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430 Raglan Street

FUNCTIONAL SERVICING & STORMWATER MANAGEMENT REPORT

Tin Shack Ltd.

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Issue	Date	Description
1	August 24, 2026	Final Report

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1 Introduction

Tatham Engineering Limited has been retained to prepare a *Functional Servicing & Stormwater Management Report* in support of the development of 430 Raglan Street in the Town of Collingwood, Simcoe County. The property is located on the west side of Raglan Street approximately 100 m south of the intersection of Raglan Street and Ron Emo Drive. The lot is described as Parts 3, 4 and 5 of Plan 51R-41297, Plan of Survey of Part of the West Half of Lot 41, Concession 7 and Part of Lot 41, Concession 8, Formerly Township of Nottawasaga) Town of Collingwood, County of Simcoe. The site is bounded by Raglan Street to the east, the Pretty River to the west, industrial land to the north and agricultural land to the south. The property is within the Nottawasaga Valley Conservation Authority (NVCA) watershed.

1.1 REPORT OBJECTIVE

The objective of this report is to address the servicing requirements of the Town of Collingwood, Simcoe County, and the NVCA with respect to sanitary servicing, water supply and distribution, and stormwater management (SWM). In particular, the following topics are discussed:

- The domestic water and fire flow demands of the proposed development;
- The sanitary flows from the proposed development; and
- Stormwater management of the proposed development.

1.2 BACKGROUND DOCUMENTS

This report was prepared recognizing provincial guidelines on water resources and the environment and background documents, including the following publications:

- The Ministry of the Environment, Conservation and Parks (MECP) Stormwater Management Practices Planning and Design Manual (2003);
- MECP Design Guidelines for Drinking Water Systems (2008);
- Credit Valley Conservation (CVC) and Toronto and Region Conservation Authority (TRCA), *Low Impact Development Stormwater Management Planning and Design Guide* (2010);
- 410 Raglan Street Geotechnical Investigation. Soil Engineers Ltd. (February 2019);
- Nottawasaga Valley Conservation Authority, Stormwater Technical Guide (2013);
- Amended Town of Collingwood Development Standards (2022); and
- Ontario Building Code (2024).



2 Development Site

2.1 EXISTING CONDITIONS

The property is approximately 2.21 ha in area and is vacant; the property is zoned industrial M-2. The site is overgrown with mixed vegetation, including areas of open field and wooded sections. The property includes a small portion of the Pretty River and its east dike. The site slopes to the west and site drainage outlets via an existing covert near the southwest corner of the site to the Pretty River.

2.2 SUBSURFACE CONDITIONS

Ontario Soil Survey Report No. 29 (Simcoe County North) defines the site soils to be Sargent sand loam (Stsl).

A geotechnical investigation prepared for the neighbouring 410 Raglan Street property (Soil Engineers Ltd., February 2019) observed a high groundwater table (0.3–0.8 m below ground level) and a low soil permeability rate (10^{-7} cm/s). Similar conditions are assumed for the 430 Raglan Street site.

2.3 PROPOSED DEVELOPMENT

The proposal for this site is to develop a 4,060 m² warehouse facility with a 1,580 m² mezzanine and associated driveway, loading docks, and parking areas.



3 Water Supply

3.1 EXISTING INFRASTRUCTURE

An existing 300 mm diameter watermain is located along the west side of Raglan Street fronting the site. There are two existing fire hydrants at each corner of the property along Raglan Street.

3.2 WATER DEMANDS ASSESSMENT

Water supply demands for the proposed development were calculated based on the warehouse design use outlined in Ontario Building Code Table 8.2.1.3.-B (2024). The supporting water demand calculations are included in Appendix A and summarized below.

- Average Day Demand - 4.70 m³/day
- Maximum Day Demand - 9.40 m³/day
- Maximum Day Plus Fire Flow Demand - 108.11 L/s
- Peak Hour Demand - 0.22 L/s

Based on Average Day Demand, the average day SDU equivalent water demand for the development is 4,700 L/day / 260 L/cap/day / 2.9 cap/SDU = 6.2 SDU

Based on Maximum Day Demand, the maximum day SDU equivalent water demand for the development is 9,400 L/day / 260 L/cap/day / 1.77 MDD/ADD / 2.9 cap/SDU = 7.0 SDU

3.2.1 Fire Flow Demands

A sprinkler sizing report was prepared by Heritage Sprinkler Design and is included in Appendix A for reference. The report confirms that the required fire flow for the system is 1,706.2 GPM (108 L/s), including the required hose stream allowance. To achieve the required fire flow at appropriate pressure for the sprinkler system, on-site fire pumping is required as the fire hydrant flow test completed for sprinkler sizing showed a residual pressure of 46 psi in the municipal watermain near the building.

3.3 PROPOSED INFRASTRUCTURE

A 250 mm diameter water service connection will be made to the existing 300 mm diameter watermain on Raglan Street. The 250 mm diameter water service will split into a 250 mm diameter fire service and a 50 mm diameter domestic service at the property line. Fire protection will be provided by a combination of the existing fire hydrants and an automatic sprinkler system.



A calculation included in Appendix A shows that the proposed 50 mm domestic water service is sufficient to service the proposed building in accordance with OBC.



4 Wastewater Servicing

4.1 EXISTING INFRASTRUCTURE

Raglan Street was recently upgraded through the Raglan Street local improvement project. This included the installation of a 300 mm sanitary sewer along Raglan Street with an outlet to the existing sewer on Hume Street.

4.2 WASTEWATER GENERATION ASSESSMENT

Wastewater generation for the proposed development was calculated based on the warehouse design use outlined in Ontario Building Code Table 8.2.1.3.-B (2024). The supporting wastewater generation calculations are included in Appendix B and summarized below.

- Average Day Flow - 4.70 m³/day
- Peak Flow - 0.31 L/s

Based on Average Day flow, the average day SDU equivalent wastewater flow for the development is 4,700 L/day / 260 L/cap/day / 2.9 cap/SDU = 6.2 SDU

4.3 PROPOSED INFRASTRUCTURE

A 150 mm diameter sanitary service connection will be made to the existing 300 mm diameter sanitary sewer on Raglan Street. A calculation of the sanitary service capacity has been prepared and is provided in Appendix B.

A calculation included in Appendix B shows that the proposed 150 mm wastewater service is sufficient to service the proposed building in accordance with OBC.



5 Stormwater Management

5.1 EXISTING CONDITIONS

The topography, ground cover, land use, and drainage patterns of the site were assessed using topographic maps, aerial photography, and a site survey. The Existing Condition Drainage Plan (Drawing DP.1), included at the end of this report, provides a visual reference for this section.

This stormwater analysis focuses on the proposed development area east of the Pretty River, covering 2.04 hectares and designated as Catchment 101 on Drawing DP.1. Drainage from Catchment 101 drains overland to the southwest corner of the site where it outlets via an existing 300 mm diameter culvert through the Pretty River Dike to the Pretty River. Catchment 101 excludes the portion of the property on the bank of the Pretty River that drains directly to the river and will not be affected by the proposed development.

To quantify existing runoff rates, a Rational Method calculation was prepared, with details on runoff coefficients, and calculations provided in Appendix C. Peak flow values for Catchment 101 are summarized in Table 1.

Table 1: Existing Condition Peak Flow Rates

STORM	Peak Runoff Flow Rate Catchment 101 (m ³ /s)
1:2-year	0.111
1:5-year	0.145
1:10-year	0.168
1:25-year	0.216
1:50-year	0.260
1:100-year	0.298

5.2 STORMWATER MANAGEMENT PLAN

The following stormwater management plan has been developed to mitigate impacts from the proposed development on local water resources.

5.2.1 Design Criteria

The proposed Stormwater Management (SWM) plan must adhere to the following design criteria:



- **Runoff Control:** The plan must maintain existing stormwater runoff rates for 1:2-year through 1:100-year design storms.
- **Water Quality Treatment:** The SWM plan must meet Level 1 “Enhanced” treatment standards as per Provincial regulations, ensuring 80% total suspended solids (TSS) removal.
- The high groundwater table and low soil permeability rate reported in the Geotechnical Investigation makes achieving the NVCA volume control criteria to retain the first 5 mm of any storm event on-site impractical. As a best effort, all runoff from impervious surfaces will be directed to the wet swale and vegetated filter strip to provide opportunity for infiltration or evapotranspiration.

5.2.2 Stormwater Management Controls

Low Impact Development (LID) strategies will be implemented to manage both water quality and quantity for site runoff. The primary LID facility will be a centralized wet swale, serving as the main control mechanism for water quality and quantity. Preliminary water quality treatment will be provided by a vegetative filter strip immediately upstream of the proposed wet swale. Discharge from the rooftop will flow to the wet swale via an overland swale. The overland swale will provide water quality treatment through attenuation and filtration of the storm flows however, runoff from the rooftop is considered clean and does not require water quality treatment.

The proposed wet swale will have a bottom elevation of 189.60 m and a top elevation of 190.90 m. Its outlet structure will consist of a perforated riser outlet connected to a 300 mm diameter reverse-graded outlet pipe, with an outlet invert elevation of 189.90 m and a 275 mm diameter orifice plate. The outlet pipe will discharge to a ditch lined with riprap directing flow the existing 300 mm diameter culvert, matching existing conditions. Additionally, if the wet swale storage capacity is exceeded, the swale will feature a spillway weir outlet with a sill elevation of 190.60 m. The system is designed to drain to the Pretty River west of the site via an existing culvert at the southwest corner of the property, maintaining the existing hydrologic regime under proposed drainage conditions.

The engineering plans, provided under separate cover, illustrate the proposed LID systems. Overall, the wet swale facility will offer approximately 151 m³ of dead storage and 554 m³ of extended detention storage. Detailed volume and discharge calculations can be found in Appendix C of this report.

5.2.3 Proposed Drainage Conditions

The Proposed Condition Drainage Plan (Drawing DP.2) is provided at the end of this report and should be referenced when reviewing this section.



Catchment 201 covers approximately 1.54 hectares and includes the proposed warehouse and parking lot. Runoff from the parking lot will drain overland to the wet swale, first passing through a vegetative filter strip for pre-treatment to enhance water quality and quantity control. Runoff from the roof of the warehouse will be directed to a grassed swale draining to the wet swale. Runoff from the roof is considered clean and does not require water quality treatment. Stormwater will outlet from the wet swale to a ditch lined with riprap to the existing culvert at the southwest corner of the property.

Catchment 202 covers approximately 0.50 hectares at the west extent of the site and consists of an existing area that will remain vegetated under proposed conditions. As the land use in this catchment will remain the same post-development, runoff from this area will not require water quality and quantity control. The catchment will drain uncontrolled overland to the existing site outlet.

5.2.4 Water Quantity Control

The proposed stormwater management measures, outlined in Section 5.2.2, are designed to attenuate proposed flows to match existing peak flow rates.

To validate this approach, an analysis was conducted using the Modified Rational Method to quantify storage volume and peak flows.

Detailed calculations for the runoff coefficient of the proposed drainage catchments, along with the Modified Rational Method analysis, are provided in Appendix C for reference. A summary of controlled flow, wet swale storage volume, uncontrolled flow, and total peak runoff flows is presented in Table 2.



Table 2: Proposed Condition Peak Flow Rates

DESIGN STORM	PEAK FLOW (CONTROLLED) CATCHMENT 201 (m ³ /s)	WET SWALE STORAGE VOLUME (m ³)	STAGE (m)	TOTAL RUNOFF/ PEAK FLOW CATCHMENTS 201 + 202 (m ³ /s)
1:2-year	0.057	177	190.16	0.084 (0.111)
1:5-year	0.076	226	190.24	0.112 (0.145)
1:10-year	0.085	267	190.29	0.126 (0.168)
1:25-year	0.099	361	190.40	0.152 (0.216)
1:50-year	0.112	458	190.50	0.176 (0.260)
1:100-year	0.123	534	190.59	0.196 (0.298)

Note: (0.066) denotes existing condition peak flow

As demonstrated in Table 2, the proposed SWM plan controls proposed condition runoff peak flows to existing condition rates for the 1:2 through 1:100-year frequency storms.

Flows exceeding the 1:100-year return frequency storm will be conveyed overland to the site outlet.

5.2.5 Water Quality Control

The wet swale will function similarly to a wetland stormwater management (SWM) facility, providing water quality control to Catchment 201. Referring to Table 3.2 of the MECP *Stormwater Management Practices Planning and Design Manual* (2003), for a 70% impervious catchment, a wetland storage volume of 120 m³/ha is required to achieve enhanced-level water quality treatment. Of this volume, 40 m³/ha is extended detention storage, and the remaining 80 m³/ha is permanent pool storage. Consequently, to meet enhanced-level water quality standards, the wet swale must provide 185 m³ of storage volume (1.54 ha × 120 m³/ha): 62 m³ of extended detention and 123 m³ of permanent pool storage.

The wet swale facility will provide 554 m³ of extended detention storage and 151 m³ of permanent pool storage, exceeding the required volume for enhanced-level water quality control, corresponding to 80% TSS removal.



Although additional water quality treatment is not required for Catchment 201, the vegetative filter strip upstream of the wet swale will provide pre-treatment for runoff, achieving total suspended solids (TSS) removal between 20% and 80%, as outlined by the Sustainable Technologies Evaluation Program.

The entirety of Catchment 202 will remain as existing and not require any water quality treatment measures.

5.3 WATER BUDGET

Pre-development and post-development water budgets were tabulated for the site using Canadian Climate Normals (1981–2010) data for the nearest station in Thornbury. The estimated pre-development annual infiltration volume for the site is 3,261 m³/yr. The estimated post-development annual infiltration volume without mitigation was calculated to be 1,307 m³/yr, resulting in an infiltration deficit of 1,954 m³/yr.

The reported high groundwater table (0.3–0.8 m below ground level) and low soil permeability rate (10⁻⁷ cm/s) limit options for implementing low impact development (LID) measures, such as soakaway pits, on-site. As a best effort to mitigate the infiltration deficit, despite the low soil permeability, the wet swale, vegetated filter strip and grassed swales will provide some amount of infiltration.

Supporting calculations are provided in Appendix C.

5.3.1 Siltation Control & Erosion Control Plan

All construction activities, including topsoil stripping, material stockpiling, and grading operations, will incorporate siltation and erosion control measures.

Erosion and sediment control (ESC) measures will be installed prior to the commencement of earthworks and will be inspected regularly and after rainfall events to confirm proper function. A stabilized construction entrance and mud tracking controls will be maintained as required. ESC measures will remain in place and be maintained until disturbed areas have been permanently stabilized (e.g., topsoiled, seeded/sodded, or otherwise protected).

To minimize erosion, sedimentation, and their potential environmental impacts, the following principles will be strictly followed:

- Limit disturbance to the minimum necessary.
- Expose the smallest possible land area to erosion for the shortest possible duration.
- Implement erosion control measures immediately as needed.
- Establish sediment control measures before construction activities begin.



- Conduct regular inspections of erosion and sediment control measures, making repairs and adjustments as necessary.
- Maintain stormwater control measures through frequent inspections.
- Installing temporary swales and check dams to manage runoff, reduce flow velocities, and promote solid settling.
- Erect silt control fences below grading areas to contain sediment movement.
- Install stone mud mats at the construction entrance to prevent off-site tracking of materials.
- Revegetating disturbed areas to enhance long-term erosion and siltation control.

The proposed grading strategy will be executed to minimize erosion, ensuring that sedimentation facilities effectively manage any erosion that occurs.

5.4 OPERATION AND MAINTENANCE CONSIDERATIONS

To maintain long-term performance of the stormwater management measures, the wet swale and vegetative filter strip should be inspected and maintained by the property owner (or their designated contractor). Typical operation and maintenance activities include the following:

- Inspect the wet swale, vegetative filter strip, and contributing swales seasonally and after major storm events for erosion, standing water issues, sediment accumulation, and debris.
- Maintain healthy vegetation (e.g., mowing of the filter strip as appropriate, re-seeding/replanting bare areas, and managing invasive species) to preserve treatment performance and slope stability.
- Remove sediment buildup at inlets, within the vegetative filter strip, and within the wet swale as required to maintain flow conveyance and storage capacity.
- Inspect the outlet structure (including perforated riser and orifice plate) and level spreader for blockage, damage, and scour; clean and repair as needed.
- Confirm that overland flow routes and spillway/weir features remain unobstructed and are not altered by grading changes, landscaping, or snow storage.
- Dispose of removed sediment and debris off-site in accordance with applicable regulations.



6 Transportation

A separate report, titled *430 Raglan Street Transportation Impact Brief*, has been prepared by Tatham Engineering to review the traffic impacts associated with the proposed development. The key points of the Transportation Impact Brief are as follows:

- The proposed development is expected to generate 7 new trips during the weekday AM peak hour and 9 new trips during the weekday PM peak hour.
- The intersections analyzed will provide excellent operations through the 2032 horizon (largely LOS A or B). Based on the resulting operations, no road network improvements are proposed.
- Given the limited traffic volumes on Raglan Street and trips to be generated from the subject site, exclusive turn lanes on Raglan Street at the site access are not considered necessary, nor would they be warranted.
- Sight lines along Raglan Street at the proposed access location exceed minimum stopping and sight distances.



7 Utilities

Utility servicing for the proposed development is readily available within the existing Raglan Street right-of-way. A brief description related to each utility is provided below.

7.1 HYDRO SERVICING

The Raglan Street right-of-way contains existing overhead Epcor servicing. The proposed industrial building will be connected to the existing Epcor infrastructure within Raglan Street right-of-way. Detailed connection strategies will be provided prior to construction.

7.2 NATURAL GAS

The Raglan Street right-of-way contains an existing natural gas main. The proposed industrial building will be connected to the existing natural gas infrastructure within the Raglan Street right-of-way. Detailed connection strategies will be provided prior to construction.

7.3 COMMUNICATIONS

The Raglan Street right-of-way contains existing Bell and Rogers communication infrastructure. The service providers will be contacted and given the opportunity to connect to the proposed industrial building. Detailed connection strategies will be provided prior to construction.

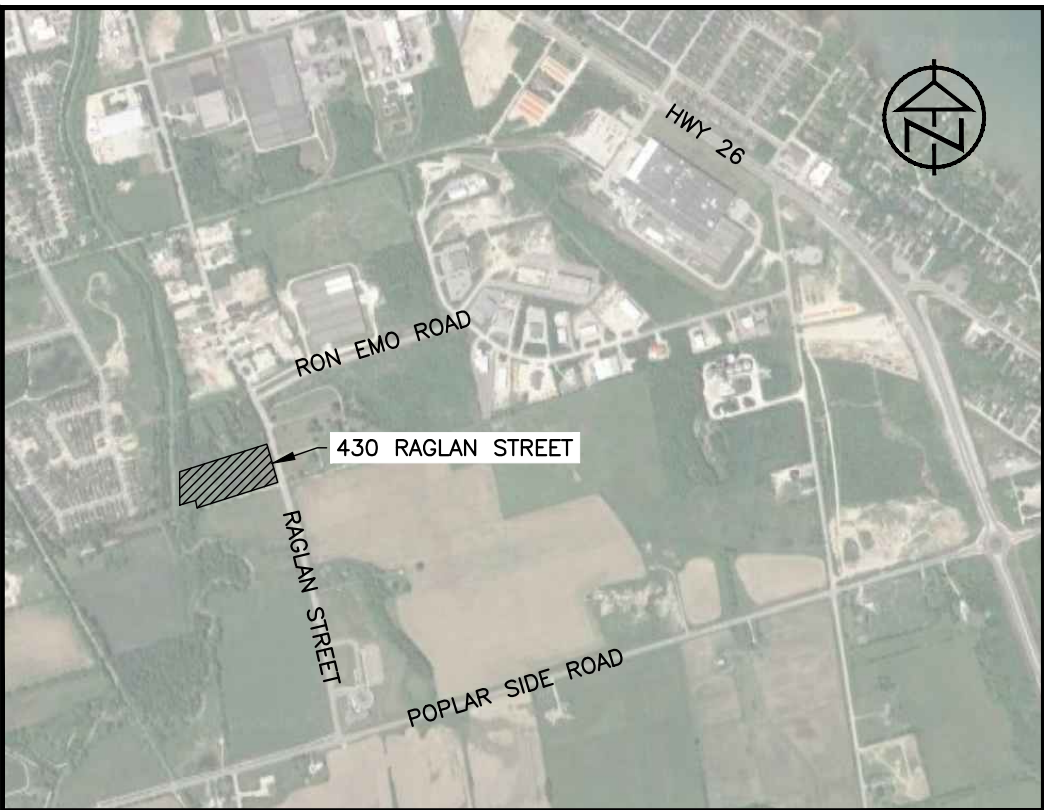
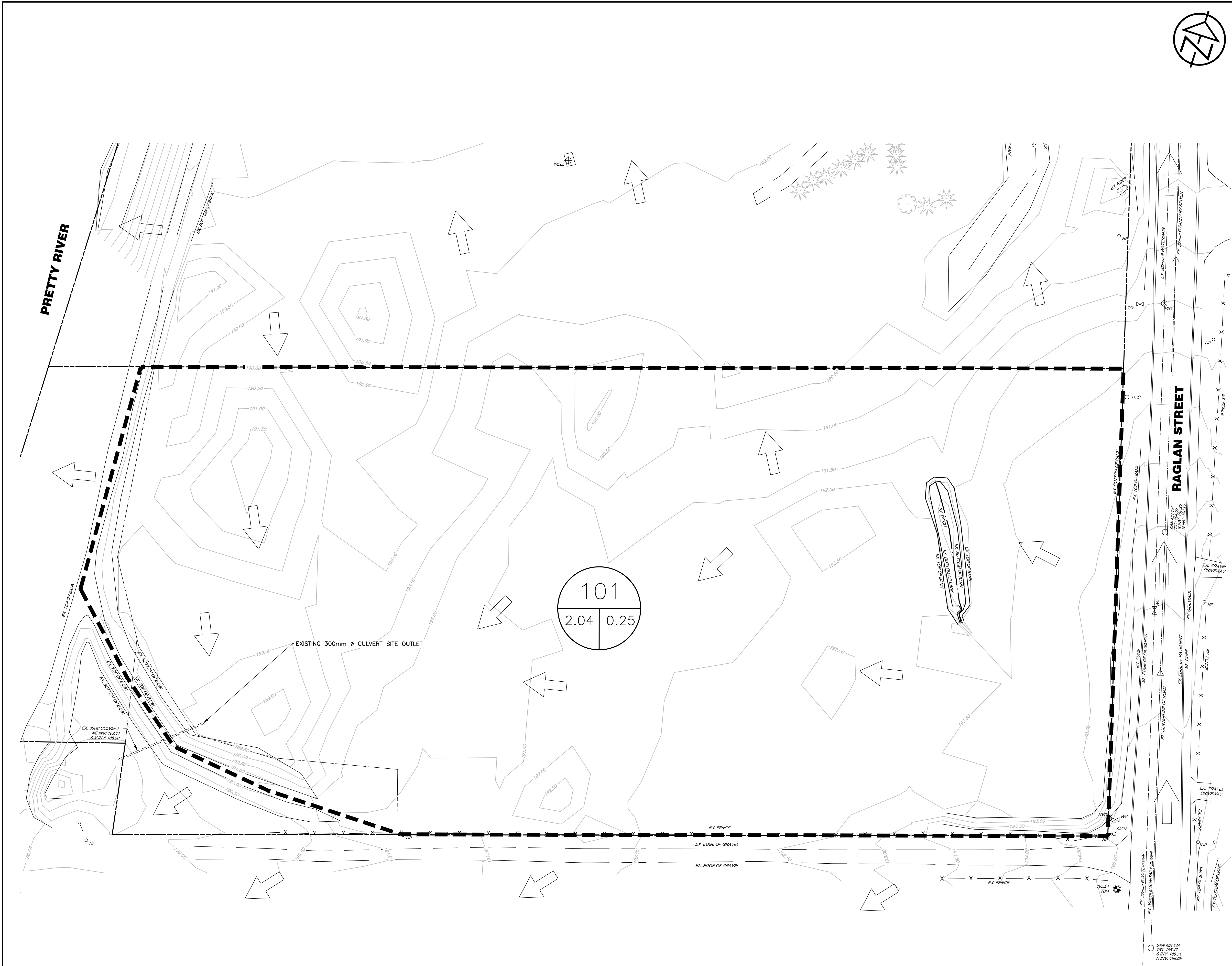


8 Summary

This report outlines the functional servicing and stormwater management (SWM) strategy for the proposed industrial development at 430 Raglan Street. The servicing strategy is summarized as follows:

- Domestic and Fire water servicing will be provided by a 250 mm diameter service connection to the existing 300 mm diameter watermain. The 250 mm diameter service connection will split into a 50 mm diameter domestic service and a 250 mm diameter fire service at the property line.
- Two fire hydrants at the north corners of the property will provide additional fire protection.
- Sanitary servicing will be provided by a 150 mm diameter service connection to the existing 300 mm diameter sanitary main within the Raglan Street right-of-way.
- Low Impact Development (LID) measures, including a wet swale and a vegetated filter strip, will provide enhanced-level water quality control and peak flow attenuation, ensuring the 1:2-year through 1:100-year runoff rates remain at existing levels and providing safe conveyance of the regional storm. The SWM plan will also increase annual infiltration volumes.





KEY PLAN
NTS

LEGEND

CATCHMENT ID 301

AREA IN HECTARES 4.00

% IMPERVIOUS/CN NUMBER 0.70

PRE-DEVELOPMENT CATCHMENT AREA ---

EXISTING OVERLAND FLOW DIRECTION →

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BENCHMARKS

COORDINATES ARE NAD83 UTM17N (CSRS); ELEVATIONS ARE GEODETIC CVD28; DERIVED FROM CANMET GNSS NETWORK.

BM1 - ELEVATION 195.24m
TOP OF SIB ON SE SIDE OF EXISTING GRAVEL DRIVEWAY ON SOUTH SIDE OF SITE.

NOTES

RAGLAN STREET INFRASTRUCTURE INFORMATION TAKEN FROM DRAWING G-2336-PP5 PREPARED BY GREENLAND CONSULTING ENGINEERS DATED JANUARY 11, 2011.

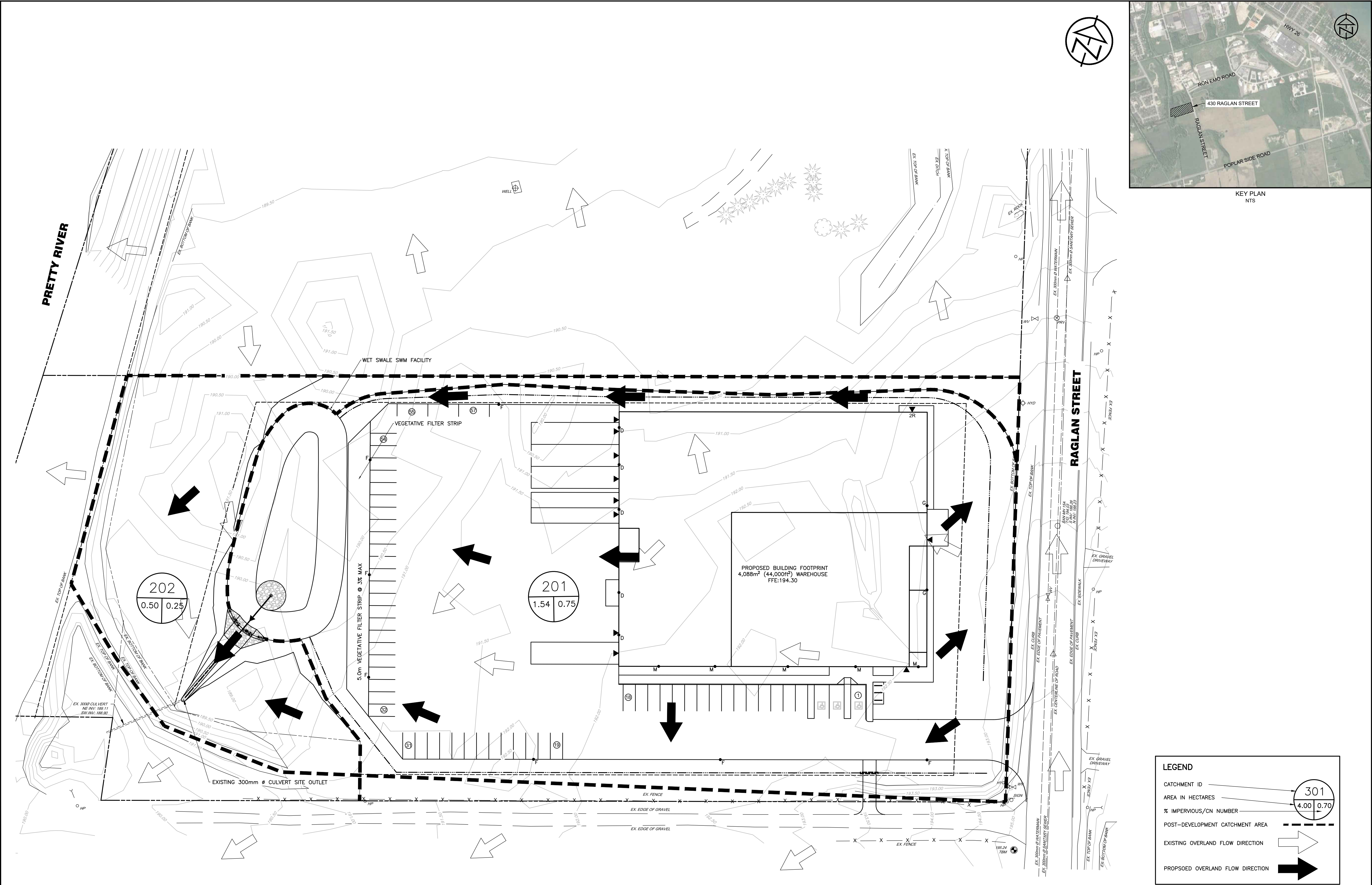
No.	REVISION DESCRIPTION	DATE	ENGINEER STAMP
1.	FIRST SUBMISSION	AUG 2026	

TIN SHACK LTD.
430 RAGLAN STREET
TOWN OF COLLINGWOOD

PRE-DEVELOPMENT
DRAINAGE PLAN



DESIGN: JB/AO	FILE: 118188	DWG:
DRAWN: EJW	DATE: MAR 2026	DP-1
CHECK: AO	SCALE: 1:400	



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			1.	FIRST SUBMISSION	AUG 2026							
							POST-DEVELOPMENT DRAINAGE PLAN			DESIGN: JBA/O CHECK: AO	FILE: 118188 SCALE: 1:400	DWG: DP-2
							DRAWN: EJW	DATE: MAR 2026				

Appendix A: Water Supply Calculations

Project Details

430 Raglan Street	118188
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Prepared By

John Birchard	Aug 21, 2026
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Municipality

Town of Collingwood

Checked By

Andrew Overholt	Aug 21, 2026
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Warehouse Demand

Number of Water Closets * Water Closet Demand

$$= 4 \text{ Water Closet} * 950 \text{ L/day/Water Closet}$$

$$= 3800 \text{ L/day} \quad \textbf{AND}$$

Number of Loading Bays * Loading Bay Demand

$$= 6 \text{ Loading Bays} * 150 \text{ L/day/Loading Bays}$$

$$= 900 \text{ L/day}$$

$$\text{Total Warehouse Demand} = 3800 \text{ L/day} + 900 \text{ L/day}$$

$$= \textbf{4700} \text{ L/day} = \textbf{4.70} \text{ m}^3/\text{day}$$

Commercial/Industrial/ Institutional Flow

Land Use	Warehouse			Total
Average Day Demand (m ³ /day)	4.70			4.70
Reference	Ontario Building Code (2024) Table 8.2.1.3.-B			

Fire Demand

Max Required Fire Demand (L/s)	108
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Based on Sprinkler System Desing by Heritage Sprinkler Design July 15, 2026.

Peaking Factors

Land Use	Warehouse			
Max Day Factor	2.0			
Peak Hour Factor	4.0			
Reference	Peaking Factors from MECP Design Guide for Drinking Water Systems 2008 Secion 3.4.4.			

Total Design Flows

Average Day Demand (m ³ /day)	4.70	Peak Hour Demand (L/s)	0.22
Maximum Day Demand (m ³ /day)	9.40	Maximum Day + Fire Demand (L/s)	108.11

Additional Notes

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Project Details

430 Raglan Street	118188	Prepared By AO	August 21, 2026
Municipality Town of Collingwood		Checked By	

Sanitary Service Sizing

Fixtures	Number	Sanitary Hydraulic Load For Fixture OBC Table 7.4.9.3 (Fixture Units)	Total Sanitary Hydraulic Load (Fixture Units)
Water Closet	4	4	16
Sink	1	1.5	1.5
Dishwasher	1	1	1
		Total	18.5

Notes & References

Per A- Table 7.4.10.5, the maximum probable drainage rate for 19 fixture units is approximately 27 gal/min or 1.7 L/s
Per Table 7.4.10.6.-C, the maximum permitted hydraulic load drained to a horizontal 150 mm (6") sanitary drainage pipe with a 1 in 50 (2%) slope is 840 fixture units. Therefore, the 6" service is sufficient.

Water Service Sizing

Fixtures	Number	Water Hydraulic Load For Fixture OBC Table 7.6.3.2.A and 7.6.3.2.C (Fixture Units)	Total Water Hydraulic Load (Fixture Units)
Water Closet	4	3	12
Kitchen Sink	1	1.4	1.4
Dishwasher	1	1.4	1.4
		Total	14.8

Notes & References

Per OBC Table A-7.6.3.1, a 2" (50mm) service which is +/- 30 m long can service 359 fixture units for system pressure between 46-60psi. The static pressure was measured at 46 psi based on a hydrant flow test prepared for the sprinkler system.



Hydraulic Calculations by HydraCALC

Heritage Sprinkler Design
812 Superior St
Lasalle, ON N9J 3E6
226-787-3436

Job Name : TIN SHACK LTD. - 190'x230' WAREHOUSE
Drawing : FP-3
Location : 430 RAGLAN ST, COLLINGWOOD, ON
Remote Area : ROOF
Contract : 26-243
Data File : CALC-ROOF-ESFR-2.WXF
Date/Time : 07/15/2026 - 09:33 AM

HYDRAULIC CALCULATIONS
for

JOB NAME TIN SHACK LTD. - 190'x230' WAREHOUSE
Location 430 RAGLAN ST, COLLINGWOOD, ON
Drawing # FP-3
Contract # 26-243
Date 7/15/26

DESIGN

Remote area # ROOF
Remote area location ROOF LEVEL
Occupancy classification STORAGE
Density K22.4/40 - Gpm/SqFt
Area of application 12 HDS - SqFt
Coverage/sprinkler 100 MAX - SqFt
Type of sprinkler calculated K-22.4 ESFR
Sprinklers calculated 12
In-rack demand N/A - GPM
Hose streams 250 - GPM
Total water required (including hose streams) 1706.2 - GPM @ 87.4 - Psi
Type of system WET
Volume of system (dry or pre-action) N/A - Gal

WATER SUPPLY INFORMATION

Test date JUL 9, 2026
Location AT SITE
Source of info 46 ST 32 RES 1574 GPM

CONTRACTOR INFO MILLER FIRE PREVENTION

Address WIARTON, ON
Phone # 519-375-7503
Name of designer AA
Authority having jurisdiction COLLINGWOOD
NOTES:

text1(35) - invisible

Water Supply Curve

Heritage Sprinkler Design
TIN SHACK LTD. - 190'x230' WAREHOUSE

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City Water Supply:

C1 - Static Pressure : 46
C2 - Residual Pressure: 32
C2 - Residual Flow : 1574

City Water Adjusted to Pump Inlet for Pf - Elev - Hose Flow

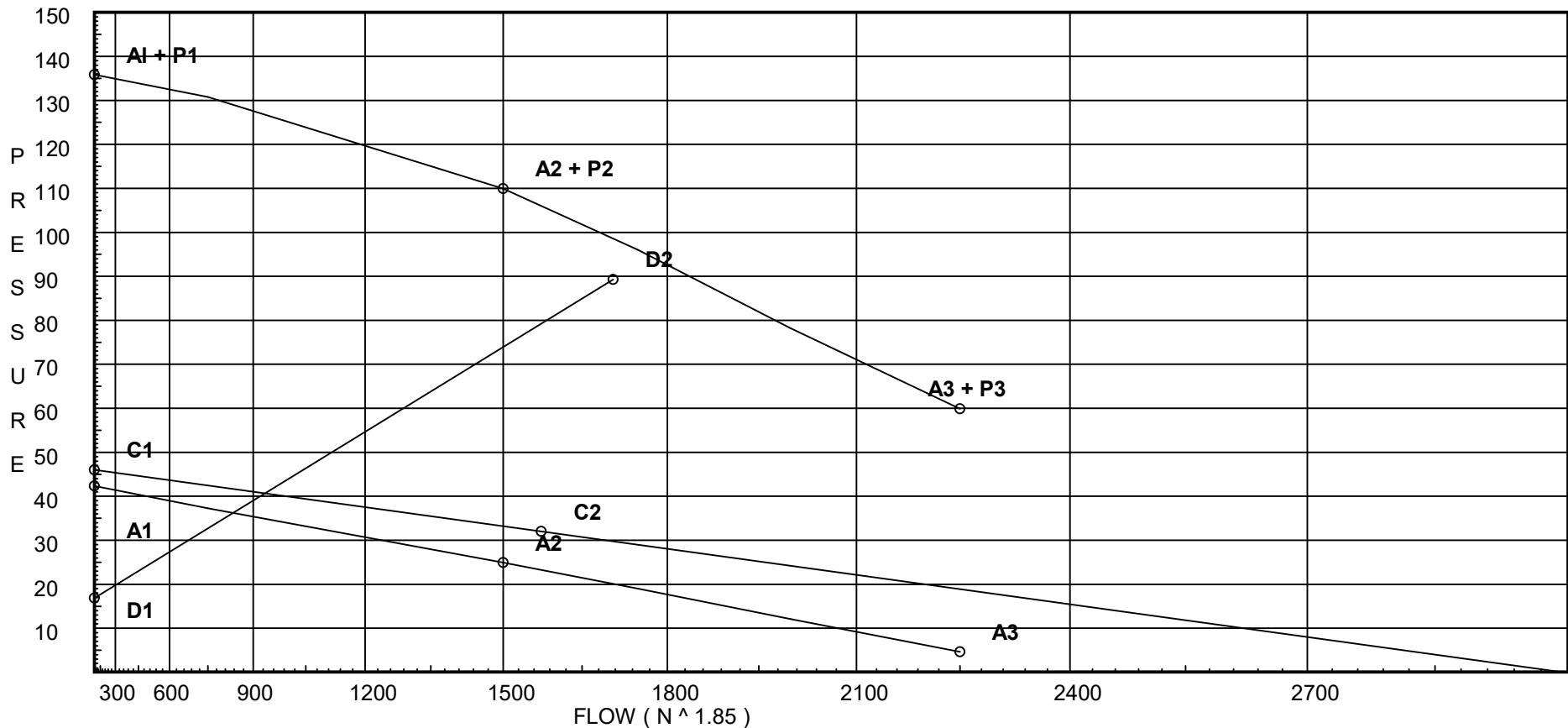
A1 - Adjusted Static: 42.335
A2 - Adj Resid : 24.911 @ 1500
A3 - Adj Resid : 4.62 @ 2250

Pump Data:

P1 - Pump Churn Pressure : 93.5
P2 - Pump Rated Pressure : 85
P2 - Pump Rated Flow : 1500
P3 - Pump Pressure @ Max Flow : 55.25
P3 - Pump Max Flow : 2250
City Residual Flow @ 0 = 2994.08
City Residual Flow @ 20 = 2199.51
City Water @ 150% of Pump = 18.89

Demand:

D1 - Elevation : 16.891
D2 - System Flow : 1706.18
D2 - System Pressure : 89.288
Hose (Demand) :
D3 - System Demand : 1706.18
Hose (Adj City) : 250
Safety Margin : 9.342



Fittings Used Summary

Heritage Sprinkler Design
TIN SHACK LTD. - 190'x230' WAREHOUSE

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Fitting Legend

Abbrev.	Name	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
J	90'Tee-Branch Grv Vic #20	0	0	4.5	6	8	8.5	10.8	13	17	16	21	25	33	41	50	65	78	88	98	120
L	NFPA 13 Long Turn Elbow	0.5	1	2	2	2	3	4	5	5	6	8	9	13	16	18	24	27	30	34	40
S	NFPA 13 Swing Check	0	0	5	7	9	11	14	16	19	22	27	32	45	55	65					
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121
Zia	Wilkins 350	Fitting generates a Fixed Loss Based on Flow																			

Units Summary

Diameter Units Inches
Length Units Feet
Flow Units US Gallons per Minute
Pressure Units Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

Flow Summary - NFPA

Heritage Sprinkler Design
TIN SHACK LTD. - 190'x230' WAREHOUSE

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SUPPLY ANALYSIS

<i>Node at Source</i>	<i>Static Pressure</i>	<i>Residual Pressure</i>	<i>Flow</i>	<i>Available Pressure</i>	<i>Total Demand</i>	<i>Required Pressure</i>
PMPD	See Information on Pump Curve			98.63	1706.18	89.288
CITY	46.0	32	1574.0	25.07	1956.18	25.07

NODE ANALYSIS

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>	
101	35.0		59.76			
102	41.0	22.4	40.53	142.61	0.6	82.333
103	41.0	22.4	40.0	141.67	0.6	82.333
104	41.0	22.4	40.0	141.67	0.6	82.333
105	41.0	22.4	40.51	142.58	0.6	82.333
106	35.0		59.48			
107	35.0		59.78			
108	41.0	22.4	40.54	142.63	0.6	82.333
109	41.0	22.4	40.02	141.7	0.6	82.333
110	41.0	22.4	40.02	141.7	0.6	82.333
111	41.0	22.4	40.53	142.6	0.6	82.333
112	35.0		59.5			
113	35.0		59.86			
114	41.0	22.4	40.6	142.73	0.6	82.333
115	41.0	22.4	40.07	141.8	0.6	82.333
116	41.0	22.4	40.07	141.8	0.6	82.333
117	41.0	22.4	40.59	142.7	0.6	82.333
118	35.0		59.58			
119	35.0		63.93			
121	35.0		64.11			
123	35.0		64.29			
125	35.0		64.45			
127	35.0		64.61			
129	35.0		64.76			
131	35.0		64.91			
133	35.0		65.05			
135	35.0		65.19			
137	35.0		65.33			
139	35.0		64.42			
141	35.0		65.58			
143	35.0		65.7			
145	35.0		65.82			
147	35.0		65.92			
149	35.0		66.02			
151	35.0		66.11			
153	35.0		66.19			
155	35.0		66.26			
157	35.0		66.33			
159	35.0		66.39			
161	35.0		66.43			
163	35.0		66.48			

Flow Summary - NFPA

Heritage Sprinkler Design
TIN SHACK LTD. - 190'x230' WAREHOUSE

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NODE ANALYSIS (cont.)

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
165	35.0		66.53		
101A	32.0		64.97		
107A	32.0		64.99		
113A	32.0		65.07		
119A	32.0		65.23		
121A	32.0		65.41		
123A	32.0		65.58		
125A	32.0		65.74		
127A	32.0		65.9		
129A	32.0		66.04		
131A	32.0		66.19		
133A	32.0		66.33		
135A	32.0		66.46		
137A	32.0		66.59		
141A	32.0		66.83		
143A	32.0		66.94		
145A	32.0		67.04		
147A	32.0		67.13		
149A	32.0		67.2		
151A	32.0		67.27		
153A	32.0		67.33		
155A	32.0		67.38		
157A	32.0		67.41		
159A	32.0		67.43		
161A	32.0		67.45		
163A	32.0		67.46		
165A	32.0		67.46		
139A	32.0		66.71		
120	35.0		63.97		
122	35.0		64.15		
124	35.0		64.34		
126	35.0		64.52		
128	35.0		64.71		
130	35.0		64.9		
132	35.0		65.1		
134	35.0		65.3		
136	35.0		65.51		
138	35.0		65.72		
140	35.0		65.85		
142	35.0		66.19		
144	35.0		66.44		
146	35.0		66.71		
148	35.0		66.99		
150	35.0		67.29		
152	35.0		67.61		
154	35.0		67.95		
156	35.0		68.32		
158	35.0		68.71		
160	35.0		69.13		
162	35.0		69.52		
164	35.0		70.02		

Flow Summary - NFPA

Heritage Sprinkler Design
TIN SHACK LTD. - 190'x230' WAREHOUSE

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NODE ANALYSIS (cont.)

<i>Node Tag</i>	<i>Elevation</i>	<i>Node Type</i>	<i>Pressure at Node</i>	<i>Discharge at Node</i>	<i>Notes</i>
166	35.0		70.55		
106A	30.0		65.88		
112A	30.0		65.91		
118A	30.0		65.99		
120A	30.0		66.14		
122A	30.0		66.32		
124A	30.0		66.51		
126A	30.0		66.7		
128A	30.0		66.89		
130A	30.0		67.08		
132A	30.0		67.28		
134A	30.0		67.49		
136A	30.0		67.71		
138A	30.0		67.93		
140A	30.0		68.16		
142A	30.0		68.42		
144A	30.0		68.68		
146A	30.0		68.97		
148A	30.0		69.27		
150A	30.0		69.59		
152A	30.0		69.93		
154A	30.0		70.3		
156A	30.0		70.69		
158A	30.0		71.12		
160A	30.0		71.58		
162A	30.0		72.0		
164A	30.0		72.54		
166A	30.0		73.12		
167	30.0		73.5		
BSR	2.0		87.38		
PMPD	2.0		89.29		
PMPS	2.0		20.18		
SPGT	2.0		24.03		
CITY	2.0		25.07	250.0	

Final Calculations : Hazen-Williams

Heritage Sprinkler Design
TIN SHACK LTD. - 190'x230' WAREHOUSE

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
101 to 102	35 41		-285.48	2.5	J 14.827	68.104 14.827 82.931	120	59.761 -2.599 -16.632		Vel = 16.80	
102 to 103	41 41	22.40	142.61	2.5		9.500	120	40.530 0.0		Vel = 8.41	
103 to 104	41 41	22.40	141.67	2.5		9.500	120	40.000 0.0		Vel = 0.07	
104 to 105	41 41		-1.2	2.635		9.500	0	0.0			
105 to 106	41 35	22.40	142.57	2.5	J 14.827	68.083 14.827 82.910	120	40.513 2.599 16.367		Vel = 16.65	
106 to 106A	35 30		0.0	2.5	T 16.474	5.000 16.474 21.474	120	59.479 2.166 4.239		Vel = 16.65	
106A			0.0 283.04					65.884		K Factor = 34.87	
107 to 108	35 41		-285.53	2.5	J 14.827	68.104 14.827 82.931	120	59.783 -2.599 -16.639		Vel = 16.80	
108 to 109	41 41	22.40	142.63	2.5		9.500	120	40.545 0.0		Vel = 8.41	
109 to 110	41 41	22.40	141.70	2.5		9.500	120	40.016 0.0		Vel = 0.07	
110 to 111	41 41	22.40	141.69	2.5		9.500	120	40.016 0.0		Vel = 8.27	
111 to 112	41 35	22.40	142.61	2.5	J 14.827	68.083 14.827 82.910	120	40.529 2.599 16.373		Vel = 16.66	
112 to 112A	35 30		0.0	2.5	T 16.474	5.000 16.474 21.474	120	59.501 2.166 4.240		Vel = 16.66	
112A			0.0 283.10					65.907		K Factor = 34.87	
113 to 114	35 41		-285.74	2.5	J 14.827	68.104 14.827 82.931	120	59.862 -2.599 -16.661		Vel = 16.81	
114 to 115	41 41	22.40	142.73	2.5		9.500	120	40.602 0.0		Vel = 8.41	
115 to 116	41 41	22.40	141.80	2.5		9.500	120	40.072 0.0		Vel = 0.07	

Final Calculations : Hazen-Williams

Heritage Sprinkler Design
TIN SHACK LTD. - 190'x230' WAREHOUSE

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
116 to 117	41 41	22.40	141.80	2.5			9.500	120	40.072 0.0			
			140.59	2.635			9.500	0.0541	0.514	Vel =	8.27	
117 to 118	41 35	22.40	142.70	2.5	J	14.827	68.083 14.827	120	40.586 2.599			
			283.29	2.635			82.910	0.1977	16.393	Vel =	16.67	
118 to 118A	35 30		0.0	2.5	T	16.474	5.000 16.474	120	59.578 2.166			
			283.29	2.635			21.474	0.1977	4.246	Vel =	16.67	
118A			0.0 283.29						65.990	K Factor =	34.87	
119 to 120	35 35		6.59	2.5	2J 2E	29.654 16.474	165.167 46.128	120	63.932 0.0			
			6.59	2.635			211.295	0.0002	0.040	Vel =	0.39	
120			0.0 6.59						63.972	K Factor =	0.82	
121 to 122	35 35		6.76	2.5	2J 2E	29.654 16.474	165.167 46.128	120	64.112 0.0			
			6.76	2.635			211.295	0.0002	0.042	Vel =	0.40	
122			0.0 6.76						64.154	K Factor =	0.84	
123 to 124	35 35		7.30	2.5	2J 2E	29.654 16.474	165.167 46.128	120	64.290 0.0			
			7.3	2.635			211.295	0.0002	0.048	Vel =	0.43	
124			0.0 7.30						64.338	K Factor =	0.91	
125 to 126	35 35		9.20	2.5	2J 2E	29.654 16.474	165.167 46.128	120	64.449 0.0			
			9.2	2.635			211.295	0.0004	0.074	Vel =	0.54	
126			0.0 9.20						64.523	K Factor =	1.15	
127 to 128	35 35		11.15	2.5	2J 2E	29.654 16.474	165.167 46.128	120	64.606 0.0			
			11.15	2.635			211.295	0.0005	0.105	Vel =	0.66	
128			0.0 11.15						64.711	K Factor =	1.39	
129 to 130	35 35		13.20	2.5	2J 2E	29.654 16.474	165.167 46.128	120	64.759 0.0			
			13.2	2.635			211.295	0.0007	0.143	Vel =	0.78	
130			0.0 13.20						64.902	K Factor =	1.64	
131 to 132	35 35		15.39	2.5	2J 2E	29.654 16.474	165.167 46.128	120	64.908 0.0			
			15.39	2.635			211.295	0.0009	0.191	Vel =	0.91	
132			0.0 15.39						65.099	K Factor =	1.91	
133 to 134	35 35		17.72	2.5	2J 2E	29.654 16.474	165.167 46.128	120	65.052 0.0			
			17.72	2.635			211.295	0.0012	0.248	Vel =	1.04	

Final Calculations : Hazen-Williams

Heritage Sprinkler Design
TIN SHACK LTD. - 190'x230' WAREHOUSE

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
134			0.0 17.72					65.300		K Factor = 2.19	
135 to 136	35 35		20.22 20.22	2.5 2.635	2J 2E 29.654 16.474	165.167 46.128 211.295	120 0.0015	65.192 0.0 0.316		Vel = 1.19	
136			0.0 20.22					65.508		K Factor = 2.50	
137 to 138	35 35		22.88 22.88	2.5 2.635	2J 2E 29.654 16.474	165.167 46.128 211.295	120 0.0019	65.326 0.0 0.397		Vel = 1.35	
138			0.0 22.88					65.723		K Factor = 2.82	
139 to 140	35 35		45.78 45.78	2.5 2.635	2J 2E 29.654 16.474	165.167 46.128 211.295	120 0.0068	64.418 0.0 1.434		Vel = 2.69	
140			0.0 45.78					65.852		K Factor = 5.64	
141 to 142	35 35		28.75 28.75	2.5 2.635	2J 2E 29.654 16.474	165.167 46.128 211.295	120 0.0029	65.583 0.0 0.607		Vel = 1.69	
142			0.0 28.75					66.190		K Factor = 3.53	
143 to 144	35 35		31.98 31.98	2.5 2.635	2J 2E 29.654 16.474	165.167 46.128 211.295	120 0.0035	65.705 0.0 0.739		Vel = 1.88	
144			0.0 31.98					66.444		K Factor = 3.92	
145 to 146	35 35		35.40 35.4	2.5 2.635	2J 2E 29.654 16.474	165.167 46.128 211.295	120 0.0042	65.819 0.0 0.892		Vel = 2.08	
146			0.0 35.40					66.711		K Factor = 4.33	
147 to 148	35 35		39.03 39.03	2.5 2.635	2J 2E 29.654 16.474	165.167 46.128 211.295	120 0.0051	65.925 0.0 1.068		Vel = 2.30	
148			0.0 39.03					66.993		K Factor = 4.77	
149 to 150	35 35		42.85 42.85	2.5 2.635	2J 2E 29.654 16.474	165.167 46.128 211.295	120 0.0060	66.023 0.0 1.269		Vel = 2.52	
150			0.0 42.85					67.292		K Factor = 5.22	
151 to 152	35 35		46.88 46.88	2.5 2.635	2J 2E 29.654 16.474	165.167 46.128 211.295	120 0.0071	66.112 0.0 1.498		Vel = 2.76	
152			0.0 46.88					67.610		K Factor = 5.70	

Final Calculations : Hazen-Williams

Heritage Sprinkler Design
TIN SHACK LTD. - 190'x230' WAREHOUSE

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
153 to 154	35 35		51.11 51.11	2.5 2.635	2J 2E 29.654 16.474	165.167 46.128 211.295	120 0.0083	66.193 0.0 1.757		Vel = 3.01	
154			0.0 51.11					67.950		K Factor = 6.20	
155 to 156	35 35		55.54 55.54	2.5 2.635	2J 2E 29.654 16.474	165.167 46.128 211.295	120 0.0097	66.265 0.0 2.051		Vel = 3.27	
156			0.0 55.54					68.316		K Factor = 6.72	
157 to 158	35 35		60.19 60.19	2.5 2.635	2J 2E 29.654 16.474	165.167 46.128 211.295	120 0.0113	66.330 0.0 2.379		Vel = 3.54	
158			0.0 60.19					68.709		K Factor = 7.26	
159 to 160	35 35		65.04 65.04	2.5 2.635	2J 2E 29.654 16.474	165.167 46.128 211.295	120 0.0130	66.388 0.0 2.746		Vel = 3.83	
160			0.0 65.04					69.134		K Factor = 7.82	
161 to 162	35 35		69.34 69.34	2.5 2.635	2J 2E 29.654 16.474	165.167 46.128 211.295	120 0.0146	66.433 0.0 3.091		Vel = 4.08	
162			0.0 69.34					69.524		K Factor = 8.32	
163 to 164	35 35		74.54 74.54	2.5 2.635	2J 2E 29.654 16.474	165.167 46.128 211.295	120 0.0167	66.481 0.0 3.534		Vel = 4.39	
164			0.0 74.54					70.015		K Factor = 8.91	
165 to 166	35 35		79.94 79.94	2.5 2.635	2J 2E 29.654 16.474	165.167 46.128 211.295	120 0.0190	66.528 0.0 4.022		Vel = 4.70	
166			0.0 79.94					70.550		K Factor = 9.52	
101A to 101	32 35		-285.48 -285.48	2.5 2.635	T 16.474	3.000 16.474 19.474	120 -0.2006	64.966 -1.299 -3.906		Vel = 16.80	
101			0.0 -285.48					59.761		K Factor = -36.93	
107A to 107	32 35		-285.53 -285.53	2.5 2.635	T 16.474	3.000 16.474 19.474	120 -0.2007	64.990 -1.299 -3.908		Vel = 16.80	
107			0.0 -285.53					59.783		K Factor = -36.93	
113A to 113	32 35		-285.74 -285.74	2.5 2.635	T 16.474	3.000 16.474 19.474	120 -0.2009	65.074 -1.299 -3.913		Vel = 16.81	

Final Calculations : Hazen-Williams

Heritage Sprinkler Design
TIN SHACK LTD. - 190'x230' WAREHOUSE

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
113			0.0 -285.74					59.862		K Factor = -36.93	
119A to 119	32 35		6.59 6.59	2.5 2.635	T 16.474	3.000 16.474 19.474	120 0.0002	65.228 -1.299 0.003		Vel = 0.39	
119			0.0 6.59					63.932		K Factor = 0.82	
121A to 121	32 35		6.76 6.76	2.5 2.635	T 16.474	3.000 16.474 19.474	120 0.0002	65.408 -1.299 0.003		Vel = 0.40	
121			0.0 6.76					64.112		K Factor = 0.84	
123A to 123	32 35		7.30 7.3	2.5 2.635	T 16.474	3.000 16.474 19.474	120 0.0002	65.585 -1.299 0.004		Vel = 0.43	
123			0.0 7.30					64.290		K Factor = 0.91	
125A to 125	32 35		9.20 9.2	2.5 2.635	T 16.474	3.000 16.474 19.474	120 0.0003	65.742 -1.299 0.006		Vel = 0.54	
125			0.0 9.20					64.449		K Factor = 1.15	
127A to 127	32 35		11.15 11.15	2.5 2.635	T 16.474	3.000 16.474 19.474	120 0.0005	65.895 -1.299 0.010		Vel = 0.66	
127			0.0 11.15					64.606		K Factor = 1.39	
129A to 129	32 35		13.20 13.2	2.5 2.635	T 16.474	3.000 16.474 19.474	120 0.0007	66.045 -1.299 0.013		Vel = 0.78	
129			0.0 13.20					64.759		K Factor = 1.64	
131A to 131	32 35		15.39 15.39	2.5 2.635	T 16.474	3.000 16.474 19.474	120 0.0009	66.189 -1.299 0.018		Vel = 0.91	
131			0.0 15.39					64.908		K Factor = 1.91	
133A to 133	32 35		17.72 17.72	2.5 2.635	T 16.474	3.000 16.474 19.474	120 0.0011	66.329 -1.299 0.022		Vel = 1.04	
133			0.0 17.72					65.052		K Factor = 2.20	
135A to 135	32 35		20.22 20.22	2.5 2.635	T 16.474	3.000 16.474 19.474	120 0.0015	66.462 -1.299 0.029		Vel = 1.19	
135			0.0 20.22					65.192		K Factor = 2.50	

Final Calculations : Hazen-Williams

Heritage Sprinkler Design
TIN SHACK LTD. - 190'x230' WAREHOUSE

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
137A to 137	32 35		22.88 22.88	2.5 2.635	T	16.474	3.000 16.474 19.474	120 -1.299 0.036		Vel = 1.35	
137			0.0 22.88					65.326		K Factor = 2.83	
123A to 139	32 35		45.78 45.78	2.5 2.635	T	16.474	3.000 16.474 19.474	120 -1.299 0.132		Vel = 2.69	
139			0.0 45.78					64.418		K Factor = 5.70	
141A to 141	32 35		28.75 28.75	2.5 2.635	T	16.474	3.000 16.474 19.474	120 -1.299 0.055		Vel = 1.69	
141			0.0 28.75					65.583		K Factor = 3.55	
143A to 143	32 35		31.98 31.98	2.5 2.635	T	16.474	3.000 16.474 19.474	120 -1.299 0.068		Vel = 1.88	
143			0.0 31.98					65.705		K Factor = 3.95	
145A to 145	32 35		35.40 35.4	2.5 2.635	T	16.474	3.000 16.474 19.474	120 -1.299 0.082		Vel = 2.08	
145			0.0 35.40					65.819		K Factor = 4.36	
147A to 147	32 35		39.03 39.03	2.5 2.635	T	16.474	3.000 16.474 19.474	120 -1.299 0.098		Vel = 2.30	
147			0.0 39.03					65.925		K Factor = 4.81	
149A to 149	32 35		42.85 42.85	2.5 2.635	T	16.474	3.000 16.474 19.474	120 -1.299 0.117		Vel = 2.52	
149			0.0 42.85					66.023		K Factor = 5.27	
151A to 151	32 35		46.88 46.88	2.5 2.635	T	16.474	3.000 16.474 19.474	120 -1.299 0.138		Vel = 2.76	
151			0.0 46.88					66.112		K Factor = 5.77	
153A to 153	32 35		51.11 51.11	2.5 2.635	T	16.474	3.000 16.474 19.474	120 -1.299 0.162		Vel = 3.01	
153			0.0 51.11					66.193		K Factor = 6.28	
155A to 155	32 35		55.54 55.54	2.5 2.635	T	16.474	3.000 16.474 19.474	120 -1.299 0.189		Vel = 3.27	

Final Calculations : Hazen-Williams

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
155			0.0 55.54					66.265		K Factor = 6.82	
157A to 157	32 35		60.19 60.19	2.5 2.635	T 16.474	3.000 16.474 19.474	120 0.0112	67.410 -1.299 0.219		Vel = 3.54	
157			0.0 60.19					66.330		K Factor = 7.39	
159A to 159	32 35		65.04 65.04	2.5 2.635	T 16.474	3.000 16.474 19.474	120 0.0130	67.434 -1.299 0.253		Vel = 3.83	
159			0.0 65.04					66.388		K Factor = 7.98	
161A to 161	32 35		69.34 69.34	2.5 2.635	T 16.474	3.000 16.474 19.474	120 0.0146	67.447 -1.299 0.285		Vel = 4.08	
161			0.0 69.34					66.433		K Factor = 8.51	
163A to 163	32 35		74.54 74.54	2.5 2.635	T 16.474	3.000 16.474 19.474	120 0.0167	67.455 -1.299 0.325		Vel = 4.39	
163			0.0 74.54					66.481		K Factor = 9.14	
165A to 165	32 35		79.94 79.94	2.5 2.635	T 16.474	3.000 16.474 19.474	120 0.0190	67.457 -1.299 0.370		Vel = 4.70	
165			0.0 79.94					66.528		K Factor = 9.80	
101A to 107A	32 32		285.48 285.48	6 6.357		8.500 8.500	120 0.0028	64.966 0.0 0.024		Vel = 2.89	
107A to 113A	32 32		285.53 571.01	6 6.357		8.500 8.500	120 0.0099	64.990 0.0 0.084		Vel = 5.77	
113A to 119A	32 32		285.74 856.75	6 6.357		7.333 7.333	120 0.0210	65.074 0.0 0.154		Vel = 8.66	
119A to 121A	32 32		-6.59 850.16	6 6.357		8.667 8.667	120 0.0208	65.228 0.0 0.180		Vel = 8.59	
121A to 123A	32 32		-6.76 843.4	6 6.357		8.667 8.667	120 0.0204	65.408 0.0 0.177		Vel = 8.53	
123A to 125A	32 32		-53.08 790.32	6 6.357		8.667 8.667	120 0.0181	65.585 0.0 0.157		Vel = 7.99	
125A to 127A	32 32		-9.20 781.12	6 6.357		8.667 8.667	120 0.0177	65.742 0.0 0.153		Vel = 7.90	

Final Calculations : Hazen-Williams

Heritage Sprinkler Design
TIN SHACK LTD. - 190'x230' WAREHOUSE

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
127A to 129A	32 32		-11.14 769.98	6 6.357		8.667 8.667	120 0.0173	65.895 0.0 0.150		Vel = 7.78	
129A to 131A	32 32		-13.21 756.77	6 6.357		8.667 8.667	120 0.0166	66.045 0.0 0.144		Vel = 7.65	
131A to 133A	32 32		-15.39 741.38	6 6.357		8.667 8.667	120 0.0162	66.189 0.0 0.140		Vel = 7.49	
133A to 135A	32 32		-17.72 723.66	6 6.357		8.667 8.667	120 0.0153	66.329 0.0 0.133		Vel = 7.32	
135A to 137A	32 32		-20.21 703.45	6 6.357		8.667 8.667	120 0.0147	66.462 0.0 0.127		Vel = 7.11	
137A to 139A	32 32		-22.88 680.57	6 6.357		8.667 8.667	120 0.0137	66.589 0.0 0.119		Vel = 6.88	
139A to 141A	32 32		0.0 680.57	6 6.357		8.667 8.667	120 0.0137	66.708 0.0 0.119		Vel = 6.88	
141A to 143A	32 32		-28.75 651.82	6 6.357		8.667 8.667	120 0.0126	66.827 0.0 0.109		Vel = 6.59	
143A to 145A	32 32		-31.98 619.84	6 6.357		8.667 8.667	120 0.0115	66.936 0.0 0.100		Vel = 6.27	
145A to 147A	32 32		-35.41 584.43	6 6.357		8.667 8.667	120 0.0104	67.036 0.0 0.090		Vel = 5.91	
147A to 149A	32 32		-39.03 545.4	6 6.357		8.667 8.667	120 0.0091	67.126 0.0 0.079		Vel = 5.51	
149A to 151A	32 32		-42.84 502.56	6 6.357		8.667 8.667	120 0.0078	67.205 0.0 0.068		Vel = 5.08	
151A to 153A	32 32		-46.88 455.68	6 6.357		8.667 8.667	120 0.0066	67.273 0.0 0.057		Vel = 4.61	
153A to 155A	32 32		-51.10 404.58	6 6.357		8.667 8.667	120 0.0052	67.330 0.0 0.045		Vel = 4.09	
155A to 157A	32 32		-55.55 349.03	6 6.357		8.667 8.667	120 0.0040	67.375 0.0 0.035		Vel = 3.53	
157A to 159A	32 32		-60.18 288.85	6 6.357		8.667 8.667	120 0.0028	67.410 0.0 0.024		Vel = 2.92	

Final Calculations : Hazen-Williams

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
159A to 161A	32 32		-65.04 223.81	6 6.357		7.333 7.333	120 0.0018	67.434 0.0 0.013		Vel = 2.26	
161A to 163A	32 32		-69.33 154.48	6 6.357		8.500 8.500	120 0.0009	67.447 0.0 0.008		Vel = 1.56	
163A to 165A	32 32		-74.54 79.94	6 6.357		8.500 8.500	120 0.0002	67.455 0.0 0.002		Vel = 0.81	
165A			0.0 79.94					67.457		K Factor = 9.73	
120 to 120A	35 30		6.59 6.59	2.5 2.635	T 16.474	5.000 16.474 21.474	120 0.0002	63.972 2.166 0.004		Vel = 0.39	
120A			0.0 6.59					66.142		K Factor = 0.81	
122 to 122A	35 30		6.76 6.76	2.5 2.635	T 16.474	5.000 16.474 21.474	120 0.0002	64.154 2.166 0.004		Vel = 0.40	
122A			0.0 6.76					66.324		K Factor = 0.83	
124 to 124A	35 30		7.30 7.3	2.5 2.635	T 16.474	5.000 16.474 21.474	120 0.0002	64.338 2.166 0.004		Vel = 0.43	
124A			0.0 7.30					66.508		K Factor = 0.90	
126 to 126A	35 30		9.20 9.2	2.5 2.635	T 16.474	5.000 16.474 21.474	120 0.0003	64.523 2.166 0.007		Vel = 0.54	
126A			0.0 9.20					66.696		K Factor = 1.13	
128 to 128A	35 30		11.15 11.15	2.5 2.635	T 16.474	5.000 16.474 21.474	120 0.0005	64.711 2.166 0.010		Vel = 0.66	
128A			0.0 11.15					66.887		K Factor = 1.36	
130 to 130A	35 30		13.20 13.2	2.5 2.635	T 16.474	5.000 16.474 21.474	120 0.0007	64.902 2.166 0.014		Vel = 0.78	
130A			0.0 13.20					67.082		K Factor = 1.61	
132 to 132A	35 30		15.39 15.39	2.5 2.635	T 16.474	5.000 16.474 21.474	120 0.0009	65.099 2.166 0.019		Vel = 0.91	
132A			0.0 15.39					67.284		K Factor = 1.88	
134 to 134A	35 30		17.72 17.72	2.5 2.635	T 16.474	5.000 16.474 21.474	120 0.0012	65.300 2.166 0.025		Vel = 1.04	

Final Calculations : Hazen-Williams

Heritage Sprinkler Design
TIN SHACK LTD. - 190'x230' WAREHOUSE

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
134A			0.0 17.72					67.491		K Factor = 2.16	
136 to 136A	35 30		20.22 20.22	2.5 2.635	T	16.474	5.000 16.474 21.474	120 2.166 0.0015	65.508 0.032		Vel = 1.19
136A			0.0 20.22					67.706		K Factor = 2.46	
138 to 138A	35 30		22.88 22.88	2.5 2.635	T	16.474	5.000 16.474 21.474	120 2.166 0.0019	65.723 0.040		Vel = 1.35
138A			0.0 22.88					67.929		K Factor = 2.78	
140 to 140A	35 30		45.78 45.78	2.5 2.635	T	16.474	5.000 16.474 21.474	120 2.166 0.0068	65.852 0.145		Vel = 2.69
140A			0.0 45.78					68.163		K Factor = 5.54	
142 to 142A	35 30		28.75 28.75	2.5 2.635	T	16.474	5.000 16.474 21.474	120 2.166 0.0028	66.190 0.061		Vel = 1.69
142A			0.0 28.75					68.417		K Factor = 3.48	
144 to 144A	35 30		31.98 31.98	2.5 2.635	T	16.474	5.000 16.474 21.474	120 2.166 0.0034	66.444 0.074		Vel = 1.88
144A			0.0 31.98					68.684		K Factor = 3.86	
146 to 146A	35 30		35.40 35.4	2.5 2.635	T	16.474	5.000 16.474 21.474	120 2.166 0.0042	66.711 0.090		Vel = 2.08
146A			0.0 35.40					68.967		K Factor = 4.26	
148 to 148A	35 30		39.03 39.03	2.5 2.635	T	16.474	5.000 16.474 21.474	120 2.166 0.0050	66.993 0.108		Vel = 2.30
148A			0.0 39.03					69.267		K Factor = 4.69	
150 to 150A	35 30		42.85 42.85	2.5 2.635	T	16.474	5.000 16.474 21.474	120 2.166 0.0060	67.292 0.128		Vel = 2.52
150A			0.0 42.85					69.586		K Factor = 5.14	
152 to 152A	35 30		46.88 46.88	2.5 2.635	T	16.474	5.000 16.474 21.474	120 2.166 0.0071	67.610 0.152		Vel = 2.76
152A			0.0 46.88					69.928		K Factor = 5.61	

Final Calculations : Hazen-Williams

Heritage Sprinkler Design
TIN SHACK LTD. - 190'x230' WAREHOUSE

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
154 to 154A	35 30		51.11 51.11	2.5 2.635	T	16.474	5.000 16.474 21.474	120 2.166 0.179		Vel = 3.01	
154A			0.0 51.11					70.295		K Factor = 6.10	
156 to 156A	35 30		55.54 55.54	2.5 2.635	T	16.474	5.000 16.474 21.474	120 2.166 0.208		Vel = 3.27	
156A			0.0 55.54					70.690		K Factor = 6.61	
158 to 158A	35 30		60.19 60.19	2.5 2.635	T	16.474	5.000 16.474 21.474	120 2.166 0.241		Vel = 3.54	
158A			0.0 60.19					71.116		K Factor = 7.14	
160 to 160A	35 30		65.04 65.04	2.5 2.635	T	16.474	5.000 16.474 21.474	120 2.166 0.278		Vel = 3.83	
160A			0.0 65.04					71.578		K Factor = 7.69	
162 to 162A	35 30		69.34 69.34	2.5 2.635	T	16.474	5.000 16.474 21.474	120 2.166 0.314		Vel = 4.08	
162A			0.0 69.34					72.004		K Factor = 8.17	
164 to 164A	35 30		74.54 74.54	2.5 2.635	T	16.474	5.000 16.474 21.474	120 2.166 0.359		Vel = 4.39	
164A			0.0 74.54					72.540		K Factor = 8.75	
166 to 166A	35 30		79.94 79.94	2.5 2.635	T	16.474	5.000 16.474 21.474	120 2.166 0.408		Vel = 4.70	
166A			0.0 79.94					73.124		K Factor = 9.35	
106A to 112A	30 30		283.04 283.04	6 6.357			8.500 8.500	120 0.0027	65.884 0.023	Vel = 2.86	
112A to 118A	30 30		283.10 566.14	6 6.357			8.500 8.500	120 0.0098	65.907 0.083	Vel = 5.72	
118A to 120A	30 30		283.29 849.43	6 6.357			7.333 7.333	120 0.0207	65.990 0.152	Vel = 8.59	
120A to 122A	30 30		6.59 856.02	6 6.357			8.667 8.667	120 0.0210	66.142 0.182	Vel = 8.65	

Final Calculations : Hazen-Williams

Heritage Sprinkler Design
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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
122A to 124A	30 30		6.76 862.78	6 6.357		8.667	120 0.0212	66.324 0.0 0.184		Vel = 8.72	
124A to 126A	30 30		7.30 870.08	6 6.357		8.667	120 0.0217	66.508 0.0 0.188		Vel = 8.80	
126A to 128A	30 30		9.20 879.28	6 6.357		8.667	120 0.0220	66.696 0.0 0.191		Vel = 8.89	
128A to 130A	30 30		11.15 890.43	6 6.357		8.667	120 0.0225	66.887 0.0 0.195		Vel = 9.00	
130A to 132A	30 30		13.20 903.63	6 6.357		8.667	120 0.0233	67.082 0.0 0.202		Vel = 9.13	
132A to 134A	30 30		15.39 919.02	6 6.357		8.667	120 0.0239	67.284 0.0 0.207		Vel = 9.29	
134A to 136A	30 30		17.72 936.74	6 6.357		8.667	120 0.0248	67.491 0.0 0.215		Vel = 9.47	
136A to 138A	30 30		20.22 956.96	6 6.357		8.667	120 0.0257	67.706 0.0 0.223		Vel = 9.67	
138A to 140A	30 30		22.88 979.84	6 6.357		8.667	120 0.0270	67.929 0.0 0.234		Vel = 9.90	
140A to 142A	30 30		45.77 1025.61	6 6.357		8.667	120 0.0293	68.163 0.0 0.254		Vel = 10.37	
142A to 144A	30 30		28.75 1054.36	6 6.357		8.667	120 0.0308	68.417 0.0 0.267		Vel = 10.66	
144A to 146A	30 30		31.98 1086.34	6 6.357		8.667	120 0.0327	68.684 0.0 0.283		Vel = 10.98	
146A to 148A	30 30		35.41 1121.75	6 6.357		8.667	120 0.0346	68.967 0.0 0.300		Vel = 11.34	
148A to 150A	30 30		39.03 1160.78	6 6.357		8.667	120 0.0368	69.267 0.0 0.319		Vel = 11.73	
150A to 152A	30 30		42.85 1203.63	6 6.357		8.667	120 0.0395	69.586 0.0 0.342		Vel = 12.17	
152A to 154A	30 30		46.87 1250.5	6 6.357		8.667	120 0.0423	69.928 0.0 0.367		Vel = 12.64	

Final Calculations : Hazen-Williams

Heritage Sprinkler Design
TIN SHACK LTD. - 190'x230' WAREHOUSE

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
154A to 156A	30 30		51.11 1301.61	6 6.357			8.667 8.667	120 0.0456	70.295 0.0 0.395		Vel = 13.16	
156A to 158A	30 30		55.54 1357.15	6 6.357			8.667 8.667	120 0.0492	70.690 0.0 0.426		Vel = 13.72	
158A to 160A	30 30		60.18 1417.33	6 6.357			8.667 8.667	120 0.0533	71.116 0.0 0.462		Vel = 14.33	
160A to 162A	30 30		65.04 1482.37	6 6.357			7.333 7.333	120 0.0581	71.578 0.0 0.426		Vel = 14.98	
162A to 164A	30 30		69.34 1551.71	6 6.357			8.500 8.500	120 0.0631	72.004 0.0 0.536		Vel = 15.69	
164A to 166A	30 30		74.54 1626.25	6 6.357			8.500 8.500	120 0.0687	72.540 0.0 0.584		Vel = 16.44	
166A to 167	30 30		79.93 1706.18	8 8.249	L	15.269	2.333 15.269 17.602	120 0.0211	73.124 0.0 0.372		Vel = 10.24	
167 to BSR	30 2		0.0 1706.18	8 8.249	B T	14.094 41.108	28.000 55.202 83.202	120 0.0211	73.496 12.127 1.759		Vel = 10.24	
BSR to PMPD	2 2		0.0 1706.18	8 8.249	S B L	52.853 14.094 15.269	8.000 82.216 90.216	120 0.0211	87.382 0.0 1.906		Vel = 10.24	
PMPD			0.0 1706.18						89.288		K Factor = 180.56	
System Demand Pressure									89.288			
Safety Margin									9.342			
Continuation Pressure									98.630			
Pressure @ Pump Outlet									98.630			
Pressure From Pump Curve									-78.453			
Pressure @ Pump Inlet									20.177			
PMPD to SPGT	2 2		0.0 1706.18	8 8.249	L G Zia	15.269 4.698 0.0	10.000 19.967 29.967	120 0.0211	20.177 3.220 0.633		** Fixed Loss = 3.22 Vel = 10.24	
SPGT to CITY	2 2		0.0 1706.18	10 10.28	G T E	7.534 75.336 33.148	75.000 116.018 191.018	140 0.0054	24.030 0.0 1.040		Vel = 6.60	
CITY			250.00 1956.18						25.070		Qa = 250.00 K Factor = 390.69	

AutoPeaking Summary

Heritage Sprinkler Design
TIN SHACK LTD. - 190'x230' WAREHOUSE

Auto Peaking Summary - List of Pipes for Area Calculated

Left			Right		
Side			Side		
From	To	Length	From	To	Length
101	102	68.104	105	106	68.083
107	108	68.104	111	112	68.083
113	114	68.104	117	118	68.083

Flow		Safety	Pressure
Required		Margin	Differential
Left	9.500 1956.303	9.473	-0.131
Area Calculated	1956.183	9.342	0.000
Right	9.500 1956.269	9.432	-0.090

Typical Distance Between Heads = 9.500

Split Point Used in Worst Area Peaked = 104

Appendix B: Wastewater Generation Calculations

Wastewater Flow Design Worksheet

Project Details

430 Raglan Street	118188
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Prepared By

John Birchard	Aug 21, 2026
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Municipality

Town of Collingwood

Checked By

Andrew Overholt	Aug 21, 2026
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Warehouse Demand

Number of Water Closets * Water Closet Demand

$$= 4 \text{ Water Closet} * 950 \text{ L/day/Water Closet}$$

$$= 3800 \text{ L/day} \quad \textbf{AND}$$

Number of Loading Bays * Loading Bay Demand

$$= 6 \text{ Loading Bays} * 150 \text{ L/day/Loading Bays}$$

$$= 900 \text{ L/day}$$

$$\text{Total Warehouse Demand} = 3800 \text{ L/day} + 900 \text{ L/day}$$

$$= \textbf{4700} \text{ L/day} = \textbf{4.70} \text{ m}^3/\text{day}$$

Commercial/Industrial/ Institutional Flow

Land Use	Warehouse			Total
Average Day Flow (m ³ /day)	4.70			4.70
Reference	1	Ontario Building Code (2024) Table 8.2.1.3.-B		

Peaking Factors

Land Use	Residential (Harmon)	Warehouse		
Peaking Factor ⁴	4.00	4.0		
Reference	2			

Infiltration

Building Area (ha)	0.4	Infiltration(L/s/ha)	0.23	Infiltration (L/s)	0.09
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Total Design Flows

Average Day Flow (m ³ /day)	4.70	Peak Flow (L/s)	0.31
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Additional Notes

OBC SANITARY AND WATER SERVICE SIZING

Project Details

430 Raglan Street	118188	Prepared By AO	August 21, 2026
Municipality Town of Collingwood		Checked By	

Sanitary Service Sizing

Fixtures	Number	Sanitary Hydraulic Load For Fixture OBC Table 7.4.9.3 (Fixture Units)	Total Sanitary Hydraulic Load (Fixture Units)
Water Closet	4	4	16
Sink	1	1.5	1.5
Dishwasher	1	1	1
		Total	18.5

Notes & References

Per A- Table 7.4.10.5, the maximum probable drainage rate for 19 fixture units is approximately 27 gal/min or 1.7 L/s
Per Table 7.4.10.6.-C, the maximum permitted hydraulic load drained to a horizontal 150 mm (6") sanitary drainage pipe with a 1 in 50 (2%) slope is 840 fixture units. Therefore, the 6" service is sufficient.

Water Service Sizing

Fixtures	Number	Water Hydraulic Load For Fixture OBC Table 7.6.3.2.A and 7.6.3.2.C (Fixture Units)	Total Water Hydraulic Load (Fixture Units)
Water Closet	4	3	12
Kitchen Sink	1	1.4	1.4
Dishwasher	1	1.4	1.4
		Total	14.8

Notes & References

Per OBC Table A-7.6.3.1, a 2" (50mm) service which is +/- 30 m long can service 359 fixture units for system pressure between 46-60psi. The static pressure was measured at 46 psi based on a hydrant flow test prepared for the sprinkler system.

Appendix C: Stormwater Management Calculations

Project Details

430 Raglan Street	118188
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Municipality

Town of Collingwood

Prepared By

John Birchard	Aug 21, 2026
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Post-Development Analysis

Pre-Development Analysis

Catchment ID	101
Catchment Area (ha)	2.04
1:5-Year Runoff Coefficient	0.25
Time of Concentration (min)	10

Controlled Catchment

Uncontrolled Catchment

201	202
1.54	0.50
0.75	0.25
10	10

Rational Method Calculations

Design Storm		2	5	10	25	50	100	Design Storm		2	5	10	25	50	100
IDF Curve	A	807	1135	1387	1676	1973	2193	i (mm/hr)		78	102	118	138	153	168
	B	6.75	7.50	7.97	8.30	9.00	9.04	201	C	0.75	0.75	0.75	0.83	0.90	0.94
	C	0.83	0.84	0.85	0.86	0.87	0.87		Q (m³/s)	0.25	0.33	0.38	0.49	0.59	0.68
101	i (mm/hr)	78	102	118	138	153	168	i (mm/hr)		78	102	118	138	153	168
	C	0.25	0.25	0.25	0.28	0.30	0.31	202	C	0.25	0.25	0.25	0.28	0.30	0.31
	Q (m³/s)	0.11	0.14	0.17	0.22	0.26	0.30		Q (m³/s)	0.03	0.04	0.04	0.05	0.06	0.07

Peak Flow Summary (m³/s)

Storm	Q _{existing}	Q _{uncontrolled}	Q _{controlled}	Q _{total}	Q _{existing} - Q _{proposed}
2	0.111	0.027	0.057	0.084	0.027
5	0.145	0.036	0.076	0.112	0.033
10	0.168	0.041	0.085	0.126	0.042
25	0.216	0.053	0.099	0.152	0.064
50	0.260	0.064	0.112	0.176	0.085
100	0.298	0.073	0.123	0.196	0.102

Required Storage Volume Summary (m³)

Duration (min)	2	5	10	25	50	100
20	153	201	236	314	389	451
40	172	226	267	361	454	527
60	168	220	262	360	458	534
80	155	202	242	340	439	514
100	137	177	214	311	407	481
120	116	148	182	275	368	439
140	93	117	147	236	325	392
160	69	84	109	194	278	341
180	43	49	70	150	229	287
200	17	13	30	104	177	231

430 Raglan Street
Wet Swale Volume Table

	Elev.	Depth	Areas		Volumes			
	(m)	(m)	Area (m ²)	Avg. Area (m ²)	Dead (m ³)	Accum. Dead (m ³)	Live (m ³)	Accum. Live (m ³)
Bottom of Forebay/Outlet	189.60	0.00	415.7	0	0	0		
	189.70	0.10	473.6	445	44	44		
	189.80	0.20	531.4	502	50	95		
Bottom of Active Storage	189.90	0.30	589.3	560	56	151	0	0
	190.00	0.40	647.1	618		151	62	62
	190.10	0.50	705.0	676		151	68	129
	190.20	0.60	762.8	734		151	73	203
	190.30	0.70	820.7	792		151	79	282
	190.40	0.80	878.5	850		151	85	367
	190.50	0.90	936.4	907		151	91	458
Top of Active Storage	190.60	1.00	994.3	965		151	97	554
	190.70	1.10	1052.1	1023		151	102	657
	190.80	1.20	1110.0	1081		151	108	765
Top of Freeboard	190.90	1.30	1167.8	1139		151	114	879

430 Raglan Street
Wet Swale Discharge Table

ORIFICE/PIPE CONTROLS

Low Flow Orifice

diameter = 275 mm
area = 0.0594 m²
Orifice C = 0.63
Invert = 189.90 m

WEIR CONTROLS

Emergency
Outlet Spillway

Length of Weir 5 m
Weir Sill Elevation 190.60 m
Weir constant K 1.7

ORIFICE EQUATION $Q = C \times A \times (2gH)^{0.5}$

WEIR FORMULA $Q = K \times L \times H^{1.5}$

where Q = flow rate (cms)
C = constant
A = area of opening(sq. m)
H = net head on the orifice
g = Acceleration due to gravity

where Q = flow rate (cms)
K = constant
L = length (m)
H = head on the weir (m)

TRAPEZOIDAL WEIR DISCHARGE

Water Level	Depth	LOW FLOW ORIFICE FLOW		Emergency Outlet Spillway		TOTAL FLOW
		Low Flow Orifice				Structure + Emergency Weir
		Head	Discharge	Head	Discharge	Discharge
(m)	(m)	(m)	(m³/s)	(m)	(m³/s)	(cms)
189.90	0.00	0.00	0.0000	0.00	0.0000	0.0000
190.00	0.10	0.00	0.0207	0.00	0.0000	0.0207
190.10	0.20	0.06	0.0414	0.00	0.0000	0.0414
190.20	0.30	0.16	0.0668	0.00	0.0000	0.0668
190.30	0.40	0.26	0.0849	0.00	0.0000	0.0849
190.40	0.50	0.36	0.0998	0.00	0.0000	0.0998
190.50	0.60	0.46	0.1127	0.00	0.0000	0.1127
190.60	0.70	0.56	0.1243	0.00	0.0000	0.1243
190.70	0.80	0.66	0.1349	0.10	0.2688	0.4037
190.80	0.90	0.76	0.1447	0.20	0.7603	0.9050
190.90	1.00	0.86	0.1539	0.30	1.3967	1.5506

430 Raglan Street
Wet Swale Stage Storage Discharge Table

Stage	Storage	Discharge
(m)	(m³)	(m³/s)
189.90	0	0.000
190.00	62	0.021
190.10	129	0.041
190.20	203	0.067
190.30	282	0.085
190.40	367	0.100
190.50	458	0.113
190.60	554	0.124
190.70	657	0.404
190.80	765	0.905
190.90	879	1.551

Design Storm	Peak Flow	Storage Volume	Elevation
	(m³/s)	(m³)	(m)
1:2 Year	0.057	177	190.16
1:5 Year	0.076	233	190.24
1:10 Year	0.085	277	190.29
1:25 Year	0.099	370	190.40
1:50 Year	0.112	464	190.50
1:100 Year	0.123	540	190.59

Water Budget

Climate Normal Data

Project Details

430 Raglan Street	118188
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Prepared By

John Birchard	August 24, 2026
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Water Budget Details

Methodology	Thornthwaite Method
Climate Data & Source	Collingwood Climate Normal Data for 2002 to 2021 (Environment Canada)
Thornthwaite Coefficient	1.056

Month	Temp (°C)	Precip (mm)	Heat Index	PET (mm)	Daylight Factor	Adjusted PET (mm)	AET (mm)	Surplus (mm)	Deficit (mm)
Jan.	-6.3	100	0.0	0.0	0.77	0.0	0.0	100.0	0.0
Feb.	-5.4	68.4	0.0	0.0	0.87	0.0	0.0	68.4	0.0
Mar.	-1.5	64	0.0	0.0	1.00	0.0	0.0	64.0	0.0
Apr.	5.5	65.3	1.2	28.9	1.12	32.5	32.5	32.8	0.0
May	11.5	82.7	3.5	71.4	1.23	88.0	82.7	0.0	5.3
Jun.	16.7	79.1	6.2	107.1	1.29	138.1	79.1	0.0	59.0
Jul.	19.8	72.1	8.0	129.6	1.26	163.5	72.1	0.0	91.4
Aug.	19.2	78.2	7.7	115.9	1.17	135.1	78.2	0.0	56.9
Sep.	15.5	95.9	5.5	80.0	1.04	83.4	83.4	12.5	0.0
Oct.	9.1	87.3	2.5	41.4	0.92	37.9	37.9	49.4	0.0
Nov.	3.1	99.6	0.5	11.3	0.80	9.0	9.0	90.6	0.0
Dec.	-2.7	99.4	0.0	0.0	0.74	0.0	0.0	99.4	0.0
Total	-	992	35.1	585.4	-	687.5	474.9	517.1	212.6

Additional Notes

PET = Potential Evapotranspiration; AET = Actual Evapotranspiration

Equations

$$PET = 16 \left(\frac{L}{12} \right) \left(\frac{N}{30} \right) \left(\frac{10T_d}{I} \right)^\alpha \text{ Where}$$

PET is the estimated potential evapotranspiration (mm/month)

T_d is the average daily temperature (degrees Celsius; if this is negative, use 0) of the month being calculated

N is the number of days in the month being calculated

L is the average day length (hours) of the month being calculated

$$\alpha = (6.75 \times 10^{-7})I^3 - (7.71 \times 10^{-5})I^2 + (1.792 \times 10^{-2})I + 0.49239$$

$$I = \sum_{i=1}^{12} \left(\frac{T_{mi}}{5} \right)^{1.514} \text{ is a heat index which depends on the 12 monthly mean temperatures } T_{mi}.^{[1]}$$

Water Budget

Pre and Post Development Comparison

Project Details

430 Raglan Street	118188
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Prepared By

John Birchard	Aug-26
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Pre-Development Catchment Details

Area (ha)	2.04
Pervious Area (ha)	2.04
Impervious Area (ha)	0.0

Post Development Catchment Details

Area (ha)	2.04
Pervious Area (ha)	1.01
Impervious Area (ha)	1.03

Infiltration Factor

Infiltration Factor	Pre-Development		Post Development	
	Pervious	Impervious	Pervious	Impervious
Topography	0.125	0.0	0.125	0.0
Soil	0.200	0.0	0.200	0.0
Land Cover	0.200	0.0	0.100	0.0
Infiltration Factor	0.525	0.0	0.425	0.0

Water Budget

Water Budget	Pervious	Impervious	Total	Pervious	Impervious	Total
Water Surplus (m ³)	6,212	0	6,212	3,075	3,136	6,212
Infiltration (m ³)	3,261	0	3,261	1,307	0	1,307
Runoff (m ³)	2,951	0	2,951	1,768	3,136	4,905
Reduction in Infiltration Volume (m ³)						1,954

Additional Notes

-No mitiigative measures to be used

Infiltration Factors

<u>Topography</u>	Flat Land, average slope < 0.6 m/km	0.3
	Rolling Land, average slope 2.8 m to 3.8 m/km	0.2
	Hilly Land, average slope 28 m to 47 m/km	0.1
<u>Soils</u>	Tight impervious clay	0.1
	Medium combinations of clay and loam	0.2
	Open Sandy loam	0.4
<u>Cover</u>	Cultivated Land	0.1
	Woodland	0.2

(Stormwater Planning and Design Manual. MOE, 2003.)