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39 Years

3200 Reid's Lane Subdivision

Conceptual Servicing and Stormwater Management Report

Prepared for: Crestview Innovation Inc.

Engineering excellence. Planning progress. Liveable landscapes.

CONCEPTUAL SERVICING AND STORMWATER MANAGEMENT REPORT

3200 REID'S LANE SUBDIVISION

CITY OF OTTAWA

Prepared by:

NOVATECH
240 Michael Cowpland Dr. Suite 200
Ottawa, Ontario
K2M 1P6

Revised November 2024
Revised June 2023
September 2021

Novatech File No.: 119089
Report Reference No.: R-2021-060

NOVATECH
Engineers, Planners & Landscape Architects

November 21, 2024

BY EMAIL

City of Ottawa
Development Review, Planning, Real Estate and
Economic Development Department
110 Laurier Ave. West, 4th Floor
Ottawa ON, K1P 1J1

Attention: Kevin Hall, C.E.T., Senior Project Manager

Re: Conceptual Servicing and Stormwater Management Report
Reid's Lane Subdivision
Response to Comments
Our File No.: 119089

Please find enclosed the revised "*Conceptual Servicing and Stormwater Management Report – Reid's Lane Subdivision*" dated November 2024, prepared in support of an application for Draft Plan Approval.

This report has been updated based on comments received from the City of Ottawa (July 31, 2023) and the Rideau Valley Conservation Authority (August 2, 2023). The comments are included in **Appendix A**.

A copy of this report has been forwarded directly to the Rideau Valley Conservation Authority.

Yours truly,

NOVATECH

Lisa Bowley, P. Eng.
Senior Project Manager
Land Development Engineering

Encl.

cc: Rideau Valley Conservation Authority
Crestview Innovation Inc.

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

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MODELLING FILES

Available upon request: Stormwater Management Modelling Files (PCSWMM)

1.0 INTRODUCTION

Novatech has been retained to provide a conceptual servicing and stormwater management report in support of an application for Draft Plan Approval for the proposed Reid's Lane subdivision.

1.1 Purpose

This report outlines the approach to servicing the development with regards to water supply, sanitary disposal, storm drainage and stormwater management. A pre-consultation meeting was held with the City of Ottawa in May 2019. Pre-consultation notes (May 16, 2019, and May 28, 2019) are included in **Appendix A** for reference.

This report has been updated based on comments received from the City of Ottawa (July 31, 2023) and the Rideau Valley Conservation Authority (August 2, 2023). The comments are included in **Appendix A**.

1.2 Site Location and Description

The Subject Property is located in the City of Ottawa. The subdivision lands are legally described as Part of Lots 27 & 28, Concession 1, Osgoode, and Part of Lots 50 & 51, Registered Plan 393, Ottawa. The property includes a portion of an adjacent eastern parcel that has been used historically as an informal walking trail connecting Osgoode Main Street and Lombardy Drive. The adjacent eastern parcel is legally described as Part of Lot 28, Concession 1, being parts 3 and 4 on Plan 5R1527, Osgoode. Refer to **Figure 1** for the site location.

The subdivision has approximately 22-metres of frontage along Lombardy Drive, and an approximate area of 3.54hectares (8.75acres). The property is vacant and located north of existing residential properties fronting onto Osgoode Main Street. Refer to **Figure 2** for existing site conditions.

1.3 Additional Reports

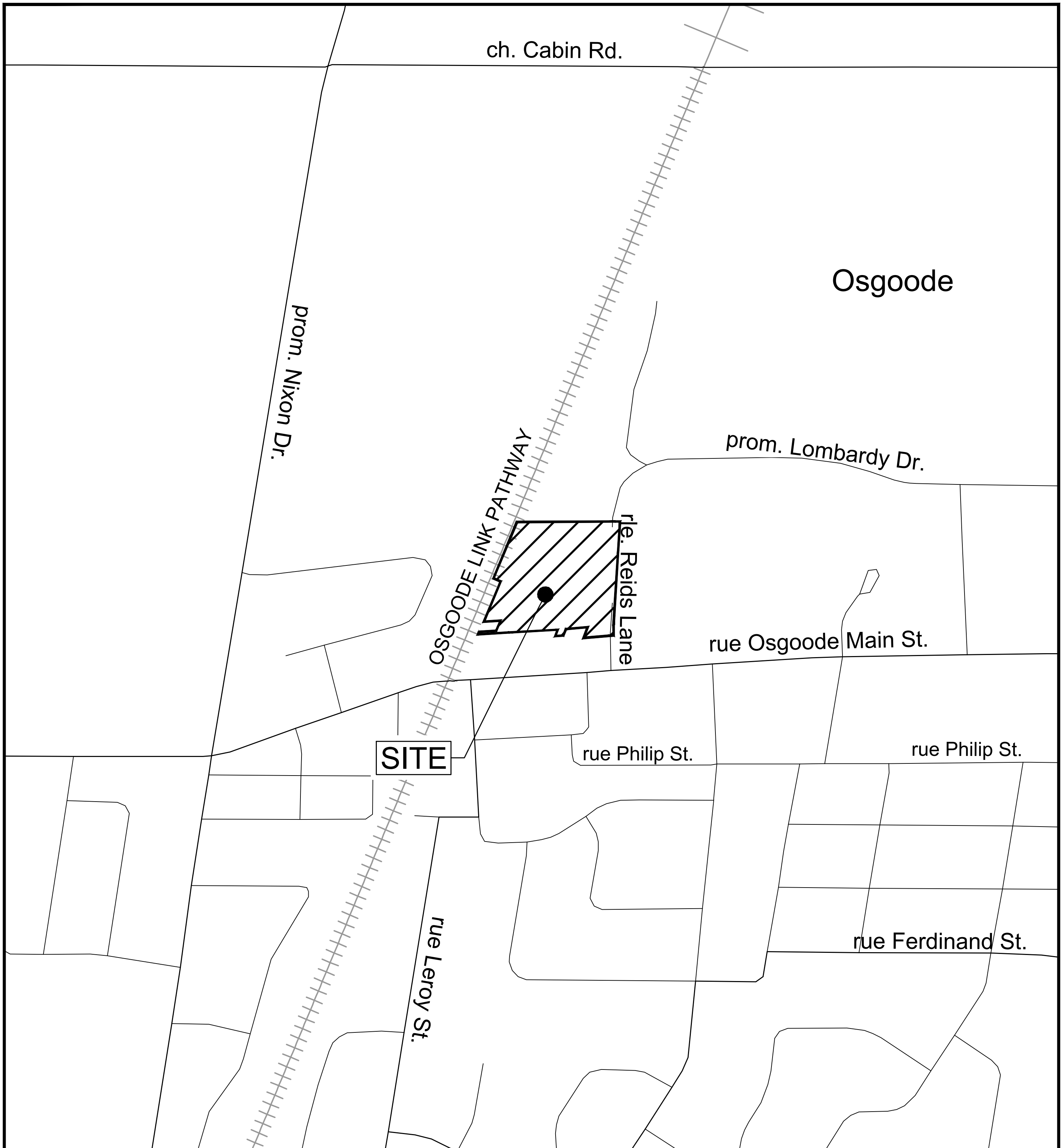
This report should be read in conjunction with the following reports:

- Tree Conservation Report and Environmental Impact Statement - Updated prepared by Muncaster Environmental Planning Inc., dated July 19, 2024;
- Hydrogeological Investigation and Terrain Evaluation prepared by Kollaard Associates, revision 2, dated June 12, 2024.

2.0 SITE SERVICING

The proposed development would extend Lombardy Drive approximately 240m from the existing cul-de-sac and would create seven residential lots with a minimum lot size of 0.4ha (1 acre). The proposed lots would front onto a proposed internal roadway (Lombardy Drive extension). Refer to the Preliminary Grading & Site Servicing Plan **(119089-PGR)** for the Typical Road Cross-Section of the proposed internal roadway.

The proposed lot layout is shown on the Draft Plan of Subdivision included with this report.



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REID'S LANE SUBDIVISION

KEY PLAN

SCALE 1 : 5000 (0 50 100 150 200)		
DATE NOV 2024	JOB 119089	FIGURE 1

SHT8X11.DWG - 216mmx279mm

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REID'S LANE SUBDIVISION

EXISTING CONDITIONS

SCALE 1 : 1250 (0 10 20 30 40 50)			
DATE NOV 2024	JOB 119089	FIGURE 2	

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2.1 Grading and Drainage

The proposed grading would have minimum slopes, where possible. The tree retention areas suggested in the Tree Conservation Report and Environmental Impact Statement would remain in a natural state.

Preliminary road grades are shown on the Preliminary Grading & Site Servicing Plan (**119089-PGR**).

2.2 Water Supply and Sewage Disposal

The proposed residential lots would be serviced by individual drilled wells. Discussion of the water supply is provided in the Hydrogeological Investigation and Terrain Evaluation prepared by Kollaard.

Sanitary servicing for the proposed residential dwellings would be provided by individual on-site septic systems. Preliminary septic system locations and recommendations regarding construction of the septic systems have been provided in the Hydrogeological Investigation and Terrain Evaluation. Applications for approvals of the septic systems would be made by individual homeowners at the building permit stage.

Conceptual locations of the well and septic systems are shown on the Lot Development Plan provided in the Kollaard report, for all proposed lots within the subdivision.

3.0 STORMWATER MANAGEMENT CRITERIA

The following criteria will be applied to the stormwater management analysis and conceptual design.

Water Quantity

- Control post-development peak flows to pre-development levels.

Conveyance

- Road and driveway culverts are to be designed to convey the anticipated post-development peak flows:
  - Road crossing culverts are to have a minimum size of 600mm and are to be sized for the 10-year event.
  - Driveway culverts are to have a minimum size of 400mm and are to be sized for the 5-year event.
- Storm drainage is to be provided using roadside ditches and side/rearyard drainage swales:
  - Storm runoff for all storms up to and including the 100-year event is to be confined within the right-of-ways or within defined drainage easements.

Water Quality

- Implement lot level and conveyance Best Management Practices.
- Provide an *Enhanced* level of water quality protection, corresponding to a long-term average total suspended solid (TSS) removal rate of 80%.

Flood Protection

- Ensure the proposed residential lots are adequately protected from surface flooding during the 100-year storm event.
- Ensure there are no adverse surface flooding effects on existing downstream residential lots during the 100-year storm event.

Erosion and Sediment Control

- Provide temporary and permanent erosion and sediment control measures prior to, during and after construction.

4.0 STORMWATER MANAGEMENT DESIGN

Pre-development and post-development drainage areas were developed to assess the stormwater management design requirements for the subject site. The Storm Drainage Area Plan (**119089-STM**) shows the catchment areas for both pre and post-development conditions.

As described by Kollaard, the soils on the site consist of topsoil underlain by fine to medium grained sand overlying silty clays or glacial tills.

In a previous submission of the Conceptual Servicing and Stormwater Management report (September 2021), the majority of the runoff in the post-development condition was directed to the Lombardy Drive roadside ditches. This design results in post-development flows from the overall site being lower than pre-development flows, however, there was an increase in flows directed to the Lombardy Drive roadside ditches. This raised concerns for the capacity of the roadside ditches along Lombardy Drive and the potential for impacts further downstream.

This design approach has been revised to result in no increase in flows to either site outlet (Lombard Drive roadside ditches or Osgood Link Pathway ditch), as discussed below.

Pre-development conditions

Under pre-development conditions, all storm runoff from the site is tributary to the Doyle Creek Municipal Drain and ultimately the Rideau River.

- The west portion of the site (area EX-1) drains to an existing ditch along the Osgoode Link Pathway
- The east portion of the site (area EX-2) drains to the Lombardy Drive roadside ditches

Storm runoff from both catchment areas (EX-1 and EX-2) is conveyed north by existing drainage ditches to the main branch of the Doyle Creek Municipal Drain.

Post-development conditions

Under post-development conditions, the drainage of the proposed development has been designed to closely match pre-development conditions. The west portion (4.41 ha) of the developed area of the subdivision will drain to the Osgoode Link Pathway and runoff will be controlled to pre-development levels through a dry pond and outlet structure. The outlet of the dry pond will be conveyed under the Osgoode Link Pathway via a proposed culvert to the west ditch across the pathway. This ditch will convey flows to Nixon Drive roadside ditch and connect into the Doyle Creek Municipal Drain.

The east portion (0.34 ha) of the subdivision will drain uncontrolled to the Lombardy Drive roadside ditches. The uncontrolled flows to the Lombardy Drive roadside ditches will be lower than pre-development flows. The two drainage outlets are shown on **Figure 3**.

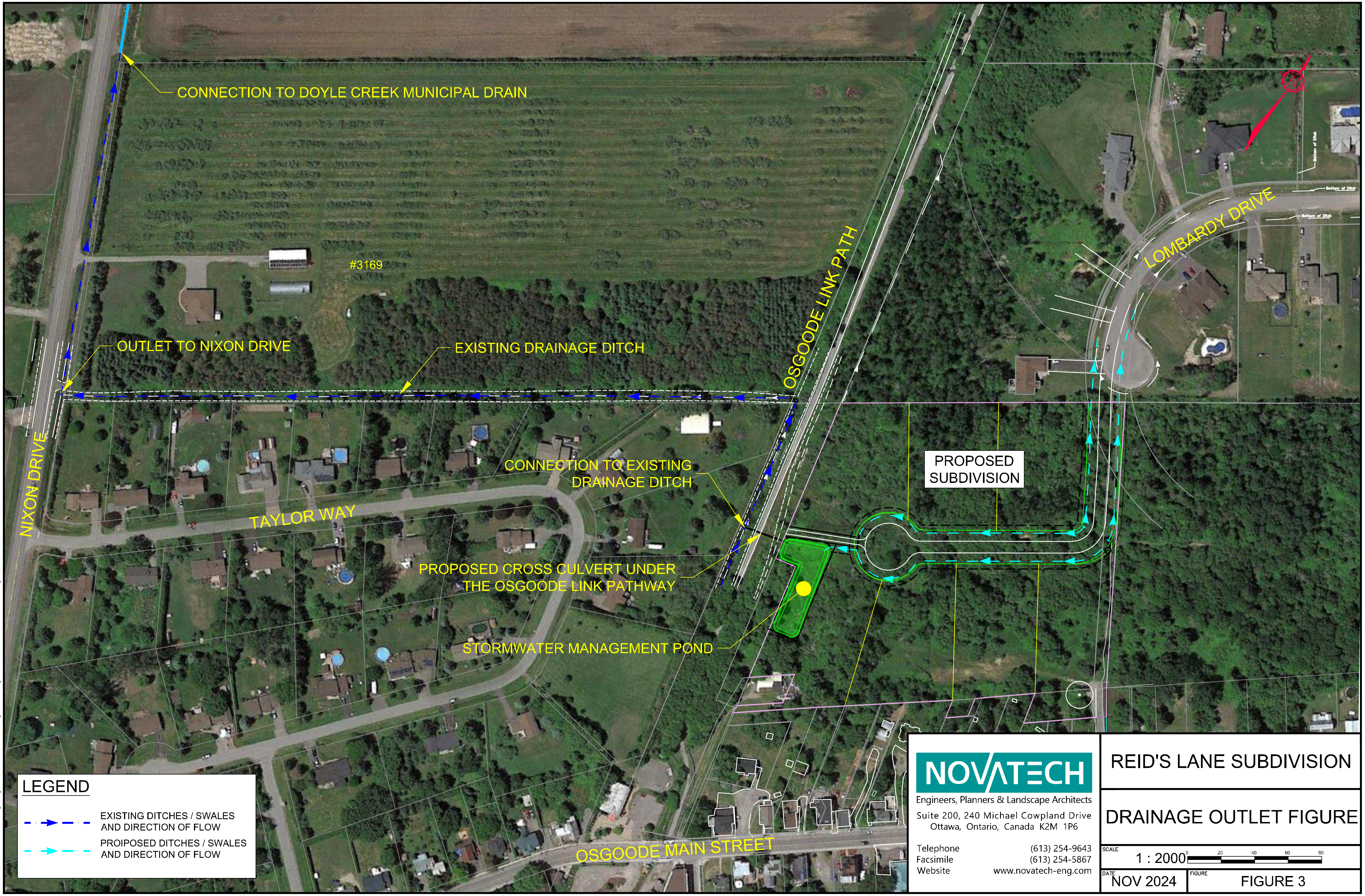
4.1 Model Parameters

The proposed rural subdivision was modelled using NASH instantaneous unit hydrograph (IUH) Alternate Runoff Method (ARM) subcatchments in PCSWMM. The ARM subcatchments generate a more conservative runoff volume from more pervious drainage areas. Due to the pre-development area being forested and the post-development conditions having large lots and tree protection areas, it was concluded that NASH IUH ARM subcatchments would be appropriate for the pre- and post-development PCSWMM models.

The time of concentration for each drainage area was calculated using the Uplands Overland Flow Method. Weighted curve numbers were calculated for each drainage area. The times of concentration, curve numbers and initial abstraction values are summarized in **Table 1**. The curve numbers are shown on the Storm Drainage Area Plan.

Table 1 – Weighted Curve Numbers

Area ID	Area (ha)	Time of Concentration (min)	CN	I_a
Pre-Development				
EX-1	3.31	16	59	13.9
EX-2	1.44	15	62	12.5
Post-Development				
A	1.18	15	65	11.6
B	0.40	15	59	13.5
C	0.18	15	59	13.5
D	0.56	15	62	12.5
E	0.48	15	69	10.4
F	0.23	15	66	11.1
G	0.11	15	68	10.5
H	0.42	15	63	12.2
EX-1	0.23	15	72	7.4
EX-2	0.48	15	75	6.4
EX-3	0.48	15	72	7.4



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4.2 Water Quantity Control

Peak flows for both pre and post-development conditions were evaluated using the PCSWMM model. Storm runoff from the subdivision will increase under post-development conditions due to an increase in imperviousness (i.e. roads, houses and driveways).

Under post-development conditions, the peak flow from the west portion of the site would be controlled by using a stormwater management dry pond with a flow control structure outletting to the Osgoode Link Pathway. A 500mm diameter culvert with a 0.5% slope will have the capacity to convey the peak runoff from the dry pond under the Osgoode Link Pathway. The ditch that will convey the runoff to the Nixon Drive roadside ditch and connect into the Doyle Creek Municipal Drain has adequate capacity for the peak flows from the controlled pond. A profile of the proposed culvert and cross-sections of the Osgoode Link Pathway ditch can be found on the Stormwater Management Pond Facility plan (**119089-SWMF**) and the Preliminary Grading & Site Servicing Plan (**119089-PGR**).

Additional quantity control, upstream of the dry pond, will be provided by 400mm diameter driveway culverts, which are smaller than the City of Ottawa minimum size of 500mm diameter. The driveways will not overtop in the 100-year storm event even with the smaller culverts and the flows will be contained within the 0.60m deep ditches.

The drainage areas that outlet to the Lombardy Drive roadside ditches has been reduced so that the post-development runoff is less than pre-development levels and therefore, no stormwater quantity control is required for this outlet.

Refer to **Appendix B** for supporting stormwater management calculations and model output. Digital PCSWMM modelling files are available upon request with this submission.

<u>Peak Flows</u>

Pre and post-development peak flows are summarized in **Table 2**.

- The 12-hour SCS storm event generated larger peak flows for both pre and post-development conditions, and results in the maximum storage required within the dry pond and roadside ditches.
- The sizing of the flow control structure was governed by the 24-hour SCS storm event due to a larger volume of runoff and lower pre-development peak flows than the other modelled design storms.

Table 2 demonstrates that the post-development flows to both Osgoode Link Pathway ditch and Lombardy Drive roadside ditches would be lower than pre-development levels for all storm events.

Table 2 – Peak Flows (L/s)

Storm Distribution->		4hr Chicago	3hr Chicago			12hr SCS			24hr SCS		
Return Period->		**25mm**	**2yr**	**5yr**	**100yr**	**2yr**	**5yr**	**100yr**	**2yr**	**5yr**	**100yr**
Osgoode Link Pathway	*Pre*	4	13	36	154	24	58	191	26	52	152
	Post [1]	16	38	92	314	63	124	352	56	102	265
	Post [2]	5	12	30	127	20	48	161	21	47	151
Lombardy Drive	*Pre*	2	8	21	81	14	31	96	14	27	74
	Post [1]	1	3	7	36	4	9	44	4	8	28
Total	*Pre*	6	21	57	235	38	89	287	40	79	226
	Post	6	15	37	163	24	57	205	25	55	179

[1] Uncontrolled flow
[2] Controlled flow

<u>Outlet to Osgoode Link Pathway Ditch</u>

The conceptual PCSWMM model indicates that the stormwater management dry pond in addition to the proposed roadside ditches would provide storage to contain the runoff from all storms up to and including the 100-year event. The post-development peak flows would be controlled by a flow control structure at the outlet of the dry pond.

A brief description of the dry pond layout is as follows:

- Pond Bottom = 90.40m
- Top of Pond = 91.00m
- Total Depth = 0.60m
- Total Available Volume = 435 m^3

The 100-year 24-Hour SCS storm event produces the maximum pond storage volume:

- 100-year Elevation = 90.91m
- 100-year Depth = 0.51m
- 100-year Volume = 360 m^3
- 100-year Outflow = 114 L/s

The control structure would be located on the west side of the dry pond at the outlet, with access from Block 8. The outlet structure will consist of a compound weir. The emergency overflow spillway will be incorporated into the compound weir and would provide relief for storm events exceeding the 100-year event. The compound weir consists of the following stages:

- Low Flow (2-year)
  - Invert = 90.40m
  - Width = 0.09m
- High Flow (100-year)
  - Invert = 90.55m
  - Width = 0.26m
- Emergency Spillway
  - Invert = 90.92m
  - Width = 5.0m
  - Side slopes = 5H:1V

The location of the dry pond is shown on the Preliminary Grading & Site Servicing Plan (**119089-PGR**). The details on the design of the dry pond and flow control structure are provided on the Stormwater Management Pond Facility plan (**119089-SWMF**).

In addition to the proposed dry pond and control structure, Best Management Practices (BMPs) and Low Impact Development (LIDs) practices (refer to **Section 4.6**) would further reduce the post-development runoff. These practices are not typically modelled during the conceptual design stage but could be added to the modelling during detailed design.

Outlet to Lombardy Drive Roadside Ditches

The conceptual PCSWMM model shows that the uncontrolled post-development runoff to the Lombardy Drive roadside ditches is below the pre-development peak flows for all storm events. No controls are required or proposed for the outlet to the Lombardy Drive roadside ditches. The proposed roadside ditches would convey the 100-year flows from the site between the east and west ditches.

4.3 Water Quality Control

The Rideau Valley Conservation Authority has indicated that an *Enhanced* level water quality control (corresponding to a long-term average TSS removal rate of 80%) is required for this subdivision. Quality control for the right-of-way and the front yard areas of the residential units would be provided by a combination of lot level "Best Management Practices" (BMPs) and conveyance controls.

Lot level BMPs would include minimizing grade changes on the lots, minimizing the disturbed area on each lot and encouraging builders to direct roof leaders to grassed areas. These practices would promote infiltration and reduce surface runoff. A treatment train approach of these BMP measures in addition to the dry pond and the grassed ditches would provide adequate treatment of the runoff. The proposed subdivision would be located on a cul-de-sac and would receive local traffic, reducing pollutant loading from the roadways. The large lots and minimal disturbance to the lots would also reduce the sediment loading from the development.

4.3.1 Dry Pond Design Criteria

As per Table 3.2 of the "*Stormwater Management Planning and Design Manual*" (MOE, March 2003), dry pond can provide 60% TSS removal. A drainage area that is 35% impervious (the proposed development is less than 35% impervious) would require 90 m^3/ha of storage. This would be a required storage volume of 428 m^3, which is less than the available pond storage. Table 4.8 of the "*Stormwater Management Planning and Design Manual*" (MOE, March 2003) requires a drawdown time between 24 to 48 hours for sediment settling. The 25mm event would drawdown over the course of 24 hours, providing time for sediments to settle out of the stored volume.

4.3.2 Grassed Swale Design Criteria

The roadside ditches would be designed as water quality swales, using criteria outlined in section 4.5.9 of the "*Stormwater Management Planning and Design Manual*" (MOE, March 2003). The design criteria used is summarized in **Table 3**.

Table 3 – Water Quality Design Criteria for Grassed Swales

Criteria	Recommended	Provided
Drainage Area	< 2.0 ha	0.11 – 1.2 ha
Channel Slope	< 4.0%	0.5% - 1.0%
Bottom Width	> 0.75 m	1.0m
Side Slopes (H:V)	> 2.5:1	3:1
25mm Event (Water Quality)		
Velocity	< 0.5 m/s	< 0.5 m /s in ditches (0.5 - 0.6 m/s through culverts)

Although grassed ditches and swales are generally used for the conveyance of storm water, under the appropriate conditions they permit significant amounts of total suspended solid (TSS) removal. Grassed ditches are effective for treatment when the bottom width is maximized while the depth of flow and channel slope is minimized.

Grassed Swale Design (Roadside Ditches)

All ditches projected to drain the roadway and upstream external areas meet the criteria listed in **Table 3**. The PCSWMM model results indicate that the peak flows generated by the 25mm storm event (water quality event) would have a maximum velocity less than 0.5m/s in the ditches.

The MOE Manual states that "*Grassed swales are most effective for stormwater treatment when depth of flow is minimized, bottom width is maximized (≥ 0.75 m) and channel slope is minimized (e.g., ≤ 1%)*". The depth of flow in the ditches during the 25mm event would range from 0 to 0.15m. Most of the ditch length would have a flow depth of less than 0.1m. The larger flow depths would occur at the upstream side of driveway culvert crossings and at the inlet to the proposed dry pond. The ditch bottom width would be 1.0m and the channel slope would be 0.5%.
Water quality calculations for each ditch would be provided as part of the detailed design submission. The conceptual model results demonstrate that it would be feasible to design the proposed ditches and swales to provide an *Enhanced* level of water quality treatment for the site.

Maintenance and Effectiveness

Case studies on the effectiveness of grassed ditches and swales for water quality control have provided variable results, which precludes the ability to precisely calculate pollutant removal efficiencies. However, the above referenced publications indicate that properly designed grassed channels can provide in excess of 80% long-term TSS removal, which will meet the requirements for an *Enhanced* level of quality control as per the MOE guidelines.

Both dry and wet swales demonstrate good pollutant removal, with dry swales providing significantly better performance for metals and nitrate. Dry swales typically remove 65 percent of total phosphorus (TP), 50 percent of total nitrogen (TN), and between 80 and 90 percent of metals. Wet swale removal rates are closer to 20 percent of TP, 40 percent of TN, and between 40 and 70 percent of metals. The total suspended solids (TSS) removal for both swale types is typically between 80 and 90 percent.[1]

[1] *Stormwater Best Management Practices in an Ultra-Urban Setting: Selection and Monitoring (FHWA, 1996) http://www.fhwa.dot.gov/environment/ultraurb/3fs10.htm*

The majority of contaminants would come from the right-of-way. Storm runoff from grassed areas does not typically require any quality treatment. The site grading and drainage system would be designed to minimize the drainage area to the roadside ditches and individual outlets to provide the requisite level of treatment. Treatment is based on the flow characteristics of the water quality storm event (25mm storm), namely the flow depth and velocity. The other recommended criteria in **Table 3** form recommended physical characteristics for a given swale based on a 35% catchment area imperviousness to achieve those flow characteristics. It is equally worth noting that the proposed site is substantially less impervious than the 35% which was used to populate the recommended physical design criteria for the grassed swale, therefore, TSS loading is anticipated to be quite low.

4.4 Flood Protection

The following items would be evaluated at the detailed design stage:

- The proposed roadside ditches/easements would be designed to convey runoff for storm events up to and including the 1:100 year event.
- Road and driveway culverts would be sized to minimize potential flooding of private property for all storms up to the 1:100 year event.
- All required quantity control storage would be provided in the roadside ditches and would be confined in the right-of-way and/or adjacent easements.
- Terrace elevations would be set a minimum of 0.3m above the 1:100year ponding elevation.

4.5 Erosion and Sediment Control

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). These measures are generally in conformance with the recommendations from the Environmental Impact Statement. An Erosion and Sediment Control drawing would be prepared at the detailed design stage.

4.5.1 Temporary Measures

- Installing silt fences;
- Installing a series of rock flow check dams at the outlet(s) from the site; and
- Conducting regular street sweeping once the roads are completed.

The proposed temporary erosion and sediment control measures would be implemented prior to construction, would remain in place throughout each phase of construction and would be inspected regularly. Design drawings would indicate that no control measure be permanently removed without prior authorization from the Engineer.

4.5.2 Permanent Measures

- Swales and roadside ditches constructed at minimum grade, where possible;
- Seeding disturbed areas and establishing grass growth; and
- Roadside ditches acting as water quality swales.

4.6 Best Management Practices and Low Impact Development

In addition to stormwater management measures designed to meet the quantity and quality control criteria for the subdivision, additional best management practices (BMPs) and low impact development practices (LIDs) should be considered where feasible. Lot-level and conveyance stormwater BMPs and LIDs can potentially increase infiltration throughout the site, and help to preserve the natural hydrologic cycle, recharge groundwater reserves, reduce runoff volumes and peak flows, and further promote the removal of pollutants from the site.

Most LIDs require periodic inspection and maintenance. As such, the selection of appropriate LIDs requires careful consideration of site conditions (soil type, groundwater table, existing and proposed land use, maintenance requirements) to ensure they will provide a long-term benefit to the proposed development.

The preliminary geotechnical investigation shows that there is a shallow depth to groundwater, making BMPs and LIDs unlikely to infiltrate effectively. BMPs and LIDs could still provide some infiltration and runoff improvements to the proposed development. The evaluation and selection of LIDs would be further refined during the detailed design process.

Maintenance of LID infrastructure in right-of-way would be the responsibility of the City, while LIDs and BMPs on private property would be the responsibility of the homeowner.

5.0 WATER BALANCE

The proposed subdivision will consist of residential lots. Proposed BMPs and LIDs are discussed in **Section 4.6**.

By implementing infiltration BMPs and LIDs as part of the storm drainage design, the impacts of development on the hydrologic cycle can be considerably reduced. In addition, infiltration of clean runoff will also benefit the stormwater management. There are currently no infiltration targets set for the site.

A water budget was performed which is included in **Appendix C**. The water budget estimates the post-development annual infiltration will be 189mm, which is a 24mm decrease from the existing conditions estimate of 213mm. The water budget calculations are based on land use and the implementation of BMPs within the proposed development will provide additional infiltration and an improved water balance. The evaluation and selection of BMPs and LIDs would be completed during the detailed design process.

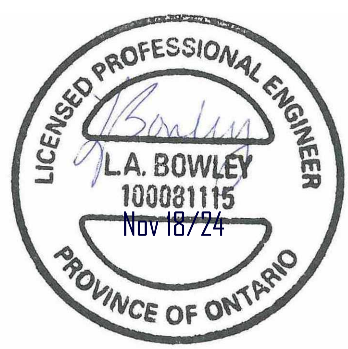
6.0 CONCLUSIONS

The conclusions are as follows:

- Servicing for residential dwellings would be provided by individual wells and septic systems.
- Stormwater quantity control measures would result in post-development peak flows below pre-development flows for the site.
  - Quantity control for flows directed to the Osgoode Link Pathway ditch would be provided by a dry pond and an outlet control structure.
  - By reducing the drainage area to Lombardy Drive roadside ditches under post-development conditions, the post-development runoff would be less than pre-development levels and no controls would be required.
- Stormwater quality control measures would provide an Enhanced level of water quality protection, corresponding to a long-term average TSS removal rate of 80%, by means of flat-bottomed roadside ditches which would act as water quality swales.
- Flood protection would be provided with 100-year storm runoff being contained within the roadside ditches. Terrace elevations would be set a minimum of 0.3m above the 1:100year ponding elevation.
- Erosion and sediment control would be provided both during construction and on a permanent basis.
- Best management practices and low impact development practices would be considered as part of the detailed design.
- The water balance shows that the proposed development would result in a 24mm decrease in infiltration.

NOVATECH

Prepared by:



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Lisa Bowley, P. Eng.
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Nov 18, 2024
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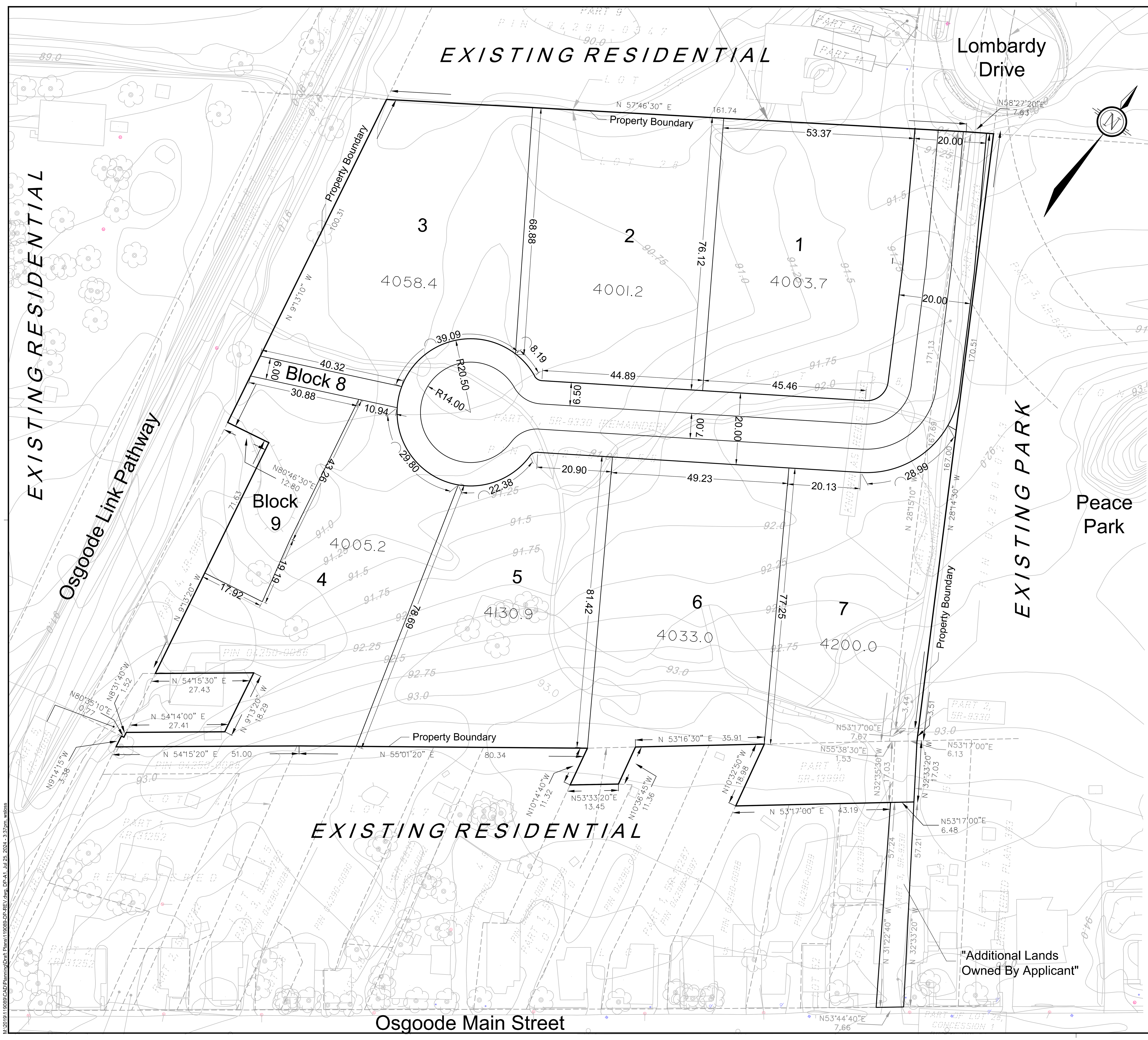
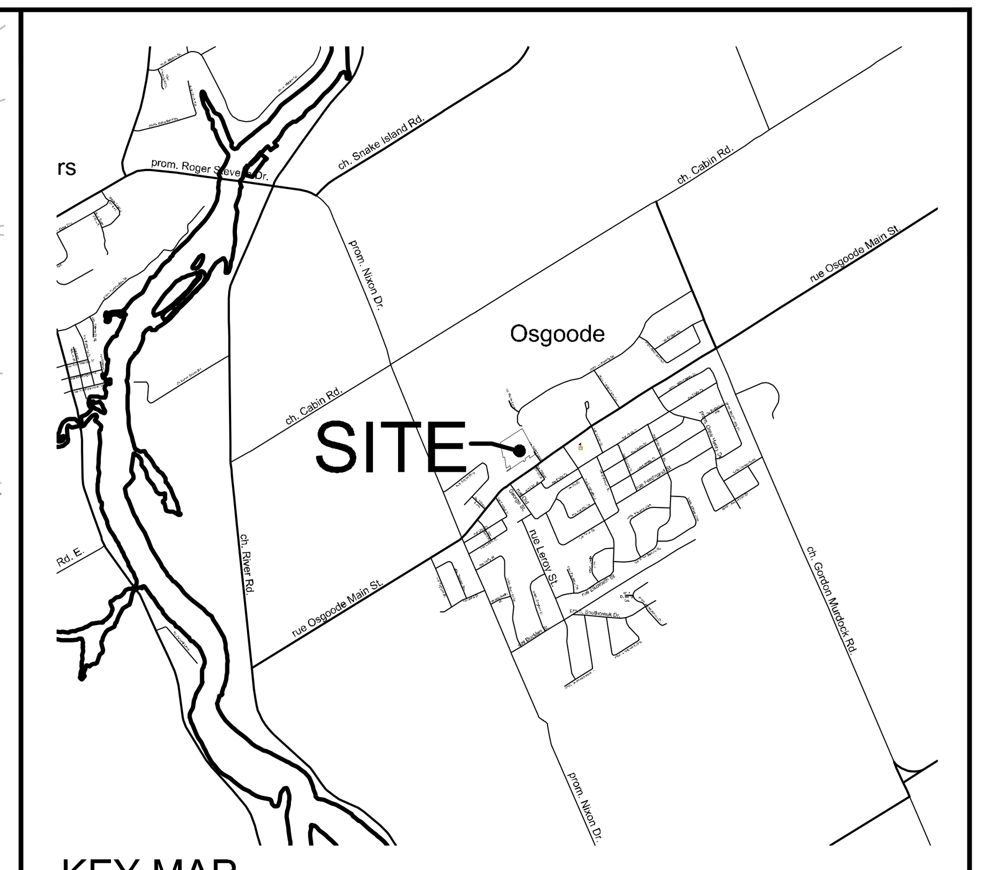
Senior Project Manager | Water Resources





KEY MAP
NOT TO SCALE

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

DRAFT PLAN OF SUBDIVISION OF
PART OF LOTS 27 & 28
CONCESSION 1
TOWNSHIP of OSGOODE
CITY OF OTTAWA
SCALE
1 : 500
DATE: JULY, 2024

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO ADJOINING LANDS ARE CORRECTLY SHOWN.

DATED ________________________

____
?surveyor name?
ONTARIO LAND SURVEYOR

FAIRHILL, MOFFATT & WOODLAND
ONTARIO LAND SURVEYORS

AA29500

OWNER'S CERTIFICATE
I/WE, ,BEING THE REGISTERED OWNER(S), HEREBY AUTHORIZE NOVATECH TO PREPARE AND SUBMIT THIS DRAFT PLAN OF SUBDIVISION TO THE CITY OF OTTAWA FOR REVIEW AND APPROVAL.

DATED ________________________

____
owner name

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51 (17) OF THE PLANNING ACT.

A) The boundaries of the land proposed to be subdivided, certified by an Ontario land Surveyor;
As shown on Draft Plan

B) The locations, widths & names of the proposed highways within the proposed subdivision & of existing highways on which the proposed subdivision abuts;
As shown on Draft Plan

C) On a small keyplan, on a scale of not less than 1cm to 100m, 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 & the relationship of the boundaries of the land to be subdivided to the boundaries of the township lot of other original grant of which the land forms the whole part;
As Shown on Draft Plan

D) The purpose for which the proposed lots are to be used;
Residential shown on Draft Plan

E) The existing uses of all adjoining lands;
Residential and Open Space shown on Draft Plan

F) The approximate dimensions & layout of the proposed lots;
As shown on Draft Plan

F.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;
No affordable housing units are proposed

G) Natural & artificial features such as buildings or other structures or installations, railways, highways, watercources, drainage ditches, wetlands & wooded areas within or adjacent to the land proposed to be subdivided;
As shown on Draft Plan

H) The availability and nature of domestic water supplies;
Development will be supplied with individual drilled wells

I) The nature & porosity of the soil;
Please refer to Hydrogeological Investigation and Terrain Evaluation

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;
Contours shown at 0.25 metre intervals on Draft Plan

K) The municipal services available or to be available to the land proposed to be subdivided;
Development will not be supplied with municipal services

L) The nature & extent of any restrictions affecting the land proposed to be subdivided, including restrictive covenants or easements. 1994, c. 23, s. 30; 1996, c. 4, s. 28 (3); 2016, c. 25, Sched. 4, s. 8 (1).;
As shown on Draft Plan.

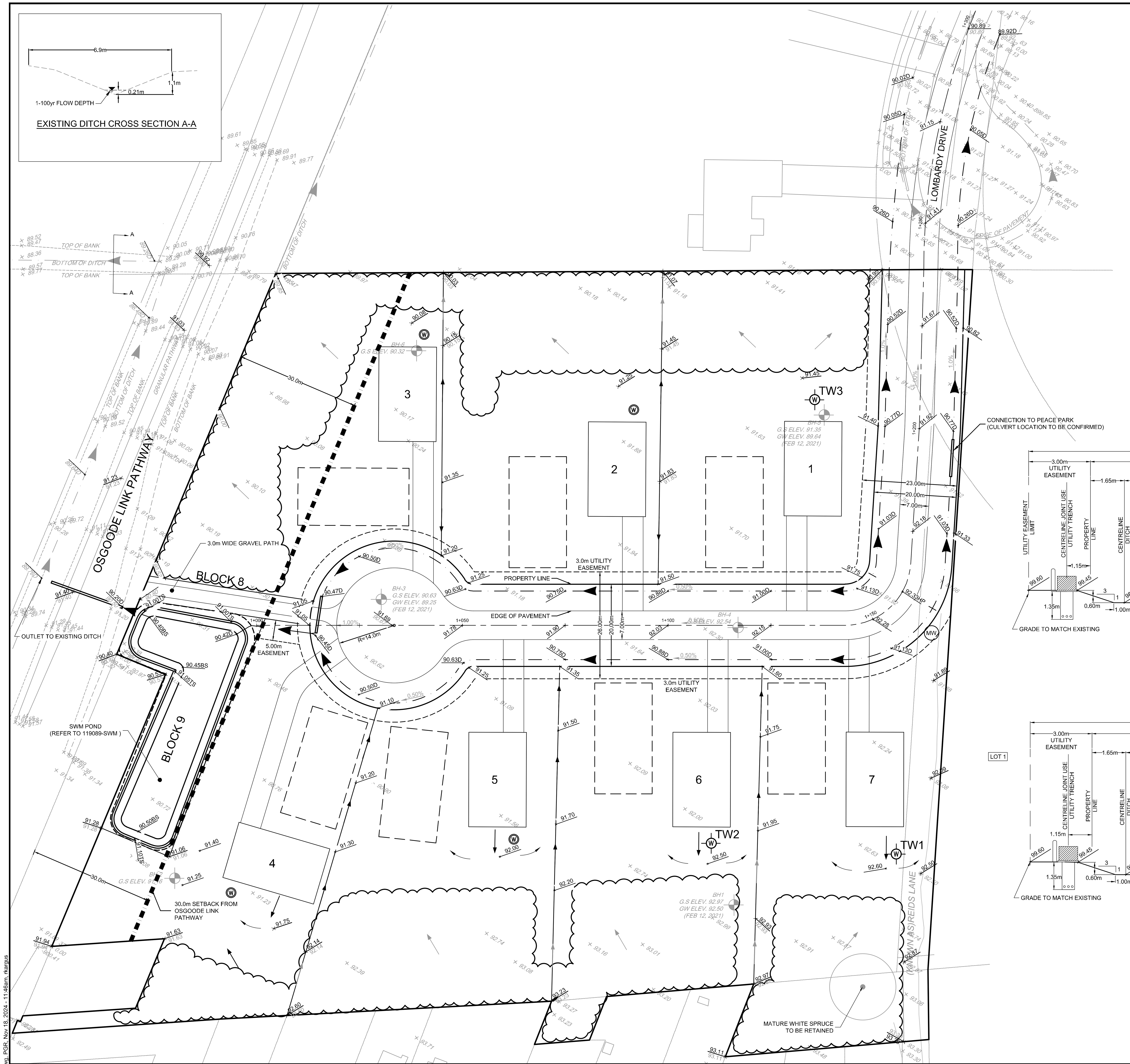
REID'S LANE SUBDIVISION

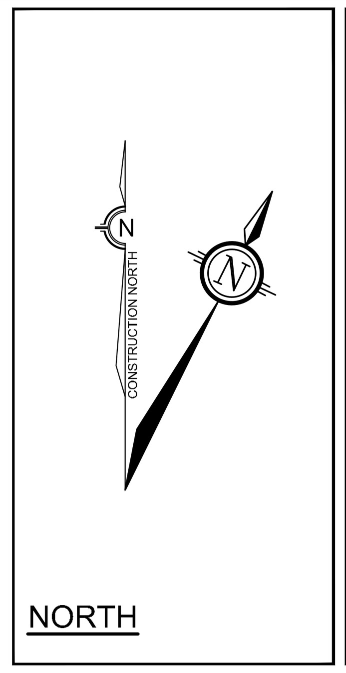
NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

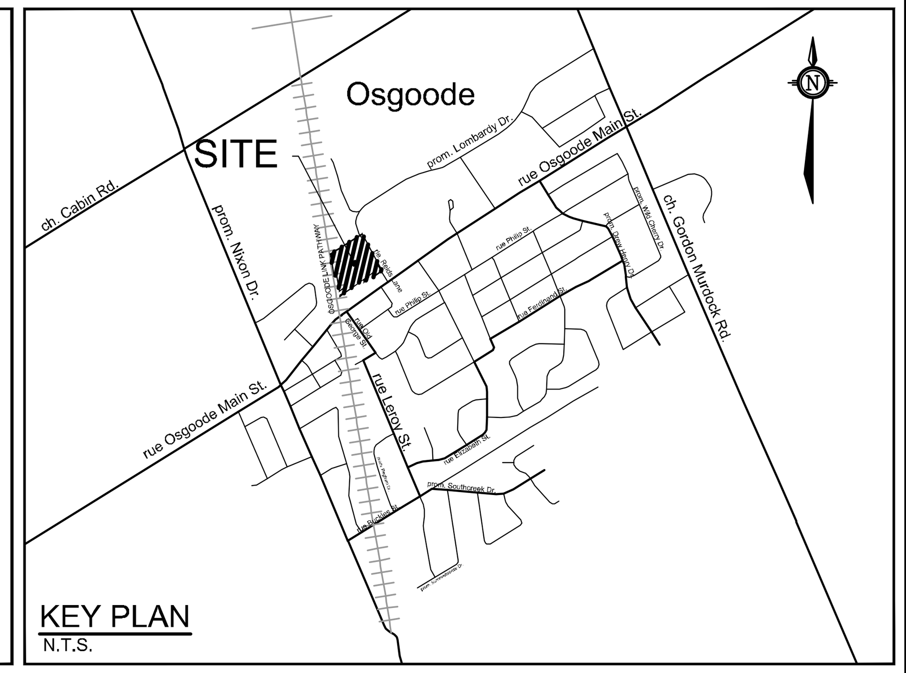
PROJECT No. 119089

Dxx-xx-xx-xxxx

#xxxxx

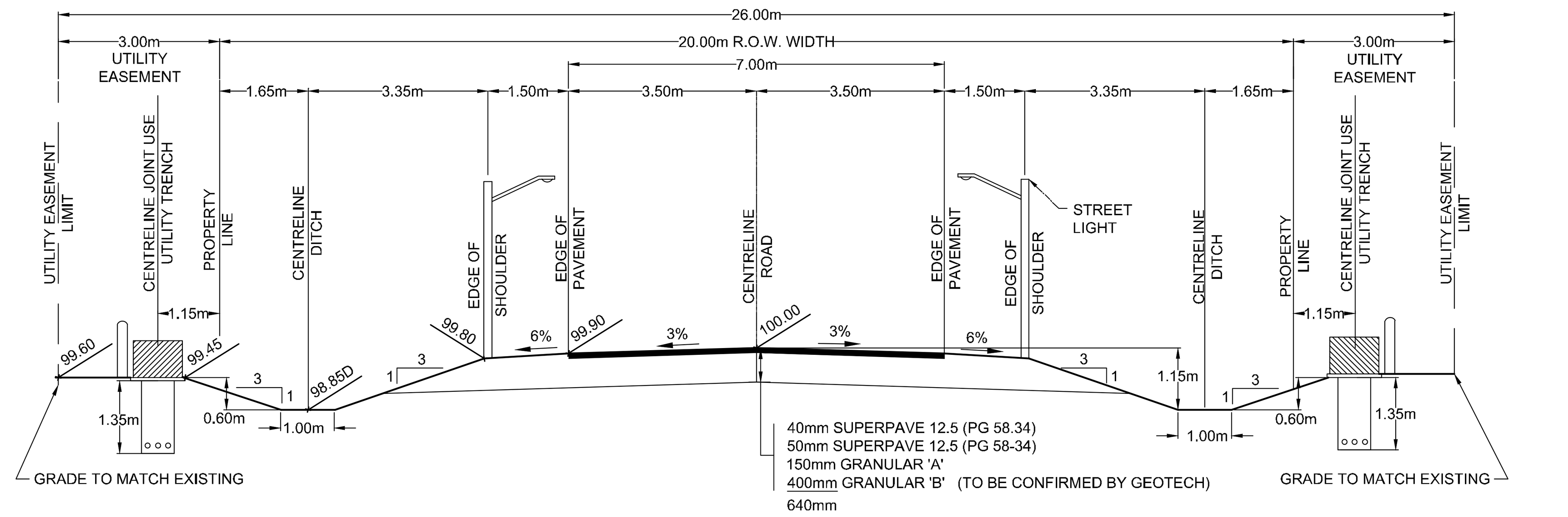






LEGEND

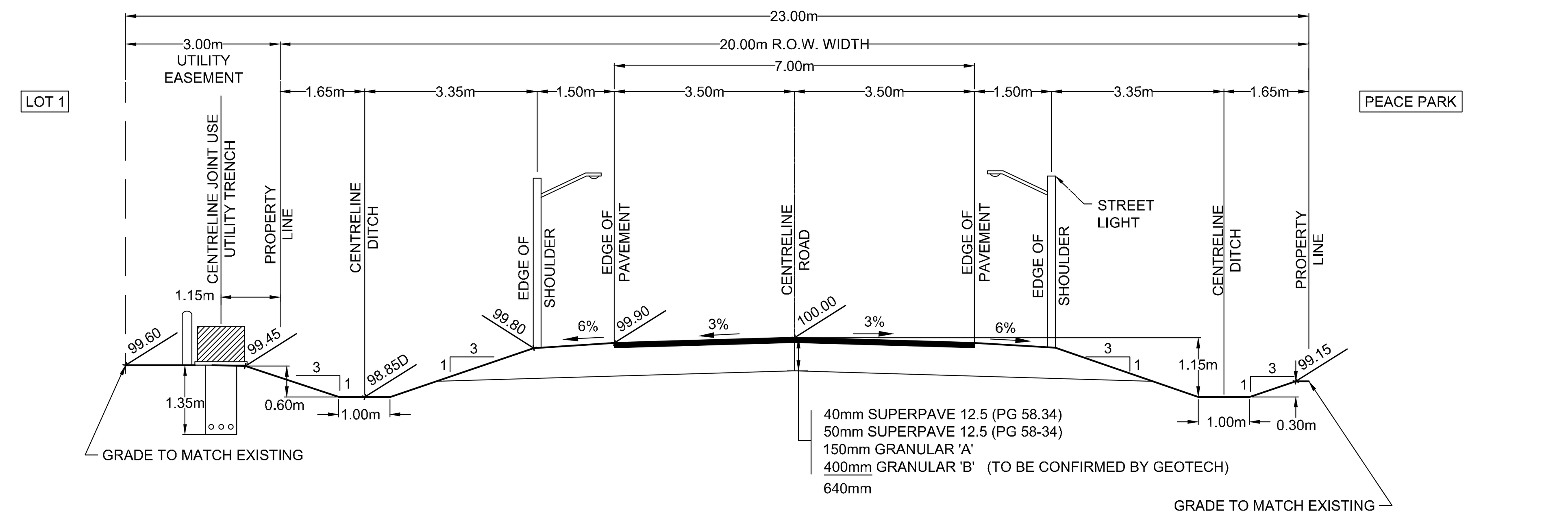
PROPERTY LINE	TEST WELL LOCATION AND NUMBER
30m SETBACK FROM THE OSGOODE LINK PATHWAY	PROPOSED MONITORING WELL
℄ DITCH AND DIRECTION OF FLOW	PROPOSED HOUSE FOOTPRINT ($320m^2$ / 3400 ft^2)
PROPOSED ELEVATION / *EXISTING ELEVATION*	PROPOSED SEPTIC ENVELOPE - 3000L/day (REFER TO HYDROGEOLOGICAL INVESTIGATION AND TERRAIN ANALYSIS REPORT PREPARED BY KOLLAARD - MAY 10, 2023
PROPOSED ELEVATION	PROPOSED TREE RETENTION LIMITS
PROPOSED DITCH ELEVATION	
GRADE AND DIRECTION	
DIRECTION OF OVERLAND FLOW	
BOREHOLE NUMBER, INFORMATION AND APPROXIMATE LOCATION (PROVIDED BY KOLLAARD ASSOCIATES, MARCH 9, 2021)	
PROPOSED CULVERT	
PROPOSED WELL	



TYPICAL CROSS SECTION - 20.0m ROW
STA. 1+050 TO 1+160

SCALE 1:100

NOTES: 1. ELEVATIONS SHOWN ARE ASSUMED
2. CROSS-SECTION TO BE VIEWED LOOKING UP CHAINAGE



TYPICAL CROSS SECTION - 20.0m ROW
STA 1+160 TO 1+240

SCALE 1:100

NOTES: 1. ELEVATIONS SHOWN ARE ASSUMED
2. CROSS-SECTION TO BE VIEWED LOOKING UP CHAINAGE

SOURCE REFERENCE:

LEGAL INFORMATION:

CITY OF OTTAWA LEGAL PLANS 5R-9330, 5R-13990, 4R-17009, 4R-20040 AND 4R-19665

TOPOGRAPHIC INFORMATION:

- *FAIRHALL MOFFATT & WOOLAND LIMITED (208-1 OSGOODE) PART OF LOTS 27 & 28 CONCESSION 1 (OSGOODE) AND PART OF LOTS 50 & 51 REGISTERED PLAN 393 / NOVEMBER 5, 2020 / MTM ZONE 9 (NAD83 ORIGINAL)*
- *FAIRHALL MOFFATT & WOOLAND LIMITED / OUTLET DITCH SURVEY / OCTOBER 29, 2024 / MTM ZONE 9 (NAD83 ORIGINAL)*

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.

No.	REVISION	DATE	BY
8.	REVISED PER CITY COMMENTS	NOV 13/24	RJK
7.	ISSUED FOR COORDINATION	JUNE 27/24	RJK
6.	ISSUED WITH REVISED CONCEPTUAL SWM REPORT	JUN 01/23	LAB
5.	ISSUED FOR COORDINATION	JUNE 13/22	LAB
4.	ISSUED FOR COORDINATION	MAY 5/22	LAB
3.	REVISED PER CITY COMMENTS	OCT 20/21	LAB
2.	ISSUED TO CITY OF OTTAWA	OCT 05/21	LAB
1.	ISSUED WITH CONCEPTUAL SWM REPORT	SEPT 03/21	LAB

SCALE 1:500

1:500 — 0 5 10 15 20

DESIGN: RJK
CHECKED: LAB
DRAWN: RJK
CHECKED: LAB
APPROVED: SMG

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER
L.A. BOWLEY
100081115
Nov 18/24
PROVINCE OF ONTARIO

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
CITY OF OTTAWA
REID'S LANE SUBDIVISION

DRAWING NAME
PRELIMINARY GRADING & SITE SERVICING PLAN

PROJECT No. 119089
REV: REV # 8
DRAWING No. 119089-PGR

PLANA1.DWG - 841mmx594mm

LEGEND

- A / 1.18 / 75 — AREA ID / DRAINAGE AREA (hectares) / CURVE NUMBER
- STORM DRAINAGE AREA
- EXISTING DITCH
- PROPOSED DITCH AND DIRECTION OF FLOW
- PROPOSED OVERLAND FLOW
- EXISTING OVERLAND FLOW

TOTAL DRAINAGE AREA = 4.75 ha

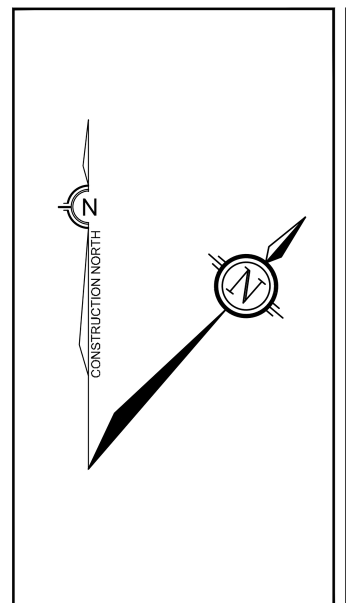
SOURCE REFERENCE:

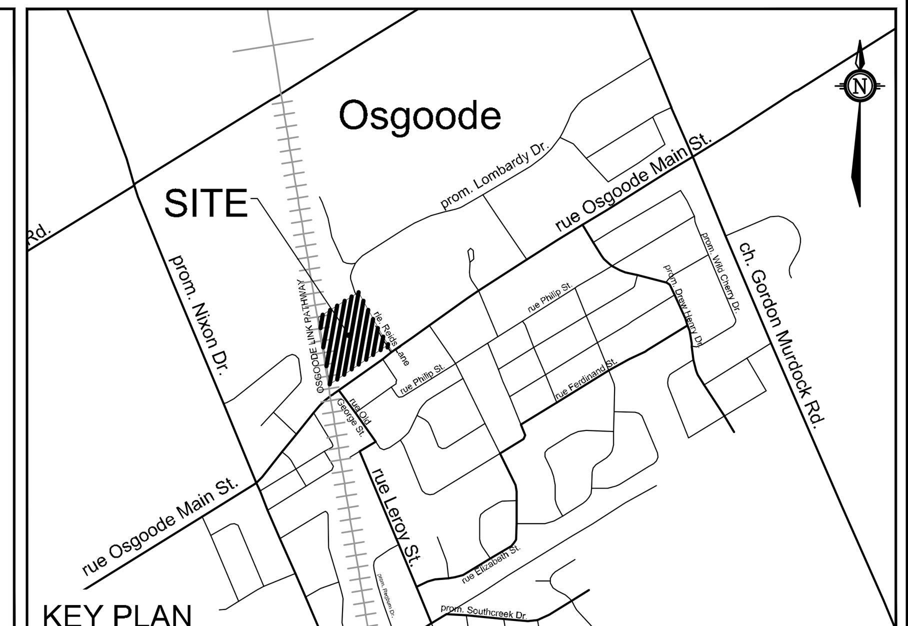
LEGAL INFORMATION:

CITY OF OTTAWA LEGAL PLANS 5R-9330, 5R-13990, 4R-17009, 4R-20040 AND 4R-19665

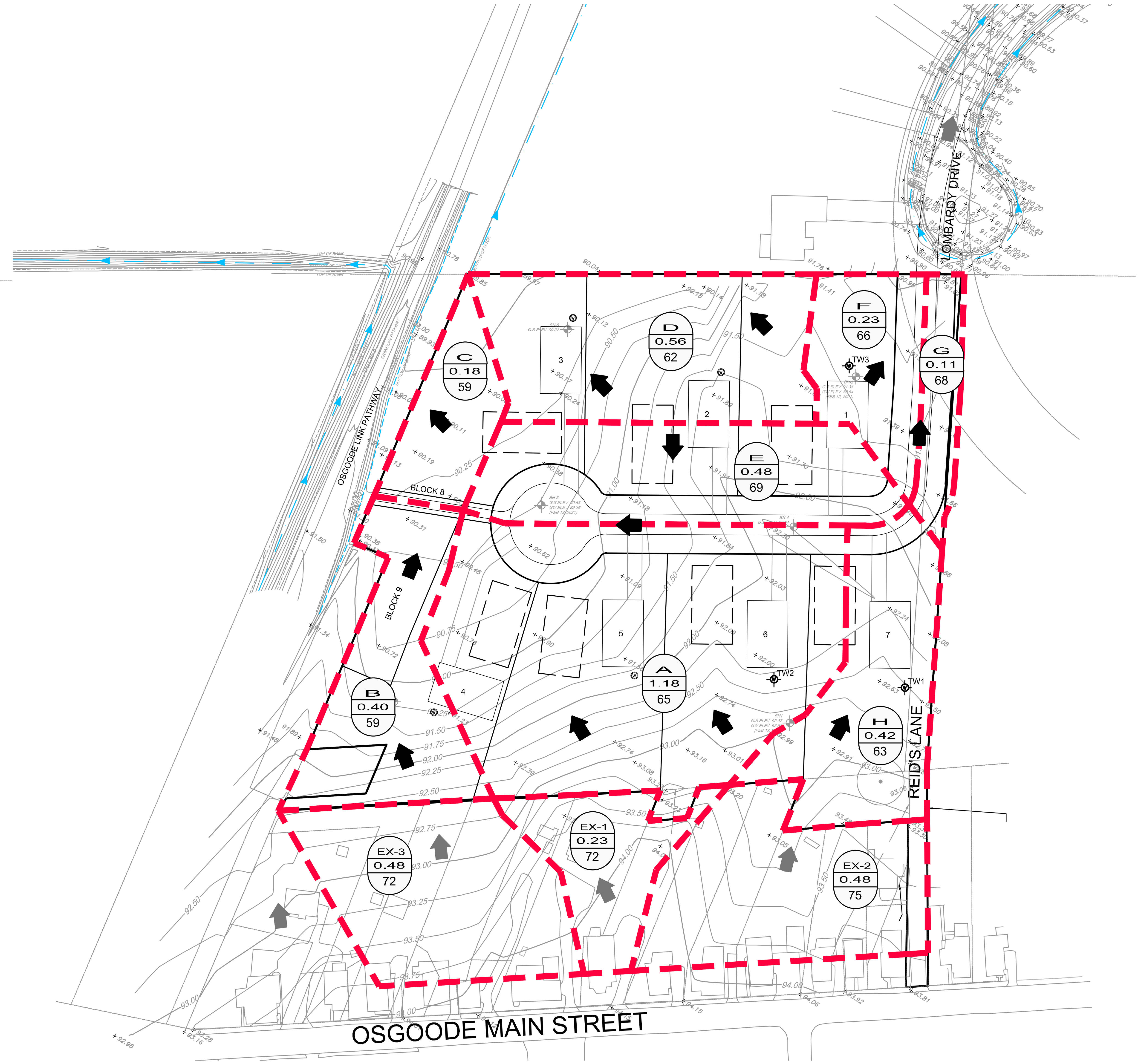
TOPOGRAPHIC INFORMATION:

- FAIRHALL MOFFATT & WOOLAND LIMITED (208-1 OSGOODE) PART OF LOTS 27 & 28 CONCESSION 1 (OSGOODE) AND PART OF LOTS 50 & 51 REGISTERED PLAN 393 / NOVEMBER 5, 2020 / MTM ZONE 9 (NAD83 ORIGINAL)
- FAIRHALL MOFFATT & WOOLAND LIMITED / OUTLET DITCH SURVEY / OCTOBER 29, 2024 / MTM ZONE 9 (NAD83 ORIGINAL)





PRE-DEVELOPMENT DRAINAGE AREAS



POST-DEVELOPMENT DRAINAGE AREAS

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No.	REVISION	DATE	BY
6.	REVISED PER CITY COMMENTS	NOV 13/24	RJK
5.	ISSUED WITH REVISED CONCEPTUAL SWM REPORT	JUN 01/23	LAB
4.	RE-ISSUED FOR DISCUSSION	FEB 17/22	LAB
3.	RE-ISSUED FOR DISCUSSION	FEB 08/22	LAB
2.	ISSUED FOR DISCUSSION	JAN 25/22	LAB
1.	ISSUED WITH CONCEPTUAL SWM REPORT	SEPT 03/21	LAB

SCALE 1:1000

1:1000 — 0 10 20 30 40

DESIGN RJK
CHECKED LAB
DRAWN RJK
CHECKED LAB
APPROVED SMG

FOR REVIEW ONLY

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

LOCATION
CITY OF OTTAWA
REID'S LANE SUBDIVISION

DRAWING NAME
STORM DRAINAGE AREA PLAN

PROJECT No. 119089
REV: REV # 6
DRAWING No. 119089-STM

PLANA1.DWG - 841mmx594mm

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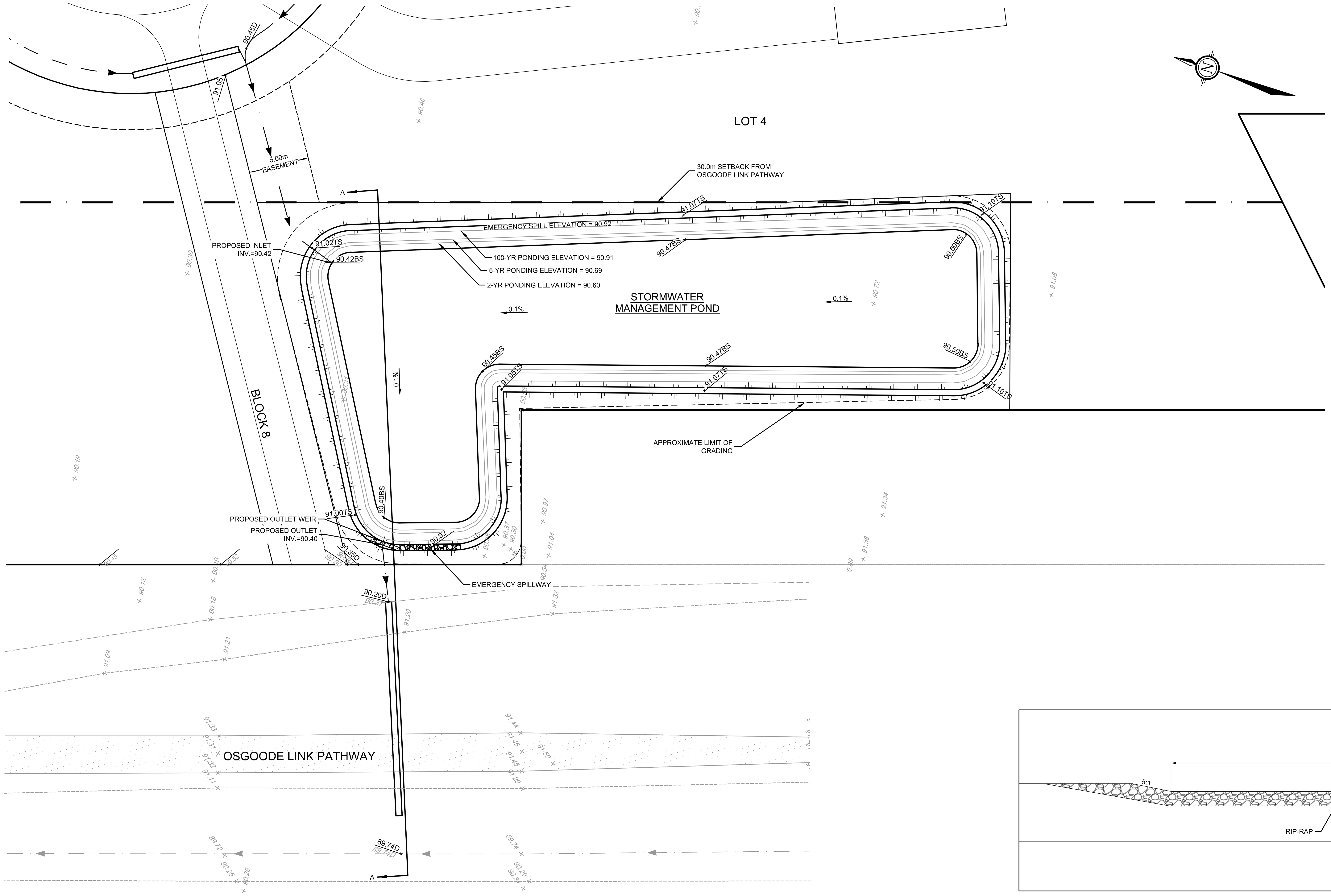
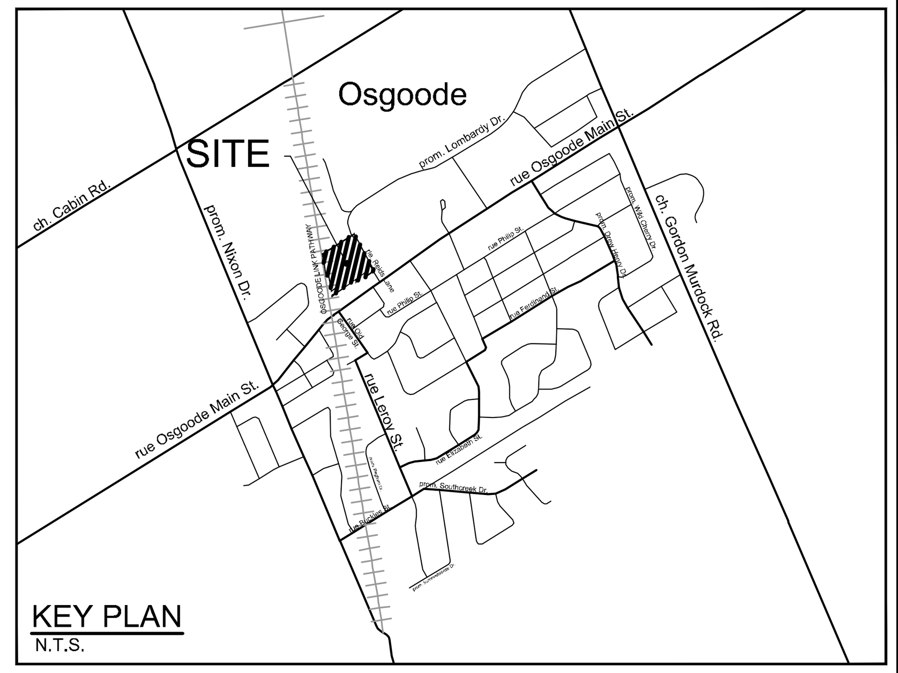


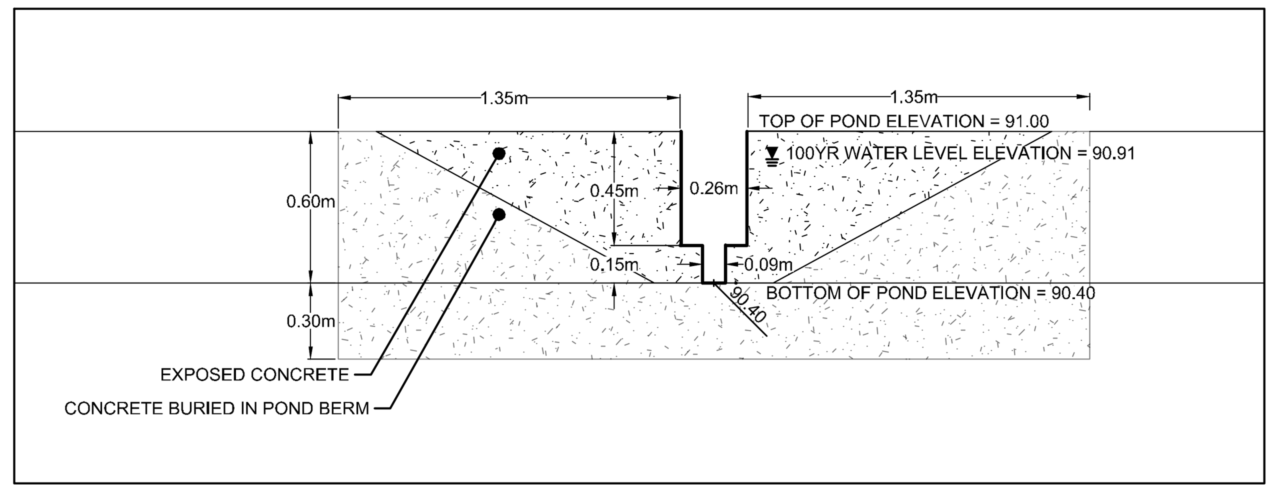
SWM POND PLAN
SCALE 1:200



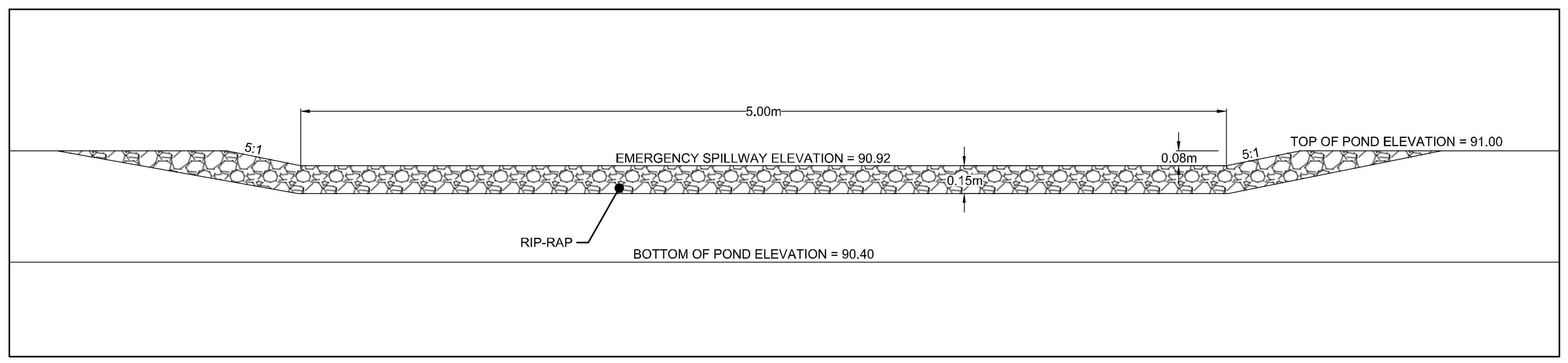
KEY PLAN
N.T.S.

LEGEND

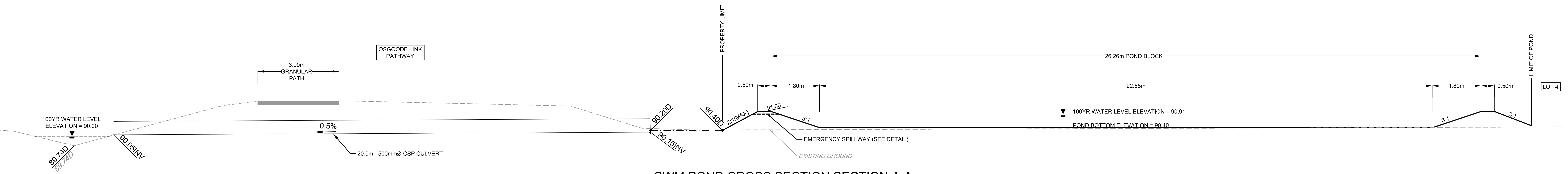
- PROPERTY LINE
- 30m SETBACK FROM THE OSGOODE LINK PATHWAY
- ℄ DITCH AND DIRECTION OF FLOW
- 92.10 / 92.02 — PROPOSED ELEVATION / EXISTING ELEVATION
- 92.53 — PROPOSED ELEVATION
- 90.97D — PROPOSED DITCH ELEVATION
- 91.00TS — PROPOSED DITCH ELEVATION
- 90.40BS — PROPOSED DITCH ELEVATION
- PROPOSED TERRACING (3:1 MAX)



OUTLET WEIR STRUCTURE
SCALE 1:25



EMERGENCY SPILLWAY
SCALE 1:25



SWM POND CROSS SECTION SECTION A-A
SCALE 1:75

NOTE:
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No.	REVISION	DATE	BY
2.	REVISED PER CITY COMMENTS	NOV 13/24	RJK
1.	ISSUED FOR DISCUSSION	MAR 29/22	LAB

SCALE 1:250

DESIGN	RJK
CHECKED	LAB
DRAWN	RJK
CHECKED	LAB
APPROVED	SMG

FOR REVIEW ONLY

LICENSED PROFESSIONAL ENGINEER M. J. PETEPIECE 100079354 PROVINCE OF ONTARIO Nov 18 2024

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

LOCATION
CITY OF OTTAWA
REID'S LANE SUBDIVISION

DRAWING NAME
STORMWATER MANAGEMENT POND FACILITY

PROJECT No. 119089
REV # 2
DRAWING No. 119089-SWMF

APPENDIX A

CORRESPONDENCE

Plan of Subdivision Pre-consultation

Meeting Date: May 16, 2019 & May 28, 2019

3200 Reid's Lane

Applicant: Novatech **Councillor** Eli El-Chantiry, Ward 5

Proposal Summary: To create a 7-lot residential subdivision and new road.

Attendees:

Murray Chown, Novatech
Susan Gordon, Novatech
Ryan Poulton, Novatech
Miles Yang, Owner
Cheryl McWilliams, Senior Planner, PIEDD, City of Ottawa
Harry Alvey, Project Manager, PIEDD, City of Ottawa
Amira Shehata, Transportation Engineer, PIEDD, City of Ottawa
Kersten Nitsche, Planner II, Parks and Facilities Planning, Recreation, Culture, and Facilities Department, City of Ottawa
Kevin Wherry, Manager, Parks and Facilities Planning, Recreation, Culture, and Facilities Department, City of Ottawa
Matthew Hayley, Environmental Planner, PIEDD, City of Ottawa
Seana Turkington, Planner, PIEDD, City of Ottawa

Meeting Minutes

May 16 Minutes

Proposal details

- Proposal to create 7 new residential lots via a Plan of Subdivision.
- There are 2 Concept Plans—Concept Plan 1 proposes encroaching onto City Parkland for the creation of a Right-of Way which starts at 26 metres and decreases to 20 metres as the road continues; Concept Plan 2 proposes an 18 metre Right-of-Way, with the road entirely contained on the subject site.
- The laneway which abuts the subject site is privately owned.

Planning (Provided by Cheryl McWilliams and Seana Turkington)

- Property designated Village on Schedule A of the Official Plan and is designated as Village Residential on the Land Use Schedule for the consolidated Villages Secondary Plan-Osgoode.
- Due to the lot configuration of abutting lots, it would be beneficial to consider lot line adjustments to the abutting lots. This would result in a more regular lot for the subject site; however, it would result in the loss of some land area for lots 4 through 7.
- Concerning a potential land swap for parkland in exchange for an extended pedestrian pathway.
- Concept Plan 1 has better connectivity with the Douglas Thompson Pathway, due to the proposed pathway between lots 3 and 4.
- The laneway to Osgoode Main currently has three properties with driveway access from the pathway. The pathway is also privately owned. If a pedestrian pathway were to be extended along this laneway, the existing driveways need to be taken into consideration.

Parks Planning Comments (Provided by Seana Turkington on behalf of Kersten Nitsche)

- Through the development application Parks will collect cash-in-lieu of parkland for this development.
- The cash-in-lieu of parkland amount will be calculated as the lesser of:

- One (1) hectare for every five hundred (500) dwelling units (pursuant to Section 42 of the *Planning Act*); or
- 10% of the value of the land as required by the Parkland Dedication By-law.

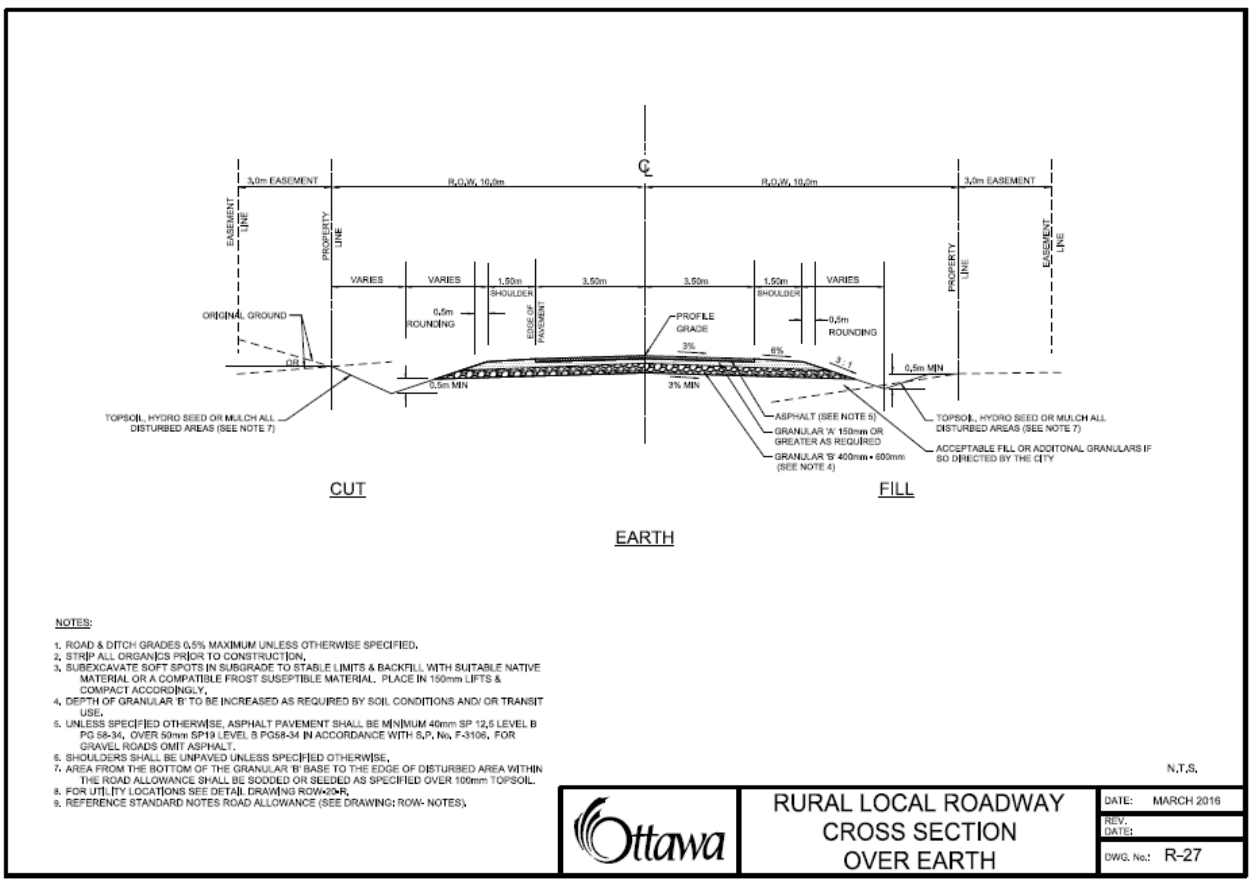
- Parks will also provide draft conditions depending on how this application proceeds.
- Parks is not supportive of Concept 1 as it proposes to use parkland for road access to the development. At this time, Parks will not support any applications to purchase parkland.

Engineering Comments (Provided by Harry Alvey)

- Review the size of the cul-de-sac to ensure that there is sufficient turning radii for garbage trucks and emergency services.
- There is an active rail line abutting the subject site. A 30-metre setback and safety berm will be required. Lots 3 and 4 will be impacted by the 30-metre setback and berm.
- At this point in time, no slope stability issues are anticipated.
- Note that there are high groundwater levels in Osgoode.

Transportation Comments (Provided by Amira Shehata)

- There is an existing pathway on Lombardi Street. If a pathway is extended further towards Osgoode Main, this would ensure pedestrian connectivity. If extension of the pathway is not possible, please explore alternative pedestrian connections.
- In the past, the intent was to extend Reid`s Lane to Osgoode Main.
- A Transportation Impact Assessment will not be required. This is based on the proposed development size and location.
- Please see the below road cross-section for a 20-metre ROW.



Environmental Comments (Provided by Matthew Hayley)

- A Tree Conservation Report will be required for any trees over 10cm in diameter.
- There is potential for Species at Risk on the subject site, specifically butternut.
- An Environmental Impact Statement will be required but, will be limited to potential Species at Risk present on site.

- There is a pathway shown in Concept Plan 1 that connects to the Douglas Thompson Pathway (DT Pathway) There is a tree on the DT Pathway that blocks the proposed pathway on Concept Plan 1. Consider moving pathway to ensure tree is preserved.

Rideau Valley Conservation Authority Comments (Provided by Jamie Batchelor)

- Regarding Stormwater Management, the recommendation is for post-development runoff to be equivalent to pre-development runoff and 80% TSS removal will be required.
- Please contact the RVCA to arrange a technical pre-consultation meeting to discuss the requirement for the hydrogeological report.

May 28 Minutes

- Considering a land exchange or outright purchase of lane to allow for the proposed Right-of-Way as shown in Concept Plan 1.

Parks Comments (Provided by Kevin Wherry and Kersten Nitsche)

- Consider connecting the proposed pathway (shown in a sketch provided May 24, 2019) to the Douglas Thompson Pathway and Peace Park.
- To infringe upon less parkland, altering the road design is highly recommended along with a width reduction to a 20-metre Right-of-Way for the entirety of the proposed road.
- There is a portion of Reid's Lane that is accessed by three properties. Consider closing Reid's Lane at the end of the access for these driveways.
- It would be worth considering a lot line adjustment to give some additional land to abutting lots. This would result in a better lot configuration for the subject site.
- Cash-in-Lieu of Parkland will be required, as will the fee in lieu of the Park Development Charge, which is currently $1818.
- There is currently some extra road allowance (the bulb-out) on Lombardy Drive. Initially, it was planned to extend Lombardy Drive to Osgoode Main. The subdivision agreement will need to be referenced to determine if this bulb-out is to return to the ownership of the property known as 5538 Lombardy Drive.

ADDITIONAL COMMENTS

Planning Comments

Official Plan: Village

Secondary Plan and/or Community Design Plan: Consolidated Villages Secondary Plan (Osgoode)

Zoning By-law: Development Reserve Zone, Subzone 1 (DR1)

Other: Based on GeoOttawa, the site has archaeological potential. As such, please fill out a screening form from the Ministry of Tourism, Culture and Sport's website and include with the application submission.

Environmental Comments

There are no further comments from Environmental Planning. For further comments from the RVCA, please contact the Conservation Authority directly.

Engineering Comments:

Water/Sanitary/Storm Servicing

- Water pipes:
  - No municipal water pipes are adjacent the proposed development. A hydrogeological and terrain analysis is required to determine that a satisfactory quality of groundwater is available and a quantity of flow that exceeds design requirements. The parameters tested shall be the "subdivision suite" known to local well testing companies.

- Sanitary Sewers:
  - No municipal sanitary pipes are adjacent the proposed development. A groundwater impact study is required to discuss the amount of septage treatment that is available if the design septage is more than 10,000 l/day.

- Storm Sewers:
    - No municipal storm pipes are adjacent the proposed development. The developer will need to define legal and sufficient outlet and achieve such outlet, entirely at the developer's cost. There appears to be a wet area on the site and an ephemeral stream that will both need to be discussed.

- Storm Water Management:
    - The consultant should determine a stormwater management regime for the application and, maintain post-development flows to pre-development levels by way of their choise, to the satisfaction of the municipality.
    - Any existing stormwater runoff from adjacent site(s) that crosses the property must be accommodated by the proposed stormwater management design.
    - Stormwater quality control is required for the site. The Rideau Valley Conservation Authority (RVCA) can be contacted to determine the level of stormwater quality control required for the site.
    - All stormwater management determinations shall have supporting rationale.
    - Stormwater management solutions should reference, and show concurrence with, the content of the Jock River Reach 2 and Mud Creek Sub-watershed Study.

Rights-of-Way

- Please refer to the City of Ottawa Private Approach By-Law 2003-447 for the entrance design.
- It is suggested that Lombardy Drive continues at the current width and that Reids Lane be converted to a MUP or other non-vehicular corridor.
- It is suggested to widen the adjacent rail corridor to the wider width of the two. The site is entirely within a 300 m rail corridor buffer and a 30 m setback and a safety berm, to appropriate standards, will be required (it is understood that the MECP will need the appropriate rail acceptance prior to their approval).
- A noise and vibration study because of the proximity of the rail corridor will be required.

Wellhead protection

- The application is within the Mississippi-Rideau highly vulnerable aquifer area- this will need to be researched for any ECA.

LID

- As per 8.3.13 of the Sewer Design Guidelines, Second Edition, document no. SDG002, prepared by the City of Ottawa, October 2012, including technical bulletins ISDTB-2014-1, PIEDTB-2016-01, ISDTB-2018-01, and ISTB-2018-04, the development shall include techniques for control of pollutants and sediments.

Permits and Approvals

- Please contact the Ministry of the Environment, Conservation and Parks (MECP) and the Rideau Valley Conservation Authority (RVCA), amongst other federal and provincial departments/agencies, to identify all the necessary permits and approvals required to facilitate the development: responsibility rests with the developer and their consultant for determining which approvals are needed and for obtaining all external agency approvals. The address shall be in good standing with all approval agencies, for example the RVCA, prior to approval.
- Copies of confirmation of correspondence will be required by the City of Ottawa from all approval agencies that a form of assent is given. Please note that a stormwater program for multiple lots is understood to be a to the direct type of Environmental Compliance Approval (ECA) application with the MOECC; please speak with your engineering consultant to understand the impact this has on the application. An MECP ECA application is not submitted until after planning approval. No construction shall commence until after a commence work notification is given in writing from an engineering Project Manager or Senior Engineer staff member of Development Review – Rural Services.

Ministry of the Environment, Conservation and Parks	Rideau Valley Conservation Authority
Contact Information:	Contact Information:
Christina Des Rochers	Roxanne Coghlan
Water Inspector	roxanne.coghlan@rvca.ca

613-521-3450 ext. 231

Christina.Desrochers@ontario.ca

Submission Requirements for engineering:

- Site Servicing Plan*
- Grading and Drainage Area Plan*
- Erosion and Sediment Control Plan* (for SPA only)

*All identified required plans are to be submitted on standard A1 size sheets as per City of Ottawa Servicing and Grading Plan Requirements (https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans#servicing-and-grading-plan-requirements), and, on at least one of the plans, note the survey monument used to establish datum on the plans with sufficient information to enable a layperson to locate the monument.

Report Submission Requirements[1]:

- Site Servicing Report
- Storm Water Management Report
    - Please note that engineering issues will need to be significantly acceptable to forward any SWM reports for modelling review.
    - Upstream catchments will need to be drawn and verified.
    - A range of historical storms will need to be modelled (if modelling is required/provided).
- Hydro-geological and terrain analysis
- Groundwater impact study (only if septage is more than 10,000 l/day)
- Erosion and Sediment Control Measures
- Geotechnical Investigation Study
    - Please note that the area may contain sensitive marine clays. If yes, please note that Atterberg limits, consolidation testing, sensitivity values, density tests, shrinkage tests, and grade raise restrictions, and vane shear test results, and rationalised discussion thereof will be required in the report. The geotechnical consultant will need to provide full copies of any published and peer reviewed papers relied on to determine results and conclusions.
    - Chemical analysis will be required.
    - Please note that a long-term groundwater elevation will be required as per section 8.2 of Technical Bulletin ISTB-2018-04, City of Ottawa, dated June 27, 2018.
    - Earthquake analysis is now required to be provided in the report.
    - Deviation from the “Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa”, 1st Edition, September 2007, Golder Associates (Geotechnical Guidelines), or “Slope Stability Guidelines for Development Applications in the City of Ottawa”, 1st Edition, December 2004, Golder Associates (Slope Stability Guidelines), revised 2012, is permitted with supply of full copies (either digital or printed) of per reviewed and published papers with specific reference to actual pages that plainly agree with the consultants’ design approach.

Footnote [1] - All required plans & reports are to be provided on a CD in *.pdf format (at application submission and for any, and all, re-submissions. Drawings shall be provided as individual files)

Application Submission Information

Application Type: **Plan of Subdivision**

For information on Applications, including fees, please visit: https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/fees-and-funding-programs/development-application-fees

The application processing timeline generally depends on the quality of the submission. For more information on standard processing timelines, please visit: https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/development-application-forms#site-plan-control

Prior to submitting a formal application, it is recommended that you pre-consult with the Ward Councillor.

Application Submission Requirements

For information on the preparation of Studies and Plans and the City's Planning and Engineering requirements, please visit: https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans

To request City of Ottawa plan(s) or report information, please contact the ISD Information Centre at (613)-580-2424 ext. 44455.

Please provide electronic copy (PDF) of all plans and studies required.

All plans and drawings must be produced on A1-sized paper and folded to 21.6 cm x 27.9 cm (8½"x 11").

Note that many of the plans and studies collected with this application must be signed, sealed and dated by a qualified engineer, architect, surveyor, planner or designated specialist.

File No.: D07-16-21-0028

July 31, 2023

Ryan Poulton
Novatech Engineering
Via email: r.poulton@novatech-eng.com

Dear Mr. Poulton,

Re: Draft Plan of Subdivision Application – 3200 Reid's Lane (2nd review)

A review of the second submission concerning the above-noted draft plan of subdivision has been undertaken by internal and external contacts. Please find below the comments on your application. *Please ensure that changes required below on one plan are reflected on all other plans, when applicable.*

General:

1. Please note that comments from the Conservation Authority's review related to Stormwater Management will be forthcoming.

Planning Comments:

2. It is the City's position that the New Official Plan approved by the Ministry of Municipal Affairs and Housing on November 4, 2022 applies to the Plan of Subdivision application for 3200 Reid's Lane.
3. In the New Official Plan, adjacent to the subject property is an identified Protected Transportation Corridor on Schedule C2, which is currently used for a multi-use pathway.
    a. The Grading Plan has identified a 30 meter setback from the mutual property line to the building face. This setback must be included in the future Zoning By-law Amendment.
    b. A Noise and Vibration Study will be required. The City acknowledges that this requirement was previously waived for the subject application, however the policy direction in the New Official Plan policies 4.1.2. 21), 4.1.7 3), 4.1.7 6), 4.1.7 7) & 10.2.1 15) regarding Protected Transportation Corridors states railway right of ways may permit interim recreational uses but shall be protected for future transportation purposes and the FCM-RAC Guidelines for New Development apply. The Noise and Vibration Study should recommend the required mitigation measures.
4. The Planning Rationale should contain a fulsome discussion on the Guidelines for New Development near Rail Corridors, including the provided mitigation measures, such as the 30-metre setback. The proposed subdivision should be designed to comply with the guideline requirements and said design considerations should be discussed in the rationale. Please revise the Planning Rationale accordingly.
5. As outlined in the Parks Comments below, the City remains unsupportive of conveying 3 metres from Peace Park for a wider Right-of -Way for the extension of Lombardy Drive. The Official Plan requirement for local roads is a right-of-way of 20 metres, which can be provided without impacts to the existing municipal park. Please explore alternative

options for the extension of Lombardy Drive and required services which does not impact the existing municipal park.

Hydrogeological Comments:

Hydrogeological Investigation and Terrain Evaluation, File # 210064, prepared by Kollaard, dated May 10, 2023

6. Please see the enclosed letter dated July 13, 2023, prepared by BluMetric Environmental for hydrogeological review comments to be addressed.

Engineering Comments:

Conceptual Servicing and Stormwater Management Report, Report No: R-2021-060, prepared by Novatech Engineering, revised June 2023.

7. In order for the ditches to meet the water quality requirements referenced in Table 3, the 25mm event must be run with a 4-hour design storm. The text (Table 2) refers to a 3 hour storm while the model label refers to a 4 hour storm.
8. It is not reasonable to only utilize swales for quality control. The Stormwater Management Planning and Design Manual does not specify that swales provide enhanced TSS removal. Further, a continuous flow dry pond only provides 60% TSS removal. Please consider the use for infiltration galleries or bioswales to help meet the 80% TSS removal target.
9. As part of the detailed design, please show the 1:100 year design storm ponding extent within the ditches on the grading plans.
10. How is runoff from the external areas routed to the proposed ditches? Section 3 says rear yard and side yard drainage will be provided. Preliminary grading plan should show what the plan is for the external drainage areas.
11. Please provide an overview of the NASHYD unit hydrograph method in the report.
12. Please confirm that the house sizes utilized in the development of the runoff coefficients for the catchments will be the maximum house sizes proposed for the lots.
13. The soil type (fine to medium sand) is probably more B than C. Tables in water balance calculations show fine sand as B. Plus assuming existing lands at CN numbers 81 and 83 is probably too high. The predevelopment CN need to be re-evaluated and more information provided.
14. Section 4.2. - The increase in runoff is not just due to increase imperviousness. Change in land use, grading, and drainage channels all add to increase flows and runoff volumes. The SWM pond proposes to hold post development flows to predevelopment flows but the runoff volume leaving the site will most likely increase unless infiltration methods are introduced. The landowner may lose rights of drainage by introducing the proposed land use changes. This could be a problem and needs to be looked at in further detail. The site needs a sufficient legal outlet.
15. Will the subdivision ditches have under drains? If so, where will the outlet?
16. Please provide an estimate of what the flow structure will be. The concern is the control structure will end up being too small and will then end up being a maintenance issue.
17. It needs to be decided now, for draft approval, if LID's will be included. There are places that have good soils with low water table values. LID's could be accommodated. Not only will they provide quality treatment, but they will reduce the runoff volume.

18. More information is needed in the report on the SWM pond for draft approval. Greater confidence is needed that it will work the way it is proposed.
    a. How much storage is required? This is required to verify the Block is of sufficient area.
    b. What are the depths? This influences the size of the pond but also there is a concern that it could reverse flow towards Lombardy Drive. Will it back up into the ditches and flow to Lombardy?
    c. What are the effects of the backwater in the receiving stream.
    d. It is proposed to be a dry pond however there currently is a wet area right where the pond is proposed. Will it be dry?
19. Need more information on how the water gets from the pond outlet to the Municipal Drain. There is a concern that there is no defined downstream channel. The EIS mentions standing water against the pathway and that a meadow marsh is evident. This in the approximate location of the proposed SWM block. Downstream works may be required. The current proposal may not have drainage rights if the runoff volumes will increase. Drainage easements or other drainage rights may be required.
20. Is there other external land that drains to the pathway at proposed outlet?
21. Historical storms and stress test will be required at detailed design.

Modeling:

22. The model results show that the 100-year flows are not contained within the ditches as culverts controlling the flows (i.e. overtopping at Lot 4 driveway). The City does not typically allow the 400 mm culverts with the exception in a few cases for SWM reasons. However, this is not discussed in the report. If 400 mm culverts are part of the SWM design this needs to be discussed. Does the SWM pond provide the quantity control?
23. Please provide the 25mm 4-hour design storm model for review in order to confirm the ditch flow velocity conditions meet the water quality criteria.

Drawings:

24. Based on the Compendium Edition of the 2021 Building Code (O.Reg 332/12) Table 8.2.1.6B Minimum Clearances for distribution piping and leaching chambers, 15 metres of clearance is required from the ditches and culverts. Please clarify that this clearance is achieved from the ditches and culverts as well as the dry pond.

Stormwater Operations:

25. The City agrees with the stormwater management design in principle. However, the ground water appears to be high according to Boreholes data from the Kollaard Geotechnical Report. Roadside ditches' infiltration capability might be compromised. A seasonable highwater table and the bedrock should be greater than 1metre below the bottom of the infiltration trench.
26. Location of the pond: there is no offset min 4m between the private property line and pond block.
27. The dry pond has to be provided with a service road to maintain the pond.
28. It appears that the pond will be only 0.65m deep. Is there an error in grading of the top of slope at the south side of the pond?

29. Please provide more information regarding the ground water table at the pond block area and a potential impact on a septic bed adjacent to the pond.

Phase I Environmental Site Assessment, Report 210064, prepared by Kollaard, dated October 19, 2022

- The Phase One identified the presence of fill from an unknown source as Area of Potential Environmental Concern (APEC). This APEC was identified based on the review of previous reports that noted historic illegal dumping on site and included soil testing confirming impacts above Site Condition Standards (SCS), as well as various debris observed on site during the Phase One site visit. A second off site APEC was identified as the former retail fuel outlet southwest of the site.

Phase II Environmental Site Assessment, Report 210064, prepared by Kollaard, dated January 24, 2023

- A Phase Two was undertaken to address the APECs. Soil testing was undertaken to test the fill in various areas as well as in the vicinity of the former retail fuel outlet. Groundwater was not sampled as previous groundwater monitoring in the vicinity of both APECS met the SCS. One soil exceedance for PAHS was identified by the Phase Two sampling results, but the report indicated that this was due to the high concentration of asphalt mixed in the fill at this sampling location. The report recommended that equipment be brought on site during excavation to segregate asphalt from soil so that the soil could be reused on site while the asphalt was removed as waste. The report also recommended that various construction debris (shingles, brick, metal, etc. be removed from site and disposed as waste.

30. Based on the above summary it is recommended that the proponent provide a Remedial Action Plan to confirm how the asphalt and other debris and the area of impacted soil identified in a previous Phase Two will be removed from the site. Following site excavation, a Remedial Action summary should also be required, confirming that these materials have been removed from the site and disposed in accordance with regulations.

Environmental Comments:

Tree Conservation Report and Environmental Impact Statement, prepared by Muncaster Environmental Planning Inc., dated April 1, 2021.

31. The original comments remain unaddressed: The TCR needs to address tree preservation and drainage through detailed design as the plan presented may not be feasible with the site’s proposed grading and drainage.
32. At this time, staff have concerns regarding the boundary trees. Please identify any boundary trees or large trees along the property lines that have a CRZ that extends into the development (e.g., over 2m within the proposed development).

Preliminary Grading Plan, 119089-PGR, prepared by Novatech Engineering, dated Sept 03/21.

33. Please ensure this plan coordinates with the EIS and Tree Conservation Report to maximize tree retention.
34. The EIS/TCR does not identify any natural features of concern but does have areas of tree retention. Since the EIS pre-dates the new Official Plan, it does not address the

small wetland that it identifies under the headwater drainage feature as indicated in the new Official Plan under section 4.9.3 policy 6) f) ii).

35. The EIS/TCR and the Preliminary Grading and Site Servicing Plan has areas of tree preservation indicated, we will need to have this carried forward into the detailed design.

Parks Comments:

36. Block 8 is a pedestrian connection (walkway block) and would not be accepted as compensation for the land being requested from Peace Park.
37. Our preference remains to be the 20 m ROW. Should the 23 m ROW be proven necessary, Parks and Facilities Planning (RCFS) would request fair market value for the area to be sold as outlined in the Retention of Municipal Parkland Policy. Below are some excerpts from the policy:

    "The City of Ottawa shall retain ownership of all municipal parkland for recreation as its primary function. Municipal parkland shall not be sold or repurposed and shall not be built upon – with the exception of built facilities that serve a park, recreation and / or cultural function – unless prior approval of the General Manager of Recreation, Cultural and Facility (RCFS) is obtained.

    The Corporate Real Estate Office (CREO) shall ensure that where municipal parkland is sold, or where land rights are provided for uses other than parkland, the Parks and Recreation Facilities Reserve Fund will be compensated at the fair market value of the affected property. This most often occurs in the case of easements over parkland. For additional clarity, when RCFS's right to provide recreation facilities is encumbered by easements or other requests for land rights, compensation will be provided.

    Unless otherwise directed by Council, 100% of the net proceeds generated under this policy shall be used to fund the development of new municipal parks and recreation facilities. The funding may be used for developing new parks and recreation facilities, upgrading existing parks or facilities, capital grants, studies, purchasing land, or other appropriate uses as directed by Council. The reserve funds cannot be used for funding ongoing operating costs."

Corporate Real Estate Office (CREO) Comments:

38. The eastern property boundary of 3200 Reids Lane abuts the Prescott Rail Corridor an inactive city-owned rail corridor, and also lies with the 300-metre buffer area of potential concern. Therefore, 3200 Reids Lane is subject to Section 4.1.2, Subsection 21) a) of the City of Ottawa's Official Plan which states:

    "The FCM-RAC Guidelines for new Development, or its successor shall apply where rail corridors or segments thereof fall within any of the following categories:

    i) Corridors used for freight.
    ii) Corridors used for both freight and urban transit.
    iii) Corridors where there is a reasonable prospect of rail freight operations resuming.
    iv) Corridors where the future use is unknown."

The complete FCM-RAC guidelines document can be viewed via the link provided below: https://www.proximityissues.ca/wp-content/uploads/2017/09/2013_05_29_Guidelines_NewDevelopment_E.pdf

39. Since 3200 Reids Lane abuts the Prescott Rail Corridor, is located within 300-metre buffer area of potential concern, and is currently undergoing the Plan of Subdivision Application process to be developed, CREO also requests that the existence of this rail corridor be registered on title and that the following clause be inserted in the Plan of Subdivision agreement for all development within 300 meters of this railway right-of-way:

    Warning: The City of Ottawa or its assigns or successors in interest has or have a right-of-way within 300 metres from the land subject hereof. There may be alteration to or expansions of the railway facilities on such rights-of-way in the future including the possibility that the railway or its assigns or successors as aforesaid may expand its operations, which expansion may affect the environment of the occupants in the vicinity, notwithstanding the inclusion of any noise and vibration attenuating measures in the design of the development and individual dwellings. The City of Ottawa will not be responsible for any complaints or claims arising from use of such facilities and/or operations on, over or under the aforesaid right-of-way.

The next submission should address each and all of the comments or issues, to ensure the effectiveness and consistency of the next review. Your resubmission cover letter must indicate how each comment has been addressed. You must coordinate the responses from the different consultants and submit only **one cover letter** with numbered responses. If revisions are made other than the ones addressing the comments above, these need to be identified in your cover letter.

If you have any questions on any of the above, please do not hesitate to contact the undersigned at 613-580-2424 extension 26510 or via email at erica.ogden-fedak@ottawa.ca.

Sincerely,

Erica C Ogden-Fedak

Erica C. Ogden-Fedak, MCIP, RPP
Planner II
Development Review Rural

c.c. Kevin Hall, Senior Engineer, Infrastructure City of Ottawa
Matthew Hayley, Environmental Planner, City of Ottawa
Warren Bedford, Parks Planner, City of Ottawa
Mike Giampa, Transportation Engineer, City of Ottawa
Richard Barker, Environmental Remediation, City of Ottawa
Sue Petrovic, Corporate Real Estate Office, City of Ottawa
Russell Chown, BluMetric Environmental Inc.
Glen McDonald, Rideau Valley Conservation Authority

Encl. Hydrogeological Review Comments Memorandum – BluMetric Environmental Inc.

Planning and Engineering - Technical Review Memorandum

Aug. 2, 2023

To: Glen McDonald, Director, Planning & Science, RVCA
From: Evelyn Liu P.Eng., Engineering & Regulation, RVCA
RE: 3200 Reid's Lane, Ottawa
Stormwater Management *Review 2nd review*

I have reviewed the following material, regarding stormwater management:

"Conceptual Servicing And Stormwater Management Report 3200 Reid's Lane Subdivision City Of Ottawa" Prepared by Melanie Schroeder, P.Eng and Lisa Bowley, P. Eng, of NOVATECH, revised June, 2023

Section 3.0 of the report states that:

The following criteria will be applied to the stormwater management analysis and conceptual design.

Water Quantity
Control post-development peak flows to pre-development levels.
Storm drainage is to be provided using roadside ditches and side/rearyard drainage.

Swales: Storm runoff for all storms up to and including the 100-year event is to be confined within the right-of-ways or within defined drainage easements.

The soils on the site consist of topsoil underlain by fine to medium grained sand overlying silty clays or glacial tills.

My comments are as followings:

1. It appears that a dry pond is proposed at Block 8 with some best management measures for stormwater management and there are no details on the side/rea ryard drainage.

2. As the site is mainly a typical rural development with favorable soil conditions, it is recommended that low impact development (LID) options such as infiltration basins or bioswales should be explored in more detail and be included directly in the stormwater management plan. The LID measures should be designed as per long-term direction from the province and current professional engineering standards for both quantity and quality control purposes.

3. The report only provides the pre-development flow and controlled post-development flow. Please provide the post-development flow (without control).

4. Please show the 1:100-year design storm ponding extent within the ditches on the grading plans.

5. Please provide more details on the side/rear yard drainage and show these details in the grading plan.

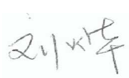
6. Please indicate overland flow routes for the site.

7. Please provide conceptual design of the dry pond and the swales, such as storage, depth in these facilities and provide plan view and cross sections views.

8. Any new outlet to the Drain will require a permit from RVCA under On Reg. 174/06.

I trust this is satisfactory for your present purpose. Please call if you have any questions.

Respectfully,
Department of Engineering and Regulation
Evelyn Liu, M.Asc., P.Eng.
Water Resources Engineer



APPENDIX B

STORMWATER MANAGEMENT CALCULATIONS

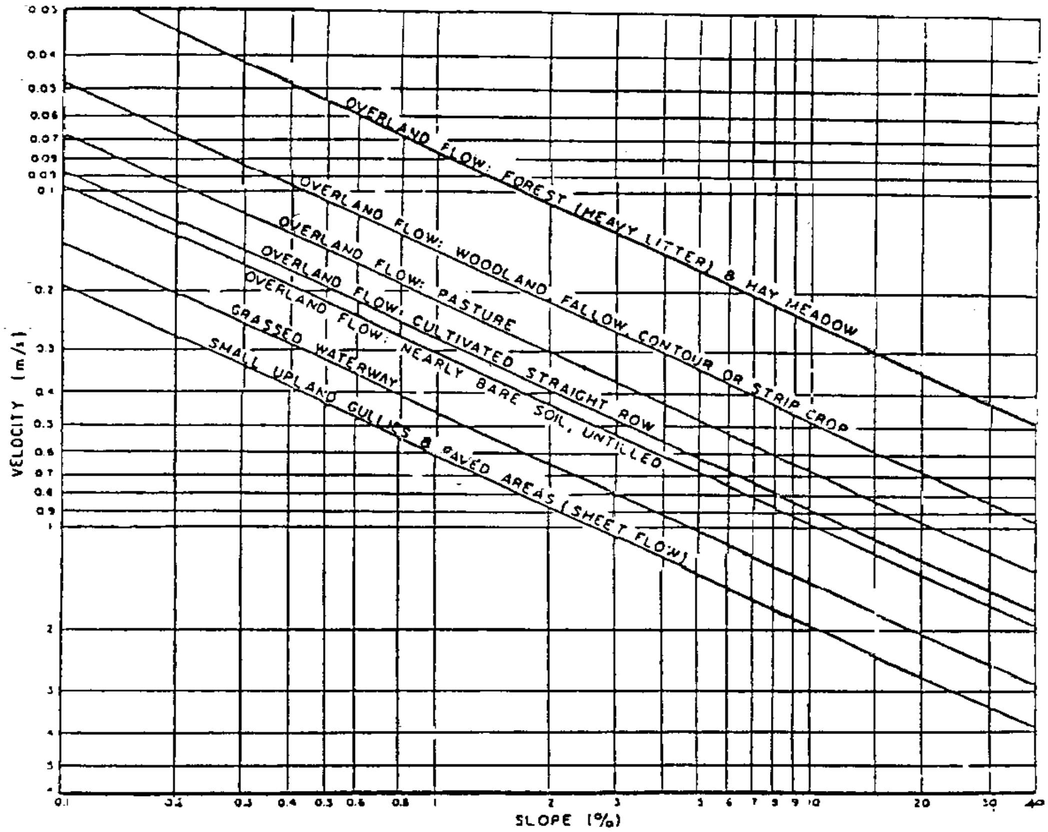


Figure A.5.2: Upland Method for Estimating Time of Concentration
(SCS National Engineering Handbook, 1971)

Project Name
Pre-Development Model Parameters

NOVATECH
Engineers, Planners & Landscape Architects

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 Concentratio (min)	Time to Peak (min)	Time to Peak (min)
EX-1	3.31	100	94.00	91.15	2.8%	0.25	6.67	195	91.15	90.00	0.6%	0.35	9.29	16	11	11
EX-2	1.44	100	93.75	92.50	1.3%	0.16	10.42	140	92.50	90.50	1.4%	0.50	4.67	15	10	10

Weighted Curve Number Calculations
Soil type 'B' (Soil Mapping and Boreholes: silty sand and sandy clay)

Area ID	Land Use 1	Area	CN	Land Use 2	Area	CN	Weighted CN	
EX-1	Forest	79%	55	Residential	21%	72	59	** Soil Type (HSG) = B; Forest Cover = Good; Residential Unit = 1/3 acre
EX-2	Forest	67%	55	Residential	33%	75	62	** Soil Type (HSG) = B; Forest Cover = Good; Residential Unit = 1/4 acre

Weighted IA Calculations

Area ID	Land Use 1	Area	IA	Land Use 2	Area	IA	Weighted IA
EX-1	Forest	79%	15.6	Residential	21%	7.4	13.9
EX-2	Forest	67%	15.6	Residential	33%	6.4	12.5

Project Name
Pre-Development Model Parameters

NOVATECH
Engineers, Planners & Landscape Architects

Time to Peak Calculations
(Uplands Overland Flow Method)
Proposed 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 of Concentration (min)
A	1.18	85	93.25	91.20	2.4%	0.32	4.43	0	-	-	-	-	0.00	4	15
B	0.40	100	92.50	90.80	1.7%	0.27	6.17	0	-	-	-	-	0.00	6	15
C	0.18	30	90.25	90.10	0.5%	0.16	3.13	0	-	-	-	-	0.00	3	15
D	0.56	50	91.90	90.15	3.5%	0.40	2.08	0	-	-	-	-	0.00	2	15
E	0.48	25	91.80	91.20	2.4%	0.32	1.30	0	-	-	-	-	0.00	1	15
F	0.23	30	91.60	91.25	1.2%	0.22	2.27	0	-	-	-	-	0.00	2	15
G	0.11	10	91.55	91.15	4.0%	0.42	0.40	0	-	-	-	-	0.00	0	15
H	0.42	95	93.40	91.50	2.0%	0.30	5.28	0	-	-	-	-	0.00	5	15
EX-1	0.23	60	94.15	93.45	1.2%	0.22	4.55	0	-	-	-	-	0.00	5	15
EX-2	0.48	60	93.90	93.15	1.3%	0.24	4.17	0	-	-	-	-	0.00	4	15
EX-3	0.48	60	94.00	92.60	2.3%	0.32	3.13	0	-	-	-	-	0.00	3	15

Weighted Curve Number Calculations
Soil type 'B' (Soil Mapping and Boreholes: silty sand and sandy clay)

Area ID	Land Use 1	Area	CN	Land Use 2	Area	CN	Weighted CN	
A	Pavement/Roof	17%	98	Lawn	83%	58	65	** Soil Type (HSG) = B; Lawn = Meadow
B	Pavement/Roof	2%	98	Lawn	98%	58	59	** Soil Type (HSG) = B; Lawn = Meadow
C	Pavement/Roof	3%	98	Lawn	98%	58	59	** Soil Type (HSG) = B; Lawn = Meadow
D	Pavement/Roof	10%	98	Lawn	90%	58	62	** Soil Type (HSG) = B; Lawn = Meadow
E	Pavement/Roof	27%	98	Lawn	73%	58	69	** Soil Type (HSG) = B; Lawn = Meadow
F	Pavement/Roof	21%	98	Lawn	79%	58	66	** Soil Type (HSG) = B; Lawn = Meadow
G	Pavement/Roof	26%	98	Lawn	74%	58	68	** Soil Type (HSG) = B; Lawn = Meadow
H	Pavement/Roof	13%	98	Lawn	87%	58	63	** Soil Type (HSG) = B; Lawn = Meadow
EX-1	Residential	100%	72	Lawn	0%	58	72	** Soil Type (HSG) = B; Lawn = Meadow; Residential Unit = 1/3 acre
EX-2	Residential	100%	75	Lawn	0%	58	75	** Soil Type (HSG) = B; Lawn = Meadow; Residential Unit = 1/4 acre
EX-3	Residential	100%	72	Lawn	0%	58	72	** Soil Type (HSG) = B; Lawn = Meadow; Residential Unit = 1/3 acre

Weighted IA Calculations

Area ID	Land Use 1	Area	IA	Land Use 2	Area	IA	Weighted IA
A	Pavement/Roof	17%	1.0	Lawn	83%	13.8	11.6
B	Pavement/Roof	2%	1.0	Lawn	98%	13.8	13.5
C	Pavement/Roof	3%	1.0	Lawn	98%	13.8	13.5
D	Pavement/Roof	10%	1.0	Lawn	90%	13.8	12.5
E	Pavement/Roof	27%	1.0	Lawn	73%	13.8	10.4
F	Pavement/Roof	21%	1.0	Lawn	79%	13.8	11.1
G	Pavement/Roof	26%	1.0	Lawn	74%	13.8	10.5
H	Pavement/Roof	13%	1.0	Lawn	87%	13.8	12.2
EX-1	Residential	100%	7.4	Lawn	0%	13.8	7.4
EX-2	Residential	100%	6.4	Lawn	0%	13.8	6.4
EX-3	Residential	100%	7.4	Lawn	0%	13.8	7.4

3200 Reid's Lane (119089)
Design Storm Time Series Data
Chicago Design Storms

NOVATECH
Engineers, Planners & Landscape Architects

C25mm-4.stm			C2-3.stm			C5-3.stm	
Duration min	Intensity mm/hr		Duration min	Intensity mm/hr		Duration min	Intensity mm/hr
0:00	0		0:00	0		0:00	0
0:10	1.51		0:10	2.81		0:10	3.68
0:20	1.75		0:20	3.5		0:20	4.58
0:30	2.07		0:30	4.69		0:30	6.15
0:40	2.58		0:40	7.3		0:40	9.61
0:50	3.46		0:50	18.21		0:50	24.17
1:00	5.39		1:00	76.81		1:00	104.19
1:10	13.44		1:10	24.08		1:10	32.04
1:20	56.67		1:20	12.36		1:20	16.34
1:30	17.77		1:30	8.32		1:30	10.96
1:40	9.12		1:40	6.3		1:40	8.29
1:50	6.14		1:50	5.09		1:50	6.69
2:00	4.65		2:00	4.29		2:00	5.63
2:10	3.76		2:10	3.72		2:10	4.87
2:20	3.17		2:20	3.29		2:20	4.3
2:30	2.74		2:30	2.95		2:30	3.86
2:40	2.43		2:40	2.68		2:40	3.51
2:50	2.18		2:50	2.46		2:50	3.22
3:00	1.98		3:00	2.28		3:00	2.98
3:10	1.81						
3:20	1.68						
3:30	1.56						
3:40	1.47						
3:50	1.38						
4:00	1.31						

3200 Reid's Lane (119089)
Design Storm Time Series Data
Chicago Design Storms

NOVATECH
Engineers, Planners & Landscape Architects

C100-3.stm

Duration min	Intensity mm/hr
0:00	0
0:10	6.05
0:20	7.54
0:30	10.16
0:40	15.97
0:50	40.65
1:00	178.56
1:10	54.05
1:20	27.32
1:30	18.24
1:40	13.74
1:50	11.06
2:00	9.29
2:10	8.02
2:20	7.08
2:30	6.35
2:40	5.76
2:50	5.28
3:00	4.88

C100-3+20%.stm

Duration min	Intensity mm/hr
0:00	0
0:10	6:14
0:20	9.05
0:30	12.19
0:40	19.16
0:50	48.78
1:00	214.27
1:10	64.86
1:20	32.78
1:30	21.89
1:40	16.49
1:50	13.27
2:00	11.15
2:10	9.62
2:20	8.5
2:30	7.62
2:40	6.91
2:50	6.34
3:00	5.86

3200 Reid's Lane (119089)
Design Storm Time Series Data
SCS Design Storms

NOVATECH
Engineers, Planners & Landscape Architects

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

3200 Reid's Lane (119089)

Design Storm Time Series Data

SCS Design Storms

S2-24.stm		S5-24.stm		S100-24.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
1:00	0.72	1:00	0.44	1:00	0.6
2:00	0.34	2:00	0.44	2:00	0.75
3:00	0.63	3:00	0.81	3:00	1.39
4:00	0.63	4:00	0.81	4:00	1.39
5:00	0.81	5:00	1.06	5:00	1.81
6:00	0.72	6:00	0.94	6:00	1.6
7:00	0.96	7:00	1.25	7:00	2.13
8:00	0.96	8:00	1.25	8:00	2.13
9:00	1.30	9:00	1.68	9:00	2.88
10:00	1.63	10:00	2.12	10:00	3.63
11:00	2.59	11:00	3.37	11:00	5.76
12:00	20.55	12:00	26.71	12:00	45.69
13:00	5.23	13:00	6.8	13:00	11.64
14:00	2.30	14:00	2.99	14:00	5.12
15:00	1.54	15:00	2	15:00	3.42
16:00	1.34	16:00	1.75	16:00	2.99
17:00	1.06	17:00	1.37	17:00	2.35
18:00	1.11	18:00	1.44	18:00	2.46
19:00	0.72	19:00	0.94	19:00	1.6
20:00	0.58	20:00	0.75	20:00	1.28
21:00	0.81	21:00	1.06	21:00	1.81
22:00	0.53	22:00	0.68	22:00	1.17
23:00	0.48	23:00	0.63	23:00	1.07
0:00	0.48	0:00	0.63	0:00	1.07

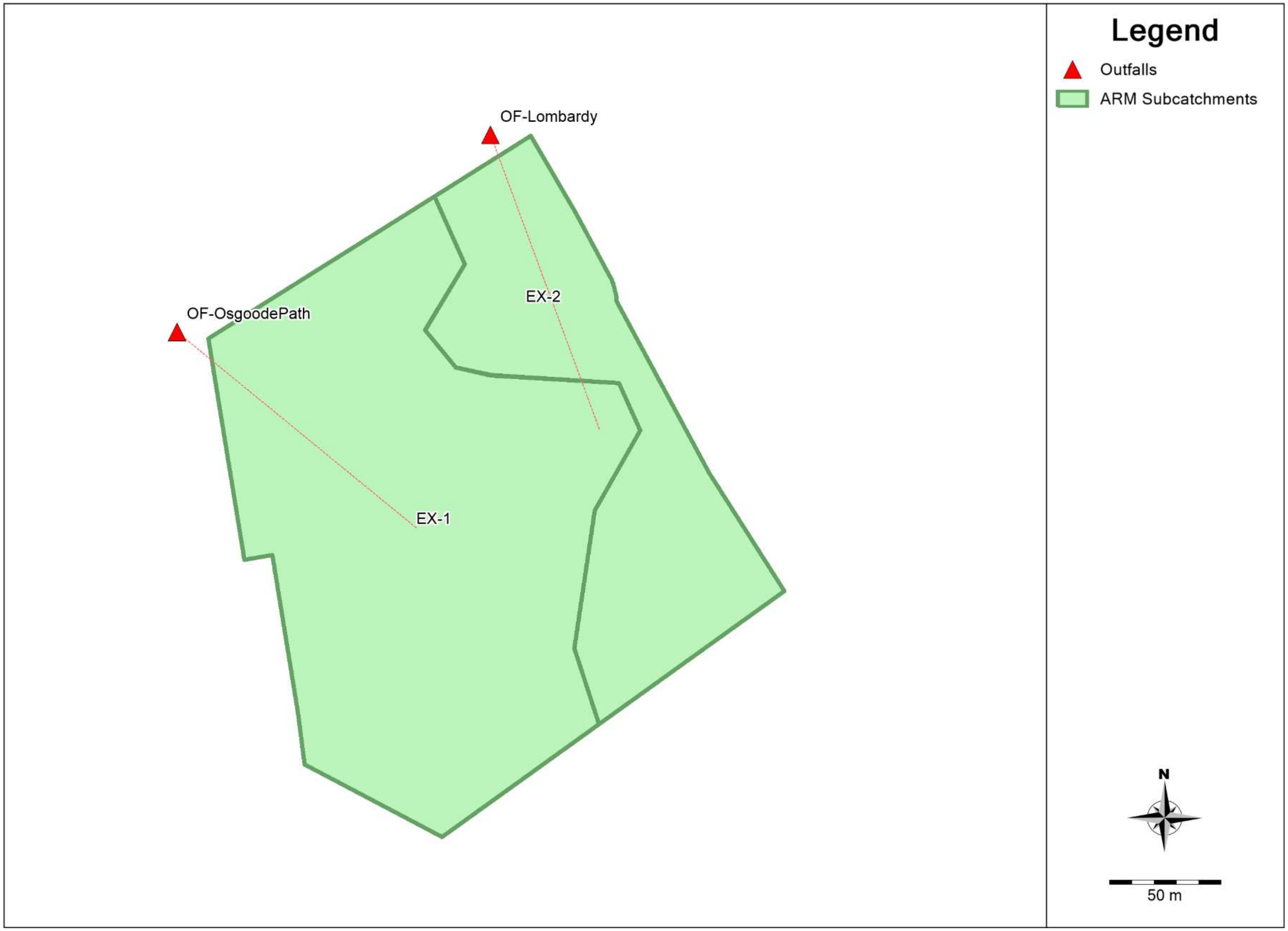
3200 Reid's Lane (119089)
PCSWMM Pre-Development Model Schematics

Overall Model Schematic

Date: 2024-11-11
M:\2019\119089\DATA\Calculations\Sewer Calcs\SWM\PCSWMM\Sub 3\119089-Pre PCSWMM Model Schematics-Rev1.docx

3200 Reid's Lane (119089)
PCSWMM Pre-Development Model Schematics

Subcatchments and Outfalls



Date: 2024-11-11
M:\2019\119089\DATA\Calculations\Sewer Calcs\SWM\PCSWMM\Sub 3\119089-Pre PCSWMM Model Schematics-Rev1.docx

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:	05/04/2021 00:00:00
Simulation end time:	05/06/2021 00:00:00
Runoff wet weather time steps:	240 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-2	Nash IUH	Raingage	1.44	15	10	62	0.01299	0.998
EX-1	Nash IUH	Raingage	3.31	16	10.67	69.33	0.028	0.999

****
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-2	93.91	65.956	27.903	0.402	95.531	0.297
EX-1	93.91	68.954	24.921	0.825	191.26	0.265

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 0
Number of pollutants 0
Number of land uses 0

****
Raingage Summary

```
****************
                                               Data       Recording
Name                 Data Source               Type       Interval
------------------------------------------------------------------------
Raingage             07-SCS100yr-12hr          INTENSITY   30 min.


************
Node Summary
************
                                          Invert      Max.    Ponded    External
Name                 Type                  Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
OF-Lombardy          OUTFALL               90.80      0.00       0.0
OF-OsgoodePath       OUTFALL               90.75      0.00       0.0



*********************************************************
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 ........... NO
  Water Quality .......... NO
Surcharge Method ......... EXTRAN
Starting Date ............ 05/04/2021 00:00:00
Ending Date .............. 05/06/2021 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00


**************************        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 ..........         0.123          1.227
External Outflow .........         0.123          1.227
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
```

```
Analysis begun on:  Mon Nov 11 15:38:58 2024
Analysis ended on:  Mon Nov 11 15:38:58 2024
Total elapsed time: < 1 sec
```

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:	05/04/2021 00:00:00
Simulation end time:	05/06/2021 00:00:00
Runoff wet weather time steps:	240 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-2	Nash IUH	Raingage	1.44	15	10	62	0.01299	0.998
EX-1	Nash IUH	Raingage	3.31	16	10.67	69.33	0.028	0.999

****
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-2	106.73	71.2	35.465	0.511	74.22	0.332
EX-1	106.73	74.735	31.964	1.058	151.848	0.299

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 0
Number of pollutants 0
Number of land uses 0

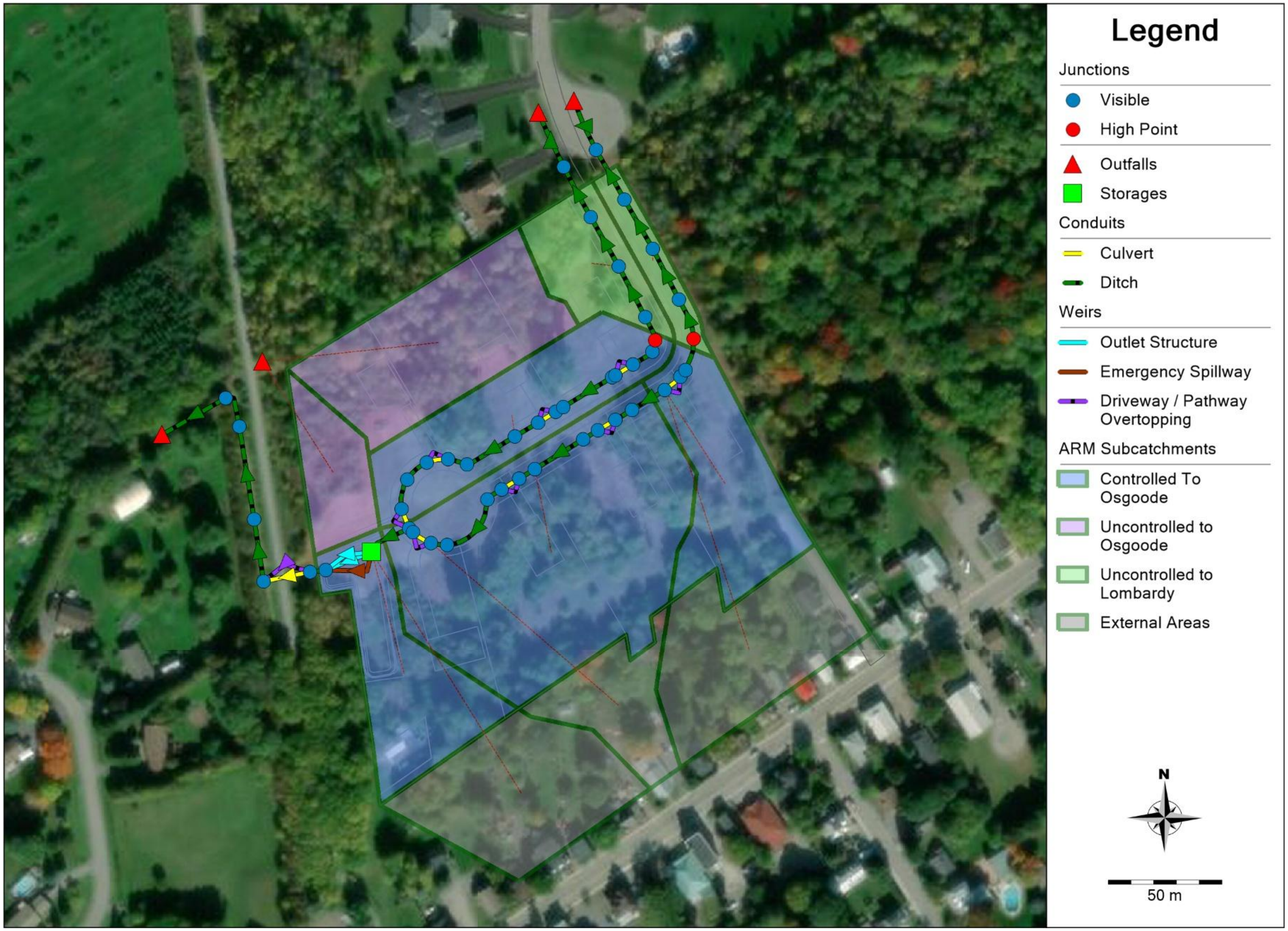
****
Raingage Summary

```
****************
                                                        Data        Recording
Name                 Data Source                        Type        Interval
-------------------------------------------------------------------------
Raingage             11-SCS100yr-24hr                   INTENSITY   60 min.


************
Node Summary
************
                                           Invert      Max.     Ponded    External
Name                 Type                   Elev.     Depth       Area    Inflow
-------------------------------------------------------------------------------
OF-Lombardy          OUTFALL                90.80      0.00        0.0
OF-OsgoodePath       OUTFALL                90.75      0.00        0.0



*********************************************************
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 ........... NO
  Water Quality .......... NO
Surcharge Method ......... EXTRAN
Starting Date ............ 05/04/2021 00:00:00
Ending Date .............. 05/06/2021 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00


**************************        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 ..........          0.157          1.568
External Outflow .........          0.157          1.568
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
```

```
Analysis begun on:  Mon Nov 11 15:42:05 2024
Analysis ended on:  Mon Nov 11 15:42:05 2024
Total elapsed time: < 1 sec
```

3200 Reid's Lane (119089)
PCSWMM Post-Development Model Schematics

Overall Model Schematic



Date: 2024-11-11
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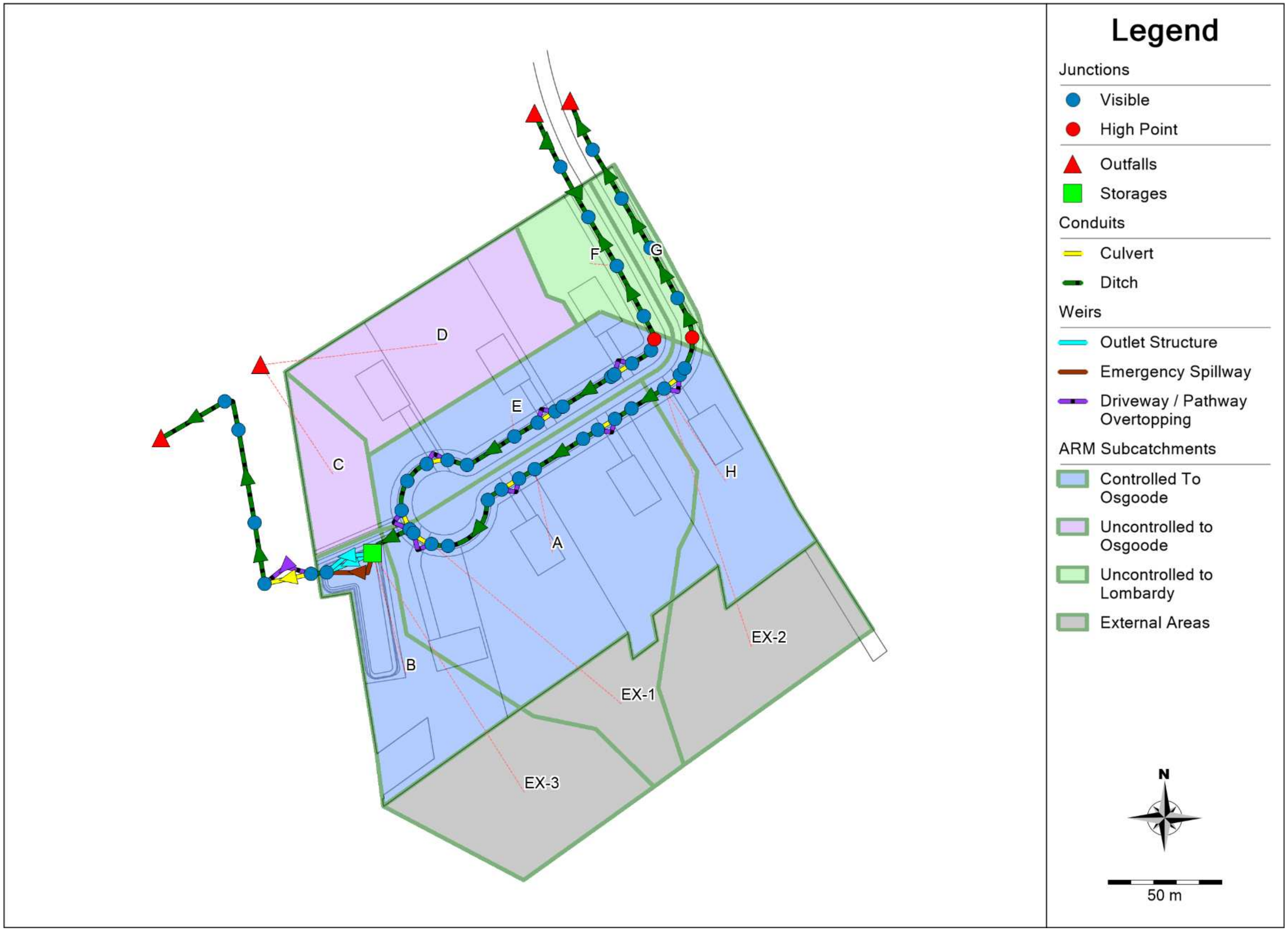
3200 Reid's Lane (119089)
PCSWMM Post-Development Model Schematics

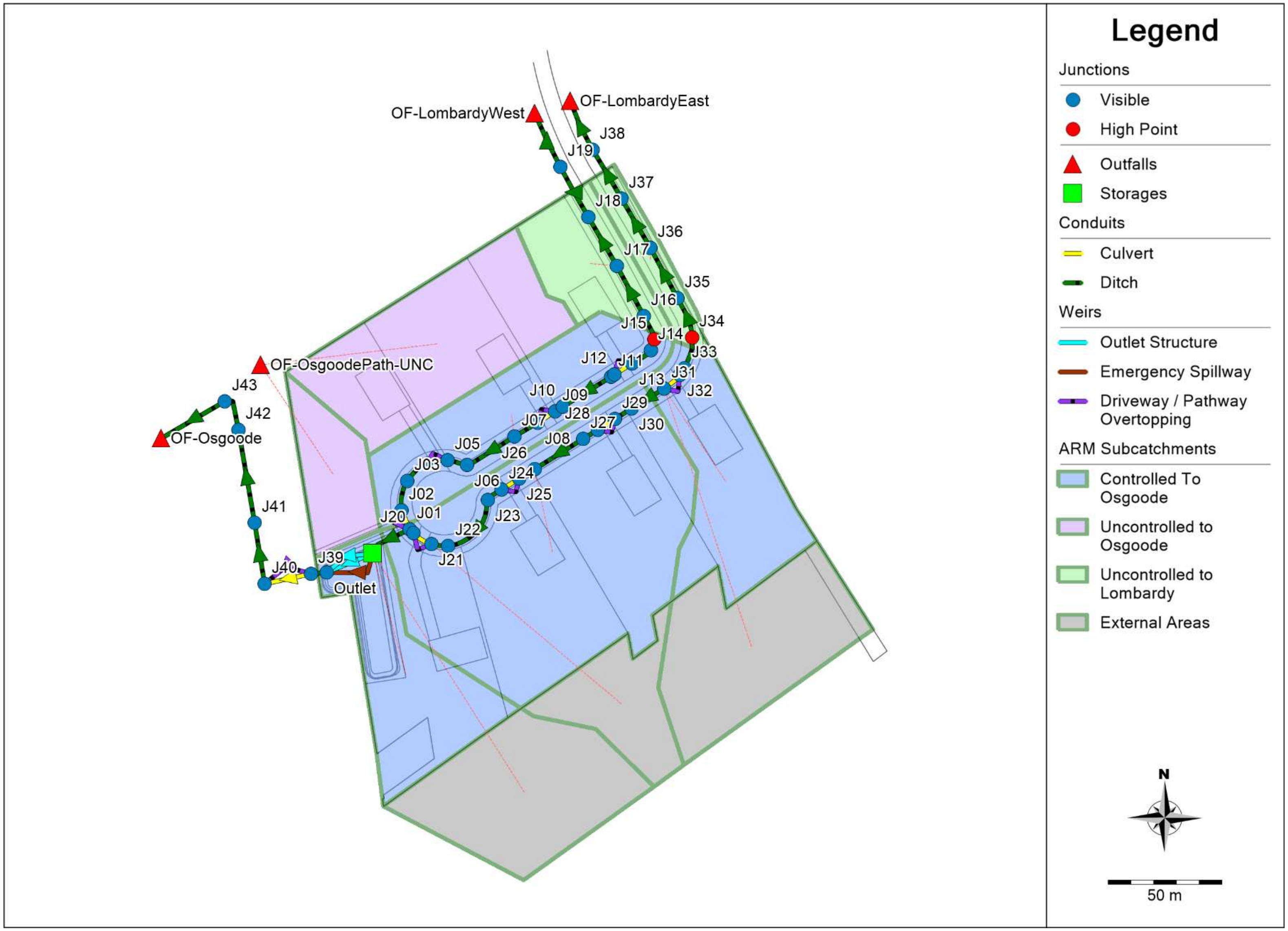
Subcatchments



Date: 2024-11-11
M:\2019\119089\DATA\Calculations\Sewer Calcs\SWM\PCSWMM\Sub 3\119089-Post PCSWMM Model Schematics_Rev2.docx

3200 Reid's Lane (119089)
PCSWMM Post-Development Model Schematics

Junctions and Outfalls



Date: 2024-11-11
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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:	05/04/2021 00:00:00
Simulation end time:	05/06/2021 00:00:00
Runoff wet weather time steps:	240 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-2	Nash IUH	Raingage	0.48	15	10	54	0.00433	0.998
EX-1	Nash IUH	Raingage	0.23	15	10	50	0.00208	0.997
EX-3	Nash IUH	Raingage	0.48	15	10	54	0.00433	0.998
D	Nash IUH	Raingage	0.56	15	10	54	0.00505	0.998
A	Nash IUH	Raingage	1.18	15	10	58	0.01065	0.998
B	Nash IUH	Raingage	0.4	15	10	54	0.00361	0.998
C	Nash IUH	Raingage	0.18	15	10	46	0.00162	0.996
E	Nash IUH	Raingage	0.48	15	10	54	0.00433	0.998
G	Nash IUH	Raingage	0.11	15	10	46	0.00099	0.996
F	Nash IUH	Raingage	0.23	15	10	50	0.00208	0.997
H	Nash IUH	Raingage	0.42	15	10	54	0.00379	0.998

****
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-2	93.91	49.432	44.375	0.213	52.671	0.473
EX-1	93.91	53.519	40.283	0.093	22.744	0.429
EX-3	93.91	53.519	40.312	0.194	47.468	0.429
D	93.91	65.956	27.893	0.156	37.151	0.297
A	93.91	62.985	30.864	0.364	87.213	0.329
B	93.91	68.743	25.1	0.1	23.708	0.267
C	93.91	68.743	25.072	0.045	10.668	0.267
E	93.91	58.622	35.208	0.169	41.1	0.375
G	93.91	59.628	34.155	0.038	9.117	0.364
F	93.91	61.814	32.009	0.074	17.715	0.341
H	93.91	64.993	28.857	0.121	28.892	0.307

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

WARNING 02: maximum depth increased for Node J09
WARNING 02: maximum depth increased for Node J13
WARNING 02: maximum depth increased for Node J21
WARNING 02: maximum depth increased for Node J25
WARNING 02: maximum depth increased for Node J29
WARNING 02: maximum depth increased for Node J32
WARNING 02: maximum depth increased for Node J39

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 0
Number of nodes ........... 49
Number of links ........... 58
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                     Data      Recording
Name                 Data Source                     Type      Interval
------------------------------------------------------------------------
Raingage             07-SCS100yr-12hr                INTENSITY   30 min.


************
Node Summary
************
                                          Invert      Max.    Ponded    External
Name                 Type                  Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
J01                  JUNCTION              90.45      1.00       0.0
J02                  JUNCTION              90.47      1.00       0.0
J03                  JUNCTION              90.50      1.00       0.0
J04                  JUNCTION              90.55      1.00       0.0
J05                  JUNCTION              90.59      1.00       0.0
J06                  JUNCTION              90.63      1.00       0.0
J07                  JUNCTION              90.75      1.00       0.0
J08                  JUNCTION              90.81      1.00       0.0
J09                  JUNCTION              90.86      1.00       0.0
J10                  JUNCTION              90.88      1.00       0.0
J11                  JUNCTION              91.00      1.00       0.0
J12                  JUNCTION              91.01      1.00       0.0
J13                  JUNCTION              91.07      1.00       0.0
J14                  JUNCTION              91.13      1.00       0.0
J15                  JUNCTION              91.18      1.00       0.0
J16                  JUNCTION              91.03      1.00       0.0
J17                  JUNCTION              90.77      1.00       0.0
J18                  JUNCTION              90.52      1.00       0.0
J19                  JUNCTION              90.26      1.00       0.0
J20                  JUNCTION              90.46      1.00       0.0
```

```
J21                 JUNCTION            90.48      1.00       0.0
J22                 JUNCTION            90.50      1.00       0.0
J23                 JUNCTION            90.63      1.00       0.0
J24                 JUNCTION            90.67      1.00       0.0
J25                 JUNCTION            90.71      1.00       0.0
J26                 JUNCTION            90.75      1.00       0.0
J27                 JUNCTION            90.88      1.00       0.0
J28                 JUNCTION            90.92      1.00       0.0
J29                 JUNCTION            90.96      1.00       0.0
J30                 JUNCTION            91.00      1.00       0.0
J31                 JUNCTION            91.07      1.00       0.0
J32                 JUNCTION            91.11      1.00       0.0
J33                 JUNCTION            91.13      1.00       0.0
J34                 JUNCTION            91.18      1.00       0.0
J35                 JUNCTION            91.03      1.00       0.0
J36                 JUNCTION            90.77      1.00       0.0
J37                 JUNCTION            90.52      1.00       0.0
J38                 JUNCTION            90.26      1.00       0.0
J39                 JUNCTION            90.15      1.55       0.0
J40                 JUNCTION            89.74      1.96       0.0
J41                 JUNCTION            89.64      2.00       0.0
J42                 JUNCTION            89.48      2.00       0.0
J43                 JUNCTION            89.26      2.00       0.0
Outlet              JUNCTION            90.40      1.00       0.0
OF-LombardyEast     OUTFALL             90.05      0.30       0.0
OF-LombardyWest     OUTFALL             90.05      0.60       0.0
OF-Osgoode          OUTFALL             88.36      1.40       0.0
OF-OsgoodePath-UNC  OUTFALL             91.00      0.00       0.0
DryPond             STORAGE             90.40      1.00       0.0


************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
---------------------------------------------------------------------------------------------
C01              J02              J01              CONDUIT            9.0    0.2222    0.0240
C02              J03              J02              CONDUIT           13.0    0.2308    0.0350
C03              J04              J03              CONDUIT           12.0    0.4167    0.0350
C04              J05              J04              CONDUIT            9.0    0.4444    0.0240
C05              J06              J05              CONDUIT            9.0    0.4444    0.0350
C06              J07              J06              CONDUIT           24.0    0.5000    0.0350
C07              J08              J07              CONDUIT           12.0    0.5000    0.0350
C08              J09              J08              CONDUIT            9.0    0.5556    0.0240
C09              J10              J09              CONDUIT            4.0    0.5000    0.0350
C10              J11              J10              CONDUIT           25.0    0.4800    0.0350
C11              J12              J11              CONDUIT            2.0    0.5000    0.0350
C12              J13              J12              CONDUIT            9.0    0.6667    0.0240
C13              J14              J13              CONDUIT           10.0    0.6000    0.0350
C14              J15              J14              CONDUIT            5.0    1.0001    0.0350
C15              J15              J16              CONDUIT           11.0    1.3638    0.0350
C16              J16              J17              CONDUIT           25.0    1.0401    0.0350
C17              J17              J18              CONDUIT           25.0    1.0001    0.0350
C18              J18              J19              CONDUIT           25.0    1.0401    0.0350
C19              J19              OF-LombardyWest  CONDUIT           26.0    0.8077    0.0350
C20              J20              J01              CONDUIT            2.0    0.5000    0.0350
C21              J21              J20              CONDUIT            9.0    0.2222    0.0240
C22              J22              J21              CONDUIT            7.0    0.2857    0.0350
```

C23	J23	J22	CONDUIT	29.0	0.4483	0.0350
C24	J24	J23	CONDUIT	8.0	0.5000	0.0350
C25	J25	J24	CONDUIT	9.0	0.4444	0.0240
C26	J26	J25	CONDUIT	8.0	0.5000	0.0350
C27	J27	J26	CONDUIT	25.0	0.5200	0.0350
C28	J28	J27	CONDUIT	8.0	0.5000	0.0350
C29	J29	J28	CONDUIT	9.0	0.4444	0.0240
C30	J30	J29	CONDUIT	9.0	0.4444	0.0350
C31	J31	J30	CONDUIT	17.0	0.4118	0.0350
C32	J32	J31	CONDUIT	9.0	0.4444	0.0240
C33	J33	J32	CONDUIT	4.0	0.5000	0.0350
C34	J34	J33	CONDUIT	14.0	0.3571	0.0350
C35	J34	J35	CONDUIT	19.0	0.7895	0.0350
C36	J35	J36	CONDUIT	25.0	1.0401	0.0350
C37	J36	J37	CONDUIT	25.0	1.0001	0.0350
C38	J37	J38	CONDUIT	25.0	1.0401	0.0350
C39	J38	OF-LombardyEast	CONDUIT	24.0	0.8750	0.0350
C40	J01	DryPond	CONDUIT	20.0	0.1500	0.0350
C41	Outlet	J39	CONDUIT	5.0	4.0032	0.0350
C42	J40	J41	CONDUIT	27.0	0.3704	0.0350
C43	J41	J42	CONDUIT	41.0	0.3902	0.0350
C44	J42	J43	CONDUIT	16.0	1.3751	0.0350
C45	J43	OF-Osgoode	CONDUIT	32.0	2.8136	0.0350
Culv-OsgoodePath	J39	J40	CONDUIT	20.0	0.5000	0.0130
W01	J02	J01	WEIR			
W02	J05	J04	WEIR			
W03	J09	J08	WEIR			
W04	J13	J12	WEIR			
W05	J21	J20	WEIR			
W06	J25	J24	WEIR			
W07	J29	J28	WEIR			
W08	J32	J31	WEIR			
W-Emergency	DryPond	Outlet	WEIR			
W-Path	J39	J40	WEIR			
W-Pond	DryPond	Outlet	WEIR			
W-PondUpper	DryPond	Outlet	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C01	CIRCULAR	0.40	0.13	0.10	0.40	1	53.18
C02	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1146.09
C03	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1540.02
C04	CIRCULAR	0.40	0.13	0.10	0.40	1	75.21
C05	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1590.53
C06	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C07	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C08	CIRCULAR	0.40	0.13	0.10	0.40	1	84.09
C09	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C10	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1652.93
C11	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C12	CIRCULAR	0.40	0.13	0.10	0.40	1	92.11
C13	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1848.03
C14	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	2385.84

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  C15              TRAPEZOIDAL          0.60      1.68      0.35      4.60          1  2786.12
  C16              TRAPEZOIDAL          0.60      1.68      0.35      4.60          1  2433.09
  C17              TRAPEZOIDAL          0.60      1.68      0.35      4.60          1  2385.84
  C18              TRAPEZOIDAL          0.60      1.68      0.35      4.60          1  2433.09
  C19              TRAPEZOIDAL          0.60      1.68      0.35      4.60          1  2144.18
  C20              TRAPEZOIDAL          0.60      1.68      0.35      4.60          1  1687.01
  C21              CIRCULAR             0.40      0.13      0.10      0.40          1    53.18
  C22              TRAPEZOIDAL          0.60      1.68      0.35      4.60          1  1275.26
  C23              TRAPEZOIDAL          0.60      1.68      0.35      4.60          1  1597.37
  C24              TRAPEZOIDAL          0.60      1.68      0.35      4.60          1  1687.01
  C25              CIRCULAR             0.40      0.13      0.10      0.40          1    75.21
  C26              TRAPEZOIDAL          0.60      1.68      0.35      4.60          1  1687.01
  C27              TRAPEZOIDAL          0.60      1.68      0.35      4.60          1  1720.42
  C28              TRAPEZOIDAL          0.60      1.68      0.35      4.60          1  1687.01
  C29              CIRCULAR             0.40      0.13      0.10      0.40          1    75.21
  C30              TRAPEZOIDAL          0.60      1.68      0.35      4.60          1  1590.53
  C31              TRAPEZOIDAL          0.60      1.68      0.35      4.60          1  1530.94
  C32              CIRCULAR             0.40      0.13      0.10      0.40          1    75.21
  C33              TRAPEZOIDAL          0.60      1.68      0.35      4.60          1  1687.01
  C34              TRAPEZOIDAL          0.60      1.68      0.35      4.60          1  1425.78
  C35              TRAPEZOIDAL          0.30      0.57      0.20      2.80          1   489.50
  C36              TRAPEZOIDAL          0.30      0.57      0.20      2.80          1   561.84
  C37              TRAPEZOIDAL          0.30      0.57      0.20      2.80          1   550.92
  C38              TRAPEZOIDAL          0.30      0.57      0.20      2.80          1   561.84
  C39              TRAPEZOIDAL          0.30      0.57      0.20      2.80          1   515.34
  C40              TRAPEZOIDAL          0.60      1.68      0.35      4.60          1   924.01
  C41              TRAPEZOIDAL          0.60      1.68      0.35      4.60          1  4773.47
  C42              OsgoodeDitch         1.66      8.97      0.81      9.70          1 13533.66
  C43              OsgoodeDitch         1.66      8.97      0.81      9.70          1 13892.02
  C44              OsgoodeDitch         1.66      8.97      0.81      9.70          1 26077.59
  C45              TaylorWayDitch       1.40      4.75      0.64      6.90          1 16912.25
  Culv-OsgoodePath CIRCULAR             0.50      0.20      0.12      0.50          1   267.02


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

  Transect OsgoodeDitch
  Area:
            0.0005     0.0019     0.0043     0.0076     0.0119
            0.0172     0.0234     0.0305     0.0387     0.0477
            0.0577     0.0687     0.0807     0.0935     0.1074
            0.1222     0.1383     0.1564     0.1755     0.1951
            0.2152     0.2357     0.2566     0.2780     0.2999
            0.3222     0.3449     0.3681     0.3918     0.4159
            0.4405     0.4655     0.4910     0.5169     0.5433
            0.5702     0.5975     0.6252     0.6534     0.6821
            0.7112     0.7408     0.7708     0.8013     0.8322
            0.8639     0.8965     0.9301     0.9646     1.0000
  Hrad:
            0.0198     0.0396     0.0594     0.0792     0.0990
            0.1188     0.1386     0.1584     0.1782     0.1980
            0.2178     0.2376     0.2574     0.2772     0.2970
            0.3168     0.3204     0.3285     0.3578     0.3863
            0.4140     0.4412     0.4677     0.4936     0.5191
            0.5440     0.5685     0.5926     0.6164     0.6397
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            0.6627      0.6854      0.7078      0.7300      0.7518
            0.7735      0.7949      0.8160      0.8370      0.8578
            0.8784      0.8988      0.9191      0.9392      0.9576
            0.9649      0.9729      0.9815      0.9905      1.0000
  Width:
            0.0266      0.0532      0.0797      0.1063      0.1329
            0.1595      0.1860      0.2126      0.2392      0.2658
            0.2924      0.3189      0.3455      0.3721      0.3987
            0.4253      0.4768      0.5264      0.5390      0.5517
            0.5643      0.5769      0.5896      0.6022      0.6148
            0.6275      0.6401      0.6527      0.6654      0.6780
            0.6906      0.7033      0.7159      0.7285      0.7412
            0.7538      0.7664      0.7791      0.7917      0.8043
            0.8170      0.8296      0.8422      0.8549      0.8691
            0.8953      0.9215      0.9477      0.9738      1.0000

  Transect TaylorWayDitch
  Area:
            0.0004      0.0016      0.0036      0.0064      0.0101
            0.0145      0.0197      0.0258      0.0326      0.0402
            0.0487      0.0579      0.0680      0.0789      0.0905
            0.1030      0.1163      0.1304      0.1453      0.1610
            0.1775      0.1948      0.2129      0.2318      0.2515
            0.2720      0.2934      0.3155      0.3384      0.3622
            0.3867      0.4121      0.4382      0.4652      0.4930
            0.5215      0.5509      0.5811      0.6121      0.6438
            0.6759      0.7084      0.7413      0.7750      0.8098
            0.8457      0.8827      0.9207      0.9598      1.0000
  Hrad:
            0.0201      0.0402      0.0603      0.0805      0.1006
            0.1207      0.1408      0.1609      0.1810      0.2011
            0.2212      0.2414      0.2615      0.2816      0.3017
            0.3218      0.3419      0.3620      0.3822      0.4023
            0.4224      0.4425      0.4626      0.4827      0.5028
            0.5229      0.5431      0.5632      0.5833      0.6034
            0.6235      0.6436      0.6637      0.6839      0.7040
            0.7241      0.7442      0.7643      0.7844      0.8117
            0.8416      0.8713      0.8984      0.9117      0.9255
            0.9396      0.9542      0.9691      0.9844      1.0000
  Width:
            0.0198      0.0395      0.0593      0.0791      0.0988
            0.1186      0.1384      0.1581      0.1779      0.1977
            0.2174      0.2372      0.2570      0.2767      0.2965
            0.3163      0.3360      0.3558      0.3756      0.3953
            0.4151      0.4349      0.4546      0.4744      0.4942
            0.5139      0.5337      0.5535      0.5732      0.5930
            0.6128      0.6326      0.6523      0.6721      0.6919
            0.7116      0.7314      0.7512      0.7709      0.7836
            0.7934      0.8032      0.8154      0.8417      0.8681
            0.8945      0.9209      0.9472      0.9736      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 ............ 05/04/2021 00:00:00
Ending Date .............. 05/06/2021 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 ........ 4
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 ..........         0.157         1.566
External Outflow .........         0.157         1.569
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 (%) .....        -0.140


***************************
Time-Step Critical Elements
***************************
Link C20 (22.98%)


********************************
Highest Flow Instability Indexes
********************************
Link Culv-OsgoodePath (3)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.42 sec
```

```
Average Time Step          :     1.79 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     :    77.31 %
    1.516 -  1.149 sec     :     8.72 %
    1.149 -  0.871 sec     :    10.91 %
    0.871 -  0.660 sec     :     2.96 %
    0.660 -  0.500 sec     :     0.11 %


******************
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
J01	JUNCTION	0.07	0.46	90.91	0	07:12	0.46
J02	JUNCTION	0.07	0.44	90.91	0	07:12	0.44
J03	JUNCTION	0.06	0.41	90.91	0	07:12	0.41
J04	JUNCTION	0.04	0.36	90.91	0	07:12	0.36
J05	JUNCTION	0.04	0.33	90.92	0	07:12	0.33
J06	JUNCTION	0.03	0.29	90.92	0	07:12	0.29
J07	JUNCTION	0.01	0.17	90.92	0	07:12	0.17
J08	JUNCTION	0.00	0.11	90.92	0	07:12	0.11
J09	JUNCTION	0.00	0.06	90.92	0	07:12	0.06
J10	JUNCTION	0.00	0.04	90.92	0	07:12	0.04
J11	JUNCTION	0.00	0.00	91.00	0	00:00	0.00
J12	JUNCTION	0.00	0.00	91.01	0	00:00	0.00
J13	JUNCTION	0.00	0.00	91.07	0	00:00	0.00
J14	JUNCTION	0.00	0.00	91.13	0	00:00	0.00
J15	JUNCTION	0.00	0.00	91.18	0	00:00	0.00
J16	JUNCTION	0.00	0.00	91.03	0	00:00	0.00
J17	JUNCTION	0.00	0.05	90.82	0	06:33	0.05
J18	JUNCTION	0.00	0.05	90.57	0	06:35	0.05
J19	JUNCTION	0.00	0.05	90.31	0	06:36	0.05
J20	JUNCTION	0.07	0.45	90.91	0	07:12	0.45
J21	JUNCTION	0.07	0.57	91.05	0	06:50	0.56
J22	JUNCTION	0.07	0.55	91.05	0	06:50	0.55
J23	JUNCTION	0.04	0.42	91.05	0	06:50	0.42
J24	JUNCTION	0.03	0.38	91.05	0	06:50	0.38
J25	JUNCTION	0.05	0.52	91.23	0	06:40	0.52
J26	JUNCTION	0.03	0.48	91.23	0	06:40	0.48
J27	JUNCTION	0.02	0.35	91.23	0	06:40	0.35
J28	JUNCTION	0.02	0.31	91.23	0	06:40	0.31
J29	JUNCTION	0.03	0.32	91.28	0	06:38	0.32
J30	JUNCTION	0.02	0.28	91.28	0	06:38	0.28
J31	JUNCTION	0.01	0.21	91.28	0	06:38	0.21
J32	JUNCTION	0.00	0.14	91.25	0	06:38	0.14
J33	JUNCTION	0.00	0.12	91.25	0	06:38	0.12
J34	JUNCTION	0.00	0.05	91.23	0	06:38	0.05
J35	JUNCTION	0.00	0.05	91.08	0	06:40	0.05
J36	JUNCTION	0.00	0.06	90.83	0	06:39	0.06

J37	JUNCTION	0.00	0.06	90.58	0	06:40	0.06
J38	JUNCTION	0.00	0.06	90.32	0	06:41	0.06
J39	JUNCTION	0.05	0.35	90.50	0	07:12	0.35
J40	JUNCTION	0.05	0.26	90.00	0	07:13	0.26
J41	JUNCTION	0.06	0.28	89.92	0	07:14	0.28
J42	JUNCTION	0.04	0.20	89.68	0	07:14	0.20
J43	JUNCTION	0.05	0.21	89.47	0	07:15	0.21
Outlet	JUNCTION	0.01	0.09	90.49	0	07:12	0.09
OF-LombardyEast	OUTFALL	0.00	0.06	90.11	0	06:41	0.06
OF-LombardyWest	OUTFALL	0.00	0.05	90.10	0	06:36	0.05
OF-Osgoode	OUTFALL	0.05	0.21	88.57	0	07:15	0.21
OF-OsgoodePath-UNC	OUTFALL	0.00	0.00	91.00	0	00:00	0.00
DryPond	STORAGE	0.09	0.51	90.91	0	07:12	0.51

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days	Time of Max Occurrence hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J01	JUNCTION	0.00	159.23	0	06:38	0	0.936	0.006
J02	JUNCTION	0.00	32.05	0	06:34	0	0.169	0.006
J03	JUNCTION	0.00	36.83	0	06:34	0	0.169	0.012
J04	JUNCTION	0.00	39.16	0	06:34	0	0.169	-0.001
J05	JUNCTION	0.00	39.64	0	06:34	0	0.169	-0.012
J06	JUNCTION	0.00	40.96	0	06:34	0	0.169	0.064
J07	JUNCTION	41.10	41.10	0	06:32	0.169	0.171	-0.070
J08	JUNCTION	0.00	1.52	0	06:59	0	0.00252	-0.023
J09	JUNCTION	0.00	1.06	0	06:59	0	0.00133	0.121
J10	JUNCTION	0.00	0.88	0	06:59	0	0.00057	0.107
J11	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J12	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J13	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J14	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J15	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J16	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J17	JUNCTION	17.71	17.71	0	06:32	0.0736	0.0736	-0.006
J18	JUNCTION	0.00	17.76	0	06:34	0	0.0736	0.001
J19	JUNCTION	0.00	17.73	0	06:35	0	0.0736	0.005
J20	JUNCTION	0.00	136.59	0	06:42	0	0.767	-0.006
J21	JUNCTION	22.74	137.70	0	06:41	0.0926	0.767	0.008
J22	JUNCTION	0.00	124.63	0	06:40	0	0.674	0.021
J23	JUNCTION	0.00	131.21	0	06:38	0	0.674	-0.015
J24	JUNCTION	0.00	132.87	0	06:38	0	0.674	-0.012
J25	JUNCTION	0.00	133.91	0	06:37	0	0.674	0.011
J26	JUNCTION	87.21	139.96	0	06:36	0.364	0.674	0.002
J27	JUNCTION	0.00	59.33	0	06:32	0	0.31	-0.002
J28	JUNCTION	0.00	61.44	0	06:32	0	0.31	-0.008
J29	JUNCTION	0.00	62.57	0	06:32	0	0.31	0.003
J30	JUNCTION	0.00	65.25	0	06:32	0	0.31	0.008
J31	JUNCTION	81.46	81.46	0	06:32	0.334	0.335	-0.011
J32	JUNCTION	0.00	17.99	0	06:37	0	0.0256	0.005
J33	JUNCTION	0.00	17.95	0	06:38	0	0.0247	-0.000

J34	JUNCTION	0.00	17.91	0	06:38	0	0.0241	-0.026
J35	JUNCTION	0.00	17.94	0	06:39	0	0.024	0.052
J36	JUNCTION	9.12	26.11	0	06:39	0.0376	0.0616	-0.015
J37	JUNCTION	0.00	26.13	0	06:39	0	0.0616	0.000
J38	JUNCTION	0.00	26.07	0	06:40	0	0.0616	0.009
J39	JUNCTION	0.00	113.36	0	07:12	0	1.23	0.035
J40	JUNCTION	0.00	113.35	0	07:12	0	1.23	-0.040
J41	JUNCTION	0.00	113.34	0	07:13	0	1.23	0.001
J42	JUNCTION	0.00	113.32	0	07:14	0	1.23	0.004
J43	JUNCTION	0.00	113.32	0	07:14	0	1.23	0.001
Outlet	JUNCTION	0.00	113.36	0	07:12	0	1.23	-0.001
OF-LombardyEast	OUTFALL	0.00	26.01	0	06:41	0	0.0616	0.000
OF-LombardyWest	OUTFALL	0.00	17.70	0	06:36	0	0.0736	0.000
OF-Osgoode	OUTFALL	0.00	113.31	0	07:15	0	1.23	0.000
OF-OsgoodePath-UNC	OUTFALL	47.82	47.82	0	06:36	0.201	0.201	0.000
DryPond	STORAGE	70.93	220.68	0	06:36	0.294	1.23	-0.185

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
DryPond	0.052	11	0	0	0.359	74	0 07:12	113.36

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF-LombardyEast	25.09	2.72	26.01	0.062
OF-LombardyWest	25.35	3.09	17.70	0.074
OF-Osgoode	44.11	27.63	113.31	1.232
OF-OsgoodePath-UNC	25.20	8.40	47.82	0.201

System	29.94	41.84	144.60	1.569

****
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
C01	CONDUIT	29.13	0 06:34	0.36	0.55	1.00
C02	CONDUIT	32.05	0 06:34	0.08	0.03	0.72
C03	CONDUIT	36.83	0 06:34	0.15	0.02	0.65
C04	CONDUIT	39.16	0 06:34	0.67	0.52	0.86
C05	CONDUIT	39.64	0 06:34	0.12	0.02	0.51
C06	CONDUIT	40.96	0 06:34	0.21	0.02	0.38
C07	CONDUIT	1.52	0 06:59	0.01	0.00	0.23
C08	CONDUIT	1.06	0 06:59	0.09	0.01	0.20
C09	CONDUIT	0.88	0 06:59	0.04	0.00	0.08
C10	CONDUIT	0.00	0 00:00	0.00	0.00	0.03
C11	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C12	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C13	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C14	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C15	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C16	CONDUIT	0.00	0 00:00	0.00	0.00	0.04
C17	CONDUIT	17.76	0 06:34	0.34	0.01	0.08
C18	CONDUIT	17.73	0 06:35	0.33	0.01	0.08
C19	CONDUIT	17.70	0 06:36	0.31	0.01	0.08
C20	CONDUIT	136.00	0 06:42	0.29	0.08	0.76
C21	CONDUIT	136.59	0 06:42	1.13	2.57	1.00
C22	CONDUIT	119.79	0 06:43	0.09	0.09	0.93
C23	CONDUIT	124.63	0 06:40	0.18	0.08	0.80
C24	CONDUIT	131.21	0 06:38	0.37	0.08	0.66
C25	CONDUIT	132.87	0 06:38	1.10	1.77	0.97
C26	CONDUIT	133.91	0 06:37	0.15	0.08	0.83
C27	CONDUIT	55.16	0 06:42	0.14	0.03	0.69
C28	CONDUIT	59.33	0 06:32	0.32	0.04	0.55
C29	CONDUIT	61.44	0 06:32	0.91	0.82	0.78
C30	CONDUIT	62.57	0 06:32	0.14	0.04	0.49
C31	CONDUIT	65.25	0 06:32	0.23	0.04	0.41
C32	CONDUIT	17.99	0 06:37	0.34	0.24	0.44
C33	CONDUIT	17.95	0 06:38	0.10	0.01	0.22
C34	CONDUIT	17.91	0 06:38	0.16	0.01	0.14
C35	CONDUIT	17.94	0 06:39	0.32	0.04	0.16
C36	CONDUIT	17.89	0 06:40	0.30	0.03	0.17
C37	CONDUIT	26.13	0 06:39	0.39	0.05	0.19
C38	CONDUIT	26.07	0 06:40	0.38	0.05	0.19
C39	CONDUIT	26.01	0 06:41	0.37	0.05	0.20
C40	CONDUIT	153.40	0 06:39	0.37	0.17	0.79
C41	CONDUIT	113.36	0 07:12	0.45	0.02	0.32
C42	CHANNEL	113.34	0 07:13	0.40	0.01	0.16
C43	CHANNEL	113.32	0 07:14	0.50	0.01	0.15
C44	CHANNEL	113.32	0 07:14	0.67	0.00	0.13
C45	CHANNEL	113.31	0 07:15	1.02	0.01	0.15
Culv-OsgoodePath	CONDUIT	113.35	0 07:12	1.03	0.42	0.57

W01	WEIR	0.00	0	00:00	0.00
W02	WEIR	0.00	0	00:00	0.00
W03	WEIR	0.00	0	00:00	0.00
W04	WEIR	0.00	0	00:00	0.00
W05	WEIR	0.00	0	00:00	0.00
W06	WEIR	0.00	0	00:00	0.00
W07	WEIR	0.00	0	00:00	0.00
W08	WEIR	0.00	0	00:00	0.00
W-Emergency	WEIR	0.00	0	00:00	0.00
W-Path	WEIR	0.00	0	00:00	0.00
W-Pond	WEIR	9.44	0	06:23	1.00
W-PondUpper	WEIR	104.02	0	07:12	0.80

****
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
C01	1.00	0.07	0.03	0.00	0.91	0.00	0.00	0.00	0.00	0.08
C02	1.00	0.09	0.51	0.00	0.39	0.00	0.00	0.00	0.69	0.00
C03	1.00	0.60	0.04	0.00	0.36	0.00	0.00	0.00	0.73	0.00
C04	1.00	0.09	0.00	0.00	0.91	0.00	0.00	0.00	0.00	0.04
C05	1.00	0.08	0.56	0.00	0.35	0.00	0.00	0.00	0.78	0.00
C06	1.00	0.64	0.02	0.00	0.33	0.00	0.00	0.00	0.83	0.00
C07	1.00	0.67	0.17	0.00	0.17	0.00	0.00	0.00	0.83	0.00
C08	1.00	0.12	0.02	0.00	0.86	0.00	0.00	0.00	0.00	0.01
C09	1.00	0.14	0.72	0.00	0.14	0.00	0.00	0.00	0.84	0.00
C10	1.00	0.86	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C11	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C12	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C13	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C14	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C15	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C16	1.00	0.68	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C17	1.00	0.65	0.02	0.00	0.32	0.00	0.00	0.00	0.79	0.00
C18	1.00	0.63	0.03	0.00	0.34	0.00	0.00	0.00	0.87	0.00
C19	1.00	0.63	0.00	0.00	0.37	0.00	0.00	0.00	0.84	0.00
C20	1.00	0.43	0.03	0.00	0.53	0.00	0.00	0.00	0.65	0.00
C21	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.00	0.07
C22	1.00	0.07	0.44	0.00	0.49	0.00	0.00	0.00	0.68	0.00
C23	1.00	0.50	0.04	0.00	0.46	0.00	0.00	0.00	0.82	0.00
C24	1.00	0.54	0.04	0.00	0.42	0.00	0.00	0.00	0.81	0.00
C25	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.00	0.00
C26	1.00	0.07	0.50	0.00	0.42	0.00	0.00	0.00	0.76	0.00
C27	1.00	0.57	0.02	0.00	0.40	0.00	0.00	0.00	0.87	0.00
C28	1.00	0.59	0.03	0.00	0.38	0.00	0.00	0.00	0.76	0.00
C29	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.00	0.02
C30	1.00	0.06	0.59	0.00	0.34	0.00	0.00	0.00	0.78	0.00
C31	1.00	0.65	0.02	0.00	0.32	0.00	0.00	0.00	0.86	0.00
C32	1.00	0.68	0.20	0.00	0.12	0.00	0.00	0.00	0.00	0.83
C33	1.00	0.87	0.00	0.00	0.13	0.00	0.00	0.00	0.03	0.00
C34	1.00	0.87	0.04	0.00	0.10	0.00	0.00	0.00	0.85	0.00
C35	1.00	0.85	0.06	0.00	0.10	0.00	0.00	0.00	0.86	0.00

C36	1.00	0.67	0.17	0.00	0.15	0.00	0.00	0.00	0.87	0.00
C37	1.00	0.65	0.02	0.00	0.33	0.00	0.00	0.00	0.81	0.00
C38	1.00	0.63	0.02	0.00	0.34	0.00	0.00	0.00	0.86	0.00
C39	1.00	0.64	0.00	0.00	0.36	0.00	0.00	0.00	0.82	0.00
C40	1.00	0.43	0.00	0.00	0.38	0.00	0.00	0.19	0.05	0.00
C41	1.00	0.51	0.00	0.00	0.30	0.00	0.00	0.19	0.21	0.00
C42	1.00	0.07	0.00	0.00	0.93	0.01	0.00	0.00	0.90	0.00
C43	1.00	0.08	0.00	0.00	0.92	0.01	0.00	0.00	0.00	0.00
C44	1.00	0.08	0.00	0.00	0.67	0.25	0.00	0.00	0.89	0.00
C45	1.00	0.09	0.00	0.00	0.86	0.05	0.00	0.00	0.56	0.00
Culv-OsgoodePath	1.00	0.07	0.00	0.00	0.00	0.00	0.00	0.93	0.00	0.30

****
Conduit Surcharge Summary
****

Conduit	Hours Full Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C01	0.85	0.85	1.05	0.01	0.01
C21	0.91	1.28	0.94	1.14	0.82
C25	0.01	0.58	0.01	0.76	0.01

Analysis begun on: Mon Nov 11 15:45:37 2024
Analysis ended on: Mon Nov 11 15:45:40 2024
Total elapsed time: 00:00:03

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:	05/04/2021 00:00:00
Simulation end time:	05/06/2021 00:00:00
Runoff wet weather time steps:	240 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-2	Nash IUH	Raingage	0.48	15	10	54	0.00433	0.998
EX-1	Nash IUH	Raingage	0.23	15	10	50	0.00208	0.997
EX-3	Nash IUH	Raingage	0.48	15	10	54	0.00433	0.998
D	Nash IUH	Raingage	0.56	15	10	54	0.00505	0.998
A	Nash IUH	Raingage	1.18	15	10	58	0.01065	0.998
B	Nash IUH	Raingage	0.4	15	10	54	0.00361	0.998
C	Nash IUH	Raingage	0.18	15	10	46	0.00162	0.996
E	Nash IUH	Raingage	0.48	15	10	54	0.00433	0.998
G	Nash IUH	Raingage	0.11	15	10	46	0.00099	0.996
F	Nash IUH	Raingage	0.23	15	10	50	0.00208	0.997
H	Nash IUH	Raingage	0.42	15	10	54	0.00379	0.998

****
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-2	106.73	52.318	54.292	0.261	37.594	0.509
EX-1	106.73	56.927	49.652	0.114	16.53	0.465
EX-3	106.73	56.927	49.688	0.238	34.507	0.466
D	106.73	71.2	35.446	0.198	28.863	0.332
A	106.73	67.706	38.949	0.46	66.974	0.365
B	106.73	74.507	32.15	0.129	18.64	0.301
C	106.73	74.507	32.106	0.058	8.383	0.301
E	106.73	62.636	44	0.211	30.849	0.412
G	106.73	63.811	42.764	0.047	6.868	0.401
F	106.73	66.35	40.27	0.093	13.504	0.377
H	106.73	70.063	36.595	0.154	22.361	0.343

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

WARNING 02: maximum depth increased for Node J09
WARNING 02: maximum depth increased for Node J13
WARNING 02: maximum depth increased for Node J21
WARNING 02: maximum depth increased for Node J25
WARNING 02: maximum depth increased for Node J29
WARNING 02: maximum depth increased for Node J32
WARNING 02: maximum depth increased for Node J39

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 0
Number of nodes ........... 49
Number of links ........... 58
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                   Data       Recording
Name                 Data Source                   Type       Interval
------------------------------------------------------------------------
Raingage             11-SCS100yr-24hr              INTENSITY   60 min.


************
Node Summary
************
                                         Invert      Max.    Ponded    External
Name                 Type                 Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
J01                  JUNCTION             90.45      1.00       0.0
J02                  JUNCTION             90.47      1.00       0.0
J03                  JUNCTION             90.50      1.00       0.0
J04                  JUNCTION             90.55      1.00       0.0
J05                  JUNCTION             90.59      1.00       0.0
J06                  JUNCTION             90.63      1.00       0.0
J07                  JUNCTION             90.75      1.00       0.0
J08                  JUNCTION             90.81      1.00       0.0
J09                  JUNCTION             90.86      1.00       0.0
J10                  JUNCTION             90.88      1.00       0.0
J11                  JUNCTION             91.00      1.00       0.0
J12                  JUNCTION             91.01      1.00       0.0
J13                  JUNCTION             91.07      1.00       0.0
J14                  JUNCTION             91.13      1.00       0.0
J15                  JUNCTION             91.18      1.00       0.0
J16                  JUNCTION             91.03      1.00       0.0
J17                  JUNCTION             90.77      1.00       0.0
J18                  JUNCTION             90.52      1.00       0.0
J19                  JUNCTION             90.26      1.00       0.0
J20                  JUNCTION             90.46      1.00       0.0
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J21	JUNCTION	90.48	1.00	0.0
J22	JUNCTION	90.50	1.00	0.0
J23	JUNCTION	90.63	1.00	0.0
J24	JUNCTION	90.67	1.00	0.0
J25	JUNCTION	90.71	1.00	0.0
J26	JUNCTION	90.75	1.00	0.0
J27	JUNCTION	90.88	1.00	0.0
J28	JUNCTION	90.92	1.00	0.0
J29	JUNCTION	90.96	1.00	0.0
J30	JUNCTION	91.00	1.00	0.0
J31	JUNCTION	91.07	1.00	0.0
J32	JUNCTION	91.11	1.00	0.0
J33	JUNCTION	91.13	1.00	0.0
J34	JUNCTION	91.18	1.00	0.0
J35	JUNCTION	91.03	1.00	0.0
J36	JUNCTION	90.77	1.00	0.0
J37	JUNCTION	90.52	1.00	0.0
J38	JUNCTION	90.26	1.00	0.0
J39	JUNCTION	90.15	1.55	0.0
J40	JUNCTION	89.74	1.96	0.0
J41	JUNCTION	89.64	2.00	0.0
J42	JUNCTION	89.48	2.00	0.0
J43	JUNCTION	89.26	2.00	0.0
Outlet	JUNCTION	90.40	1.00	0.0
OF-LombardyEast	OUTFALL	90.05	0.30	0.0
OF-LombardyWest	OUTFALL	90.05	0.60	0.0
OF-Osgoode	OUTFALL	88.36	1.40	0.0
OF-OsgoodePath-UNC	OUTFALL	91.00	0.00	0.0
DryPond	STORAGE	90.40	1.00	0.0

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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
C01	J02	J01	CONDUIT	9.0	0.2222	0.0240
C02	J03	J02	CONDUIT	13.0	0.2308	0.0350
C03	J04	J03	CONDUIT	12.0	0.4167	0.0350
C04	J05	J04	CONDUIT	9.0	0.4444	0.0240
C05	J06	J05	CONDUIT	9.0	0.4444	0.0350
C06	J07	J06	CONDUIT	24.0	0.5000	0.0350
C07	J08	J07	CONDUIT	12.0	0.5000	0.0350
C08	J09	J08	CONDUIT	9.0	0.5556	0.0240
C09	J10	J09	CONDUIT	4.0	0.5000	0.0350
C10	J11	J10	CONDUIT	25.0	0.4800	0.0350
C11	J12	J11	CONDUIT	2.0	0.5000	0.0350
C12	J13	J12	CONDUIT	9.0	0.6667	0.0240
C13	J14	J13	CONDUIT	10.0	0.6000	0.0350
C14	J15	J14	CONDUIT	5.0	1.0001	0.0350
C15	J15	J16	CONDUIT	11.0	1.3638	0.0350
C16	J16	J17	CONDUIT	25.0	1.0401	0.0350
C17	J17	J18	CONDUIT	25.0	1.0001	0.0350
C18	J18	J19	CONDUIT	25.0	1.0401	0.0350
C19	J19	OF-LombardyWest	CONDUIT	26.0	0.8077	0.0350
C20	J20	J01	CONDUIT	2.0	0.5000	0.0350
C21	J21	J20	CONDUIT	9.0	0.2222	0.0240
C22	J22	J21	CONDUIT	7.0	0.2857	0.0350

C23	J23	J22	CONDUIT	29.0	0.4483	0.0350
C24	J24	J23	CONDUIT	8.0	0.5000	0.0350
C25	J25	J24	CONDUIT	9.0	0.4444	0.0240
C26	J26	J25	CONDUIT	8.0	0.5000	0.0350
C27	J27	J26	CONDUIT	25.0	0.5200	0.0350
C28	J28	J27	CONDUIT	8.0	0.5000	0.0350
C29	J29	J28	CONDUIT	9.0	0.4444	0.0240
C30	J30	J29	CONDUIT	9.0	0.4444	0.0350
C31	J31	J30	CONDUIT	17.0	0.4118	0.0350
C32	J32	J31	CONDUIT	9.0	0.4444	0.0240
C33	J33	J32	CONDUIT	4.0	0.5000	0.0350
C34	J34	J33	CONDUIT	14.0	0.3571	0.0350
C35	J34	J35	CONDUIT	19.0	0.7895	0.0350
C36	J35	J36	CONDUIT	25.0	1.0401	0.0350
C37	J36	J37	CONDUIT	25.0	1.0001	0.0350
C38	J37	J38	CONDUIT	25.0	1.0401	0.0350
C39	J38	OF-LombardyEast	CONDUIT	24.0	0.8750	0.0350
C40	J01	DryPond	CONDUIT	20.0	0.1500	0.0350
C41	Outlet	J39	CONDUIT	5.0	4.0032	0.0350
C42	J40	J41	CONDUIT	27.0	0.3704	0.0350
C43	J41	J42	CONDUIT	41.0	0.3902	0.0350
C44	J42	J43	CONDUIT	16.0	1.3751	0.0350
C45	J43	OF-Osgoode	CONDUIT	32.0	2.8136	0.0350
Culv-OsgoodePath	J39	J40	CONDUIT	20.0	0.5000	0.0130
W01	J02	J01	WEIR			
W02	J05	J04	WEIR			
W03	J09	J08	WEIR			
W04	J13	J12	WEIR			
W05	J21	J20	WEIR			
W06	J25	J24	WEIR			
W07	J29	J28	WEIR			
W08	J32	J31	WEIR			
W-Emergency	DryPond	Outlet	WEIR			
W-Path	J39	J40	WEIR			
W-Pond	DryPond	Outlet	WEIR			
W-PondUpper	DryPond	Outlet	WEIR			

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Cross Section Summary
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Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C01	CIRCULAR	0.40	0.13	0.10	0.40	1	53.18
C02	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1146.09
C03	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1540.02
C04	CIRCULAR	0.40	0.13	0.10	0.40	1	75.21
C05	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1590.53
C06	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C07	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C08	CIRCULAR	0.40	0.13	0.10	0.40	1	84.09
C09	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C10	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1652.93
C11	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C12	CIRCULAR	0.40	0.13	0.10	0.40	1	92.11
C13	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1848.03
C14	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	2385.84

C15	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	2786.12
C16	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	2433.09
C17	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	2385.84
C18	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	2433.09
C19	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	2144.18
C20	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C21	CIRCULAR	0.40	0.13	0.10	0.40	1	53.18
C22	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1275.26
C23	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1597.37
C24	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C25	CIRCULAR	0.40	0.13	0.10	0.40	1	75.21
C26	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C27	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1720.42
C28	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C29	CIRCULAR	0.40	0.13	0.10	0.40	1	75.21
C30	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1590.53
C31	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1530.94
C32	CIRCULAR	0.40	0.13	0.10	0.40	1	75.21
C33	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C34	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1425.78
C35	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	489.50
C36	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	561.84
C37	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	550.92
C38	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	561.84
C39	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	515.34
C40	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	924.01
C41	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	4773.47
C42	OsgoodeDitch	1.66	8.97	0.81	9.70	1	13533.66
C43	OsgoodeDitch	1.66	8.97	0.81	9.70	1	13892.02
C44	OsgoodeDitch	1.66	8.97	0.81	9.70	1	26077.59
C45	TaylorWayDitch	1.40	4.75	0.64	6.90	1	16912.25
Culv-OsgoodePath	CIRCULAR	0.50	0.20	0.12	0.50	1	267.02

```
****************
Transect Summary
****************

Transect OsgoodeDitch
Area:
           0.0005     0.0019     0.0043     0.0076     0.0119
           0.0172     0.0234     0.0305     0.0387     0.0477
           0.0577     0.0687     0.0807     0.0935     0.1074
           0.1222     0.1383     0.1564     0.1755     0.1951
           0.2152     0.2357     0.2566     0.2780     0.2999
           0.3222     0.3449     0.3681     0.3918     0.4159
           0.4405     0.4655     0.4910     0.5169     0.5433
           0.5702     0.5975     0.6252     0.6534     0.6821
           0.7112     0.7408     0.7708     0.8013     0.8322
           0.8639     0.8965     0.9301     0.9646     1.0000
Hrad:
           0.0198     0.0396     0.0594     0.0792     0.0990
           0.1188     0.1386     0.1584     0.1782     0.1980
           0.2178     0.2376     0.2574     0.2772     0.2970
           0.3168     0.3204     0.3285     0.3578     0.3863
           0.4140     0.4412     0.4677     0.4936     0.5191
           0.5440     0.5685     0.5926     0.6164     0.6397
```

```
            0.6627      0.6854      0.7078      0.7300      0.7518
            0.7735      0.7949      0.8160      0.8370      0.8578
            0.8784      0.8988      0.9191      0.9392      0.9576
            0.9649      0.9729      0.9815      0.9905      1.0000
  Width:
            0.0266      0.0532      0.0797      0.1063      0.1329
            0.1595      0.1860      0.2126      0.2392      0.2658
            0.2924      0.3189      0.3455      0.3721      0.3987
            0.4253      0.4768      0.5264      0.5390      0.5517
            0.5643      0.5769      0.5896      0.6022      0.6148
            0.6275      0.6401      0.6527      0.6654      0.6780
            0.6906      0.7033      0.7159      0.7285      0.7412
            0.7538      0.7664      0.7791      0.7917      0.8043
            0.8170      0.8296      0.8422      0.8549      0.8691
            0.8953      0.9215      0.9477      0.9738      1.0000

  Transect TaylorWayDitch
  Area:
            0.0004      0.0016      0.0036      0.0064      0.0101
            0.0145      0.0197      0.0258      0.0326      0.0402
            0.0487      0.0579      0.0680      0.0789      0.0905
            0.1030      0.1163      0.1304      0.1453      0.1610
            0.1775      0.1948      0.2129      0.2318      0.2515
            0.2720      0.2934      0.3155      0.3384      0.3622
            0.3867      0.4121      0.4382      0.4652      0.4930
            0.5215      0.5509      0.5811      0.6121      0.6438
            0.6759      0.7084      0.7413      0.7750      0.8098
            0.8457      0.8827      0.9207      0.9598      1.0000
  Hrad:
            0.0201      0.0402      0.0603      0.0805      0.1006
            0.1207      0.1408      0.1609      0.1810      0.2011
            0.2212      0.2414      0.2615      0.2816      0.3017
            0.3218      0.3419      0.3620      0.3822      0.4023
            0.4224      0.4425      0.4626      0.4827      0.5028
            0.5229      0.5431      0.5632      0.5833      0.6034
            0.6235      0.6436      0.6637      0.6839      0.7040
            0.7241      0.7442      0.7643      0.7844      0.8117
            0.8416      0.8713      0.8984      0.9117      0.9255
            0.9396      0.9542      0.9691      0.9844      1.0000
  Width:
            0.0198      0.0395      0.0593      0.0791      0.0988
            0.1186      0.1384      0.1581      0.1779      0.1977
            0.2174      0.2372      0.2570      0.2767      0.2965
            0.3163      0.3360      0.3558      0.3756      0.3953
            0.4151      0.4349      0.4546      0.4744      0.4942
            0.5139      0.5337      0.5535      0.5732      0.5930
            0.6128      0.6326      0.6523      0.6721      0.6919
            0.7116      0.7314      0.7512      0.7709      0.7836
            0.7934      0.8032      0.8154      0.8417      0.8681
            0.8945      0.9209      0.9472      0.9736      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 ............ 05/04/2021 00:00:00
Ending Date .............. 05/06/2021 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 ........ 4
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 ..........         0.196         1.962
External Outflow .........         0.196         1.964
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 (%) .....        -0.072


***************************
Time-Step Critical Elements
***************************
Link C20 (37.33%)


********************************
Highest Flow Instability Indexes
********************************
Link Culv-OsgoodePath (10)
Link C42 (2)


*************************
Routing Time Step Summary
*************************
```

```
Minimum Time Step           :     0.09 sec
Average Time Step           :     1.71 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      :    66.55 %
    1.516 -  1.149 sec      :    19.32 %
    1.149 -  0.871 sec      :    11.31 %
    0.871 -  0.660 sec      :     2.65 %
    0.660 -  0.500 sec      :     0.17 %


******************
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
J01	JUNCTION	0.09	0.46	90.91	0	13:26	0.46
J02	JUNCTION	0.08	0.45	90.92	0	13:26	0.45
J03	JUNCTION	0.07	0.42	90.92	0	13:26	0.42
J04	JUNCTION	0.05	0.37	90.92	0	13:26	0.37
J05	JUNCTION	0.05	0.33	90.92	0	13:27	0.33
J06	JUNCTION	0.03	0.29	90.92	0	13:27	0.29
J07	JUNCTION	0.02	0.17	90.92	0	13:27	0.17
J08	JUNCTION	0.00	0.11	90.92	0	13:27	0.11
J09	JUNCTION	0.00	0.06	90.92	0	13:27	0.06
J10	JUNCTION	0.00	0.04	90.92	0	13:27	0.04
J11	JUNCTION	0.00	0.00	91.00	0	00:00	0.00
J12	JUNCTION	0.00	0.00	91.01	0	00:00	0.00
J13	JUNCTION	0.00	0.00	91.07	0	00:00	0.00
J14	JUNCTION	0.00	0.00	91.13	0	00:00	0.00
J15	JUNCTION	0.00	0.00	91.18	0	00:00	0.00
J16	JUNCTION	0.00	0.00	91.03	0	00:00	0.00
J17	JUNCTION	0.00	0.04	90.81	0	13:00	0.04
J18	JUNCTION	0.00	0.04	90.56	0	13:02	0.04
J19	JUNCTION	0.01	0.04	90.30	0	13:03	0.04
J20	JUNCTION	0.09	0.45	90.91	0	13:26	0.45
J21	JUNCTION	0.09	0.55	91.03	0	13:14	0.55
J22	JUNCTION	0.08	0.53	91.03	0	13:14	0.53
J23	JUNCTION	0.04	0.41	91.04	0	13:14	0.41
J24	JUNCTION	0.04	0.37	91.04	0	13:14	0.37
J25	JUNCTION	0.06	0.45	91.16	0	13:07	0.45
J26	JUNCTION	0.04	0.41	91.16	0	13:07	0.41
J27	JUNCTION	0.02	0.28	91.16	0	13:07	0.28
J28	JUNCTION	0.02	0.24	91.16	0	13:07	0.24
J29	JUNCTION	0.04	0.27	91.23	0	13:04	0.27
J30	JUNCTION	0.02	0.23	91.23	0	13:04	0.23
J31	JUNCTION	0.02	0.16	91.23	0	13:04	0.16
J32	JUNCTION	0.00	0.11	91.22	0	13:04	0.11
J33	JUNCTION	0.00	0.09	91.22	0	13:04	0.09
J34	JUNCTION	0.00	0.03	91.21	0	13:04	0.03
J35	JUNCTION	0.00	0.03	91.06	0	13:06	0.03

J36	JUNCTION	0.00	0.04	90.81	0	13:04	0.04
J37	JUNCTION	0.00	0.04	90.56	0	13:05	0.04
J38	JUNCTION	0.00	0.04	90.30	0	13:06	0.04
J39	JUNCTION	0.07	0.35	90.50	0	13:27	0.35
J40	JUNCTION	0.07	0.26	90.00	0	13:27	0.26
J41	JUNCTION	0.08	0.28	89.92	0	13:28	0.28
J42	JUNCTION	0.06	0.20	89.68	0	13:29	0.20
J43	JUNCTION	0.06	0.21	89.47	0	13:29	0.21
Outlet	JUNCTION	0.02	0.09	90.49	0	13:26	0.09
OF-LombardyEast	OUTFALL	0.00	0.04	90.09	0	13:06	0.04
OF-LombardyWest	OUTFALL	0.01	0.04	90.09	0	13:03	0.04
OF-Osgoode	OUTFALL	0.06	0.21	88.57	0	13:29	0.21
OF-OsgoodePath-UNC	OUTFALL	0.00	0.00	91.00	0	00:00	0.00
DryPond	STORAGE	0.12	0.51	90.91	0	13:26	0.51

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days	Time of Max Occurrence hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J01	JUNCTION	0.00	125.48	0	13:01	0	1.19	0.007
J02	JUNCTION	0.00	18.51	0	12:53	0	0.211	0.003
J03	JUNCTION	0.00	22.46	0	12:53	0	0.211	0.008
J04	JUNCTION	0.00	24.40	0	12:53	0	0.211	-0.002
J05	JUNCTION	0.00	25.53	0	12:53	0	0.211	-0.006
J06	JUNCTION	0.00	28.62	0	12:53	0	0.211	0.043
J07	JUNCTION	30.85	30.85	0	13:00	0.211	0.213	-0.048
J08	JUNCTION	0.00	1.55	0	13:13	0	0.0026	-0.010
J09	JUNCTION	0.00	1.09	0	13:13	0	0.00139	0.099
J10	JUNCTION	0.00	0.90	0	13:13	0	0.000598	0.094
J11	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J12	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J13	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J14	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J15	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J16	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J17	JUNCTION	13.50	13.50	0	13:00	0.0926	0.0926	-0.004
J18	JUNCTION	0.00	13.48	0	13:01	0	0.0926	0.001
J19	JUNCTION	0.00	13.46	0	13:02	0	0.0926	0.003
J20	JUNCTION	0.00	110.92	0	13:01	0	0.975	-0.003
J21	JUNCTION	16.53	112.49	0	13:02	0.114	0.976	0.003
J22	JUNCTION	0.00	103.35	0	13:02	0	0.861	0.013
J23	JUNCTION	0.00	109.75	0	13:03	0	0.861	-0.009
J24	JUNCTION	0.00	111.15	0	13:03	0	0.861	-0.009
J25	JUNCTION	0.00	111.92	0	13:03	0	0.861	0.006
J26	JUNCTION	66.97	114.77	0	13:02	0.46	0.861	0.002
J27	JUNCTION	0.00	50.60	0	13:01	0	0.402	-0.002
J28	JUNCTION	0.00	51.26	0	13:01	0	0.402	-0.004
J29	JUNCTION	0.00	51.51	0	13:00	0	0.402	0.002
J30	JUNCTION	0.00	52.20	0	13:00	0	0.402	0.004
J31	JUNCTION	59.95	59.95	0	13:00	0.414	0.415	-0.006
J32	JUNCTION	0.00	7.72	0	13:04	0	0.0142	0.005

J33	JUNCTION	0.00	7.70	0	13:04	0	0.0133	-0.004
J34	JUNCTION	0.00	7.67	0	13:04	0	0.0126	-0.015
J35	JUNCTION	0.00	7.67	0	13:05	0	0.0126	0.045
J36	JUNCTION	6.87	14.26	0	13:04	0.047	0.0596	-0.008
J37	JUNCTION	0.00	14.23	0	13:05	0	0.0596	0.002
J38	JUNCTION	0.00	14.20	0	13:05	0	0.0596	0.004
J39	JUNCTION	0.00	114.23	0	13:26	0	1.56	0.084
J40	JUNCTION	0.00	114.22	0	13:27	0	1.55	-0.090
J41	JUNCTION	0.00	114.21	0	13:27	0	1.56	0.002
J42	JUNCTION	0.00	114.19	0	13:28	0	1.56	0.002
J43	JUNCTION	0.00	114.18	0	13:29	0	1.56	0.001
Outlet	JUNCTION	0.00	114.23	0	13:26	0	1.56	-0.001
OF-LombardyEast	OUTFALL	0.00	14.16	0	13:06	0	0.0596	0.000
OF-LombardyWest	OUTFALL	0.00	13.44	0	13:03	0	0.0926	0.000
OF-Osgoode	OUTFALL	0.00	114.18	0	13:29	0	1.56	0.000
OF-OsgoodePath-UNC	OUTFALL	37.25	37.25	0	13:00	0.256	0.256	0.000
DryPond	STORAGE	53.15	174.49	0	13:02	0.367	1.55	-0.093

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

No nodes were surcharged.


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

No nodes were flooded.


**********************
Storage Volume Summary
**********************
```

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
DryPond	0.066	14	0	0	0.360	74	0 13:26	114.23

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

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF-LombardyEast	42.14	1.41	14.16	0.060
OF-LombardyWest	42.45	2.10	13.44	0.093
OF-Osgoode	60.47	23.65	114.18	1.555
OF-OsgoodePath-UNC	42.25	5.78	37.25	0.256

```
 ------------------------------------------------------------
 System               46.83      32.94    151.33       1.964


 *******************
 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
C01	CONDUIT	16.44	0	12:40	0.27	0.31	1.00
C02	CONDUIT	18.51	0	12:53	0.07	0.02	0.72
C03	CONDUIT	22.46	0	12:53	0.13	0.01	0.65
C04	CONDUIT	24.40	0	12:53	0.63	0.32	0.87
C05	CONDUIT	25.53	0	12:53	0.11	0.02	0.51
C06	CONDUIT	28.62	0	12:53	0.19	0.02	0.38
C07	CONDUIT	1.55	0	13:13	0.01	0.00	0.23
C08	CONDUIT	1.09	0	13:13	0.09	0.01	0.21
C09	CONDUIT	0.90	0	13:13	0.04	0.00	0.08
C10	CONDUIT	0.00	0	00:00	0.00	0.00	0.03
C11	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C12	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C13	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C14	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C15	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C16	CONDUIT	0.00	0	00:00	0.00	0.00	0.03
C17	CONDUIT	13.48	0	13:01	0.31	0.01	0.07
C18	CONDUIT	13.46	0	13:02	0.30	0.01	0.07
C19	CONDUIT	13.44	0	13:03	0.29	0.01	0.07
C20	CONDUIT	110.53	0	13:01	0.25	0.07	0.77
C21	CONDUIT	110.92	0	13:01	0.89	2.09	1.00
C22	CONDUIT	97.30	0	13:10	0.10	0.08	0.91
C23	CONDUIT	103.35	0	13:02	0.18	0.06	0.78
C24	CONDUIT	109.75	0	13:03	0.35	0.07	0.64
C25	CONDUIT	111.15	0	13:03	0.98	1.48	0.96
C26	CONDUIT	111.92	0	13:03	0.14	0.07	0.72
C27	CONDUIT	48.74	0	13:06	0.14	0.03	0.58
C28	CONDUIT	50.60	0	13:01	0.31	0.03	0.44
C29	CONDUIT	51.26	0	13:01	0.88	0.68	0.63
C30	CONDUIT	51.51	0	13:00	0.13	0.03	0.41
C31	CONDUIT	52.20	0	13:00	0.21	0.03	0.33
C32	CONDUIT	7.72	0	13:04	0.20	0.10	0.35
C33	CONDUIT	7.70	0	13:04	0.06	0.00	0.17
C34	CONDUIT	7.67	0	13:04	0.10	0.01	0.10
C35	CONDUIT	7.67	0	13:05	0.23	0.02	0.10
C36	CONDUIT	7.63	0	13:06	0.20	0.01	0.11
C37	CONDUIT	14.23	0	13:05	0.31	0.03	0.14
C38	CONDUIT	14.20	0	13:05	0.31	0.03	0.14
C39	CONDUIT	14.16	0	13:06	0.30	0.03	0.14
C40	CONDUIT	121.72	0	13:02	0.30	0.13	0.80
C41	CONDUIT	114.23	0	13:26	0.44	0.02	0.32
C42	CHANNEL	114.21	0	13:27	0.40	0.01	0.16
C43	CHANNEL	114.19	0	13:28	0.50	0.01	0.15
C44	CHANNEL	114.18	0	13:29	0.67	0.00	0.13
C45	CHANNEL	114.18	0	13:29	1.02	0.01	0.15

Culv-OsgoodePath	CONDUIT	114.22	0	13:27	1.03	0.43	0.57
W01	WEIR	0.00	0	00:00			0.00
W02	WEIR	0.00	0	00:00			0.00
W03	WEIR	0.00	0	00:00			0.00
W04	WEIR	0.00	0	00:00			0.00
W05	WEIR	0.00	0	00:00			0.00
W06	WEIR	0.00	0	00:00			0.00
W07	WEIR	0.00	0	00:00			0.00
W08	WEIR	0.00	0	00:00			0.00
W-Emergency	WEIR	0.00	0	00:00			0.00
W-Path	WEIR	0.00	0	00:00			0.00
W-Pond	WEIR	9.44	0	12:27			1.00
W-PondUpper	WEIR	104.88	0	13:26			0.81

****
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 ----------								
C01	1.00	0.12	0.04	0.00	0.84	0.00	0.00	0.00	0.00	0.11
C02	1.00	0.16	0.27	0.00	0.58	0.00	0.00	0.00	0.49	0.00
C03	1.00	0.42	0.04	0.00	0.54	0.00	0.00	0.00	0.54	0.00
C04	1.00	0.15	0.00	0.00	0.85	0.00	0.00	0.00	0.00	0.06
C05	1.00	0.15	0.32	0.00	0.53	0.00	0.00	0.00	0.69	0.00
C06	1.00	0.47	0.02	0.00	0.51	0.00	0.00	0.00	0.75	0.00
C07	1.00	0.49	0.35	0.00	0.16	0.00	0.00	0.00	0.70	0.00
C08	1.00	0.23	0.02	0.00	0.75	0.00	0.00	0.00	0.00	0.01
C09	1.00	0.25	0.62	0.00	0.14	0.00	0.00	0.00	0.71	0.00
C10	1.00	0.86	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C11	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C12	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C13	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C14	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C15	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C16	1.00	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C17	1.00	0.48	0.02	0.00	0.50	0.00	0.00	0.00	0.55	0.00
C18	1.00	0.46	0.03	0.00	0.52	0.00	0.00	0.00	0.79	0.00
C19	1.00	0.46	0.00	0.00	0.54	0.00	0.00	0.00	0.62	0.00
C20	1.00	0.25	0.03	0.00	0.71	0.00	0.00	0.00	0.44	0.00
C21	1.00	0.11	0.00	0.00	0.89	0.00	0.00	0.00	0.00	0.07
C22	1.00	0.11	0.21	0.00	0.68	0.00	0.00	0.00	0.45	0.00
C23	1.00	0.32	0.04	0.00	0.65	0.00	0.00	0.00	0.74	0.00
C24	1.00	0.35	0.04	0.00	0.61	0.00	0.00	0.00	0.75	0.00
C25	1.00	0.12	0.00	0.00	0.88	0.00	0.00	0.00	0.00	0.05
C26	1.00	0.12	0.27	0.00	0.61	0.00	0.00	0.00	0.55	0.00
C27	1.00	0.38	0.02	0.00	0.60	0.00	0.00	0.00	0.78	0.00
C28	1.00	0.40	0.03	0.00	0.57	0.00	0.00	0.00	0.52	0.00
C29	1.00	0.11	0.00	0.00	0.89	0.00	0.00	0.00	0.00	0.04
C30	1.00	0.11	0.35	0.00	0.54	0.00	0.00	0.00	0.59	0.00
C31	1.00	0.46	0.02	0.00	0.52	0.00	0.00	0.00	0.74	0.00
C32	1.00	0.48	0.39	0.00	0.13	0.00	0.00	0.00	0.00	0.70
C33	1.00	0.86	0.00	0.00	0.13	0.00	0.00	0.00	0.70	0.00
C34	1.00	0.87	0.04	0.00	0.10	0.00	0.00	0.00	0.72	0.00

C35	1.00	0.85	0.06	0.00	0.10	0.00	0.00	0.00	0.72	0.00
C36	1.00	0.50	0.35	0.00	0.15	0.00	0.00	0.00	0.74	0.00
C37	1.00	0.47	0.02	0.00	0.50	0.00	0.00	0.00	0.57	0.00
C38	1.00	0.46	0.02	0.00	0.52	0.00	0.00	0.00	0.76	0.00
C39	1.00	0.46	0.00	0.00	0.54	0.00	0.00	0.00	0.61	0.00
C40	1.00	0.25	0.00	0.00	0.53	0.00	0.00	0.22	0.06	0.00
C41	1.00	0.33	0.00	0.00	0.43	0.00	0.00	0.24	0.33	0.00
C42	1.00	0.12	0.00	0.00	0.87	0.01	0.00	0.00	0.83	0.00
C43	1.00	0.13	0.00	0.00	0.86	0.01	0.00	0.00	0.00	0.00
C44	1.00	0.14	0.00	0.00	0.76	0.10	0.00	0.00	0.82	0.00
C45	1.00	0.15	0.00	0.00	0.81	0.05	0.00	0.00	0.32	0.00
Culv-OsgoodePath	1.00	0.12	0.00	0.00	0.00	0.00	0.00	0.88	0.00	0.40

****
Conduit Surcharge Summary
****

Conduit	--------- Hours Full -------- Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C01	0.99	0.99	1.24	0.01	0.01
C21	1.11	1.47	1.11	1.31	1.11
C25	0.01	0.46	0.01	0.80	0.01

Analysis begun on: Mon Nov 11 15:48:47 2024
Analysis ended on: Mon Nov 11 15:48:50 2024
Total elapsed time: 00:00:03

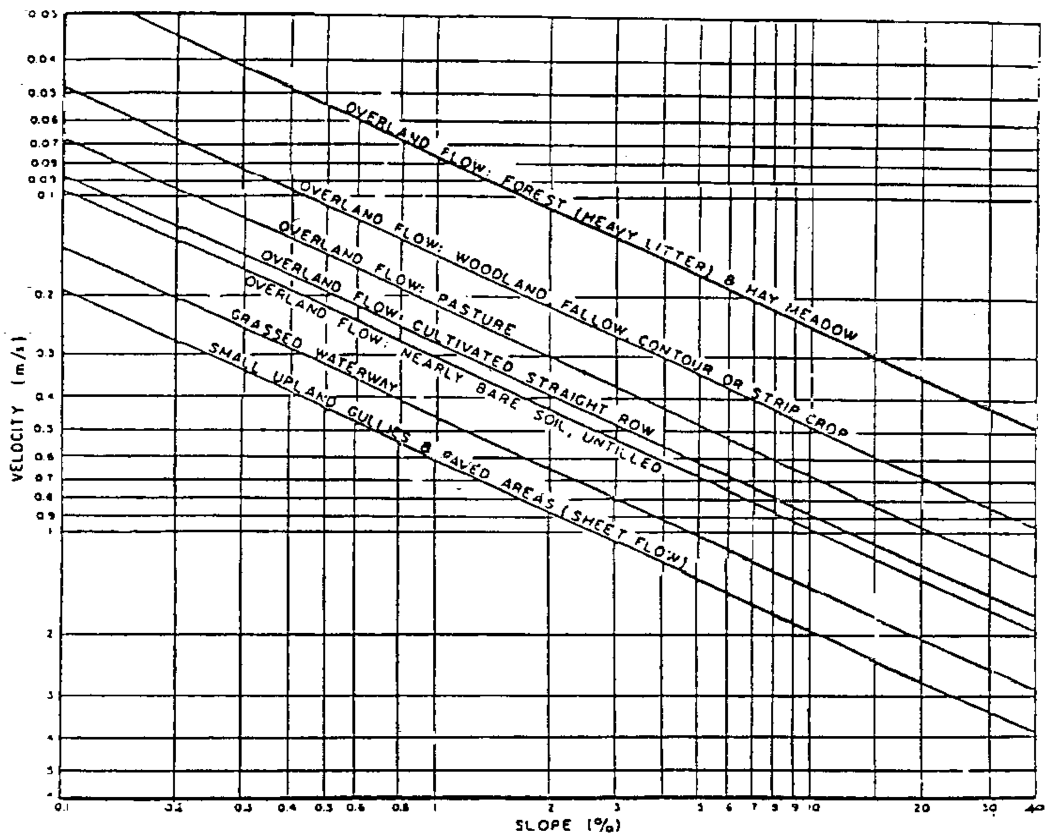


Figure A.5.2: Upland Method for Estimating Time of Concentration (SCS National Engineering Handbook, 1971)

Project Name
Pre-Development Model Parameters

NOVATECH
Engineers, Planners & Landscape Architects

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

Area ID	Area (ha)	Overland Flow Length (m)	Overland Flow Elevation U/S (m)	Overland Flow Elevation D/S (m)	Overland Flow Slope (%)	Overland Flow Velocity (m/s)	Overland Flow Travel Time (min)	Concentrated Overland Flow Length (m)	Concentrated Overland Flow Elevation U/S (m)	Concentrated Overland Flow Elevation D/S (m)	Concentrated Overland Flow Slope (%)	Concentrated Overland Flow Velocity (m/s)	Concentrated Overland Flow Travel Time (min)	Overall Time of Concentration (min)	Overall Time to Peak (min)	Overall Time to Peak (min)
EX-1	3.31	100	94.00	91.15	2.8%	0.25	6.67	195	91.15	90.00	0.6%	0.35	9.29	16	11	11
EX-2	1.44	100	93.75	92.50	1.3%	0.16	10.42	140	92.50	90.50	1.4%	0.50	4.67	15	10	10

Weighted Curve Number Calculations
Soil type 'B' (Soil Mapping and Boreholes: silty sand and sandy clay)

Area ID	Land Use 1	Area	CN	Land Use 2	Area	CN	Weighted CN	
EX-1	Forest	79%	55	Residential	21%	72	59	** Soil Type (HSG) = B; Forest Cover = Good; Residential Unit = 1/3 acre
EX-2	Forest	67%	55	Residential	33%	75	62	** Soil Type (HSG) = B; Forest Cover = Good; Residential Unit = 1/4 acre

Weighted IA Calculations

Area ID	Land Use 1	Area	IA	Land Use 2	Area	IA	Weighted IA
EX-1	Forest	79%	15.6	Residential	21%	7.4	13.9
EX-2	Forest	67%	15.6	Residential	33%	6.4	12.5

Project Name
Pre-Development Model Parameters

NOVATECH
Engineers, Planners & Landscape Architects

Time to Peak Calculations
(Uplands Overland Flow Method)
Proposed 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 of Concentration (min)
A	1.18	85	93.25	91.20	2.4%	0.32	4.43	0	-	-	-	-	0.00	4	15
B	0.40	100	92.50	90.80	1.7%	0.27	6.17	0	-	-	-	-	0.00	6	15
C	0.18	30	90.25	90.10	0.5%	0.16	3.13	0	-	-	-	-	0.00	3	15
D	0.56	50	91.90	90.15	3.5%	0.40	2.08	0	-	-	-	-	0.00	2	15
E	0.48	25	91.80	91.20	2.4%	0.32	1.30	0	-	-	-	-	0.00	1	15
F	0.23	30	91.60	91.25	1.2%	0.22	2.27	0	-	-	-	-	0.00	2	15
G	0.11	10	91.55	91.15	4.0%	0.42	0.40	0	-	-	-	-	0.00	0	15
H	0.42	95	93.40	91.50	2.0%	0.30	5.28	0	-	-	-	-	0.00	5	15
EX-1	0.23	60	94.15	93.45	1.2%	0.22	4.55	0	-	-	-	-	0.00	5	15
EX-2	0.48	60	93.90	93.15	1.3%	0.24	4.17	0	-	-	-	-	0.00	4	15
EX-3	0.48	60	94.00	92.60	2.3%	0.32	3.13	0	-	-	-	-	0.00	3	15

Weighted Curve Number Calculations
Soil type 'B' (Soil Mapping and Boreholes: silty sand and sandy clay)

Area ID	Land Use 1	Area	CN	Land Use 2	Area	CN	Weighted CN	
A	Pavement/Roof	17%	98	Lawn	83%	58	65	** Soil Type (HSG) = B; Lawn = Meadow
B	Pavement/Roof	2%	98	Lawn	98%	58	59	** Soil Type (HSG) = B; Lawn = Meadow
C	Pavement/Roof	3%	98	Lawn	98%	58	59	** Soil Type (HSG) = B; Lawn = Meadow
D	Pavement/Roof	10%	98	Lawn	90%	58	62	** Soil Type (HSG) = B; Lawn = Meadow
E	Pavement/Roof	27%	98	Lawn	73%	58	69	** Soil Type (HSG) = B; Lawn = Meadow
F	Pavement/Roof	21%	98	Lawn	79%	58	66	** Soil Type (HSG) = B; Lawn = Meadow
G	Pavement/Roof	26%	98	Lawn	74%	58	68	** Soil Type (HSG) = B; Lawn = Meadow
H	Pavement/Roof	13%	98	Lawn	87%	58	63	** Soil Type (HSG) = B; Lawn = Meadow
EX-1	Residential	100%	72	Lawn	0%	58	72	** Soil Type (HSG) = B; Lawn = Meadow; Residential Unit = 1/3 acre
EX-2	Residential	100%	75	Lawn	0%	58	75	** Soil Type (HSG) = B; Lawn = Meadow; Residential Unit = 1/4 acre
EX-3	Residential	100%	72	Lawn	0%	58	72	** Soil Type (HSG) = B; Lawn = Meadow; Residential Unit = 1/3 acre

Weighted IA Calculations

Area ID	Land Use 1	Area	IA	Land Use 2	Area	IA	Weighted IA
A	Pavement/Roof	17%	1.0	Lawn	83%	13.8	11.6
B	Pavement/Roof	2%	1.0	Lawn	98%	13.8	13.5
C	Pavement/Roof	3%	1.0	Lawn	98%	13.8	13.5
D	Pavement/Roof	10%	1.0	Lawn	90%	13.8	12.5
E	Pavement/Roof	27%	1.0	Lawn	73%	13.8	10.4
F	Pavement/Roof	21%	1.0	Lawn	79%	13.8	11.1
G	Pavement/Roof	26%	1.0	Lawn	74%	13.8	10.5
H	Pavement/Roof	13%	1.0	Lawn	87%	13.8	12.2
EX-1	Residential	100%	7.4	Lawn	0%	13.8	7.4
EX-2	Residential	100%	6.4	Lawn	0%	13.8	6.4
EX-3	Residential	100%	7.4	Lawn	0%	13.8	7.4

3200 Reid's Lane (119089)
Design Storm Time Series Data
Chicago Design Storms

NOVATECH
Engineers, Planners & Landscape Architects

C25mm-4.stm		C2-3.stm		C5-3.stm	
Duration min	Intensity mm/hr	Duration min	Intensity mm/hr	Duration min	Intensity mm/hr
0:00	0	0:00	0	0:00	0
0:10	1.51	0:10	2.81	0:10	3.68
0:20	1.75	0:20	3.5	0:20	4.58
0:30	2.07	0:30	4.69	0:30	6.15
0:40	2.58	0:40	7.3	0:40	9.61
0:50	3.46	0:50	18.21	0:50	24.17
1:00	5.39	1:00	76.81	1:00	104.19
1:10	13.44	1:10	24.08	1:10	32.04
1:20	56.67	1:20	12.36	1:20	16.34
1:30	17.77	1:30	8.32	1:30	10.96
1:40	9.12	1:40	6.3	1:40	8.29
1:50	6.14	1:50	5.09	1:50	6.69
2:00	4.65	2:00	4.29	2:00	5.63
2:10	3.76	2:10	3.72	2:10	4.87
2:20	3.17	2:20	3.29	2:20	4.3
2:30	2.74	2:30	2.95	2:30	3.86
2:40	2.43	2:40	2.68	2:40	3.51
2:50	2.18	2:50	2.46	2:50	3.22
3:00	1.98	3:00	2.28	3:00	2.98
3:10	1.81				
3:20	1.68				
3:30	1.56				
3:40	1.47				
3:50	1.38				
4:00	1.31				

3200 Reid's Lane (119089)
Design Storm Time Series Data
Chicago Design Storms

C100-3.stm			C100-3+20%.stm	
Duration	Intensity		Duration	Intensity
min	mm/hr		min	mm/hr
0:00	0		0:00	0
0:10	6.05		0:10	6:14
0:20	7.54		0:20	9.05
0:30	10.16		0:30	12.19
0:40	15.97		0:40	19.16
0:50	40.65		0:50	48.78
1:00	178.56		1:00	214.27
1:10	54.05		1:10	64.86
1:20	27.32		1:20	32.78
1:30	18.24		1:30	21.89
1:40	13.74		1:40	16.49
1:50	11.06		1:50	13.27
2:00	9.29		2:00	11.15
2:10	8.02		2:10	9.62
2:20	7.08		2:20	8.5
2:30	6.35		2:30	7.62
2:40	5.76		2:40	6.91
2:50	5.28		2:50	6.34
3:00	4.88		3:00	5.86

3200 Reid's Lane (119089)
Design Storm Time Series Data
SCS Design Storms

NOVATECH
Engineers, Planners & Landscape Architects

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

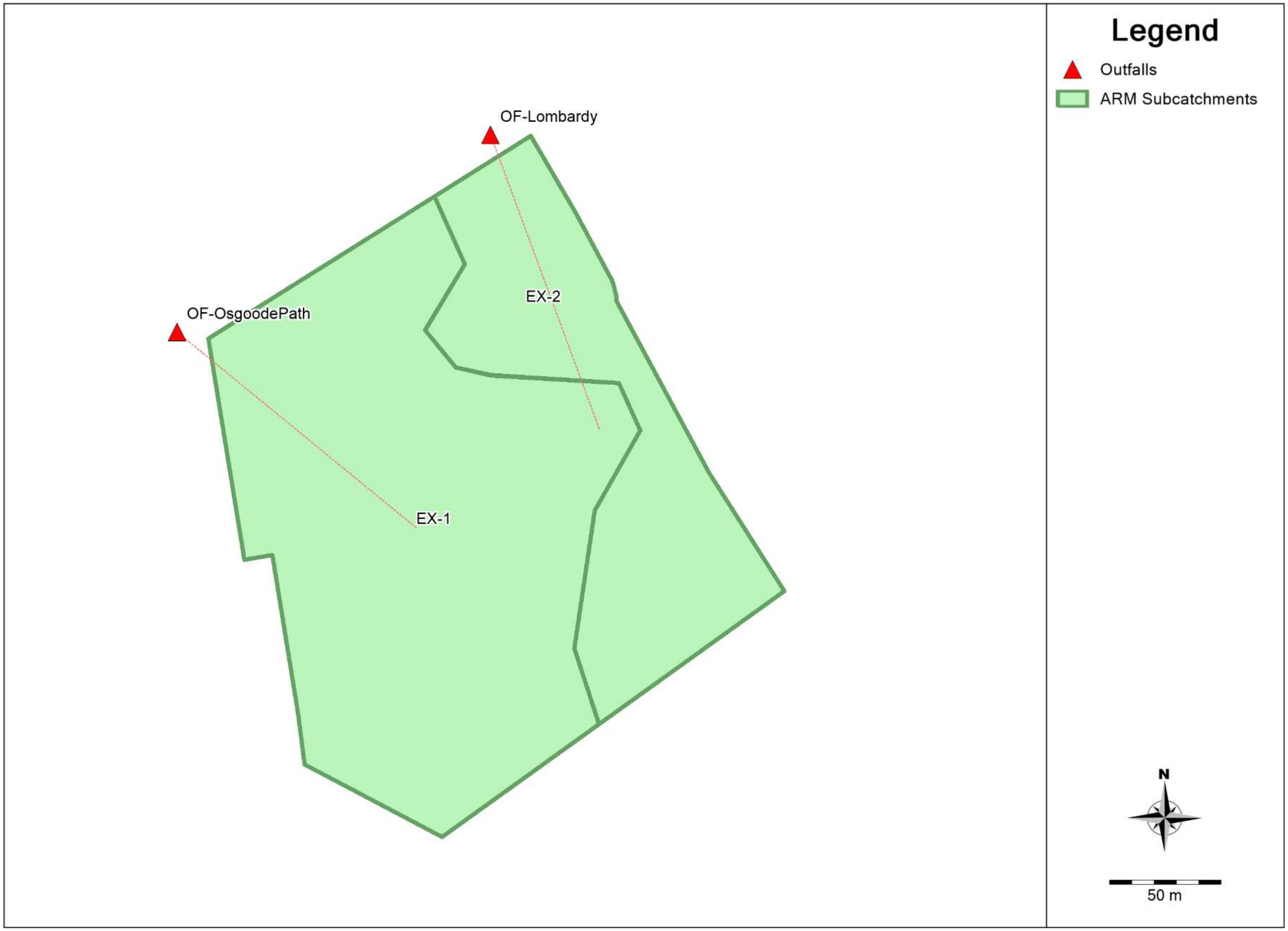
3200 Reid's Lane (119089)
Design Storm Time Series Data
SCS Design Storms

S2-24.stm		S5-24.stm		S100-24.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
1:00	0.72	1:00	0.44	1:00	0.6
2:00	0.34	2:00	0.44	2:00	0.75
3:00	0.63	3:00	0.81	3:00	1.39
4:00	0.63	4:00	0.81	4:00	1.39
5:00	0.81	5:00	1.06	5:00	1.81
6:00	0.72	6:00	0.94	6:00	1.6
7:00	0.96	7:00	1.25	7:00	2.13
8:00	0.96	8:00	1.25	8:00	2.13
9:00	1.30	9:00	1.68	9:00	2.88
10:00	1.63	10:00	2.12	10:00	3.63
11:00	2.59	11:00	3.37	11:00	5.76
12:00	20.55	12:00	26.71	12:00	45.69
13:00	5.23	13:00	6.8	13:00	11.64
14:00	2.30	14:00	2.99	14:00	5.12
15:00	1.54	15:00	2	15:00	3.42
16:00	1.34	16:00	1.75	16:00	2.99
17:00	1.06	17:00	1.37	17:00	2.35
18:00	1.11	18:00	1.44	18:00	2.46
19:00	0.72	19:00	0.94	19:00	1.6
20:00	0.58	20:00	0.75	20:00	1.28
21:00	0.81	21:00	1.06	21:00	1.81
22:00	0.53	22:00	0.68	22:00	1.17
23:00	0.48	23:00	0.63	23:00	1.07
0:00	0.48	0:00	0.63	0:00	1.07

Overall Model Schematic

3200 Reid's Lane (119089)
PCSWMM Pre-Development Model Schematics

Subcatchments and Outfalls



Date: 2024-11-11
M:\2019\119089\DATA\Calculations\Sewer Calcs\SWM\PCSWMM\Sub 3\119089-Pre PCSWMM Model Schematics-Rev1.docx

```
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:              05/04/2021 00:00:00
Simulation end time:                05/06/2021 00:00:00
Runoff wet weather time steps:      240 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-2	Nash IUH	Raingage	1.44	15	10	62	0.01299	0.998
EX-1	Nash IUH	Raingage	3.31	16	10.67	69.33	0.028	0.999

```
******************
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-2	93.91	65.956	27.903	0.402	95.531	0.297
EX-1	93.91	68.954	24.921	0.825	191.26	0.265

```
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 ........... 0
Number of pollutants ...... 0
Number of land uses ....... 0


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

```
****************
                                                         Data       Recording
Name                 Data Source                         Type       Interval
------------------------------------------------------------------------
Raingage             07-SCS100yr-12hr                    INTENSITY   30 min.


************
Node Summary
************
                                           Invert      Max.    Ponded    External
Name                 Type                   Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
OF-Lombardy          OUTFALL                90.80      0.00       0.0
OF-OsgoodePath       OUTFALL                90.75      0.00       0.0



*********************************************************
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 ........... NO
  Water Quality .......... NO
Surcharge Method ......... EXTRAN
Starting Date ............ 05/04/2021 00:00:00
Ending Date .............. 05/06/2021 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00


**************************        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 ..........          0.123          1.227
External Outflow .........          0.123          1.227
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
```

```
Analysis begun on:  Mon Nov 11 15:38:58 2024
Analysis ended on:  Mon Nov 11 15:38:58 2024
Total elapsed time: < 1 sec
```

```
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:              05/04/2021 00:00:00
Simulation end time:                05/06/2021 00:00:00
Runoff wet weather time steps:      240 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-2	Nash IUH	Raingage	1.44	15	10	62	0.01299	0.998
EX-1	Nash IUH	Raingage	3.31	16	10.67	69.33	0.028	0.999

```
******************
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-2	106.73	71.2	35.465	0.511	74.22	0.332
EX-1	106.73	74.735	31.964	1.058	151.848	0.299

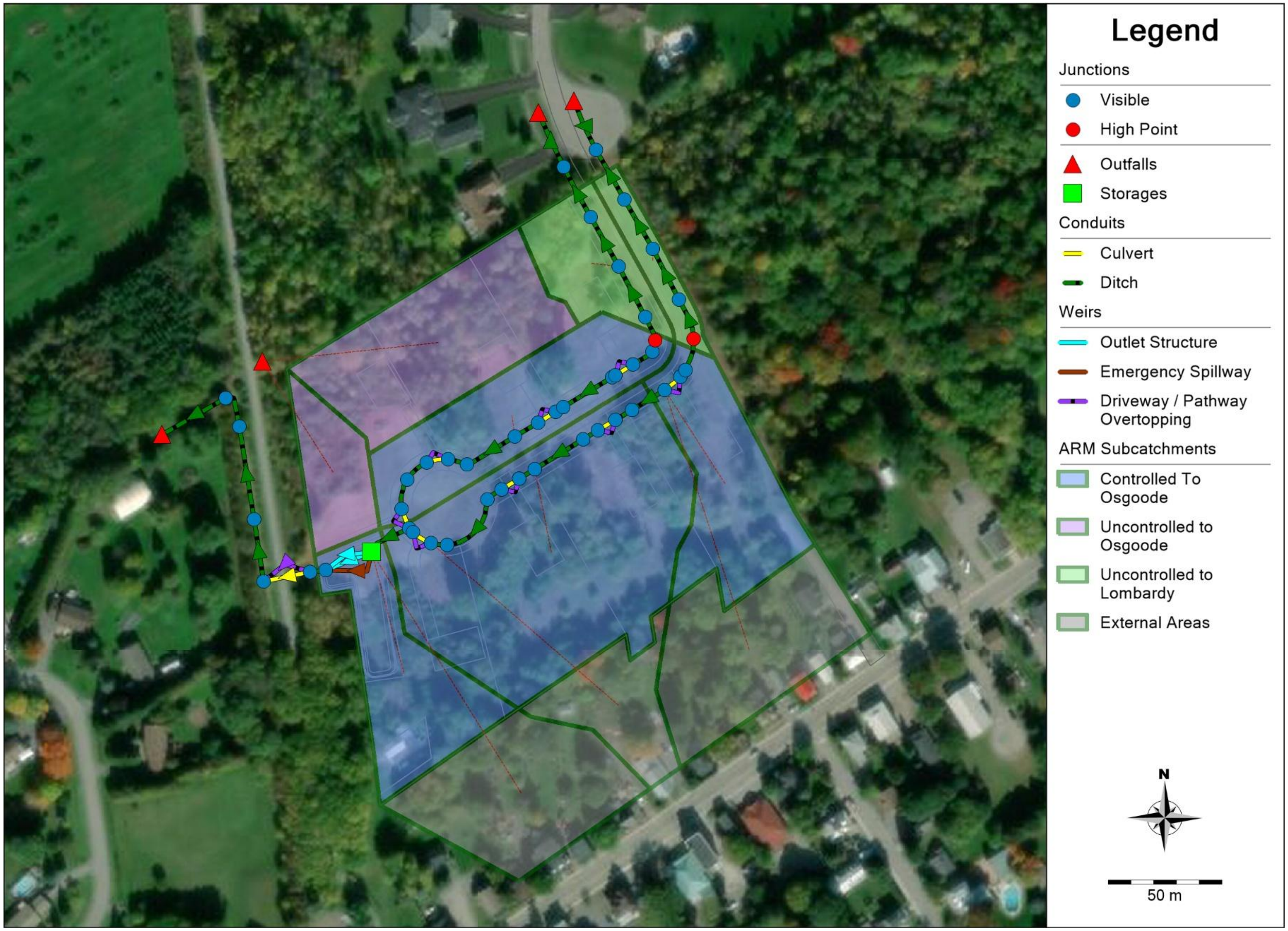
```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------


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


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

```
****************
                                                Data       Recording
Name                 Data Source                Type       Interval
-----------------------------------------------------------------------
Raingage             11-SCS100yr-24hr           INTENSITY   60 min.


************
Node Summary
************
                                         Invert      Max.    Ponded    External
Name                 Type                 Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
OF-Lombardy          OUTFALL              90.80      0.00       0.0
OF-OsgoodePath       OUTFALL              90.75      0.00       0.0



*********************************************************
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 ........... NO
  Water Quality .......... NO
Surcharge Method ......... EXTRAN
Starting Date ............ 05/04/2021 00:00:00
Ending Date .............. 05/06/2021 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00


**************************        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 ..........         0.157          1.568
External Outflow .........         0.157          1.568
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
```

```
Analysis begun on:  Mon Nov 11 15:42:05 2024
Analysis ended on:  Mon Nov 11 15:42:05 2024
Total elapsed time: < 1 sec
```

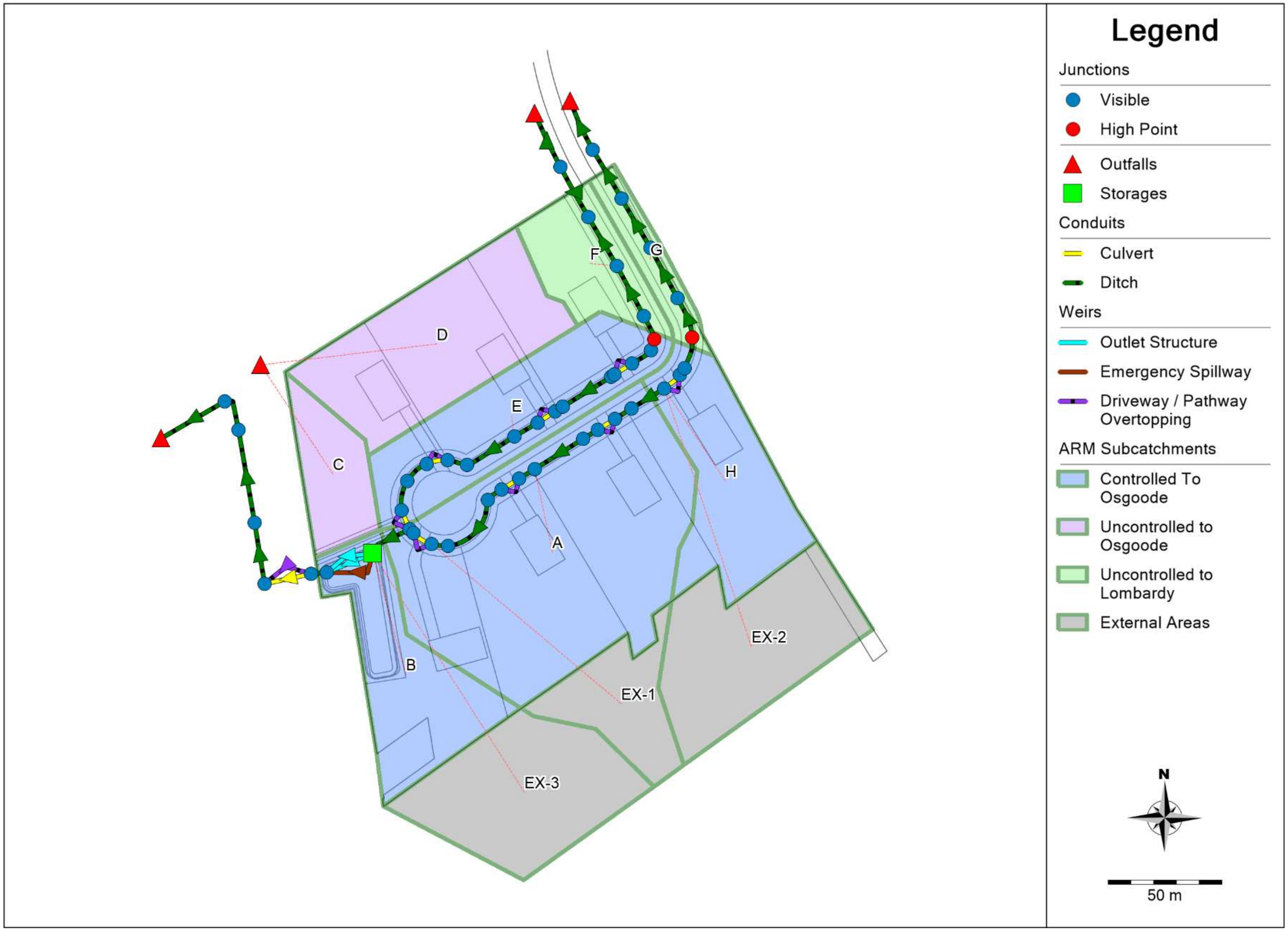
3200 Reid's Lane (119089)
PCSWMM Post-Development Model Schematics

Overall Model Schematic



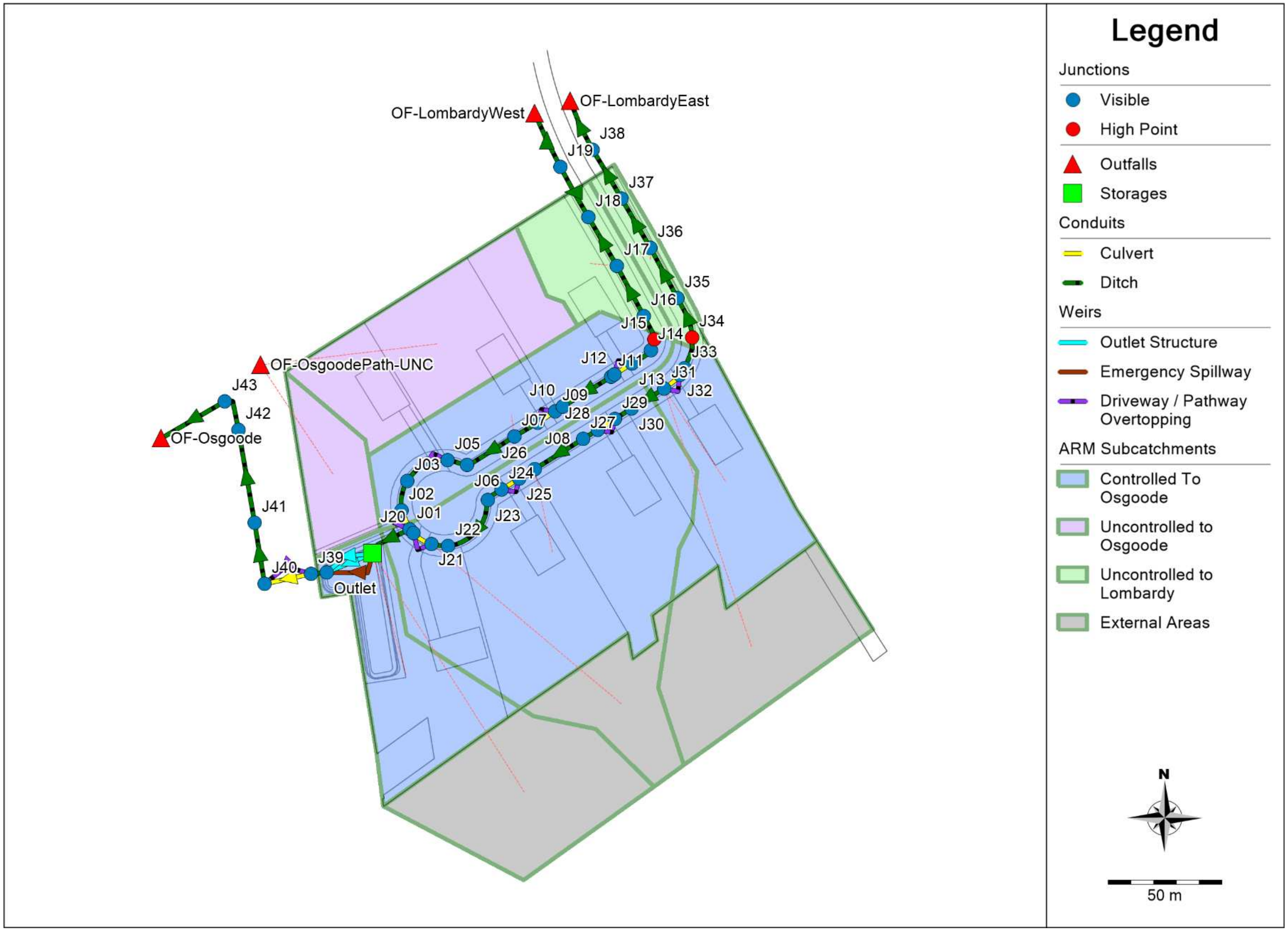
Date: 2024-11-11
M:\2019\119089\DATA\Calculations\Sewer Calcs\SWM\PCSWMM\Sub 3\119089-Post PCSWMM Model Schematics_Rev2.docx

Subcatchments



3200 Reid's Lane (119089)
PCSWMM Post-Development Model Schematics

Junctions and Outfalls



Date: 2024-11-11
M:\2019\119089\DATA\Calculations\Sewer Calcs\SWM\PCSWMM\Sub 3\119089-Post PCSWMM Model Schematics_Rev2.docx

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:	05/04/2021 00:00:00
Simulation end time:	05/06/2021 00:00:00
Runoff wet weather time steps:	240 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-2	Nash IUH	Raingage	0.48	15	10	54	0.00433	0.998
EX-1	Nash IUH	Raingage	0.23	15	10	50	0.00208	0.997
EX-3	Nash IUH	Raingage	0.48	15	10	54	0.00433	0.998
D	Nash IUH	Raingage	0.56	15	10	54	0.00505	0.998
A	Nash IUH	Raingage	1.18	15	10	58	0.01065	0.998
B	Nash IUH	Raingage	0.4	15	10	54	0.00361	0.998
C	Nash IUH	Raingage	0.18	15	10	46	0.00162	0.996
E	Nash IUH	Raingage	0.48	15	10	54	0.00433	0.998
G	Nash IUH	Raingage	0.11	15	10	46	0.00099	0.996
F	Nash IUH	Raingage	0.23	15	10	50	0.00208	0.997
H	Nash IUH	Raingage	0.42	15	10	54	0.00379	0.998

****
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-2	93.91	49.432	44.375	0.213	52.671	0.473
EX-1	93.91	53.519	40.283	0.093	22.744	0.429
EX-3	93.91	53.519	40.312	0.194	47.468	0.429
D	93.91	65.956	27.893	0.156	37.151	0.297
A	93.91	62.985	30.864	0.364	87.213	0.329
B	93.91	68.743	25.1	0.1	23.708	0.267
C	93.91	68.743	25.072	0.045	10.668	0.267
E	93.91	58.622	35.208	0.169	41.1	0.375
G	93.91	59.628	34.155	0.038	9.117	0.364
F	93.91	61.814	32.009	0.074	17.715	0.341
H	93.91	64.993	28.857	0.121	28.892	0.307

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

WARNING 02: maximum depth increased for Node J09
WARNING 02: maximum depth increased for Node J13
WARNING 02: maximum depth increased for Node J21
WARNING 02: maximum depth increased for Node J25
WARNING 02: maximum depth increased for Node J29
WARNING 02: maximum depth increased for Node J32
WARNING 02: maximum depth increased for Node J39

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 0
Number of nodes ........... 49
Number of links ........... 58
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                              Data       Recording
Name                 Data Source                              Type       Interval
-------------------------------------------------------------------------------------
Raingage             07-SCS100yr-12hr                         INTENSITY   30 min.


************
Node Summary
************
                                                   Invert      Max.    Ponded    External
Name                 Type                           Elev.     Depth      Area    Inflow
-----------------------------------------------------------------------------------------
J01                  JUNCTION                       90.45      1.00       0.0
J02                  JUNCTION                       90.47      1.00       0.0
J03                  JUNCTION                       90.50      1.00       0.0
J04                  JUNCTION                       90.55      1.00       0.0
J05                  JUNCTION                       90.59      1.00       0.0
J06                  JUNCTION                       90.63      1.00       0.0
J07                  JUNCTION                       90.75      1.00       0.0
J08                  JUNCTION                       90.81      1.00       0.0
J09                  JUNCTION                       90.86      1.00       0.0
J10                  JUNCTION                       90.88      1.00       0.0
J11                  JUNCTION                       91.00      1.00       0.0
J12                  JUNCTION                       91.01      1.00       0.0
J13                  JUNCTION                       91.07      1.00       0.0
J14                  JUNCTION                       91.13      1.00       0.0
J15                  JUNCTION                       91.18      1.00       0.0
J16                  JUNCTION                       91.03      1.00       0.0
J17                  JUNCTION                       90.77      1.00       0.0
J18                  JUNCTION                       90.52      1.00       0.0
J19                  JUNCTION                       90.26      1.00       0.0
J20                  JUNCTION                       90.46      1.00       0.0
```

```
J21                 JUNCTION            90.48      1.00       0.0
J22                 JUNCTION            90.50      1.00       0.0
J23                 JUNCTION            90.63      1.00       0.0
J24                 JUNCTION            90.67      1.00       0.0
J25                 JUNCTION            90.71      1.00       0.0
J26                 JUNCTION            90.75      1.00       0.0
J27                 JUNCTION            90.88      1.00       0.0
J28                 JUNCTION            90.92      1.00       0.0
J29                 JUNCTION            90.96      1.00       0.0
J30                 JUNCTION            91.00      1.00       0.0
J31                 JUNCTION            91.07      1.00       0.0
J32                 JUNCTION            91.11      1.00       0.0
J33                 JUNCTION            91.13      1.00       0.0
J34                 JUNCTION            91.18      1.00       0.0
J35                 JUNCTION            91.03      1.00       0.0
J36                 JUNCTION            90.77      1.00       0.0
J37                 JUNCTION            90.52      1.00       0.0
J38                 JUNCTION            90.26      1.00       0.0
J39                 JUNCTION            90.15      1.55       0.0
J40                 JUNCTION            89.74      1.96       0.0
J41                 JUNCTION            89.64      2.00       0.0
J42                 JUNCTION            89.48      2.00       0.0
J43                 JUNCTION            89.26      2.00       0.0
Outlet              JUNCTION            90.40      1.00       0.0
OF-LombardyEast     OUTFALL             90.05      0.30       0.0
OF-LombardyWest     OUTFALL             90.05      0.60       0.0
OF-Osgoode          OUTFALL             88.36      1.40       0.0
OF-OsgoodePath-UNC  OUTFALL             91.00      0.00       0.0
DryPond             STORAGE             90.40      1.00       0.0


************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
---------------------------------------------------------------------------------------------
C01              J02              J01              CONDUIT            9.0    0.2222    0.0240
C02              J03              J02              CONDUIT           13.0    0.2308    0.0350
C03              J04              J03              CONDUIT           12.0    0.4167    0.0350
C04              J05              J04              CONDUIT            9.0    0.4444    0.0240
C05              J06              J05              CONDUIT            9.0    0.4444    0.0350
C06              J07              J06              CONDUIT           24.0    0.5000    0.0350
C07              J08              J07              CONDUIT           12.0    0.5000    0.0350
C08              J09              J08              CONDUIT            9.0    0.5556    0.0240
C09              J10              J09              CONDUIT            4.0    0.5000    0.0350
C10              J11              J10              CONDUIT           25.0    0.4800    0.0350
C11              J12              J11              CONDUIT            2.0    0.5000    0.0350
C12              J13              J12              CONDUIT            9.0    0.6667    0.0240
C13              J14              J13              CONDUIT           10.0    0.6000    0.0350
C14              J15              J14              CONDUIT            5.0    1.0001    0.0350
C15              J15              J16              CONDUIT           11.0    1.3638    0.0350
C16              J16              J17              CONDUIT           25.0    1.0401    0.0350
C17              J17              J18              CONDUIT           25.0    1.0001    0.0350
C18              J18              J19              CONDUIT           25.0    1.0401    0.0350
C19              J19              OF-LombardyWest  CONDUIT           26.0    0.8077    0.0350
C20              J20              J01              CONDUIT            2.0    0.5000    0.0350
C21              J21              J20              CONDUIT            9.0    0.2222    0.0240
C22              J22              J21              CONDUIT            7.0    0.2857    0.0350
```

C23	J23	J22	CONDUIT	29.0	0.4483	0.0350
C24	J24	J23	CONDUIT	8.0	0.5000	0.0350
C25	J25	J24	CONDUIT	9.0	0.4444	0.0240
C26	J26	J25	CONDUIT	8.0	0.5000	0.0350
C27	J27	J26	CONDUIT	25.0	0.5200	0.0350
C28	J28	J27	CONDUIT	8.0	0.5000	0.0350
C29	J29	J28	CONDUIT	9.0	0.4444	0.0240
C30	J30	J29	CONDUIT	9.0	0.4444	0.0350
C31	J31	J30	CONDUIT	17.0	0.4118	0.0350
C32	J32	J31	CONDUIT	9.0	0.4444	0.0240
C33	J33	J32	CONDUIT	4.0	0.5000	0.0350
C34	J34	J33	CONDUIT	14.0	0.3571	0.0350
C35	J34	J35	CONDUIT	19.0	0.7895	0.0350
C36	J35	J36	CONDUIT	25.0	1.0401	0.0350
C37	J36	J37	CONDUIT	25.0	1.0001	0.0350
C38	J37	J38	CONDUIT	25.0	1.0401	0.0350
C39	J38	OF-LombardyEast	CONDUIT	24.0	0.8750	0.0350
C40	J01	DryPond	CONDUIT	20.0	0.1500	0.0350
C41	Outlet	J39	CONDUIT	5.0	4.0032	0.0350
C42	J40	J41	CONDUIT	27.0	0.3704	0.0350
C43	J41	J42	CONDUIT	41.0	0.3902	0.0350
C44	J42	J43	CONDUIT	16.0	1.3751	0.0350
C45	J43	OF-Osgoode	CONDUIT	32.0	2.8136	0.0350
Culv-OsgoodePath	J39	J40	CONDUIT	20.0	0.5000	0.0130
W01	J02	J01	WEIR			
W02	J05	J04	WEIR			
W03	J09	J08	WEIR			
W04	J13	J12	WEIR			
W05	J21	J20	WEIR			
W06	J25	J24	WEIR			
W07	J29	J28	WEIR			
W08	J32	J31	WEIR			
W-Emergency	DryPond	Outlet	WEIR			
W-Path	J39	J40	WEIR			
W-Pond	DryPond	Outlet	WEIR			
W-PondUpper	DryPond	Outlet	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C01	CIRCULAR	0.40	0.13	0.10	0.40	1	53.18
C02	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1146.09
C03	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1540.02
C04	CIRCULAR	0.40	0.13	0.10	0.40	1	75.21
C05	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1590.53
C06	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C07	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C08	CIRCULAR	0.40	0.13	0.10	0.40	1	84.09
C09	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C10	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1652.93
C11	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C12	CIRCULAR	0.40	0.13	0.10	0.40	1	92.11
C13	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1848.03
C14	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	2385.84

C15	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	2786.12
C16	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	2433.09
C17	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	2385.84
C18	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	2433.09
C19	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	2144.18
C20	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C21	CIRCULAR	0.40	0.13	0.10	0.40	1	53.18
C22	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1275.26
C23	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1597.37
C24	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C25	CIRCULAR	0.40	0.13	0.10	0.40	1	75.21
C26	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C27	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1720.42
C28	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C29	CIRCULAR	0.40	0.13	0.10	0.40	1	75.21
C30	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1590.53
C31	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1530.94
C32	CIRCULAR	0.40	0.13	0.10	0.40	1	75.21
C33	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C34	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1425.78
C35	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	489.50
C36	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	561.84
C37	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	550.92
C38	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	561.84
C39	TRAPEZOIDAL	0.30	0.57	0.20	2.80	1	515.34
C40	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	924.01
C41	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	4773.47
C42	OsgoodeDitch	1.66	8.97	0.81	9.70	1	13533.66
C43	OsgoodeDitch	1.66	8.97	0.81	9.70	1	13892.02
C44	OsgoodeDitch	1.66	8.97	0.81	9.70	1	26077.59
C45	TaylorWayDitch	1.40	4.75	0.64	6.90	1	16912.25
Culv-OsgoodePath	CIRCULAR	0.50	0.20	0.12	0.50	1	267.02

```
****************
Transect Summary
****************

Transect OsgoodeDitch
Area:
            0.0005     0.0019     0.0043     0.0076     0.0119
            0.0172     0.0234     0.0305     0.0387     0.0477
            0.0577     0.0687     0.0807     0.0935     0.1074
            0.1222     0.1383     0.1564     0.1755     0.1951
            0.2152     0.2357     0.2566     0.2780     0.2999
            0.3222     0.3449     0.3681     0.3918     0.4159
            0.4405     0.4655     0.4910     0.5169     0.5433
            0.5702     0.5975     0.6252     0.6534     0.6821
            0.7112     0.7408     0.7708     0.8013     0.8322
            0.8639     0.8965     0.9301     0.9646     1.0000
Hrad:
            0.0198     0.0396     0.0594     0.0792     0.0990
            0.1188     0.1386     0.1584     0.1782     0.1980
            0.2178     0.2376     0.2574     0.2772     0.2970
            0.3168     0.3204     0.3285     0.3578     0.3863
            0.4140     0.4412     0.4677     0.4936     0.5191
            0.5440     0.5685     0.5926     0.6164     0.6397
```

```
            0.6627     0.6854     0.7078     0.7300     0.7518
            0.7735     0.7949     0.8160     0.8370     0.8578
            0.8784     0.8988     0.9191     0.9392     0.9576
            0.9649     0.9729     0.9815     0.9905     1.0000
Width:
            0.0266     0.0532     0.0797     0.1063     0.1329
            0.1595     0.1860     0.2126     0.2392     0.2658
            0.2924     0.3189     0.3455     0.3721     0.3987
            0.4253     0.4768     0.5264     0.5390     0.5517
            0.5643     0.5769     0.5896     0.6022     0.6148
            0.6275     0.6401     0.6527     0.6654     0.6780
            0.6906     0.7033     0.7159     0.7285     0.7412
            0.7538     0.7664     0.7791     0.7917     0.8043
            0.8170     0.8296     0.8422     0.8549     0.8691
            0.8953     0.9215     0.9477     0.9738     1.0000

Transect TaylorWayDitch
Area:
            0.0004     0.0016     0.0036     0.0064     0.0101
            0.0145     0.0197     0.0258     0.0326     0.0402
            0.0487     0.0579     0.0680     0.0789     0.0905
            0.1030     0.1163     0.1304     0.1453     0.1610
            0.1775     0.1948     0.2129     0.2318     0.2515
            0.2720     0.2934     0.3155     0.3384     0.3622
            0.3867     0.4121     0.4382     0.4652     0.4930
            0.5215     0.5509     0.5811     0.6121     0.6438
            0.6759     0.7084     0.7413     0.7750     0.8098
            0.8457     0.8827     0.9207     0.9598     1.0000
Hrad:
            0.0201     0.0402     0.0603     0.0805     0.1006
            0.1207     0.1408     0.1609     0.1810     0.2011
            0.2212     0.2414     0.2615     0.2816     0.3017
            0.3218     0.3419     0.3620     0.3822     0.4023
            0.4224     0.4425     0.4626     0.4827     0.5028
            0.5229     0.5431     0.5632     0.5833     0.6034
            0.6235     0.6436     0.6637     0.6839     0.7040
            0.7241     0.7442     0.7643     0.7844     0.8117
            0.8416     0.8713     0.8984     0.9117     0.9255
            0.9396     0.9542     0.9691     0.9844     1.0000
Width:
            0.0198     0.0395     0.0593     0.0791     0.0988
            0.1186     0.1384     0.1581     0.1779     0.1977
            0.2174     0.2372     0.2570     0.2767     0.2965
            0.3163     0.3360     0.3558     0.3756     0.3953
            0.4151     0.4349     0.4546     0.4744     0.4942
            0.5139     0.5337     0.5535     0.5732     0.5930
            0.6128     0.6326     0.6523     0.6721     0.6919
            0.7116     0.7314     0.7512     0.7709     0.7836
            0.7934     0.8032     0.8154     0.8417     0.8681
            0.8945     0.9209     0.9472     0.9736     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 ............ 05/04/2021 00:00:00
Ending Date .............. 05/06/2021 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 ........ 4
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 ..........         0.157          1.566
External Outflow .........         0.157          1.569
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 (%) .....        -0.140


***************************
Time-Step Critical Elements
***************************
Link C20 (22.98%)


********************************
Highest Flow Instability Indexes
********************************
Link Culv-OsgoodePath (3)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.42 sec
```

```
Average Time Step          :     1.79 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     :    77.31 %
    1.516 -  1.149 sec     :     8.72 %
    1.149 -  0.871 sec     :    10.91 %
    0.871 -  0.660 sec     :     2.96 %
    0.660 -  0.500 sec     :     0.11 %
```

****
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
J01	JUNCTION	0.07	0.46	90.91	0	07:12	0.46
J02	JUNCTION	0.07	0.44	90.91	0	07:12	0.44
J03	JUNCTION	0.06	0.41	90.91	0	07:12	0.41
J04	JUNCTION	0.04	0.36	90.91	0	07:12	0.36
J05	JUNCTION	0.04	0.33	90.92	0	07:12	0.33
J06	JUNCTION	0.03	0.29	90.92	0	07:12	0.29
J07	JUNCTION	0.01	0.17	90.92	0	07:12	0.17
J08	JUNCTION	0.00	0.11	90.92	0	07:12	0.11
J09	JUNCTION	0.00	0.06	90.92	0	07:12	0.06
J10	JUNCTION	0.00	0.04	90.92	0	07:12	0.04
J11	JUNCTION	0.00	0.00	91.00	0	00:00	0.00
J12	JUNCTION	0.00	0.00	91.01	0	00:00	0.00
J13	JUNCTION	0.00	0.00	91.07	0	00:00	0.00
J14	JUNCTION	0.00	0.00	91.13	0	00:00	0.00
J15	JUNCTION	0.00	0.00	91.18	0	00:00	0.00
J16	JUNCTION	0.00	0.00	91.03	0	00:00	0.00
J17	JUNCTION	0.00	0.05	90.82	0	06:33	0.05
J18	JUNCTION	0.00	0.05	90.57	0	06:35	0.05
J19	JUNCTION	0.00	0.05	90.31	0	06:36	0.05
J20	JUNCTION	0.07	0.45	90.91	0	07:12	0.45
J21	JUNCTION	0.07	0.57	91.05	0	06:50	0.56
J22	JUNCTION	0.07	0.55	91.05	0	06:50	0.55
J23	JUNCTION	0.04	0.42	91.05	0	06:50	0.42
J24	JUNCTION	0.03	0.38	91.05	0	06:50	0.38
J25	JUNCTION	0.05	0.52	91.23	0	06:40	0.52
J26	JUNCTION	0.03	0.48	91.23	0	06:40	0.48
J27	JUNCTION	0.02	0.35	91.23	0	06:40	0.35
J28	JUNCTION	0.02	0.31	91.23	0	06:40	0.31
J29	JUNCTION	0.03	0.32	91.28	0	06:38	0.32
J30	JUNCTION	0.02	0.28	91.28	0	06:38	0.28
J31	JUNCTION	0.01	0.21	91.28	0	06:38	0.21
J32	JUNCTION	0.00	0.14	91.25	0	06:38	0.14
J33	JUNCTION	0.00	0.12	91.25	0	06:38	0.12
J34	JUNCTION	0.00	0.05	91.23	0	06:38	0.05
J35	JUNCTION	0.00	0.05	91.08	0	06:40	0.05
J36	JUNCTION	0.00	0.06	90.83	0	06:39	0.06

J37	JUNCTION	0.00	0.06	90.58	0	06:40	0.06
J38	JUNCTION	0.00	0.06	90.32	0	06:41	0.06
J39	JUNCTION	0.05	0.35	90.50	0	07:12	0.35
J40	JUNCTION	0.05	0.26	90.00	0	07:13	0.26
J41	JUNCTION	0.06	0.28	89.92	0	07:14	0.28
J42	JUNCTION	0.04	0.20	89.68	0	07:14	0.20
J43	JUNCTION	0.05	0.21	89.47	0	07:15	0.21
Outlet	JUNCTION	0.01	0.09	90.49	0	07:12	0.09
OF-LombardyEast	OUTFALL	0.00	0.06	90.11	0	06:41	0.06
OF-LombardyWest	OUTFALL	0.00	0.05	90.10	0	06:36	0.05
OF-Osgoode	OUTFALL	0.05	0.21	88.57	0	07:15	0.21
OF-OsgoodePath-UNC	OUTFALL	0.00	0.00	91.00	0	00:00	0.00
DryPond	STORAGE	0.09	0.51	90.91	0	07:12	0.51

****
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
J01	JUNCTION	0.00	159.23	0 06:38	0	0.936	0.006
J02	JUNCTION	0.00	32.05	0 06:34	0	0.169	0.006
J03	JUNCTION	0.00	36.83	0 06:34	0	0.169	0.012
J04	JUNCTION	0.00	39.16	0 06:34	0	0.169	-0.001
J05	JUNCTION	0.00	39.64	0 06:34	0	0.169	-0.012
J06	JUNCTION	0.00	40.96	0 06:34	0	0.169	0.064
J07	JUNCTION	41.10	41.10	0 06:32	0.169	0.171	-0.070
J08	JUNCTION	0.00	1.52	0 06:59	0	0.00252	-0.023
J09	JUNCTION	0.00	1.06	0 06:59	0	0.00133	0.121
J10	JUNCTION	0.00	0.88	0 06:59	0	0.00057	0.107
J11	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
J12	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
J13	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
J14	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
J15	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
J16	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
J17	JUNCTION	17.71	17.71	0 06:32	0.0736	0.0736	-0.006
J18	JUNCTION	0.00	17.76	0 06:34	0	0.0736	0.001
J19	JUNCTION	0.00	17.73	0 06:35	0	0.0736	0.005
J20	JUNCTION	0.00	136.59	0 06:42	0	0.767	-0.006
J21	JUNCTION	22.74	137.70	0 06:41	0.0926	0.767	0.008
J22	JUNCTION	0.00	124.63	0 06:40	0	0.674	0.021
J23	JUNCTION	0.00	131.21	0 06:38	0	0.674	-0.015
J24	JUNCTION	0.00	132.87	0 06:38	0	0.674	-0.012
J25	JUNCTION	0.00	133.91	0 06:37	0	0.674	0.011
J26	JUNCTION	87.21	139.96	0 06:36	0.364	0.674	0.002
J27	JUNCTION	0.00	59.33	0 06:32	0	0.31	-0.002
J28	JUNCTION	0.00	61.44	0 06:32	0	0.31	-0.008
J29	JUNCTION	0.00	62.57	0 06:32	0	0.31	0.003
J30	JUNCTION	0.00	65.25	0 06:32	0	0.31	0.008
J31	JUNCTION	81.46	81.46	0 06:32	0.334	0.335	-0.011
J32	JUNCTION	0.00	17.99	0 06:37	0	0.0256	0.005
J33	JUNCTION	0.00	17.95	0 06:38	0	0.0247	-0.000

J34	JUNCTION	0.00	17.91	0	06:38	0	0.0241	-0.026
J35	JUNCTION	0.00	17.94	0	06:39	0	0.024	0.052
J36	JUNCTION	9.12	26.11	0	06:39	0.0376	0.0616	-0.015
J37	JUNCTION	0.00	26.13	0	06:39	0	0.0616	0.000
J38	JUNCTION	0.00	26.07	0	06:40	0	0.0616	0.009
J39	JUNCTION	0.00	113.36	0	07:12	0	1.23	0.035
J40	JUNCTION	0.00	113.35	0	07:12	0	1.23	-0.040
J41	JUNCTION	0.00	113.34	0	07:13	0	1.23	0.001
J42	JUNCTION	0.00	113.32	0	07:14	0	1.23	0.004
J43	JUNCTION	0.00	113.32	0	07:14	0	1.23	0.001
Outlet	JUNCTION	0.00	113.36	0	07:12	0	1.23	-0.001
OF-LombardyEast	OUTFALL	0.00	26.01	0	06:41	0	0.0616	0.000
OF-LombardyWest	OUTFALL	0.00	17.70	0	06:36	0	0.0736	0.000
OF-Osgoode	OUTFALL	0.00	113.31	0	07:15	0	1.23	0.000
OF-OsgoodePath-UNC	OUTFALL	47.82	47.82	0	06:36	0.201	0.201	0.000
DryPond	STORAGE	70.93	220.68	0	06:36	0.294	1.23	-0.185

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
DryPond	0.052	11	0	0	0.359	74	0 07:12	113.36

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF-LombardyEast	25.09	2.72	26.01	0.062
OF-LombardyWest	25.35	3.09	17.70	0.074
OF-Osgoode	44.11	27.63	113.31	1.232
OF-OsgoodePath-UNC	25.20	8.40	47.82	0.201

```
System               29.94     41.84    144.60       1.569


********************
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
-----------------------------------------------------------------------------
C01                  CONDUIT   29.13     0  06:34      0.36    0.55     1.00
C02                  CONDUIT   32.05     0  06:34      0.08    0.03     0.72
C03                  CONDUIT   36.83     0  06:34      0.15    0.02     0.65
C04                  CONDUIT   39.16     0  06:34      0.67    0.52     0.86
C05                  CONDUIT   39.64     0  06:34      0.12    0.02     0.51
C06                  CONDUIT   40.96     0  06:34      0.21    0.02     0.38
C07                  CONDUIT    1.52     0  06:59      0.01    0.00     0.23
C08                  CONDUIT    1.06     0  06:59      0.09    0.01     0.20
C09                  CONDUIT    0.88     0  06:59      0.04    0.00     0.08
C10                  CONDUIT    0.00     0  00:00      0.00    0.00     0.03
C11                  CONDUIT    0.00     0  00:00      0.00    0.00     0.00
C12                  CONDUIT    0.00     0  00:00      0.00    0.00     0.00
C13                  CONDUIT    0.00     0  00:00      0.00    0.00     0.00
C14                  CONDUIT    0.00     0  00:00      0.00    0.00     0.00
C15                  CONDUIT    0.00     0  00:00      0.00    0.00     0.00
C16                  CONDUIT    0.00     0  00:00      0.00    0.00     0.04
C17                  CONDUIT   17.76     0  06:34      0.34    0.01     0.08
C18                  CONDUIT   17.73     0  06:35      0.33    0.01     0.08
C19                  CONDUIT   17.70     0  06:36      0.31    0.01     0.08
C20                  CONDUIT  136.00     0  06:42      0.29    0.08     0.76
C21                  CONDUIT  136.59     0  06:42      1.13    2.57     1.00
C22                  CONDUIT  119.79     0  06:43      0.09    0.09     0.93
C23                  CONDUIT  124.63     0  06:40      0.18    0.08     0.80
C24                  CONDUIT  131.21     0  06:38      0.37    0.08     0.66
C25                  CONDUIT  132.87     0  06:38      1.10    1.77     0.97
C26                  CONDUIT  133.91     0  06:37      0.15    0.08     0.83
C27                  CONDUIT   55.16     0  06:42      0.14    0.03     0.69
C28                  CONDUIT   59.33     0  06:32      0.32    0.04     0.55
C29                  CONDUIT   61.44     0  06:32      0.91    0.82     0.78
C30                  CONDUIT   62.57     0  06:32      0.14    0.04     0.49
C31                  CONDUIT   65.25     0  06:32      0.23    0.04     0.41
C32                  CONDUIT   17.99     0  06:37      0.34    0.24     0.44
C33                  CONDUIT   17.95     0  06:38      0.10    0.01     0.22
C34                  CONDUIT   17.91     0  06:38      0.16    0.01     0.14
C35                  CONDUIT   17.94     0  06:39      0.32    0.04     0.16
C36                  CONDUIT   17.89     0  06:40      0.30    0.03     0.17
C37                  CONDUIT   26.13     0  06:39      0.39    0.05     0.19
C38                  CONDUIT   26.07     0  06:40      0.38    0.05     0.19
C39                  CONDUIT   26.01     0  06:41      0.37    0.05     0.20
C40                  CONDUIT  153.40     0  06:39      0.37    0.17     0.79
C41                  CONDUIT  113.36     0  07:12      0.45    0.02     0.32
C42                  CHANNEL  113.34     0  07:13      0.40    0.01     0.16
C43                  CHANNEL  113.32     0  07:14      0.50    0.01     0.15
C44                  CHANNEL  113.32     0  07:14      0.67    0.00     0.13
C45                  CHANNEL  113.31     0  07:15      1.02    0.01     0.15
Culv-OsgoodePath     CONDUIT  113.35     0  07:12      1.03    0.42     0.57
```

W01	WEIR	0.00	0	00:00	0.00
W02	WEIR	0.00	0	00:00	0.00
W03	WEIR	0.00	0	00:00	0.00
W04	WEIR	0.00	0	00:00	0.00
W05	WEIR	0.00	0	00:00	0.00
W06	WEIR	0.00	0	00:00	0.00
W07	WEIR	0.00	0	00:00	0.00
W08	WEIR	0.00	0	00:00	0.00
W-Emergency	WEIR	0.00	0	00:00	0.00
W-Path	WEIR	0.00	0	00:00	0.00
W-Pond	WEIR	9.44	0	06:23	1.00
W-PondUpper	WEIR	104.02	0	07:12	0.80

****
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
C01	1.00	0.07	0.03	0.00	0.91	0.00	0.00	0.00	0.00	0.08
C02	1.00	0.09	0.51	0.00	0.39	0.00	0.00	0.00	0.69	0.00
C03	1.00	0.60	0.04	0.00	0.36	0.00	0.00	0.00	0.73	0.00
C04	1.00	0.09	0.00	0.00	0.91	0.00	0.00	0.00	0.00	0.04
C05	1.00	0.08	0.56	0.00	0.35	0.00	0.00	0.00	0.78	0.00
C06	1.00	0.64	0.02	0.00	0.33	0.00	0.00	0.00	0.83	0.00
C07	1.00	0.67	0.17	0.00	0.17	0.00	0.00	0.00	0.83	0.00
C08	1.00	0.12	0.02	0.00	0.86	0.00	0.00	0.00	0.00	0.01
C09	1.00	0.14	0.72	0.00	0.14	0.00	0.00	0.00	0.84	0.00
C10	1.00	0.86	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C11	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C12	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C13	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C14	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C15	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C16	1.00	0.68	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C17	1.00	0.65	0.02	0.00	0.32	0.00	0.00	0.00	0.79	0.00
C18	1.00	0.63	0.03	0.00	0.34	0.00	0.00	0.00	0.87	0.00
C19	1.00	0.63	0.00	0.00	0.37	0.00	0.00	0.00	0.84	0.00
C20	1.00	0.43	0.03	0.00	0.53	0.00	0.00	0.00	0.65	0.00
C21	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.00	0.07
C22	1.00	0.07	0.44	0.00	0.49	0.00	0.00	0.00	0.68	0.00
C23	1.00	0.50	0.04	0.00	0.46	0.00	0.00	0.00	0.82	0.00
C24	1.00	0.54	0.04	0.00	0.42	0.00	0.00	0.00	0.81	0.00
C25	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.00	0.00
C26	1.00	0.07	0.50	0.00	0.42	0.00	0.00	0.00	0.76	0.00
C27	1.00	0.57	0.02	0.00	0.40	0.00	0.00	0.00	0.87	0.00
C28	1.00	0.59	0.03	0.00	0.38	0.00	0.00	0.00	0.76	0.00
C29	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.00	0.02
C30	1.00	0.06	0.59	0.00	0.34	0.00	0.00	0.00	0.78	0.00
C31	1.00	0.65	0.02	0.00	0.32	0.00	0.00	0.00	0.86	0.00
C32	1.00	0.68	0.20	0.00	0.12	0.00	0.00	0.00	0.00	0.83
C33	1.00	0.87	0.00	0.00	0.13	0.00	0.00	0.00	0.03	0.00
C34	1.00	0.87	0.04	0.00	0.10	0.00	0.00	0.00	0.85	0.00
C35	1.00	0.85	0.06	0.00	0.10	0.00	0.00	0.00	0.86	0.00

```
C36                    1.00    0.67  0.17  0.00  0.15  0.00  0.00  0.00  0.87  0.00
C37                    1.00    0.65  0.02  0.00  0.33  0.00  0.00  0.00  0.81  0.00
C38                    1.00    0.63  0.02  0.00  0.34  0.00  0.00  0.00  0.86  0.00
C39                    1.00    0.64  0.00  0.00  0.36  0.00  0.00  0.00  0.82  0.00
C40                    1.00    0.43  0.00  0.00  0.38  0.00  0.00  0.19  0.05  0.00
C41                    1.00    0.51  0.00  0.00  0.30  0.00  0.00  0.19  0.21  0.00
C42                    1.00    0.07  0.00  0.00  0.93  0.01  0.00  0.00  0.90  0.00
C43                    1.00    0.08  0.00  0.00  0.92  0.01  0.00  0.00  0.00  0.00
C44                    1.00    0.08  0.00  0.00  0.67  0.25  0.00  0.00  0.89  0.00
C45                    1.00    0.09  0.00  0.00  0.86  0.05  0.00  0.00  0.56  0.00
Culv-OsgoodePath       1.00    0.07  0.00  0.00  0.00  0.00  0.00  0.93  0.00  0.30


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

----------------------------------------------------------------------------
                                                           Hours        Hours
                       --------- Hours Full --------    Above Full   Capacity
Conduit                 Both Ends  Upstream  Dnstream   Normal Flow   Limited
----------------------------------------------------------------------------
C01                          0.85      0.85      1.05        0.01         0.01
C21                          0.91      1.28      0.94        1.14         0.82
C25                          0.01      0.58      0.01        0.76         0.01


Analysis begun on:  Mon Nov 11 15:45:37 2024
Analysis ended on:  Mon Nov 11 15:45:40 2024
Total elapsed time: 00:00:03
```

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: 05/04/2021 00:00:00
Simulation end time: 05/06/2021 00:00:00
Runoff wet weather time steps: 240 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-2	Nash IUH	Raingage	0.48	15	10	54	0.00433	0.998
EX-1	Nash IUH	Raingage	0.23	15	10	50	0.00208	0.997
EX-3	Nash IUH	Raingage	0.48	15	10	54	0.00433	0.998
D	Nash IUH	Raingage	0.56	15	10	54	0.00505	0.998
A	Nash IUH	Raingage	1.18	15	10	58	0.01065	0.998
B	Nash IUH	Raingage	0.4	15	10	54	0.00361	0.998
C	Nash IUH	Raingage	0.18	15	10	46	0.00162	0.996
E	Nash IUH	Raingage	0.48	15	10	54	0.00433	0.998
G	Nash IUH	Raingage	0.11	15	10	46	0.00099	0.996
F	Nash IUH	Raingage	0.23	15	10	50	0.00208	0.997
H	Nash IUH	Raingage	0.42	15	10	54	0.00379	0.998

****
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-2	106.73	52.318	54.292	0.261	37.594	0.509
EX-1	106.73	56.927	49.652	0.114	16.53	0.465
EX-3	106.73	56.927	49.688	0.238	34.507	0.466
D	106.73	71.2	35.446	0.198	28.863	0.332
A	106.73	67.706	38.949	0.46	66.974	0.365
B	106.73	74.507	32.15	0.129	18.64	0.301
C	106.73	74.507	32.106	0.058	8.383	0.301
E	106.73	62.636	44	0.211	30.849	0.412
G	106.73	63.811	42.764	0.047	6.868	0.401
F	106.73	66.35	40.27	0.093	13.504	0.377
H	106.73	70.063	36.595	0.154	22.361	0.343

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

WARNING 02: maximum depth increased for Node J09
WARNING 02: maximum depth increased for Node J13
WARNING 02: maximum depth increased for Node J21
WARNING 02: maximum depth increased for Node J25
WARNING 02: maximum depth increased for Node J29
WARNING 02: maximum depth increased for Node J32
WARNING 02: maximum depth increased for Node J39

*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 0
Number of nodes ........... 49
Number of links ........... 58
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                               Data       Recording
Name                 Data Source                               Type       Interval
-------------------------------------------------------------------------------------
Raingage             11-SCS100yr-24hr                          INTENSITY    60 min.


************
Node Summary
************
                                                     Invert      Max.    Ponded    External
Name                 Type                             Elev.     Depth      Area    Inflow
------------------------------------------------------------------------------------------
J01                  JUNCTION                         90.45      1.00       0.0
J02                  JUNCTION                         90.47      1.00       0.0
J03                  JUNCTION                         90.50      1.00       0.0
J04                  JUNCTION                         90.55      1.00       0.0
J05                  JUNCTION                         90.59      1.00       0.0
J06                  JUNCTION                         90.63      1.00       0.0
J07                  JUNCTION                         90.75      1.00       0.0
J08                  JUNCTION                         90.81      1.00       0.0
J09                  JUNCTION                         90.86      1.00       0.0
J10                  JUNCTION                         90.88      1.00       0.0
J11                  JUNCTION                         91.00      1.00       0.0
J12                  JUNCTION                         91.01      1.00       0.0
J13                  JUNCTION                         91.07      1.00       0.0
J14                  JUNCTION                         91.13      1.00       0.0
J15                  JUNCTION                         91.18      1.00       0.0
J16                  JUNCTION                         91.03      1.00       0.0
J17                  JUNCTION                         90.77      1.00       0.0
J18                  JUNCTION                         90.52      1.00       0.0
J19                  JUNCTION                         90.26      1.00       0.0
J20                  JUNCTION                         90.46      1.00       0.0
```

J21	JUNCTION	90.48	1.00	0.0
J22	JUNCTION	90.50	1.00	0.0
J23	JUNCTION	90.63	1.00	0.0
J24	JUNCTION	90.67	1.00	0.0
J25	JUNCTION	90.71	1.00	0.0
J26	JUNCTION	90.75	1.00	0.0
J27	JUNCTION	90.88	1.00	0.0
J28	JUNCTION	90.92	1.00	0.0
J29	JUNCTION	90.96	1.00	0.0
J30	JUNCTION	91.00	1.00	0.0
J31	JUNCTION	91.07	1.00	0.0
J32	JUNCTION	91.11	1.00	0.0
J33	JUNCTION	91.13	1.00	0.0
J34	JUNCTION	91.18	1.00	0.0
J35	JUNCTION	91.03	1.00	0.0
J36	JUNCTION	90.77	1.00	0.0
J37	JUNCTION	90.52	1.00	0.0
J38	JUNCTION	90.26	1.00	0.0
J39	JUNCTION	90.15	1.55	0.0
J40	JUNCTION	89.74	1.96	0.0
J41	JUNCTION	89.64	2.00	0.0
J42	JUNCTION	89.48	2.00	0.0
J43	JUNCTION	89.26	2.00	0.0
Outlet	JUNCTION	90.40	1.00	0.0
OF-LombardyEast	OUTFALL	90.05	0.30	0.0
OF-LombardyWest	OUTFALL	90.05	0.60	0.0
OF-Osgoode	OUTFALL	88.36	1.40	0.0
OF-OsgoodePath-UNC	OUTFALL	91.00	0.00	0.0
DryPond	STORAGE	90.40	1.00	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C01	J02	J01	CONDUIT	9.0	0.2222	0.0240
C02	J03	J02	CONDUIT	13.0	0.2308	0.0350
C03	J04	J03	CONDUIT	12.0	0.4167	0.0350
C04	J05	J04	CONDUIT	9.0	0.4444	0.0240
C05	J06	J05	CONDUIT	9.0	0.4444	0.0350
C06	J07	J06	CONDUIT	24.0	0.5000	0.0350
C07	J08	J07	CONDUIT	12.0	0.5000	0.0350
C08	J09	J08	CONDUIT	9.0	0.5556	0.0240
C09	J10	J09	CONDUIT	4.0	0.5000	0.0350
C10	J11	J10	CONDUIT	25.0	0.4800	0.0350
C11	J12	J11	CONDUIT	2.0	0.5000	0.0350
C12	J13	J12	CONDUIT	9.0	0.6667	0.0240
C13	J14	J13	CONDUIT	10.0	0.6000	0.0350
C14	J15	J14	CONDUIT	5.0	1.0001	0.0350
C15	J15	J16	CONDUIT	11.0	1.3638	0.0350
C16	J16	J17	CONDUIT	25.0	1.0401	0.0350
C17	J17	J18	CONDUIT	25.0	1.0001	0.0350
C18	J18	J19	CONDUIT	25.0	1.0401	0.0350
C19	J19	OF-LombardyWest	CONDUIT	26.0	0.8077	0.0350
C20	J20	J01	CONDUIT	2.0	0.5000	0.0350
C21	J21	J20	CONDUIT	9.0	0.2222	0.0240
C22	J22	J21	CONDUIT	7.0	0.2857	0.0350

C23	J23	J22	CONDUIT	29.0	0.4483	0.0350
C24	J24	J23	CONDUIT	8.0	0.5000	0.0350
C25	J25	J24	CONDUIT	9.0	0.4444	0.0240
C26	J26	J25	CONDUIT	8.0	0.5000	0.0350
C27	J27	J26	CONDUIT	25.0	0.5200	0.0350
C28	J28	J27	CONDUIT	8.0	0.5000	0.0350
C29	J29	J28	CONDUIT	9.0	0.4444	0.0240
C30	J30	J29	CONDUIT	9.0	0.4444	0.0350
C31	J31	J30	CONDUIT	17.0	0.4118	0.0350
C32	J32	J31	CONDUIT	9.0	0.4444	0.0240
C33	J33	J32	CONDUIT	4.0	0.5000	0.0350
C34	J34	J33	CONDUIT	14.0	0.3571	0.0350
C35	J34	J35	CONDUIT	19.0	0.7895	0.0350
C36	J35	J36	CONDUIT	25.0	1.0401	0.0350
C37	J36	J37	CONDUIT	25.0	1.0001	0.0350
C38	J37	J38	CONDUIT	25.0	1.0401	0.0350
C39	J38	OF-LombardyEast	CONDUIT	24.0	0.8750	0.0350
C40	J01	DryPond	CONDUIT	20.0	0.1500	0.0350
C41	Outlet	J39	CONDUIT	5.0	4.0032	0.0350
C42	J40	J41	CONDUIT	27.0	0.3704	0.0350
C43	J41	J42	CONDUIT	41.0	0.3902	0.0350
C44	J42	J43	CONDUIT	16.0	1.3751	0.0350
C45	J43	OF-Osgoode	CONDUIT	32.0	2.8136	0.0350
Culv-OsgoodePath	J39	J40	CONDUIT	20.0	0.5000	0.0130
W01	J02	J01	WEIR			
W02	J05	J04	WEIR			
W03	J09	J08	WEIR			
W04	J13	J12	WEIR			
W05	J21	J20	WEIR			
W06	J25	J24	WEIR			
W07	J29	J28	WEIR			
W08	J32	J31	WEIR			
W-Emergency	DryPond	Outlet	WEIR			
W-Path	J39	J40	WEIR			
W-Pond	DryPond	Outlet	WEIR			
W-PondUpper	DryPond	Outlet	WEIR			

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*********************
Cross Section Summary
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Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C01	CIRCULAR	0.40	0.13	0.10	0.40	1	53.18
C02	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1146.09
C03	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1540.02
C04	CIRCULAR	0.40	0.13	0.10	0.40	1	75.21
C05	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1590.53
C06	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C07	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C08	CIRCULAR	0.40	0.13	0.10	0.40	1	84.09
C09	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C10	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1652.93
C11	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1687.01
C12	CIRCULAR	0.40	0.13	0.10	0.40	1	92.11
C13	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	1848.03
C14	TRAPEZOIDAL	0.60	1.68	0.35	4.60	1	2385.84

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C15              TRAPEZOIDAL          0.60      1.68      0.35      4.60         1  2786.12
C16              TRAPEZOIDAL          0.60      1.68      0.35      4.60         1  2433.09
C17              TRAPEZOIDAL          0.60      1.68      0.35      4.60         1  2385.84
C18              TRAPEZOIDAL          0.60      1.68      0.35      4.60         1  2433.09
C19              TRAPEZOIDAL          0.60      1.68      0.35      4.60         1  2144.18
C20              TRAPEZOIDAL          0.60      1.68      0.35      4.60         1  1687.01
C21              CIRCULAR             0.40      0.13      0.10      0.40         1    53.18
C22              TRAPEZOIDAL          0.60      1.68      0.35      4.60         1  1275.26
C23              TRAPEZOIDAL          0.60      1.68      0.35      4.60         1  1597.37
C24              TRAPEZOIDAL          0.60      1.68      0.35      4.60         1  1687.01
C25              CIRCULAR             0.40      0.13      0.10      0.40         1    75.21
C26              TRAPEZOIDAL          0.60      1.68      0.35      4.60         1  1687.01
C27              TRAPEZOIDAL          0.60      1.68      0.35      4.60         1  1720.42
C28              TRAPEZOIDAL          0.60      1.68      0.35      4.60         1  1687.01
C29              CIRCULAR             0.40      0.13      0.10      0.40         1    75.21
C30              TRAPEZOIDAL          0.60      1.68      0.35      4.60         1  1590.53
C31              TRAPEZOIDAL          0.60      1.68      0.35      4.60         1  1530.94
C32              CIRCULAR             0.40      0.13      0.10      0.40         1    75.21
C33              TRAPEZOIDAL          0.60      1.68      0.35      4.60         1  1687.01
C34              TRAPEZOIDAL          0.60      1.68      0.35      4.60         1  1425.78
C35              TRAPEZOIDAL          0.30      0.57      0.20      2.80         1   489.50
C36              TRAPEZOIDAL          0.30      0.57      0.20      2.80         1   561.84
C37              TRAPEZOIDAL          0.30      0.57      0.20      2.80         1   550.92
C38              TRAPEZOIDAL          0.30      0.57      0.20      2.80         1   561.84
C39              TRAPEZOIDAL          0.30      0.57      0.20      2.80         1   515.34
C40              TRAPEZOIDAL          0.60      1.68      0.35      4.60         1   924.01
C41              TRAPEZOIDAL          0.60      1.68      0.35      4.60         1  4773.47
C42              OsgoodeDitch         1.66      8.97      0.81      9.70         1 13533.66
C43              OsgoodeDitch         1.66      8.97      0.81      9.70         1 13892.02
C44              OsgoodeDitch         1.66      8.97      0.81      9.70         1 26077.59
C45              TaylorWayDitch       1.40      4.75      0.64      6.90         1 16912.25
Culv-OsgoodePath CIRCULAR             0.50      0.20      0.12      0.50         1   267.02


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

Transect OsgoodeDitch
Area:
            0.0005     0.0019     0.0043     0.0076     0.0119
            0.0172     0.0234     0.0305     0.0387     0.0477
            0.0577     0.0687     0.0807     0.0935     0.1074
            0.1222     0.1383     0.1564     0.1755     0.1951
            0.2152     0.2357     0.2566     0.2780     0.2999
            0.3222     0.3449     0.3681     0.3918     0.4159
            0.4405     0.4655     0.4910     0.5169     0.5433
            0.5702     0.5975     0.6252     0.6534     0.6821
            0.7112     0.7408     0.7708     0.8013     0.8322
            0.8639     0.8965     0.9301     0.9646     1.0000
Hrad:
            0.0198     0.0396     0.0594     0.0792     0.0990
            0.1188     0.1386     0.1584     0.1782     0.1980
            0.2178     0.2376     0.2574     0.2772     0.2970
            0.3168     0.3204     0.3285     0.3578     0.3863
            0.4140     0.4412     0.4677     0.4936     0.5191
            0.5440     0.5685     0.5926     0.6164     0.6397
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            0.6627     0.6854     0.7078     0.7300     0.7518
            0.7735     0.7949     0.8160     0.8370     0.8578
            0.8784     0.8988     0.9191     0.9392     0.9576
            0.9649     0.9729     0.9815     0.9905     1.0000
  Width:
            0.0266     0.0532     0.0797     0.1063     0.1329
            0.1595     0.1860     0.2126     0.2392     0.2658
            0.2924     0.3189     0.3455     0.3721     0.3987
            0.4253     0.4768     0.5264     0.5390     0.5517
            0.5643     0.5769     0.5896     0.6022     0.6148
            0.6275     0.6401     0.6527     0.6654     0.6780
            0.6906     0.7033     0.7159     0.7285     0.7412
            0.7538     0.7664     0.7791     0.7917     0.8043
            0.8170     0.8296     0.8422     0.8549     0.8691
            0.8953     0.9215     0.9477     0.9738     1.0000

  Transect TaylorWayDitch
  Area:
            0.0004     0.0016     0.0036     0.0064     0.0101
            0.0145     0.0197     0.0258     0.0326     0.0402
            0.0487     0.0579     0.0680     0.0789     0.0905
            0.1030     0.1163     0.1304     0.1453     0.1610
            0.1775     0.1948     0.2129     0.2318     0.2515
            0.2720     0.2934     0.3155     0.3384     0.3622
            0.3867     0.4121     0.4382     0.4652     0.4930
            0.5215     0.5509     0.5811     0.6121     0.6438
            0.6759     0.7084     0.7413     0.7750     0.8098
            0.8457     0.8827     0.9207     0.9598     1.0000
  Hrad:
            0.0201     0.0402     0.0603     0.0805     0.1006
            0.1207     0.1408     0.1609     0.1810     0.2011
            0.2212     0.2414     0.2615     0.2816     0.3017
            0.3218     0.3419     0.3620     0.3822     0.4023
            0.4224     0.4425     0.4626     0.4827     0.5028
            0.5229     0.5431     0.5632     0.5833     0.6034
            0.6235     0.6436     0.6637     0.6839     0.7040
            0.7241     0.7442     0.7643     0.7844     0.8117
            0.8416     0.8713     0.8984     0.9117     0.9255
            0.9396     0.9542     0.9691     0.9844     1.0000
  Width:
            0.0198     0.0395     0.0593     0.0791     0.0988
            0.1186     0.1384     0.1581     0.1779     0.1977
            0.2174     0.2372     0.2570     0.2767     0.2965
            0.3163     0.3360     0.3558     0.3756     0.3953
            0.4151     0.4349     0.4546     0.4744     0.4942
            0.5139     0.5337     0.5535     0.5732     0.5930
            0.6128     0.6326     0.6523     0.6721     0.6919
            0.7116     0.7314     0.7512     0.7709     0.7836
            0.7934     0.8032     0.8154     0.8417     0.8681
            0.8945     0.9209     0.9472     0.9736     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 ............ 05/04/2021 00:00:00
Ending Date .............. 05/06/2021 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 ........ 4
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 ..........         0.196          1.962
External Outflow .........         0.196          1.964
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 (%) .....        -0.072


***************************
Time-Step Critical Elements
***************************
Link C20 (37.33%)


********************************
Highest Flow Instability Indexes
********************************
Link Culv-OsgoodePath (10)
Link C42 (2)


*************************
Routing Time Step Summary
*************************
```

```
Minimum Time Step           :     0.09 sec
Average Time Step           :     1.71 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      :    66.55 %
    1.516 -  1.149 sec      :    19.32 %
    1.149 -  0.871 sec      :    11.31 %
    0.871 -  0.660 sec      :     2.65 %
    0.660 -  0.500 sec      :     0.17 %


******************
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
J01	JUNCTION	0.09	0.46	90.91	0	13:26	0.46
J02	JUNCTION	0.08	0.45	90.92	0	13:26	0.45
J03	JUNCTION	0.07	0.42	90.92	0	13:26	0.42
J04	JUNCTION	0.05	0.37	90.92	0	13:26	0.37
J05	JUNCTION	0.05	0.33	90.92	0	13:27	0.33
J06	JUNCTION	0.03	0.29	90.92	0	13:27	0.29
J07	JUNCTION	0.02	0.17	90.92	0	13:27	0.17
J08	JUNCTION	0.00	0.11	90.92	0	13:27	0.11
J09	JUNCTION	0.00	0.06	90.92	0	13:27	0.06
J10	JUNCTION	0.00	0.04	90.92	0	13:27	0.04
J11	JUNCTION	0.00	0.00	91.00	0	00:00	0.00
J12	JUNCTION	0.00	0.00	91.01	0	00:00	0.00
J13	JUNCTION	0.00	0.00	91.07	0	00:00	0.00
J14	JUNCTION	0.00	0.00	91.13	0	00:00	0.00
J15	JUNCTION	0.00	0.00	91.18	0	00:00	0.00
J16	JUNCTION	0.00	0.00	91.03	0	00:00	0.00
J17	JUNCTION	0.00	0.04	90.81	0	13:00	0.04
J18	JUNCTION	0.00	0.04	90.56	0	13:02	0.04
J19	JUNCTION	0.01	0.04	90.30	0	13:03	0.04
J20	JUNCTION	0.09	0.45	90.91	0	13:26	0.45
J21	JUNCTION	0.09	0.55	91.03	0	13:14	0.55
J22	JUNCTION	0.08	0.53	91.03	0	13:14	0.53
J23	JUNCTION	0.04	0.41	91.04	0	13:14	0.41
J24	JUNCTION	0.04	0.37	91.04	0	13:14	0.37
J25	JUNCTION	0.06	0.45	91.16	0	13:07	0.45
J26	JUNCTION	0.04	0.41	91.16	0	13:07	0.41
J27	JUNCTION	0.02	0.28	91.16	0	13:07	0.28
J28	JUNCTION	0.02	0.24	91.16	0	13:07	0.24
J29	JUNCTION	0.04	0.27	91.23	0	13:04	0.27
J30	JUNCTION	0.02	0.23	91.23	0	13:04	0.23
J31	JUNCTION	0.02	0.16	91.23	0	13:04	0.16
J32	JUNCTION	0.00	0.11	91.22	0	13:04	0.11
J33	JUNCTION	0.00	0.09	91.22	0	13:04	0.09
J34	JUNCTION	0.00	0.03	91.21	0	13:04	0.03
J35	JUNCTION	0.00	0.03	91.06	0	13:06	0.03

J36	JUNCTION	0.00	0.04	90.81	0	13:04	0.04
J37	JUNCTION	0.00	0.04	90.56	0	13:05	0.04
J38	JUNCTION	0.00	0.04	90.30	0	13:06	0.04
J39	JUNCTION	0.07	0.35	90.50	0	13:27	0.35
J40	JUNCTION	0.07	0.26	90.00	0	13:27	0.26
J41	JUNCTION	0.08	0.28	89.92	0	13:28	0.28
J42	JUNCTION	0.06	0.20	89.68	0	13:29	0.20
J43	JUNCTION	0.06	0.21	89.47	0	13:29	0.21
Outlet	JUNCTION	0.02	0.09	90.49	0	13:26	0.09
OF-LombardyEast	OUTFALL	0.00	0.04	90.09	0	13:06	0.04
OF-LombardyWest	OUTFALL	0.01	0.04	90.09	0	13:03	0.04
OF-Osgoode	OUTFALL	0.06	0.21	88.57	0	13:29	0.21
OF-OsgoodePath-UNC	OUTFALL	0.00	0.00	91.00	0	00:00	0.00
DryPond	STORAGE	0.12	0.51	90.91	0	13:26	0.51

****
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
J01	JUNCTION	0.00	125.48	0	13:01	0	1.19	0.007
J02	JUNCTION	0.00	18.51	0	12:53	0	0.211	0.003
J03	JUNCTION	0.00	22.46	0	12:53	0	0.211	0.008
J04	JUNCTION	0.00	24.40	0	12:53	0	0.211	-0.002
J05	JUNCTION	0.00	25.53	0	12:53	0	0.211	-0.006
J06	JUNCTION	0.00	28.62	0	12:53	0	0.211	0.043
J07	JUNCTION	30.85	30.85	0	13:00	0.211	0.213	-0.048
J08	JUNCTION	0.00	1.55	0	13:13	0	0.0026	-0.010
J09	JUNCTION	0.00	1.09	0	13:13	0	0.00139	0.099
J10	JUNCTION	0.00	0.90	0	13:13	0	0.000598	0.094
J11	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J12	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J13	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J14	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J15	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J16	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J17	JUNCTION	13.50	13.50	0	13:00	0.0926	0.0926	-0.004
J18	JUNCTION	0.00	13.48	0	13:01	0	0.0926	0.001
J19	JUNCTION	0.00	13.46	0	13:02	0	0.0926	0.003
J20	JUNCTION	0.00	110.92	0	13:01	0	0.975	-0.003
J21	JUNCTION	16.53	112.49	0	13:02	0.114	0.976	0.003
J22	JUNCTION	0.00	103.35	0	13:02	0	0.861	0.013
J23	JUNCTION	0.00	109.75	0	13:03	0	0.861	-0.009
J24	JUNCTION	0.00	111.15	0	13:03	0	0.861	-0.009
J25	JUNCTION	0.00	111.92	0	13:03	0	0.861	0.006
J26	JUNCTION	66.97	114.77	0	13:02	0.46	0.861	0.002
J27	JUNCTION	0.00	50.60	0	13:01	0	0.402	-0.002
J28	JUNCTION	0.00	51.26	0	13:01	0	0.402	-0.004
J29	JUNCTION	0.00	51.51	0	13:00	0	0.402	0.002
J30	JUNCTION	0.00	52.20	0	13:00	0	0.402	0.004
J31	JUNCTION	59.95	59.95	0	13:00	0.414	0.415	-0.006
J32	JUNCTION	0.00	7.72	0	13:04	0	0.0142	0.005

J33	JUNCTION	0.00	7.70	0	13:04	0	0.0133	-0.004
J34	JUNCTION	0.00	7.67	0	13:04	0	0.0126	-0.015
J35	JUNCTION	0.00	7.67	0	13:05	0	0.0126	0.045
J36	JUNCTION	6.87	14.26	0	13:04	0.047	0.0596	-0.008
J37	JUNCTION	0.00	14.23	0	13:05	0	0.0596	0.002
J38	JUNCTION	0.00	14.20	0	13:05	0	0.0596	0.004
J39	JUNCTION	0.00	114.23	0	13:26	0	1.56	0.084
J40	JUNCTION	0.00	114.22	0	13:27	0	1.55	-0.090
J41	JUNCTION	0.00	114.21	0	13:27	0	1.56	0.002
J42	JUNCTION	0.00	114.19	0	13:28	0	1.56	0.002
J43	JUNCTION	0.00	114.18	0	13:29	0	1.56	0.001
Outlet	JUNCTION	0.00	114.23	0	13:26	0	1.56	-0.001
OF-LombardyEast	OUTFALL	0.00	14.16	0	13:06	0	0.0596	0.000
OF-LombardyWest	OUTFALL	0.00	13.44	0	13:03	0	0.0926	0.000
OF-Osgoode	OUTFALL	0.00	114.18	0	13:29	0	1.56	0.000
OF-OsgoodePath-UNC	OUTFALL	37.25	37.25	0	13:00	0.256	0.256	0.000
DryPond	STORAGE	53.15	174.49	0	13:02	0.367	1.55	-0.093

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

No nodes were surcharged.


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

No nodes were flooded.


**********************
Storage Volume Summary
**********************
```

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
DryPond	0.066	14	0	0	0.360	74	0 13:26	114.23

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

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
OF-LombardyEast	42.14	1.41	14.16	0.060
OF-LombardyWest	42.45	2.10	13.44	0.093
OF-Osgoode	60.47	23.65	114.18	1.555
OF-OsgoodePath-UNC	42.25	5.78	37.25	0.256

System	46.83	32.94	151.33	1.964

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

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days	Time of Max Occurrence hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C01	CONDUIT	16.44	0	12:40	0.27	0.31	1.00
C02	CONDUIT	18.51	0	12:53	0.07	0.02	0.72
C03	CONDUIT	22.46	0	12:53	0.13	0.01	0.65
C04	CONDUIT	24.40	0	12:53	0.63	0.32	0.87
C05	CONDUIT	25.53	0	12:53	0.11	0.02	0.51
C06	CONDUIT	28.62	0	12:53	0.19	0.02	0.38
C07	CONDUIT	1.55	0	13:13	0.01	0.00	0.23
C08	CONDUIT	1.09	0	13:13	0.09	0.01	0.21
C09	CONDUIT	0.90	0	13:13	0.04	0.00	0.08
C10	CONDUIT	0.00	0	00:00	0.00	0.00	0.03
C11	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C12	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C13	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C14	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C15	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C16	CONDUIT	0.00	0	00:00	0.00	0.00	0.03
C17	CONDUIT	13.48	0	13:01	0.31	0.01	0.07
C18	CONDUIT	13.46	0	13:02	0.30	0.01	0.07
C19	CONDUIT	13.44	0	13:03	0.29	0.01	0.07
C20	CONDUIT	110.53	0	13:01	0.25	0.07	0.77
C21	CONDUIT	110.92	0	13:01	0.89	2.09	1.00
C22	CONDUIT	97.30	0	13:10	0.10	0.08	0.91
C23	CONDUIT	103.35	0	13:02	0.18	0.06	0.78
C24	CONDUIT	109.75	0	13:03	0.35	0.07	0.64
C25	CONDUIT	111.15	0	13:03	0.98	1.48	0.96
C26	CONDUIT	111.92	0	13:03	0.14	0.07	0.72
C27	CONDUIT	48.74	0	13:06	0.14	0.03	0.58
C28	CONDUIT	50.60	0	13:01	0.31	0.03	0.44
C29	CONDUIT	51.26	0	13:01	0.88	0.68	0.63
C30	CONDUIT	51.51	0	13:00	0.13	0.03	0.41
C31	CONDUIT	52.20	0	13:00	0.21	0.03	0.33
C32	CONDUIT	7.72	0	13:04	0.20	0.10	0.35
C33	CONDUIT	7.70	0	13:04	0.06	0.00	0.17
C34	CONDUIT	7.67	0	13:04	0.10	0.01	0.10
C35	CONDUIT	7.67	0	13:05	0.23	0.02	0.10
C36	CONDUIT	7.63	0	13:06	0.20	0.01	0.11
C37	CONDUIT	14.23	0	13:05	0.31	0.03	0.14
C38	CONDUIT	14.20	0	13:05	0.31	0.03	0.14
C39	CONDUIT	14.16	0	13:06	0.30	0.03	0.14
C40	CONDUIT	121.72	0	13:02	0.30	0.13	0.80
C41	CONDUIT	114.23	0	13:26	0.44	0.02	0.32
C42	CHANNEL	114.21	0	13:27	0.40	0.01	0.16
C43	CHANNEL	114.19	0	13:28	0.50	0.01	0.15
C44	CHANNEL	114.18	0	13:29	0.67	0.00	0.13
C45	CHANNEL	114.18	0	13:29	1.02	0.01	0.15

Culv-OsgoodePath	CONDUIT	114.22	0	13:27	1.03	0.43	0.57
W01	WEIR	0.00	0	00:00			0.00
W02	WEIR	0.00	0	00:00			0.00
W03	WEIR	0.00	0	00:00			0.00
W04	WEIR	0.00	0	00:00			0.00
W05	WEIR	0.00	0	00:00			0.00
W06	WEIR	0.00	0	00:00			0.00
W07	WEIR	0.00	0	00:00			0.00
W08	WEIR	0.00	0	00:00			0.00
W-Emergency	WEIR	0.00	0	00:00			0.00
W-Path	WEIR	0.00	0	00:00			0.00
W-Pond	WEIR	9.44	0	12:27			1.00
W-PondUpper	WEIR	104.88	0	13:26			0.81

```
***************************
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 ----------								
C01	1.00	0.12	0.04	0.00	0.84	0.00	0.00	0.00	0.00	0.11
C02	1.00	0.16	0.27	0.00	0.58	0.00	0.00	0.00	0.49	0.00
C03	1.00	0.42	0.04	0.00	0.54	0.00	0.00	0.00	0.54	0.00
C04	1.00	0.15	0.00	0.00	0.85	0.00	0.00	0.00	0.00	0.06
C05	1.00	0.15	0.32	0.00	0.53	0.00	0.00	0.00	0.69	0.00
C06	1.00	0.47	0.02	0.00	0.51	0.00	0.00	0.00	0.75	0.00
C07	1.00	0.49	0.35	0.00	0.16	0.00	0.00	0.00	0.70	0.00
C08	1.00	0.23	0.02	0.00	0.75	0.00	0.00	0.00	0.00	0.01
C09	1.00	0.25	0.62	0.00	0.14	0.00	0.00	0.00	0.71	0.00
C10	1.00	0.86	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C11	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C12	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C13	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C14	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C15	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C16	1.00	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C17	1.00	0.48	0.02	0.00	0.50	0.00	0.00	0.00	0.55	0.00
C18	1.00	0.46	0.03	0.00	0.52	0.00	0.00	0.00	0.79	0.00
C19	1.00	0.46	0.00	0.00	0.54	0.00	0.00	0.00	0.62	0.00
C20	1.00	0.25	0.03	0.00	0.71	0.00	0.00	0.00	0.44	0.00
C21	1.00	0.11	0.00	0.00	0.89	0.00	0.00	0.00	0.00	0.07
C22	1.00	0.11	0.21	0.00	0.68	0.00	0.00	0.00	0.45	0.00
C23	1.00	0.32	0.04	0.00	0.65	0.00	0.00	0.00	0.74	0.00
C24	1.00	0.35	0.04	0.00	0.61	0.00	0.00	0.00	0.75	0.00
C25	1.00	0.12	0.00	0.00	0.88	0.00	0.00	0.00	0.00	0.05
C26	1.00	0.12	0.27	0.00	0.61	0.00	0.00	0.00	0.55	0.00
C27	1.00	0.38	0.02	0.00	0.60	0.00	0.00	0.00	0.78	0.00
C28	1.00	0.40	0.03	0.00	0.57	0.00	0.00	0.00	0.52	0.00
C29	1.00	0.11	0.00	0.00	0.89	0.00	0.00	0.00	0.00	0.04
C30	1.00	0.11	0.35	0.00	0.54	0.00	0.00	0.00	0.59	0.00
C31	1.00	0.46	0.02	0.00	0.52	0.00	0.00	0.00	0.74	0.00
C32	1.00	0.48	0.39	0.00	0.13	0.00	0.00	0.00	0.00	0.70
C33	1.00	0.86	0.00	0.00	0.13	0.00	0.00	0.00	0.70	0.00
C34	1.00	0.87	0.04	0.00	0.10	0.00	0.00	0.00	0.72	0.00

```
C35                    1.00   0.85  0.06  0.00  0.10  0.00  0.00  0.00  0.72  0.00
C36                    1.00   0.50  0.35  0.00  0.15  0.00  0.00  0.00  0.74  0.00
C37                    1.00   0.47  0.02  0.00  0.50  0.00  0.00  0.00  0.57  0.00
C38                    1.00   0.46  0.02  0.00  0.52  0.00  0.00  0.00  0.76  0.00
C39                    1.00   0.46  0.00  0.00  0.54  0.00  0.00  0.00  0.61  0.00
C40                    1.00   0.25  0.00  0.00  0.53  0.00  0.00  0.22  0.06  0.00
C41                    1.00   0.33  0.00  0.00  0.43  0.00  0.00  0.24  0.33  0.00
C42                    1.00   0.12  0.00  0.00  0.87  0.01  0.00  0.00  0.83  0.00
C43                    1.00   0.13  0.00  0.00  0.86  0.01  0.00  0.00  0.00  0.00
C44                    1.00   0.14  0.00  0.00  0.76  0.10  0.00  0.00  0.82  0.00
C45                    1.00   0.15  0.00  0.00  0.81  0.05  0.00  0.00  0.32  0.00
Culv-OsgoodePath       1.00   0.12  0.00  0.00  0.00  0.00  0.00  0.88  0.00  0.40


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

----------------------------------------------------------------------------
                                                           Hours        Hours
                       --------- Hours Full --------    Above Full   Capacity
Conduit                Both Ends  Upstream  Dnstream   Normal Flow    Limited
----------------------------------------------------------------------------
C01                         0.99      0.99      1.24      0.01          0.01
C21                         1.11      1.47      1.11      1.31          1.11
C25                         0.01      0.46      0.01      0.80          0.01


Analysis begun on:  Mon Nov 11 15:48:47 2024
Analysis ended on:  Mon Nov 11 15:48:50 2024
Total elapsed time: 00:00:03
```

APPENDIX C

WATER BALANCE CALCULATIONS

Water Balance Model Description

The Thornthwaite-Mather (1957) water balance models are conceptual models that are used to simulate steady-state climatic averages or continuous values of precipitation (rain + snow), snowpack, snowmelt, soil moisture, evapotranspiration, and water surplus (infiltration + runoff) (refer to **Figure 1**). Input parameters consist of daily precipitation *(PRECIP),* temperature *(MAX / MIN TEMP),* potential evaportranspiration *(PET)*, and the available water content *(AWC)* that can also be referred to as the water holding capacity of the soil. All water quantities in the model are based on monthly calculations and are represented as depths (volume per unit area) of liquid water over the area being simulated. *All model units are in millimetres (mm)*.

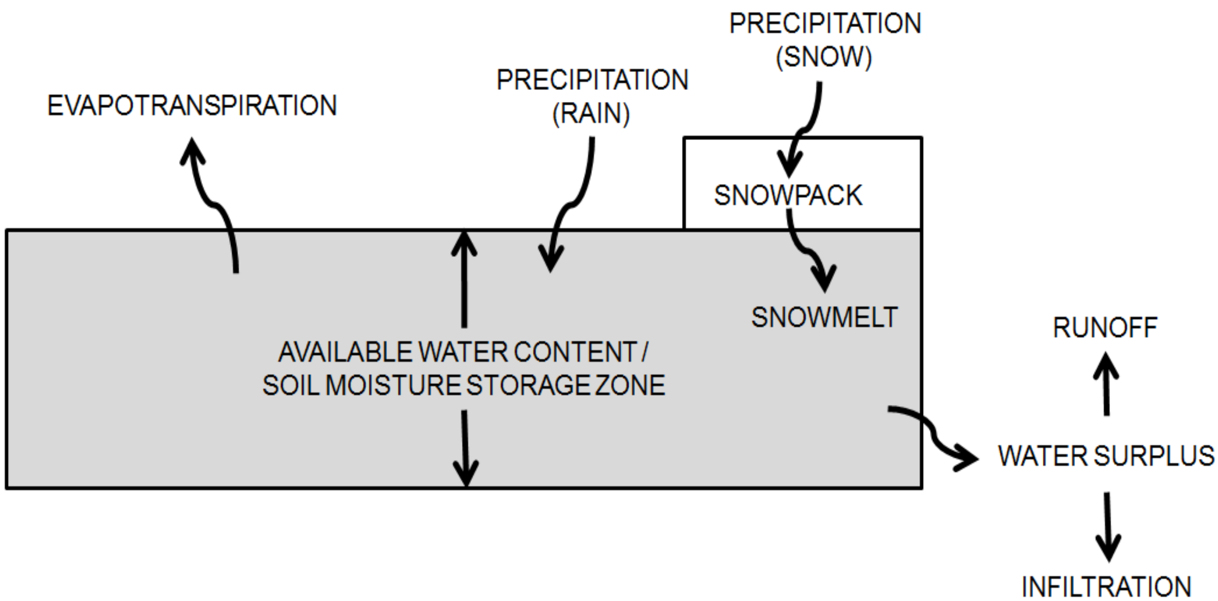


Figure 1: Conceptual Water Balance Model

Available Water Content (Water Holding Capacity)

The available water content (AWC) or water holding capacity of the soil was taken from Table 3.1 from the *Stormwater Management and Planning Manual (MOE, 2003)*, which has been reproduced in **Table 1** below. The available water content is the soil-moisture storage zone or the zone between the field capacity and vertical extent of the root zone.

Table 1: Water Holding Capacity Values (MOE, 2003)

Land Use / Soil Type	Hydrologic Soil Group	Water Holding Capacity (mm)
Urban Lawns / Shallow Rooted Crops (spinach, beans, beets, carrots)		
Fine Sand	A	50
Fine Sandy Loam	B	75
Silt Loam	C	125
Clay Loam	CD	100
Clay	D	75

Water Balance Model Description

Land Use / Soil Type	Hydrologic Soil Group	Water Holding Capacity (mm)
Moderately Rooted Crops (corn and cereal grains)		
Fine Sand	A	75
Fine Sandy Loam	B	150
Silt Loam	C	200
Clay Loam	CD	200
Clay	D	150
Pasture and Shrubs		
Fine Sand	A	100
Fine Sandy Loam	B	150
Silt Loam	C	250
Clay Loam	CD	250
Clay	D	200
Mature Forests		
Fine Sand	A	250
Fine Sandy Loam	B	300
Silt Loam	C	400
Clay Loam	CD	400
Clay	D	350

Precipitation

Daily precipitation *(PRECIP)* values consist of the total daily rainfall and water equivalent of snowmelt that fell on that day. Based on the mean daily temperature *(MEAN TEMP)* precipitation falls either as rainfall *(RAIN)* or the water equivalent of snowfall *(SNOW)*:

- *RAIN: If (MEAN TEMP >= 0, RAIN, SNOW)*
- *SNOW: If (MEAN TEMP < 0, SNOW, RAIN)*

Snowmelt / Snowpack / Water Input

Snowmelt *(MELT)* occurs if there is available snow (water equivalent) in the snowpack *(SNOWPACK)* and the maximum daily temperature *(MAX TEMP)* is greater than 0. The available snowmelt is limited to the available water in the snowpack.

Snowmelt is computed by a degree-day equation (Haith, 1985):

SNOWMELT (cm/d) = MELT COEFICIENT x [AIR TEMP (^{O}C) – MELT TEMP(^{O}C)]

The melt coefficient is typically 0.45 for northern climates (Haith, 1985). The melt temperature is assumed to be 0^{O}C. The air temperature is assumed to be the max temperature multiplied by a ratio of the max to min temperatures:

AIR TEMP = *MAX TEMP / (MAX TEMP – MIN TEMP)*

Therefore the snowmelt equation is:

- *MELT: If (MAX TEMP > 0, IF(SNOWPACK > 0, MIN((MAX TEMP*0.45*MAX TEMP/(MAX TEMP – MIN TEMP)*10mm/cm), SNOWPACK), 0), 0)*

Snow accumulates in the snowpack from the previous day if precipitation falls as snow and there is no snowmelt or the amount of snow that falls in a day exceeds the daily snowmelt:

$SNOWPACK_N = SNOWPACK_{N-1} + SNOW - MELT$

The initial snowmelt on day 1 (i.e. January 1) is assumed to be 0. The initial snowpack on day 1 is assumed to be the snowpack on the last day of simulation (i.e. December 31).

The total water input (W) is rain + snowmelt. This is the available water that fills the soil moisture storage zone each day.

Evaluation

Measured potential evaporation (PE) data (i.e. lake evaporation) is provided with the Environment Canada Climate Normals (see example below). The data represents daily averages for each month over a 20+ year period.

▼ Evaporation

Evaporation														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Lake Evaporation (mm)	0	0	0	0	3.6	4.3	4.5	3.7	2.4	1.4	0	0	0	C

The daily evaporation data was assumed to represent the middle or 15th of each month and ‘smoothed’ to represent the transition from month to month (see **Figure 2** below). As shown in **Figure 2** this produces a more realistic curve of potential evapotranspiration.

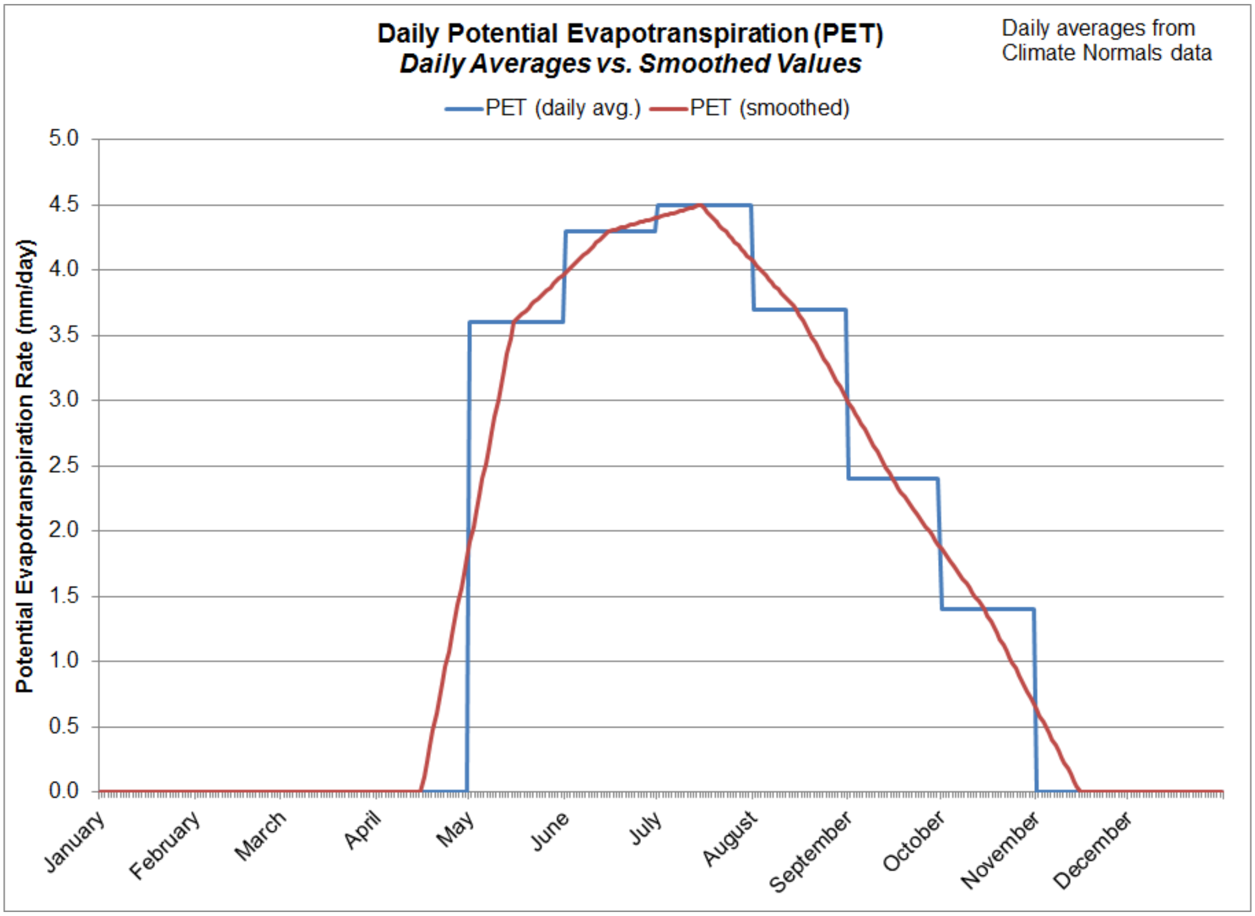


Figure 2: Daily Potential Evapotranspiration Rates (Daily Averages vs. Smoothed Values)

Potential Evapotranspiration

To convert potential evaporation data to potential crop evapotranspiration (PET) data a cover coefficient is applied based on land use and growing / dormant seasons:

PET = PE x Crop Cover Coefficient

Crop cover coefficients are based on the crop growth stages for different crop types (see **Figure 3**). A typical crop coefficient curve is shown in **Figure 4**, which depicts a crop that provides transpiration above the potential evaporation rates during the growing season.

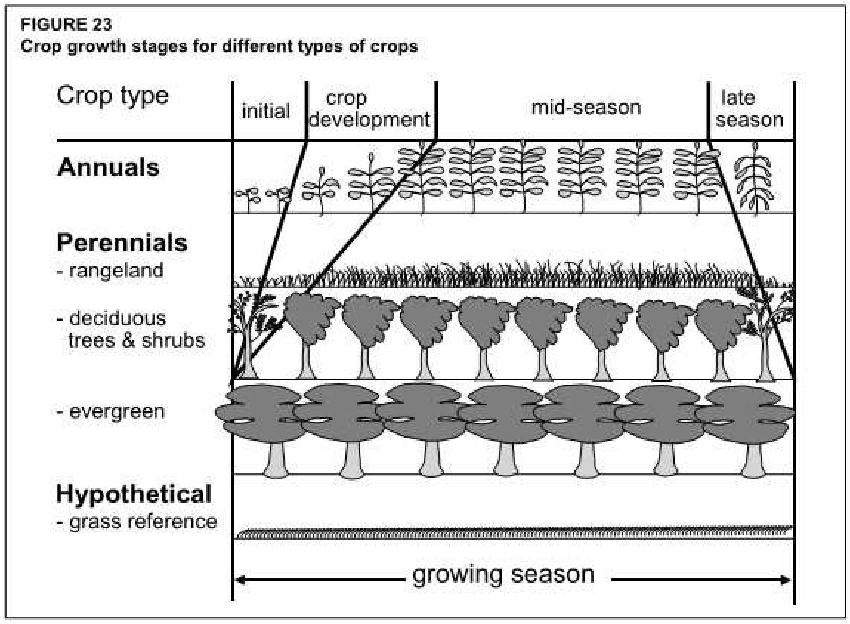


Figure 3: Crop Growth Stages for Different Types of Crops

Source: Food and Agriculture Organization of the United Nations (FAO), 1998, Crop Evapotranspiration - Guidelines for Computing Crop Water Requirements. FAO Irrigation and Drainage paper 56.

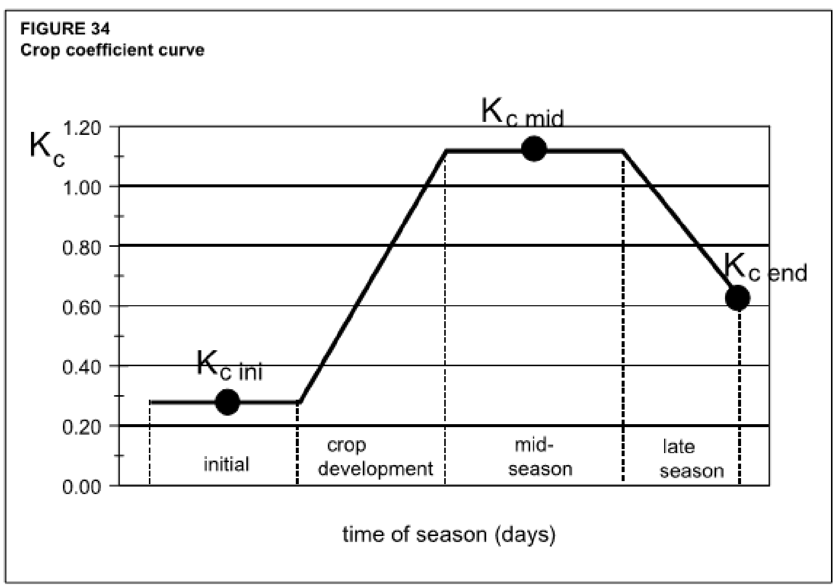


Figure 4: Crop Coefficient Curve

Source: Food and Agriculture Organization of the United Nations (FAO), 1998, Crop Evapotranspiration - Guidelines for Computing Crop Water Requirements. FAO Irrigation and Drainage paper 56.

Water Balance Model Description

The crop cover coefficients used in the water budget model for the various land use types is shown in **Table 2**. The growing / dormant seasons are shown in **Table 3**. The crop cover coefficients for the initial growing season are based on the average value of the dormant and middle of the growing season.

Table 2: Crop Cover Coefficients

Land Use	Dormant Season	Initial Growing Season	Middle of Growing Season	End of Growing Season
Urban Lawns / Shallow Rooted Crops	0.40	0.78	1.15	0.55
Moderately Rooted Crops	0.30	0.73	1.15	0.40
Pasture and Shrubs	0.40	0.68	0.95	0.90
Mature Forest	0.3	0.75	1.20	0.30
Impervious Areas	1.00	1.00	1.00	1.00

Reference: Data is based on Table 12 from the Food and Agriculture Organization of the United Nations (FAO), 1998, Crop Evapotranspiration - Guidelines for Computing Crop Water Requirements. FAO Irrigation and Drainage paper 56.

Table 3: Crop Growing Season

Month(s)	Crop Growing Season
January – April	Dormant Season
May	Initial Growing Season
June - August	Middle of Growing Season
September	End of Growing Season
October - December	Dormant Season (harvest in October)

Reference: Food and Agriculture Organization of the United Nations (FAO), 1977, Crop Water Requirements. FAO Irrigation and Drainage paper 24.

Actual Evapotranspiration

Following Alley (1984), if the monthly water input (i.e. rain + snowmelt) is greater than the potential evapotranspiration (PET) rate, the actual evapotranspiration (AET) rate takes place at the potential evapotranspiration rate:

IF W > PET, then AET = PET

If the monthly water input is less than the potential evapotranspiration rate (i.e. W < PET) then the actual evapotranspiration rate is the sum of the water input and an increment removed from the available water in the soil moisture storage zone (SOIL WATER):

IF W < PET, then AET = W + ΔSOIL WATER

WHERE: ΔSOIL WATER = SOIL WATER$_{N-1}$ – SOIL WATER$_N$

Figure 5 shows a comparison of the average monthly potential evapotranspiration and actual evapotranspiration rates.

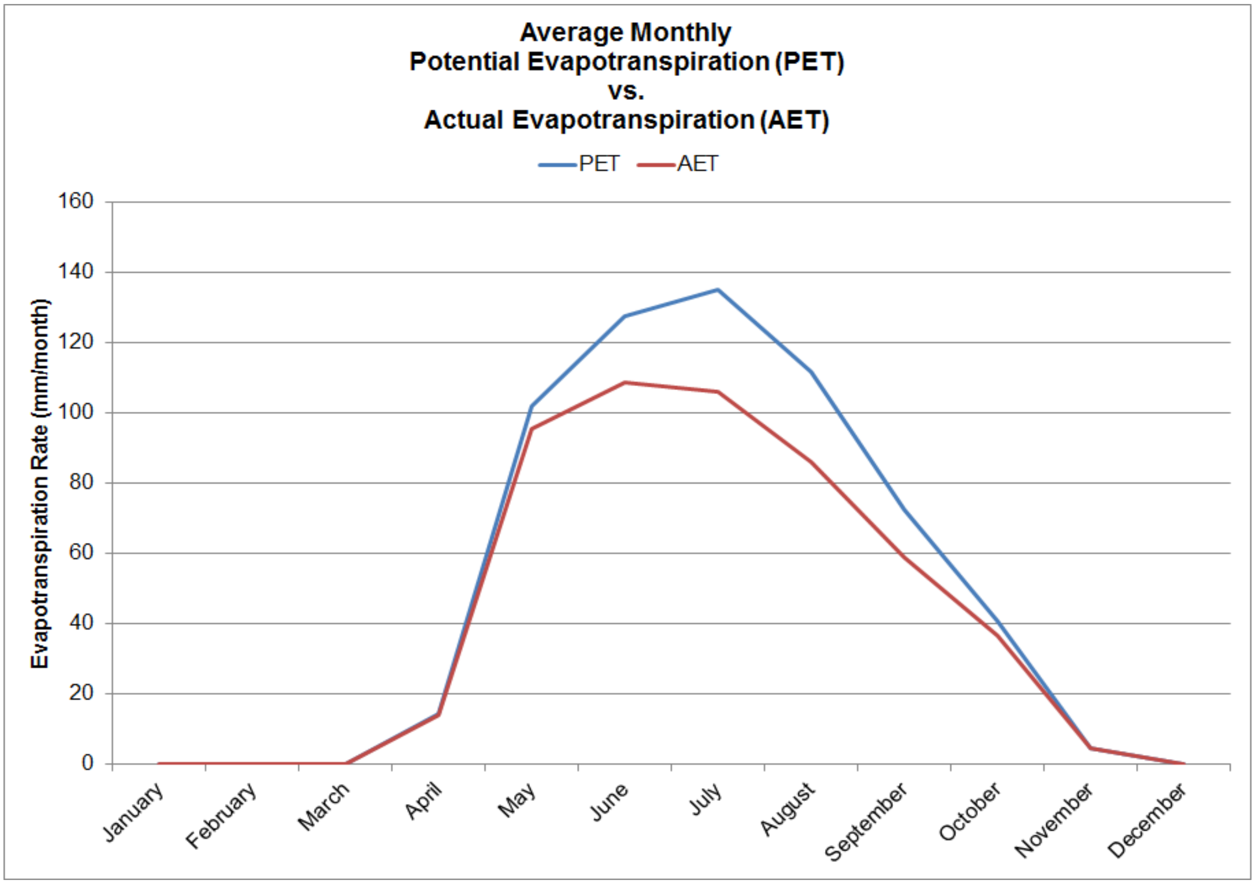


Figure 5: Average Monthly Potential Evapotranspiration vs. Actual Evapotranspiration

Soil Moisture

The soil moisture storage zone (SOIL WATER) is the amount of water available for actual evapotranspiration, but actual evapotranspiration is limited by the potential evapotranspiration rate.

The decrease / change in the soil moisture storage zone (ΔSOIL WATER) is based on the following relationship (Thornthwaite,1948), where AWC represents the available water content:

$$\Delta SOIL\ WATER = SOIL\ WATER_{N-1} \times [1-\exp(-((PET - W) / AWC))]$$

The soil moisture storage zone is replenished with rainwater and snowmelt (i.e. the water input) to the maximum value of the available water content (AWC):

$$SOIL\ WATER_N = \min[(W - PET) + SOIL\ WATER_{N-1}),\ AWC]$$

Water Balance Model Description

Water Surplus

The water surplus (SURPLUS) is defined as the excess water that is greater than the available water content (AWC).

SURPLUS = W – AET - ΔSOIL WATER

The water surplus represents the difference between precipitation and evapotranspiration. It is an estimate of the water that is available to contribute to infiltration and runoff (i.e. streamflow).

Infiltration / Runoff

The amount of water surplus that is infiltration was determined by summing the infiltration factors (IF) based on topography, soils and land cover. Since the water surplus represents infiltration and runoff; direct runoff is the amount of water surplus remaining after taking into account infiltration: (1.0 – infiltration factor = runoff factor). The infiltration and runoff factors were applied to the average monthly water surplus values:

INFILTRATION = IF x SURPLUS

RUNOFF = (1.0 – IF) x SURPLUS

The infiltration factors are shown in **Table 4**, which was reproduced from Table 3.1 in the *Stormwater Management and Planning Manual (MOE, 2003)*. These infiltration factors were initially presented in the document *“Hydrogeological Technical Information Requirements for Land Development Applications” (MOE, 1995)*.

Table 4: Infiltration Factors (MOE, 2003)

Description	Value of Infiltration Factor
Topography	
Flat Land, average slope < 0.6 m/km	0.3
Rolling Land, average slope 2.8 m/km to 3.8 m/km	0.2
Hilly Land, average slope 28 m/km to 47 m/km	0.1
Surficial Soils	
Tight impervious clay	0.1
Medium combination of clay and loam	0.2
Open sandy loam	0.4
Land Cover	
Cultivated Land	0.1
Woodland	0.2

Water Balance Model Description

Each soil type been assigned a corresponding infiltration factor as per Table 3.1 in the *Stormwater Management and Planning Manual (MOE, 2003),* as shown in **Table 5** below.

Table 5: Soils Infiltration Factors

Soil Type	Hydrologic Soil Group	Infiltration Factor
Coarse Sand	A	0.40
Fine Sand	AB	0.40
Fine Sandy Loam	B	0.30
Loam	BC	0.30
Silt Loam	C	0.20
Clay Loam	CD	0.15
Clay	D	0.10

The land use was combined into five (5) main categories (mature forest, row crops, pasture / meadow, urban lawns, and impervious areas) to be consistent with Table 3.1 in the *Stormwater Management and Planning Manual (MOE, 2003)*. The land use infiltration factors are shown in **Table 6** below.

Table 6: Land Use Infiltration Factor

Land Use	Infiltration Factor
Urban Lawns	0.10
Row Crops	0.10
Pasture / Meadow	0.10
Mature Forest	0.20
Impervious Areas	0.00

Land Use / Soils / Topography

The available water content (AWC) and infiltration factors (IF), and crop cover coefficients (CROP COEF) are determined based on the combination of land use, soils and topography, as shown in **Table 7**.

Table 7: Model Parameters based on Land Use / Soils (existing areas)

Land Use	Soils (HSG)	AWC (mm)	IF (Land Use)	IF (Soils)	Crop Cover Coefficient			
					Dormant Season	Initial Growing Season	Middle of Growing Season	End of Growing Season
Urban Lawns	A	50	0.10	0.40	0.40	0.78	1.15	0.55
	AB	62.5		0.40				
	B	75		0.30				
	BC	100		0.30				
	C	125		0.20				
	CD	100		0.15				
	D	75		0.10				
Row Crops	A	75	0.10	0.40	0.30	0.73	1.15	0.40
	AB	112.5		0.40				
	B	150		0.30				
	BC	175		0.30				
	C	200		0.20				
	CD	200		0.15				
	D	150		0.10				
Pasture / Meadow	A	100	0.10	0.40	0.40	0.68	0.95	0.90
	AB	125		0.40				
	B	150		0.30				
	BC	200		0.30				
	C	250		0.20				
	CD	250		0.15				
	D	200		0.10				
Mature Forest	A	250	0.20	0.40	0.30	0.75	1.20	0.30
	AB	275		0.40				
	B	300		0.30				
	BC	350		0.30				
	C	400		0.20				
	CD	400		0.15				
	D	350		0.10				
Impervious Areas *(see Table 9)*	A	1.57	0.00	0.00	1.00	1.00	1.00	1.00
	AB	1.57						
	B	1.57						
	BC	1.57						
	C	1.57						
	CD	1.57						
	D	1.57						

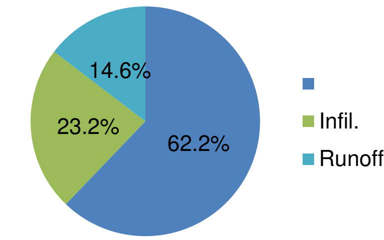
*For impervious areas, potential evapotranspiration is equal to potential evaporation (i.e. crop cover coefficient = 1.00).

3200 Reid's Lane (119089)
Water Balance Calculations

Pre-Development **Drainage Area** 4.750 ha

Landuse	% of Watershed	Watershed Area	% of Pervious Area within Watershed	Water Holding Capacity	Infiltration Factor	Factor	Condition	Infiltration Factor
Mature Forest	74.9%	3.560	76.6%	300 mm	0.20	**Topography**	Rolling to Hilly Land	0.15
Pasture/Meadow	0.0%	0.000	0.0%	150 mm	0.10	**Soils**	Silty sand / Sandy Clay	0.30
Urban Lawns	22.9%	1.087	23.4%	75 mm	0.10		**Pervious Infiltration Factor**	**0.63**
Imp. Areas	2.2%	0.103	-	0 mm	0.00		**Weighted Infiltration Factor**	**0.61**
Average				**242 mm**	**0.18**		**Runoff Factor**	**0.39**

*table 3.1 MOE

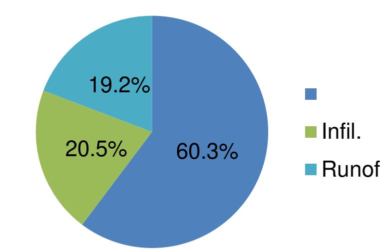


Ottawa (6105976)
1981-2010

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Total Precipitation (mm)	**P**	63	50	58	71	87	93	84	84	93	86	83	70	**920**
Potential Evapotranspiration (mm)	**PE**	0	0	0	0	112	129	136	115	72	43	0	0	**607**
Total Precip. - Potential ET (mm)	P-PE	63	50	58	71	-25	-36	-52	-31	21	43	83	70	
Soil Moisture Storage (mm)	ST	242	242	242	242	218	188	151	133	154	196	242	242	
Change in Soil Moisture Storage (mm)	ΔST	0	0	0	0	-24	-30	-36	-18	21	43	46	0	
Deficit (mm)	D	0	0	0	0	1	6	16	13	0	0	0	0	**35**
Actual Evapotranspiration (mm)	**AE**	0	0	0	0	110	123	121	102	72	43	0	0	**572**
Water Surplus (mm)	**S**	63	50	58	71	0	0	0	0	0	0	37	70	**348**
Annual Infiltration (mm)	**I**													**213**
Annual Runoff (mm)	**R**													**135**

Post-Development **Drainage Area** 4.750 ha

Landuse	% of Watershed	Watershed Area	% of Pervious Area within Watershed	Water Holding Capacity	Infiltration Factor	Factor	Condition	Infiltration Factor
Mature Forest	34.7%	1.648	39.6%	300 mm	0.20	**Topography**	Rolling to Hilly Land	0.15
Pasture/Meadow	0.0%	0.000	0.0%	150 mm	0.10	**Soils**	Silty sand / Sandy Clay	0.30
Urban Lawns	52.9%	2.512	60.4%	75 mm	0.10		**Pervious Infiltration Factor**	**0.59**
Imp. Areas	12.4%	0.590	-	0 mm	0.00		**Weighted Infiltration Factor**	**0.52**
Average				**144 mm**	**0.14**		**Runoff Factor**	**0.48**



Ottawa (6105976)
1981-2010

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Total Precipitation (mm)	**P**	63	50	58	71	87	93	84	84	93	86	83	70	**920**
Potential Evapotranspiration (mm)	**PE**	0	0	0	0	112	129	136	115	72	43	0	0	**607**
Total Precip. - Potential Evap. (mm)	P-PE	63	50	58	71	-25	-36	-52	-31	21	43	83	70	
Soil Moisture Storage (mm)	ST	144	144	144	144	121	94	65	52	73	116	144	144	
Change in Soil Moisture Storage (mm)	ΔST	0	0	0	0	-23	-27	-29	-13	21	43	28	0	
Deficit (mm)	D	0	0	0	0	2	9	23	18	0	0	0	0	**53**
Actual Evapotranspiration (mm)	**AE**	0	0	0	0	110	120	113	96	72	43	0	0	**554**
Water Surplus (mm)	**S**	63	50	58	71	0	0	0	0	0	0	55	70	**365**
Annual Infiltration (mm)	**I**													**189**
Annual Runoff (mm)	**R**													**177**

Notes:
1) Uses measured average monthly total precipitation and potential evaporation data (converted to evapotranspiration based on a cover coefficient of 1.0).
2) Actual evapotranspiration and water surplus calculated using the Thornthwaite & Mather (1957) methodology.
3) Runoff and infiltration calculated as per the MOE SWM Planning and Design Manual (2003) methodology.
4) Impervious areas consist of rooftops, roads, and driveways.

Annual Summary

Sceneario	**Precipitation**	**ET**		**Surplus**		**Infil.**		**Runoff**	
Pre-Development	920 mm	572 mm	62.2%	348 mm	37.8%	213 mm	23.2%	135 mm	14.6%
Post-Development	920 mm	554 mm	60.3%	365 mm	39.7%	189 mm	20.5%	177 mm	19.2%
Difference (Post - Pre)	0 mm	-18 mm	-1.9%	18 mm	1.9%	-25 mm	-2.7%	42 mm	4.6%

Thornthwaite, C.W., and Mather, J.R. 1957. Instructions and tables for computing potential evapotranspiration and the water balance.
Centerton, N.J., Laboratory of Climatology, Publications in Climatology, v.10, no.3, p.185-311

Prepared by Novatech Engineering Consultants Ltd.
Date: 11/11/2024