative Extraneous Drainage Area (ha.)	Design Extraneous Flow Q(e) (L/s)	Total Peak Design Flow Q(D) (L/s)
TOTAL HANNAN HILLS DEVELOPMENT			4	106	0.300	0.300	1.2	3.5	4.2	4.1	4.1	4.1	1.4	5.6

Demand Equation / Parameters

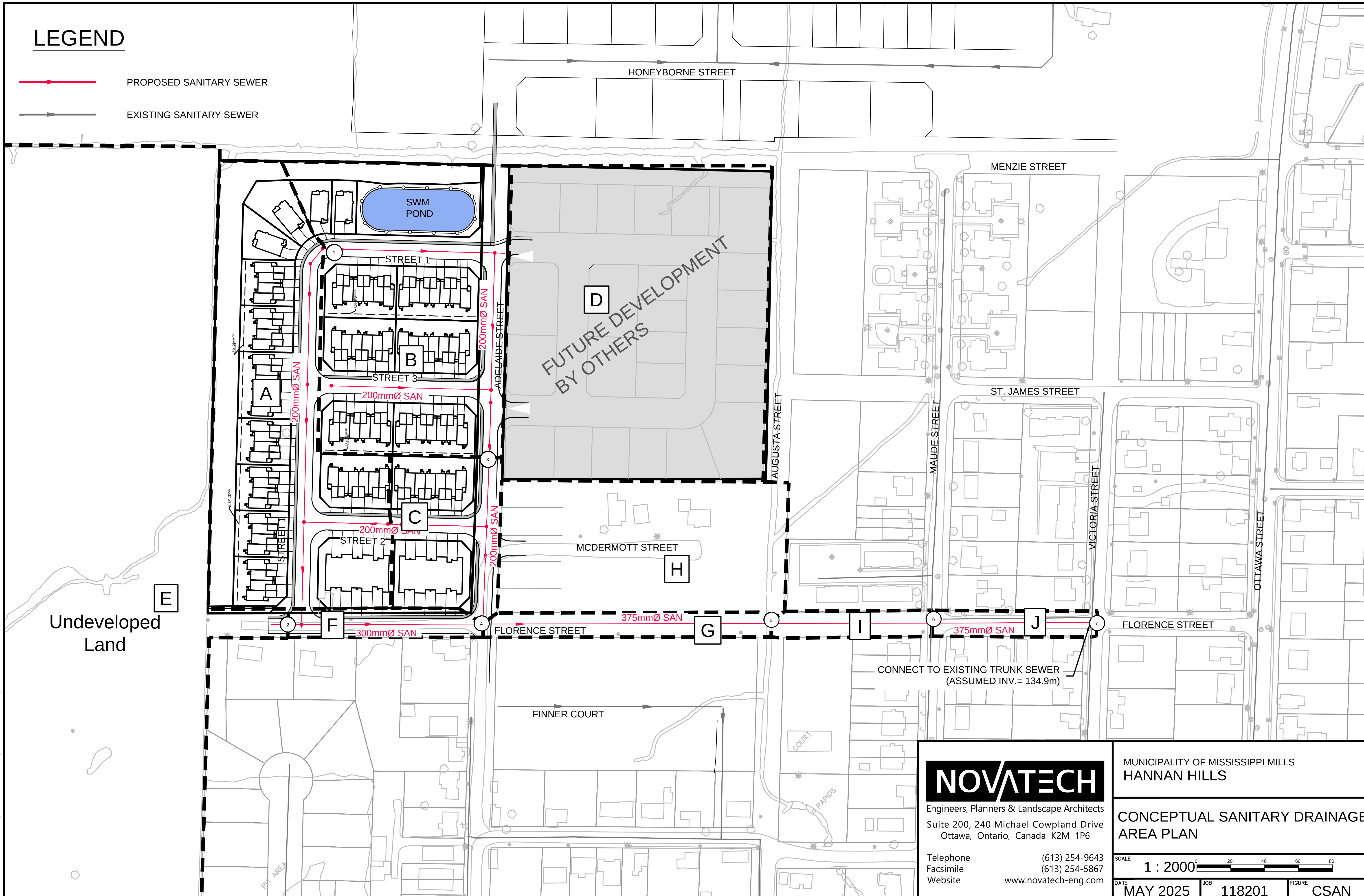
1. **Q(D) =** Q(p) + Q(ici) + Q(e)
2. **Q(p) =** (P x q x M x K / 86,400)
3. **q =** 350 L/per person/day (design)
4. **M = Harmon Formula (maximum of 4.0)**
5. **K =** 0.8 (design)
6. **Park flow is considered equivalent to a single unit / ha**
   Park Demand = 4 single unit equivalent / park ha (~ 3,600 L/ha/day)
7. **Q(ici) =** ICI Area x ICI Flow x ICI Peak
8. **Q(e) =** 0.33 L/s/ha (design)

Definitions

Q(D) = Peak Design Flow (L/s)
Q(p) = Peak Design Population Flow (L/s)
Q(q) = Average Population Flow (L/s)

	Singles	Townhouses
P = Residential Population =	3.4	2.7

q = Average Capita Flow
M = Harmon Formula
K = Harmon Correction Factor
Q(ici) = Industrial / Commercial / Institutional Flow (L/s)
Q(e) = Extraneous Flow (L/s)



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Website www.novatech-eng.com

MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS

CONCEPTUAL SANITARY DRAINAGE AREA PLAN

SCALE 1 : 2000 (0 20 40 60 80)

DATE MAY 2025 | JOB 118201 | FIGURE CSAN

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SANITARY SEWER DESIGN SHEET

NOVATECH
Engineers, Planners & Landscape Architects

Novatech Project #: 118201
Project Name: Hannan Hills Subdivision
Date: May 2025
Input By: A.Rongve
Reviewed By: A.McAuley
Drawing Reference: 118201-CSAN

Legend: Design Input by User
As-Built Input by User
Cumulative Cell
Calculated Design Cell Output

Reference: City of Ottawa - Sewer Design Guidelines (2012 and TBs)
MOE - Design Guidelines for Sewage Works (2008)
JL Richards Master Plan Update Report (February 2018)

Location			Demand												Design Capacity							
			Residential Flow									Extraneous Flow Area Method		Total Design Flow	Proposed Sewer Pipe Sizing / Design							
Area ID	From MH	To MH	Singles	Semis / Towns	Population (in 1000's)	Cumulative Population (in 1000's)	Average Pop. Flow Q(q) (L/s)	Design Peaking Factor M	Peak Design Pop. Flow Q(p) (L/s)	Res. Drainage Area (ha.)	Cumulative Res. Drainage Area (ha.)	Cumulative Extraneous Drainage Area (ha.)	Design Extraneous Flow Q(e) (L/s)	Total Peak Design Flow Q(D) (L/s)	Pipe Length (m)	Pipe Size (mm) and Material	Pipe ID Actual (m)	Roughness n	Design Grade So (%)	Capacity Qfull (L/s)	Full Flow Velocity (m/s)	Q(D) / Qfull
A	1	2	2	48	0.136	0.136	0.55	3.56	1.97	1.959	1.959	1.959	0.65	2.62	230	200 PVC	0.203	0.013	0.4	21.6	0.67	12.1%
E (FUTURE)	-	2		1049	2.832	2.832	11.47	2.97	34.09	40.100	40.100	40.100	13.23	47.32								
F	2	4				2.969	12.03	2.96	35.56	0.188	42.247	42.247	13.94	49.50	108	300 PVC	0.305	0.013	0.4	63.8	0.87	77.6%
B	1	3	2	39	0.112	0.112	0.45	3.58	1.63	1.951	1.951	1.951	0.64	2.27	225	200 PVC	0.203	0.013	0.4	21.6	0.67	10.5%
D (Menzie Enclaves)	-	3		56	0.151	0.151	0.61	3.55	2.18	2.879	2.879	2.879	0.95	3.13								
C	3	4		19	0.051	0.315	1.27	3.46	4.40	0.593	5.423	5.423	1.79	6.19	100	200 PVC	0.203	0.013	0.4	21.6	0.67	28.6%
G	4	5			0.000	3.283	13.30	2.93	38.93	0.240	47.910	47.910	15.81	54.74	170	375 PVC	0.381	0.013	0.3	103.5	0.91	52.9%
H (Future McDermott)	-	5	5	3	0.025	0.025	0.10	3.69	0.38	1.320	1.320	1.320	0.44	0.81								
I	5	6			0.000	3.308	13.40	2.92	39.20	0.144	49.374	49.374	16.29	55.49		375 PVC	0.381	0.013	0.3	103.5	0.91	53.6%
J	6	7			0.000	3.308	13.40	2.92	39.20	0.145	49.519	49.519	16.34	55.54		375 PVC	0.381	0.013	0.3	103.5	0.91	53.7%
			9	**1214**	**3.308**	**3.308**	**13.40**	**2.92**	**39.20**	**49.519**	**49.519**	**49.519**	**16.34**	**55.54**	**833.0**							

Demand Equation / Parameters

1. **Q(D) =** Q(p) + Q(ici) + Q(e)
2. **Q(p) =** (P x q x M x K / 86,400)
3. **q =** 350 L/per person/day (design)
4. **M = Harmon Formula (maximum of 4.0)**
5. **K =** 0.8 (design)
6. **Park flow is considered equivalent to a single unit / ha**
   Park Demand = 4 single unit equivalent / park ha (~ 3,600 L/ha/day)
7. **Q(ici) =** ICI Area x ICI Flow x ICI Peak
8. **Q(e) =** 0.33 L/s/ha (design)

Definitions

Q(D) = Peak Design Flow (L/s)
Q(p) = Peak Design Population Flow (L/s)
Q(q) = Average Population Flow (L/s)

	Singles	Semi's/Townhouses
P = Residential Population =	3.4	2.7

q = Average Capita Flow
M = Harmon Formula
K = Harmon Correction Factor
Q(ici) = Industrial / Commercial / Institutional Flow (L/s)
Q(e) = Extraneous Flow (L/s)

Capacity Equation

Q full = $1000*(1/n)*A_p*R^{2/3}*So^{0.5}$

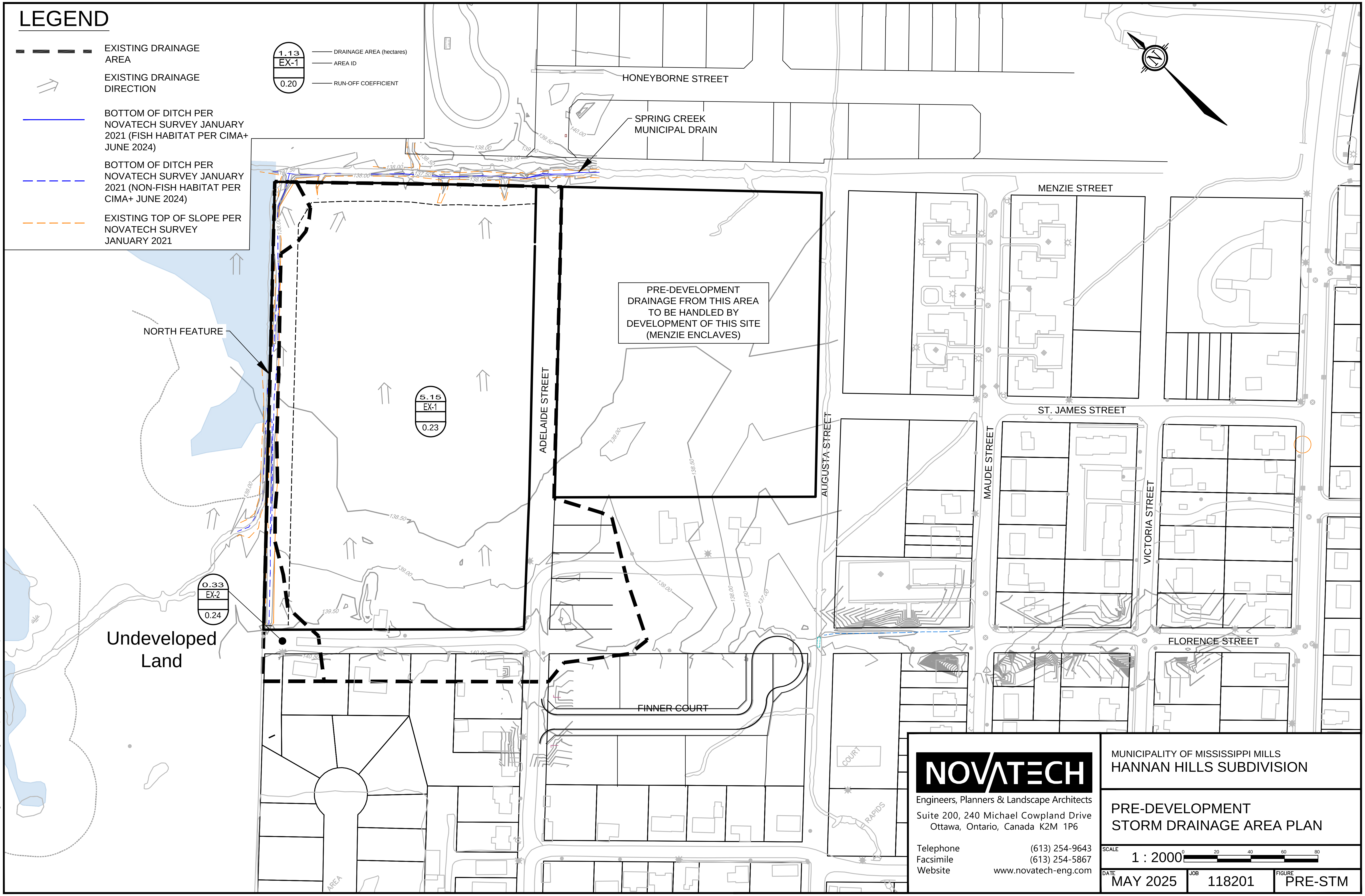
Definitions

Q full = Capacity (L/s)
n = Manning coefficient of roughness (0.013)
A_p = Pipe flow area (m^2)
R = Hydraulic Radius of wetted area (dia./4 for full pipes)
So = Pipe slope/gradient

APPENDIX D

Storm Sewer Design

- Pre-Development Storm Drainage Area Plan (118201-PRE-STM) – May 2025
- Preliminary Storm Drainage Area Plan (118201-POST-STM) – May 2025
- 5-Year Storm Sewer Design Sheet – May 2025



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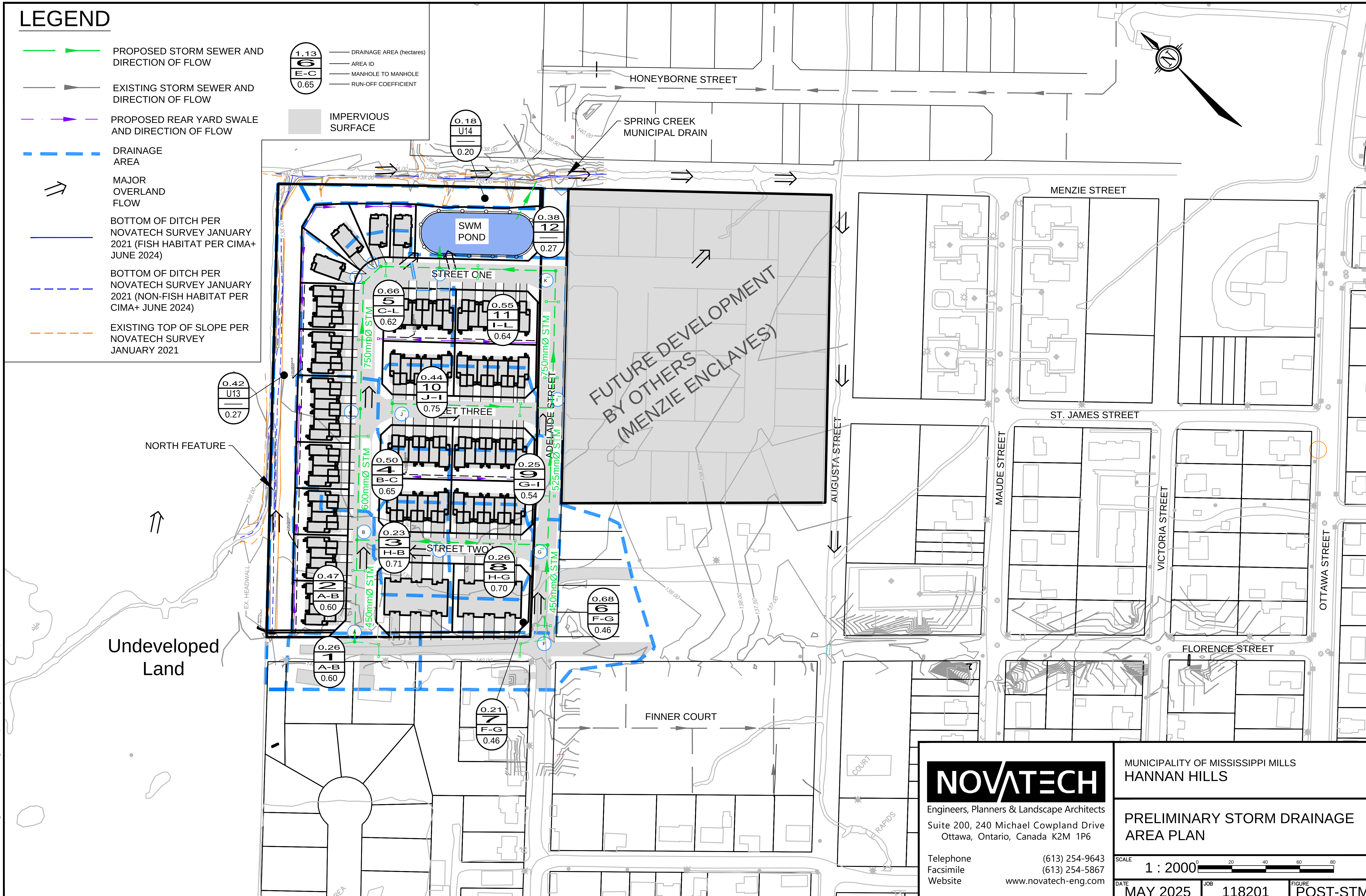

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5 Year Storm Sewer Design Sheet

DRAINAGE AREA	LOCATION		AREA (Ha)				FLOW					PROPOSED SEWER							
	FROM	TO	TOTAL AREA	R= 0.2	R= 0.9	C Value	INDIV 2.78 AR	ACCUM 2.78 AR	TIME OF CONC.	RAINFALL INTENSITY I	*PEAK FLOW Q (l/s)	PIPE SIZE (mm)	PIPE SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min.)	EXCESS CAPACITY (l/s)	Q/Qfull
1&2	A	B	0.73	0.31	0.42	0.60	1.21	1.21	10.00	104.19	126.59	450	0.4	60	180.50	1.13	0.88	53.90	0.70
3	H	B	0.23	0.06	0.17	0.71	0.45	0.45	10.00	104.19	47.39	450	0.4	53.0	180.50	1.13	0.78	133.11	0.26
4	B	C	0.50	0.18	0.32	0.65	0.90	2.57	10.78	100.25	257.31	600	0.4	77.0	388.73	1.37	0.93	131.42	0.66
5	C	L	0.66	0.26	0.40	0.62	1.14	3.70	11.71	95.94	355.19	750	0.4	120.0	704.81	1.59	1.25	349.62	0.50
6&7	F	G	0.89	0.56	0.33	0.46	1.14	1.14	10.00	104.19	118.90	450	0.4	56.0	180.50	1.13	0.82	61.60	0.66
8	H	G	0.26	0.08	0.18	0.70	0.50	0.50	10.00	104.19	52.37	450	0.4	59.0	180.50	1.13	0.87	128.13	0.29
9	G	I	0.25	0.13	0.12	0.54	0.37	2.01	10.82	100.04	201.31	525	0.4	81.0	272.27	1.26	1.07	70.96	0.74
10	J	I	0.44	0.10	0.35	0.75	0.92	0.92	10.00	104.19	95.62	450	0.4	94.0	180.50	1.13	1.38	84.88	0.53
11	I	L	0.55	0.20	0.35	0.64	0.98	3.91	11.90	95.13	371.59	750	0.3	152.0	610.38	1.38	1.84	238.79	0.61
	L	POND					0.00	7.61	13.73	87.89	668.66	825	0.3	15.0	787.01	1.47	0.17	118.35	0.85
			4.50																

Additional Drainage Areas

12	Pond	0.38	0.34	0.04	0.27
U13	Uncontrolled to Wetland	0.42	0.38	0.04	0.27
U14	Uncontrolled to Menzie drain	0.18	0.18	0.00	0.20

Definitions
Q = 2.78 AIR
Q = Peak Flow, in Litres per second (L/s)
A = Area in hectares (ha)
I = 5 YEAR Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min Velocity = 0.76 m/sec.
3) 5 Year intensity = $998.071 / (\text{time} + 6.053)^{0.814}$

APPENDIX E

Conceptual Stormwater Management Modeling

Hannan Hills Subdivision (118201)
Pre-Development Model Parameters

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Time to Peak Calculations
(Uplands Overland Flow Method)
Existing Conditions

Area ID	Area (ha)	Overland Flow						Concentrated Overland Flow						Overall		
		Length (m)	Elevation U/S (m)	Elevation D/S (m)	Slope (%)	Velocity (m/s)	Travel Time (min)	Length (m)	Elevation U/S (m)	Elevation D/S (m)	Slope (%)	Velocity (m/s)	Travel Time (min)	Time of Concentration (min)	Time to Peak (min)	Time to Peak (min)
EX-1	5.15	100	140.5	138.5	2.0%	0.21	7.94	196	138.5	138.0	0.3%	0.32	10.21	18	12	12
EX-2	0.33	76	140.8	139.0	2.3%	0.24	5.28	-	-	-	-	-	-	5	4	10

Weighted Curve Number Calculations
Soil type 'B'

Area ID	Land Use 1	Area	CN	Land Use 2	Area	CN	Land Use 3	Area	CN	Weighted CN	
EX-1	Impervious	4%	98	Lawn	4%	61	Forest	91%	60	62	Silty sand/glacial till = soil type B
EX-2	Impervious	7%	98	Lawn	9%	61	Forest	84%	60	63	Silty sand/glacial till = soil type B

Weighted IA Calculations

Area ID	Land Use 1	Area	IA	Land Use 2	Area	IA	Land Use 3	Area	IA	Weighted IA
EX-1	Impervious	4%	0.4	Lawn	4%	12.2	Forest	91%	12.7	12.1
EX-2	Impervious	7%	0.4	Lawn	9%	12.2	Forest	84%	12.7	11.8

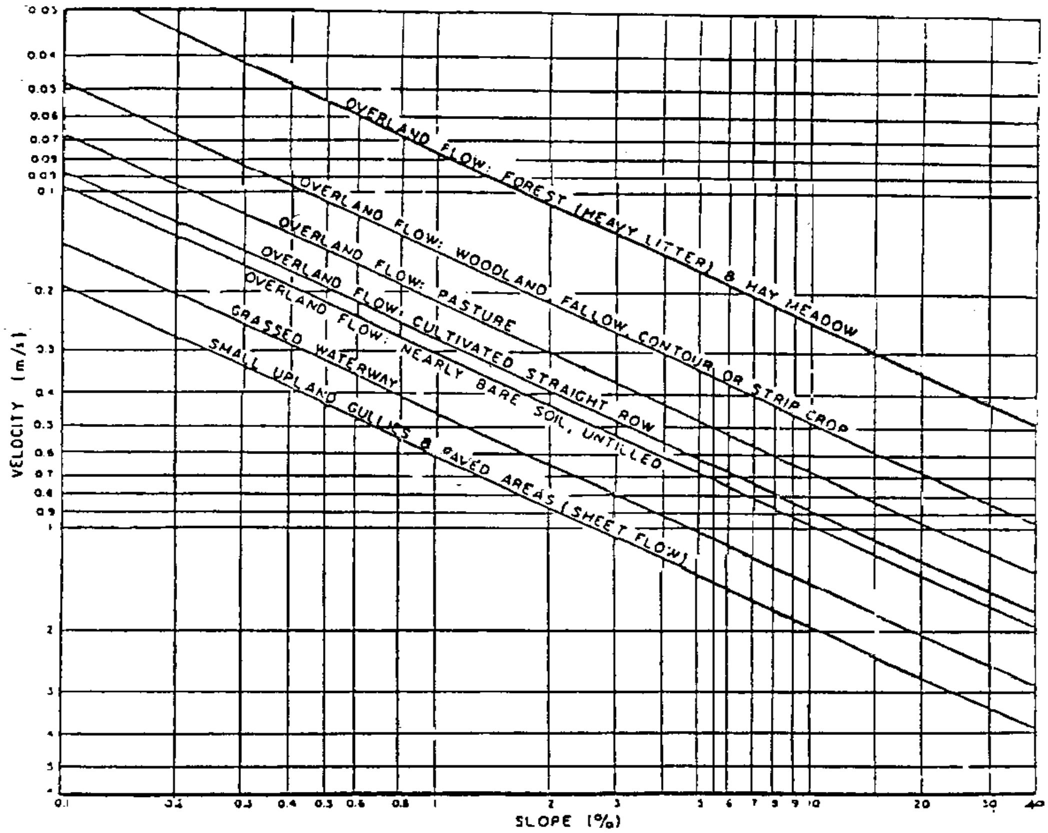

Figure A.5.2: Upland Method for Estimating Time of Concentration (SCS National Engineering Handbook, 1971)

Hannan Hills Subdivision (118201)
Post-Development Model Parameters

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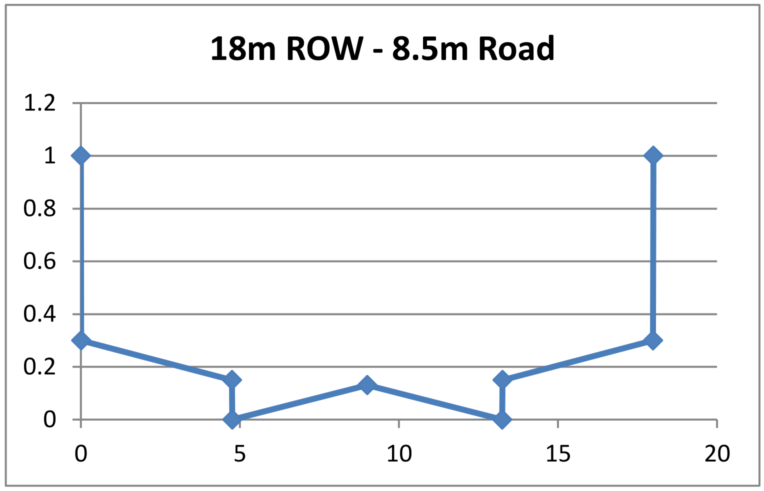
Area ID	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	No Depression (%)	Flow Path Length (m)	Equivalent Width (m)	Average Slope (%)
01	0.26	0.60	57.1%	15%	33	79	2%
02	0.47	0.60	57.1%	65%	44	106	2%
03	0.23	0.71	72.9%	45%	30	78	2%
04	0.50	0.65	64.3%	60%	37	135	2%
05	0.66	0.62	60.0%	60%	39	170	2%
06	0.68	0.46	37.1%	5%	33	205	2%
07	0.21	0.46	37.1%	50%	18	115	2%
08	0.26	0.70	71.4%	45%	31	84	2%
09	0.25	0.54	48.6%	60%	58	43	2%
10	0.44	0.75	78.6%	40%	24	181	2%
11	0.55	0.64	62.9%	30%	55	101	2%
12	0.38	0.27	10.0%	80%	69	55	2%
U13	0.42	0.27	10.0%	0%	15	287	2%
U14	0.18	0.20	0.0%	0%	14	132	2%
TOTAL:	**5.49**	0.55	49.4%				

Hannan Hills Subdivision (118201)
Roadway Cross-Sections

18m ROW - 8.5m Road

Station (m)	Depth (m)
0	1
0.01	0.3
4.75	0.15
4.76	0
9	0.13
13.24	0
13.25	0.15
17.99	0.3
18	1



Hannan Hills Subdivision (118201)
Design Storm Time Series Data
Chicago Design Storms

C25mm-4.stm		C2-6.stm		C5-6.stm	
Duration	Intensity	Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr	min	mm/hr
0:00	0	0:00	0	0:00	0
0:10	1.51	0:10	1.37	0:10	1.78
0:20	1.75	0:20	1.49	0:20	1.94
0:30	2.07	0:30	1.63	0:30	2.13
0:40	2.58	0:40	1.82	0:40	2.37
0:50	3.46	0:50	2.05	0:50	2.68
1:00	5.39	1:00	2.37	1:00	3.1
1:10	13.44	1:10	2.81	1:10	3.68
1:20	56.67	1:20	3.5	1:20	4.58
1:30	17.77	1:30	4.69	1:30	6.15
1:40	9.12	1:40	7.3	1:40	9.61
1:50	6.14	1:50	18.21	1:50	24.17
2:00	4.65	2:00	76.81	2:00	104.19
2:10	3.76	2:10	24.08	2:10	32.04
2:20	3.17	2:20	12.36	2:20	16.34
2:30	2.74	2:30	8.32	2:30	10.96
2:40	2.43	2:40	6.3	2:40	8.29
2:50	2.18	2:50	5.09	2:50	6.69
3:00	1.98	3:00	4.29	3:00	5.63
3:10	1.81	3:10	3.72	3:10	4.87
3:20	1.68	3:20	3.29	3:20	4.3
3:30	1.56	3:30	2.95	3:30	3.86
3:40	1.47	3:40	2.68	3:40	3.51
3:50	1.38	3:50	2.46	3:50	3.22
4:00	1.31	4:00	2.28	4:00	2.98
		4:10	2.12	4:10	2.77
		4:20	1.99	4:20	2.6
		4:30	1.87	4:30	2.44
		4:40	1.77	4:40	2.31
		4:50	1.68	4:50	2.19
		5:00	1.6	5:00	2.08
		5:10	1.52	5:10	1.99
		5:20	1.46	5:20	1.9
		5:30	1.4	5:30	1.82
		5:40	1.34	5:40	1.75
		5:50	1.29	5:50	1.68
		6:00	1.24	6:00	1.62

Hannan Hills Subdivision (118201)
Design Storm Time Series Data
Chicago Design Storms

C100-6.stm			C100-6+20%.stm	
Duration	Intensity		Duration	Intensity
min	mm/hr		min	mm/hr
0:00	0		0:00	0
0:10	2.9		0:10	11:31
0:20	3.16		0:20	3.79
0:30	3.48		0:30	4.18
0:40	3.88		0:40	4.66
0:50	4.39		0:50	5.27
1:00	5.07		1:00	6.08
1:10	6.05		1:10	7.26
1:20	7.54		1:20	9.05
1:30	10.16		1:30	12.19
1:40	15.97		1:40	19.16
1:50	40.65		1:50	48.78
2:00	178.56		2:00	214.27
2:10	54.05		2:10	64.86
2:20	27.32		2:20	32.78
2:30	18.24		2:30	21.89
2:40	13.74		2:40	16.49
2:50	11.06		2:50	13.27
3:00	9.29		3:00	11.15
3:10	8.02		3:10	9.62
3:20	7.08		3:20	8.5
3:30	6.35		3:30	7.62
3:40	5.76		3:40	6.91
3:50	5.28		3:50	6.34
4:00	4.88		4:00	5.86
4:10	4.54		4:10	5.45
4:20	4.25		4:20	5.1
4:30	3.99		4:30	4.79
4:40	3.77		4:40	4.52
4:50	3.57		4:50	4.28
5:00	3.4		5:00	4.08
5:10	3.24		5:10	3.89
5:20	3.1		5:20	3.72
5:30	2.97		5:30	3.56
5:40	2.85		5:40	3.42
5:50	2.74		5:50	3.29
6:00	2.64		6:00	3.17

Hannan Hills Subdivision (118201)
Design Storm Time Series Data
SCS Design Storms

S2-12.stm		S5-12.stm		S100-12.stm	
Duration	Intensity	Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr	min	mm/hr
0:00	0.00	0:00	0	0:00	0
0:30	1.27	0:30	1.69	0:30	2.82
1:00	0.59	1:00	0.79	1:00	1.31
1:30	1.10	1:30	1.46	1:30	2.44
2:00	1.10	2:00	1.46	2:00	2.44
2:30	1.44	2:30	1.91	2:30	3.19
3:00	1.27	3:00	1.69	3:00	2.82
3:30	1.69	3:30	2.25	3:30	3.76
4:00	1.69	4:00	2.25	4:00	3.76
4:30	2.29	4:30	3.03	4:30	5.07
5:00	2.88	5:00	3.82	5:00	6.39
5:30	4.57	5:30	6.07	5:30	10.14
6:00	36.24	6:00	48.08	6:00	80.38
6:30	9.23	6:30	12.25	6:30	20.47
7:00	4.06	7:00	5.39	7:00	9.01
7:30	2.71	7:30	3.59	7:30	6.01
8:00	2.37	8:00	3.15	8:00	5.26
8:30	1.86	8:30	2.47	8:30	4.13
9:00	1.95	9:00	2.58	9:00	4.32
9:30	1.27	9:30	1.69	9:30	2.82
10:00	1.02	10:00	1.35	10:00	2.25
10:30	1.44	10:30	1.91	10:30	3.19
11:00	0.93	11:00	1.24	11:00	2.07
11:30	0.85	11:30	1.12	11:30	1.88
12:00	0.85	12:00	1.12	12:00	1.88

Hannan Hills Subdivision (118201)
Conceptual PCSWMM Model - Orifice Sizing

NOVATECH
Engineers, Planners & Landscape Architects

Equivalent Orifice Sizing

Inlet Name	Inlet / Outlet Node	Invert (m)	T/G (m)	CB Depth (m)	Area ID	Drainage Area (ha)	Static Ponding Depth (m)	Design Flow Rate[1] (L/s)	Artificial Orifice Dia.[2] (m)	Modelled Orifice Dia.[3] (m)
O-CB01	CB01	139.12	139.87	0.75	1 & 2	0.73	0.25	141.2	0.278	0.295
O-CB02	CB02	139.02	139.77	0.75	4	0.50	0.25	107.2	0.242	0.250
O-CB03	CB03	138.94	139.69	0.75	5	0.66	0.25	133.2	0.270	0.280
O-CB04	CB04	139.04	139.79	0.75	11	0.55	0.15	111.7	0.247	0.252
O-CB05	CB05	139.02	139.77	0.75	9	0.25	0.25	40.5	0.149	0.149
O-CB06	CB06	139.07	139.82	0.75	6&7	0.89	0.25	131.0	0.267	0.295
O-CB07	CB07	139.12	139.87	0.75	3	0.23	0.25	55.4	0.174	0.176
O-CB08	CB08	139.07	139.82	0.75	8	0.26	0.25	61.5	0.183	0.185
O-CB09	CB09	139.02	139.77	0.75	10	0.44	0.25	113.3	0.249	0.255
TOTAL						**4.51**	**-**	**895.0**	**-**	

[1] Design flow rate = 5-year peak flow based on PCSWMM model results (6-hour Chicago storm).

[2] Theoretical orifice size based on design flow rate and estimated 0.75m CB depth.

[3] Modelled orifice size to convey 5-year runoff due to shallow pipes causing backwater into orifices.

Hannan Hills (118201)
SWM Facility Design

Dry Pond - Stage-Storage

Stage	Elevation	Depth	Area	Volume	
				Stage	Total
	(m)	(m)	m^2	m^3	m^3
Low Flow Channel - Outlet	137.60	0.00	0.0	0	0
Low Flow Channel - Inlet	137.69	0.09	50.0	2	2
Bottom of Slope	137.85	0.25	963.0	81	83
	138.60	1.00	1416.0	892	975
Top of Pond	139.50	1.90	1964.0	1,521	2,496

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

05/16/2025

Province:	Ontario
City:	Almonte
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Project Name:	Hannan Hills
Project Number:	118201
Designer Name:	Melanie Schroeder
Designer Company:	Novatech
Designer Email:	m.schroeder@novatech-eng.com
Designer Phone:	613-254-9643
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Site Name:	Hannan Hills

Drainage Area (ha):	4.89
% Imperviousness:	54.60

Runoff Coefficient 'c': 0.62

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0
Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	99.05
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	3016
Estimated Average Annual Sediment Volume (L/yr):	2452

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	50
EFO5	58
EFO6	65
EFO8	76
EFO10	83
EFO12	87

Recommended Stormceptor EFO Model: EFO10

Estimated Net Annual Sediment (TSS) Load Reduction (%): 83

Water Quality Runoff Volume Capture (%): > 90

THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

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

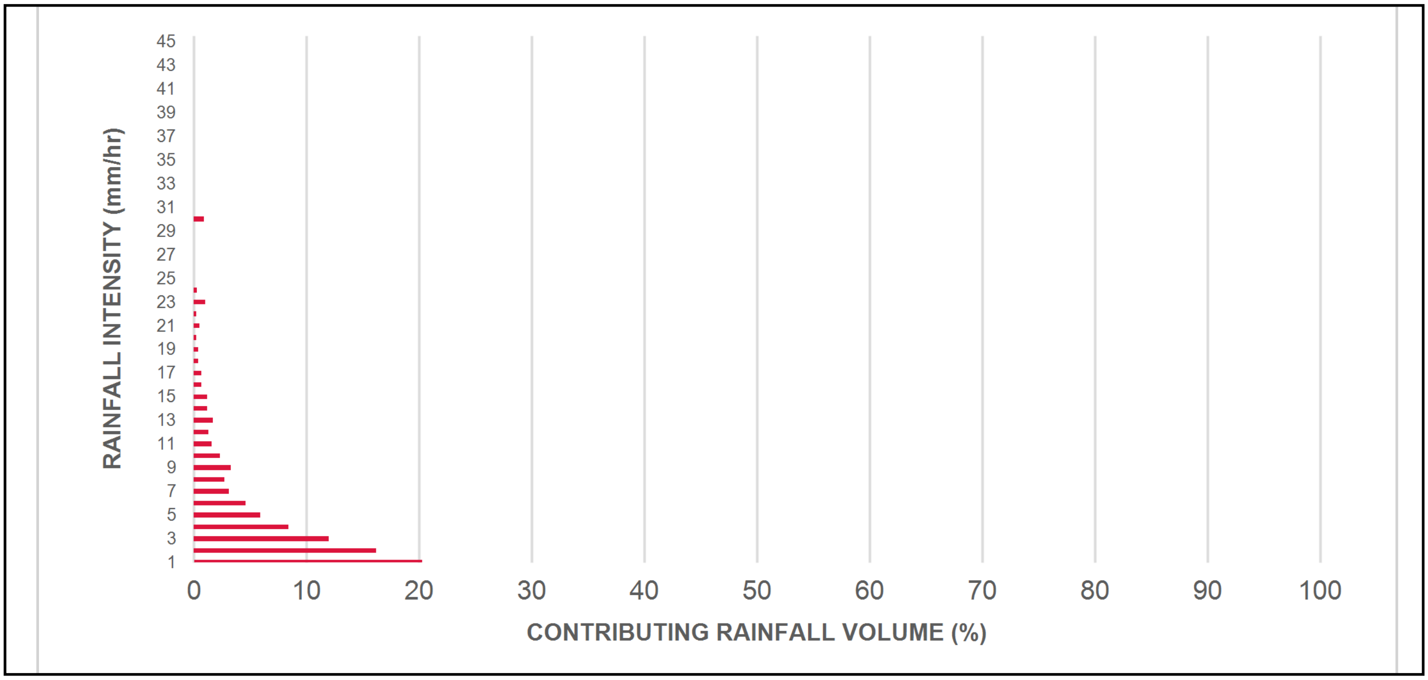
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

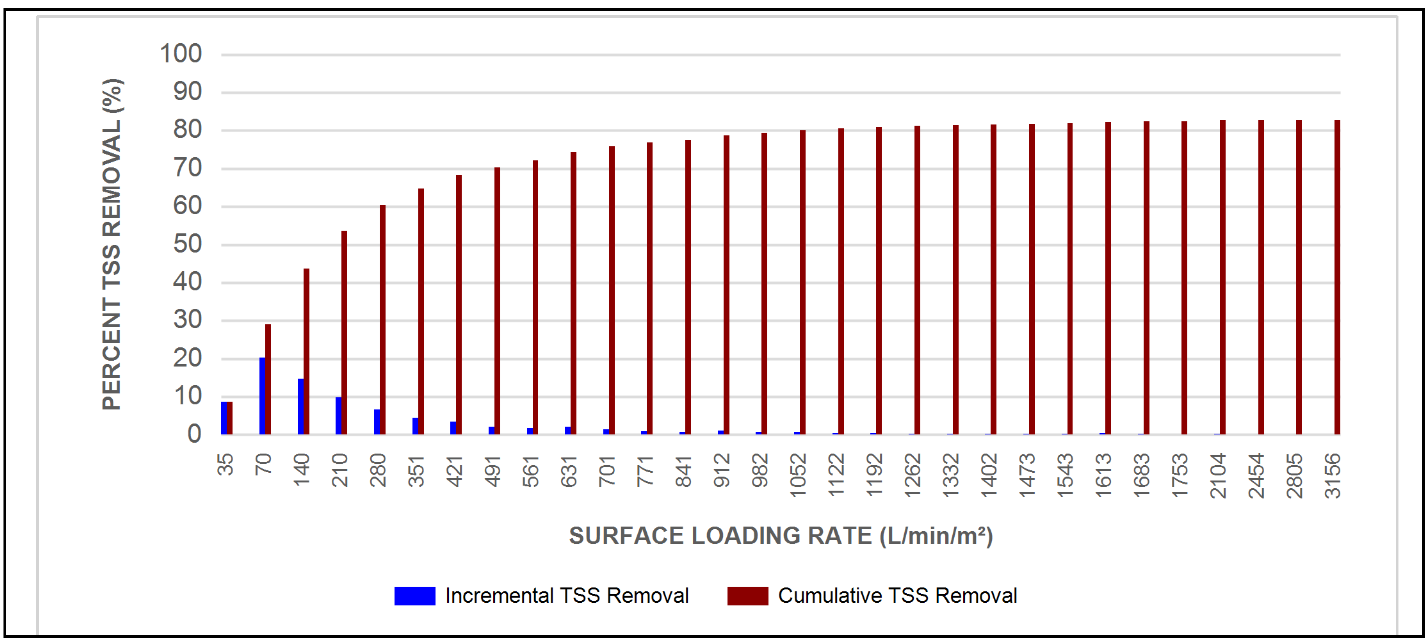
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.6	8.6	4.27	256.0	35.0	100	8.6	8.6
1.00	20.3	29.0	8.53	512.0	70.0	100	20.3	29.0
2.00	16.2	45.2	17.06	1024.0	140.0	91	14.7	43.7
3.00	12.0	57.2	25.60	1536.0	210.0	83	9.9	53.6
4.00	8.4	65.6	34.13	2048.0	280.0	79	6.7	60.3
5.00	5.9	71.6	42.66	2560.0	351.0	76	4.5	64.8
6.00	4.6	76.2	51.19	3071.0	421.0	73	3.4	68.2
7.00	3.1	79.3	59.72	3583.0	491.0	70	2.1	70.3
8.00	2.7	82.0	68.25	4095.0	561.0	66	1.8	72.2
9.00	3.3	85.3	76.79	4607.0	631.0	64	2.1	74.3
10.00	2.3	87.6	85.32	5119.0	701.0	64	1.5	75.8
11.00	1.6	89.2	93.85	5631.0	771.0	63	1.0	76.8
12.00	1.3	90.5	102.38	6143.0	841.0	63	0.8	77.6
13.00	1.7	92.2	110.91	6655.0	912.0	62	1.1	78.7
14.00	1.2	93.5	119.44	7167.0	982.0	62	0.8	79.4
15.00	1.2	94.6	127.98	7679.0	1052.0	60	0.7	80.1
16.00	0.7	95.3	136.51	8190.0	1122.0	59	0.4	80.5
17.00	0.7	96.1	145.04	8702.0	1192.0	57	0.4	80.9
18.00	0.4	96.5	153.57	9214.0	1262.0	56	0.2	81.2
19.00	0.4	96.9	162.10	9726.0	1332.0	54	0.2	81.4
20.00	0.2	97.1	170.63	10238.0	1402.0	52	0.1	81.5
21.00	0.5	97.5	179.17	10750.0	1473.0	50	0.2	81.7
22.00	0.2	97.8	187.70	11262.0	1543.0	48	0.1	81.9
23.00	1.0	98.8	196.23	11774.0	1613.0	45	0.5	82.3
24.00	0.3	99.1	204.76	12286.0	1683.0	44	0.1	82.4
25.00	0.0	99.1	213.29	12798.0	1753.0	42	0.0	82.4
30.00	0.9	100.0	255.95	15357.0	2104.0	35	0.3	82.8
35.00	0.0	100.0	298.61	17917.0	2454.0	30	0.0	82.8
40.00	0.0	100.0	341.27	20476.0	2805.0	26	0.0	82.8
45.00	0.0	100.0	383.93	23036.0	3156.0	24	0.0	82.8
Estimated Net Annual Sediment (TSS) Load Reduction =								**83 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF5 / EFO5	1.5	5	90	762	30	762	30	710	25
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

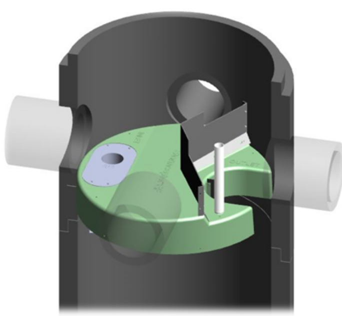
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

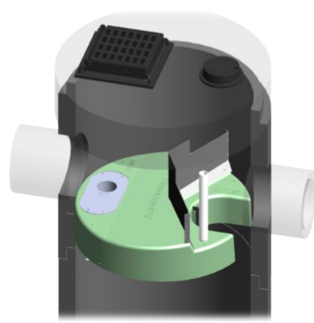
DESIGN FLEXIBILITY

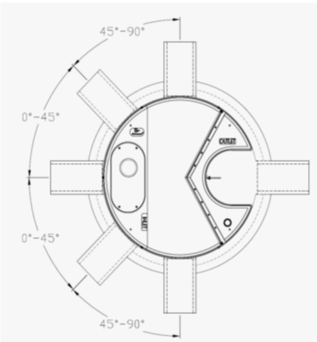
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

OIL CAPTURE AND RETENTION

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







INLET-TO-OUTLET DROP

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

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

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

HEAD LOSS

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

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

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

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

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	5 ft (1524 mm) Diameter OGS Units:	1.95 m^3 sediment / 420 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

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

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

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

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

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

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

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

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid

Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

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

Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Pre-development - Overall Model Schematic

Date: 2025-05-16
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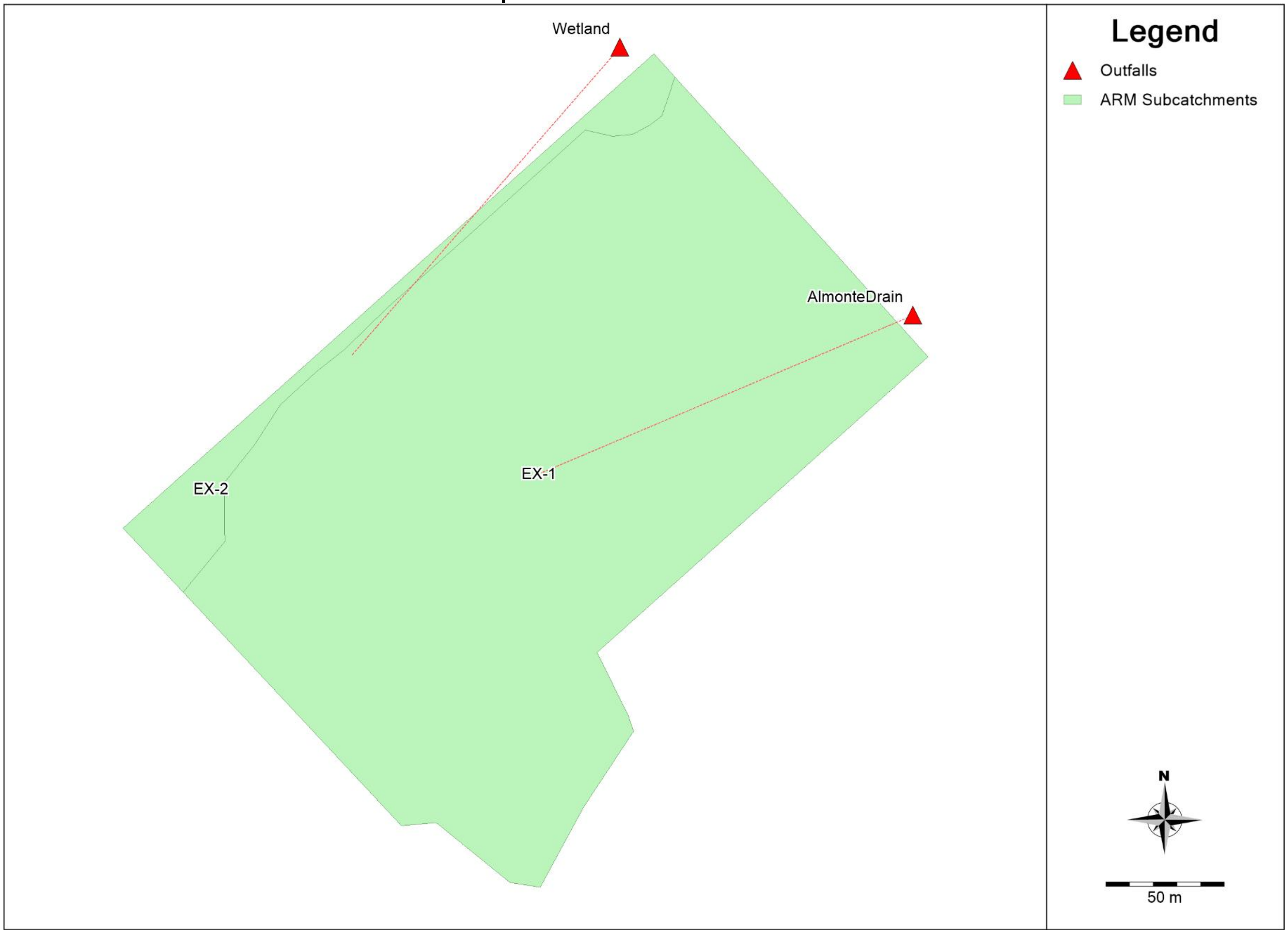
Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Pre-development - Subcatchments and Outfalls



Date: 2025-05-16
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```
ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM VERSION 7.6.3620
---------------------------------------------------------

This is a new version of ARM - your feedback and suggestions are solicited.
Create a ticket, post on the PCSWMM feature request forum, or email us directly!

Simulation start time:               01/25/2021 00:00:00
Simulation end time:                 01/27/2021 00:00:00
Runoff wet weather time steps:       300 seconds
Report time steps:                   60 seconds
Number of data points:               2881


******************************
Unit Hydrographs Runoff Method
******************************
```

Subcatchment	Runoff Method	Raingage	Area (ha)	Time of Concentration (min)	Time to Peak (min)	Time after Peak (min)	Peak UH Flow (m³/s/mm)	UH Depth (mm)
EX-1	Nash IUH	Raingage	5.15	18	12	83	0.03872	0.998
EX-2	Nash IUH	Raingage	0.33	5	3.33	26.67	0.00893	0.822

```
******************
ARM Runoff Summary
******************
```

Subcatchment	Total Precip (mm)	Total Losses (mm)	Total Runoff (mm)	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff (fraction)
EX-1	82.323	60.494	21.786	1.122	304.43	0.265
EX-2	82.323	59.685	18.615	0.061	26.83	0.226

```
WARNING ARM01: Computed UH depth for ARM subcatchment EX-2 is not unity. Consider reducing wet weather time step.


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


*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 0
Number of nodes ........... 2
Number of links ........... 1
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
```

Name	Data Source	Data Type	Recording Interval
Raingage	06-C6hr-100yr	INTENSITY	10 min.

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

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
Wetland	JUNCTION	138.00	1.00	0.0	
AlmonteDrain	OUTFALL	137.50	0.00	0.0	

```
************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
---------------------------------------------------------------------------------------------
Drain            Wetland          AlmonteDrain     CONDUIT          163.0    0.3067    0.0130


*********************
Cross Section Summary
*********************
                                        Full     Full     Hyd.     Max.   No. of     Full
Conduit          Shape                 Depth     Area     Rad.    Width  Barrels     Flow
---------------------------------------------------------------------------------------
Drain            DUMMY                  0.00     0.00     0.00     0.00        1     0.00


****************
Transect Summary
****************

Transect 18mROW
Area:
            0.0009     0.0034     0.0077     0.0137     0.0214
            0.0308     0.0417     0.0530     0.0657     0.0801
            0.0962     0.1139     0.1333     0.1543     0.1770
            0.2005     0.2240     0.2475     0.2710     0.2945
            0.3180     0.3415     0.3650     0.3885     0.4120
            0.4356     0.4591     0.4826     0.5061     0.5296
            0.5531     0.5766     0.6001     0.6237     0.6472
            0.6707     0.6942     0.7177     0.7412     0.7648
            0.7883     0.8118     0.8353     0.8588     0.8824
            0.9059     0.9294     0.9529     0.9765     1.0000
Hrad:
            0.0188     0.0376     0.0564     0.0751     0.0939
            0.1127     0.1406     0.1767     0.2070     0.2318
            0.2524     0.2698     0.2847     0.2977     0.3093
            0.3240     0.3404     0.3578     0.3760     0.3948
            0.4140     0.4335     0.4532     0.4731     0.4932
            0.5133     0.5335     0.5538     0.5742     0.5945
```

```
            0.6149     0.6353     0.6557     0.6761     0.6965
            0.7169     0.7373     0.7577     0.7780     0.7983
            0.8186     0.8389     0.8591     0.8793     0.8995
            0.9197     0.9398     0.9599     0.9800     1.0000
Width:
            0.0726     0.1453     0.2179     0.2905     0.3631
            0.4358     0.4721     0.5073     0.5776     0.6478
            0.7180     0.7882     0.8584     0.9287     0.9989
            0.9989     0.9990     0.9990     0.9990     0.9990
            0.9991     0.9991     0.9991     0.9992     0.9992
            0.9992     0.9993     0.9993     0.9993     0.9994
            0.9994     0.9994     0.9995     0.9995     0.9995
            0.9996     0.9996     0.9996     0.9997     0.9997
            0.9997     0.9997     0.9998     0.9998     0.9998
            0.9999     0.9999     0.9999     1.0000     1.0000


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

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 01/25/2021 00:00:00
Ending Date .............. 01/27/2021 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
```

```
Routing Time Step ........ 2.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m
```

```
**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.000         0.000
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.118         1.183
External Outflow .........         0.118         1.183
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.000
```

```
***************************
Time-Step Critical Elements
***************************
None
```

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

```
*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     1.50 sec
Average Time Step           :     2.00 sec
```

```
Maximum Time Step           :     2.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
Time Step Frequencies       :
    2.000 -  1.516 sec      :   100.00 %
    1.516 -  1.149 sec      :     0.00 %
    1.149 -  0.871 sec      :     0.00 %
    0.871 -  0.660 sec      :     0.00 %
    0.660 -  0.500 sec      :     0.00 %
```

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

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
Wetland	JUNCTION	0.00	0.00	138.00	0 00:00	0.00
AlmonteDrain	OUTFALL	0.00	0.00	137.50	0 00:00	0.00

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

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
Wetland	JUNCTION	26.83	26.83	0 02:15	0.0614	0.0614	0.000
AlmonteDrain	OUTFALL	304.39	317.38	0 02:25	1.12	1.18	0.000

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

```
*********************

Surcharging occurs when water rises above the top of the highest conduit.
---------------------------------------------------------------------
                                           Max. Height   Min. Depth
                               Hours       Above Crown    Below Rim
Node                 Type      Surcharged       Meters       Meters
---------------------------------------------------------------------
Wetland              JUNCTION       48.00        0.000        1.000


*********************
Node Flooding Summary
*********************

No nodes were flooded.


**********************
Outfall Loading Summary
**********************

-----------------------------------------------------------
                       Flow       Avg       Max       Total
                       Freq      Flow      Flow      Volume
Outfall Node           Pcnt       LPS       LPS    10^6 ltr
-----------------------------------------------------------
AlmonteDrain          11.21     61.10    317.38       1.183
-----------------------------------------------------------
System                11.21     61.10    317.38       1.183


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

-----------------------------------------------------------------------------
                               Maximum  Time of Max   Maximum    Max/    Max/
                                |Flow|   Occurrence   |Veloc|    Full    Full
Link                 Type          LPS  days hr:min     m/sec    Flow   Depth
-----------------------------------------------------------------------------
Drain                DUMMY       26.83     0  02:15


***************************
Flow Classification Summary
***************************

-------------------------------------------------------------------------------------
                    Adjusted    ---------- Fraction of Time in Flow Class ----------
                     /Actual         Up    Down  Sub   Sup   Up    Down  Norm  Inlet
Conduit               Length    Dry  Dry   Dry   Crit  Crit  Crit  Crit  Ltd   Ctrl
-------------------------------------------------------------------------------------


*************************
Conduit Surcharge Summary
*************************

No conduits were surcharged.


Analysis begun on:  Fri May 16 15:48:54 2025
Analysis ended on:  Fri May 16 15:48:55 2025
Total elapsed time: 00:00:01
```

Hannan Hills Subdivision (118201)
PCSWMM Pre-Development Model Output (100-year 12-hour SCS)

```
ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM VERSION 7.6.3620
---------------------------------------------------------

This is a new version of ARM - your feedback and suggestions are solicited.
Create a ticket, post on the PCSWMM feature request forum, or email us directly!

Simulation start time:                01/25/2021 00:00:00
Simulation end time:                  01/27/2021 00:00:00
Runoff wet weather time steps:        300 seconds
Report time steps:                    60 seconds
Number of data points:                2881


******************************
Unit Hydrographs Runoff Method
******************************
```

Subcatchment	Runoff Method	Raingage	Area (ha)	Time of Concentration (min)	Time to Peak (min)	Time after Peak (min)	Peak UH Flow (m³/s/mm)	UH Depth (mm)
EX-1	Nash IUH	Raingage	5.15	18	12	83	0.03872	0.998
EX-2	Nash IUH	Raingage	0.33	5	3.33	26.67	0.00893	0.822

```
******************
ARM Runoff Summary
******************
```

Subcatchment	Total Precip (mm)	Total Losses (mm)	Total Runoff (mm)	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff (fraction)
EX-1	93.91	65.728	28.136	1.449	326.918	0.3
EX-2	93.91	64.76	23.973	0.079	23.776	0.255

```
WARNING ARM01: Computed UH depth for ARM subcatchment EX-2 is not unity. Consider reducing wet weather time step.


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


*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 0
Number of nodes ........... 2
Number of links ........... 1
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
```

Name	Data Source	Data Type	Recording Interval
Raingage	D3-S12hr-100yr	INTENSITY	30 min.

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

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
Wetland	JUNCTION	138.00	1.00	0.0	
AlmonteDrain	OUTFALL	137.50	0.00	0.0	

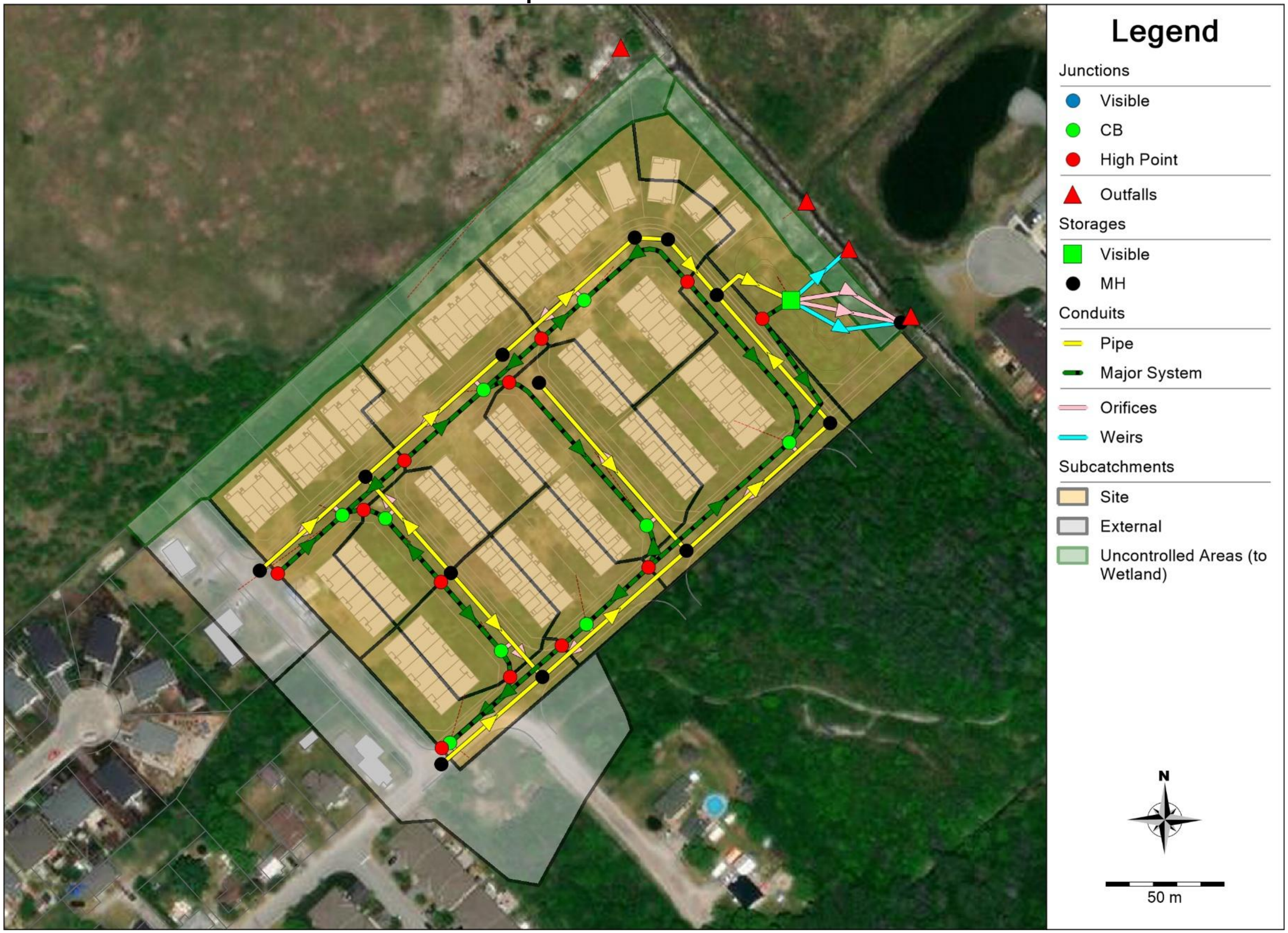
```
************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
---------------------------------------------------------------------------------------------
Drain            Wetland          AlmonteDrain     CONDUIT          163.0    0.3067    0.0130


*********************
Cross Section Summary
*********************
                                        Full     Full     Hyd.     Max.   No. of     Full
Conduit          Shape                 Depth     Area     Rad.    Width  Barrels     Flow
---------------------------------------------------------------------------------------
Drain            DUMMY                  0.00     0.00     0.00     0.00        1     0.00


****************
Transect Summary
****************

Transect 18mROW
Area:
            0.0009     0.0034     0.0077     0.0137     0.0214
            0.0308     0.0417     0.0530     0.0657     0.0801
            0.0962     0.1139     0.1333     0.1543     0.1770
            0.2005     0.2240     0.2475     0.2710     0.2945
            0.3180     0.3415     0.3650     0.3885     0.4120
            0.4356     0.4591     0.4826     0.5061     0.5296
            0.5531     0.5766     0.6001     0.6237     0.6472
            0.6707     0.6942     0.7177     0.7412     0.7648
            0.7883     0.8118     0.8353     0.8588     0.8824
            0.9059     0.9294     0.9529     0.9765     1.0000
Hrad:
            0.0188     0.0376     0.0564     0.0751     0.0939
            0.1127     0.1406     0.1767     0.2070     0.2318
            0.2524     0.2698     0.2847     0.2977     0.3093
            0.3240     0.3404     0.3578     0.3760     0.3948
            0.4140     0.4335     0.4532     0.4731     0.4932
            0.5133     0.5335     0.5538     0.5742     0.5945
            0.6149     0.6353     0.6557     0.6761     0.6965
            0.7169     0.7373     0.7577     0.7780     0.7983
            0.8186     0.8389     0.8591     0.8793     0.8995
            0.9197     0.9398     0.9599     0.9800     1.0000
Width:
            0.0726     0.1453     0.2179     0.2905     0.3631
            0.4358     0.4721     0.5073     0.5776     0.6478
            0.7180     0.7882     0.8584     0.9287     0.9989
            0.9989     0.9990     0.9990     0.9990     0.9990
            0.9991     0.9991     0.9991     0.9992     0.9992
            0.9992     0.9993     0.9993     0.9993     0.9994
            0.9994     0.9994     0.9995     0.9995     0.9995
            0.9996     0.9996     0.9996     0.9997     0.9997
            0.9997     0.9997     0.9998     0.9998     0.9998
            0.9999     0.9999     0.9999     1.0000     1.0000


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

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 01/25/2021 00:00:00
Ending Date .............. 01/27/2021 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
```

```
Routing Time Step ........ 2.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.000         0.000
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.153         1.528
External Outflow .........         0.153         1.528
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.000


***************************
Time-Step Critical Elements
***************************
None


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


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     1.50 sec
Average Time Step           :     2.00 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
Time Step Frequencies       :
    2.000 -  1.516 sec      :   100.00 %
    1.516 -  1.149 sec      :     0.00 %
    1.149 -  0.871 sec      :     0.00 %
    0.871 -  0.660 sec      :     0.00 %
    0.660 -  0.500 sec      :     0.00 %


******************
Node Depth Summary
******************

---------------------------------------------------------------------------------
                               Average  Maximum  Maximum  Time of Max    Reported
                                 Depth    Depth      HGL   Occurrence   Max Depth
Node                 Type       Meters   Meters   Meters  days hr:min      Meters
---------------------------------------------------------------------------------
Wetland              JUNCTION     0.00     0.00   138.00     0  00:00        0.00
AlmonteDrain         OUTFALL      0.00     0.00   137.50     0  00:00        0.00


*******************
Node Inflow Summary
*******************

-------------------------------------------------------------------------------------------------
                                Maximum  Maximum                  Lateral       Total        Flow
                                Lateral    Total  Time of Max      Inflow      Inflow     Balance
                                 Inflow   Inflow   Occurrence      Volume      Volume       Error
Node                 Type           LPS      LPS  days hr:min    10^6 ltr    10^6 ltr     Percent
-------------------------------------------------------------------------------------------------
Wetland              JUNCTION     23.77    23.77     0  06:30      0.0791      0.0791       0.000
AlmonteDrain         OUTFALL     326.89   344.53     0  06:35        1.45        1.53       0.000


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

```
*********************

Surcharging occurs when water rises above the top of the highest conduit.
---------------------------------------------------------------------
                                           Max. Height   Min. Depth
                               Hours       Above Crown    Below Rim
Node                 Type      Surcharged       Meters       Meters
---------------------------------------------------------------------
Wetland              JUNCTION       48.00        0.000        1.000


*********************
Node Flooding Summary
*********************

No nodes were flooded.


***********************
Outfall Loading Summary
***********************

-----------------------------------------------------------
                       Flow       Avg       Max       Total
                       Freq      Flow      Flow      Volume
Outfall Node           Pcnt       LPS       LPS    10^6 ltr
-----------------------------------------------------------
AlmonteDrain          17.79     49.68    344.53       1.528
-----------------------------------------------------------
System                17.79     49.68    344.53       1.528


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

-----------------------------------------------------------------------------
                               Maximum  Time of Max   Maximum    Max/    Max/
                                |Flow|   Occurrence   |Veloc|    Full    Full
Link                 Type          LPS  days hr:min     m/sec    Flow   Depth
-----------------------------------------------------------------------------
Drain                DUMMY       23.77     0  06:30


***************************
Flow Classification Summary
***************************

-------------------------------------------------------------------------------------
                    Adjusted    ---------- Fraction of Time in Flow Class ----------
                     /Actual         Up    Down  Sub   Sup   Up    Down  Norm  Inlet
Conduit               Length    Dry  Dry   Dry   Crit  Crit  Crit  Crit  Ltd   Ctrl
-------------------------------------------------------------------------------------


*************************
Conduit Surcharge Summary
*************************

No conduits were surcharged.


Analysis begun on:  Fri May 16 15:47:08 2025
Analysis ended on:  Fri May 16 15:47:09 2025
Total elapsed time: 00:00:01
```

Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Post-development - Overall Model Schematic



Date: 2025-05-16
M:\2018\118201\DATA\Calculations\SWM\118201-PCSWMM Model Schematics_Rev2.docx

Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Post-development - Subcatchments and Flow Lengths

Date: 2025-05-16
M:\2018\118201\DATA\Calculations\SWM\118201-PCSWMM Model Schematics_Rev2.docx

Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Post-development – Storage Nodes

Date: 2025-05-16
M:\2018\118201\DATA\Calculations\SWM\118201-PCSWMM Model Schematics_Rev2.docx

Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Post-development – Junctions and Outfalls

Date: 2025-05-16
M:\2018\118201\DATA\Calculations\SWM\118201-PCSWMM Model Schematics_Rev2.docx

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

WARNING 02: maximum depth increased for Node CB03
WARNING 02: maximum depth increased for Node CB04
WARNING 02: maximum depth increased for Node CB06
WARNING 02: maximum depth increased for Node CB08

****
Element Count
****

Number of rain gages 1
Number of subcatchments ... 14
Number of nodes 39
Number of links 50
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Raingage	06-C6hr-100yr	INTENSITY	10 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
01	0.26	78.81	57.10	2.0000	Raingage	CB01
02	0.47	105.99	57.10	2.0000	Raingage	CB01
03	0.23	77.88	72.90	2.0000	Raingage	CB07
04	0.50	135.36	64.30	2.0000	Raingage	CB02
05	0.66	169.99	60.00	2.0000	Raingage	CB03
06	0.68	204.53	37.10	2.0000	Raingage	CB06
07	0.21	115.37	37.10	2.0000	Raingage	CB06
08	0.26	84.49	71.40	2.0000	Raingage	CB08
09	0.25	43.09	48.60	2.0000	Raingage	CB05
10	0.44	181.48	78.60	2.0000	Raingage	CB09
11	0.55	100.84	62.90	2.0000	Raingage	CB04
12	0.38	54.68	10.00	2.0000	Raingage	DryPond
U13	0.42	287.13	10.00	2.0000	Raingage	Wetland
U14	0.18	132.22	0.00	2.0000	Raingage	DR-Drain

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CB01	JUNCTION	139.12	1.75	0.0	
CB02	JUNCTION	139.02	1.75	0.0	
CB03	JUNCTION	138.94	1.75	0.0	
CB04	JUNCTION	139.04	1.75	0.0	
CB05	JUNCTION	139.02	1.75	0.0	
CB06	JUNCTION	139.07	1.75	0.0	
CB07	JUNCTION	139.12	1.75	0.0	
CB08	JUNCTION	139.07	1.75	0.0	
CB09	JUNCTION	139.02	1.75	0.0	
HP01	JUNCTION	140.17	1.00	0.0	
HP02	JUNCTION	140.12	1.00	0.0	
HP03	JUNCTION	140.02	1.00	0.0	
HP04	JUNCTION	139.94	1.00	0.0	
HP05	JUNCTION	140.02	1.00	0.0	
HP06	JUNCTION	140.07	1.00	0.0	
HP07	JUNCTION	140.12	1.00	0.0	
HP08	JUNCTION	140.07	1.00	0.0	
HP09	JUNCTION	140.17	1.00	0.0	
HP10	JUNCTION	140.12	1.00	0.0	
HP11	JUNCTION	140.02	1.00	0.0	
HP12	JUNCTION	140.09	1.00	0.0	
AlmonteDrain	OUTFALL	137.50	0.38	0.0	
DR-Drain	OUTFALL	0.00	0.00	0.0	
PondSpill	OUTFALL	139.00	0.00	0.0	
Wetland	OUTFALL	0.00	0.00	0.0	
DryPond	STORAGE	137.60	2.40	0.0	

MH_outlet	STORAGE	137.55	1.45	0.0
MH01	STORAGE	139.04	1.26	0.0
MH02	STORAGE	138.65	1.60	0.0
MH03	STORAGE	138.20	1.95	0.0
MH04	STORAGE	137.88	2.22	0.0
MH05	STORAGE	137.84	2.26	0.0
MH06	STORAGE	137.73	2.34	0.0
MH07	STORAGE	137.99	2.06	0.0
MH08	STORAGE	138.20	1.95	0.0
MH09	STORAGE	138.73	1.47	0.0
MH10	STORAGE	139.05	1.20	0.0
MH11	STORAGE	139.00	1.30	0.0
MH12	STORAGE	138.85	1.30	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
MH01-02	MH01	MH02	CONDUIT	60.0	0.4000	0.0130
MH02-03	MH02	MH03	CONDUIT	77.0	0.3896	0.0130
MH03-04	MH03	MH04	CONDUIT	74.0	0.4324	0.0130
MH04-05	MH04	MH05	CONDUIT	14.0	0.2857	0.0130
MH05-06	MH05	MH06	CONDUIT	31.0	0.1290	0.0130
MH06-SWMF	MH06	DryPond	CONDUIT	15.0	0.2000	0.0130
MH07-06	MH07	MH06	CONDUIT	72.0	0.2639	0.0130
MH08-07	MH08	MH07	CONDUIT	81.0	0.2593	0.0130
MH09-08	MH09	MH08	CONDUIT	81.0	0.3704	0.0130
MH10-09	MH10	MH09	CONDUIT	56.0	0.4464	0.0130
MH11-02	MH11	MH02	CONDUIT	53.0	0.3774	0.0130
MH11-09	MH11	MH09	CONDUIT	59.0	0.3390	0.0130
MH12-08	MH12	MH08	CONDUIT	94.0	0.3723	0.0130
MHoutlet-Drain	MH_outlet	AlmonteDrain	CONDUIT	5.0	1.0001	0.0130
MS01	HP01	CB01	CONDUIT	37.0	0.8108	0.0150
MS02	HP10	CB01	CONDUIT	9.0	2.7789	0.0150
MS03	HP10	CB07	CONDUIT	10.0	2.5008	0.0150
MS04	HP09	CB07	CONDUIT	35.0	0.8572	0.0150
MS05	HP02	CB01	CONDUIT	35.0	0.7143	0.0150
MS06	HP02	CB02	CONDUIT	45.0	0.7778	0.0150
MS07	HP11	CB02	CONDUIT	11.0	2.2733	0.0150
MS08	HP03	CB02	CONDUIT	32.0	0.7813	0.0150
MS09	HP03	CB03	CONDUIT	24.0	1.3751	0.0150
MS10	HP04	CB03	CONDUIT	57.0	0.4386	0.0150
MS11	HP04	CB04	CONDUIT	85.0	0.1765	0.0150
MS12	HP07	CB06	CONDUIT	4.0	7.5212	0.0150
MS13	HP08	CB06	CONDUIT	5.0	5.0063	0.0150
MS14	HP08	CB08	CONDUIT	12.0	2.0838	0.0150
MS15	HP09	CB08	CONDUIT	38.0	0.9211	0.0150
MS16	HP06	CB06	CONDUIT	62.0	0.4032	0.0150
MS17	HP06	CB05	CONDUIT	14.0	2.1433	0.0150
MS18	HP05	CB05	CONDUIT	35.0	0.7143	0.0150
MS19	HP11	CB09	CONDUIT	84.0	0.2976	0.0150
MS20	HP05	CB09	CONDUIT	19.0	1.3159	0.0150
MS21	HP05	CB04	CONDUIT	79.0	0.2911	0.0150
MS22	HP12	CB04	CONDUIT	5.0	6.0108	0.0130
MS23	HP12	DryPond	CONDUIT	3.0	148.8086	0.0350
O-CB01	CB01	MH01	ORIFICE			
O-CB02	CB02	MH02	ORIFICE			
O-CB03	CB03	MH03	ORIFICE			
O-CB04	CB04	MH08	ORIFICE			
O-CB05	CB05	MH09	ORIFICE			
O-CB06	CB06	MH10	ORIFICE			
O-CB07	CB07	MH02	ORIFICE			
O-CB08	CB08	MH09	ORIFICE			
O-CB09	CB09	MH12	ORIFICE			
O-SWMF1	DryPond	MH_outlet	ORIFICE			
O-SWMF2	DryPond	MH_outlet	ORIFICE			
W1	DryPond	MH_outlet	WEIR			
W2	DryPond	PondSpill	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
MH01-02	CIRCULAR	0.45	0.16	0.11	0.45	1	180.33
MH02-03	CIRCULAR	0.60	0.28	0.15	0.60	1	383.28
MH03-04	CIRCULAR	0.75	0.44	0.19	0.75	1	732.13
MH04-05	CIRCULAR	0.75	0.44	0.19	0.75	1	595.11

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MH05-06         CIRCULAR          0.75     0.44     0.19     0.75        1   399.93
MH06-SWMF       CIRCULAR          0.82     0.53     0.21     0.82        1   641.99
MH07-06         CIRCULAR          0.75     0.44     0.19     0.75        1   571.93
MH08-07         CIRCULAR          0.75     0.44     0.19     0.75        1   566.89
MH09-08         CIRCULAR          0.53     0.22     0.13     0.53        1   261.74
MH10-09         CIRCULAR          0.45     0.16     0.11     0.45        1   190.51
MH11-02         CIRCULAR          0.45     0.16     0.11     0.45        1   175.15
MH11-09         CIRCULAR          0.45     0.16     0.11     0.45        1   166.01
MH12-08         CIRCULAR          0.45     0.16     0.11     0.45        1   173.98
MHoutlet-Drain  CIRCULAR          0.38     0.11     0.09     0.38        1   175.35
MS01            18mROW            1.00    15.30     0.52    18.00        1 59038.69
MS02            18mROW            1.00    15.30     0.52    18.00        1 109295.52
MS03            18mROW            1.00    15.30     0.52    18.00        1 103683.03
MS04            18mROW            1.00    15.30     0.52    18.00        1 60702.19
MS05            18mROW            1.00    15.30     0.52    18.00        1 55412.96
MS06            18mROW            1.00    15.30     0.52    18.00        1 57823.47
MS07            18mROW            1.00    15.30     0.52    18.00        1 98855.21
MS08            18mROW            1.00    15.30     0.52    18.00        1 57952.40
MS09            18mROW            1.00    15.30     0.52    18.00        1 76885.01
MS10            18mROW            1.00    15.30     0.52    18.00        1 43421.46
MS11            18mROW            1.00    15.30     0.52    18.00        1 27542.69
MS12            18mROW            1.00    15.30     0.52    18.00        1 179809.60
MS13            18mROW            1.00    15.30     0.52    18.00        1 146698.80
MS14            18mROW            1.00    15.30     0.52    18.00        1 94644.70
MS15            18mROW            1.00    15.30     0.52    18.00        1 62924.71
MS16            18mROW            1.00    15.30     0.52    18.00        1 41633.77
MS17            18mROW            1.00    15.30     0.52    18.00        1 95987.85
MS18            18mROW            1.00    15.30     0.52    18.00        1 55412.96
MS19            18mROW            1.00    15.30     0.52    18.00        1 35768.53
MS20            18mROW            1.00    15.30     0.52    18.00        1 75211.08
MS21            18mROW            1.00    15.30     0.52    18.00        1 35377.01
MS22            RECT_OPEN         1.00     3.00     0.60     3.00        1 40250.57
MS23            RECT_OPEN         1.00     3.00     0.60     3.00        1 74386.52


****************
Transect Summary
****************

Transect 18mROW
```

```
Area:
            0.0009     0.0034     0.0077     0.0137     0.0214
            0.0308     0.0417     0.0530     0.0657     0.0801
            0.0962     0.1139     0.1333     0.1543     0.1770
            0.2005     0.2240     0.2475     0.2710     0.2945
            0.3180     0.3415     0.3650     0.3885     0.4120
            0.4356     0.4591     0.4826     0.5061     0.5296
            0.5531     0.5766     0.6001     0.6237     0.6472
            0.6707     0.6942     0.7177     0.7412     0.7648
            0.7883     0.8118     0.8353     0.8588     0.8824
            0.9059     0.9294     0.9529     0.9765     1.0000
Hrad:
            0.0188     0.0376     0.0564     0.0751     0.0939
            0.1127     0.1406     0.1767     0.2070     0.2318
            0.2524     0.2698     0.2847     0.2977     0.3093
            0.3240     0.3404     0.3578     0.3760     0.3948
            0.4140     0.4335     0.4532     0.4731     0.4932
            0.5133     0.5335     0.5538     0.5742     0.5945
            0.6149     0.6353     0.6557     0.6761     0.6965
            0.7169     0.7373     0.7577     0.7780     0.7983
            0.8186     0.8389     0.8591     0.8793     0.8995
            0.9197     0.9398     0.9599     0.9800     1.0000
Width:
            0.0726     0.1453     0.2179     0.2905     0.3631
            0.4358     0.4721     0.5073     0.5776     0.6478
            0.7180     0.7882     0.8584     0.9287     0.9989
            0.9989     0.9990     0.9990     0.9990     0.9990
            0.9991     0.9991     0.9991     0.9992     0.9992
            0.9992     0.9993     0.9993     0.9993     0.9994
            0.9994     0.9994     0.9995     0.9995     0.9995
            0.9996     0.9996     0.9996     0.9997     0.9997
            0.9997     0.9997     0.9998     0.9998     0.9998
            0.9999     0.9999     0.9999     1.0000     1.0000


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

Hannan Hills Subdivision (118201)
PCSWMM Post-Development Model Output (100-year 6-hour Chicago)

```
****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 01/25/2021 00:00:00
Ending Date .............. 01/28/2021 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 2.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.452        82.323
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.150        27.246
Surface Runoff ...........         0.304        55.325
Final Storage ............         0.002         0.437
Continuity Error (%) .....        -0.832


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.304         3.037
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.304         3.039
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....        -0.080


***************************
Time-Step Critical Elements
***************************
Link MHoutlet-Drain (17.48%)


********************************
Highest Flow Instability Indexes
********************************
Link O-CB06 (7)
Link O-CB03 (7)
Link O-CB01 (6)
Link O-CB02 (4)
Link O-CB09 (4)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.92 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.09
Percent Not Converging      :     0.00
Time Step Frequencies       :
```

2.000 -	1.516 sec	:	94.47	%
1.516 -	1.149 sec	:	3.83	%
1.149 -	0.871 sec	:	1.69	%
0.871 -	0.660 sec	:	0.00	%
0.660 -	0.500 sec	:	0.01	%

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
01	82.32	0.00	0.00	22.84	46.34	13.04	59.38	0.15	109.66	0.721
02	82.32	0.00	0.00	23.02	46.83	12.74	59.57	0.28	190.04	0.724
03	82.32	0.00	0.00	14.27	59.53	8.56	68.08	0.16	107.22	0.827
04	82.32	0.00	0.00	18.97	52.67	10.91	63.58	0.32	218.74	0.772
05	82.32	0.00	0.00	21.34	49.15	12.07	61.22	0.40	278.41	0.744
06	82.32	0.00	0.00	33.86	30.02	18.53	48.55	0.33	240.12	0.590
07	82.32	0.00	0.00	33.32	30.27	19.40	49.67	0.10	84.78	0.603
08	82.32	0.00	0.00	15.08	58.31	8.98	67.28	0.17	120.13	0.817
09	82.32	0.00	0.00	28.05	39.84	14.64	54.48	0.14	88.32	0.662
10	82.32	0.00	0.00	11.21	64.10	6.94	71.03	0.31	210.57	0.863
11	82.32	0.00	0.00	19.95	51.30	10.96	62.27	0.34	227.40	0.756
12	82.32	0.00	0.00	51.20	8.21	23.25	31.45	0.12	62.48	0.382
U13	82.32	0.00	0.00	47.82	8.08	27.50	35.58	0.15	146.43	0.432
U14	82.32	0.00	0.00	53.18	0.00	30.48	30.48	0.05	59.05	0.370

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	hr:min	Reported Max Depth Meters
CB01	JUNCTION	0.05	1.01	140.13	0	02:14	1.01
CB02	JUNCTION	0.06	0.96	139.98	0	02:14	0.96
CB03	JUNCTION	0.07	0.99	139.93	0	02:14	0.99
CB04	JUNCTION	0.05	0.90	139.94	0	02:14	0.90
CB05	JUNCTION	0.06	0.99	140.01	0	02:24	0.99
CB06	JUNCTION	0.05	1.03	140.10	0	02:15	1.03
CB07	JUNCTION	0.04	0.95	140.07	0	02:13	0.95
CB08	JUNCTION	0.05	0.97	140.04	0	02:18	0.97
CB09	JUNCTION	0.06	0.94	139.96	0	02:13	0.94
HP01	JUNCTION	0.00	0.00	140.17	0	00:00	0.00
HP02	JUNCTION	0.00	0.01	140.13	0	02:14	0.01
HP03	JUNCTION	0.00	0.00	140.02	0	00:00	0.00
HP04	JUNCTION	0.00	0.00	139.94	0	02:17	0.00
HP05	JUNCTION	0.00	0.00	140.02	0	00:00	0.00
HP06	JUNCTION	0.00	0.03	140.10	0	02:13	0.03
HP07	JUNCTION	0.00	0.00	140.12	0	00:00	0.00
HP08	JUNCTION	0.00	0.03	140.10	0	02:15	0.03
HP09	JUNCTION	0.00	0.00	140.17	0	00:00	0.00
HP10	JUNCTION	0.00	0.01	140.13	0	02:13	0.01
HP11	JUNCTION	0.00	0.00	140.02	0	00:00	0.00
HP12	JUNCTION	0.00	0.00	140.09	0	00:00	0.00
AlmonteDrain	OUTFALL	0.04	0.38	137.88	0	02:50	0.38
DR-Drain	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
PondSpill	OUTFALL	0.00	0.00	139.00	0	00:00	0.00

Wetland	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
DryPond	STORAGE	0.46	2.12	139.72	0	02:52	2.12
MH_outlet	STORAGE	0.04	0.32	137.87	0	02:51	0.32
MH01	STORAGE	0.05	0.78	139.82	0	02:37	0.78
MH02	STORAGE	0.11	1.13	139.78	0	02:42	1.13
MH03	STORAGE	0.22	1.55	139.75	0	02:44	1.55
MH04	STORAGE	0.33	1.86	139.74	0	02:50	1.86
MH05	STORAGE	0.35	1.90	139.74	0	02:50	1.90
MH06	STORAGE	0.40	2.00	139.73	0	02:51	2.00
MH07	STORAGE	0.29	1.75	139.74	0	02:49	1.75
MH08	STORAGE	0.22	1.55	139.75	0	02:45	1.55
MH09	STORAGE	0.09	1.06	139.79	0	02:42	1.06
MH10	STORAGE	0.05	0.78	139.83	0	02:38	0.78
MH11	STORAGE	0.05	0.78	139.78	0	02:42	0.78
MH12	STORAGE	0.08	0.91	139.76	0	02:48	0.91

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
CB01	JUNCTION	299.70	299.70	0 02:10	0.434	0.435	0.207
CB02	JUNCTION	218.74	218.74	0 02:10	0.318	0.319	0.587
CB03	JUNCTION	278.41	278.41	0 02:10	0.404	0.404	0.512
CB04	JUNCTION	227.40	227.40	0 02:10	0.342	0.343	0.486
CB05	JUNCTION	88.32	88.32	0 02:10	0.136	0.145	0.242
CB06	JUNCTION	324.90	324.90	0 02:10	0.434	0.436	0.337
CB07	JUNCTION	107.22	107.22	0 02:10	0.157	0.157	0.317
CB08	JUNCTION	120.13	120.13	0 02:10	0.175	0.182	0.231
CB09	JUNCTION	210.57	210.57	0 02:10	0.312	0.314	0.745
HP01	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP02	JUNCTION	0.00	22.55	0 02:13	0	0.00171	51.146
HP03	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP04	JUNCTION	0.00	5.81	0 02:15	0	0.000889	93.487
HP05	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP06	JUNCTION	0.00	56.03	0 02:12	0	0.0103	6.231
HP07	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP08	JUNCTION	0.00	20.21	0 02:11	0	0.00747	0.638
HP09	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP10	JUNCTION	0.00	9.84	0 02:12	0	0.000285	28.953
HP11	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP12	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
AlmonteDrain	OUTFALL	0.00	179.49	0 02:51	0	2.83	0.000
DR-Drain	OUTFALL	59.05	59.05	0 02:10	0.0548	0.0548	0.000
PondSpill	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
Wetland	OUTFALL	146.43	146.43	0 02:10	0.149	0.149	0.000
DryPond	STORAGE	62.48	795.89	0 02:08	0.119	2.83	-0.016
MH_outlet	STORAGE	0.00	177.36	0 02:52	0	2.83	-0.007
MH01	STORAGE	0.00	155.79	0 02:09	0	0.432	0.449
MH02	STORAGE	0.00	337.46	0 02:07	0	0.983	0.117
MH03	STORAGE	0.00	469.21	0 02:06	0	1.38	-0.772
MH04	STORAGE	0.00	423.36	0 02:07	0	1.39	0.019
MH05	STORAGE	0.00	407.13	0 02:07	0	1.39	0.045
MH06	STORAGE	0.00	764.09	0 02:07	0	2.71	-0.037
MH07	STORAGE	0.00	391.71	0 02:07	0	1.32	0.068
MH08	STORAGE	0.00	459.74	0 02:06	0	1.31	-0.967
MH09	STORAGE	0.00	253.13	0 02:08	0	0.743	0.298
MH10	STORAGE	0.00	152.67	0 02:09	0	0.417	0.111
MH11	STORAGE	0.00	47.18	0 02:08	0	0.0794	0.049
MH12	STORAGE	0.00	119.17	0 02:07	0	0.311	0.626

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

Hannan Hills Subdivision (118201)
PCSWMM Post-Development Model Output (100-year 6-hour Chicago)

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**********************
Storage Volume Summary
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Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
DryPond	0.253	12	0	0	1.651	81	0 02:52	177.36
MH_outlet	0.000	3	0	0	0.000	22	0 02:51	179.49
MH01	0.000	4	0	0	0.001	62	0 02:37	154.46
MH02	0.000	7	0	0	0.001	71	0 02:42	326.37
MH03	0.000	11	0	0	0.002	79	0 02:44	423.36
MH04	0.000	15	0	0	0.002	84	0 02:50	407.13
MH05	0.000	16	0	0	0.002	84	0 02:50	398.97
MH06	0.000	17	0	0	0.002	85	0 02:51	746.22
MH07	0.000	14	0	0	0.002	85	0 02:49	365.38
MH08	0.000	11	0	0	0.002	80	0 02:45	391.71
MH09	0.000	6	0	0	0.001	72	0 02:42	243.63
MH10	0.000	4	0	0	0.001	65	0 02:38	151.23
MH11	0.000	4	0	0	0.001	60	0 02:42	35.76
MH12	0.000	6	0	0	0.001	70	0 02:48	122.51

```
***********************
Outfall Loading Summary
***********************
```

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
AlmonteDrain	49.03	28.20	179.49	2.835
DR-Drain	2.53	9.85	59.05	0.055
PondSpill	0.00	0.00	0.00	0.000
Wetland	10.08	6.73	146.43	0.149
System	15.41	44.78	232.47	3.039

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

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
MH01-02	CONDUIT	154.46	0 02:09	1.36	0.86	1.00
MH02-03	CONDUIT	326.37	0 02:06	1.59	0.85	1.00
MH03-04	CONDUIT	423.36	0 02:07	1.09	0.58	1.00
MH04-05	CONDUIT	407.13	0 02:07	0.92	0.68	1.00
MH05-06	CONDUIT	398.97	0 02:07	0.90	1.00	1.00
MH06-SWMF	CONDUIT	746.22	0 02:07	1.40	1.16	1.00
MH07-06	CONDUIT	365.38	0 02:07	0.83	0.64	1.00
MH08-07	CONDUIT	391.71	0 02:07	1.05	0.69	1.00
MH09-08	CONDUIT	227.89	0 02:06	1.41	0.87	1.00
MH10-09	CONDUIT	151.23	0 02:09	1.32	0.79	1.00
MH11-02	CONDUIT	35.76	0 02:45	0.24	0.20	1.00
MH11-09	CONDUIT	36.18	0 02:45	0.34	0.22	1.00
MH12-08	CONDUIT	122.51	0 02:06	1.09	0.70	1.00
MHoutlet-Drain	CONDUIT	179.49	0 02:51	1.82	1.02	0.92
MS01	CHANNEL	0.00	0 00:00	0.00	0.00	0.13
MS02	CHANNEL	9.84	0 02:12	0.02	0.00	0.13
MS03	CHANNEL	0.31	0 02:14	0.03	0.00	0.10
MS04	CHANNEL	0.00	0 00:00	0.00	0.00	0.10
MS05	CHANNEL	22.55	0 02:13	0.12	0.00	0.13
MS06	CHANNEL	0.50	0 02:14	0.10	0.00	0.11
MS07	CHANNEL	0.00	0 00:00	0.00	0.00	0.11
MS08	CHANNEL	0.00	0 00:00	0.00	0.00	0.11
MS09	CHANNEL	0.00	0 00:00	0.00	0.00	0.12
MS10	CHANNEL	0.02	0 02:17	0.05	0.00	0.12
MS11	CHANNEL	5.81	0 02:15	0.03	0.00	0.08
MS12	CHANNEL	0.00	0 00:00	0.00	0.00	0.14
MS13	CHANNEL	20.21	0 02:11	0.04	0.00	0.15
MS14	CHANNEL	13.75	0 02:15	0.03	0.00	0.12
MS15	CHANNEL	0.00	0 00:00	0.00	0.00	0.11
MS16	CHANNEL	56.03	0 02:12	0.09	0.00	0.15
MS17	CHANNEL	16.49	0 02:13	0.14	0.00	0.13

MS18	CHANNEL	0.00	0	00:00	0.00	0.00	0.12
MS19	CHANNEL	0.00	0	00:00	0.00	0.00	0.09
MS20	CHANNEL	0.00	0	00:00	0.00	0.00	0.09
MS21	CHANNEL	0.00	0	00:00	0.00	0.00	0.08
MS22	CONDUIT	0.00	0	00:00	0.00	0.00	0.08
MS23	CONDUIT	0.00	0	00:00	0.00	0.00	0.50
O-CB01	ORIFICE	155.79	0	02:09			1.00
O-CB02	ORIFICE	115.68	0	02:08			1.00
O-CB03	ORIFICE	148.46	0	02:09			1.00
O-CB04	ORIFICE	117.27	0	02:10			1.00
O-CB05	ORIFICE	40.90	0	02:07			1.00
O-CB06	ORIFICE	152.67	0	02:09			1.00
O-CB07	ORIFICE	59.46	0	02:09			1.00
O-CB08	ORIFICE	64.85	0	02:08			1.00
O-CB09	ORIFICE	119.17	0	02:07			1.00
O-SWMF1	ORIFICE	16.29	0	02:48			1.00
O-SWMF2	ORIFICE	43.66	0	02:52			1.00
W1	WEIR	117.43	0	02:52			0.54
W2	WEIR	0.00	0	00:00			0.00

****
Flow Classification Summary
****

	Adjusted	---------- Fraction of Time in Flow Class ----------								
Conduit	/Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
MH01-02	1.00	0.00	0.00	0.00	0.16	0.00	0.00	0.84	0.03	0.00
MH02-03	1.00	0.00	0.00	0.00	0.27	0.00	0.00	0.73	0.10	0.00
MH03-04	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.13	0.00
MH04-05	1.00	0.00	0.30	0.00	0.70	0.00	0.00	0.00	0.60	0.00
MH05-06	1.00	0.00	0.00	0.00	0.44	0.00	0.00	0.56	0.01	0.00
MH06-SWMF	1.00	0.00	0.00	0.00	0.46	0.00	0.00	0.53	0.01	0.00
MH07-06	1.00	0.00	0.00	0.00	0.44	0.00	0.00	0.56	0.07	0.00
MH08-07	1.00	0.00	0.12	0.00	0.88	0.00	0.00	0.00	0.66	0.00
MH09-08	1.00	0.00	0.00	0.00	0.24	0.00	0.00	0.75	0.09	0.00
MH10-09	1.00	0.00	0.00	0.00	0.16	0.00	0.00	0.84	0.03	0.00
MH11-02	1.00	0.84	0.00	0.00	0.16	0.00	0.00	0.00	0.88	0.00
MH11-09	1.00	0.83	0.01	0.00	0.16	0.00	0.00	0.00	0.87	0.00
MH12-08	1.00	0.00	0.00	0.00	0.22	0.00	0.00	0.77	0.10	0.00
MHoutlet-Drain	1.00	0.00	0.00	0.00	0.51	0.48	0.00	0.00	0.64	0.00
MS01	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS02	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS03	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS04	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS05	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS06	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS07	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS08	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS09	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS10	1.00	0.03	0.00	0.00	0.02	0.00	0.00	0.95	0.01	0.00
MS11	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS12	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS13	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS14	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS15	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS16	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS17	1.00	0.03	0.00	0.00	0.02	0.00	0.00	0.95	0.01	0.00
MS18	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS19	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS20	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS21	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS22	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS23	1.00	0.07	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

	--------- Hours Full --------			Hours Above Full	Hours Capacity
Conduit	Both Ends	Upstream	Dnstream	Normal Flow	Limited
MH01-02	2.33	2.33	4.85	0.01	0.01
MH02-03	4.85	4.85	7.48	0.01	0.01
MH03-04	7.48	7.48	10.99	0.01	0.01
MH04-05	10.99	10.99	11.73	0.01	0.01

MH05-06	11.72	11.73	12.60	0.01	0.43
MH06-SWMF	12.46	12.48	13.15	0.27	0.58
MH07-06	9.53	9.53	12.60	0.01	0.01
MH08-07	7.48	7.48	9.53	0.01	0.01
MH09-08	4.81	4.81	7.44	0.01	0.01
MH10-09	2.23	2.23	4.86	0.01	0.01
MH11-02	2.72	2.72	4.85	0.01	0.01
MH11-09	2.72	2.72	4.86	0.01	0.01
MH12-08	4.44	4.44	7.48	0.01	0.01
MHoutlet-Drain	0.01	0.01	0.05	0.08	0.01

```
Analysis begun on:  Fri May 16 16:50:44 2025
Analysis ended on:  Fri May 16 16:50:47 2025
Total elapsed time: 00:00:03
```

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

WARNING 02: maximum depth increased for Node CB03
WARNING 02: maximum depth increased for Node CB04
WARNING 02: maximum depth increased for Node CB06
WARNING 02: maximum depth increased for Node CB08

****
Element Count
****

Number of rain gages 1
Number of subcatchments ... 14
Number of nodes 39
Number of links 50
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Raingage	D3-S12hr-100yr	INTENSITY	30 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
01	0.26	78.81	57.10	2.0000	Raingage	CB01
02	0.47	105.99	57.10	2.0000	Raingage	CB01
03	0.23	77.88	72.90	2.0000	Raingage	CB07
04	0.50	135.36	64.30	2.0000	Raingage	CB02
05	0.66	169.99	60.00	2.0000	Raingage	CB03
06	0.68	204.53	37.10	2.0000	Raingage	CB06
07	0.21	115.37	37.10	2.0000	Raingage	CB06
08	0.26	84.49	71.40	2.0000	Raingage	CB08
09	0.25	43.09	48.60	2.0000	Raingage	CB05
10	0.44	181.48	78.60	2.0000	Raingage	CB09
11	0.55	100.84	62.90	2.0000	Raingage	CB04
12	0.38	54.68	10.00	2.0000	Raingage	DryPond
U13	0.42	287.13	10.00	2.0000	Raingage	Wetland
U14	0.18	132.22	0.00	2.0000	Raingage	DR-Drain

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
CB01	JUNCTION	139.12	1.75	0.0	
CB02	JUNCTION	139.02	1.75	0.0	
CB03	JUNCTION	138.94	1.75	0.0	
CB04	JUNCTION	139.04	1.75	0.0	
CB05	JUNCTION	139.02	1.75	0.0	
CB06	JUNCTION	139.07	1.75	0.0	
CB07	JUNCTION	139.12	1.75	0.0	
CB08	JUNCTION	139.07	1.75	0.0	
CB09	JUNCTION	139.02	1.75	0.0	
HP01	JUNCTION	140.17	1.00	0.0	
HP02	JUNCTION	140.12	1.00	0.0	
HP03	JUNCTION	140.02	1.00	0.0	
HP04	JUNCTION	139.94	1.00	0.0	
HP05	JUNCTION	140.02	1.00	0.0	
HP06	JUNCTION	140.07	1.00	0.0	
HP07	JUNCTION	140.12	1.00	0.0	
HP08	JUNCTION	140.07	1.00	0.0	
HP09	JUNCTION	140.17	1.00	0.0	
HP10	JUNCTION	140.12	1.00	0.0	
HP11	JUNCTION	140.02	1.00	0.0	
HP12	JUNCTION	140.09	1.00	0.0	
AlmonteDrain	OUTFALL	137.50	0.38	0.0	
DR-Drain	OUTFALL	0.00	0.00	0.0	
PondSpill	OUTFALL	139.00	0.00	0.0	
Wetland	OUTFALL	0.00	0.00	0.0	
DryPond	STORAGE	137.60	2.40	0.0	

MH_outlet	STORAGE	137.55	1.45	0.0
MH01	STORAGE	139.04	1.26	0.0
MH02	STORAGE	138.65	1.60	0.0
MH03	STORAGE	138.20	1.95	0.0
MH04	STORAGE	137.88	2.22	0.0
MH05	STORAGE	137.84	2.26	0.0
MH06	STORAGE	137.73	2.34	0.0
MH07	STORAGE	137.99	2.06	0.0
MH08	STORAGE	138.20	1.95	0.0
MH09	STORAGE	138.73	1.47	0.0
MH10	STORAGE	139.05	1.20	0.0
MH11	STORAGE	139.00	1.30	0.0
MH12	STORAGE	138.85	1.30	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
MH01-02	MH01	MH02	CONDUIT	60.0	0.4000	0.0130
MH02-03	MH02	MH03	CONDUIT	77.0	0.3896	0.0130
MH03-04	MH03	MH04	CONDUIT	74.0	0.4324	0.0130
MH04-05	MH04	MH05	CONDUIT	14.0	0.2857	0.0130
MH05-06	MH05	MH06	CONDUIT	31.0	0.1290	0.0130
MH06-SWMF	MH06	DryPond	CONDUIT	15.0	0.2000	0.0130
MH07-06	MH07	MH06	CONDUIT	72.0	0.2639	0.0130
MH08-07	MH08	MH07	CONDUIT	81.0	0.2593	0.0130
MH09-08	MH09	MH08	CONDUIT	81.0	0.3704	0.0130
MH10-09	MH10	MH09	CONDUIT	56.0	0.4464	0.0130
MH11-02	MH11	MH02	CONDUIT	53.0	0.3774	0.0130
MH11-09	MH11	MH09	CONDUIT	59.0	0.3390	0.0130
MH12-08	MH12	MH08	CONDUIT	94.0	0.3723	0.0130
MHoutlet-Drain	MH_outlet	AlmonteDrain	CONDUIT	5.0	1.0001	0.0130
MS01	HP01	CB01	CONDUIT	37.0	0.8108	0.0150
MS02	HP10	CB01	CONDUIT	9.0	2.7789	0.0150
MS03	HP10	CB07	CONDUIT	10.0	2.5008	0.0150
MS04	HP09	CB07	CONDUIT	35.0	0.8572	0.0150
MS05	HP02	CB01	CONDUIT	35.0	0.7143	0.0150
MS06	HP02	CB02	CONDUIT	45.0	0.7778	0.0150
MS07	HP11	CB02	CONDUIT	11.0	2.2733	0.0150
MS08	HP03	CB02	CONDUIT	32.0	0.7813	0.0150
MS09	HP03	CB03	CONDUIT	24.0	1.3751	0.0150
MS10	HP04	CB03	CONDUIT	57.0	0.4386	0.0150
MS11	HP04	CB04	CONDUIT	85.0	0.1765	0.0150
MS12	HP07	CB06	CONDUIT	4.0	7.5212	0.0150
MS13	HP08	CB06	CONDUIT	5.0	5.0063	0.0150
MS14	HP08	CB08	CONDUIT	12.0	2.0838	0.0150
MS15	HP09	CB08	CONDUIT	38.0	0.9211	0.0150
MS16	HP06	CB06	CONDUIT	62.0	0.4032	0.0150
MS17	HP06	CB05	CONDUIT	14.0	2.1433	0.0150
MS18	HP05	CB05	CONDUIT	35.0	0.7143	0.0150
MS19	HP11	CB09	CONDUIT	84.0	0.2976	0.0150
MS20	HP05	CB09	CONDUIT	19.0	1.3159	0.0150
MS21	HP05	CB04	CONDUIT	79.0	0.2911	0.0150
MS22	HP12	CB04	CONDUIT	5.0	6.0108	0.0130
MS23	HP12	DryPond	CONDUIT	3.0	148.8086	0.0350
O-CB01	CB01	MH01	ORIFICE			
O-CB02	CB02	MH02	ORIFICE			
O-CB03	CB03	MH03	ORIFICE			
O-CB04	CB04	MH08	ORIFICE			
O-CB05	CB05	MH09	ORIFICE			
O-CB06	CB06	MH10	ORIFICE			
O-CB07	CB07	MH02	ORIFICE			
O-CB08	CB08	MH09	ORIFICE			
O-CB09	CB09	MH12	ORIFICE			
O-SWMF1	DryPond	MH_outlet	ORIFICE			
O-SWMF2	DryPond	MH_outlet	ORIFICE			
W1	DryPond	MH_outlet	WEIR			
W2	DryPond	PondSpill	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
MH01-02	CIRCULAR	0.45	0.16	0.11	0.45	1	180.33
MH02-03	CIRCULAR	0.60	0.28	0.15	0.60	1	383.28
MH03-04	CIRCULAR	0.75	0.44	0.19	0.75	1	732.13
MH04-05	CIRCULAR	0.75	0.44	0.19	0.75	1	595.11

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MH05-06          CIRCULAR            0.75     0.44     0.19     0.75         1   399.93
MH06-SWMF        CIRCULAR            0.82     0.53     0.21     0.82         1   641.99
MH07-06          CIRCULAR            0.75     0.44     0.19     0.75         1   571.93
MH08-07          CIRCULAR            0.75     0.44     0.19     0.75         1   566.89
MH09-08          CIRCULAR            0.53     0.22     0.13     0.53         1   261.74
MH10-09          CIRCULAR            0.45     0.16     0.11     0.45         1   190.51
MH11-02          CIRCULAR            0.45     0.16     0.11     0.45         1   175.15
MH11-09          CIRCULAR            0.45     0.16     0.11     0.45         1   166.01
MH12-08          CIRCULAR            0.45     0.16     0.11     0.45         1   173.98
MHoutlet-Drain   CIRCULAR            0.38     0.11     0.09     0.38         1   175.35
MS01             18mROW              1.00    15.30     0.52    18.00         1 59038.69
MS02             18mROW              1.00    15.30     0.52    18.00         1 109295.52
MS03             18mROW              1.00    15.30     0.52    18.00         1 103683.03
MS04             18mROW              1.00    15.30     0.52    18.00         1 60702.19
MS05             18mROW              1.00    15.30     0.52    18.00         1 55412.96
MS06             18mROW              1.00    15.30     0.52    18.00         1 57823.47
MS07             18mROW              1.00    15.30     0.52    18.00         1 98855.21
MS08             18mROW              1.00    15.30     0.52    18.00         1 57952.40
MS09             18mROW              1.00    15.30     0.52    18.00         1 76885.01
MS10             18mROW              1.00    15.30     0.52    18.00         1 43421.46
MS11             18mROW              1.00    15.30     0.52    18.00         1 27542.69
MS12             18mROW              1.00    15.30     0.52    18.00         1 179809.60
MS13             18mROW              1.00    15.30     0.52    18.00         1 146698.80
MS14             18mROW              1.00    15.30     0.52    18.00         1 94644.70
MS15             18mROW              1.00    15.30     0.52    18.00         1 62924.71
MS16             18mROW              1.00    15.30     0.52    18.00         1 41633.77
MS17             18mROW              1.00    15.30     0.52    18.00         1 95987.85
MS18             18mROW              1.00    15.30     0.52    18.00         1 55412.96
MS19             18mROW              1.00    15.30     0.52    18.00         1 35768.53
MS20             18mROW              1.00    15.30     0.52    18.00         1 75211.08
MS21             18mROW              1.00    15.30     0.52    18.00         1 35377.01
MS22             RECT_OPEN           1.00     3.00     0.60     3.00         1 40250.57
MS23             RECT_OPEN           1.00     3.00     0.60     3.00         1 74386.52


****************
Transect Summary
****************

Transect 18mROW
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Area:
            0.0009     0.0034     0.0077     0.0137     0.0214
            0.0308     0.0417     0.0530     0.0657     0.0801
            0.0962     0.1139     0.1333     0.1543     0.1770
            0.2005     0.2240     0.2475     0.2710     0.2945
            0.3180     0.3415     0.3650     0.3885     0.4120
            0.4356     0.4591     0.4826     0.5061     0.5296
            0.5531     0.5766     0.6001     0.6237     0.6472
            0.6707     0.6942     0.7177     0.7412     0.7648
            0.7883     0.8118     0.8353     0.8588     0.8824
            0.9059     0.9294     0.9529     0.9765     1.0000
Hrad:
            0.0188     0.0376     0.0564     0.0751     0.0939
            0.1127     0.1406     0.1767     0.2070     0.2318
            0.2524     0.2698     0.2847     0.2977     0.3093
            0.3240     0.3404     0.3578     0.3760     0.3948
            0.4140     0.4335     0.4532     0.4731     0.4932
            0.5133     0.5335     0.5538     0.5742     0.5945
            0.6149     0.6353     0.6557     0.6761     0.6965
            0.7169     0.7373     0.7577     0.7780     0.7983
            0.8186     0.8389     0.8591     0.8793     0.8995
            0.9197     0.9398     0.9599     0.9800     1.0000
Width:
            0.0726     0.1453     0.2179     0.2905     0.3631
            0.4358     0.4721     0.5073     0.5776     0.6478
            0.7180     0.7882     0.8584     0.9287     0.9989
            0.9989     0.9990     0.9990     0.9990     0.9990
            0.9991     0.9991     0.9991     0.9992     0.9992
            0.9992     0.9993     0.9993     0.9993     0.9994
            0.9994     0.9994     0.9995     0.9995     0.9995
            0.9996     0.9996     0.9996     0.9997     0.9997
            0.9997     0.9997     0.9998     0.9998     0.9998
            0.9999     0.9999     0.9999     1.0000     1.0000


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************
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Hannan Hills Subdivision (118201)
PCSWMM Post-Development Model Output (100-year 12-hour SCS)

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****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 01/25/2021 00:00:00
Ending Date .............. 01/28/2021 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 2.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.516        93.910
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.181        32.925
Surface Runoff ...........         0.334        60.810
Final Storage ............         0.002         0.437
Continuity Error (%) .....        -0.279


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.334         3.338
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.334         3.340
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....        -0.055


***************************
Time-Step Critical Elements
***************************
Link MHoutlet-Drain (19.04%)


********************************
Highest Flow Instability Indexes
********************************
Link O-CB06 (11)
Link O-CB03 (8)
Link O-CB09 (8)
Link O-CB02 (8)
Link O-CB07 (6)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.91 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.10
Percent Not Converging      :     0.00
Time Step Frequencies       :
```

```
      2.000 -  1.516 sec      :    94.11 %
      1.516 -  1.149 sec      :     3.94 %
      1.149 -  0.871 sec      :     1.82 %
      0.871 -  0.660 sec      :     0.13 %
      0.660 -  0.500 sec      :     0.01 %
```

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
01	93.91	0.00	0.00	27.65	52.97	12.78	65.75	0.17	53.17	0.700
02	93.91	0.00	0.00	27.84	53.45	12.58	66.03	0.31	95.09	0.703
03	93.91	0.00	0.00	17.30	67.99	8.27	76.26	0.18	48.87	0.812
04	93.91	0.00	0.00	22.97	60.13	10.68	70.81	0.35	103.97	0.754
05	93.91	0.00	0.00	25.83	56.11	11.86	67.97	0.45	135.46	0.724
06	93.91	0.00	0.00	40.92	34.33	18.33	52.66	0.36	130.00	0.561
07	93.91	0.00	0.00	40.38	34.57	18.93	53.50	0.11	41.39	0.570
08	93.91	0.00	0.00	18.28	66.59	8.70	75.29	0.20	55.06	0.802
09	93.91	0.00	0.00	33.82	45.47	14.57	60.04	0.15	47.79	0.639
10	93.91	0.00	0.00	13.60	73.23	6.61	79.84	0.35	94.55	0.850
11	93.91	0.00	0.00	24.11	58.57	10.83	69.40	0.38	112.56	0.739
12	93.91	0.00	0.00	61.32	9.37	23.33	32.69	0.12	50.52	0.348
U13	93.91	0.00	0.00	57.92	9.24	26.91	36.15	0.15	77.56	0.385
U14	93.91	0.00	0.00	64.40	0.00	29.86	29.86	0.05	32.40	0.318

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	Time of Max Occurrence hr:min	Reported Max Depth Meters
CB01	JUNCTION	0.05	0.92	140.04	0	06:32	0.92
CB02	JUNCTION	0.06	0.89	139.91	0	06:33	0.89
CB03	JUNCTION	0.07	0.91	139.85	0	06:33	0.91
CB04	JUNCTION	0.06	0.84	139.88	0	06:33	0.84
CB05	JUNCTION	0.06	0.92	139.94	0	06:34	0.92
CB06	JUNCTION	0.06	0.98	140.05	0	06:33	0.98
CB07	JUNCTION	0.05	0.85	139.97	0	06:32	0.85
CB08	JUNCTION	0.05	0.87	139.94	0	06:32	0.87
CB09	JUNCTION	0.06	0.85	139.87	0	06:32	0.85
HP01	JUNCTION	0.00	0.00	140.17	0	00:00	0.00
HP02	JUNCTION	0.00	0.00	140.12	0	00:00	0.00
HP03	JUNCTION	0.00	0.00	140.02	0	00:00	0.00
HP04	JUNCTION	0.00	0.00	139.94	0	00:00	0.00
HP05	JUNCTION	0.00	0.00	140.02	0	00:00	0.00
HP06	JUNCTION	0.00	0.00	140.07	0	00:00	0.00
HP07	JUNCTION	0.00	0.00	140.12	0	00:00	0.00
HP08	JUNCTION	0.00	0.00	140.07	0	00:00	0.00
HP09	JUNCTION	0.00	0.00	140.17	0	00:00	0.00
HP10	JUNCTION	0.00	0.00	140.12	0	00:00	0.00
HP11	JUNCTION	0.00	0.00	140.02	0	00:00	0.00
HP12	JUNCTION	0.00	0.00	140.09	0	00:00	0.00
AlmonteDrain	OUTFALL	0.05	0.38	137.88	0	06:58	0.38
DR-Drain	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
PondSpill	OUTFALL	0.00	0.00	139.00	0	00:00	0.00

Wetland	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
DryPond	STORAGE	0.51	2.13	139.73	0	07:03	2.13
MH_outlet	STORAGE	0.05	0.35	137.90	0	07:05	0.35
MH01	STORAGE	0.06	0.75	139.79	0	06:39	0.75
MH02	STORAGE	0.12	1.11	139.76	0	07:00	1.11
MH03	STORAGE	0.24	1.55	139.75	0	07:00	1.55
MH04	STORAGE	0.37	1.86	139.74	0	07:01	1.86
MH05	STORAGE	0.39	1.90	139.74	0	07:01	1.90
MH06	STORAGE	0.44	2.01	139.74	0	07:02	2.01
MH07	STORAGE	0.32	1.75	139.74	0	07:01	1.75
MH08	STORAGE	0.24	1.55	139.75	0	07:00	1.55
MH09	STORAGE	0.11	1.04	139.77	0	06:58	1.04
MH10	STORAGE	0.06	0.76	139.81	0	06:44	0.76
MH11	STORAGE	0.06	0.77	139.77	0	06:59	0.77
MH12	STORAGE	0.08	0.91	139.76	0	07:00	0.91

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
CB01	JUNCTION	148.26	148.26	0 06:30	0.481	0.481	0.210
CB02	JUNCTION	103.97	103.97	0 06:30	0.354	0.355	0.342
CB03	JUNCTION	135.46	135.46	0 06:30	0.449	0.449	0.661
CB04	JUNCTION	112.56	112.56	0 06:30	0.382	0.383	0.265
CB05	JUNCTION	47.79	47.79	0 06:30	0.15	0.15	0.120
CB06	JUNCTION	171.39	171.39	0 06:30	0.47	0.471	0.370
CB07	JUNCTION	48.87	48.87	0 06:30	0.175	0.175	0.160
CB08	JUNCTION	55.06	55.06	0 06:30	0.196	0.196	0.048
CB09	JUNCTION	94.55	94.55	0 06:30	0.351	0.353	0.372
HP01	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP02	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP03	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP04	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP05	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP06	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP07	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP08	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP09	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP10	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP11	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP12	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
AlmonteDrain	OUTFALL	0.00	188.59	0 07:05	0	3.13	0.000
DR-Drain	OUTFALL	32.40	32.40	0 06:30	0.0537	0.0537	0.000
PondSpill	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
Wetland	OUTFALL	77.56	77.56	0 06:30	0.152	0.152	0.000
DryPond	STORAGE	50.52	657.42	0 06:19	0.124	3.13	-0.003
MH_outlet	STORAGE	0.00	181.20	0 07:03	0	3.13	-0.007
MH01	STORAGE	0.00	130.60	0 06:17	0	0.48	0.344
MH02	STORAGE	0.00	271.32	0 06:15	0	1.09	0.062
MH03	STORAGE	0.00	359.93	0 06:18	0	1.53	-0.570
MH04	STORAGE	0.00	345.21	0 06:18	0	1.54	0.015
MH05	STORAGE	0.00	335.57	0 06:18	0	1.54	0.024
MH06	STORAGE	0.00	637.10	0 06:19	0	3.01	-0.019
MH07	STORAGE	0.00	321.76	0 06:18	0	1.47	0.035
MH08	STORAGE	0.00	357.56	0 06:11	0	1.46	-0.620
MH09	STORAGE	0.00	217.32	0 06:15	0	0.814	0.224
MH10	STORAGE	0.00	131.19	0 06:16	0	0.469	-0.011
MH11	STORAGE	0.00	32.26	0 06:14	0	0.0783	0.009
MH12	STORAGE	0.00	92.22	0 06:17	0	0.352	0.556

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Node Surcharge Summary
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No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

Hannan Hills Subdivision (118201)
PCSWMM Post-Development Model Output (100-year 12-hour SCS)

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Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
DryPond	0.277	14	0	0	1.661	81	0 07:03	181.20
MH_outlet	0.000	3	0	0	0.000	24	0 07:05	188.59
MH01	0.000	5	0	0	0.001	60	0 06:39	128.57
MH02	0.000	8	0	0	0.001	70	0 07:00	245.48
MH03	0.000	12	0	0	0.002	80	0 07:00	345.21
MH04	0.000	17	0	0	0.002	84	0 07:01	335.57
MH05	0.000	17	0	0	0.002	84	0 07:01	330.65
MH06	0.000	19	0	0	0.002	86	0 07:02	625.45
MH07	0.000	15	0	0	0.002	85	0 07:01	306.84
MH08	0.000	12	0	0	0.002	80	0 07:00	321.76
MH09	0.000	7	0	0	0.001	71	0 06:58	187.62
MH10	0.000	5	0	0	0.001	63	0 06:44	130.69
MH11	0.000	4	0	0	0.001	59	0 06:59	27.95
MH12	0.000	7	0	0	0.001	70	0 07:00	89.50

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
AlmonteDrain	55.38	27.59	188.59	3.134
DR-Drain	2.93	9.05	32.40	0.054
PondSpill	0.00	0.00	0.00	0.000
Wetland	18.71	3.94	77.56	0.152
System	19.26	40.58	199.79	3.340

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
MH01-02	CONDUIT	128.57	0 06:16	1.28	0.71	1.00
MH02-03	CONDUIT	245.48	0 06:19	1.41	0.64	1.00
MH03-04	CONDUIT	345.21	0 06:18	0.78	0.47	1.00
MH04-05	CONDUIT	335.57	0 06:18	0.76	0.56	1.00
MH05-06	CONDUIT	330.65	0 06:18	0.75	0.83	1.00
MH06-SWMF	CONDUIT	625.45	0 06:19	1.17	0.97	1.00
MH07-06	CONDUIT	306.84	0 06:19	0.69	0.54	1.00
MH08-07	CONDUIT	321.76	0 06:18	0.75	0.57	1.00
MH09-08	CONDUIT	178.89	0 06:11	1.26	0.68	1.00
MH10-09	CONDUIT	130.69	0 06:16	1.22	0.69	1.00
MH11-02	CONDUIT	27.95	0 06:48	0.18	0.16	1.00
MH11-09	CONDUIT	30.17	0 06:16	0.34	0.18	1.00
MH12-08	CONDUIT	89.50	0 06:09	1.04	0.51	1.00
MHoutlet-Drain	CONDUIT	188.59	0 07:05	1.82	1.08	0.97
MS01	CHANNEL	0.00	0 00:00	0.00	0.00	0.08
MS02	CHANNEL	0.00	0 00:00	0.00	0.00	0.08
MS03	CHANNEL	0.00	0 00:00	0.00	0.00	0.05
MS04	CHANNEL	0.00	0 00:00	0.00	0.00	0.05
MS05	CHANNEL	0.00	0 00:00	0.00	0.00	0.08
MS06	CHANNEL	0.00	0 00:00	0.00	0.00	0.07
MS07	CHANNEL	0.00	0 00:00	0.00	0.00	0.07
MS08	CHANNEL	0.00	0 00:00	0.00	0.00	0.07
MS09	CHANNEL	0.00	0 00:00	0.00	0.00	0.08
MS10	CHANNEL	0.00	0 00:00	0.00	0.00	0.08
MS11	CHANNEL	0.00	0 00:00	0.00	0.00	0.05
MS12	CHANNEL	0.00	0 00:00	0.00	0.00	0.12
MS13	CHANNEL	0.00	0 00:00	0.00	0.00	0.12
MS14	CHANNEL	0.00	0 00:00	0.00	0.00	0.06
MS15	CHANNEL	0.00	0 00:00	0.00	0.00	0.06
MS16	CHANNEL	0.00	0 00:00	0.00	0.00	0.12
MS17	CHANNEL	0.00	0 00:00	0.00	0.00	0.08

MS18	CHANNEL	0.00	0	00:00	0.00	0.00	0.08
MS19	CHANNEL	0.00	0	00:00	0.00	0.00	0.05
MS20	CHANNEL	0.00	0	00:00	0.00	0.00	0.05
MS21	CHANNEL	0.00	0	00:00	0.00	0.00	0.05
MS22	CONDUIT	0.00	0	00:00	0.00	0.00	0.05
MS23	CONDUIT	0.00	0	00:00	0.00	0.00	0.50
O-CB01	ORIFICE	130.60	0	06:17			1.00
O-CB02	ORIFICE	94.16	0	06:16			1.00
O-CB03	ORIFICE	120.90	0	06:16			1.00
O-CB04	ORIFICE	100.90	0	06:17			1.00
O-CB05	ORIFICE	35.79	0	06:15			1.00
O-CB06	ORIFICE	131.19	0	06:16			1.00
O-CB07	ORIFICE	46.97	0	06:18			1.00
O-CB08	ORIFICE	52.02	0	06:17			1.00
O-CB09	ORIFICE	92.22	0	06:17			1.00
O-SWMF1	ORIFICE	16.29	0	06:56			1.00
O-SWMF2	ORIFICE	43.80	0	07:03			1.00
W1	WEIR	121.22	0	07:03			0.55
W2	WEIR	0.00	0	00:00			0.00

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		Fraction of Time in Flow Class								
MH01-02	1.00	0.01	0.00	0.00	0.17	0.00	0.00	0.82	0.03	0.00
MH02-03	1.00	0.01	0.00	0.00	0.28	0.00	0.00	0.71	0.10	0.00
MH03-04	1.00	0.01	0.03	0.00	0.96	0.00	0.00	0.00	0.20	0.00
MH04-05	1.00	0.01	0.39	0.00	0.60	0.00	0.00	0.00	0.54	0.00
MH05-06	1.00	0.01	0.00	0.00	0.49	0.00	0.00	0.50	0.02	0.00
MH06-SWMF	1.00	0.01	0.00	0.00	0.53	0.00	0.00	0.47	0.01	0.00
MH07-06	1.00	0.01	0.01	0.00	0.48	0.00	0.00	0.50	0.08	0.00
MH08-07	1.00	0.01	0.14	0.00	0.86	0.00	0.00	0.00	0.63	0.00
MH09-08	1.00	0.01	0.00	0.00	0.26	0.00	0.00	0.73	0.09	0.00
MH10-09	1.00	0.01	0.00	0.00	0.17	0.00	0.00	0.82	0.03	0.00
MH11-02	1.00	0.83	0.00	0.00	0.17	0.00	0.00	0.00	0.81	0.00
MH11-09	1.00	0.81	0.01	0.00	0.17	0.00	0.00	0.00	0.81	0.00
MH12-08	1.00	0.01	0.00	0.00	0.24	0.00	0.00	0.76	0.09	0.00
MHoutlet-Drain	1.00	0.01	0.00	0.00	0.45	0.54	0.00	0.00	0.57	0.00
MS01	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS02	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS03	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS04	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS05	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS06	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS07	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS08	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS09	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS10	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS11	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS12	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS13	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS14	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS15	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS16	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS17	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS18	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS19	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS20	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS21	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS22	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS23	1.00	0.04	0.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Conduit Surcharge Summary
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Conduit	Hours Full Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
MH01-02	2.39	2.39	5.41	0.01	0.01
MH02-03	5.41	5.41	8.34	0.01	0.01
MH03-04	8.34	8.34	11.89	0.01	0.01
MH04-05	11.89	11.89	12.64	0.01	0.01

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MH05-06                 12.64     12.64     13.52      0.01         0.43
MH06-SWMF               13.39     13.40     14.09      0.01         0.63
MH07-06                 10.42     10.42     13.52      0.01         0.01
MH08-07                  8.35      8.35     10.42      0.01         0.01
MH09-08                  5.36      5.36      8.31      0.01         0.01
MH10-09                  2.29      2.29      5.41      0.01         0.01
MH11-02                  2.81      2.81      5.41      0.01         0.01
MH11-09                  2.81      2.81      5.41      0.01         0.01
MH12-08                  4.82      4.82      8.35      0.01         0.01
MHoutlet-Drain           0.01      0.01      0.14      0.18         0.01


Analysis begun on:  Fri May 16 16:12:20 2025
Analysis ended on:  Fri May 16 16:12:23 2025
Total elapsed time: 00:00:03
```

Hannan Hills Subdivision (118201)
Pre-Development Model Parameters

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Time to Peak Calculations
(Uplands Overland Flow Method)
Existing Conditions

Area ID	Area (ha)	Overland Flow						Concentrated Overland Flow						Overall		
		Length (m)	Elevation U/S (m)	Elevation D/S (m)	Slope (%)	Velocity (m/s)	Travel Time (min)	Length (m)	Elevation U/S (m)	Elevation D/S (m)	Slope (%)	Velocity (m/s)	Travel Time (min)	Time of Concentration (min)	Time to Peak (min)	Time to Peak (min)
EX-1	5.15	100	140.5	138.5	2.0%	0.21	7.94	196	138.5	138.0	0.3%	0.32	10.21	18	12	12
EX-2	0.33	76	140.8	139.0	2.3%	0.24	5.28	-	-	-	-	-	-	5	4	10

Weighted Curve Number Calculations
Soil type 'B'

Area ID	Land Use 1	Area	CN	Land Use 2	Area	CN	Land Use 3	Area	CN	Weighted CN	
EX-1	Impervious	4%	98	Lawn	4%	61	Forest	91%	60	62	Silty sand/glacial till = soil type B
EX-2	Impervious	7%	98	Lawn	9%	61	Forest	84%	60	63	Silty sand/glacial till = soil type B

Weighted IA Calculations

Area ID	Land Use 1	Area	IA	Land Use 2	Area	IA	Land Use 3	Area	IA	Weighted IA
EX-1	Impervious	4%	0.4	Lawn	4%	12.2	Forest	91%	12.7	12.1
EX-2	Impervious	7%	0.4	Lawn	9%	12.2	Forest	84%	12.7	11.8

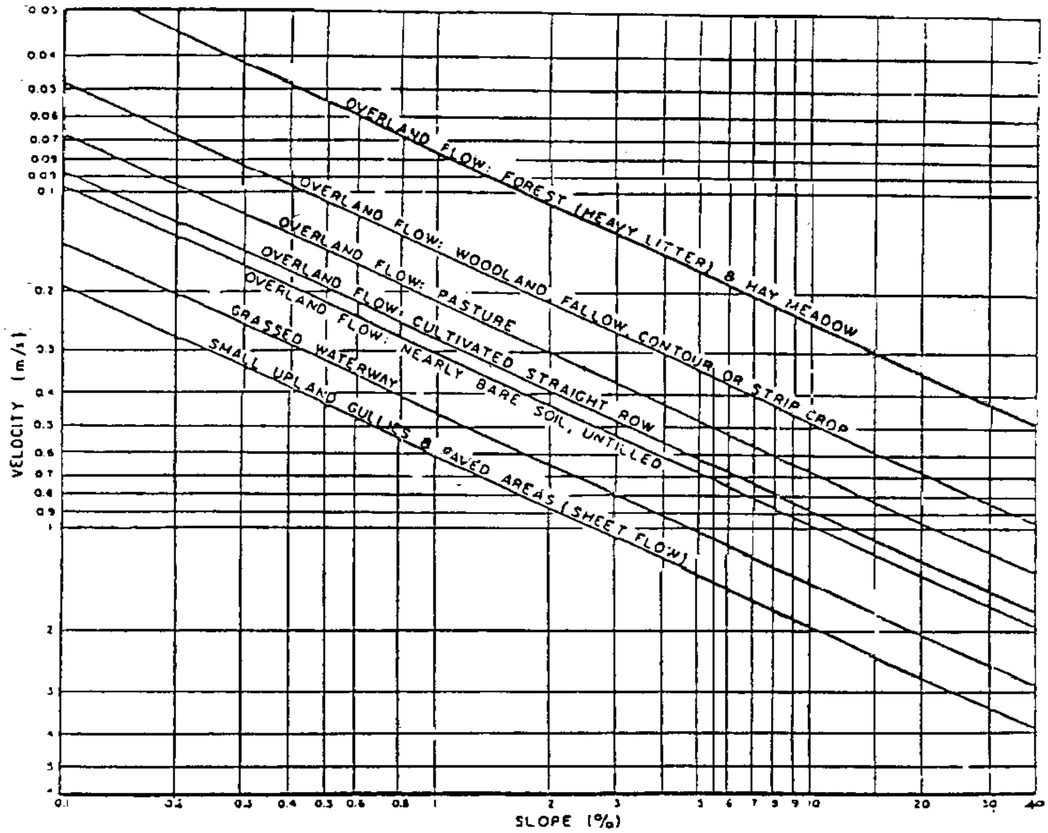

Figure A.5.2: Upland Method for Estimating Time of Concentration (SCS National Engineering Handbook, 1971)

Hannan Hills Subdivision (118201)
Post-Development Model Parameters

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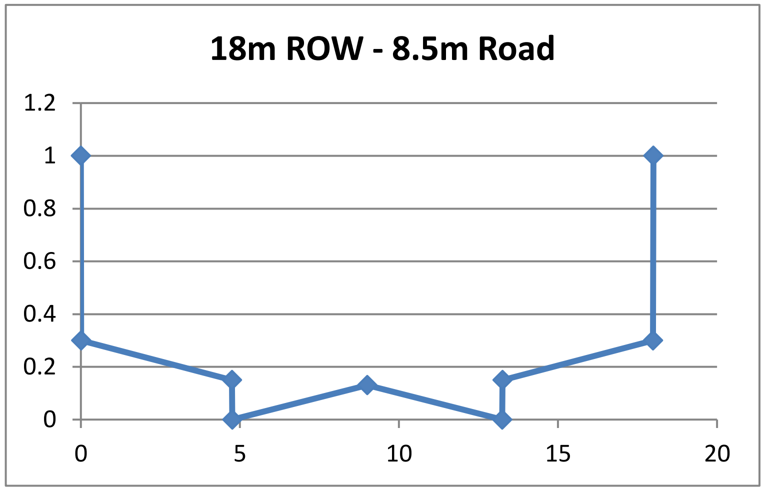
Area ID	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	No Depression (%)	Flow Path Length (m)	Equivalent Width (m)	Average Slope (%)
01	0.26	0.60	57.1%	15%	33	79	2%
02	0.47	0.60	57.1%	65%	44	106	2%
03	0.23	0.71	72.9%	45%	30	78	2%
04	0.50	0.65	64.3%	60%	37	135	2%
05	0.66	0.62	60.0%	60%	39	170	2%
06	0.68	0.46	37.1%	5%	33	205	2%
07	0.21	0.46	37.1%	50%	18	115	2%
08	0.26	0.70	71.4%	45%	31	84	2%
09	0.25	0.54	48.6%	60%	58	43	2%
10	0.44	0.75	78.6%	40%	24	181	2%
11	0.55	0.64	62.9%	30%	55	101	2%
12	0.38	0.27	10.0%	80%	69	55	2%
U13	0.42	0.27	10.0%	0%	15	287	2%
U14	0.18	0.20	0.0%	0%	14	132	2%
TOTAL:	**5.49**	0.55	49.4%				

Hannan Hills Subdivision (118201)
Roadway Cross-Sections

18m ROW - 8.5m Road

Station (m)	Depth (m)
0	1
0.01	0.3
4.75	0.15
4.76	0
9	0.13
13.24	0
13.25	0.15
17.99	0.3
18	1



Hannan Hills Subdivision (118201)
Design Storm Time Series Data
Chicago Design Storms

C25mm-4.stm		C2-6.stm		C5-6.stm	
Duration	Intensity	Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr	min	mm/hr
0:00	0	0:00	0	0:00	0
0:10	1.51	0:10	1.37	0:10	1.78
0:20	1.75	0:20	1.49	0:20	1.94
0:30	2.07	0:30	1.63	0:30	2.13
0:40	2.58	0:40	1.82	0:40	2.37
0:50	3.46	0:50	2.05	0:50	2.68
1:00	5.39	1:00	2.37	1:00	3.1
1:10	13.44	1:10	2.81	1:10	3.68
1:20	56.67	1:20	3.5	1:20	4.58
1:30	17.77	1:30	4.69	1:30	6.15
1:40	9.12	1:40	7.3	1:40	9.61
1:50	6.14	1:50	18.21	1:50	24.17
2:00	4.65	2:00	76.81	2:00	104.19
2:10	3.76	2:10	24.08	2:10	32.04
2:20	3.17	2:20	12.36	2:20	16.34
2:30	2.74	2:30	8.32	2:30	10.96
2:40	2.43	2:40	6.3	2:40	8.29
2:50	2.18	2:50	5.09	2:50	6.69
3:00	1.98	3:00	4.29	3:00	5.63
3:10	1.81	3:10	3.72	3:10	4.87
3:20	1.68	3:20	3.29	3:20	4.3
3:30	1.56	3:30	2.95	3:30	3.86
3:40	1.47	3:40	2.68	3:40	3.51
3:50	1.38	3:50	2.46	3:50	3.22
4:00	1.31	4:00	2.28	4:00	2.98
		4:10	2.12	4:10	2.77
		4:20	1.99	4:20	2.6
		4:30	1.87	4:30	2.44
		4:40	1.77	4:40	2.31
		4:50	1.68	4:50	2.19
		5:00	1.6	5:00	2.08
		5:10	1.52	5:10	1.99
		5:20	1.46	5:20	1.9
		5:30	1.4	5:30	1.82
		5:40	1.34	5:40	1.75
		5:50	1.29	5:50	1.68
		6:00	1.24	6:00	1.62

Hannan Hills Subdivision (118201)
Design Storm Time Series Data
Chicago Design Storms

C100-6.stm		C100-6+20%.stm	
Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr
0:00	0	0:00	0
0:10	2.9	0:10	11:31
0:20	3.16	0:20	3.79
0:30	3.48	0:30	4.18
0:40	3.88	0:40	4.66
0:50	4.39	0:50	5.27
1:00	5.07	1:00	6.08
1:10	6.05	1:10	7.26
1:20	7.54	1:20	9.05
1:30	10.16	1:30	12.19
1:40	15.97	1:40	19.16
1:50	40.65	1:50	48.78
2:00	178.56	2:00	214.27
2:10	54.05	2:10	64.86
2:20	27.32	2:20	32.78
2:30	18.24	2:30	21.89
2:40	13.74	2:40	16.49
2:50	11.06	2:50	13.27
3:00	9.29	3:00	11.15
3:10	8.02	3:10	9.62
3:20	7.08	3:20	8.5
3:30	6.35	3:30	7.62
3:40	5.76	3:40	6.91
3:50	5.28	3:50	6.34
4:00	4.88	4:00	5.86
4:10	4.54	4:10	5.45
4:20	4.25	4:20	5.1
4:30	3.99	4:30	4.79
4:40	3.77	4:40	4.52
4:50	3.57	4:50	4.28
5:00	3.4	5:00	4.08
5:10	3.24	5:10	3.89
5:20	3.1	5:20	3.72
5:30	2.97	5:30	3.56
5:40	2.85	5:40	3.42
5:50	2.74	5:50	3.29
6:00	2.64	6:00	3.17

Hannan Hills Subdivision (118201)
Design Storm Time Series Data
SCS Design Storms

S2-12.stm			S5-12.stm			S100-12.stm	
Duration	Intensity		Duration	Intensity		Duration	Intensity
min	mm/hr		min	mm/hr		min	mm/hr
0:00	0.00		0:00	0		0:00	0
0:30	1.27		0:30	1.69		0:30	2.82
1:00	0.59		1:00	0.79		1:00	1.31
1:30	1.10		1:30	1.46		1:30	2.44
2:00	1.10		2:00	1.46		2:00	2.44
2:30	1.44		2:30	1.91		2:30	3.19
3:00	1.27		3:00	1.69		3:00	2.82
3:30	1.69		3:30	2.25		3:30	3.76
4:00	1.69		4:00	2.25		4:00	3.76
4:30	2.29		4:30	3.03		4:30	5.07
5:00	2.88		5:00	3.82		5:00	6.39
5:30	4.57		5:30	6.07		5:30	10.14
6:00	36.24		6:00	48.08		6:00	80.38
6:30	9.23		6:30	12.25		6:30	20.47
7:00	4.06		7:00	5.39		7:00	9.01
7:30	2.71		7:30	3.59		7:30	6.01
8:00	2.37		8:00	3.15		8:00	5.26
8:30	1.86		8:30	2.47		8:30	4.13
9:00	1.95		9:00	2.58		9:00	4.32
9:30	1.27		9:30	1.69		9:30	2.82
10:00	1.02		10:00	1.35		10:00	2.25
10:30	1.44		10:30	1.91		10:30	3.19
11:00	0.93		11:00	1.24		11:00	2.07
11:30	0.85		11:30	1.12		11:30	1.88
12:00	0.85		12:00	1.12		12:00	1.88

Hannan Hills Subdivision (118201)
Conceptual PCSWMM Model - Orifice Sizing

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Equivalent Orifice Sizing

Inlet Name	Inlet / Outlet Node	Invert (m)	T/G (m)	CB Depth (m)	Area ID	Drainage Area (ha)	Static Ponding Depth (m)	Design Flow Rate[1] (L/s)	Artificial Orifice Dia.[2] (m)	Modelled Orifice Dia.[3] (m)
O-CB01	CB01	139.12	139.87	0.75	1 & 2	0.73	0.25	141.2	0.278	0.295
O-CB02	CB02	139.02	139.77	0.75	4	0.50	0.25	107.2	0.242	0.250
O-CB03	CB03	138.94	139.69	0.75	5	0.66	0.25	133.2	0.270	0.280
O-CB04	CB04	139.04	139.79	0.75	11	0.55	0.15	111.7	0.247	0.252
O-CB05	CB05	139.02	139.77	0.75	9	0.25	0.25	40.5	0.149	0.149
O-CB06	CB06	139.07	139.82	0.75	6&7	0.89	0.25	131.0	0.267	0.295
O-CB07	CB07	139.12	139.87	0.75	3	0.23	0.25	55.4	0.174	0.176
O-CB08	CB08	139.07	139.82	0.75	8	0.26	0.25	61.5	0.183	0.185
O-CB09	CB09	139.02	139.77	0.75	10	0.44	0.25	113.3	0.249	0.255
TOTAL						**4.51**	**-**	**895.0**	**-**	

[1] Design flow rate = 5-year peak flow based on PCSWMM model results (6-hour Chicago storm).
[2] Theoretical orifice size based on design flow rate and estimated 0.75m CB depth.
[3] Modelled orifice size to convey 5-year runoff due to shallow pipes causing backwater into orifices.

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Dry Pond - Stage-Storage

Stage	Elevation	Depth	Area	Volume	
				Stage	Total
	(m)	(m)	m^2	m^3	m^3
Low Flow Channel - Outlet	137.60	0.00	0.0	0	0
Low Flow Channel - Inlet	137.69	0.09	50.0	2	2
Bottom of Slope	137.85	0.25	963.0	81	83
	138.60	1.00	1416.0	892	975
Top of Pond	139.50	1.90	1964.0	1,521	2,496

Stormceptor® | Rinker MATERIALS

Stormceptor® EF Sizing Report

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

05/16/2025

Province:	Ontario
City:	Almonte
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Project Name:	Hannan Hills
Project Number:	118201
Designer Name:	Melanie Schroeder
Designer Company:	Novatech
Designer Email:	m.schroeder@novatech-eng.com
Designer Phone:	613-254-9643
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Site Name:	Hannan Hills

Drainage Area (ha):	4.89
% Imperviousness:	54.60

Runoff Coefficient 'c': 0.62

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0
Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	99.05
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	3016
Estimated Average Annual Sediment Volume (L/yr):	2452

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	50
EFO5	58
EFO6	65
EFO8	76
EFO10	83
EFO12	87

Recommended Stormceptor EFO Model: EFO10

Estimated Net Annual Sediment (TSS) Load Reduction (%): 83

Water Quality Runoff Volume Capture (%): > 90

imbrium

THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

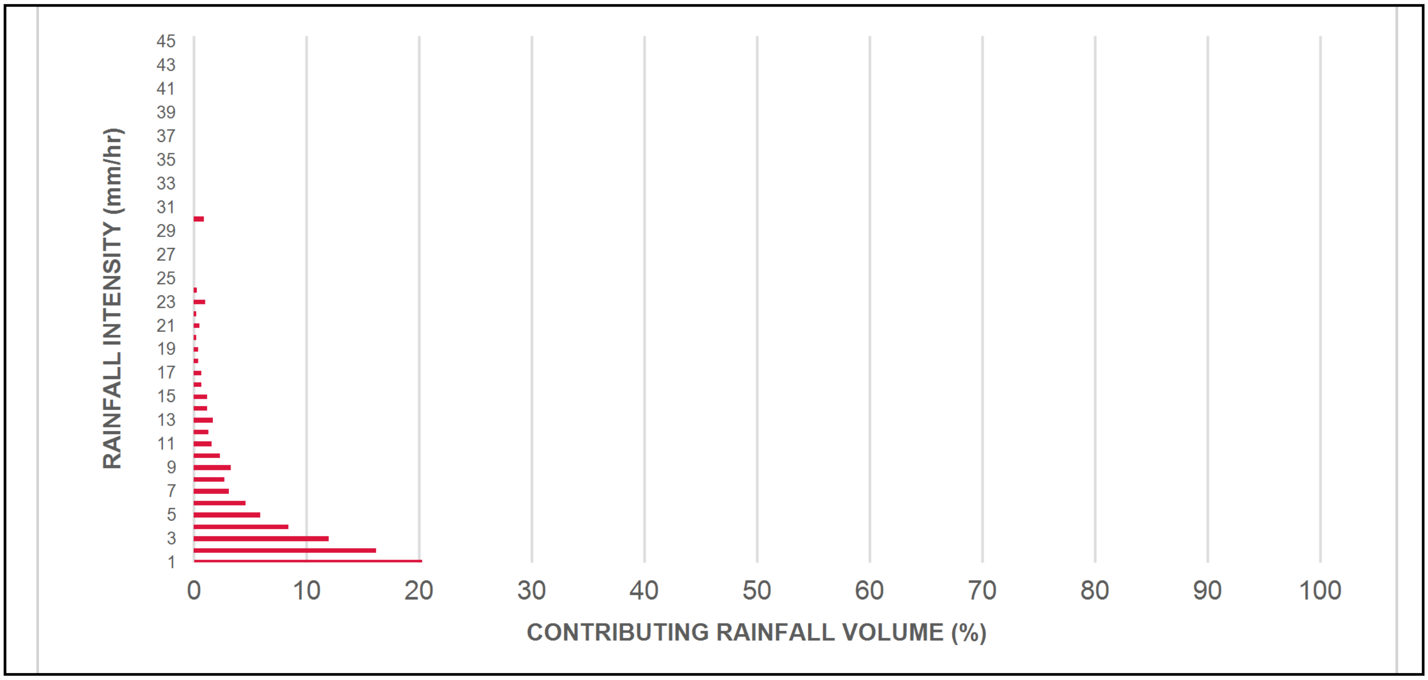
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

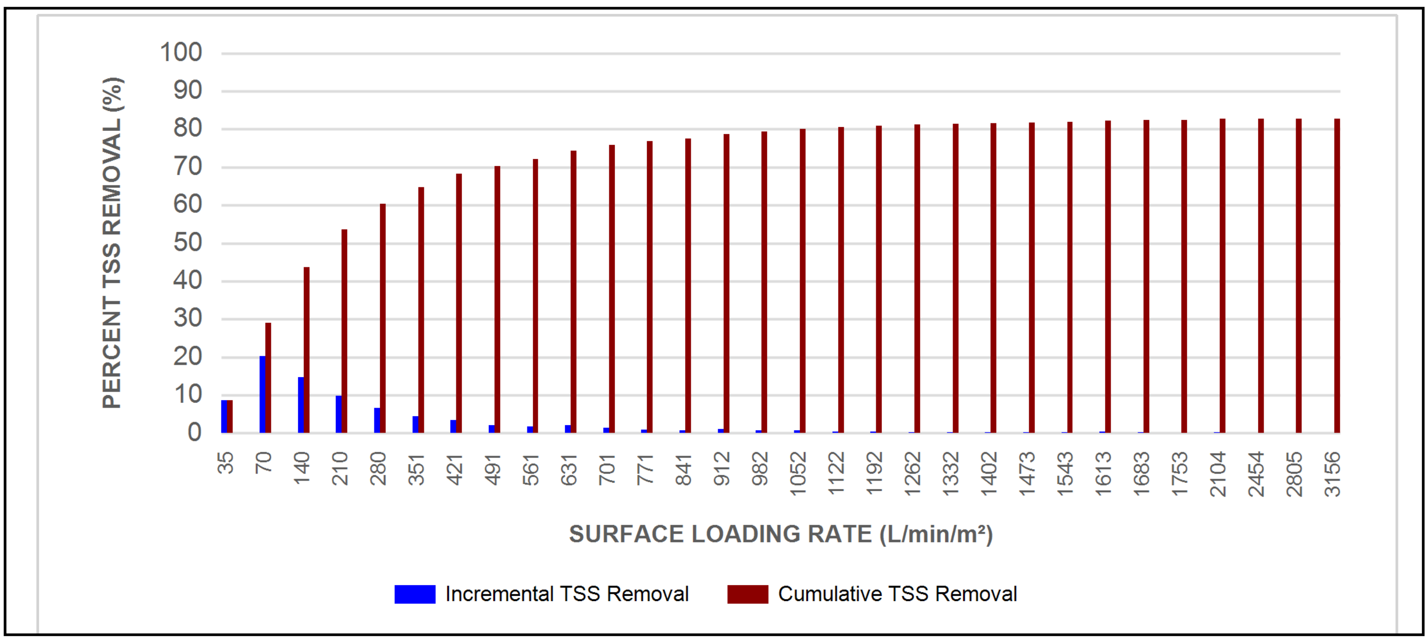
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.6	8.6	4.27	256.0	35.0	100	8.6	8.6
1.00	20.3	29.0	8.53	512.0	70.0	100	20.3	29.0
2.00	16.2	45.2	17.06	1024.0	140.0	91	14.7	43.7
3.00	12.0	57.2	25.60	1536.0	210.0	83	9.9	53.6
4.00	8.4	65.6	34.13	2048.0	280.0	79	6.7	60.3
5.00	5.9	71.6	42.66	2560.0	351.0	76	4.5	64.8
6.00	4.6	76.2	51.19	3071.0	421.0	73	3.4	68.2
7.00	3.1	79.3	59.72	3583.0	491.0	70	2.1	70.3
8.00	2.7	82.0	68.25	4095.0	561.0	66	1.8	72.2
9.00	3.3	85.3	76.79	4607.0	631.0	64	2.1	74.3
10.00	2.3	87.6	85.32	5119.0	701.0	64	1.5	75.8
11.00	1.6	89.2	93.85	5631.0	771.0	63	1.0	76.8
12.00	1.3	90.5	102.38	6143.0	841.0	63	0.8	77.6
13.00	1.7	92.2	110.91	6655.0	912.0	62	1.1	78.7
14.00	1.2	93.5	119.44	7167.0	982.0	62	0.8	79.4
15.00	1.2	94.6	127.98	7679.0	1052.0	60	0.7	80.1
16.00	0.7	95.3	136.51	8190.0	1122.0	59	0.4	80.5
17.00	0.7	96.1	145.04	8702.0	1192.0	57	0.4	80.9
18.00	0.4	96.5	153.57	9214.0	1262.0	56	0.2	81.2
19.00	0.4	96.9	162.10	9726.0	1332.0	54	0.2	81.4
20.00	0.2	97.1	170.63	10238.0	1402.0	52	0.1	81.5
21.00	0.5	97.5	179.17	10750.0	1473.0	50	0.2	81.7
22.00	0.2	97.8	187.70	11262.0	1543.0	48	0.1	81.9
23.00	1.0	98.8	196.23	11774.0	1613.0	45	0.5	82.3
24.00	0.3	99.1	204.76	12286.0	1683.0	44	0.1	82.4
25.00	0.0	99.1	213.29	12798.0	1753.0	42	0.0	82.4
30.00	0.9	100.0	255.95	15357.0	2104.0	35	0.3	82.8
35.00	0.0	100.0	298.61	17917.0	2454.0	30	0.0	82.8
40.00	0.0	100.0	341.27	20476.0	2805.0	26	0.0	82.8
45.00	0.0	100.0	383.93	23036.0	3156.0	24	0.0	82.8
Estimated Net Annual Sediment (TSS) Load Reduction =								**83 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF5 / EFO5	1.5	5	90	762	30	762	30	710	25
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

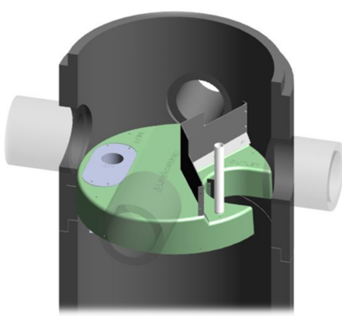
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

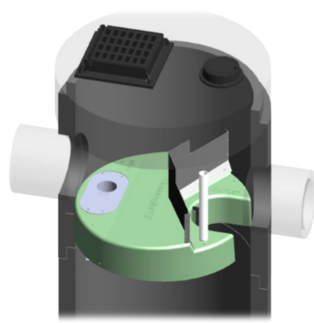
DESIGN FLEXIBILITY

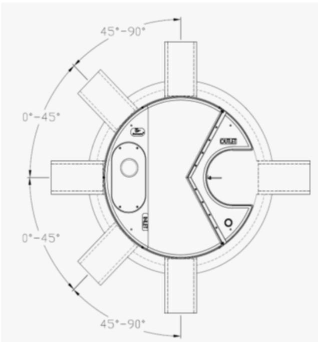
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

OIL CAPTURE AND RETENTION

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







INLET-TO-OUTLET DROP

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

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

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

HEAD LOSS

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

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
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

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	5 ft (1524 mm) Diameter OGS Units:	1.95 m^3 sediment / 420 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

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

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

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

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

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

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

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

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid

Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

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

Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Pre-development - Overall Model Schematic

Date: 2025-05-16
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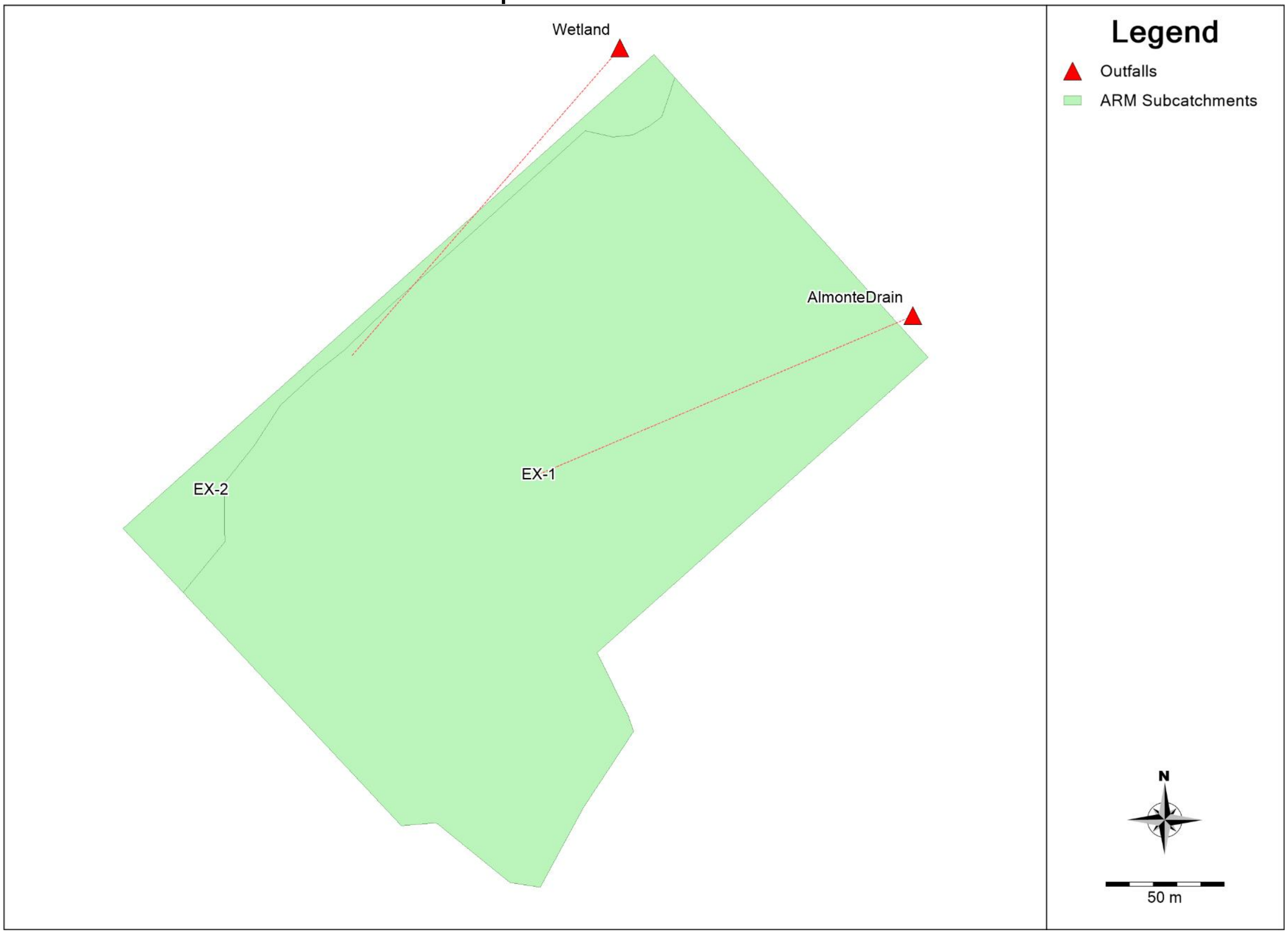
Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Pre-development - Subcatchments and Outfalls



Date: 2025-05-16
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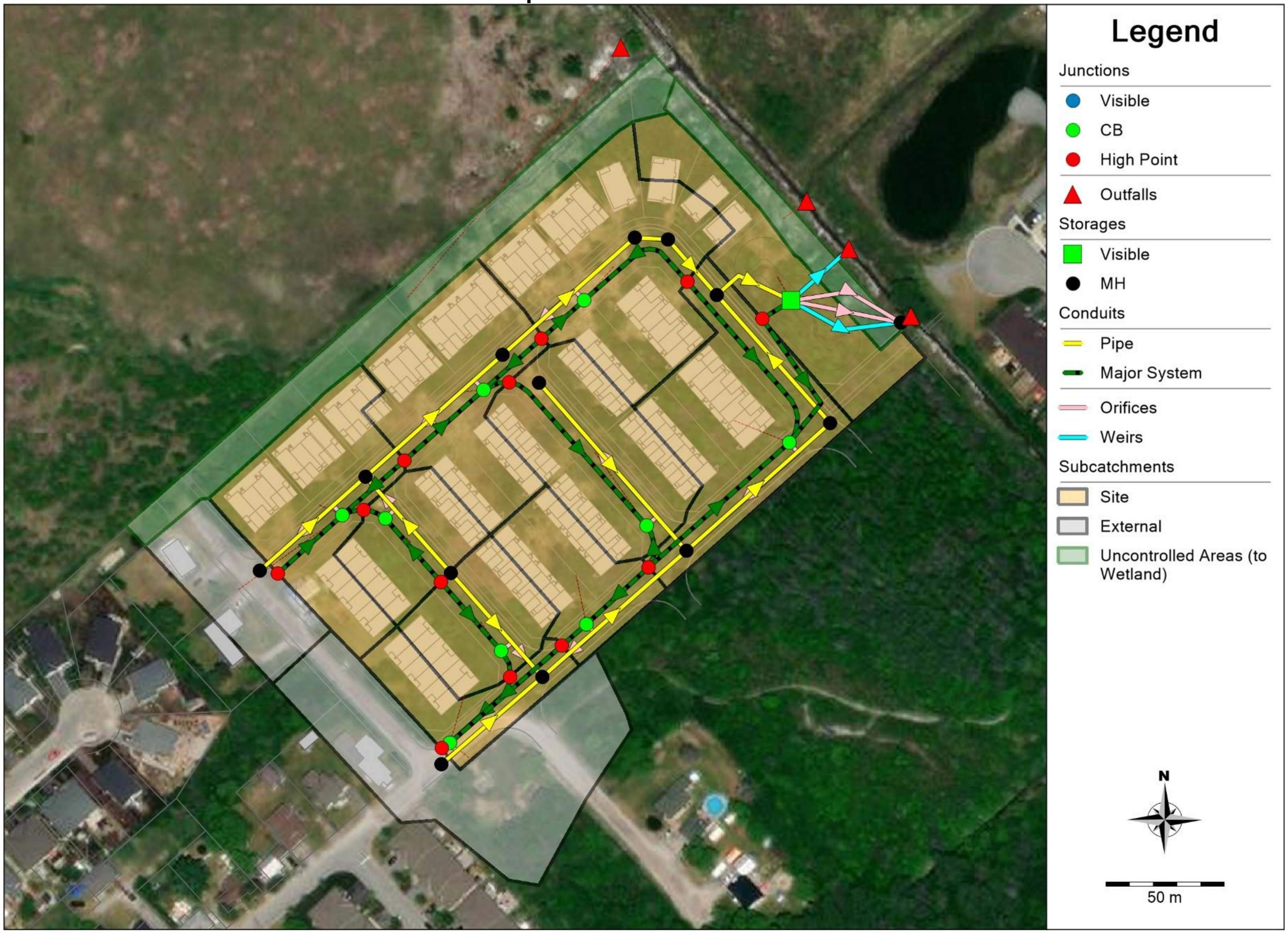
Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Post-development - Overall Model Schematic



Date: 2025-05-16
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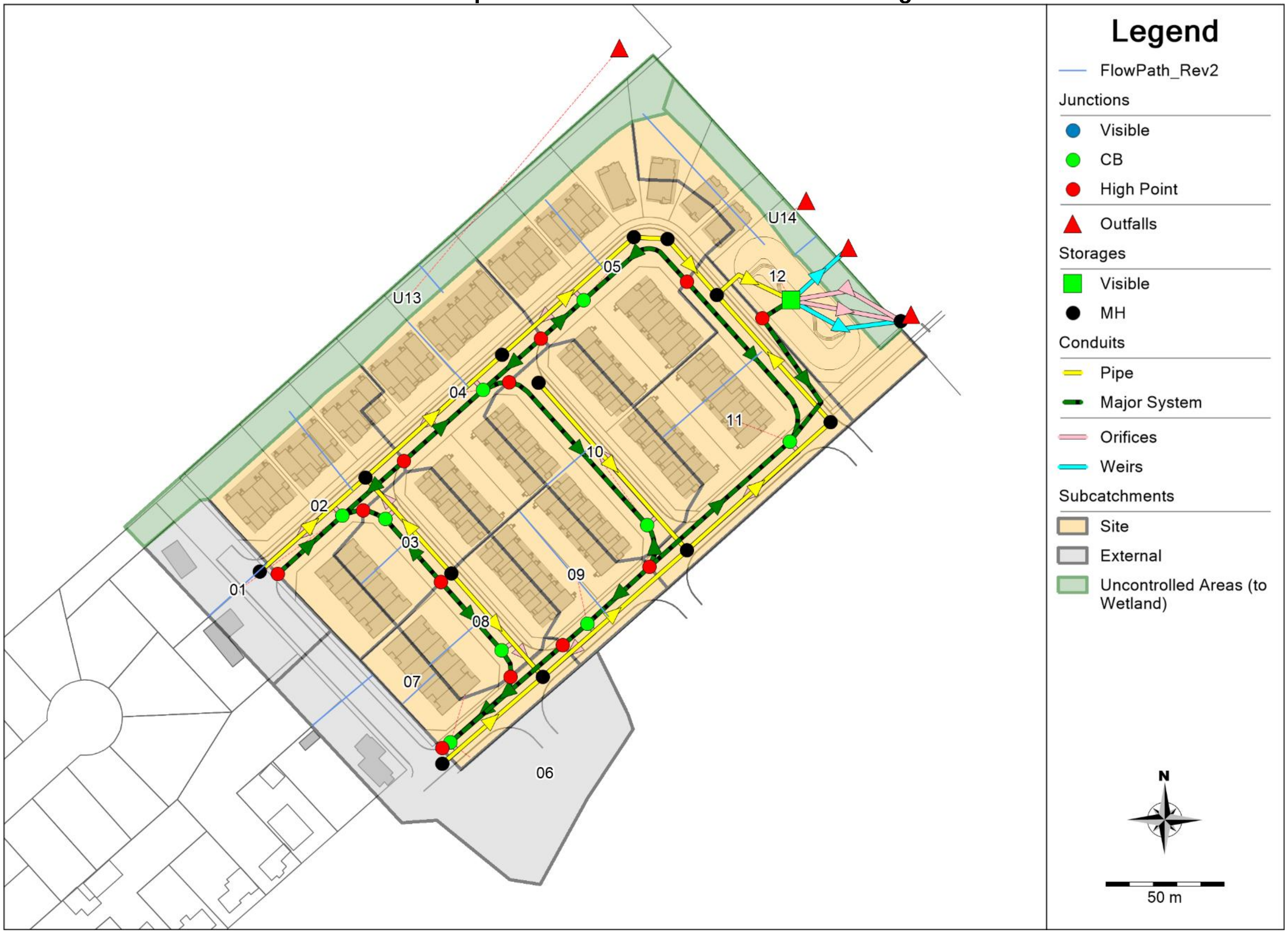
Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Post-development - Subcatchments and Flow Lengths



Date: 2025-05-16
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Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Post-development – Storage Nodes

Date: 2025-05-16
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Hannan Hills Subdivision (118201)
PCSWMM Model Schematics

Post-development – Junctions and Outfalls

Date: 2025-05-16
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Hannan Hills Subdivision (118201)
PCSWMM Pre-Development Model Output (100-year 6-hour Chicago)

```
ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM VERSION 7.6.3620
---------------------------------------------------------

This is a new version of ARM - your feedback and suggestions are solicited.
Create a ticket, post on the PCSWMM feature request forum, or email us directly!

Simulation start time:                01/25/2021 00:00:00
Simulation end time:                  01/27/2021 00:00:00
Runoff wet weather time steps:        300 seconds
Report time steps:                    60 seconds
Number of data points:                2881


******************************
Unit Hydrographs Runoff Method
******************************
```

Subcatchment	Runoff Method	Raingage	Area (ha)	Time of Concentration (min)	Time to Peak (min)	Time after Peak (min)	Peak UH Flow (m³/s/mm)	UH Depth (mm)
EX-1	Nash IUH	Raingage	5.15	18	12	83	0.03872	0.998
EX-2	Nash IUH	Raingage	0.33	5	3.33	26.67	0.00893	0.822

```
******************
ARM Runoff Summary
******************
```

Subcatchment	Total Precip (mm)	Total Losses (mm)	Total Runoff (mm)	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff (fraction)
EX-1	82.323	60.494	21.786	1.122	304.43	0.265
EX-2	82.323	59.685	18.615	0.061	26.83	0.226

```
WARNING ARM01: Computed UH depth for ARM subcatchment EX-2 is not unity. Consider reducing wet weather time step.


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


*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 0
Number of nodes ........... 2
Number of links ........... 1
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
```

Name	Data Source	Data Type	Recording Interval
Raingage	06-C6hr-100yr	INTENSITY	10 min.

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

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
Wetland	JUNCTION	138.00	1.00	0.0	
AlmonteDrain	OUTFALL	137.50	0.00	0.0	

```
************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
---------------------------------------------------------------------------------------------
Drain            Wetland          AlmonteDrain     CONDUIT          163.0    0.3067    0.0130


*********************
Cross Section Summary
*********************
                                        Full     Full     Hyd.     Max.   No. of     Full
Conduit          Shape                 Depth     Area     Rad.    Width  Barrels     Flow
---------------------------------------------------------------------------------------
Drain            DUMMY                  0.00     0.00     0.00     0.00        1     0.00


****************
Transect Summary
****************

Transect 18mROW
Area:
            0.0009     0.0034     0.0077     0.0137     0.0214
            0.0308     0.0417     0.0530     0.0657     0.0801
            0.0962     0.1139     0.1333     0.1543     0.1770
            0.2005     0.2240     0.2475     0.2710     0.2945
            0.3180     0.3415     0.3650     0.3885     0.4120
            0.4356     0.4591     0.4826     0.5061     0.5296
            0.5531     0.5766     0.6001     0.6237     0.6472
            0.6707     0.6942     0.7177     0.7412     0.7648
            0.7883     0.8118     0.8353     0.8588     0.8824
            0.9059     0.9294     0.9529     0.9765     1.0000
Hrad:
            0.0188     0.0376     0.0564     0.0751     0.0939
            0.1127     0.1406     0.1767     0.2070     0.2318
            0.2524     0.2698     0.2847     0.2977     0.3093
            0.3240     0.3404     0.3578     0.3760     0.3948
            0.4140     0.4335     0.4532     0.4731     0.4932
            0.5133     0.5335     0.5538     0.5742     0.5945
            0.6149     0.6353     0.6557     0.6761     0.6965
            0.7169     0.7373     0.7577     0.7780     0.7983
            0.8186     0.8389     0.8591     0.8793     0.8995
            0.9197     0.9398     0.9599     0.9800     1.0000
Width:
            0.0726     0.1453     0.2179     0.2905     0.3631
            0.4358     0.4721     0.5073     0.5776     0.6478
            0.7180     0.7882     0.8584     0.9287     0.9989
            0.9989     0.9990     0.9990     0.9990     0.9990
            0.9991     0.9991     0.9991     0.9992     0.9992
            0.9992     0.9993     0.9993     0.9993     0.9994
            0.9994     0.9994     0.9995     0.9995     0.9995
            0.9996     0.9996     0.9996     0.9997     0.9997
            0.9997     0.9997     0.9998     0.9998     0.9998
            0.9999     0.9999     0.9999     1.0000     1.0000


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

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 01/25/2021 00:00:00
Ending Date .............. 01/27/2021 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
```

```
Routing Time Step ........ 2.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m
```

```
**************************        Volume         Volume
Flow Routing Continuity        hectare-m       10^6 ltr
**************************     ---------      ---------
Dry Weather Inflow .......         0.000          0.000
Wet Weather Inflow .......         0.000          0.000
Groundwater Inflow .......         0.000          0.000
RDII Inflow ..............         0.000          0.000
External Inflow ..........         0.118          1.183
External Outflow .........         0.118          1.183
Flooding Loss ............         0.000          0.000
Evaporation Loss .........         0.000          0.000
Exfiltration Loss ........         0.000          0.000
Initial Stored Volume ....         0.000          0.000
Final Stored Volume ......         0.000          0.000
Continuity Error (%) .....         0.000
```

```
***************************
Time-Step Critical Elements
***************************
None
```

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

```
*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     1.50 sec
Average Time Step           :     2.00 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
Time Step Frequencies       :
    2.000 -  1.516 sec      :   100.00 %
    1.516 -  1.149 sec      :     0.00 %
    1.149 -  0.871 sec      :     0.00 %
    0.871 -  0.660 sec      :     0.00 %
    0.660 -  0.500 sec      :     0.00 %
```

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

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
Wetland	JUNCTION	0.00	0.00	138.00	0 00:00	0.00
AlmonteDrain	OUTFALL	0.00	0.00	137.50	0 00:00	0.00

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

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
Wetland	JUNCTION	26.83	26.83	0 02:15	0.0614	0.0614	0.000
AlmonteDrain	OUTFALL	304.39	317.38	0 02:25	1.12	1.18	0.000

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

```
*********************

Surcharging occurs when water rises above the top of the highest conduit.
---------------------------------------------------------------------
                                               Max. Height  Min. Depth
                                   Hours       Above Crown   Below Rim
Node                 Type      Surcharged           Meters      Meters
---------------------------------------------------------------------
Wetland              JUNCTION       48.00            0.000       1.000


*********************
Node Flooding Summary
*********************

No nodes were flooded.


**********************
Outfall Loading Summary
**********************

-----------------------------------------------------------
                       Flow       Avg       Max       Total
                       Freq      Flow      Flow      Volume
Outfall Node           Pcnt       LPS       LPS    10^6 ltr
-----------------------------------------------------------
AlmonteDrain          11.21     61.10    317.38       1.183
-----------------------------------------------------------
System                11.21     61.10    317.38       1.183


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

-----------------------------------------------------------------------------
                               Maximum  Time of Max   Maximum    Max/    Max/
                                |Flow|   Occurrence   |Veloc|    Full    Full
Link                 Type          LPS  days hr:min     m/sec    Flow   Depth
-----------------------------------------------------------------------------
Drain                DUMMY       26.83     0  02:15


***************************
Flow Classification Summary
***************************

-------------------------------------------------------------------------------------
                    Adjusted    ---------- Fraction of Time in Flow Class ----------
                     /Actual         Up    Down  Sub   Sup   Up    Down  Norm  Inlet
Conduit               Length    Dry  Dry   Dry   Crit  Crit  Crit  Crit  Ltd   Ctrl
-------------------------------------------------------------------------------------


*************************
Conduit Surcharge Summary
*************************

No conduits were surcharged.


Analysis begun on:  Fri May 16 15:48:54 2025
Analysis ended on:  Fri May 16 15:48:55 2025
Total elapsed time: 00:00:01
```

Hannan Hills Subdivision (118201)
PCSWMM Pre-Development Model Output (100-year 12-hour SCS)

ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM VERSION 7.6.3620

This is a new version of ARM - your feedback and suggestions are solicited.
Create a ticket, post on the PCSWMM feature request forum, or email us directly!

Simulation start time:	01/25/2021 00:00:00
Simulation end time:	01/27/2021 00:00:00
Runoff wet weather time steps:	300 seconds
Report time steps:	60 seconds
Number of data points:	2881

Unit Hydrographs Runoff Method

Subcatchment	Runoff Method	Raingage	Area (ha)	Time of Concentration (min)	Time to Peak (min)	Time after Peak (min)	Peak UH Flow (m^3/s/mm)	UH Depth (mm)
EX-1	Nash IUH	Raingage	5.15	18	12	83	0.03872	0.998
EX-2	Nash IUH	Raingage	0.33	5	3.33	26.67	0.00893	0.822

ARM Runoff Summary

Subcatchment	Total Precip (mm)	Total Losses (mm)	Total Runoff (mm)	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff (fraction)
EX-1	93.91	65.728	28.136	1.449	326.918	0.3
EX-2	93.91	64.76	23.973	0.079	23.776	0.255

WARNING ARM01: Computed UH depth for ARM subcatchment EX-2 is not unity. Consider reducing wet weather time step.

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

Element Count

Number of rain gages 1
Number of subcatchments ... 0
Number of nodes 2
Number of links 1
Number of pollutants 0
Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
Raingage	D3-S12hr-100yr	INTENSITY	30 min.

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
Wetland	JUNCTION	138.00	1.00	0.0	
AlmonteDrain	OUTFALL	137.50	0.00	0.0	

```
************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
---------------------------------------------------------------------------------------------
Drain            Wetland          AlmonteDrain     CONDUIT          163.0    0.3067    0.0130


*********************
Cross Section Summary
*********************
                                        Full     Full     Hyd.     Max.   No. of     Full
Conduit          Shape                 Depth     Area     Rad.    Width  Barrels     Flow
---------------------------------------------------------------------------------------
Drain            DUMMY                  0.00     0.00     0.00     0.00        1     0.00


****************
Transect Summary
****************

Transect 18mROW
Area:
            0.0009     0.0034     0.0077     0.0137     0.0214
            0.0308     0.0417     0.0530     0.0657     0.0801
            0.0962     0.1139     0.1333     0.1543     0.1770
            0.2005     0.2240     0.2475     0.2710     0.2945
            0.3180     0.3415     0.3650     0.3885     0.4120
            0.4356     0.4591     0.4826     0.5061     0.5296
            0.5531     0.5766     0.6001     0.6237     0.6472
            0.6707     0.6942     0.7177     0.7412     0.7648
            0.7883     0.8118     0.8353     0.8588     0.8824
            0.9059     0.9294     0.9529     0.9765     1.0000
Hrad:
            0.0188     0.0376     0.0564     0.0751     0.0939
            0.1127     0.1406     0.1767     0.2070     0.2318
            0.2524     0.2698     0.2847     0.2977     0.3093
            0.3240     0.3404     0.3578     0.3760     0.3948
            0.4140     0.4335     0.4532     0.4731     0.4932
            0.5133     0.5335     0.5538     0.5742     0.5945
            0.6149     0.6353     0.6557     0.6761     0.6965
            0.7169     0.7373     0.7577     0.7780     0.7983
            0.8186     0.8389     0.8591     0.8793     0.8995
            0.9197     0.9398     0.9599     0.9800     1.0000
Width:
            0.0726     0.1453     0.2179     0.2905     0.3631
            0.4358     0.4721     0.5073     0.5776     0.6478
            0.7180     0.7882     0.8584     0.9287     0.9989
            0.9989     0.9990     0.9990     0.9990     0.9990
            0.9991     0.9991     0.9991     0.9992     0.9992
            0.9992     0.9993     0.9993     0.9993     0.9994
            0.9994     0.9994     0.9995     0.9995     0.9995
            0.9996     0.9996     0.9996     0.9997     0.9997
            0.9997     0.9997     0.9998     0.9998     0.9998
            0.9999     0.9999     0.9999     1.0000     1.0000


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

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 01/25/2021 00:00:00
Ending Date .............. 01/27/2021 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
```

```
  Routing Time Step ........ 2.00 sec
  Variable Time Step ....... YES
  Maximum Trials ........... 8
  Number of Threads ........ 1
  Head Tolerance ........... 0.001500 m


  **************************        Volume         Volume
  Flow Routing Continuity        hectare-m       10^6 ltr
  **************************     ---------      ---------
  Dry Weather Inflow .......         0.000          0.000
  Wet Weather Inflow .......         0.000          0.000
  Groundwater Inflow .......         0.000          0.000
  RDII Inflow ..............         0.000          0.000
  External Inflow ..........         0.153          1.528
  External Outflow .........         0.153          1.528
  Flooding Loss ............         0.000          0.000
  Evaporation Loss .........         0.000          0.000
  Exfiltration Loss ........         0.000          0.000
  Initial Stored Volume ....         0.000          0.000
  Final Stored Volume ......         0.000          0.000
  Continuity Error (%) .....         0.000


  ***************************
  Time-Step Critical Elements
  ***************************
  None


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


  *************************
  Routing Time Step Summary
  *************************
  Minimum Time Step           :     1.50 sec
  Average Time Step           :     2.00 sec
  Maximum Time Step           :     2.00 sec
  Percent in Steady State     :     0.00
  Average Iterations per Step :     2.00
  Percent Not Converging      :     0.00
  Time Step Frequencies       :
      2.000 -  1.516 sec      :   100.00 %
      1.516 -  1.149 sec      :     0.00 %
      1.149 -  0.871 sec      :     0.00 %
      0.871 -  0.660 sec      :     0.00 %
      0.660 -  0.500 sec      :     0.00 %


  ******************
  Node Depth Summary
  ******************

  ---------------------------------------------------------------------------------
                               Average  Maximum  Maximum  Time of Max    Reported
                                 Depth    Depth      HGL   Occurrence   Max Depth
  Node                 Type     Meters   Meters   Meters  days hr:min      Meters
  ---------------------------------------------------------------------------------
  Wetland              JUNCTION   0.00     0.00   138.00     0  00:00        0.00
  AlmonteDrain         OUTFALL    0.00     0.00   137.50     0  00:00        0.00


  *******************
  Node Inflow Summary
  *******************

  -------------------------------------------------------------------------------------------------
                                Maximum  Maximum                  Lateral       Total        Flow
                                Lateral    Total  Time of Max      Inflow      Inflow     Balance
                                 Inflow   Inflow   Occurrence      Volume      Volume       Error
  Node                 Type         LPS      LPS  days hr:min    10^6 ltr    10^6 ltr     Percent
  -------------------------------------------------------------------------------------------------
  Wetland              JUNCTION   23.77    23.77     0  06:30      0.0791      0.0791       0.000
  AlmonteDrain         OUTFALL   326.89   344.53     0  06:35        1.45        1.53       0.000


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

```
*********************

Surcharging occurs when water rises above the top of the highest conduit.
---------------------------------------------------------------------
                                           Max. Height   Min. Depth
                               Hours       Above Crown    Below Rim
Node                 Type      Surcharged       Meters       Meters
---------------------------------------------------------------------
Wetland              JUNCTION       48.00        0.000        1.000


*********************
Node Flooding Summary
*********************

No nodes were flooded.


**********************
Outfall Loading Summary
**********************

-----------------------------------------------------------
                       Flow       Avg       Max       Total
                       Freq       Flow      Flow      Volume
Outfall Node           Pcnt       LPS       LPS    10^6 ltr
-----------------------------------------------------------
AlmonteDrain          17.79     49.68    344.53       1.528
-----------------------------------------------------------
System                17.79     49.68    344.53       1.528


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

-----------------------------------------------------------------------------
                               Maximum  Time of Max   Maximum    Max/    Max/
                                |Flow|   Occurrence   |Veloc|    Full    Full
Link                 Type          LPS  days hr:min     m/sec    Flow   Depth
-----------------------------------------------------------------------------
```

```
Drain                DUMMY       23.77     0  06:30


***************************
Flow Classification Summary
***************************

-------------------------------------------------------------------------------------
                    Adjusted    ---------- Fraction of Time in Flow Class ----------
                     /Actual         Up    Down  Sub   Sup   Up    Down  Norm  Inlet
Conduit               Length    Dry  Dry   Dry   Crit  Crit  Crit  Crit  Ltd   Ctrl
-------------------------------------------------------------------------------------


*************************
Conduit Surcharge Summary
*************************

No conduits were surcharged.


Analysis begun on:  Fri May 16 15:47:08 2025
Analysis ended on:  Fri May 16 15:47:09 2025
Total elapsed time: 00:00:01
```

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

WARNING 02: maximum depth increased for Node CB03
WARNING 02: maximum depth increased for Node CB04
WARNING 02: maximum depth increased for Node CB06
WARNING 02: maximum depth increased for Node CB08

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 14
Number of nodes ........... 39
Number of links ........... 50
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                    Data       Recording
Name                 Data Source                    Type       Interval
------------------------------------------------------------------------
Raingage             06-C6hr-100yr                  INTENSITY   10 min.


********************
Subcatchment Summary
********************
Name                       Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------------
01                         0.26     78.81     57.10    2.0000 Raingage             CB01
02                         0.47    105.99     57.10    2.0000 Raingage             CB01
03                         0.23     77.88     72.90    2.0000 Raingage             CB07
04                         0.50    135.36     64.30    2.0000 Raingage             CB02
05                         0.66    169.99     60.00    2.0000 Raingage             CB03
06                         0.68    204.53     37.10    2.0000 Raingage             CB06
07                         0.21    115.37     37.10    2.0000 Raingage             CB06
08                         0.26     84.49     71.40    2.0000 Raingage             CB08
09                         0.25     43.09     48.60    2.0000 Raingage             CB05
10                         0.44    181.48     78.60    2.0000 Raingage             CB09
11                         0.55    100.84     62.90    2.0000 Raingage             CB04
12                         0.38     54.68     10.00    2.0000 Raingage             DryPond
U13                        0.42    287.13     10.00    2.0000 Raingage             Wetland
U14                        0.18    132.22      0.00    2.0000 Raingage             DR-Drain

************
Node Summary
************
                                         Invert      Max.    Ponded    External
Name                 Type                 Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
CB01                 JUNCTION            139.12      1.75       0.0
CB02                 JUNCTION            139.02      1.75       0.0
CB03                 JUNCTION            138.94      1.75       0.0
CB04                 JUNCTION            139.04      1.75       0.0
CB05                 JUNCTION            139.02      1.75       0.0
CB06                 JUNCTION            139.07      1.75       0.0
CB07                 JUNCTION            139.12      1.75       0.0
CB08                 JUNCTION            139.07      1.75       0.0
CB09                 JUNCTION            139.02      1.75       0.0
HP01                 JUNCTION            140.17      1.00       0.0
HP02                 JUNCTION            140.12      1.00       0.0
HP03                 JUNCTION            140.02      1.00       0.0
HP04                 JUNCTION            139.94      1.00       0.0
HP05                 JUNCTION            140.02      1.00       0.0
HP06                 JUNCTION            140.07      1.00       0.0
HP07                 JUNCTION            140.12      1.00       0.0
HP08                 JUNCTION            140.07      1.00       0.0
HP09                 JUNCTION            140.17      1.00       0.0
HP10                 JUNCTION            140.12      1.00       0.0
HP11                 JUNCTION            140.02      1.00       0.0
HP12                 JUNCTION            140.09      1.00       0.0
AlmonteDrain         OUTFALL             137.50      0.38       0.0
DR-Drain             OUTFALL               0.00      0.00       0.0
PondSpill            OUTFALL             139.00      0.00       0.0
Wetland              OUTFALL               0.00      0.00       0.0
DryPond              STORAGE             137.60      2.40       0.0
```

MH_outlet	STORAGE	137.55	1.45	0.0
MH01	STORAGE	139.04	1.26	0.0
MH02	STORAGE	138.65	1.60	0.0
MH03	STORAGE	138.20	1.95	0.0
MH04	STORAGE	137.88	2.22	0.0
MH05	STORAGE	137.84	2.26	0.0
MH06	STORAGE	137.73	2.34	0.0
MH07	STORAGE	137.99	2.06	0.0
MH08	STORAGE	138.20	1.95	0.0
MH09	STORAGE	138.73	1.47	0.0
MH10	STORAGE	139.05	1.20	0.0
MH11	STORAGE	139.00	1.30	0.0
MH12	STORAGE	138.85	1.30	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
MH01-02	MH01	MH02	CONDUIT	60.0	0.4000	0.0130
MH02-03	MH02	MH03	CONDUIT	77.0	0.3896	0.0130
MH03-04	MH03	MH04	CONDUIT	74.0	0.4324	0.0130
MH04-05	MH04	MH05	CONDUIT	14.0	0.2857	0.0130
MH05-06	MH05	MH06	CONDUIT	31.0	0.1290	0.0130
MH06-SWMF	MH06	DryPond	CONDUIT	15.0	0.2000	0.0130
MH07-06	MH07	MH06	CONDUIT	72.0	0.2639	0.0130
MH08-07	MH08	MH07	CONDUIT	81.0	0.2593	0.0130
MH09-08	MH09	MH08	CONDUIT	81.0	0.3704	0.0130
MH10-09	MH10	MH09	CONDUIT	56.0	0.4464	0.0130
MH11-02	MH11	MH02	CONDUIT	53.0	0.3774	0.0130
MH11-09	MH11	MH09	CONDUIT	59.0	0.3390	0.0130
MH12-08	MH12	MH08	CONDUIT	94.0	0.3723	0.0130
MHoutlet-Drain	MH_outlet	AlmonteDrain	CONDUIT	5.0	1.0001	0.0130
MS01	HP01	CB01	CONDUIT	37.0	0.8108	0.0150
MS02	HP10	CB01	CONDUIT	9.0	2.7789	0.0150
MS03	HP10	CB07	CONDUIT	10.0	2.5008	0.0150
MS04	HP09	CB07	CONDUIT	35.0	0.8572	0.0150
MS05	HP02	CB01	CONDUIT	35.0	0.7143	0.0150
MS06	HP02	CB02	CONDUIT	45.0	0.7778	0.0150
MS07	HP11	CB02	CONDUIT	11.0	2.2733	0.0150
MS08	HP03	CB02	CONDUIT	32.0	0.7813	0.0150
MS09	HP03	CB03	CONDUIT	24.0	1.3751	0.0150
MS10	HP04	CB03	CONDUIT	57.0	0.4386	0.0150
MS11	HP04	CB04	CONDUIT	85.0	0.1765	0.0150
MS12	HP07	CB06	CONDUIT	4.0	7.5212	0.0150
MS13	HP08	CB06	CONDUIT	5.0	5.0063	0.0150
MS14	HP08	CB08	CONDUIT	12.0	2.0838	0.0150
MS15	HP09	CB08	CONDUIT	38.0	0.9211	0.0150
MS16	HP06	CB06	CONDUIT	62.0	0.4032	0.0150
MS17	HP06	CB05	CONDUIT	14.0	2.1433	0.0150
MS18	HP05	CB05	CONDUIT	35.0	0.7143	0.0150
MS19	HP11	CB09	CONDUIT	84.0	0.2976	0.0150
MS20	HP05	CB09	CONDUIT	19.0	1.3159	0.0150
MS21	HP05	CB04	CONDUIT	79.0	0.2911	0.0150
MS22	HP12	CB04	CONDUIT	5.0	6.0108	0.0130
MS23	HP12	DryPond	CONDUIT	3.0	148.8086	0.0350
O-CB01	CB01	MH01	ORIFICE			
O-CB02	CB02	MH02	ORIFICE			
O-CB03	CB03	MH03	ORIFICE			
O-CB04	CB04	MH08	ORIFICE			
O-CB05	CB05	MH09	ORIFICE			
O-CB06	CB06	MH10	ORIFICE			
O-CB07	CB07	MH02	ORIFICE			
O-CB08	CB08	MH09	ORIFICE			
O-CB09	CB09	MH12	ORIFICE			
O-SWMF1	DryPond	MH_outlet	ORIFICE			
O-SWMF2	DryPond	MH_outlet	ORIFICE			
W1	DryPond	MH_outlet	WEIR			
W2	DryPond	PondSpill	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
MH01-02	CIRCULAR	0.45	0.16	0.11	0.45	1	180.33
MH02-03	CIRCULAR	0.60	0.28	0.15	0.60	1	383.28
MH03-04	CIRCULAR	0.75	0.44	0.19	0.75	1	732.13
MH04-05	CIRCULAR	0.75	0.44	0.19	0.75	1	595.11

```
MH05-06          CIRCULAR             0.75      0.44      0.19      0.75         1   399.93
MH06-SWMF        CIRCULAR             0.82      0.53      0.21      0.82         1   641.99
MH07-06          CIRCULAR             0.75      0.44      0.19      0.75         1   571.93
MH08-07          CIRCULAR             0.75      0.44      0.19      0.75         1   566.89
MH09-08          CIRCULAR             0.53      0.22      0.13      0.53         1   261.74
MH10-09          CIRCULAR             0.45      0.16      0.11      0.45         1   190.51
MH11-02          CIRCULAR             0.45      0.16      0.11      0.45         1   175.15
MH11-09          CIRCULAR             0.45      0.16      0.11      0.45         1   166.01
MH12-08          CIRCULAR             0.45      0.16      0.11      0.45         1   173.98
MHoutlet-Drain   CIRCULAR             0.38      0.11      0.09      0.38         1   175.35
MS01             18mROW               1.00     15.30      0.52     18.00         1 59038.69
MS02             18mROW               1.00     15.30      0.52     18.00         1 109295.52
MS03             18mROW               1.00     15.30      0.52     18.00         1 103683.03
MS04             18mROW               1.00     15.30      0.52     18.00         1 60702.19
MS05             18mROW               1.00     15.30      0.52     18.00         1 55412.96
MS06             18mROW               1.00     15.30      0.52     18.00         1 57823.47
MS07             18mROW               1.00     15.30      0.52     18.00         1 98855.21
MS08             18mROW               1.00     15.30      0.52     18.00         1 57952.40
MS09             18mROW               1.00     15.30      0.52     18.00         1 76885.01
MS10             18mROW               1.00     15.30      0.52     18.00         1 43421.46
MS11             18mROW               1.00     15.30      0.52     18.00         1 27542.69
MS12             18mROW               1.00     15.30      0.52     18.00         1 179809.60
MS13             18mROW               1.00     15.30      0.52     18.00         1 146698.80
MS14             18mROW               1.00     15.30      0.52     18.00         1 94644.70
MS15             18mROW               1.00     15.30      0.52     18.00         1 62924.71
MS16             18mROW               1.00     15.30      0.52     18.00         1 41633.77
MS17             18mROW               1.00     15.30      0.52     18.00         1 95987.85
MS18             18mROW               1.00     15.30      0.52     18.00         1 55412.96
MS19             18mROW               1.00     15.30      0.52     18.00         1 35768.53
MS20             18mROW               1.00     15.30      0.52     18.00         1 75211.08
MS21             18mROW               1.00     15.30      0.52     18.00         1 35377.01
MS22             RECT_OPEN            1.00      3.00      0.60      3.00         1 40250.57
MS23             RECT_OPEN            1.00      3.00      0.60      3.00         1 74386.52


****************
Transect Summary
****************

Transect 18mROW
```

```
Area:
            0.0009     0.0034     0.0077     0.0137     0.0214
            0.0308     0.0417     0.0530     0.0657     0.0801
            0.0962     0.1139     0.1333     0.1543     0.1770
            0.2005     0.2240     0.2475     0.2710     0.2945
            0.3180     0.3415     0.3650     0.3885     0.4120
            0.4356     0.4591     0.4826     0.5061     0.5296
            0.5531     0.5766     0.6001     0.6237     0.6472
            0.6707     0.6942     0.7177     0.7412     0.7648
            0.7883     0.8118     0.8353     0.8588     0.8824
            0.9059     0.9294     0.9529     0.9765     1.0000
Hrad:
            0.0188     0.0376     0.0564     0.0751     0.0939
            0.1127     0.1406     0.1767     0.2070     0.2318
            0.2524     0.2698     0.2847     0.2977     0.3093
            0.3240     0.3404     0.3578     0.3760     0.3948
            0.4140     0.4335     0.4532     0.4731     0.4932
            0.5133     0.5335     0.5538     0.5742     0.5945
            0.6149     0.6353     0.6557     0.6761     0.6965
            0.7169     0.7373     0.7577     0.7780     0.7983
            0.8186     0.8389     0.8591     0.8793     0.8995
            0.9197     0.9398     0.9599     0.9800     1.0000
Width:
            0.0726     0.1453     0.2179     0.2905     0.3631
            0.4358     0.4721     0.5073     0.5776     0.6478
            0.7180     0.7882     0.8584     0.9287     0.9989
            0.9989     0.9990     0.9990     0.9990     0.9990
            0.9991     0.9991     0.9991     0.9992     0.9992
            0.9992     0.9993     0.9993     0.9993     0.9994
            0.9994     0.9994     0.9995     0.9995     0.9995
            0.9996     0.9996     0.9996     0.9997     0.9997
            0.9997     0.9997     0.9998     0.9998     0.9998
            0.9999     0.9999     0.9999     1.0000     1.0000


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

Hannan Hills Subdivision (118201)
PCSWMM Post-Development Model Output (100-year 6-hour Chicago)

```
****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 01/25/2021 00:00:00
Ending Date .............. 01/28/2021 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 2.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.452        82.323
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.150        27.246
Surface Runoff ...........         0.304        55.325
Final Storage ............         0.002         0.437
Continuity Error (%) .....        -0.832


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.304         3.037
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.304         3.039
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....        -0.080


***************************
Time-Step Critical Elements
***************************
Link MHoutlet-Drain (17.48%)


********************************
Highest Flow Instability Indexes
********************************
Link O-CB06 (7)
Link O-CB03 (7)
Link O-CB01 (6)
Link O-CB02 (4)
Link O-CB09 (4)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.92 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.09
Percent Not Converging      :     0.00
Time Step Frequencies       :
```

2.000 - 1.516 sec	:	94.47 %
1.516 - 1.149 sec	:	3.83 %
1.149 - 0.871 sec	:	1.69 %
0.871 - 0.660 sec	:	0.00 %
0.660 - 0.500 sec	:	0.01 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
01	82.32	0.00	0.00	22.84	46.34	13.04	59.38	0.15	109.66	0.721
02	82.32	0.00	0.00	23.02	46.83	12.74	59.57	0.28	190.04	0.724
03	82.32	0.00	0.00	14.27	59.53	8.56	68.08	0.16	107.22	0.827
04	82.32	0.00	0.00	18.97	52.67	10.91	63.58	0.32	218.74	0.772
05	82.32	0.00	0.00	21.34	49.15	12.07	61.22	0.40	278.41	0.744
06	82.32	0.00	0.00	33.86	30.02	18.53	48.55	0.33	240.12	0.590
07	82.32	0.00	0.00	33.32	30.27	19.40	49.67	0.10	84.78	0.603
08	82.32	0.00	0.00	15.08	58.31	8.98	67.28	0.17	120.13	0.817
09	82.32	0.00	0.00	28.05	39.84	14.64	54.48	0.14	88.32	0.662
10	82.32	0.00	0.00	11.21	64.10	6.94	71.03	0.31	210.57	0.863
11	82.32	0.00	0.00	19.95	51.30	10.96	62.27	0.34	227.40	0.756
12	82.32	0.00	0.00	51.20	8.21	23.25	31.45	0.12	62.48	0.382
U13	82.32	0.00	0.00	47.82	8.08	27.50	35.58	0.15	146.43	0.432
U14	82.32	0.00	0.00	53.18	0.00	30.48	30.48	0.05	59.05	0.370

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
CB01	JUNCTION	0.05	1.01	140.13	0 02:14	1.01
CB02	JUNCTION	0.06	0.96	139.98	0 02:14	0.96
CB03	JUNCTION	0.07	0.99	139.93	0 02:14	0.99
CB04	JUNCTION	0.05	0.90	139.94	0 02:14	0.90
CB05	JUNCTION	0.06	0.99	140.01	0 02:24	0.99
CB06	JUNCTION	0.05	1.03	140.10	0 02:15	1.03
CB07	JUNCTION	0.04	0.95	140.07	0 02:13	0.95
CB08	JUNCTION	0.05	0.97	140.04	0 02:18	0.97
CB09	JUNCTION	0.06	0.94	139.96	0 02:13	0.94
HP01	JUNCTION	0.00	0.00	140.17	0 00:00	0.00
HP02	JUNCTION	0.00	0.01	140.13	0 02:14	0.01
HP03	JUNCTION	0.00	0.00	140.02	0 00:00	0.00
HP04	JUNCTION	0.00	0.00	139.94	0 02:17	0.00
HP05	JUNCTION	0.00	0.00	140.02	0 00:00	0.00
HP06	JUNCTION	0.00	0.03	140.10	0 02:13	0.03
HP07	JUNCTION	0.00	0.00	140.12	0 00:00	0.00
HP08	JUNCTION	0.00	0.03	140.10	0 02:15	0.03
HP09	JUNCTION	0.00	0.00	140.17	0 00:00	0.00
HP10	JUNCTION	0.00	0.01	140.13	0 02:13	0.01
HP11	JUNCTION	0.00	0.00	140.02	0 00:00	0.00
HP12	JUNCTION	0.00	0.00	140.09	0 00:00	0.00
AlmonteDrain	OUTFALL	0.04	0.38	137.88	0 02:50	0.38
DR-Drain	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
PondSpill	OUTFALL	0.00	0.00	139.00	0 00:00	0.00

Wetland	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
DryPond	STORAGE	0.46	2.12	139.72	0	02:52	2.12
MH_outlet	STORAGE	0.04	0.32	137.87	0	02:51	0.32
MH01	STORAGE	0.05	0.78	139.82	0	02:37	0.78
MH02	STORAGE	0.11	1.13	139.78	0	02:42	1.13
MH03	STORAGE	0.22	1.55	139.75	0	02:44	1.55
MH04	STORAGE	0.33	1.86	139.74	0	02:50	1.86
MH05	STORAGE	0.35	1.90	139.74	0	02:50	1.90
MH06	STORAGE	0.40	2.00	139.73	0	02:51	2.00
MH07	STORAGE	0.29	1.75	139.74	0	02:49	1.75
MH08	STORAGE	0.22	1.55	139.75	0	02:45	1.55
MH09	STORAGE	0.09	1.06	139.79	0	02:42	1.06
MH10	STORAGE	0.05	0.78	139.83	0	02:38	0.78
MH11	STORAGE	0.05	0.78	139.78	0	02:42	0.78
MH12	STORAGE	0.08	0.91	139.76	0	02:48	0.91

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
CB01	JUNCTION	299.70	299.70	0 02:10	0.434	0.435	0.207
CB02	JUNCTION	218.74	218.74	0 02:10	0.318	0.319	0.587
CB03	JUNCTION	278.41	278.41	0 02:10	0.404	0.404	0.512
CB04	JUNCTION	227.40	227.40	0 02:10	0.342	0.343	0.486
CB05	JUNCTION	88.32	88.32	0 02:10	0.136	0.145	0.242
CB06	JUNCTION	324.90	324.90	0 02:10	0.434	0.436	0.337
CB07	JUNCTION	107.22	107.22	0 02:10	0.157	0.157	0.317
CB08	JUNCTION	120.13	120.13	0 02:10	0.175	0.182	0.231
CB09	JUNCTION	210.57	210.57	0 02:10	0.312	0.314	0.745
HP01	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP02	JUNCTION	0.00	22.55	0 02:13	0	0.00171	51.146
HP03	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP04	JUNCTION	0.00	5.81	0 02:15	0	0.000889	93.487
HP05	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP06	JUNCTION	0.00	56.03	0 02:12	0	0.0103	6.231
HP07	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP08	JUNCTION	0.00	20.21	0 02:11	0	0.00747	0.638
HP09	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP10	JUNCTION	0.00	9.84	0 02:12	0	0.000285	28.953
HP11	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP12	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
AlmonteDrain	OUTFALL	0.00	179.49	0 02:51	0	2.83	0.000
DR-Drain	OUTFALL	59.05	59.05	0 02:10	0.0548	0.0548	0.000
PondSpill	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
Wetland	OUTFALL	146.43	146.43	0 02:10	0.149	0.149	0.000
DryPond	STORAGE	62.48	795.89	0 02:08	0.119	2.83	-0.016
MH_outlet	STORAGE	0.00	177.36	0 02:52	0	2.83	-0.007
MH01	STORAGE	0.00	155.79	0 02:09	0	0.432	0.449
MH02	STORAGE	0.00	337.46	0 02:07	0	0.983	0.117
MH03	STORAGE	0.00	469.21	0 02:06	0	1.38	-0.772
MH04	STORAGE	0.00	423.36	0 02:07	0	1.39	0.019
MH05	STORAGE	0.00	407.13	0 02:07	0	1.39	0.045
MH06	STORAGE	0.00	764.09	0 02:07	0	2.71	-0.037
MH07	STORAGE	0.00	391.71	0 02:07	0	1.32	0.068
MH08	STORAGE	0.00	459.74	0 02:06	0	1.31	-0.967
MH09	STORAGE	0.00	253.13	0 02:08	0	0.743	0.298
MH10	STORAGE	0.00	152.67	0 02:09	0	0.417	0.111
MH11	STORAGE	0.00	47.18	0 02:08	0	0.0794	0.049
MH12	STORAGE	0.00	119.17	0 02:07	0	0.311	0.626

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Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

Hannan Hills Subdivision (118201)
PCSWMM Post-Development Model Output (100-year 6-hour Chicago)

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
DryPond	0.253	12	0	0	1.651	81	0 02:52	177.36
MH_outlet	0.000	3	0	0	0.000	22	0 02:51	179.49
MH01	0.000	4	0	0	0.001	62	0 02:37	154.46
MH02	0.000	7	0	0	0.001	71	0 02:42	326.37
MH03	0.000	11	0	0	0.002	79	0 02:44	423.36
MH04	0.000	15	0	0	0.002	84	0 02:50	407.13
MH05	0.000	16	0	0	0.002	84	0 02:50	398.97
MH06	0.000	17	0	0	0.002	85	0 02:51	746.22
MH07	0.000	14	0	0	0.002	85	0 02:49	365.38
MH08	0.000	11	0	0	0.002	80	0 02:45	391.71
MH09	0.000	6	0	0	0.001	72	0 02:42	243.63
MH10	0.000	4	0	0	0.001	65	0 02:38	151.23
MH11	0.000	4	0	0	0.001	60	0 02:42	35.76
MH12	0.000	6	0	0	0.001	70	0 02:48	122.51

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
AlmonteDrain	49.03	28.20	179.49	2.835
DR-Drain	2.53	9.85	59.05	0.055
PondSpill	0.00	0.00	0.00	0.000
Wetland	10.08	6.73	146.43	0.149
System	15.41	44.78	232.47	3.039

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
MH01-02	CONDUIT	154.46	0 02:09	1.36	0.86	1.00
MH02-03	CONDUIT	326.37	0 02:06	1.59	0.85	1.00
MH03-04	CONDUIT	423.36	0 02:07	1.09	0.58	1.00
MH04-05	CONDUIT	407.13	0 02:07	0.92	0.68	1.00
MH05-06	CONDUIT	398.97	0 02:07	0.90	1.00	1.00
MH06-SWMF	CONDUIT	746.22	0 02:07	1.40	1.16	1.00
MH07-06	CONDUIT	365.38	0 02:07	0.83	0.64	1.00
MH08-07	CONDUIT	391.71	0 02:07	1.05	0.69	1.00
MH09-08	CONDUIT	227.89	0 02:06	1.41	0.87	1.00
MH10-09	CONDUIT	151.23	0 02:09	1.32	0.79	1.00
MH11-02	CONDUIT	35.76	0 02:45	0.24	0.20	1.00
MH11-09	CONDUIT	36.18	0 02:45	0.34	0.22	1.00
MH12-08	CONDUIT	122.51	0 02:06	1.09	0.70	1.00
MHoutlet-Drain	CONDUIT	179.49	0 02:51	1.82	1.02	0.92
MS01	CHANNEL	0.00	0 00:00	0.00	0.00	0.13
MS02	CHANNEL	9.84	0 02:12	0.02	0.00	0.13
MS03	CHANNEL	0.31	0 02:14	0.03	0.00	0.10
MS04	CHANNEL	0.00	0 00:00	0.00	0.00	0.10
MS05	CHANNEL	22.55	0 02:13	0.12	0.00	0.13
MS06	CHANNEL	0.50	0 02:14	0.10	0.00	0.11
MS07	CHANNEL	0.00	0 00:00	0.00	0.00	0.11
MS08	CHANNEL	0.00	0 00:00	0.00	0.00	0.11
MS09	CHANNEL	0.00	0 00:00	0.00	0.00	0.12
MS10	CHANNEL	0.02	0 02:17	0.05	0.00	0.12
MS11	CHANNEL	5.81	0 02:15	0.03	0.00	0.08
MS12	CHANNEL	0.00	0 00:00	0.00	0.00	0.14
MS13	CHANNEL	20.21	0 02:11	0.04	0.00	0.15
MS14	CHANNEL	13.75	0 02:15	0.03	0.00	0.12
MS15	CHANNEL	0.00	0 00:00	0.00	0.00	0.11
MS16	CHANNEL	56.03	0 02:12	0.09	0.00	0.15
MS17	CHANNEL	16.49	0 02:13	0.14	0.00	0.13

MS18	CHANNEL	0.00	0	00:00	0.00	0.00	0.12
MS19	CHANNEL	0.00	0	00:00	0.00	0.00	0.09
MS20	CHANNEL	0.00	0	00:00	0.00	0.00	0.09
MS21	CHANNEL	0.00	0	00:00	0.00	0.00	0.08
MS22	CONDUIT	0.00	0	00:00	0.00	0.00	0.08
MS23	CONDUIT	0.00	0	00:00	0.00	0.00	0.50
O-CB01	ORIFICE	155.79	0	02:09			1.00
O-CB02	ORIFICE	115.68	0	02:08			1.00
O-CB03	ORIFICE	148.46	0	02:09			1.00
O-CB04	ORIFICE	117.27	0	02:10			1.00
O-CB05	ORIFICE	40.90	0	02:07			1.00
O-CB06	ORIFICE	152.67	0	02:09			1.00
O-CB07	ORIFICE	59.46	0	02:09			1.00
O-CB08	ORIFICE	64.85	0	02:08			1.00
O-CB09	ORIFICE	119.17	0	02:07			1.00
O-SWMF1	ORIFICE	16.29	0	02:48			1.00
O-SWMF2	ORIFICE	43.66	0	02:52			1.00
W1	WEIR	117.43	0	02:52			0.54
W2	WEIR	0.00	0	00:00			0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class ----------								
MH01-02	1.00	0.00	0.00	0.00	0.16	0.00	0.00	0.84	0.03	0.00
MH02-03	1.00	0.00	0.00	0.00	0.27	0.00	0.00	0.73	0.10	0.00
MH03-04	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.13	0.00
MH04-05	1.00	0.00	0.30	0.00	0.70	0.00	0.00	0.00	0.60	0.00
MH05-06	1.00	0.00	0.00	0.00	0.44	0.00	0.00	0.56	0.01	0.00
MH06-SWMF	1.00	0.00	0.00	0.00	0.46	0.00	0.00	0.53	0.01	0.00
MH07-06	1.00	0.00	0.00	0.00	0.44	0.00	0.00	0.56	0.07	0.00
MH08-07	1.00	0.00	0.12	0.00	0.88	0.00	0.00	0.00	0.66	0.00
MH09-08	1.00	0.00	0.00	0.00	0.24	0.00	0.00	0.75	0.09	0.00
MH10-09	1.00	0.00	0.00	0.00	0.16	0.00	0.00	0.84	0.03	0.00
MH11-02	1.00	0.84	0.00	0.00	0.16	0.00	0.00	0.00	0.88	0.00
MH11-09	1.00	0.83	0.01	0.00	0.16	0.00	0.00	0.00	0.87	0.00
MH12-08	1.00	0.00	0.00	0.00	0.22	0.00	0.00	0.77	0.10	0.00
MHoutlet-Drain	1.00	0.00	0.00	0.00	0.51	0.48	0.00	0.00	0.64	0.00
MS01	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS02	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS03	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS04	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS05	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS06	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS07	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS08	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS09	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS10	1.00	0.03	0.00	0.00	0.02	0.00	0.00	0.95	0.01	0.00
MS11	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS12	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS13	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS14	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS15	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS16	1.00	0.03	0.00	0.00	0.01	0.00	0.00	0.96	0.01	0.00
MS17	1.00	0.03	0.00	0.00	0.02	0.00	0.00	0.95	0.01	0.00
MS18	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS19	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS20	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS21	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS22	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS23	1.00	0.07	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
MH01-02	2.33	2.33	4.85	0.01	0.01
MH02-03	4.85	4.85	7.48	0.01	0.01
MH03-04	7.48	7.48	10.99	0.01	0.01
MH04-05	10.99	10.99	11.73	0.01	0.01

MH05-06	11.72	11.73	12.60	0.01	0.43
MH06-SWMF	12.46	12.48	13.15	0.27	0.58
MH07-06	9.53	9.53	12.60	0.01	0.01
MH08-07	7.48	7.48	9.53	0.01	0.01
MH09-08	4.81	4.81	7.44	0.01	0.01
MH10-09	2.23	2.23	4.86	0.01	0.01
MH11-02	2.72	2.72	4.85	0.01	0.01
MH11-09	2.72	2.72	4.86	0.01	0.01
MH12-08	4.44	4.44	7.48	0.01	0.01
MHoutlet-Drain	0.01	0.01	0.05	0.08	0.01

```
Analysis begun on:  Fri May 16 16:50:44 2025
Analysis ended on:  Fri May 16 16:50:47 2025
Total elapsed time: 00:00:03
```

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

WARNING 02: maximum depth increased for Node CB03
WARNING 02: maximum depth increased for Node CB04
WARNING 02: maximum depth increased for Node CB06
WARNING 02: maximum depth increased for Node CB08

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 14
Number of nodes ........... 39
Number of links ........... 50
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                Data       Recording
Name                Data Source                 Type       Interval
------------------------------------------------------------------------
Raingage            D3-S12hr-100yr              INTENSITY   30 min.


********************
Subcatchment Summary
********************
Name                       Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------------
01                         0.26     78.81     57.10    2.0000 Raingage             CB01
02                         0.47    105.99     57.10    2.0000 Raingage             CB01
03                         0.23     77.88     72.90    2.0000 Raingage             CB07
04                         0.50    135.36     64.30    2.0000 Raingage             CB02
05                         0.66    169.99     60.00    2.0000 Raingage             CB03
06                         0.68    204.53     37.10    2.0000 Raingage             CB06
07                         0.21    115.37     37.10    2.0000 Raingage             CB06
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08                         0.26     84.49     71.40    2.0000 Raingage             CB08
09                         0.25     43.09     48.60    2.0000 Raingage             CB05
10                         0.44    181.48     78.60    2.0000 Raingage             CB09
11                         0.55    100.84     62.90    2.0000 Raingage             CB04
12                         0.38     54.68     10.00    2.0000 Raingage             DryPond
U13                        0.42    287.13     10.00    2.0000 Raingage             Wetland
U14                        0.18    132.22      0.00    2.0000 Raingage             DR-Drain

************
Node Summary
************
                                      Invert      Max.    Ponded    External
Name                Type               Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
CB01                JUNCTION          139.12      1.75       0.0
CB02                JUNCTION          139.02      1.75       0.0
CB03                JUNCTION          138.94      1.75       0.0
CB04                JUNCTION          139.04      1.75       0.0
CB05                JUNCTION          139.02      1.75       0.0
CB06                JUNCTION          139.07      1.75       0.0
CB07                JUNCTION          139.12      1.75       0.0
CB08                JUNCTION          139.07      1.75       0.0
CB09                JUNCTION          139.02      1.75       0.0
HP01                JUNCTION          140.17      1.00       0.0
HP02                JUNCTION          140.12      1.00       0.0
HP03                JUNCTION          140.02      1.00       0.0
HP04                JUNCTION          139.94      1.00       0.0
HP05                JUNCTION          140.02      1.00       0.0
HP06                JUNCTION          140.07      1.00       0.0
HP07                JUNCTION          140.12      1.00       0.0
HP08                JUNCTION          140.07      1.00       0.0
HP09                JUNCTION          140.17      1.00       0.0
HP10                JUNCTION          140.12      1.00       0.0
HP11                JUNCTION          140.02      1.00       0.0
HP12                JUNCTION          140.09      1.00       0.0
AlmonteDrain        OUTFALL           137.50      0.38       0.0
DR-Drain            OUTFALL             0.00      0.00       0.0
PondSpill           OUTFALL           139.00      0.00       0.0
Wetland             OUTFALL             0.00      0.00       0.0
DryPond             STORAGE           137.60      2.40       0.0
```

```
MH_outlet           STORAGE             137.55      1.45       0.0
MH01                STORAGE             139.04      1.26       0.0
MH02                STORAGE             138.65      1.60       0.0
MH03                STORAGE             138.20      1.95       0.0
MH04                STORAGE             137.88      2.22       0.0
MH05                STORAGE             137.84      2.26       0.0
MH06                STORAGE             137.73      2.34       0.0
MH07                STORAGE             137.99      2.06       0.0
MH08                STORAGE             138.20      1.95       0.0
MH09                STORAGE             138.73      1.47       0.0
MH10                STORAGE             139.05      1.20       0.0
MH11                STORAGE             139.00      1.30       0.0
MH12                STORAGE             138.85      1.30       0.0


************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
---------------------------------------------------------------------------------------------
MH01-02          MH01             MH02             CONDUIT           60.0    0.4000    0.0130
MH02-03          MH02             MH03             CONDUIT           77.0    0.3896    0.0130
MH03-04          MH03             MH04             CONDUIT           74.0    0.4324    0.0130
MH04-05          MH04             MH05             CONDUIT           14.0    0.2857    0.0130
MH05-06          MH05             MH06             CONDUIT           31.0    0.1290    0.0130
MH06-SWMF        MH06             DryPond          CONDUIT           15.0    0.2000    0.0130
MH07-06          MH07             MH06             CONDUIT           72.0    0.2639    0.0130
MH08-07          MH08             MH07             CONDUIT           81.0    0.2593    0.0130
MH09-08          MH09             MH08             CONDUIT           81.0    0.3704    0.0130
MH10-09          MH10             MH09             CONDUIT           56.0    0.4464    0.0130
MH11-02          MH11             MH02             CONDUIT           53.0    0.3774    0.0130
MH11-09          MH11             MH09             CONDUIT           59.0    0.3390    0.0130
MH12-08          MH12             MH08             CONDUIT           94.0    0.3723    0.0130
MHoutlet-Drain   MH_outlet        AlmonteDrain     CONDUIT            5.0    1.0001    0.0130
MS01             HP01             CB01             CONDUIT           37.0    0.8108    0.0150
MS02             HP10             CB01             CONDUIT            9.0    2.7789    0.0150
MS03             HP10             CB07             CONDUIT           10.0    2.5008    0.0150
MS04             HP09             CB07             CONDUIT           35.0    0.8572    0.0150
MS05             HP02             CB01             CONDUIT           35.0    0.7143    0.0150
MS06             HP02             CB02             CONDUIT           45.0    0.7778    0.0150
MS07             HP11             CB02             CONDUIT           11.0    2.2733    0.0150
MS08             HP03             CB02             CONDUIT           32.0    0.7813    0.0150
MS09             HP03             CB03             CONDUIT           24.0    1.3751    0.0150
MS10             HP04             CB03             CONDUIT           57.0    0.4386    0.0150
MS11             HP04             CB04             CONDUIT           85.0    0.1765    0.0150
MS12             HP07             CB06             CONDUIT            4.0    7.5212    0.0150
MS13             HP08             CB06             CONDUIT            5.0    5.0063    0.0150
MS14             HP08             CB08             CONDUIT           12.0    2.0838    0.0150
MS15             HP09             CB08             CONDUIT           38.0    0.9211    0.0150
MS16             HP06             CB06             CONDUIT           62.0    0.4032    0.0150
MS17             HP06             CB05             CONDUIT           14.0    2.1433    0.0150
MS18             HP05             CB05             CONDUIT           35.0    0.7143    0.0150
MS19             HP11             CB09             CONDUIT           84.0    0.2976    0.0150
MS20             HP05             CB09             CONDUIT           19.0    1.3159    0.0150
MS21             HP05             CB04             CONDUIT           79.0    0.2911    0.0150
MS22             HP12             CB04             CONDUIT            5.0    6.0108    0.0130
MS23             HP12             DryPond          CONDUIT            3.0  148.8086    0.0350
O-CB01           CB01             MH01             ORIFICE
O-CB02           CB02             MH02             ORIFICE
O-CB03           CB03             MH03             ORIFICE
O-CB04           CB04             MH08             ORIFICE
O-CB05           CB05             MH09             ORIFICE
O-CB06           CB06             MH10             ORIFICE
O-CB07           CB07             MH02             ORIFICE
O-CB08           CB08             MH09             ORIFICE
O-CB09           CB09             MH12             ORIFICE
O-SWMF1          DryPond          MH_outlet        ORIFICE
O-SWMF2          DryPond          MH_outlet        ORIFICE
W1               DryPond          MH_outlet        WEIR
W2               DryPond          PondSpill        WEIR


*********************
Cross Section Summary
*********************
                                        Full     Full     Hyd.     Max.   No. of     Full
Conduit          Shape                 Depth     Area     Rad.    Width  Barrels     Flow
---------------------------------------------------------------------------------------
MH01-02          CIRCULAR               0.45     0.16     0.11     0.45        1   180.33
MH02-03          CIRCULAR               0.60     0.28     0.15     0.60        1   383.28
MH03-04          CIRCULAR               0.75     0.44     0.19     0.75        1   732.13
MH04-05          CIRCULAR               0.75     0.44     0.19     0.75        1   595.11
```

```
MH05-06         CIRCULAR            0.75     0.44     0.19     0.75         1   399.93
MH06-SWMF       CIRCULAR            0.82     0.53     0.21     0.82         1   641.99
MH07-06         CIRCULAR            0.75     0.44     0.19     0.75         1   571.93
MH08-07         CIRCULAR            0.75     0.44     0.19     0.75         1   566.89
MH09-08         CIRCULAR            0.53     0.22     0.13     0.53         1   261.74
MH10-09         CIRCULAR            0.45     0.16     0.11     0.45         1   190.51
MH11-02         CIRCULAR            0.45     0.16     0.11     0.45         1   175.15
MH11-09         CIRCULAR            0.45     0.16     0.11     0.45         1   166.01
MH12-08         CIRCULAR            0.45     0.16     0.11     0.45         1   173.98
MHoutlet-Drain  CIRCULAR            0.38     0.11     0.09     0.38         1   175.35
MS01            18mROW              1.00    15.30     0.52    18.00         1 59038.69
MS02            18mROW              1.00    15.30     0.52    18.00         1 109295.52
MS03            18mROW              1.00    15.30     0.52    18.00         1 103683.03
MS04            18mROW              1.00    15.30     0.52    18.00         1 60702.19
MS05            18mROW              1.00    15.30     0.52    18.00         1 55412.96
MS06            18mROW              1.00    15.30     0.52    18.00         1 57823.47
MS07            18mROW              1.00    15.30     0.52    18.00         1 98855.21
MS08            18mROW              1.00    15.30     0.52    18.00         1 57952.40
MS09            18mROW              1.00    15.30     0.52    18.00         1 76885.01
MS10            18mROW              1.00    15.30     0.52    18.00         1 43421.46
MS11            18mROW              1.00    15.30     0.52    18.00         1 27542.69
MS12            18mROW              1.00    15.30     0.52    18.00         1 179809.60
MS13            18mROW              1.00    15.30     0.52    18.00         1 146698.80
MS14            18mROW              1.00    15.30     0.52    18.00         1 94644.70
MS15            18mROW              1.00    15.30     0.52    18.00         1 62924.71
MS16            18mROW              1.00    15.30     0.52    18.00         1 41633.77
MS17            18mROW              1.00    15.30     0.52    18.00         1 95987.85
MS18            18mROW              1.00    15.30     0.52    18.00         1 55412.96
MS19            18mROW              1.00    15.30     0.52    18.00         1 35768.53
MS20            18mROW              1.00    15.30     0.52    18.00         1 75211.08
MS21            18mROW              1.00    15.30     0.52    18.00         1 35377.01
MS22            RECT_OPEN           1.00     3.00     0.60     3.00         1 40250.57
MS23            RECT_OPEN           1.00     3.00     0.60     3.00         1 74386.52


****************
Transect Summary
****************

Transect 18mROW
```

```
Area:
            0.0009     0.0034     0.0077     0.0137     0.0214
            0.0308     0.0417     0.0530     0.0657     0.0801
            0.0962     0.1139     0.1333     0.1543     0.1770
            0.2005     0.2240     0.2475     0.2710     0.2945
            0.3180     0.3415     0.3650     0.3885     0.4120
            0.4356     0.4591     0.4826     0.5061     0.5296
            0.5531     0.5766     0.6001     0.6237     0.6472
            0.6707     0.6942     0.7177     0.7412     0.7648
            0.7883     0.8118     0.8353     0.8588     0.8824
            0.9059     0.9294     0.9529     0.9765     1.0000
Hrad:
            0.0188     0.0376     0.0564     0.0751     0.0939
            0.1127     0.1406     0.1767     0.2070     0.2318
            0.2524     0.2698     0.2847     0.2977     0.3093
            0.3240     0.3404     0.3578     0.3760     0.3948
            0.4140     0.4335     0.4532     0.4731     0.4932
            0.5133     0.5335     0.5538     0.5742     0.5945
            0.6149     0.6353     0.6557     0.6761     0.6965
            0.7169     0.7373     0.7577     0.7780     0.7983
            0.8186     0.8389     0.8591     0.8793     0.8995
            0.9197     0.9398     0.9599     0.9800     1.0000
Width:
            0.0726     0.1453     0.2179     0.2905     0.3631
            0.4358     0.4721     0.5073     0.5776     0.6478
            0.7180     0.7882     0.8584     0.9287     0.9989
            0.9989     0.9990     0.9990     0.9990     0.9990
            0.9991     0.9991     0.9991     0.9992     0.9992
            0.9992     0.9993     0.9993     0.9993     0.9994
            0.9994     0.9994     0.9995     0.9995     0.9995
            0.9996     0.9996     0.9996     0.9997     0.9997
            0.9997     0.9997     0.9998     0.9998     0.9998
            0.9999     0.9999     0.9999     1.0000     1.0000


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

Hannan Hills Subdivision (118201)
PCSWMM Post-Development Model Output (100-year 12-hour SCS)

```
****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 01/25/2021 00:00:00
Ending Date .............. 01/28/2021 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 2.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 4
Head Tolerance ........... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         0.516        93.910
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.181        32.925
Surface Runoff ...........         0.334        60.810
Final Storage ............         0.002         0.437
Continuity Error (%) .....        -0.279


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.334         3.338
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.334         3.340
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....        -0.055


***************************
Time-Step Critical Elements
***************************
Link MHoutlet-Drain (19.04%)


********************************
Highest Flow Instability Indexes
********************************
Link O-CB06 (11)
Link O-CB03 (8)
Link O-CB09 (8)
Link O-CB02 (8)
Link O-CB07 (6)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.91 sec
Maximum Time Step           :     2.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.10
Percent Not Converging      :     0.00
Time Step Frequencies       :
```

```
      2.000 -  1.516 sec      :    94.11 %
      1.516 -  1.149 sec      :     3.94 %
      1.149 -  0.871 sec      :     1.82 %
      0.871 -  0.660 sec      :     0.13 %
      0.660 -  0.500 sec      :     0.01 %
```

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

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
01	93.91	0.00	0.00	27.65	52.97	12.78	65.75	0.17	53.17	0.700
02	93.91	0.00	0.00	27.84	53.45	12.58	66.03	0.31	95.09	0.703
03	93.91	0.00	0.00	17.30	67.99	8.27	76.26	0.18	48.87	0.812
04	93.91	0.00	0.00	22.97	60.13	10.68	70.81	0.35	103.97	0.754
05	93.91	0.00	0.00	25.83	56.11	11.86	67.97	0.45	135.46	0.724
06	93.91	0.00	0.00	40.92	34.33	18.33	52.66	0.36	130.00	0.561
07	93.91	0.00	0.00	40.38	34.57	18.93	53.50	0.11	41.39	0.570
08	93.91	0.00	0.00	18.28	66.59	8.70	75.29	0.20	55.06	0.802
09	93.91	0.00	0.00	33.82	45.47	14.57	60.04	0.15	47.79	0.639
10	93.91	0.00	0.00	13.60	73.23	6.61	79.84	0.35	94.55	0.850
11	93.91	0.00	0.00	24.11	58.57	10.83	69.40	0.38	112.56	0.739
12	93.91	0.00	0.00	61.32	9.37	23.33	32.69	0.12	50.52	0.348
U13	93.91	0.00	0.00	57.92	9.24	26.91	36.15	0.15	77.56	0.385
U14	93.91	0.00	0.00	64.40	0.00	29.86	29.86	0.05	32.40	0.318

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

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days	hr:min	Reported Max Depth Meters
CB01	JUNCTION	0.05	0.92	140.04	0	06:32	0.92
CB02	JUNCTION	0.06	0.89	139.91	0	06:33	0.89
CB03	JUNCTION	0.07	0.91	139.85	0	06:33	0.91
CB04	JUNCTION	0.06	0.84	139.88	0	06:33	0.84
CB05	JUNCTION	0.06	0.92	139.94	0	06:34	0.92
CB06	JUNCTION	0.06	0.98	140.05	0	06:33	0.98
CB07	JUNCTION	0.05	0.85	139.97	0	06:32	0.85
CB08	JUNCTION	0.05	0.87	139.94	0	06:32	0.87
CB09	JUNCTION	0.06	0.85	139.87	0	06:32	0.85
HP01	JUNCTION	0.00	0.00	140.17	0	00:00	0.00
HP02	JUNCTION	0.00	0.00	140.12	0	00:00	0.00
HP03	JUNCTION	0.00	0.00	140.02	0	00:00	0.00
HP04	JUNCTION	0.00	0.00	139.94	0	00:00	0.00
HP05	JUNCTION	0.00	0.00	140.02	0	00:00	0.00
HP06	JUNCTION	0.00	0.00	140.07	0	00:00	0.00
HP07	JUNCTION	0.00	0.00	140.12	0	00:00	0.00
HP08	JUNCTION	0.00	0.00	140.07	0	00:00	0.00
HP09	JUNCTION	0.00	0.00	140.17	0	00:00	0.00
HP10	JUNCTION	0.00	0.00	140.12	0	00:00	0.00
HP11	JUNCTION	0.00	0.00	140.02	0	00:00	0.00
HP12	JUNCTION	0.00	0.00	140.09	0	00:00	0.00
AlmonteDrain	OUTFALL	0.05	0.38	137.88	0	06:58	0.38
DR-Drain	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
PondSpill	OUTFALL	0.00	0.00	139.00	0	00:00	0.00

Wetland	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
DryPond	STORAGE	0.51	2.13	139.73	0	07:03	2.13
MH_outlet	STORAGE	0.05	0.35	137.90	0	07:05	0.35
MH01	STORAGE	0.06	0.75	139.79	0	06:39	0.75
MH02	STORAGE	0.12	1.11	139.76	0	07:00	1.11
MH03	STORAGE	0.24	1.55	139.75	0	07:00	1.55
MH04	STORAGE	0.37	1.86	139.74	0	07:01	1.86
MH05	STORAGE	0.39	1.90	139.74	0	07:01	1.90
MH06	STORAGE	0.44	2.01	139.74	0	07:02	2.01
MH07	STORAGE	0.32	1.75	139.74	0	07:01	1.75
MH08	STORAGE	0.24	1.55	139.75	0	07:00	1.55
MH09	STORAGE	0.11	1.04	139.77	0	06:58	1.04
MH10	STORAGE	0.06	0.76	139.81	0	06:44	0.76
MH11	STORAGE	0.06	0.77	139.77	0	06:59	0.77
MH12	STORAGE	0.08	0.91	139.76	0	07:00	0.91

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
CB01	JUNCTION	148.26	148.26	0 06:30	0.481	0.481	0.210
CB02	JUNCTION	103.97	103.97	0 06:30	0.354	0.355	0.342
CB03	JUNCTION	135.46	135.46	0 06:30	0.449	0.449	0.661
CB04	JUNCTION	112.56	112.56	0 06:30	0.382	0.383	0.265
CB05	JUNCTION	47.79	47.79	0 06:30	0.15	0.15	0.120
CB06	JUNCTION	171.39	171.39	0 06:30	0.47	0.471	0.370
CB07	JUNCTION	48.87	48.87	0 06:30	0.175	0.175	0.160
CB08	JUNCTION	55.06	55.06	0 06:30	0.196	0.196	0.048
CB09	JUNCTION	94.55	94.55	0 06:30	0.351	0.353	0.372
HP01	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP02	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP03	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP04	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP05	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP06	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP07	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP08	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP09	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP10	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP11	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
HP12	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
AlmonteDrain	OUTFALL	0.00	188.59	0 07:05	0	3.13	0.000
DR-Drain	OUTFALL	32.40	32.40	0 06:30	0.0537	0.0537	0.000
PondSpill	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
Wetland	OUTFALL	77.56	77.56	0 06:30	0.152	0.152	0.000
DryPond	STORAGE	50.52	657.42	0 06:19	0.124	3.13	-0.003
MH_outlet	STORAGE	0.00	181.20	0 07:03	0	3.13	-0.007
MH01	STORAGE	0.00	130.60	0 06:17	0	0.48	0.344
MH02	STORAGE	0.00	271.32	0 06:15	0	1.09	0.062
MH03	STORAGE	0.00	359.93	0 06:18	0	1.53	-0.570
MH04	STORAGE	0.00	345.21	0 06:18	0	1.54	0.015
MH05	STORAGE	0.00	335.57	0 06:18	0	1.54	0.024
MH06	STORAGE	0.00	637.10	0 06:19	0	3.01	-0.019
MH07	STORAGE	0.00	321.76	0 06:18	0	1.47	0.035
MH08	STORAGE	0.00	357.56	0 06:11	0	1.46	-0.620
MH09	STORAGE	0.00	217.32	0 06:15	0	0.814	0.224
MH10	STORAGE	0.00	131.19	0 06:16	0	0.469	-0.011
MH11	STORAGE	0.00	32.26	0 06:14	0	0.0783	0.009
MH12	STORAGE	0.00	92.22	0 06:17	0	0.352	0.556

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

Hannan Hills Subdivision (118201)
PCSWMM Post-Development Model Output (100-year 12-hour SCS)

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
DryPond	0.277	14	0	0	1.661	81	0 07:03	181.20
MH_outlet	0.000	3	0	0	0.000	24	0 07:05	188.59
MH01	0.000	5	0	0	0.001	60	0 06:39	128.57
MH02	0.000	8	0	0	0.001	70	0 07:00	245.48
MH03	0.000	12	0	0	0.002	80	0 07:00	345.21
MH04	0.000	17	0	0	0.002	84	0 07:01	335.57
MH05	0.000	17	0	0	0.002	84	0 07:01	330.65
MH06	0.000	19	0	0	0.002	86	0 07:02	625.45
MH07	0.000	15	0	0	0.002	85	0 07:01	306.84
MH08	0.000	12	0	0	0.002	80	0 07:00	321.76
MH09	0.000	7	0	0	0.001	71	0 06:58	187.62
MH10	0.000	5	0	0	0.001	63	0 06:44	130.69
MH11	0.000	4	0	0	0.001	59	0 06:59	27.95
MH12	0.000	7	0	0	0.001	70	0 07:00	89.50

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
AlmonteDrain	55.38	27.59	188.59	3.134
DR-Drain	2.93	9.05	32.40	0.054
PondSpill	0.00	0.00	0.00	0.000
Wetland	18.71	3.94	77.56	0.152
System	19.26	40.58	199.79	3.340

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
MH01-02	CONDUIT	128.57	0 06:16	1.28	0.71	1.00
MH02-03	CONDUIT	245.48	0 06:19	1.41	0.64	1.00
MH03-04	CONDUIT	345.21	0 06:18	0.78	0.47	1.00
MH04-05	CONDUIT	335.57	0 06:18	0.76	0.56	1.00
MH05-06	CONDUIT	330.65	0 06:18	0.75	0.83	1.00
MH06-SWMF	CONDUIT	625.45	0 06:19	1.17	0.97	1.00
MH07-06	CONDUIT	306.84	0 06:19	0.69	0.54	1.00
MH08-07	CONDUIT	321.76	0 06:18	0.75	0.57	1.00
MH09-08	CONDUIT	178.89	0 06:11	1.26	0.68	1.00
MH10-09	CONDUIT	130.69	0 06:16	1.22	0.69	1.00
MH11-02	CONDUIT	27.95	0 06:48	0.18	0.16	1.00
MH11-09	CONDUIT	30.17	0 06:16	0.34	0.18	1.00
MH12-08	CONDUIT	89.50	0 06:09	1.04	0.51	1.00
MHoutlet-Drain	CONDUIT	188.59	0 07:05	1.82	1.08	0.97
MS01	CHANNEL	0.00	0 00:00	0.00	0.00	0.08
MS02	CHANNEL	0.00	0 00:00	0.00	0.00	0.08
MS03	CHANNEL	0.00	0 00:00	0.00	0.00	0.05
MS04	CHANNEL	0.00	0 00:00	0.00	0.00	0.05
MS05	CHANNEL	0.00	0 00:00	0.00	0.00	0.08
MS06	CHANNEL	0.00	0 00:00	0.00	0.00	0.07
MS07	CHANNEL	0.00	0 00:00	0.00	0.00	0.07
MS08	CHANNEL	0.00	0 00:00	0.00	0.00	0.07
MS09	CHANNEL	0.00	0 00:00	0.00	0.00	0.08
MS10	CHANNEL	0.00	0 00:00	0.00	0.00	0.08
MS11	CHANNEL	0.00	0 00:00	0.00	0.00	0.05
MS12	CHANNEL	0.00	0 00:00	0.00	0.00	0.12
MS13	CHANNEL	0.00	0 00:00	0.00	0.00	0.12
MS14	CHANNEL	0.00	0 00:00	0.00	0.00	0.06
MS15	CHANNEL	0.00	0 00:00	0.00	0.00	0.06
MS16	CHANNEL	0.00	0 00:00	0.00	0.00	0.12
MS17	CHANNEL	0.00	0 00:00	0.00	0.00	0.08

MS18	CHANNEL	0.00	0	00:00	0.00	0.00	0.08
MS19	CHANNEL	0.00	0	00:00	0.00	0.00	0.05
MS20	CHANNEL	0.00	0	00:00	0.00	0.00	0.05
MS21	CHANNEL	0.00	0	00:00	0.00	0.00	0.05
MS22	CONDUIT	0.00	0	00:00	0.00	0.00	0.05
MS23	CONDUIT	0.00	0	00:00	0.00	0.00	0.50
O-CB01	ORIFICE	130.60	0	06:17			1.00
O-CB02	ORIFICE	94.16	0	06:16			1.00
O-CB03	ORIFICE	120.90	0	06:16			1.00
O-CB04	ORIFICE	100.90	0	06:17			1.00
O-CB05	ORIFICE	35.79	0	06:15			1.00
O-CB06	ORIFICE	131.19	0	06:16			1.00
O-CB07	ORIFICE	46.97	0	06:18			1.00
O-CB08	ORIFICE	52.02	0	06:17			1.00
O-CB09	ORIFICE	92.22	0	06:17			1.00
O-SWMF1	ORIFICE	16.29	0	06:56			1.00
O-SWMF2	ORIFICE	43.80	0	07:03			1.00
W1	WEIR	121.22	0	07:03			0.55
W2	WEIR	0.00	0	00:00			0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class ----------								
MH01-02	1.00	0.01	0.00	0.00	0.17	0.00	0.00	0.82	0.03	0.00
MH02-03	1.00	0.01	0.00	0.00	0.28	0.00	0.00	0.71	0.10	0.00
MH03-04	1.00	0.01	0.03	0.00	0.96	0.00	0.00	0.00	0.20	0.00
MH04-05	1.00	0.01	0.39	0.00	0.60	0.00	0.00	0.00	0.54	0.00
MH05-06	1.00	0.01	0.00	0.00	0.49	0.00	0.00	0.50	0.02	0.00
MH06-SWMF	1.00	0.01	0.00	0.00	0.53	0.00	0.00	0.47	0.01	0.00
MH07-06	1.00	0.01	0.01	0.00	0.48	0.00	0.00	0.50	0.08	0.00
MH08-07	1.00	0.01	0.14	0.00	0.86	0.00	0.00	0.00	0.63	0.00
MH09-08	1.00	0.01	0.00	0.00	0.26	0.00	0.00	0.73	0.09	0.00
MH10-09	1.00	0.01	0.00	0.00	0.17	0.00	0.00	0.82	0.03	0.00
MH11-02	1.00	0.83	0.00	0.00	0.17	0.00	0.00	0.00	0.81	0.00
MH11-09	1.00	0.81	0.01	0.00	0.17	0.00	0.00	0.00	0.81	0.00
MH12-08	1.00	0.01	0.00	0.00	0.24	0.00	0.00	0.76	0.09	0.00
MHoutlet-Drain	1.00	0.01	0.00	0.00	0.45	0.54	0.00	0.00	0.57	0.00
MS01	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS02	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS03	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS04	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS05	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS06	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS07	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS08	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS09	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS10	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS11	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS12	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS13	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS14	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS15	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS16	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS17	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS18	1.00	0.98	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS19	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS20	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS21	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS22	1.00	0.99	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MS23	1.00	0.04	0.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	--------- Hours Full -------- Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
MH01-02	2.39	2.39	5.41	0.01	0.01
MH02-03	5.41	5.41	8.34	0.01	0.01
MH03-04	8.34	8.34	11.89	0.01	0.01
MH04-05	11.89	11.89	12.64	0.01	0.01

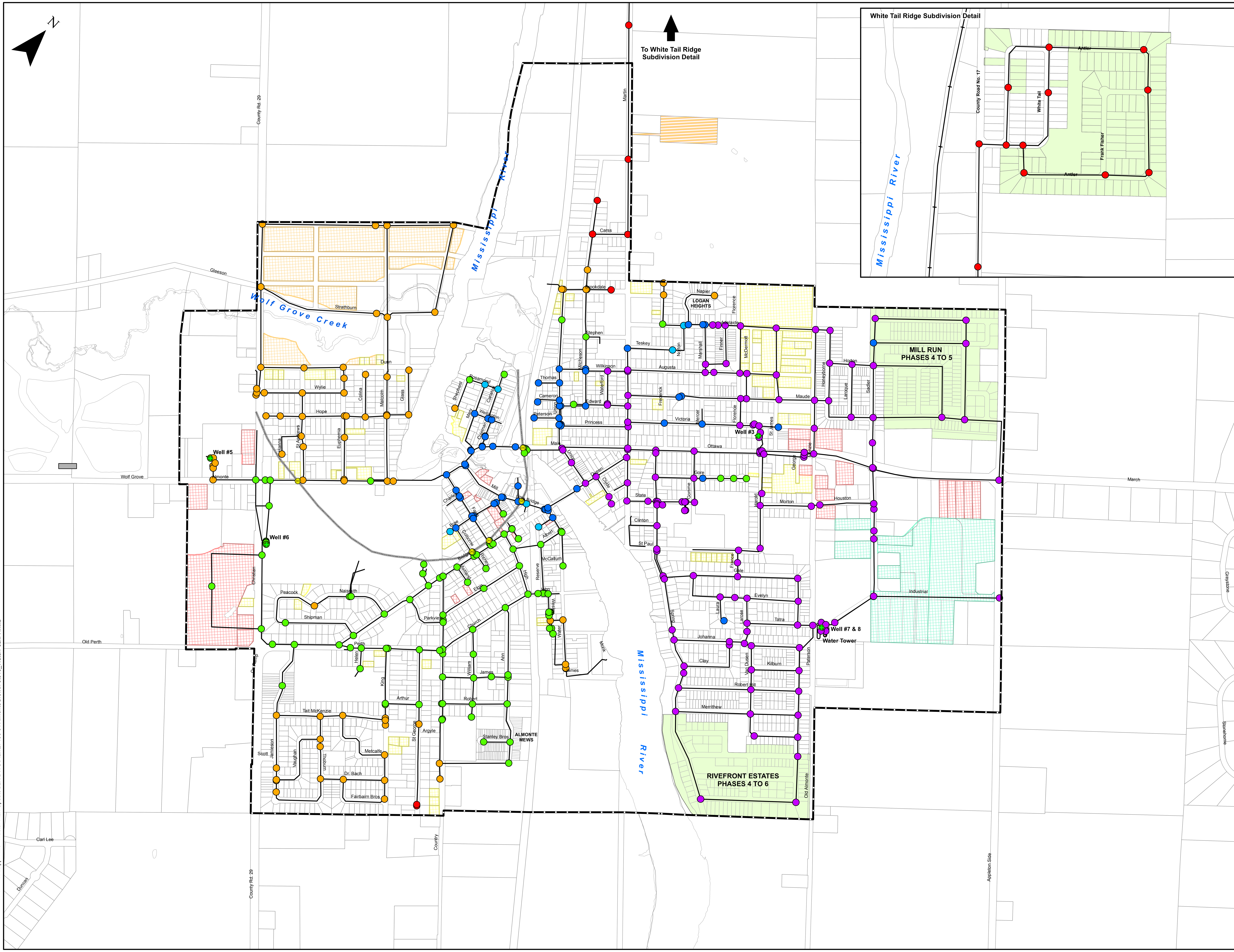
MH05-06	12.64	12.64	13.52	0.01	0.43
MH06-SWMF	13.39	13.40	14.09	0.01	0.63
MH07-06	10.42	10.42	13.52	0.01	0.01
MH08-07	8.35	8.35	10.42	0.01	0.01
MH09-08	5.36	5.36	8.31	0.01	0.01
MH10-09	2.29	2.29	5.41	0.01	0.01
MH11-02	2.81	2.81	5.41	0.01	0.01
MH11-09	2.81	2.81	5.41	0.01	0.01
MH12-08	4.82	4.82	8.35	0.01	0.01
MHoutlet-Drain	0.01	0.01	0.14	0.18	0.01

```
Analysis begun on:  Fri May 16 16:12:20 2025
Analysis ended on:  Fri May 16 16:12:23 2025
Total elapsed time: 00:00:03
```

APPENDIX F

Excerpts From J.L. Richards Master Plan Update Report – February 2018

- Master Plan Update Report Figures 11, 12, 13, 14, 25



Max Day + Fire Flow

- < 32 L/s
- 33 to 50 L/s
- 51 to 67 L/s
- 68 to 75 L/s
- 76 to 100 L/s
- 100 to 300 L/s

Infrastructure

- Pressure Reducing Valve
- Well
- Water Tower
- Pressure Zone
- Watermain

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Business Park (17.0 ha)
- Commercial (15.6 ha)
- Residential - Geenfield (14.2 ha)
- Residential - Infill (16.0 ha)

No.	ISSUE / REVISION	DD/MM/YY

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

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PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM 5 TO 10 YEARS (2023 TO 2028) MAX DAY DEMAND / FIRE FLOW

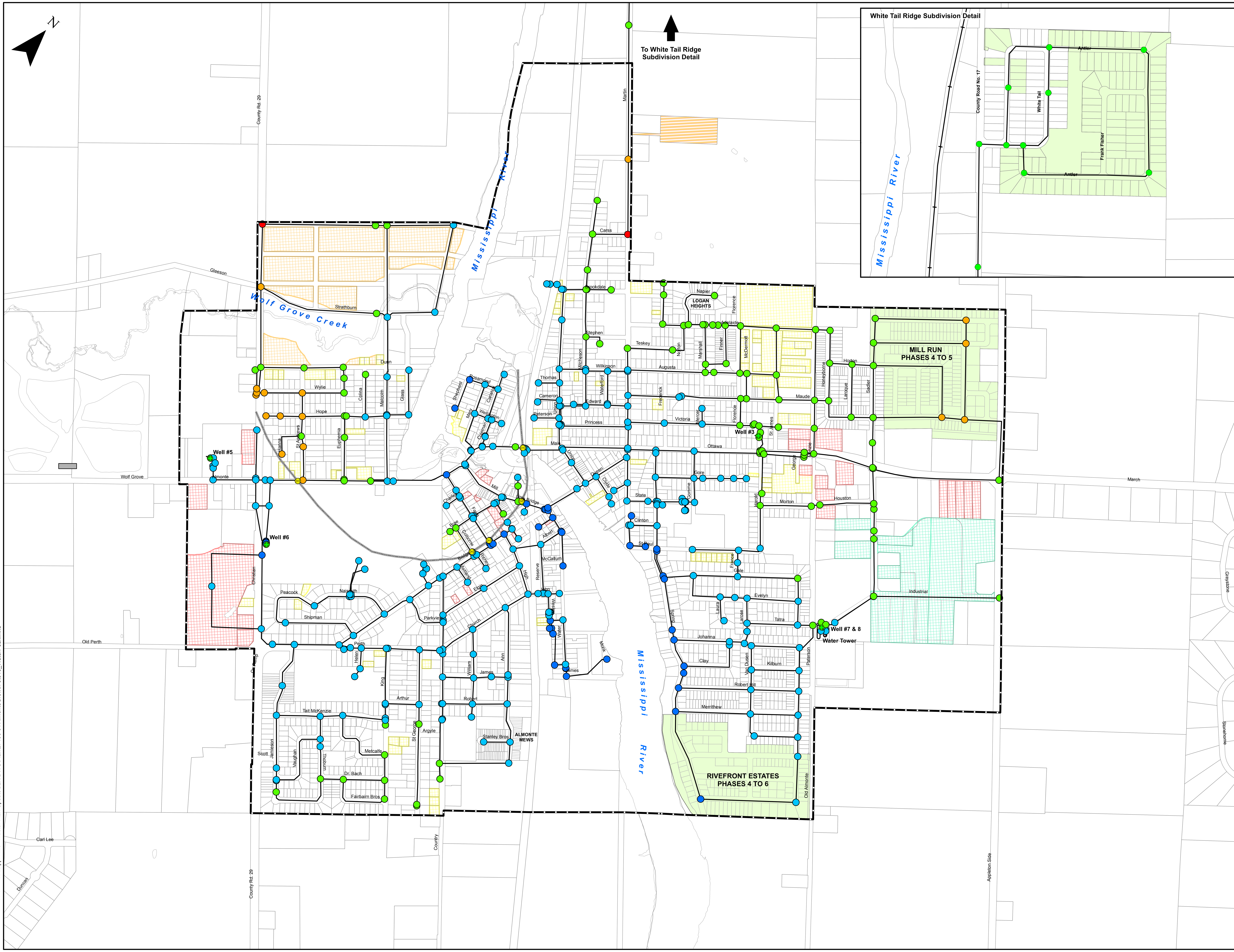
DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #:

FIGURE 11

PLOT DATE: January 5, 2018 8:54:26 AM

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth 5to10_WaterPeakFF.mxd



File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth 5to10_WaterPeak.mxd

Peak Hour

- < 274 kPa
- 275 to 300 kPa
- 301 to 400 kPa
- 401 to 500 kPa
- 501 to 550 kPa
- > 550 kPa

Infrastructure

- Pressure Reducing Valve
- Well
- Water Tower
- Pressure Zone
- Watermain

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Closed Waste Disposal Site
- Registered Subdivision
- Business Park (17.0 ha)
- Commercial (15.6 ha)
- Residential - Geenfield (14.2 ha)
- Residential - Infill (16.0 ha)

No.	ISSUE / REVISION	DD/MM/YY

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PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

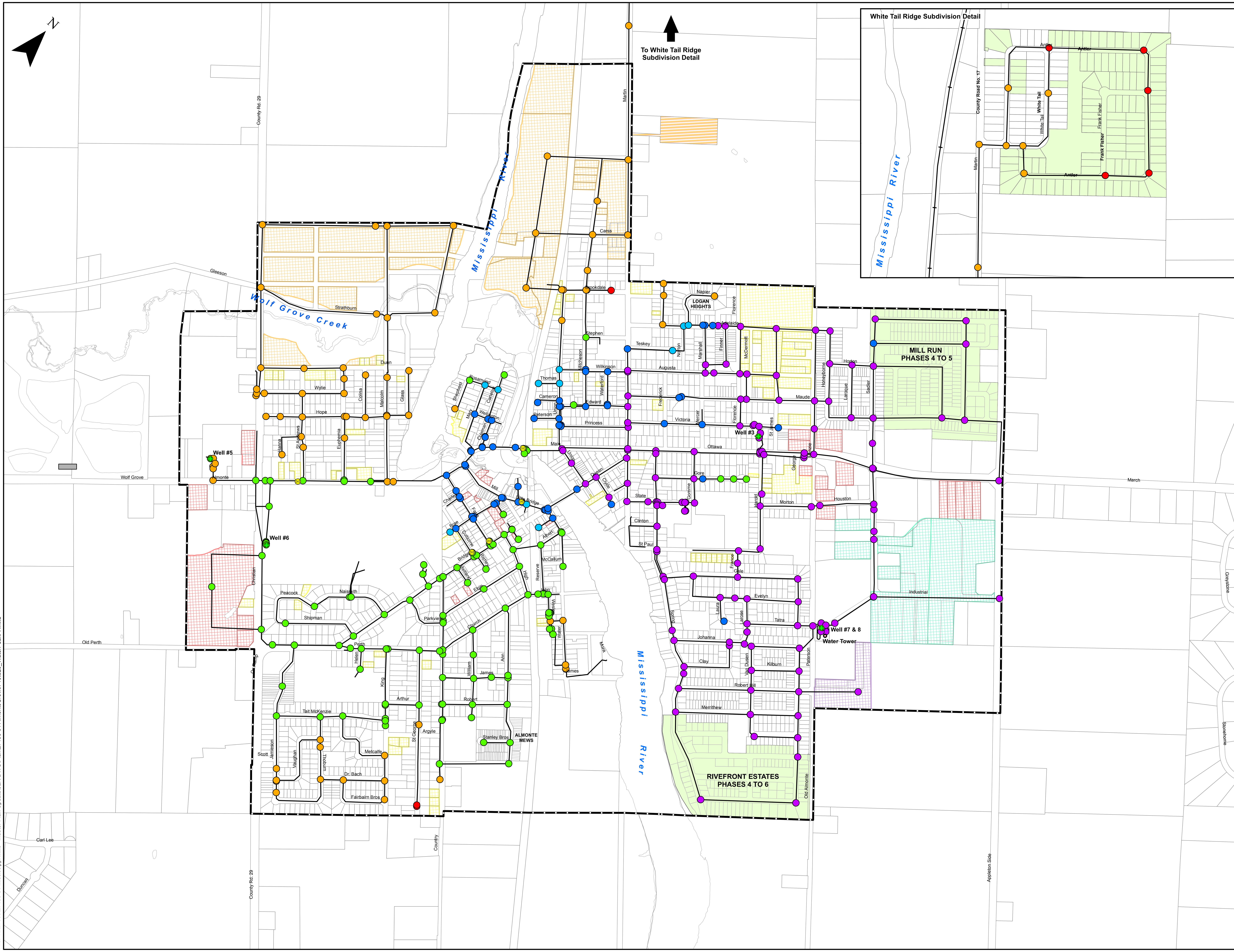
DRAWING:

ALMONTE WARD WATER SYSTEM 5 TO 10 YEARS (2023 TO 2028) PEAK HOUR

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 12**

PLOT DATE: January 5, 2018 8:56:08 AM



No.	ISSUE / REVISION	DD/MM/YY

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MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM 10 TO 20 YEARS (2029 TO 2037) MAX DAY DEMAND / FIRE FLOW

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 13**

PLOT DATE: January 5, 2018 8:58:10 AM

File: R:\27000\27456-01 Mississippi Mills - Master Plan Update\JLR DWG\Plan\27456-01 AlmonteGrowth 10to20_WaterPeakFF.mxd

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PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

ALMONTE WARD WATER SYSTEM 10 TO 20 YEARS (2029 TO 2037) PEAK HOUR

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 14**

PLOT DATE: January 5, 2018 8:59:35 AM

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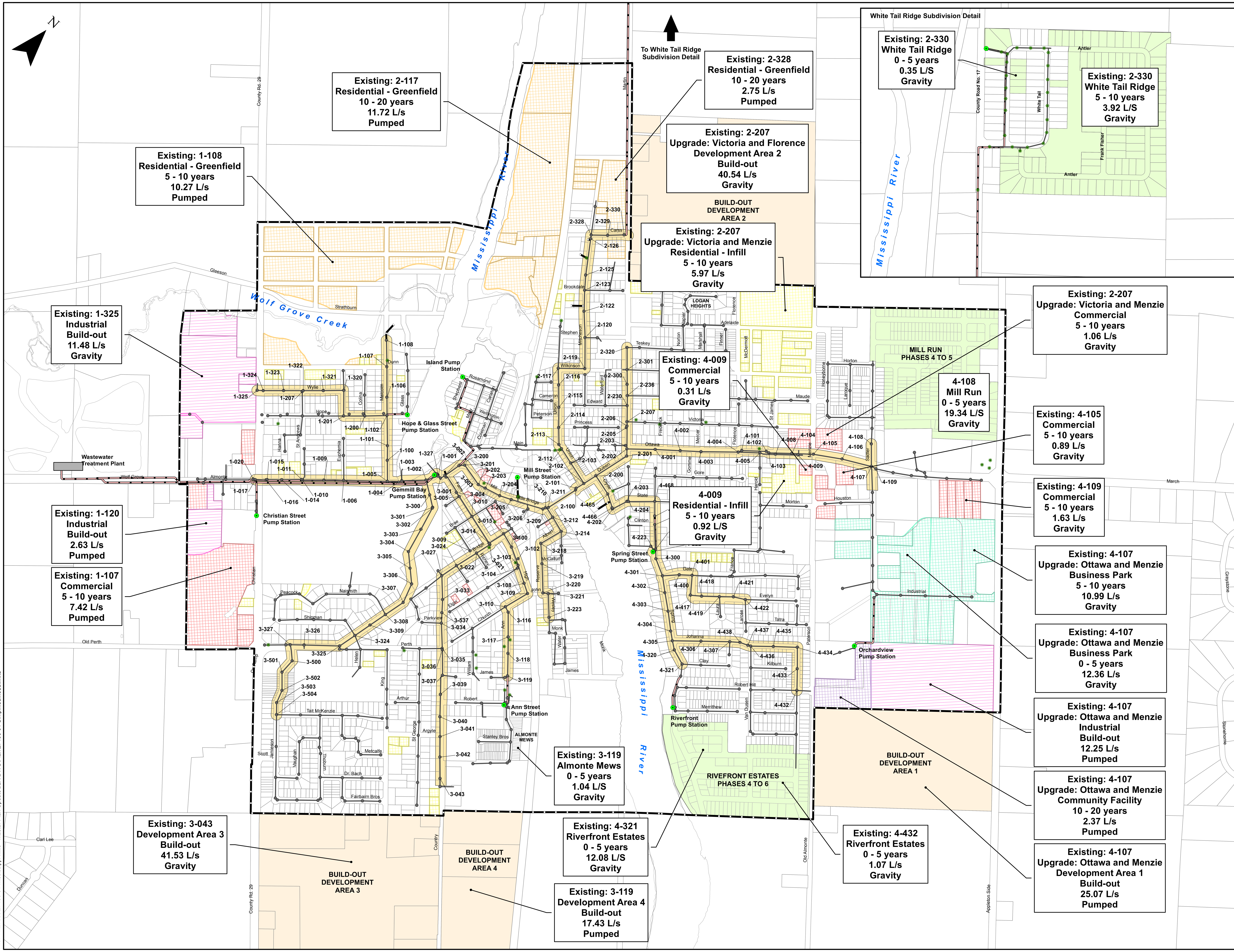

Infrastructure

- 4-102 Manhole ID
- Pumping Station
- Cleanout
- Sanitary Manhole
- Sanitary Sewer
- Private Forcemain
- Forcemain
- Sanitary Trunk Sewers

Land Use

- Almonte Ward Limits
- Existing Lots
- Future Lots
- Registered Subdivision
- Build Out
- Business Park (17.0 ha)
- Community Facility (3.1 ha)
- Commercial (15.6 ha)
- Industrial (24.1 ha)
- Residential - Geenfield (34.2 ha)
- Residential - Infill (16.0 ha)

Existing: 4-109 / Upgrade : Ottawa and Menzie / Commercial / 5 - 10 years / 1.63 L/s / Gravity

- Manhole ID
- Intersection
- Development Name or Type
- Development Timeline
- Estimated Park Flow
- Anticipated Future Trunk Servicing

No.	ISSUE / REVISION	DD/MM/YY

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SCALE: 0 50 100 200 300 400 Meters

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PROJECT:

MUNICIPALITY OF MISSISSIPPI MILLS ALMONTE WARD WATER AND WASTEWATER INFRASTRUCTURE MASTER PLAN UPDATE

MISSISSIPPI MILLS, ONTARIO

DRAWING:

WASTEWATER HYDRAULIC MODEL DEMAND ALLOCATION

DESIGN: MB
DRAWN: KTK
CHECKED: SG
JLR #: 27456-01

DRAWING #: **FIGURE 25**

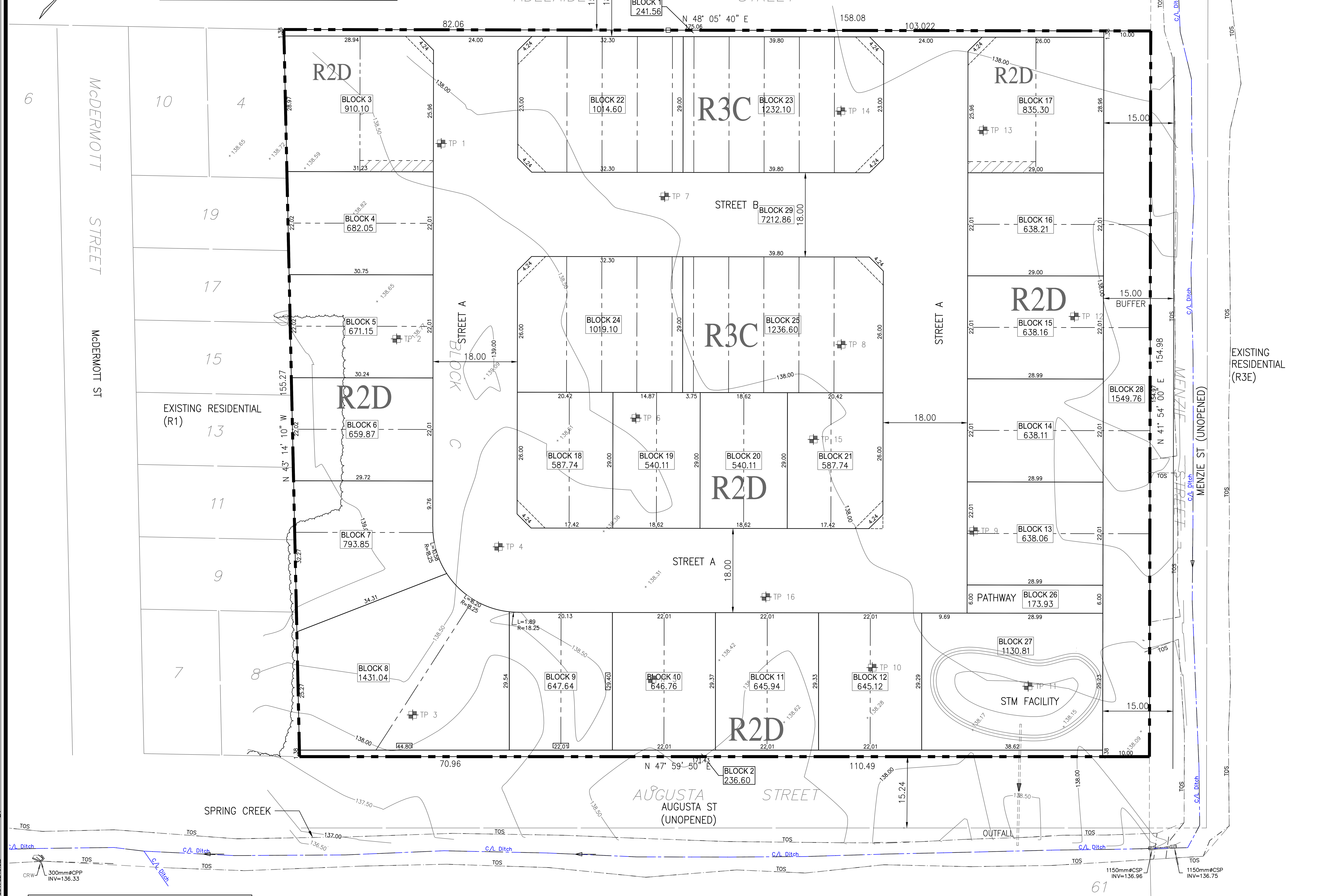
PLOT DATE: January 5, 2018 10:32:24 AM

APPENDIX G

Menzie Enclaves Subdivision Drawing

- Menzie Enclaves Draft Plan of Subdivision Option 3 (DP-1, rev2), prepared by Advance Engineering – March 2024

NOTE:
1– BLOCKS 3 & 17 ARE FACING ADELAIDE ST.
2– BLOCKS 22 & 23 SHALL HAVE ACTIVE STREET FRONTAGES ALONG ADELAIDE ST SUCH AS FRONT DOORS WITH WALKWAYS LEADING DIRECTLY TO ADELAIDE ST ENTRANCES.
3– POSSIBLE SERVICING OF THE FOUR BLOCKS FACING ADELAIDE ST VIA STREET A AND STREET B



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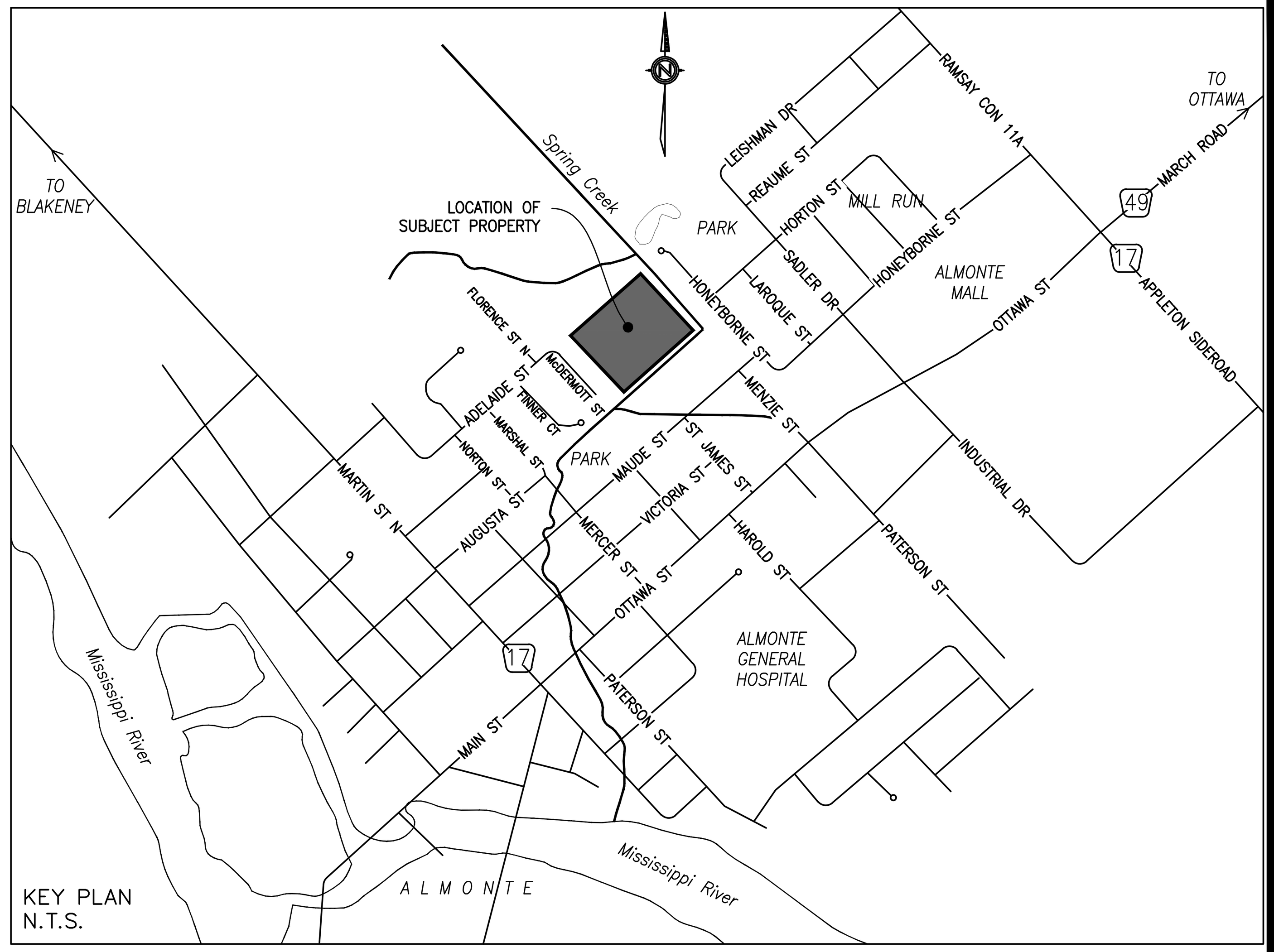


SURVEY LEGEND

	Denotes	
—□—	"	Survey Monument Planted
—■—	"	Survey Monument Found
SIB	"	Standard Iron Bar
SSIB	"	Short Standard Iron Bar
IB	"	Iron Bar
CC	"	Cut Cross
CP	"	Concrete Pin
IBø	"	Round Iron Bar
S&W	"	Spike & Washer
SSIB*	"	Short Standard Iron Bar
IB*	"	Iron Bar
(WIT)	"	Witness
Meas.	"	Measured
(AOG)	"	Annis, O'Sullivan, Vollebekk Ltd.
(P1)	"	Plan
(P2)	"	Plan
(P3)	"	Plan
·	"	Deciduous Tree
✳	"	Coniferous Tree
○ MH–ST	"	Maintenance Hole (Storm Sewer)
○ MH	"	Maintenance Hole (Unidentified)
□ CB	"	Catch Basin
CSP	"	Corrugated Steel Pipe
CPP	"	Corrugated Plastic Pipe
CCP	"	Concrete Pipe
BOS	"	Bottom of Slope
CRW	"	Concrete Retaining Wall
T/G	"	Top of Grate
FH	"	Fire Hydrant
+65.00	"	Location of Elevations
+65.00	"	Top of Wall Elevation
C/L	"	Centreline

NOTES:
– DISTANCES ARE IN METRE. TO CONVERT TO FEET DIVIDE BY 0.3048.
– PROPOSED 1.5m SIDEWALK ON ONE SIDE OF THE STREETS.
– CHAIN–LINK FENCES SHALL BE INSTALLED ON EITHER SIDE OF THE PUBLIC WALKWAYS AND SURROUNDING THE STORMWATER FACILITY
– WATERMAIN, SANITARY SEWERS AND OTHER UTILITIES HAVE BEEN IDENTIFIED ALONG ADELAIDE ST AND FINNER CT.

DRAFT PLAN OF SUBDIVISION OF

PARK LOT 2, BLOCK C, HENDERSON SECTION,
AND
LOTS 1 TO 25 INCLUSIVE, PARK BLOCK C,
McLEAN SECTION,
AND
ALFRED STREET
AND
ALEXANDRA STREET
REGISTERED PLAN 6262
FORMER TOWN OF ALMONTE
MUNICIPALITY OF MISSISSIPPI MILLS
COUNTY OF LANARK

No.	REVISION / ISSUE	DATE MM/DD/YY
2	RIPARIAN AREA ADDED AS A BLOCK	03/04/24
1	DRAFT PLAN APPROVAL – OPTION 3	10/02/23

PREPARED BY:
Mongi Mabrouk P.Eng.
Phone: 613-896-9170
Email: eng.services.ca@gmail.com
ADVANCE ENGINEERING

PROJECT NAME AND ADDRESS:

MENZIE ENCLAVES SUBDIVISION

ADELAIDE ST, ALMONTE, MISSISSIPPI MILLS, ONTARIO

APPLICANT:
ASH SHARMA
13165647 CANADA INC. (514-817-8265)
27 Queen Street East #407 Toronto, ON

TITLE:

DRAFT PLAN OF SUBDIVISION OPTION 3

SCALE: 1:400
DRAFTED BY:
PROJECT No.: 123
DATE: 03-04-2024
DRAWING No.: DP-1

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO THE ADJOINING LANDS ARE CORRECTLY SHOWN.

DATED

(ONTARIO LAND SURVEYOR)
ANNIS O'SULLIVAN VOLLEBEKK LTD.

OWNER'S CERTIFICATE

I, 13165647 CANADA INC., BEING THE REGISTERED OWNER, HEREBY AUTHORIZE ADVANCE ENGINEERING TO PREPARE AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION TO THE COUNTY OF LANARK FOR REVIEW AND APPROVAL.

DATED

FOR 13165647 CANADA INC.
ASH SHARMA

SUBJECT TO THE CONDITIONS, IF ANY SET FORTH IN MY LETTER

DATED ...., 202 ,

THIS DRAFT PLAN IS APPROVED BY THE COUNTY OF LANARK

UNDER SECTION 51 OF THE PLANNING ACT THIS .... DAY

OF ...., 202 .

KURT GREAVES – CAO
COUNTY OF LANARK

TABLE OF BLOCKS

BLOCK No.	AREA (m²)	DESCRIPTION
1	241.56	ADELAIDE ST WIDENING
2	236.60	AUGUSTA ST WIDENING
3	910.10	2 SEMI–DETACHED
4	682.05	2 SEMI–DETACHED
5	671.15	2 SEMI–DETACHED
6	659.87	2 SEMI–DETACHED
7	793.85	2 SEMI–DETACHED
8	1431.04	2 SEMI–DETACHED
9	647.64	2 SEMI–DETACHED
10	646.76	2 SEMI–DETACHED
11	645.94	2 SEMI–DETACHED
12	645.12	2 SEMI–DETACHED
13	638.06	2 SEMI–DETACHED
14	638.11	2 SEMI–DETACHED
15	638.16	2 SEMI–DETACHED

BLOCK No.	AREA (m²)	DESCRIPTION
16	638.21	2 SEMI–DETACHED
17	835.30	2 SEMI–DETACHED
18	587.74	2 SEMI–DETACHED
19	540.11	2 SEMI–DETACHED
20	540.11	2 SEMI–DETACHED
21	587.74	2 SEMI–DETACHED
22	1014.60	4 TOWNHOUSES
23	1232.10	5 TOWNHOUSES
24	1019.10	4 TOWNHOUSES
25	1236.60	5 TOWNHOUSES
26	173.93	6M PATHWAY / UTILITY
27	1130.81	STORMWATER FACILITY
28	1549.76	RIPARIAN AREA
29	7212.86	R–O–W–

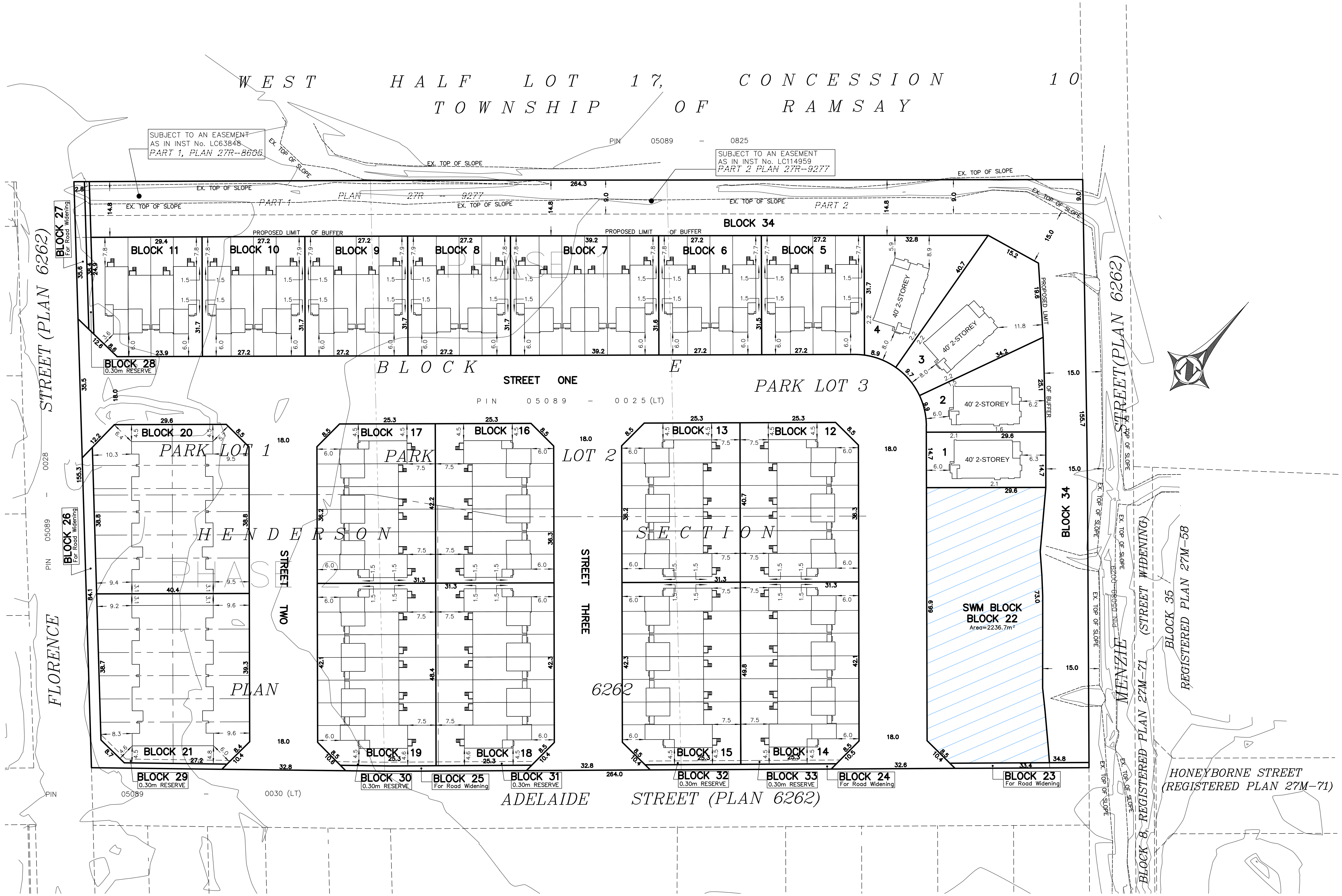
ZONING TYPE	UNITS	AREA (ha)	RATIO LD & MD	DENSITY PER NET ha	REQUIRED DENSITY	TOTAL UNITS	DENSITY PER NET ha	DENSITY PER GROSS ha
MEDIUM DENSITY (TOWNHOUSES R3C)	18	0.4502	25.2%	40.0	30-40	56	31.3	19.70
LOW DENSITY (SEMI-DETACHED R2D)	38	1.3377	74.8%	28.4	15-30			
			100.0%					

TOTAL NET AREA (ha): 1.7879
TOTAL GROSS AREA (ha): 2.8425 Including R-O-Ws, Riparian and STM Facility

MEDIUM DENSITY (TOWNHOUSES)	18	32%
LOW DENSITY (SEMI)	38	68%

CONTENT REQUIRED UNDER SECTION 51 (17) OF THE PLANNING ACT, R.S.O.1990:

(17) The applicant shall provide the approval authority with the prescribed information and material and as many copies as may be required by the approval authority of a draft plan of the proposed subdivision drawn to scale and showing,
(a) the boundaries of the land proposed to be subdivided, certified by an Ontario land surveyor; AS SHOWN ON THE DRAFT PLAN.
(b) the locations, widths and names of the proposed highways within the proposed subdivision and of existing highways on which the proposed subdivision abuts; AS SHOWN ON THE DRAFT PLAN.
(c) on a small key plan, on a scale of not less than one centimetre to 100 metres, all of the land adjacent to the proposed subdivision that is owned by the applicant or in which the applicant has an interest, every subdivision adjacent to the proposed subdivision and the relationship of the boundaries of the land to be subdivided to the boundaries of the township lot or other original grant of which the land forms the whole or part; AS SHOWN ON THE DRAFT PLAN.
(d) the purpose for which the proposed lots are to be used; RESIDENTIAL: SEMI–DETACHED AND TOWNHOUSE BLOCKS, ONE BLOCK FOR A STORMWATER MANAGEMENT FACILITY AND TWO BLOCKS FOR FUTURE ROAD EXTENSION AS SHOWN ON THE DRAFT PLAN.
(e) the existing uses of all adjoining lands; EXISTING RESIDENTIAL TO THE WEST, VACANT LAND TO THE NORTH AND RESIDENTIAL BEYOND SPRING CREEK EAST AND SOUTH AS SHOWN ON THE DRAFT PLAN.
(f) the approximate dimensions and layout of the proposed lots; AS SHOWN ON THE DRAFT PLAN.
(a.1) if any affordable housing units are being proposed, the shape and dimensions of each proposed affordable housing unit and the approximate location of each proposed affordable housing unit in relation to other proposed residential units; N/A
(g) natural and artificial features such as buildings or other structures or installations, railways, highways, watercourses, drainage ditches, wetlands and wooded areas within or adjacent to the land proposed to be subdivided; SPRING CREEK ON EAST AND SOUTH SIDE OF DEVELOPMENT AS SHOWN ON THE DRAFT PLAN. PROVIDE 15 m BUFFER FOR FISH HABITAT ALONG THE CREEK.
(h) the availability and nature of domestic water supplies; AVAILABLE VIA MUNICIPAL WATERMAIN AT ADELAIDE ST AND MENZIE ST.
(i) the nature and porosity of the soil; LAYER OF TOPSOIL AND/OR PEAT (0.1 TO 0.4 m) UNDERLAIN BY MARL (0.4 TO 0.8 m) AND/OR A GLACIAL TILL DEPOSIT (0.1 TO 0.7 m). BEDROCK AT DEPTHS RANGING BETWEEN 0.3 AND 1.1 m.
(j) existing contours or elevations as may be required to determine the grade of the highways and the drainage of the land proposed to be subdivided; AS SHOWN ON THE DRAFT PLAN.
(k) the municipal services available or to be available to the land proposed to be subdivided; SANITARY SEWER, WATER SUPPLY ARE AVAILABLE ACCORDING TO THE MUNICIPAL MASTER PLAN. BELL, HYDRO AND GAS ARE ALSO IN THE IMMEDIATE AREA and
(l) the nature and extent of any restrictions affecting the land proposed to be subdivided, including restrictive covenants or easements. 15 m SETBACK ALONG THE SPRING CREEK.



SKETCH TO ILLUSTRATE A SUBDIVISION CONCEPT PLAN OF ALL OF

PARK LOTS 1, 2 & 3 BLOCK E, HENDERSON SECTION PLAN 6262

MUNICIPALITY OF MISSISSIPPI MILLS

COUNTY OF LANARK

EGIS SURVEYING INC

SCALE 1 : 500

0 10 20 30 40 50 Metres

METRIC :

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

Hannan Hills – Concept Plan Information

	PHASE 1	PHASE 2	TOTAL
UNITS	60	50	110
TOTAL AREA (Ha)	3.02	1.12	4.14
TOTAL RESIDENTIAL AREA (Ha)	1.46	0.91	2.37
NET DENSITY	41.09	54.94	46.41
GROSS DENSITY	19.87	44.64	26.57

SETBACKS:

FRONT YARD = 6m
REAR YARD = 7.5m
INTERIOR SIDEYARD = 1.2m
EXTERIOR SIDEYARD = 4.5m

JOB No. 24-2594	DRAWING: 24-2594 Concept Plan_V16
THIS PLAN WAS PREPARED FOR: THOMAS CAVANAGH CONSTRUCTION LTD.	

egis SURVEYING INC.
info.north-america@egis-group.com
www.egis-group.com
3240 Drummond Con. 5A, R.R. #7
Perth, ON K7H 3C9
Tel: 613-267-6524 Fax: 613-267-7992

EXAMINED:	CAD: MP

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

SOURCE REFERENCE:
Hannan Hills Concept Plan: *24-2594 Concept Plan_V14*
EGIS Surveying Inc.
Legal Plan: *24-2594 Draft Plan of Subdivision_V3*
EGIS Surveying Inc.
Menzie Enclaves Concept Plan: *Menzie Enclaves Subdivision - Draft Plan of Subdivision Option 3, Advance Engineering Ltd.*
Topographic Survey: *Topographic Information by Novatech (2021)*

No.	REVISION	DATE	BY
4.	REVISED PER COMMENTS	MAY 27/25	ARM
3.	ISSUED WITH SERVICEABILITY AND CSWM REPORT	JUN 12/24	ARM
2.	ISSUED WITH DEVELOPMENT COST ESTIMATE	MAR 12/24	MNP
1.	ISSUED WITH SERVICEABILITY AND CSWM REPORT	MAY 20/21	ARM

SCALE 1:500

DESIGN MNP
CHECKED AAR
DRAWN MNP
CHECKED AAR
APPROVED ARM

FOR REVIEW ONLY

NOVATECH
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Website www.novatech-eng.com

LOCATION
MUNICIPALITY OF MISSISSIPPI MILLS
HANNAN HILLS SUBDIVISION

DRAWING NAME
PRELIMINARY GRADING AND SERVICING PLAN

PROJECT No. 118201-00
REV # 4
DRAWING No. 118201-PGS

M:\2018\118201\CAD\Design\118201-CGS.dwg, PGS, May 27, 2025 - 3:17pm, mblanton