

August 29, 2025
VH Proj. No. 33259-24

786 Group Inc.

**Re: Stormwater Management Brief
Proposed Truck Parking Lot
265 Woolwich Street South, Township of Woolwich**

1.0 Introduction

Van Harten Surveying Inc. (Van Harten) is pleased to submit this Stormwater Management Brief in support of the Zoning By-Law Application for the property located at 265 Woolwich Street South in the Township of Woolwich.

The purpose of this Stormwater Management Brief is to outline proposed stormwater management for the proposed development. The following reports and background information were referenced to inform this report and supporting design calculations:

- City of Kitchener - Development Manual (Summer 2021)
- CMT Engineering Inc. – Geotechnical Investigation (April 2, 2024)
- Harper Dell & Associates Inc. – Preliminary Site Plan (August 2025)
- Hydrogeological Consulting Services Inc. – Scoped Hydrogeology Study (June 2, 2024)
- Ministry of the Environment - Stormwater Management Planning and Design Manual (March 2003)
- Region of Waterloo and Area Municipalities – Design Guidelines and Supplemental Specifications for Municipal Services (February 2024)
- Township of Woolwich – Engineering Development and Infrastructure Manual (March 28, 2022)

Relevant excerpts from the above reports and background information have been provided in Appendix A.

This report has been revised per comments received by the Township of Woolwich and the Grand River Conservation Authority.

2.0 Existing Site Conditions

The site encompasses an area of approximately 3.52 ha and is currently zoned Agricultural (A) with the rear of the property being zoned Natural Hazard. The site is bounded by an existing residential property to the north, natural hazard lands to the east, Woolwich Street South to the west, and a residential/commercial property to the south. There are no municipal services (storm, sanitary, or water) to the property and the property is currently vacant overgrown meadow lands.

CMT Engineering Inc. completed a Geotechnical Investigation (April 2, 2024) and Hydrogeological Consulting Services Inc. completed a Scoped Hydrogeology Study (June 2, 2024) to confirm the subsurface soils and groundwater conditions on-site. Details of the groundwater and subsurface soil conditions can be referenced in the following section.

Subsurface Soils

CMT Engineering Inc. conducted a geotechnical field investigation on January 26, 2024 and advanced six (6) boreholes across the site. Based on the Geotechnical Investigation and borehole logs the subsurface soils on-site are comprised of a mixture of sand and gravel with some silt. A slug test analysis was complete by Hydrogeological Consulting Services Inc. to determine the hydraulic conductivity of the soils. According to the results of the slug testing the hydraulic conductivity of the soils ranged from 1.1×10^{-5} m/sec to 2.9×10^{-5} m/sec which equates to a conservative infiltration rate of 30 mm/hr. Assigning a safety factor of 2.0 to the prescribed infiltration rate, the design infiltration rate for the site was determined to be 15 mm/hr.

Groundwater

Based on the Scoped Hydrogeology Study completed by Hydrogeological Consulting Services Inc. four (4) monitoring wells were advanced across the site and groundwater was encountered at a depth ranging from 2.66 mbgs to 2.84 mbgs on March 7, 2024.

Regulatory Limits

Due to the site's proximity to the Breslau Drain, GRCA-regulated wetland, and tree driplines, the following setbacks have been established to guide the overall development limits:

- All development is proposed outside and above the Regulatory Flood Elevation (Elevation = 312.80 m).
- All development is proposed outside and setback from tree driplines.
- A 30 m setback from the GRCA-staked wetland has been maintained.

It should be noted that, due to grading constraints, the southern stormwater outlet has been located within the floodplain to ensure that all drainage remains contained within the property and is not directed onto neighbouring lands to the south.

3.0 Proposed Development Conditions

According to the Preliminary Site Plan prepared by Harper Dell & Associates Inc. the proposal is to construct a 8,555 sq.m. gravel truck parking lot with a total of 96 parking spaces. Storm servicing for the proposed development will be provided through a combination of on-site stormwater management facilities and conveyance swales. Access to the site will be provided through a connection to Woolwich Street South.

4.0 Stormwater Management

4.1 Stormwater Management Criteria

The Township of Woolwich – Engineering Development and Infrastructure Manual and the Region of Waterloo and Area Municipalities – Design Guidelines and Supplemental Specifications for Municipal Services were referenced to determine the stormwater management criteria for the proposed development. Based on the design guidelines the following stormwater criteria apply to the site:

Stormwater Quantity Control – Post development peak-flows controlled to pre-development levels for the 2-year through 100-year storm events.

Stormwater Quality Control – Provide enhanced protection - 80% total suspended solid (TSS) removal.

Stormwater Erosion Control – Provide extended detention for the 25mm storm event.

4.2 Existing Drainage Patterns

An existing condition drainage plan has been prepared based on the topographic survey completed by Van Harten.

Two catchments have been identified under the existing conditions for the site (Table 1) as a local high point exists that divides the site into an eastern and western catchment. The western catchment (Catchment 101) is comprised of brush lands and drains from east to west with runoff being directed overland to a poorly defined ditch along Woolwich Street South. The eastern catchment (Catchment 102) is comprised of brush lands and drains from west to east with runoff being directed overland through the adjacent property to the south. It should be noted that all flows from the site ultimately drain to the Breslau Drain.

It should be acknowledged that the property accepts runoff from a portion of the residential property to the north (Catchment EX1). The proposed development will continue to accept these external flows under the full buildout conditions through the implementation of a swale along the northern property limits.

Table 1 summarizes the pre-development drainage areas and hydrologic design parameters. The Existing Drainage Plan can be referenced in Appendix C.

Table 1: Existing Conditions Catchments and Hydrologic Design Parameters

Hydrologic Parameter	Catchment 101 ^N	Catchment 102 ^N	Catchment EX1 ^N
Catchment Area (ha)	0.512	1.753	0.230
Curve Number	35	35	51.83
Initial Abstraction (mm)	8.0	8.0	4.35
Slope (%)	1.0	1.97	0.50
Time to Peak (hr)	0.26	0.29	0.12

N = Nashyd

4.3 Proposed Drainage Patterns

A proposed drainage plan has been prepared based on the Site Grading Plan prepared by Van Harten. Based on the Site Grading Plan, three post-development drainage catchments were identified. Additional details of each catchment have been provided below.

Catchment 201 – Consists of entrance, parking lot, and landscaped runoff. All runoff from this catchment will be conveyed overland to the Woolwich Street South ditch prior to discharging to the Breslau Drain.

Catchment 202 – Consists of parking lot runoff and accumulated rainfall within the stormwater management facility. All runoff from this catchment will be captured and conveyed by the private stormwater storm sewer system to the stormwater management facility for stormwater quantity control prior to discharging to the Breslau Drain.

Catchment UC1 – Consists of landscaped runoff. All storm events from this catchment will be directed uncontrolled via swales and overland flow to the Breslau Drain.

The catchment properties under the proposed conditions are summarized in Table 2.

Table 2: Proposed Conditions Catchments and Hydrologic Design Parameters

Hydrologic Parameter	Catchment 201 ^N	Catchment 202 ^S		Catchment UC1 ^N	Catchment EX1 ^N
Catchment Area (ha)	0.239	1.047		0.978	0.230
Percent Imperv (%) / Curve Number	48.10	100%		36.08	51.83
Initial Abstraction Depression Storage (mm)	4.54	5.0	3.0	7.19	4.35
Slope (%) (Perv Imperv)	2.50	0.5	0.5	0.8	0.5
Time to Peak (hr)	0.20	-		0.36	0.12

4.4 Water Quantity

The stormwater management quantity control criteria for the site is subject to The Township of Woolwich – Engineering Development and Infrastructure Manual and the Region of Waterloo and Area Municipalities – Design Guidelines and Supplemental Specifications for Municipal Services. Based on the manuals, the stormwater management quantity control criteria for the proposed development includes controlling the post development peak flow rates to the pre-development peak flow rates for the 2-year through 100-year storm events.

Quality control calculations were prepared using Visual Otthymo and IDF parameters obtained from the City of Kitchener Development Manual to calculate the return period peak flows (2 through 100-year storm event) under the existing and proposed conditions for each respective outlet (Table 3 and Table 4). The Visual Otthymo output file is provided in Appendix B.

Table 3: Peak Flow and Storage Requirements Summary (Breslau Drain Outlet)

Storm Event (yr)	Pre-Development Peak Flow (m ³ /s)	Post-Development Controlled Peak Flow (m ³ /s)	Required Storage (m ³)	Provided Storage (m ³)*
2	0.005	0.007	295	1442
5	0.013	0.012	420	
10	0.021	0.016	508	
25	0.032	0.023	613	
50	0.042	0.033	684	
100	0.054	0.046	752	

*Includes 31cm of freeboard.

Table 4: Peak Flow Summary (Woolwich Street South Ditch Outlet)

Storm Event (yr)	Pre-Development Peak Flow (m³/s)	Post-Development Peak Flow (m³/s)	Flow Increase (L/s)
2	0.004	0.004	0
5	0.008	0.009	1
10	0.013	0.013	0
25	0.019	0.019	0
50	0.025	0.025	0
100	0.032	0.031	-1

Quantity controls are required for Catchment 202 (parking lot runoff) and will be achieved through a dry pond equipped with an outlet control structure. The dry pond will provide 1,442 m³ of storage to satisfy the quantity control requirements.

Runoff from Catchment 202 will be attenuated to pre-development levels via a control structure, which includes a 75 mm diameter cored orifice at an invert elevation of 312.90 m and a 250 mm cast-in-place concrete rectangular weir at an invert elevation of 313.18 m, located at the outlet of the dry pond. Additional details of the outlet control structure and pond design are provided in Appendix B.

As shown in Tables 3 and 4, peak flows to the Woolwich Street South ditch will increase slightly during the 5-year storm event (1 L/s), while flows for all other storm events will remain at or below pre-development levels. Flows to the Breslau Drain outlet will rise by 2 L/s during the 2-year event and be maintained at pre-development levels for all other storm events. The 75 mm orifice represents a best-practice design, and the resulting increase in flow to the watercourse is considered negligible.

4.5 Water Quality and Erosion Controls

Stormwater quality controls for the proposed development will achieve “enhanced” treatment, targeting 80 % total suspended solids (TSS) removal. This will be accomplished using a treatment train approach, including CB Shields in catchbasins within the gravel parking lot and an oil-grit separator (HS6 or equivalent). These components will work together to provide the required TSS removal. Details of the proposed oil-grit separator and treatment train calculations are provided in Appendix C.

The treatment train mechanisms are summarized in Table 5. Total TSS removal for the development was calculated using a weighted average to determine cumulative removal. Runoff from landscaped areas is excluded from these calculations, as it is considered clean.

Table 5: Proposed TSS Removal Rate

Catchment ID	Area (ha)	Treatment Train Features (% TSS Removal)			Total TSS Removal (%) ³
202	0.80 ¹	CB Shield (50%)	Hydrostorm HS6 (50%) ²	Dry Pond (60%)	90
TOTAL	0.80				90

¹ Gravel Parking Area within Catchment 202, all other areas considered clean run-off

² Hydrostorm units have been certified under NJDEP for 50% removal credit

³ Total TSS removal calculated using the following formula: $R = A + B - [(A \times B) / 100]$, A = TSS removal for first mechanism, B = TSS removal rate for second mechanism.

As shown in Table 5, the weighted average TSS removal for the proposed development indicates that the treatment train approach will achieve 90 % removal, meeting and exceeding the 'Enhanced' water quality standard of 80 % TSS removal.

Catchments 201 and UC1 consist primarily of clean runoff, with minor contributions from the proposed parking lot and landscaped areas. Therefore, formal water quality controls are not provided for these catchments; stormwater polishing will occur through conveyance swales and sheet flow over landscaped areas.

4.6 Operation and Maintenance

The future property owners will be required to inspect the works on an annual basis to ensure their continued functioning.

- All grass swales should be maintained clear of obstructions so that they function as intended. The property owner should inspect on a routine basis for erosion, in particular at outlet locations, and repair any gullies, rills or bare spots.
- The dry pond and control structure should be inspected for obstructions after every major rainfall event and suspended solids should be removed when sufficient buildup occurs.
- The Hydrostorm HS6 oil-grit separator and CB Shields should be inspected per the manufactures specifications and suspended solids should be removed when sufficient buildup occurs.

The maintenance of the stormwater management features on the site is the sole responsibility of the property owner and should be completed on an as needed basis.

5.0 Erosion and Sediment Control

An Erosion and Sediment Control Plan has been prepared to minimize the potential of sediment runoff from the site onto the neighbouring properties and the road allowance. Temporary erosion and sediment controls may be removed once the construction has been completed and grass growth has been re-established over the disturbed areas.

It is noted that the erosion and sediment control plan is a dynamic plan, and alteration and additions to these measures may be necessary to respond to changing site conditions during construction. Additional sediment and erosion control devices and structures should be kept on-site at all times.

Construction of the dry pond should be scheduled so that its integrity is not compromised during subsequent construction.

At the time of construction, a contact table similar to the one provided below should be provided for key contacts in the event of any issues at the site.

Contact	Phone Number
Township of Woolwich	519-669-1647
Grand River Conservation Authority	519-621-2761
Ministry of Environment – Spills Reporting	1-800-268-6060
Owner	TBD
Builder	TBD
Van Harten Surveying Inc. (Engineer)	519-821-2763

6.0 Closure

The completed Stormwater Management Brief is specific to the site based on our knowledge of the proposed development. We trust that this report is suitable to support the Zoning By-Law Amendment for the proposed development. Please contact our office if you have any questions or require further consultation.

Respectfully submitted,

Van Harten Surveying Inc.



Blair Henderson, C.E.T.
Certified Engineering Technologist

Van Harten Surveying Inc.



Brett Pond, P. Eng.
Professional Engineer



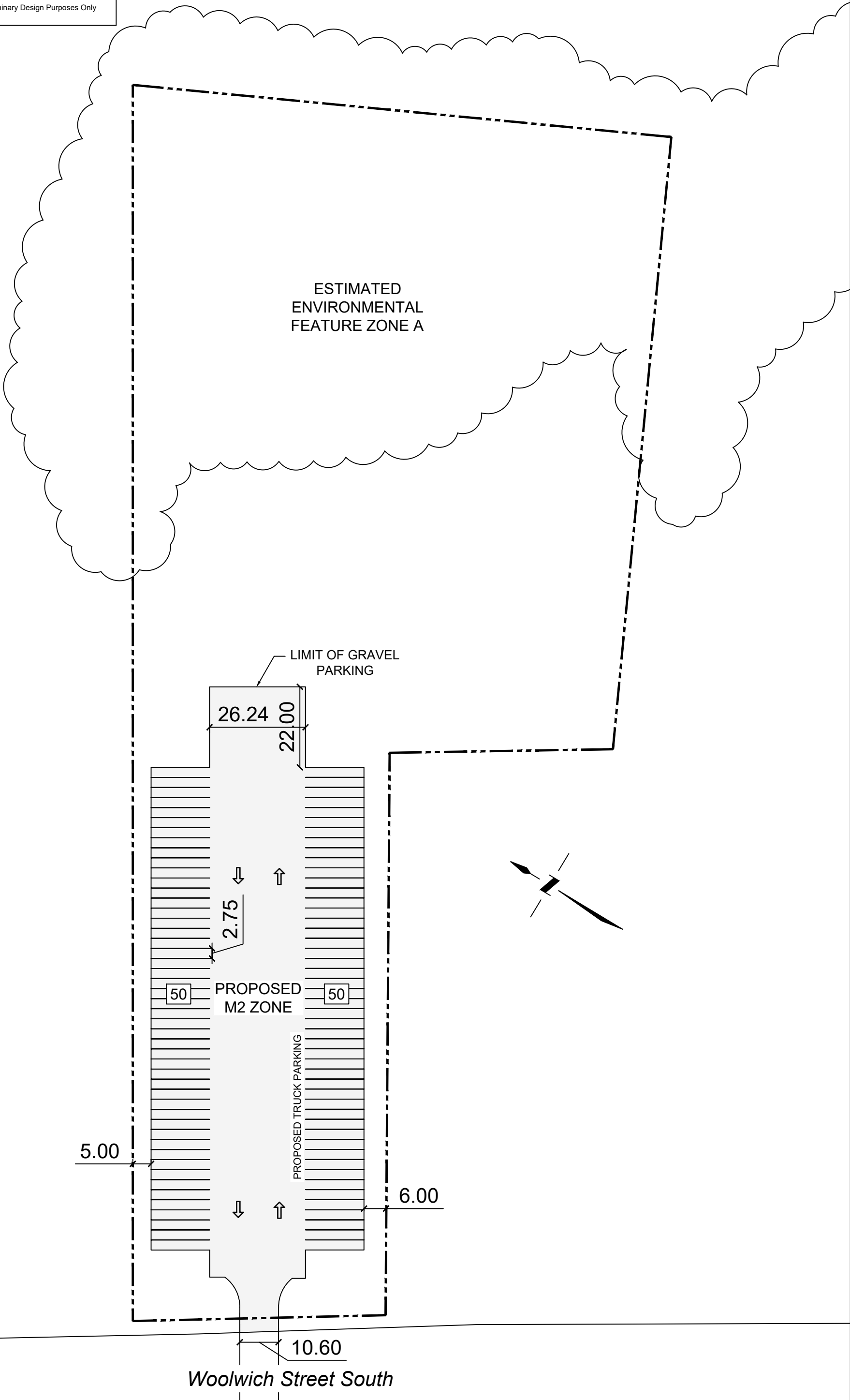
Encl. Appendix A – Background Information
Encl. Appendix B – Stormwater Management Calculations
Encl. Appendix C – Figures

APPENDIX A

BACKGROUND INFORMATION

General Notes:

- 1. Do Not Scale Drawings
- 2. These Plans Are For Preliminary Design Purposes Only



Preliminary Site Plan
265 Woolwich Street South, Guelph, ON
Proposed Parking Plan

Harper Dell & Associates Inc.
Planning, Parking, Zoning
Land Development Consultants
1370 Hurontario St.
Mississauga, ON, L5G 3G4

Date: July 16, 2024
Scale: 1:1000

SP



APPENDIX B

STORMWATER MANAGEMENT CALCULATIONS

Project No: 33259-24
 Project Name: 265 Woolwich Street South
 Project Location: Woolwich
 Date: 2024-07-02
 Update: 2024-07-02



NASHYD Hydraulic Parameter Sheet Pre-Development Catchment 101

Catchment Area: 0.512 ha
 Outlet: Woolwich St.

On-site Soils:

Type	Classification
Grandby Sandy Loam	A

*Per Ontario Soil Mapping, CMT Geotech Investigation, and HCS HydroG Assessment

Impervious Land Use:

Roadway/Building		Gravel		Sidewalk		SWM Facility		Total	
Area	CN	Area	CN	Area	CN	Area	CN	Area	Weighted CN
								0.00	0.00

*All areas are in Hectares.

Pervious Land Use:

Lawn		Woodland		Cultivated		Brush		Total	
Area	CN	Area	CN	Area	CN	Area	CN	Area	Weighted CN
						0.512	35	0.512	35.00

*All areas are in Hectares.

Composite Initial Abstraction:

Landuse	IA (mm)	Area
Lawn	5	0
Woodland	10	0
Cultivated	7	0
Brush	8	0.512
Impervious	2	0
Catchment Weighted	8.00	0.512

Composite Runoff Coefficient:

Landuse	RC	Area
Lawn		0
Woodland		0
Cultivated		0
Brush	0.15	0.512
Impervious		0
Catchment Weighted	0.15	0.512

Land Use VO Inputs:

Composite Curve Number: 35.00
 Composite Initial Abstraction (mm): 8.00
 Composite Runoff Coefficient: 0.15
 Flow Length (m): 59.0
 Slope (%): 1.00
 Time to Concentration (hr): 0.40
 Time to Peak (hr): 0.26

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 Project Name: 265 Woolwich Street South
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NASHYD Hydraulic Parameter Sheet Pre-Development Catchment 102

Catchment Area: 1.753 ha
 Outlet: GCRA Watercourse

On-site Soils:

Type	Classification
Grandby Sandy Loam	A

*Per Ontario Soil Mapping, CMT Geotech Investigation, and
HCS HydroG Assessment

Impervious Land Use:

Roadway/Building		Gravel		Sidewalk		SWM Facility		Total	
Area	CN	Area	CN	Area	CN	Area	CN	Area	Weighted CN
								0.00	0.00

*All areas are in Hectares.

Pervious Land Use:

Lawn		Woodland		Cultivated		Brush		Total	
Area	CN	Area	CN	Area	CN	Area	CN	Area	Weighted CN
						1.753	35	1.753	35.00

*All areas are in Hectares.

Composite Initial Abstraction:

Landuse	IA (mm)	Area
Lawn	5	0
Woodland	10	0
Cultivated	7	0
Brush	8	1.753
Impervious	2	0
Catchment Weighted	8.00	1.753

Composite Runoff Coefficient:

Landuse	RC	Area
Lawn		0
Woodland		0
Cultivated		0
Brush	0.15	1.753
Impervious		0
Catchment Weighted	0.15	1.753

Land Use VO Inputs:

Composite Curve Number: 35.00
 Composite Initial Abstraction (mm): 8.00
 Composite Runoff Coefficient: 0.15
 Flow Length (m): 115.0
 Slope (%): 1.97
 Time to Concentration (hr): 0.44
 Time to Peak (hr): 0.29

Project No: 33259-24
 Project Name: 265 Woolwich Street South
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NASHYD Hydraulic Parameter Sheet External Catchment EX1

Catchment Area: 0.230 ha

Outlet: GCRA Watercourse

On-site Soils:

Type	Classification
Grandby Sandy Loam	A

*Per Ontario Soil Mapping, CMT Geotech Investigation, and HCS HydroG Assessment

Impervious Land Use:

Roadway/Building		Gravel		Sidewalk		SWM Facility		Total	
Area	CN	Area	CN	Area	CN	Area	CN	Area	Weighted CN
0.050	98							0.050	98.00

*All areas are in Hectares.

Pervious Land Use:

Lawn		Woodland		Cultivated		Brush		Total	
Area	CN	Area	CN	Area	CN	Area	CN	Area	Weighted CN
0.180	39							0.180	39.00

*All areas are in Hectares.

Composite Initial Abstraction:

Landuse	IA (mm)	Area
Lawn	5	0.180
Woodland	10	0
Cultivated	7	0
Brush	8	0
Impervious	2	0.050
Catchment Weighted	4.35	0.230

Composite Runoff Coefficient:

Landuse	RC	Area
Lawn	0.25	0.180
Woodland		0
Cultivated		0
Brush		0
Impervious	0.90	0.050
Catchment Weighted	0.39	0.230

Land Use VO Inputs:

Composite Curve Number: 51.83
 Composite Initial Abstraction (mm): 4.35
 Composite Runoff Coefficient: 0.39
 Flow Length (m): 15.0
 Slope (%): 0.50
 Time to Concentration (hr): 0.19
 Time to Peak (hr): 0.12

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NASHYD Hydraulic Parameter Sheet Post-Development Catchment 201

Catchment Area: 0.239 ha

Outlet: Woolwich St.

On-site Soils:

Type	Classification
Grandby Sandy Loam	A

*Per Ontario Soil Mapping, CMT Geotech Investigation, and
HCS HydroG Assessment

Impervious Land Use:

Roadway/Building		Gravel		Sidewalk		SWM Facility		Total	
Area	CN	Area	CN	Area	CN	Area	CN	Area	Weighted CN
		0.037	98					0.04	98.00

*All areas are in Hectares.

Pervious Land Use:

Lawn		Woodland		Cultivated		Brush		Total	
Area	CN	Area	CN	Area	CN	Area	CN	Area	Weighted CN
0.202	39							0.202	39.00

*All areas are in Hectares.

Composite Initial Abstraction:

Landuse	IA (mm)	Area
Lawn	5	0.202
Woodland	10	0
Cultivated	7	0
Brush	8	0
Impervious	2	0.037
Catchment Weighted	4.54	0.239

Composite Runoff Coefficient:

Landuse	RC	Area
Lawn	0.25	0.202
Woodland		0
Cultivated		0
Brush		0
Impervious	0.90	0.037
Catchment Weighted	0.35	0.239

Land Use VO Inputs:

Composite Curve Number: 48.10
 Composite Initial Abstraction (mm): 4.54
 Composite Runoff Coefficient: 0.35
 Flow Length (m): 100.0
 Slope (%): 2.50
 Time to Concentration (hr): 0.30
 Time to Peak (hr): 0.20

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Project Name: 265 Woolwich Street South
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STANHYD Hydraulic Parameter Sheet
Post-Development Catchment 202

Catchment Area: 1.047
Outlet: GCRA Watercourse

On-site Soils:

Type	Classification
Grandby Sandy Loam	A

*Per Ontario Soil Mapping, CMT Geotech Investigation, and
HCS HydroG Assessment

Impervious Land Use:

Roadway/Driveway		Gravel		Building		SWM Facility		Total	
Area	CN	Area	CN	Area	CN	Area	CN	Area	Weighted CN
		0.816	98			0.231	50	1.047	87.39

*All areas are in Hectares.

Impervious Land Use VO Inputs:

Depression Storage (mm): 3.0 *increased to 3mm due to gravel lot
Slope (%): 0.5
Flow Length (m from model): 83.55
Total Indirectly Connected Impervious Area (ha): 0.000
Total Directly Connected Impervious Area (ha): 1.047
T IMP: 1.00
X IMP: 1.00

Pervious Land Use:

Lawn		Woodland		Cultivated		Brush		Total	
Area	CN	Area	CN	Area	CN	Area	CN	Area	Weighted CN
								0.0	0.00

*All areas are in Hectares.

Pervious Land Use VO Inputs:

Pervious Curve Number: 39.00
Initial Abstraction (mm): 5.00
Slope (%): 0.5
Flow Length (m): 10.0

Pervious Initial Abstraction:

Landuse	IA (mm)	Area
Lawn	5	0
Woodland	10	0
Cultivated	7	0
Brush	8	0
Catchment Weighted	0.00	0

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NASHYD Hydraulic Parameter Sheet Post-Development Catchment UC1

Catchment Area: 0.978 ha
 Outlet: GCRA Watercourse

On-site Soils:

Type	Classification
Grandby Sandy Loam	A

*Per Ontario Soil Mapping, CMT Geotech Investigation, and
 HCS HydroG Assessment

Impervious Land Use:

Roadway/Building		Gravel		Sidewalk		SWM Facility		Total	
Area	CN	Area	CN	Area	CN	Area	CN	Area	Weighted CN
								0.00	0.00

*All areas are in Hectares.

Pervious Land Use:

Lawn		Woodland		Cultivated		Brush		Total	
Area	CN	Area	CN	Area	CN	Area	CN	Area	Weighted CN
0.264	39					0.714	35	0.978	36.08

*All areas are in Hectares.

Composite Initial Abstraction:

Landuse	IA (mm)	Area
Lawn	5	0.264
Woodland	10	0
Cultivated	7	0
Brush	8	0.714
Impervious	2	0
Catchment Weighted	7.19	0.978

Composite Runoff Coefficient:

Landuse	RC	Area
Lawn	0.25	0.264
Woodland		0
Cultivated		0
Brush	0.15	0.714
Impervious		0
Catchment Weighted	0.18	0.978

Land Use VO Inputs:

Composite Curve Number: 36.08
 Composite Initial Abstraction (mm): 7.19
 Composite Runoff Coefficient: 0.18
 Flow Length (m): 100.0
 Slope (%): 0.80
 Time to Concentration (hr): 0.54
 Time to Peak (hr): 0.36

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Storage and Control Structure Calculations

Circular Orifice (Low Flow):	Diameter =	0.075	Rectangular Weir (High Flow):	Length =	0.25	m
	Invert Elevation =	312.90		Invert Elevation =	313.18	m
	Orifice Coeff =	0.62		Weir Coeff =	1.84	m

Elev. (m)	Storage Volume (m ³)	Circular Orifice Discharge (m ³ /s)	Rect Weir Discharge (m ³ /s)	Total Discharge (m ³ /s)	Storage (ha.m)
312.90	0	0.000	0.000	0.000	0.000
312.95	92	0.001	0.000	0.001	0.009
313.00	185	0.003	0.000	0.003	0.018
313.05	280	0.004	0.000	0.004	0.028
313.10	377	0.005	0.000	0.005	0.038
313.15	475	0.006	0.000	0.006	0.047
313.18	535	0.006	0.000	0.006	0.053
313.20	575	0.006	0.001	0.008	0.058
313.25	677	0.007	0.009	0.015	0.068
313.30	781	0.007	0.019	0.026	0.078
313.35	887	0.008	0.032	0.040	0.089
313.40	994	0.008	0.047	0.056	0.099
313.50	1214	0.009	0.083	0.092	0.121
313.60	1442	0.010	0.125	0.135	0.144

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Stormwater Quality Requirements (Dry Pond)

Catchment	Area (ha)	Percent Impervious	25mm Runoff Vol. (mm)	25mm Runoff Vol. (m3)
202	1.047	100	21.79	229

MOE Water Quality Volume Requirement (60% TSS removal) = 240 m³/ha
= 252 m³

Stormwater Extended Detention Requirements (Dry Pond)

Extended Detention Volume = 252 m³
Extended Detention Elevation = 313.02 *Average Depth of Extended Detention
Extended Detention Orifice Diameter = 75 mm
Orifice Invert Elevation= 312.90
Extended Detention Orifice Area = 0.004418 m²
Extended Detention Orifice Discharge Coefficient = 0.62
Average Extended Detention Head = 0.12 m
Average Surface Area of Extended Detention = 1855 m²
Drawdown Time = 29 hr *60% TSS removal at 26 hours

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Project Name: 265 Woolwich Street South
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Date: 2024-07-11
Update: 2024-10-15



Erosion Controls - Riprap Sizing Calculation (GRCA OUTLET)

Riprap Rock Size Calculation:

Equation: $D_{50} = V^2 / 2 * g * C^2 (S-1)$

D_{50} =	0.15	Median diameter of riprap (m)
V =	0.56	Water velocity (m/s)
g =	9.81	Gravity (m/s)
C =	1.2	Isbash Const. (C=0.86 high to 1.2 low turb)
S =	2.65	Specific Gravity of Stone

D_{Design}^{50} =	0.007	m	
D_{Design}^{50} =	6.73	mm	(min riprap size)
$D_{Provided}^{50}$ =	150	mm	

Notes:

- Water velocity per flowmaster full flow pipe calculations.
- 1.2 used for Isbash Constant to provide safety factor into design.

Project No: 33259-24
Project Name: 265 Woolwich Street South
Project Location: Woolwich
Date: 2024-07-02
Update: 2025-08-30



Stormwater Quality Controls - Treatment Train Calculation

TSS Removal Rates per Best Management Practice:

Best Management Practice	Adopted Removal Rate (%)
Bioretention System	90
Constructed Stormwater Wetland	90
Extended Detention Basin	40-60
Oil-Grit Separator	50
Jellyfish Filter	80+
Vegetative Filter	60-80
Wet Pond	50-90
Dry Pond	60
Catchbasin Shield	50

*Removal rates per the New Jersey Best Management Practices Manual (April 2007)

Proposed Best Management Practice:

Best Management Practice	Adopted Removal Rate (%)
Oil-Grit Separator	50
Catchbasin Shield	50
Dry Pond	60

*Extended detention to be provided by the tank but has not been included in this calculation.

TSS Removal Rate for Best Management Practices in Series:

Equation:

$$R = A + B - [(A \times B) / 100]$$

R = Total TSS Removal Rate
A = TSS Removal Rate of the First BMP
B = TSS Removal Rate of the Second BMP

Combined TSS Removal = 75 %

TSS Removal Rate for Best Management Practices in Series:

Equation:

$$R = A + B - [(A \times B) / 100]$$

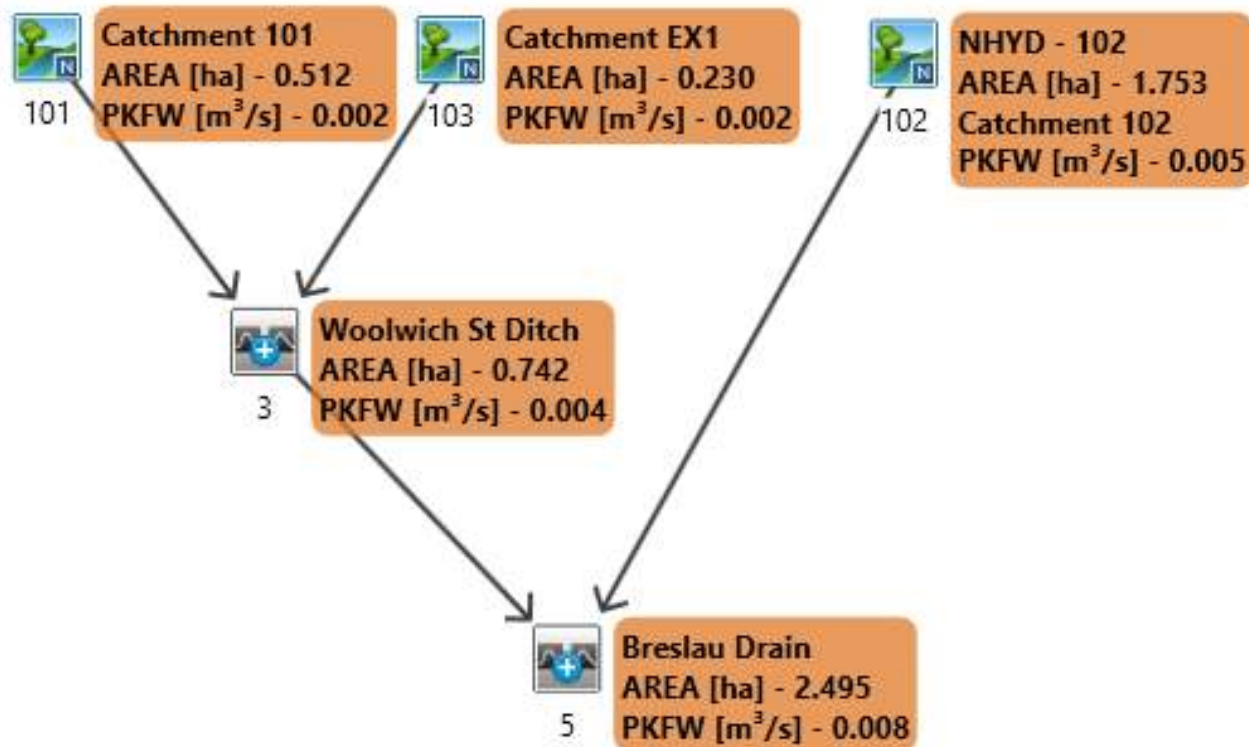
R = Total TSS Removal Rate
A = TSS Removal Rate of the Combined BMP
B = TSS Removal Rate of the Third BMP

Combined TSS Removal = 90 %

*Additional TSS removal will be provided by the grassed swale at the outlet of the depression storage facility

Pre-Development Uncontrolled Visual Otthymo Schematic

(100-Year Storm)



=====

V V I SSSSS U U A L (v 6.2.2017)
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 M M O O
000 T T H H Y M M 000

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\V02\voin.dat

Output filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\0e46753a-8d7f-4f98-b2c9-e455a3204508\s

Summary filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\0e46753a-8d7f-4f98-b2c9-e455a3204508\s

DATE: 08-28-2025

TIME: 09:44:58

USER:

COMMENTS: _____

** SIMULATION : 002yr 3hr 10min Chicago **

| CHICAGO STORM |
Ptotal= 34.25 mm

IDF curve parameters: A= 743.000
B= 6.000
C= 0.799

used in: $INTENSITY = A / (t + B)^C$

Duration of storm = 3.00 hrs

Storm time step = 10.00 min

Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	3.15	0.83	81.10	1.67	5.62	2.50	3.01
0.17	3.89	1.00	25.63	1.83	4.75	2.67	2.77
0.33	5.18	1.17	13.34	2.00	4.13	2.83	2.56
0.50	7.98	1.33	9.07	2.17	3.67		
0.67	19.47	1.50	6.91	2.33	3.30		

```
-----
| CALIB                                     |
| NASHYD ( 0101) | Area (ha)= 0.51 Curve Number (CN)= 35.0
| ID= 1 DT=10.0 min | Ia (mm)= 8.00 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.26
```

Unit Hyd Qpeak (cms)= 0.075

PEAK FLOW (cms)= 0.002 (i)

TIME TO PEAK (hrs)= 1.333

RUNOFF VOLUME (mm)= 1.370

TOTAL RAINFALL (mm)= 34.255

RUNOFF COEFFICIENT = 0.040

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| CALIB                                     |
| NASHYD ( 0103) | Area (ha)= 0.23 Curve Number (CN)= 51.8
| ID= 1 DT=10.0 min | Ia (mm)= 4.35 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.12
```

Unit Hyd Qpeak (cms)= 0.073

PEAK FLOW (cms)= 0.002 (i)

TIME TO PEAK (hrs)= 1.000

RUNOFF VOLUME (mm)= 2.882

TOTAL RAINFALL (mm)= 34.255

RUNOFF COEFFICIENT = 0.084

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0003) |
| 1 + 2 = 3 |
-----
          AREA    QPEAK    TPEAK    R.V.
          (ha)    (cms)    (hrs)    (mm)
ID1= 1 ( 0101):    0.51    0.002    1.33    1.37
+ ID2= 2 ( 0103):    0.23    0.002    1.00    2.88
=====
ID = 3 ( 0003):    0.74    0.004    1.17    1.84

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB |
| NASHYD ( 0102) |
| ID= 1 DT=10.0 min |
-----
          Area    (ha)=    1.75    Curve Number    (CN)= 35.0
          Ia      (mm)=    8.00    # of Linear Res.(N)= 3.00
          U.H. Tp(hrs)=    0.29

```

Unit Hyd Qpeak (cms)= 0.231

PEAK FLOW (cms)= 0.005 (i)
 TIME TO PEAK (hrs)= 1.333
 RUNOFF VOLUME (mm)= 1.375
 TOTAL RAINFALL (mm)= 34.255
 RUNOFF COEFFICIENT = 0.040

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0005) |
| 1 + 2 = 3 |
-----
          AREA    QPEAK    TPEAK    R.V.
          (ha)    (cms)    (hrs)    (mm)
ID1= 1 ( 0102):    1.75    0.005    1.33    1.37
+ ID2= 2 ( 0003):    0.74    0.004    1.17    1.84
=====
ID = 3 ( 0005):    2.50    0.008    1.33    1.51

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

=====
=====
V    V    I    SSSSS    U    U    A    L
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
VW    I    SSSSS    UUUUU    A    A    LLLLL

```

(v 6.2.2017)

```

      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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Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\V02\voin.dat

Output filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\735053c7-9e49-4537-b11e-82d36826b5e6\s

Summary filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\735053c7-9e49-4537-b11e-82d36826b5e6\s

DATE: 08-28-2025

TIME: 09:44:58

USER:

COMMENTS: _____

```

*****
** SIMULATION : 005yr 3hr 10min Chicago **
*****

```

```

-----
| CHICAGO STORM |
| Ptotal= 47.24 mm |
-----

```

IDF curve parameters: A=1593.000
 B= 11.000
 C= 0.879

used in: INTENSITY = $A / (t + B)^C$

Duration of storm = 3.00 hrs
 Storm time step = 10.00 min
 Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	3.46	0.83	109.68	1.67	7.17	2.50	3.26

0.17	4.52		1.00	40.71		1.83	5.81		2.67	2.93
0.33	6.48		1.17	20.28		2.00	4.87		2.83	2.67
0.50	11.07		1.33	12.91		2.17	4.19			
0.67	30.47		1.50	9.28		2.33	3.67			

```

-----
| CALIB                                     |
| NASHYD ( 0101) | Area (ha)= 0.51 Curve Number (CN)= 35.0
| ID= 1 DT=10.0 min | Ia (mm)= 8.00 # of Linear Res.(N)= 3.00
-----
|                                     |
|                                     | U.H. Tp(hrs)= 0.26
|                                     |

```

Unit Hyd Qpeak (cms)= 0.075

PEAK FLOW (cms)= 0.004 (i)
 TIME TO PEAK (hrs)= 1.333
 RUNOFF VOLUME (mm)= 2.982
 TOTAL RAINFALL (mm)= 47.236
 RUNOFF COEFFICIENT = 0.063

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB                                     |
| NASHYD ( 0103) | Area (ha)= 0.23 Curve Number (CN)= 51.8
| ID= 1 DT=10.0 min | Ia (mm)= 4.35 # of Linear Res.(N)= 3.00
-----
|                                     |
|                                     | U.H. Tp(hrs)= 0.12
|                                     |

```

Unit Hyd Qpeak (cms)= 0.073

PEAK FLOW (cms)= 0.005 (i)
 TIME TO PEAK (hrs)= 1.000
 RUNOFF VOLUME (mm)= 5.657
 TOTAL RAINFALL (mm)= 47.236
 RUNOFF COEFFICIENT = 0.120

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0003) |
| 1 + 2 = 3 |
-----
|                                     | AREA   QPEAK   TPEAK   R.V.
|                                     | (ha)   (cms)   (hrs)   (mm)
| ID1= 1 ( 0101): | 0.51   0.004   1.33    2.98
| + ID2= 2 ( 0103): | 0.23   0.005   1.00    5.66
|=====
| ID = 3 ( 0003): | 0.74   0.008   1.17    3.81

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB |
| NASHYD ( 0102) | Area (ha)= 1.75 Curve Number (CN)= 35.0
| ID= 1 DT=10.0 min | Ia (mm)= 8.00 # of Linear Res.(N)= 3.00
-----
| U.H. Tp(hrs)= 0.29

```

Unit Hyd Qpeak (cms)= 0.231

PEAK FLOW (cms)= 0.013 (i)
 TIME TO PEAK (hrs)= 1.333
 RUNOFF VOLUME (mm)= 2.993
 TOTAL RAINFALL (mm)= 47.236
 RUNOFF COEFFICIENT = 0.063

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0005) |
| 1 + 2 = 3 |
-----

```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0102):	1.75	0.013	1.33	2.99
+ ID2= 2 (0003):	0.74	0.008	1.17	3.81
=====				
ID = 3 (0005):	2.50	0.020	1.33	3.24

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
=====
=====

```

```

V V I SSSSS U U A L (v 6.2.2017)
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 TTTTT TTTTT 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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Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\V02\voin.dat

Output filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\fb67134c-432f-4021-a69e-25753ce191f0\s

Summary filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\fb67134c-432f-4021-a69e-25753ce191f0\s

DATE: 08-28-2025

TIME: 09:44:58

USER:

COMMENTS: _____

** SIMULATION : 010yr 3hr 10min Chicago **

| CHICAGO STORM |
Ptotal= 56.26 mm

IDF curve parameters: A=2221.000
 B= 12.000
 C= 0.908

used in: INTENSITY = $A / (t + B)^C$

Duration of storm = 3.00 hrs

Storm time step = 10.00 min

Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	3.65	0.83	134.16	1.67	8.06	2.50	3.42
0.17	4.89	1.00	50.03	1.83	6.42	2.67	3.05
0.33	7.23	1.17	24.37	2.00	5.30	2.83	2.75
0.50	12.87	1.33	15.14	2.17	4.50		
0.67	37.17	1.50	10.64	2.33	3.89		

CALIB

NASHYD (0101)	Area (ha)=	0.51	Curve Number (CN)=	35.0
ID= 1 DT=10.0 min	Ia (mm)=	8.00	# of Linear Res.(N)=	3.00
-----	U.H. Tp(hrs)=	0.26		

Unit Hyd Qpeak (cms)= 0.075

PEAK FLOW (cms)= 0.006 (i)
 TIME TO PEAK (hrs)= 1.333
 RUNOFF VOLUME (mm)= 4.433
 TOTAL RAINFALL (mm)= 56.258
 RUNOFF COEFFICIENT = 0.079

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
NASHYD (0103)	Area (ha)=	0.23	Curve Number (CN)=	51.8
ID= 1 DT=10.0 min	Ia (mm)=	4.35	# of Linear Res.(N)=	3.00
-----	U.H. Tp(hrs)=	0.12		

Unit Hyd Qpeak (cms)= 0.073

PEAK FLOW (cms)= 0.008 (i)
 TIME TO PEAK (hrs)= 1.000
 RUNOFF VOLUME (mm)= 8.028
 TOTAL RAINFALL (mm)= 56.258
 RUNOFF COEFFICIENT = 0.143

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0003)				
1 + 2 = 3				

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0101):	0.51	0.006	1.33	4.43
+ ID2= 2 (0103):	0.23	0.008	1.00	8.03
=====				
ID = 3 (0003):	0.74	0.013	1.17	5.55

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB				
NASHYD (0102)	Area (ha)=	1.75	Curve Number (CN)=	35.0
ID= 1 DT=10.0 min	Ia (mm)=	8.00	# of Linear Res.(N)=	3.00
-----	U.H. Tp(hrs)=	0.29		

Unit Hyd Qpeak (cms)= 0.231

PEAK FLOW (cms)= 0.021 (i)

TIME TO PEAK (hrs)= 1.333

RUNOFF VOLUME (mm)= 4.449

TOTAL RAINFALL (mm)= 56.258

RUNOFF COEFFICIENT = 0.079

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| ADD HYD ( 0005) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0102):    1.75    0.021    1.33    4.45
+ ID2= 2 ( 0003):    0.74    0.013    1.17    5.55
=====
ID = 3 ( 0005):    2.50    0.031    1.33    4.78
=====
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

```
=====
=====
=====
=====
V  V  I  SSSSS  U  U  A  L  (v 6.2.2017)
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
WV   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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Output filename:
C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\c0
ed385d-a9f8-4386-b36b-318d10ec6fdf\s
Summary filename:
C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\c0
ed385d-a9f8-4386-b36b-318d10ec6fdf\s

DATE: 08-28-2025 TIME: 09:44:58

USER:

COMMENTS: _____

** SIMULATION : 025yr 3hr 10min Chicago **

| CHICAGO STORM | IDF curve parameters: A=3158.000
| Ptotal= 68.23 mm | B= 15.000
C= 0.936
used in: INTENSITY = A / (t + B)^C
Duration of storm = 3.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	4.19	0.83	155.47	1.67	9.94	2.50	3.90
0.17	5.78	1.00	63.30	1.83	7.78	2.67	3.43
0.33	8.84	1.17	31.36	2.00	6.32	2.83	3.05
0.50	16.30	1.33	19.30	2.17	5.27		
0.67	47.29	1.50	13.35	2.33	4.49		

| CALIB |
| NASHYD (0101) | Area (ha)= 0.51 Curve Number (CN)= 35.0
| ID= 1 DT=10.0 min | Ia (mm)= 8.00 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 0.26

Unit Hyd Qpeak (cms)= 0.075

PEAK FLOW (cms)= 0.010 (i)
TIME TO PEAK (hrs)= 1.333
RUNOFF VOLUME (mm)= 6.751
TOTAL RAINFALL (mm)= 68.226
RUNOFF COEFFICIENT = 0.099

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| CALIB |
| NASHYD ( 0103) | Area (ha)= 0.23 Curve Number (CN)= 51.8
| ID= 1 DT=10.0 min | Ia (mm)= 4.35 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.12
```

Unit Hyd Qpeak (cms)= 0.073

PEAK FLOW (cms)= 0.011 (i)
TIME TO PEAK (hrs)= 1.000
RUNOFF VOLUME (mm)= 11.672
TOTAL RAINFALL (mm)= 68.226
RUNOFF COEFFICIENT = 0.171

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| ADD HYD ( 0003) |
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.
|-----| (ha) (cms) (hrs) (mm)
ID1= 1 ( 0101): 0.51 0.010 1.33 6.75
+ ID2= 2 ( 0103): 0.23 0.011 1.00 11.67
=====
ID = 3 ( 0003): 0.74 0.019 1.17 8.28
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| CALIB |
| NASHYD ( 0102) | Area (ha)= 1.75 Curve Number (CN)= 35.0
| ID= 1 DT=10.0 min | Ia (mm)= 8.00 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.29
```

Unit Hyd Qpeak (cms)= 0.231

PEAK FLOW (cms)= 0.032 (i)
TIME TO PEAK (hrs)= 1.333

RUNOFF VOLUME (mm)= 6.774
TOTAL RAINFALL (mm)= 68.226
RUNOFF COEFFICIENT = 0.099

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0005)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0102):		1.75	0.032	1.33	6.77
+ ID2= 2 (0003):		0.74	0.019	1.17	8.28
=====					
ID = 3 (0005):		2.50	0.048	1.33	7.22

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

V	V	I	SSSSS	U	U	A	L	(v 6.2.2017)
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	TTTTT	TTTTT	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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```
***** D E T A I L E D   O U T P U T *****
```

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Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\V02\voin.dat
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Output filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\426436cd-17d7-4df5-87ce-ad5e4c99dcfc\s

Summary filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\426436cd-17d7-4df5-87ce-ad5e4c99dcfc\s

DATE: 08-28-2025

TIME: 09:44:58

USER:

COMMENTS: _____

** SIMULATION : 050yr 3hr 10min Chicago **

| CHICAGO STORM |
Ptotal= 77.60 mm

IDF curve parameters: A=3886.000
B= 16.000
C= 0.950

used in: INTENSITY = $A / (t + B)^C$

Duration of storm = 3.00 hrs

Storm time step = 10.00 min

Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	4.54	0.83	176.19	1.67	11.20	2.50	4.21
0.17	6.37	1.00	73.10	1.83	8.68	2.67	3.68
0.33	9.92	1.17	36.22	2.00	6.99	2.83	3.25
0.50	18.63	1.33	22.14	2.17	5.78		
0.67	54.62	1.50	15.18	2.33	4.89		

| CALIB |
| NASHYD (0101) |
ID= 1 DT=10.0 min

Area (ha)= 0.51 Curve Number (CN)= 35.0
Ia (mm)= 8.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.26

Unit Hyd Qpeak (cms)= 0.075

PEAK FLOW (cms)= 0.013 (i)

TIME TO PEAK (hrs)= 1.333

RUNOFF VOLUME (mm)= 8.860

TOTAL RAINFALL (mm)= 77.602

RUNOFF COEFFICIENT = 0.114

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB |
| NASHYD ( 0103) | Area (ha)= 0.23 Curve Number (CN)= 51.8
| ID= 1 DT=10.0 min | Ia (mm)= 4.35 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.12

```

Unit Hyd Qpeak (cms)= 0.073

PEAK FLOW (cms)= 0.014 (i)
 TIME TO PEAK (hrs)= 1.000
 RUNOFF VOLUME (mm)= 14.885
 TOTAL RAINFALL (mm)= 77.602
 RUNOFF COEFFICIENT = 0.192

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0003) |
| 1 + 2 = 3 |
|-----|
| ID1= 1 ( 0101): | AREA QPEAK TPEAK R.V.
|                   | (ha) (cms) (hrs) (mm)
| + ID2= 2 ( 0103): | 0.51 0.013 1.33 8.86
|                   | 0.23 0.014 1.00 14.88
|=====|
| ID = 3 ( 0003): | 0.74 0.025 1.17 10.73

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB |
| NASHYD ( 0102) | Area (ha)= 1.75 Curve Number (CN)= 35.0
| ID= 1 DT=10.0 min | Ia (mm)= 8.00 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.29

```

Unit Hyd Qpeak (cms)= 0.231

PEAK FLOW (cms)= 0.042 (i)
 TIME TO PEAK (hrs)= 1.333
 RUNOFF VOLUME (mm)= 8.890
 TOTAL RAINFALL (mm)= 77.602
 RUNOFF COEFFICIENT = 0.115

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0005)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
-----	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0102):	1.75	0.042	1.33	8.89
+ ID2= 2 (0003):	0.74	0.025	1.17	10.73
=====				
ID = 3 (0005):	2.50	0.063	1.33	9.44

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 =====
 =====

V	V	I	SSSSS	U	U	A	L		(v 6.2.2017)
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	TTTTT	TTTTT	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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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYM0 6.2\V02\voin.dat

Output filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\aa
 675745-3e57-4b7b-9ebd-b9e0138031b8\s

Summary filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\aa
 675745-3e57-4b7b-9ebd-b9e0138031b8\s

DATE: 08-28-2025

TIME: 09:44:58

USER:

COMMENTS: _____

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

 | CHICAGO STORM |
Ptotal= 87.03 mm

IDF curve parameters: A=4688.000
 B= 17.000
 C= 0.962
 used in: INTENSITY = A / (t + B)^C

Duration of storm = 3.00 hrs
 Storm time step = 10.00 min
 Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	'	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	4.88	0.83	196.54		1.67	12.48	2.50	4.51
0.17	6.96	1.00	83.09		1.83	9.60	2.67	3.91
0.33	11.02	1.17	41.25		2.00	7.66	2.83	3.44
0.50	21.03	1.33	25.07		2.17	6.29		
0.67	62.12	1.50	17.06		2.33	5.28		

 | CALIB |
 | NASHYD (0101) |
ID= 1 DT=10.0 min

Area (ha)= 0.51 Curve Number (CN)= 35.0
 Ia (mm)= 8.00 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= 0.26

Unit Hyd Qpeak (cms)= 0.075

PEAK FLOW (cms)= 0.016 (i)
 TIME TO PEAK (hrs)= 1.333
 RUNOFF VOLUME (mm)= 11.227
 TOTAL RAINFALL (mm)= 87.029
 RUNOFF COEFFICIENT = 0.129

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 | CALIB |
 | NASHYD (0103) |
ID= 1 DT=10.0 min

Area (ha)= 0.23 Curve Number (CN)= 51.8
 Ia (mm)= 4.35 # of Linear Res.(N)= 3.00
 U.H. Tp(hrs)= 0.12

Unit Hyd Qpeak (cms)= 0.073

PEAK FLOW (cms)= 0.018 (i)
 TIME TO PEAK (hrs)= 1.000
 RUNOFF VOLUME (mm)= 18.401
 TOTAL RAINFALL (mm)= 87.029
 RUNOFF COEFFICIENT = 0.211

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0003) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0101):    0.51    0.016      1.33    11.23
+ ID2= 2 ( 0103):    0.23    0.018      1.00    18.40
=====
ID = 3 ( 0003):    0.74    0.032      1.17    13.45
  
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB |
| NASHYD ( 0102) |
| ID= 1 DT=10.0 min |
-----
          Area      (ha)=    1.75    Curve Number (CN)= 35.0
          Ia      (mm)=    8.00    # of Linear Res.(N)= 3.00
          U.H. Tp(hrs)=    0.29
  
```

Unit Hyd Qpeak (cms)= 0.231

PEAK FLOW (cms)= 0.054 (i)
 TIME TO PEAK (hrs)= 1.333
 RUNOFF VOLUME (mm)= 11.265
 TOTAL RAINFALL (mm)= 87.029
 RUNOFF COEFFICIENT = 0.129

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

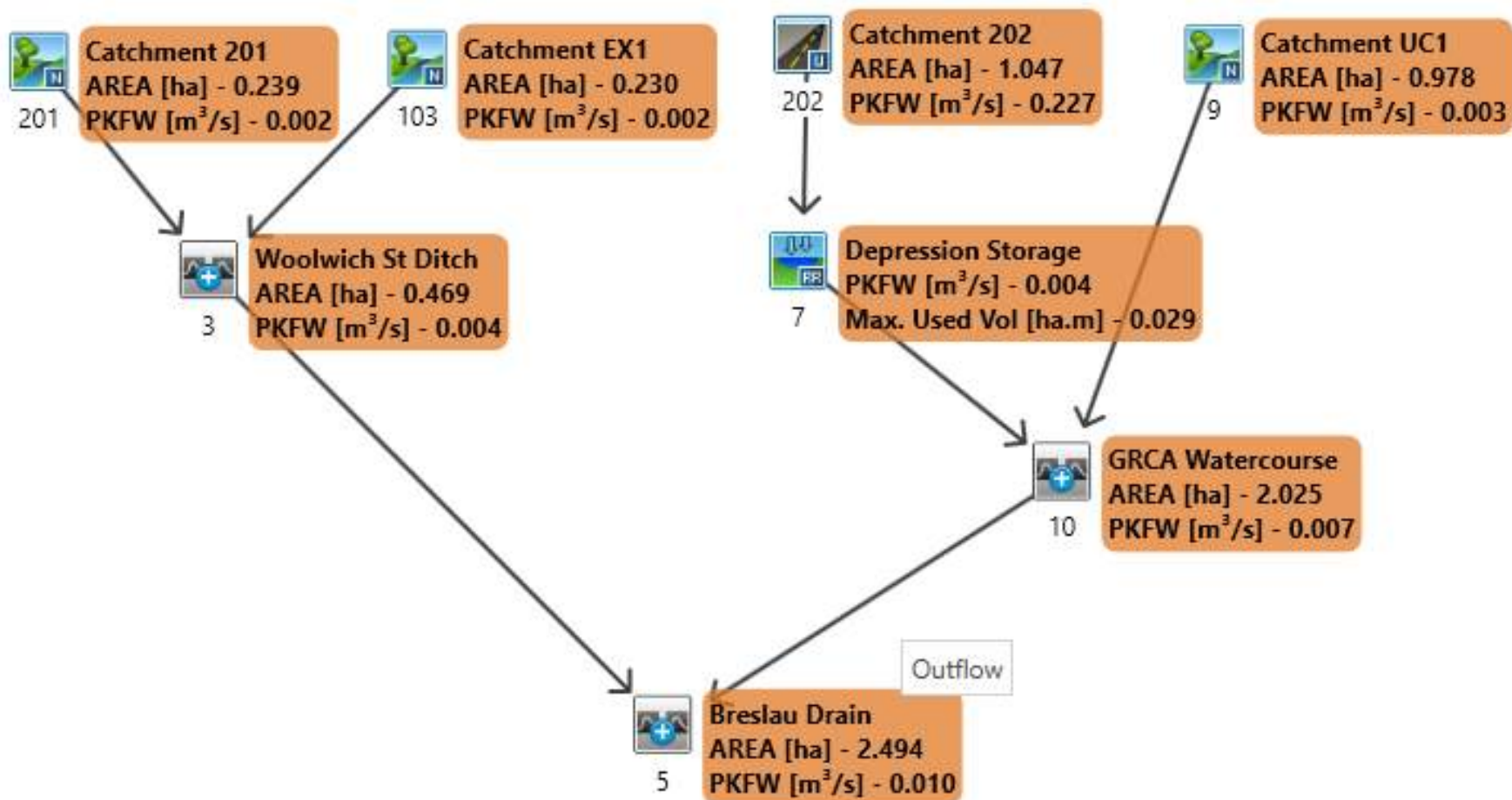
```

-----
| ADD HYD ( 0005) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0102):    1.75    0.054      1.33    11.27
+ ID2= 2 ( 0003):    0.74    0.032      1.17    13.45
=====
ID = 3 ( 0005):    2.50    0.081      1.33    11.92
  
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Post-Development Controlled Visual Otthymo Schematic

(100-Year Storm)



=====

V V I SSSSS U U A L (v 6.2.2017)
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 M M O O
000 T T H H Y M M 000

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\V02\voin.dat

Output filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\d3
c9134e-040f-4dc3-90e8-fa34787e643a\s

Summary filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\d3
c9134e-040f-4dc3-90e8-fa34787e643a\s

DATE: 08-28-2025

TIME: 09:42:33

USER:

COMMENTS: _____

** SIMULATION : 002yr 3hr 10min Chicago **

| CHICAGO STORM |
Ptotal= 34.25 mm

IDF curve parameters: A= 743.000
B= 6.000
C= 0.799

used in: $INTENSITY = A / (t + B)^C$

Duration of storm = 3.00 hrs

Storm time step = 10.00 min

Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	3.15	0.83	81.10	1.67	5.62	2.50	3.01
0.17	3.89	1.00	25.63	1.83	4.75	2.67	2.77
0.33	5.18	1.17	13.34	2.00	4.13	2.83	2.56
0.50	7.98	1.33	9.07	2.17	3.67		
0.67	19.47	1.50	6.91	2.33	3.30		

| CALIB |
| NASHYD (0103) | Area (ha)= 0.23 Curve Number (CN)= 51.8
| ID= 1 DT=10.0 min | Ia (mm)= 4.35 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 0.20

Unit Hyd Qpeak (cms)= 0.044

PEAK FLOW (cms)= 0.002 (i)

TIME TO PEAK (hrs)= 1.167

RUNOFF VOLUME (mm)= 3.272

TOTAL RAINFALL (mm)= 34.255

RUNOFF COEFFICIENT = 0.096

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| NASHYD (0201) | Area (ha)= 0.24 Curve Number (CN)= 48.1
| ID= 1 DT=10.0 min | Ia (mm)= 4.54 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 0.20

Unit Hyd Qpeak (cms)= 0.046

PEAK FLOW (cms)= 0.002 (i)

TIME TO PEAK (hrs)= 1.167

RUNOFF VOLUME (mm)= 2.829

TOTAL RAINFALL (mm)= 34.255

RUNOFF COEFFICIENT = 0.083

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0003) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0103):    0.23    0.002    1.17    3.27
+ ID2= 2 ( 0201):    0.24    0.002    1.17    2.83
=====
ID = 3 ( 0003):    0.47    0.004    1.17    3.05

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB |
| NASHYD ( 0009) |
| ID= 1 DT=10.0 min |
-----
          Area      (ha)=    0.98      Curve Number      (CN)= 36.1
          Ia        (mm)=    7.19      # of Linear Res.(N)= 3.00
          U.H. Tp(hrs)=    0.36

```

Unit Hyd Qpeak (cms)= 0.104

PEAK FLOW (cms)= 0.003 (i)
 TIME TO PEAK (hrs)= 1.500
 RUNOFF VOLUME (mm)= 1.530
 TOTAL RAINFALL (mm)= 34.255
 RUNOFF COEFFICIENT = 0.045

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB |
| STANDHYD ( 0202) |
| ID= 1 DT=10.0 min |
-----
          Area      (ha)=    1.05
          Total Imp(%)= 99.00      Dir. Conn.(%)= 99.00

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.04	0.01
Dep. Storage	(mm)=	3.00	5.00
Average Slope	(%)=	0.50	0.50
Length	(m)=	83.55	10.00
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	81.10	2.69
over (min)	10.00	30.00
Storage Coeff. (min)=	3.07 (ii)	22.85 (ii)
Unit Hyd. Tpeak (min)=	10.00	30.00
Unit Hyd. peak (cms)=	0.16	0.04

TOTALS

PEAK FLOW	(cms)=	0.23	0.00	0.227 (iii)
TIME TO PEAK	(hrs)=	1.00	1.50	1.00
RUNOFF VOLUME	(mm)=	31.25	2.01	30.96

TOTAL RAINFALL (mm)=	34.25	34.25	34.25
RUNOFF COEFFICIENT =	0.91	0.06	0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 39.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0007)		OVERFLOW IS OFF			
IN= 2---> OUT= 1					
DT= 5.0 min					

	OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000		0.0080	0.0580
	0.0010	0.0090		0.0150	0.0680
	0.0030	0.0180		0.0260	0.0780
	0.0040	0.0280		0.0400	0.0890
	0.0050	0.0380		0.0560	0.0990
	0.0060	0.0470		0.0920	0.1210
	0.0060	0.0530		0.1350	0.1440
	AREA (ha)	QPEAK (cms)		TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0202)	1.047	0.227		1.00	30.96
OUTFLOW: ID= 1 (0007)	1.047	0.004		3.08	28.77
	PEAK FLOW REDUCTION [Qout/Qin](%)= 1.83				
	TIME SHIFT OF PEAK FLOW (min)=125.00				
	MAXIMUM STORAGE USED (ha.m.)= 0.0295				

ADD HYD (0010)				
1 + 2 = 3				

ID1= 1 (0007):	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	1.05	0.004	3.08	28.77
+ ID2= 2 (0009):	0.98	0.003	1.50	1.53
	=====			
ID = 3 (0010):	2.02	0.007	1.50	15.62

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0005)

1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0010):	2.02	0.007	1.50	15.62
+ ID2= 2 (0003):	0.47	0.004	1.17	3.05
=====				
ID = 3 (0005):	2.49	0.010	1.33	13.25

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

```

V   V   I   SSSSS   U   U   A   L           (v 6.2.2017)
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
VW      I   SSSSS   UUUUU   A   A   LLLLL

```

```

000   TTTTT   TTTTT   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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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\V02\voin.dat

Output filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\2b
 eb51d3-12e7-4f19-97bd-7d5931f9f9c1\s

Summary filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\2b
 eb51d3-12e7-4f19-97bd-7d5931f9f9c1\s

DATE: 08-28-2025

TIME: 09:42:33

USER:

COMMENTS: _____

** SIMULATION : 005yr 3hr 10min Chicago **

CHICAGO STORM
Ptotal= 47.24 mm

IDF curve parameters: A=1593.000
B= 11.000
C= 0.879

used in: INTENSITY = $A / (t + B)^C$

Duration of storm = 3.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	3.46	0.83	109.68	1.67	7.17	2.50	3.26
0.17	4.52	1.00	40.71	1.83	5.81	2.67	2.93
0.33	6.48	1.17	20.28	2.00	4.87	2.83	2.67
0.50	11.07	1.33	12.91	2.17	4.19		
0.67	30.47	1.50	9.28	2.33	3.67		

CALIB
NASHYD (0103)
ID= 1 DT=10.0 min

Area (ha)= 0.23 Curve Number (CN)= 51.8
Ia (mm)= 4.35 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.20

Unit Hyd Qpeak (cms)= 0.044

PEAK FLOW (cms)= 0.005 (i)
TIME TO PEAK (hrs)= 1.167
RUNOFF VOLUME (mm)= 6.419
TOTAL RAINFALL (mm)= 47.236
RUNOFF COEFFICIENT = 0.136

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
NASHYD (0201)

Area (ha)= 0.24 Curve Number (CN)= 48.1

| ID= 1 DT=10.0 min | Ia (mm)= 4.54 # of Linear Res.(N)= 3.00

 U.H. Tp(hrs)= 0.20

Unit Hyd Qpeak (cms)= 0.046

PEAK FLOW (cms)= 0.004 (i)
TIME TO PEAK (hrs)= 1.167
RUNOFF VOLUME (mm)= 5.602
TOTAL RAINFALL (mm)= 47.236
RUNOFF COEFFICIENT = 0.119

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0003) |
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.

 (ha) (cms) (hrs) (mm)
ID1= 1 (0103): 0.23 0.005 1.17 6.42
+ ID2= 2 (0201): 0.24 0.004 1.17 5.60
=====

ID = 3 (0003): 0.47 0.009 1.17 6.00

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB |
| NASHYD (0009) | Area (ha)= 0.98 Curve Number (CN)= 36.1
| ID= 1 DT=10.0 min | Ia (mm)= 7.19 # of Linear Res.(N)= 3.00

 U.H. Tp(hrs)= 0.36

Unit Hyd Qpeak (cms)= 0.104

PEAK FLOW (cms)= 0.007 (i)
TIME TO PEAK (hrs)= 1.500
RUNOFF VOLUME (mm)= 3.262
TOTAL RAINFALL (mm)= 47.236
RUNOFF COEFFICIENT = 0.069

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| STANDHYD (0202) | Area (ha)= 1.05
| ID= 1 DT=10.0 min | Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00

 IMPERVIOUS PERVIOUS (i)
Surface Area (ha)= 1.04 0.01

Dep. Storage	(mm)=	3.00	5.00	
Average Slope	(%)=	0.50	0.50	
Length	(m)=	83.55	10.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		109.68	5.94	
over (min)		10.00	20.00	
Storage Coeff. (min)=		2.72 (ii)	17.13 (ii)	
Unit Hyd. Tpeak (min)=		10.00	20.00	
Unit Hyd. peak (cms)=		0.17	0.06	
				TOTALS
PEAK FLOW (cms)=		0.31	0.00	0.310 (iii)
TIME TO PEAK (hrs)=		1.00	1.33	1.00
RUNOFF VOLUME (mm)=		44.24	4.06	43.83
TOTAL RAINFALL (mm)=		47.24	47.24	47.24
RUNOFF COEFFICIENT =		0.94	0.09	0.93

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 39.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0007)	OVERFLOW IS OFF			
IN= 2---> OUT= 1				
DT= 5.0 min				
	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0080	0.0580
	0.0010	0.0090	0.0150	0.0680
	0.0030	0.0180	0.0260	0.0780
	0.0040	0.0280	0.0400	0.0890
	0.0050	0.0380	0.0560	0.0990
	0.0060	0.0470	0.0920	0.1210
	0.0060	0.0530	0.1350	0.1440
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0202)	1.047	0.310	1.00	43.83
OUTFLOW: ID= 1 (0007)	1.047	0.005	3.08	41.65
	PEAK FLOW REDUCTION [Qout/Qin](%)= 1.76			
	TIME SHIFT OF PEAK FLOW (min)=125.00			
	MAXIMUM STORAGE USED (ha.m.)= 0.0420			

```

-----
| ADD HYD ( 0010) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
      ID1= 1 ( 0007):  1.05  0.005  3.08  41.65
+ ID2= 2 ( 0009):  0.98  0.007  1.50  3.26
=====
      ID = 3 ( 0010):  2.02  0.012  1.50  23.11

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0005) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
      ID1= 1 ( 0010):  2.02  0.012  1.50  23.11
+ ID2= 2 ( 0003):  0.47  0.009  1.17  6.00
=====
      ID = 3 ( 0005):  2.49  0.019  1.33  19.89

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

V  V  I  SSSSS  U  U  A  L  (v 6.2.2017)
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  M  M  O  O
000  T    T  H  H  Y  M  M  000

```

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\V02\voin.dat

Output filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\95
 1e557c-b258-4907-866a-90ec681577d4\s

Summary filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\951e557c-b258-4907-866a-90ec681577d4\s

DATE: 08-28-2025

TIME: 09:42:33

USER:

COMMENTS: _____

** SIMULATION : 010yr 3hr 10min Chicago **

| CHICAGO STORM |
Ptotal= 56.26 mm

IDF curve parameters: A=2221.000
B= 12.000
C= 0.908

used in: INTENSITY = $A / (t + B)^C$

Duration of storm = 3.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	3.65	0.83	134.16	1.67	8.06	2.50	3.42
0.17	4.89	1.00	50.03	1.83	6.42	2.67	3.05
0.33	7.23	1.17	24.37	2.00	5.30	2.83	2.75
0.50	12.87	1.33	15.14	2.17	4.50		
0.67	37.17	1.50	10.64	2.33	3.89		

| CALIB |
| NASHYD (0103) |
ID= 1 DT=10.0 min

Area (ha)= 0.23 Curve Number (CN)= 51.8
Ia (mm)= 4.35 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.20

Unit Hyd Qpeak (cms)= 0.044

PEAK FLOW (cms)= 0.007 (i)

TIME TO PEAK (hrs)= 1.167

RUNOFF VOLUME (mm)= 9.112

TOTAL RAINFALL (mm)= 56.258
RUNOFF COEFFICIENT = 0.162

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| CALIB |
| NASHYD ( 0201) | Area (ha)= 0.24 Curve Number (CN)= 48.1
| ID= 1 DT=10.0 min | Ia (mm)= 4.54 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.20
```

Unit Hyd Qpeak (cms)= 0.046

PEAK FLOW (cms)= 0.006 (i)
TIME TO PEAK (hrs)= 1.167
RUNOFF VOLUME (mm)= 7.996
TOTAL RAINFALL (mm)= 56.258
RUNOFF COEFFICIENT = 0.142

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| ADD HYD ( 0003) |
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.
|-----| (ha) (cms) (hrs) (mm)
ID1= 1 ( 0103): 0.23 0.007 1.17 9.11
+ ID2= 2 ( 0201): 0.24 0.006 1.17 8.00
=====
ID = 3 ( 0003): 0.47 0.014 1.17 8.54
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| CALIB |
| NASHYD ( 0009) | Area (ha)= 0.98 Curve Number (CN)= 36.1
| ID= 1 DT=10.0 min | Ia (mm)= 7.19 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.36
```

Unit Hyd Qpeak (cms)= 0.104

PEAK FLOW (cms)= 0.011 (i)
TIME TO PEAK (hrs)= 1.333
RUNOFF VOLUME (mm)= 4.810
TOTAL RAINFALL (mm)= 56.258
RUNOFF COEFFICIENT = 0.085

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB |
| STANDHYD ( 0202) | Area (ha)= 1.05
| ID= 1 DT=10.0 min | Total Imp(%)= 99.00 Dir. Conn.(%)= 99.00
-----

```

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	1.04	0.01	
Dep. Storage (mm)=	3.00	5.00	
Average Slope (%)=	0.50	0.50	
Length (m)=	83.55	10.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	134.16	9.03	
over (min)	10.00	20.00	
Storage Coeff. (min)=	2.51 (ii)	14.69 (ii)	
Unit Hyd. Tpeak (min)=	10.00	20.00	
Unit Hyd. peak (cms)=	0.17	0.07	
			TOTALS
PEAK FLOW (cms)=	0.38	0.00	0.381 (iii)
TIME TO PEAK (hrs)=	1.00	1.33	1.00
RUNOFF VOLUME (mm)=	53.26	5.86	52.78
TOTAL RAINFALL (mm)=	56.26	56.26	56.26
RUNOFF COEFFICIENT =	0.95	0.10	0.94

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 39.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| RESERVOIR( 0007) | OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----

```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0080	0.0580
0.0010	0.0090	0.0150	0.0680
0.0030	0.0180	0.0260	0.0780
0.0040	0.0280	0.0400	0.0890
0.0050	0.0380	0.0560	0.0990
0.0060	0.0470	0.0920	0.1210
0.0060	0.0530	0.1350	0.1440

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
--------------	----------------	----------------	--------------

INFLOW : ID= 2 (0202) 1.047 0.381 1.00 52.78
 OUTFLOW: ID= 1 (0007) 1.047 0.006 1.75 50.60

PEAK FLOW REDUCTION [Qout/Qin](%)= 1.57
 TIME SHIFT OF PEAK FLOW (min)= 45.00
 MAXIMUM STORAGE USED (ha.m.)= 0.0508

```
-----
| ADD HYD ( 0010) |
| 1 + 2 = 3 |
-----
          AREA    QPEAK    TPEAK    R.V.
          (ha)    (cms)    (hrs)    (mm)
ID1= 1 ( 0007):    1.05    0.006    1.75    50.60
+ ID2= 2 ( 0009):    0.98    0.011    1.33    4.81
=====
ID = 3 ( 0010):    2.02    0.016    1.50    28.48
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0005) |
| 1 + 2 = 3 |
-----
          AREA    QPEAK    TPEAK    R.V.
          (ha)    (cms)    (hrs)    (mm)
ID1= 1 ( 0010):    2.02    0.016    1.50    28.48
+ ID2= 2 ( 0003):    0.47    0.014    1.17    8.54
=====
ID = 3 ( 0005):    2.49    0.027    1.33    24.73
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

V   V   I   SSSSS U   U   A   L           (v 6.2.2017)
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  TTTTT TTTTT 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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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\V02\voin.dat

Output filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\03
81beff-87f6-47f7-9971-7e46d772c4a3\s

Summary filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\03
81beff-87f6-47f7-9971-7e46d772c4a3\s

DATE: 08-28-2025

TIME: 09:42:33

USER:

COMMENTS: _____

** SIMULATION : 025yr 3hr 10min Chicago **

| CHICAGO STORM | IDF curve parameters: A=3158.000
| Ptotal= 68.23 mm | B= 15.000
| | C= 0.936

used in: INTENSITY = A / (t + B)^C

Duration of storm = 3.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	'	hrs	mm/hr	hrs	mm/hr
0.00	4.19	0.83	155.47		1.67	9.94	2.50	3.90
0.17	5.78	1.00	63.30		1.83	7.78	2.67	3.43
0.33	8.84	1.17	31.36		2.00	6.32	2.83	3.05
0.50	16.30	1.33	19.30		2.17	5.27		
0.67	47.29	1.50	13.35		2.33	4.49		

| CALIB |

NASHYD (0103)	Area (ha)= 0.23	Curve Number (CN)= 51.8
ID= 1 DT=10.0 min	Ia (mm)= 4.35	# of Linear Res.(N)= 3.00
-----	U.H. Tp(hrs)= 0.20	

Unit Hyd Qpeak (cms)= 0.044

PEAK FLOW (cms)= 0.010 (i)
 TIME TO PEAK (hrs)= 1.167
 RUNOFF VOLUME (mm)= 13.248
 TOTAL RAINFALL (mm)= 68.226
 RUNOFF COEFFICIENT = 0.194

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
NASHYD (0201)	Area (ha)= 0.24	Curve Number (CN)= 48.1
ID= 1 DT=10.0 min	Ia (mm)= 4.54	# of Linear Res.(N)= 3.00
-----	U.H. Tp(hrs)= 0.20	

Unit Hyd Qpeak (cms)= 0.046

PEAK FLOW (cms)= 0.009 (i)
 TIME TO PEAK (hrs)= 1.167
 RUNOFF VOLUME (mm)= 11.695
 TOTAL RAINFALL (mm)= 68.226
 RUNOFF COEFFICIENT = 0.171

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0003)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0103):	0.23	0.010	1.17	13.25
+ ID2= 2 (0201):	0.24	0.009	1.17	11.70
=====				
ID = 3 (0003):	0.47	0.020	1.17	12.46

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB		
NASHYD (0009)	Area (ha)= 0.98	Curve Number (CN)= 36.1
ID= 1 DT=10.0 min	Ia (mm)= 7.19	# of Linear Res.(N)= 3.00
-----	U.H. Tp(hrs)= 0.36	

Unit Hyd Qpeak (cms)= 0.104

PEAK FLOW (cms)= 0.017 (i)

TIME TO PEAK (hrs)= 1.333

RUNOFF VOLUME (mm)= 7.268

TOTAL RAINFALL (mm)= 68.226

RUNOFF COEFFICIENT = 0.107

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0202)	Area (ha)=	1.05	
ID= 1 DT=10.0 min	Total Imp(%)=	99.00	Dir. Conn.(%)= 99.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.04	0.01	
Dep. Storage (mm)=	3.00	5.00	
Average Slope (%)=	0.50	0.50	
Length (m)=	83.55	10.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	155.47	15.55	
over (min)	10.00	20.00	
Storage Coeff. (min)=	2.37 (ii)	12.17 (ii)	
Unit Hyd. Tpeak (min)=	10.00	20.00	
Unit Hyd. peak (cms)=	0.17	0.07	
			TOTALS
PEAK FLOW (cms)=	0.44	0.00	0.443 (iii)
TIME TO PEAK (hrs)=	1.00	1.17	1.00
RUNOFF VOLUME (mm)=	65.23	8.68	64.66
TOTAL RAINFALL (mm)=	68.23	68.23	68.23
RUNOFF COEFFICIENT =	0.96	0.13	0.95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 39.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0007)		OVERFLOW IS OFF	
IN= 2---> OUT= 1			
DT= 5.0 min			

	OUTFLOW	STORAGE	OUTFLOW
	(cms)	(ha.m.)	(cms)
	0.0000	0.0000	0.0080
			0.0580

0.0010	0.0090	0.0150	0.0680
0.0030	0.0180	0.0260	0.0780
0.0040	0.0280	0.0400	0.0890
0.0050	0.0380	0.0560	0.0990
0.0060	0.0470	0.0920	0.1210
0.0060	0.0530	0.1350	0.1440

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0202)	1.047	0.443	1.00	64.66
OUTFLOW: ID= 1 (0007)	1.047	0.010	2.75	62.47

PEAK FLOW REDUCTION [Qout/Qin](%)= 2.32
 TIME SHIFT OF PEAK FLOW (min)=105.00
 MAXIMUM STORAGE USED (ha.m.)= 0.0613

```

-----
| ADD HYD ( 0010) |
| 1 + 2 = 3 |
-----

```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0007):	1.05	0.010	2.75	62.47
+ ID2= 2 (0009):	0.98	0.017	1.33	7.27
=====				
ID = 3 (0010):	2.02	0.023	1.50	35.81

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0005) |
| 1 + 2 = 3 |
-----

```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0010):	2.02	0.023	1.50	35.81
+ ID2= 2 (0003):	0.47	0.020	1.17	12.46
=====				
ID = 3 (0005):	2.49	0.039	1.33	31.42

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

=====
=====
V   V   I   SSSSS  U   U   A   L           (v 6.2.2017)
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
      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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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\V02\voin.dat

Output filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\38
 c105ae-75fe-4747-ae1c-bbcd612875f3\s

Summary filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\38
 c105ae-75fe-4747-ae1c-bbcd612875f3\s

DATE: 08-28-2025

TIME: 09:42:33

USER:

COMMENTS: _____

```

*****
** SIMULATION : 050yr 3hr 10min Chicago **
*****

```

```

-----
| CHICAGO STORM |
| Ptotal= 77.60 mm |
-----

```

IDF curve parameters: A=3886.000
 B= 16.000
 C= 0.950

used in: INTENSITY = $A / (t + B)^C$

Duration of storm = 3.00 hrs
 Storm time step = 10.00 min
 Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	4.54	0.83	176.19	1.67	11.20	2.50	4.21

0.17	6.37		1.00	73.10		1.83	8.68		2.67	3.68
0.33	9.92		1.17	36.22		2.00	6.99		2.83	3.25
0.50	18.63		1.33	22.14		2.17	5.78			
0.67	54.62		1.50	15.18		2.33	4.89			

```

-----
| CALIB                                     |
| NASHYD ( 0103) | Area (ha)= 0.23 Curve Number (CN)= 51.8
| ID= 1 DT=10.0 min | Ia (mm)= 4.35 # of Linear Res.(N)= 3.00
-----
|                                     |
|                                     | U.H. Tp(hrs)= 0.20

```

Unit Hyd Qpeak (cms)= 0.044

PEAK FLOW (cms)= 0.013 (i)
 TIME TO PEAK (hrs)= 1.167
 RUNOFF VOLUME (mm)= 16.895
 TOTAL RAINFALL (mm)= 77.602
 RUNOFF COEFFICIENT = 0.218

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB                                     |
| NASHYD ( 0201) | Area (ha)= 0.24 Curve Number (CN)= 48.1
| ID= 1 DT=10.0 min | Ia (mm)= 4.54 # of Linear Res.(N)= 3.00
-----
|                                     |
|                                     | U.H. Tp(hrs)= 0.20

```

Unit Hyd Qpeak (cms)= 0.046

PEAK FLOW (cms)= 0.012 (i)
 TIME TO PEAK (hrs)= 1.167
 RUNOFF VOLUME (mm)= 14.977
 TOTAL RAINFALL (mm)= 77.602
 RUNOFF COEFFICIENT = 0.193

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0003) |
| 1 + 2 = 3 |
-----
|                                     | AREA   QPEAK   TPEAK   R.V.
|                                     | (ha)   (cms)   (hrs)   (mm)
| ID1= 1 ( 0103): | 0.23   0.013   1.17   16.90
| + ID2= 2 ( 0201): | 0.24   0.012   1.17   14.98
|=====|
| ID = 3 ( 0003): | 0.47   0.026   1.17   15.92

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
NASHYD (0009)	Area (ha)=	0.98	Curve Number (CN)= 36.1
ID= 1 DT=10.0 min	Ia (mm)=	7.19	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.36	

Unit Hyd Qpeak (cms)= 0.104

PEAK FLOW (cms)= 0.022 (i)

TIME TO PEAK (hrs)= 1.333

RUNOFF VOLUME (mm)= 9.499

TOTAL RAINFALL (mm)= 77.602

RUNOFF COEFFICIENT = 0.122

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0202)	Area (ha)=	1.05	
ID= 1 DT=10.0 min	Total Imp(%)=	99.00	Dir. Conn.(%)= 99.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	1.04	0.01	
Dep. Storage (mm)=	3.00	5.00	
Average Slope (%)=	0.50	0.50	
Length (m)=	83.55	10.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	176.19	20.32	
over (min)	10.00	20.00	
Storage Coeff. (min)=	2.25 (ii)	11.06 (ii)	
Unit Hyd. Tpeak (min)=	10.00	20.00	
Unit Hyd. peak (cms)=	0.17	0.08	
			TOTALS
PEAK FLOW (cms)=	0.50	0.00	0.503 (iii)
TIME TO PEAK (hrs)=	1.00	1.17	1.00
RUNOFF VOLUME (mm)=	74.60	11.22	73.97
TOTAL RAINFALL (mm)=	77.60	77.60	77.60
RUNOFF COEFFICIENT =	0.96	0.14	0.95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 39.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0007)		OVERFLOW IS OFF			
IN= 2---> OUT= 1					
DT= 5.0 min					

	OUTFLOW	STORAGE	OUTFLOW	STORAGE	
	(cms)	(ha.m.)	(cms)	(ha.m.)	
	0.0000	0.0000	0.0080	0.0580	
	0.0010	0.0090	0.0150	0.0680	
	0.0030	0.0180	0.0260	0.0780	
	0.0040	0.0280	0.0400	0.0890	
	0.0050	0.0380	0.0560	0.0990	
	0.0060	0.0470	0.0920	0.1210	
	0.0060	0.0530	0.1350	0.1440	
	AREA	QPEAK	TPEAK	R.V.	
	(ha)	(cms)	(hrs)	(mm)	
INFLOW : ID= 2 (0202)	1.047	0.503	1.00	73.97	
OUTFLOW: ID= 1 (0007)	1.047	0.015	2.42	71.78	
	PEAK FLOW REDUCTION [Qout/Qin](%)= 3.07				
	TIME SHIFT OF PEAK FLOW (min)= 85.00				
	MAXIMUM STORAGE USED (ha.m.)= 0.0684				

ADD HYD (0010)				
1 + 2 = 3				

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0007):	1.05	0.015	2.42	71.78
+ ID2= 2 (0009):	0.98	0.022	1.33	9.50
=====				
ID = 3 (0010):	2.02	0.033	1.50	41.70

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0005)				
1 + 2 = 3				

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0010):	2.02	0.033	1.50	41.70
+ ID2= 2 (0003):	0.47	0.026	1.17	15.92
=====				
ID = 3 (0005):	2.49	0.052	1.33	36.85

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

=====

V V I SSSSS U U A L (v 6.2.2017)
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 TTTTT TTTTT 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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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\V02\voin.dat

Output filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\005584b0-5dae-42d6-8f1e-4b0b635d5c9f\s

Summary filename:

C:\Users\brett.pond\AppData\Local\Civica\XH5\084a661c-f3c9-4760-8bf5-173e1340ff09\005584b0-5dae-42d6-8f1e-4b0b635d5c9f\s

DATE: 08-28-2025

TIME: 09:42:32

USER:

COMMENTS: _____

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

| CHICAGO STORM |
Ptotal= 87.03 mm

IDF curve parameters: A=4688.000
B= 17.000
C= 0.962

used in: $INTENSITY = A / (t + B)^C$

Duration of storm = 3.00 hrs

Storm time step = 10.00 min

Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	4.88	0.83	196.54	1.67	12.48	2.50	4.51
0.17	6.96	1.00	83.09	1.83	9.60	2.67	3.91
0.33	11.02	1.17	41.25	2.00	7.66	2.83	3.44
0.50	21.03	1.33	25.07	2.17	6.29		
0.67	62.12	1.50	17.06	2.33	5.28		

CALIB			
NASHYD (0103)	Area (ha)=	0.23	Curve Number (CN)= 51.8
ID= 1 DT=10.0 min	Ia (mm)=	4.35	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.20	

Unit Hyd Qpeak (cms)= 0.044

PEAK FLOW (cms)= 0.017 (i)

TIME TO PEAK (hrs)= 1.167

RUNOFF VOLUME (mm)= 20.887

TOTAL RAINFALL (mm)= 87.029

RUNOFF COEFFICIENT = 0.240

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
NASHYD (0201)	Area (ha)=	0.24	Curve Number (CN)= 48.1
ID= 1 DT=10.0 min	Ia (mm)=	4.54	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.20	

Unit Hyd Qpeak (cms)= 0.046

PEAK FLOW (cms)= 0.015 (i)

TIME TO PEAK (hrs)= 1.167

RUNOFF VOLUME (mm)= 18.586

TOTAL RAINFALL (mm)= 87.029

RUNOFF COEFFICIENT = 0.214

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0003) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0103):    0.23    0.017    1.17    20.89
+ ID2= 2 ( 0201):    0.24    0.015    1.17    18.59
=====
ID = 3 ( 0003):    0.47    0.032    1.17    19.71

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB |
| NASHYD ( 0009) |
| ID= 1 DT=10.0 min |
-----
          Area      (ha)=    0.98      Curve Number      (CN)= 36.1
          Ia        (mm)=    7.19      # of Linear Res.(N)= 3.00
          U.H. Tp(hrs)=    0.36

```

Unit Hyd Qpeak (cms)= 0.104

PEAK FLOW (cms)= 0.028 (i)
 TIME TO PEAK (hrs)= 1.333
 RUNOFF VOLUME (mm)= 11.996
 TOTAL RAINFALL (mm)= 87.029
 RUNOFF COEFFICIENT = 0.138

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| CALIB |
| STANDHYD ( 0202) |
| ID= 1 DT=10.0 min |
-----
          Area      (ha)=    1.05
          Total Imp(%)= 99.00      Dir. Conn.(%)= 99.00

```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.04	0.01
Dep. Storage	(mm)=	3.00	5.00
Average Slope	(%)=	0.50	0.50
Length	(m)=	83.55	10.00
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	196.54	25.62
over (min)	10.00	20.00
Storage Coeff. (min)=	2.15 (ii)	10.18 (ii)
Unit Hyd. Tpeak (min)=	10.00	20.00
Unit Hyd. peak (cms)=	0.17	0.08

TOTALS

PEAK FLOW	(cms)=	0.56	0.00	0.562 (iii)
TIME TO PEAK	(hrs)=	1.00	1.17	1.00
RUNOFF VOLUME	(mm)=	84.03	14.04	83.33

TOTAL RAINFALL (mm)=	87.03	87.03	87.03
RUNOFF COEFFICIENT =	0.97	0.16	0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 39.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0007)		OVERFLOW IS OFF			
IN= 2---> OUT= 1					
DT= 5.0 min					

	OUTFLOW	STORAGE		OUTFLOW	STORAGE
	(cms)	(ha.m.)		(cms)	(ha.m.)
	0.0000	0.0000		0.0080	0.0580
	0.0010	0.0090		0.0150	0.0680
	0.0030	0.0180		0.0260	0.0780
	0.0040	0.0280		0.0400	0.0890
	0.0050	0.0380		0.0560	0.0990
	0.0060	0.0470		0.0920	0.1210
	0.0060	0.0530		0.1350	0.1440
	AREA	QPEAK	TPEAK	R.V.	
	(ha)	(cms)	(hrs)	(mm)	
INFLOW : ID= 2 (0202)	1.047	0.562	1.00	83.33	
OUTFLOW: ID= 1 (0007)	1.047	0.023	2.17	81.15	
PEAK FLOW REDUCTION [Qout/Qin](%)= 4.07					
TIME SHIFT OF PEAK FLOW (min)= 70.00					
MAXIMUM STORAGE USED (ha.m.)= 0.0752					

ADD HYD (0010)				
1 + 2 = 3				

ID1= 1 (0007):	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
	1.05	0.023	2.17	81.15
+ ID2= 2 (0009):	0.98	0.028	1.33	12.00
=====				
ID = 3 (0010):	2.02	0.046	1.50	47.75

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (0005)|

1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0010):	2.02	0.046	1.50	47.75
+ ID2= 2 (0003):	0.47	0.032	1.17	19.71
=====				
ID = 3 (0005):	2.49	0.068	1.33	42.48

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.



Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area ²	A	B	C	D
<i>Fully developed urban areas</i>					
Open space (lawns, parks, golf courses, cemeteries, etc.) ³ :					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) ⁴ . .		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					



Hydroworks Sizing Summary

265 Woolwich

08-28-2025

Recommended Size: HydroStorm HS 6

Hydroworks Sizing Program Version 5.8.5

A HydroStorm HS 6 is recommended to provide 80 % annual TSS removal based on a drainage area of 0.803 (ha) with an imperviousness of 100 % and Kitchener / Waterloo, Ontario rainfall for the 20 um to 2000 um particle size distribution.

The recommended HydroStorm HS 6 treats 98 % of the annual runoff and provides 84 % annual TSS removal for the Kitchener / Waterloo rainfall records and 20 um to 2000 um particle size distribution.

The HydroStorm has a headloss coefficient (K) of 1.04. Since a peak flow was not specified, headloss was calculated using the full pipe flow of .35 (m³/s) for the given 450 (mm) pipe diameter at 1.5% slope. The headloss was calculated to be 256 (mm) based on a flow depth of 450 (mm) (full pipe flow).

This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

The sizing program is for sizing purposes only and does not address any site specific parameters such as hydraulic gradeline, tailwater submergence, groundwater, soils bearing capacity, etc. Headloss calculations are not a hydraulic gradeline calculation since this requires a starting water level and an analysis of the entire system downstream of the HydroStorm .

TSS Removal Sizing Summary

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

Main Dimensions Rainfall Site TSS PSD TSS Load Site Storage By-Pass Custom CAD Video Other

Site Parameters

Area (ha) 0.803

Imperviousness (%) 100

Units

☐ U.S.

☒ Metric

Rainfall Station

Kitchener / Waterloo Ontario

1998 To 2018 Rainfall Timestep = 15 min.

Project Title (2 lines) 265 Woolwich

ETV Lab Testing Results ☐ Post Treatment Recharge

Outlet Pipe

Diam. (mm) 450 Peak Design Flow (m3/s)

Slope (%) 1.5

HydroStorm Annual Sizing Results

Model #	Qlow (m3/s)	Qtot (m3/s)	Flow Capture (%)	TSS Removal (%)
Unavailable	.021	.349	93 %	61 %
HS 4	.036	.349	97 %	72 %
HS 5	.044	.349	98 %	78 %
HS 6	.053	.349	98 %	84 %
Unavailable	.075	.349	99 %	87 %
HS 8	.1	.349	100 %	90 %
HS 10	.142	.349	100 %	94 %
HS 12	.193	.349	100 %	96 %

Particle Size Distribution

Size (um)	%	SG
20	20	2.65
60	20	2.65
150	20	2.65
400	20	2.65
2000	20	2.65

Note: Results vary significantly based on particle size distribution

Simulate

TSS Particle Size Distribution

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

Main Dimensions Rainfall Site TSS PSD TSS Load Site Storage By-Pass Custom CAD Video Other

TSS Particle Size Distribution

Size (um)	%	SG
20	20	2.65
60	20	2.65
150	20	2.65
400	20	2.65
2000	20	2.65
*		

Notes:

1. To change data just click a cell and type in the new value(s)
2. To add a row just go to the bottom of the table and start typing.
3. To delete a row, select the row by clicking on the first pointer column, then press delete
4. To sort the table click on one of the column headings

TSS Distributions

☐ ETV Canada

☐ Standard HDS Design

☐ Alden Laboratory

☐ OK110

☐ Toronto

☒ Ontario Fine

☐ ETV Canada (Calgary)

☐ Calgary Forebay

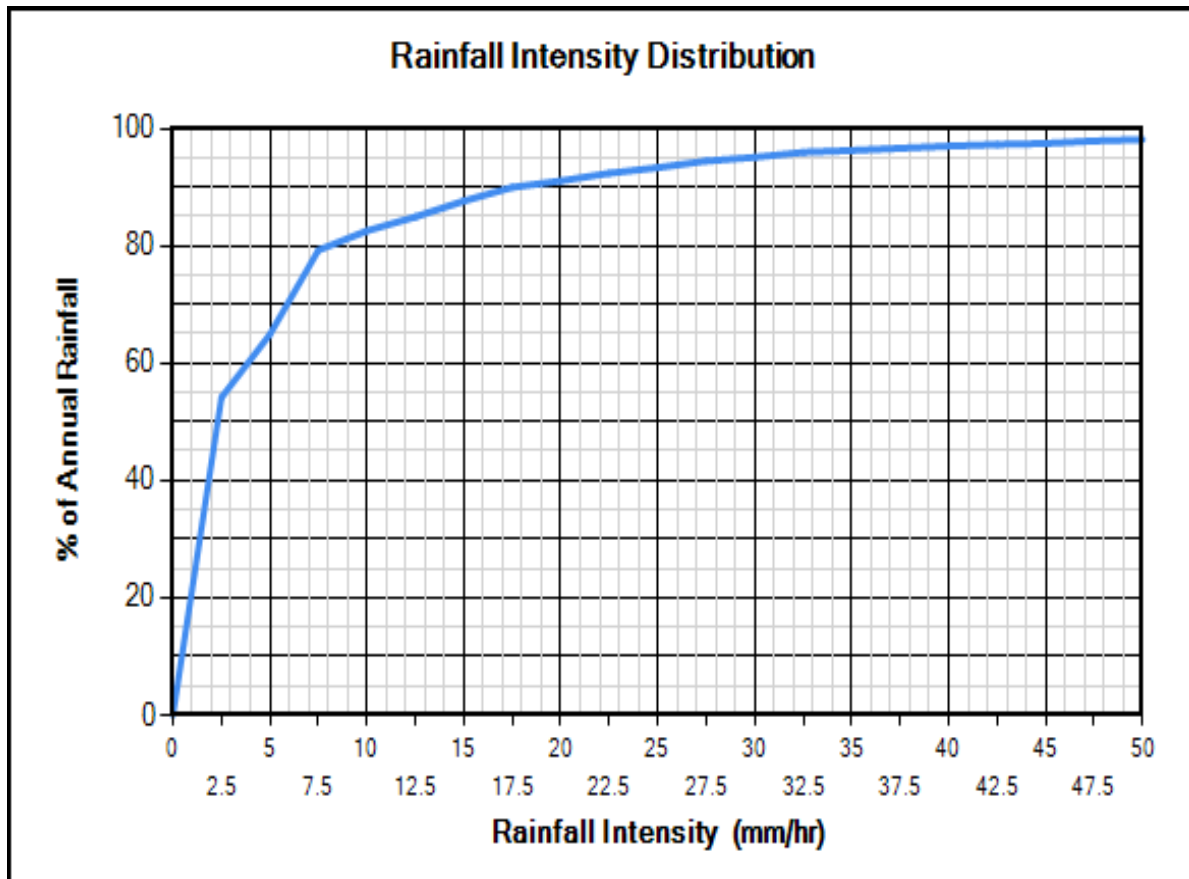
☐ Kitchener

☐ User Defined

Clear

You must select a particle size distribution for TSS to simulate TSS removal

Water Temp (C) 20



Site Physical Characteristics

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

Main Dimensions Rainfall Site TSS PSD TSS Load Site Storage By-Pass Custom CAD Video Other

Catchment Parameters

Width (m) Imperv. Mannings n Maintenance Frequency (months)

Perv Mannings n

Slope (%) Imp. Depress. Storage (mm)

Perv. Depress. Storage (mm)

Daily Evaporation (mm/day)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	2.54	2.54	3.81	3.81	3.81	2.54	2.54	0	0

Infiltration

Max. Infiltration Rate (mm/hr)

Min. Infiltration Rate (mm/hr)

Infiltration Decay Rate (1/s)

Infiltration Regen. Rate (1/s)

Catch Basins

of Catch basins

Constant Baseflow

Roof Runoff (m3/s)

Resets all parameters excluding input catchment width.

Dimensions And Capacities

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

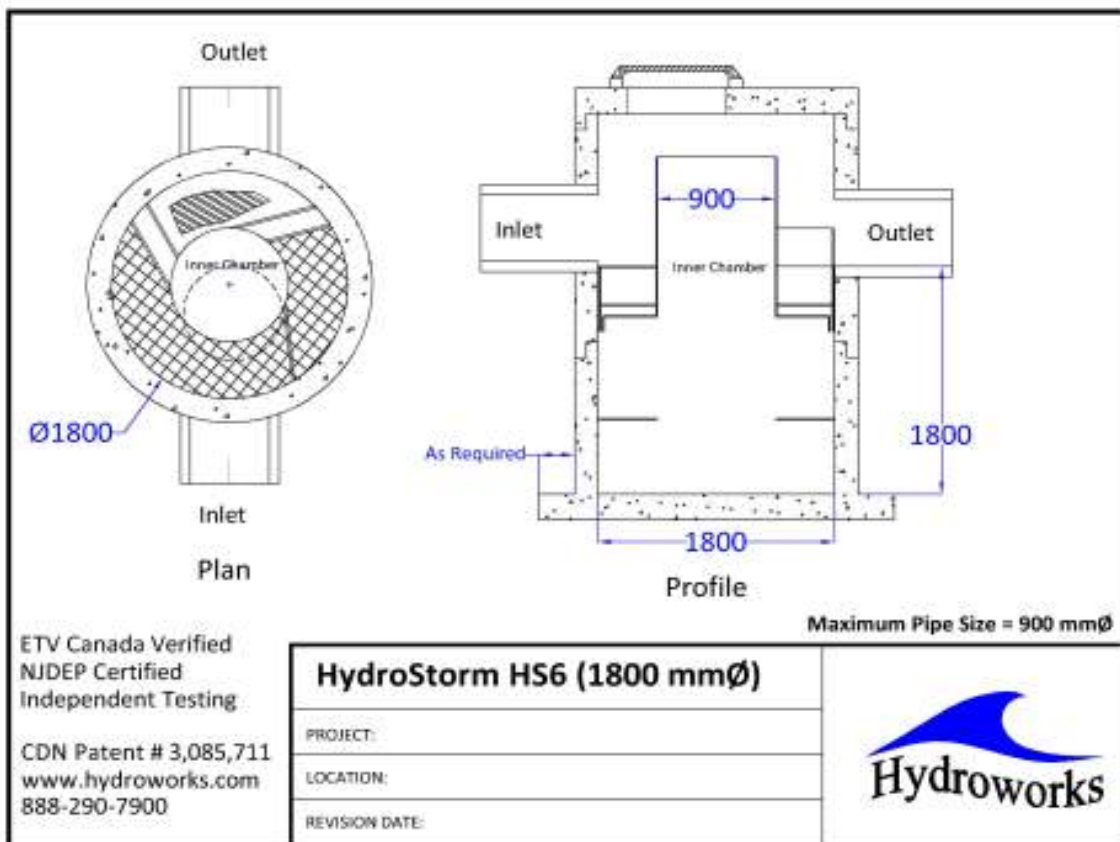
File Product Units CAD Video Help

Main Dimensions Rainfall Site TSS PSD TSS Load Site Storage By-Pass Custom CAD Video Other

Dimensions and Capacities					
Model	Diam. (m)	Depth (m)	Float. Vol. (L)	Sediment Vol. (m3)	Total Vol. (m3)
HS 3	0.91	1.07	185	0.4	0.7
HS 4	1.22	1.22	381	0.9	1.4
HS 5	1.52	1.52	642	1.8	2.8
HS 6	1.83	1.83	1041	3.2	4.8
HS 7	2.13	1.98	1575	4.6	7.1
HS 8	2.44	2.13	2354	6.3	10
HS 10	3.05	2.74	4327	13.2	20
HS 12	3.66	3.35	7164	23.8	35.2

Depth = Depth from outlet invert to inside bottom of tank

Generic HS 6 CAD Drawing



TSS Buildup And Washoff

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

Main Dimensions Rainfall Site TSS PSD TSS Load Site Storage By-Pass Custom CAD Video Other

TSS Buildup

☐ Power Linear
☒ Exponential
☐ Michaelis-Menton
☐ No Buildup Required

TSS Washoff

☒ Power-Exponential
☐ Rating Curve (no upper limit)
☐ Rating Curve (limited to buildup)
☐ Event Mean Concentration

Street Sweeping

Efficiency (%)
Start Month
Stop Month
Frequency (days)
Available Fraction

Soil Erosion

☐ Add Erosion to TSS

Reset to Default Values

TSS Buildup Parameters

Limit (kg/ha)
Coeff (kg/ha)
Exponent

TSS Washoff Parameters

Coefficient
Exponent

TSS Buildup

☒ Based on Area
☐ Based on Curb Length

Upstream Quantity Storage

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

Main Dimensions Rainfall Site TSS PSD TSS Load Site Storage By-Pass Custom CAD Video Other

Quantity Control Storage

	Storage (m3)	Discharge (m3/s)
▶	0	0
*		

Clear

Other Parameters

The screenshot shows the 'Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm' window. The 'Other' tab is selected, displaying several configuration sections:

- Scaling Law:**
 - ☒ Peclet Scaling based on diameter x depth
 - ☐ Peclet Scaling based on surface area (diameter x diameter)
- TSS Removal Extrapolation:**
 - ☒ Extrapolate TSS Removal for flows lower than tested
 - ☐ No TSS Removal extrapolation for flows lower than tested
 - ☐ No TSS Removal extrapolation for lower flows or inter-event periods
- Lab Testing:**
 - ☐ Use NJDEP Lab Testing Results
 - ☒ Use ETV Canada Lab Testing Results
- Oil / Sediment Storage:**
 - ☒ Oil Spill Storage in Pretreatment Area
 - ☐ Sediment Storage in Pretreatment Area
 - ☐ 50% Oil Spill / 50% Sediment Storage in Pretreatment Area
- TSS Removal Results:**
 - ☒ Required TSS Removal
 - ☐ Choose Model #
- TSS Removal Required:**
 - TSS Removal (%) Enter required TSS Removal (%)

Flagged Issues

None

Hydroworks Sizing Program - Version 5.8.5

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1-800-290-7900

www.hydroworks.com



Hydroworks® HydroStorm

Operations & Maintenance Manual

Version 1.2

Please call Hydroworks at 888-290-7900 or email us at support@hydroworks.com if you have any questions regarding the Inspection Checklist. Please email a copy of the completed checklist to Hydroworks at for our records.

Introduction

The HydroStorm is a state-of-the-art hydrodynamic separator. Hydrodynamic separators remove solids, debris and lighter than water (oil, trash, floating debris) pollutants from stormwater. Hydrodynamic separators and other water quality measures are mandated by regulatory agencies (Town/City, State, Federal Government) to protect storm water quality from pollution generated by urban development (traffic, people) as part of new development permitting requirements.

As storm water treatment structures fill up with pollutants they become less and less effective in removing new pollution. Therefore, it is important that storm water treatment structures be maintained on a regular basis to ensure that they are operating at optimum performance. The HydroStorm is no different in this regard and this manual has been assembled to provide the owner/operator with the necessary information to inspect and coordinate maintenance of their HydroStorm.

Hydroworks® HydroStorm Operation

The Hydroworks HydroStorm (HS) separator is a unique hydrodynamic by-pass separator. It incorporates a protected submerged pretreatment zone to collect larger solids, a treatment tank to remove finer solids, and a dual set of weirs to create a high flow bypass. High flows are conveyed directly to the outlet and do not enter the treatment area, however, the submerged pretreatment area still allows removal of coarse solids during high flows.

Under normal or low flows, water enters an inlet area with a horizontal grate. The area underneath the grate is submerged with openings to the main treatment area of the separator. Coarse solids fall through the grate and are either trapped in the pretreatment area or conveyed into the main treatment area depending on the flow rate. Fines are transported into the main treatment area. Openings and weirs in the pretreatment area allow entry of water and solids into the main treatment area and cause water to rotate in the main treatment area creating a vortex motion. Water in the main treatment area is forced to rise along the walls of the separator to discharge from the treatment area to the downstream pipe.

The vortex motion forces solids and floatables to the middle of the inner chamber. Floatables are trapped since the inlet to the treatment area is submerged. The design maximizes the retention of settled solids since solids are forced to the center of the inner chamber by the vortex motion of water while water must flow up the walls of the separator to discharge into the downstream pipe.

A set of high flow weirs near the outlet pipe create a high flow bypass over both the pretreatment area and main treatment chamber. The rate of flow into the treatment area is regulated by the number and size of openings into the treatment chamber and the height of by-pass weirs. High flows flow over the weirs directly to the outlet pipe preventing the scour and resuspension of any fines collected in the treatment chamber.



A central access tube is located in the structure to provide access for cleaning. The arrangement of the inlet area and bypass weirs near the outlet pipe facilitate the use of multiple inlet pipes.

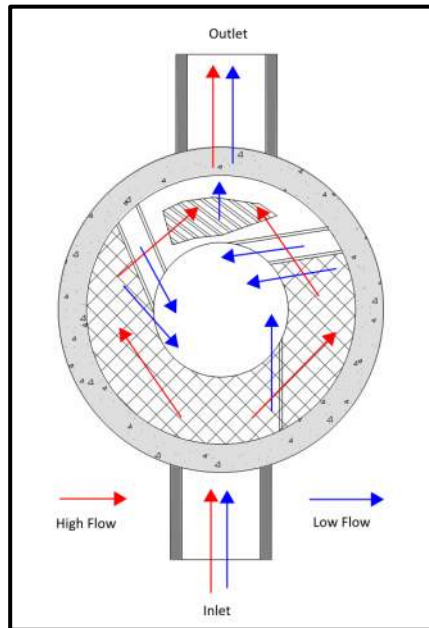


Figure 1. Hydroworks HydroStorm Operation – Plan View

Figure 2 is a profile view of the HydroStorm separator showing the flow patterns for low and high flows.

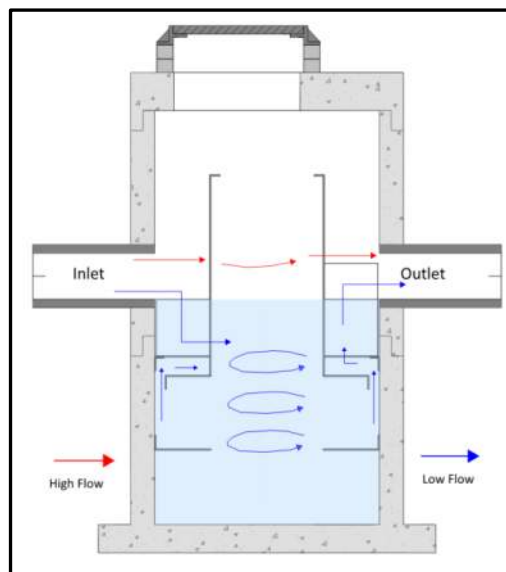


Figure 2. Hydroworks HydroStorm Operation – Profile View

The HS 4i is an inlet version of the HS 4 separator. There is a catch-basin grate on top of the HS 4i. A funnel sits underneath the grate on the frame and directs the water to the inlet side of the separator to ensure all low flows are properly treated. The whole funnel is removed for inspection and cleaning.

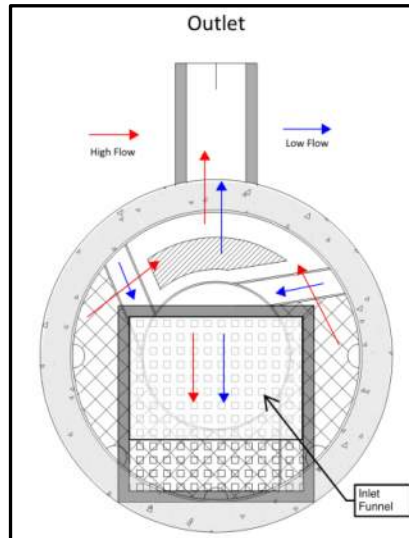


Figure 3. Hydroworks HS 4i Funnel

Construction Materials

The inner chamber and outlet baffle are made out of a copolymer plastic. The shell of the structure is pre-cast concrete. Pre-cast concrete is readily accepted by all municipalities since it has the following advantages:

- long service life
- ease of installation (less dependent on backfill (contractor proficiency) for structural integrity)
- concrete structures are designed for both anti-buoyancy and traffic loading without any field requirements (such as structural loading slabs in traffic areas and anti-buoyancy slabs to prevent groundwater uplift).
- low maintenance requirements

Hydroworks HS Separator Dimensions and Capacities

The HS separator is manufactured in a variety of sizes from 4 ft inside diameter to 12 ft inside diameter as shown in Table 1. Larger sizes may not be available in all areas. Please check with Hydroworks to ensure availability of the larger model sizes.



Table 1. Hydroworks HS Separator Dimensions*					
Model	Structure Inside Diam. (SID) (mm)	Structure Depth (mm)*	Sediment/ Sinking Trash Volume (L)	Oil/Floating Trash Volume (L)	Permanent Pool Wet Volume (L)
HS 3	900	1050	420	150	700
HS 4	1200	1200	845	355	1420
HS 5	1500	1500	1695	620	2775
HS 6	1800	1800	3110	1020	4800
HS 7	2100	1950	4530	1550	7080
HS 8	2400	2100	6225	2325	9960
HS 9	2700	2400	9200	3195	14410
HS 10	3000	2700	13025	4275	20015
HS 12	3600	3000	20525	7095	30535

*Dimensions vary with project requirements

The volumes provided in Table 1 for oil and sediment are to full capacity and not indicative of recommended depths/volumes for maintenance.

Headloss

Any water quality system implemented in a storm drain network will create headloss in the system. In general, depending on the configuration of the by-pass, systems designed to treat high flows or all of the flow will have a higher headloss impact on the storm drain network than systems that by-pass high flows.

The headloss created by the HS separator was measured in an independent laboratory (Alden Research Laboratory) for a full-scale HS 4. The K value ($h = K v^2/(2g)$) for headloss calculations was determined to be 1.04 as shown in Figure 3.

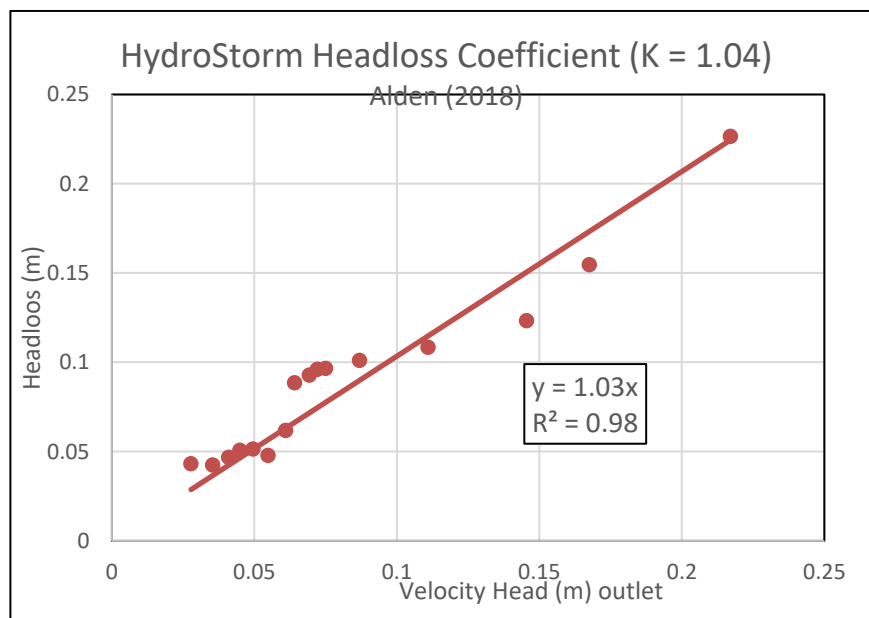


Figure 3. HydroStorm Headloss K Factor (1.04)



Inspection

Procedure

Floatables

A visual inspection can be conducted for floatables by removing the covers and looking down into the center access tube of the separator. Separators with an inlet grate (HS 4i or custom separator) will have a plastic funnel located under the grate that must be removed from the frame prior to inspection or maintenance. If you are missing a funnel please contact Hydroworks at the numbers provided at the end of this document.

TSS/Sediment

Inspection for TSS build-up can be conducted using a Sludge Judge®, Core Pro®, AccuSludge® or equivalent sampling device that allows the measurement of the depth of TSS/sediment in the unit. These devices typically have a ball valve at the bottom of the tube that allows water and TSS to flow into the tube when lowering the tube into the unit. Once the unit touches the bottom of the device, it is quickly pulled upward such that the water and TSS in the tube forces the ball valve closed allowing the user to see a full core of water/TSS in the unit. The unit should be inspected for TSS through each of the access covers. Several readings (2 or 3) should be made at each access cover to ensure that an accurate TSS depth measurement is recorded.

Frequency

Construction Period

The HydroStorm separator should be inspected every four weeks and after every large storm (over 0.5" (12.5 mm) of rain) during the construction period.

Post-Construction Period

The Hydroworks HydroStorm separator should be inspected during the first year of operation for normal stabilized sites (grassed or paved areas). If the unit is subject to oil spills or runoff from unstabilized (storage piles, exposed soils) areas the HydroStorm separator should be inspected more frequently (4 times per year). The initial annual inspection will indicate the required future frequency of inspection and maintenance if the unit was maintained after the construction period.

Reporting

Reports should be prepared as part of each inspection and include the following information:



1. Date of inspection
2. GPS coordinates of Hydroworks unit
3. Time since last rainfall
4. Date of last inspection
5. Installation deficiencies (missing parts, incorrect installation of parts)
6. Structural deficiencies (concrete cracks, broken parts)
7. Operational deficiencies (leaks, blockages)
8. Presence of oil sheen or depth of oil layer
9. Estimate of depth/volume of floatables (trash, leaves) captured
10. Sediment depth measured
11. Recommendations for any repairs and/or maintenance for the unit
12. Estimation of time before maintenance is required if not required at time of inspection

A sample inspection checklist is provided at the end of this manual.

Maintenance

Procedure

The Hydroworks HydroStorm unit is typically maintained using a vacuum truck. There are numerous companies that can maintain the HydroStorm separator. Maintenance with a vacuum truck involves removing all of the water and sediment together. The water is then separated from the sediment on the truck or at the disposal facility.

A central access opening (24" (600 mm) or greater) is provided to the gain access to the lower treatment tank of the unit. This is the primary location to maintain by vacuum truck. The pretreatment area can also be vacuumed and/or flushed into the lower treatment tank of the separator for cleaning via the central access once the water level is lowered below the pretreatment floor.

In instances where a vacuum truck is not available other maintenance methods (i.e. clamshell bucket) can be used, but they will be less effective. If a clamshell bucket is used the water must be decanted prior to cleaning since the sediment is under water and typically fine in nature.

The local municipality should be consulted for the allowable disposal options for both water and sediments prior to any maintenance operation. Once the water is decanted the sediment can be removed with the clamshell bucket.

Disposal of the contents of the separator depend on local requirements. Maintenance of a Hydroworks HydroStorm unit will typically take 1 to 2 hours based on a vacuum truck and longer for other cleaning methods (i.e. clamshell bucket).



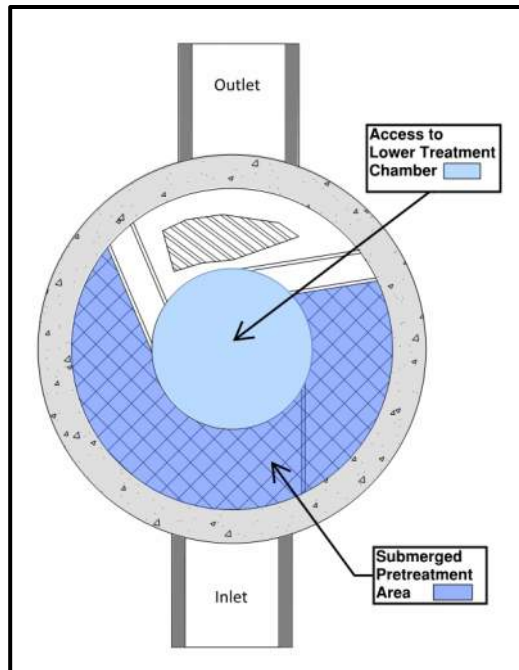


Figure 3. Maintenance Access

Frequency

Construction Period

A HydroStorm separator can fill with construction sediment quickly during the construction period. The HydroStorm must be maintained during the construction period when the depth of TSS/sediment reaches 24" (600 mm). It must also be maintained during the construction period if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the area of the separator

The HydroStorm separator should be maintained at the end of the construction period, prior to operation for the post-construction period.

Post-Construction Period

The HydroStorm was independently tested by Alden Research Laboratory in 2017. A HydroStorm HS 4 was tested for scour with a 50% sediment depth of 0.5 ft.(150 mm). The sump depths given in Table 1 are scaled larger than required based on standard scaling requirements (NJDEP, ETV Canada). Accordingly maintenance depths for units larger than the HS 4 will be larger than 300 mm.

There will be designs with increased sediment storage based on specifications or site-specific criteria. A measurement of the total depth in the separator through the central access tube should be taken and compared to sump depth given in Table 1.



The standard sump depth from Table 1 should be subtracted from the measured depth and the resulting extra depth should be added to the values given in Table 2 to determine the site-specific sediment maintenance depth for that separator.

For example, if the measured sump depth in the HS-7 is 7.5 feet, then the sediment maintenance depth for that HS-7 is 2.25 ft ($= 0.5 + 1.75$) and the separator does not need to be cleaned for sediment accumulation until the measure sediment depth is 2.25 ft.

The HydroStorm separator must also be maintained if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the water surface of the separator.

Table 2 Standard Maintenance Depths for HydroStorm Models

Model	Diameter ft (mm)	Sediment Maintenance Depth for Total Water Depth ft (mm)*
HS-3	3 (900)	1 (300)
HS-4	4 (1200)	1 (300)
HS-5	5 (1500)	1.75 (530)
HS-6	6 (1800)	2 (610)
HS-7	7 (2100)	1.75 (535)
HS-8	8 (2400)	1.5 (465)
HS-9	9 (2700)	1.75 (540)
HS-10	10 (3000)	2 (615)
HS-12	12 (3600)	1.5 (470)

*based on standard sump depths in Table 1



HYDROSTORM INSPECTION SHEET

Date _____
Date of Last Inspection _____

Site _____
City _____
State _____
Owner _____

GPS Coordinates _____

Date of last rainfall _____

Site Characteristics

	Yes	No
Soil erosion evident	☐	☐
Exposed material storage on site	☐	☐
Large exposure to leaf litter (lots of trees)	☐	☐
High traffic (vehicle) area	☐	☐

HydroStorm

	Yes	No
Obstructions in the inlet or outlet	☐ *	☐
Missing internal components	☐ **	☐
Improperly installed inlet or outlet pipes	☐ ***	☐
Internal component damage (cracked, broken, loose pieces)	☐ **	☐
Floating debris in the separator (oil, leaves, trash)	☐	☐
Large debris visible in the separator	☐ *	☐
Concrete cracks/deficiencies	☐ ***	☐
Exposed rebar	☐ **	☐
Water seepage (water level not at outlet pipe invert)	☐ ***	☐
Water level depth below outlet pipe invert _____"		

Routine Measurements

Floating debris depth	< 0.5" (13mm)	☐	>0.5" 13mm)	☐ *
Floating debris coverage	< 50% of surface area	☐	> 50% surface area	☐ *
Sludge depth	< 12" (300mm)	☐	> 12" (300mm)	☐ *

* Maintenance required
** Repairs required
*** Further investigation is required





Hydroworks® HydroStorm

One Year Limited Warranty

Hydroworks, LLC warrants, to the purchaser and subsequent owner(s) during the warranty period subject to the terms and conditions hereof, the Hydroworks HydroStorm to be free from defects in material and workmanship under normal use and service, when properly installed, used, inspected and maintained in accordance with Hydroworks written instructions, for the period of the warranty. The standard warranty period is 1 year.

The warranty period begins once the separator has been manufactured and is available for delivery. Any components determined to be defective, either by failure or by inspection, in material and workmanship will be repaired, replaced or remanufactured at Hydroworks' option provided, however, that by doing so Hydroworks, LLC will not be obligated to replace an entire insert or concrete section, or the complete unit. This warranty does not cover shipping charges, damages, labor, any costs incurred to obtain access to the unit, any costs to repair/replace any surface treatment/cover after repair/replacement, or other charges that may occur due to product failure, repair or replacement.

This warranty does not apply to any material that has been disassembled or modified without prior approval of Hydroworks, LLC, that has been subjected to misuse, misapplication, neglect, alteration, accident or act of God, or that has not been installed, inspected, operated or maintained in accordance with Hydroworks, LLC instructions and is in lieu of all other warranties expressed or implied. Hydroworks, LLC does not authorize any representative or other person to expand or otherwise modify this limited warranty.

The owner shall provide Hydroworks, LLC with written notice of any alleged defect in material or workmanship including a detailed description of the alleged defect upon discovery of the defect. Hydroworks, LLC should be contacted at 136 Central Ave., Clark, NJ 07066 or any other address as supplied by Hydroworks, LLC. (888-290-7900).

This limited warranty is exclusive. There are no other warranties, express or implied, or merchantability or fitness for a particular purpose and none shall be created whether under the uniform commercial code, custom or usage in the industry or the course of dealings between the parties. Hydroworks, LLC will replace any goods that are defective under this warranty as the sole and exclusive remedy for breach of this warranty.

Subject to the foregoing, all conditions, warranties, terms, undertakings or liabilities (including liability as to negligence), expressed or implied, and howsoever arising, as to the condition, suitability, fitness, safety, or title to the Hydroworks HydroStorm are hereby negated and excluded and Hydroworks, LLC gives and makes no such representation, warranty or undertaking except as expressly set forth herein. Under no circumstances shall Hydroworks, LLC be liable to the Purchaser or to any third party for product liability claims; claims arising from the design, shipment, or installation of the HydroStorm, or the cost of other goods or services related to the purchase and installation of the HydroStorm. For this Limited Warranty to apply, the HydroStorm must be installed in accordance with all site conditions required by state and local codes; all other applicable laws; and Hydroworks' written installation instructions.

Hydroworks, LLC expressly disclaims liability for special, consequential or incidental damages (even if it has been advised of the possibility of the same) or breach of expressed or implied warranty. Hydroworks, LLC shall not be liable for penalties or liquidated damages, including loss of production and profits; labor and materials; overhead costs; or other loss or expense incurred by the purchaser or any third party. Specifically excluded from limited warranty coverage are damages to the HydroStorm arising from ordinary wear and tear; alteration, accident, misuse, abuse or neglect; improper maintenance, failure of the product due to improper installation of the concrete sections or improper sizing; or any other event not caused by Hydroworks, LLC. This limited warranty represents Hydroworks' sole liability to the purchaser for claims related to the HydroStorm, whether the claim is based upon contract, tort, or other legal basis.

Worksheet for GRCA Outlet

Project Description	
Friction Method	Manning
Solve For	Formula
	Normal Depth
Input Data	
Roughness Coefficient	0.030
Channel Slope	0.008 m/m
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Discharge	51.00 L/s
Results	
Normal Depth	173.6 mm
Flow Area	0.1 m ²
Wetted Perimeter	1.1 m
Hydraulic Radius	82.3 mm
Top Width	1.04 m
Critical Depth	142.6 mm
Critical Slope	0.023 m/m
Velocity	0.56 m/s
Velocity Head	0.02 m
Specific Energy	0.19 m
Froude Number	0.612
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 mm
Length	0.0 m
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 mm
Profile Description	N/A
Profile Headloss	0.00 m
Downstream Velocity	0.00 m/s
Upstream Velocity	0.00 m/s
Normal Depth	173.6 mm
Critical Depth	142.6 mm
Channel Slope	0.008 m/m
Critical Slope	0.023 m/m

5YR STORM SEWER DESIGN SHEET

Location			Drainage Area				Runoff				Pipe						
Catchment ID	From	To	A	C	AC	Cuml AC	Tc	Cumul Tc	I	Q	Length	Pipe Dia	Pipe Slope	Full Capacity	V	Time of Flow	% full
	MH	MH	ha				min	min	mm/hr	L/S	m	mm	%	LPS	m/s	min	
	DCB1	DCBMH1	0.41	0.90	0.369	0.369	10.0	10.0	109.68	112.42	60.0	375	0.50%	123.98	1.12	0.89	90.7%
	DCBMH1	MH2	0.38	0.90	0.342	0.711	10.0	10.9	105.74	208.85	22.9	450	1.00%	285.11	1.79	0.21	73.3%
	MH2	POND	0.00	0.00	0.000	0.711	10.0	11.1	104.85	207.08	33.9	450	1.50%	349.18	2.20	0.26	59.3%

Notes:
Cumulative Tc for each manhole stretch.

Kitchener/Waterloo IDF Return Period 5-Year A 1593 B 11 C 0.8789 Manning's N 0.013 Runoff Coefficient Multiplier 1				Van Harten File No. 33259-24 Property Address: 265 Woolwich Street South Date: 30-Aug-25	
---	--	--	--	---	--

Project No: 33259-24
 Project Name: 265 Woolwich Street South
 Project Location: Woolwich
 Date: 7/2/2024
 Update: 7/2/2024



Catchbasin Inlet Capacity Analysis

Design Storm Event:

Event	a	b	c	Time of Conc. (min.)	Intensity (mm/hr)
5 Year	1593.00	11.00	0.879	10.00	109.68

Flow to Each Structure:

Structure ID	Area (ha)	Runoff Coefficient "C"	100-yr Q* (m ³ /s)
DCB1	0.409	0.90	0.112
DCBMH1	0.384	0.90	0.105

*Flow calculated with the Rational Method using the Kitchener/Waterloo IDF Parameters using a TC time of 10 minutes, 0.90 runoff coefficient for gravel and 0.15 for landscape.

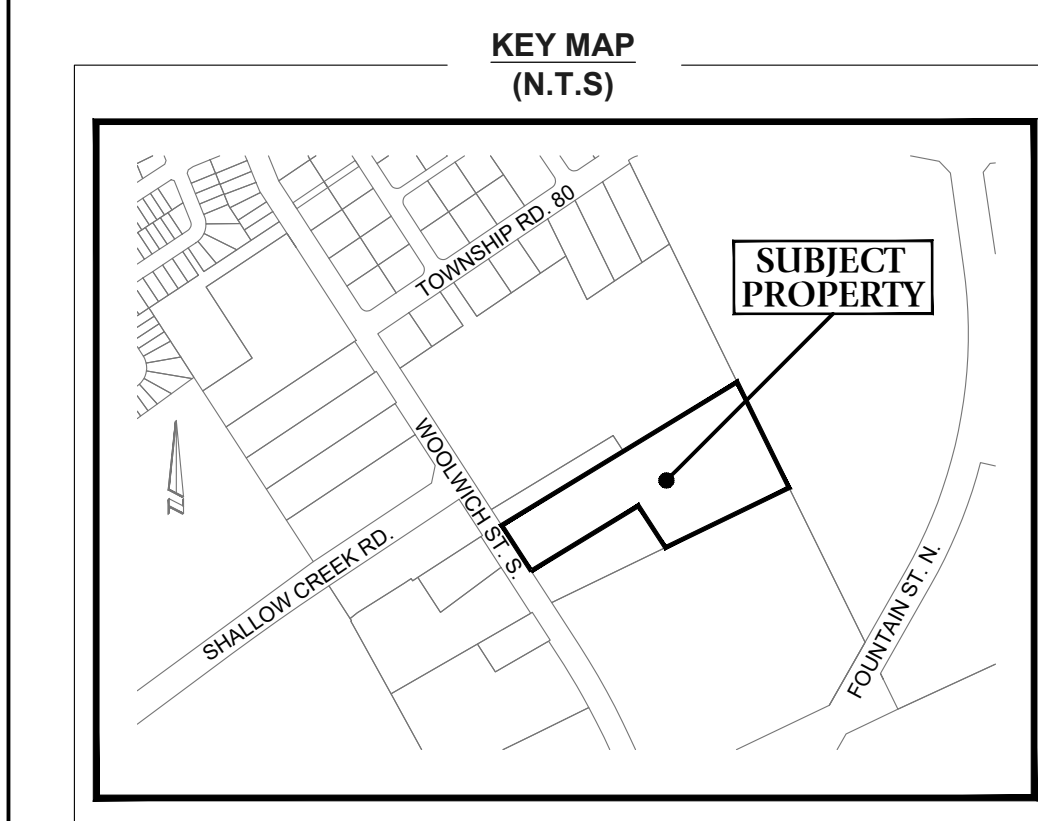
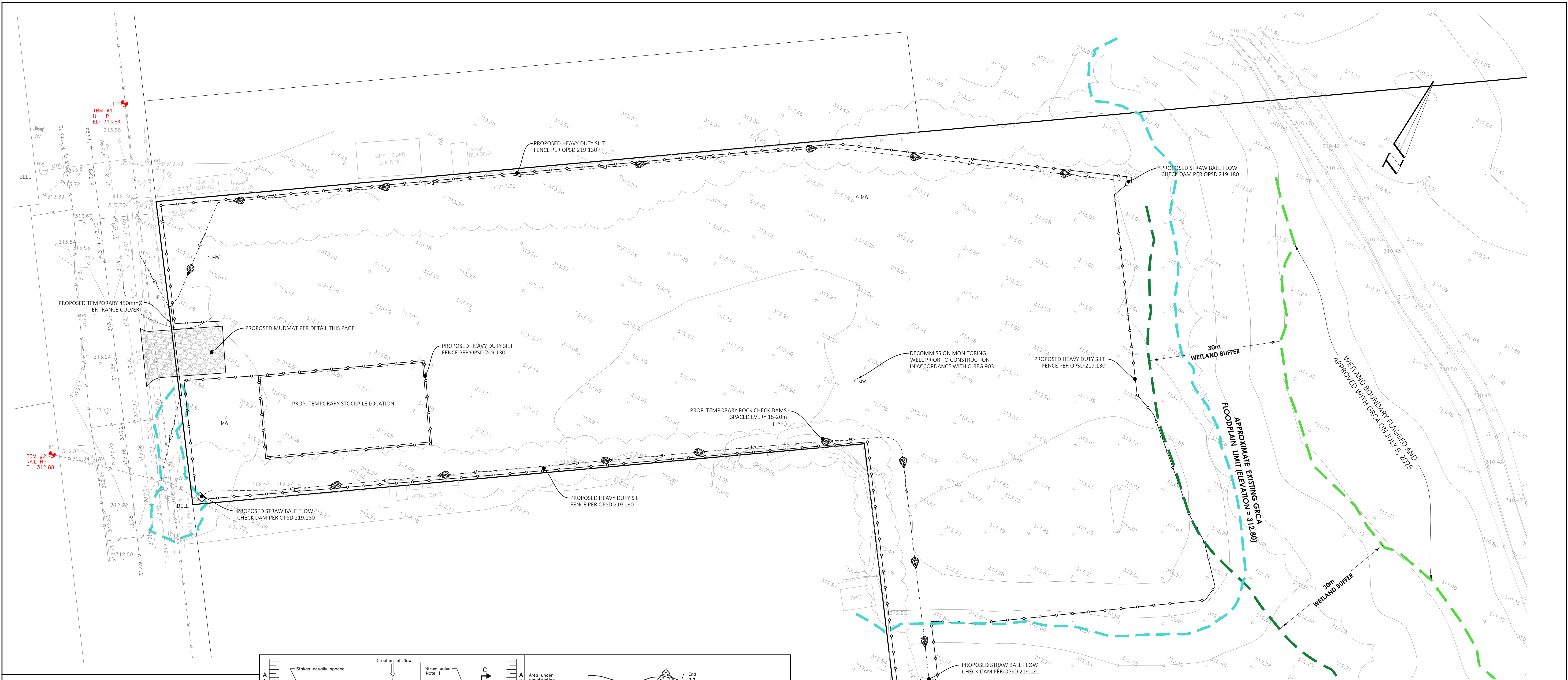
Ponding Requirements to Capture Design Storm:

Catchment	100 yr Q (m ³ /s)	Ponding Req'd (m)*	Ponding Prov'd (m)
DCB1	0.112	0.11	0.30
DCBMH1	0.105	0.11	0.12

*Ponding required to capture design flow per Design Chart 4.19 of the MTO Drainage Manual - Part 4.

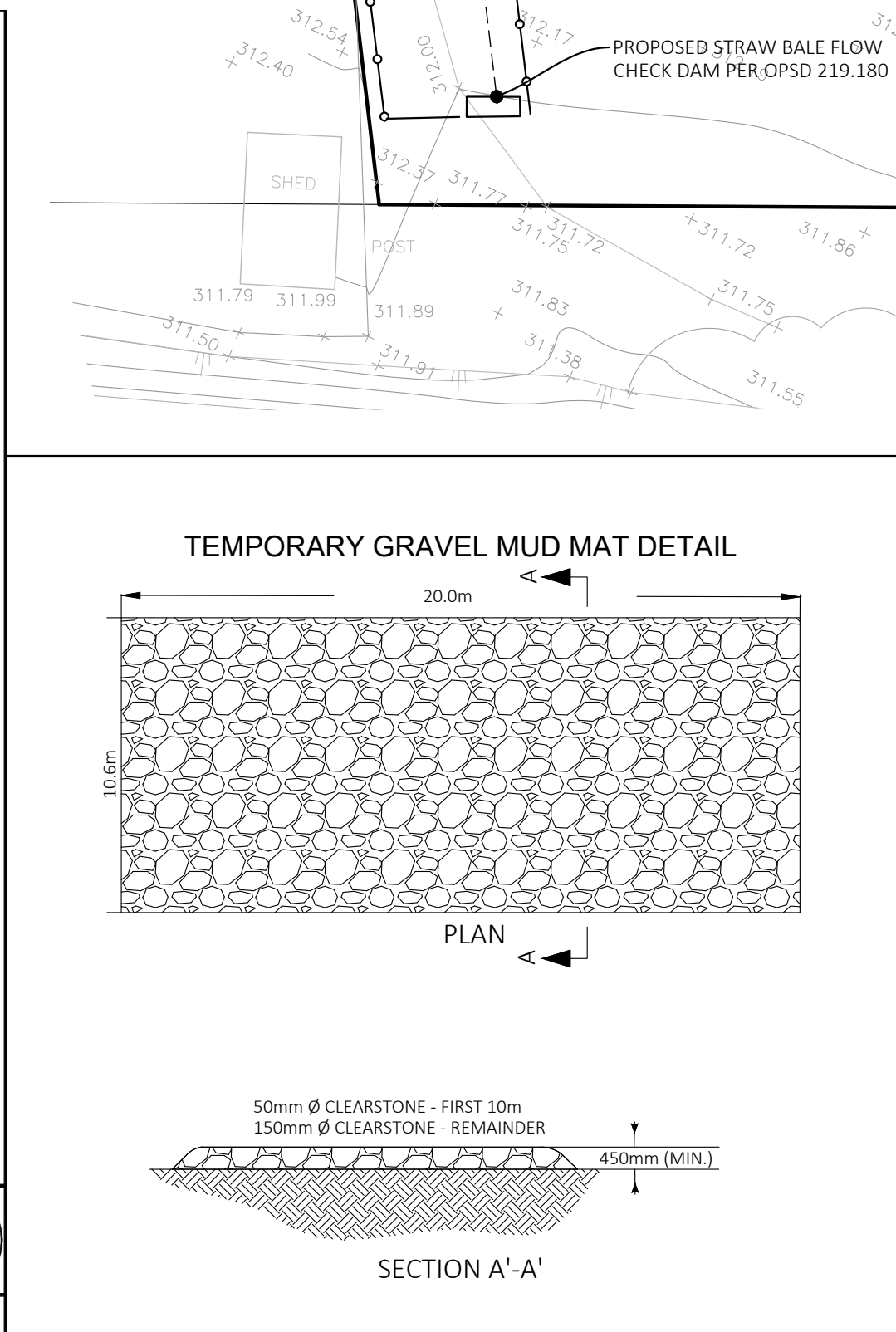
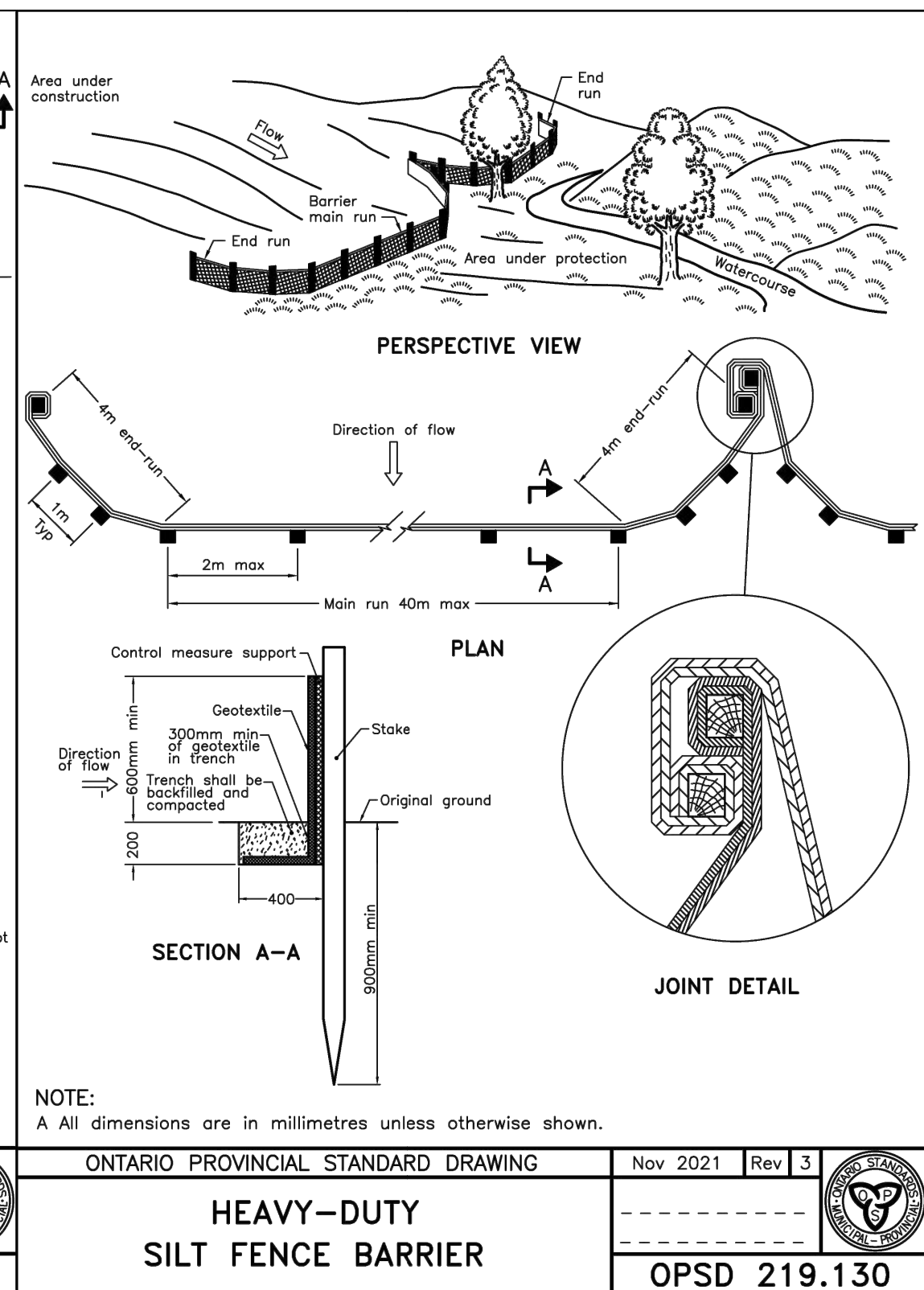
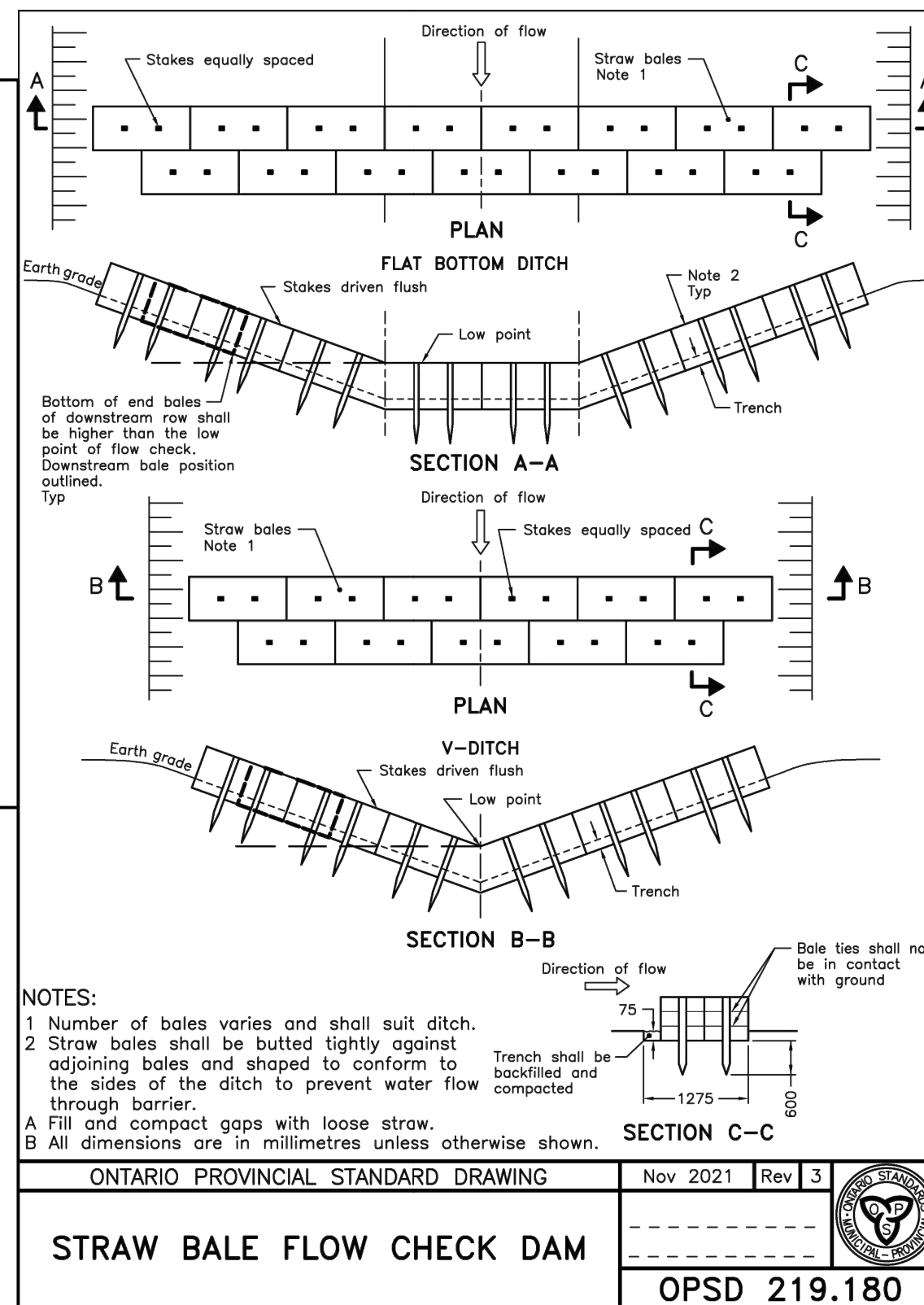
APPENDIX C

FIGURES



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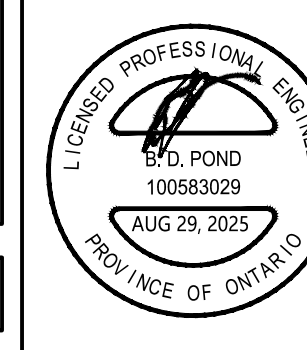
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	- PR. SWALE		- 30m WETLAND BUFFER
	- TREELINE		- WETLAND BOUNDARY
	- PR. MUDMAT		- PR. SILT FENCE



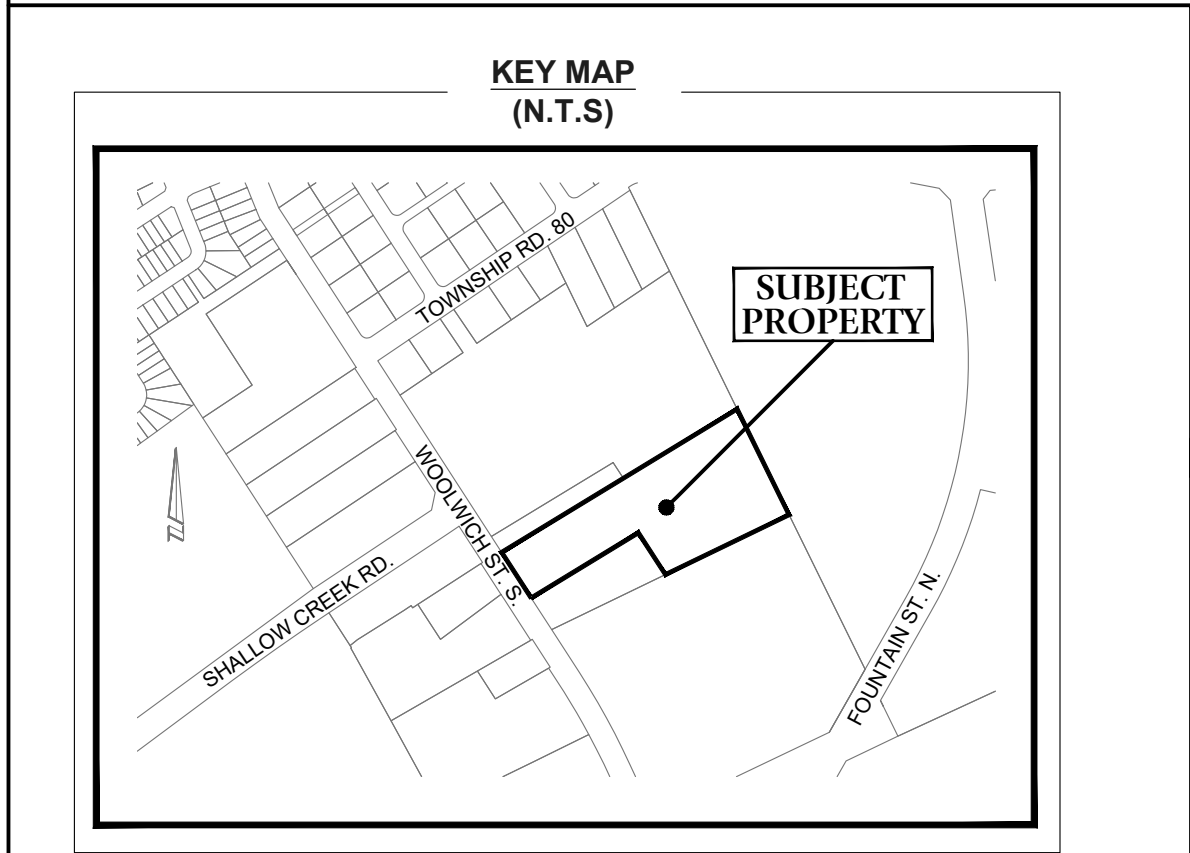
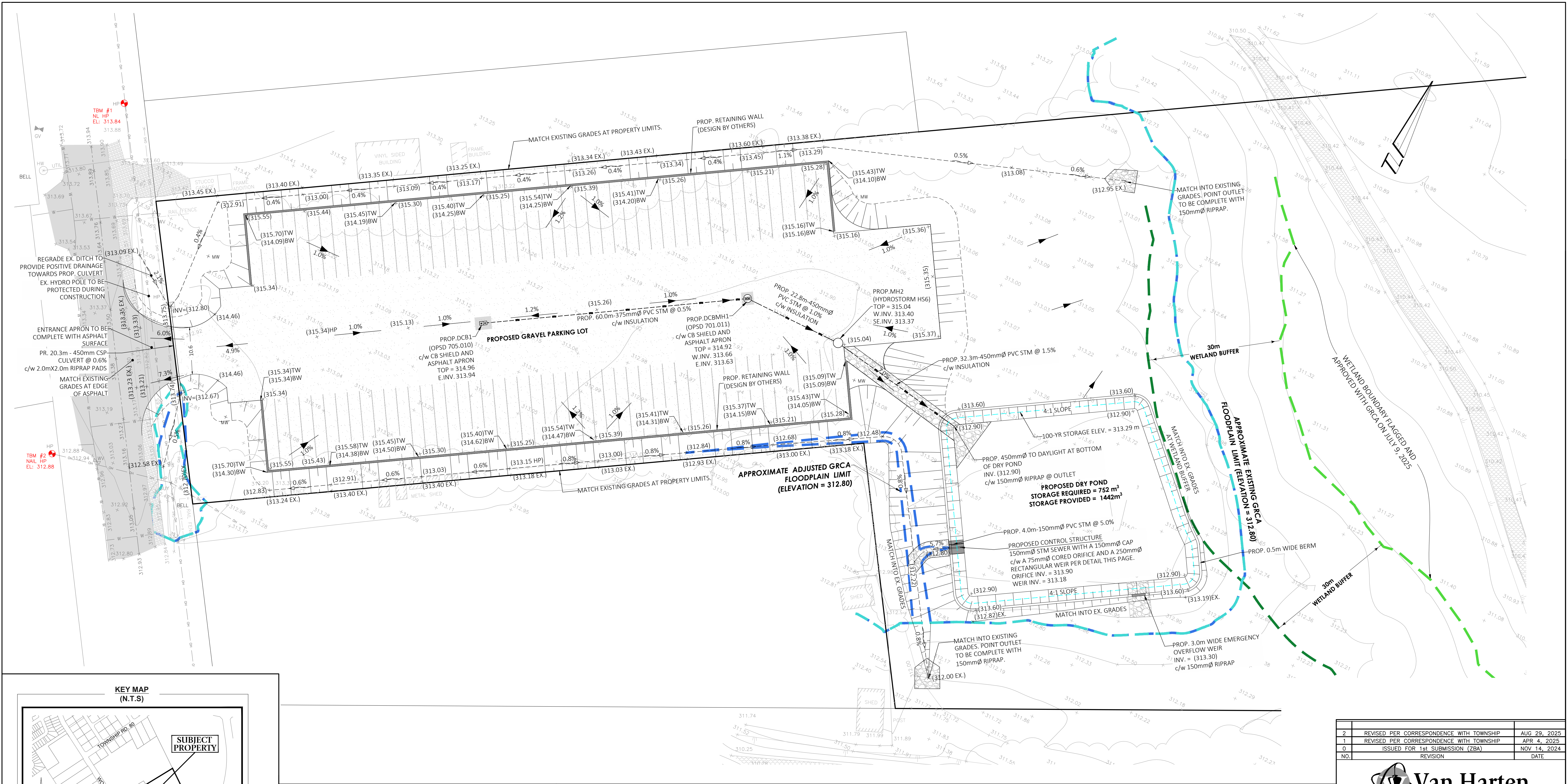
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NOT FOR CONSTRUCTION

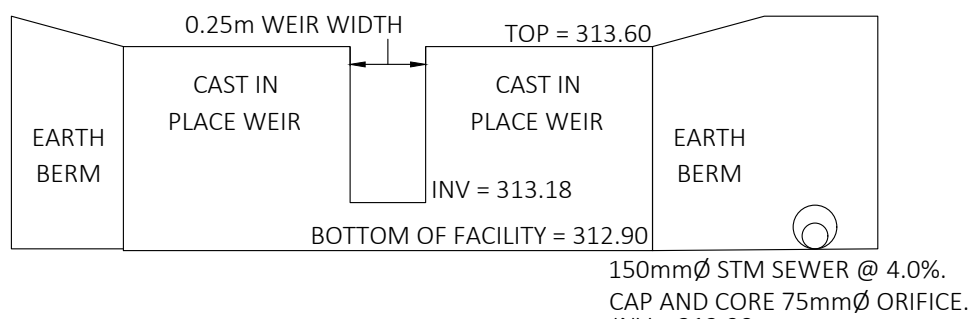


2	REVISED PER CORRESPONDENCE WITH TOWNSHIP	AUG 29, 2025
1	REVISED PER CORRESPONDENCE WITH TOWNSHIP	APR 4, 2025
0	ISSUED FOR 1st SUBMISSION (ZBA)	NOV 14, 2024
NO.	REVISION	DATE
Van Harten LAND SURVEYORS - ENGINEERS		
Kitchener/Waterloo Ph: 519-742-8371		
Guelph Ph: 519-821-2763		
Orangeville Ph: 519-940-4110		
www.vanharten.com info@vanharten.com		
DRAWN BY: CE DESIGNED BY: BP CHECKED BY: KC		
Aug 29, 2025-2:14pm		
C:\Users\B\A\1\HEN\AppData\Local\Temp\Actual\236952\GRADING PT LOT 115 (33259-24 786 GROUP INC.) IJM 2010.dwg		
PREPARED FOR: 786 GROUP INC.		
PROPOSED TRUCK PARKING LOT 265 WOOLWICH STREET SOUTH TOWNSHIP OF WOOLWICH REGIONAL MUNICIPALITY OF WATERLOO		
DRAWING TITLE: EROSION & SEDIMENT CONTROL PLAN		
PROJECT No. 33259-24		
DRAWING No:	SHEET No:	REVISION:
C01	1 OF 5	2
DRAWING SCALE:		1:400

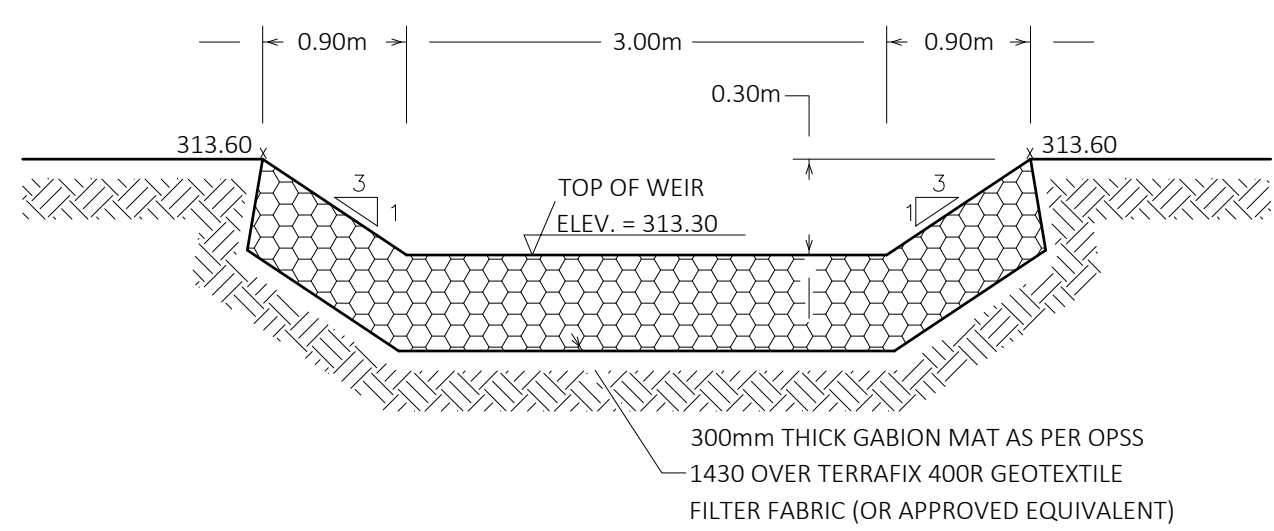


- LEGEND:**
- (300.00) - PROPOSED ELEVATION
 - (300.00)TW - PR. TOP OF WALL ELEV.
 - (300.00)BW - PR. BOTTOM OF WALL ELEV.
 - EXISTING ELEVATION
 - SLOPE 3:1 MAX
 - DIRECTION OF FLOW
 - TREELINE
 - PR. SILT FENCE
 - PR. STORM SEWER
 - ASPHALT
 - GRAVEL
 - APPROXIMATE EX. GRCA FLOODPLAIN LIMIT
 - APPROXIMATE PR. GRCA FLOODPLAIN LIMIT
 - 30m WETLAND BUFFER
 - WETLAND BOUNDARY
 - DOUBLE CATCHBASIN
 - DOUBLE CATCHBASIN MANHOLE
 - MANHOLE

**PROPOSED CONTROL STRUCTURE DETAIL
N.T.S.**



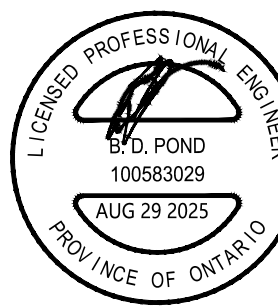
**BROAD CRESTED OVERFLOW WEIR
N.T.S.**



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1	REVISED PER CORRESPONDENCE WITH TOWNSHIP	APR 4, 2025
0	ISSUED FOR 1st SUBMISSION (ZBA)	NOV 14, 2024
NO.	REVISION	DATE



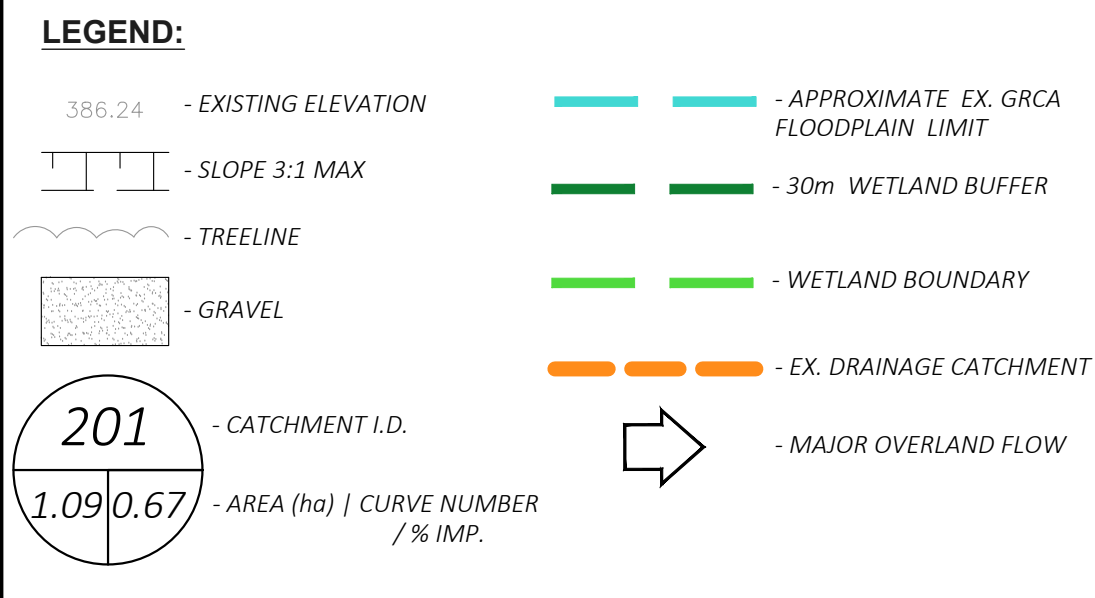
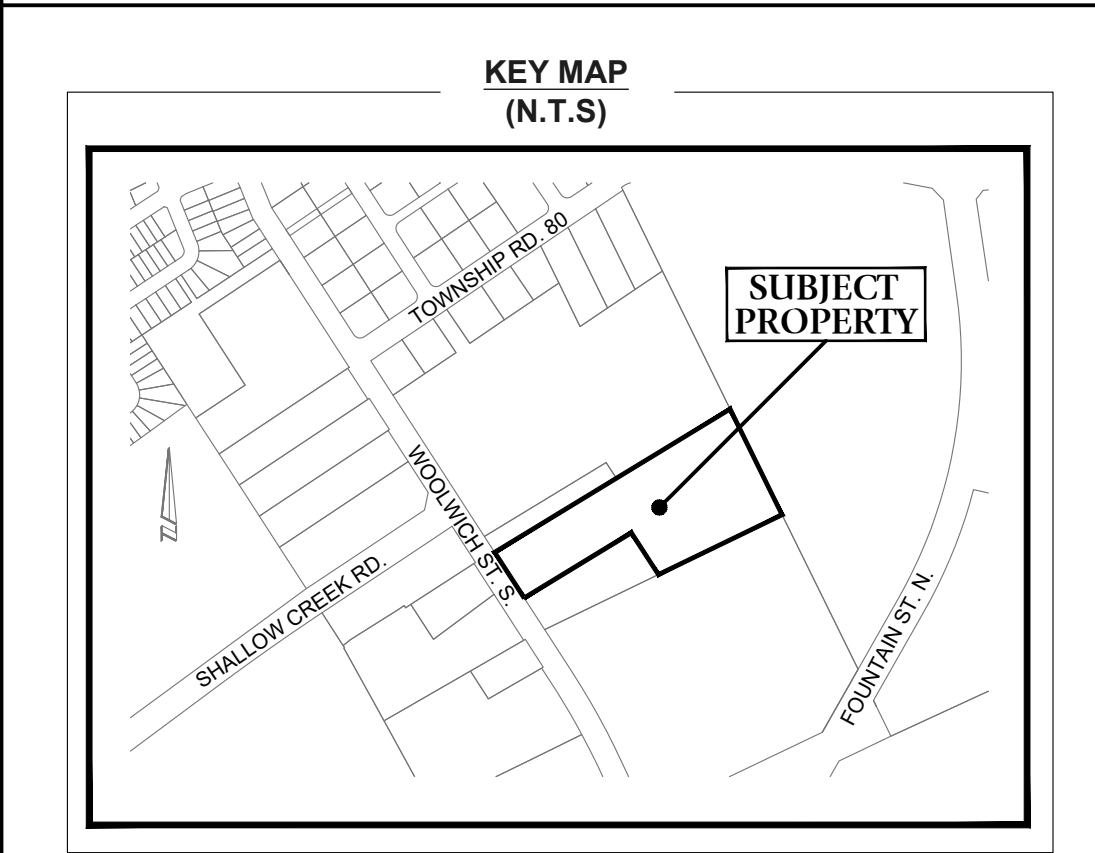
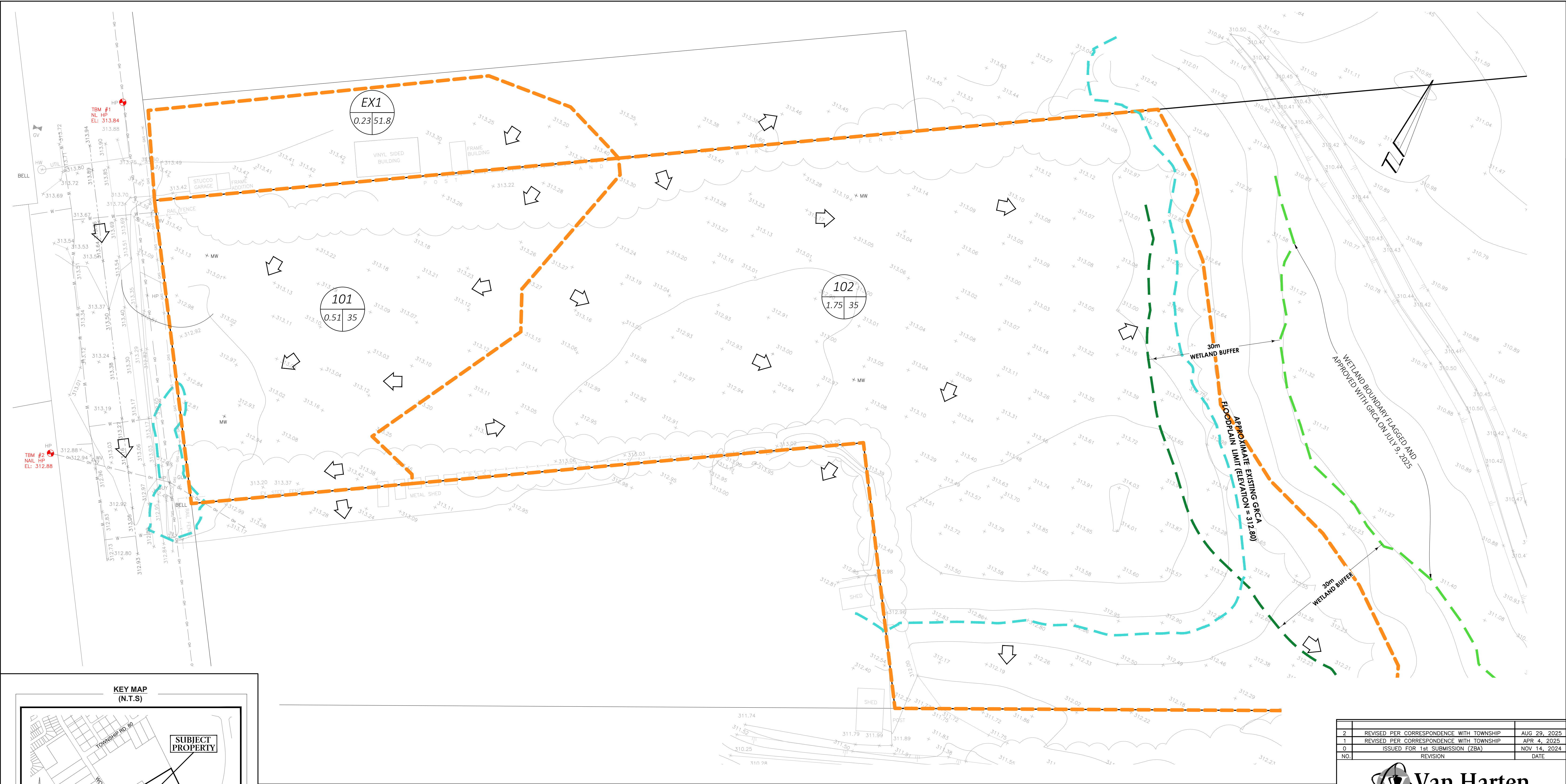
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PREPARED FOR: 786 GROUP INC.		

**PROPOSED TRUCK PARKING LOT
265 WOOLWICH STREET SOUTH
TOWNSHIP OF WOOLWICH
REGIONAL MUNICIPALITY OF WATERLOO**

**SITE GRADING AND SERVICING
PLAN**

PROJECT No. 33259-24

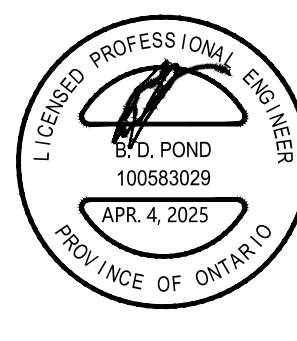
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C02	DRAWING SCALE:	1:400	2



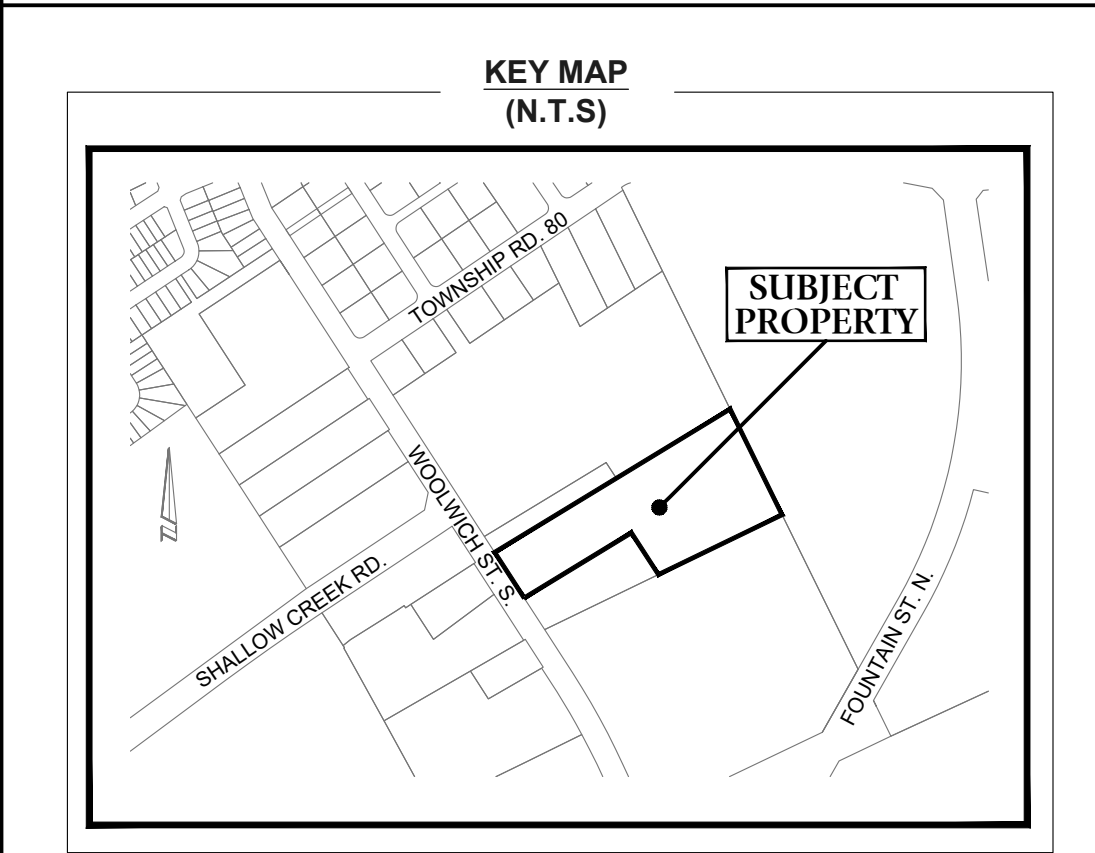
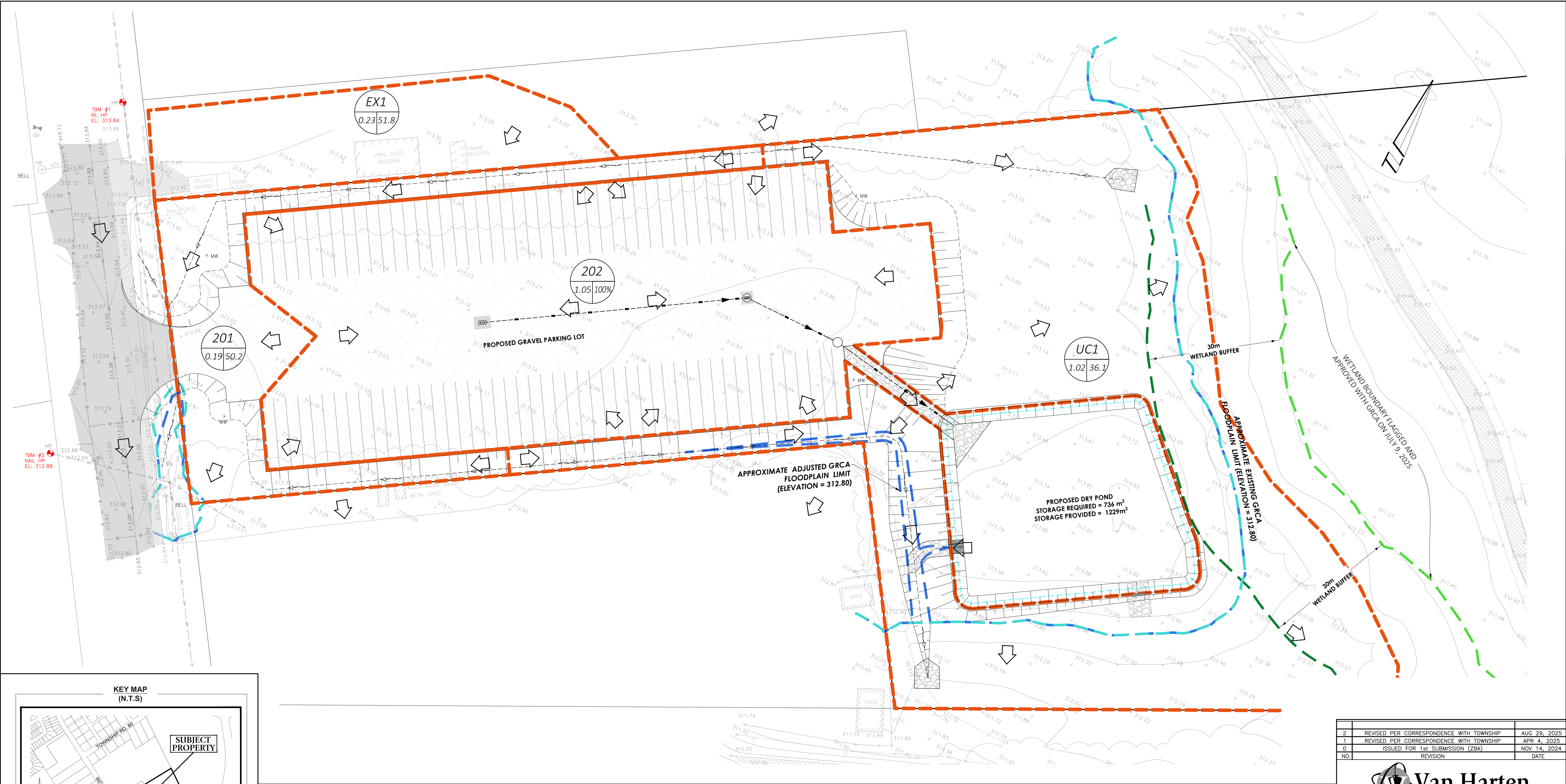
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www.vanharten.com info@vanharten.com		
DRAWN BY: CE DESIGNED BY: BP CHECKED BY: KC		
Aug 29, 2025-2:14pm C:\Users\BAIR\1\HEN\ApptData\LocalTemp\Actual\sh.236952\GRADING PT LOT 115 (83259-24) 786 GROUP INC.) UTM 310-04W		
PREPARED FOR: 786 GROUP INC.		
PROPOSED TRUCK PARKING LOT 265 WOOLWICH STREET SOUTH TOWNSHIP OF WOOLWICH REGIONAL MUNICIPALITY OF WATERLOO		
DRAWING TITLE: EXISTING DRAINAGE PLAN		
PROJECT No. 33259-24		
DRAWING No: C03	SHEET No: 3 OF 5	REVISION: 2
DRAWING SCALE: 1:400		



LEGEND:

- 386.24 - EXISTING ELEVATION
- SLOPE 3:1 MAX
- TREELINE
- GRAVEL
- 201 - CATCHMENT I.D.
- AREA (ha) / CURVE NUMBER / % IMP.
- APPROXIMATE EX. GRCA FLOODPLAIN LIMIT
- APPROXIMATE PR. GRCA FLOODPLAIN LIMIT
- 30m WETLAND BUFFER
- WETLAND BOUNDARY
- PR. DRAINAGE CATCHMENT
- MAJOR OVERLAND FLOW

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NOT FOR CONSTRUCTION



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NO.	REVISION	DATE

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Aug 29, 2025-2:14pm
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PREPARED FOR: 786 GROUP INC.

**PROPOSED TRUCK PARKING LOT
265 WOOLWICH STREET SOUTH
TOWNSHIP OF WOOLWICH
REGIONAL MUNICIPALITY OF WATERLOO**

DRAWING TITLE: **PROPOSED DRAINAGE PLAN**

PROJECT No. 33259-24

DRAWING No: C04	SHEET No: 4 OF 5	REVISION: 2
DRAWING SCALE: 1:400		

GENERAL NOTES

- CONSTRUCTION FOR THIS PROJECT TO COMPLY WITH THE MOST CURRENT VERSION OF THE TOWNSHIP OF WOOLWICH ENGINEERING, DEVELOPMENT AND INFRASTRUCTURE MANUAL, REGION OF WATERLOO AND AREA MUNICIPALITIES DSSMS, THE ONTARIO BUILDING CODE, AND THE ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS.
- ALL CONSTRUCTION TO BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT, AND REGULATIONS FOR CONSTRUCTION PROJECTS.
- A ROAD WORK PERMIT MUST BE OBTAINED FROM THE TOWNSHIP PRIOR TO COMMENCING ANY WORKS WITHIN THE MUNICIPAL ROAD ALLOWANCE.
- THE OWNER IS RESPONSIBLE FOR COORDINATION OF ALL REQUIRED UTILITIES.
- CONTRACTOR TO BE RESPONSIBLE FOR PROVISION, MAINTENANCE AND RESTORATION OF THE CONSTRUCTION ACCESS.
- TEMPORARY SEDIMENT CONTROL DEVICES ARE TO BE INSTALLED PRIOR TO ANY CONSTRUCTION ON THE SITE AND ARE TO BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD TO THE SATISFACTION OF THE TOWNSHIP AND GRAND RIVER CONSERVATION AUTHORITY.
- DISTURBED AREAS TO BE MINIMIZED TO THE EXTENT POSSIBLE, AND TEMPORARILY OR PERMANENTLY STABILIZED OR RESTORED AS THE WORK PROGRESSES.
- THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR LOCATES, EXPOSING, SUPPORTING AND PROTECTING ALL UNDERGROUND AND OVERHEAD UTILITIES AND STRUCTURES EXISTING AT THE TIME OF CONSTRUCTION IN THE ARE OF THEIR WORK WHETHER SHOWN ON THE PLANS OR NOT AND FOR ALL REPAIRS AND CONSEQUENCES RELATING TO DAMAGE OF SAME.
- THE CONTRACTOR(S) SHALL BE SOLELY RESPONSIBLE TO GIVE 72 HOURS WRITTEN NOTICE TO THE UTILITIES, FOR THE PURPOSES OF INSPECTION BY THE CONCERNED UTILITY. THIS INSPECTION WILL BE FOR THE DURATION OF CONSTRUCTION, WITH THE CONTRACTOR RESPONSIBLE FOR ALL COSTS ARISING FROM SUCH INSPECTION.
- A GEOTECHNICAL CONSULTANT SHOULD BE RETAINED TO CARRY OUT NECESSARY INSPECTIONS AND TESTING DURING CONSTRUCTION TO ENSURE PROPER PLACEMENT OF MATERIAL AND ADEQUATE COMPACTION.
- ANY ERRORS, OMISSIONS AND/OR CHANGE OF CONDITIONS ON SITE TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO PERFORMING THE RELATED WORK.
- THIS IS NOT A PLAN OF SURVEY AND SHALL NOT BE USED FOR TRANSACTION OR MORTGAGE PURPOSES.

GRADING NOTES

- THE ENGINEER/DESIGN HEREBY CERTIFIES THAT THE PROPOSED LOT DRAINAGE AND/OR GRADING PLAN HAVE BEEN DESIGNED IN ACCORDANCE WITH DRAINAGE COMMON LAW IN ONTARIO, SOUND ENGINEERING PRINCIPLES AND THE ONTARIO BUILDING CODE ARTICLES SUCH AS BUT NOT LIMITED TO 9.14.6.1 & 9.15.4.6. THE ENGINEER/DESIGNER ENSURES ARTIFICIALLY COLLECTED AND/OR SURFACE DRAINAGE WILL NOT ADVERSELY AFFECT ADJACENT PROPERTIES.
- PROPOSED DRIVEWAY SLOPES TO BE BETWEEN 2% MINIMUM AND 8% MAXIMUM.
- GRAVEL PARKING AREA TO BE GRADED BETWEEN 1.0% AND 5% MAXIMUM.
- ALL SLOPES NOT TO EXCEED 3H:1V UNLESS OTHERWISE NOTED.
- DISTURBED LOT AREAS TO BE RESTORED WITH MINIMUM 150mm TOPSOIL AND EITHER SEED OR SOD, UNLESS OTHERWISE SPECIFIED ON PROJECT LANDSCAPE PLANS.
- RETAINING WALLS TO BE DESIGNED BY OTHERS. RETAINING WALLS TO BE DESIGNED COMPLETE WITH GUARD WHERE REQUIRED BY THE ONTARIO BUILDING CODE. RETAINING WALLS IN EXCESS OF 0.6m HEIGHT ARE TO BE DESIGNED BY A PROFESSIONAL ENGINEER.
- MATCH EXISTING GRADES AT ALL PROPERTY BOUNDARIES. GRADING NOT TO EXTEND ONTO ADJACENT PROPERTIES WITHOUT PRIOR WRITTEN PERMISSION OF THE AFFECTED PROPERTY OWNER(S). A COPY OF ANY SUCH AGREEMENT IS TO BE MADE AVAILABLE TO THE DIRECTOR OF ENGINEERING PRIOR TO ANY TOPSOIL STRIPPING OR GRADING.
- ALL GRANULAR MATERIAL TO BE COMPACTED TO MINIMUM 100% AND OTHER MISCELLANEOUS FILL MATERIAL TO BE COMPACTED TO MINIMUM 95% STANDARD PROCTOR MAXIMUM DRY DENSITY (UNLESS OTHERWISE PRESCRIBED BY A QUALIFIED GEOTECHNICAL ENGINEER).
- ALL EARTHWORKS ACTIVITIES TO BE UNDERTAKEN IN CONFORMANCE WITH O.Reg. 406/19 REGARDING ON-SITE AND EXCESS SOIL MANAGEMENT.

WORKS WITHIN THE MUNICIPAL RIGHT-OF-WAY

- PRIOR TO COMMENCEMENT OF ANY WORKS WITHIN THE MUNICIPAL ROAD ALLOWANCE, THE OWNER IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS FROM THE TOWNSHIP OF WOOLWICH AND/OR REGION OF WATERLOO AND/OR MTO.
- CONTRACTOR TO COMPLY WITH CONDITIONS OF ALL PERMITS ISSUED BY THE MUNICIPALITY, WHERE A PERMIT CONDITION DIFFERS FROM THESE NOTES, THE PERMIT(S) SHALL TAKE PRECEDENT.
- NOTIFICATION TO FIRE AND EMERGENCY SERVICES, AND SCHOOL, BOARDS REQUIRED TO BE PROVIDED A MINIMUM OF 48 HOURS PRIOR TO COMMENCING WORK.
- ROAD MUST BE MAINTAINED TO A MINIMUM OF ONE LANE AT ALL TIMES FOR EMERGENCY ACCESS PER THE OTM GUIDELINES.
- A MINIMUM OF 3.5m CLEARANCE IS TO BE PROVIDED FROM THE LIMITS OF ALL SIDEWALKS AND DRIVEWAYS TO THE EXISTING UTILITY STRUCTURES WITHIN THE MUNICIPAL RIGHT OF WAY. IF THIS CLEARANCE IS NOT MAINTAINED, THEY SHALL BE RELOCATED AT THE APPLICANT'S EXPENSE.
- CONTRACTOR IS RESPONSIBLE FOR PROPERLY COMPACTING THE BACKFILL MATERIAL AND REPLACING ALL SURFACES TO ORIGINAL CONDITION OR BETTER.
- BACKFILL MATERIALS AND PLACEMENT TO CONFORM TO THE ROAD OCCUPANCY PERMIT. SERVICE CONNECTION BACKFILL TO BE DISCUSSED WITH THE TOWNSHIP.
- DISTURBED BOULEVARD AREAS TO FINE GRADED AND RESTORED WITH 300mm TOPSOIL AND No. 1 NURSERY SOD TO THE SATISFACTION OF THE TOWNSHIP.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR TRAFFIC CONTROL IN ACCORDANCE WITH OTM BOOK 7 – TEMPORARY CONDITIONS.

TEMPORARY EROSION AND SEDIMENT CONTROL NOTES

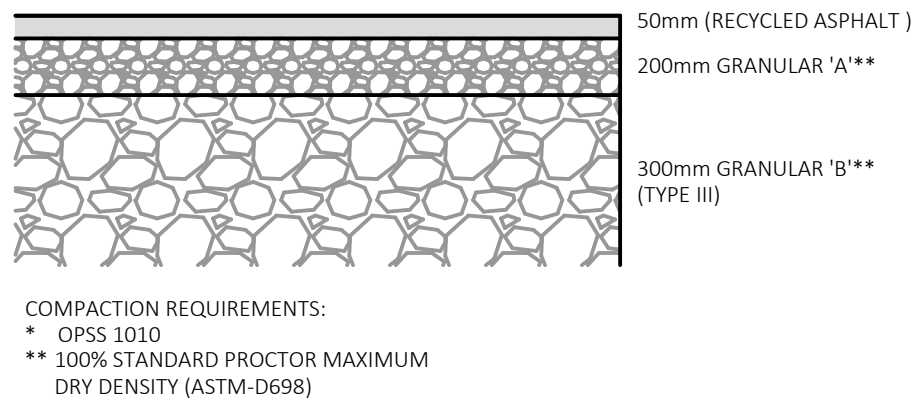
- EROSION AND SEDIMENT CONTROL (ESC) MEASURES TO BE IMPLEMENTED PRIOR TO, AND MAINTAINED DURING THE CONSTRUCTION PHASES. ALL DAMAGED EROSION AND SEDIMENT CONTROLS SHOULD BE REPAIRED AND/OR REPLACED WITHIN 48 HOURS OF INSPECTION.
- THE CONTRACTOR IS RESPONSIBLE TO ENSURE THAT TEMPORARY SEDIMENT CONTROLS ARE FUNCTIONING AS INTENDED.
- ALL DISTURBED GROUND LEFT INACTIVE FOR 30 DAYS SHALL BE VEGETATED, SUBJECT TO WEATHER CONDITIONS.
- DISTURBED AREAS TO BE MINIMIZED TO THE EXTENT POSSIBLE, AND TEMPORARILY OR PERMANENTLY STABILIZED OR RESTORED AS THE WORK PROGRESSES.
- ALL IN-WATER AND NEAR-WATER WORKS TO BE CONDUCTED IN THE DRY WITH APPROPRIATE EROSION AND SEDIMENT CONTROLS.
- ALL GRADES WITHIN THE REGULATORY FLOOD PLAIN TO BE MAINTAINED OR MATCHED.
- THE CONTRACTOR SHALL MONITOR THE WEATHER SEVERAL DAYS IN ADVANCE OF THE ONSET OF THE PROJECT TO ENSURE THAT THE WORKS WILL BE CONDUCTED DURING FAVOURABLE WEATHER CONDITIONS. SHOULD AN UNEXPECTED STORM ARISE, THE CONTRACTOR IS TO REMOVE ALL UNFIXED ITEMS FROM THE REGIONAL STORM FLOOD PLAIN THAT WOULD HAVE THE POTENTIAL TO CAUSE A SPILL OR AN OBSTRUCTION TO FLOW (e.g. FUEL TANKS, PORTA-POTTIES, MACHINERY, EQUIPMENT, CONSTRUCTION MATERIAL, etc.).
- ALL ACCESS TO THE WORK SITE TO BE FROM EITHER SIDE OF THE WATERCOURSE. NO EQUIPMENT OR VEHICLES ARE PERMITTED TO CROSS THROUGH THE WATERCOURSE UNLESS APPROVED BY THE GRCA. WHERE IMPACTS TO LOCAL FISH POPULATIONS MAY OCCUR DURING THEIR SPAWNING, NURSERY AND MIGRATORY PERIODS, CONSTRUCTION TIMING WINDOWS SHOULD APPLY TO IN-WATER OR NEAR-WATER ACTIVITIES. THE PROPONENT/CONTRACTOR SHOULD CONFIRM APPLICABILITY AND DATES WITH APPROPRIATE PROVINCIAL AND FEDERAL AGENCIES.
- FISH AND WILDLIFE STRANDED WITHIN THE WORK AREA TO BE CAPTURED AND RELEASED LIVE IN SUITABLE HABITAT UPSTREAM OF THE WORK AREA UNDER THE SUPERVISION OF QUALIFIED AQUATIC TECHNICAL STAFF. THE PROPONENT/CONTRACTOR SHOULD CONFIRM REQUIREMENTS DIRECTLY WITH THE MINISTRY OF NATURAL RESOURCES AND FORESTRY.
- THE EROSION AND SEDIMENT CONTROL STRATEGIES ARE NOT STATIC AND MAY NEED TO BE UPGRADED/AMENDED AS SITE CONDITIONS CHANGE TO MINIMIZE SEDIMENT LADEN RUNOFF FROM LEAVING THE WORK AREA. IF THE IDENTIFIED MEASURES ON THE PLAN ARE NOT EFFECTIVE IN PREVENTING THE RELEASE OF A DELETERIOUS SUBSTANCE, INCLUDING SEDIMENT, THEN ALTERNATIVE MEASURES MUST BE IMPLEMENTED IMMEDIATELY TO MINIMIZE POTENTIAL ECOLOGICAL IMPACTS. ADDITIONAL ESC MEASURES ARE TO BE KEPT ON SITE AND USED AS NECESSARY.
- NO ALTERNATIVE METHODS OF EROSION PROTECTION SHALL BE PERMITTED UNLESS APPROVED BY THE DESIGN CONSULTANT AND THE TOWNSHIP OF WOOLWICH.
- INSPECTION OF ESC MEASURES SHOULD OCCUR, AT MINIMUM: DURING PERIODS OF EARTHWORKS ACTIVITIES:
 - ON A WEEKLY BASIS;
 - AFTER EVERY RAINFALL EVENT;
 - AFTER SIGNIFICANT SNOWMELT EVENTS;
 - DAILY DURING PERIODS OF EXTENDED RAIN OR SNOWMELT.DURING INACTIVE PERIODS:
 - ONCE A MONTH;
 - AFTER SIGNIFICANT RAINFALL OR SNOWMELT EVENTS.
- ALL ACTIVITIES, INCLUDING MAINTENANCE PROCEDURES, TO BE CONTROLLED TO PREVENT THE ENTRY OF PETROLEUM PRODUCTS, DEBRIS, RUBBLE, CONCRETE OR OTHER DELETERIOUS SUBSTANCES INTO SEWERS, WATER BODIES AND/OR DITCHES.
- VEHICULAR REFUELING AND MAINTENANCE TO BE COMPLETED IN A DESIGNATED AREA.
- ALL CONSTRUCTION VEHICLES MUST ENTER AND EXIT THE SITE ONLY FROM THE APPROVED ACCESS ROUTE.
- CONTRACTOR TO BE RESPONSIBLE FOR PROVISIONS, MAINTENANCE AND RESTORATION OF THE CONSTRUCTION ACCESS.
- MUD MAT TO BE CONSTRUCTED AT THE ACCESS POINT TO THE SITE. CONTRACTOR TO MAINTAIN MUD MAT TO MAXIMIZE EFFECTIVENESS AT ALL TIMES. ALL VEHICLES ARE TO ENTER AND LEAVE THE SITE VIA THE MUD MAT.
- THE CONTRACTOR IS RESPONSIBLE FOR ENSURING MUNICIPAL ROADWAYS AND SIDEWALKS ARE CLEARED OF ALL SEDIMENTS FROM VEHICULAR TRACKING AT THE END OF EACH WORKING DAY. STREET SWEEPING TO BE UNDERTAKEN AS NEEDED.
- NO CONSTRUCTION ACTIVITY OR MACHINERY SHALL BE ALLOWED BEYOND THE LIMIT OF THE TEMPORARY SEDIMENT CONTROL FENCE OR THE SITE WORKS.
- THE CONTRACTOR SHALL TAKE CARE AND CONTROL SPILLS, FLUIDS AND MATERIALS DURING CONSTRUCTION TO MINIMIZE RISK TO THE ENVIRONMENT.
- DEWATERING WILL NOT BE PERMITTED DURING CONSTRUCTION. SHOULD DEWATERING BE REQUIRED, A SEPARATE PLAN AND APPROVAL IS TO BE OBTAINED. NO PUMPING OF SEDIMENT LADEN RUNOFF FORM THE SITE IS PERMITTED AT ANY TIME.
- THE CONTRACTOR IS RESPONSIBLE TO IMPLEMENT DUST CONTROL MEASURES AND CONSTRUCTION BEST PRACTICE GUIDELINES AS APPROVED BY THE TOWNSHIP AND/OR CONSERVATION AUTHORITY.
- PRIOR TO SITE DISTURBANCE THE CONTRACTOR / PROPONENT SHOULD ENSURE THAT THE WORKS ARE IN CONFORMANCE WITH MIGRATORY BIRDS CONVENTION ACT. PLEASE NOTE THAT THE GENERAL BREEDING BIRD TIMING WINDOW FOR THIS AREA IS APRIL 1ST TO AUGUST 31ST, HOWEVER, BREEDING ACTIVITIES MIGHT INITIATE PRIOR TO AND CONTINUE PAST THIS PERIOD.
- TOPSOIL AND TEMPORARY MATERIAL STOCKPILES TO BE ENCLOSED WITH SEDIMENT CONTROL FENCE. SEDIMENT CONTROL FENCE FOR STOCKPILES TO BE TERRAFIX TERRAFENCE OR APPROVED EQUIVALENT. REMOVE TEMPORARY SEDIMENT CONTROLS FOLLOWING COMPLETION OF CONSTRUCTION AND SITE STABILIZATION.
- ACCUMULATED SEDIMENT TO BE REMOVED FORM THE SEDIMENT BARRIER ONCE IT REACHES A DEPTH OF MAXIMUM 300mm. ALL ACCUMULATED SEDIMENT IS TO BE REMOVED PRIOR TO REMOVING THE TEMPORARY SEDIMENT CONTROL FENCING.
- AN AFTER HOURS CONTACT LIST IS TO BE VISIBLY POSTED ON-SITE FOR EMERGENCIES. ALL THE PLANS SHOULD HAVE THE NAME AND CONTACT INFORMATION FOR THE PERSON RESPONSIBLE FOR MAINTENANCE OF ESC MEASURES.
- ANY SEDIMENT OR OTHER SPILL FROM THE SITE IS TO BE REPORTED TO THE MINISTRY OF ENVIRONMENT (SPILL ACTION CENTRE) AT 1-800-268-6060.

CONTACT LIST

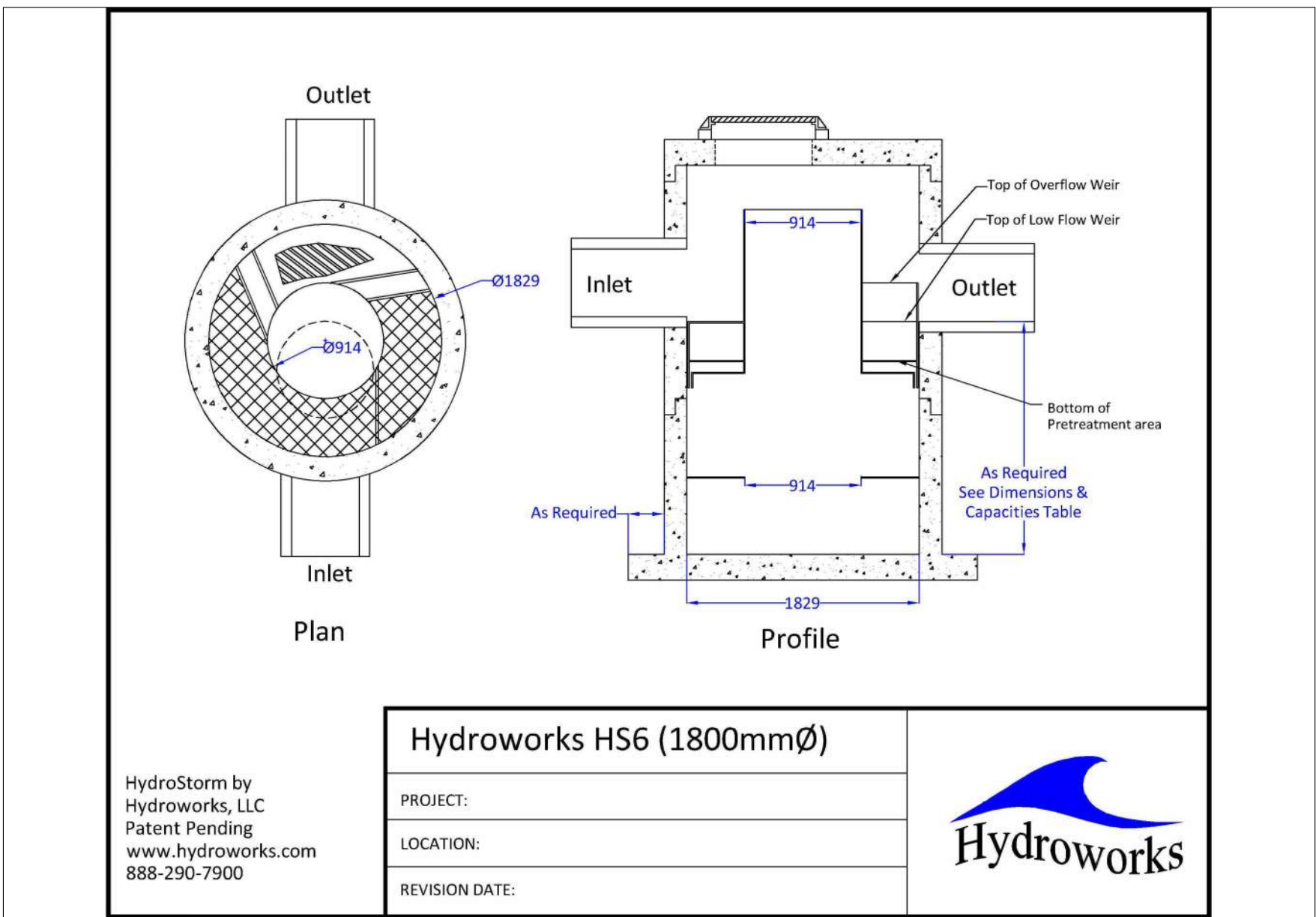
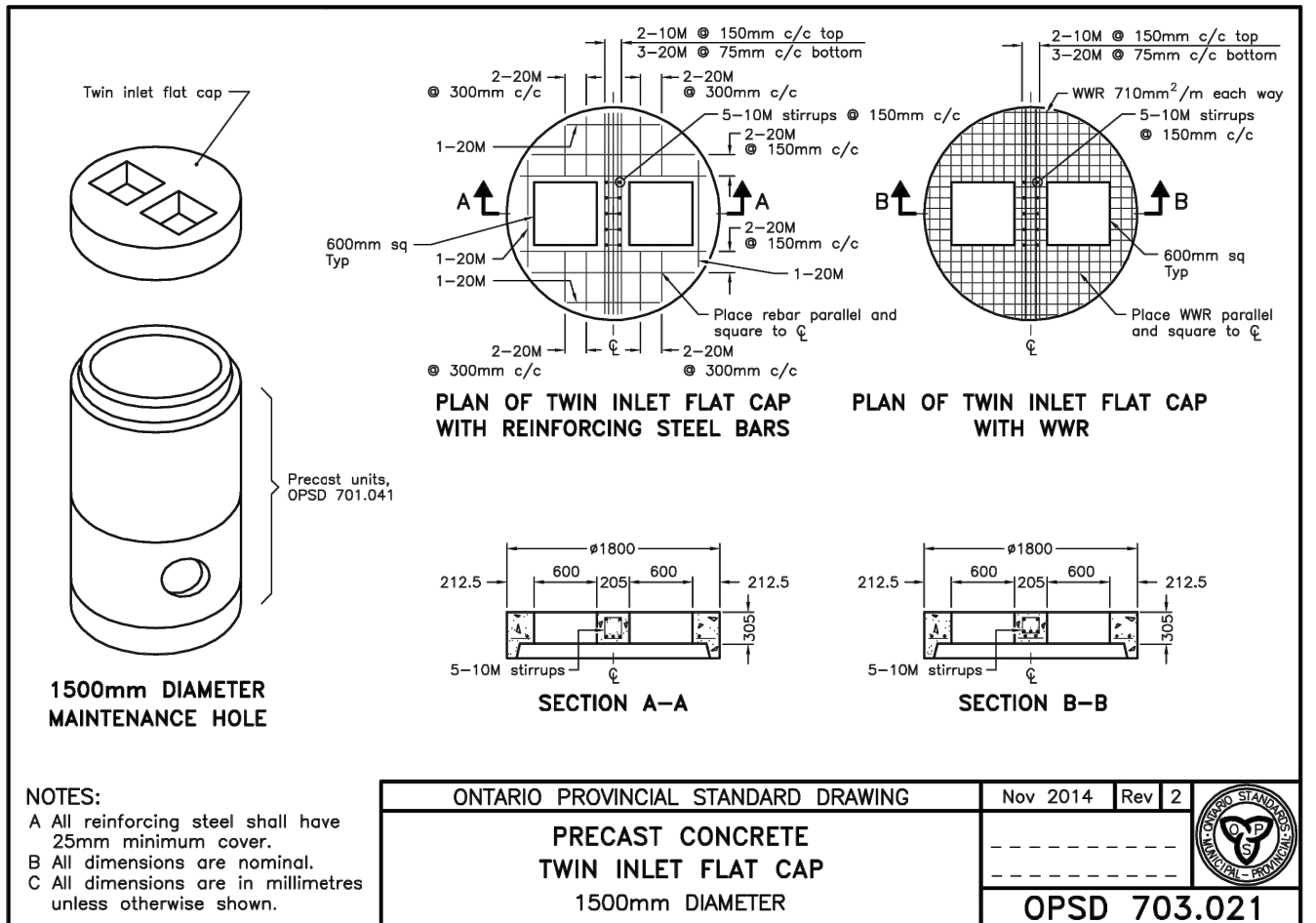
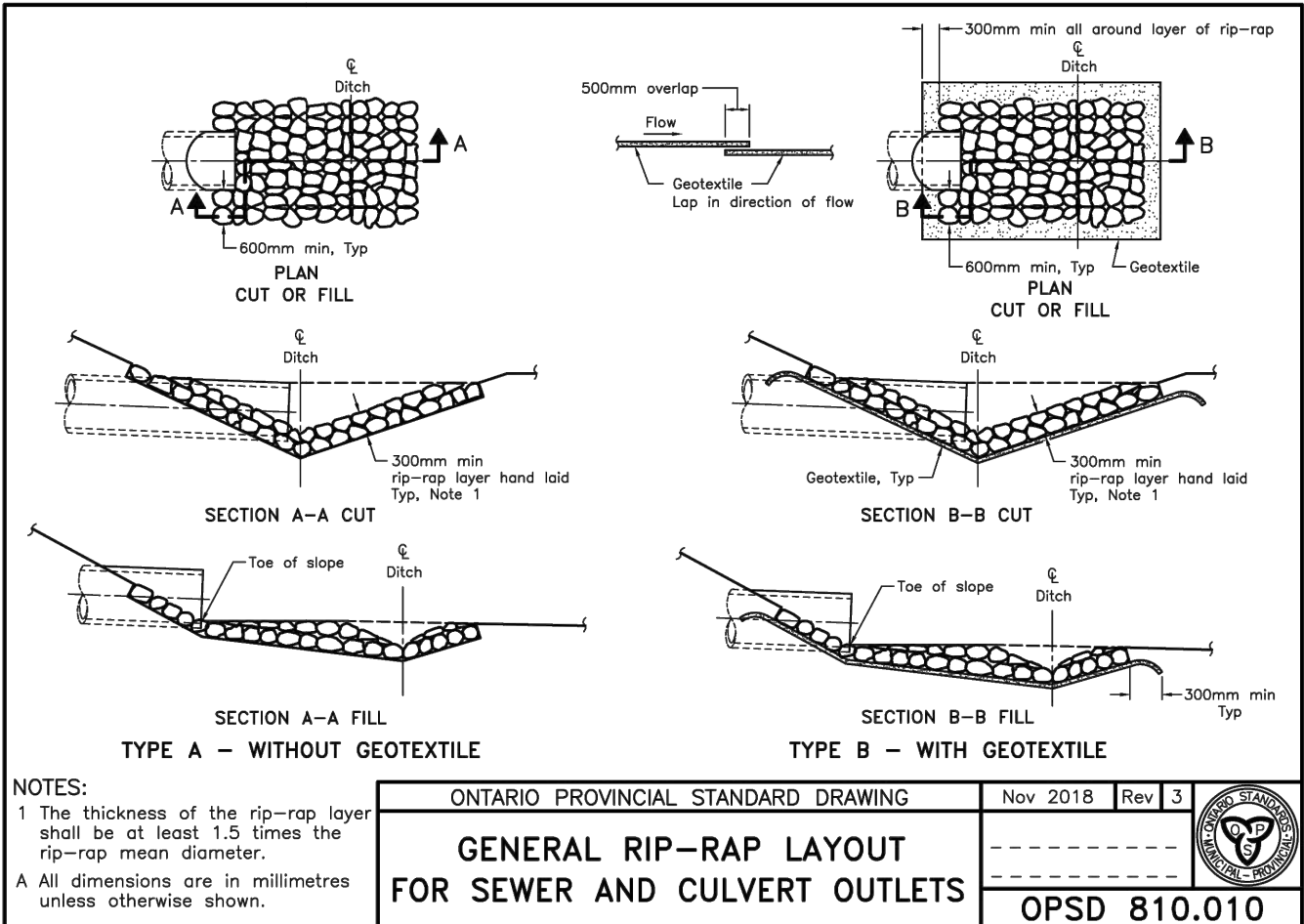
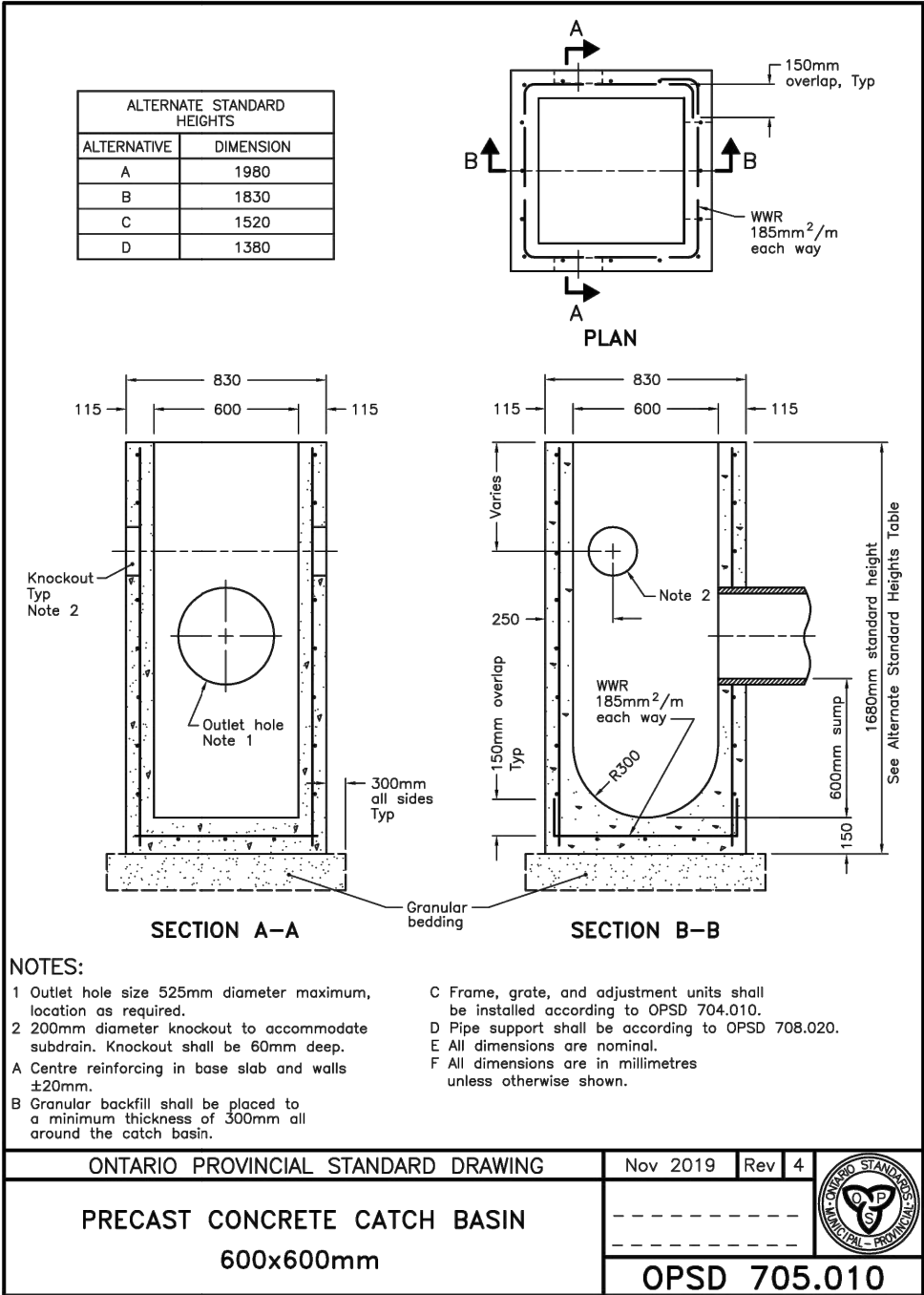
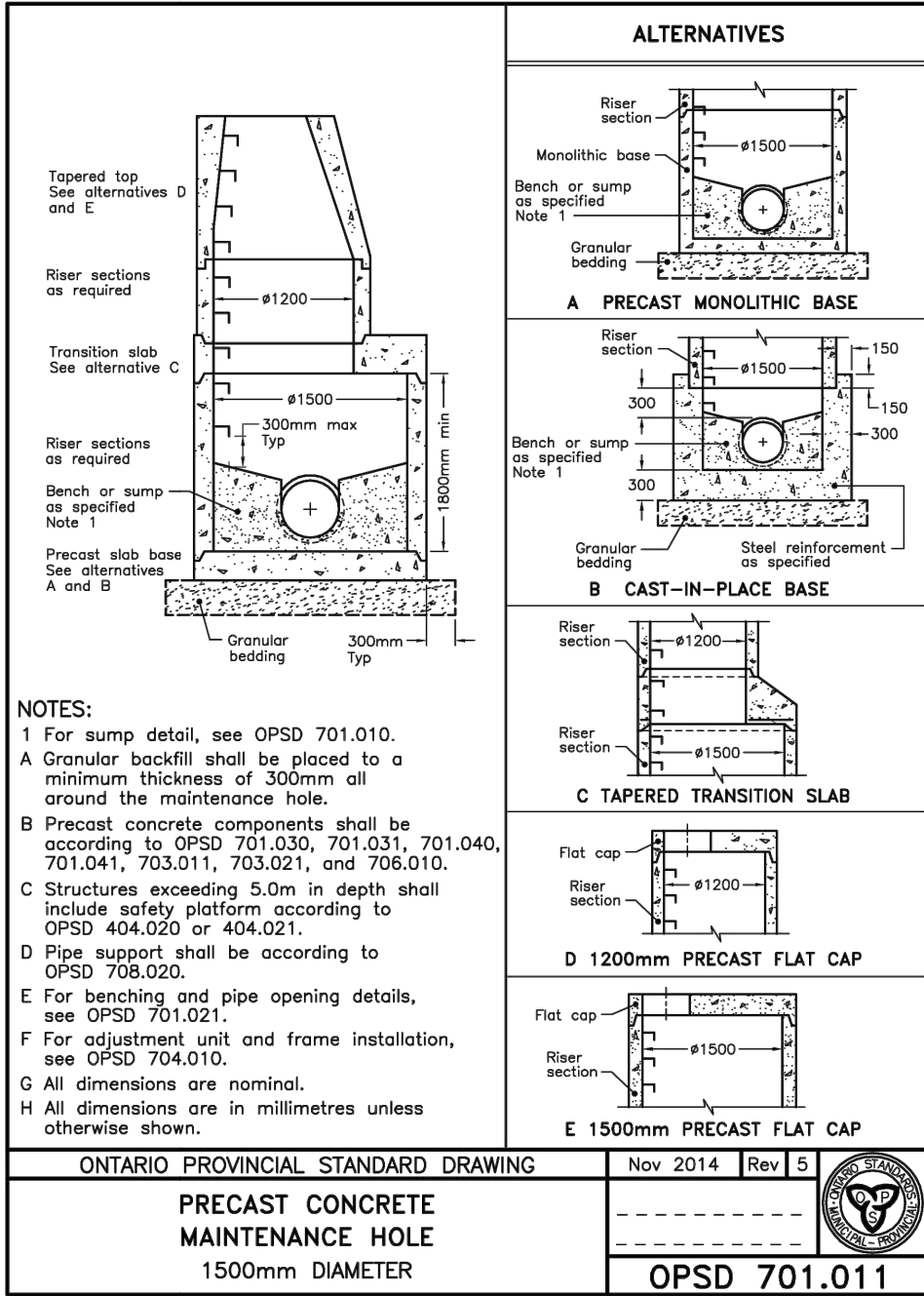
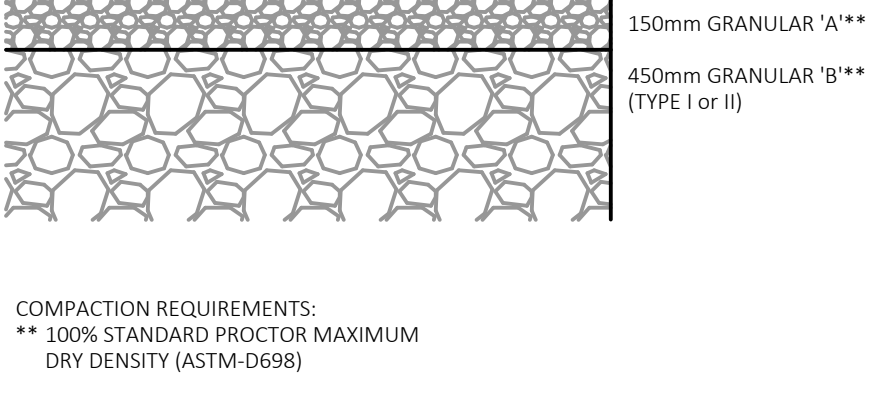
TOWNSHIP OF WOOLWICH
GRAND RIVER CONSERVATION AUTHORITY
MINISTRY OF ENVIRONMENT-SPILLS REPORTING
OWNER
BUILDER
ENGINEER - VAN HARTEN SURVEYING INC.

519-669-1647
519-621-2761
1-800-268-6060
TBD
TBD
519-821-2763

ASPHALT ENTRANCE DETAIL (MIN.)
(N.T.S.)



GRAVEL STRUCTURE DETAIL (MIN.)
(N.T.S.)



2	REVISED PER CORRESPONDENCE WITH TOWNSHIP	AUG 29, 2025
1	REVISED PER CORRESPONDENCE WITH TOWNSHIP	APR 4, 2025
0	ISSUED FOR 1st SUBMISSION (ZBA)	NOV 14, 2024
NO.	REVISION	DATE



Kitchener/Waterloo Ph: 519-742-8371	Guelph Ph: 519-821-2763	Orangeville Ph: 519-940-4110
www.vanharten.com		info@vanharten.com

DRAWN BY: CE	DESIGNED BY: BP	CHECKED BY: KC
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PREPARED FOR: 786 GROUP INC.

PROPOSED TRUCK PARKING LOT
265 WOOLWICH STREET SOUTH
TOWNSHIP OF WOOLWICH
REGIONAL MUNICIPALITY OF WATERLOO

DRAWING TITLE:
NOTES AND DETAILS

PROJECT No. 33259-24

DRAWING No:	SHEET No:	5 OF 5	REVISION:
C05	DRAWING SCALE:	NTS	2