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772082 Highway 10, Dundalk

**PRELIMINARY FUNCTIONAL SERVICING &
STORMWATER MANAGEMENT REPORT**

772082 Highway 10 Inc.

Document Control

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1 Introduction

Tatham Engineering Limited (Tatham) has been retained by 772082 Highway 10 Inc. to prepare a Preliminary Functional Servicing and Stormwater Management Report (FSSWMR) in support of a Settlement Area expansion, through an Official Plan Amendment (OPA) application, for a mixed-use residential and commercial development located at 772082 Highway 10 in Dundalk, in the Township of Southgate (Township).

1.1 OBJECTIVES

This report was prepared to demonstrate the servicing feasibility of the subject property with respect to municipal water and wastewater servicing, stormwater management (SWM), site grading, drainage, and utility distribution. The following reports have also been prepared by Tatham under separate cover with summaries provided herein:

- *Natural Hazard Assessment (NHA)* (May 2025); and
- *Transportation Impact Study (TIS)* (February 2026).

1.2 GUIDELINES AND BACKGROUND REPORTS

This report has been prepared in consideration of the following municipal, provincial, and agency guideline documents:

- The Ministry of the Environment, Conservation, and Parks (MECP, formerly known as Ministry of Environment), Stormwater Management Practices Planning and Design Manual (March 2003);
- Grand River Conservation Authority (GRCA), Preliminary SWM Submission Checklist (2017);
- Greater Golden Horseshoe Area Conservation Authorities (GGHACA), Erosion & Sediment Control Guideline for Urban Construction (December 2006);
- Agriculture Canada, Soils of Grey County (South Sheet), Ontario: Report No. 17 of the Ontario Soil Survey (1978);
- MECP, Design Guidelines for Drinking-Water Systems (updated May 11, 2023); and
- Township of Southgate, *Municipal Servicing Standards* (June 2022).

This report is prepared in consideration of the following Township studies and publications, as well as reports related to feasibility of municipal servicing:

- Triton Engineering Services Limited, Township of Southgate Dundalk Water Supply and Wastewater Treatment Facility 2025 Reserve Capacity Calculations (May 2025);



- Triton Engineering Services Limited, The Dundalk Water and Sanitary Servicing Strategy Report - Township of Southgate (July 2024);
- Triton Engineering Services Limited, Township of Southgate Dundalk Wastewater Treatment Facility - Municipal Class Environmental Assessment "Schedule C" Environmental Study Report (April 2024);
- C.F. Crozier & Associates Inc., Functional Servicing, Traffic & Stormwater Management Brief - Dundalk Ministerial Zoning Order - Dundalk Northwest Development, Dundalk Northeast Development, Dundalk Southeast Development Inc. (February 2022);
- C.F. Crozier & Associates Inc., Functional Servicing Report - Dundalk Meadows Development - Flato Dundalk Meadows Inc. (December 2015);
- C.F. Crozier & Associates Inc., Preliminary Stormwater Management & Floodplain Assessment Report - Dundalk Meadows Development - Flato Dundalk Meadows Inc. (December 2015);
- C.F. Crozier & Associates Inc., Servicing & Stormwater Management Implementation Report - Dundalk Meadows Development - Flato Dundalk Meadows Inc. (April 2023); and
- C.F. Crozier & Associates Inc., Functional Servicing & Stormwater Management Report - Dundalk Southeast Development Flato Green Inc. (October 2024).



2 Site Description

2.1 SUBJECT PROPERTY

The subject property (772082 Highway 10) consists of approximately 31.3 ha of agricultural, forest and wetlands, and is located on the southwest side of Highway 10. The developable area (based on environmental and natural hazards constraints) is 24.2 ha, as shown on the site plan provided in Appendix A. The subject property is bounded by Highway 10 to the northeast, agricultural lands to the northwest, a proposed development to the southeast (Southeast MZO Lands (Eco Park)), and an existing watercourse/municipal drain (James Foley Drain) which traverses the subject property to the southwest.

We understand portions of the property are currently designated as 'Special Policy Area', 'Hazard Land' and 'Provincially Significant Wetland' based on the Township's current Official Plan, and 'Agricultural', 'Environmental Protection' and 'Wetland' based on the Township's Zoning By-Law.

The property is located within Grand River Conservation Authority (GRCA) watershed and is partially located within their regulated area due to natural hazards associated with the James Foley Drain.

Refer to Figure 1 for the Site Location Plan.

2.2 SITE TOPOGRAPHY

Information related to existing topography, ground cover, and drainage patterns has been determined through a review of relevant background studies and available contour mapping.

A scoped topographic survey of the James Foley Drain was completed by Tatham in April 2025. A detailed topographic survey of the subject property was not available at the time of this report. GIS contour mapping data (obtained from the Ontario Digital Terrain Model by Ontario Geohub) was used to assess existing drainage conditions and to inform the conceptual grading design.

The subject property consists of mainly agricultural croplands with areas of forest and wetlands. The southern half of the site gently slopes (-1 to 1.5%) towards the James Foley Drain, while the northern half of the site gently slopes (-1.5 to 2%) towards the southeast (into the adjacent Southeast MZO Lands property).

Based on available contour data, there appears to be approximately 12 ha of external drainage contributing to the northern half of the site.



2.3 SOURCE WATER PROTECTION

The site is located within the Grand River Source Protection Area. The site is within the following source water protection areas as defined by the Source Protection Information Atlas:

- Well Head Protection Area (WHPA) D; and
- Significant Groundwater Recharge Area (SGRA).

The site is not located within the following source water protection areas:

- Highly Vulnerable Aquifer (HVA);
- Intake Protection Zone; and
- Issue Contributing Area (Sodium, Chloride).

Source water protection is expected to be required as part of the detailed design. Source water protection may be provided by limiting stormwater infiltration to clean water sources (i.e. rooftop runoff) and through the development of a salt management plan.

2.4 GEOTECHNICAL AND HYDROGEOLOGICAL SETTING

At the time of this report, a site specific geotechnical report was not available. Based on the *Soils of Grey County* soil survey report, the existing soils are classified as Listowel Silt Loam (Ls) which is classified as Hydrologic Soil Group (HSG) B and Parkhill Loam (Pal) which is classified as HSG C.

Based on the *Oak Ridges Moraine Groundwater Program*, groundwater levels are reported at depths between 0 and 4.5 m ±.

As the project advances, geotechnical and hydrogeological investigations will be required in support of detailed design to confirm subsurface soil and groundwater conditions.

2.5 PROPOSED DEVELOPMENT

The proposed residential component of the subject property consists of the following unit types, based on a conceptual site plan layout which will be confirmed as the project advances:

- 40 townhouse units;
- 182 single-family detached units; and
- 550 apartment units (within the commercial mixed-use space).



The Conceptual Site Plan prepared by IPS also includes internal roads, SWM blocks, open spaces, a 0.41 ha park block, 6.13 ha of commercial mixed-use space (1.18 ha of commercial ground floor area), and a future road extension block (Street 'A') which allows for connectivity between the adjacent parcels (one of which is the Southeast MZO Lands).



3 Municipal Servicing

Dundalk is serviced by municipal water and wastewater. The Dundalk water system consists of a single pressure zone watermain distribution network that includes an elevated water tower, an on-grade reservoir, three supply wells and reservoirs to achieve chlorine contact time for water quality. The Dundalk wastewater system includes municipal sanitary sewers which convey sewage to the existing Wastewater Treatment Facility (WWTF), located on Eco Park Way and Ida Street.

Triton Engineering prepared a letter to the Township in May 2025 assessing the remaining capacities of existing systems in Dundalk, taking into account both current and future developments with committed and uncommitted allocations. Triton utilized the following criteria to assess residual capacities within the systems, with results summarized using an Equivalent Residential Unit (ERU) approach:

- Single family detached, Semi-detached and Townhouse units = 1.0 ERU
- Apartment = 0.7 ERU
- Population density = 2.76 persons/ERU

Committed ERUs are units that have not yet been constructed, though have been reserved servicing capacity (or granted allocation) by the Township. Uncommitted ERUs are potential, future developments that have not yet been granted allocation by the Township.

3.1 SURROUNDING DEVELOPMENTS

There are several proposed developments in Dundalk that require servicing allocation. A summary of select larger-scale developments within the area are, as follows:

- Flato East Development (under construction, northwest of the site);
- Glenelg (Phase 3);
- Northwest MZO Lands (Dundalk North West);
- Northeast MZO Lands (Ida Subdivision); and
- Southeast MZO Lands (Eco Park, southeast of the site).

Refer to Figure 1 for more details on the location and extents of these developments.

The proposed Southeast MZO Lands development immediately adjacent to the subject property is expected to proceed prior to the subject property development. As such and based on information presented in the various Crozier documents which have been prepared in support of



the Southeast MZO Lands, provisions for future connection of water and sanitary services to the subject property, as well as for conveyance of the stormwater flows from the drainage area for the northern half of the subject property, have been considered.

3.2 MUNICIPAL SERVICING RESERVE CAPACITIES

Triton's letter calculated the 2025 residual capacities for Dundalk's municipal servicing system under existing conditions, as shown in Table 1.

Table 1: Municipal Servicing 2025 Residual Capacities

SYSTEM	UNCOMMITTED RESIDUAL CAPACITY (ERUs)
Water Supply	1,091
Water Storage ¹	3,432 m ³
Wastewater Treatment Facility	429

¹Triton calculated water storage system's uncommitted reserve capacity in cubic metres rather than ERUs.

Triton's 2025 letter also summarizes that there are currently 1,945 water ERUs and 1,911 sanitary ERUs of unallocated capacity. However, considering all future development lands within Dundalk (excluding the subject property), there is insufficient servicing capacity available within the existing systems to service the planned future growth. While the Triton 2025 letter does not consider the subject property, the Triton Water and Sanitary Servicing Strategy Report dated July 2024 does include the subject property in the longer term planning of the Township's water and wastewater servicing strategy.

Therefore, it is understood that Dundalk's municipal servicing infrastructure will require significant upgrades in order to service the full build-out of the planned developments. Based on a meeting with the Township, the timing of these upgrades will be dependent on the pace of future development.

The Triton WWTF Class EA (April 2024) proposes to increase the servicing capacity at the Township's WWTF to accommodate future growth. However, the ultimate build-out (Phase 2) of the WWTF expansion as per the Class EA report appears to be insufficient to service the entirety of planned, future developments. Therefore, it is expected additional upgrades beyond the planned Phase 2 improvements will be required.



4 Water Supply and Distribution

4.1 EXISTING WATER SYSTEM

4.1.1 Water Supply

The Dundalk water system consists of a single pressure zone watermain distribution network that includes an elevated water tower, an on-grade reservoir, three supply wells and reservoirs to achieve chlorine contact time for water quality. The water supply firm capacity is 2,817 m³/day. The three wells have potential to provide up to 4,780 m³/day, however, the MECP recommends the firm capacity is to be based on the largest well being out of service.

Per MECP design guidelines, water supply allocation is based on maximum day demand (MDD). The MDD of the existing water system is 1,371 m³/day. The resulting residual capacity of the water supply system is 1,446 m³/day. This equates to a residual capacity of 1,091 ERUs under existing conditions. Therefore, there currently does not appear to be sufficient water supply in the existing system to service the unallocated developments. However, as previously mentioned, the Township is aware of this and there are long-term plans to increase the firm water supply of the system. Further coordination with the Township will be required to advance the design of the required system upgrades.

4.1.2 Water Storage

The Dundalk water storage system includes an elevated water tower (3,995 m³ storage) and an on-grade water reservoir D3 (1,365 m³ storage), with a combined existing system storage capacity of 5,360 m³.

Dundalk's water storage requirements and potential upgrades based on the pace of development growth will be coordinated with the Township as part of future water servicing studies.

4.1.3 Linear Water Distribution Infrastructure

The subject property is not located in an area of Dundalk that is currently serviced by the municipal water system. The closest municipal water infrastructure includes:

- 150 mm watermain that terminate at the intersection of Milliner Ave and Highway 10 to the northwest of the site (approximately 350 m from the subject property); and
- 150 mm watermain along Eco Park Way (approximately 600 m southwest of the subject property).



4.2 PROPOSED WATER SYSTEM

4.2.1 Water Demands

The water demands of the subject property have been estimated by applying design criteria from Triton's letter and in consideration of applicable MECP criteria, as summarized in Table 2.

Table 2: Engineering Design Criteria for Proposed Water Demands

DESIGN CRITERION	DESIGN VALUE
Per Capita Demand (L/cap/day) ¹	322
Commercial/Mixed-use Demand (L/ha/day) ²	28,000
Equivalent Residential Unit (ERU) PPU ¹	2.76
Residential Maximum Day Demand Factor ²	2.00
Residential Peak Hour Demand Factor ²	3.00
Commercial Maximum Day Demand Factor	2.00
Commercial Peak Hour Demand Factor	2.00

¹Triton Engineering's "Township of Southgate Dundalk Water Supply and Wastewater Treatment Facility 2025 Reserve Capacity Calculations" letter (May 20, 2025)

²MECP's *Design Guidelines for Drinking-Water Systems* (January 2023)

A summary of the subject property's water demands is provided in Table 3.

Table 3: Proposed Water Demands

SCENARIO	VOLUME (m ³ /day)	FLOW (L/s)
Average Day Demand (ADD)	572.71	6.63
Maximum Day Demand (MDD)	1,145.42	13.26
Peak Hour Demand (PHD)	-	19.50
Fire Flow (FF)	-	200
MDD + FF	-	213.26

Detailed calculations can be found in Appendix B.



Utilizing Triton's 2025 letter design criteria, the subject property's ADD equates to approximately 644 ERUs ($572.71 \text{ m}^3/\text{day} \div (2.76 \text{ cap/ERU} \times 0.322 \text{ m}^3/\text{day/cap})$).

4.2.2 Water Storage Requirements

The water storage requirements, and need for potential upgrades will need to be further assessed by the Township as part of future infrastructure planning, ensuring that all proposed developments are adequately considered.

4.2.3 Fire Protection

Required fire flows for the subject property have been estimated in accordance with the Water Supply Public Fire Protection (2020) prepared by the Fire Underwriters Survey (FUS). Based on reasonable assumptions with respect to building design stated on the fire flow calculations, the required fire flow is 200 L/s.

Refer to Appendix B for FUS Fire Flow Calculations.

4.2.4 Linear Water Distribution Infrastructure

The site will be provided with municipal water supply via connection to the future Southeast MZO Lands (Eco Park) development to the southeast, as proposed in the Crozier FSR (2024). The Southeast MZO Lands propose a future looped watermain system via extension of watermain within Highway 10, as well as extension of watermain from Eco Park Way. The sizing of the linear water distribution system will be coordinated with the Township and the adjacent developer during future project stages

Refer to Drawing MSP.1 for the preliminary site servicing plan.



5 Sanitary Sewage System

5.1 EXISTING SANITARY SYSTEM

The capacity of the Dundalk WWTF has been assessed based on Triton's WWTF Class EA (2024) and the Triton Servicing Strategy Report (2024). The existing WWTF is understood to have a capacity of 1,832 m³/day. Triton's 2025 letter states the Average Day Flow (ADF) of the existing serviced area is 1,215 m³/day, resulting in a residual capacity of 617 m³/day (745 ERUs) under existing conditions. However, the residual capacity is further reduced to the equivalent of 429 ERUs when factoring in the committed developments. Therefore, there is insufficient capacity in the existing WWTF to service the planned developments within Dundalk.

It is our understanding the WWTF will be upgraded in two phases: Phase 1 will be completed in the short term and will increase the capacity to 3,025 m³/day, while Phase 2 will be completed at a later, undetermined date, and will increase the capacity to 4,200 m³/day. However, as stated in Section 3.2, it is understood that expansion beyond 4,200 m³/day is expected to be required to service the full build out of all planned developments.

Further coordination with the Township will be required to advance studies to support this future expansion, if deemed necessary considering development timelines.

5.2 EXISTING LINEAR INFRASTRUCTURE

The subject property is not located in an area of Dundalk that is currently serviced by the municipal wastewater system. The closest municipal wastewater infrastructure includes:

- 250 mm sanitary gravity sewer along Eco Park Way (approximately 600 m southwest of the subject property).

5.3 PROPOSED SANITARY SYSTEM

5.3.1 Sewage Flows

The sewage flows generated from the subject property have been estimated by applying design criteria from Triton's letter, MECP and the Township, as summarized in Table 4.



Table 4: Engineering Design Criteria for Proposed Sewage Flows

DESIGN CRITERION	DESIGN VALUE
Per capita flow (L/cap/day) ¹	300
Commercial/mixed-use demand (L/ha/day) ²	28,000
Equivalent Residential Unit (ERU) PPU ¹	2.76
Residential Peaking Factor ²	Harmon
Commercial Peaking Factor ²	2.00

¹Triton Engineering's "Township of Southgate Dundalk Water Supply and Wastewater Treatment Facility 2025 Reserve Capacity Calculations" letter (May 20, 2025)

²MECP's *Design Guidelines for Drinking-Water Systems* (January 2016)

A summary of the sewage flows generated from the subject property is provided in Table 5.

Table 5: Proposed Sewage Flows

SCENARIO	VOLUME (m ³ /day)	FLOW (L/s)
Average Day Flow (ADF)	535.84	6.20
Extraneous Flow	-	3.63
Peak Flow (PF) (incl. Extraneous)	-	24.81

Detailed calculations can be found in Appendix C.

Utilizing Triton's 2025 letter design criteria, the subject property's ADF equates to approximately 607 ERUs (502.80 m³/day ÷ (2.76 cap/ERU × 0.300 m³/day/cap)).

5.3.2 Linear Infrastructure

The proposed sewage flows from the subject property will be directed to two sanitary stubs provided by the Southeast MZO Lands (Eco Park) development. The sewage will then flow by gravity to a new sewage pumping station (to be located within the Southeast MZO Lands site), before being pumped via forcemain to the existing gravity sewer in Eco Park Way, where flows are conveyed to the existing WWTF.

Refer to Drawing MSP.1 for the preliminary site servicing plan.



6 Stormwater Management Plan

This preliminary SWM plan was prepared in consideration of neighbouring developments bounding the site to the northwest (Dundalk Meadows) and to the southeast (Southeast MZO Lands). The ultimate receiver for the site is the Foley Drain which bisects the site.

A portion of the site is located within the GRCA Regulation Limit due to natural hazards associated with the Foley Drain. As such, appropriate approvals and permits will be required at the detailed design stage.

The Dundalk Meadows development to the northwest has sufficient stormwater quantity controls and conveyance routes to drain their site-generated flows internally and away from the subject property. As such, drainage from the Dundalk Meadows development is not expected to be conveyed through the subject property. A 1,350 mm dia. storm sewer is proposed within the Southeast MZO Lands development to convey Regional (Hurricane Hazel) Storm runoff from the subject property to a downstream wetland feature. Approximately half of the subject property will drain to this future downstream conveyance system (identified as Outlet #1), while the remainder will drain directly to the Foley Drain (identified as Outlet #2).

Refer to the *Functional Servicing, Traffic & Stormwater Management Brief – Dundalk Ministerial Zoning Order* and the *Functional Servicing & Stormwater Management Report – Dundalk Southeast Development Flato Green Inc.* prepared by Crozier, for additional information.

6.1 PRE-DEVELOPMENT CONDITIONS

Under existing conditions, the site is split into two internal catchments as shown on the Pre-Development Drainage Plan (Drawing DP.1) enclosed for reference and described below:

- Catchment 101 has an area of approximately 15.06 ha and is generally comprised of woodland and meadows. A Curve Number (CN) of 62.3 was assigned. Runoff from this catchment drains at approximately 0.2% slope to Outlet #1.
- Catchment 102 has an area of approximately 16.26 ha is generally comprised of woodland and meadows. A CN of 61.0 was assigned. Runoff from this catchment drains at approximately 0.9% slope to directly to Foley Drain at Outlet #2.
- Catchment EXT-1 is an external catchment with an area of approximately 11.40 ha comprised entirely of woodland. For the purpose of this assessment, this parcel is assumed to be undeveloped. A CN of 60.0 was assigned. Runoff from this catchment drains through the site at approximately 0.6% slope to Outlet #1.



Existing conditions have been modelled using Visual OTTHYMO (VO6.2), applying site-specific Intensity-Duration Frequency (IDF) rainfall data generated using the IDF Curve Look-up Tool in accordance with Township standards. 1:100-year peak flow rates were generated using the 3-hour Chicago (CHI) and 24-hour SCS Type II (SCS) storm distributions under antecedent moisture conditions (AMC) II conditions. In addition, the Regional storm was modelled under AMC III conditions. A summary is provided below, and modeling and results are provided in Appendix D for reference.

Table 6: Pre-Development Peak Flow Summary

STORM EVENT	OUTLET #1 PEAK FLOW (m ³ /s)		OUTLET #2 PEAK FLOW (m ³ /s)	
	3HR CHI	24hr SCS	3HR CHI	24hr SCS
1:100-year	0.545	1.339	0.339	0.835
Regional (Hazel)	2.679		1.658	

Note: for the purpose of determining required storage volumes, the 1:2-year through 1:50-year storm events were excluded for this design phase. Additional analysis will be completed in support of detailed design.

6.2 POST-DEVELOPMENT CONDITIONS

Under proposed conditions, the site will continue to drain to Outlet #1 and #2. The site consists of three internal catchments and one external catchment as illustrated in the Post-Development Drainage Plan (Drawing DP.2) enclosed for reference and as described below:

- Catchment 201 has an area of approximately 16.45 ha and is comprised of a portion of the subject property with a total imperviousness (TIMP) of 58%. Runoff from this catchment will drain to a proposed SWM facility (SWM Pond #1), prior to discharging into the Southeast MZO Lands site (Outlet #1).
- Catchment 202 has an area of approximately 7.75 ha and is comprised of a portion of the subject property with a TIMP of 52%. Runoff from this catchment will drain to a proposed SWM Facility (SWM Pond #2), prior to discharging controlled runoff into the Foley Drain (Outlet #2).
- Catchment 203 has an area of approximately 7.12 ha and is comprised of woodland cover with a CN of 60.0. This catchment remains undeveloped to respect the Environmental Protection Area and the required 30 m buffer located to the south of the site. The Foley Drain also crosses through this catchment. Runoff from this catchment will drain uncontrolled directly to the Foley Drain (Outlet #2).
- Catchment EXT-1 as described in Section 6.1 of this report will continue to drain through the subject property and will ultimately be conveyed to Outlet #1. Runoff from this



catchment is accommodated in the overall SWM approach through designated overland flow routes and sizing of SWM Pond #1.

Minor flows (1:5-year storm event) will be conveyed through the site via a combination of swales and storm sewers while major flows (up to and including the 1:100-year storm event) will be conveyed via designated overland flow routes to SWM Pond #1 and #2.

6.3 STORMWATER QUANTITY CONTROL

A post-development hydrologic analysis was completed using VO6.2 to preliminarily size the proposed ponds, ensuring adequate quantity (peak flow) control is provided. Detailed design of SWM Pond #1 and SWM Pond #2 will be completed at future design stages.

Through the preliminary hydrologic analysis, it was determined that SWM Pond #1 and SWM Pond #2 require 10,000 m³ and 5,000 m³ of active storage, respectively, to control the 1:100-year post-development peak flow rate to the pre-development rate or less at both outlets.

Preliminary design elevations for both ponds are as follows:

- Top of Pond Elevation: 514.20 masl (SWM Pond #1) and 513.00 masl (SWM Pond #2)
- Outlet Pipe/Permanent Pool Elevation: 512.20 masl (SWM Pond #1) and 511.00 masl (SWM Pond #2)
- Bottom of Pond Elevation: 511.20 masl (SWM Pond #1) and 510.00 masl (SWM Pond #2)

A summary of the post-development peak flow summary is provided below, and modeling and results are provided in Appendix D for reference.



Table 7: Post-Development Peak Flow Summary

STORM EVENT	OUTLET #1 PEAK FLOW (m ³ /s)		OUTLET #2 PEAK FLOW (m ³ /s)	
	3HR CHI	24hr SCS	3HR CHI	24hr SCS
1:100-year	0.494 (<i>0.545</i>)	0.980 (<i>1.339</i>)	0.319 (<i>0.339</i>)	0.803 (<i>0.835</i>)
Regional (Hazel)	3.360 (<i>2.679</i>)		1.906 (<i>1.658</i>)	

Note: for the purpose of determining required storage volumes, the 1:2-year through 1:50-year storm events were excluded for this design phase. Additional analysis will be completed in support of detailed design. Values in (*italics*) denote pre-development conditions.

6.4 STORMWATER QUALITY CONTROL

Enhanced-level stormwater quality protection will be provided to achieve 80% TSS removal via SWM Pond #1 and SWM Pond #2 which are proposed as wet ponds complete with a sediment forebay, permanent pool, and wet cell.

To achieve 80% TSS removal, SWM Pond #1 will require approximately 2,715 m³ of permanent pool and 2,189 m³ of extended detention volume for its contributing drainage area (27.85 ha from Catchments 201 and EXT-1), while SWM Pond #2 will require approximately 1,104 m³ of permanent pool and 741 m³ of extended detention volume for its contributing drainage area (7.75 ha from Catchment 202).

6.5 WATER BALANCE

In accordance with GRCA requirements, a site-specific water balance assessment will be required at the detailed design stage. The site will be designed to mitigate infiltration deficits through the incorporation of infiltration-based Low Impact Development (LID) facilities. As mentioned previously in Section 2.4 of this report, geotechnical and hydrogeological investigations will be required to aid in the design of these LIDs, providing data such as in-situ infiltration rates, hydraulic conductivities, and high groundwater levels (HGWL). A 24-48-hour drawdown time within the LID facilities and 1 m separation between the invert of LID facilities and the HGWL will be required, and only clean runoff will be infiltrated (i.e., rooftop drainage or pre-treated runoff).

Potential LID alternatives to be considered at detailed design include lot-level controls (such as soakaway pits), exfiltration systems within road allowances, and/or central LID facilities located at, or upstream of the SWMFs. A detailed LID assessment will be completed in support of detailed design.



7 Natural Hazard Assessment

A *Natural Hazards Assessment* was completed for the subject property, in support of the OPA application. The study included both hydrologic and hydraulic analysis to establish the floodplain limits across the subject property. Although an existing backwater condition impacts the subject property, the majority of the site remains outside of the regulatory floodplain limits and is therefore considered suitable for proposed development.

Opportunities to refine the floodplain limits and reduce the impacts of the backwater condition may be further refined through detailed hydraulic assessment, which could include the evaluation of proposed cut/fill compensation strategies, potential improvements to culvert hydraulic capacity, or a combination of both. Any such refinements would be subject to the review and approval of the Grand River Conservation Authority (GRCA).

As the watercourse is a municipal drain (which allows for the ability to complete regular maintenance), an erosion hazard allowance is not expected to be required.



8 Transportation

8.1 ACCESS

The single access to the subject property will be served by the future construction of Eco Park Way extension, which will form a 4-leg intersection with Highway 10 and 240 Sideroad. The roadway is planned to connect the existing portion of Eco Park Way from IDA street. The access is also expected to serve Dundalk Southeast development and Industrial Lands. There is a proposed 'emergency access only' route through the commercial area to Highway 10.

8.2 INTERNAL ROADS

The internal roadways will be a combination of 20 m and 30 m road allowances. The roads will be assumed by the Township who will undertake routine maintenance and snowplowing activities.

8.3 TRANSPORTATION IMPACT STUDY

A *Transportation Impact Study* has been prepared by Tatham under separate cover and should be read in conjunction with this report.

In addressing the study area traffic operations, the intersections of Highway 10 with Dufferin Road 9/Main Street East and the site access of Eco Park Way were analyzed under existing (2025) and future (2030, 2035, 2040 and 2045) horizon years. The review included an assessment of intersection operations and queue operations based on improvements proposed in the TIS for Dundalk SE development. Based on the assessment of existing, background and total conditions, the following improvements are recommended:

- 2030 Horizon (50% build out)
 - upgrading the intersection of Highway 10, Eco Park Way and 240 Sideroad from stop control to signalized intersection. Furthermore, dedicated left-turn lanes with appropriate storage, parallel deceleration, and taper lengths to enhance traffic flow and accommodate peak-hour demands.
- 2035 Horizon (100% build out)
 - Increasing capacity on Highway 10 to a 4-lane cross section (2 lanes per direction) with advanced green for left turning movement for northbound traffic on both Highway 10 intersections with Dufferin Road 9 and Eco Park Way.
 - right turn storage lane for eastbound traffic on Main Street East and additional left turn storage lane for eastbound traffic on Eco Park Way



As with the background conditions, the operating conditions for the future total conditions will be largely dictated by the completion of the background developments identified in the report. Should the developments not proceed as assumed, or the volumes not occur as projected, the need for the timing of the above noted intersection improvements should be confirmed. Thus, it is recommended that ongoing monitoring of development and traffic levels be conducted to confirm the need for the timing of the recommended improvements.

8.4 SIGHT LINES

The available sight lines along Highway 10 at Eco Park Way were reviewed and determined to exceed the Transportation Association of Canada guidelines for distance requirements.



9 Grading & Landscaping

9.1 GRADING

The overall site grading design maintains existing drainage patterns, matches existing grading along the perimeter of the site and limit of developable area, and minimizes earthworks required during construction.

9.1.1 Criteria

Preliminary grading has been reviewed in accordance with the Township design standards and best practices as noted below:

- minimum road slope 0.5%;
- maximum road slope 8%;
- main road right-of-way 20 m;
- collector right-of-way 30 m;
- minimize the need for retaining walls;
- minimize the volume of earth to be moved and balance on-site cut/fill; and
- achieve drainage and SWM objectives.

Refer to Appendix E for the Preliminary Site Grading Plan (SG.1). Grading will be refined at the detailed design stage.

9.1.2 Road Grading

Internal road grading has been developed to ensure stormwater runoff is conveyed to the proposed outlets. The major overland flow routes along the road network terminate at the end of pipe SWM facilities as shown in the Conceptual Site Plan found in Appendix A.

9.1.3 Lot Grading

Lot grading will be designed to provide positive drainage away from the dwellings and will be in accordance with Township engineering standards.

9.2 LANDSCAPING

A detailed landscaping design will be completed at the detailed design stage. Landscape features and plantings will be provided in accordance with Township landscaping standards, and they will be coordinated to ensure there are no conflicts with respect to civil servicing.



10 Erosion & Sediment Control

Erosion and sediment control measures will be implemented for all construction activities within the development site including vegetation clearing, topsoil stripping, stockpiling of materials, site access construction, grading and servicing. The basic principles considered to minimize erosion and sedimentation and the potential negative environmental impacts include:

- minimize disturbance activities where possible;
- expose the smallest possible land area to erosion for the shortest amount of time;
- institute erosion control measures as required immediately;
- implement sediment control measures before the outset of construction activities; and
- carry out regular inspection of erosion/sediment control measures and repair or maintain them, as necessary.

Erosion and sediment control measures shall be implemented in accordance with relevant Township, GRCA, *Erosion & Sediment Control Best Management Practices Guide*, and OPSD standards and are to include the following:

- sediment control fence to be constructed prior to commencement of any grading operations;
- temporary swales, silt ponds, and check dams will be constructed to control runoff during construction by reducing velocities and promoting settlement of particulates
- designated construction vehicle entrance(s) with stone mud mat;
- heavy-duty silt fence surrounding stripping and material stock pile areas;
- long-term siltation and erosion control will be enhanced with a re-vegetation strategy for disturbed areas;
- catch basin filter screens;
- sediment traps placed in all existing and proposed catch basins adjacent to the site; and
- confine refueling and servicing of equipment sufficiently away from existing drainage systems.

Regular inspection of control measures will be completed through a monitoring and mitigation plan, with regular repairs made as necessary. An erosion and sediment control plan will be developed during the detailed design stage.



11 Utilities

The following utilities provide services to the subject property:

- Hydro One;
- Enbridge;
- Bell Canada; and
- Rogers Communication Inc.

All utilities (electrical, gas and telecommunications) are expected to be available to service the subject property. Utility coordination will be initiated at future design stages.



12 Summary

The subject property can be adequately serviced, recognizing upgrades to the existing municipal water supply and wastewater systems will be required, consistent with current Township plans.

Water Supply & Distribution

The development will be serviced with municipal watermain. A looped internal watermain system will be provided with connections to the two watermain stubs in the MZO Southeast Lands adjacent to the site. The MZO Southeast Lands will extend a watermain to the nearest municipal watermain connections at the intersection of Milliner Ave and Highway 10, and along Eco Park Way. The subject property will require water supply servicing allocation for the estimated 644 ERUs once future water system upgrades have been completed. Expansion of existing water storage reservoirs may be required, subject to future assessment.

Sewage Collection & Treatment

The development will be serviced with gravity sewers discharging to the two sanitary sewer stubs in the MZO Southeast Lands adjacent to the site, discharging to a new sewage pump station. The flows will be pumped via a forcemain to an existing sanitary sewer in Eco Park Way, ultimately discharging to the WWTF. The subject property will require wastewater supply servicing allocation for the estimated 607 ERUs, recognizing expansion of the existing WWTF is required.

Stormwater Management Plan

Stormwater quantity and quality controls will be provided to mitigate negative impacts to the downstream lands and the natural environment. Water quantity and quality control will be provided through the design of two stormwater management facilities (wet ponds) and water balance objectives will be achieved via low impact development facilities.

Natural Hazard Assessment

A Natural Hazard Assessment has been prepared under separate cover to confirm the proposed site will be developed with consideration of the Folley Drain floodplain.

Transportation

A Transportation Impact Study has been prepared under separate cover to confirm the internal networks are sufficient for the proposed use and that any adverse impacts that may result to the external road system can be appropriately mitigated.



Grading & Landscaping

A concept grading design was prepared in accordance with design standards and best practices to achieve the objectives of the SWM plan and tying into existing grades while respecting the floodplain limits.

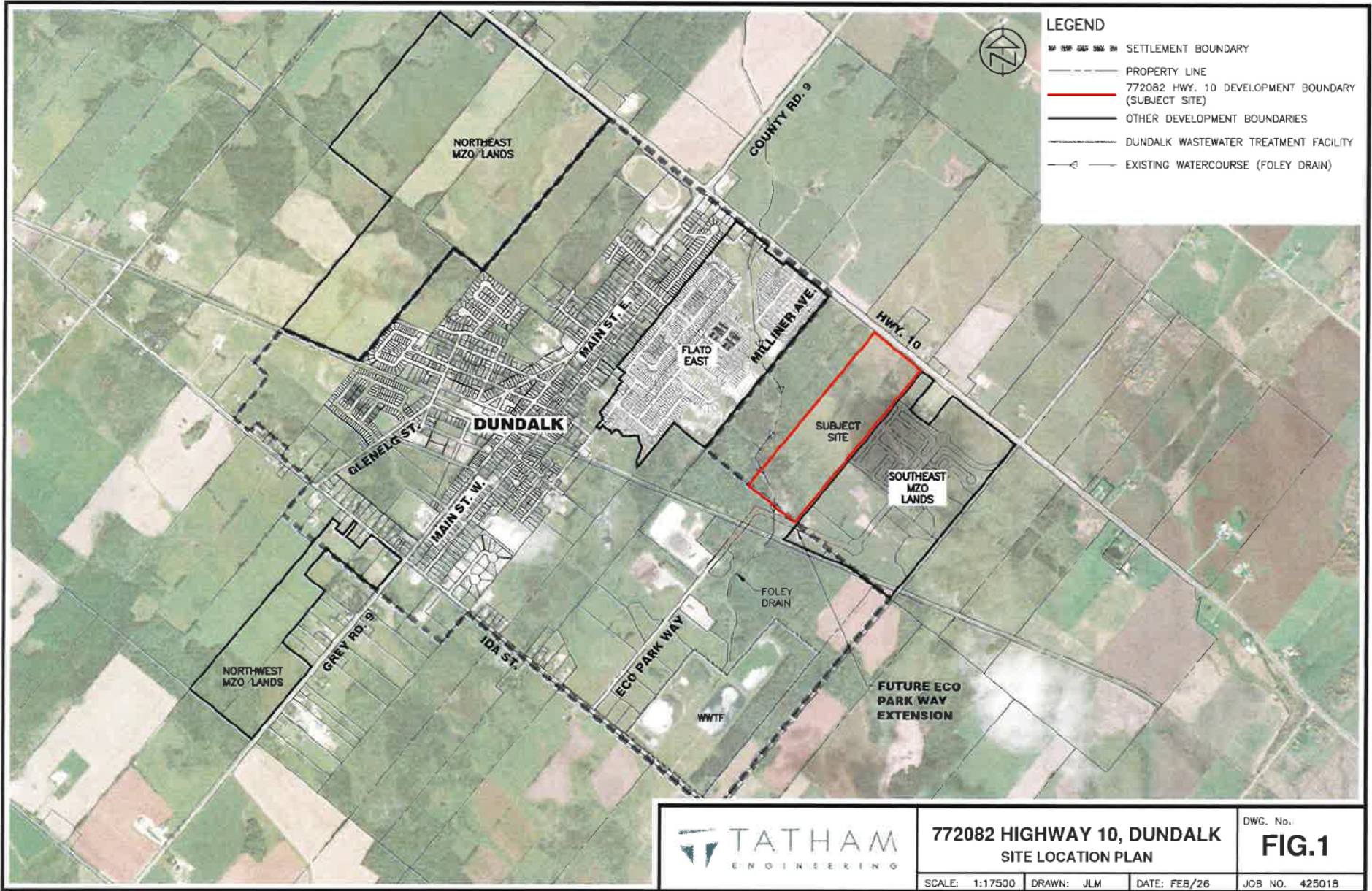
Erosion & Sediment Control

A detailed erosion and sediment control plan will be prepared and executed prior to construction in accordance with the Township, GRCA and OPSD standards.

Utilities

Utilities are expected to be available to service the subject property. Utility coordination and designs will be initiated during the detailed design stage.





Drawing Name: 425018-1001.dwg, Plotted: Feb 11, 2026



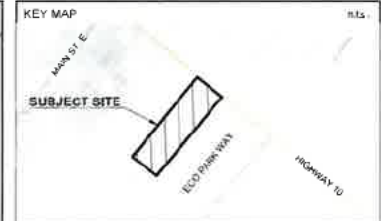
772082 HIGHWAY 10, DUNDALK
SITE LOCATION PLAN

DWG. No.: **FIG.1**

SCALE: 1:17500 | DRAWN: JLM | DATE: FEB/26 | JOB NO. 425018

**Appendix A:
Concept Site Plan**





CONCEPTUAL SITE PLAN



- LEGEND**
- Subject Lands (313,263.85m² / 31.33 ha)
 - Developments Limit (242,194.55m² / 24.21 ha)
 - Single Detached Dwellings (92,756.58m² / 9.26 ha)
 - Standard Townhouse Dwellings (8,000.15m² / 0.81 ha)
 - Commercial Mixed-Use (61,282.33m² / 6.13 ha)
 - Park (4,087.05m² / 0.41 ha)
 - Walkways (729.00m² / 0.07 ha)
 - S.W.M. Ponds (19,651.86m² / 1.96 ha)
 - Open Space (1,921.05m² / 0.19 ha)
 - Environmental Protection (64,437.32m² / 6.44 ha)

Note: Information shown is approximate and subject to change.

CONCEPTUAL SITE PLAN

772082 HWY. 10, DUNDALK

SCHEDULE OF REVISIONS			
No.	Date	Description	By

IPS INNOVATIVE PLANNING SOLUTIONS
 PLANNERS - PROJECT MANAGERS - LAND DEVELOPMENT
 2081715 AVE. W. SUITE 2000 VANCOUVER, BC V6V 2K6
 TEL: 778-434-1111

Date: Jan. 5, 2026 Drawn By: A.S.
 File: 23-1342 Checked: D.G.

Appendix B: Water Calculations



Preliminary Water Demands Design Worksheet

Project Details

772082 Highway 10, Dundalk	425018
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Prepared By

JLM	January 14, 2026
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Municipality

Township of Southgate

Checked By

MB	February 4, 2026
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Residential Flow

Unit Type	Single Family	Semi Detached	Townhouse	Apartment	Total
Number of Units	182		40	550	772
Pop Density (cap/unit) ¹	2.76		2.76	1.93	-
Population (cap)	503		111	1,062	1,676
Average Demand (L/day/cap) ²	322		322	322	-
Ave Day Demand (m ³ /day)	161.97	0.00	35.74	341.96	539.67
Reference	1 Triton Engineering's "Township of Southgate Dundalk Water Supply and Wastewater Treatment Facility 2025 Reserve Capacity Calculations" letter (dated May 20, 2025). Apartment units based on assumption that each unit is 0.7 ERU.				
	2 Triton Engineering's "Township of Southgate Dundalk Water Supply and Wastewater Treatment Facility 2025 Reserve Capacity Calculations" letter (dated May 20, 2025)				

Commercial/Industrial/ Institutional Flow

Land Use	Commercial	Industrial	Institutional	Total
Area (ha)	1.18	-	-	1.18
Average Demand (m ³ /day/ha) ³	28	-	-	-
Average Day Demand (m ³ /day)	33.04	0.00	0.00	33.04
Reference	3 MECP's <i>Design Guidelines for Drinking-Water Systems</i> (updated May 11, 2023)			

Fire Demand

Max Required Fire Demand (L/s)	200
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Fire Underwriter's Survey (2020); to be confirmed at detailed design

Peaking Factors

Land Use	Residential	Commercial	Industrial	Institutional
Maximum Day ⁴	2	2		
Peak Hour ⁵	3	2		
Reference	4 Res. only from MECP's <i>Design Guidelines for Drinking-Water Systems</i> (updated May 11, 2023)			
	5 Res. only from MECP's <i>Design Guidelines for Drinking-Water Systems</i> (updated May 11, 2023)			

Total Design Flows

Average Day Demand (m³/day)	572.71	Peak Hour Demand (L/s)	19.50
Maximum Day Demand (m³/day)	1,145.42	Maximum Day + Fire Demand (L/s)	213.26

Additional Notes

We have conservatively assumed an MDD peaking factor of 2 for the commercial space per MECP's *Design Guidelines for Drinking-Water Systems*. This is similar to our assumption for the commercial peaking factor found in the Sanitary Flow Calculations. Township engineering standards do not list commercial peaking factors for water demands.

Project Details

772082 Highway 10, Dundalk	425018
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Municipality

Dundalk, Township of Southgate

Prepared By

JLM	February 4, 2026
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Checked By

DB	February 4, 2026
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Fire Underwriters Survey Fire Flow Calculations

Calculation based on 2020 Publication "Water Supply for Public Fire Protection" by Fire Underwriters Survey (FUS).

Calculation based on end townhouse block located at the intersection of Street 'B' and Street 'I'. Assumes a standard 2-storey townhouse block and minimum setbacks stated in the Township's Zoning By-Law (March 2025). A 2-hour rated firewall between neighbouring units is conservatively assumed to be required such that the cumulative maximum area of units not separated by a firewall does not exceed 600 m². Calculation to be confirmed during detailed design, upon receipt of final site plan.

Calculations

Step	Description	Term	Options	Multiplier Associated with Option	Choose	Value used	Unit	Total Fire Flow (L/min)	
1	Frame Use for Construction of Unit	Coefficient related to type of construction (C)	Framing Material						N/A
			Type V - Wood Frame Construction	1.5	Type V - Wood Frame Construction	1.5	%		
			Type IVA - Mass Timber Construction	0.8					
			Type IVB - Mass Timber Construction	0.9					
			Type IVC - Mass Timber Construction	1.0					
			Type IVD - Mass Timber Construction	1.5					
			Ordinary Construction	1.0					
			Non-combustible Construction	0.8					
Fire Resistive Construction	0.6								

2	Total Effective Area	Largest Floor Area			600	m ²	N/A		
		Percentage of the Total Area of the Other Floors for Coefficient 1.0 to 1.5		100%	600				
		Percentage of the Total Area of the Other Floors for Coefficient below 1.0:							
		a) If any vertical opening in the building are unprotected, consider the two largest adjoining floor areas plus 50% of all floors immediately above them up to a maximum of eight, or		50%					
		b) If all vertical openings and exterior vertical communications are properly protected in accordance with the National Building Code, consider only the single largest Floor Area plus 25% of each of the two immediately adjoining floors.		25%					
Total Effective Area				1200					
3	Required Fire Flow without Reductions or Increases	Required Fire Flows without Reductions or Increases per FUS): (RFF= 220 x C x A ^{0.5})					11,000		
4	Factors Affecting Burning	Reductions / Increases Due to Factors Affecting Burning							
4.1	Combustibility of Building Contents	Occupancy content hazard reduction or surcharge	Non-combustible	-0.25	Limited combustible	-0.15	%	(1,650)	9,350
			Limited combustible	-0.15					
			Combustible	0.00					
			Free burning	0.15					
			Rapid burning	0.25					
4.2	Reduction Due to Presence of Sprinklers	Sprinkler reduction	For a fully supervised system the conditions a), b) and c) below must be met.			0	%	-	9,350
			a) Automatic sprinkler protection designed and installed in accordance with NFPA 13	-0.3	No				
			b) Water supply is standard for both the system and the Fire Department hose lines	-0.1	No				
			c) Fully supervised system	-0.1	No				
			None	0.0	No				

4.3	Separation Distance Between Units (Use 10% for 2 hour Fire Separation between adjacent units)	Exposure distance between units	North Side (2-hour rated firewall)	0 to 3.0 m	0.10	0.25	%	2,338	11,688
			East Side (End townhouse block)	10.1 to 20.0 m	0.15				
			South Side (Street 'I')	Greater than 30.0 m	0.00				
			West Side (Street 'B')	Greater than 30.0 m	0.00				
4.4	Combustibility of Wood Shingle or Shake Roof Material	Surcharge for potential to spread fire	Non-combustible roofing material	0	Non-combustible roofing material	0	L/min	0	11,688
			Low risk of fire spread	2000					
			Moderate risk of fire spread	3000					
			High risk of fire spread	4000					
Total Required Fire Flow, rounded to nearest 1000 L/min, with max/min limits applied								12000	
5	Required Fire Flow, Duration and Volume	Total Required Fire Flow (above) in L/s						200	
		Required Duration of Fire Flow of				12,000	L/min (hrs)	2.5	
		Required Volume for Fire Flow of				12,000	L/min (m ³)	1,800	

Appendix C: Sanitary Calculations



Project Details

772082 Highway 10, Dundalk	425018
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Prepared By

JLM	January 14, 2026
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Municipality

Township of Southgate

Checked By

MB	February 3, 2026
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Residential Flow

Unit Type	Single Family	Semi Detached	Townhouse	Apartment	Total
Number of Units	182	0	40	550	772
Pop Density (cap/unit) ¹	2.76	2.76	2.76	1.93	-
Population	503	0	111	1062	1,676
Average Flow (L/day/cap) ²	300	300	300	300	-
Ave Day Flow (m ³ /day)	150.90	0.00	33.30	318.60	502.80
Reference	1 Triton Engineering's "Township of Southgate Dundalk Water Supply and Wastewater Treatment Facility 2025 Reserve Capacity Calculations" letter (dated May 20, 2025)				
	2 Triton Engineering's "Township of Southgate Dundalk Water Supply and Wastewater Treatment Facility 2025 Reserve Capacity Calculations" letter (dated May 20, 2025)				

Commercial/Industrial/ Institutional Flow

Land Use	Commercial	Industrial	Institutional	Total
Area (ha)	1.18	-	-	1.18
Average Flow (m ³ /day/ha) ³	28	-	-	-
Average Day Flow (m ³ /day)	33.04	0.00	0.00	33.04
Reference	3 MECP's <i>Design Guidelines for Sewage Works</i> (updated September 4, 2024)			

Peaking Factors

Land Use	Residential (Harmon)	Commercial	Industrial	Institutional
Peaking Factor ⁴	3.64	2	-	-
Reference	4 MECP's <i>Design Guidelines for Sewage Works</i> (updated September 4, 2024)			

Infiltration

Serviced Area (ha)	24.2	Infiltration(L/s/ha)	0.15	Infiltration (L/s)	3.63
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Total Design Flows

Average Day Flow (m³/day)	535.84	Peak Flow (L/s)	24.81
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Additional Notes

MECP's *Design Guidelines for Sewage Works* states peaking factors will be similar to relative peak water usage rates and to reference the *Design Guidelines for Drinking-Water Systems*. We have conservatively assumed a peaking factor of 2 per the *Design Guidelines for Drinking-Water Systems* for the commercial space.

Appendix D:
Stormwater Management
Calculations

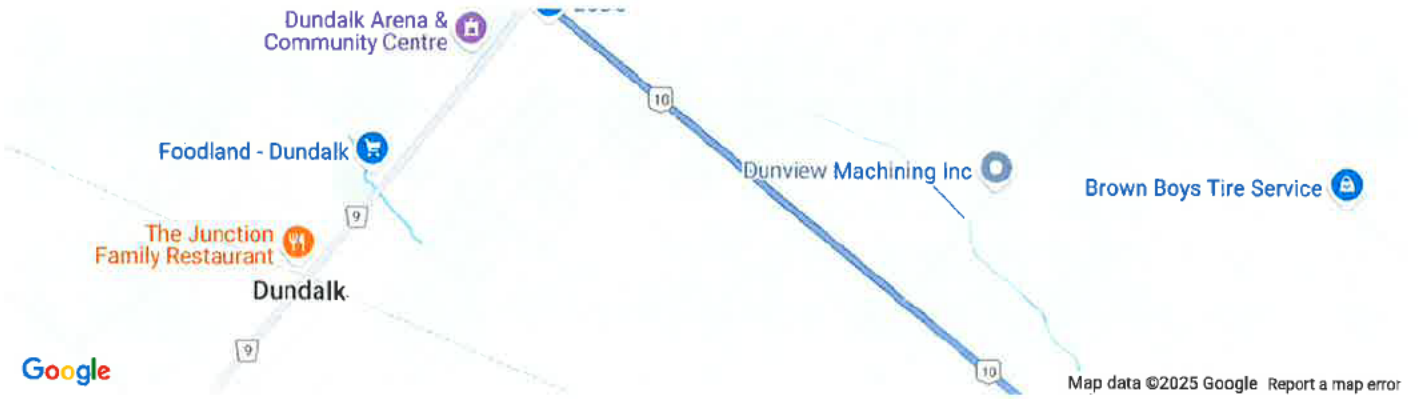


Pre-Development Conditions Hydrological Analysis

Active coordinate

44° 10' 15" N, 80° 22' 14" W (44.170833,-80.370833)

Retrieved: Wed, 28 May 2025 15:46:30 GMT



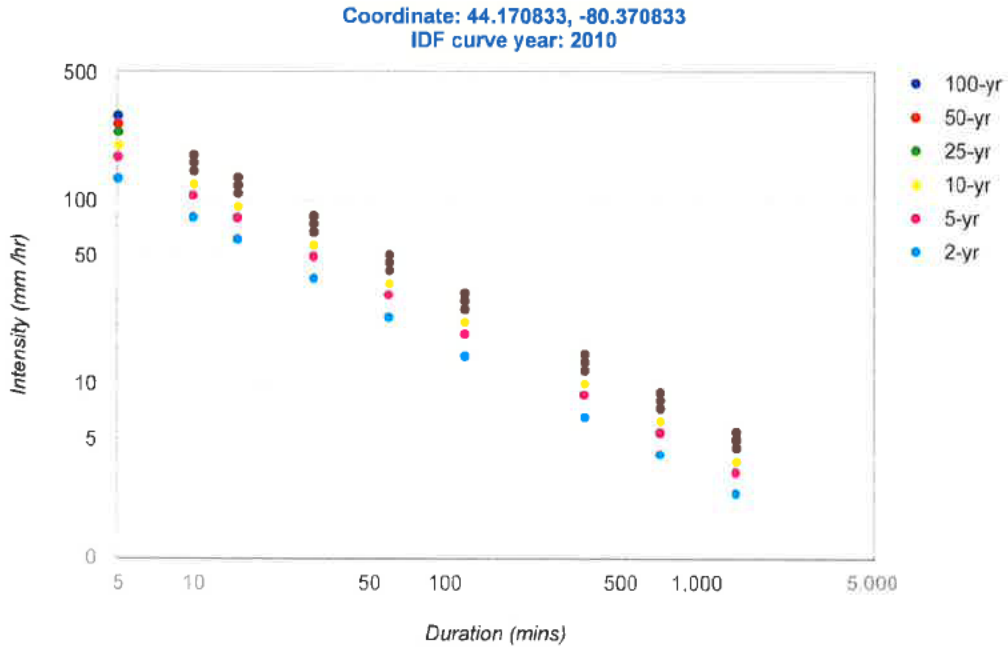
Location summary

These are the locations in the selection.

IDF Curve: 44° 10' 15" N, 80° 22' 14" W (44.170833,-80.370833)

Results

An IDF curve was found.



Coefficient summary

IDF Curve: 44° 10' 15" N, 80° 22' 14" W (44.170833,-80.370833)

Retrieved: Wed, 28 May 2025 15:46:30 GMT

Data year: 2010

IDF curve year: 2010

Return period	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A	23.1	30.6	35.5	41.8	46.4	51.0
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

Statistics

Rainfall intensity (mm hr⁻¹)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	131.2	80.8	60.9	37.5	23.1	14.2	6.6	4.1	2.5
5-yr	173.8	107.1	80.6	49.7	30.6	18.8	8.7	5.4	3.3
10-yr	201.6	124.2	93.6	57.6	35.5	21.9	10.1	6.3	3.8
25-yr	237.4	146.3	110.2	67.9	41.8	25.7	11.9	7.4	4.5
50-yr	263.6	162.3	122.3	75.3	46.4	28.6	13.3	8.2	5.0
100-yr	289.7	178.4	134.4	82.8	51.0	31.4	14.6	9.0	5.5

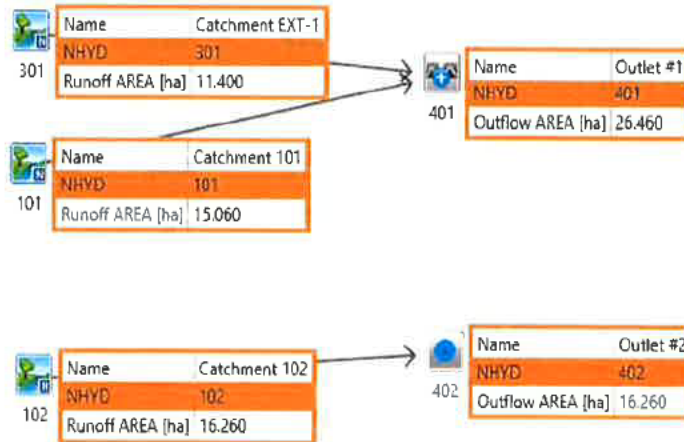
Rainfall depth (mm)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	10.9	13.5	15.2	18.8	23.1	28.5	39.6	48.8	60.1
5-yr	14.5	17.8	20.2	24.8	30.6	37.7	52.5	64.6	79.6
10-yr	16.8	20.7	23.4	28.8	35.5	43.7	60.9	75.0	92.4
25-yr	19.8	24.4	27.5	33.9	41.8	51.5	71.7	88.3	108.8
50-yr	22.0	27.1	30.6	37.7	46.4	57.2	79.6	98.0	120.8
100-yr	24.1	29.7	33.6	41.4	51.0	62.8	87.5	107.7	132.7

Terms of Use

You agree to the [Terms of Use](#) of this site by reviewing, using, or interpreting these data.

Legend:



Project Details

772082 Highway 10, Dundalk	425018
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Prepared By

LJC	February 5, 2026
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Data Sources

Detailed Soil Survey Reports for Ontario, MTO Drainage Management Manual (1997)

Pre-Development Condition

Watershed	GRCA
Catchment ID	101
Catchment Area (ha)	15.06
Impervious %	

Average Curve Number (CN), Runoff Coefficient (C) & Initial Abstraction (IA)

Soil Symbol	Ls			
Soil Series	Listowel			
Hydrologic Soils Group	B			
Soil Texture	Silt Loam			
Runoff Coefficient Type	2			
Area (ha)	15.06			
Percentage of Catchment	100%			

Land Cover Category	IA	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C
Impervious	2		100	0.95									
Gravel	3		89	0.50									
Woodland	10	8.00	60	0.25									
Pasture/Lawns	5		69	0.28									
Meadows	8	7.06	65	0.27									
Cultivated	7		74	0.35									
Waterbody	12		50	0.05									
Average CN			62.34										
Average C			0.26										
Average IA			9.06										

Time to Peak Calculations

Max Catchment Elevation (m)	514.00
Min Catchment Elevation (m)	513.25
Catchment Length (m)	325
Catchment Slope (%)	0.23%
Method	Airport Method
Time of Concentration (mins)	80.38

Summary

Catchment CN	62.3
Catchment C	0.26
Catchment IA (mm)	9.06
Time of Concentration (hrs)	1.34
Catchment Time to Peak (hrs)	0.89
Catchment Time Step (mins)	10.72

Project Details

772082 Highway 10, Dundalk	425018
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Prepared By

LJC	February 5, 2026
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Data Sources

Detailed Soil Survey Reports for Ontario, MTO Drainage Management Manual (1997)

Pre-Development Condition

Watershed	GRCA
Catchment ID	102
Catchment Area (ha)	16.26
Impervious %	

Average Curve Number (CN), Runoff Coefficient (C) & Initial Abstraction (IA)

Soil Symbol	Ls			
Soil Series	Listowel			
Hydrologic Soils Group	B			
Soil Texture	Silt Loam			
Runoff Coefficient Type	2			
Area (ha)	16.26			
Percentage of Catchment	100%			

Land Cover Category	IA	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C
Impervious	2		100	0.95									
Gravel	3		89	0.50									
Woodland	10	12.99	60	0.25									
Pasture/Lawns	5		69	0.28									
Meadows	8	3.27	65	0.27									
Cultivated	7		74	0.35									
Waterbody	12		50	0.05									
Average CN			61.01										
Average C			0.25										
Average IA			9.60										

Time to Peak Calculations

Max Catchment Elevation (m)	514.00
Min Catchment Elevation (m)	509.00
Catchment Length (m)	575
Catchment Slope (%)	0.87%
Method	Airport Method
Time of Concentration (mins)	69.34

Summary

Catchment CN	61.0
Catchment C	0.25
Catchment IA (mm)	9.60
Time of Concentration (hrs)	1.16
Catchment Time to Peak (hrs)	0.77
Catchment Time Step (mins)	9.24

Project Details

772082 Highway 10, Dundalk	425018
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Prepared By

LJC	February 5, 2026
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Data Sources

Detailed Soil Survey Reports for Ontario, MTO Drainage Management Manual (1997)

Pre-Development Condition

Watershed	GRCA
Catchment ID	EXT-1
Catchment Area (ha)	11.40
Impervious %	

Average Curve Number (CN), Runoff Coefficient (C) & Initial Abstraction (IA)

Soil Symbol	Ls			
Soil Series	Listowel			
Hydrologic Soils Group	B			
Soil Texture	Silt Loam			
Runoff Coefficient Type	2			
Area (ha)	11.40			
Percentage of Catchment	100%			

Land Cover Category	IA	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C
Impervious	2		100	0.95									
Gravel	3		89	0.50									
Woodland	10	11.40	60	0.25									
Pasture/Lawns	5		69	0.28									
Meadows	8		65	0.27									
Cultivated	7		74	0.35									
Waterbody	12		50	0.05									
Average CN			60.00										
Average C			0.25										
Average IA			10.00										

Time to Peak Calculations

Max Catchment Elevation (m)	516.00
Min Catchment Elevation (m)	514.00
Catchment Length (m)	325
Catchment Slope (%)	0.62%
Method	Airport Method
Time of Concentration (mins)	58.64

Summary

Catchment CN	60.0
Catchment C	0.25
Catchment IA (mm)	10.00
Time of Concentration (hrs)	0.98
Catchment Time to Peak (hrs)	0.65
Catchment Time Step (mins)	7.82

```

V V I SSSS U U A L (v 6.2.2022)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLLL

```

```

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

```

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\vojn.dat
 Output filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\085a3bf3-
 Summary filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\085a3bf3-

DATE: 02/05/2026 TIME: 02:14:58

USER:

COMMENTS: _____

```

*****
** SIMULATION : 01 - 2yr 3hr 10min Chicago **
*****

```

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ 0.00 hrs								
CHIC STORM [Ptot= 32.13 mm]		10.0						
** CALIB NASHYD [CN=62.3 [N = 3.0:Tp 0.89]	0101	1 5.0	15.06	0.05	2.50	3.01	0.09	0.000
CHIC STORM [Ptot= 32.13 mm]		10.0						
** CALIB NASHYD [CN=60.0 [N = 3.0:Tp 0.65]	0301	1 5.0	11.40	0.04	2.08	2.56	0.08	0.000
ADD [0101+ 0301]	0401	3 5.0	26.46	0.08	2.33	2.82	n/a	0.000
CHIC STORM [Ptot= 32.13 mm]		10.0						
** CALIB NASHYD [CN=61.0 [N = 3.0:Tp 0.77]	0102	1 5.0	16.26	0.05	2.33	2.75	0.09	0.000

```

V V I SSSS U U A L (v 6.2.2022)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLLL

```

```

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

```

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***** SUMMARY OUTPUT *****

***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\vojn.dat
 Output filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\085a3bf3-
 Summary filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\085a3bf3-

DATE: 02/05/2026 TIME: 02:14:58

USER:

COMMENTS: _____

```

*****
** SIMULATION : 02 - 5yr 3hr 10min Chicago **
*****

```

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ 0.00 hrs								
CHIC STORM [Ptot= 42.56 mm]		10.0						
** CALIB NASHYD [CN=62.3 [N = 3.0:Tp 0.89]	0101	1 5.0	15.06	0.10	2.33	6.00	0.14	0.000
CHIC STORM [Ptot= 42.56 mm]		10.0						
** CALIB NASHYD [CN=60.0 [N = 3.0:Tp 0.65]	0301	1 5.0	11.40	0.08	2.00	5.25	0.12	0.000
ADD [0101+ 0301]	0401	3 5.0	26.46	0.17	2.17	5.68	n/a	0.000
CHIC STORM [Ptot= 42.56 mm]		10.0						
** CALIB NASHYD [CN=61.0 [N = 3.0:Tp 0.77]	0102	1 5.0	16.26	0.11	2.17	5.56	0.13	0.000

```

V V I SSSS U U A L (v 6.2.2022)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLLL

```

```

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
OOO T T H H Y M M OOO

```

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\vojn.dat
 Output filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\c304093f-
 Summary filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\c304093f-

DATE: 02/05/2026 TIME: 02:14:58

USER:

COMMENTS: _____

```

*****
** SIMULATION : 03 - 10yr 3hr 10min Chicago **
*****

```

```

*****
W/E COMMAND      HYD ID  DT   AREA  Qpeak Tpeak R.V. R.C.  Qbase
                min   ha   cms   hrs   mm   mm   mm   cms

START @ 0.00 hrs
-----
CHIC STORM      10.0
[ Ptot= 49.38 mm ]
** CALIB NASHYD 0101 1 5.0 15.06 0.14 2.33 8.38 0.17 0.000
[CN=62.3
 [ N = 3.0:Tp 0.89]
CHIC STORM      10.0
[ Ptot= 49.38 mm ]
** CALIB NASHYD 0301 1 5.0 11.40 0.11 1.92 7.43 0.15 0.000
[CN=60.0
 [ N = 3.0:Tp 0.65]
ADD [ 0101+ 0301] 0401 3 5.0 26.46 0.25 2.17 7.97 n/a 0.000
CHIC STORM      10.0
[ Ptot= 49.38 mm ]
** CALIB NASHYD 0102 1 5.0 16.26 0.15 2.08 7.83 0.16 0.000
[CN=61.0
 [ N = 3.0:Tp 0.77]

```

```

V V I SSSS U U A L (v 6.2.2022)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y MM MM O O
O O T T H H Y Y M M O O
OOO T T H H Y M M OOO

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```

***** SUMMARY OUTPUT *****

```

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\lcarretas\AppData\Local\Civica\VH5\37da801c-0645-417b-9a14-2735e001dd43\alb7d1a8-
Summary filename: C:\Users\lcarretas\AppData\Local\Civica\VH5\37da801c-0645-417b-9a14-2735e001dd43\alb7d1a8-

```

```

DATE: 02/05/2026          TIME: 02:14:58
USER:
COMMENTS:

```

```

*****
** SIMULATION : 04 - 25yr 3hr 10min Chicago **
*****
W/E COMMAND      HYD ID  DT   AREA  Qpeak Tpeak R.V. R.C.  Qbase
                min   ha   cms   hrs   mm   mm   mm   cms

START @ 0.00 hrs
-----
CHIC STORM      10.0
[ Ptot= 58.14 mm ]
** CALIB NASHYD 0101 1 5.0 15.06 0.20 2.25 11.88 0.20 0.000
[CN=62.3
 [ N = 3.0:Tp 0.89]
CHIC STORM      10.0
[ Ptot= 58.14 mm ]
** CALIB NASHYD 0301 1 5.0 11.40 0.16 1.92 10.66 0.18 0.000

```

```

[CN=60.0
 [ N = 3.0:Tp 0.65]
ADD [ 0101+ 0301] 0401 3 5.0 26.46 0.36 2.08 11.35 n/a 0.000
CHIC STORM      10.0
[ Ptot= 58.14 mm ]
** CALIB NASHYD 0102 1 5.0 16.26 0.22 2.08 11.17 0.19 0.000
[CN=61.0
 [ N = 3.0:Tp 0.77]

```

```

V V I SSSS U U A L (v 6.2.2022)
V V I SS U U A A L
V V I SS U U A A A A L
VV I SSSS UUUU A A LLLLL

OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y MM MM O O
O O T T H H Y Y M M O O
OOO T T H H Y M M OOO

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```

***** SUMMARY OUTPUT *****

```

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\lcarretas\AppData\Local\Civica\VH5\37da801c-0645-417b-9a14-2735e001dd43\8310fa32-
Summary filename: C:\Users\lcarretas\AppData\Local\Civica\VH5\37da801c-0645-417b-9a14-2735e001dd43\8310fa32-

```

```

DATE: 02/05/2026          TIME: 02:14:59
USER:
COMMENTS:

```

```

*****
** SIMULATION : 05 - 50yr 3hr 10min Chicago **
*****
W/E COMMAND      HYD ID  DT   AREA  Qpeak Tpeak R.V. R.C.  Qbase
                min   ha   cms   hrs   mm   mm   mm   cms

START @ 0.00 hrs
-----
CHIC STORM      10.0
[ Ptot= 64.54 mm ]
** CALIB NASHYD 0101 1 5.0 15.06 0.25 2.25 14.72 0.23 0.000
[CN=62.3
 [ N = 3.0:Tp 0.89]
CHIC STORM      10.0
[ Ptot= 64.54 mm ]
** CALIB NASHYD 0301 1 5.0 11.40 0.21 1.83 13.29 0.21 0.000
[CN=60.0
 [ N = 3.0:Tp 0.65]
ADD [ 0101+ 0301] 0401 3 5.0 26.46 0.45 2.08 14.10 n/a 0.000
CHIC STORM      10.0
[ Ptot= 64.54 mm ]
** CALIB NASHYD 0102 1 5.0 16.26 0.28 2.08 13.89 0.22 0.000
[CN=61.0
 [ N = 3.0:Tp 0.77]

```

```

V V I SSSS U U A L (v 6.2.2022)
V V I SS U U A A L
V V I SS U U A A A A L

```

V V I SS U U A A L
VV I SSSS UUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y M M O O
O O T T H H Y Y M M O O
000 T T H H Y Y M M 000

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\vojn.dat
Output filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\c1eb7606-
Summary filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\c1eb7606-

DATE: 02/05/2026 TIME: 02:14:59

USER:

COMMENTS: _____

** SIMULATION : 06 - 100Yr 3hr 10min Chicago **

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C. mm	Qbase cms
START @ 0.00 hrs								
CHIC STORM [Ptot= 70.94 mm]	10.0							
** CALIB NASHYD [CN=62.3 [N = 3.0:Tp 0.89]	0101	1 5.0	15.06	0.31	2.25	17.76	0.25	0.000
CHIC STORM [Ptot= 70.94 mm]	10.0							
** CALIB NASHYD [CN=60.0 [N = 3.0:Tp 0.65]	0301	1 5.0	11.40	0.25	1.83	16.13	0.23	0.000
ADD [0101+ 0301]	0401	3 5.0	26.46	0.55	2.00	17.06	n/a	0.000
CHIC STORM [Ptot= 70.94 mm]	10.0							
** CALIB NASHYD [CN=61.0 [N = 3.0:Tp 0.77]	0102	1 5.0	16.26	0.34	2.00	16.82	0.24	0.000

V V I SSSS U U A A L (v 6.2.2022)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y M M O O
O O T T H H Y Y M M O O
000 T T H H Y Y M M 000

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\vojn.dat
Output filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\13dc1791-
Summary filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\13dc1791-

DATE: 02/05/2026 TIME: 02:14:59

USER:

COMMENTS: _____

** SIMULATION : 07 - 2yr 24hr 15min SCS Type **

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C. mm	Qbase cms
START @ 0.00 hrs								
READ STORM [Ptot= 60.13 mm] fname : C:\Users\lcarretas\AppData\Local\Temp\d7494092-c914-4f6e-9ffd-b193dcabb8f8\8106e773-3b81-4a16-96fe remark: 2yr 24hr 15min SCS Type II (MTO)	15.0							
** CALIB NASHYD [CN=62.3 [N = 3.0:Tp 0.89]	0101	1 5.0	15.06	0.16	13.17	12.74	0.21	0.000
READ STORM [Ptot= 60.13 mm] fname : C:\Users\lcarretas\AppData\Local\Temp\d7494092-c914-4f6e-9ffd-b193dcabb8f8\8106e773-3b81-4a16-96fe remark: 2yr 24hr 15min SCS Type II (MTO)	15.0							
** CALIB NASHYD [CN=60.0 [N = 3.0:Tp 0.65]	0301	1 5.0	11.40	0.13	12.83	11.45	0.19	0.000
ADD [0101+ 0301]	0401	3 5.0	26.46	0.28	13.00	12.18	n/a	0.000
READ STORM [Ptot= 60.13 mm] fname : C:\Users\lcarretas\AppData\Local\Temp\d7494092-c914-4f6e-9ffd-b193dcabb8f8\8106e773-3b81-4a16-96fe remark: 2yr 24hr 15min SCS Type II (MTO)	15.0							
** CALIB NASHYD [CN=61.0 [N = 3.0:Tp 0.77]	0102	1 5.0	16.26	0.18	13.00	11.99	0.20	0.000

V V I SSSS U U A A L (v 6.2.2022)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y M M O O
O O T T H H Y Y M M O O
000 T T H H Y Y M M 000

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\vojn.dat
Output filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\3d6178df-
Summary filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\3d6178df-

DATE: 02/05/2026 TIME: 02:15:00

USER:

COMMENTS: _____

** SIMULATION : 08 - 5yr 24hr 15min SCS Type **

```

=====
W/E COMMAND      HYD ID  DT      AREA  Qpeak Tpeak  R.V. R.C.  Qbase
                min      ha      cms   hrs   mm
START @ 0.00 hrs
-----
READ STORM      15.0
[ Ptot= 79.65 mm ]
fname : C:\Users\lcarretas\AppData\Local\Temp\d7494092-c914-4f6e-9ffd-b193dcabb8f8\1d0d670c-12f7-4e25-bf30
remark: 5yr 24hr 15min SCS Type II (MTO)
** CALIB NASHYD      0101  1  5.0  15.06  0.28 13.17  22.22 0.28  0.000
[CN=62.3 ]
[ N = 3.0:Tp 0.89 ]
**
READ STORM      15.0
[ Ptot= 79.65 mm ]
fname : C:\Users\lcarretas\AppData\Local\Temp\d7494092-c914-4f6e-9ffd-b193dcabb8f8\1d0d670c-12f7-4e25-bf30
remark: 5yr 24hr 15min SCS Type II (MTO)
** CALIB NASHYD      0301  1  5.0  11.40  0.24 12.83  20.30 0.25  0.000
[CN=60.0 ]
[ N = 3.0:Tp 0.65 ]
**
ADD [ 0101+ 0301] 0401  3  5.0  26.46  0.51 13.00  21.39 n/a  0.000
**
READ STORM      15.0
[ Ptot= 79.65 mm ]
fname : C:\Users\lcarretas\AppData\Local\Temp\d7494092-c914-4f6e-9ffd-b193dcabb8f8\1d0d670c-12f7-4e25-bf30
remark: 5yr 24hr 15min SCS Type II (MTO)
** CALIB NASHYD      0102  1  5.0  16.26  0.32 13.00  21.11 0.27  0.000
[CN=61.0 ]
[ N = 3.0:Tp 0.77 ]
**
=====

```

```

V  V  I  SSSSS  U  U  A  L          (v 6.2.2022)
V  V  I  SS    U  U  A  A  L
V  V  I  SS    U  U  A  A  A  L
V  V  I  SS    U  U  A  A  L
VV   I  SSSSS  UUUUU  A  A  LLLLL

000  TTTT  TTTT  H  H  Y  Y  M  M  000  TM
O  O  T    T  H  H  Y  Y  MM  MM  O  O
O  O  T    T  H  H  Y  Y  M  M  O  O
000  T    T  H  H  Y  Y  M  M  000

```

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\vojn.dat
Output filename: C:\Users\lcarretas\AppData\Local\Civica\H5\37da801c-0645-417b-9a14-2735e001dd43\be9bd133-
Summary filename: C:\Users\lcarretas\AppData\Local\Civica\H5\37da801c-0645-417b-9a14-2735e001dd43\be9bd133-

DATE: 02/05/2026 TIME: 02:15:00

USER:

COMMENTS:

** SIMULATION : 09 -10yr 24hr 15min SCS Type **

```

W/E COMMAND      HYD ID  DT      AREA  Qpeak Tpeak  R.V. R.C.  Qbase
                min      ha      cms   hrs   mm
START @ 0.00 hrs
-----
READ STORM      15.0
[ Ptot= 92.40 mm ]
fname : C:\Users\lcarretas\AppData\Local\Temp\d7494092-c914-4f6e-9ffd-b193dcabb8f8\38ca4202-1eed-4f52-8fcd
remark: 10yr 24hr 15min SCS Type II (MTO)
** CALIB NASHYD      0101  1  5.0  15.06  0.51 13.08  39.25 0.36  0.000
[CN=62.3 ]
[ N = 3.0:Tp 0.89 ]
**
READ STORM      15.0
[ Ptot=108.80 mm ]
fname : C:\Users\lcarretas\AppData\Local\Temp\d7494092-c914-4f6e-9ffd-b193dcabb8f8\60e82135-f6ce-4c17-b0af
remark: 25yr 24hr 15min SCS Type II (MTO)
** CALIB NASHYD      0301  1  5.0  11.40  0.45 12.83  36.40 0.33  0.000
[CN=60.0 ]
[ N = 3.0:Tp 0.65 ]
**
=====

```

```

** CALIB NASHYD      0101  1  5.0  15.06  0.38 13.08  29.30 0.32  0.000
[CN=62.3 ]
[ N = 3.0:Tp 0.89 ]
**
READ STORM      15.0
[ Ptot= 92.40 mm ]
fname : C:\Users\lcarretas\AppData\Local\Temp\d7494092-c914-4f6e-9ffd-b193dcabb8f8\38ca4202-1eed-4f52-8fcd
remark: 10yr 24hr 15min SCS Type II (MTO)
** CALIB NASHYD      0301  1  5.0  11.40  0.33 12.83  26.97 0.29  0.000
[CN=60.0 ]
[ N = 3.0:Tp 0.65 ]
**
ADD [ 0101+ 0301] 0401  3  5.0  26.46  0.69 13.00  28.30 n/a  0.000
**
READ STORM      15.0
[ Ptot= 92.40 mm ]
fname : C:\Users\lcarretas\AppData\Local\Temp\d7494092-c914-4f6e-9ffd-b193dcabb8f8\38ca4202-1eed-4f52-8fcd
remark: 10yr 24hr 15min SCS Type II (MTO)
** CALIB NASHYD      0102  1  5.0  16.26  0.43 13.00  27.96 0.30  0.000
[CN=61.0 ]
[ N = 3.0:Tp 0.77 ]
**
=====

```

```

V  V  I  SSSSS  U  U  A  L          (v 6.2.2022)
V  V  I  SS    U  U  A  A  L
V  V  I  SS    U  U  A  A  A  L
VV   I  SSSSS  UUUUU  A  A  LLLLL

```

```

000  TTTT  TTTT  H  H  Y  Y  M  M  000  TM
O  O  T    T  H  H  Y  Y  MM  MM  O  O
O  O  T    T  H  H  Y  Y  M  M  O  O
000  T    T  H  H  Y  Y  M  M  000

```

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\vojn.dat
Output filename: C:\Users\lcarretas\AppData\Local\Civica\H5\37da801c-0645-417b-9a14-2735e001dd43\341d8b71-
Summary filename: C:\Users\lcarretas\AppData\Local\Civica\H5\37da801c-0645-417b-9a14-2735e001dd43\341d8b71-

DATE: 02/05/2026 TIME: 02:14:59

USER:

COMMENTS:

** SIMULATION : 10 - 25yr 24hr 15min SCS Type **

```

W/E COMMAND      HYD ID  DT      AREA  Qpeak Tpeak  R.V. R.C.  Qbase
                min      ha      cms   hrs   mm
START @ 0.00 hrs
-----
READ STORM      15.0
[ Ptot=108.80 mm ]
fname : C:\Users\lcarretas\AppData\Local\Temp\d7494092-c914-4f6e-9ffd-b193dcabb8f8\60e82135-f6ce-4c17-b0af
remark: 25yr 24hr 15min SCS Type II (MTO)
** CALIB NASHYD      0101  1  5.0  15.06  0.51 13.08  39.25 0.36  0.000
[CN=62.3 ]
[ N = 3.0:Tp 0.89 ]
**
READ STORM      15.0
[ Ptot=108.80 mm ]
fname : C:\Users\lcarretas\AppData\Local\Temp\d7494092-c914-4f6e-9ffd-b193dcabb8f8\60e82135-f6ce-4c17-b0af
remark: 25yr 24hr 15min SCS Type II (MTO)
** CALIB NASHYD      0301  1  5.0  11.40  0.45 12.83  36.40 0.33  0.000
[CN=60.0 ]
[ N = 3.0:Tp 0.65 ]
**
=====

```

```

ADD [ 0101+ 0301] 0401 3 5.0 26.46 0.94 13.00 38.02 n/a 0.000
READ STORM 15.0
[ Ptot=108.80 mm ]
fname : C:\Users\lcarretas\AppData\Local\Temp\d7494092-c914-4f6e-9ffd-b193dcabb8f8\60e82135-f6ce-4c17-b0af
remark: 25yr 24hr 15min SCS Type II (MTO)
** CALIB NASHYD 0102 1 5.0 16.26 0.59 13.00 37.62 0.35 0.000
[CN=61.0]
[ N = 3.0:Tp 0.77]

```

```

V V I SSSSS U U A L (v 6.2.2022)
V V I SS U U A A L
V V I SS U U AAAAA L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y MM MM O O
O O T T H H Y Y M M O O
000 T T H H Y M M 000

```

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***** SUMMARY OUTPUT *****

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Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\vojn.dat
Output filename: C:\Users\lcarretas\AppData\Local\Civica\VH5\37da801c-0645-417b-9a14-2735e001dd43\8110f14d-
Summary filename: C:\Users\lcarretas\AppData\Local\Civica\VH5\37da801c-0645-417b-9a14-2735e001dd43\8110f14d-

```

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DATE: 02/05/2026 TIME: 02:15:01
USER:

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COMMENTS:

```

*****
** SIMULATION : 11 - 50yr 24hr 15min SCS Type **
*****

```

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ 0.00 hrs								
READ STORM [Ptot=120.77 mm] fname : C:\Users\lcarretas\AppData\Local\Temp\d7494092-c914-4f6e-9ffd-b193dcabb8f8\0060a3e2-9749-4893-b880 remark: 50yr 24hr 15min SCS Type II (MTO)		15.0						
** CALIB NASHYD [CN=62.3] [N = 3.0:Tp 0.89]	0101	1	5.0	15.06	0.61	13.08	47.02 0.39	0.000
READ STORM [Ptot=120.77 mm] fname : C:\Users\lcarretas\AppData\Local\Temp\d7494092-c914-4f6e-9ffd-b193dcabb8f8\0060a3e2-9749-4893-b880 remark: 50yr 24hr 15min SCS Type II (MTO)		15.0						
** CALIB NASHYD [CN=60.0] [N = 3.0:Tp 0.65]	0301	1	5.0	11.40	0.54	12.83	43.80 0.36	0.000
ADD [0101+ 0301] 0401 3 5.0 26.46 1.13 12.92 45.63 n/a 0.000								
READ STORM [Ptot=120.77 mm] fname : C:\Users\lcarretas\AppData\Local\Temp\d7494092-c914-4f6e-9ffd-b193dcabb8f8\0060a3e2-9749-4893-b880 remark: 50yr 24hr 15min SCS Type II (MTO)		15.0						
** CALIB NASHYD [CN=61.0] [N = 3.0:Tp 0.77]	0102	1	5.0	16.26	0.71	13.00	45.18 0.37	0.000

```

V V I SSSSS U U A L (v 6.2.2022)
V V I SS U U A A L
V V I SS U U AAAAA L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

```

```

000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y MM MM O O
O O T T H H Y Y M M O O
000 T T H H Y M M 000

```

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***** SUMMARY OUTPUT *****

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Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\vojn.dat
Output filename: C:\Users\lcarretas\AppData\Local\Civica\VH5\37da801c-0645-417b-9a14-2735e001dd43\d336102b-
Summary filename: C:\Users\lcarretas\AppData\Local\Civica\VH5\37da801c-0645-417b-9a14-2735e001dd43\d336102b-

```

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DATE: 02/05/2026 TIME: 02:15:01
USER:

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COMMENTS:

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*****
** SIMULATION : 12 - 100yr 24hr 15min SCS Typ **
*****

```

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ 0.00 hrs								
READ STORM [Ptot=132.74 mm] fname : C:\Users\lcarretas\AppData\Local\Temp\d7494092-c914-4f6e-9ffd-b193dcabb8f8\bdd89cb0-92ca-4b39-beea remark: 100yr 24hr 15min SCS Type II (MTO)		15.0						
** CALIB NASHYD [CN=62.3] [N = 3.0:Tp 0.89]	0101	1	5.0	15.06	0.72	13.08	55.15 0.42	0.000
READ STORM [Ptot=132.74 mm] fname : C:\Users\lcarretas\AppData\Local\Temp\d7494092-c914-4f6e-9ffd-b193dcabb8f8\bdd89cb0-92ca-4b39-beea remark: 100yr 24hr 15min SCS Type II (MTO)		15.0						
** CALIB NASHYD [CN=60.0] [N = 3.0:Tp 0.65]	0301	1	5.0	11.40	0.64	12.83	51.58 0.39	0.000
ADD [0101+ 0301] 0401 3 5.0 26.46 1.34 12.92 53.61 n/a 0.000								
READ STORM [Ptot=132.74 mm] fname : C:\Users\lcarretas\AppData\Local\Temp\d7494092-c914-4f6e-9ffd-b193dcabb8f8\bdd89cb0-92ca-4b39-beea remark: 100yr 24hr 15min SCS Type II (MTO)		15.0						
** CALIB NASHYD [CN=61.0] [N = 3.0:Tp 0.77]	0102	1	5.0	16.26	0.84	13.00	53.11 0.40	0.000

```

V V I SSSSS U U A L (v 6.2.2022)
V V I SS U U A A L
V V I SS U U AAAAA L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

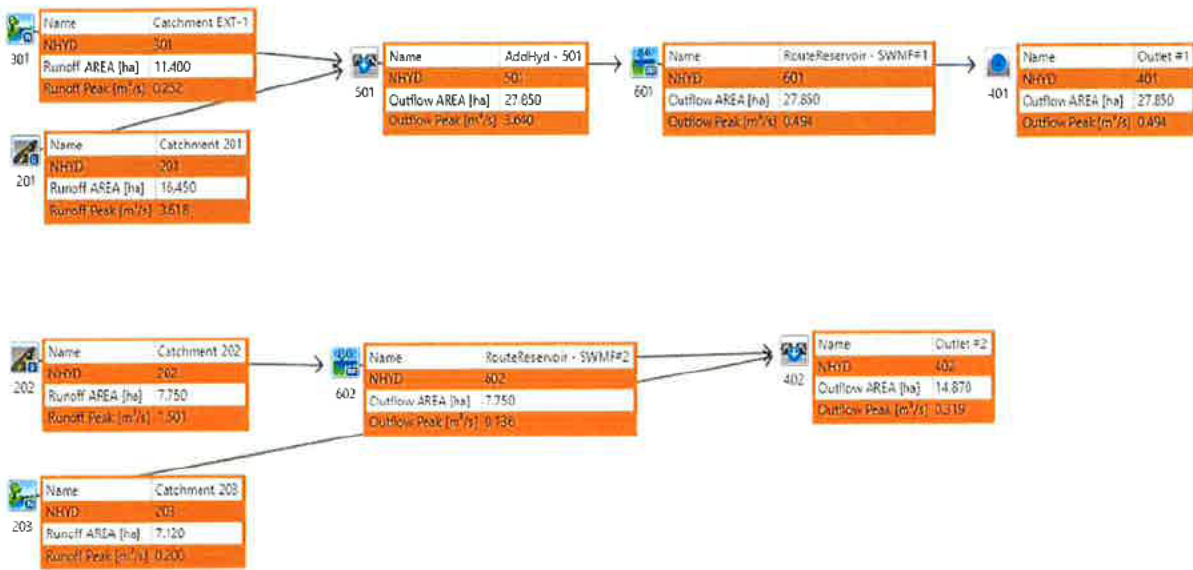
```

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000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y MM MM O O
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```


Post-Development Conditions Hydrological Analysis

Legend:


Catchment 201 - StandHyd								
Land Use Category	Area	Total Imperviousness (TIMP)	TIMP Area	Directly Connected Imperviousness (XIMP)	XIMP Area	Pervious Area	Pervious CN	Pervious IA
	ha	%	ha	%	ha	ha	-	mm
Towns	0.81	45%	0.36	23%	0.08	0.45	69.0	5.00
Single-Detached	4.75	45%	2.14	23%	0.48	2.61	69.0	5.00
Apartment Buildings	1.18	100%	1.18	100%	1.18	0.00	69.0	5.00
Parking Lot	3.01	100%	3.01	100%	3.01	0.00	69.0	5.00
20 m Road Allowance	3.23	75%	2.42	75%	1.82	0.81	69.0	5.00
SWMF Block	1.01	50%	0.51	50%	0.25	0.51	69.0	5.00
Landscape/Park	2.46	0%	0.00	0%	0.00	2.46	69.0	5.00
Total	16.45	58%	9.62	41%	6.82	6.83	69.0	5.00

Catchment 202 - StandHyd								
Land Use Category	Area	Total Imperviousness (TIMP)	TIMP Area	Directly Connected Imperviousness (XIMP)	XIMP Area	Pervious Area	Pervious CN	Pervious IA
	ha	%	ha	%	ha	ha	-	mm
Single-Detached	4.44	45%	2.00	23%	0.45	2.44	69.0	5.00
20 m Road Allowance	2.12	75%	1.59	75%	1.19	0.53	69.0	5.00
SWMF Block	0.95	50%	0.48	50%	0.24	0.48	69.0	5.00
Landscape/Park	0.24	0%	0.00	0%	0.00	0.24	69.0	5.00
Total	7.75	52%	4.06	24%	1.88	3.69	69.0	5.00

Catchment 203 - NasHyd								
Land Use Category	Area	Total Imperviousness (TIMP)	TIMP Area	Directly Connected Imperviousness (XIMP)	XIMP Area	Pervious Area	Pervious CN	Pervious IA
	ha	%	ha	%	ha	ha	-	mm
Woodland / Total	7.12	0%	0.00	0%	0.00	7.12	60.0	10.00

Summary

Total Site Area:	31.32 ha
Total Site TIMP Area:	13.68 ha
Total Site TIMP:	44 %

Project Details

772082 Highway 10, Dundalk	425018
----------------------------	--------

Prepared By

LJC	February 4, 2026
-----	------------------

Data Sources

Detailed Soil Survey Reports for Ontario, MTO Drainage Management Manual (1997)

Post Development Condition

Watershed	GRCA
Catchment ID	203
Catchment Area (ha)	7.12
Impervious %	

Average Curve Number (CN), Runoff Coefficient (C) & Initial Abstraction (IA)

Soil Symbol	Ls			
Soil Series	Listowel			
Hydrologic Soils Group	B			
Soil Texture	Silt Loam			
Runoff Coefficient Type	2			
Area (ha)	7.12			
Percentage of Catchment	100%			

Land Cover Category	IA	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C	A (ha)	CN	C
Impervious	2		100	0.95									
Gravel	3		89	0.50									
Woodland	10	7.12	60	0.25									
Pasture/Lawns	5		69	0.28									
Meadows	8		65	0.27									
Cultivated	7		74	0.35									
Waterbody	12		50	0.05									
Average CN			60.00										
Average C			0.25										
Average IA			10.00										

Time to Peak Calculations

Max Catchment Elevation (m)	511.00
Min Catchment Elevation (m)	509.00
Catchment Length (m)	200
Catchment Slope (%)	1.00%
Method	Airport Method
Time of Concentration (mins)	39.19

Summary

Catchment CN	60.0
Catchment C	0.25
Catchment IA (mm)	10.00
Time of Concentration (hrs)	0.65
Catchment Time to Peak (hrs)	0.44
Catchment Time Step (mins)	5.23

Visual OTTHYMO Model Parameter Calculations (StandHYD)

Project Details

772082 Highway 10, Dundalk	425018
----------------------------	--------

Prepared By

LJC	February 4, 2026
-----	------------------

Data Sources

Detailed Soil Survey Reports for Ontario, MTO Drainage Management Manual (1997)

Post Development Condition

Watershed	GRCA
Catchment ID	201
Catchment Area (ha)	16.45
Impervious %	58%
Pervious Area (ha)	6.83

Average Curve Number (CN) & Initial Abstraction (IA) for Pervious Area

Soil Symbol	Ls			
Soil Series	Listowel			
Hydrologic Soils Group	B			
Soil Texture	Silt Loam			
Runoff Coefficient Type	2			
Area (ha)	6.83			
Percentage of Catchment	100%			

Land Cover Category	IA	A (ha)	CN	A (ha)	CN	A (ha)	CN	A (ha)	CN
Impervious	2		100						
Gravel	3		89						
Woodland	10		60						
Pasture/Lawns	5	6.83	69						
Meadows	8		65						
Cultivated	7		74						
Waterbody	12		50						
Average CN		69.00							
Average IA		5.00							

Summary

Catchment CN:	69.0
---------------	------

Catchment IA (mm):	5.00
--------------------	------

Notes

CN and IA values have been calculated for the pervious area of the catchment only.

Project Details

772082 Highway 10, Dundalk	425018
----------------------------	--------

Prepared By

LJC	February 4, 2026
-----	------------------

Data Sources

Detailed Soil Survey Reports for Ontario, MTO Drainage Management Manual (1997)

Post Development Condition

Watershed	GRCA
Catchment ID	202
Catchment Area (ha)	7.75
Impervious %	52%
Pervious Area (ha)	3.69

Average Curve Number (CN) & Initial Abstraction (IA) for Pervious Area

Soil Symbol	Ls			
Soil Series	Listowel			
Hydrologic Soils Group	B			
Soil Texture	Silt Loam			
Runoff Coefficient Type	2			
Area (ha)	3.69			
Percentage of Catchment	100%			

Land Cover Category	IA	A (ha)	CN	A (ha)	CN	A (ha)	CN	A (ha)	CN
Impervious	2		100						
Gravel	3		89						
Woodland	10		60						
Pasture/Lawns	5	3.69	69						
Meadows	8		65						
Cultivated	7		74						
Waterbody	12		50						
Average CN			69.00						
Average IA			5.00						

Summary

Catchment CN:	69.0
---------------	------

Catchment IA (mm):	5.00
--------------------	------

Notes

CN and IA values have been calculated for the pervious area of the catchment only.

```

V V I SSSSS U U A L (v 6.2.2022)
V V I SS U U A A L
V V I SS U U A A A L
V V I SS U U A A L
V V I SSSSS UUUU A A LLLLL

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000 TTTT TTTT H H Y Y M M 000 TM
0 0 T T H H Y Y MM MM 0 0
0 0 T T H H Y Y M M 0 0
000 T T H H Y Y M M 000

```

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\vojn.dat
Output filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\74d4ea10-
Summary filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\74d4ea10-

DATE: 02/05/2026 TIME: 02:17:56

USER:

COMMENTS:

```

*****
** SIMULATION : 01 - 2yr 3hr 10min Chicago **
*****

```

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ 0.00 hrs								
CHIC STORM [Ptot= 32.13 mm]		10.0						
* CALIB NASHYD [CN=60.0 [N = 3.0:Tp 0.44]	0203	1 5.0	7.12	0.03	1.67	2.56	0.08	0.000
CHIC STORM [Ptot= 32.13 mm]		10.0						
* CALIB STANDHYD [I%=24.0:S%= 2.00]	0202	1 5.0	7.75	0.42	1.00	13.78	0.43	0.000
* Reservoir OUTFLOW:	0602	1 5.0	7.75	0.04	3.00	13.73	n/a	0.000
ADD [0203+ 0602]	0402	3 5.0	14.87	0.07	1.92	8.38	n/a	0.000
CHIC STORM [Ptot= 32.13 mm]		10.0						
* CALIB STANDHYD [I%=41.0:S%= 2.00]	0201	1 5.0	16.45	1.33	1.00	17.15	0.53	0.000
CHIC STORM [Ptot= 32.13 mm]		10.0						
* CALIB NASHYD [CN=60.0 [N = 3.0:Tp 0.65]	0301	1 5.0	11.40	0.04	2.08	2.56	0.08	0.000
ADD [0201+ 0301]	0501	3 5.0	27.85	1.33	1.00	11.18	n/a	0.000
* Reservoir OUTFLOW:	0601	1 5.0	27.85	0.16	2.58	11.17	n/a	0.000

```

V V I SSSSS U U A L (v 6.2.2022)
V V I SS U U A A L

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V V I SS U U A A A A L
V V I SS U U A A L
V V I SSSSS UUUU A A LLLLL
000 TTTT TTTT H H Y Y M M 000 TM
0 0 T T H H Y Y MM MM 0 0
0 0 T T H H Y Y M M 0 0
000 T T H H Y Y M M 000

```

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\vojn.dat
Output filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\74d4ea10-
Summary filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\74d4ea10-

DATE: 02/05/2026 TIME: 02:17:57

USER:

COMMENTS:

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*****
** SIMULATION : 02 - 5yr 3hr 10min Chicago **
*****

```

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ 0.00 hrs								
CHIC STORM [Ptot= 42.56 mm]		10.0						
* CALIB NASHYD [CN=60.0 [N = 3.0:Tp 0.44]	0203	1 5.0	7.12	0.06	1.58	5.25	0.12	0.000
CHIC STORM [Ptot= 42.56 mm]		10.0						
* CALIB STANDHYD [I%=24.0:S%= 2.00]	0202	1 5.0	7.75	0.63	1.00	20.56	0.48	0.000
* Reservoir OUTFLOW:	0602	1 5.0	7.75	0.07	2.92	20.51	n/a	0.000
ADD [0203+ 0602]	0402	3 5.0	14.87	0.12	1.75	13.20	n/a	0.000
CHIC STORM [Ptot= 42.56 mm]		10.0						
* CALIB STANDHYD [I%=41.0:S%= 2.00]	0201	1 5.0	16.45	1.87	1.00	24.51	0.58	0.000
CHIC STORM [Ptot= 42.56 mm]		10.0						
* CALIB NASHYD [CN=60.0 [N = 3.0:Tp 0.65]	0301	1 5.0	11.40	0.08	2.00	5.25	0.12	0.000
ADD [0201+ 0301]	0501	3 5.0	27.85	1.88	1.00	16.62	n/a	0.000
* Reservoir OUTFLOW:	0601	1 5.0	27.85	0.24	2.67	16.61	n/a	0.000

```

V V I SSSSS U U A L (v 6.2.2022)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
V V I SSSSS UUUU A A LLLLL
000 TTTT TTTT H H Y Y M M 000 TM

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O O T T H H Y Y MM MM O O
 O O T T H H Y Y M M O O
 000 T T H H Y M M 000
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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voim.dat
 Output filename: C:\Users\lcarretas\AppData\Local\Civica\VH5\37da801c-0645-417b-9a14-2735e001dd43\3727a195-
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DATE: 02/05/2026 TIME: 02:17:55

USER:

COMMENTS: _____

 ** SIMULATION : 03 - 10yr 3hr 10min Chicago **

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ 0.00 hrs								
CHIC STORM [Ptot= 49.38 mm]		10.0						
** CALIB NASHYD [CN=60.0 [N = 3.0:Tp 0.44]	0203	1 5.0	7.12	0.09	1.58	7.43	0.15	0.000
CHIC STORM [Ptot= 49.38 mm]		10.0						
* CALIB STANDHYD [I%=24.0:S%= 2.00]	0202	1 5.0	7.75	0.77	1.00	25.34	0.51	0.000
** Reservoir OUTFLOW:	0602	1 5.0	7.75	0.08	2.92	25.28	n/a	0.000
ADD [0203+ 0602]	0402	3 5.0	14.87	0.16	1.67	16.73	n/a	0.000
CHIC STORM [Ptot= 49.38 mm]		10.0						
* CALIB STANDHYD [I%=41.0:S%= 2.00]	0201	1 5.0	16.45	2.31	1.00	29.59	0.60	0.000
CHIC STORM [Ptot= 49.38 mm]		10.0						
* CALIB NASHYD [CN=60.0 [N = 3.0:Tp 0.65]	0301	1 5.0	11.40	0.11	1.92	7.43	0.15	0.000
ADD [0201+ 0301]	0501	3 5.0	27.85	2.32	1.00	20.52	n/a	0.000
** Reservoir OUTFLOW:	0601	1 5.0	27.85	0.30	2.58	20.51	n/a	0.000

V V I SSSSS U U A L (v 6.2.2022)
 V V I SS U U A A L
 V V I SS U U A A A A L
 V V I SS U U A A L
 V V I SSSSS UUUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM
 O O T T H H Y Y MM MM O O
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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voim.dat
 Output filename: C:\Users\lcarretas\AppData\Local\Civica\VH5\37da801c-0645-417b-9a14-2735e001dd43\525ccc15-
 Summary filename: C:\Users\lcarretas\AppData\Local\Civica\VH5\37da801c-0645-417b-9a14-2735e001dd43\525ccc15-

DATE: 02/05/2026 TIME: 02:17:55

USER:

COMMENTS: _____

 ** SIMULATION : 04 - 25yr 3hr 10min Chicago **

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ 0.00 hrs								
CHIC STORM [Ptot= 58.14 mm]		10.0						
* CALIB NASHYD [CN=60.0 [N = 3.0:Tp 0.44]	0203	1 5.0	7.12	0.13	1.58	10.66	0.18	0.000
CHIC STORM [Ptot= 58.14 mm]		10.0						
* CALIB STANDHYD [I%=24.0:S%= 2.00]	0202	1 5.0	7.75	0.96	1.00	31.80	0.55	0.000
** Reservoir OUTFLOW:	0602	1 5.0	7.75	0.10	2.83	31.74	n/a	0.000
ADD [0203+ 0602]	0402	3 5.0	14.87	0.22	1.67	21.65	n/a	0.000
CHIC STORM [Ptot= 58.14 mm]		10.0						
* CALIB STANDHYD [I%=41.0:S%= 2.00]	0201	1 5.0	16.45	2.83	1.00	36.37	0.63	0.000
CHIC STORM [Ptot= 58.14 mm]		10.0						
* CALIB NASHYD [CN=60.0 [N = 3.0:Tp 0.65]	0301	1 5.0	11.40	0.16	1.92	10.66	0.18	0.000
ADD [0201+ 0301]	0501	3 5.0	27.85	2.84	1.00	25.85	n/a	0.000
** Reservoir OUTFLOW:	0601	1 5.0	27.85	0.37	2.67	25.84	n/a	0.000

V V I SSSSS U U A L (v 6.2.2022)
 V V I SS U U A A L
 V V I SS U U A A A A L
 V V I SS U U A A L
 V V I SSSSS UUUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM
 O O T T H H Y Y MM MM O O
 O O T T H H Y M M O O
 000 T T H H Y M M 000

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
 Output filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\5289cc49-
 Summary filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\5289cc49-

DATE: 02/05/2026 TIME: 02:17:57
 USER:

DATE: 02/05/2026 TIME: 02:17:56

USER:

COMMENTS:

 ** SIMULATION : 05 - 30yr 3hr 10min Chicago **

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ 0.00 hrs								
CHIC STORM [Ptot= 64.54 mm]		10.0						
** CALIB NASHYD [CN=60.0 [N = 3.0:Tp 0.44]	0203	1 5.0	7.12	0.16	1.50	13.29	0.21	0.000
CHIC STORM [Ptot= 64.54 mm]		10.0						
* CALIB STANDHYD [I%=24.0:S%= 2.00]	0202	1 5.0	7.75	1.11	1.00	36.71	0.57	0.000
** Reservoir OUTFLOW:	0602	1 5.0	7.75	0.12	2.83	36.65	n/a	0.000
ADD [0203+ 0602]	0402	3 5.0	14.87	0.26	1.58	25.46	n/a	0.000
CHIC STORM [Ptot= 64.54 mm]		10.0						
* CALIB STANDHYD [I%=41.0:S%= 2.00]	0201	1 5.0	16.45	3.22	1.00	41.48	0.64	0.000
CHIC STORM [Ptot= 64.54 mm]		10.0						
* CALIB NASHYD [CN=60.0 [N = 3.0:Tp 0.65]	0301	1 5.0	11.40	0.21	1.83	13.29	0.21	0.000
ADD [0201+ 0301]	0501	3 5.0	27.85	3.23	1.00	29.94	n/a	0.000
** Reservoir OUTFLOW:	0601	1 5.0	27.85	0.43	2.67	29.93	n/a	0.000

```
V V I SSSS U U A L (v 6.2.2022)
V V I SS U U A A L
V V I SS U U A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLLL
```

```
000 TTTT TTTT H H Y Y M M 000 TM
0 0 T T H H Y Y MM MM 0 0
0 0 T T H H Y M M 0 0
000 T T H H Y M M 000
```

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
 Output filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\839d8f9-
 Summary filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\839d8f9-

COMMENTS:

 ** SIMULATION : 06 - 100yr 3hr 10min Chicago **

W/E COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
START @ 0.00 hrs								
CHIC STORM [Ptot= 70.94 mm]		10.0						
** CALIB NASHYD [CN=60.0 [N = 3.0:Tp 0.44]	0203	1 5.0	7.12	0.20	1.50	16.13	0.23	0.000
CHIC STORM [Ptot= 70.94 mm]		10.0						
* CALIB STANDHYD [I%=24.0:S%= 2.00]	0202	1 5.0	7.75	1.50	1.00	41.75	0.59	0.000
** Reservoir OUTFLOW:	0602	1 5.0	7.75	0.14	2.75	41.70	n/a	0.000
ADD [0203+ 0602]	0402	3 5.0	14.87	0.32	1.58	29.45	n/a	0.000
CHIC STORM [Ptot= 70.94 mm]		10.0						
* CALIB STANDHYD [I%=41.0:S%= 2.00]	0201	1 5.0	16.45	3.62	1.00	46.70	0.66	0.000
CHIC STORM [Ptot= 70.94 mm]		10.0						
* CALIB NASHYD [CN=60.0 [N = 3.0:Tp 0.65]	0301	1 5.0	11.40	0.25	1.83	16.13	0.23	0.000
ADD [0201+ 0301]	0501	3 5.0	27.85	3.64	1.00	34.19	n/a	0.000
** Reservoir OUTFLOW:	0601	1 5.0	27.85	0.49	2.67	34.18	n/a	0.000

```
V V I SSSS U U A L (v 6.2.2022)
V V I SS U U A A L
V V I SS U U A A A L
VV I SSSS UUUU A A LLLLL
```

```
000 TTTT TTTT H H Y Y M M 000 TM
0 0 T T H H Y Y MM MM 0 0
0 0 T T H H Y M M 0 0
000 T T H H Y M M 000
```

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
 Output filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\ae5d7b4f-
 Summary filename: C:\Users\lcarretas\AppData\Local\Civica\XH5\37da801c-0645-417b-9a14-2735e001dd43\ae5d7b4f-

DATE: 02/05/2026 TIME: 02:17:59
 USER:

COMMENTS:

** SIMULATION : 07 - 2yr 24hr 15min SCS Type **

Table with columns: W/E COMMAND, HYD ID, DT min, AREA ha, Qpeak cms, Tpeak hrs, R.V. mm, R.C., Qbase cms. Includes simulation details for CALIB NASHYD and CALIB STANDHYD.

V V I SSSSS U U A L (v 6.2.2022)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM
0 0 T T H H Y Y MM MM 0 0
0 0 T T H H Y M M 0 0
000 T T H H Y M M 000

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\lcarretas\AppData\Local\Civica\VH5\37da801c-0645-417b-9a14-2735e001dd43\1f4ac844-
Summary filename: C:\Users\lcarretas\AppData\Local\Civica\VH5\37da801c-0645-417b-9a14-2735e001dd43\1f4ac844-

DATE: 02/05/2026

TIME: 02:17:57

USER:

COMMENTS:

** SIMULATION : 08 - 5yr 24hr 15min SCS Type **

Table with columns: W/E COMMAND, HYD ID, DT min, AREA ha, Qpeak cms, Tpeak hrs, R.V. mm, R.C., Qbase cms. Includes simulation details for CALIB NASHYD and CALIB STANDHYD.

V V I SSSSS U U A L (v 6.2.2022)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM
0 0 T T H H Y Y MM MM 0 0
0 0 T T H H Y M M 0 0
000 T T H H Y M M 000

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
Output filename: C:\Users\lcarretas\AppData\Local\Civica\VH5\37da801c-0645-417b-9a14-2735e001dd43\1f108ae4-
Summary filename: C:\Users\lcarretas\AppData\Local\Civica\VH5\37da801c-0645-417b-9a14-2735e001dd43\1f108ae4-

***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\vojn.dat
Output filename: C:\Users\carretas\AppData\Local\Civica\VH5\37da801c-0645-417b-9a14-2735e001dd43\86f46e31-
Summary filename: C:\Users\carretas\AppData\Local\Civica\VH5\37da801c-0645-417b-9a14-2735e001dd43\86f46e31-

DATE: 02/05/2026 TIME: 02:17:58
USER:

COMMENTS:

** SIMULATION : 11 - 50yr 24hr 15min SCS Type **

Table with columns: W/E COMMAND, HYD ID, DT min, AREA ha, Qpeak cms, Tpeak hrs, R.V. mm, R.C., Qbase cms. Rows include storm events and reservoir outflows.

V V I SSSSS U U A L (v 6.2.2022)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM
0 0 T T H H Y Y M M 0 0
0 0 T T H H Y Y M M 0 0
000 T T H H Y Y M M 000

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***** SUMMARY OUTPUT *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\vojn.dat
Output filename: C:\Users\carretas\AppData\Local\Civica\VH5\37da801c-0645-417b-9a14-2735e001dd43\76b8e8f4-
Summary filename: C:\Users\carretas\AppData\Local\Civica\VH5\37da801c-0645-417b-9a14-2735e001dd43\76b8e8f4-

DATE: 02/05/2026 TIME: 02:17:58
USER:

COMMENTS:

** SIMULATION : 12 - 100yr 24hr 15min SCS Typ **

Table with columns: W/E COMMAND, HYD ID, DT min, AREA ha, Qpeak cms, Tpeak hrs, R.V. mm, R.C., Qbase cms. Rows include storm events and reservoir outflows.

V V I SSSSS U U A L (v 6.2.2022)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM
0 0 T T H H Y Y M M 0 0
0 0 T T H H Y Y M M 0 0

Stormwater Management Facility Calculations

 ** SIMULATION:01 - 2yr 3hr 10min Chicago **

RESERVOIR(0601)		OVERFLOW IS OFF			
IN= 2--> OUT= 1		OUTFLOW	STORAGE	OUTFLOW	STORAGE
DT= 5.0 min		(cms)	(ha.m.)	(cms)	(ha.m.)
		0.0000	0.0000	0.9820	0.9074
		0.5220	0.6000	0.0000	0.0000
		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0501)		27.850	1.329	1.00	11.18
OUTFLOW: ID= 1 (0601)		27.850	0.161	2.58	11.17
PEAK FLOW REDUCTION [Qout/Qin](%)= 12.14					
TIME SHIFT OF PEAK FLOW (min)= 95.00					
MAXIMUM STORAGE USED (ha.m.)= 0.1856					

 ** SIMULATION:02 - 5yr 3hr 10min Chicago **

RESERVOIR(0601)		OVERFLOW IS OFF			
IN= 2--> OUT= 1		OUTFLOW	STORAGE	OUTFLOW	STORAGE
DT= 5.0 min		(cms)	(ha.m.)	(cms)	(ha.m.)
		0.0000	0.0000	0.9820	0.9074
		0.5220	0.6000	0.0000	0.0000
		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0501)		27.850	1.876	1.00	16.62
OUTFLOW: ID= 1 (0601)		27.850	0.240	2.67	16.61
PEAK FLOW REDUCTION [Qout/Qin](%)= 12.80					
TIME SHIFT OF PEAK FLOW (min)= 100.00					
MAXIMUM STORAGE USED (ha.m.)= 0.2762					

 ** SIMULATION:03 - 10yr 3hr 10min Chicago **

RESERVOIR(0601)		OVERFLOW IS OFF			
IN= 2--> OUT= 1		OUTFLOW	STORAGE	OUTFLOW	STORAGE
DT= 5.0 min		(cms)	(ha.m.)	(cms)	(ha.m.)
		0.0000	0.0000	0.9820	0.9074
		0.5220	0.6000	0.0000	0.0000
		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0501)		27.850	2.317	1.00	20.52
OUTFLOW: ID= 1 (0601)		27.850	0.297	2.58	20.51
PEAK FLOW REDUCTION [Qout/Qin](%)= 12.81					
TIME SHIFT OF PEAK FLOW (min)= 95.00					
MAXIMUM STORAGE USED (ha.m.)= 0.3412					

 ** SIMULATION:04 - 25yr 3hr 10min Chicago **

RESERVOIR(0601)		OVERFLOW IS OFF			
IN= 2--> OUT= 1		OUTFLOW	STORAGE	OUTFLOW	STORAGE
DT= 5.0 min		(cms)	(ha.m.)	(cms)	(ha.m.)
		0.0000	0.0000	0.9820	0.9074
		0.5220	0.6000	0.0000	0.0000
		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0501)		27.850	2.839	1.00	25.85
OUTFLOW: ID= 1 (0601)		27.850	0.374	2.67	25.84
PEAK FLOW REDUCTION [Qout/Qin](%)= 13.16					
TIME SHIFT OF PEAK FLOW (min)= 100.00					
MAXIMUM STORAGE USED (ha.m.)= 0.4295					

 ** SIMULATION:05 - 50yr 3hr 10min Chicago **

RESERVOIR(0601)		OVERFLOW IS OFF			
IN= 2--> OUT= 1		OUTFLOW	STORAGE	OUTFLOW	STORAGE
DT= 5.0 min		(cms)	(ha.m.)	(cms)	(ha.m.)
		0.0000	0.0000	0.9820	0.9074
		0.5220	0.6000	0.0000	0.0000
		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0501)		27.850	3.234	1.00	29.94
OUTFLOW: ID= 1 (0601)		27.850	0.433	2.67	29.93
PEAK FLOW REDUCTION [Qout/Qin](%)= 13.38					
TIME SHIFT OF PEAK FLOW (min)= 100.00					
MAXIMUM STORAGE USED (ha.m.)= 0.4974					

 ** SIMULATION:06 - 100yr 3hr 10min Chicago **

RESERVOIR(0601)		OVERFLOW IS OFF			
IN= 2--> OUT= 1		OUTFLOW	STORAGE	OUTFLOW	STORAGE
DT= 5.0 min		(cms)	(ha.m.)	(cms)	(ha.m.)
		0.0000	0.0000	0.9820	0.9074
		0.5220	0.6000	0.0000	0.0000
		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0501)		27.850	3.640	1.00	34.19
OUTFLOW: ID= 1 (0601)		27.850	0.494	2.67	34.18
PEAK FLOW REDUCTION [Qout/Qin](%)= 13.57					
TIME SHIFT OF PEAK FLOW (min)= 100.00					
MAXIMUM STORAGE USED (ha.m.)= 0.5678					

 ** SIMULATION:07 - 2yr 24hr 15min SCS Type II (MTO) **

RESERVOIR(0601)		OVERFLOW IS OFF			
IN= 2--> OUT= 1		OUTFLOW	STORAGE	OUTFLOW	STORAGE
DT= 5.0 min		(cms)	(ha.m.)	(cms)	(ha.m.)
		0.0000	0.0000	0.9820	0.9074
		0.5220	0.6000	0.0000	0.0000
		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0501)		27.850	1.649	12.25	27.10
OUTFLOW: ID= 1 (0601)		27.850	0.276	13.33	27.09
PEAK FLOW REDUCTION [Qout/Qin](%)= 16.72					
TIME SHIFT OF PEAK FLOW (min)= 65.00					
MAXIMUM STORAGE USED (ha.m.)= 0.3171					

 ** SIMULATION:08 - 5yr 24hr 15min SCS Type II (MTO) **

RESERVOIR(0601)		OVERFLOW IS OFF			
IN= 2--> OUT= 1		OUTFLOW	STORAGE	OUTFLOW	STORAGE
DT= 5.0 min		(cms)	(ha.m.)	(cms)	(ha.m.)
		0.0000	0.0000	0.9820	0.9074
		0.5220	0.6000	0.0000	0.0000
		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0501)		27.850	2.558	12.25	40.18
OUTFLOW: ID= 1 (0601)		27.850	0.410	13.33	40.17
PEAK FLOW REDUCTION [Qout/Qin](%)= 16.04					
TIME SHIFT OF PEAK FLOW (min)= 65.00					
MAXIMUM STORAGE USED (ha.m.)= 0.4716					

 ** SIMULATION:09 - 10yr 24hr 15min SCS Type II (MTO) **

```

RESERVOIR( 0601)
IN= 2--> OUT= 1
DT= 5.0 min
OVERFLOW IS OFF
  
```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.9820	0.9074
0.5220	0.6000	0.0000	0.0000

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
27.850	3.124	12.25	49.35
27.850	0.505	13.33	49.34

INFLOW : ID= 2 (0501)
 OUTFLOW: ID= 1 (0601)

PEAK FLOW REDUCTION [qout/qin](%)= 16.16
 TIME SHIFT OF PEAK FLOW (min)= 65.00
 MAXIMUM STORAGE USED (ha.m.)= 0.5804

 ** SIMULATION:25mm 4-hr CHI **

```

RESERVOIR( 0601)
IN= 2--> OUT= 1
DT= 5.0 min
OVERFLOW IS OFF
  
```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.9820	0.9074
0.5220	0.6000	0.0000	0.0000

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
27.850	0.772	1.50	7.87
27.850	0.105	3.08	7.86

INFLOW : ID= 2 (0501)
 OUTFLOW: ID= 1 (0601)

PEAK FLOW REDUCTION [qout/qin](%)= 13.60
 TIME SHIFT OF PEAK FLOW (min)= 95.00
 MAXIMUM STORAGE USED (ha.m.)= 0.1208

 ** SIMULATION:10 - 25yr 24hr 15min SCS Type II (MTO) **

```

RESERVOIR( 0601)
IN= 2--> OUT= 1
DT= 5.0 min
OVERFLOW IS OFF
  
```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.9820	0.9074
0.5220	0.6000	0.0000	0.0000

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
27.850	3.887	12.25	61.71
27.850	0.692	13.25	61.70

INFLOW : ID= 2 (0501)
 OUTFLOW: ID= 1 (0601)

PEAK FLOW REDUCTION [qout/qin](%)= 17.80
 TIME SHIFT OF PEAK FLOW (min)= 60.00
 MAXIMUM STORAGE USED (ha.m.)= 0.7138

 ** SIMULATION:11 - 50yr 24hr 15min SCS Type II (MTO) **

```

RESERVOIR( 0601)
IN= 2--> OUT= 1
DT= 5.0 min
OVERFLOW IS OFF
  
```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.9820	0.9074
0.5220	0.6000	0.0000	0.0000

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
27.850	4.464	12.25	71.06
27.850	0.835	13.25	71.05

INFLOW : ID= 2 (0501)
 OUTFLOW: ID= 1 (0601)

PEAK FLOW REDUCTION [qout/qin](%)= 18.70
 TIME SHIFT OF PEAK FLOW (min)= 60.00
 MAXIMUM STORAGE USED (ha.m.)= 0.8091

 ** SIMULATION:12 - 100yr 24hr 15min SCS Type II (MTO) **

```

RESERVOIR( 0601)
IN= 2--> OUT= 1
DT= 5.0 min
OVERFLOW IS OFF
  
```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.9820	0.9074
0.5220	0.6000	0.0000	0.0000

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
27.850	5.057	12.25	80.66
27.850	0.980	13.17	80.64

INFLOW : ID= 2 (0501)
 OUTFLOW: ID= 1 (0601)

PEAK FLOW REDUCTION [qout/qin](%)= 19.38
 TIME SHIFT OF PEAK FLOW (min)= 55.00
 MAXIMUM STORAGE USED (ha.m.)= 0.9066

 ** SIMULATION:01 - 2yr 3hr 10min Chicago **

RESERVOIR(0602)		OVERFLOW IS OFF			
IN= 2--> OUT= 1		OUTFLOW	STORAGE	OUTFLOW	STORAGE
DT= 5.0 min		(cms)	(ha.m.)	(cms)	(ha.m.)
		0.0000	0.0000	0.3110	0.3824
		0.1830	0.3050	0.0000	0.0000

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0202)	7.750	0.416	1.00	13.78
OUTFLOW: ID= 1 (0602)	7.750	0.044	3.00	13.73

PEAK FLOW REDUCTION [qout/qin](%)= 10.68
TIME SHIFT OF PEAK FLOW (min)=120.00
MAXIMUM STORAGE USED (ha.m.)= 0.0740

 ** SIMULATION:02 - 5yr 3hr 10min Chicago **

RESERVOIR(0602)		OVERFLOW IS OFF			
IN= 2--> OUT= 1		OUTFLOW	STORAGE	OUTFLOW	STORAGE
DT= 5.0 min		(cms)	(ha.m.)	(cms)	(ha.m.)
		0.0000	0.0000	0.3110	0.3824
		0.1830	0.3050	0.0000	0.0000

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0202)	7.750	0.631	1.00	20.56
OUTFLOW: ID= 1 (0602)	7.750	0.067	2.92	20.51

PEAK FLOW REDUCTION [qout/qin](%)= 10.57
TIME SHIFT OF PEAK FLOW (min)=115.00
MAXIMUM STORAGE USED (ha.m.)= 0.1111

 ** SIMULATION:03 - 10yr 3hr 10min Chicago **

RESERVOIR(0602)		OVERFLOW IS OFF			
IN= 2--> OUT= 1		OUTFLOW	STORAGE	OUTFLOW	STORAGE
DT= 5.0 min		(cms)	(ha.m.)	(cms)	(ha.m.)
		0.0000	0.0000	0.3110	0.3824
		0.1830	0.3050	0.0000	0.0000

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0202)	7.750	0.771	1.00	25.34
OUTFLOW: ID= 1 (0602)	7.750	0.082	2.92	25.28

PEAK FLOW REDUCTION [qout/qin](%)= 10.67
TIME SHIFT OF PEAK FLOW (min)=115.00
MAXIMUM STORAGE USED (ha.m.)= 0.1371

 ** SIMULATION:04 - 25yr 3hr 10min Chicago **

RESERVOIR(0602)		OVERFLOW IS OFF			
IN= 2--> OUT= 1		OUTFLOW	STORAGE	OUTFLOW	STORAGE
DT= 5.0 min		(cms)	(ha.m.)	(cms)	(ha.m.)
		0.0000	0.0000	0.3110	0.3824
		0.1830	0.3050	0.0000	0.0000

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0202)	7.750	0.963	1.00	31.80
OUTFLOW: ID= 1 (0602)	7.750	0.103	2.83	31.74

PEAK FLOW REDUCTION [qout/qin](%)= 10.74
TIME SHIFT OF PEAK FLOW (min)=110.00
MAXIMUM STORAGE USED (ha.m.)= 0.1723

 ** SIMULATION:05 - 50yr 3hr 10min Chicago **

RESERVOIR(0602)		OVERFLOW IS OFF			
IN= 2--> OUT= 1		OUTFLOW	STORAGE	OUTFLOW	STORAGE
DT= 5.0 min		(cms)	(ha.m.)	(cms)	(ha.m.)
		0.0000	0.0000	0.3110	0.3824
		0.1830	0.3050	0.0000	0.0000

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0202)	7.750	1.110	1.00	36.71
OUTFLOW: ID= 1 (0602)	7.750	0.119	2.83	36.65

PEAK FLOW REDUCTION [qout/qin](%)= 10.75
TIME SHIFT OF PEAK FLOW (min)=110.00
MAXIMUM STORAGE USED (ha.m.)= 0.1990

 ** SIMULATION:06 - 100yr 3hr 10min Chicago **

RESERVOIR(0602)		OVERFLOW IS OFF			
IN= 2--> OUT= 1		OUTFLOW	STORAGE	OUTFLOW	STORAGE
DT= 5.0 min		(cms)	(ha.m.)	(cms)	(ha.m.)
		0.0000	0.0000	0.3110	0.3824
		0.1830	0.3050	0.0000	0.0000

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0202)	7.750	1.501	1.00	41.75
OUTFLOW: ID= 1 (0602)	7.750	0.136	2.75	41.70

PEAK FLOW REDUCTION [qout/qin](%)= 9.06
TIME SHIFT OF PEAK FLOW (min)=105.00
MAXIMUM STORAGE USED (ha.m.)= 0.2267

 ** SIMULATION:07 - 2yr 24hr 15min SCS Type II (MTO) **

RESERVOIR(0602)		OVERFLOW IS OFF			
IN= 2--> OUT= 1		OUTFLOW	STORAGE	OUTFLOW	STORAGE
DT= 5.0 min		(cms)	(ha.m.)	(cms)	(ha.m.)
		0.0000	0.0000	0.3110	0.3824
		0.1830	0.3050	0.0000	0.0000

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0202)	7.750	0.664	12.25	33.31
OUTFLOW: ID= 1 (0602)	7.750	0.078	13.25	33.25

PEAK FLOW REDUCTION [qout/qin](%)= 11.70
TIME SHIFT OF PEAK FLOW (min)= 60.00
MAXIMUM STORAGE USED (ha.m.)= 0.1295

 ** SIMULATION:08 - 5yr 24hr 15min SCS Type II (MTO) **

RESERVOIR(0602)		OVERFLOW IS OFF			
IN= 2--> OUT= 1		OUTFLOW	STORAGE	OUTFLOW	STORAGE
DT= 5.0 min		(cms)	(ha.m.)	(cms)	(ha.m.)
		0.0000	0.0000	0.3110	0.3824
		0.1830	0.3050	0.0000	0.0000

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0202)	7.750	1.004	12.25	48.81
OUTFLOW: ID= 1 (0602)	7.750	0.115	13.17	48.75

PEAK FLOW REDUCTION [qout/qin](%)= 11.48
TIME SHIFT OF PEAK FLOW (min)= 55.00
MAXIMUM STORAGE USED (ha.m.)= 0.1921

 ** SIMULATION:09 - 10yr 24hr 15min SCS Type II (MTO) **

```

RESERVOIR( 0602)
IN= 2--> OUT= 1
DT= 5.0 min
OVERFLOW IS OFF
  
```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.3110	0.3824
0.1830	0.3050	0.0000	0.0000

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
7.750	1.245	12.25	59.46
7.750	0.141	13.17	59.40

INFLOW : ID= 2 (0202)
 OUTFLOW: ID= 1 (0602)

PEAK FLOW REDUCTION [qout/qin](%)= 11.35
 TIME SHIFT OF PEAK FLOW (min)= 55.00
 MAXIMUM STORAGE USED (ha.m.)= 0.2356

 ** SIMULATION:25mm 4-hr CHI **

```

RESERVOIR( 0602)
IN= 2--> OUT= 1
DT= 5.0 min
OVERFLOW IS OFF
  
```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.3110	0.3824
0.1830	0.3050	0.0000	0.0000

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
7.750	0.237	1.50	9.62
7.750	0.029	3.83	9.56

INFLOW : ID= 2 (0202)
 OUTFLOW: ID= 1 (0602)

PEAK FLOW REDUCTION [qout/qin](%)= 12.11
 TIME SHIFT OF PEAK FLOW (min)=140.00
 MAXIMUM STORAGE USED (ha.m.)= 0.0478

 ** SIMULATION:10 - 25yr 24hr 15min SCS Type II (MTO) **

```

RESERVOIR( 0602)
IN= 2--> OUT= 1
DT= 5.0 min
OVERFLOW IS OFF
  
```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.3110	0.3824
0.1830	0.3050	0.0000	0.0000

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
7.750	1.749	12.25	73.60
7.750	0.176	13.08	73.54

INFLOW : ID= 2 (0202)
 OUTFLOW: ID= 1 (0602)

PEAK FLOW REDUCTION [qout/qin](%)= 10.09
 TIME SHIFT OF PEAK FLOW (min)= 50.00
 MAXIMUM STORAGE USED (ha.m.)= 0.2942

 ** SIMULATION:11 - 50yr 24hr 15min SCS Type II (MTO) **

```

RESERVOIR( 0602)
IN= 2--> OUT= 1
DT= 5.0 min
OVERFLOW IS OFF
  
```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.3110	0.3824
0.1830	0.3050	0.0000	0.0000

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
7.750	2.027	12.25	84.17
7.750	0.231	12.92	84.11

INFLOW : ID= 2 (0202)
 OUTFLOW: ID= 1 (0602)

PEAK FLOW REDUCTION [qout/qin](%)= 11.41
 TIME SHIFT OF PEAK FLOW (min)= 40.00
 MAXIMUM STORAGE USED (ha.m.)= 0.3344

 ** SIMULATION:12 - 100yr 24hr 15min SCS Type II (MTO) **

```

RESERVOIR( 0602)
IN= 2--> OUT= 1
DT= 5.0 min
OVERFLOW IS OFF
  
```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.3110	0.3824
0.1830	0.3050	0.0000	0.0000

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
7.750	2.312	12.25	94.90
7.750	0.293	12.92	94.85

INFLOW : ID= 2 (0202)
 OUTFLOW: ID= 1 (0602)

PEAK FLOW REDUCTION [qout/qin](%)= 12.69
 TIME SHIFT OF PEAK FLOW (min)= 40.00
 MAXIMUM STORAGE USED (ha.m.)= 0.3722

SWM Pond #1 - Water Quality Requirements

Project Details

772082 Highway 10, Dundalk	425018
----------------------------	--------

Prepared By

LJC	February 5, 2026
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Water Quality Sizing Criteria

Methodology & Data Source	Volumetric water quality criteria as presented in Table 3.2 in Ministry of Environment, Conservation and Parks (MECP) Stormwater Management Planning & Design Manual (SWMPDM) March 2003.
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Contributing Catchments

Catchment ID	Area (ha)	Impervious (%)
201	16.45	58%
EXT-1	11.40	0%
Total	27.85	34.3%

Treatment Method Details

SWM Facility Type	Wet Pond
Target Treatment Level	Enhanced Level
Treatment Percentage	80%

Treatment Requirements

Water Quality Storage Requirement	3,829 m ³
Extended Detention Volume (40 m³)	1,114 m ³
Permanent Pool Volume Required	2,715 m ³
25 mm Storm Runoff Depth	8 mm
25 mm Storm Runoff Volume	2,189 m ³
Required Extended Detention Volume	2,189 m ³
Erosion Control Storage Required	3,342 m ³

SWM Pond #2 - Water Quality Requirements

Project Details

772082 Highway 10, Dundalk	425018
----------------------------	--------

Prepared By

LJC	February 5, 2026
-----	------------------

Water Quality Sizing Criteria

Methodology & Data Source	Volumetric water quality criteria as presented in Table 3.2 in Ministry of Environment, Conservation and Parks (MECP) Stormwater Management Planning & Design Manual (SWMPDM) March 2003.
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Contributing Catchments

Catchment ID	Area (ha)	Impervious (%)
202	7.75	52%
Total	7.75	52.0%

Treatment Method Details

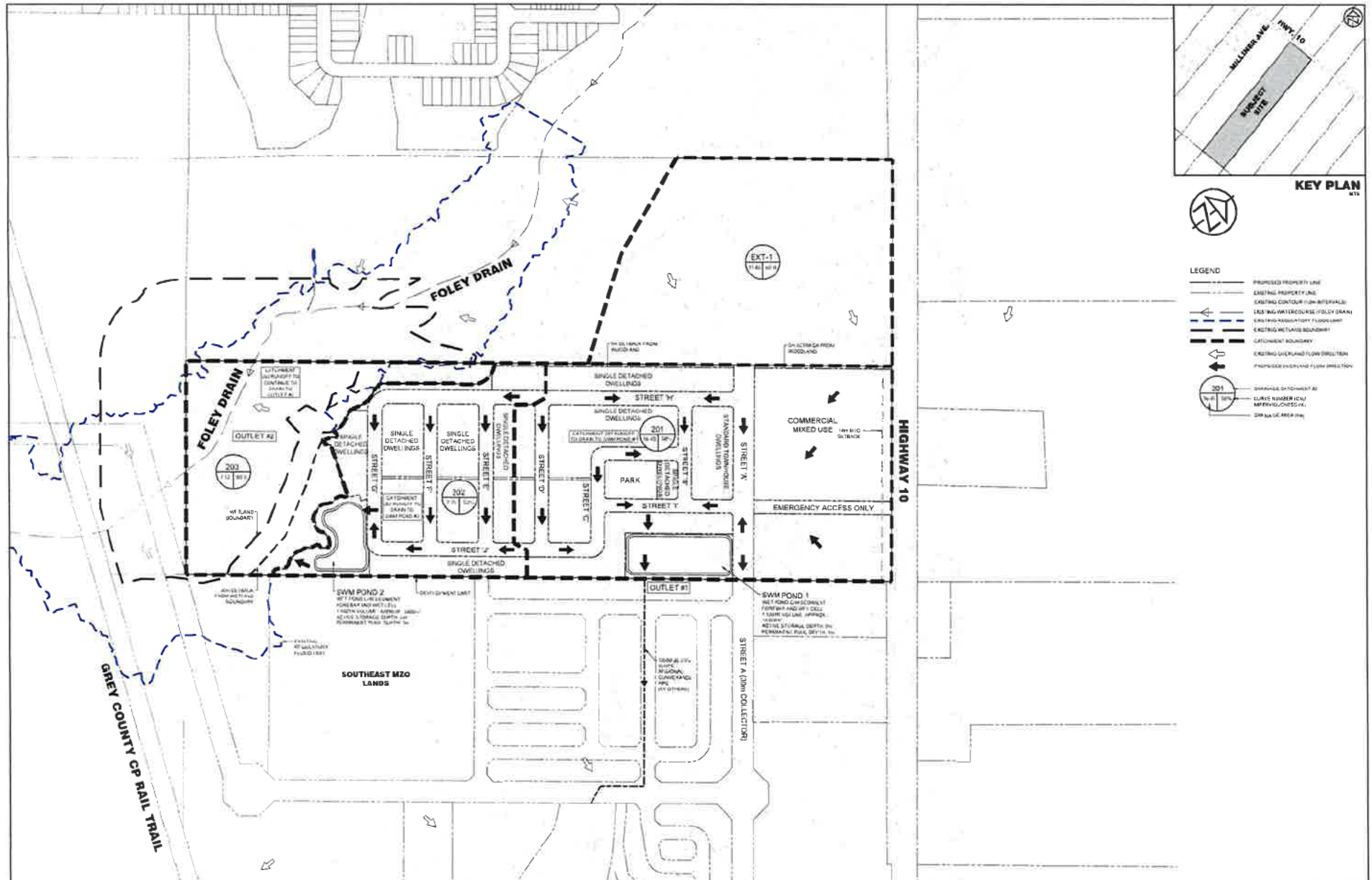
SWM Facility Type	Wet Pond
Target Treatment Level	Enhanced Level
Treatment Percentage	80%

Treatment Requirements

Water Quality Storage Requirement	1,414 m ³
Extended Detention Volume (40 m³)	310 m ³
Permanent Pool Volume Required	1,104 m ³
25 mm Storm Runoff Depth	10 mm
25 mm Storm Runoff Volume	741 m ³
Required Extended Detention Volume	741 m ³
Erosion Control Storage Required	775 m ³

Appendix E: Drawings





KEY PLAN



LEGEND

- PROPOSED PROPERTY LINE
- EXISTING PROPERTY LINE
- EXISTING CONTOUR FLOW INTERVAL
- EXISTING WATERCOURSE (FOLEY DRAIN)
- EXISTING ROAD/TOP OF FLOODWAY
- EXISTING UTILITY BOUNDARY
- CATCHMENT BOUNDARY
- EXISTING OVERLAND FLOW DIRECTION
- PROPOSED OVERLAND FLOW DIRECTION
- CATCHMENT AREA
- CURVE NUMBER (M) APPROXIMATE
- SWM AREA (M²)

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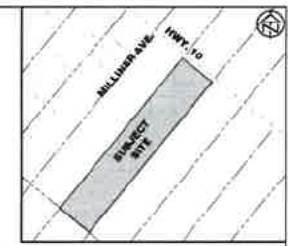
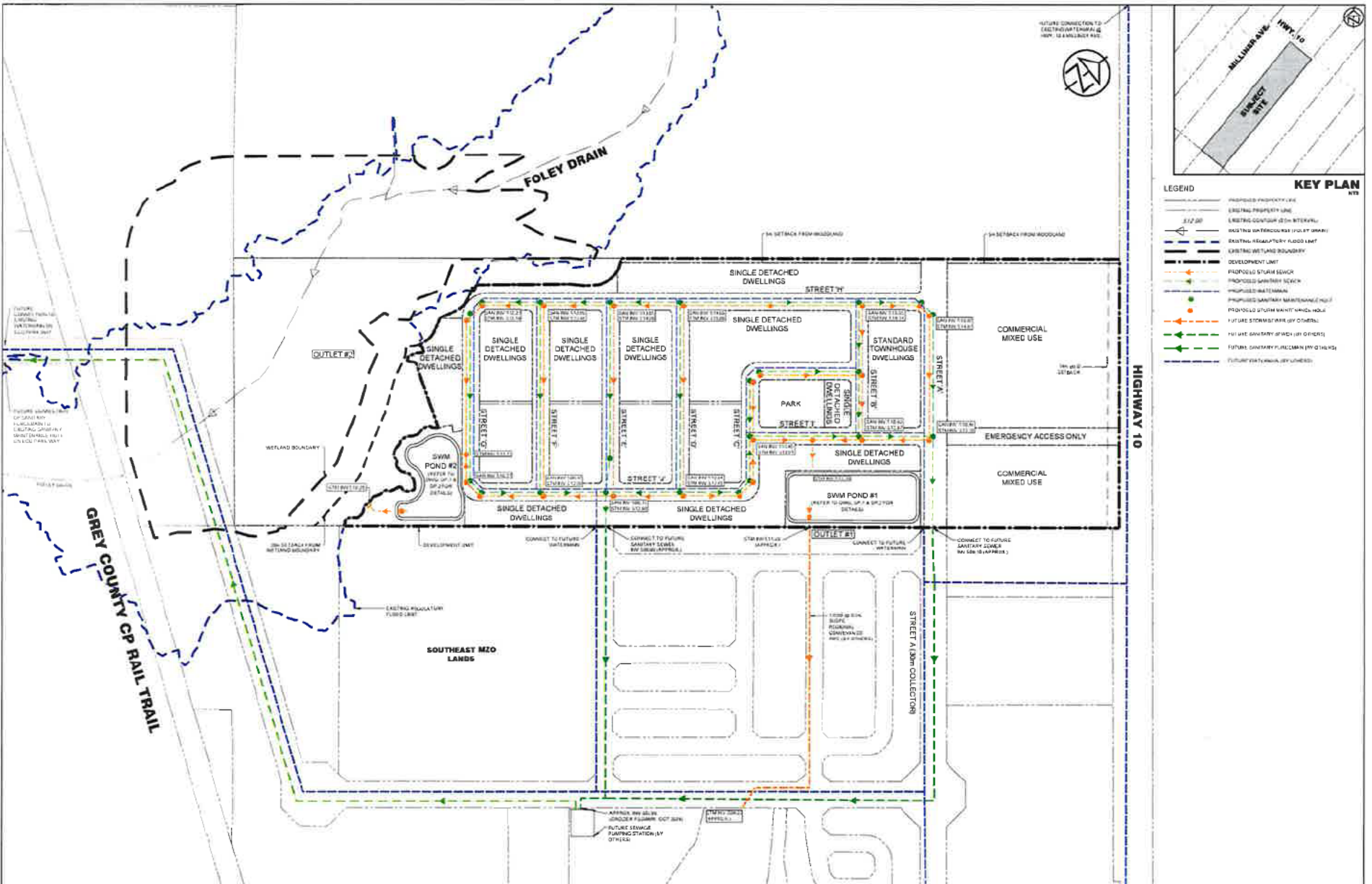
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772082 HIGHWAY 10 VILLAGE OF BUNDALA

POST-DEVELOPMENT DRAINAGE PLAN

TATHAM ENGINEERING

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DRAWN: LM	DATE: FEB 2024	
CHECKED: MB	SCALE: 1:1	



- LEGEND**
- PROPOSED PROPERTY LINE
 - EXISTING PROPERTY LINE
 - PROPOSED STORM SEWER
 - PROPOSED SANITARY SEWER
 - PROPOSED WATER MAIN
 - PROPOSED SANITARY MANHOLE
 - PROPOSED STORM MANHOLE
 - FUTURE SANITARY MANHOLE (BY OTHERS)
 - FUTURE STORM MANHOLE (BY OTHERS)
 - FUTURE SANITARY FORCE MAIN (BY OTHERS)
 - FUTURE WATER MAIN (BY OTHERS)
 - PROPOSED EASEMENT
 - EXISTING REGULATORY FLOOD LIMIT
 - EXISTING WETLAND BOUNDARY
 - DEVELOPMENT LIMIT
 - EXISTING WATERCOURSE (ON INTERIOR)
 - EXISTING WATERCOURSE (ON EXTERIOR)
 - 5:12:00
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**772082 HIGHWAY 10
 VILLAGE OF DUNDALK**

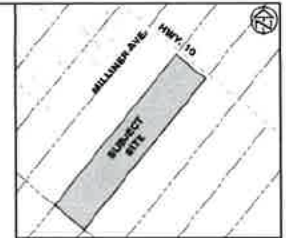
PRELIMINARY MASTER SERVICING PLAN

TATHAM
 ENGINEERING

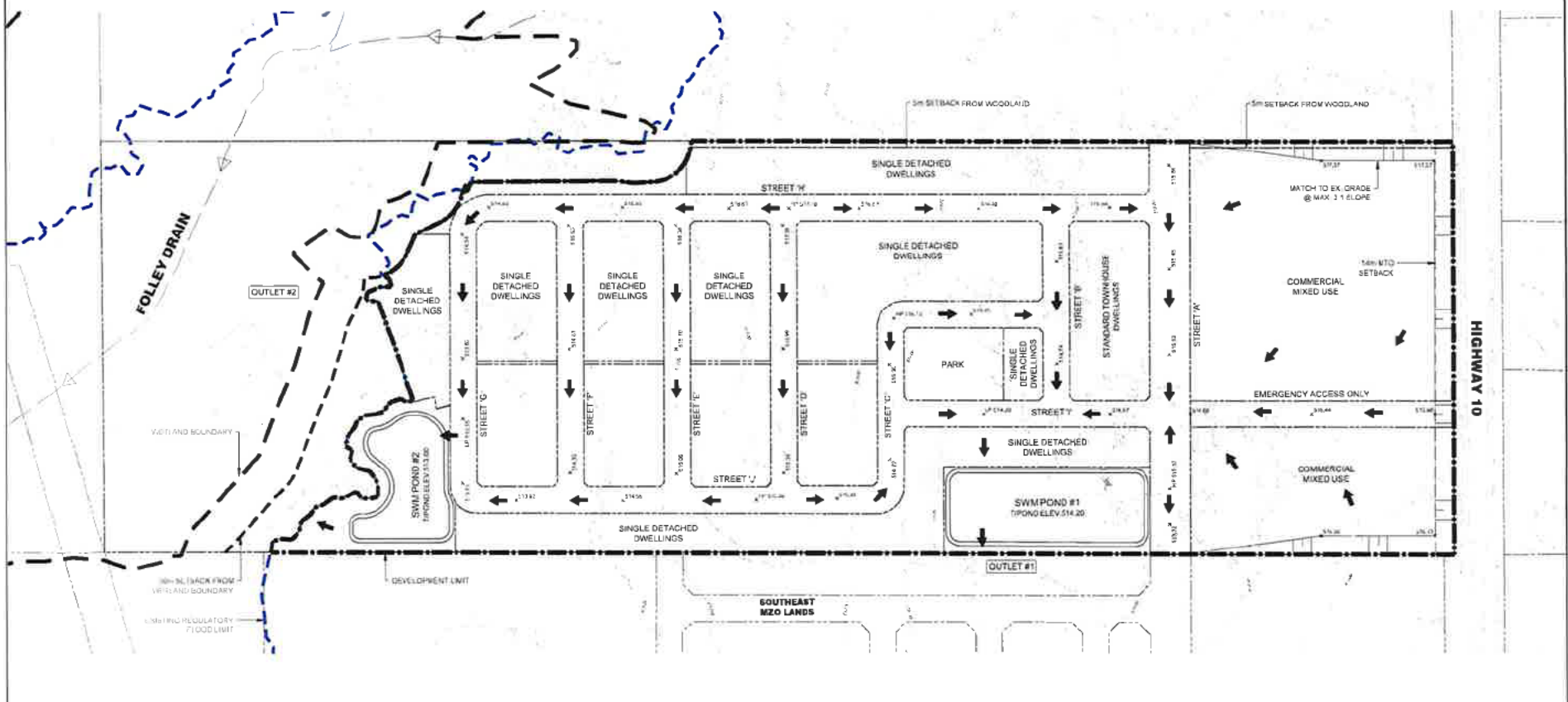
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CHECK: WJ	DATE: FEB 2024		
CHECK: WJ	SCALE: 1"=20'		

LEGEND

- PROPOSED PROPERTY LINE
- EXISTING PROPERTY LINE
- PROPOSED RIGHT-OF-WAY BOUNDARY
- EXISTING RIGHT-OF-WAY BOUNDARY
- PROPOSED EASEMENT BOUNDARY
- EXISTING EASEMENT BOUNDARY
- PROPOSED FLOOD LIMIT
- EXISTING FLOOD LIMIT
- PROPOSED WETLAND BOUNDARY
- EXISTING WETLAND BOUNDARY
- PROPOSED ROAD CENTERLINE
- EXISTING ROAD CENTERLINE
- PROPOSED ROAD RIGHT-OF-WAY BOUNDARY
- EXISTING ROAD RIGHT-OF-WAY BOUNDARY



KEY PLAN
074



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**772082 HIGHWAY 10
 VILLAGE OF DUNDALK**

PRELIMINARY GRADING PLAN

TATHAM ENGINEERING

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